NORTH AMERICAN WATERFOWL MANAGEMENT PLAN

ATLANTIC COAST JOINT VENTURE

WATERFOWL IMPLEMENTATION PLAN

REVISION

June 2005

TABLE OF CONTENTS

LIST OF FIGURES..... III

LIST OF TABLES V

SIGNATURE PAGE. VIII

EXECUTIVE SUMMARY 1

1. INTRODUCTION 2

2.1 Overall description 7

2.2 Waterfowl Habitat 7

3. HABITAT STATUS AND TRENDS 15

3.1 Status and Trends of Wetlands 15

3.2 Status and Trends of Other Habitat Types 18

4. WATERFOWL POPULATION STATUS AND TRENDS 31

4.1 Breeding Populations 31

4.2 Wintering Populations 34

5. THREATS TO THE CONSERVATION OF WATERFOWL IN THE ACJV 36

5.1 Habitat Loss, Fragmentation and Degradation 36

5.2 Contaminants 37

5.3 Disease 37

5.4 Invasive Species 37
5.4.1 Alligatorweed 38
5.4.2 Purple Loosestrife 39
5.4.3 Common Reed 39
5.4.4 Water Chestnut 39

5.5 Predation and Harvest 40

5.6 Human population and disturbance 40

5.7 Global Climate Change 43

6. GOALS AND OBJECTIVES FOR WATERFOWL CONSERVATION 44

6.1 Continental Prioritization 44

6.2 Joint Venture Prioritization.....44

6.3 Regional Prioritization 48

6.4 Atlantic Coast Joint Venture Planning Objectives 48

7. STRATEGIES TO ACHIEVE GOALS AND OBJECTIVES 64

7.1 Conservation Coordination and Delivery 64

7.2 Important Geographic Areas for Waterfowl Habitat Conservation in the Atlantic Coast Joint Venture ..66

7.2.1 Connecticut 70
7.2.2 Delaware 95
7.2.3 Florida.....112
7.2.4 Georgia 128
7.2.5 Maine 152
7.2.6 Maryland.....167
7.2.7 Massachusetts 191
7.2.8 New Hampshire 217
7.2.9 New Jersey.....224
7.2.10 New York.....247
7.2.11 North Carolina 283
7.2.12 Pennsylvania 327
7.2.13 Puerto Rico 363
7.2.14 Rhode Island 416
7.2.15 South Carolina 436
7.2.16 Vermont 470
7.2.17 Virginia 480
7.2.18 West Virginia.....506

7.3 Waterfowl Habitat Conservation Strategies 517

8. HABITAT ACCOMPLISHMENTS FOR THE ATLANTIC COAST JOINT VENTURE 521

APPENDIX A. 530

APPENDIX B 537

LIST OF FIGURES

Figure 1.1. Administrative boundaries of NAWMP habitat joint ventures in the United States... 3

Figure 1.2. Adminstrative boundaries of the Atlantic Coast Joint Venture. Original boundary circa 1988 depicted in panel A while current boundary, as of 2001, is depicted in panel B. 4

Figure 2.1. Land Use / Land Cover in the mainland portion of the Atlantic Coast Joint Venture based on USGS National Land. 10

Figure 4.1. Percent change of palustrine forested wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. 17

Figure 3.2. Percent change of estuarine emergent wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. 19

Figure 3.3. Percent change of lacustrine wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. 20

Figure 3.4. Percent change of palustrine emergent wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. 21

Figure 3.5. Percent change of palustrine scrub-shrub wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. 22

Figure 3.6. Percent change of palustrine unconsolidate bottom wetlands (e.g., ponds) in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. 23

Figure 5.1. Percent change in population by county between decennial censuses of 1950 - 1970 and 1970 - 2000. Data from U.S. Census Bureau. 42

Figure 6.1. Waterfowl Conservation Regions (WCR) as delineated in 2004 Update of the North American Waterfowl Management Plan. Within the ACJV, these regions are the same as Bird Conservation Regions (BCR) with the following exceptions. Southern boundary of WCR 30 is north of revised southern boundary of BCR 30 (i.e., WCR 30 excludes southern extent of Chesapeake Bay). WCR 27 is subdivided into three regions unlike BCR 27. The ACJV recognizes WCR 69 pursuant to FWS Southeastern Region internal memo. 53

Figure 7.1. Areas designated for waterfowl conservation within the ACJV. 68

Figure 7.2. Connecticut waterfowl focus areas. 70

Figure 7.3. Delaware waterfowl focus areas. 95

Figure 7.4. Florida waterfowl focus areas. 112

Figure 7.5. Georgia waterfowl focus areas. 128

Figure 7.6. Maine waterfowl focus areas. 152

Figure 7.7. Maryland waterfowl focus areas. 167

Figure 7.8. Massachusetts waterfowl focus areas. 191

Figure 7.9. New Hampshire waterfowl focus areas. 217

Figure 7.10. New Jersey waterfowl focus areas. 224

Figure 7.11. New York waterfowl focus areas. 247

Figure 7.12. North Carolina waterfowl focus areas. 283

Figure 7.13. Pennsylvania waterfowl focus areas. 327

Figure 7.14. Puerto Rico waterfowl focus areas. 363

Figure 7.15. Rhode Island waterfowl focus areas. 416

Figure 7.16. South Carolina waterfowl focus areas. 436

Figure 7.17. Vermont waterfowl focus areas. 471

Figure 7.18. Virginia waterfowl focus areas. 480

Figure 7.19. West Virginia waterfowl focus areas. 506

LIST OF TABLES

Table 2.1. Land Use/Land Cover of the Atlantic Coast Joint Venture area as determined by National Land Cover Data (NLCD, 1993), categories slightly modified for this table. 9

Table 2.2. Native waterfowl species found within the administrative boundary of the Atlantic Coast Joint Venture. Species occurrence is indicated in last two columns; nonbreeding season includes migration. 11

Table 3.1. Predicted area (ha) and percent change of predicted wetland extent based on zero-inflated logistic regression models in the ACJV for the 1970s and 1990s. Standard error estimates for state level predictions currently not available but will be added as they become available. Total wetland area and total percent change are shown at bottom of table. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. Taken from Koneff and Royle (2004). 16

Table 3.2. Predicted area (ha) and percent change of six wetlands classes in the ACJV for between the 1970s and 1990s summarized by Bird Conservation Region (BCR). Bold values are standard errors of the predictions expressed as percentage of predicted wetland area. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. Taken from Koneff and Royle (2004). 24

Table 3.3. Classification categories for USGS Land Use Land Cover (LULC) data used as baseline condition for ACJV circa mid-1970s (http://www.epa.gov/ngispgm3/spdata/EPAGIRAS/meta/metadata.txt). 26

Table 3.4 NLCD two-level land cover classification system. 28

Table 3.5 Percent of landscape by land cover category for each data set and percent change between the mid-1970s (LULC) and mid-1990s (NLCD). Note that not all classes were reconcilable between the two data sets, thus caution must be used in interpreting change for Urban/Recreational Grasses category which only exited in the NLCD data. 29

Table 3.6. Matrix showing how land cover has changed in the ACJV between the 1970s and 1990s. Table shows percent of landscape that was classified as a given land cover type in the Land Use Land Cover (LULC) data set in the 1970s (columns) and their resulting classification in the 1992 National Land Cover Data (NLCD) data set (rows). Primary diagonal cells (highlighted in grey) show percent of landscape that the same classification in the two data sets. Note there was no comparable LULC category thus, class 85 is absent from that data set. 30

Table 4.1. Breeding population estimates for waterfowl from the Waterfowl Breeding Population and Habitat Survey (WBPHS Stratum 62, Maine) and from the Northeastern States Plot Survey (Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA). Trends were calculated from log-transformed (ln) population estimates for 10 years in Stratum 62 (1995-2004), and for 12 years of the Northeastern Plot Surveys (1993 – 2004). Some species are not differentiated in the May breeding, Stratum 62, due to difficulties in identification from

the air. Blank cells indicate no population estimate was available for a particular species-survey combination. Data obtained from Migratory Bird Management Office of the U.S. Fish and Wildlife Service, 2004. 33

Table 4.2. Linear regression analyses of Midwinter Survey data, 1970 - 2003, for the ACJV portion of the Atlantic Flyway. Data were log-transformed (ln) prior to analyses. Wood Duck was dropped from these analyses due to inconsistent time-series in the Mid-winter Survey..... 35

Table 5.1. Census estimates of total U.S. population living with the ACJV from each Decennial census conducted by the U.S. Census Bureau. 41

Table 6.1. Continental breeding population objectives, average population size (ducks: 1994 – 2003, geese & swans: 2001 - 2003) and long-term trend for species occurring in the ACJV. Data from 2004 Update of the North American Waterfowl Management Plan..... 45

Table 6.2. Continental priority matrix for ducks. 46

Table 6.3. Continental priority matrix for geese and swans. 46

Table 6.4. Continental NAWMP priority for waterfowl species occurring within the administrative boundary of the Atlantic Coast Joint Venture..... 47

Table 6.5. Regional conservation need as defined by the 2004 NAWMP Update..... 49

Table 6.6 Breeding waterfowl species prioritization for the ACJV. Continental score taken from 2004 Update to the North American Waterfowl Management Plan (US Fish and Wildlife 2004). Area importance score is the proportion of the ACJV that each species breeds in.. Conservation Tier was determined by using the matrix presented in Table 6.5. Categorization of area importance scores used the following splits: High > 0.50, 0.25 < Moderately High < 0.50, Moderately Low < 0.25. 50

Table 6.7. Nonbreeding waterfowl species prioritization for the ACJV. Continental score taken from 2004 Update to the North American Waterfowl Management Plan (US Fish and Wildlife 2004). Area importance score is the mean proportion of the conterminous United States Mid-winter Survey total that occurs in the ACJV (1990-2001) except where noted. Conservation Tier was determined by using the matrix presented in Table 6.5. Categorization of area importance scores used the following splits: High > 0.50, 0.25 < Moderately High < 0.50, Moderately Low < 0.25..... 51

Table 6.8. Interim habitat objectives for the Atlantic Coast Joint Venture based on the expert opinion of Waterfowl Technical Committee Representatives. Objectives are based on Representative's professional knowledge of local wetland and waterfowl conditions. See footnotes for methodology used by individual states to estimate these interim objectives..... 56

Table 7.1. State-level summary of acreage designated as waterfowl conservation areas. Two tiers of a three-tiered system are shown; sub-focus areas are not shown but their acreage is included in focus area totals..... 69

Table 8.1. Yearly conservation accomplishments (acres) of all partners in the ACJV. 522

Table 8.2. Cumulative habitat accomplishments of all partners participating in the joint venture by state. 523

Table 8.3. Cumulative habitat conservation accomplishments (acres) within the ACJV by program. 524

Table 8.4. Comparison of accomplishments to goals within the ACJV. Table is under preparation and will be available soon..... 524

The following document, "Atlantic Coast Joint Venture Waterfowl Implementation Plan Revision" dated June 2005, is fully endorsed and supported by the Management Board of the Atlantic Coast Joint Venture.

Andy Manus (Chair)
The Nature Conservancy

Emily Jo Williams (Vice Chair)
U.S. Fish and Wildlife Service
Southeast Region

Gerald Barnhart
New York State Department of
Environmental Conservation

Gwenda L. Brewer
Maryland Department of Natural
Resources

Jose Chabert
Puerto Rico Department of Natural and
Environmental Resources

David Cobb
North Carolina Wildlife Resources
Commission

Robert Ellis
Virginia Department of Game
and Inland Fisheries

Ken Elowe
Maine Department of Inland
Fisheries and Wildlife

Patrick Emory
Delaware Department of
Natural Resources

John Frampton
South Carolina Department of
Natural Resources

Noel Holcomb
Georgia Department of
Natural Resources

Helen Hooper
The Nature Conservancy

Judd Howell
U.S. Geological Survey
Patuxent Wildlife Research Center

Paul Johansen
West Virginia Division
of Natural Resources

Scott Klinger
Pennsylvania Game Commission

Michael Lapisky
Rhode Island Department of
Environmental Management

Craig LeSchack
Ducks Unlimited, Inc.

Wayne MacCallum
Massachusetts Division of
Fisheries and Wildlife

Martin J. McHugh
New Jersey Division of Fish and Wildlife

Frank Montalbano
Florida Fish and Wildlife
Conservation Commission

Marvin Moriarty
U.S. Fish and Wildlife Service
Northeast Region

Edward Parker
Connecticut Department of
Environmental Protection

Ron Regan
Vermont Department of Fish and Wildlife

Steve Weber
New Hampshire Fish
and Game Department

Scot Williamson
Wildlife Management Institute

David Wilson
U.S. Forest Service

John Yancy
National Park Service

EXECUTIVE SUMMARY

The Atlantic Coast Joint Venture (ACJV) is a partnership of federal, regional and state agencies and organizations focused on the conservation of habitat for native bird species in the Atlantic Flyway of the United States from Maine south to Puerto Rico. The joint venture was originally formed as a regional partnership focused on the conservation of waterfowl and wetlands under the North American Waterfowl Management Plan (NAWMP) in 1988. This plan is a revision of the original ACJV Implementation plan completed in 1988 that addresses the expanded geographic area and mission of the joint venture as well as the updates to NAWMP. It steps down continental and regional waterfowl population and habitat goals from the NAWMP 2004 Update to the ACJV area, presents habitat conservation goals and population indices for the ACJV consistent with this update, provides current status assessments for waterfowl and their habitats in the joint venture, and updates focus area narratives and maps for each state. The ACJV is strongly committed to conserving the 41 species of native waterfowl occurring in the U.S. portion of the Atlantic Flyway. This document is intended as a blueprint for conserving the valuable breeding, migration and wintering waterfowl habitat present within the ACJV boundary based on the best available information and the expert opinion of waterfowl biologists from throughout the flyway. This revision also provides a great deal of the baseline information necessary for moving forward with a more rigorous approach for setting future habitat goals as additional information becomes available and documents information gaps that have to be addressed before additional progress can be made.

This document is divided into eight principal sections that:

- Describe important wintering, breeding and migration habitats,
- Report on habitat trends,
- Report on population trends for breeding and wintering waterfowl,
- Describe threats facing waterfowl in the ACJV,
- Provide a set of priority species for the JV and each Waterfowl Conservation Region,
- Set revised habitat goals for the next five to ten years,
- Outline strategies that can be used to achieve stated goals, and
- Report on achievements by JV partners since 1988.

Most importantly, this plan identifies 149 focus areas for waterfowl conservation throughout the joint venture. ACJV partners need to conserve, through protection, restoration or enhancement, more than 638,000 ha (>1,577,000 acres) of wetlands and associated uplands over the next five to ten years to meet our commitment to waterfowl populations under the NAWMP**.** Detailed descriptions of each waterfowl focus area are provided and can be used by existing and potential partners to guide important conservation actions.

1. INTRODUCTION

The North American Waterfowl Management Plan (NAWMP), signed in 1986 by the United States and Canada and later by Mexico in 1994, was developed in response to the dramatic declines seen in waterfowl populations during the mid 1980s. NAWMP, the first continental conservation plan of its kind, recognized the need for a coordinated effort to conserve wetlands and waterfowl habitats across North America if waterfowl populations were to be maintained and ultimately restored to higher levels. Specifically, NAWMP set specific population and habitat objectives that coincided with population levels observed during the 1970s; a time frame during which total populations were thought to be adequate for both consumptive and nonconsumptive uses. These goals were to be achieved through the conservation of landscapes coordinated by regional partnerships making decisions based on the best available science. This effort would require protecting, restoring and enhancing millions of hectares of wetlands and uplands in the United States, Canada and Mexico. Therefore, a unique delivery mechanism would be needed since no single government agency or conservation agency could meet these lofty ambitions.

NAWMP recognized that the most effective way to deliver habitat conservation for waterfowl across the continent was through self-directed, regionally-based partnerships known as joint ventures. These joint venture partnerships are a means for federal, state, and local governments, national conservation organizations, private individuals or groups, corporations, and other interested parties to pool limited resources to meet the goals set out by NAWMP. Currently, there are 14 habitat Joint Ventures in the United States (Fig. 1.1) and 4 in Canada. Additionally, three species Joint Ventures, Arctic Goose, Black Duck and Sea Duck, have been created to meet the goals and objectives of NAWMP.

The original joint ventures were associated with specific "Waterfowl Habitat Areas of Major Concern in the United States and Canada." Two of the original six habitat joint ventures were the Atlantic Coast Joint Venture (ACJV) including the coastal plain from Maine to South Carolina and the Lower Great Lakes – St. Lawrence Basin Joint Venture (LGL/SLB JV) encompassing the U.S. portion of the lake plains of Lakes Erie and Ontario and the St. Lawrence River Valley (Fig. 1.2a). Initial priorities for both of these Joint Ventures were predicated primarily on the conservation of the American Black Duck (*Anas rubripes*). The initial objectives of these two joint ventures were to increase the wintering population index of black ducks to 385,000, an increase of almost 75% over the average index for the 1980s. To reach this goal NAWMP envisioned protecting 10,000 acres of breeding and migration habitat in the LGL/SLB JV and protecting 50,000 acres of migration and wintering habitat in the ACJV. In addition to these protected acres, NAWMP suggested increasing the wintering carrying capacity by 25% of land already managed for waterfowl in the eastern United States. The Category Plan for Preservation of Black Duck Wintering Habitat, Atlantic Coast (U.S. Fish and Wildlife Service 1988) identified specific areas and habitat protection goals for wintering black ducks in the 13 Atlantic Coast states from Maine to South Carolina. The original Atlantic Coast Joint Venture Plan (Atlantic Coast Joint Venture 1988) built upon this plan, refined wintering areas, and added information on breeding areas and adjacent upland areas. Based on this process, the original ACJV goals were to protect, manage or enhance approximately 355,775 ha (879,138

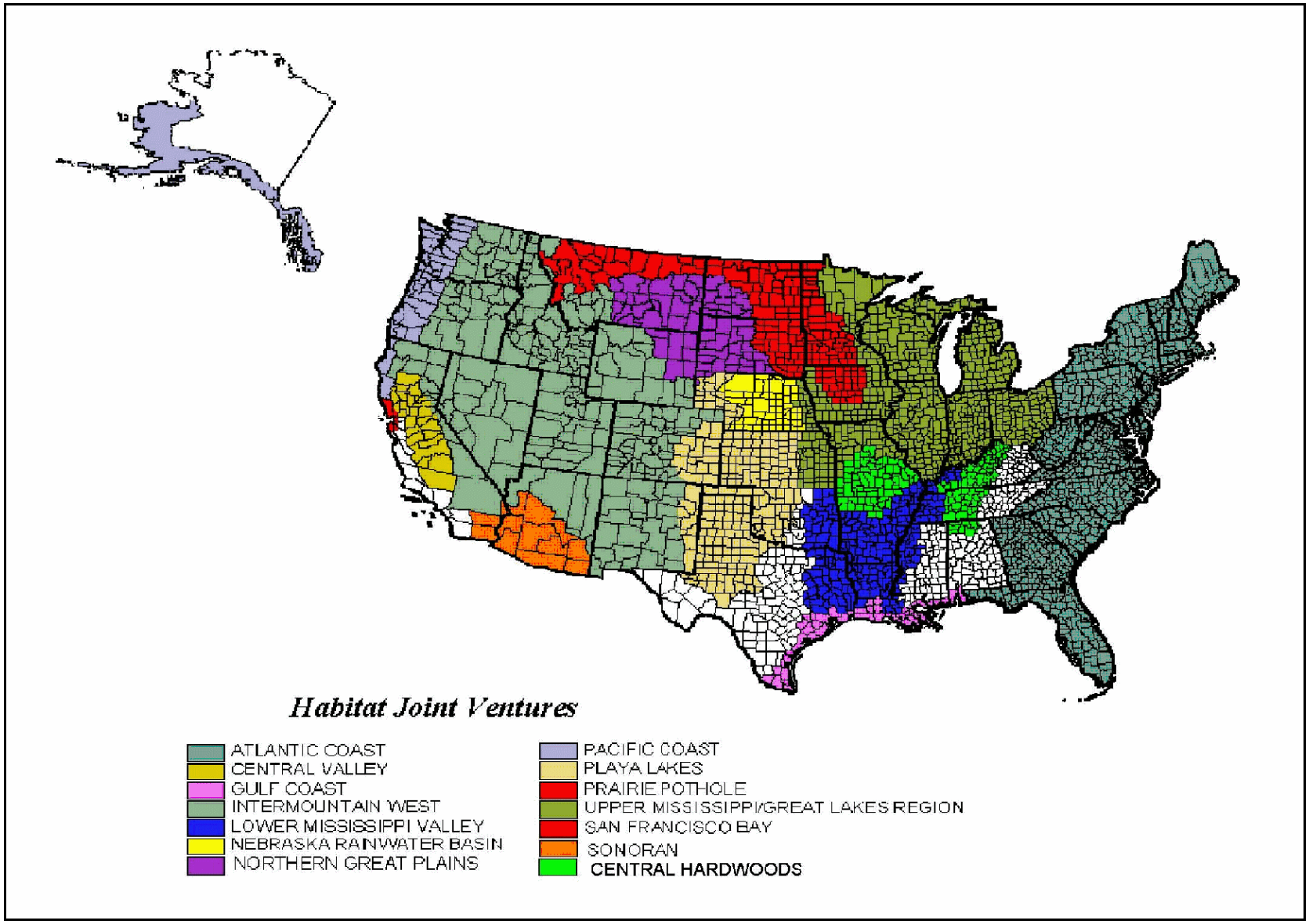

Figure 1.1. Administrative boundaries of NAWMP habitat joint ventures in the United States.

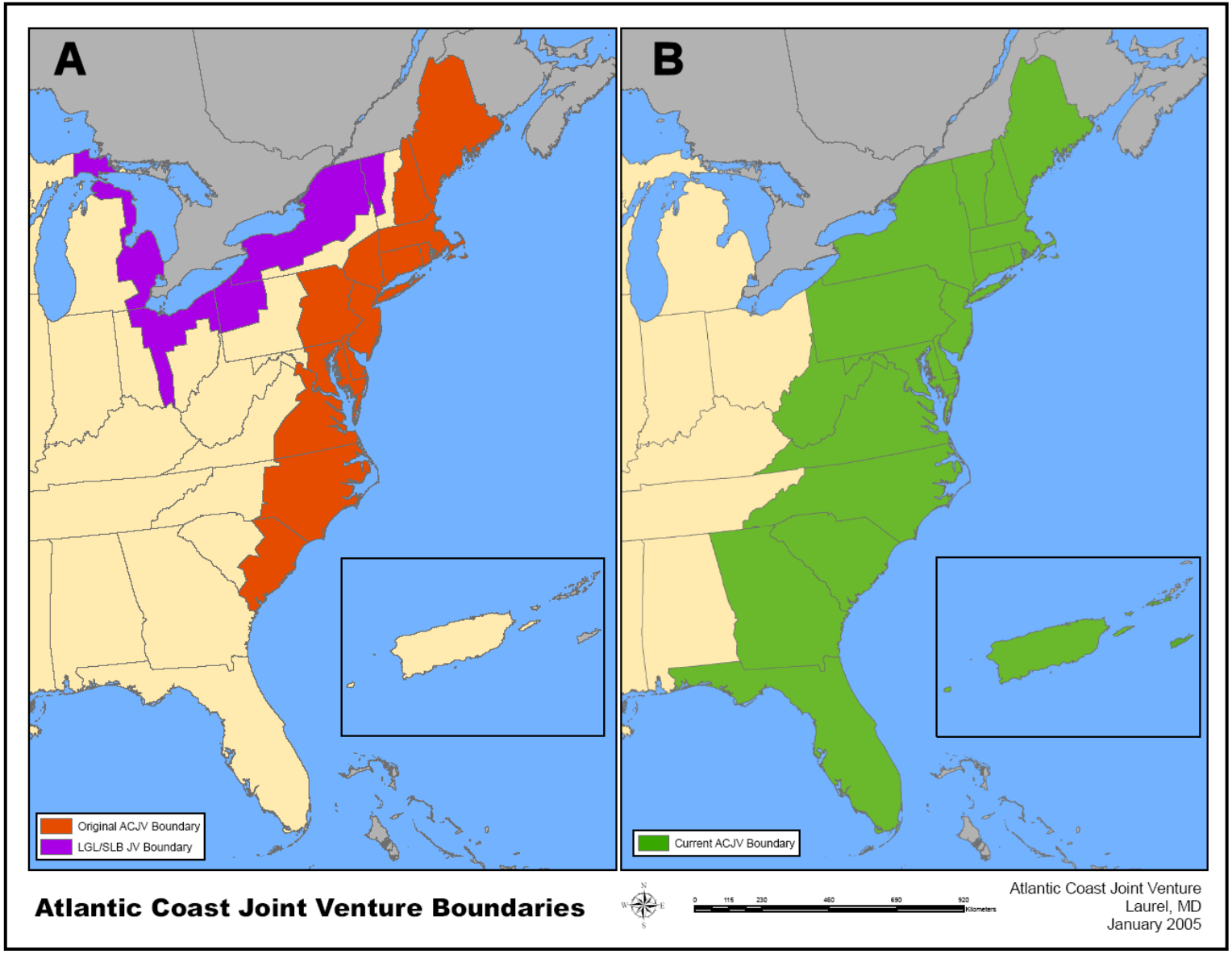

Figure 1.2. Adminstrative boundaries of the Atlantic Coast Joint Venture. Original boundary circa 1988 depicted in panel A while current boundary, as of 2001, is depicted in panel B.

acres) of wetland and upland buffer habitats and to improve or enhance an additional 67,169 ha (165,977 acres) of wetland habitats on federal and state-owned lands. In 1996, the Lower Great - Lakes St. Lawrence Basin Joint Venture was dissolved with the eastern part added to the Atlantic Coast Joint Venture. In addition, Georgia (1994), West Virginia (1996), Florida (1997), and Puerto Rico (2001) all became partners in the ACJV resulting in a joint venture boundary that matches the U.S. portion of the Atlantic Flyway boundary (Fig. 1.2b). The objectives for the ACJV (reflected in the 1998 NAWMP Update) increased to protection of 382,429 ha (945,000 acres), restoration of 35,633 ha (88,050 acres) and enhancement of an additional 49,267 ha (121,740 acres) of waterfowl habitat.

The mission of the ACJV also has continued to evolve with the decision by the ACJV Management Board to embrace a more comprehensive approach that emphasizes all-bird conservation. It is important to note that although the Joint Venture has adopted the concept of all-bird conservation, the emphasis of this ACJV Waterfowl Implementation Plan revision is still on habitat conservation for waterfowl consistent with the objectives of the North American Waterfowl Management Plan.

> *The purpose of this document is to step down the continental and regional goals of the North American Waterfowl Management Plan 2004 Update to the ACJV area, present a current status assessment of waterfowl and their habitats in the joint venture, update focus area narratives and maps for each state, and present habitat conservation goals and population indices for the ACJV consistent with NAWMP.*

The ACJV will integrate the information from this plan with information from the other continental, national, and regional bird conservation plans to determine integrated bird conservation goals at the eco-regional scale for all of the Bird Conservation Regions (BCR) partially or wholly within the Atlantic Coast Joint Venture (Fig. 1.3).

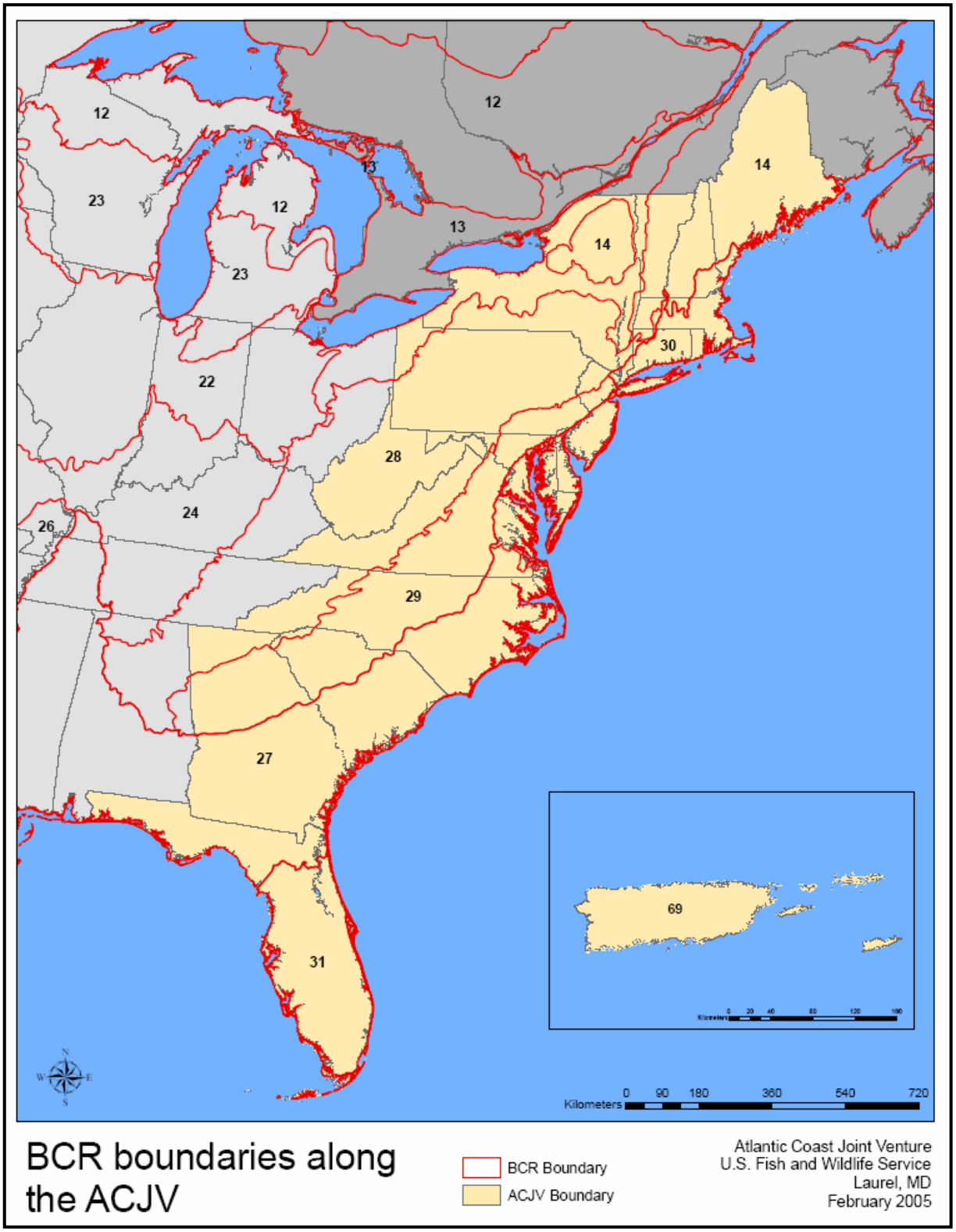

Figure 1.3. Bird Conservation Regions (BCR) of the Atlantic Coast Joint Venture. BCR 13 - Lower Great Lakes / St. Lawrence Plain, BCR 14 – Atlantic Northern Forest, BCR 27 – Southeastern Coastal Plain, BCR 28 – Appalachian Mtns, BCR 29 – Piedmont, BCR 30 – New England / Mid-Atlantic Coast, BCR 31 – Peninsular Florida, BCR 69 – Puerto Rico and U.S. Virgin Islands (not officially recognized by NABCI)

2. DESCRIPTION OF THE ATLANTIC COAST JOINT VENTURE AREA

2.1 Overall description

The Atlantic Coast Joint Venture area comprises the 17 states in the Atlantic Flyway of the United States as well as the Commonwealth of Puerto Rico. This joint venture includes a total area of 114,526,200 hectares (283 million acres, 442,000 square miles) representing 12% of the total area of the United States plus Puerto Rico. It is the most densely populated region in the U.S. with a total of over 105 million people living in the area – about 38% of the conterminous U.S. population (based on 2000 census data). There is a tremendous diversity of ecosystems and habitats in the joint venture area from the boreal forests and rocky coastline at the northern reaches of the joint venture in Maine to the tropical mangrove swamps and coral reefs of Florida and Puerto Rico to the south and from the rugged peaks of the Appalachian Mountains in the west to the low-lying Atlantic Coastal Plain with its many coastal rivers, bays and estuaries forming the joint venture's eastern boundary. The Atlantic Ocean coastline extends for 2,069 miles from Maine to Florida with a combined shoreline of all tidal areas along the coast adding up to 28,673 miles. The land area within the joint venture boundary is dominated by the eastern deciduous forest that is much reduced from its historical extent but still accounts for nearly 30% of the total land cover; all forest types combined account for over half of the land cover. About a fifth of the total joint venture is in agriculture, predominantly pasture and hay. Wetlands and open water together also account for about a fifth of the total area. Although only about 5% of the total land use is classified as urban and residential, this classification greatly underestimates the extent of urban and suburban sprawl and resulting habitat fragmentation. Land use/land cover percentages in the Joint Venture are summarized in Table 2.1 and shown in Figure 2.1. The variety of habitats in the joint venture supports a high abundance and diversity of bird species including 38 native species of waterfowl (Table 2.2), 40 species of shorebirds, 88 species of waterbirds (including pelagic species) and approximately 200 landbird species.

2.2 Waterfowl Habitat

The ACJV encompasses a tremendous diversity of wetland and upland habitat types and, thus, supports a diverse group of wildlife including migratory birds such as waterfowl, shorebirds, colonial waterbirds, and neotropical migrants, threatened and endangered species, anadromous fishes, and non-migratory wildlife. A majority of migratory waterfowl wintering within the ACJV are located within a narrow band along the coast encompassing tidal freshwater, estuarine, and nearshore marine habitats. The ACJV contains 40% of the coastal marshes in the conterminous U.S. with three-quarters of these located south of Maryland in North Carolina, South Carolina, and Georgia (Chabreck 1988). Large inland lakes and artificial reservoirs are used as feeding and resting areas especially in the south Atlantic states where they rarely freeze during the winter.

Although coastal marshes are less extensive in the north Atlantic states of Maine, New Hampshire, Rhode Island, Connecticut, and Massachusetts, they still provide

valuable wintering habitat since most inland wetlands in this area freeze during the winter. For example, estuarine habitats of coastal Maine are important to wintering waterfowl, especially Black Ducks, Common Eiders, and scoters where large tidal amplitudes and sheltered bays provide relatively

Table 2.1. Land Use/Land Cover of the Atlantic Coast Joint Venture area as determined by National Land Cover Data (NLCD, 1993), categories slightly modified for this table.

Aggregated LULC	%	Specific LULC Classification	%
Forested	53.7	Deciduous Forest	27.5
		Evergreen	14.0
		Mixed	12.3
Agricultural	19.9	Orchards/vineyards/other	0.4
		Grasslands/herbaceous	1.2
		Pasture/hay	10.0
		Row crops	8.4
Open water	9.9	Open water	9.9
Wetlands	9.1	Woody wetlands	7.1
		Emergent herbaceous wetlands	2.1
Urban/residential	5.3	Low intensity residential	2.9
		High intensity residential	0.6
		Commercial/industrial/transportation	1.1
		Urban/recreational grasses	0.5
		Quarries/strip mines/gravel pits	0.2
Barren	1.8	Bare rock/sand/clay	0.1
		Transitional	1.7
Shrubland	0.1	Shrubland	0.1

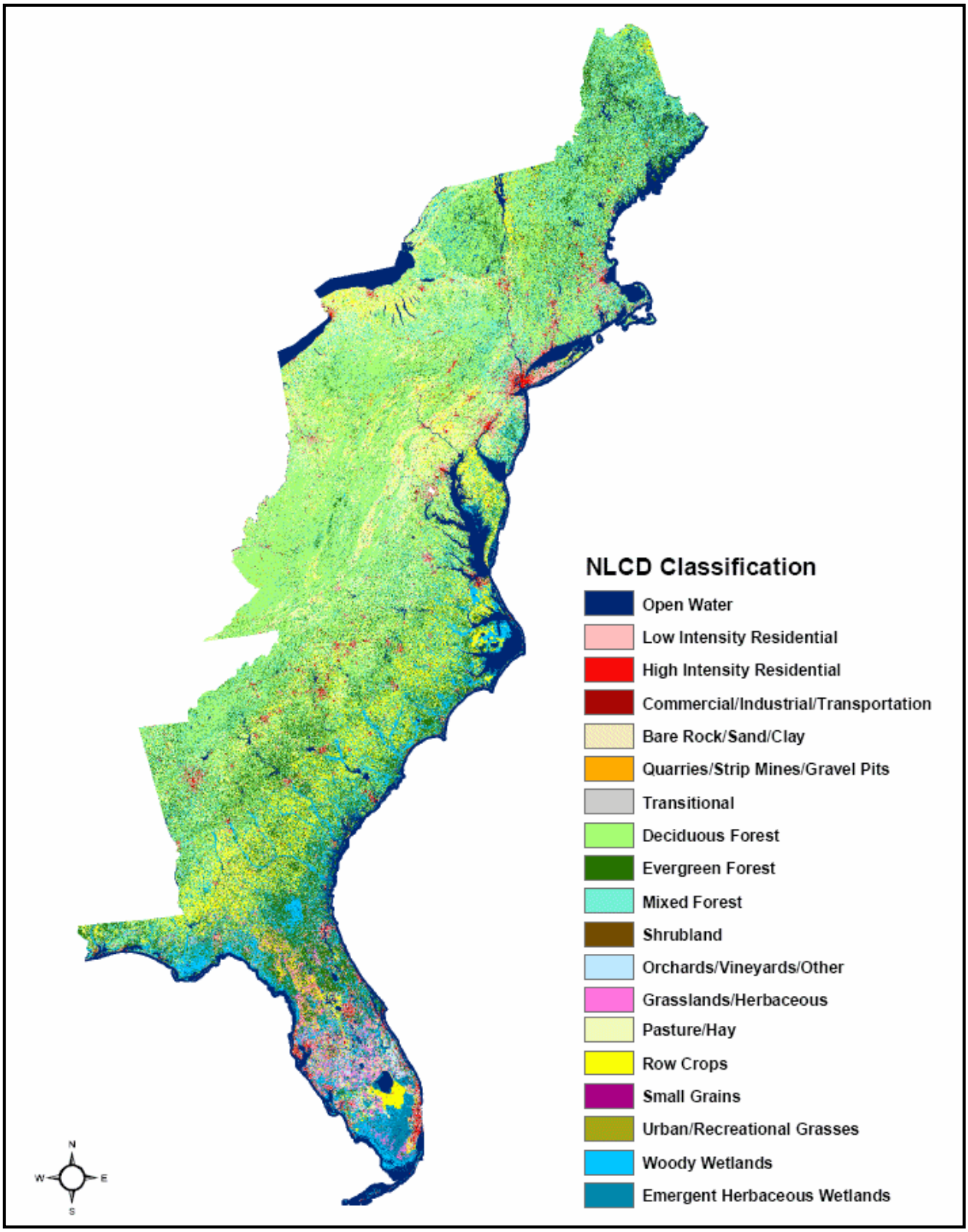

Figure 2.1. Land Use / Land Cover in the mainland portion of the Atlantic Coast Joint Venture based on USGS National Land.

Table 2.2. Native waterfowl species found within the administrative boundary of the Atlantic Coast Joint Venture. Species occurrence is indicated in last two columns; nonbreeding season includes migration.

Species		Season	
Common Name	Scientific Name	Breeding	Nonbreeding
Black-bellied Whistling-Duck	*Dendrocygna autumnalis*	X	X
Fulvous Whistling-Duck	*Dendrocygna bicolor*	X	X
West Indian Whistling-Duck[1,2]	*Dendrocygna arborea*	X	X
White-fronted Goose	*Anser albifrons*		X
Greater Snow Goose	*Chen caerulescens atlantica*		X
Lesser Snow Goose	*Chen caerulescens caerulescens*		X
Ross's Goose	*Chen rossii*		X
Canada Goose	*Branta canadensis*	X	X
Atlantic Brant	*Branta bernicla*		X
Tundra Swan	*Cygnus columbianus*		X
Wood Duck	*Aix sponsa*	X	X
Gadwall	*Anas strepera*	X	X
American Wigeon	*Anas americana*	X	X
American Black Duck	*Anas rubripes*	X	X
Mallard	*Anas platyrhynchos*	X	X
Mottled Duck	*Anas fulvigula*	X	X
Blue-winged Teal	*Anas discors*	X	X
Northern Shoveler	*Anas clypeata*	X	X
Northern Pintail	*Anas acuta*	X	X
White-cheeked Pintail[1]	*Anas bahamensis*	X	X
Green-winged Teal	*Anas crecca*	X	X
Canvasback	*Aythya valisineria*		X
Redhead	*Aythya americana*	X	X
Ring-necked Duck	*Aythya collaris*	X	X
Greater Scaup	*Aythya marila*		X
Lesser Scaup	*Aythya affinis*		X
King Eider	*Somateria spectabilis*		X
Common Eider	*Somateria mollissima*	X	X
Harlequin Duck	*Histrionicus histrionicus*		X
Surf Scoter	*Melanitta perspicillata*		X
White-winged Scoter	*Melanitta fusca*		X
Black Scoter	*Melanitta nigra*		X
Long-tailed Duck	*Clangula hyemalis*		X
Bufflehead	*Bucephala albeola*	X	X

[1] – Within the ACJV these species only occur in Puerto Rico.
[2] – Species listed as Critically Endangered in Puerto Rico
[3] – Species listed as Endangered in Puerto Rico

Table 2.2 (cont.). Native waterfowl species found within the administrative boundary of the Atlantic Coast Joint Venture. Species occurrence is indicated in last two columns; nonbreeding season includes migration.

Species		Season	
Common Name	Scientific Name	Breeding	Nonbreeding
Common Goldeneye	*Bucephala clangula*	X	X
Barrow's Goldeneye	*Bucephala islandica*		X
Hooded Merganser	*Lophodytes cucullatus*	X	X
Common Merganser	*Mergus merganser*	X	X
Red-breasted Merganser	*Mergus serrator*	X	X
Masked Duck[3]	*Nomonyx dominicus*	X	X
Ruddy Duck	*Oxyura jamaicensis*	X	X

[1] – Within the ACJV these species only occur in Puerto Rico.
[2] – Species listed as Critically Endangered in Puerto Rico
[3] – Species listed as Endangered in Puerto Rico

ice-free areas for feeding and loafing. These areas also provide extensive mudflats used by migrating shorebirds. In addition to valuable wintering and migration habitat, the north Atlantic states, primarily Maine, provide valuable breeding habitat for American Black Ducks along isolated beaver flowages in the boreal forest and Common Eiders along the rocky coasts and the numerous offshore islands.

Major estuaries of southern New England and New York, including Massachusetts Bay, Buzzards Bay, Narragansett Bay, the Peconic Bays, Long Island Sound, and New York and New Jersey Harbor provide sheltered open water that is important for wintering sea ducks and bay ducks such as scoters and scaup as well as fringing saltmarshes and mudflats important for dabbling ducks such as Mallard (Jorde et al. 1989). The barrier beaches, backbarrier coastal lagoons and coastal salt marshes of Long Island and New Jersey provide wintering habitat for a number of waterfowl species, including Black Ducks and Brant, and provide valuable migration habitat for shorebirds and other waterfowl.

Interior lowland habitats in New York, Pennsylvania and New England, particularly lake plains and river valleys such as Lake Champlain, the Finger Lakes, lower Great Lakes, and the Hudson, St. Lawrence, and Niagara and Connecticut Rivers provide important breeding habitat for Mallard and other dabbling ducks. The lower Great Lakes provide important wintering and migration habitat for greater and lesser scaup, goldeneye and a diversity of other waterfowl. Extensive farm fields provide Canada geese, snow geese and other waterfowl an abundance of waste grain.

The Appalachian Mountains of Pennsylvania, Virginia and West Virginia, contain numerous forested wetland and riparian habitats, often enhanced by beaver that provide important breeding habitats for wood ducks, mallards and black ducks. Although West Virginia has only a limited amount of wetlands it still provides important waterfowl habitat. Large agricultural river valleys, particularly the Ohio on the states western border and the Potomac in the eastern panhandle, provide important migration habitat for a large variety of waterfowl species and winter fair numbers of mallards and black ducks. SJBP Canada geese migrate through and winter in the Ohio valley. Wood ducks breed at moderate densities throughout the state.

The mid-Atlantic states of Maryland, Virginia, and North Carolina provide some of the most important and extensive migration and wintering habitat along the Atlantic coast. As much as 40% of the wintering waterfowl along the Atlantic Coast are found in the Chesapeake Bay region of Virginia and Maryland and Currituck-Albermarle-Pamlico Sound region of North Carolina (Hindman and Stotts 1989). The Chesapeake Bay, the largest estuary in the conterminous U.S, watershed drains approximately 165,760 km^2 (64,000 mi^2) of New York, Pennsylvania, Maryland, Virginia and West Virginia, with the bay covering approximately 11,500 km^2 (4,440 mi^2; Hindman and Stotts 1989). Habitats within this region range from freshwater flooded forested wetlands of the interior to salt estuarine bays near the mouth of the Chesapeake and Currituck-Albemarle-Pamlico Sound (Hindman and Stotts 1989). Agricultural fields and pastureland surround the bay in both Maryland and Virginia providing extensive habitat for Canada geese. Waterfowl important to the Chesapeake Bay and surrounding estuarine habitats include black ducks, American Wigeon, Blue-winged Teal, Canvasbacks, and

scaup. Natural lakes and reservoirs increase in importance in the south Atlantic Flyway because they rarely freeze during the winter, although they are not used as extensively as the coastal areas. Important lakes of the mid-Atlantic reside mainly in North Carolina and include Lake Mattamuskeet, Pungo, Phelps, and Alligator Lake (Johnson and Montalbano 1989).

The southern portion of the U.S. Atlantic Flyway also is comprised of a diversity of wetland types providing important habitat for migrating and wintering waterfowl, shorebirds, and other wetland-associated migratory birds. Habitats are diverse along the south Atlantic Coast ranging from natural and artificial lakes and reservoirs, flooded bottomland hardwoods, and Carolina bays to extensive stands of smooth cordgrass in the low salt marsh of South Carolina and Georgia. Although the majority of the waterfowl using the south Atlantic Flyway use the coastal zone (Gordon et al. 1989), inland natural and artificial freshwater lakes and reservoirs become important areas for resting and feeding (Johnson and Montalbano 1989). In the coastal zone, more than 32,000 ha of coastal impoundments provide important habitat for waterfowl, waterbirds, and shorebirds (Gordon et al. 1989). Dabbling ducks show a preference for these managed wetlands over non-managed wetlands, and these wetlands are critical for maintaining waterfowl populations, particularly in highly altered landscapes (Gordon et al. 1998). The majority of the coastal zone of South Carolina and Georgia is classified as salt marsh, but contains approximately 28% of the tidal freshwater marsh found along the Atlantic Coast (Gordon et al. 1989). Waterfowl and migratory bird use of the south Atlantic Flyway is extensive but concentrated in the coastal areas of South Carolina and lakes of Florida. South Carolina winters approximately 30% of the dabbling ducks in the Atlantic Flyway including large concentrations of Green-winged Teal, Northern Shovelers, Mallards, and Northern Pintails (Gordon et al. 1989). Canada geese and diving ducks use the coast of South Carolina but are present in relatively low numbers. Georgia winters approximately 2% of the dabbling ducks and 3% of the divers in the Atlantic Flyway (Gordon et al. 1989). In Florida, the Upper Everglades, Orange Creek, and Ocklawaha basins provide significant inland wetlands, supporting large numbers of Ring-necked Ducks and Blue-winged Teal. These areas are also extremely important for Mottled Duck. In the immediate coastal zone, the St. John's and Indian River basins provide some of the best habitat for waterfowl in the state, typically wintering over 400,000 ducks. The freshwater lakes of Florida provide good wintering habitat for a number of waterfowl including Lesser Scaup, Ring-necked Ducks, American Wigeon, and Blue-winged Teal. Although not extensively used by large numbers of waterfowl, the Gulf Coast of Florida, especially in the Big Bend region, provides important habitat for Redheads and Lesser Scaup.

Puerto Rico, the smallest (8,802 km^2, 3,398 mi^2) and eastern most of the Greater Antilles, lies within the subtropical latitudinal region, and contains six life zones (Ewel and Whitmore 1973). Throughout the coastal zone, historically there were many wetlands and marshes that sustained most of the native and migratory waterfowl. However, during the 1940s and 1950s many of these habitats, such as Guánica and Anegado Lagoon's, in the southwest, and Humacao lagoons in the east, were drained and used for agricultural purposes. As a result of these agricultural practices, man-made ponds were constructed for irrigation purposes. These man made ponds were deep enough to benefit waterfowl species such as ruddy ducks, and other divers. Today, some of these ponds, mainly those in the south of the island, are critical habitat for the Ruddy duck, an endangered species in Puerto Rico, as well as many other migrant species.

3. HABITAT STATUS AND TRENDS

3.1 Status and Trends of Wetlands

Since the settlement of the United States by the Europeans, wetlands have been viewed as impediments to progress, harbingers of insect pests and disease, and wastelands to be drained for farming (Koneff and Royle 2004). For nearly 200 years, this view of wetlands predominated and millions of acres were lost for agriculture, silviculture, development, and insect and disease abatement. Approximately 89.5 million hectares (220 million acres) of wetlands originally covered the conterminous United States at the time of European settlement (Dahl 1990, U.S. Environ. Prot. Agency 1998, Dahl 2000). By 1997 only an estimated 42.7 million ha (105.5 million acres) of wetlands remained in the conterminous U.S. (Dahl 2000). The greatest rate of loss occurred from the 1950s to the 1970s with an average annual net loss of 185,400 hectares (458,000 acres) (Frayer et al. 1983). Between the mid 1970s and mid 1980s that rate had slowed to 117,400 ha (290,000 acres) per year and was further reduced between 1986 and 1997 to 23,700 ha (58,500 acres) per year (Dahl 2000). Forested wetlands have shown the heaviest losses in recent years with two-thirds of the loss due to agriculture, development, and other practices and the remaining one-third lost to conversion to other types of wetlands (Hefner et al. 1994). Most states in the ACJV have lost on average 25% to 50% of their original wetlands with Connecticut losing an estimated 74% while New Hampshire has lost only 9% of their wetlands (U.S. Environ. Prot. Agency 1998).

Although the status assessments of wetland change (e.g., Dahl 1990 and Dahl 2000) in the U.S. are informative, they are based on a stratified, randomly selected sample of plots (1,040 ha or 2,560 acres) such that the results provide estimates of change for the U.S. as a whole. One cannot use these data to depict spatial patterns at a scale useful to developing explicit waterfowl management objectives. Towards that end, the ACJV commissioned a study that sought to create a spatially-explicit model of wetland loss (Koneff and Royle 2004). They developed zero-inflated logistic regression models to predict the area of six wetland classes within 1,036 ha (2,560 acres) grid cells throughout the ACJV. The models predict the areal extent of each wetland class in each of four decades: 1950s, 1970s, 1980s, and 1990s. Overall estimates of wetland change for the ACJV between the 1970s and 1990s, showed similar trends to those estimated by Dahl (2000) (Table 3.1). Overall, approximately 8.5% of wetlands were lost or converted to other wetland types between the 1950s and 1970s with more palustrine emergent wetlands being lost than other types. The amount of wetland loss declined between the 1970s and 1990s due to most states enacting wetland protection laws, but the ACJV still lost approximately 5.6% of the remaining wetlands during those two decades. Palustrine forested wetlands suffered the greatest loss during this period, declining by almost 6%. Only two wetland classes, lacustrine and palustrine unconsolidated bottom (i.e., ponds), showed a general increase across the 4 decades, 0.9% and 1.7% respectively.

The previous summary ignores the spatially explicit aspect of Koneff and Royle's (2004) approach. That is, their results allow one to map wetland change with a minimum resolution of 10.36 km^2 pixels, thus allowing one to depict where the greatest change for each wetland class has occurred (Fig 3.1). Examination of this map shows that forested wetlands have decreased across a large proportion of the ACJV. It is important to note that there are several important

Table 3.1. Predicted area (ha) and percent change of predicted wetland extent based on zero-inflated logistic regression models in the ACJV for the 1970s and 1990s. Standard error estimates for state level predictions currently not available but will be added as they become available. Total wetland area and total percent change are shown at bottom of table. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. Taken from Koneff and Royle (2004).

State	Year				% Change
	1970s		1990s		
	Ha	s.e.	Ha	s.e.	
Connecticut	99,581		89,171		-10%
Delaware	100,045		87,027		-13%
District of Columbia	262		286		9%
Florida	5,058,378		4,876,250		-4%
Georgia	2,983,620		2,864,562		-4%
Maine	1,351,094		1,156,253		-14%
Maryland	245,185		232,981		-5%
Massachusetts	237,754		210,578		-11%
New Hampshire	177,296		174,375		-2%
New Jersey	331,305		325,030		-2%
New York	809,818		822,364		2%
North Carolina	2,212,152		1,867,394		-16%
Pennsylvania	326,124		348,532		7%
Rhode Island	32,683		25,505		-22%
South Carolina	1,818,351		1,741,033		-4%
Vermont	114,698		101,741		-11%
Virginia	581,469		608,540		5%
West Virginia	66,137		95,951		45%
Total	16,545,951		15,627,574		-6%

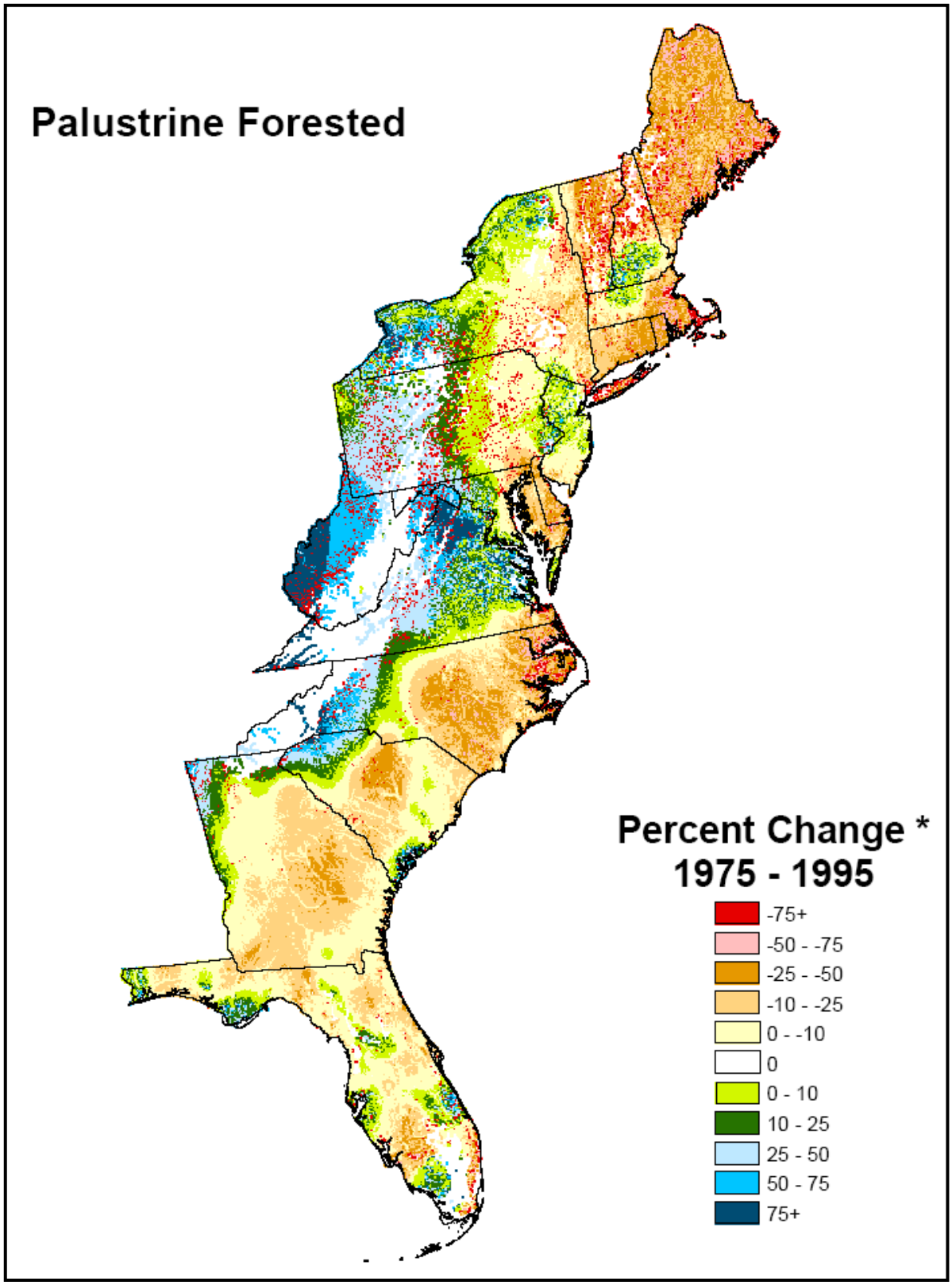

Figure 3.1. Percent change of palustrine forested wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes.

points that need to be considered when examining the spatial pattern of change for any of the wetland classes. First, model fit, although statistically significant, was better for some classes than others. Specifically, Koneff and Royle (2004) state that model fit was best for estuarine emergent, lacustrine, and palustrine forested wetland classes. Model fit was poorer for palustrine emergent, scrub-shrub, and unconsolidated bottom classes. Second, spatially the model fit was poorer in the mountainous regions of the JV where there were fewer sample plots. Patterns from the Appalachian, Green and White Mountain regions should be viewed with caution and would require field validation before broad generalizations can be made. Maps depicting percent change between the 1970s and 1990s are presented (Figs 3.1 – 3.6). These spatially explicit maps also allow us to summarize wetland changes by any administrative or eco-regional boundary within the ACJV. For example, wetland change can be summarized by Bird Conservation Regions (BCRs, Table 3.2).

3.2 Status and Trends of Other Habitat Types

Unfortunately, there have been no comparable monitoring efforts in the United States to monitor changes in other habitat types (i.e., uplands) as has been done with wetlands. Fortunately, two data sets exist that allowed us to assess changes to other habitat types using coarse land use/land cover classifications (Anderson Level II).

We used USGS Land Use and Land Cover (LULC) data derived from circa mid-1970s to mid-1980s aerial photo-interpretation to represent the baseline condition for the ACJV that corresponds to the time period that NAWMP assumes provided adequate waterfowl populations. Minimum mapping units for LULC vary from 4 ha (10 acres) for man-made features to 16 ha (40 acres) for natural features (http://edc.usgs.gov/products/landcover/lulc.html). The original classification had 21 categories of land cover (Table 3.3).

The most recent comprehensive land cover data available for the ACJV is the USGSs 1992 National Land Cover Data (NLCD, http://landcover.usgs.gov/prodescription.asp). These data were derived from early- to mid-1990s Landsat Thematic Mapper (TM) satellite imagery. A modified Anderson Level II classification scheme resulting in 21 land cover classes were mapped consistently across the U.S. (Table 3.4). Unlike the LULC that was mapped as polygons, the NLCD is a raster data set with a spatial resolution of 0.09 ha (0.22 acre).

In order to conduct these analyses the LULC data were converted to a raster data set with a spatial resolution of 0.09 ha (0.22 acre) to match the NLCD. The different classification schemes of the LULC and NLCD were cross-walked to yield a common classification of 15 land cover types. Each resulting class in the re-coded LULC data set was used as a mask to determine how that specific land cover type had changed between the mid-1970s to mid-1990s (Table 3.5). It is important to note that not all land cover categories were able to be reconciled between the two data sets. Specifically, the NLCD data set had a category for Urban/Recreational Grasses; however, it was not clear how such pixels had been classified in the LULC data set.

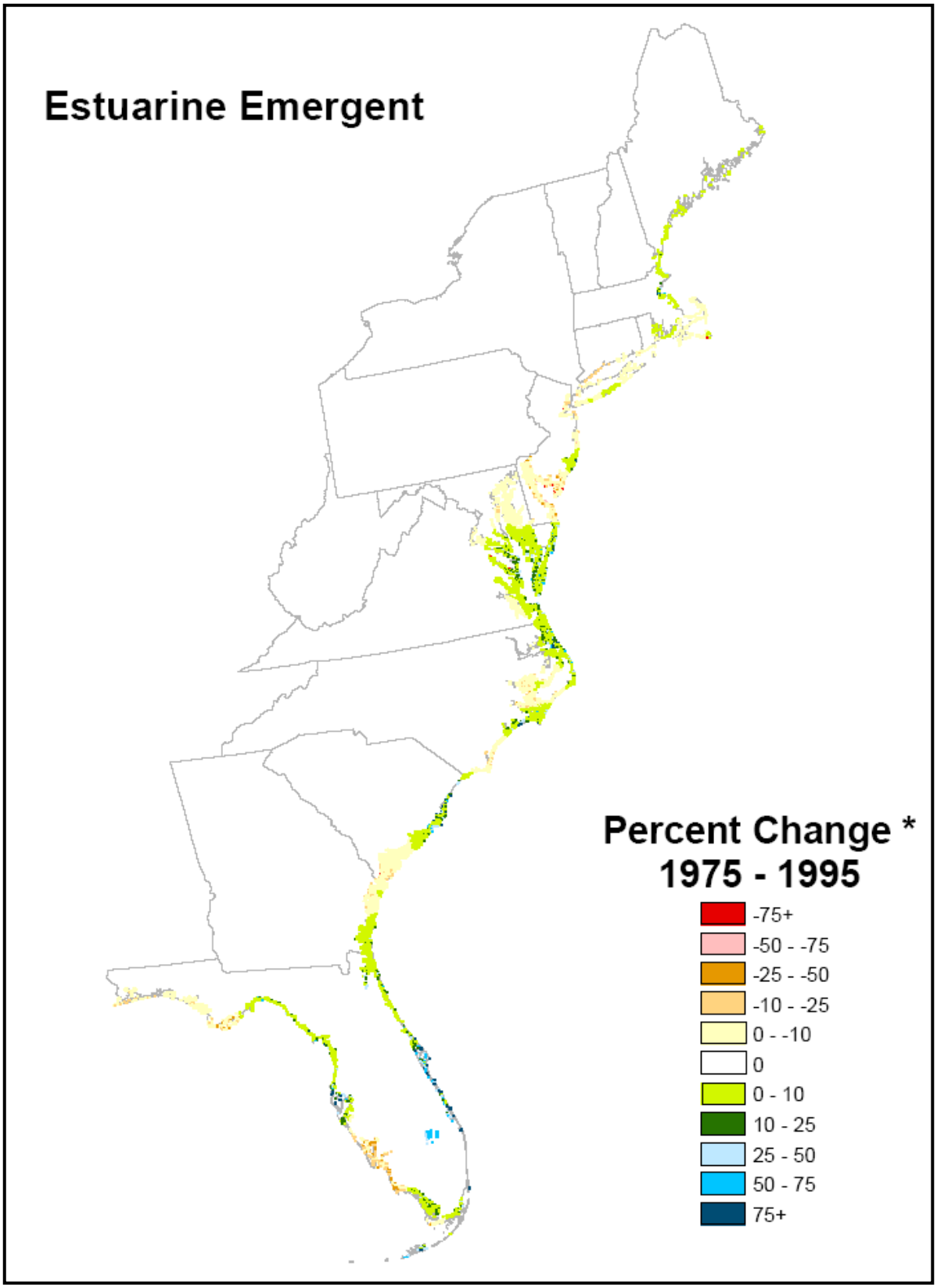

Figure 3.2. Percent change of estuarine emergent wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes.

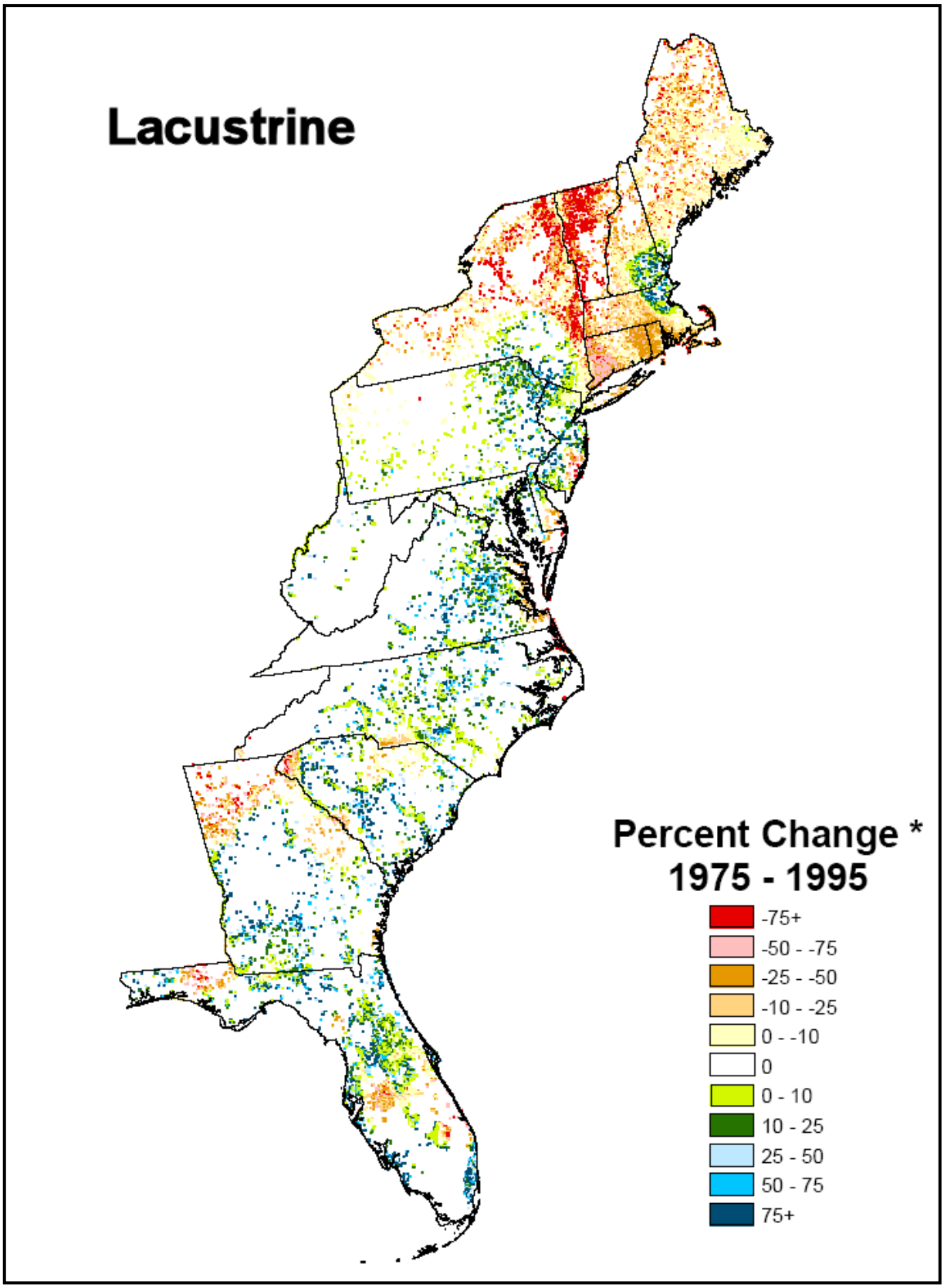

Figure 3.3. Percent change of lacustrine wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes.

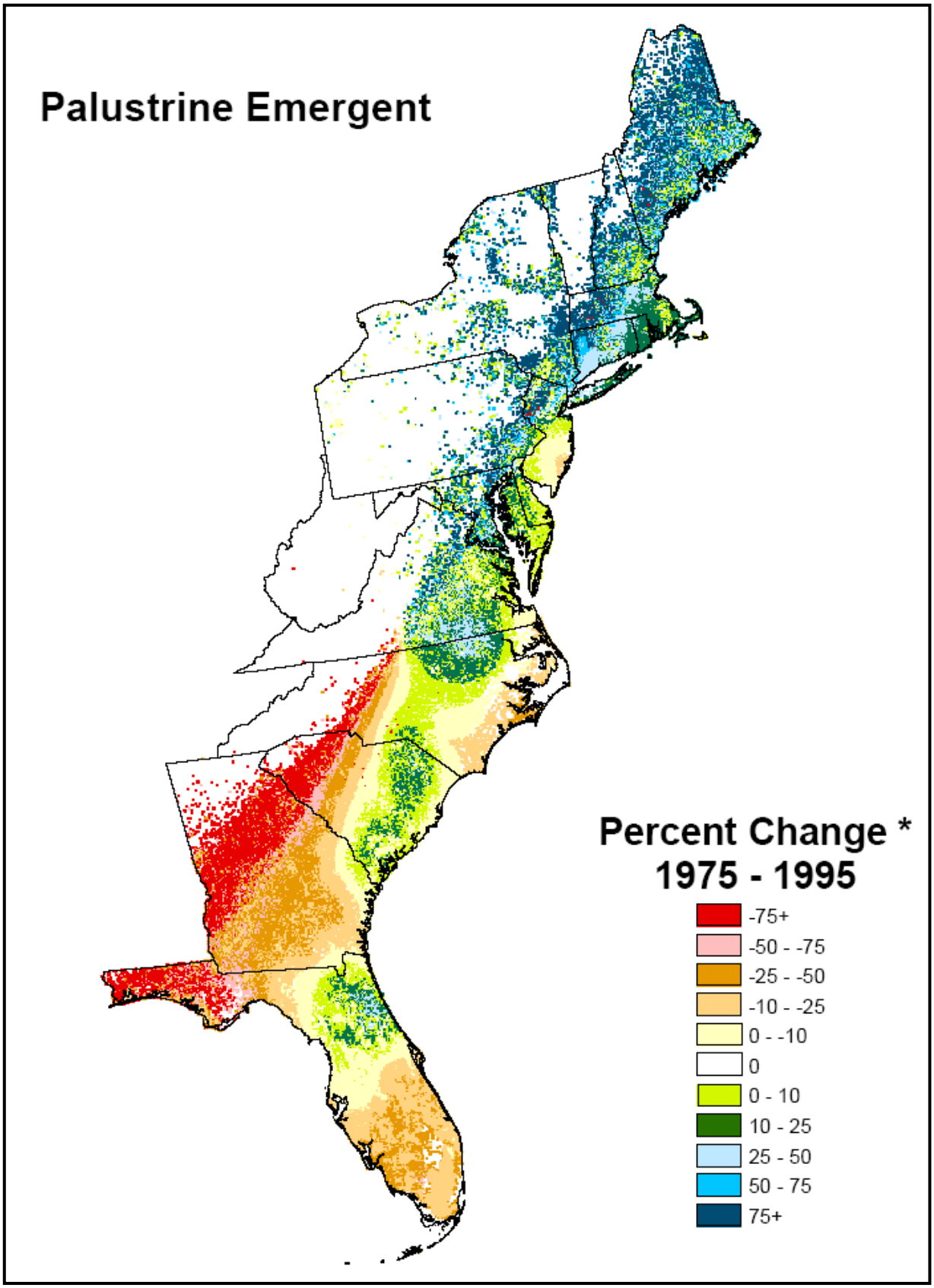

Figure 3.4. Percent change of palustrine emergent wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes.

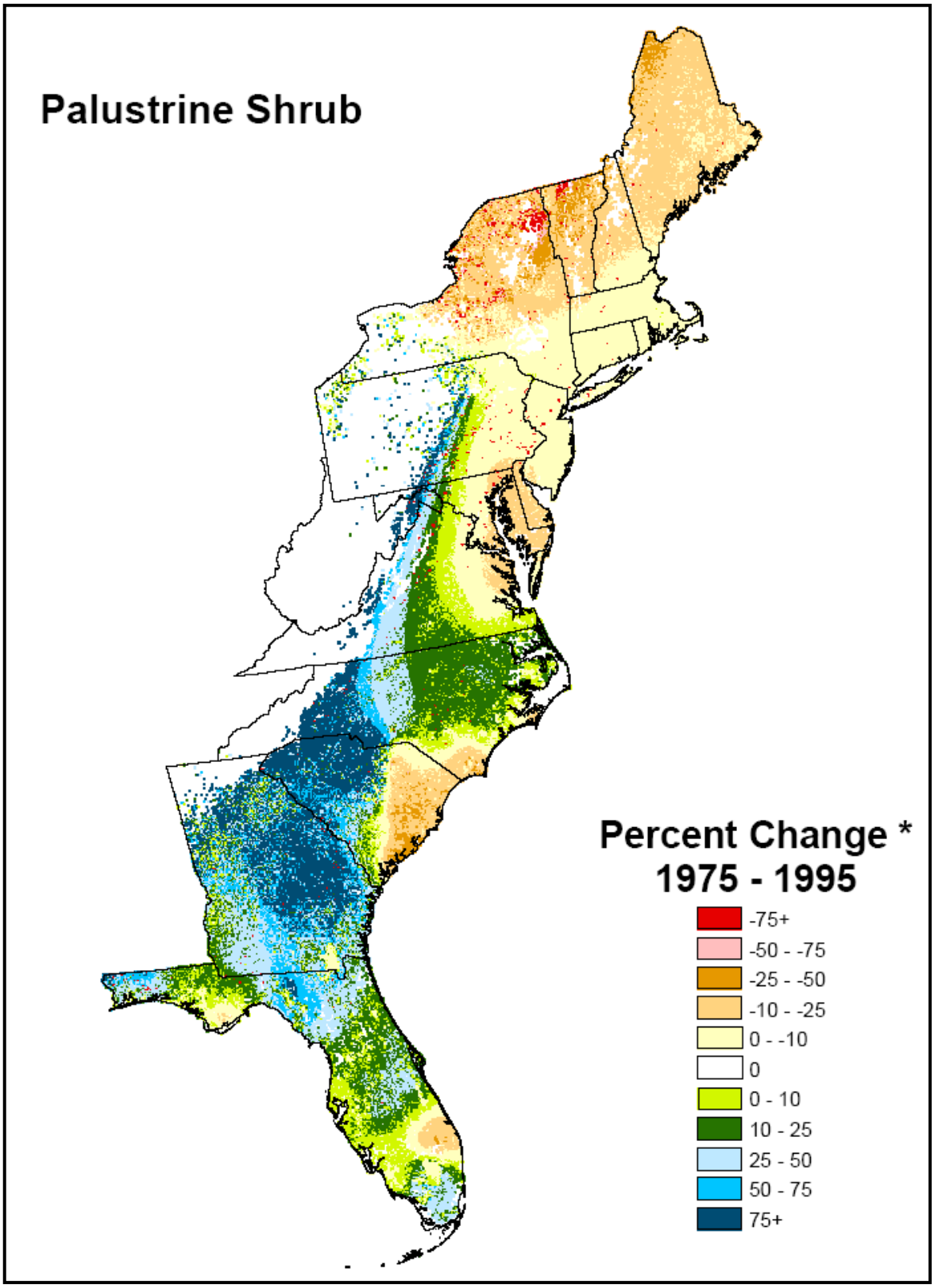

Figure 3.5. Percent change of palustrine scrub-shrub wetlands in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes.

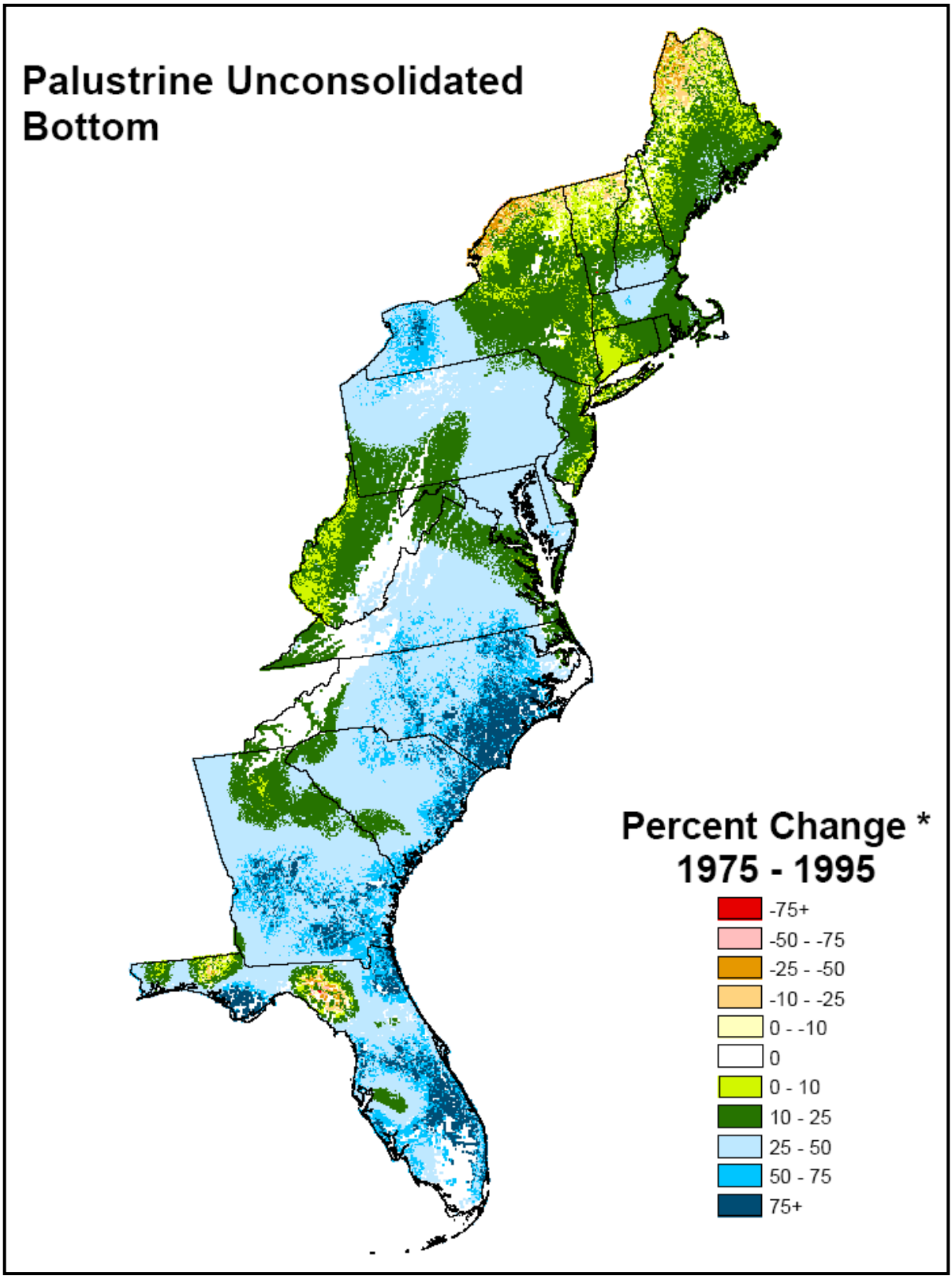

Figure 3.6. Percent change of palustrine unconsolidate bottom wetlands (e.g., ponds) in the ACJV at a resolution of 10.36 km2. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes.

Table 3.2. Predicted area (ha) and percent change of six wetlands classes in the ACJV for between the 1970s and 1990s summarized by Bird Conservation Region (BCR). Bold values are standard errors of the predictions expressed as percentage of predicted wetland area. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. Taken from Koneff and Royle (2004).

Wetland Class	BCR[1]	Predicted Area 1970s		1990s		Percent Change 70s-90s
Estuarine Emergent	LGL	0	**0.0**	0	**0.0**	0.00%
	ANF	2,500	**13.9**	2,600	**14.0**	0.00%
	SCP	478,500	**1.0**	478,700	**1.1**	0.00%
	AMT	0	**0.0**	0	**0.0**	0.00%
	PMT	3,300	**3.4**	3,200	**3.5**	0.00%
	NMC	277,600	**1.3**	277,400	**1.3**	0.00%
	PFL	83,200	**2.3**	84,100	**2.3**	0.01%
Lacustrine	LGL	238,800	**2.8**	233,200	**2.7**	-0.03%
	ANF	488,500	**3.4**	467,600	**3.3**	-0.13%
	SCP	203,100	**6.2**	213,700	**5.6**	0.06%
	AMT	82,100	**12.3**	84,700	**11.2**	0.02%
	PMT	249,300	**4.9**	259,100	**4.3**	0.06%
	NMC	74,800	**12.4**	69,700	**12.2**	-0.03%
	PFL	419,700	**1.6**	422,900	**1.6**	0.02%
Palustrine						
Emergent	LGL	28,100	**66.5**	30,300	**48.2**	0.01%
	ANF	81,000	**48.5**	118,300	**26.2**	0.23%
	SCP	410,600	**17.0**	353,000	**16.1**	-0.35%
	AMT	16,400	**307.8**	21,500	**186.3**	0.03%
	PMT	44,700	**110.1**	37,000	**102.5**	-0.05%
	NMC	69,900	**30.2**	77,100	**22.5**	0.04%
	PFL	1,328,600	**2.3**	1,152,200	**2.2**	-1.07%
Forested	LGL	310,700	**7.5**	324,700	**6.1**	0.08%
	ANF	714,700	**6.8**	528,000	**7.7**	-1.13%
	SCP	5,701,800	**1.5**	4,981,300	**1.5**	-4.35%
	AMT	296,600	**21.0**	341,200	**14.5**	0.27%
	PMT	629,600	**10.8**	617,600	**9.2**	-0.07%
	NMC	484,900	**5.6**	405,600	**5.9**	-0.48%
	PFL	1,025,300	**2.3**	979,600	**2.1**	-0.28%

[1] BCR Abbreviations – LGL: Lower Great Lakes / St. Lawrence Plain (13), ANF: Atlantic Northern Forest (14), SCP: Southeastern Coastal Plain (27), AMT: Appalachian Mountains (28), PMT: Piedmont (29), NMC: New England / Mid-Atlantic Coast (30), PFL: Peninsular Florida (31)

Table 3.2 (cont.). Predicted area (ha) and percent change of six wetlands classes in the ACJV for between the 1970s and 1990s summarized by Bird Conservation Region (BCR). Bold values are standard errors of the predictions expressed as percentage of predicted wetland area. Predicted percent change reflects a combination of conversion both to and from upland as well as to and from other wetland classes. Taken from Koneff and Royle (2004).

Wetland Class	BCR[1]	Predicted Area				Percent Change
		1970s		1990s		70s-90s
Scrub-shrub	LGL	60,800	**29.2**	54,300	**31.4**	-0.04%
	ANF	375,500	**9.6**	331,600	**10.5**	-0.27%
	SCP	1,112,300	**6.4**	1,220,000	**5.6**	0.65%
	AMT	51,900	**81.4**	54,200	**77.0**	0.01%
	PMT	138,800	**34.7**	175,300	**26.2**	0.22%
	NMC	165,700	**13.1**	154,700	**13.4**	-0.07%
	PFL	496,100	**4.8**	530,200	**4.3**	0.21%
Unconsolidated Bottom	LGL	18,000	**738**	22,000	**7.9**	0.02%
	ANF	44,500	**6.8**	53,000	**7.3**	0.05%
	SCP	121,300	**4.5**	172,300	**4.0**	0.31%
	AMT	56,200	**7.6**	79,100	**8.1**	0.14%
	PMT	75,900	**5.0**	100,700	**4.7**	0.15%
	NMC	34,600	**4.9**	42,300	**5.0**	0.05%
	PFL	49,800	**3.6**	73,700	**3.0**	0.14%

[1] BCR Abbreviations – LGL: Lower Great Lakes / St. Lawrence Plain (13), ANF: Atlantic Northern Forest (14), SCP: Southeastern Coastal Plain (27), AMT: Appalachian Mountains (28), PMT: Piedmont (29), NMC: New England / Mid-Atlantic Coast (30), PFL: Peninsular Florida (31)

Table 3.3. Classification categories for USGS Land Use Land Cover (LULC) data used as baseline condition for ACJV circa mid-1970s (http://www.epa.gov/ngispgm3/spdata/EPAGIRAS/meta/metadata.txt).

Anderson Level I	Anderson Level II	Description
1		**Urban or built-up land**
	11	Residental
	12	Commercial and services
	13	Industrial
	14	Transportation, communication, utilities
	15	Industrial and commercial complexes
	16	Mixed urban or built-up land
	17	Other urban or built-up land
2		**Agricultural land**
	21	Cropland and pasture
	22	Orchards, groves, vineyards, nurseries and ornamental horticultural
	23	Confined feeeding operations
	24	Other agricultural land
3		**Rangeland**
	31	Herbaceous rangeland
	32	Shrub and brush rangeland
	33	Mixed rangeland
4		**Forest land**
	41	Deciduous forest land
	42	Evergreen forest land
	43	Mixed forest land
5		**Water**
	51	Streams and canals
	52	Lakes
	53	Reservoirs
	54	Bays and estuaries
6		**Wetland**
	61	Forested wetland
	62	Nonforested wetland
7		**Barren land**
	71	Dry salt flats
	72	Beaches
	73	Sandy areas not beaches
	74	Bare exposed rock
	75	Strip mines, quarries, gravel pits
	76	Transitional areas

Table 3.3 (cont.). Classification categories for USGS Land Use Land Cover (LULC) data used as baseline condition for ACJV circa mid-1970s (http://www.epa.gov/ngispgm3/spdata/EPAGIRAS/meta/metadata.txt).

Anderson Level I	Anderson Level II	Descriptions
8		**Tundra**
	81	Shrub and brush tundra
	82	Herbaceous tundra
	83	Bare ground
	84	Wet tundra
	85	Mixed tundra
9		**Perennial snow or ice**
	91	Perennial snowfields
	92	Glaciers

Table 3.4 NLCD two-level land cover classification system.

Level I	Level II	Description
10		Water
	11	Open Water
	12	Perennial Ice/Snow
20		Developed
	21	Low Intensity Residential
	22	High Intensity Residential
	23	Commercial/Industrial/Transportation
30		Barren
	31	Bare Rock/Sand/Clay
	32	Quarries/Strip Mines/Gravel Pits
	33	Transitional
40		Forested Upland
	41	Deciduous Forest
	42	Evergreen Forest
	43	Mixed Forest
50		Shrubland
	51	Shrubland
60		Non-Natural Woody
	61	Orchards/Vineyards/Other
70		Herbaceous Upland
	71	Grasslands/Herbaceous
80		Planted/Cultivated
	81	Pasture/Hay
	82	Row Crops
	83	Small Grains
	84	Fallow
	85	Urban/Recreational Grasses
90		Wetlands
	91	Woody Wetlands
	92	Emergent Herbaceous Wetlands

Table 3.5 Percent of landscape by land cover category for each data set and percent change between the mid-1970s (LULC) and mid-1990s (NLCD). Note that not all classes were reconcilable between the two data sets, thus caution must be used in interpreting change for Urban/Recreational Grasses category which only exited in the NLCD data.

Class	LULC	NLCD	% Change
Open Water	6.79%	7.36%	0.58%
Developed	5.83%	4.69%	-1.15%
Bare Rock/Sand/Clay	0.06%	0.11%	0.04%
Quarries/Strip Mines/Gravel Pits	0.34%	0.22%	-0.13%
Transitional	0.51%	1.80%	1.29%
Deciduous Forest	21.15%	28.26%	7.10%
Evergreen Forest	14.97%	14.43%	-0.54%
Mixed Forest	17.91%	12.60%	-5.30%
Shrubland	0.31%	0.14%	-0.17%
Orchards/Vineyards/Other	0.62%	0.37%	-0.25%
Grasslands/Herbaceous	1.01%	1.20%	0.19%
Planted/Cultivated	23.36%	18.94%	-4.43%
Urban/Recreational Grasses		0.41%	
Woody Wetlands	5.17%	7.32%	2.15%
Emergent Herbaceous Wetlands	1.95%	2.16%	0.21%

Interpreting the changes in land cover composition between the 1970s LULC data and the1990s NLCD data is problematic due to inherent differences in how the data were collected and classified. The LULC data is based on interpreted aerial photographs using traditional photogrammetry techniques; whereas the NLCD data were from a digital sensor on a satellite in orbit and then processed by various computer-based classification algorithms. Some of the change in land cover classes between the two time periods (Table 3.5) is quite likely due to differences in how each data set was classified. In making a determination of what is a real change versus an issue with methodological differences, it is informative to look how individual pixels changed from the 1970s to the 1990s (Table 3.6). In order to correctly interpret this confusion matrix, it is important to keep in mind that the only valid comparisons are made oolumn-wise. For example, for pixels that were classified as Transitional (33) in the LULC data set, only 3.7% were still classified as Transitional in the mid-1990s. In accounting for this change, we see that 25% of the pixels were classified as Developed in the NLCD data set; an additional 31% were later classified as Forested. Examination of Table 3.6 shows that there is generally good agreement between the two classified data sets; remember there was a relatively low overall change over the 20 year interval.

Table 3.6. Matrix showing how land cover has changed in the ACJV between the 1970s and 1990s. Table shows percent of landscape that was classified as a given land cover type in the Land Use Land Cover (LULC) data set in the 1970s (columns) and their resulting classification in the 1992 National Land Cover Data (NLCD) data set (rows). Primary diagonal cells (highlighted in grey) show percent of landscape that the same classification in the two data sets. Note there was no comparable LULC category thus, class 85 is absent from that data set.

NLCD Land Cover Class	LULC Land Cover Class														
	11	20	31	32	33	41	42	43	51	61	71	80	85	91	92
11	92.1%	1.9%	24.3%	3.6%	3.1%	0.6%	0.7%	0.8%	2.2%	1.6%	1.5%	0.7%		2.1%	12.9%
20	0.6%	53.7%	5.6%	5.1%	25.2%	1.1%	1.7%	1.3%	5.1%	7.5%	6.7%	2.0%		0.8%	1.1%
31	0.1%	0.3%	32.2%	1.1%	0.6%	0.0%	0.1%	0.0%	0.8%	0.1%	0.2%	0.1%		0.1%	0.3%
32	0.0%	0.3%	0.2%	20.8%	1.2%	0.2%	0.1%	0.1%	0.1%	0.3%	0.4%	0.1%		0.1%	0.0%
33	0.1%	1.0%	0.8%	2.8%	3.7%	0.5%	6.1%	1.7%	1.3%	0.6%	1.8%	1.1%		1.5%	0.7%
41	1.3%	12.9%	10.1%	33.4%	15.4%	65.1%	16.4%	40.0%	19.6%	4.4%	0.0%	14.9%		4.2%	2.3%
42	1.3%	5.8%	5.3%	5.9%	15.5%	8.0%	39.0%	20.1%	11.0%	4.9%	17.3%	6.6%		17.0%	5.6%
43	0.9%	7.0%	4.9%	6.5%	7.6%	16.6%	17.2%	23.0%	8.4%	2.1%	0.0%	6.7%		4.5%	1.7%
51	0.1%	0.1%	0.5%	1.1%	1.0%	0.0%	0.5%	0.0%	2.5%	0.1%	0.3%	0.0%		0.2%	0.3%
61	0.0%	0.3%	0.1%	0.1%	0.7%	0.0%	0.1%	0.0%	1.2%	37.9%	2.2%	0.2%		0.2%	0.3%
71	0.1%	0.4%	1.1%	2.6%	6.4%	0.0%	1.0%	0.0%	4.4%	3.4%	25.6%	2.4%		1.1%	3.8%
80	0.7%	9.9%	1.6%	11.7%	8.1%	4.8%	6.1%	6.8%	16.0%	31.2%	13.1%	61.8%		4.0%	2.6%
85	0.0%	3.9%	0.6%	0.6%	1.3%	0.1%	0.1%	0.1%	1.5%	0.3%	0.6%	0.3%		0.1%	0.1%
91	1.1%	1.7%	3.6%	2.4%	6.9%	2.6%	9.7%	5.4%	16.1%	2.9%	17.5%	2.4%		58.7%	15.1%
92	1.5%	0.9%	9.0%	2.1%	3.2%	0.3%	1.2%	0.5%	9.8%	2.7%	12.7%	0.7%		5.2%	53.1%

Land Cover Class Codes: 11: Open Water, 20: Developed, 31: Bare Rock/ Sand/Clay, 32: Quarries/Strip Mines/Gravel Pits, 33: Transitional, 41: Deciduous Forest, 42: Evergreen Forest, 43: Mixed Forest, 51: Shrubland, 61: Orchards/Vineyards/Other, 71: Grasslands/Herbaceous, 80: Planted/Cultivated, 85: Urban/Recreational Grasses, 91: Woody Wetlands, 92: Emergent Herbaceous Wetlands

4. WATERFOWL POPULATION STATUS AND TRENDS

The Atlantic Coast of North America supports a diverse array of migrating and wintering waterfowl species. A total of 41 species of native waterfowl are known to be found in the ACJV at some time during the year, two of these species are restricted to Puerto Rico. Twenty-five species are known to breed within the Atlantic Coast Joint Venture (Table 2.2). Of the less numerous waterfowl species, mottled ducks are common residents in Florida and South Carolina with a growing population along the coast of Georgia. Small numbers of fulvous whistling ducks are present in Florida and Georgia during the winter.

4.1 Breeding Populations

The ACJV provides breeding habitat for 25 species including black ducks, mallards, wood ducks, mottled ducks, and small numbers of other waterfowl species (Table 2.2). Numbers of breeding waterfowl in the Atlantic Coast have been estimated in the past primarily through the North American Breeding Bird Survey. Within the past 10 years, however, coordinated surveys specifically for breeding waterfowl have been conducted from the mid-Atlantic states northward into Maine and in the eastern provinces of Canada. Trends in wood duck populations still are monitored through the Breeding Bird Survey. Since 1989, breeding population estimates for mallards and other waterfowl (not separated) are compiled for the northeastern U.S. in conjunction with the July Production and Habitat Survey. Contributing states include all or portions of Delaware, Connecticut, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont (U.S. Fish and Wildl. Serv. 2004). As of 2004, Mallards had shown a non-statistically significant decrease in their population in the northeastern part of the ACJV (Table 4.1). The eastern survey area, strata 51-56, was established in 1990 to estimate the breeding population in eastern Canada of the 10 most common species that breed in eastern North America and winter along the Atlantic Coast. These include mallards, black duck, gadwall, wigeon, green-winged teal, ring-necked duck, goldeneye, bufflehead, and Lesser Scaup, goldeneye (undifferentiated) and mergansers (undifferentiated). In 1995 Maine was included as stratum 62 of the eastern survey area (U.S. Fish and Wildl. Serv. 1997). Current population estimates show all species maintaining relatively stable breeding populations during this period (Table 4.1). The only statistically significant decrease was observed in the undifferentiated mergansers.

Within the past 20 years resident populations of giant Canada geese have become prevalent within all states of the ACJV. Many populations have readily adapted to the extensive urban and suburban development along the Atlantic Coast states and, thus, have created many nuisance problems for state agencies. Also, the proliferation of resident Canada geese has confounded the ability to monitor populations of migratory Canada geese during the mid-winter surveys. These resident populations provide additional hunting opportunity in most Atlantic Flyway states. However, use of hunting in reduction and control of some of these resident populations is difficult due to the location of many flocks in residential areas, which promotes high survival and little hunting mortality. Thus, alternate methods of control to reduce nuisance complaints have been employed which includes constant harassment by air cannons or dogs,

‘round-ups’ and relocation during molting, and spraying lawns and golf course greens with aversive agents.

Table 4.1. Breeding population estimates for waterfowl from the Waterfowl Breeding Population and Habitat Survey (WBPHS Stratum 62, Maine) and from the Northeastern States Plot Survey (Includes all or portions of CT, DE, MD, MA, NH, NJ, NY, PA, RI, VT, and VA). Trends were calculated from log-transformed (ln) population estimates for 10 years in Stratum 62 (1995-2004), and for 12 years of the Northeastern Plot Surveys (1993 – 2004). Some species are not differentiated in the May breeding, Stratum 62, due to difficulties in identification from the air. Blank cells indicate no population estimate was available for a particular species-survey combination. Data obtained from Migratory Bird Management Office of the U.S. Fish and Wildlife Service, 2004.

Species	WBPHS Stratum 62, Maine			Northeastern Plot Survey		
	Slope (s.e.)	P	df	Slope (s.e.)	P	df
Mallard	-0.0360 (0.049)	NS	8	-0.0003 (0.007)	NS	10
Merganser[1]	-0.2100 (0.066)	*	8			
Common Merganser				0.0190 (0.024)	NS	10
Hooded Merganser				0.0443 (0.015)	*	10
American Black Duck	-0.0818 (0.047)	NS	8	-0.0134 (0.012)	NS	10
Green-winged Teal	0.2003 (0.089)	NS	8	0.0441 (0.041)	NS	10
Ring-necked Duck	0.0070 (0.076)	NS	8			
Goldeneye[1]	0.0989 (0.359)	NS	8			
Bufflehead	0.1186 (0.077)	NS	8			
Wood Duck				0.0126 (0.007)	NS	10
Canada Goose	0.0379 (0.063)	NS	8	0.0377 (0.010)	**	10
Blue-winged Teal				-0.0104 (0.035)	NS	10

NS – P > 0.05
* - 0.01 < P # 0.05
** - 0.001 < P # 0.01
*** - P # 0.0001
[1] – Undifferentiated species

4.2 Wintering Populations

In an analysis of recent Mid-Winter Survey (MWS) data (1970-2003) trends were calculated for 21 species or species groups (e.g., undifferentiated scoters) (Table 4.2). All indices were log-transformed (ln) prior to conducting a simple linear regression to test for long-term trends in MWS indices. Of the 20 species/species groups, eight showed statistically significant decreases (American Black Duck, American Wigeon, Canvasback, Common Goldeneye, Long-tailed Duck, Mallard, Northern Pintail, and scoters [undifferentiated]). Six species showed statistically significant increasing trends (Brant, Bufflehead, merganser [undifferentiated], Ring-necked Duck, snow goose [undifferentiated] and Tundra Swan). The remaining seven species had trends that were not statistically significant indicating an absence of directionality.

American Black Duck populations continue to be a major concern in the ACJV. The majority of the continental population winters along the Atlantic Coast of the U.S. and Canada (U.S. Fish and Wildl. Serv. 1988). Black ducks have been declining about 3% per year since the 1950s based on the Mid Winter Survey (Longcore et al. 1998, McAuley et al. 1998, see Table 4.2 for recent analysis of these data). Schools of thought differ as to the reason for the decline of black ducks. These include hybridization with mallards, excessive harvest, and continued habitat degradation through loss of habitat and increased disturbance from development adjacent to important wintering areas and potential chemical contamination of important wintering areas. Although harvest restrictions were implemented in 1983 and the continental population in the MWS appears to have stabilized (Longcore et al. 1998, McAuley et al. 1998), mid-winter indices of black ducks are well below the objective established by NAWMP. Populations appear to have stabilized only in the ACJV at approximately 223,800 birds (average MWS count from 1990-2003). Counts in the Mississippi Flyway were at all time lows, 37,400 in 1997 (U.S. Fish and Wildl. Serv. 1997).

Recently, much concern has been directed at sea ducks in the Atlantic Flyway which includes common eiders, oldsquaws, scoters (all 3 species), and harlequin ducks. Traditionally, sea ducks have been hunted in both the regular duck season and a special sea duck season which has been long (107 days) with liberal bag limits (7 birds) and within a sea duck zone, which varies among states. Status of sea ducks was evaluated for the first time in 1993 by the Office of Migratory Bird Management and 1994 by the Atlantic Flyway Technical Section. Only recently, in 1998, have the special sea duck seasons been reviewed (Caithamer et al. 1998, unpubl. rep.). Because of the paucity of information on population dynamics and the effects of hunting on sea ducks, trends in sea duck populations have been difficult to detect. However, in 1993 the Atlantic Flyway Council and the U.S. Fish and Wildlife Service restricted scoter harvests in response to population indices that showed decreasing populations. Also, low numbers of harlequin ducks have prompted Canada to list the species as endangered in eastern Canada and they are listed as threatened by the state of Maine. In response to the growing concern for sea duck populations and equivocal and weak conclusions based on traditional, long-term population monitoring techniques, a Sea Duck Joint Venture (SDJV) has been formed to address the issues surrounding sea duck ecology and population management. Currently, the ACJV and SDJV are funding efforts to develop new sampling protocols for developing a robust method for estimating wintering populations of sea ducks along the Atlantic Coast.

Table 4.2. Linear regression analyses of Midwinter Survey data, 1970 - 2003, for the ACJV portion of the Atlantic Flyway. Data were log-transformed (ln) prior to analyses. Wood Duck was dropped from these analyses due to inconsistent time-series in the Mid-winter Survey.

Species	Direction	Slope	s.e.	P	r^2	Df
American Black Duck	-	-0.0055	0.0016	**	0.266	32
Green-winged Teal		0.0120	0.0065	NS	0.097	32
American Wigeon	-	-0.0161	0.0045	**	0.282	32
Brant	+	0.0250	0.0053	***	0.407	32
Bufflehead	+	0.0124	0.0032	***	0.318	32
Canada Goose[1]		0.0032	0.0027	NS	0.041	32
Canvasback	-	-0.0120	0.0033	***	0.292	32
Common Goldeneye	-	-0.0229	0.0046	***	0.438	32
Gadwall		0.0023	0.0070	NS	0.003	32
Long-tailed Duck	-	-0.0265	0.0073	***	0.293	32
Mallard	-	-0.0111	0.0031	**	0.288	32
Merganser[2]	+	0.0253	0.0047	***	0.475	32
Northern Pintail	-	-0.0285	0.0046	***	0.546	32
Northern Shoveler		-0.0072	0.0053	NS	0.054	32
Redhead		-0.0145	0.0086	NS	0.082	32
Ring-necked Duck	+	0.0249	0.0057	***	0.377	32
Ruddy Duck		0.0137	0.0076	NS	0.091	32
Scaup[3]		0.0042	0.0052	NS	0.020	32
Scoter[4]	-	-0.0340	0.0104	**	0.251	32
Snow Goose[5]	+	0.0639	0.0048	***	0.845	32
Tundra Swan	+	0.0160	0.0020	***	0.667	32

NS – P > 0.05

* - 0.01 < P # 0.05

** - 0.001 < P # 0.01

*** - P # 0.0001

[1] – Combines four populations (North Atlantic, Atlantic, Atlantic Flyway Resident, Southern James Bay) that are managed separately.

[2] – Undifferentiated mergansers

[3] – Undifferentiated scaup

[4] – Undifferentiated scoters

[5] – Combines Greater and Lesser Snow Goose populations; may include some individuals of Ross' Goose

5. THREATS TO THE CONSERVATION OF WATERFOWL IN THE ACJV

Threats facing waterfowl in the ACJV vary by species and geographic area but can be grouped into general categories that include habitat loss, fragmentation and degradation, contaminants, over-harvest, genetic introgression with congenerics, nest predation, and mortality from commercial fisheries (broadly defined to include interactions with aquaculture). Although none of these factors are unique to the ACJV, the large and increasing human population found within the joint venture boundary increase the frequency and severity of these threats (see section 5.4).

5.1 Habitat Loss, Fragmentation and Degradation

Of the threats mentioned, habitat loss, fragmentation and degradation are the ones threatening the largest number of waterfowl species in the ACJV. Although the rate of wetland loss has decreased, loss of wetlands remains a major concern across the ACJV. Between the 1970s and 1990s approximately 918,000 ha (2,268,418 acres) of wetland habitat was lost or converted in the ACJV (Table 3.1, Koneff and Royle 2004), an average loss of approximately 45,900 ha per year (113,421 acres per year).

Several waterfowl species (e.g., Canvasback, Redhead and Tundra Swan) that winter in the ACJV are dependent on the presence of submerged aquatic vegetation (SAV) beds along the coast of the mid-Atlantic region. For example, it has been estimated that SAV once covered more than 80,900 ha (200,000 acres) of the Chesapeake Bay; as of 2003 an estimated 26,187 ha (64,709 acres) of SAV beds remained in the bay, a loss of seventy percent (http://www.chesapeakebay.net/info/baygras.cfm#SAV%20Decline). Such declines can have a dramatic impact on wintering waterfowl populations. Historically, an estimated 80,000 Redheads used this resource in the Chesapeake Bay. Today only a few thousand individuals are found annually (U.S. Fish and Wildlife Service, 19??). The causes of these declines are well documented and include declining water quality, disease, direct disturbance to SAV beds, and alteration of shallow water habitats. Mute Swan, an invasive species with an increasing population in the ACJV, also is responsible for further degradation of SAV beds in the mid-Atlantic region.

A regional habitat threat facing several species of waterfowl (e.g., Common and Hooded Mergansers, Common Goldeneye and Wood Duck) that breed in the ACJV is a reduction in availability of natural cavities (Dugger et al. 1994, Eadie et al. 1995, Hepp and Bellrose 1995, Mallory and Metz 1999). This is mainly the result of changes in silvicultural practices that favor shorter rotations (i.e., the interval between harvests) and snag removal due to safety concerns. The results of such practices are younger forests with fewer trees of the size and age class necessary to have naturally occurring nest cavities. The effect of this threat is more pronounced in the Southeast and is not perceived as a concern in the Northeast due to the more mature successional stage of the forests in this region (E. Robinson, pers. comm.). Although wildlife managers have known for years that nest boxes are an effective management tool to counter the loss of natural cavities, their installation and maintenance is expensive and time-consumptive so this management option is unlikely to completely offset the loss of natural cavities.

Degradation of near-shore and off-shore habitats from commercial fisheries and increasing aquaculture is of increasing concern especially along the northern coast of the ACJV. Species thought to be susceptible to these impacts include: Long-tailed Duck, Common Eider, Harlequin Duck, Surf Scoter and Atlantic Brant (Reed et al. 1998, Savard et al. 1998, Robertson and Goudie 1999, Goudie et al. 2000, Robertson and Savard 2002). Although the level of effect has not been quantified, it is expected that the impact of these activities will increase given the current governmental policies to expand aquaculture and increasing reliance of commercial fisheries on non-traditional species.

5.2 Contaminants

Environmental contaminants continue to be a major problem in wildlife conservation throughout the U.S. including the ACJV. Waterfowl face numerous sources of contamination including municipal waste water treatment facilities, atmospheric deposition from Midwestern power generating facilities, agricultural runoff, industrial production facilities, and coastal oil spills. Waterfowl in the ACJV must contend with numerous toxic compounds that include DDE, PCBs, mercury, lead, and a plethora of pesticides and herbicides. Not withstanding the immediate mortality, contaminants also have been shown to depress an individual's survival rate and may lower their reproductive rate (Schmitt 1998). Additionally, certain contaminants have been shown to cause birth defects that can lead to lower recruitment rates or reduce future cohorts' reproductive rates.

Elevated levels of heavy metals such as selenium, mercury, and cadmium can impair reproductive function and individual fitness of waterfowl (e.g. Benson et al. 1976, Zicus et al. 1988). Similarly, the negative impacts to reproductive processes of various organochlorines such as DDT and PCB's are well known (e.g. Babcock and Flickinger 1977). Research conducted in the Long Island Sound in the early 1990's indicated that exposure to organochlorines and heavy metals may pose serious risks to wintering waterfowl, particularly greater scaup and other diving ducks (Perkins and Barclay 1997). High levels of PCB's have been found in dabbling ducks in various locations of the ACJV (e.g. Housatonic River)

5.3 Disease

Waterfowl in the wild are susceptible to numerous pathogens that result in an unknown number of mortalities every year, but may result in large die-offs under certain conditions (Bellrose 1976, Friend 1988). Waterfowl in the ACJV are susceptible to pathogens that cause avian botulism (*Clostridium botulinum*), avian cholera (*Pasteurella multocida*) and duck plague (also known as duck virus enteritis; herpes virus). It is believed that mortality from disease has increased substantially over the last couple of decades (Friend 1988) Also, as waterfowl become more concentrated as a result of habitat loss and degradation, local populations become more susceptible to major die-offs these pathogens can cause. Initiation of monitoring programs where waterfowl tend to concentrate during migration and the winter can be useful in allowing early detection of epidemic outbreaks of these diseases.

5.4 Invasive Species

The proliferation of numerous exotic species of vegetation poses a serious risk to waterfowl throughout the ACJV. Perhaps, this is most evident in Florida where the impact of non-indigenous (non-native, alien, or exotic) plants is one of the greatest threats to Florida's natural areas.

In 1978, over 170 non-native plants species were naturalized (reproducing and continuing to exist without cultivation) in Florida's most heavily popularized counties (St. Lucie, Martin, Palm Beach, Broward, and Dade, Austin 1978). Statewide, 1,200 or 29% of the plant species now growing outside of cultivation in Florida are non-native (Wunderlin et.al. 1996). These species tend to expand rapidly and have widespread, detrimental ecological impacts. Examples include, Australian Pine (*Casuarina* spp.), which have devastated beach plant communities, Brazilian pepper (*Shinus terebinthifolius*), which now infests over 405,000 ha in the state, melaleuca (*Melaleuca quinquenervia*), which now forms monocultures in nearly 162,000 ha of wetlands, and hydrilla (*Hydrilla verticillata*), which has displaced native aquatic plant communities in over 50% of Florida's water bodies. Other invasive species include Japanese climbing fern (*Lygodium japonicum*), para grass (*Urochloa mutica*), waterhyacinth (*Eichhornia crassipies*), and water lettuce (Pistia stratiotes), among others (Langeland and Burks 1998).

However, Florida is not the only state in the ACJV to experience significant ecological degradation due to invasive species. Control of invasive species is an ongoing effort from Maine to Florida. The most problematic invasive species that negatively impact waterfowl resources in the ACJV include: alligatorweed, purple loosestrife, common reed and water chestnut.

5.4.1 Alligatorweed

Alligatorweed (*Alternanthera philoxeroides* [Mart.] Griseb.) is a South American immigrant that has invaded waterways in the United States, primarily in the southeastern states. It also is a weed in tropical and mild temperate regions around the world. Alligatorweed roots readily along waterways and then grows over the water surface as an anchored floating plant. It also grows terrestrially during dry periods. Alligatorweed is a federal noxious weed and a prohibited or noxious plant in Arizona, California, Florida, and South Carolina (USDA, NRCS, 1999). Alligatorweed grows in the coastal plain from Virginia to southern Florida and westward along coastal areas to Texas. A distribution map provided by Reed (1970) indicates that the northern limit inland is at about the middle of Alabama, Georgia, and South Carolina, with an extension slightly further north in the warmer Mississippi Valley. Current data on the extent of infestation and overall control costs in the Southeast are lacking.

Alligatorweed, like many other invasive aquatic plants, displaces native plants in ditches, along banks, and in shallow water (Holm et al., 1997). Alligatorweed disrupts water flow causing increased sedimentation, and it shades submersed plants and animals causing reduced oxygen levels beneath the mat (Quimby and Kay, 1976). A variety of biological and chemical control approaches have been tried. The biological control methods are more successful in the southern-most range of alligatorweed as opposed to the northern range extend of alligatorweed. Current costs are approximately $170 to $370/ha for control of alligatorweed with the herbicides glyphosate and fluoridone.

5.4.2 Purple Loosestrife

The invasive plant, purple loosestrife (*Lythrum salicaria*), has been a serious detriment to wetland ecosystems for the past several decades. Its ability to suppress native plant communities has resulted in the eventual alteration of a wetland's structure and function (Thompson et al. 1987). Purple loosestrife has little value for resident wildlife in these communities, resulting in a reduction in numbers and species richness. In areas where loosestrife seeds are present in the soil, any disturbance quickly results in a monoculture which excludes native plants. This has made it very difficult to employ management techniques such as periodic drawdowns or even the construction of dikes to create shallow impoundments. Attempts to suppress purple loosestrife have included mowing, burning, application of herbicides, disking and flooding, with only temporary relief.

Recently, biological control of purple loosestrife has had significant results. Testing begun in the late 1980s indicated a high degree of host specificity by the weevil, *Hylobius transversovittatus*, and two beetles of the Genus *Galerucella*. Field studies at several State Wildlife Management Areas and two National Wildlife Refuges in New York resulted in noticeable effects on the vigor of these plants about 3 years post-treatment. After 5 years, the plants were suppressed in extent by 80 to 90 % of pre-treatment levels (DEC files). It is now believed that these agents are capable of controlling purple loosestrife at tolerable levels on our landscape. These insects are currently being distributed and released in over 30 states and in Canada.

5.4.3 Common Reed

Common reed (*Phragmites australis*) is an invasive perennial grass that is propagated through the rhizomes. Although the species is now thought to be native to North America, a more invasive genotype appears to have been introduced from the Old World. Due to its broad salinity tolerance, Phragmites typically creates large monocultures in both brackish and freshwater wetlands. Homogenous stands of Phragmites significantly degrade ecological function of tidal wetlands (Marks et al. 1994) and drastically reduce plant species diversity (Warren 1994). Loss of diversity in Phragmites dominated wetlands is not limited to plant species. Numerous studies (e.g. Benoit and Askins 1999, Angradi et al. 2001) have documented the loss of both avian and macro-invertebrate density and taxa richness in Phragmites-dominated marshes. In areas where changes in tidal hydrology (e.g. tidal restrictions caused by roads) have resulted in a decrease in salinity and or water levels, it may be possible to control Phragmites by restoring the original tidal hydrology. Other control methods include cutting, burning and application of herbicides but these methods often control Phragmites only for short periods. Initial investigations of biological control have produced promising results and should be supported. (Bernd Blossey, personal communication).

5.4.4 Water Chestnut

Water Chestnut (*Trapa natans*) is a floating-leaved aquatic native to Europe, Asia and tropical Africa. Introduced to New York State in the late 1800's, it has spread via interconnected

waterways into Vermont and Massachusetts. It has also been confirmed in Connecticut, Maryland and Virginia. A fierce competitor in shallow bays with soft bottoms, water chestnut creates nearly impenetrable mats across wide areas of water, out competing native submergent and floating-leaved aquatics, and is of limited value to waterfowl and other wildlife. Chemical control and manual and mechanical harvesting techniques are being used to control populations (Naylor 2003).

5.5 Predation and Harvest

Although several species (e.g., American Black Duck, Canvasback and Wood Duck) are thought to be susceptible to the effects of additive hunting mortality there is no credible evidence that current hunting regulations in the conterminous U.S. are too liberal. An exception to this is Puerto Rico, where hunting is thought to be a major threat to the West Indian Whistling-Duck in Puerto Rico (Puerto Rico DNR, unpubl. report).

Unlike harvest mortality, nest predation is related to habitat quality and is affecting local populations of nesting waterfowl in different regions of the JV. Specifically, the USDA's Animal and Plant Health Inspection Service are conducting a predator control program on Virginia's barrier islands. One goal of this program is increasing black duck reproduction which had dropped due to nest predation by raccoons and red fox (U.S. Dept. of Agriculture 2005). In Puerto Rico, predation of chicks has been noted as a major threat to White-cheeked Pintails (Puerto Rico DNR, unpubl. report).

5.6 Human population and disturbance

As of 2000, the ACJV was home to almost 38% of the U.S. population excluding Alaska and Hawaii (U.S. Census Bureau, Table 5.1). While the percentage of the total U.S. population within the JV boundary has decreased from 41% to 38% since 1950, the absolute number of people living in the JV has increased by more than 46 million people. Such an increase is accompanied by an increase in the infrastructure required by our society: more housing, new roads, and new buildings for businesses and shopping. Within the ACJV this is the largest single factor resulting in the fragmentation and loss of habitat. The increase in development and urbanization is not distributed randomly across the JV (Fig. 5.1), however. The majority of the increase is concentrated along the Atlantic seaboard which contains some of the best waterfowl habitat within the JV.

As a consequence of the increasing human population, waterfowl have been and will continue to be subjected to increasing human disturbance. Conflicts over recreational use of areas protected to provide habitat for waterfowl and other wildlife will become more frequent, reducing refuge areas and pushing waterfowl to less favorable sites. Such disturbances could lead to greater energetic demands during the winter when it is normally difficult to find adequate food resources. Such a scenario would mean that individuals enter the breeding season with fewer fat reserves which could lead to lowered reproductive rates. Also, increasing storm water

Table 5.1. Census estimates of total U.S. population living with the ACJV from each Decennial census conducted by the U.S. Census Bureau.

State	US Census Figures					
	1950	1960	1970	1980	1990	2000
CT	2,007,280	2,535,234	3,031,709	3,107,576	3,287,116	3,146,477
DC	802,178	763,956	756,510	638,333	606,900	572,059
DE	318,085	446,292	548,104	594,338	666,168	783,600
FL	2,771,305	4,951,560	6,789,443	9,746,324	12,937,926	15,982,378
GA	3,444,578	3,943,116	4,589,575	5,463,105	6,478,216	8,186,453
MA	4,690,514	5,148,578	5,689,170	5,737,037	6,016,425	6,349,097
MD	2,343,001	3,100,689	3,922,399	4,216,975	4,781,468	5,296,486
ME	913,774	969,265	992,048	1,124,660	1,227,928	1,274,923
NC	4,061,929	4,556,155	5,082,059	5,881,766	6,628,637	8,049,313
NH	533,242	606,921	737,681	920,610	1,109,252	1,235,786
NJ	4,835,329	6,066,782	7,168,164	7,364,823	7,730,188	8,414,350
NY	14,830,192	16,782,304	18,236,967	17,558,072	17,990,455	18,976,457
PA	10,498,012	11,319,366	11,793,909	11,863,895	11,881,643	12,281,054
PR	2210703	2349544	2712033	3196520	3522037	3,815,893
RI	791,896	859,488	946,725	947,154	1,003,464	1,048,319
SC	2,117,027	2,382,594	2,590,516	3,121,820	3,486,703	4,012,012
VA	3,318,680	3,966,949	4,648,494	5,346,818	6,187,358	7,078,515
VT	377,747	389,881	444,330	511,456	562,758	608,827
WV	2,005,552	1,860,421	1,744,237	1,949,644	1,793,477	1,808,344
ACJV Total	62,871,024	72,999,095	82,424,073	89,290,926	97,898,119	108,920,343
%US Population[1]	41%	40%	40%	39%	39%	38%

[1] – Percent of conterminous US population estimate plus the Commonwealth of Puerto Rico

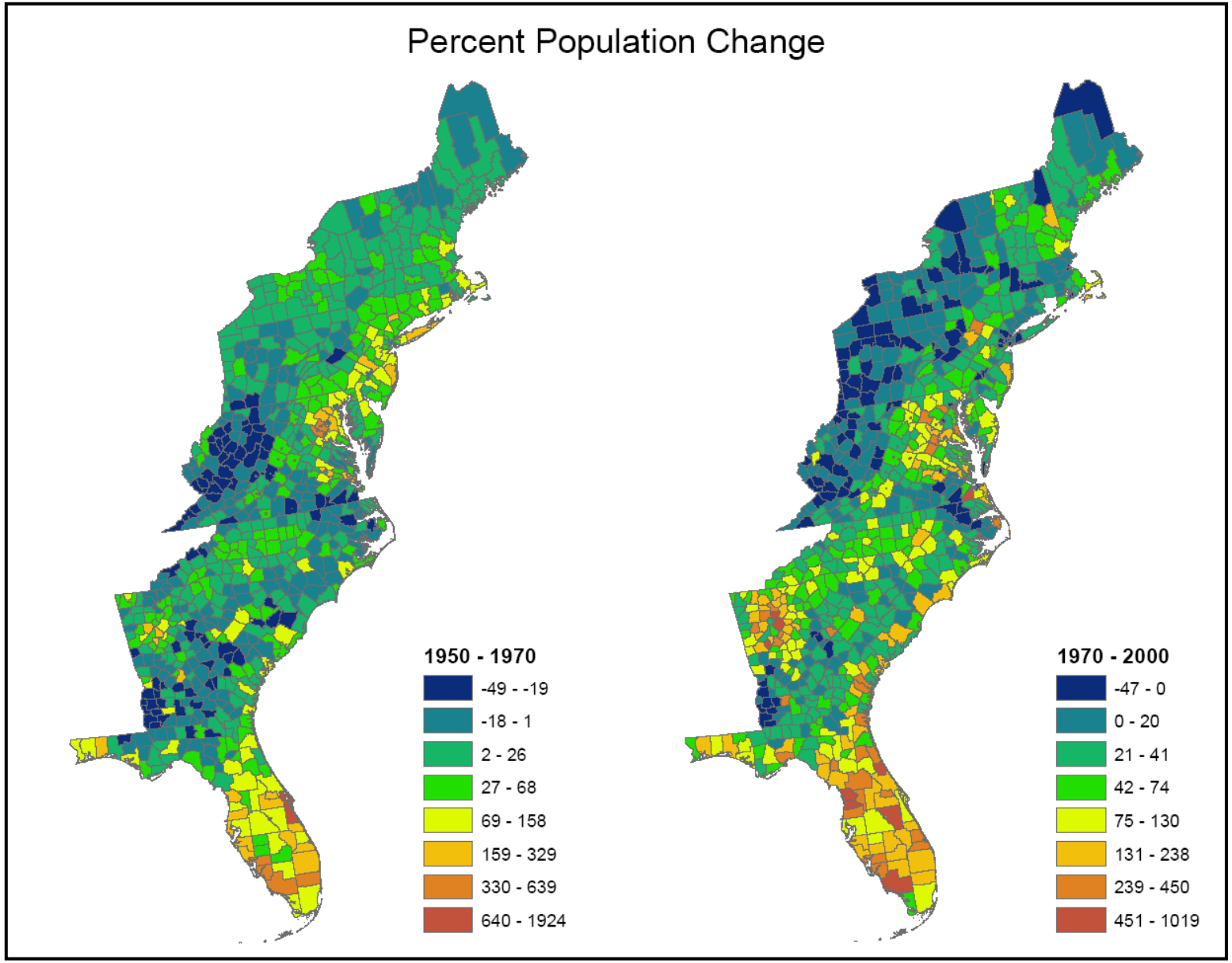

Figure 5.1. Percent change in population by county between decennial censuses of 1950 - 1970 and 1970 - 2000. Data from U.S. Census Bureau.

runoff, with increased siltation and chemicals associated with urbanization degrade water quality and reduce habitat.

5.7 Global Climate Change

Although there is a great deal of uncertainty in the exact magnitude of predicted changes, most global climate change models suggest that global temperatures will continue to rise at unnaturally fast rates, sea levels will rise as a result of melting ice fields and precipitation patterns will change. Inkley et al. (2004) state "Ignoring climate change is likely to increasingly result in failure to reach wildlife management objectives." Thus, it is important that the potential impacts of climate be understood so that appropriate management plans can be drafted. Within the ACJV, it is generally believed that the Southeast and the Mid-Atlantic States will experience the greatest change (Smith 2004 – Pew Center for Climate Change). Both of these regions will be extremely susceptible to rise in sea levels from a combination of sea level rise and marsh subsidence putting some of the ACJVs most important coastal marshes at risk of being lost (Inkley et al. 2004, Smith 2004). In the Chesapeake Bay, sea level rise may be as much as 19cm by 2030 and 66cm by the end of the century (Inkley 2004). Such dramatic increases in water level will result in the loss of suitable foraging habitat for wintering waterfowl. In the Southeast, increasing temperatures may reduce water quality and increase the likelihood of severe hurricanes (Smith 2004).

The Great Lakes/ St. Lawrence is expected to receive less runoff under most existing climate change models that will result in lower water levels in the region. Although this area is important for waterfowl throughout the year, such impacts may have a disproportional effect on the species that use this area as major staging grounds during migration (e.g., Greater Snow Goose).

In addition to the impacts already mentioned, it is expected there will be a general northward migration of ecosystem types as a result of increasing temperatures (U.S. Department of State 2002, Smith 2004). Prasad et al. (USFS 1999) have produced predictive models showing how forest types respond under five different climate change models as the result of doubling CO_2 concentrations. There is good agreement among the predictions based on the five different models. Generally, oak/hickory and oak/pine forests become the dominant forest types throughout the ACJV, with the complete loss of sub-boreal forest types. Whether this will have an impact on waterfowl is unknown, but is mentioned to illustrate the severity of the changes facing wildlife managers.

6. GOALS AND OBJECTIVES FOR WATERFOWL CONSERVATION

6.1 Continental Prioritization

The 2004 NAWMP Update set continental population objectives and regional priorities for waterfowl conservation in North America. The ACJV is responsible for taking those objectives and priorities and translating them to objectives and priorities for the joint venture. Population objectives have only been set for nine species or populations of ducks, five species or populations of geese and one species of swan (Table 6.1). Of the 15 species or populations of waterfowl that occur in the ACJV and have continental population objectives, only four (Northern Pintail, American Black Duck, American Wigeon and the Southern James Bay population of Canada Geese) are below their stated goals.

Continental prioritization for ducks considered only two factors, continental population trend and combined continental harvest. Population trends were estimated from the Waterfowl Breeding Population and Habitat Survey for the period 1970 – 2002 and were categorized as: increasing, stable, unknown or decreasing. The latter two categories were weighted equally in the prioritization scheme. Data from the U.S. FWS Waterfowl Parts Survey and similar data from Canada were combined to provide an estimate of total harvest. Species were categorized according to their composition of the total harvest as follows: high (>15%), moderate (1-14%) and low (<1%). Continental prioritization for geese and swans deviated in that harvest was not considered and was replaced by deviation from the stated population objective. This deviation was categorized as: below, unknown, at objective or above. Final priority categories were assigned based on a matrix of these factors: for ducks (Table 6.2), for geese and swans (Table 6.3). For waterfowl species occurring in the ACJV, the assigned continental priority values are shown in Table 6.4.

6.2 Joint Venture Prioritization

Although the 2004 NAWMP Update includes a regional prioritization scheme it does not easily translate into a joint venture wide priority species list for the ACJV. Therefore, a quantitative index was developed using information that captured the breeding and non-breeding conservation needs of individual species at the scale of the joint venture. We used data that were generated during the NAWMP prioritization effort and data representing geographic importance of the species within the joint venture to develop a five-tiered species priority list for the JV.

Data used in calculating a prioritization index for waterfowl species in the ACJV were obtained from the 2004 NAWMP Update, U.S. Fish and Wildlkife Service Mid-winter Waterfowl Survey and from NatureServe range maps (Data provided by NatureServe in collaboration with Robert Ridgely, James Zook, The Nature Conservancy — Migratory Bird Program, Conservation International — Center for Applied Biodiversity Science, World Wildlife Fund — US, and Environment Canada — WILDSPACE). Specific data in the ACJV priority index included:

Table 6.1. Continental breeding population objectives, average population size (ducks: 1994 – 2003, geese & swans: 2001 - 2003) and long-term trend for species occurring in the ACJV. Data from 2004 Update of the North American Waterfowl Management Plan.

Species	Objective	Average Pop Size	Long-term Trend
Ducks			
Mallard	8,200,000	8,640,000	No Trend
Northern Pintail	5,600,000	2,815,000	Decreasing
American Black Duck	640,000[a]	533,000[a]	Decreasing[c]
Mottled Duck, FL subspecies	9,400[b]	11,000[b]	Increasing[d]
Gadwall	1,500,000	2,963,000	Increasing
American Wigeon	3,000,000	2,628,000	No Trend
Green-winged Teal	1,900,000	2,485,000	Increasing
Northern Shoveler	2,000,000	3,318,000	Increasing
Redhead	640,000	811,000	No Trend
Canvasback	540,000	657,000	No Trend
Geese			
Canada Goose			
Atlantic	150,000[e]	156,200	Increasing
Atlantic Flyway Resident	650,000[f]	1,022,000	Increasing
Southern James Bay	100,000[g]	95,200	No Trend
Greater Snow Goose	500,000[g]	702,700	No Trend
Atlantic Brant	124,000[h]	163,800	No Trend
Swans			
Tundra Swan – Eastern	80,000[h]	103,400	Increasing

[a] – Estimate derived from relationship between Mid-winter Waterfowl Survey counts to population estimates derived from the Breeding Waterfowl Plot Survey of Eastern Canada; since this was published this relationship was found to be statistically invalid so the ACJV has chosen to use the wintering objective of 385,000 black ducks as an objective.
[b] – Objective corresponds to that portion of the breeding range sampled by the Florida Mottled Duck Survey. Reported average is for 1994 – 2000.
[c] – Based on Mid-winter Survey data
[d] – 1994 – 2000
[e] – Breeding pair index; objective partitioned: 150,000 pairs Ungava Peninsula, 25,000 pairs boreal Quebec
[f] – Total spring population; reduce to this level by 2005
[g] – Total spring population
[h] – Winter population

Table 6.2. Continental priority matrix for ducks.

Importance in Harvest	Population Trend			
	Decreasing	Unknown	Stable	Increasing
High	Highest	Highest	High	Moderate High
Moderate	High	High	Moderate High	Moderate
Low	Moderate High	Moderate High	Moderate	Moderate Low

Table 6.3. Continental priority matrix for geese and swans.

Population Size Relative to Objective	Population Trend			
	Decreasing	Unknown	Stable	Increasing
Below	Highest	Highest	High	Moderate High
Unknown	Highest	Expert Opinion	Moderate High	Moderate
At Objective	High	Moderate High	Moderate	Moderate Low
Above	Moderate	Moderate Low	Moderate Low	Expert Opinion

Table 6.4. Continental NAWMP priority for waterfowl species occurring within the administrative boundary of the Atlantic Coast Joint Venture.

Common Name	Continental Priority
Black-bellied Whistling-Duck	Moderate Low
Fulvous Whistling-Duck	Moderate Low
West Indian Whistling-Duck[1]	N/A
Greater Snow Goose	Above Objective
Canada Goose	
Atlantic	High
Southern James Bay	High
North Atlantic	Moderate High
Atlantic Flyway Resident	Above Objective
Atlantic Brant	Moderate Low
Tundra Swan	Moderate Low
Wood Duck	Moderate
Gadwall	Moderate
American Wigeon	Moderate High
American Black Duck	High
Mallard	High
Mottled Duck	Moderate
Blue-winged Teal	Moderate High
Northern Shoveler	Moderate
Northern Pintail	High
White-cheeked Pintail[1]	N/A
Green-winged Teal	Moderate
Canvasback	Moderate High
Redhead	Moderate High
Ring-necked Duck	Moderate
Greater Scaup	Moderate
Lesser Scaup	High
King Eider	Moderate High
Common Eider	High
Harlequin Duck	Moderate
Surf Scoter	Moderate High
White-winged Scoter	Moderate High
Black Scoter	Moderate High
Long-tailed Duck	Moderate High
Bufflehead	Moderate
Common Goldeneye	Moderate High
Barrow's Goldeneye	Moderate
Hooded Merganser	Moderate Low
Common Merganser	Moderate Low
Red-breasted Merganser	Moderate Low
Masked Duck[1]	N/A
Ruddy Duck	Moderate Low

1) *Breeding or Non-breeding Area Importance* – geographic importance of the ACJV to a particular species based on the proportion of the total U.S. Mid-winter Survey count occurring in the joint venture (wintering) or proportion of the ACJV used for breeding as depicted by the digital range maps obtained from NatureServe. In cases where there was a lack of data alternate sources of information were used such as Bellrose (1976) and expert opinion.

2) *Continental Score* – NAWMP Continental priority converted to numeric score, 1 = moderately low and 5 = highest (-5 for species with populations significantly greater than population objective (e.g., resident Canada Goose);

Values for these parameters for individual species were obtained from the North American Waterfowl Management Plan (U.S. Fish and Wildlife Service 2004) or NatureServe (http://www.natureserve.org/getData/birdMaps.jsp).

Species were then assigned to one of five conservation tiers, Low through High as depicted in Table 6.5. Area importance scores were converted to categories based on the following splits: High ≥ 50% of U.S. population, 25% ≤ Moderately High < 50% and Moderately Low < 25%. Species that rank Highest should be afforded the highest conservation concern while those that rank Low are species with no immediate threat to their long-term population viability. Two wintering species, resident Canada Goose and Greater Snow Goose, are considered species of "management concern" due to overpopulation. Breeding and non-breeding priority scores are presented in Tables 6.6 and 6.7, respectively.

6.3 Regional Prioritization

The 2004 NAWMP Update includes a regional species prioritization scheme whose stated purpose is to help joint ventures prioritize their conservation actions. This regional prioritization is based on Waterfowl Conservation Regions (WCRs) that are slightly modified BCRs. In the ACJV WCRs are identical to BCRs with the exception of BCR 27, Southeast Coastal Plain, which has been subdivided into three separate WCRs (Fig. 6.1). This prioritization is useful at the scale of the individual WCR (or related BCR) and we recommend partners consult these lists prior to developing regional and/or local conservation plans. This regional information is summarized in Appendix A for the nine WCRs partially or wholly within the ACJV (N.B., NAWMP does not currently recognize any WCR in the West Indies).

6.4 Atlantic Coast Joint Venture Planning Objectives

As part of its responsibility in implementing the goals stated by NAWMP, joint ventures are expected to develop habitat goals that are biologically linked to the continental breeding population goals. Ultimately, these goals are to be expressed as an amount of habitat that needs to be protected, enhanced or restored in the ACJV area in order to contribute to achieving NAWMP waterfowl population objectives at the regional and continental scales. At this time

Table 6.5. Regional conservation need as defined by the 2004 NAWMP Update (Appendix B, 2004 NAWMP Update). Numeric ranks used in ACJV prioritization index in parentheses.

	Continental Priority			
Geographic Importance	**High**	**Moderately High**	**Moderate**	**Moderately Low or Above Objective**
High	Highest (5)	High (4)	High (4)	High (4)
Moderately High	High (4)	Moderately High (3)	Moderately High (3)	Moderate (2)
Moderately Low	Moderate (2)	Moderately Low (1)	Moderately Low (1)	Low (0)

Table 6.6 Breeding waterfowl species prioritization for the ACJV. Continental score taken from 2004 Update to the North American Waterfowl Management Plan (US Fish and Wildlife 2004). Area importance score is the proportion of the ACJV that each species breeds in.. Conservation Tier was determined by using the matrix presented in Table 6.5. Categorization of area importance scores used the following splits: High > 0.50, 0.25 < Moderately High < 0.50, Moderately Low < 0.25.

Species	Continental Score	Area Importance	Conservation Tier
Wood Duck	Moderate	0.982	High
Hooded Merganser	Moderately Low	0.882	High
American Black Duck	High	0.395	High
Blue-winged Teal	Moderately High	0.345	Moderately High
Mallard	High	0.322	High
Green-winged Teal	Moderate	0.156	Moderately Low
Ring-necked Duck	Moderate	0.109	Moderately Low
Common Merganser	Moderately Low	0.087	Low
Mottled Duck	Moderate	0.078	Moderately Low
Gadwall	Moderate	0.076	Moderately Low
Red-breasted Merganser	Moderately Low	0.056	Low
Northern Pintail	High	0.039	Moderate
Redhead	Moderately High	0.035	Moderately Low
Fulvous Whistling-Duck	Moderate	0.034	Moderately Low
Common Eider	High	0.034	Moderate

Table 6.7. Nonbreeding waterfowl species prioritization for the ACJV. Continental score taken from 2004 Update to the North American Waterfowl Management Plan (US Fish and Wildlife 2004). Area importance score is the mean proportion of the conterminous United States Mid-winter Survey total that occurs in the ACJV (1990-2001) except where noted. Conservation Tier was determined by using the matrix presented in Table 6.5. Categorization of area importance scores used the following splits: High > 0.50, 0.25 < Moderately High < 0.50, Moderately Low < 0.25.

Species	Continental Score	Area Importance	Conservation Tier
American Black Duck	High	0.771	Highest
Canada Goose - Atlantic	High	0.750[1]	Highest
Canada Goose - Southern James Bay	High	0.750[1]	Highest
Wood Duck	Moderate	0.750[1]	High
Atlantic Brant	Moderately Low	1.000	High
Tundra Swan – Eastern	Moderately Low	0.964	High
Canada Goose – North Atlantic	Moderately High	0.850[1]	High
Greater Scaup	Moderate	0.750[1]	High
Red-breasted Merganser	Moderately Low	0.750[1]	High
Lesser Scaup	High	0.375[1]	High
Common Eider	High	0.375[1]	High
Bufflehead	Moderate	0.424	Moderately High
Ruddy Duck	Moderately Low	0.388	Moderately High
Surf Scoter	Moderately High	0.375[1]	Moderately High
White-winged Scoter	Moderately High	0.375[1]	Moderately High
Canvasback	Moderately High	0.316	Moderately High
Mallard	High	0.031	Moderate
Northern Pintail	High	0.021	Moderate
Redhead	Moderately High	0.240	Moderately Low
Ring-necked Duck	Moderate	0.237	Moderately Low
Common Goldeneye	Moderately High	0.160	Moderately Low
Black Scoter	Moderately High	0.125[2]	Moderately Low
King Eider	Moderately High	0.125[1]	Moderately Low
Blue-winged Teal	Moderately High	0.125[1]	Moderately Low
Barrow's Goldeneye	Moderate	0.125[2]	Moderately Low
Fulvous Whistling Duck	Moderate	0.125[1]	Moderately Low
Long-tailed Duck	Moderately High	0.089	Moderately Low
Green-winged Teal	Moderate	0.054	Moderately Low

Species	Continental Score	Area Importance	Conservation Tier
American Wigeon	Moderately High	0.043	Moderately Low
Harlequin Duck	Moderate	0.034	Moderately Low
Mottled Duck	Moderate	0.013	Moderately Low
Northern Shoveler	Moderate	0.013	Moderately Low
Gadwall	Moderate	0.012	Moderately Low
Hooded Merganser	Moderately Low	0.220	Low
Common Merganser	Moderately Low	0.125	Low
Greater White-fronted Goose	Moderately Low	0.000	Low

[1] – Area importance determined from range map in Bellrose (1976)
[2] - Area importance determined from expert opinion

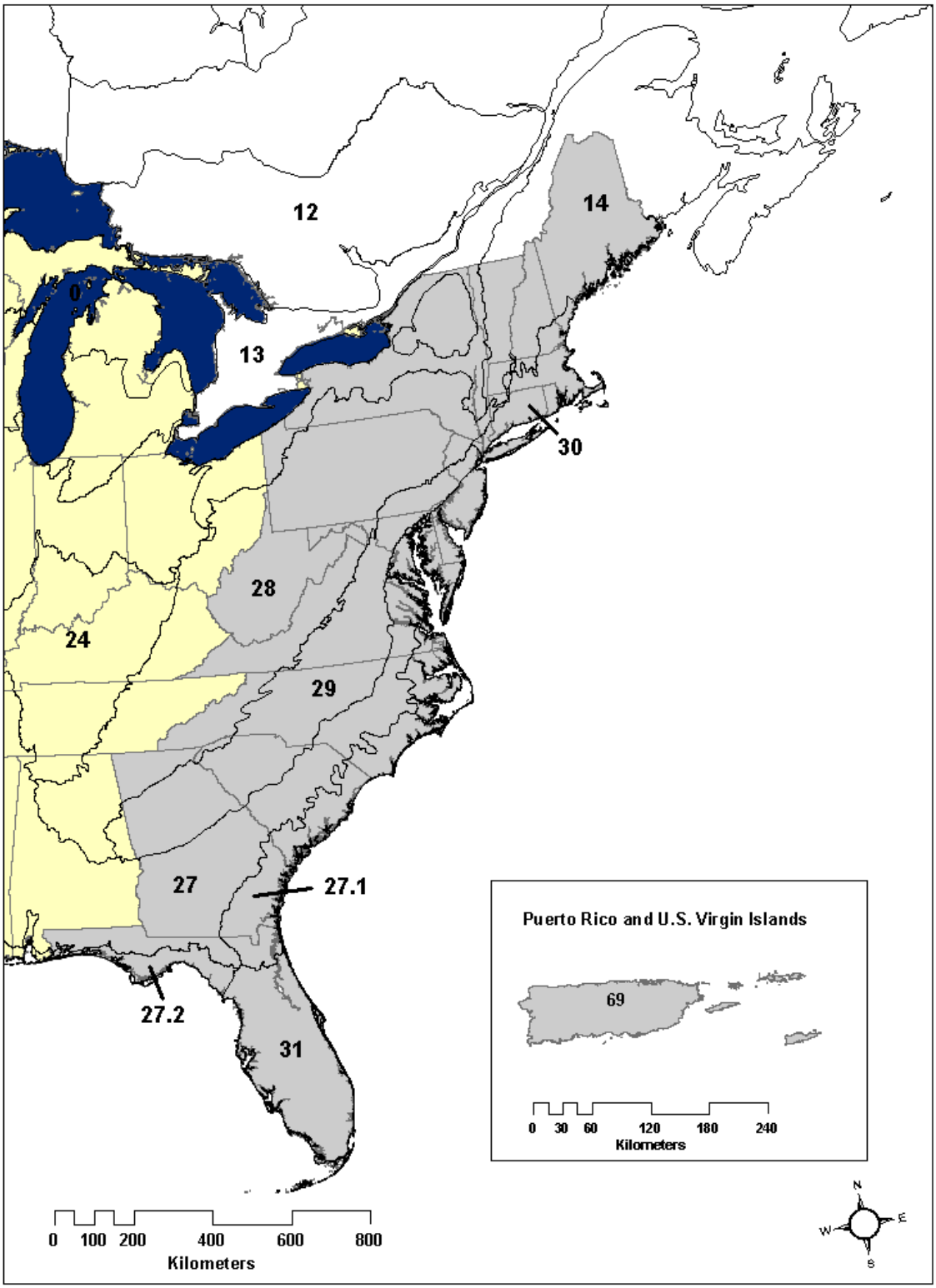

Figure 6.1. Waterfowl Conservation Regions (WCR) as delineated in 2004 Update of the North American Waterfowl Management Plan. Within the ACJV, these regions are the same as Bird Conservation Regions (BCR) with the following exceptions. Southern boundary of WCR 30 is north of revised southern boundary of BCR 30 (i.e., WCR 30 excludes southern extent of Chesapeake Bay). WCR 27 is subdivided into three regions unlike BCR 27. The ACJV recognizes WCR 69 pursuant to FWS Southeastern Region internal memo.

there is no consensus on how migratory or wintering waterfowl populations and habitat relate to the breeding objectives of NAWMP. The NAWMP National Science Support Team (NSST) has therefore recommended an interim method that uses a combination of MWS and harvest data to proportionally allocate the continental objectives between the various joint ventures. An evaluation of these methods indicates that this allocation works reasonably well for most duck species (exceptions include: Mottled Duck, whistling-ducks, Blue-winged Teal and Wood Ducks) but not for geese in general (M. Koneff, pers. comm.).

Implicit in such an endeavor is the assumption that local or regional actions are hierarchical in nature and can be aggregated to, in this case, a larger spatial scale. Although intuitive, there is no clear consensus on the functional form of such a relationship. In the absence of a clear analytical solution to the problem, the NSST reviewed alternative approaches and reached consensus in November 2003. As the official technical advisory committee of NAWMP, the NSST recommendations are being followed by most of the non-breeding joint ventures in North America. The method being recommended by the NSST is a three-step approach that allows non-breeding joint ventures to "step-down" the continental population goals into regional goals that can be used for planning habitat delivery programs. The NSST recommends that these numbers not be used as a performance metric per se, but only for baseline planning purposes. As such the first step of the process is to determine the proportion of the continental population goals a joint venture might be responsible for over-wintering. The second step is to explicitly state the assumptions being made as to the regional requirements of waterfowl, resource availability and assess trends of the resource. Lastly, joint ventures need to evaluate the validity of the assumptions made in the second step.

The NSST recommendations only concern the first step of this process: determination of the proportional allocation of continental objectives to the regional scale. The NSST is advocating the use of MWS and county level, species specific harvest data as a reasonable first approximation of the wintering distribution of waterfowl. It was noted that use of this approach incorporates all the potential biases that have been identified regarding the MWS data (Heusmann, Eggemann and other citations here). Although there are local data sets that might overcome some of these limitations, there is no other data set that covers the entire joint venture that could be used as a surrogate. Likewise, the county level-harvest data contain their own biases but lack of an alternate surrogate argues in favor of their use.

As a first approximation of objectively determining how many acres the ACJV needs to protect, restore or enhance, we used the NSST approach to calculate what the ACJV Waterfowl Technical Committee has termed a Wintering Habitat Capability Index (WHCI; see Appendix B for results of this exercises). After a thorough review of this approach and the results obtained for the ACJV, a sub-committee of the Waterfowl Technical Committee (WTC) reached the consensus that there were too many unanswered questions from this approach to use it to set habitat goals within the ACJV. Specifically, this sub-committee noted that although using the NSST approach attempts to integrate conservation efforts in the ACJV with NAWMP goals using a rigorous, science-based approach there where over-riding issues that warrant caution at this time. Specifically, they believed this method:

1. Uses data sources in a way that they were not designed for and thus yields unreasonable results in a number of cases,

2. Lacks a method and/or data necessary to convert a regional population objective into habitat goals for a large portion of the ACJV; the noted exception was in the Southeast where a case could be made that reasonable data exist, and

3. Does not include clear linkage between NAWMP continental objectives and harvest regulations and that until this relationship is formally stated it will remain unclear how to proceed.

Until consensus can be reached on how to convert the WHCI into an estimate of how much habitat needs to be protected, restored or enhanced we will rely on expert opinion from each partner state's Waterfowl Technical Committee (WTC) Representative. Thus, we asked for an estimate of the acres (wetlands and associated uplands) that still need to be protected, restored or enhanced in each Waterfowl Focus Area (see Section 7.2 for Focus Area definition) for wetland and waterfowl conservation. These estimates were to be based on an individual's knowledge of the area, an assessment of waterfowl habitat needs in that focus area, areas that have already been conserved there, and GIS tools if available. For each Waterfowl Focus Area, a map showing National Wetland Inventory and topographic features including a summary table of the area by wetland class was reviewed by each state's ACJV Waterfowl Technical Committee member. If there are acres outside of the focus areas that needed to be protected, restored or enhanced for waterfowl conservation, those were to be included as a separate total. The total of these focus area and state acreage goals for all states will constitute an interim acreage goal for the ACJV (Table 6.8). Based on this information, going forward, ACJV partners need to conserve, through protection, restoration or enhancement, more than 638,000 ha (>1,577,000 acres) of wetlands and associated uplands to meet our commitment under the NAWMP.

As the ACJV moves forward, our desire is to embrace a more biologically sound approach to estimating population-based habitat goals. The diversity of habitats and large spatial scale of the ACJV currently preclude the use of energetic models used by other non-breeding joint ventures as the ACJV currently does not have the necessary information to parameterize the model for all habitat types (Conroy and Gordon, 1990). In addition, adopting this approach relies on the unproved assumption that food is the limiting factor for waterfowl within the ACJV. Future research in the joint venture will focus on determining limiting factors and testing assumptions to allow for habitat models and population-based habitat objectives. These efforts will also allow for an evaluation of the effectiveness of conservation actions on these populations.

Table 6.8. Interim habitat objectives for the Atlantic Coast Joint Venture based on the expert opinion of Waterfowl Technical Committee Representatives. Objectives are based on Representative's professional knowledge of local wetland and waterfowl conditions. See footnotes for methodology used by individual states to estimate these interim objectives.

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
Connecticut[1]									
	Connecticut River and Tidal Wetlands Complex							468	1157
	Fishers Island Sound Complex							104	256
	Greater Hammonasset Complex							143	353
	Lower Housatonic River - Great Meadows							111	275
	Lower Thames River System							20	50
	New Haven Harbor							242	598
	Norwalk Islands							65	160
	Subtotal	0	0	0	0	0	0	**1,153**	**2,849**
Delaware									
	Bayshore	1,214	3,000	16,187	40,000	202	500	17,603	43,500
	Blackbird	202	500	1,821	4,500	81	200	2,104	5,200
	Inland Bays	202	500	1,821	4,500	40	100	2,063	5,100
	Nanticoke	1,012	2,500	405	1,000	81	200	1,498	3,700
	Subtotal	2,630	6,500	20,234	50,000	404	1,000	**23,268**	**57,500**
Florida									
	Gulf Coast	15,351	37,934					15,351	37,934
	Orange Creek/Ocklawaha Basin	1,147	2,835	5,736	14,175	3,442	8,505	10,325	25,515
	Tallahassee Area Lakes	1,294	3,197	6,468	15,983	3,881	9,590	11,643	28,770
	Upper Everglades Basin	7,387	18,254	36,935	91,267	22,161	54,761	66,483	164,282
	Upper St. Johns and Adjacent Coast	3,347	8,271	16,736	41,355	10,041	24,813	30,124	74,439
	Subtotal	28,526	70,491	65,875	162,780	39,525	97,669	**133,926**	**330,940**
Georgia[2]									
	Coastal							2,299	5,681
	Savannah River							2,884	7,126
	Oconee/Ocmulgee/ Altamaha							3,058	7,556
	Chattahoochee/Flint Rivers							2,769	6,842
	Dougherty Plains							267	660

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	Carolina Bays							904	2,234
	Ogeechee River							190	469
	Okefenokee Basin							215	531
	Subtotal							**12,586**	**31,099**
Maine									
	Downeast							0	0
	Lower Merrymeeting Bay							0	0
	Southwest Coast							0	0
	Cobscook Bay							0	0
	Narraguagus River							0	0
	Aroostook River							0	0
	Machais River							0	0
	Saco River							0	0
	Allagash / Saint Johns Rivers							0	0
	Flagstaff Lake/Dead River/Kennebec River							0	0
	Androscoggin River							0	0
	Piscataquis / Penobscot Rivers							0	0
	Sebasticook Lake							0	0
	Umbagog Lake							0	0
	Square Lake							0	0
	Moosehead Lake							0	0
	Grand Lakes / St Croix River							0	0
	Outside of Focus Areas								
	Inland Planning Area							0	0
	Subtotal							**0**	**0**
Maryland									
	Atlantic Coastal Bays	40,469	100,000	2,023	5,000	28,328	70,000	70,820	175,000
	Blackwater - Nanticoke River	0						0	0
	Chester River & Kent County Bayshore	4,047	10,000	405	1,000	202	500	4,654	11,500
	Choptank River	8,094	20,000	809	2,000	809	2,000	9,712	24,000
	Eastern Bay	8,094	20,000	809	2,000	405	1,000	9,308	23,000
	Patuxent River	2,023	5,000	405	1,000	202	500	2,630	6,500

State	Focus Area		Protect		Enhance		Restore		Total	
			Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	Potomac River		8,094	20,000			4,047	10,000	12,141	30,000
	Susquehanna River		2,023	5,000	202	500	405	1,000	2,630	6,500
	Tangier Sound & Bay Islands		40,469	100,000	2,023	5,000	2,023	5,000	44,515	110,000
		Subtotal	113,313	280,000	6,676	16,500	36,421	90,000	**156,410**	**386,500**
Massachusetts										
	Barnstable Marshes		1,214	3,000	971	2,400			2,185	5,400
	Buzzards Bay		81	200	81	200	162	400	324	800
	Duxbury Marshes		304	750	304	750			608	1,500
	Greater Boston		1,182	2,920			81	200	1,263	3,120
	Inland Rivers		1,214	3,000	607	1,500			1,821	4,500
	Inner Cape Cod		382	945	486	1,200	121	300	989	2,445
	North Shore		6,511	16,090	2,711	6,700	162	400	9,384	23,190
	North South Rivers		565	1,395	364	900	81	200	1,010	2,495
	Outer Cape Cod		686	1,695	324	800			1,010	2,495
	Westport Rivers		425	1,050			81	200	506	1,250
		Subtotal	12,564	31,045	5,848	14,450	688	1,700	**19,100**	**47,195**
New Hampshire										
	Connecticut River - NH		1,214	3,000	40	100	40	100	1,294	3,200
	Great Bay		2,023	5,000	40	100	40	100	2,103	5,200
	Lake Umbagog*		4,047	10,000					4,047	10,000
		Subtotal	7,284	18,000	80	200	80	200	**7,444**	**18,400**
New Jersey										
	Delaware Bayshores Marshes								3,845	9,500
	Delaware River Freshwater Wetlands								647	1,600
	North Coast Complex								1,416	3,500
	Northern New Jersey Limestone								789	1,950
	Passaic River Basin								506	1,250
	Pineland Bogs								1,093	2,700
	South Coast Atlantic								4,452	11,000
		Subtotal							**12,748**	**31,500**
New York										
	Finger Lakes				14	35			14	35

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	Hudson River Valley	107	265					107	265
	Lake Champlain							0	0
	Lake Ontario Islands	1,619	4,000			890	2,200	2,509	6,200
	Lake Shore Marshes	202	500			51	125	253	625
	Long Island South Shore Complex							0	0
	Montezuma Wetlands	1,214	3,000			809	2,000	2,023	5,000
	Niagara River/Buffalo Harbor					47	117	47	117
	Oneida Lake	202	500			421	1,040	623	1,540
	Peconic Bay Marshes							0	0
	St. Lawrence Plain	4,856	12,000			1,214	3,000	6,070	15,000
	Tonwanda/Iroquois/Oak Orchard Complex	61	150			20	50	81	200
	Outside of Focus Areas								
	Upper Conewango	1012	2,500			121	300	1,133	2,800
	Lower Conewango	202	500					202	500
	Alder Bottom	121	300					121	300
	Keaney Swamp					40	100	40	100
	Hartland	121	300			61	150	182	450
	Subtotal	9,717	24,015	14	35	3,674	9,082	**13,405**	**33,132**
North Carolina[3]									
	Roanoke / Chowan Rivers	4,047	10,000	81	200	202	500	4,330	10,700
	Northern Albemarle	405	1,000	81	200	81	200	567	1,400
	Currituck Sound / North River	1,214	3,000	202	500	202	500	1,618	4,000
	Albemarle / Pamlico Peninsula	2,023	5,000	809	2,000	1,012	2,500	3,844	9,500
	Southern Outer Banks	40	100	405	1,000	40	100	485	1,200
	Neuse / Pamlico Rivers	4,047	10,000	1,012	2,500	1,619	4,000	6,678	16,500
	New River	202	500	81	200	40	100	323	800
	Lower Cape Fear River	4,047	10,000	809	2,000	1,214	3,000	6,070	15,000
	Carolina Bays	2,023	5,000	405	1,000	81	200	2,509	6,200
	Waccamaw River	405	1,000	81	200	81	200	567	1,400
	Lumber River	809	2,000	202	500	405	1,000	1,416	3,500
	Upper Neuse River	202	500	81	200	81	200	364	900
	Falls / Jordan Lakes	405	1,000	202	500	81	200	688	1,700

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	Lower Pee Dee River	405	1,000	81	200	81	200	567	1,400
	Outside of Focus Areas	809	2,000	81	200	81	200	971	2,400
	Subtotal	21,083	52,100	4,613	11,400	5,301	13,100	**30,997**	**76,600**
Pennsylvania									
	Pike County	809	2,000	101	250	486	1,200	1,396	3,450
	Susquehanna River	202	500	202	500	809	2,000	1,213	3,000
	Middle Creek	1,012	2,500	61	150	202	500	1,275	3,150
	Ohio River	40	100	2	5	10	25	52	130
	Shenango River	607	1,500	202	500	607	1,500	1,416	3,500
	Pymatuning	486	1,200	61	150	324	800	871	2,150
	Cussewago Bottoms	898	2,220	30	75	40	100	968	2,395
	Preque Isle					336	830	336	830
	Outside of Focus Areas								
	Delaware River Basin Planning Area	1,214	3,000	405	1,000	1,012	2,500	2,631	6,500
	Northwest Planning Area	101	250	40	100	152	375	293	725
	Upper Susquehanna River Planning Area	486	1,200	101	250	809	2,000	1,396	3,450
	Lower Susquehanna River Planning Area	324	800	304	750	1,012	2,500	1,640	4,050
	Subtotal	6,179	15,270	1,509	3,730	5,799	14,330	**13,487**	**33,330**
Puerto Rico									
	Torrecillas, Loiza							1,617	3,996
	Las Cucharillas Marsh, Cataño, Guaynabo and Bayamón							500	1,236
	El Mameyal, Dorado							410	1,014
	Hacienda la Esperanza, Manatí							266	658
	Ciénaga de Cibuco, Vega Baja							408	1,008
	Caño Tiburones, Arecibo							1,214	3,000
	Cayures Lagoon, Añasco							115	283
	Cuevas Lagoon, Cabo Rojo							284	701
	Boquerón Wildlife Refuge, Cabo Rojo							184	454
	Laguna de Cartagena, Lajas							174	429
	El Tuque, Ponce							295	729
	La Esperanza, Ponce							1,354	3,346

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	Serrallés Lagoons Complex, Ponce							207	512
	Punta Petrona, Santa Isabel							186	460
	Punta Arenas, Mar Negro, Bahía de Jobos and Punta Pozuelo, Guayama and Salinas							5,309	13,120
	Humacao Wildlife Refuge, Naguabo and Humacao							197	486
	Ceiba Mangrove forest and lagoons (Roosevelt Roads)							0	0
	Aguas Prietas Lagoon, Fajardo							187	462
	Vieques lagoons, Kiani							146	362
	Vieques lagoons, Playa Grande							66	164
	Vieques lagoons, Chivas and Yanuel							93	230
	Punta Guilarte*							297	734
	Central Roig							274	677
	Culebra Lagoons, Flamenco							71	175
	Culebra Lagoons, Zoni							13	31
	Culebra Lagoons, Cornelius							4	10
	Subtotal							**13,871**	**34,277**
Rhode Island									
	100 Acre Cove / Warren / Plamer River							513	1,268
	Arnold Neck							144	355
	Hamilton Cove							81	201
	Boyd Marsh							52	128
	Fogland Point							409	1,010
	Briggs Marsh							464	1,146
	Coastal Ponds							2,433	6,011
	Narragansett Bay Islands							29	72
	Pettaquamscutt Cove							468	1,157
	Subtotal							**4,593**	**11,348**
South Carolina									
	ACE	8,094	20,000	4,047	10,000			12,141	30,000
	Santee River	8,094	20,000	6,677	16,500			14,771	36,500

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	CAWS	4,047	10,000					4,047	10,000
	South Lowcountry	8,094	20,000	4,047	10,000			12,141	30,000
	Santee Lakes	8,782	21,700	6,880	17,000			15,662	38,700
	Winyah	4,047	10,000	607	1,500			4,654	11,500
	Great-Pee Dee -Lynches	4,047	10,000					4,047	10,000
	Catawba River Basin	2,023	5,000	809	2,000			2,832	7,000
	Upper Savannah	2,023	5,000	607	1,500			2,630	6,500
	Little Pee Dee/Lumber	12,141	30,000					12,141	30,000
	Upper Waccamaw	6,070	15,000					6,070	15,000
	Congaree-Wateree-Upper Santee	2,023	5,000	607	1,500			2,630	6,500
	Subtotal	69,485	171,700	24,281	60,000	0	0	**93,766**	**231,700**
Vermont									
	Connecticut River - VT	101	250					101	250
	Lake Champlain	1,467	3,625			142	350	1,609	3,975
	Lake Memphramagog	2,064	5,101					2,064	5,101
	Subtotal	3,632	8,976	0	0	142	350	**3,774**	**9,326**
Virginia									
	Delmarva Peninsula	16,321	40,330	3,264	8,065	1,632	4,033	21,217	52,428
	Lower James River	12,200	30,147	2,439	6,027	1,219	3,012	15,858	39,186
	Rappahannock River	6,388	15,785	1,278	3,158	639	1,579	8,305	20,522
	Roanoke River	5,000	12,355	4,461	11,023	1,487	3,674	10,948	27,052
	Southeast Virginia	12,180	30,097	2,436	6,019	1,218	3,010	15,834	39,126
	Lower Potomac River	2,889	7,139	1,078	2,664	289	714	4,256	10,517
	Western Bayshore	5,670	14,011	1,134	2,802	567	1,401	7,371	18,214
	York/Poquoson River	5,000	12,355	1,000	2,471	500	1,236	6,500	16,062
	Outside of Focus Areas								
	Shenandoah River Planning Area	1,000	2,471	1,000	2,471	100	247	2,100	5,189
	Upper Potomac River	2,500	6,178	1,000	2,471	250	618	3,750	9,267
	Subtotal	69,148	170,868	19,090	47,171	7,901	19,524	**96,139**	**237,563**
West Virginia									
	Canaan Valley	1,376	3,400			40	100	1,416	3,500
	Tygart Valley	40	100					40	100

State	Focus Area	Protect		Enhance		Restore		Total	
		Hectare	Acres	Hectares	Acres	Hectares	Acres	Hectares	Acres
	Meadow River	51	125	24	60			75	185
	Ohio River	202	500	20	50			222	550
	Subtotal	1,669	4,125	44	110	40	100	**1,753**	**4,335**
	ACJV Totals	**345,230**	**853,090**	**148,264**	**366,376**	**99,975**	**247,055**	**638,420**	**1,577,594**

1 – Based on GIS analysis of what is feasible within 10 years.
2 – Goals based on step-down of NAWMP continental population goals converted to duck-use days. Stated goals are what is believed to be feasible within 10 years.
3 – Expert opinion that accounted for historical and current waterfowl use within each focus area; perceived amount of habitat loss with focus area; cost/benefits of protecting habitat within each focus area along with current ownership patterns and prevailing economic market conditions. Goals are for the next 10 years.

7. STRATEGIES TO ACHIEVE GOALS AND OBJECTIVES

7.1 Conservation Coordination and Delivery

The following text, goal, objective and strategies are excerpted from the Atlantic Coast Joint Venture Strategic Plan approved by the Management Board in 2004.

The joint venture offers the opportunity to coordinate among the many partners planning and implementing bird conservation in the ACJV area. While acknowledging the mission and accomplishments of individual partner agencies and organizations that make up the joint venture, the ACJV partners recognize that, by coordinating planning and delivery among partners, the joint venture can focus limited resources on the highest conservation priorities and tie together individual conservation efforts in a meaningful way throughout the flyway. ACJV partners share a common responsibility for implementing continental, national and regional bird conservation plans in the ACJV area. Implementing these plans and providing effective bird conservation requires planning and implementing at a variety of scales, including flyway, region, state, focus area and project. The joint venture needs to provide the infrastructure to support planning and implementation at these scales and translation among these scales. In order to effectively coordinate and deliver habitat conservation, the joint venture will need increased funding for both administration and implementation.

Goal: Provide a structure and process that attracts partners, leverages and generates funding, and implements projects that support ACJV goals and objectives.

- Objective 1 - Structure: Maintain capacity and structure to facilitate partnerships at various scales.
    - Strategy 1: Develop and follow a strategic plan for the joint venture and update at least every five years;
    - Strategy 2: Design and host at least annual or semiannual meetings for ACJV Management Board and technical committees to facilitate communication and effective implementation within the ACJV;
    - Strategy 3: Hire adequate staff to maintain an effective partner-based structure to facilitate project development, implementation, evaluation and communication at multiple scales;
    - Strategy 4: Facilitate state working groups, composed of state agencies and key partners, to step down regional goals and determine implementation strategies at the state scale;
    - Strategy 5: Support formation of partnerships in key focus areas in the ACJV or where there is sufficient interest.
- Objective 2 - NAWMP: Ensure the effective delivery of waterfowl habitat conservation in the joint venture area consistent with the North American Waterfowl Management Plan.

- Strategy 1: Maintain an active, functioning ACJV Waterfowl Technical Committee;
- Strategy 2: Complete a revised ACJV Waterfowl Implementation Plan that steps down the NAWMP continental goals and objectives and provides priority species, population and habitat objectives, focus areas and conservation strategies for the joint venture and for each state in the joint venture;
- Strategy 3: Using priority conservation actions under NAWMP, develop and implement priority projects in the ACJV area;
- Strategy 4: Ensure that waterfowl priorities are incorporated into BCR and state level planning.

- Objective 3 - NABCI: Integrate planning and implementation to more efficiently and effectively meet habitat needs of all birds throughout the flyway and BCRs consistent with all the major continental, national and state bird conservation initiatives.
  - Strategy 1: Maintain an active, functioning Integrated Bird Conservation Committee (IBCC) that represents the major bird conservation initiatives in the ACJV area;
  - Strategy 2: Provide input from the IBCC to the management board and partner agencies and organizations on priority projects to be included in agency and organization plans;
  - Strategy 3: Facilitate BCR workshops and initiatives with key partners in each BCR to identify highest conservation priorities within each BCR;
  - Strategy 4: Work with partners to step down regional goals to each state consistent with continental, national and BCR plans;
  - Strategy 5: Assign a joint venture coordinator or point of contact for each state and BCR (coordinators may have multiple BCRs and states assigned to them);
  - Strategy 6: Facilitate support for international projects to conserve ACJV priority species.
- Objective 4 – Project Funding: Seek increased funding for coordinating the activities of the joint venture and providing seed funding for projects; effectively obtain funding through federal grant programs; provide information that informs and guides the delivery of other funding sources.
  - Strategy 1: Maintain an active list of priority projects to respond to calls for proposals from foundations and other funding sources;
  - Strategy 2: Seek additional joint venture project seed funding and develop a sound process for prioritizing and tracking joint venture funded projects;
  - Strategy 3: Maximize success with federal habitat conservation grant funds (including North American Wetlands Conservation Act, National Coastal Wetland Conservation Act, Neotropical Migratory Bird Conservation Act, National Fish and Wildlife Foundation) by informing partners of funding opportunities, matching joint venture priority projects with appropriate funding

sources, facilitating project-scale partnerships, providing biological information to support grant applications, and providing efficient administrative support with grant processes;

- Strategy 4: Seek new and non-traditional partners and funding sources to meet the expanded habitat conservation priorities in the joint venture;
- Strategy 5: Provide products from biological planning efforts to deliver bird conservation programs through non-traditional funding sources (e.g., Farm Bill, Forest Legacy);
- Strategy 6: Provide products that inform the state Comprehensive Wildlife Conservation Strategy process to ensure that regional needs are met by individual State Wildlife Grants and other state grants.
- Strategy 7: Provide support to National Wildlife Refuges and National Forests seeking funding for habitat protection and restoration.

7.2 Important Geographic Areas for Waterfowl Habitat Conservation in the Atlantic Coast Joint Venture

In the process of defining important geographic areas for waterfowl conservation in the Atlantic Coast Joint Venture, it has become clear that the original concept and definitions of focus areas are not adequate to map and describe important areas for waterfowl conservation in landscapes where the habitats and conservation needs are sparsely distributed over large areas or in areas where the targeted activity addresses other conservation issues such as protecting water quality. In order to capture the conservation needs in the diversity of landscapes in the ACJV, we used a three-tier, hierarchical approach to mapping and defining areas. From coarsest to finest they would be planning areas, focus areas and sub-focus areas. Definitions for each of the three types follow.

I. Planning Areas

Waterfowl Conservation Planning Areas are large areas within a state or region that generally contain small patches of suitable habitats for waterfowl dispersed across the landscape. The boundaries of the planning areas are based on units used to plan waterfowl habitat conservation within a state such as watersheds or physiographic areas. These ecological boundaries may be generalized or simplified by using recognizable cultural or political features such as roads, county or town boundaries. The boundary description and justification for planning areas should clearly state the justification for the planning area boundary and identify the habitats within the larger area that are in need of protection, restoration or enhancement. An example would be the watersheds feeding into Chesapeake Bay. In this region, watershed boundaries are the logical units used to plan for restoration of wetlands and water quality. The justification for the boundary would indicate the importance of restoring small wetlands and buffers throughout the watershed to provide habitat and food sources for waterfowl during spring and fall migration and to improve the water quality of the bay. Large wetland complexes and river corridors within the watershed planning areas are identified as focus areas and specific wetlands are defined as sub focus areas.

II. Focus Areas

Focus areas are habitat complexes that are priorities for waterfowl conservation. Unlike planning areas, they are defined by specific continuous or contiguous suitable habitat areas. Criteria for focus area delineations are:

1. Regionally important to one or more life history stages or seasonal-use periods of waterfowl.
2. Developed within the context of landscape-level conservation and biodiversity.
3. Discrete and distinguishable habitats or habitat complexes demonstrating clear ornithological importance. The boundaries are defined using ecological factors such as wetlands and wetland buffers.
4. Large enough to supply all the necessary requirements for survival during the season for which it is important, except where small, disjunct areas are critical to survival and a biological connection is made.

Examples of focus areas are complexes of salt marshes and coastal bays along the coast or river corridors and associated floodplain wetlands with known importance to waterfowl.

III. Sub-Focus Areas

Sub-focus areas are specific, discrete habitat patches such as marshes, bays or islands within a larger habitat complex focus area (e.g., a specific salt marsh within a coastal wetland complex). Many focus areas may not need to have sub-focus areas but they can be useful to help describe specific sites for waterfowl conservation.

Partners in the ACJV have identified 13 planning areas and 136 focus areas (Fig 7.1). Through this process more than 45 million hectares (>113 million acres) are targeted for conservation actions that will benefit waterfowl and other wetland dependent wildlife. These acreages are broken down by type of area (e.g., focus area or planning area) and state (Table 7.1). State WTC members and ACJV staff have developed detailed descriptions of each focus area that highlight priority species that occur in each area and note conservation actions that are likely to benefit waterfowl. These are organized by state (alphabetical order) in the following pages.

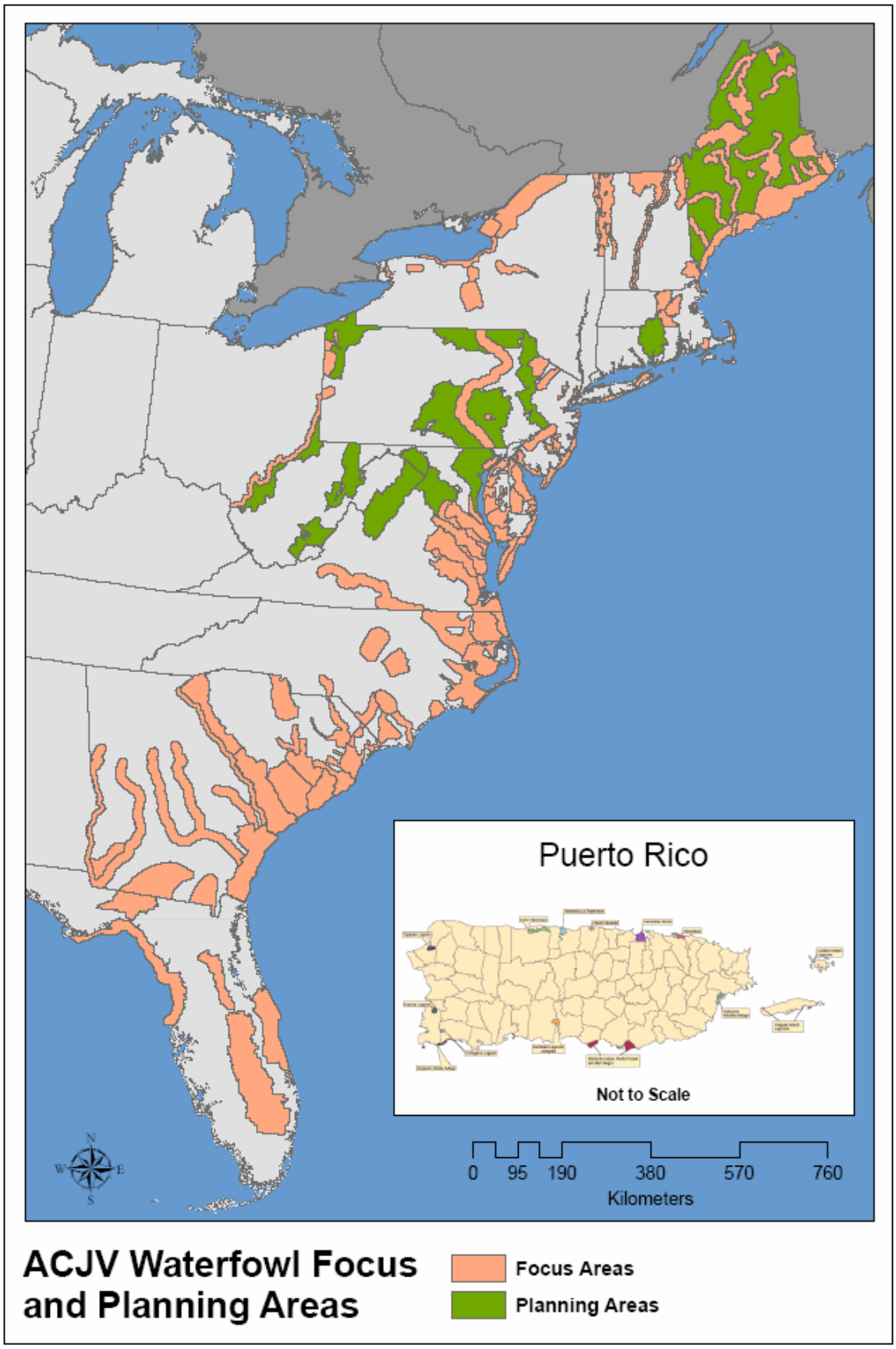

Figure 7.1. Areas designated for waterfowl conservation within the ACJV.

Table 7.1. State-level summary of acreage designated as waterfowl conservation areas. Two tiers of a three-tiered system are shown; sub-focus areas are not shown but their acreage is included in focus area totals.

A - Focus Areas

State	Hectares	Acres
CT	44,519	110,008
DE	373,959	924,069
FL	4,008,010	9,903,969
GA	5,125,823	12,666,134
MA	420,641	1,039,422
MD	1,037,169	2,562,890
ME	3,599,027	8,893,354
NC	3,326,589	8,220,148
NH	476,794	1,178,179
NJ	654,073	1,616,243
NY	1,849,570	4,570,369
PA	1,191,087	2,943,228
RI	10,454	25,832
SC	4,177,936	10,323,864
VA	2,595,022	6,412,414
VT	909,102	2,246,431
WV	438,395	1,083,293
Total	30,238,170	74,719,847

B - Planning Areas

State	Hectares	Acres
CT	380,960	941,369
MD	539,037	1,331,984
ME	7,671,676	18,957,049
PA	4,278,687	10,572,824
VA	1,280,624	3,164,478
WV	1,568,442	3,875,689
Total	15,719,426	38,843,393
Grand Totals	45,957,596	113,563,240

7.2.1 Connecticut

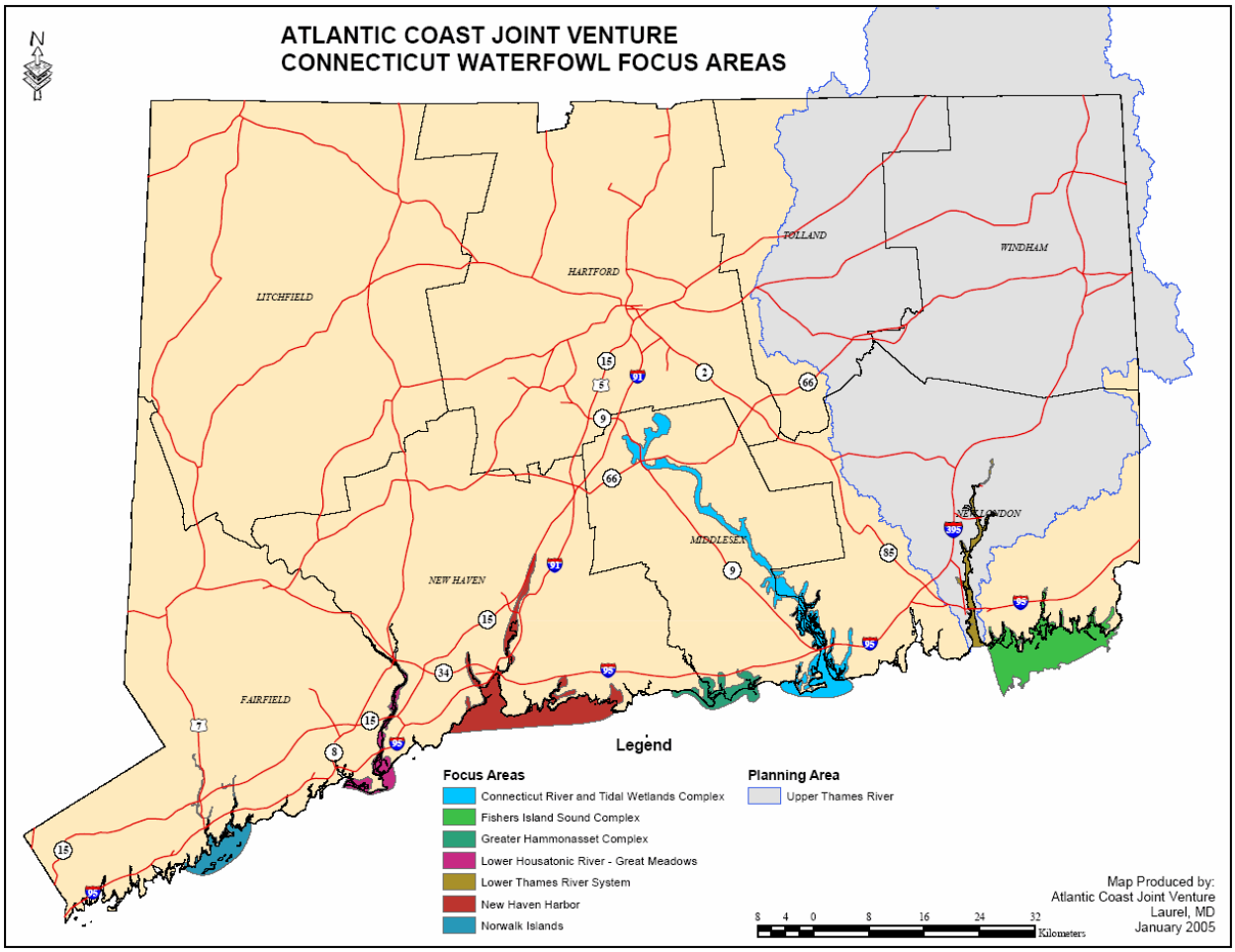

Figure 7.2. Connecticut waterfowl focus areas.

Focus Area: Connecticut River, Connecticut
Sub-Focus Areas: None

Area Description:

This wetlands and river focus area consists of over 20 individual tidal wetland units and river islands of various sizes occurring along a 40-mile (64 km) stretch of the lower Connecticut River from Old Saybrook to Cromwell. The focus area encompasses 11,426 hectares (28,234 acres). Taken as a whole, this focus area represents a gradation of tidal wetlands from a very narrow zone of relatively high salinity marshes at the mouth of the Connecticut River where it enters Long Island Sound, through an intermediate zone of brackish, lower salinity wetlands, to extensive freshwater tidal marshes and floodplain forests beginning at Deep River and extending upriver to Cromwell.

Ownership/Protection:

Of the 23 wetland/island units comprising this focus area, at least 14 (61%) are in need of protection and/or management, either wholly or in part. While some are entirely privately owned, many have some form of protective ownership. Several of these areas contain individual parcels owned and managed by the Connecticut Department of Environmental Protection or by conservation groups such as The Nature Conservancy, Connecticut River Gateway Commission and various Town conservation and land trusts.

Acreage to Conserve:

Approximately 468 hectares (1,157 acres) of tidal wetlands within the focus area require acquisition and/or enhancement. Of this figure, approximately 364 hectares (900 acres) are privately owned and could be considered in jeopardy and in need of acquisition. New programs in place, such as the Landowner Incentive Plan, could allow for the restoration and enhancement of many of these privately-owned wetlands. Statewide, no estimate of wetlands in need of acquisition and/or enhancement is available.

Since 1988, approximately 193 hectares (479 acres) of wetland habitat within the focus area have been enhanced. Enhancement has been achieved through the use of open marsh water management techniques. An additional 191 hectares (474 acres) have undergone intensive vegetation control (*Phragmites* control). Statewide, in areas outside of ACJV focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Special Recognition:

From a regional standpoint, there are no areas in the Northeast that support such extensive or high quality fresh and brackish tidal wetland systems as those in the Connecticut River estuary. The lower Connecticut River is a Ramsar designated site. In addition, four areas within the focus area (Pratt/Post, Seldon Island, Whalebone Creek, and Chapman's Pond) are designated as Important Bird Areas (IBA) by the National Audubon Society.

Waterfowl:

The freshwater coves and tidal saltmarshes at the mouth of the river contain some of the most important areas for migrating and wintering waterfowl in the state. The remaining wild rice marshes within the focus area provide excellent food sources for breeding, staging, and wintering waterfowl. In addition, large concentrations of American Black Duck, Green-winged Teal, Mallard, and American Wigeon utilize the Great Island complex at the mouth of the river. Significant numbers of Greater Scaup, Canvasback, Ruddy Duck, and Atlantic Brant winter within the focus area.

Table 1. Waterfowl species identified in the Gulf Coast Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Green-winged Teal	X	X	X
Mallard	X	X	X
American Wigeon		X	X
Greater Scaup		X	X
Canvasback		X	X
Ruddy Duck		X	X
Atlantic Brant		X	X

Other Migratory Birds:

The lower Connecticut River constitutes the core of breeding Osprey in the state. In addition, the mudflats of the river and Great Island provide foraging habitat for a myriad of shorebirds, including; Willet, Red Knot, various species of sandpiper, Ruddy Turnstone, and Whimbrel. Griswold Point at the mouth of the river hosts nesting populations of the federally threatened Piping Plover as well as Least Tern. The tidal marshes in the lower river support globally significant populations of nesting Saltmarsh Sharp-tailed Sparrow, listed as 'near threatened' by BirdLife International, and historic populations of nesting Black Rail. The lower river also supports nesting and wintering concentrations of Bald Eagle.

Threats:

Although wetlands in Connecticut are regulated by State and Federal laws, such areas and the species which depend upon them continue to be adversely impacted by various types of human disturbances and activities (e.g. burning, mowing, mosquito ditching) and habitat alteration of upland borders and tributaries. In addition, illegal fills and activities occur over the area. The threat of oil spills and toxic contamination of the river are constant. Dredging, dredge spoil disposal, land fills, marina development, stormwater discharges, non-point source pollution and increased sediment loads pose significant problems for living resources in and along the river. There have also been various proposals to impound certain marshes, to locate a sewage treatment plant at the mouth of the river and to divert water from the river to supply water to

Boston. Invasive species such as Mute Swan, common reed and purple loosestrife threaten the typical marsh vegetation of numerous wetlands in the complex.

Conservation Recommendations:

A substantial portion of this nationally significant tidal marsh complex remains unprotected and/or is not being effectively managed so as to maintain its high species and habitat diversity and to optimize fish and wildlife productivity. The current complicated ownership pattern necessitates establishment of cooperative management and conservation agreements among all parties in order to protect this valuable ecosystem in its entirety rather than by any piecemeal approach. Such an arrangement could include zoning ordinances and other restrictions to maintain or enhance existing land uses. Aggressive management of invasive species such as the Mute Swan and common reed need to be pursued. Habitat degradation of protected areas is occurring due to lack of aggressive management. Acquisition of adjacent upland habitats should be actively pursued to provide buffers to existing wetlands. Restoration of tidal marshes through open marsh management techniques may be appropriate in some areas.

Focus Area: Fishers Island Sound, Connecticut
Sub-Focus Areas: None

Area Description:

This major estuary complex encompasses all of Fishers Island Sound and Little Narragansett Bay, including the coastline of southeastern Connecticut from the mouth of the Thames River to Watch Hill, Rhode Island, and the north shore of Fishers Island, New York. This large, estuary-dominated complex includes all of the waters and adjacent shorelines of Fishers Island Sound, or that body of water lying between Fishers Island (New York) and the southeastern coast of Connecticut, and enclosed within the area east of a boundary line drawn from the mouth of the Thames River at Avery Point (Groton) to the western end of Fishers Island, and north of a line drawn from the eastern end of Fishers Island to and including Napatree Point (Rhode Island) and Little Narragansett Bay. This area is approximately 13 miles (21 km) long in a southwest-northeast direction, and from 2 to 5 miles (3-8 km) in width in a north-south direction between the mainland and Fishers Island and encompasses 10,421 hectares (25,750 acres).

Ownership/Protection:

This complex has a mixed ownership pattern of Public Trust waters, several State-owned areas, Town parks and extensive private residential lands. State of Connecticut-owned areas include Bluff Point Coastal Preserve and State Park, Haley Farm State Park, Sixpenny Island Wildlife Area and Barn Island Wildlife Management Area. The Town of Westerly, Rhode Island, owns Napatree Point.

Acreage to Conserve:

Approximately 103 hectares (256 acres) of tidal wetlands within the focus area need acquisition and/or enhancement. Of this figure, approximately 80 hectares (200 acres) are privately owned and could be considered in need of acquisition. New programs in place, such as the Landowner Incentive Plan, could allow for the restoration and enhancement of many of these privately-owned wetlands. Statewide, no estimate of wetlands in need of acquisition and/or enhancement is available.

Since 1988, approximately 19 hectares (47 acres) of wetland habitat within the focus area have been enhanced. Enhancement has been achieved through the use of open marsh water management techniques. An additional 3.6 hectares (9 acres) have undergone intensive vegetation control (*Phragmites* control). Statewide, in areas outside of ACJV focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Waterfowl:

Fishers Island Sound is a high quality, shallow estuarine environment with extensive eelgrass beds, supporting regionally significant seasonal concentrations and populations of waterfowl and shorebirds, important finfish nursery and spawning areas and substantial commercial and recreational shellfish beds. Over-wintering and migrating flocks of waterfowl

of special emphasis occurring in significant numbers in the coves and open water environments here include Atlantic Brant, American Black Duck, Canada Goose, Common Goldeneye, Bufflehead and Hooded, Common and Red-breasted Merganser. This area is especially important as a breeding area for American Black Duck, with lesser numbers of Mallard and Canada Goose.

Table 1. Waterfowl species identified in the Fishers Island Sound Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Atlantic Brant		X	X
Canada Goose	X	X	X
Common Goldeneye		X	X
Bufflehead		X	X
Hooded Merganser	X	X	X
Common Merganser		X	X
Red-breasted Merganser		X	X
Mallard	X	X	X

Other Migratory Birds:

Osprey nest in several places along the Connecticut shoreline and on Fishers Island, and appear to be increasing in this area, as is also American Oystercatcher which breeds on several offshore island beaches. Ram Island is an important rookery for several species of colonial wading birds, including Black-crowned Night-Heron, Snowy Egret, Glossy Ibis, Great Egret, and Little Blue Heron, as well as such problem species as Double-crested Cormorant, Great Black-backed Gull and Herring Gull. These last three species seem to be increasing their numbers and populations everywhere along the coast, often displacing nesting terns and Piping Plover. Common, Least and Roseate Tern and Piping Plover commonly nested on several area beaches in the recent past, but in the past several years essentially only the Least and Common Tern still breed, and even then only at a very few localities, such as small offshore islets and on Fishers Island. Roseate Tern and Piping Plover, U.S. Endangered and Threatened species, respectively, have not nested on area beaches in the Connecticut portion of this complex in several years (although Piping Plover still nest on Napatree Beach, Rhode Island) even though suitable habitat appears available. Human-related disturbances and perhaps displacement by gulls are likely responsible for the abandonment of these sites. Marshes in this complex, particularly those at Barn Island, provide nesting habitat for American Bittern, Least Bittern, Black Rail and Seaside Sparrow, all regional species of special emphasis.

Threats:

Increased residential and marina development in the area, with consequent runoff of chemicals and fertilizers, increased turbidity and sedimentation, and discharges of sewage,

stormwaters, and wastes, potentially threatens water quality throughout the rivers, coves and waters of Fishers Island Sound, to the detriment of habitat quality for the area's significant fish and wildlife resources. This area also receives heavy recreational use, especially boating and beach activities, which can adversely impact wildlife populations during certain times of the year. Of particular concern are human-related disturbances to colonial-nesting waterbirds. Nesting populations of terns and Piping Plovers are highly vulnerable to human intrusions into nesting areas during the critical nesting season (mid-April to August), and stray pets can pose serious hazards to eggs and young birds. In several areas within this complex there are considerable problems with invasive species such as common reed, Japanese honeysuckle, Asiatic bittersweet and Mute Swan, and also with dense concentrations of white-tailed deer.

Conservation Recommendations:

The apparent abandonment of several area nesting beaches of terns and Piping Plover as a result of human disturbances is of particular concern, and requires intensive efforts to protect both currently-occupied sites as well as recent historical localities by all available means, including beach closures, fencing, predator/pet removal, posting, beach warden patrols and public education. Habitat improvement and restoration of degraded or abandoned nesting beaches using dredging spoils should be considered. Efforts should be made to identify and implement those tasks and objectives of the Piping Plover and Roseate Tern recovery plans that may be applicable to areas within this complex. Opportunities should be sought to develop cooperative management and conservation programs between various governmental agencies, private conservation organizations and private landowners to best manage and protect for the long term the living resources of this significant estuarine complex. Protection and maintenance of water quality and wetlands throughout this complex through monitoring and regulation are necessary to ensure the continued high value of this area to fish, wildlife and plant populations dependent on them.

Focus Area: Greater Hammonasset Complex, Connecticut
Sub-Focus Areas: None

Area Description:

This complex is located along the central coast of Connecticut on the north shore of Long Island Sound, between the Towns of Madison and Westbrook and encompasses 3,182 hectares (7,863 acres). The boundary of this complex extends west to east from the nearshore area of Tuxis Island and the adjacent Connecticut mainland to Menunketesuck Island, a distance of about 12 miles (19 km), and inland to the limits of anadromous fish passage up the Hammonasset, Indian, Menunketesuck and Patchogue Rivers. In addition to those areas mentioned, the following areas are also included within this complex: Tuxis Island, Hammonasset State Park and marshes, Cedar Island, Clinton Harbor, Harbor View Beach, Hammock River wetlands, Indian River wetlands and Duck Island.

Ownership/Protection:

Ownership is a mixed pattern of public lands and waters and private lands, including Hammonasset State Park and Natural Area Preserve, Hammock River Marsh Wildlife Area, Black Pond Wildlife Area, Salt Meadow Unit of the Stewart B. McKinney National Wildlife Refuge and Duck Island Wildlife Area (Connecticut Department of Environmental Protection). Menunketesuck Island is privately owned; Tuxis Island is owned by the Town of Madison.

Acreage to Conserve:

Approximately 142 ha (353 acres) of tidal wetlands within the focus area need acquisition and/or enhancement. Of this figure, approximately 121 hectares (300 acres) are privately owned and could be considered in need of acquisition. New programs in place, such as the Landowner Incentive Program, could allow for the restoration and enhancement of many of these privately owned wetlands. Statewide, no estimate of wetlands in need of acquisition and/or enhancement is available.

Since 1988, approximately 44 hectares (109 acres) of wetland habitat within the focus area have been enhanced. Enhancement has been achieved through the use of open marsh water management techniques. An additional 19 hectares (47 acres) have undergone intensive vegetation control (*Phragmites* control). Statewide, in areas outside of Atlantic Coast Joint Venture focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Special Recognition:

The Salt Meadow Unit of Stewart B. McKinney NWR, Hammonasset State Park, and Menunketesuck and Duck islands are recognized by the National Audubon Society as an Important Bird Areas (IBA) for migratory birds.

Waterfowl:

The estuarine marshes of this complex, including Hammonasset and Menunketesuck marshes, are important areas for wintering waterfowl, especially American Black Duck, Green-

winged Teal, Red-breasted Merganser, and Bufflehead. The offshore waters are important wintering and migratory stopover areas for sea ducks and diving ducks, scoters and Long-tailed Duck in particular.

Table 1. Waterfowl species identified in the Greater Hammonasset Complex Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Green-winged Teal	X	X	X
Red-breasted Merganser		X	X
Bufflehead		X	X
Long-tailed Duck		X	X
Scoter			X

Other Migratory Birds:

Several of the beaches and islands (Tuxis, Menunketesuck and Duck) have nesting colonies of Piping Plover, a U.S. Threatened species, Roseate Tern, a U.S. Endangered species, Common Tern, Least Tern and American Oystercatcher. Menunketesuck Island previously contained one of the two largest nesting colonies of Least Tern in Connecticut, a species that has been impacted greatly in the past from human disturbance. Only a few pairs nest now. Common Tern presently nest here. Significant intertidal mudflats adjacent to Menunketesuck Island are an important stopover area for migratory shorebirds, including, Ruddy Turnstone, Red Knot, Sanderling, Dunlin, and Purple Sandpiper. The area is perhaps the primary wintering area for shorebirds in Connecticut. The offshore waters often host significant numbers of migratory water birds, including Common and Red-throated Loon, Horned Grebe and Northern Gannet. Duck Island hosts a significant colony of long-legged wading birds and the tidal marshes in the area are key foraging areas for these birds. Globally-significant numbers of Saltmarsh Sharp-tailed Sparrow, listed as 'near-threatened' by BirdLife International, nest in the marshes at Hammonasset, the Hammock River Marsh, and Salt Meadow Unit of Stewart B. McKinney NWR. Hammonasset Beach State Park and the Salt Meadow Unit of Stewart B. McKinney NWR are key stopover areas for migratory songbirds in spring and particularly fall migration. Hammonasset is an important stopover and wintering area for Northern Harrier and to a lesser degree Short-eared Owl. Salt Meadow Unit has relatively unfragmented forest habitats for coastal Connecticut and hosts nesting populations of several species of concern, including Wood Thrush and Worm-eating Warbler. Significant early successional habitats also exist at Salt Meadow Unit, providing important habitat for species of conservaiton concern, including, American Woodcock, Blue-winged Warbler, and Eastern Towhee.

Threats:

Disturbances to nesting colonies of Piping Plover and terns on beaches and islands in this complex should be given high priority among resource issues. These colonies are extremely vulnerable to human-related disturbances ranging from trampling of eggs and nests by beach-

walkers and picnickers and deliberate vandalism to predation by unrestrained dogs and cats and other mammalian predators. With increasing shoreline and marina development in the area, resulting in some instances in outright destruction of habitat, there are also serious potential threats to the water quality of rivers and nearshore waters from discharges of pesticides, road runoff, farmland fertilizers, and sewage discharges, which can greatly reduce habitat quality for the many significant populations and seasonal concentrations of fish and wildlife species using this area. Increased turbidity and alterations of channels and tidal currents due to dredging are also issues of concern, including deposition of spoils on inappropriate areas, although such materials can also be used for improving beach habitats of nesting birds. Erosion of sand dunes and bluffs in the Hammonasset area due to unregulated pedestrian access is a problem in this area. Development of upland edges of saltmarshes threatens the loss of important buffer zones for these fragile habitats. Forest fragmentation due to development threatens the integrity of forest habitats at Salt Meadow Unit, as well as migratory corridors leading to this important land bird stopover area. Early succession habitats at Salt Meadow Unit are in need of active management to prevent conversion of declining habitat type to later successional stages.

Conservation Recommendations:

Piping Plover and tern nesting areas need to be afforded maximum protection, employing all available means to prevent the intrusion of humans and stray animals into these areas during the critical nesting season (mid-April to August), including fenced exclosures, posting, beach warden patrols, predator removal and public education. Efforts should also be made to identify and implement those tasks and objectives of the Piping Plover and Roseate Tern recovery plans that may be applicable to nesting areas in this complex, particularly those involving habitat restoration and enhancement of degraded areas. Protection of nesting areas on private property should be accomplished to the greatest extent practicable and feasible through the use of cooperative agreements and conservation easements. There are numerous opportunities and challenges throughout this complex for various governmental agencies, private conservation organizations and private landowners to work cooperatively in conserving and protecting this valuable complex of fish, wildlife and plant habitats.

Certain privately-owned parcels in the Menunketesuck area should be considered for acquisition by the Federal government as additions to the National Wildlife Refuge System (Salt Meadow National Wildlife Refuge) so as to protect and manage them for their significant regional biological values, undeveloped upland areas adjacent to important marsh habitats should be considered for acquisition by federal or state agencies (e.g. Griswold Airport, properties adjacent and proximal to Salt Meadow Unit). Increased funding is necessary for habitat management of early successional habitats at Salt Meadow Unit.

Focus Area: Lower Housatonic River/Great Meadows, Connecticut
Sub-Focus Areas: None

Area Description:

This marsh/barrier beach/river focus area encompasses 2,840 hectares (7,017 acres) and is located on the southwestern Connecticut shoreline of western Long Island Sound between the mouth of the Housatonic River and Bridgeport Harbor. Portions of the lower Housatonic River are also included. The area boundary includes all of Long Beach, Pleasure Beach and Great Meadows Marsh, just east of Bridgeport Harbor, eastward to Lordship Beach, the mouth of the Housatonic River, Milford Point, Charles Island, and the Charles E. Wheeler State Wildlife Area (Nells Island marshes) and from there northward up the river to Derby Dam.

Ownership/Protection:

Most of the Great Meadows marsh is in public ownership. The majority of the marsh is owned by the United States Fish and Wildlife Service (Stewart B. McKinney NWR). Long Beach is owned by the Town of Stratford. There is a colony of beach cottages at the western end of Long Beach that is leased from the Town. The Town cooperates with State personnel in managing the shorebird nesting area on Long Beach. Milford Point includes Federal (Stewart B. McKinney National Wildlife Refuge) and privately-owned (CT Audubon) parcels. The Connecticut Audubon leases this piece of Milford Point from the Connecticut Department of Environmental Protection. Nells Island/Wheeler State Wildlife Management Area and several marshy islands upstream are owned and managed by the Connecticut Department of Environmental Protection.

Acreage to Conserve:

Approximately 111 hectares (275 acres) of tidal wetlands within the focus area need acquisition and/or enhancement. Of this figure, approximately 81 hectares (200 acres) are privately owned and could be considered in need of acquisition. New programs in place, such as the Landowner Incentive Program, could allow for the restoration and enhancement of many of these privately-owned wetlands. Statewide, no estimate of wetlands in need of acquisition and/or enhancement is available.

Since 1988, approximately 16 hectares (41 acres) of wetland habitat within the focus area have been enhanced. Enhancement has been achieved through the use of open marsh water management techniques. An additional 10 hectares (25 acres) have undergone intensive vegetation control (*Phragmites* control). Statewide, in areas outside of ACJV focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Special Recognition:

Milford Point, Great Meadows, Charles Island, and Nell's Island are all designated as Important Bird Areas (IBA) by the National Audubon Society.

Waterfowl:

Great Meadows is of high regional significance in that it contains the largest block of un-ditched high salt marsh 91 hectares (225 acres) left in the State of Connecticut. The marsh provides an important wintering, nesting and migration habitat for many waterfowl species, including Atlantic Brant, American Black Duck, Green-winged Teal, American Wigeon, Gadwall, Canvasback, and Greater and Lesser Scaup. The near shore waters along the coast from Bridgeport to Milford often harbor large wintering flocks of scaup and scoters.

Table 1. Waterfowl species identified in the Lower Housatonic River/Great Meadows Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Atlantic Brant		X	X
Green-winged Teal	X	X	X
American Wigeon		X	X
Gadwall	X	X	X
Canvasback		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Mallard	X	X	X

Other Migratory Birds:

The entire area is heavily used during migration by numerous species of shorebirds, especially the mud flats. Willet, Red Knot, various species of sandpiper, Ruddy Turnstone, and Whimbrel are prevalent in the area during migration. Wading birds breeding on the Norwalk Islands also utilize the mudflats around these marshes for feeding. The marsh is used as a feeding area by migrating and wintering raptors such as Northern Harrier, Osprey, Bald Eagle and Peregrine Falcon. Black-crowned Night-Heron, Green-backed Heron, American and Least Bittern and Pied-billed Grebe have been recorded as nesting in the Great Meadows marsh. Undisturbed portions of Long Beach support small nesting populations of Piping Plover, a U.S. Threatened species, American Oystercatcher, Common and Least Tern, Killdeer and Spotted Sandpiper. Roseate Tern, a U.S. Endangered species, historically nested in this area. During migration, upwards of 5,000 shorebirds roost on the beaches above high tide. Some of the State's best examples of backdune sandflat communities occur on Long Beach and Pleasure Beach.

Threats:

Private development, storm water discharges, marine sand and gravel mining, marina construction and channel dredging are of immediate and potential threat to the habitats in this complex, particularly surrounding the Great Meadows marsh area, both in reducing available wildlife habitat area and increasing the level of human disturbance and the risk of contaminants

and degraded water quality in the general area. Lead is a major contaminant in the vicinity of Lordship Point, the result of this area being a popular trap and skeet range for over 60 years. During this time an estimated 4.8 million pounds of lead shot may have been deposited into the sediments around Lordship Point. Current remediation of the area, however, is underway. Further studies will be conducted to determine whether lead is still a potential problem to migratory birds. Non-point source pollution from the river watershed is thought to be a significant problem to the coastal waters in this area; studies are underway to further define this problem and to seek solutions. Human-related disturbances to colonial beach-nesting terns and Piping Plover, whether unintentionally or the result of purposeful intrusions into nesting areas and acts of vandalism, or from stray animals and unleashed cats and dogs, are of major concern at all known nesting localities in this area. Populations of Piping Plover, Common and Least Tern and other shorebirds nesting on beaches in this complex are subject to disturbance by people passing through the area or sunbathing on or near the nesting areas and by predation from stray or unleashed pets. Disturbance of roosting migratory shorebirds and lack of high tide foraging habitat for them are also key problems. There were significant tidal and freshwater pools at Stratford Great Meadows historically, and those have either been filled in or overgrown with *Phragmites*. *Phragmites* threatens to displace cordgrass marsh vegetation in several areas.

Conservation Recommendations:

Acquisition of privately-held salt marsh adjacent to publicly owned habitats should be aggressively pursued. Diverse partnerships between governmental and non-governmental groups need to be developed to pursue funding for acquisition and continued habitat restoration. It is essential that nesting beaches of Piping Plover and terns in this complex be protected from human-related disturbances during the critical nesting season (mid-April to August), using all available methods to exclude people and stray animals from these areas. Fenced exclosures, posting, predator traps, beach warden patrols and public education should all be considered in a protection strategy. Efforts should be made to identify and implement those tasks and objectives of the piping plover recovery plan that may be applicable to these beaches, including opportunities to restore or enhance degraded beach habitat. State and Federal programs to protect and enhance water quality in Long Island Sound and adjacent waters should continue to focus on protecting tidal freshwater and brackish wetlands and coastal water quality through the regulatory process and in addressing the problems of hypoxia, oil spills, non-point source pollution, sewage and waste disposal and heavy metal contaminants in these waters to restore and maintain important fish and wildlife habitat.

Focus Area: Lower Thames River System, Connecticut
Sub-Focus Areas: None

Area Description:

This area encompasses the lower tidal reaches of the Thames River in southeastern Connecticut from New London and Groton at the mouth to Norwich. The boundary of this site includes the river channel, waters and shoreline wetlands of the lower tidal reaches of the Thames River from the confluence of the Shetucket and Quinebaug Rivers a few miles north of Norwich to the mouth of the river at New London and Groton where it enters into the eastern end of Long Island Sound, a river length of approximately 19 miles (31 kilometers). Specific areas of biological significance, in addition to the river itself, include the Mamacoke Island marshes, Horton Cove, Poquetanuck Cove marshes, Smith Cove, Greens Harbor and small rocky islands at the river mouth. The focus area is 2,121 hectares (5,242 acres) in size.

Ownership/Protection:

This area is primarily Public Trust waters and State and private conservation and research lands. Connecticut College owns and manages Mamacoke Island Natural Area.

Acreage to Conserve:

Approximately 20 hectares (50 acres) of tidal wetlands within the focus area need acquisition and/or enhancement. All of these wetlands are privately owned and could be considered in need of acquisition. New programs in place, such as the Landowner Incentive Plan, could allow for the restoration and enhancement of many of these privately-owned wetlands. Statewide, no estimate of wetlands in need of acquisition and/or enhancement is available.

Since 1988, no wetland acreage has undergone restoration or enhancement. Statewide, in areas outside of ACJV focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Special Recognition:

Mamacoke Island, Smith Cove, and the adjacent coves are designated by the National Audubon Society as Important Bird Areas.

Waterfowl:

Several of the shallow tidal coves and associated brackish marshes in the lower Thames River contain regionally significant concentrations of wintering and migrating waterfowl, especially of several species not commonly found elsewhere or in similar concentrations in the region. These include relatively large numbers of Canvasback, American Wigeon, American Black Duck, Gadwall, Mallard, Redhead, Common Goldeneye and Hooded Merganser. Also found here are Common and Red-breasted Merganser, and Greater and Lesser Scaup.

Table 1. Waterfowl species identified in the Lower Thames River System Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
American Wigeon		X	X
Atlantic Brant		X	X
Great Scaup		X	X
Lesser Scaup		X	X
Canvasback		X	X
Gadwall		X	X
Mallard	X	X	X
Redhead		X	X
Common Goldeneye		X	X
Hooded Merganser	X	X	X
Red-breasted Merganser		X	X

Other Migratory Birds:

Osprey breed at several places along the river. Small rocky islets in the river mouth contain nesting populations of Common and Roseate Tern, the latter a federally-listed endangered species.

Threats:

Industrial, commercial and residential development along the river corridor impacts fish and wildlife populations and habitats largely through direct losses of habitat and degradations in habitat quality, particularly water quality. Heavy metal contamination, sewage, stormwater and waste discharges, shoreline marina development and dredging are all of concern in the Thames River aquatic environment. The river is reported to have significant water quality problems, particularly in certain upstream areas and at the mouth of the river.

Conservation Recommendations:

Particular attention needs to be focused on restoring and protecting the water quality of the Thames River and its high value to fish and wildlife populations, especially anadromous fish and overwintering waterfowl. Protective measures should include stringent regulatory overview and enforcement of existing Federal, State and local environmental regulations, as well as developing and implementing environmentally sound planning and zoning policies and restoration programs. Additionally, exotic species such as Mute Swan and *Phragmites* need to be aggressively managed in this focus area.

Focus Area: New Haven Harbor, Connecticut
Sub-Focus Areas: None

Area Description:

This complex consists of 10,751 hectares (26,566 acres). The focus area is centered primarily along the central coast of Connecticut on Long Island Sound, in the New Haven Harbor area and areas to the east. The outer, shoreward boundary of this largely nearshore water and tidal flat-dominated complex extends from Merwin Point, just south of Woodmont (Milford) east to Sachem Head (Guilford), a distance of approximately 14.5 miles (23 kilometers). Enclosed within this boundary are the east and west shoreline areas around New Haven Harbor to the limit of anadromous fish passage on the West and Quinnipiac Rivers, including the Quinnipiac Meadows wetlands area and the North Haven and Wallingford sand plains north of New Haven Harbor. To the east of New Haven Harbor, the boundary incorporates the Branford River, Leetes Island and Joshua Cove marshes and tidal flats and nearshore waters of Long Island Sound for a distance averaging 1-2 miles (2-3 kilometers) south of the shoreline. A number of important wildlife islands in the Branford-Guilford vicinity are included within this nearshore water boundary, most notably The Thimbles and Kelsey Island.

Ownership/Protection:

A significant portion of this complex includes public coastal and river waters and wetlands, while the rest represents various mixtures of publicly and privately owned lands. Several of the islands are privately held, as is most of the sand plains area along the Quinnipiac River.

Acreage to Conserve:

Approximately 242 hectares (598 acres) of tidal wetlands within the focus area need acquisition and/or enhancement. Of this figure, approximately 210 hectares (520 acres) are privately-owned and could be considered in need of acquisition. New programs in place, such as the Landowner Incentive Program, could allow for the restoration and enhancement of many of these privately owned wetlands.

Since 1988, approximately 5.6 hectares (14 acres) of wetland habitat within the focus area have been enhanced. Enhancement has been achieved through the use of open marsh water management techniques. An additional 43 hectares (107 acres) have undergone intensive vegetation control (*Phragmites* control). Statewide, in areas outside of ACJV focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Special Recognition:

Sandy Point in West Haven and Lighthouse Point Park in New Haven are recognized by the National Audubon Society as an Important Bird Area (IBA) for migratory birds.

Waterfowl:

The open water areas and tidal flats in New Haven Harbor and the nearshore area south

of Guilford, Branford and East Haven contain some of the largest and most important concentrations of wintering and migrating waterfowl along the Connecticut coast, especially American Black Duck, Canvasback, American Wigeon, Greater and Lesser Scaup, Common Goldeneye and three species of scoter. The New Haven tidal flats are one of the most important wintering areas for American Black Duck in Connecticut. The Quinnipiac Marshes are extremely productive biologically, in spite of the heavy industrialization that lines its banks and its chemically polluted waters and soils, especially with heavy metals. Migratory waterfowl using these marshes for nesting include American Black Duck, Mallard and Gadwall.

Table 1. Waterfowl species identified in the New Haven Harbor Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck		X	X
Canvasback		X	X
American Wigeon		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Common Goldeneye		X	X
Scoter		X	X
Gadwall		X	X

Other Migratory Birds:

The sand and mud flats at Long Wharf, City Point and Morse Point/Sandy Point in New Haven Harbor are regionally significant staging areas for large concentrations of migrating sandpipers, terns, including the federally endangered Roseate Tern, plovers, turnstones and other shorebirds and waterfowl that feed on these flats to sustain them on their long journeys southward or northward. Shorebird species of special note include Semi-palmated Sandpiper, Dunlin, Red Knot, Ruddy Turnstone, Least Sandpiper and Sanderling. Tidal flats in New Haven Harbor in the vicinity of Long Wharf historically hosted thousands to tens of thousands of foraging migratory shorebirds, but shorebird use of this area has been much reduced since the 1970's. Jetties at the mouth of New Haven Harbor support regionally significant numbers of wintering Purple Sandpiper. Morse Point currently supports nesting populations of Piping Plover, a U.S. Threatened species, Least and Common Tern and Black Skimmer. Lighthouse Point Park has been the site of a hawkwatch continuously since 1974. On average over 5000 raptors are counted from this location. Lighthouse Point Park is also an important stopover area for migratory landbirds in fall migration. The Quinnipiac River Tidal Marsh hosts nesting Saltmarsh Sharp-tailed Sparrow, which is listed as globally "near threatened" by BirdLife International, as well as nesting populations of Least Bittern, Pied-billed Grebe, Common Moorhen and Seaside Sparrow and is an important foraging area for long-legged wading birds. Elsewhere in the complex, Common Tern nest on a few of the islands to the east of New Haven Harbor. Wading bird rookeries are established on a few of the outer Thimbles, mostly Snowy

Egret, Great Egret and Black-crowned Night-Heron. The nearshore areas also contain abundant shellfish beds, particularly for American oyster and hard-shelled clams.

Threats:

The large seasonal concentrations of wildlife utilizing the extensive tidal mud and sand flats and open waters of this complex are extremely vulnerable to an oil spill or hazardous chemical discharge, particularly in New Haven Harbor. Numerous other activities potentially threaten natural ecosystems and fish and wildlife populations in this industrialized zone, including waste and sewage disposal, storm water discharge, shoreline development, erosion control projects, channel dredging and wetland alterations. Heavy metal and PCB pollution of soils and waters is of special concern, as are contaminated sediments in portions of New Haven Harbor and Mill River due to storm water, sewage treatment plant and industrial discharges. Invasion of Phragmites is a serious problem in many areas of the Quinnipiac tidal marsh and in Old Field Creek marsh. In spite of it all, however, significant wildlife populations continue to persist in this area, albeit at much reduced levels from former levels of abundance. Human-related disturbances to colonial beach-nesting terns and Piping Plover, whether unintentionally or the result of purposeful intrusions into nesting areas and acts of vandalism, or from stray animals and unleashed cats and dogs, are of major concern at all known nesting localities in this area. There are several historical, but presently unoccupied, localities for breeding birds in this area, particularly for Roseate Tern, a U.S. Endangered species. Such areas were likely abandoned due to disturbance.

Conservation Recommendations:

Protection of the nearshore waters and intertidal flats from catastrophic events such as an oil spill or hazardous chemical discharge needs to be given the highest priority among resource concerns in this area. Attention needs to be focused not only on formulating oil spill contingency plans, but developing the highest degree of readiness to respond to such an event, particularly during critical times of the year when wildlife populations are at their peak and most vulnerable, such as spring and fall migrations and winter. Measures should also be sought and instituted, whether by regulation, zoning, planning, cooperative agreements or full-scale restoration programs such as the National Estuary Program, to restore, maintain, enhance and protect aquatic and terrestrial resources in this complex. Opportunities should be identified to restore or enhance degraded wetlands, including control of common reed, and other coastal habitats in this complex to increase their value to fish and wildlife. Studies should be conducted into the reasons for the decline in the numbers of migratory shorebirds using the mudflats in the area of Long Wharf and possible remedial action to restore the value of this area as a shorebird foraging area. The Old Field Creek area has significant potential for restoration and creation of shorebird foraging habitat.

Disturbances to colonial nesting birds, whether sand beaches or island rookeries, need to be minimized or eliminated entirely. Human and stray animal intrusions into nesting areas during the critical nesting season (mid-April to August) should be prevented using a variety of methods, including fenced exclosures, posting, beach warden patrols, trapping of animals and public education. Pertinent tasks and objectives of the Piping Plover Recovery Plan should be identified and implemented on area beaches, especially those aimed at habitat restoration, enhancement and protection. A regional or basin-wide conservation and management plan

should be developed and implemented for protecting and enhancing wintering waterfowl populations in central and western Long Island Sound, in partnership with governmental agencies, private conservation groups and landowners.

Focus Area: Norwalk Islands, Connecticut
Sub-Focus Areas: None

Area Description:

The Norwalk Islands are located in western Long Island Sound, approximately one to one-and-a-half miles (2 kilometers) offshore (south) of the city of Norwalk, along the southwest coast of Connecticut. The mainland portion of this focus area occurs between Rowayton and Sherwood Island State Park. This focus area encompasses 3,778 hectares (9,335 acres) and includes all of the Norwalk Islands (Sheffield Island, Shea Island, Copps Island, Chimon Island, Betts Island, Long Beach Island, Grassy Island, Goose Island, Cockenoe Island and several smaller islands) and the mainland tidal wetlands and mudflats at Fivemile River, Village Creek (Hoyt Island), Norwalk Harbor (Harborview and Seaview Park), Shorehaven-Canfield Island, mouth of Saugatuck River, Compo Cove and Sherwood Millpond, as well as the intervening embayed waters of Long Island Sound. The length of this focus area in a southwest-northeast direction is approximately 6 miles (16 kilometers), and 2 to 3 miles (3-5 kilometers) in width. Also included in this focus area are the mainstem channels of the Norwalk River up to the vicinity of the Silvermine River, and the Saugatuck River to its confluence with the Aspetuck River, near Sipperly Hill.

Ownership/Protection:

Most of the larger islands are publicly-owned (Federal National Wildlife Refuge, Town), while many of the smaller ones are in private ownership. The waters and mudflats along the mainland are in the Public Trust (below mean high water). A few of the mainland wetland areas are privately-owned. Many of the larger islands are designated under the Coastal Barriers Resource Act.

Acreage to Conserve:

Approximately 64 hectares (160 acres) of tidal wetlands within the focus area need acquisition and/or enhancement. Of this figure, approximately 61 hectares (150 acres) are privately owned and could be considered in need of acquisition. New programs in place, such as the Landowner Incentive Program, could allow for the restoration and enhancement of many of these privately owned wetlands.

Since 1988, approximately 24 hectares (60 acres) of wetland habitat within the focus area have been enhanced. Enhancement has been achieved through the use of open marsh water management techniques. An additional 23.8 hectares (59 acres) have undergone intensive vegetation control (*Phragmites* control). Statewide, in areas outside of ACJV focus areas, approximately 187 hectares (463 acres) of inland wetlands have undergone either enhancement or restoration activities. An additional 182 hectares (452 acres) have been controlled for exotic vegetation.

Special Recognition:

None at the moment.

Waterfowl:

Both the waters and tidal flats around these islands as well as the mainland marsh and cove sites, particularly Five Mile River, Village Creek, Norwalk Harbor, Canfield Island and the mouth of the Saugatuck River, are significant concentration areas for wintering waterfowl of special emphasis, especially American Black Duck, American Wigeon, Atlantic Brant, Greater and Lesser Scaup and Gadwall.

Table 1. Waterfowl species identified in the Norwalk Islands Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck		X	X
American Wigeon		X	X
Atlantic Brant		X	X
Great Scaup		X	X
Lesser Scaup		X	X
Gadwall		X	X

Other Migratory Birds:

The Norwalk Islands are of high regional significance to breeding colonial wading birds. These rookeries are mostly dominated by Black-crowned Night-Heron, but also include Great Egret, Snowy Egret, Cattle Egret, Little Blue Heron, Yellow-crowned Night-Heron, Green-backed Heron and Glossy Ibis. A large colony of colonial waders is found on Cockenoe Island. These birds utilize the other islands, mainland marshes, and intertidal flats for feeding. The most important wading bird feeding areas in this focus area are the tidal flats around some of the islands and on the mainland at Village Creek-Hoyt Island, Norwalk Harbor, Shorehaven-Canfield Island, Saugatuck River mouth and Compo Cove-Sherwood Millpond. Birds from these islands also utilize the mudflats at Great Meadows (Stratford) for feeding. Small nesting colonies of herons and egrets occur on Shea and Grassy Islands and others. Also nesting on beaches on a few of the Norwalk Islands are Piping Plover, a U.S. Threatened species, Least Tern, Common Tern, and American Oystercatcher. Problem species also nesting in this area include large numbers of Great Black-backed Gull and Herring Gull and increasing numbers of Double-crested Cormorant. Roseate Tern, a U.S. Endangered species, historically nested on Goose Island.

Threats:

Although most of the Norwalk Islands are already in public ownership and are not likely to be developed, they are still subject to varying degrees of human disturbance, especially to the wading bird rookeries and nesting colonies of beach-nesting Piping Plover and terns. Human disturbances in the form of intrusions into nesting areas during the critical nesting and fledging season can cause colonies to be temporarily or even permanently abandoned. Predation of eggs and young birds by Norway rats, raccoons, and gulls are also a threat to these colonies. The heavily urbanized mainland shoreline in this area poses threats to water quality through chemical

contamination, oil spills, sewage and storm water discharges, waste disposal, marina development, dredging and numerous other activities that potentially degrade both terrestrial and aquatic habitats of fish and wildlife resources. The waters of western Long Island Sound are subject to low oxygen levels (hypoxia) during the summer months, which can stress and even kill marine organisms if prolonged.

Conservation Recommendations:

The protection and management of colonial wading bird rookeries and colonies of beach-nesting terns and Piping Plover need to be given high priority in this area. Because these birds are very sensitive and vulnerable to human disturbances during the critical nesting season (mid-April to August), protective strategies and measures should be designed to prevent people and unleashed pets from entering these areas, using such measures as closed areas with fenced exclosures, posting, warden patrols, trapping and removal of pets or feral animals, rats, etc., and public education. Small mammal control should be pursued on these islands. Educational programs to inform the general public of the need for avoidance at certain critical time periods need to be initiated.

Planning Area: Upper Thames River Watershed, Connecticut
Focus Areas: Thames River

Area Description:

The Upper Thames River Watershed Planning Area is located in northeast Connecticut and encompasses 376,548 hectares (941,371 acres). This entire watershed, most of which lies within the administrative boundaries of Connecticut, contains 10 individual river sub-basins and is critical to breeding and staging waterfowl in Connecticut. Wetland habitat is distributed throughout the planning area, often in the form of forested wetlands or small emergent-wetland complexes. The entire watershed lies within that portion of Connecticut that is presently least developed. The Upper Thames River Watershed is predominantly forested, with large tracts of privately owned agricultural land. Development pressure, however, is increasing, and from the period 1990-2002, the percent of the watershed classified as developed has increased 9.4% (University of Connecticut 2004). Developed land now comprises 11.9% of the entire watershed. With increased development come declines in water quality and loss of habitat. Degradation of water quality in the upper reaches of the watershed becomes magnified downstream as flow enters the Thames River and, ultimately, spills into Fisher's Sound and Long Island Sound.

Ownership/Protection:

The 376,548 hectares (930,466 acres) of the watershed that lie within Connecticut is a patchwork of both private and public land holdings. The state of Connecticut owns significant acreage throughout the watershed in the Goodwin State Forest (SF), Natchaug SF, Nipmuck SF, and Pachaug SF. Several Department of Environmental Protection-owned wildlife management areas are also within the boundaries of the watershed. Private conservation groups such as the Windham Land Trust and Audubon Society have small, but significant, holdings within the planning area.

Acreage to Conserve:

New programs in place, such as the Landowner Incentive Plan, could allow for the restoration and enhancement of privately owned wetlands within the planning area. Within the planning area, there are 32,732 hectares (80,884 acres) of wetlands or open water. There is no reasonable estimate of acreage to conserve within that figure, however, of the total watershed, approximately 20,234 hectares (50,000 acres) of forested and non-forested emergent wetlands exist in the watershed. Less than half of those acres are currently protected either through their location on state controlled or non governmental organization (NGO) controlled lands. Statewide, no estimate of wetlands in need of acquisition and/or enhancement is available.

Special Recognition:

Two of the major sub-basins in the planning area are designated as a National Heritage Corridor (Quinebaug and Shetucket Rivers Valley National Heritage Corridor). The National Audubon Society has targeted several areas within the planning area as potential Important Bird Areas.

Waterfowl:

This entire watershed is the major production area for Wood Duck in the state. Wood Duck nesting success and production within the watershed are significantly higher than any other area of the state. In addition to Wood Duck production, the Thames River Watershed also harbors some of the remaining nesting Black Duck in the state. The incidence of breeding Hooded Mergansers is increasing within the planning area. Gadwall and Blue-winged Teal are occasional breeders.

Table 1. Waterfowl species identified in the Connecticut River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Gadwall	X	X	X
Mallard	X	X	X
Blue-winged Teal	X	X	
Hooded Merganser	X	X	X

Other Migratory Birds:

Several of the inland marshes in this watershed are important breeding and stopover areas for various rallid species such as Sora and Virginia Rail. Breeding Pied-billed Grebe are known to occur in at least one locale within the planning area. State endangered American Bittern breeding records occur within the watershed boundary.

Threats:

Although wetlands in Connecticut are regulated by State and Federal laws, such areas and the species which depend upon them continue to be adversely impacted by various types of human disturbances and activities (e.g. development and un-permitted wetland destruction) and habitat alteration of upland borders and tributaries. Stormwater discharges, non-point source pollution, and increased sediment loads pose significant problems for living resources throughout the planning area. Invasive species such as Mute Swan, *Phragmites*, and purple loosestrife threaten the marsh vegetation and native biota of numerous wetlands in the planning area.

Conservation Recommendations:

Land-use planning that maximizes wetland conservation and open space needs to be actively pursued by municipalities within the planning area. Many towns within the planning area are developing plans that maximize biological diversity and open space. On a regional scale, this must continue. Regional planning committees comprising several adjacent municipalities have arisen in other parts of the state, and it is not unreasonable that these types of regional arrangements will proliferate into this watershed. Aggressive management of invasive species such as the Mute Swan, *Phragmites*, and purple loosestrife need to be pursued. Manpower and funding constraints have resulted in habitat degradation of protected areas in this planning area. Additionally, water level manipulation on state owned impoundments is

necessary. Acquisition of adjacent upland habitats should be actively pursued to provide buffers to existing wetlands.

7.2.2 Delaware

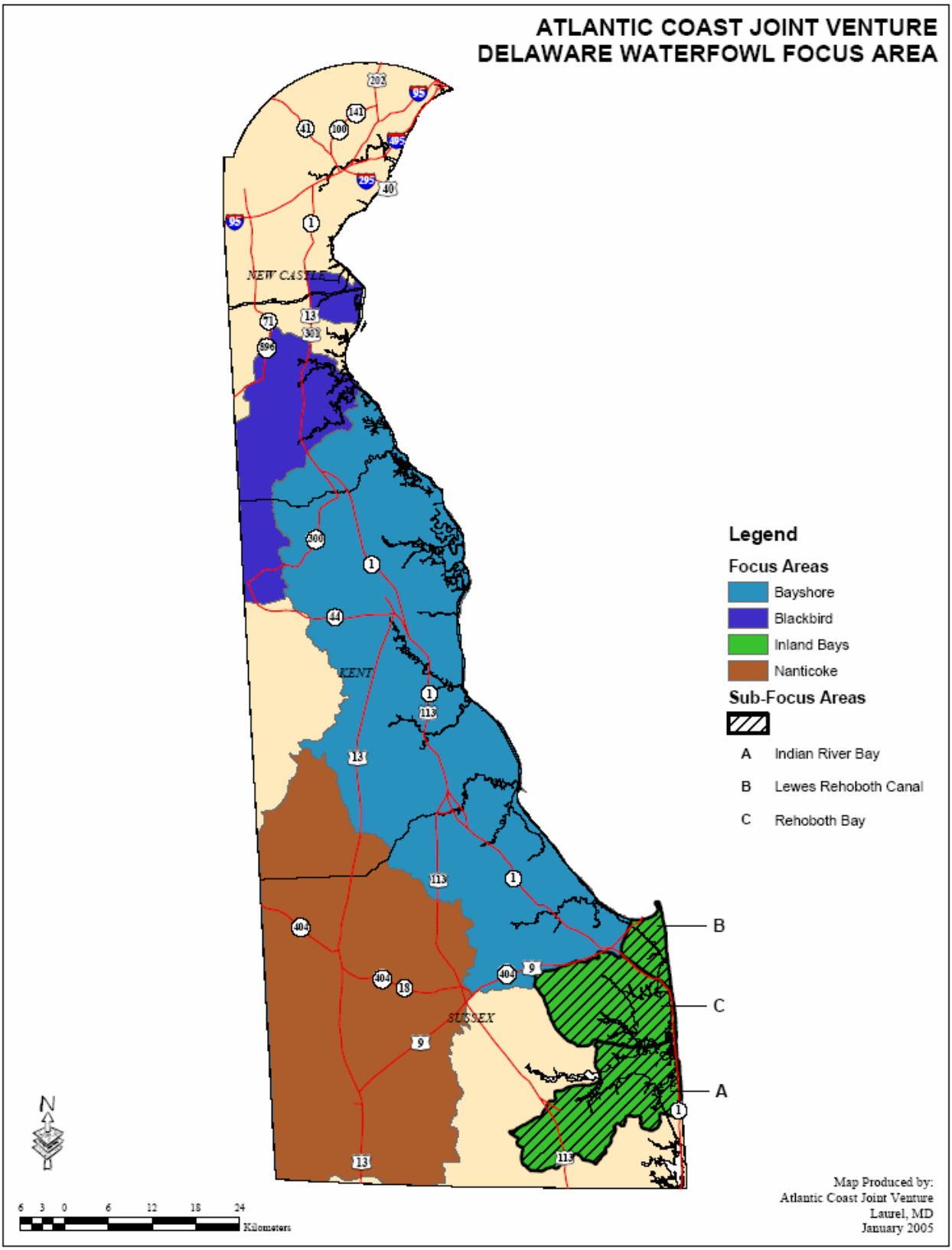

Figure 7.3. Delaware waterfowl focus areas.

Focus Area: Bayshore Focus Area, Delaware
Sub-Focus Areas: None

Area Description:

The Bayshore Focus Area encompasses approximately 165,054 hectares (407,857 acres) of land of. Approximately 23,876 hectares (59, 000 acres or 15 %) is protected at the federal or state level or by private interests. The area stretches south from the Cedar Swamp Wildlife Management Area approximately 84 kilometers (52 miles) to Lewes and is bounded on the eastern edge by the Delaware Bay and Estuary.

Examination of the 2002 Land Use Land Cover data for Delaware indicates the predominant landuse practice in the Focus Area is agriculture, which utilizes approximately 71,705 hectares (177,187 acres or 45 %) of upland habitat. The remaining land is comprised of wetlands and deep water habitat (26 %), forests (11 %) and residential, commercial and industrial development (18 %) (Earth Data International of MD, LLC., 2003).

The Bayshore Focus Area contains some of the most natural and undeveloped wetlands remaining in the state of Delaware. Salt marshes in this region are composed of primarily smooth cordgrass, salt meadow cordgrass, spike grass, glassworts, marsh orach, sea lavender, salt marsh aster, black grass and common reed (Tiner, 1985). Smooth cordgrass, salt hay grass, narrow leaved cattail, big cordgrass, common reed and rose mallow dominant the irregularly flooded brackish marshes (Tiner, 1985). In the regularly flooded tidal marsh areas smooth cordgass and water hemp, arrow arum, pickerelweed, and soft stemmed bulrush are the primary plant species (Tiner, 1985).

Ownership/Protection:

Much of this region has already been conserved or protected for wildlife by federal and state agencies and other private entities 24,123 hectares (59,611 acres). However, 85 % of it still remains in private ownership. Realizing the importance of this Focus Area to migratory waterfowl and shorebirds the federal government has preserved two large tracts of land along the coast which total over 10,117 hectares (25,000 acres): Prime Hook National Wildlife Refuge and Bombay Hook National Wildlife Refuge. In addition, the state of Delaware has protected approximately 10,117 hectares (25,000 acres) of habitat at Woodland Beach Wildlife Management Area (WMA), Little Creek WMA, Ted Harvey Conservation Area, Milford Neck Wetland Management Area and Prime Hook Wetland Management Area to name just a few. The marshes and impoundments on these state lands are managed to maximize use by waterfowl and shorebirds. Finally, two non-profit organizations, The Nature Conservancy and Delaware Wild Lands Inc., have contributed significantly to the protection of habitat for waterfowl within the Bayshore region by purchasing approximately 3,327 hectares (8,000 acres) of land.

Special Recognition:

The Delmarva Peninsula is world renown for its wetlands and coastal estuaries. Wetlands on the peninsula have been designated under the Ramsar Convention and the Western Hemisphere Shorebird Reserve Network as areas of world importance to some species of shorebirds. Partners in Flight recognize wetlands and associated habitats across the peninsula as critical to neotropical migrants. The Nature Conservancy has identified rare and endangered habitats and species of amphibians, plants and insects. NOAA has established two National

Estuarine Research Reserves on the Peninsula and the USFWS owns and manages thousands of acres of wetlands across the peninsula (Delaware Reserve, 2004). A minimum of ten million dollars has been allocated under the North American Wetlands Conservation Act to protect, restore and enhance wetlands on the peninsula and state agencies continue to place top priority on protection of remaining wetlands. Finally, the Delmarva Conservation Corridor was established under the 2002 Farm Bill to establish a network of public and private lands for a variety of purposes including maintaining biodiversity in the region (The Delmarva Conservation Corridor Information Sheet, 2003).

Waterfowl:

Some of the best breeding and wintering waterfowl habitat in the State of Delaware is found within the Bayshore Focus Area. During the fall and winter hundreds of thousands (e.g. 251,706, January 06, 2004) of waterfowl utilize this area for feeding and resting including significant numbers of Canada Goose, Black Duck, Mallard, Pintail and Snow Goose. Over 80% (200,000) of the Atlantic Flyway's Snow Goose population winters in this focus area (Delaware Bay, 2004). In addition this area also contains the largest concentration of Northern Shoveler, American Widgeon and Gadwall in the state of Delaware (Waterfowl Surveys in Delaware). This area is also important for the production of American Black Duck, Mallard and Wood Duck.

Table 1: Priority waterfowl species dependent upon wetlands within Delaware

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Wood Duck	X	X	X
Blue-winged Teal	X	X	X
Green-winged Teal	X	X	X
Gadwall	X	X	X
Wigeon		X	X
Northern Shoveler		X	X
Northern Pintail		X	X
Canvasback		X	X
Scaup		X	X
Ring-necked Duck		X	X
Merganser	X	X	X
Ruddy Duck	X	X	X
Bufflehead		X	X
AP Canada Goose	X	X	X
Greater Snow Goose		X	X

Other Migratory Birds:

Located along the eastern coast of Delaware, the Bayshore Focus Area provides some of the most critical habitat (beaches, adjacent marshes and impoundments) for migratory shorebirds. More specifically, the Bayshore Focus Area is a major stopover "refueling" site for up to a million shorebirds during spring migration – including 80% of the Western Hemisphere's

Red Knot population as well as significant numbers of Dunlin, Ruddy Turnstone, Semipalmated Sandpiper, Least Sandpiper, Short-billed Dowitcher and others. In addition, the Bayshore Focus Area has vast expanses of tidal marsh that support critical habitat for marsh-nesting birds like the Black Rail, Clapper Rail and King Rail and Northern Harrier.

Threats:

The major threats impacting waterfowl in the Bayshore Focus Area include increasing development, decreasing water quality and invasive species proliferation. Vast areas of forest and wetland habitats are being altered to facilitate agriculture and residential development. Water quality has been degraded due to increasing non-point source pollution associated with agricultural production and increase increasing development.

Phragmites has invaded native salt marshes and formed large monotypic stands that have reduced the amount of available habitat for waterfowl. These trends could be detrimental to the hundreds of thousands of waterfowl that utilize this for migration or as wintering or breeding habitat.

Conservation Recommendations:

Efforts should focus on protecting, restoring and enhancing wetlands and associated uplands in areas adjacent to protected lands with the goal of forming large contiguous tracts of undisturbed habitat within the Bayshore Focus Area. Public and private partnerships should be developed to utilize existing funding programs and manage development in a responsible manner to maintain populations of wetland dependent migratory birds and biodiversity. Long-term protection should be favored; however, multiple ten-fifteen year agreements for restoration and enhancement will be a primary tool to maintain wildlife populations.

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Focus Area: Blackbird Focus Area, Delaware
Sub-Focus areas: None

Area Description:

The Blackbird Bay to Bay Focus Area stretches from the Maryland/Delaware border to the Delaware Bay. It encompasses the Blackbird River watershed, Appoquinimink River watershed and part of the Chester River watershed approximately 36,247 hectares (89,568 acres). Of this land, 44 % is in agricultural use, 27 % is wetland habitat and 12 % is forest habitat. Approximately 4,856 hectares (12,000 acres) of land has been protected at the state level (Blackbird State Forest, Blackiston Wildlife Area, Cedar Swamp Wildlife Area, Augustine Wildlife Area and the C&D Canal Wildlife Area) (Earth Data International of MS, LLC., 2003). The remaining 17% is in some form of residential, commercial or industrial development. Protection and/or restoration of the remaining freshwater tidal and non-tidal wetlands, brackish marshes and associated upland habitat within this portion of the state are critical to wintering waterfowl.

In the Blackbird Bay to Bay Focus Area there are approximately 6,474 hectares (16,000 acres) of palustrine forested wetlands comprised of red maples, sweet gum, tulip tree, green ash, white ash (Fraxinus Americana), black gum, loblolly pine, American elm, pin oak, red oak, willow oak and American Elm (Tiner, 1985). Plant species found in forested wetlands within the Focus Area may include sweet pepperbush, inkberry, highbush blueberry and elderberry (Tiner, 1985). Herbaceous plants found in red maple swamps may include skunk cabbage, royal fern, cinnamon fern, a variety of sedges, jewelweed and others (Tiner, 1985).

In addition, there are over 6,070 hectares (15,000 acres) of estuarine emergent wetlands in the Blackbird Bay to Bay Focus Area composed primarily of smooth cordgrass, salt meadow cordgrass, or spike grass, glassworts, marsh orach, sea lavender, salt marsh astere, black grass and common reed (in areas with higher salinity)(Tiner, 1985). Smooth cordgrass, salt hay grass, narrow leaved cattail, big cordgrass, common reed and rose mallow dominant the irregularly flooded brackish marshes (Tiner, 1985). In the regularly flooded tidal marsh areas smooth cordgass, water hemp, arrow arum, pickerelweed, and soft stemmed bulrush are the most common plant species (Tiner, 1985). Combined, these wetlands are known to support over 23,000 wintering waterfowl (Tiner, 1985).

Ownership/Protection:

Approximately 85% of the land in Delaware is privately owned and the Blackbird Bay to Bay Focus Area is no exception. Approximately 4,856 hectares (12,000 acres) of land (13%) has been protected at the state level (Blackbird State Forest, Blackiston Wildlife Area, Cedar Swamp Wildlife Area, Augustine Wildlife Area and the C&D Canal Wildlife Area). The remaining land within the Blackbird Bay to Bay Focus Area is privately owned and subject to increasing development pressure. This increasing desire to move out of the cities and into the “country” is the largest threat to waterfowl habitat within the state of Delaware. Protection and/or restoration of the remaining wetlands and associated upland habitat within this portion of the state are critical to wintering waterfowl.

Special Recognition:

Wetlands in the Blackbird Bay to Bay Focus Area are recognized by the Ramsar Convention of Wetlands for both the Chesapeake and Delaware Bays. NOAA has established two National Estuarine Research Reserves on the Delmarva Peninsula one of which occurs in the Blackbird Bay to Bay Focus Area (Delaware Reserve, 2004). Partners in Flight recognize wetlands and associated habitats across the peninsula as critical to neotropical migrants. The Nature Conservancy has identified rare and endangered habitats and species of amphibians, plants and insects. Finally, the Delmarva Conservation Corridor was established under the 2002 Farm Bill to establish a network of public and private lands for a variety of purposes including maintaining biodiversity in the region (The Delmarva Conservation Corridor Information Sheet, 2003).

Waterfowl:

The Blackbird Bay to Bay Focus Area supports over 23,000 wintering waterfowl including Snow Goose, Black Duck, Mallard, Pintail, Ring-neck Duck, Bufflehead, Tundra and Mute Swan. Less prevalent are wintering populations of Canada Goose, Green-winged Teal, Blue-winged Teal, Gadwall, Northern Pintail, Wigeon and Northern Shoveler (Waterfowl Surveys in Delaware, 2004). In addition, these wetlands provide habitat for breeding Black Duck, Mallard and Wood Duck.

Table 1: Waterfowl species in the Blackbird Bay Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Wood Duck	X	X	X
Blue-winged Teal		X	X
Green-winged Teal		X	X
Gadwall		X	X
Wigeon		X	X
Northern Shoveler		X	X
Northern Pintail		X	X
Canvasback		X	X
Scaup		X	X
Ring-necked Duck		X	X
Merganser		X	X
Ruddy		X	X
Bufflehead		X	X
AP Canada Goose	X	X	X
Greater Snow Goose		X	X

Other Migratory Birds:

The forests of the Blackbird Bay to Bay Focus Area provide critical habitat for several neotropical migrants including Yellow Warbler, Black and White Warbler, Prothonotary Warbler, Worm-eating Warbler, Red and White-eyed Vireo, Indigo Bunting, Eastern wood-Pewee, Great Crested Flycatcher, Eastern Kingbird and Scarlet Tanager.

Threats:

Delaware is the second smallest state and is home to over 0.75 million people and 65% of the people live on only 21% of the land primarily in New Castle County (Environmental Law Institute, 1999). As such, the Blackbird Bay to Bay Focus Area is subject to increasing development pressures. From 1980 to 1990 development in the New Castle County has grown by 11% (CensusScope, 2004). Forest loss throughout the state during this period totaled more than 22,257 hectares (55,000 acres) and threatens to decrease water quality and reduce habitat available for waterfowl. Wetlands are also under pressure from development with more than 1,740 hectares (4,300 acres) lost between 1982 and 1997 (Environmental Law Institute, 1999). Because of increased residential, commercial and agricultural development, this region has become a priority area for the Liveable Delaware Initiative, Forest Legacy Program, Agriculture Preservation, The Nature Conservancy's Ecoregional Planning Initiative and the Chesapeake Bay Planning Conservation Project.

In addition, *Phragmites* poses a major threat to wetland habitats within the Blackbird Bay to Bay Focus Area. Historically the freshwater tidal, non-tidal wetlands and brackish marshes were comprised of salt marsh cord grass, big cordgrass, salt wort, high tide bush and groundsel bush (Tiner, 2001). Today, these wetland areas are typically filled with *Phragmites* and the amount of available habitat for waterfowl has been reduced as a result. *Phragmites* control remains a priority for the State of Delaware.

Conservation Recommendations:

Protect, restore and enhance wetlands and associated uplands wherever and whenever opportunities arise within this Blackbird Bay to Bay Focus Area. Work with other public and private partnerships to utilize existing funding programs and manage development in a responsible manner to minimize disturbance and maintain populations of wetland dependent migratory birds and biodiversity. Long term protection should be favored; however, multiple 10-15 year agreements for restoration and enhancement will be a primary tool to maintain wildlife populations.

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Focus Area: Inland Bays, Delaware
Sub Focus areas: Indian River Bay, Lewes Rehoboth Canal, Rehoboth Bay

Area Description:

The Inland Bays Focus Area is approximately 45,324 hectares (111,998 acres) in size stretching from Lewes south to Bethany Beach. It is bounded on the east by the Atlantic Ocean and encompasses the Indian River Bay, Little Assawoman Bay and Rehoboth Bay and their tributaries.

Historically, the Inland Bays Focus Area was primarily rural with agricultural production being the primary land use. However with improved highways in the 1950's and 60's increased accessibility to this region accelerated both residential development and tourism (Imperial, 2000). Today, the dominant Land Use Land Covers are wetland habitat including man made lakes, streams and reservoirs comprising of 34 %, agricultural lands making up 30 % of the focus area and forest lands making up 16 % of the land cover within the focus area. The remaining area is comprised of commercial, industrial and residential development 95,617 hectares (236,275 acres) and growing (LULC, 2002).

The Inland Bays and adjacent upland area are comprised of 15,093 hectares (37,297 acres) of wetland that support over 8,000 ducks and geese (Waterfowl Surveys in Delaware, 2004). Salt marshes in this region are composed of primarily smooth cordgrass, salt meadow cordgrass, or spike grass, glassworts, marhs orach, sea lavender, salt marsh astere, black grass, and common reed (Tiner, 1985). Smooth cordgrass, salt hay grass, narrow leaved cattail, big cordgrass, common reed and rose mallow dominant the irregularily flooded brackish marshes (Tiner, 1985). In the regularly flooded tidal marsh areas smooth cordgass and water hemp, arrow arum, pickerelweed, and soft stemmed bulrush are the primary plant species (Tiner, 1985). Seasonally- flooded forested wetlands in the Inland Bays Focus Area include dominant species such as red maple, sweet gum black gum or loblolly pine (Tiner, 1985). Sub-dominant trees may include ashes, river birch, sweet bay, basket oak, swamp white oak, pin oak, and American Elm (Tiner, 1985). Shrubs found in red maple swamps may include sweet pepperbush, southern arrowwood, winterberry, highbush blueberry, to name a few (Tiner, 1985). In addition several herbaceous plants may be found throughout the red maple swamps including skunk cabbage, royal fern, cinnamon fern, and others (Tiner, 1985).

Ownership/Protection:

Ninety-two % of the Inland Bay Focus Area is in private ownership. The remaining 8% is owned by the State of Delaware. Cape Henlopen State Park, Delaware Seashore State Park, Holts Landing, Love Creek Wildlife Management Area (WMA), Bluff Point WMA and Assawoman WMA are the only protected areas within this focus area. However, recreational use of some of these properties has rendered them less desirable to wildlife than undisturbed natural habitat. With such a high percentage of the land in this focus area in private lands it becomes increasingly important to work with these landowners to come up with cooperative solutions to habitat management.

Special Recognition:

The Delaware Coastal Zone including the Inland Bays Focus Area has been designated an "Important Bird Area of Global Magnitude" due to the thousands of birds that utilize these resources during spring and fall migration (Important Bird Areas in Delaware, 2004). In addition, Partners in Flight recognize wetlands and associated habitats across the peninsula as critical to neotropical migrants. The Nature Conservancy has identified rare and endangered habitats and species of amphibians, plants and insects. A minimum of ten million dollars has been allocated under the North American Wetlands Conservation Act to protect, restore and enhance wetlands on the peninsula and state agencies continue to place top priority on protection of remaining wetlands. Finally, the Delmarva Conservation Corridor was established under the 2002 Farm Bill to establish a network of public and private lands for a variety of purposes including maintaining biodiversity in the region (The Delmarva Conservation Corridor Information Sheet, 2003).

Waterfowl:

Some of the best breeding and wintering waterfowl habitat in the State of Delaware is found within the Inland Bays Focus Area. The bays and associated wetlands within this focus area support approximately 8,000 ducks and geese including the largest population of Brant, American Wigeon and Bufflehead within the state (Waterfowl Surveys in Delaware, 2004). In addition, the focus area supports breeding populations of Canada Goose, American Black Duck, Mallard, Gadwall, Wood Duck and wintering populations of Northern Pintail, Mute Swan, Canvasback, Shoveler, Green-winged Teal and Goldeneye. Ring-necked Duck, Canvasback, Scaup, Scoter, Merganser and Ruddy Duck used to winter in large numbers in the Inland Bays Focus Area. However, only a few locations remain in Sussex County however only a few areas of suitable habitat remain.

Table 1. Priority waterfowl species dependent upon wetlands within Delaware.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Wood Duck	X	X	X
Blue-winged Teal			
Green-winged Teal		X	X
Gadwall	X	X	X
Wigeon		X	X
Northern Shoveler		X	X
Northern Pintail		X	X
Canvasback		X	X
Scaup		X	X
Ring-necked Duck		X	X
Merganser		X	X
Ruddy		X	X
Bufflehead		X	X
AP Canada Goose		X	X
Brant		X	X
Greater Snow Goose		X	X

Other Migratory Birds:

The Inland Bays Focus Area is important to hundreds of thousands of migratory shorebirds and songbirds during spring and fall migration, including Piping Plover, American Oystercatcher, Great Black-backed Gull, Common Tern, Forster's Tern, Prothonotary, Worm-eating, Prairie and Kentucky Warblers, Wood Thrush, Least Tern, Brown Headed Nuthatch and Yellow Throated Warbler.

Threats:

The Inland Bays and surrounding uplands are undergoing extensive development. Growth in this region has outpaced the national average (Imperial, 2000). The population has grown from 80,356 people in 1970 to 113,225 people in 1990 and is expected to grow to 150,000 people by 2011 (Estuaries on the Edge: The Vital Link Between Land and Sea, 2004). The majority of these people move into the eastern portion of the focus area close to the beach. This doesn't include the hundreds of thousands of visitors that come to the inland bays area each summer. The population in this focus area may increase by more than 200% in the summer on weekends (Inland Bays Environmental Profile, 2000). Residential and commercial development is the largest threat to the natural communities in the focus area.

The second largest threat to waterfowl and other migratory birds in the Inland Bays Focus Area is point and non-point source pollution including, but not limited to, urban and agricultural runoff, erosion and sedimentation, dredging, filling, channelization, stabilization, storm water discharge, wastewater outfalls and septic and ground water discharge. Agriculture, particularly poultry litter, appears to be a significant contributor of nitrogen leachate and phosphorus runoff into the Inland Bays. Over 70 million chickens are produced in the focus area per year, generating 90,000 tons of manure and litter (Inland Bays Environmental Profile). Manure and litter products leach into the sandy soils and into the groundwater increasing the phosphorous and nitrogen loads entering the watershed. The Inland Bays have had outbreaks of *Pfiesteria* and red and brown tides due to high concentrations of nitrogen and phosphorus entering the watershed (Inland Bays Environmental Profile, 2000). In addition SAV's (Submerged Aquatic Vegetation) such as eelgrass and widgeon grass found historically in the Inland Bays have disappeared due to increased turbidity and excess nutrients. Attempts have been made to restablish SAV beds in the Bays with little success (Inland Bays Environmental Profile, 2000).

Conservation Recommendations:

Protect, restore and enhance wetlands and associated uplands wherever and whenever opportunities arise within the Inland Bays. Develop public and private partnerships to utilize existing funding programs and manage development in a responsible manner to maintain populations of wetland dependent migratory birds and biodiversity. Long-term protection should be favored; however, multiple 10-15 year agreements for restoration and enhancement will be a primary tool to maintain wildlife populations on private lands. Restoration and protection in the Inland Bays Focus Area will compliment other efforts within the region to address habitat destruction and overall water quality in the Bay. Such ongoing efforts include: Delaware Inland Bays Estuary Program, Livable Delaware and Green Infrastructure Program and the Agriculture Preservation Program.

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Focus Area: Nanticoke Focus Area, Delaware
Sub-Focus areas: None

Area Description:

The Nanticoke Focus Area is defined by the boundaries of the Nanticoke watershed and encompasses over 121,406 hectares (300,000 acres) of land within the state of Delaware. The Focus Area is 28 kilometers (17 miles) wide stretching from the Maryland state line on the west to the Redden State Forest on the east and 59 kilometers (36 miles) long from Hollandsville in the North and to the Maryland state line in the south. The watershed itself is the largest watershed within the state of Delaware covering 1/3 of the State's surface. Total focus area size is 127,459 hectares (314,959 acres).

An examination of the 2002 Land Use Land Cover data for Delaware indicates that the predominant land types in the Nanticoke Focus Area are agricultural lands, wetlands and mixed forests. Agricultural lands account for 54 % of the land cover within the region. Wetlands account for 20 % of the land within the Nanticoke Focus Area and mixed forests make up 16 % (Earth Data International of MD, LLC, 2003).

The Nanticoke Focus Area contains approximately 34,398 hectares (85,000 acres) of wetlands, of which approximately 23,307 hectares (57,594 acres) are palustrine forested wetlands. Tree species occurring in these wetlands include loblolly pine, Virginia pine, Sweetgum, red maple and various oaks, Atlantic white cedar, sweet gum and numerous shrubs (Maryland-Delaware, Blackwater – Nanticoke Focus Area, 1990). The remaining wetland habitat is made up of brackish and freshwater tidal wetlands and freshwater non-tidal wetlands. These brackish and freshwater wetlands have exceptionally high value to wildlife, waterfowl and other migratory birds. The brackish wetlands occur along the main Nanticoke River and are characterized by salt grass, giant cordgrass, saltmarsh cordgrass, saltmeadow cordgrass, Olney three-square, black needlerush and hightide bush (Maryland-Delaware, Blackwater – Nanticoke Focus Area, 1990).

Tidal freshwater or slightly brackish wetlands along the tributaries of the Nanticoke contain some of the largest stands of wild rice in Delaware. Other species include Olney three-square, common three-square, giant cordgass, narrowleaf cattail, white waterlily, arrow-arum, rice cutgrass, jewelweed, spatterdock, sweet flag, bulrushes, burreeds and saltmeadow cordgrass (Maryland-Delaware, Blackwater – Nanticoke Focus Area, 1990).

Ownership/Protection:

Past initiatives by State agencies and private entities have been able to protect and/or enhance approximately 8,903 hectares (22,000 acres) of land preserving much of the integrity of the Nanticoke river shoreline and upland buffers. The state of Delaware has protected nearly 8,498 hectares (21,000 acres of land on Marshyhope Wildlife Management Area (WMA), Old Furnace WMA, Nanticoke WMA, Trap Pond State Park and Redden Forest among others. In addition The Nature Conservancy has preserved over 161 hectares (400 acres) on the Middleford North Tract in the upper tributaries of the Nanticoke Watershed. The remaining 118,553 hectares (292,951 acres or 93%) are in immediate need of attention as development pressure and agricultural/sivilcultural practices continue to grow.

Special Recognition:

The Nanticoke Focus Area (watershed) was designated in 1991 by The Nature Conservancy as a "BioReserve and Last Great Place" due to the rich diversity of plant and animal species and its regionally significant natural areas (Whigham et al, 2004).
Over 200 rare, threatened or endangered plant species have been identified in the Nanticoke River Watershed as well as 70 rare threatened or endangered animal species (Effects of Sediment and Nutrients o Plant Diversity and Species Composition of Tidal Freshwater Wetlands of the Nanticoke River Bioreserve). In addition, the wetlands within the focus area have been designated under the Ramsar Convention as part of the Chesapeake Bay Watershed. Partners in Flight recognize wetlands and associated habitats across the peninsula as critical to neotropical migrants dependant upon forested wetland habitat. A minimum of ten million dollars has been allocated under the North American Wetlands Conservation Act to protect, restore and enhance wetlands on the peninsula and state agencies continue to place top priority on protection of remaining wetlands. Finally, the Delmarva Conservation Corridor was established under the 2002 Farm Bill to establish a network of public and private lands for a variety of purposes including maintaining biodiversity in the region (The Delmarva Conservation Corridor Information Sheet, 2003).

Waterfowl:

Historically, the Nanticoke Focus Area provided significant breeding, wintering and migrating habitat for a variety of waterfowl. Even today, large numbers of waterfowl are known to use the Nanticoke as they migrate to and from their northern breeding grounds. These species include the American Black Duck, Blue-winged Teal and Wood Duck and to a lesser extent the Green-winged Teal, Northern Pintail, American Widgeon, Gadwall, Ring-necked Duck, Common Merganser and Canada Goose. In addition, numerous species use the Nanticoke for breeding and nesting habitat including Black Duck and Blue-winged Teal.

Table 1. Waterfowl species in the Nanticoke Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Wood Duck	X	X	X
Blue-winged Teal	X	X	X
Green-winged Teal		X	X
Gadwall	X	X	X
Wigeon		X	X
Northern Shoveler			
Northern Pintail		X	X
Canvasback			
Scaup			
Ring-necked Duck		X	X
Merganser		X	X
Ruddy			
Bufflehead			
AP Canada Goose	X	X	X
Greater Snow Goose			

Other Migratory Birds:

The Nanticoke Focus Area offers opportunities for protecting and enhancing habitat for neotropical migrants including the Northern Parula, American Redstart, Hooded Warbler, Yellow-throated Warbler, Cerulean Warbler, Prothonatary Warbler, Acadian Flycatcher and other state-rare birds associated with palustrine forested wetlands.

Threats:

Increasing residential development continues to be one of the greatest threats to the Nanticoke Focus Area. Between 1990 and 2020, the population of Sussex County is projected to grow just over 56 % (Delaware Office of State Planning Coordination, 1999). This residential sprawl, along with increasing agricultural and sivicultural practices, threatens to decrease water quality and reduce available habitat within the Focus Area for wildlife, particularly waterfowl. As a result of recent and projected increases in growth, there has been (and will continue to be) an increased challenge to balance various land uses with habitat protection.

Conservation Recommendations:

Protect, restore and enhance wetlands and associated uplands wherever and whenever opportunities arise within this Nanticoke Focus Area. Develop public and private partnerships to utilize existing funding programs and manage development in a responsible manner to maintain populations of wetland-dependent migratory birds and biodiversity. Long-term protection should be favored; however, multiple 10-15 year agreements for restoration and enhancement will be a primary tool to maintain wildlife populations on private lands.

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7.2.3 Florida

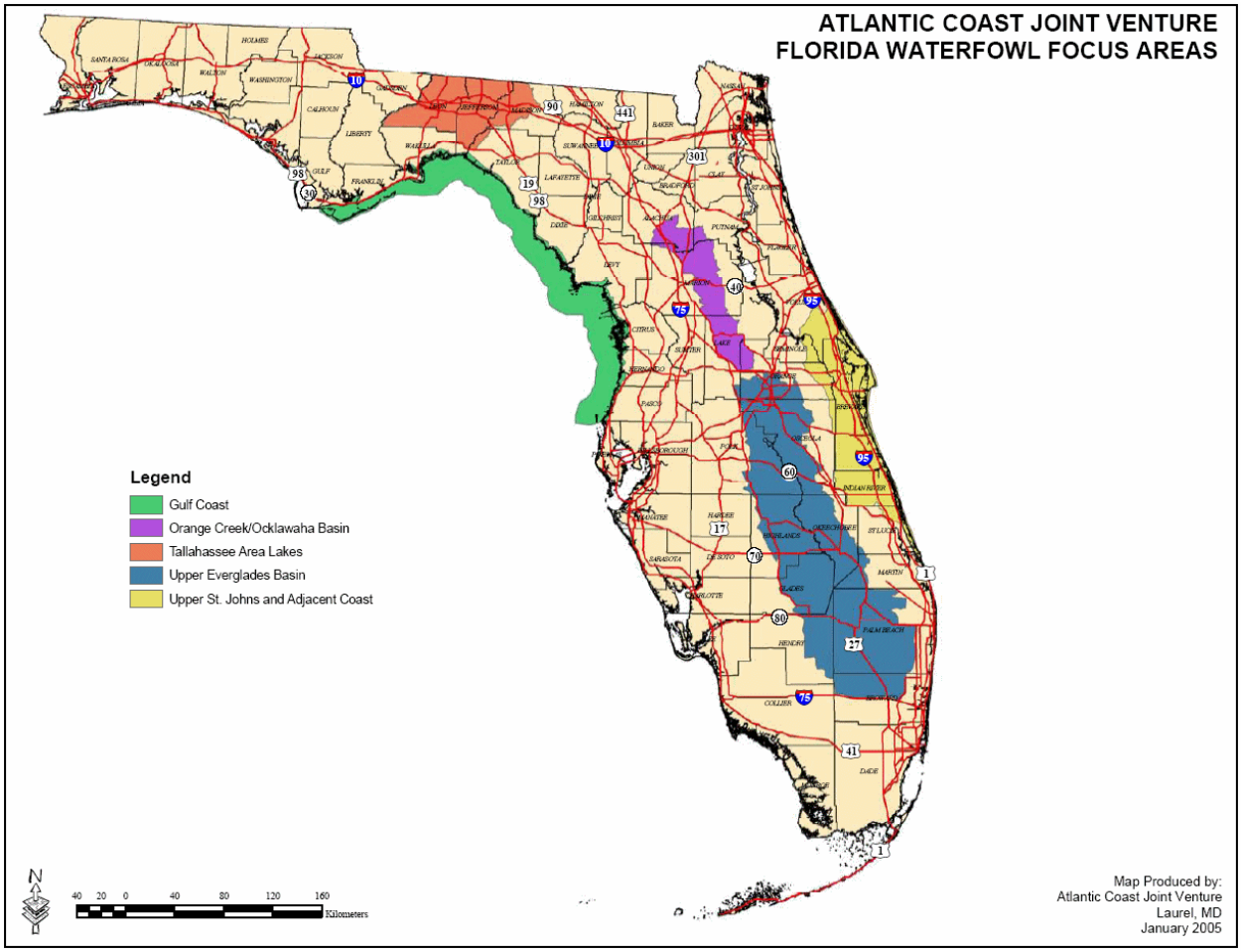

Figure 7.4. Florida waterfowl focus areas.

Focus Area: Gulf Coast, Florida
Sub-Focus Areas: None

Area Description:

The boundary of this focus area is the inland extent of coastal salt marsh habitat, as identified by Florida Fish and Wildlife Conservation Commission's Landsat TM data, from Franklin County (Apalachicola Bay) to Pasco County and out approximately 24.14km (15 miles) seaward, or the extent of sea grass beds. This area comprises about 845,365 hectares (2,088,933 acres), including 485,624 hectares (1.2 million acres) of wetlands. Major wetland types and their acreages include estuarine subtidal unconsolidated bottom 192,775 hectares (476,357 acres), marine subtidal unconsolidated bottom 152,693 hectares (377,312 acres), estuarine subtidal aquatic bed 63,062 hectares (155,830 acres), estuarine intertidal emergent marsh 58,269 hectares (143,986 acres) and palustrine scrub-shrub 19,468 hectares (49,108 acres).

Ownership/Protection:

Coastal lands are predominately under State/Federal protection from the Pasco/Hernando County line northward to the terminus of the focus area. Only a small percentage of the Pasco County coastline is currently in public ownership. Ownership is approximately 80% public.

Special Recognition:

Notable sites within the Focus Area include numerous State Wildlife Management Areas, National Wildlife Refuges (Chassahowitzka, Lower Suwannee, St. Marks, St. Vincent), Aquatic Preserves (St. Martin's Marsh, Big Bend Seagrass, Alligator Harbor, Apalachicola Bay), State Parks (Waccasassa Bay), and a State Buffer Preserve (Crystal River). Several conservation easements are located within 8-16 kilometer (5-10 miles) from the coast.

Waterfowl:

The Gulf Coast of Florida, principally from Apalachicola to Cedar Key, provides valuable habitat for waterfowl. Approximately 100,000 ducks normally winter in the Big Bend portion of the Florida Gulf Coast. In particular, large flocks of Redhead and Lesser and Greater Scaup can occur within 16 kilometers (10 miles) of the shoreline. Also present are Gadwall, Green-winged Teal, Bufflehead, and Red-breasted Merganser (Table 1).

Table 1. Waterfowl species identified in the Gulf Coast Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Redhead		X	X
Bufflehead		X	X
Hooded Merganser		X	X
Ring-necked Duck		X	X

Species	Breeding	Migration	Wintering
Lesser And Greater Scaup		X	X
Red-breasted Merganser		X	X
Blue-winged Teal		X	X
Gadwall		X	X
Mottled Duck	X		X
Green-winged Teal		X	X
American Wigeon		X	X
Northern Shoveler		X	X
Northern Pintail		X	X

Threats:

Predominant threats include habitat loss and reduced water quality resulting from development and human disturbance to beach nesting species such as terns, plovers, and American Oystercatcher. Protected coastal habitats are threatened by insufficient protection of upland buffers and shortfalls in prescribed burn programs. Nitrate levels in coastal rivers have been rising since the 1960's and continue to threaten water quality. Sea level rise and the subsequent intrusion of saltwater into freshwater and brackish environments also threaten to alter coastal environments.

Other Migratory Birds:

Critical areas for shorebirds, terns, Brown Pelican and other water birds exist in this area. Species of special interest Include Black Rail, Wood Stork, Least Tern, Snowy Plover, Wilson's Plover, Limpkin, Florida Sandhill Crane, Whooping Crane, Marsh Wren, American Oystercatcher, Snowy and Piping Plover, Short-Billed Dowitcher, and Seaside Sparrow.

Conservation Recommendations:

Protection of adjacent uplands should be pursued through fee title acquisition or acquiring conservation easements. Restoration activities should focus on improving water quality to minimize nitrate levels and implementing prescribed burning programs in fire maintained ecosystems. This may be accomplished through landowner incentives programs and cooperative management agreements.

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Focus Area: Orange Creek and Ocklawah Basin, Florida
Sub-Focus Areas: None

Area Description:

This focus area includes portions of Alachua, Marion, Lake, and Orange Counties. A broad corridor of wetlands extends south of Gainesville from Paynes Prairie, south along the floodplain of the Ocklawaha River, including the Ocklawaha chain-of-lakes, and ending at Lake Apopka and its surrounding basin. Total area comprises approximately 319,273 hectares (788,937 acres), including 114,741 hectares (283,531 acres) of wetlands. Major wetland types include lacustrine limnetic unconsolidated bottom 46,767 hectares (115,565 acres), palustrine forested 30,008 hectares (74,152 acres), palustrine emergent marsh 19,431 hectares (48,015 acres), palustrine aquatic bed 2,262 hectares (5,589 acres), and palustrine scrub-shrub 5,054 hectares (12,488 acres). This focus area includes some of the largest and recreationally most significant lakes in Florida, as well as extensive areas of marsh and hardwood swamp. This region provides a rich diversity of habitats for waterfowl and other avian species. The wetland resources of Orange Creek Basin and the floodplain of the Ocklawaha River are relatively intact, although threatened by encroaching development, exotic species, and runoff. Lake Apopka and its surrounding basin have been considerably impacted by agricultural development, including the conversion of thousands of acres of former floodplain marshes to row crop production, urbanization, and hydrological alteration. This area also includes some of the largest wetland restoration efforts in the nation. Among the most notable of these efforts has been the acquisition and on-going restoration of nearly 8,094 hectares (20,001 acres) of agricultural lands along the north shore of Lake Apopka. This area is well known for its diverse and abundant bird life, particularly migrating shorebirds.

Ownership/Protection:

A substantial portion of the land in the focus area is under State or Federal ownership. The Florida Department of Environmental Protection's Division of Recreation and Parks, the St. Johns River Water Management District, and the U.S. Forest Service are the primary owners. Additional lands are under county or municipal ownership, and conservation easements are common for less-than-fee acquisition of conservation lands. Beyond the urban centers, private ownership is diverse and includes commercial timber plantations, private horse farms, and agricultural operations consisting of citrus, cattle, and row crop farms.

Special Recognition:

Special recognition sites include Paynes Prairie Preserve State Park, Gum Root Swamp, Lochloosa, and Emeralda Marsh Wildlife Management Areas, Ocala National Forest, and Lake Apopka Restoration Area. The American Bird Conservancy and National Audubon Society have designated many of these sites as Important Bird Areas. In particular, the Lake Apopka north shore restoration area has been defined as one of Florida's few staging areas for migrating shorebirds.

Waterfowl:

The wetlands in this region of Florida consist of freshwater emergent marshes, numerous lakes, and hardwood swamps. Resident species, such as the Florida Mottled Duck and Wood

Duck, and a variety of wintering species, such Blue-winged Teal and Ring-necked Duck, remain important components of these wetland systems (Table 1).

Table 1. Waterfowl species identified in the Orange Creek/Ocklawaha Basin Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Ring-necked Duck		X	X
Blue-winged Teal		X	X
Mottled Duck	X		X
Green-winged Teal		X	X
American Wigeon		X	X
Northern Shoveler		X	X
Northern Pintail		X	X

Other Migratory Birds:

Lake Apopka's north shore restoration area historically served as a staging area for migrating shorebirds. The Orange Creek Basin and the Ocklawaha River as it passes through the Ocala Forest are bordered by relatively intact upland forest habitat. The bird life is diverse and includes all resident waterbird species including Bald Eagle, Swallow-tailed Kite, Osprey, Wood Stork, Limpkin, White Pelican, grebes, and numerous upland species.

Threats:

Urban encroachment and stormwater runoff have resulted in poor water quality leading to eutrophication in many lakes and streams. Additional threats include interest in further structural alteration to stabilize water level, invasive exotic plants, and human disturbance from water based recreation.

Conservation Recommendations:

Because the majority of wetlands in this focus area are in state and federal ownership, emphasis should be directed towards restoring or emulating through management the natural hydroperiod and integrity of the wetlands. Seasonal water level manipulations to mimic the natural hydroperiod and controlling exotic and noxious vegetation will enhance wetland habitat for wildlife and may improve water quality. As the urban interface encroaches upon these wetlands, conservation activities should focus on protecting surrounding uplands through fee-title acquisition or conservation easements.

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Focus Area: Tallahassee Area Lakes, Florida
Sub-Focus Areas: None

Area Description:

This focus area includes Leon County, Jefferson County north of Highway 98, and Madison County north of Highway 98 and within the Aucilla River Basin. Total area comprises approximately 420,423 hectares (1,038,883 acres), including 142,885 hectares (353,083 acres) of wetlands. Major wetland types and their acreages include palustrine forested 114,362 hectares (282,599 acres), palustrine emergent marsh 7,447 hectares (18,402 acres), palustrine scrub-shrub 6,675 hectares (16,494 acres), lacustrine littoral aquatic bed 5,031 hectares (12,432 acres), and lacustrine limnetic unconsolidated bottom 2,992 hectares (7,393 acres). A series of sinkhole lakes occurs in the Tallahassee area, many of which are dominated by floating-leaved plants and edged with cypress-gum-tupelo bottomland hardwoods. These lakes provide important wintering habitats for waterfowl, primarily Wood Duck and Ring-necked Duck, and year-round habitat for locally breeding Wood Duck. Many private quail-hunting plantations in this region also include managed waterfowl impoundments supporting substantial concentrations of primarily Ring-necked Duck, but also lesser numbers of Blue-winged Teal and Green-winged Teal, Gadwall, American Wigeon, Lesser Scaup, other species. Additionally, the upland component of the focus area supports many high priority landbirds, including Northern Bobwhite, Red-cockaded Woodpecker, and Southeastern American Kestrel.

Ownership/Protection:

The ownership pattern in this focus area is largely private. However, the focus area includes a significant portion of the Apalachicola National Forest. Additional ownerships include other federal, state, county, and municipal properties. Much of the area is important for outdoor recreation.

Special Recognition:

The U.S. Fish and Wildlife Service recognize a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986. There are several Important Bird Areas (IBA) in the focus area, designated by both the American Bird Conservancy and National Audubon Society. These IBA's include the Apalachicola National Forest, Red Hills Ecosystem, and Lake Lafayette. There are also several State Wildlife Management Areas and State Parks and a National Forest in the focus area, providing a variety of habitats for a large number of avian species.

Waterfowl:

This region of Florida consists of mostly inland lakes and other freshwater systems that support breeding populations of Wood Duck and large wintering populations of Ring-necked Duck and Wood Duck. Other species that are important for recreation are Blue-winged Teal, Green-winged Teal, Gadwall, and American Wigeon.

Table 1. Waterfowl species using the Tallahassee Lakes Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Ring-necked Duck		X	X
Gadwall		X	X
Blue-winged Teal		X	X
Northern Pintail		X	X
American Wigeon			X
American Black Duck			X
Mallard			X
Northern Shoveler		X	X
Green-winged Teal		X	X

Other Migratory Birds:

This region of Florida is highly important to many other migratory birds, primarily waterbirds and landbirds. Important species here are Wood Stork, Limpkin, Glossy and White Ibis, Swallow-tailed Kite, Swainson's Warbler, Painted Bunting, Prairie Warbler, and Prothonotary Warbler. Other high-priority species associated with the vast pine grassland savannas in this focus area are Red-cockaded Woodpecker, Northern Bobwhite, Bachman's Sparrow, and American Kestrel.

Threats:

Halting the loss of wetlands, and protection and restoration of bottomland hardwood communities are the most important wetland conservation needs in this focus area. Timber harvest in wetlands also is a concern. From the mid-1970's to mid-1980's, approximately 45 square miles of Florida's palustrine vegetated wetlands were lost annually. Shallow emergent wetlands have sustained the greatest loss because they are most easily drained. Perhaps the most immediate threat is continued population expansion. Florida is experiencing tremendous population growth, creating demands upon the land for industrial and residential development, agriculture, and water management, all of which have significant negative effects to Florida's wetlands.

Conservation Recommendations:

Restoration of natural hydrology and conservation of forested wetlands are most important in this focus area. Since many of the important wetlands are connected to sinkholes and the connections have been altered by levees and structures, management is important to maintain or provide high quality wetlands for waterfowl. Additionally, pine ecosystems are in

need of proper fire management to restore avian communities associated with fire maintained

ecosystems. Because much of the ownership in this area is private, landowner incentives such as tax breaks, conservation easements, or cooperative management agreements should be used to maintain and restore the integrity of the wetlands and the longleaf pine ecosystem.

References:

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands Resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Upper Everglades Basin, Florida
Sub-Focus Areas: None

Area Description:

This focus area includes the Kissimmee River Basin, Lake Okeechobee, the Everglades Agricultural Area, and portions of Broward County north of I-75. Total area comprises approximately 1,745,385 hectares (4,312,924 acres), including 728,437 hectares (1.8 million acres) of wetlands. Major wetland types and their acreages include palustrine emergent marsh 317,719 hectares (795,100 acres), lacustrine unconsolidated bottom 146,542 hectares (362,100 acres), palustrine scrub-shrub 125,425 hectares (309,933 acres), and palustrine forested wetland 83,136 hectares (205,435 acres). Drainage, unfavorable water level management, and agricultural practices have seriously degraded wetland habitat in this area. Several large-scale habitat restoration projects are underway. The South Florida Water Management District and others are restoring the Kissimmee River by back-filling 35 kilometers (22 miles) of the dredged river channel. This effort is predicted to restore more than 103.6 square kilometers (40 square miles) of floodplain wetlands. Several major initiatives are underway to reduce the nutrient pollution generated by agriculture practices north of Lake Okeechobee and in the Everglades Agricultural Area.

Ownership/Protection:

The majority of wetland ecosystems within this focus area are owned by various governmental entities including the South Florida Water Management District, U. S. Fish and Wildlife Service, National Park Service, Florida Fish and Wildlife Conservation Commission, and Florida Department of Environmental Protection. Other large land holdings include several Indian reservations. There are several agricultural operations within this focus area including dairy farms, citrus, cattle, vegetable row crops, and sugarcane.

Special Recognition:

The Kissimmee chain of lakes (upper basin) south to Lake Okeechobee and beyond (lower basin) constitutes a majority of the lands included in the Everglades Restoration Act and as such, is part of the Comprehensive Everglades Restoration Plan. The Kissimmee chain of lakes is particularly important to numerous waterbirds during droughts and dewatering events in the lower basin. Special recognition sites include Big Cypress National Preserve, Loxahatchee National Wildlife Refuge, numerous state Wildlife Management Areas and Stormwater Treatment Areas, the Kissimmee River Public Use Area, and the Lake Wales Ridge, among others.

Waterfowl:

This highly altered environment continues to provide significant habitat for resident species such as Mottled Duck and Fulvous Whistling-Duck and wintering species such as Ring-necked Duck, Blue-winged Teal, and Lesser Scaup. Associated prairie uplands interspersed with small pothole-type wetlands in this region constitute the core of Mottled Duck breeding habitat. Rice culture in the Everglades Agricultural Area (EAA) is especially important for breeding Fulvous Whistling-Duck.

Table 1. Waterfowl species using the Upper Everglades Basin Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Fulvous Whistling-Duck	X	X	X
Black-Bellied Whistling-Duck	X	X	X
Mottled Duck	X		X
Ring-necked Duck			X
Blue-winged Teal		X	X
Northern Pintail			X
American Wigeon			X
Lesser Scaup			X
Canvasback			X
Northern Shoveler		X	X
Green-winged Teal		X	X

Other Migratory Birds:

The Upper Everglades Basin is very important to migratory and resident songbirds, shorebirds and wading birds (i.e., Wood Stork, White Ibis, Limpkin, Snail Kite, rails, and bitterns). Additionally, this area contains the largest wading bird colony in South Florida (Alley North colony in Water Conservation Area 3AN). Last year this colony contained more than 50% of the nests in South Florida (mostly White Ibis nests). The Kissimmee River Basin is important for Crested Caracaras, Florida Grasshopper Sparrow, Sandhill Crane, a non-migratory flock of Whooping Crane, Bald Eagle, Snail Kite, and migratory and wintering wading birds. Also, Red-cockaded Woodpecker is located in some sections.

Threats:

There are three major threats within this focus area: hydrologic alteration, nutrient enrichment, and invasion of exotic plants. Hydrologic alteration has resulted from river channelization, water-level control of lakes, and impounding wetlands into discrete sections. This has altered the depth and flow of water through the Everglades, affecting prey availability and foraging behavior of numerous wading birds. High nutrient loading of phosphorus and nitrogen from the Everglades Agricultural Area has resulted in poor water quality and conversion of plant communities from sawgrass marsh to dense, monotypic stands of cattails. Exotic species such as Brazilian pepper, *Melaleuca*, and *Lygodium* are invasive, difficult to control, and threaten the native plant communities.

Conservation Recommendations:

Major conservation efforts are currently underway with the Comprehensive Everglades Restoration Plan, including fee title acquisition, purchase of conservation easements, and restoration plans addressing water quality requirements. Efforts should be directed to protect and restore organic farm fields in the Everglades Agricultural Area, reversing the stabilization of water levels on Lake Okeechobee, and control of exotic and noxious vegetation.

Focus Area: Upper St. Johns and Adjacent Coast, Florida
Sub-Focus Areas: None

Area Description:

This focus area includes the portions of Volusia, Seminole, Orange, and Osceola Counties lying south and east of I-4 within the St. Johns River basin, the entire Merritt Island National Wildlife Refuge, all of Brevard and Indian River counties, and portions of St. Lucie, Okeechobee, and Martin Counties lying within the southern Indian River Basin (ends at St. Lucie Inlet). This area comprises approximately 677,466 hectares (1,674,050 acres), including 334,715 hectares (827,097 acres) of wetlands. Major wetland types and their acreages include palustrine emergent marsh 102,475 hectares (253,222 acres), estuarine subtidal unconsolidated bottom 80,349 hectares (198,546 acres), palustrine forested 52,713 hectares (130,251 acres), palustrine scrub-shrub 25,122 hectares (62,076 acres), and marine subtidal unconsolidated bottom 23,861 hectares (58,959 acres). This region provides some of the best habitat for waterfowl in the state. Before development of the upper St. Johns River Basin, 117,363 hectares (290,000 acres) of marsh were inundated during years of normal rainfall. Since the turn of the century, almost 80% of the floodplain marshes were diked and drained, mostly for agriculture. In the 1970's, the U.S. Army Corps of Engineers and the St. Johns River Water Management District began restoring wetland habitats in the upper basin of the river. The main components of this restoration effort include floodplain preservation through land acquisition and construction of agricultural irrigation and stormwater management reservoirs. The adjacent coast includes the Indian River, Banana River, Mosquito Lagoon, and associated coastal impoundments, including Merritt Island National Wildlife Refuge. This area provides wintering habitat for about 400,000 ducks. About three-fourths of these are Lesser Scaup using open water habitats associated with seagrass beds. Other abundant species include Ring-necked Duck, Northern Pintail, Blue-winged Teal, American Wigeon, and Mottled Duck.

Ownership/Protection:

A substantial portion of the lands in the Upper St. Johns River Basin and Adjacent Coast are owned by State or Federal Agencies. The St. Johns River Water Management District, an agency of the state, is the primary owner of river floodplain marshes. Additional lands are in private ownership, most of which include large citrus and cattle ranches. The adjacent coast, including Cape Canaveral and Merritt Island area is in federal ownership (NASA, U.S. Fish and Wildlife Service, U.S. Air Force, and U.S. National Park Service). Outside of the urban areas along US Highway 1 and the Indian River lagoon south of Merritt Island, much of the land is privately owned. Conservation easements constrain development on a number of these properties. Additional ownerships include other federal, state, county, and municipal agencies.

Special Recognition:

The Merritt Island National Wildlife Refuge is recognized as a Global Important Birding Area, National Estuary, Candidate Marine Protected Area, Essential Fish Habitat, and Outstanding Florida Waters. Also, much of the entire adjacent coast area has received Important Bird Area (IBA) designation by the American Bird Conservancy and the National Audubon

Society. Many of the upper St. Johns floodplain marshes are independently managed as state Wildlife Management Areas, are designated as IBA's, and have received funding from the North American Wetlands Conservation Act, Ducks Unlimited, and the Wetlands Reserve Program.

Waterfowl:

This region of Florida consists of mostly freshwater emergent marsh in the upper St. Johns Basin and brackish/estuarine marsh in the Mosquito Lagoon and Indian and Banana rivers (IRL). These systems support breeding populations of Wood Duck, Mottled Duck, And Black-Bellied-Whistling-Duck and large wintering populations of Ring-necked Duck, Blue-winged Teal, And Lesser Scaup. Other species that are important for recreational uses are Green-winged Teal, American Wigeon, and Northern Pintail.

Table 1. Waterfowl species using the Upper St. Johns and Adjacent Coast Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Ring-necked Duck		X	X
Blue-winged Teal		X	X
Black-Bellied Whistling-Duck	X	X	X
Mottled Duck	X		X
Lesser Scaup		X	X
Green-winged Teal		X	X
American Wigeon		X	X
Northern Shoveler		X	X
Northern Pintail		X	X

Other Migratory Birds:

This region of Florida is highly important to many other resident and migratory birds. Important species include Whooping Crane, Wood Stork, Brown Pelican, Least Tern, Bald Eagle, Limpkin, Peregrine Falcon, rails, Glossy and White Ibis, Reddish Egret, Roseate Spoonbill, Snail Kite, Swallow-Tailed Kite, Snowy and Piping Plover, Short-Billed Dowitcher, near shore pelagic species, Swainson's Warbler, Painted Bunting, Prairie Warbler, and Prothonotary Warbler.

Threats:

Florida is experiencing tremendous population growth, creating demands upon the land and fish and wildlife resources for recreational and commercial uses, industrial and residential development, agriculture, and water management, all of which have significant negative impacts

to Florida's wetlands and wetland wildlife. Fortunately, the majority of critical wetlands within this focus area are owned by governmental entities. However, poor water quality resulting from

urban/suburban and agricultural runoff and an increasing presence of invasive exotic plants pose a significant threat to restoring and enhancing wetland habitat. In the Indian River Lagoon, most of the tidal salt marshes were impounded for mosquito control in the mid 1960's. The majority of these impoundments lie within the boundary of the Merritt Island National Wildlife Refuge, which has historically managed the impoundments for waterfowl and other migratory birds. Refuge staff has received pressure to restore the impoundments to estuarine salt marsh that could threaten several thousand acres of migrating and wintering habitat for waterfowl such as Northern Pintail, American Wigeon, Gadwall, and Green-winged Teal and Blue-winged Teal.

Conservation Recommendations:

Wetland management, hydrological restoration, and protection and restoration of wetland communities are the most important needs in this focus area. Because many of the important wetlands in this focus area are modified, water management is critical to maintain or provide the high quality wetlands for waterfowl resources here. Open-water estuary and associated water quality and submerged aquatic plant communities are critical to fish and wildlife populations, including endangered species like the manatee and sea turtles. Additionally, proper fire management needs to be implemented to restore avian communities associated with fire-maintained ecosystems. On public lands, government programs should be used to maintain and restore the integrity of the wetlands and open water habitat.

References:

Herring, G. and Jaime A. Collazo. 2003. Estimating winter survival and temporary emigration of lesser scaup in Florida. North Carolina Cooperative Fish and Wildlife Research Unit, North Carolina State University, Raleigh, NC 27695. Abstract.

Pranty, Bill. 2002. The Important Bird Areas of Florida: 2000-2002. Audubon of Florida. Tampa, FL 33619.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands Resources Act, Southeast Region, Regional Wetlands Concept Plan.

7.2.4 Georgia

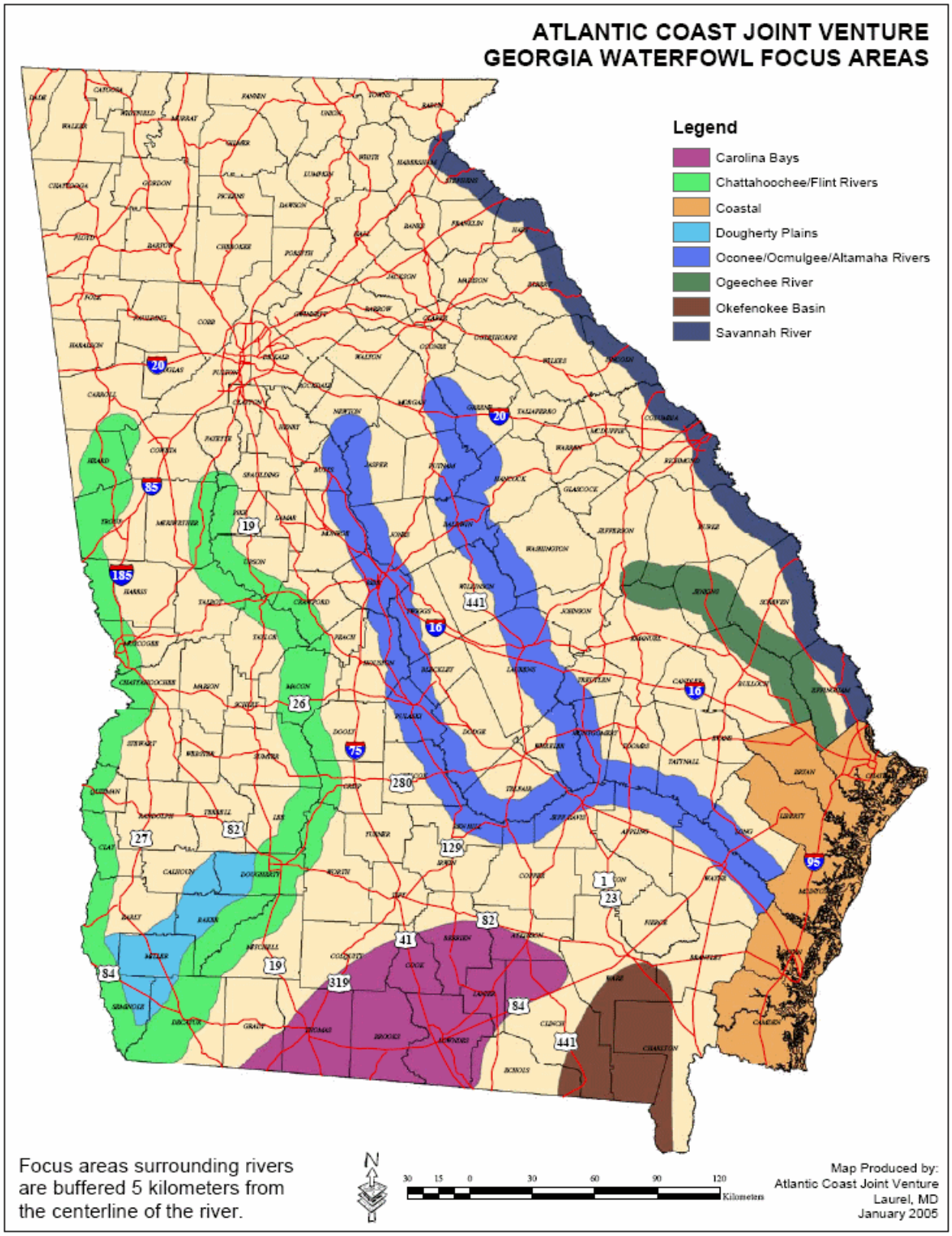

Figure 7.5. Georgia waterfowl focus areas.

Focus Area: Carolina Bays, Georgia
Sub-Focus Areas: None

Area Description:

The Carolina Bays Focus Area encompasses 738,305 hectares (1,824,384 acres) in south central Georgia, bordering north Florida and lying due north and adjacent to the Tallahassee Area Lakes Focus Area in Florida. This area is characterized by numerous depressional wetlands known as Carolina Bays. Over 404 hectares (1000 acres) of these wetlands occupy the focus area. Many of these bays have been drained or altered, but some are intact, and many could easily be restored to provide an important variety of habitat type for waterfowl and other wetland dependent species. These bays are dominated by tupelo gum and bald cypress, while much of the surrounding landscape is dominated by southern pine forests. These areas were historically important wintering and migration habitat for Ring-necked Duck and other diving ducks, but were also utilized heavily by Blue-winged Teal, American Wigeon, Gadwall and Black Duck.

Ownership/Protection:

Land in this region is primarily privately owned. Uplands are dominated by industrial forest interests and agriculture. The relatively low number of landowners in the region has helped retain the natural qualities of the region and limit development. Opportunities exist to restore drained and altered Carolina Bays, and to restore large areas to longleaf pine.

Special Recognition:

There is tremendous potential to restore the natural hydrology of drained and altered Carolina Bays. This area has tremendous potential to restore the longleaf pine/wiregrass ecosystem in the southern United States. Outdoor recreation is popular here, dominated by deer and quail hunting. Wetlands in this region are dominated by Carolina Bays. These depressional wetlands are largely fed by rain and groundwater, and are found primarily in the Carolinas and Georgia. Origin of these bays is not known, and they vary in size from less than an acre to several hundred acres. These bays provide habitat for a variety of reptiles and amphibians, waterfowl, and waterbirds.

Waterfowl:

These wetlands were historically important wintering and migration habitat for Ring-necked Duck and other diving ducks, but were also utilized heavily by Blue-winged Teal, American Wigeon, Gadwall and Black Duck.

Table 1. Waterfowl species using the Carolina Bays Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Ring-necked Duck		X	X
Blue-winged Teal		X	

Species	**Breeding**	**Migration**	**Wintering**
American Wigeon			X
Gadwall			X
Black Duck			X
Mallard			X
Hooded Merganser			X

Other Migratory Birds:

Carolina bays are very important to waterbirds, including Great Blue Heron, White Ibis, Wood Stork, Snowy Egret, and Little Blue Heron. Landbirds that are important here include Prothonotary Warbler, Worm-eating Warbler, Ovenbird, and Black-and-White Warbler. Priority species associated with the pine uplands are Red-cockaded Woodpecker, Bachman's Sparrow, Brown-headed Nuthatch, Red-headed Woodpecker, and Chuck-Will's-Widow.

Threats:

Current threats in this region are primarily and directly related to hydrology of Carolina Bays. Recent court decisions allowing the drainage and filling of these wetlands could significantly affect the floral and faunal resources of these wetlands, as well as water quality in the region. Continued drainage for agriculture, forestry, and peat mining affect the hydrology of the landscape and the biological resources. There is tremendous potential to restore the natural hydrology of these wetlands in the Carolina Bays Focus Area.

Conservation Recommendations:

Major conservation actions here are restoration of the natural hydrology of Carolina Bays, and protection of extensive bays and remaining wetlands. Major recommendations for this focus area are to limit development through conservation easements, and to provide incentives to landowners to protect and restore the longleaf pine/wiregrass ecosystem.

References:

Hunter, W.C., L. Peoples and J. Collazo. 2001. South Atlantic Coastal Plain Partners In Flight Bird Conservation Plan, 158pp.

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources, Personal Communication

Sharitz, R.R., and J.W. Gibbons. 1982. The Ecology of Southeastern Shrub Bogs (Pocosins) and Carolina Bays: A Community Profile. U.S. Fish & Wildlife Service, 94pp.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands Resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Chattahoochee/Flint Rivers, Georgia
Sub-Focus Areas: None

Area Description:

This large focus area encompasses 1,128,547 hectares (2,788,691 acres) in two major river basins in southwest Georgia, the Flint and Chattahoochee Rivers. The Central Dougherty Plain Focus Area lies between these two prongs of the focus area. The Flint River corridor is characterized by extensive riverine swamps, and where many of the surrounding wetlands were drained for agriculture. The Chattahoochee River is also characterized by extensive riverine swamps, and forms the western boundary of Georgia. Both rivers are important for migrating and wintering waterfowl. A significant component of this focus area, Lake Seminole, forms at the confluence of the two rivers. This large lake is shallow over much of its area, providing excellent wintering waterfowl habitat. Much of the landscape here is in agriculture, with the remaining in pine or mixed pine-hardwood forests. There are extreme threats to both of these river systems by increasing urban sprawl and discharges upstream from the Atlanta metropolitan area. When this river systems flows into Florida, it becomes the Apalachicola River. Upstream water quality is extremely important to water quality of the Apalachicola River and Apalachicola Bay.

Ownership/Protection:

Ownership in this focus area is primarily privately, and in agriculture and forestry interests. One major federal installation, Fort Benning, is located near the Chattahoochee River, and is very important for longleaf pine forests and associated avian species, such as the federally endangered Red-cockaded Woodpecker.

Special Recognition:

The U.S. Fish and Wildlife Service recognizes one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Cemochechobee Creek supports the presence of three federally threatened and endangered species, Wood Stork, Bald Eagle, and Erect trillium. A significant population of Red-cockaded Woodpecker is located at Fort Benning, and there are several Important Bird Areas located in this focus area: Seminole Lake Wildlife Management Area, Fort Benning, and Swamp of TOA (Chickasawhatchee Swamp). Portions of the Southwest Focus Area of Georgia's Bobwhite Quail Initiative are located in the focus area. The Chattahoochee and Flint Rivers converge to form the Apalachicola River which flows into Apalachicola Bay. Water quality in the Chattahoochee/Flint Rivers Focus area is extremely important to water quality in the Apalachicola River and Bay, affecting organisms in the river, estuary, and bay.

Waterfowl:

These two river systems are extremely important to migrating and wintering waterfowl, as well as breeding Wood Duck. The Flint River was an important migration corridor for Mallard, Black Duck, Gadwall, American Wigeon, and Blue-winged Teal prior too much of the area being drained for agriculture. This area now serves as a primary migration route to

wintering areas further south for Blue-winged Teal, Canvasback, Ring-necked Duck, Redhead, and some species of dabbling ducks. The Chattahoochee River is a major migration route for dabbling ducks, such as Blue-winged Teal, Mallard, Black Duck, Green-winged Teal, Gadwall, and American Wigeon to the Caribbean and South America. Lake Seminole provides wintering habitat for large numbers of both diving and dabbling ducks, including Redhead, Canvasback, American Wigeon, and Mallard. Additionally, large numbers of American Coot winter on the lake, attracted by large amounts of aquatic vegetation growing in the shallow water.

Table 1. Waterfowl species using the Chattahoochee/Flint Rivers Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Mallard		X	X
Black Duck			X
Gadwall			X
American Wigeon			X
Blue-winged Teal		X	
Ring-necked Duck			X
Canvasback		X	
Redhead		X	
Green-winged Teal		X	
Canada Goose			X
Ruddy Duck		X	
Bufflehead		X	

Other Migratory Birds:

This focus area is important for several federally threatened and endangered species: Wood Stork, Red-cockaded Woodpecker, and Bald Eagle. Other important species here are Glossy and White Ibis, Swallow-tailed Kite, Swainson's Warbler, Prairie Warbler, and Prothonotary Warbler. Other high priority species associated with the pine grassland savannas in this focus area are Red-cockaded Woodpecker, Northern Bobwhite, Bachman's Sparrow, and American Kestrel.

Threats:

The primary threat to this focus area is the degradation of water quality of both both river systems, and the subsequent effects on Lake Seminole, the Apalachicola River, and Apalachicola Bay. Impacts to water quality in these rivers are from agriculture and upstream discharges from the Atlanta metropolitan area. Future impacts will be from additional urban sprawl and increased recreational use, especially along the river banks and tributaries. Erosion and sedimentation is most prevalent on the Chattahoochee River, degrading habitat for many species, and degrading the quality of life for residents and visitors throughout the region.

Conservation Recommendations:

The primary conservation recommendations here are to protect remaining properties along the waterfronts of both rivers and in the watersheds of both rivers. This can be done through fee title acquisition and conservation easements. Water use and water quality needs to be addressed in a comprehensive water management plan, and partners throughout the region (Georgia, southeast Alabama, and north Florida) need to work to together to properly manage metropolitan discharges, agricultural runoff, recreational impacts, water use, and urban sprawl.

References:

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

www.sherpaguides.com/Georgia/flint_river/

www.sherpaguides.com/Georgia/chattohoochee_river/

Focus Area: Coastal, Georgia
Sub-Focus Areas: None

Area Description:

The Coastal Focus Area encompasses 821,533 hectares (2,030,045 acres) along the entire coast of Georgia, bordering four other focus areas in Georgia: Savannah River, Ogeechee River, Oconee/Ocmulgee/Altamaha Rivers, and Okefenokee Basin Focus Area, and bordering South Carolina to the north and Florida to the south. This area supports some of the richest and diverse flora and fauna in Georgia and the southeastern United States. This area includes the coastal portions of several important estuarine river ecosystems in the southeast, including the Savannah, Altamaha, Satilla, and St. Mary's Rivers. The coastal area is also characterized by extensive tidal salt marshes and freshwater marshes, buffered by an extensive network of "marsh" islands and barrier islands along the entire coast. All of these freshwater and saltwater systems, and marsh island and barrier island systems in the coastal Georgia area support one of the most biologically productive systems in the world, providing food, nesting, and nursery ground habitat for a high diversity of aquatic animals, including birds, mammals, and reptiles.

Ownership/Protection:

Land ownership in this focus area is largely private, with agriculture and forestry the primary land uses. Much of the coastal area is becoming increasingly urbanized, with private developments occurring along much of the coast. More than two-thirds of the barrier islands are protected through federal, state, or private initiatives. There are significant acreages in national wildlife refuges, state wildlife management areas, military installations, state parks, and private conservation preserves.

Special Recognition:

The U.S. Fish and Wildlife Service recognizes eleven wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Lower Satilla River, St. Mary's River, Black Hammock, Lower Altamaha River Swamp, St. Simons Island Rookery, Grantley Tract, Buffalo Swamp, Creighton Island, Julianton Plantation, Oldnor Island, Wahoo Island, and the Towaliga River. There are numerous federal ownerships in the coastal area, including the Savannah Coastal Refuges Complex (which includes seven National Wildlife Refuges), Fort Stewart, and Cumberland Island National Seashore. The Sapelo Island National Estuarine Research Reserve is in this focus area, and there are numerous state wildlife management areas and parks located here, including Jekyll Island Park and Altamaha Wildlife Management Area. The Nature Conservancy has several preserves in the area, including Cathead Creek and Carrs Island Preserves. The Altamaha River Delta is a Western Hemisphere Shorebird Reserve Network site, and also in The Nature Conservancy's Altamaha River Bioreserve Initiative, and the Georgia Department of Natural Resources Preservation 2000 and River Care land acquisition programs.

Waterfowl:

The coastal tidal areas are heavily used by waterfowl as migration and wintering habitat.

Tidal freshwater areas are used by dabbling ducks, and salt water areas, such as bays and sounds, provide resting and escape habitat for both dabbling and diving ducks. Managed wetlands are used almost exclusively in areas dominated by brackish and saltwater. Tidal forested swamps along the major river systems are also heavily used. Diving ducks tend to use expanses of open water, and saltwater bays and sounds.

Table 1. Waterfowl species using the Coastal Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard			X
Northern Pintail		X	X
Northern Shoveler			X
Blue-winged Teal		X	
Ring-necked Duck			X
American Wigeon			X
Gadwall			X
Redhead			X
Canvasback			X
Lesser Scaup			X
Mottled Duck	X		X
Wood Duck	X	X	X
Green-winged Teal		X	
Bufflehead		X	X
Ruddy Duck			X
Hooded Merganser		X	X
Red-breasted Merganser			X
Black Duck			X

Other Migratory Birds:

The entire coast of Georgia is rich in avian diversity, and highly important to many species. Waterbirds important in this area include White Ibis, Anhinga, Black Tern, Great Blue Heron, Great Egret, Green Heron, and Little Blue Heron. Shorebirds that utilize this area are American Woodcock, Short-billed Dowitcher, Red Knot, Semi-palmated Sandpiper, Stilt

Sandpiper, Wilson's Plover, and American Oystercatcher. High priority landbirds include Swallow-tailed Kite, Wood Thrush, Northern Parula, Yellow-throated Warbler, Prothonotary Warbler, Swainson's Warbler, Hooded Warbler, Painted Bunting, Henslow's Sparrow, Yellow-billed Cuckoo, Acadian Flycatcher, Blue-gray Gnatcatcher, Mississippi Kite, Red-shouldered Hawk, Red-eyed Vireo, Summer Tanager, and Louisiana Waterthrush.

Threats:

The primary threat to this focus area is rapid growth of urban areas and tourism, threatening the protection of water drinking supplies and coastal water quality. Heavy and increased development of coastal areas and barrier islands will cause increased stormwater runoff and pollution, impacting the marsh. Impacts to the marsh may disrupt natural processes in the estuaries and barrier islands, fragmenting habitat and wildlife corridors. Development of coastal beaches, dunes, and maritime forests immediately reduces habitat for many high priority species.

Conservation Recommendations:

The primary conservation recommendations for the Coastal Focus Area should be focused on protection of estuaries, barrier islands, and marsh hammocks. Protection of these areas will provide important habitats for many priority species and retain water quality necessary for healthy ecosystems. Conservation recommendations in this area range from protecting specific sites from human disturbance to protection and acquisition of large acreages of important conservation lands. Lands can be protected through acquisition by federal, state, and private entities, permanently protecting the land. Because much of this area is in private ownership, working with the landowner to manage and protect these private lands is very important. Additionally, restricting human use and disturbance in areas known to be heavily used by high priority bird species is an option.

References:

American Bird Conservancy, Important Bird Areas.

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication

National Audubon Society, Important Bird Areas.

The Nature Conservancy, Georgia Chapter.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

www. Sherpaguides.com/Georgia/okefenokee_swamp/

Focus Area: Dougherty Plains, Georgia
Sub-Focus Areas: None

Area Description:

The Dougherty Plains Focus Area is primarily a large complex 218,520 hectares (539,974 acres) of riverine and limestone depressional wetlands located in southwest Georgia encompassing portions of Early, Calhoun, Dougherty, Baker, Miller, Seminole, and Decatur counties. This focus area is located between two major rivers that comprise the majority of another Focus Area in the Atlantic Coast Joint Venture, the Chattahoochee/Flint Rivers Focus Area. Wetlands in this focus area are hydrologically connected and create one of the largest remaining, relatively intact, inland wetland ecosystems in the southern United States. Much of the landscape has been cleared for agriculture and silviculture, creating numerous opportunities for future restoration efforts. Land ownership here is primarily privately owned, with a large number of plantations that are primarily used for hunting. Habitats in this focus area include depressional and riverine herbaceous, forested, and shrub-scrub wetlands, mixed oak-pine forests, industrial pine forests, and hardwood forests.

Ownership/Protection:

This focus area is largely rural in nature, and dominated by privately owned lands, including industrial forest lands, large plantations, and smaller family owned farms. Many of the large plantations have been preserved, and are generally undeveloped, where hunting is a primary recreational activity. These large plantations encompass thousands of acres, preserving many of the wetlands in this area.

Special Recognition:

The U.S. Fish and Wildlife Service recognizes two wetland complexes as priority under the Federal Emergency Wetlands Resources Act of 1986: Swamp of TOA (Chickasawhatchee Swamp), and Cooleewahee Creek and Limesink Ponds. The TOA Swamp, the largest lime sink in Georgia supports the federally endangered Wood Stork and the federally threatened Bald Eagle. The rare Georgia blind salamander also occurs here. The Wood Stork and Bald Eagle area also found in the Cooleewahee Creek area, as well as the blind salamander and the Dougherty Plain cave crayfish. Additionally, the underground aquifer, the Upper Floridan Aquifer, is thought to supply much of the drinking water for this region of Georgia.

Waterfowl:

This region of Georgia consists of mostly inland lakes and other freshwater systems that support breeding populations of Wood Duck and large wintering populations of Ring-necked Duck. Other species that are important for recreational uses are Blue-winged Teal, Green-winged Teal, and American Wigeon.

Table 1. Waterfowl species using the Dougherty Plains Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard			X
Black Duck			X
Blue-winged Teal		X	
Gadwall		X	X
American Wigeon		X	X
Green-winged Teal		X	
Canvasback		X	
Redhead		X	
Ring-necked Duck		X	X

Other Migratory Birds:

The wetlands of the Central Doughtery Plains are important to a large number of waterbirds, landbirds, and endangered species. The Wood Stork occurs here, as does the Snowy Egret, Little Blue Heron, White Ibis, and Black-crowned Night Heron. Important landbirds are the Prothonotary Warbler, Yellow-throated Warbler, Northern Parula, Yellow-throated Vireo, and Swallow-tailed Kite. Two federally threatened and endangered species occur here, the Wood Stork, and Bald Eagle. The state listed Bachman's Sparrow also occurs here in high densities. Georgia Department of Natural Resources has initiated a Bobwhite Quail Initiative in a portion of this sub-focus area.

Threats:

The primary threats in this focus area are conversion of existing habitats to other land uses, such as agriculture, silviculture, and urban sprawl, reducing the source of source water and groundwater withdrawals.

Conservation Recommendations:

Wetlands in this focus area are necessary in maintaining and enhancing region water quality through their ability to remove pollutants from surface water runoff. They also contribute significantly to direct recharge of underground aquifers. Therefore, it is necessary to protect these wetlands for water quality. Major conservation actions here are restoration of prior converted wetlands, enhancement of existing wetlands, and protection of extensive tracts or remaining wetlands. Protection can be accomplished through acquisition or protection through conservation easements by federal, state, or private conservation organizations.

References:

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication.

Rowell, M.C, S.C. Johnson, and V. Fasselt. Technical Summary Document for The Central Dougherty Plain Advance Identification of Wetlands. EPA 904/R-97/005.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands Resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Oconee/Ocmulgee/Altamaha Rivers, Georgia
Sub-Focus Areas: None

Area Description:

This large focus area encompasses 1,248,079 hectares (3,084,060 acres) and is delineated on the watersheds of three extremely important river systems in Georgia, the Oconee, Ocmulgee, and Altamaha Rivers. This watershed is the second largest watershed on the Atlantic Coast, second only to the Chesapeake Bay watershed. The Oconee and Ocmulgee Rivers merge in central Georgia, forming the Altamaha River, perhaps one of the most important river systems in Georgia and the southeastern United States for natural resources. These watersheds area characterized by extensive riparian areas, bottomland hardwoods, and beaver pond complexes to the north, and by extensive bottomland hardwood floodplain areas nearer the coast. These extensive floodplains serve as a refuge to over 130 endangered, threatened, and rare plants and animals, including seven species of freshwater mussels found nowhere else. This focus area is extremely rich in avian fauna, with large numbers of waterfowl, wading birds, and landbirds utilizing the focus area. Major habitats in this focus area are bottomland hardwood forests, including cypress-tupelo-blackgum and swamp chestnut-cherrybark oak-shumard oak forest types, isolated depressional wetlands, beaver pond complexes, longleaf and loblolly pine forests, mixed oak-hardwood forests, and oxbow lakes.

Ownership/Protection:

Much of the land in this focus area is privately owned, with major land use being agriculture and forest industry. There are considerable acreages protected in this focus area by federal, state, and private interests. Federal lands include Piedmont and Bond Swamp National Wildlife Refuges. The Oconee National Forest is located in the northern portion of the focus area, and there are numerous state wildlife management areas in the three river systems. Additionally, numerous properties are protected by conservation easements through the Georgia Department of Natural Resources, and various land trusts, such as Trust for Public Land and The Nature Conservancy.

Special Recognition:

The U.S. Fish and Wildlife Service recognizes a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Upper Altamaha River Swamp, Indian Island Club, Bond Swamp, Ocmulgee Creek, Big Indian Mossy Creek, Big Grocery Creek, Oconee River, Towaliga River, Alcovy River Swamp, Springfield Lake, and Osciewithcee Springs. These wetlands support some of the most extensive bottomland hardwood swamps remaining in the southeastern United States, and are located near several National Wildlife Refuges and State Wildlife Management Areas. Additionally, these areas provide habitat for large numbers of waterfowl, wading birds, neotropical migratory birds, and a number of state and federally threatened and endangered species, including Bald Eagle, shortnose sturgeon, bird-voiced tree frog, and mole salamander. The Nature Conservancy has designated the Altamaha River a top conservation priority, listed it as one of the top 75 remaining “Last Great Places” in the world, and has thus, established the Altamaha River Bioreserve. All three river

systems are the major focus are many local, regional, and national conservation efforts and partnerships.

Waterfowl:

These extensive riverine swamps serve as a north-south migration route and wintering area, primarily for dabbling ducks. The Oconee River corridor is heavily used by Black Duck, Mallard, Blue-winged and Green-winged Teal, and Ring-necked Duck. This corridor is also characterized by beaver pond complexes and riverine wetlands in the Piedmont and by extensive bottomland hardwoods to the south and nearer the Coastal Focus Area. The Ocmulgee/Altamaha River corridors form one of the most utilized waterfowl flyways through Georgia, heavily used by Mallard, Black Duck, Green-winged and Blue-winged Teal, Gadwall, American Wigeon, Ring-necked Duck, Redhead, And Canvasback. These river corridors are also characterized by beaver pond complexes to the north and extensive bottomland hardwood swamps nearer the coast.

Table 1. Waterfowl species using the Oconee/Ocmulgee/Altamaha Rivers Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Black Duck			X
Green-winged Teal		X	X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Gadwall			X
American Wigeon			X
Canvasback		X	
Northern Pintail		X	
Northern Shoveler		X	X
Lesser Scaup		X	
Bufflehead		X	
Hooded Merganser	X	X	X
Mallard		X	X

Other Migratory Birds:

This focus area is extremely important to a number of high priority species recognized in existing continental bird conservation plans. Some of the most important species in this area include White Ibis, Swallow-tailed Kite, American Woodcock, Wood Thrush, Northern Parula, Yellow-throated Warbler, Prothonotary Warbler, Swainson's Warbler, Hooded Warbler, Painted Bunting, Henlsow's Sparrow, and Yellow-billed Cuckoo. Other high priority species that are primarily migrants through this important focus area are Louisiana Waterthrush, Cerulean Warbler, and Kirtland's Warbler.

Threats:

The primary threats to this focus area are changes in land use practices that result in habitat loss and degradation. Natural communities in the focus area are still being lost to urban sprawl, agriculture, intense forest management, and land development.

Conservation Recommendations:

The primary conservation recommendations are to protect these extensive floodplains through fee title acquisition or conservation easements. This can be done by federal, state, and private organizations. Additionally, restoration of commercial pine stands and agricultural areas to their former natural plant communities is important as these areas are protected.

References:

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication.

Ocmulgee River Watershed Management Plan. 2003. Georgia Department of Community Affairs.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

www.sherpaguides.com/Georgia/altamaha_river.html.

Focus Area: Ogeechee River, Georgia
Sub-Focus Areas: None

Area Description:

The Ogeechee River Focus Area encompasses 271,184 hectares (670,108 acres) in portions of seven counties in eastern Georgia. This focus area covers much of the Ogeechee River Basin, flanked by the Savannah River Focus Area to the east and the Oconee/Ocmulgee/Altamaha Focus area to the west. The Ogeechee River is a "black water" river, carrying high loads of organic carbon. This focus area is comprised of forests, agricultural lands, and wetlands. Much of the forested areas are bottomland hardwood forests and pine or mixed pine-hardwood forests, with the wetlands primarily in the bottomland hardwood forest types. Forestry and agriculture are a major part of the economy in this focus area. The Floridan Aquifer underlies much of this focus area, and there are heavy demands upon the water resources of the basin for agriculture, industry, municipal use. Agricultural demands on water are expected to increase in the future. The headwaters of the Ogeechee River are in the Piedmont, eventually flowing from the Piedmont and emptying into the Atlantic Ocean. A variety of habitats throughout this focus area supports a high diversity of animals, including endangered and threatened species, waterfowl, and neotropical migratory birds.

Ownership/Protection:

This focus area is largely rural in nature, with land ownership primarily in private lands. These private lands are comprised of forestry ownerships in small, private ownerships and commercial forestry interests, and agricultural lands. A small percentage of the land is in public ownership.

Special Recognition:

The U.S. Fish and Wildlife Service recognize a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Lower Ogeechee River, Middle Ogeechee River, Big Dukes Pond, and Kent's Landing Swamp. Special recognition in these areas are for their importance to anadromous fish (federally endangered shortnose sturgeon), extensive remote remnant of the Ogeechee River forested floodplain, presence of three federally endangered species (Wood Stork, Red-cockaded Woodpecker, shortnose sturgeon), and the importance to the striped bass fishery. Additionally, portions of two focus areas (Central and East) are included under Georgia's Bobwhite Quail Initiative in this focus area.

Waterfowl:

Waterfowl using this focus area are very similar to those using the extensive bottomland forests of the Savannah River Basin.

Table 1. Waterfowl species using the Ogeechee River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
American Wigeon			X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Wood Duck	X	X	X
Hooded Merganser		X	X

Other Migratory Birds:

The Ogeechee River is highly important to many other migratory birds, primarily waterbirds and landbirds. Important species here are Wood Stork, Swallow-tailed Kite, Swainson's Warbler, Painted Bunting, Prairie Warbler, and Prothonotary Warbler. Other high priority species associated with the pine grassland savannas in this focus area are Red-cockaded Woodpecker, Northern Bobwhite, Bachman's Sparrow, and American Kestrel. Portions of two focus areas under Georgia's Bobwhite Quail Initiative (Central and East) are located in this focus area.

Threats:

Much of the threat in this focus area is related to municipal, industrial, and agricultural source and non-point source pollution and discharge into the Ogeechee River Basin. Key environmental stressors are high levels of fecal coliform bacteria, concentration of heavy metals, nutrient loading, fish tissue contamination, stream flow and temperature modification, and sediment loading and habitat degradation. All of these stressors affect the water quality of the basin, and the organisms that inhabit the basin.

Conservation Recommendations:

The primary conservation recommendations are to acquire or protect extensive areas of the bottomland hardwood forests through fee title acquisition or conservation easements. Protection of the remaining bottomland hardwood forests would maintain and improve the water quality of the basin. Additionally, restoration of industrial pine forests to longleaf pine, on both small and large commercial ownerships, and management and protection of these forests will greatly increase the water quality in the basin. Finally, a comprehensive management plan for the Ogeechee River Basin, The Ogeechee River Basin Management Plan 2001, makes recommendations for improving the water quality of the basin, and which should be utilized by the stakeholders in this focus area.

References:

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication.

Ogeechee River Basin Management Plan 2001. Georgia Department of Natural Resources, Environmental Protection Division.

www.sherpaguides.com/Georgia/coast/northern_coast/ogeechee_river.html

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands Resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Okefenokee Basin, Georgia
Sub-Focus Areas: None

Area Description:

The South Georgia Okefenokee Basin Focus Area encompasses 306,997 hectares (758,605 acres) in southeast Georgia, with the Okefenokee Swamp being a major part of the ecosystem. This entire ecosystem is extremely large, found in both Georgia and Florida. Okefenokee is a huge basin, with extensive peat deposits, characterized with numerous islands and lakes, and freshwater marsh and prairie. Dominant trees in the swamp are pond cypress, blackgum, loblolly bay, red bay, sweet bay, and water ash. Floating islands of shrubs, trees, and peat are found throughout the swamp. Uplands surrounding the basin are typically mature pine forests with dense understories. There are approximately 20 different habitat types within the swamp, and there area approximately 233 species of birds, 49 species of mammals, 64 species of reptiles, 37 species of amphibians, and 39 fish species found in the region.

Ownership/Protection:

Approximately half of the Okefenokee Basin Focus Area is in public ownership, the Okefenokee National Wildlife Refuge. The remaining lands are privately owned with land use primarily forestry or agriculture. The entire basin encompasses portions of Georgia and Florida, with the Osceola National Forest located on the southern side of the basin in Florida. Efforts are currently underway to place additional significant acreage into public ownership in this region.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: the Suwannee River. This river system lies in portions of four southeastern Georgia counties, and is adjacent to the Okefenokee National Wildlife Refuge, and is home to several endangered species. The Okefenokee Swamp, the largest peat producing swamp in North America, is in this focus area, as is the Okefenokee National Wildlife Refuge. Okefenokee is a Wetland of International Importance by the United Nations through the Ramsar Convention.

Waterfowl:

Table 1. Waterfowl species using the Okefenokee Basin Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Black Duck			X
Green-winged Teal		X	
Hooded Merganser		X	X

Species	**Breeding**	**Migration**	**Wintering**
Mallard			X
Ring-necked Duck		X	X

Other Migratory Birds:

The avian richness of the Okefenokee Basin is tremendous. Virtually all of the herons and egrets of eastern North America can be found here. Some notable species are Wood Stork, Sandhill Crane, Anhinga, Great Blue Heron, Little Blue Heron, Great Egret, and White Ibis. High priority landbirds include Swallow-tailed Kite, Prothonotary Warbler, Red-cockaded Woodpecker, Brown-headed Nuthatch, and Red-headed Woodpecker.

Threats:

Threats to this region, in general, are remaining attempts to drain, log, and develop the area. A major issue of the west side of the basin is the existence of the Suwannee River Sill, an earthen dam built to lessen the threat of wildfires to local residents. The suppression of wildfires, and the lack of prescribed burning in some areas pose a threat to the integrity of the ecosystem and the safety of the residents in the region. Furthermore, mining interests for peat and titanium on the eastern side threatens the entire hydrology of the ecosystem.

Conservation Recommendations:

Maintaining the natural hydrology of this huge basin is key to preserving its natural features. Because public ownerships are a major component of this ecosystem, partnerships should be developed with private and industrial entities to ensure the protection of this basin and the Floridian aquifer. Impacts of mining should be studied thoroughly, and until impacts of mining to the Okefenokee Basin are well understood, mining should proceed cautiously. Hydrology on the western side of the basin should be restored the Suwannee River floodplain, allowing for prescribed fire to once again become an integral component of this functioning ecosystem.

References:

Hunter, W.C., L. Peoples and J. Collazo. 2001. South Atlantic Coastal Plain Partners In Flight Bird Conservation Plan, 158pp.

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

www. Sherpaguides.com/Georgia/okefenokee_swamp/

Atlantic Coast Joint Venture - Focus Area Report

www.okefenokee.fws.gov

Focus Area: Savannah River, Georgia
Sub-Focus Areas: None

Area Description:

The Savannah River Focus Area encompasses 392,607 hectares (970,150 acres) in a lengthy watershed that reaches from the foothills of the Appalachian Mountains at the confluence of the Seneca and Tugaloo Rivers 476 kilometers (296 miles) to the Atlantic Ocean. The Savannah River flows through three distinct ecoregions, the Southern Blue Ridge, the Piedmont, and the Southeastern Coastal Plain. Portions of thirteen counties in Georgia are in this focus area, as are portions of three major reservoirs, Hartwell, Russell, and Clark's Hill Reservoirs. Habitats along this river corridor are primarily riparian (upper reaches), bottomland hardwoods, and estuarine. Deepwater inland habitats are available on the major reservoirs, and much of the lower watershed is characterized by industrial and private forestry practices, with a large potential for longleaf pine restoration. Much of the relatively undeveloped coastal region is low-lying and poorly drained, characterized by bottomland hardwoods, pine forests, and cypress-tupelo swamp communities. Salt marsh delta predominates the lower reach of the Savannah River. Land use in the upper mountainous basin is largely recreational and timber production, with agriculture being moderate in the middle reach of the Savannah River. The Savannah River is home to more than 75 species of rare plants and animals, providing habitat for a wide diversity of vertebrates from the mountains to the coast. Major threats to the habitats of the Savannah River system are point source pollution, non-source point pollution (forestry, agriculture, urban land use), dam release impacts, Savannah River Site discharges and releases, and habitat alteration/destruction (dredging, salinity impacts, sedimentation, hydropower releases, development).

Ownership/Protection:

The ownership pattern in this river corridor is largely privately owned. There are several significant federal ownerships along the three major reservoirs, including the Savannah National Wildlife Refuge and the Chattahoochee National Forest, and there are numerous State Wildlife Management Areas, State Parks, and other state protected areas along the Savannah River. Other conservation organizations hold conservation easements on some properties along the Savannah River. Much of the landscape in this focus area is privately-owned and dominated by timber and agriculture production, although the upper reach has considerable recreational activity, and the lower reach is relatively undeveloped, dominated by bottomland hardwood forests, pine forests, cypress-tupelo swamp, and estuarine intertidal salt marsh.

Special Recognition:

The U.S. Fish and Wildlife Service recognizes a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Mulberry Grove, Bear Island I and II, Ebenezer Swamp, Merry Brothers Pond, and Savannah River Swamp. There are numerous Important Bird Area's in the focus area, designated by both the American Bird Conservancy and National Audubon Society, including Phinizy Swamp, Chattahoochee National Forest, and Savannah National Wildlife Refuge. The lower reach of the Savannah River is part of the Savannah River Basin Initiative, an effort by the Georgia Chapter of The Nature Conservancy. Additionally, the Environmental Protection Agency is coordinating a stakeholder's community-

based environmental protection effort called the Savannah River Basin Watershed Project.

Waterfowl:

This corridor is characterized by three major reservoirs along the northern half and extensive bottomland hardwood forest south of Augusta. These large reservoirs inundated large areas of important wintering waterfowl habitat. Significant wetland habitat exists in the riverine swamps, beaver pond complexes, and secondary watersheds of the Savannah River.

Table 1. Waterfowl species using the Savannah River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
American Wigeon			X
Blue-winged Teal		X	
Ring-necked Duck			X
Wood Duck	X	X	X
Gadwall		X	X
Lesser Scaup		X	X
Green-winged Teal		X	

Other Migratory Birds:

This Savannah River is highly important to many other migratory birds, primarily waterbirds and landbirds. Important species here are Wood Stork, Glossy and White Ibis, Swallow-tailed Kite, Swainson's Warbler, Painted Bunting, Prairie Warbler, and Prothonotary Warbler. Other high priority species associated with the pine grassland savannas in this focus area are Red-cockaded Woodpecker, Northern Bobwhite, Bachman's Sparrow, and American Kestrel. Georgia Department of Natural Resources has initiated a Bobwhite Quail Initiative in two counties along the Savannah River, Burke and Screvin Counties.

Threats:

Because of the length of this focus area, there are many different threats to habitat, including, but not restricted to: non-point source pollution (forestry, agriculture, urban land use), Savannah River Site discharges and releases, dam release impacts (low dissolved oxygen, fish kills, cold water releases), habitat alteration/destruction (dredging, salinity changes, sedimentation, development, hydropower releases), modification and physical changes is estuary, and urban stormwater runoff.

Conservation Recommendations:

One of the major conservation actions in this focus area is the protection of remaining bottomland hardwood forests. From Augusta to the Atlantic Ocean, significant tracts of undeveloped forested wetlands remain. These lands should be acquired or protected through

conservation easements by federal, state, or private conservation organizations. The pine uplands have great potential for restoration to longleaf pine. Significant issues are associated with the three major reservoirs and the Savannah River Site, and actions should be taken to reduce and minimize all activities that impact water quality. In the upper portion of the Savannah River Focus Area, measures should be taken to reduce impacts to water quality from timber production and excessive recreational use. Riparian areas and associated watersheds should be protected.

References:

American Bird Conservancy, Important Bird Areas.

Environmental Protection Agency, Community-Based Environmental Protection.

Environmental Protection Agency, Ecoplaces.

Proposal for Expansion of the Boundary of the Atlantic Coast Joint Venture of the North American Waterfowl Management Plan to Include Focus Areas Within the State of Georgia, December 1, 1992, Georgia Dept. of Natural Resources. Personal Communication.

National Audubon Society, Important Bird Areas.

Schmitt, Dennis N., and J. H. Hornsby. 1985. A Fisheries Survey of the Savannah River. Georgia Dept. of Natural Resources, Game and Fish Division, Atlanta, GA. 91pp.

The Nature Conservancy, Georgia Chapter.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

7.2.5 Maine

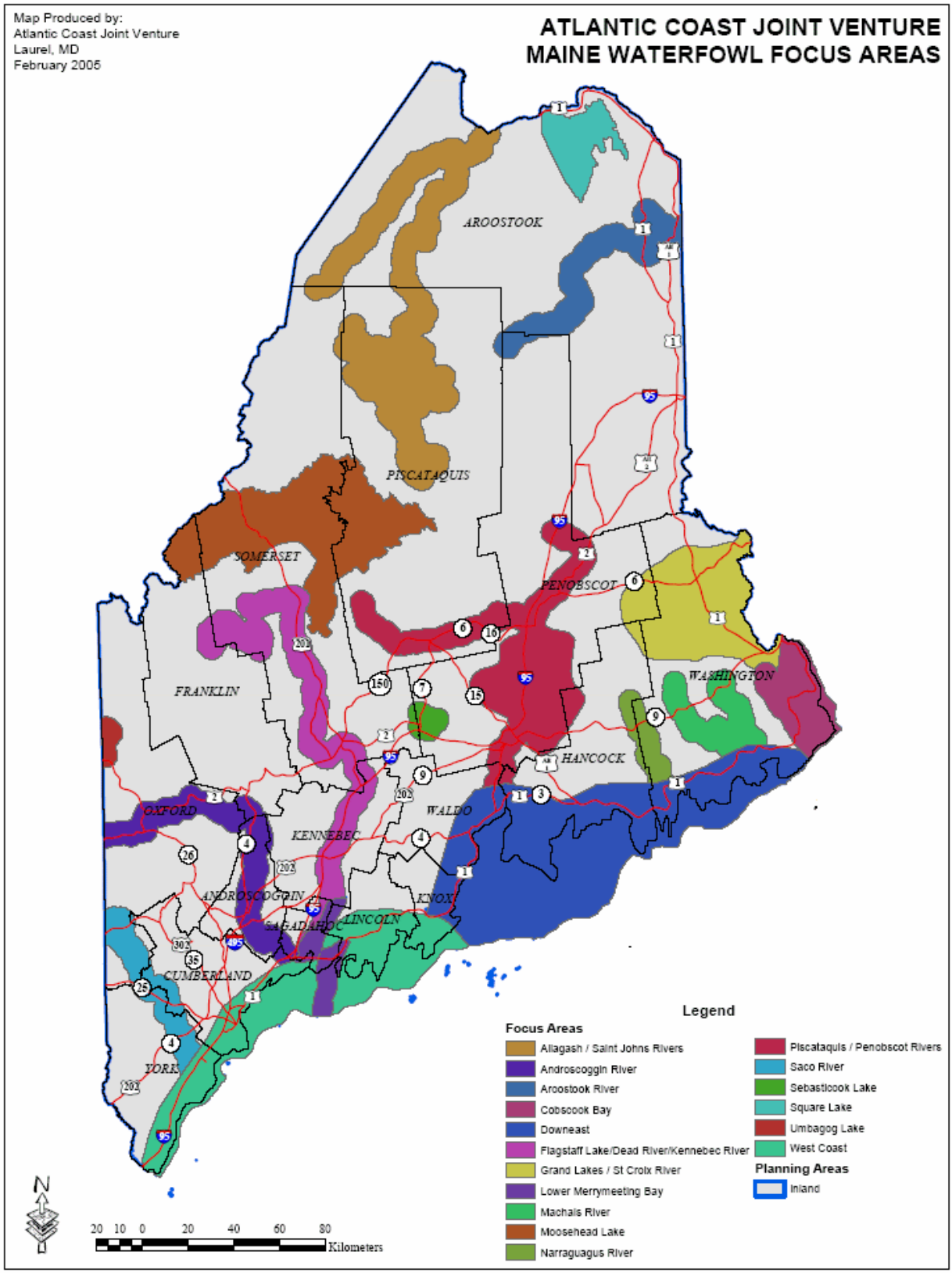

Figure 7.6. Maine waterfowl focus areas.

Focus Area: Cobscook Bay, Maine
Sub-Focus Areas: None

Area Description:

The Cobscook Bay Focus Area boundaries extend from northeast of Machias Bay along the coast of Maine to the Canadian border and encompasses 109,432 hectares (270,411 acres). The boundaries continue along the United States/Canada border across the mouth of Cobscook Bay and into the St. Croix River as far as the town of Calais, Maine. It extends inland approximately 20-30 kilometers (12-18 miles) encompassing all of Cobscook Bay and several large freshwater lakes including Pennamaquan and Boyden Lakes. The interior of the focus area is characterized by rolling hills with large rock outcrops and scattered boulders (U.S. Fish and Wildlife Service 1990). Numerous beaver-created flowages or wetlands are located throughout the landscape as well as many natural freshwater lakes, streams, bogs, wet meadows, and other forested and scrub-shrub wetlands. Wetlands are characterized by sedges, rushes, cattails with alder and willow dominating shrub wetlands and sweet gale, leatherleaf, and sphagnum moss in bogs. Forested wetlands are dominated by spruce, white cedar, red maple, and some tamarack. The coast is unique to the eastern United States and is characterized by deep embayments, high, rocky cliffs, extensive mudflats, and numerous coastal islands (U.S. Fish and Wildlife Service 1992). The extensive second-growth forests are comprised of quaking and bigtooth aspen, paper and gray birch, red maple, beech, spruce, and balsam fir with scattered white pine and hemlock. The understory of the forested uplands includes winterberry, bracken fern, bunchberry, and sarsasparilla. Fields and meadows, including blueberry barrens, are scattered throughout the focus area. Alder also is abundant in reverting farmlands and along margins of streams and beaver flowages. Cobscook Bay is a complex of inlets, bays, tidal creeks, and rivers with approximately 156 kilometers (97 miles) of shoreline and is recognized as one of the most outstanding habitats in Maine and the northeastern United States (U.S. Fish and Wildlife Service 1990). It experiences the highest tides in the United States outside of Alaska with fluctuations up to 7 meters (24 feet). Approximately half the water in the bay is exchanged with each tidal cycle (U.S. Fish and Wildlife Service 1992). These large tides create huge expanses of mudflats that benefit thousands of migrating birds as well as large expanses of ice-free habitat for wintering waterfowl and other migratory birds.

Ownership/Protection:

The majority of the Cobscook Bay focus area is under private ownership. Public ownership includes the Moosehorn National Wildlife Refuge located in two divisions within the focus area. The 8,000 hectares (19,768 acres) Baring Unit is located near Calais and the 3,500 hectares (8,648 acres) Edmunds Unit is located adjacent to Cobscook Bay. Sections of each unit of the Moosehorn Refuge are designated as Wilderness Areas. In addition, the State of Maine owns several state parks including Cobscook Bay and Quoddy Head State Parks.

Special Recognition:

The wetlands of the Cobscook Bay area have been identified for protection under the Regional Wetlands Concept Plan of the U.S. Fish and Wildlife Service and in the Environmental Protection Agency's Priority Wetlands of New England.

Waterfowl:

Cobscook Bay, during certain winters, supports as much as a quarter of Maine's wintering American Black Duck and Canada Goose. The ice-free bays provide Black Duck and other waterfowl wintering habitat when inland marshes are frozen. Black Duck, Mallard, Ring-necked Duck, Wood Duck, Hooded Merganser, and Blue-winged and Green-winged Teal also use the focus area for nesting habitat. Resident and migrant Canada Goose also are prevalent throughout the focus area. Common Goldeneye and Bufflehead use the area in the winter extent.

Table 1. Waterfowl species using the Cobscook Bay focus area, Maine.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Ring-necked Duck	X	X	
Wood Duck	X	X	
Hooded Merganser	X	X	
Blue-winged Teal	X	X	
Green-winged Teal	X	X	
Mallard	X	X	X
Canada Geese	X	X	X
Common Goldeneye		X	X
Bufflehead		X	X
Common Eider		X	X

Other Migratory Birds:

Over 216 species of birds have been identified on the Moosehorn NWR alone. The Cobscook Bay Focus Area provides habitat for a great diversity of nesting, migrating, and wintering birds in addition to waterfowl. Cobscook Bay supports the highest nesting density of Bald Eagle in the northeastern U.S as well as wintering as many as 400 Bald Eagle annually. Even when Bald Eagle populations were at their lowest, the Bay maintained high numbers because of the quality of the habitat. The extensive tidal flats of Cobscook Bay provide essential habitat for migrating shorebirds. Thousands of shorebirds representing over 20 species depend on the bay for stopover sites during migration including Semipalmated and Black-bellied Plover, Ruddy Turnstone, Whimbrel, Red Knot, Sanderling, and Least, White-rumped and Semipalmated Sandpiper. The habitats of eastern Maine, especially those within the focus area, represent some of the most important American Woodcock nesting habitat in the northeastern United States. The primary management objective of the Moosehorn NWR is research and development of forest management techniques to improve woodcock nesting habitat. In addition to migratory birds, the Dennys and St. Croix Rivers support runs of Atlantic salmon as well as American shad, alewives, and American eels.

Threats:

The most serious and immediate threat to the integrity of the high-quality habitats of the Cobscook Bay Focus Area is second-home development, especially along the shoreline of the bay itself and along lakes and streams. Pressure for second home development is increasing as southern Maine becomes more crowded. Disturbance to migratory birds during the winter from increased shoreline development and potential decrease in water quality are threats to the

survival of many of these species using this critical habitat. Numerous aquaculture facilities are sited within Cobscook Bay.

Conservation Recommendations:

The most pressing need within the focus area is to protect available habitat through fee simple or easement acquisition. The Moosehorn NWR has an active acquisition program that has resulted in a number of acres secured adjacent to both the Baring and Edmunds Units. The highest priority areas should be shoreline properties around Cobscook Bay and interior lakes and streams.

References:

U.S. Fish and Wildlife Service. 1990. Proposal to protect wildlife habitat adjacent to Moosehorn National Wildlife Refuge, Washington County, Maine – Final Environmental Assessment. Hadley, MA 32pp.

U.S. Fish and Wildlife Service. 1992. Land protection plan: Moosehorn National Wildlife Refuge. Hadley, MA 18pp.

Focus Area: Downeast Maine
Sub-Focus Areas: None

Area Description:

The Downeast Focus Area is located in central and eastern coastal Maine and includes hundreds of miles of relatively undeveloped coastline that encompass 676,569 hectares (1,671,832 acres). Marine and estuarine habitats within this focus area are particularly significant habitats for migrating shorebirds and wintering waterfowl, particularly Black Duck, Common Eider and Harlequin Duck. This focus areas many coastal islands that vary in size from 1 acre to the largest island, Mount Desert Island. Large tidal amplitude combined with gentle topography and many freshwater tributaries and rivers in this region provide extensive intertidal mud flats in protected bays. Salt marsh systems occur at the mouths of the tributaries in estuarine areas. Historically, many of these salt marshes were ditched for mosquito control and/or salt hay farming. Wintering waterfowl, Bald Eagle, and shorebirds rely heavily on these habitats for survival. The focus area is roughly divided between the freshwater tidal habitats of western Penobscot Bay through Machias Bay to the bold coastal area east of Culter. Extensive emergent wetlands, including wild rice, pickerel weed, water parsnip, and several species of bulrush, as well as broad mud flats, riparian habitats, and a relatively undeveloped shoreline are ideal for breeding, migrating, and wintering birds. Numerous rivers, including the Penobscot River, and many smaller rivers and streams, drain into the Atlantic Ocean in this focus area. The uplands are composed of a mix of spruce-fir and hardwood forests interspersed with agricultural fields and meadows. The forests and fields extend down to the high tide mark.

Ownership/Protection:

Most of the land within the focus area is privately owned. However, agencies such as the Maine Department of Inland Fisheries and Wildlife, U.S. Fish and Wildlife Service, and private organizations such as the Maine Coast Heritage Trust, The Nature Conservancy and local land trusts have been active within the focus area protecting critical habitat, particularly nationally significant islands and high value coastal property. The State of Maine maintains several state parks and wildlife management areas and federal land managed by the U.S. Fish and Wildlife Service (Petit Manan National Wildlife Refuge) and National Park Service (Acadia National Park) are also located in this focus area.

Special Recognition:

A number of sites within the focus area have been recognized by the U.S. Fish and Wildlife Service's Regional Wetlands Concept Plan as important wetlands.

Waterfowl:

More than 30 species of waterfowl have been documented using this focus area. The area hosts thousands of ducks and geese during fall and spring migration as well as providing critical habitat for nesting and wintering waterfowl. Common Eider nest on many islands in this focus area. The high tidal amplitude keeps much of the critical habitat ice-free and open during the winter. The prevalent species of waterfowl include Black Duck, Mallard, teal, Ring-necked Duck, Wood Duck, all species of mergansers, Canada Goose, Common Eider, scoters, Bufflehead, Common Goldeneye, Long-tailed Duck, and Harlequin Duck. Further, the offshore

islands of Jericho and outer Penobscot Bays provide winter habitat for two-thirds of the eastern Harlequin Duck population.

Table 1. Waterfowl species using the Downeast Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	
Wood Duck	X	X	
Ring-necked Duck	X	X	X
Green-winged Teal	X	X	
Blue-winged Teal		X	
Common Eider	X	X	X
Common Goldeneye		X	X
Common Merganser	X	X	X
Red-breasted Merganser		X	X
Hooded Merganser	X	X	X
Bufflehead		X	X
Long-tailed Duck		X	X
Surf Scoter		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Harlequin Duck		X	X
Canada Goose	X	X	X
Snow Goose		X	

Other Migratory Birds:

The tremendous diversity of habitats within the focus area is reflected in the diversity of migratory birds that use the focus area. Over 200 species of migratory birds have been documented in the focus area. Over 30 species of shorebirds have been documented using the broad tidal mudflats. Some of the more common species include Semipalmated, Solitary, and Pectoral Sandpiper, Black-bellied Plover, Greater and Lesser Yellowleg, Ruddy Turnstone, and Dunlin. Wading birds include Great Blue and Green Heron as well as American Bittern, Snowy, Cattle, and occasionally Great Egret, and Glossy Ibis. Three threatened or endangered species are found in the focus area and include Piping Plover and Least and Roseate Tern. Bald Eagle also breed, migrate, and winter in the focus area.

Riply Neck, in Harrington, is a fall migration stopover for approximately 25,000 shorebirds, with almost 95% of these being Semipalmated Sandpiper and Semipalmated Plover. The Nelson's Sharp-tailed Sparrow, an obligate salt marsh bird in the northeast that occurs in this area, is the highest overall conservation priority in Partners in Flight Area 28 due to its restricted range and small total population. The North Atlantic Regional Shorebird Plan has identified as a high priority the need to protect Purple Sandpiper winter habitats along the east coast. This area likely plays a significant role in providing wintering habitat to a significant portion (as much as 33%) of the eastern North American population.

Threats:

Several issues threaten the integrity of the focus area. Currently, the shoreline is relatively undeveloped and, thus, disturbance from the shoreline is considered relatively minor. The focus area is comprised of numerous coastal communities from Rockland to Machias. The coastal communities within or adjacent to the focus area are experiencing moderate to rapid growth, especially for second homes. The increased shoreline development can lead to habitat fragmentation and increased disturbance both from the shoreline and from increased watercraft use. In addition, the Penobscot River drains about one-quarter of Maine with numerous major industries upriver. Penobscot Bay is a major terminus for oil tanker traffic. Thus, the threat for water quality degradation is high.

Conservation Recommendations:

The relative undisturbed nature of the shoreline and islands should be protected through fee or easement acquisition to prevent any additional disturbance. Water quality is critical to the integrity and diversity of habitats within the focus area. This should be closely monitored especially with the potential for industrial pollution in the western portion of this focus area.

Focus Area: Inland Wetlands, Maine
Sub-Focus Areas: None

Area Description:

Maine wetlands provide breeding and migration habitats of importance to Black Duck and other wildlife. Certain wetland complexes, because of their geographic location and orientation, are of particular importance as migration corridors and staging areas. Merrymeeting Bay is a perfect example of these circumstances and its significance has been acknowledged by classification as a separate focus area. Other Maine drainages provide similar benefits and are identified in this focus area. Breeding habitats identified in this focus area are inland freshwater systems with either historic or current importance as Black Duck breeding habitats. Waterfowl use of some of the historically important breeding areas has declined as some of the wetlands have been degraded as dams have fallen into disrepair. In addition to acquisition and enhancement of breeding habitat in this focus area, management of statewide beaver populations to encourage maximum wetland development acceptable to landowners will continue to provide quality Black Duck breeding habitat.

This focus area is vast and encompasses most of the State of Maine. The area includes over 3,000 lakes and ponds, 32,000 streams and rivers with an untold numbers of beaver impacted wetlands.

Ownership/Protection:

Most of the land within the focus area is privately owned. However, agencies such as the Maine Department of Inland Fisheries and Wildlife, U.S. Fish and Wildlife Service (National Wildlife Refuges) and private organizations such as The Nature Conservancy and local land trusts have been active within the focus area protecting critical habitat. The State of Maine maintains several state parks (including Baxter State Park) within this focus area.

Special Recognition:

A number of sites within the focus area have been recognized by the U.S. Fish and Wildlife Service's Regional Wetlands Concept Plan as important wetlands.

Waterfowl:

More than 30 species of waterfowl have been documented using this focus area. The area hosts thousands of ducks and geese during fall and spring migration as well as providing critical habitat for nesting waterfowl. The prevalent species of waterfowl include Black Duck, Mallard, teal, Ring-necked Duck, Wood Duck, all species of mergansers, Canada Goose, and Common Goldeneye.

Table 1. Waterfowl species using the Merrymeeting Bay/Lower Kennebec River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	

Wood Duck	X	X	
Ring-necked Duck	X	X	X
Green-winged Teal		X	
Blue-winged Teal		X	
Common Eider		X	X
Common Goldeneye		X	X
Common Merganser	X	X	X
Red-breasted Merganser		X	X
Hooded Merganser	X	X	X
Bufflehead		X	X
Long-tailed Duck		X	X
Surf Scoter		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Canada Goose	X	X	X
Snow Goose		X	

Other Migratory Birds:

The tremendous diversity of habitats within the focus area is reflected in the diversity of migratory birds that use them. Over 200 species of migratory birds have been documented in the focus area. A diverse array of wading birds uses the area including Great Blue and Green Heron as well as American and Least Bittern, Snowy, Cattle, and Great Egret, and Glossy Ibis. Many threatened or endangered species are found in the focus area and include breeding and nesting Black Tern, Sedge Wren and Bald Eagle.

Threats:

Several issues threaten the integrity of the focus area. Currently, in many cases, the lake and riverfront shoreline is relatively undeveloped and, thus, disturbance from the shoreline is minimal. However, the focus area includes several of Maine's largest urban centers. Also, the small towns within or adjacent to the focus area are experiencing moderate to rapid growth, especially for second homes. The increased shoreline development can lead to habitat fragmentation and increased disturbance both from the shoreline and from increased watercraft use. In addition, many of the major rivers contain significant industries, primarily paper mills. The threat for water quality degradation is high. Invasive species such as purple loosestrife are present in the focus area, but to date has not proven to be a major problem.

Conservation Recommendations:

The relative undisturbed nature of the freshwater wetlands and associated shoreline should be protected through fee or easement acquisition to prevent any additional disturbance. Water quality is critical to the integrity and diversity of habitats within the focus area. This should be closely monitored especially with the potential for industrial pollution upriver. Also, invasive species should either be eradicated or closely monitored for spread.

Focus Area: Merrymeeting Bay/Lower Kennebec River, Maine
Sub-Focus Areas: None

Area Description:

The Merrymeeting Bay/Lower Kennebec River Focus Area is located in southern Maine about 50 kilometers north of Portland and is one of the most important wetland complexes along the northeast coast. The focus area encompasses 55,182 hectares (136,357 acres) and is roughly divided between the freshwater tidal habitats of Merrymeeting Bay and the brackish to saltwater habitats of the Lower Kennebec River. The juxtaposition of these two areas provide for a diverse mix of habitats, which are important to many species of migratory birds. Merrymeeting Bay is the largest freshwater tidal marsh north of the Chesapeake Bay formed from the confluence of two large rivers, the Kennebec and Androscoggin, and four smaller tributaries, the Eastern River, Cathance River, Muddy River, and the Abagadasset River. Extensive emergent wetlands, including wild rice, pickerel weed, water parsnip, and several species of bulrush, as well as broad mud flats, riparian habitats, and a relatively undeveloped shoreline are ideal for breeding, migrating, and wintering birds. In conjunction with the freshwater tidal marshes is the Lower Kennebec River. The river enters Merrymeeting Bay on the north and drains the bay to the south into the Atlantic Ocean. The Kennebec River is characterized by brackish to saltwater marshes and embayments as well as mudflats along a 25 kilometer (15 miles) stretch from the bay to the mouth of the river. The uplands are composed of a mix of spruce-fir and hardwood forests interspersed with agricultural fields and meadows. The forest extends down to the high tide line.

Ownership/Protection:

Much of the land within the focus area is privately owned. However, agencies such as the Maine Department of Inland Fisheries and Wildlife, U.S. Fish and Wildlife Service, and private organizations such as The Nature Conservancy and local land trusts have been active within the focus area protecting critical habitat. The state of Maine maintains several state parks and the U.S. Fish and Wildlife Service maintain Pond Island National Wildlife Refuge located at the mouth of the Lower Kennebec River.

Special Recognition:

The Merrymeeting Bay/Lower Kennebec River is recognized as one of the premier migratory bird habitats on the northeast coast of the United States. A number of sites within the focus area have been recognized by the U.S. Fish and Wildlife Service's Regional Wetlands Concept Plan as important wetlands.

Waterfowl:

More than 30 species of waterfowl have been documented using the Merrymeeting Bay/Lower Kennebec River Focus Area. The area hosts thousands of ducks and geese during fall and spring migration as well as providing critical habitat for nesting and wintering waterfowl. Merrymeeting Bay has been noted to hold up to 40,000 waterfowl at one time during migration. It provides habitat for the largest concentration of Canada and Snow Goose in the state. The high tidal amplitude keeps much of the critical habitat ice-free and open during the winter, especially in the Lower Kennebec river area. The prevalent species of waterfowl include Black Duck, Mallard, teal, Ring-necked Duck, Wood Duck, all species of mergansers, Canada Goose, Common Eider, scoters, Bufflehead, Common Goldeneye, and Long-tailed Duck.

Table 1. Waterfowl species using the Merrymeeting Bay/Lower Kennebec River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	
Wood Duck	X	X	
Ring-necked Duck	X	X	X
Green-winged Teal		X	
Blue-winged Teal		X	
Common Eider		X	X
Common Goldeneye		X	X
Common Merganser	X	X	X
Red-breasted Merganser		X	X
Hooded Merganser	X	X	X
Bufflehead		X	X
Long-tailed Duck		X	X
Surf Scoter		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Canada Goose	X	X	X
Snow Goose		X	

Other Migratory Birds:

The tremendous diversity of habitats within the focus area is reflected in the diversity of migratory birds that use them. Over 200 species of migratory birds have been documented in the focus area. Over 30 species of shorebirds have been documented using the broad tidal mudflats. Some of the more common species include Semipalmated, Solitary, and Pectoral Sandpiper, Black-bellied Plover, Greater and Lesser Yellowleg, Ruddy Turnstone, and Dunlin. Wading birds include Great Blue and Green Heron as well as American Bittern, Snowy, Cattle, and Great Egret, and Glossy Ibis. Three threatened or endangered species are found in the focus area and include Piping Plover and Least and Roseate Tern. Bald Eagle also breed, migrate, and winter here.

Threats:

Several issues threaten the integrity of the focus area. Currently, the shoreline is relatively undeveloped and, thus, disturbance from the shoreline is at a minimum. However, the focus area is relatively close to several of Maine's largest urban centers including Portland, Lewiston-Auburn, and Augusta. Also, the small towns within or adjacent to the focus area are experiencing moderate to rapid growth, especially for second homes. The increased shoreline development can lead to habitat fragmentation and increased disturbance both from the shoreline and from increased watercraft use. In addition, the Androscoggin and Kennebec Rivers drain about one-third of Maine with both rivers containing major industries upriver. The threat for water quality degradation is high. Invasive species such as purple loosestrife are present but have not proven to be a problem. This may be due to ice scouring every year.

Conservation Recommendations:

The relative undisturbed nature of the shoreline should be protected through fee or easement acquisition to prevent any additional disturbance. Water quality is critical to the integrity and diversity of habitats within the focus area. This should be closely monitored especially with the potential for industrial pollution upriver. Also, invasive species should either be eradicated or closely monitored for spread.

Focus Area: South West Coast, Maine
Sub-Focus Areas: None

Area Description:

The South West Coast Focus Area is located in southern Maine from the New Hampshire border to midcoast Maine, near Rockland but excludes the freshwater tidal habitats of Merrymeeting Bay and the brackish to saltwater habitats of the Lower Kennebec River, as these wetlands comprise a separate focus area. This focus area encompasses 356,340 hectares (880,532 acres). The wetlands in this area provide wintering and migration habitats for Black Duck and other waterfowl where intertidal mudflat and extensive saltmarsh habitats occur. The physiography and topography of this region provide conditions suitable for Maine's largest saltmarshes.

Ownership/Protection:

Much of the significant salt marsh habitats in this focus area are already secured in either state or federal ownership. The remaining salt marsh habitat in this region occurs in small acreages associated with the riparian zone of estuarine systems.

Special Recognition:

The wetlands and deepwater habitats of the Southwest Coast Focus Area have been identified for protection under the Regional Wetlands Concept Plan of the U.S. Fish and Wildlife Service and in the Environmental Protection Agency's Priority Wetlands of New England. The Southwest Coast Focus Area provides significant wintering habitat to several species of waterfowl, waterbirds, Bald Eagle, and Purple Sandpiper. Approximately half of the waterfowl counted during Maine's Midwinter Waterfowl Survey in 2005 occurred in this focus area, including American Black Duck (40% of Maine's total), Common Eider (50%), scoter spp. (>50%), Long-tailed Duck (>50%), goldeneye spp. (40%), merganser spp. (>40%), Bufflehead (37%), Canada Goose (60%), and Mallard (>70%). The Southwest Coast also harbored significant numbers of Maine's wintering populations of Bald Eagle (22% the MWS count), Common Loon (26%), and Purple Sandpiper (52%). The North Atlantic Regional Shorebird Plan has identified as a high priority the need to protect Purple Sandpiper winter habitats along the east coast. This focus area likely plays a significant role in providing wintering habitat to a substantial portion of the eastern North American population of Purple Sandpiper. The Saltmarsh Sharp-tailed Sparrow, an obligate saltmarsh bird of the Northeast, is the highest overall conservation priority in Partners in Flight Area 30 due to its restricted range and small total population. The Southwest Coast Focus Area constitutes the breeding distribution of Saltmarsh Sharp-tailed Sparrow within Maine.

Waterfowl:

More than 30 species of waterfowl have been documented using the West Coast Focus Area. The area hosts thousands of ducks and geese during fall and spring migration as well as providing critical habitat for wintering waterfowl. The prevalent species of waterfowl include Black Duck, Mallard, teals, Ring-necked Duck, Wood Duck, all species of mergansers, Canada Goose, Common Eider, scoters, Bufflehead, Common Goldeneye, Long-tailed Duck, and Harlequin Duck.

Table 1. Waterfowl species using the West Coast Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	
Wood Duck	X	X	
Ring-necked Duck	X	X	X
Green-winged Teal		X	
Blue-winged Teal		X	
Common Eider		X	X
Common Goldeneye		X	X
Common Merganser		X	X
Red-breasted Merganser		X	X
Hooded Merganser	X	X	X
Bufflehead		X	X
Long-tailed Duck		X	X
Harlequin Duck		X	X
Surf Scoter		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Canada Goose	X	X	X
Snow Goose		X	

Other Migratory Birds:

The tremendous diversity of habitats within the focus area is reflected in the diversity of migratory birds that use the planning area. Over 200 species of migratory birds have been documented in the focus area. Over 30 species of shorebirds have been documented using the salt marshes of southern Maine. Some of the more common species include Semipalmated, Solitary, and Pectoral Sandpiper, Black-bellied Plover, Greater and Lesser Yellowlegs, Ruddy Turnstone, and Dunlin. Wading birds include Great Blue and Green Heron as well as American Bittern, Snowy, Cattle, and Great Egret, and Glossy Ibis. Three threatened or endangered species are found in the focus area and include Piping Plover and Least and Roseate Tern. This area includes the edge of the range and a zone of overlap between the Nelson's Sharp-tailed Sparrow and the Salmarsh Sharp-tailed Sparrow. Bald Eagle also breed, migrate, and winter in the focus area. Bald Eagle, shorebird, and waterfowl use of these habitats occur during migration and wintering periods. Nesting Least Tern and Piping Plover can be found in discreet locations along developed beaches within the focus area.

Threats:

Several issues threaten the integrity of the focus area. Currently, the shoreline is extensively developed, thus, disturbance from the shoreline is at a maximum. This focus area contains Maine's largest urban centers including Portland. Also, the small towns within or adjacent to the focus area are experiencing moderate to rapid growth. The increased shoreline

development can lead to habitat fragmentation and increased disturbance. The threat for water quality degradation is high. Invasive species such as *Phragmites* is present in the focus area.

Conservation Recommendations:

The most pressing need within the focus area is to protect available habitat through fee simple or easement acquisition. The Rachel Carson National Wildlife Refuge has an active acquisition program that has resulted in a number of acres secured. The highest priority areas should be shoreline properties around Casco Bay and interior lakes and streams to protect water quality.

7.2.6 Maryland

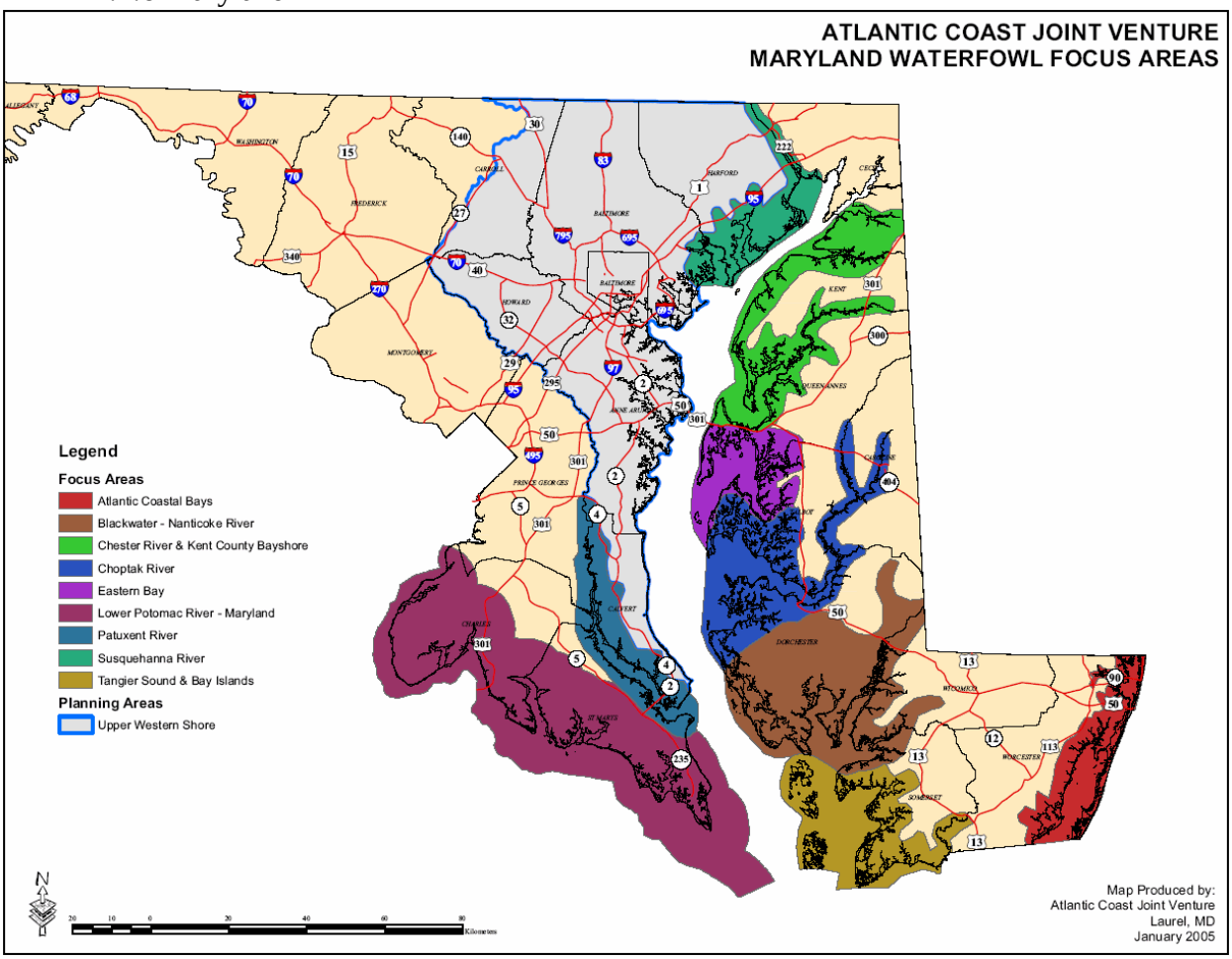

Figure 7.7. Maryland waterfowl focus areas.

Focus Area: Atlantic Coastal Bays
Sub-Focus Areas: None

Area Description:

The Atlantic Coastal Bays Focus Area is approximately 62,145 hectares (153,563 acres) in size and extends from Bishopville at its northern end, south to the Virginia state line. It is bounded on the east by the Atlantic Ocean and encompasses the following bays and their associated tributaries: Assawoman Bay, Isle of Wight Bay, Sinepuxent Bay, Newport Bay, and Chincoteague Bay.

The human population in the Coastal Bays focus area has increased steadily since 1940 (10,000 – 30,000+) and is expected to double again by 2020 (Wasniak et. al, 2004). This growing human population places great pressure on the estuarine bays and tributaries that make up the Atlantic Coastal Bays Focus Area. The bays are uniform and shallow in depth, (< 10 feet in depth), with limited tidal exchange and river input. Groundwater is an important source of freshwater input. This combination of characteristics increases the susceptibility of the bays to inputs from septic systems, agriculture, wastewater treatment facilities and other non-point sources of pollution in the form of nutrients and chemicals.

Wetlands in the coastal bays, especially in the northern bays, have decreased significantly, an estimated 103,105 hectares (254,778 acres) lost since settlement of the region. This loss and/or alteration is the result of numerous activities, including conversion to agriculture, development, and other human-related land uses. Large networks of ditches have drained tidal and nontidal wetlands and the construction of canals and bulkheads have further impacted wetlands through loss of spatial extent and deteriorated wetland quality or availability to waterfowl.

Ownership/Protection:

Much of the Atlantic Coastal Bays Focus Area is in private ownership. The State of Maryland and National Park Service own and manage Assateague Island National Seashore, Assateague State Park, and E.A. Vaughn Wildlife Management Area.

Waterfowl:

The Atlantic Coastal Bays Focus Area is an important area for breeding and wintering waterfowl, containing some of the best habitat within the state. The bays and associated wetlands within the focus area support approximately 9,500 American Black Duck, 3,700 American Wigeon, 1,300 Atlantic Brant, 1,700 Bufflehead, 500 Canada Goose, 300 Canvasback, 1,100 Gadwall, 1100 scaup, 5,000 Greater Snow Goose, 2,200 Mallard, 2,400 Northern Pintail, and 40 Red-breasted Merganser.

Table 1. Waterfowl species occurring in the Atlantic Coastal Bays Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X

Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/NAP Canada Goose		X	X
AFRP Canada Goose	X		X
Greater Snow Goose		X	X
Atlantic Brant		X	X
Gadwall	X	X	X
Ruddy Duck		X	X
Common Goldeneye		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

The Atlantic Coastal Bays Focus Area is important to many migratory birds during spring and fall migration, in addition to providing valuable breeding habitat for waterbirds, shorebirds, and saltmarsh associates, including terns, herons, egrets, American Oystercatcher, Black Skimmer, Willet, Piping Plover, and Saltmarsh Sparrow.

Threats:

Degraded water quality is a large threat to the Atlantic Coastal Bays Focus Area. Maryland's Coastal Bays display differences in water quality ranging from generally degraded conditions within or close to tributaries to better conditions in the more open, well-flushed bay regions. Nutrient enrichment and high nitrite levels in the freshwater reaches of streams, in addition to excess algae, chronic brown tide blooms, macroalgae blooms, and incidents of low dissolved oxygen are all symptoms of degraded water quality resulting from increased pressures on the system from agriculture and human development, including poultry litter. The Atlantic Coastal Bays have experienced outbreaks of *Pfiesteria* as a result of high nutrient inputs. Degraded water quality has also resulted in loss of submerged aquatic vegetation. Other threats include development, sedimentation, streambank erosion, dredging, filling, channelization, storm

water discharge, wastewater outfalls, and septic and groundwater discharge (Wasniak et. al, 2004). An overabundance of Greater Snow Goose is leading to saltmarsh degradation in Newport Bay.

Conservation Recommendations:

Protection, restoration and enhancement of wetlands and associated uplands should occur whenever possible. Projects providing protection in perpetuity are most desirable, but shorter-term conservation agreement private landowners need to be incorporated into planning and implementation efforts. Natural ponds degraded by mosquito control actions should be restored to historic conditions. Reduce the Mute Swan population to protect critical bay living resources.

References:

Wazniak, C., M. Hall, C. Cain, D. Wilson, R. Jesien, J. Thomas, T. Carruthers, and W. Dennison. 2004. State of the Maryland Coastal Bays. Maryland Department of Natural Resources, Maryland Coastal Bays Program, and University of Maryland Center for Environmental Sciences.

Focus Area: Blackwater – Nanticoke River
Sub-Focus Area: None

Area Description:

The Blackwater – Nanticoke River Focus Area is approximately 162,352 hectares (401,179 acres) on the Delmarva Peninsula in southeast Maryland, and encompasses the Nanticoke River, its associated watershed, and Blackwater National Wildlife Refuge (NWR), whose most prominent feature is the Blackwater River and watershed. The Nanticoke River watershed covers approximately 50,585 hectares (125,000 acres) in Dorchester and Wicomico Counties. A large portion of the watershed is forested (approximately 38 %) and supports the largest continuous pine forest left on the Delmarva Peninsula. Freshwater wetlands border nearly all the major streams and these wetlands account for 22 % of the land surface, including wooded swamp along Marshyhope Creek. The Nanticoke is also listed on the Nationwide Rivers Inventory because of its undeveloped nature and is one of the least spoiled rivers in the Chesapeake Bay. Blackwater National Wildlife Refuge (NWR) was established in 1933 as a refuge for migratory birds and includes over 10,926 hectares (27,000 acres), composed mainly of rich tidal marsh characterized by fluctuating water levels and varying salinity. The focus area supports many forest species, including loblolly pine, sweetgum, red maple, Atlantic white cedar and a variety of oaks and significant numbers of rare and endangered plant species including box huckleberry, Parker's pipewort, seaside alder and reversed bladderwort.

Historically, the Nanticoke River supported a thriving shipbuilding industry; the towns of Vienna, Sharptown, and Bethel were major shipbuilding centers. Today, the area remains rural with agriculture as the primary land use, utilizing approximately 43 % of the land in the watershed. The majority of agricultural lands are used for animal production, with poultry being the most common. In fact, the Nanticoke has more animal production units than any other river basin in Maryland. Other agricultural uses include corn, soybean, and winter wheat. Timber harvest is the second largest land use in the focus area and amounts to well over 121,406 hectares (300,000 acres) across the lower Delmarva Peninsula.

Ownership/Protection:

The focus area has a number of large public land holdings, including Blackwater NWR, Fishing Bay Wildlife Management Area (WMA), and Taylor’s Island WMA.

Special Recognition:

The Blackwater – Nanticoke Focus Area supports some of the most extensive unfragmented stands of forest in the Chesapeake Bay region. It is an important nesting area for Bald Eagles and other migratory birds. Waterfowl hunting and commercial hunting leases contribute significantly to the economy of the area. It is the only region in the State of Maryland that supports Sika deer populations.

Waterfowl:

The focus area is renowned for the quality of its waterfowl habitat. The Nanticoke Watershed together with the neighboring Blackwater River Watershed support 35 % of all wintering waterfowl, which use the Atlantic Flyway. Blackwater NWR supports as many as 50,000 geese, ducks, and Tundra Swan during their migration along the Atlantic Flyway. Many

wintering waterfowl species utilize the focus area and mid-winter harvest survey information from 2003 estimates 31,000 Canada Goose, 12,000 Ruddy Duck, 8,200 Snow Goose, 7,000 Canvasback, 6,800 Mallard, 4,000 American Black Duck, 3,200 Tundra Swan, 1,300 Bufflehead, 800 Mute Swan, 800 Merganser, 800 Northern Pintail, 700 Redhead, 450 Scoter, 430 Green-winged Teal, 350 Gadwall, 200 American Wigeon, 100 Scaup (2,600 in 2002), 40 Common Goldeneye, and 20 Long-tailed Duck within focus area boundaries.

Table 1. Waterfowl species occurring in Blackwater – Nanticoke River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal	X	X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X	X	X
Greater Snow Goose		X	X
Lesser Snow Goose		X	X
Gadwall	X	X	X
Ruddy Duck		X	X
Common Goldeneye		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

In addition to abundant waterfowl species, the Blackwater - Nanticoke Focus Area supports over 250 species of migratory birds and 165 species of threatened or endangered plants. It is an important area for nesting Bald Eagle and the endangered Delmarva fox squirrel, and

many other species make their home in the large stands of loblolly pine and hardwoods. The forested Nanticoke River corridor is also important during migration periods for many songbirds. The extensive marshes provide critical habitat for Least Bittern, overwintering shorebirds, and several species of breeding rails and Saltmarsh Sparrow.

Threats:

Development is not occurring as rapidly in the Blackwater – Nanticoke Focus Area as other areas in Maryland but is steadily increasing. Conversion of agricultural lands to housing developments threaten wintering waterfowl by increasing the levels of nutrients entering the focus area watersheds. The soils of the Nanticoke Watershed are extremely permeable and nutrients from agricultural runoff and septic systems easily pass into groundwater. In return, groundwater inputs to the estuaries lead to seagrass dieoffs. Mute Swan also threaten SAV beds when they concentrate during molting. Nutria, an invasive species, degrades marsh communities and eradication programs are underway. **Phragmites,** ***another invasive species, also threatens wetland habitats availability within the focus area; Maryland Department of Natural Resources has a program underway to control*** **Phragmites** ***on private and public lands.***

Conservation Recommendations:

Protecting, restoring and enhancing wetlands should occur whenever opportunities arise. There are a number of Conservation Reserve Program and Conservation Reserve Enhancement Program projects underway and these programs should receive continuing support. Nutria eradication efforts must continue, as well as phragmites control programs. Mute Swan populations should be reduced to eliminate detrimental effects on sea grasses and other critical bay living resources. Wetland reconstruction should be implemented on Blackwater NWR. Partnerships with NGOs (such as Ducks Unlimited, Inc.), private industry and governments should continue to be supported for work on wetland conservation and restoration.

References:

A User's Guide to the Nanticoke Watershed: Understanding and Appreciating the River A brochure produced by: Nanticoke Watershed Preservation Committee, Seaford DE 19973, Nanticoke River Watershed Conservancy, Seaford DE 19973, and Friends of the Nanticoke River, Nanticoke, MD 21840-0015

http://blackwater.fws.gov/

USFWS Mid-winter Waterfowl Surveys – Bird Node

Focus Area: Chester River and Kent County Bayshore
Sub-Focus Area: None

Area Description:

The Chester River and Kent County Bayshore Focus Area is approximately 111,430 hectares (275,348 acres) in size and stretches from the Elk and Bohemia Rivers in the north to the mouth of the Chester River at Love Point. In addition to the above named rivers, the focus area includes the Sassafras River and more than 40 named tributaries.

The primary land use in the Chester River and Kent County Bayshore Focus Area is agriculture, where high quality soils grow corn and winter wheat. The focus area is important for wintering waterfowl, and supports approximately 200,000 Atlantic Population (AP) Canada Goose. The focus area supports numerous hunting leases for geese, making waterfowl hunting the second or third most important industry in the area.

Ownership/Protection:

The majority of the focus area is in private ownership. Eastern Neck National Wildlife Refuge is the only protected area within the focus area.

Special Recognition:

The Chester River and Kent County Bayshore Focus Area supports important beds of submerged aquatic vegetation (SAV) that are critical to breeding and wintering waterfowl in the Atlantic Flyway. Approximately 1/3 of Maryland's population of American Black Duck (6,000) utilize the focus area and, as stated above, it is an important area for wintering geese. It is also an important area for wintering Scaup where 120,000 individuals have been recorded.

Waterfowl:

The Chester River and Kent County Bayshore Focus Area supports some of the most important wintering habitat in the state for Black Duck and wintering geese. Twenty waterfowl species were recorded wintering in the focus area in 2003, including 196,000 Canada Goose, 38,800 Snow Goose, 18,000 Scaup (114,000 during 2002 surveys), 14,200 Canvasback, 10,300 Mallard, 4,000 Black Duck, 3,800 Ruddy Duck, 1,500 Merganser, 800 Tundra Swan (2300 in 2002), 400 Bufflehead, 300 Ring-necked Duck, 300 Mute Swan, 100 Common Goldeneye, in addition to small numbers of scoters, Redhead, Long-tailed Duck, American Wigeon, Gadwall (400 detected during 2002 surveys), and Northern Pintail.

Table 1. Waterfowl species occurring in the Chester River and Kent County Bayshore Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Hooded Merganser	X	X	X

Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X		X
Greater Snow Geese		X	X
Lesser Snow Goose		X	X
Gadwall		X	X
Ruddy Duck		X	X
Bufflehead		X	X
Mergansers		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

Undisturbed shoreline cliffs of the Chester River and Kent County Bayshore Focus Area continue to support nesting Bank Swallow, as well as a federally-listed tiger beetle. Remaining riparian forest supports breeding neotropical migrants such as Cerulean Warbler, while the agricultural landscape provides habitat for grassland nesting species, including Grasshopper and Vesper Sparrow.

Threats:

The development of uplands, especially the conversion of agricultural lands to residential developments is a great threat. Point and non-point source pollution from increasing human populations, decreasing water quality, and invasive species proliferation all threaten habitats in the focus area. Water quality has been degraded due to increasing non-point source pollution associated with agricultural production and increasing residential development. Bay grasses, critical to waterfowl populations, are threatened by elevated nutrients entering the watershed.

Conservation Recommendations:

Efforts should focus on protecting, restoring and enhancing wetlands and associated uplands in areas via public and private partnerships and existing funding programs. For example CREP and CRP programs should be used to levy resources for wetland conservation, specifically shell impoundments. Long-term protection should be favored; however, multiple ten-fifteen year

agreements for restoration and enhancement will be a primary tool to maintain wildlife populations on private lands. The Mute Swan population should be reduced to protect critical bay living resources.

Focus Area: Choptank River
Sub-Focus Area: None

Area Description:

The Choptank River Focus Area is approximately 120,540 hectares (297,860 acres) in size and extends from Ridgely Maryland, downriver to the mouth of the Choptank River. The larger water bodies in the focus area include the Choptank, Little Choptank, and Tred Avon Rivers and Broad, Harris, and Tuckahoe Creeks. The Choptank River Watershed drains approximately 700 square miles of land in Maryland, including portions of Caroline, Dorchester, Queen Anne's, and Talbot Counties in the middle of the Eastern Shore.

The Choptank basin is 58 % agricultural, 33 % forested, and 9 % urban (Maryland Department of Natural Resources website). Wetlands within the focus area have been ditched and drained for agriculture for decades. Corn, soybeans, and winter wheat are the main commodities grown. The majority of the housing in the basin is in either rural or farm settings. Tourism also plays a role in the economy of the focus area.

Ownership/Protection:

The majority of the Choptank River Focus Area is in private ownership. Public lands include Tuckahoe and Martinak State Parks. Population densities are lower on the south side of the Choptank River, where corn, soybeans and winter wheat are grown. Tourism contributes significantly to the local economy.

Special Recognition:

The Choptank River Focus Area is an important area for Atlantic Population Canada Goose because of its many miles of shoreline habitat. This landscape feature, in combination with it's agricultural lands and numerous creeks, make it important habitat for migrating and wintering waterfowl, including Scoter, Long-tailed Duck, and Tundra Swan. The lower portion of the watershed is an important concentration area for waterfowl.

Waterfowl:

Many waterfowl species use the Choptank River Focus Area during migration and to over winter but geese are present in the largest numbers with 113,000 Canada Goose and 17,000 Snow Goose detected by 2003 mid-winter waterfowl surveys. Other species detected by the 2003 mid-winter survey include Mallard (10,200), Canvasback (6,000), Scaup (5,000), Ruddy Duck (4,100), Tundra Swan (2,970), Bufflehead (2,000), Mute Swan (2,000), Black Duck (1,200), Goldeneye (1,200), Red-headed Duck (1,000), Scoter (300), Merganser (100), Northern Pintail (100), and Long-tailed Ducks (40).

Table 1. Waterfowl species occurring in the Choptank River Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	

Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X		X
Greater Snow Goose		X	X
Lesser Snow Goose		X	X
Gadwall		X	X
Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

The Choptank River Focus Area includes limited forested riparian corridors that provide stopover habitat and breeding areas for migrant songbirds. Marshes in the upper Choptank River support breeding Virginia and King Rails, a dense concentration of Marsh Wren, and breeding Common Moorhen.

Threats:

One of the greatest threats to the Choptank River Focus Area is land use conversion from agriculture to residential. Presently, agriculture is the dominant land use in the focus area, but pressures for residential residences are likely to change the ratio of agriculture-to-developed lands over the next decade. Non-point source pollution (nutrients and sediment loads), from both agricultural and residential lands, is a major threat to waterfowl habitats. Beds of submerged aquatic vegetation (SAV), a critical habitat for waterfowl in the focus area, are being negatively impacted by elevated nutrients and sediment loads coming out of rivers and tributaries. Mute Swans are also threatening bay grasses.

Conservation Recommendations:

Continue to work through partnerships to implement Conservation Reserve Program and Conservation Reserve Enhancement Program to restore wetland habitats in the focus area.

Continue to protect Bald Eagle nesting sites. Restore SAV throughout the focus area. Reduce Mute Swan population to protect critical bay living resources.

References:

http://www.dnr.state.md.us/bay/tribstrat/choptank/choptank.pdf

Focus Area: Eastern Bay
Sub Focus areas: None

Area Description:

The Eastern Bay Focus Area is approximately 57,254 hectares (141,477 acres) in size, is located on the eastern shore of Maryland and includes the Wye and Miles Rivers and Bayshore/Kent Island.

Historically, the lands within the Eastern Bay Focus Area were private and managed for agricultural use, including tobacco and wheat farming. With the eventual threat of residential development, the state of Maryland purchased a portion of the focus area, Wye Island Natural Resources Management Area (NRMA) in the mid 1970's to ensure its preservation.

Ownership/Protection:

Most of the focus area remains in private ownership, with the exception of Wye Island NRMA, which is located in the tidal recesses of the Chesapeake Bay between the Wye River and the Wye East River. Of Wye Island's 1,133 hectares (2,800 acres), 991 hectares (2,450 acres) are managed by the Maryland Department of Natural Resources (MD DNR) State Forest and Park Service for the purposes of agricultural and resource management, particularly wintering. Lands within the NRMA are also managed to provide high quality habitat for wintering Atlantic Population (AP) Canada Goose and other native wildlife.

Special Recognition:

The Eastern Bay Focus Area contains important wintering habitat for wintering waterfowl, including Tundra Swan, AP Canada Goose, and American Black Duck.

Waterfowl:

Waterfowl use the Eastern Bay Focus Area in large numbers during the winter months, where tidal wetlands and submerged aquatic vegetation provide valuable habitat. Specifically, large numbers of Tundra Swan and Canada Goose are found in the focus area; 2003 Mid-winter Surveys results report 45,000 Canada Goose and 1,300 Tundra Swan. Other species wintering in the focus area include Ruddy Duck (2,700; 6,000 detected by 2002 survey), Canvasback (2,100; 5,700 during 2001 surveys), Scaup (1,600; 6,000 during 2002 surveys), Bufflehead (1,300; 2000 detected by 2001 and 2002 surveys), Mallard (1,000; 4,000 detected during 2002 surveys), Black Duck (700; 1,200 and 1400 during 2002 and 2001 surveys, respectively), Goldeneye (200), and Mute Swan (700).

Table 1. Waterfowl species occurring in Eastern Bay Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Greater Scaup		X	X

Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X		X
Gadwall		X	X
Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

The Eastern Bay Focus Area is an important site for breeding colonial waterbirds. Poplar Island supports 50 hectares (125 acres) of colonial waterbird nesting habitat for Snowy Egret, Great Egret, Double-crested Cormorant, Common Tern, Least Tern, Green Heron, and Great Blue Heron. Black Duck also use the island for breeding.

Threats:

One of the greatest threats to the Eastern Bay Focus Area is land use conversion from agriculture to residential properties. Presently, agriculture is the dominant land use in the focus area, but pressure for residential development is high and growth continues to occur in the focus area at a rapid rate. Non-point source pollution (nutrients and sediment loads), from both agricultural and residential lands, is a major threat to waterfowl habitats in the focus area. Submerged aquatic vegetation beds, a critical habitat for waterfowl in the focus area, are threatened by elevated nutrients and sediment loads coming out of rivers and tributaries.

Conservation Recommendations:

Continued support for restoring Poplar Island using dredged material from the maintenance of the Baltimore Harbor and Corps of Engineers Channels Federal Navigation Project should occur. Habitats protected and restored by this effort include 323 hectares (800 acres) of shallow water with SAV and 50 hectares (125 acres) of colonial waterbird and Bald Eagle nesting habitat. Upon completion of the project, the island will be turned over to the MD DNR to manage. Habitat for wintering waterfowl and Least Tern, Common Tern, and Great Blue Heron colonies should continue to be created. Continue to work towards stabilizing the

shorelines within the focus area through partnerships with MD DNR, NGOs and other federal agencies. The Mute Swan population should be reduced to protect critical Bay living resources.

Focus Area: Patuxent River
Sub-Focus Area: None

Area Description:

The Patuxent River Focus Area is approximately 67,769 hectares (167,460 acres) in size, extends from Prince George's County in the north to the river's mouth in St. Mary's County, and includes the Western Branch and Little and Middle Patuxent Rivers. Land use in the focus area consists of high and low density development and agriculture lands. Because of the developed nature of the Patuxent River Focus Area, urban non-point and point sources both account for approximately one-third of nutrients entering the river, while agriculture contributes roughly one fifth of the nutrients (Maryland DNR). As the population in the focus area increases, nutrient loads from these sources will increase. Between 1970 and 2000, the population in the watershed increased by 136 % and is projected to grow by another 22 % by 2020 (Maryland DNR).

Ownership/Protection:

The Patuxent River Focus Area is a mix of private and public lands, with the majority of acreage in private ownership. Public lands within the focus area include Patuxent River Park, Merkle Wildlife Sanctuary, Bowen Wildlife Management Area, Patuxent River Natural Resources Management Area (NRMA), Patuxent Vista NRMA, Jug Bay Wetland Sancutary, and Patuxent Naval Air Station.

Special Recognition:

The focus area is an important migration area for Sora Rail.

Waterfowl:

The Patuxent River Focus Area is an important area for dabbling ducks and Atlantic Population Canada Goose. A high percentage of Maryland's Ruddy Duck population uses the area. Maryland supports approximately one-fourth of the continental population of Ruddy Duck (400,000) during the winter and the Patuxent River Focus Area supports up to 23,000 individuals (2001 Mid-winter Survey). Specifically, the 2004 Mid-winter waterfowl survey detected 1,700 Black Duck, 900 Bufflehead, 14,300 Canada Goose, 900 Canvasback, 1,700 Scaup, 1,700 Mallard, 400 Red breasted Merganser, 19,000 Ruddy Duck, and 300 Tundra Swan.

Table 1. Waterfowl species occurring in the Patuxent River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X

American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal	X	X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X		X
Gadwall		X	X
Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

Extensive freshwater marshes in the Patuxent River Focus Area support breeding Least Bittern, American Bittern, Virginia Rail, and King Rail, and provide migratory habitat for Sora Rail and other wetland birds. Extensive riparian forest along the river corridor supports a number of breeding and migrating songbirds.

Threats:

Development is the largest threat to the focus area. Non-point source pollution (nutrients and sediment loads) from both agricultural and residential lands is a major threat to waterfowl habitats in the focus area. Submerged aquatic vegetation (SAV) beds, a critical habitat for waterfowl, are being negatively impacted by elevated nutrients and sediment loads coming out surrounding lands. Oil spills area a potential threat to the focus area because of the power plant located at Chock Point.

Conservation Recommendations:

Development pressure in the Patuxent River Focus Area creates an urgent need to identify, protect, restore, and manage remaining wetlands and their associated upland habitats. Continued support for ongoing SAV transplanting efforts is a priority. Mute Swan control is underway and should continue until populations are reduced to numbers that no longer negatively impact wetland habitats, waterfowl and other migratory bird species.

References:

Maryland DNR Website -
http://mddnr.chesapeakebay.net/wsprofiles/surf/prof/wsprof.cfm?watershed=02131101

Focus Area: Tangier Sound and Bay Islands
Sub-Focus Area: None

Area Description:

The Tangier Sound and Bay Islands Focus Area is approximately 100,350 hectares (247,969 acres) in size and extends from Bloodsworth Island in the north, south to the Virginia/Maryland state line. The focus area includes Tangier Sound, a portion of Pocomoke Sound and their islands (Bloodsworth Island, Smith Island, Cedar Island, and South Marsh Island). The focus area is rural in character; most residents make their livelihoods on the water. Timber harvest and poultry also play significant roles in supporting the local economy. Pocomoke Sound is famous for waterfowl and rail hunting.

The Tangier Sound and Bay Islands Focus Area is composed of a mix of habitat types, from estuarine bays and deep-water islands, to abundant marshes, mixed hardwood habitats and loblolly pine stands. Smith Island, Maryland's last inhabited Chesapeake Bay Island accessible only by boat, is located 19 kilometers (12 miles) west of Crisfield, Maryland, and straddles the Maryland-Virginia state line. The island is populated by a unique culture of watermen descended from settlers who inhabited the island 350 years ago. Smith Island is part of a chain of islands that form the border between Chesapeake Bay and Tangier Sound, is 97 % emergent wetlands, and supports the largest contiguous submerged aquatic vegetation (SAV) bed in the bay. South Marsh Island, also in Tangier Sound, is also characterized entirely by marsh habitat, with 1,214 hectares (3,000 acres) of marshlands, punctuated by ponds and creeks.

Ownership/Protection:

A significant portion of the focus area is in public ownership. The mainland portion of the focus area includes Deal Island Wildlife Management Area (WMA), Fairmount WMA, and Janes Island State Park. Within Tangier and Pocomoke Sounds are Bloodsworth Island (used as a bombing range by the U.S. Navy), South Marsh Island WMA, Cedar Island WMA, Pocomoke Sound WMA, and Martin National Wildlife Refuge.

Special Recognition:

The Tangier Sound and Bay Islands Focus Area supports some of the best remaining bay grass beds in Maryland and is very important for American Black Duck. A portion of the focus area, Cedar Island, is legendary for its ability to attract large numbers of Black Duck due to its 1,214 hectares (3,000 acres) of tidal marsh, ponds and creeks.

Waterfowl:

The Tangier Sound and Bay Islands Focus Area supports large numbers of a great variety of waterfowl species, both commonly seen species, such as Black Duck, Mallards, Scaup, and Canada Goose, and less commonly seen species such as Wigeon, Northern Pintail, Gadwall, Green and Blue-winged Teals, and Northern Shoveler. Redhead and Canvasback winter in the focus area in large numbers. Black Duck, Mallard, Blue-winged Teal, and Gadwall commonly breed in the focus area.

Table 1. Waterfowl species occurring in the Tangier Sound and Bay Islands Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal	X	X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X		X
Atlantic Brant		X	X
Gadwall	X	X	X
Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

The Tangier Sound and Bay Islands Focus Area supports some of the largest concentrations of the state's heron, egret, and ibis populations, with very high numbers of nesting pairs on Deal Island. Deal Island also supports one of Maryland's only breeding populations of Black-necked Stilts. On Marsh Island, the endangered Peregrine Falcon nests on towers once used to reintroduce young falcons into the wild. Other islands support important breeding tern colonies. The expansive marsh habitat in the focus area attracts other uncommon birds, like the American Oystercatcher, the Black Skimmer, and the Black Rail.

Threats:

One of the greatest threats to the focus area is the continued decline of bay grass beds resulting from elevated levels of nutrients in agricultural and residential runoff entering the bay. Nutrient runoff from poultry farms causes excess nutrients to get into bay waters, triggers algal

blooms, and results in bay grass die-offs. Erosion of natural shorelines and sedimentation deposits into the bay also threaten habitats within the focus area.

Conservation Recommendations:

Efforts are underway to restore lost wetlands on the northern end of Smith Island in the Martin National Wildlife Refuge (NWR). Tremendous loss of SAV around parts of Smith Island and be stopped and potentially reversed by protecting and restoring historic wetland communities. The recommended project includes restoration of Back Cove and Fog Point Cove using stone breakwaters and backfill, and protection of the western shoreline of the Martin NWR using breakwaters and backfill from the northern jetty near Ewell to Fog Point. Over a 50-year project life, these projects will restore or protect approximately 768 hectares (1,900 acres) of SAV and restore or protect 97 hectares (240 acres) of wetlands. The Mute Swan population should be reduced to protect critical Bay living resources.

Other wetland and bay grass restoration projects should be targeted for funding and implemented. Partners should continue to work towards stabilizing the shorelines within the focus area through partnerships with MD DNR, non-governmental organizations and other federal agencies.

Focus Area: Tidal Potomac River, Maryland and Virginia
Sub-Focus Area: None

Area Description:

The Tidal Potomac River Focus Area is shared by northeast Virginia and southwest Maryland and encompasses 474,376 hectares (1,172,203 acres) in Virginia and 295,258 hectares (729,596 acres) in Maryland. **The area as a whole, especially upland habitat, is considerably developed, but the brackish and freshwater tidal wetlands have remained relatively undeveloped and provide a wide diversity of habitat for many waterfowl species. The Potomac River proper is owned by the State of Maryland and the adjacent marshes are owned by both Virginia and Maryland, on the respective sides of the river. These riverine marshes are composed of highly brackish *Spartina* marshes near the mouth of the Potomac to freshwater *Peltandra, Lotus* and wild rice marshes inland. Historically, hardwood forests dominated areas beyond the river. These forests have given way to row crop agriculture, truck farms, horse/hobby farms, loblolly pine plantations, and residential and industrial development. In recent historical times, the shallow water areas of the Potomac had a high-density of submerged aquatic vegetation (SAV) beds (*Hydrilla*).**

Ownership/Protection:

The majority of land in this focus area is in private ownership. In Virginia, the U.S. Fish and Wildlife Service owns Masons Neck National Wildlife Refuge (NWR) and Marumsco NWR, The Virginia Department of Conservation and Recreation owns several state parks, Mason Neck State Park, Leesylvania State Park, Caledon Natural Area, and Westmoreland State Park, as well as several small natural area preserves. Additional federal ownership in the area includes Quantico Marine Corps Base, Dahlgren Laboratory, George Washington Birthplace National Monument, and Fort Belvoir Military Reservation. In Maryland, the Maryland Department of Natural Resources manages several state wildlife management areas and parks including Bowen WMA, Chicamuxen WMA, Chapel Point State Park (SP), Point Lookout SP, St. Mary's River SP, and St. Clements Island SP. The National Park Service owns the Zekia Swamp and Mattawoman Natural Environmental Areas. Additional federal lands include **the** U.S. Naval Warfare Center at Indian Head and Stump Neck and the Blossom Point Proving Grounds,

Special Recognition:

The Chesapeake Bay Estuarine Complex received Ramsar designation in1987.

Waterfowl:

Six high priority species, (Black Duck, Mallard, Northern Pintail, Greater and Lesser Scaup, Southern James Bay Population Canada Goose) utilize the focus area for wintering and migration habitat. Puddle duck species and Canada Geese utilize flooded marshes and the adjacent rivers and lakes for food in the form of invertebrates, plant material and seeds. The scaup use the adjacent open-water marshes to feed on SAV, and other invertebrates. Other priority species, including the Wood Duck, American Wigeon, Redhead, Canvasback and Ring-necked Duck, utilize these same areas for foraging and loafing. Wood Duck and both teal species abound in the emergent marshes for brood rearing (Wood Duck) and staging in the early fall.

Table 1. Waterfowl species using the Potomac River Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal	X	X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
AFRP Canada Goose	X		X
Gadwall		X	X
Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X
Long-tailed Duck		X	X
Scoters		X	X

Other Migratory Birds:

This area supports nearly 25 % of the coastal population of Bald Eagle in Virginia, and a number of pairs in Maryland. Waterfront development and increased urbanization are the most important limiting factors on the distribution and future population trends of Bald Eagle and many other species in this focus area. Small, narrow fragments of bottomland and swamp forest border Potomac River tributaries in Virginia and extensive forested areas in southern Maryland provide habitat for Acadian Flycatcher, Yellow-throated Vireo, Northern Parula, and Prothonotary Warbler. Small, isolated populations of Swainson's Warbler (Virginia) and Worm-eating Warbler (Virginia and Maryland) may be found in forested wetlands with dense understory vegetation. Tidal marshes are irregularly distributed along the shores of the Potomac River but are extensive along some of the associated creeks and tributaries. These habitats are important for Virginia Rail, Sora, American Bittern, and Least Bittern. Marshes in the lower salinity zones and upper reaches of the Potomac River also support King Rail. Historical records indicate that the coastal plain Swamp Sparrow inhabited some of these areas as well. However, their complete distribution among the marshes in this focus area is unknown.

Threats:

Additional development of riparian and forested areas remains a large threat. Increasing stormwater runoff, with increased siltation and chemicals associated with urbanization degrade water quality. Increasing boat traffic, both recreational and work related, reduce refuge areas and push waterfowl to less favorable sites.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields and farmed wetland pasture that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Preservation of bottomland hardwood forest for nesting Wood Duck and other cavity nesting passerines needs to be addressed. The Mute Swan population should be reduced to protect critical Bay living resources.

7.2.7 Massachusetts

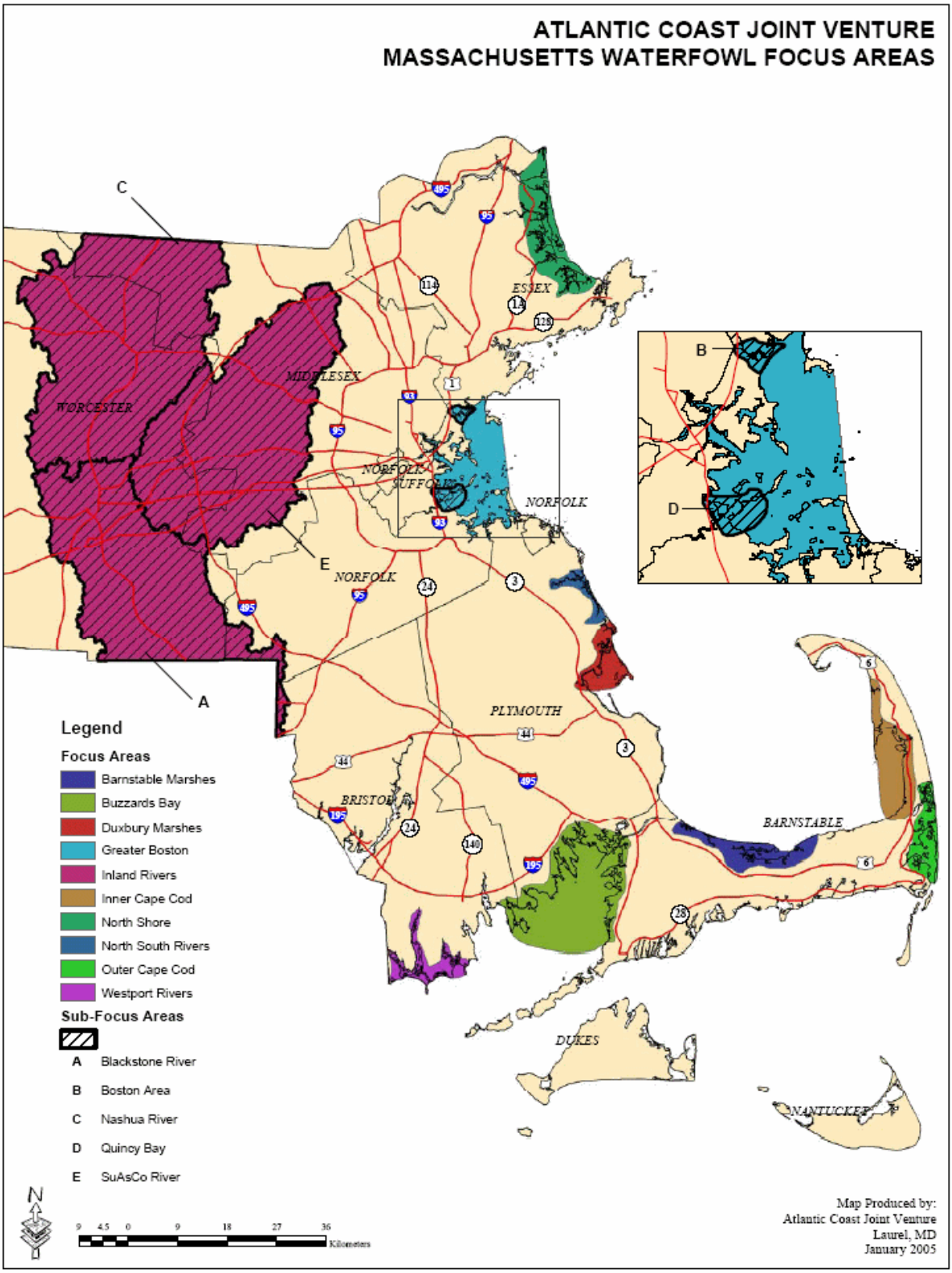

Figure 7.8. Massachusetts waterfowl focus areas.

Focus Area: Barnstable Marshes, Massachusetts
Sub-Focus Areas: None

Area Description:

The Barnstable Marshes lie on the inner coast of Cape Cod which fronts Cape Cod Bay just east of the Cape Cod Canal. Protected from the full brunt of New England's winter weather by Sandy Neck, at more than 9 kilometers (6 miles) in length, the marshes are one of the largest barrier beaches on the New England coast. The marshes provide haven for several thousand American Black Duck as well as hundreds of Mallard, Canada Goose, and various diving duck species including Common Goldeneye, Bufflehead, and Merganser. In addition, the marshes provide nesting habitat for Common and Least Tern. It is also utilized by a variety of shorebirds including Piping Plover.

Ownership/Protection:

The Barnstable Marshes encompass 8,300 hectares (20,511 acres). There is no federal ownership and the state owns only 88 hectares (219 acres). However, there are 2,082 hectares (5,147 acres) in municipal ownership, much of it in the Sandy Neck Reservation, and nonprofit organizations own another 204 hectares (505 acres). An additional 80 hectares (197 acres) are privately owned but protected. The rest is unprotected property.

Special Recognition:

The Sandy Neck/Barnstable Harbor area has been recognized as a Massachusetts Area of Critical Concern since 1978. The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Roseate Tern	*Sterna dougallii*	E (federally E)	✓
Piping Plover	*Charadrius melodus*	T (federally T)	✓
Diamondback Terrapin	*Malaclemys terrapin*	T	✓
Water-willow Stem-borer	*Papaipema sulphurata*	T	✓
Eastern Spadefoot	*Scaphiopus holbrookii*	T	✓
Salt Reedgrass	*Spartina cynosuroides*	T	
Swamp Oats	*Sphenopholis pensylvanica*	T	✓
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	SC	✓
Spotted Turtle	*Clemmys guttata*	SC	
New England Blazing Star	*Liatris borealis*	SC	✓

Common Name	Scientific Name	State Status	Core Habitat?
Plymouth Gentian	*Sabatia kennedyana*	SC	✓
Least Tern	*Sterna antillarum*	SC	✓
Common Tern	*Sterna hirundo*	SC	✓
Eastern Box Turtle	*Terrapene carolina*	SC	✓
Barn Owl	*Tyto alba*	SC	

This focus area also includes BioMap Core Habitat for the Coastal Interdunal Marsh/Swale, Maritime Dune, Maritime Juniper Woodland/Shrubland, Maritime Oak - Holly Forest/Woodland, Maritime Pitch Pine on Dunes, Maritime Shrubland, and Salt Marsh natural communities. The Barnstable Marshes are also included in the Pioneer-project Coastal Records (CORE) as one of several sites along the east coast of the U.S. CORE was started in 1991 to improve methods to reconstruct Holocene sea-level rise from salt marsh deposits.

Waterfowl:

The Barnstable Marshes provide breeding, migration, and wintering habitat for a variety of waterfowl species. The area has a long history of waterfowl hunting tradition.

Table 1. Waterfowl species of the Barnstable Marshes Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal	X	X	
Gadwall		X	
Greater Scaup		X	
Common Goldeneye		X	X
Bufflehead		X	X
Red Breasted Merganser		X	X
Scoter species		X	X
Common Eider		X	X
Canada Goose	X	X	X
Atlantic Brant		X	X

Other Migratory Birds:

Nearly 300 bird species have been noted within the Sandy Neck/Great Marshes system of the Barnstable Marshes.

Threats:

Development pressures on Cape Cod are escalating and the quality of the salt marsh is threatened by shoreline development.

Conservation Recommendations:

Continue to acquire property and conservations restrictions within the Barnstable Marshes Focus Area as done in recent projects funded by the National Coastal Wetlands Conservation Grant Program.

Focus Area: Buzzards Bay, Massachusetts
Sub-Focus Areas: None

Area Description:

The Buzzards Bay Focus Area encompasses the broad stretch of Massachusetts' southern coastline from Woods Hole on Cape Cod to the Rhode Island line and includes some 59,893 hectares (148,000 acres). An irregular coastline is created by the many rivers, streams, harbors, and bays that occur along it. Salt marsh habitat is limited to small sites scattered along the coast throughout the region and total 1,485 hectares (3,670 acres). Another 101 hectares (250 acres) of tidal flats are found in the region. Many small off-shore islands and rock outcroppings are found in the region including a series of larger islands known as the Elizabeth Island Chain or the Gosnold Group. The presence of the Cape Cod Canal makes inner Buzzards Bay a major shipping channel for both commercial and recreational boat traffic.

Ownership/Protection:

Sixty three hectares (157 acres) are federally owned, primarily by the Department of Defense. The state owns 364 hectares (900 acres) and municipalities, 594 hectares (1,470 acres). Non-profit groups own another 736 hectares (1,820 acres).

Special Recognition:

The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Roseate Tern	*Sterna dougallii*	E (federally E)	✓
American Bittern	*Botaurus lentiginosus*	E	✓
Long's Bittercress	*Cardamine longii*	E	✓
Mattamuskeet Panic-grass	*Dichanthelium mattamuskeetense*	E	✓
American Waterwort	*Elatine americana*	E	✓
Estuary Pipewort	*Eriocaulon parkeri*	E	✓
River Arrowhead	*Sagittaria subulata* var. *subulata*	E	✓
Broad Tinker's-weed	*Triosteum perfoliatum*	E	✓
Piping Plover	*Charadrius melodus*	T (federally Threatened)	✓
Arethusa	*Arethusa bulbosa*	T	
Purple Needlegrass	*Aristida purpurascens*	T	
Pygmyweed	*Crassula aquatica*	T	

Common Name	Scientific Name	State Status	Core Habitat?
Diamondback Terrapin	*Malaclemys terrapin*	T	✓
Water-willow Stem-borer	*Papaipema sulphurata*	T	
Salt Reedgrass	*Spartina cynosuroides*	T	✓
Triangle Floater	*Alasmidonta undulata*	SC	
Spotted Turtle	*Clemmys guttata*	SC	
Bushy Rockrose	*Helianthemem dumosum*	SC	✓
New England Blazing Star	*Liatris borealis*	SC	✓
Seabeach Knotweed	*Polygonum glaucum*	SC	✓
Plymouth Gentian	*Sabatia kennedyana*	SC	
Bristly Foxtail	*Setaria geniculata*	SC	✓
Least Tern	*Sterna antillarum*	SC	✓
Common Tern	*Sterna hirundo*	SC	✓
American Sea-Blite	*Suaeda calceoliformis*	SC	
Eastern Box Turtle	*Terrapene carolina*	SC	
Drunk Apamea Moth	*Apamea inebriata*	Proposed for listing as SC	

Waterfowl:

Large numbers of assorted waterfowl winter in the Buzzards Bay Focus Area. Two to three thousand Black Duck are counted on midwinter waterfowl surveys scattered in small flocks ranging in size from a few dozen to a few hundred. Several hundred Mallard also winter in the area, primarily on the freshwater rivers and streams that dump into Buzzards Bay. It is an important site for Greater Scaup, Common Goldeneye, Bufflehead, and mergansers. Three thousand or more Canada Goose make it their winter home as southern New England has become the winter terminus of North Atlantic Population Canada Goose. Small numbers of Atlantic Brant winter in the area and in recent years, Common Eider have extended their range farther south along the coast. This is perhaps in response to the development of a breeding population introduced on Penekise Island in the Elizabeth Island Chain in eastern Buzzards Bay (Stanton 1989).

Table 1. Waterfowl species of the Buzzards Bay Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal		X	
Longtail Duck		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Scoter species		X	X
Common Eider	X	X	X
Canada Goose	X	X	X
Atlantic Brant		X	X
Mute Swan	X	X	X

Other Migratory Birds:

Double Crested Cormorant, Herring, Greater Black-backed, and Ring-billed Gull, Common and Red-throated Loon, various shore bird species, and Osprey use this area.

Threats:

Oil spills have occurred in the past, most recently in 2003, resulting in the loss of waterfowl and other migratory birds as well as contamination of shellfish beds.

Conservation Recommendations:

Many pockets of salt marsh in the Buzzards Bay Focus Area have been historically ditched for mosquito control. Restoration of these marshes to natural tidal flows would benefit wintering Black Duck and other migratory bird species. Acquisition of remaining undeveloped shoreline and marshes will help conserve important waterfowl wintering habitats.

References:

Stanton, P. B. 1989. Establishing a breeding Eider Duck population in Massachusetts. Proceedings: 1989 Oil Spill Conference (Prevention, Behavior, Control, Clean Up). American Petroleum Institute Publ. 4479. Washington, DC.

Focus Area: Duxbury/Plymouth Bay, Massachusetts
Sub-Focus Areas: None

Area Description:

The northern portion of Plymouth Bay contain the remaining strips of salt marsh along this long-settled coastline, with a major piece of marsh remaining in Duxbury/Marshfield, protected by a long barrier beach. This area is an important wintering site for Black Duck, a variety of diving duck species, Canada Goose, and Atlantic Brant. The tidal flats along the bay shorelines are particularly important to wintering Black Duck. The region encompasses 6,758 hectares (16,700 acres) including 673 hectares (1,665 acres) of salt marsh. The town of Plymouth is the location of both the historic Plymouth Rock site and the Mayflower II is anchored in Plymouth Harbor.

Ownership/Protection:

There is only 14 hectares (36 acres) under state protection and another 68 hectares (170 acres) in municipal ownership. Nonprofit organizations own 186 hectares (460 acres).

Special Recognition:

The Duxbury marshes are identified in the Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1988) and are considered Core Habitat by Massachusetts' Bio Mapping Program. The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Upland Sandpiper	*Bartramia longicauda*	E	✓
Least Bittern	*Ixobrychus exilis*	E	
Piping Plover	*Charadrius melodus*	T (federally Threatened)	✓
Sharp-shinned Hawk	*Accipiter striatus*	SC	
Spotted Turtle	*Clemmys guttata*	SC	
Common Moorhen	*Gallinula chloropus*	SC	
Four-toed Salamander	*Hemidactylium scutatum*	SC	
Least Tern	*Sterna antillarum*	SC	✓
Eastern Box Turtle	*Terrapene carolina*	SC	✓
Barn Owl	*Tyto alba*	SC	

Waterfowl:

The focus area is a major Black Duck wintering site, normally hosting 10% to 15% of Massachusetts' total wintering Black Duck population. Up to 200 Mallard use the area, significant since most Mallard in Massachusetts winter on inland park sites. Several thousand Common Eider also winter in the area as well as hundreds of Goldeneye, Bufflehead, and Red-breasted Merganser. Atlantic Brant are normally seen on midwinter waterfowl surveys and area Canada Goose are common though most birds are from the resident population.

Table 1. Waterfowl species of the Duxbury/Kingston Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal		X	
Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Scoter species		X	X
Common Eider		X	X
Canada Goose	X	X	X
Atlantic Brant		X	

Other Migratory Birds:

Arctic, Common, and Least Tern, all listed as state "special concern" are found here as are Piping Plover, listed as both state and federally threatened. Roseate Tern, a state- and federally- listed endangered species, utilize the area. Critical migratory stop-over habitat for the Red Knot lies within this focus area. In addition, assorted shorebirds utilized the area during spring and autumn migrations with some species overwintering in the area.

Threats:

The thin strips of remaining salt marsh are endangered by shoreline development.

Conservation Recommendations:

Approximately 607 hectares (1,500 acres) should be protected or enhanced.

References:

U.S. Fish and Wildlife Service. 1988. Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast, Priority Category 20. Newton Corners, MA.

Focus Area: Greater Boston Area, Massachusetts
Sub-Focus Areas: None

Area Description:

Located immediately north of Boston, the marshes along the Pines and Saugus Rivers are the last remaining tracts of extensive salt marsh in the greater Boston metropolitan area. The focus area covers 967 hectares (2,390 acres) of which 509 hectares (1,260 acres) are saltmarsh. Dissected by roads and degraded by illegal dumping and the invasion of Phragmites, the area still provides habitat for a variety of wildlife.

A smaller area 131 hectares (325 acres), including 81 hectares (200 acres) of salt marsh located on the north end of Quincy Bay, coupled with the tidal flats of the region, provide winter habitat for several hundred American Black Duck, 1,000 to 3,000 Atlantic Brant, and a growing flock of Canada Goose. Shoreline development is intensive throughout the greater Boston area.

Ownership/Protection:

The state owns 279 hectares (690 acres) of the Pines and Saugus Rivers area marshes while another 133 hectares (330 acres) are in municipal ownership. Only 5 hectares (13 acres) are under state ownership in the Quincy/Dorchester area with 20 hectares (50 acres) in municipal ownership.

Special Recognition:

The Quincy/Dorchester area is identified in the Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1988). This area is a state designated Area of Critical Concern. The Massachusetts Natural Heritage & Endangered Species Program lists the Common Tern as a species of special concern in this focus area.

Waterfowl:

The expansion of Logan International Airport and the dredging of the Boston Harbor channel over the last half century have resulted in greatly reduced number of Black Duck in the Boston area. A bright spot has been the establishment of a population of breeding Common Eider on the Boston Harbor islands. Reports of flocks of 200 or more nearly fledged young in recent years indicate this is a healthy, growing population, likely the results of attempts to establish breeding eider colonies in Massachusetts in the 1970s (Stanton 1989, Heusmann 1995).

Table 1. Waterfowl species of the Greater Boston Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck		X	X
Mallard	X	X	X
Green-winged Teal		X	
Greater Scaup		X	X
Common Goldeneye		X	X
Bufflehead		X	X

Red-breasted Merganser		X	X
Scoter species		X	X
Common Eider	X	X	X
Canada Goose	X	X	X
Atlantic Brant		X	X

Other Migratory Birds:

Common and Red-throated Loon, Horned and Red-necked Grebe, shorebirds such as Purple Sandpiper, Sanderling, and Dunlin use the area as do various gull species.

Threats:

The proposed Saugus River Flood Damage Reduction project would increase development pressures on lands adjacent to the marsh. Approximately 607 hectares (1,500 acres) of salt marsh would be affected. Lynn Harbor, a low-tide feeding site for Black Duck and winter habitat for a variety of diving duck species, has been proposed for dredging projects which would eliminate important mussel flats.

Conservation Recommendations:

Fee title acquisition of remaining salt marsh habitat. Vegetative control of Phragmites to restore salt marsh habitat.

References:

Heusmann, H W. 1995. The Eider Duck. Massachusetts Wildlife 45(1):31-37.

Stanton, P. B. 1989. Establishing a breeding eider duck population in Massachusetts. Proceedings: 1989 Oil Spill Conference (Prevention, Behavior, Control, Clean Up). American Petroleum Institute Publ. 4479. Washington, DC.

U.S. Fish and Wildlife Service. 1988. Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast, Priority Category 20. Newton Corners, MA.

Focus Area: Inland Rivers, Massachusetts
Sub-Focus Areas: Blackstone Valley; Nashua River; SuAsCo System

Area Description:

The river systems of Massachusetts provide valuable wildlife habitat as well as a variety of other important ecosystem functions. In Massachusetts' long history, most rivers and streams were dammed in many places to provide power sources for a variety of mills. Although many of these mills are now defunct, the resulting mill ponds have succeeded into valuable wetland habitat. At the same time, there is a movement underway to remove such dams to restore streams to their natural free-flowing state for fisheries and other reasons.

The Blackstone River and its tributaries in Worcester County is one example of removal of dams to restore natural flow. Much of the waterfowl production is associated with old impoundments created at the turn of the last century. These impoundments are now falling into disrepair and in danger of being drained, resulting in the loss of valuable wetland habitat. The recently completed Lackey Pond dam replacement project, a Massachusetts D.U., Inc. M.A.R.S.H. project on the Mumford River in the Blackstone Valley is one example of a successful wetland restoration project which has resulted in restoration of a flourishing deep freshwater marsh. Since this area was designated an Atlantic Coast Joint Venture focus area, MassWildlife has also acquired 29 hectares (59 acres) on the Blackstone River in Grafton as the Quinsigamond Marshes M.A.R.S.H project. Total sub-focus area size is 86,877 hectares (214,678 acres).

The Nashua River in Middlesex County is one of the few northward flowing rivers in the state. Once one of the most polluted rivers, it has been greatly cleaned up and now carries a Class B rating in many sections. The upstream portion of the river pass through or along the former Fort Devens Military Reservation, the Oxbow National Wildlife Refuge (NWR), and the state's Bolton Flats Wildlife Management Area (WMA). The Nashua is one of the few rivers in eastern Massachusetts that still meanders through relatively undeveloped rural habitat. Total sub-focus area size is 115,441 hectares (285,261 acres).

The SuAsCo system, is so named because it includes the Sudbury and the Assabet Rivers' which both arise in the town of Westborough then meander in different directions until they join in Concord to form the Concord River. The system is located in the eastern coastal plain and has some of the most productive waterfowl habitat in the state. Although Black Duck production has declined with urbanization, Wood Duck, Mallard, and Canada Goose are plentiful. Both the Great Meadows NWR and the state's Pantry Brook WMA are located in this region. The restoration of a dike/water control structure on Pantry Brook as a D.U. Inc., M.A.R.S.H has restored deep and shallow marsh wetlands to an area that was growing into pure shrub/scrub swamp and upland habitat. Total sub-focus area size is 103,504 hectares (255,764 acres).

Ownership/Protection:

Ownership/Protection varies greatly within the systems. The Great Meadows NWR encompasses 1,563 hectares (3,863 acres) in the Sudbury and Concord River systems and MassWildlife owns the 166 hectares (411 acre) Pantry Brook WMA which abuts and drains into

the Sudbury River. Pantry Brook is a M.A.R.S.H. project site and a low dam has reclaimed about 30 hectares (75 acres) of deep marsh habitat that had previously succeeded into shrub/scrub wetland. The Assabet NWR on the Assabet portion of the SUASCO system consists of 902 hectares (2,230 acres). The Oxbow NWR in the Nashua River watershed is 674 hectares (1,667 acres).

Special Recognition:

The Central Nashua River Valley has been recognized as a Massachusetts Area of Critical Environmental Concern since 1996. Westborough Cedar Swamp, the headwaters for both the Assabet and Sudbury Rivers of the SUASCO system was designated an Area of Critical Environmental Concern in 1975.

Waterfowl:

Wood Duck, Mallard, and Canada Goose are common nesters on inland rivers. Some Black Duck continue to nest as well although the species as declined greatly as a nesting bird during the past 50 years and is now uncommon (Heusmann and Sauer 2000). Hooded Merganser numbers have increased four fold over the past 20 years (Heusmann et al. 2000). Blue-winged and Green-winged Teal are uncommon nesters on impoundments within the watersheds. Increasing beaver populations have created new waterfowl habitat and beaver sometimes attempt to place dams on major rivers as well as brooks and streams.

Table 1. Waterfowl species of the Inland Rivers Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal	X	X	
Blue-winged Teal	X	X	
Wood Duck	X	X	
Ring-necked Duck		X	
Hooded Merganser	X	X	
Red-breasted Merganser		X	
Canada Goose	X	X	X

Other Migratory Birds:

A wide variety of migratory birds use the corridors of inland rivers, both wetland dependent species and others such as neotropical migrants. Sora and Virginia Rail are commonly seen during airboat nightlight duck banding operations on Sudbury, Assabet and Blackstone Rivers, along with Black-crowned Night Heron, bitterns, and Great Blue Heron. Besides the American Bittern, species of special concern include the Least Bittern, Blanding's and spotted turtles, Pied-billed Grebe, water shrew and the swollen wedge mussel.

Threats:

While Massachusetts has had wetland protection laws since the 1970s and has increased the buffer zone along rivers, shoreline development is still a great threat. Invasive plant species, especially water chestnut chokes long stretches of both the Sudbury and Assabet Rivers,

crowding out what used to be beds of wild rice. Water chestnut also occurs on the Nashua River and other inland rivers, apparently spread by proliferating numbers of resident Canada Goose (Mirick 1996). The policy of dam removal has the potential for further eliminating wetland habitat as mill ponds are drained.

Conservation Recommendations:

There is a need to both acquire more habitats to protect river corridors and to institute control measures for water chestnut and purple loosestrife.

References:

Heusmann, H W. and J. R. Sauer. 2000. The northeastern states' waterfowl breeding population survey. Wildl. Soc. Bull. 28:1-11.

Heusmann, H W, T. J. Early, and B. J. Nikula. 2000. Evidence of an increasing Hooded Merganser population in Massachusetts. Wilson Bull. 112:413-415.

Mirick, P. G. 1996. Goose grief. Massachusetts Wildlife. 46(2):15-16.

Focus Area: Inner Cape Cod, Massachusetts
Sub-Focus Areas: None

Area Description:

The Inner Cape Cod Focus Area extends from East Brewster to North Truro on the Cape Cod Bay side of Cape Cod and includes Wellfleet Harbor. The Cape Cod National Seashore protects some of the northern portions of the focus area including the important Great Island barrier beach.

Ownership/Protection:

The Inner Cape Cod Focus Area includes 12,030 hectares (29,729 acres). There are 936 hectares (2,313 acres) federally protected as part of the Cape Cod National Seashore, 71 hectares (177 acres) in state ownership, 182 hectares (452 acres) in municipal ownership, 321 hectares (794 acres) protected by nonprofit organizations (Massachusetts Audubon), and 37 hectares (93 acres) privately protected. The southern section is this barrier beach is largely in private ownership. Massachusetts Audubon owns a 4,451 hectares (11,000 acres) sanctuary within the focus area.

Special Recognition:

Inner Cape Cod Bay has been recognized as a Massachusetts Area of Critical Environmental Concern since 1985. The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Least Bittern	*Ixobrychus exilis*	E	✓
Oysterleaf	*Mertensia maritime*	E	✓
Prickly Pear	*Opuntia humifusa*	E	
Piping Plover	*Charadrius melodus*	T (federally T)	✓
Melsheimer's Sack Bearer	*Cicinnus melsheimerii*	T	✓
Northern Harrier	*Circus cyaneus*	T	✓
Diamondback Terrapin	*Malaclemys terrapin*	T	✓
Water-willow Stem-borer	*Papaipema sulphurata*	T	✓
Vesper Sparrow	*Pooecetes gramineus*	T	✓
Seabeach Dock	*Rumex pallidus*	T	✓
Eastern Spadefoot	*Scaphiopus holbrookii*	T	✓
Salt Reedgrass	*Spartina cynosuroides*	T	✓
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	SC	✓

Common Name	Scientific Name	State Status	Core Habitat?
Gerhard's Underwing Moth	*Catocala herodias gerhardi*	SC	✓
Chain Dot Geometer	*Cingilia catenaria*	SC	
Spotted Turtle	*Clemmys guttata*	SC	✓
Broom Crowberry	*Corema conradii*	SC	✓
Commons's Panic-grass	*Dichanthelium commonsianum*	SC	✓
New England Bluet	*Enallagma laterale*	SC	✓
Bushy Rockrose	*Helianthemem dumosum*	SC	✓
Four-toed Salamander	*Hemidactylium scutatum*	SC	✓
Pale Green Pinion Moth	*Lithophane viridipallens*	SC	✓
Northern Brocade Moth	*Oligia hausta*	SC	✓
Dune Noctuid Moth	*Oncocnemis riparia*	SC	
Pink Sallow	*Psectraglaea carnosa*	SC	
Plymouth Gentian	*Sabatia kennedyana*	SC	
Least Tern	*Sterna antillarum*	SC	✓
Common Tern	*Sterna hirundo*	SC	✓
Eastern Box Turtle	*Terrapene carolina*	SC	✓

This Focus Area also includes BioMap Core Habitat for the Estuarine Intertidal: Saline/Brackish Flats and Marine Intertidal: Flats natural communities.

Waterfowl:

The Inner Cape area provides breeding, migration, and wintering habitat for a several waterfowl and water bird species. The focus area is an important wintering site for American Black Duck and migrant Canada Goose. Often, large numbers of Common Eider winter in Wellfleet Harbor. Annually, several hundred Red-breasted Merganser and Bufflehead, utilize the area as do fewer numbers of Goldeneye, Mallard, and Atlantic Brant.

Table 1. Waterfowl species of the Inner Cape Cod Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Common Eider		X	X
Canada Goose	X	X	X
Atlantic Brant		X	X

Other Migratory Birds:

About 250 species of birds have been sighted at the Wellfleet Bay Wildlife Sanctuary. Of those, some sixty species are nesters including the Green Heron, Clapper Rail, Red-tailed Hawk, Northern Harrier, American Kestrel, Screech Owl, Great Horned Owl, American Woodcock, Black-billed Cuckoo, Ruby Throated Hummingbird, and Prairie, Pine, and Yellow Warbler.

Threats:

Development pressures on Cape Cod continue to threaten unprotected natural resources on the Cape. *Phragmites* is an invasive species that continues to thrive and expand its range in coastal sites.

Conservation Recommendations:

Mosquito control ditching is limited in this area of Cape Cod but small pockets of salt marsh are ditched and should be restored. Conservations restrictions on private property should be sought. Restoration of tidal flow to the Herring River will result in increases tidal marsh for waterfowl.

Focus Area: North and South River Marshes, Massachusetts
Sub-Focus Areas: None

Area Description:

The North and South Rivers are coastal estuaries located in the towns of Scituate and Marshfield, Massachusetts south of Boston and north of Plymouth Bay. The region consists of 2,717 hectares (6,714 acres). Approximately 607 hectares (1,500 acres) are salt marsh heavily infested with *Phragmites* as one travels upriver. The flow of the North River is primarily perpendicular to the coast while the South River parallels the coast. The region is not greatly developed by eastern Massachusetts standards.

Ownership/Protection:

Only 4.4 hectares (11 acres) are in state ownership. The towns of Scituate and Marshfield own 283 hectares (700 acres) and 77 hectares (190 acres) are protected by nonprofit groups. The greatest bulk of the area is in private ownership.

Special Recognition:

The North River has been designated a protected Scenic River. The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Estuary Beggar-ticks	*Bidens hyperborea* var. *colpophila*	E	
Piping Plover	*Charadrius melodus*	T (federally Threatened)	✓
Seabeach Needlegrass	*Aristida tuberculosa*	T	✓
Least Tern	*Sterna antillarum*	SC	
American Sea-Blite	*Suaeda calceoliformis*	SC	✓
Eastern Box Turtle	*Terrapene carolina*	SC	✓

Waterfowl:

Several hundred Black Duck, a few dozen Mallard, as well as various diving duck species use the North and South Rivers for wintering habitat. A few dozen to several hundred Common Eider often winter in the mouth of the two river systems. Canada Goose graze on nearby golf courses but rest on the rivers.

Table 1. Waterfowl species of the North and South Rivers Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Gadwall		X	
Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Scoter species		X	
Common Eider		X	X
Canada Goose	X	X	X
Atlantic Brant		X	

Other Migratory Birds:

The North and South Rivers used to be important Sora and Virginia Rail hunting areas when wild rice beds lined the banks. Their numbers have been reduced due to their habitat invaded by Phragmites.

Threats:

The area is threatened by continued expansion of *Phragmites*, shoreline development, and building of marinas.

Conservation Recommendations:

Shoreline protection through acquisition of key tracts. *Phragmites* control.

Focus Area: North Shore Marshes, Masachusetts
Sub-Focus Areas: None

Area Description:

The North Shore Marshes are the largest contiguous salt marsh in Massachusetts. These marshes extend 27 kilometers (17 miles) from the New Hampshire line to Cape Ann and are interlaced with tidal flats, upland islands, sounds, bays and nine rivers. The marsh, dunes, barrier beach and associated uplands spread over some 14,943 hectares (36,924 acres) and includes 6,474 hectares (16,000 acres) of salt marsh. This region is located in the Acadian Province eco-region, an area of high tidal amplitude extending from the Avalon Peninsula, Newfoundland to Cape Cod. The area contains two American Black Duck wintering concentration sites, one in the mouth of the Merrimac River and a second south of Plum Island Sound. The Plum Island area and Parker River National Wildlife Refuge (NWR) are popular tourist destinations for day tripping from spring through fall.

Ownership/Protection:

This focus area contains the 2,696 hectares (6,662 acres) Parker River NWR and 798 hectares (1,972 acres) of in state wildlife management area. An additional 619 hectares (1,530 acres) are also in state ownership. One hundred and eighty hectares (446 acres) are in municipal ownership and 2,088 hectares (5,160 acres) are owned by nonprofit organizations. The remaining acres are in private ownership.

Special Recognition:

The Merrimack site and adjacent areas are identified in the Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast by the U.S. Fish and Wildlife Service. The North Shore Marshes are also identified by Massachusetts as an Area of Critical Concern. The Newburyport/Merrimac River estuary has been identified as an international migratory shorebird stopover site in the Western Hemisphere Shorebird Reserve Network .

The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Roseate Tern	*Sterna dougallii*	E (federally E)	✓
Upland Sandpiper	*Bartramia longicauda*	E	✓
American Bittern	*Botaurus lentiginosus*	E	
Least Bittern	*Ixobrychus exilis*	E	

Common Name	Scientific Name	State Status	Core Habitat?
Pied-billed Grebe	*Podilymbus podiceps*	E	
Piping Plover	*Charadrius melodus*	T (federally Threatened)	✓
Seabeach Needlegrass	*Aristida tuberculosa*	T	✓
Vesper Sparrow	*Pooecetes gramineus*	T	✓
King Rail	*Rallus elegans*	T	✓
Seabeach Dock	*Rumex pallidus*	T	✓
Eastern Spadefoot	*Scaphiopus holbrookii*	T	✓
Sharp-shinned Hawk	*Accipiter striatus*	SC	
New England Siltsnail	*Cincinnatia winkleyi*	SC	✓
Spotted Turtle	*Clemmys guttata*	SC	
Common Moorhen	*Gallinula chloropus*	SC	
Coastal Marsh Snail	*Littoridinops tenuipes*	SC	✓
Least Tern	*Sterna antillarum*	SC	✓
Common Tern	*Sterna hirundo*	SC	✓
American Sea-Blite	*Suaeda calceoliformis*	SC	✓
Mystic Valley Amphipod	*Crangonyx aberrans*	SC (proposed for de-listing)	

This focus area also includes BioMap Core Habitat for the Salt Marsh, Maritime Dune, and Coastal Interdunal Marsh/Swale natural communities.

Waterfowl:

The North Shore Marshes provide breeding, migration, and wintering habitat for a variety of waterfowl species. The area has a long history of both waterfowl hunting tradition and waterfowl research.

Table 1. Waterfowl species of the North Shore Marshes Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal		X	
Gadwall		X	
Wood Duck	X	X	
Greater Scaup		X	
Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Scoter species		X	X
Common Eider		X	X
Canada Goose	X	X	X
Atlantic Brant		X	

Other Migratory Birds:

Least Bittern, Pied-billed Grebe, and Piping Plover are found here, all of which are on the state's "Threatened" list, while American Bittern, Common Moorhen, and Common Tern are

species of "Special Concern." The area is also home to Roseate and Least Tern. The area is used by dozens of species of wading birds, shorebirds, and neotropical migrant landbirds.

Threats:

Shoreline development and invasive species are the two greatest threats to the region. Massachusetts wetland protection laws insure that the marshes themselves remain intact but development in the area may impact quality of the marshes. Degradation of habitat by *Phragmites* threatens the marsh itself. Mute Swan now nest in the area and are controlled only on the Parker River NWR.

Conservation Recommendations:

Salt marsh restoration through open marsh management techniques and protection of buffering uplands provide the most effective means of protecting salt marsh habitat.

References:

Bailey, R. G. 1976. Ecoregions of the United States. U. S. Forest Service, Ogden, Utah. (Map only; scale 1:7,500,000).

U.S. Fish and Wildlife Service. 1988. Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast, Priority Category 20. Newton Corners, MA.

Focus Area: Outer Cape Cod, Massachusetts
Sub-Focus Areas: None

Area Description:

The Cape Cod National Seashore protects much of outer Cape Cod. American Black Duck, migrant Canada Goose, and Atlantic Brant winter in Pleasant Bay outside the National Seashore boundaries. The tidal flats and salt marsh around Sipson Meadow and Strong Island are among the most important wintering habitats in Massachusetts. The nature of the Outer Cape area is subject to change as natural erosion and siltation breaches and restores sections of barrier beach.

Ownership/Protection:

The Outer Cape Cod Focus Area consists of 6,799 hectares (16,801 acres) of which 599 hectares (1,482 acres) are protected by the Cape Cod National Seashore. The state owns only 2.8 hectares (7 acres), but municipal governments own 83 hectares (206 acres) and nonprofit agencies, 181 hectares (448 acres). There are additionally 41 hectares (102 acres) privately protected.

Special Recognition:

Pleasant Bay has been recognized as a Massachusetts Area of Critical Environmental Concern since 1987. The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Roseate Tern	*Sterna dougallii*	E (federally E)	✓
Short-eared Owl	*Asio flammeus*	E	✓
Piping Plover	*Charadrius melodus*	T (federally T)	✓
Diamondback Terrapin	*Malaclemys terrapin*	T	✓
Strigose Knotweed	*Polygonum setaceum* var. *interjectum*	T	
Comet Darner	*Anax longipes*	SC	
Spotted Turtle	*Clemmys guttata*	SC	✓
New England Bluet	*Enallagma laterale*	SC	✓
Bushy Rockrose	*Helianthemem dumosum*	SC	
Least Tern	*Sterna antillarum*	SC	✓
Common Tern	*Sterna hirundo*	SC	✓
Arctic Tern	*Sterna paradisaea*	SC	✓
Eastern Box Turtle	*Terrapene carolina*	SC	✓

This focus area also includes BioMap Core Habitat for the Estuarine Intertidal: Saline/Brackish Flats natural community.

Waterfowl:

The Outer Cape area provides breeding and migration habitat in the Nauset Marshes and migration and wintering habitat in Pleasant Bay for a variety of waterfowl and water bird species. It has been a traditional waterfowling site for both Cape Cod and mainland sportsmen.

Table 1. Waterfowl species of the Outer Cape Cod Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal	X	X	
Gadwall		X	
Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Scoter species		X	X
Common Eider		X	X
Canada Goose	X	X	X
Atlantic Brant		X	X

Other Migratory Birds:

A variety of migratory birds utilize the area including wading species, shorebirds, raptors, neotropical migrants, and other passerines.

Threats:

Development pressures on Cape Cod are escalating and the quality of the salt marsh is threatened by shoreline development and increased tourist related activities.

Conservation Recommendations:

Acquire conservation restrictions on buffering properties.

Focus Area: Westport Rivers, Massachusetts
Sub-Focus Areas: None

Area Description:

The East and West Branches of the Westport River are located in the southwestern corner of coastal Massachusetts, next to Rhode Island. The area is located in the Virginian Province as classified by Bailey (1976), a coastal region of low tidal amplitude and the heart of the Black Duck wintering range that extends from Cape Cod to Cape Hatteras (U.S. Fish and Wildlife Service 1988). The West Branch is the shorter of the two, extending back only 6 kilometers (4 miles) before abruptly narrowing at the mouth of the small Gray's Mill Pond in Adamsville, Rhode Island on the Massachusetts border. The East Branch extends back 14 kilometers (9 miles) originating at the outlet of Noquochoke Lake in Dartmouth, Massachusetts. Both branches are characterized by large numbers of islands of various sizes and elevations. The total focus area size is 6,221 hectares (15,371 acres) and contains 400 hectares (990 acres) of salt marsh and about 101 hectares (250) acres of important tidal flats.

Ownership/Protection:

There is no acreage under federal protection but the state owns 210 hectares (520 acres), most of which is the Horseneck Beach State Park. There is 39 hectares (97 acres) in municipal ownership and 58 hectares (145 acres) protected by nonprofit organizations.

Special Recognition:

Westport Point is identified in the Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast by the U.S. Fish and Wildlife Service (U.S. Fish and Wildlife Service 1988) as an important Black Duck wintering site.

The following table is a list of current records of state-listed rare species for this focus area accepted by The Massachusetts Natural Heritage & Endangered Species Program (NHESP). In addition, there is a column indicating whether the Focus Area includes BioMap or Living Waters Core Habitat for each species. The NHESP recently delineated areas across the state, called Core Habitats, which if protected would conserve the most viable populations of rare species and the best examples of natural communities over the long term. The BioMap covers terrestrial and wetland species and communities; the Living Waters map covers truly aquatic species and communities.

State status abbreviations: E – Endangered; T – Threatened; SC – Species of Special Concern

Common Name	Scientific Name	State Status	Core Habitat?
Northeastern Beach Tiger Beetle	*Cicindela dorsalis dorsalis*	E (federally T)	✓
Least Bittern	*Ixobrychus exilis*	E	
Crested Fringed Orchis	*Platanthera cristata*	E	✓
Sea Pink	*Sabatia stellaris*	E	✓
Northern Gama-Grass	*Tripsacum dactyloides*	E	✓
Marbled Salamander	*Ambystoma opacum*	T	✓
Grasshopper Sparrow	*Ammodramus savannarum*	T	✓

Common Name	Scientific Name	State Status	Core Habitat?
Arethusa	*Arethusa bulbosa*	T	
Piping Plover	*Charadrius melodus*	T	
Northern Harrier	*Circus cyaneus*	T	✓
Imperial Moth	*Eacles imperialis*	T	
Diamondback Terrapin	*Malaclemys terrapin*	T	✓
King Rail	*Rallus elegans*	T	✓
Grass-Leaved Ladies'-Tresses	*Spiranthes vernalis*	T	✓
Coastal Heathland Cutworm	*Abagrotis nefascia benjamini*	SC	✓
Straight Lined Mallow Moth	*Bagisara rectifascia*	SC	
Chain Dot Geometer	*Cingilia catenaria*	SC	✓
Spotted Turtle	*Clemmys guttata*	SC	✓
Four-Toed Salamander	*Hemidactylium scutatum*	SC	✓
New England Blazing Star	*Liatris borealis*	SC	✓
Pale Green Pinion Moth	*Lithophane viridipallens*	SC	
Pinnate Water-Milfoil	*Myriophyllum pinnatum*	SC	
Plymouth Gentian	*Sabatia kennedyana*	SC	✓
Bristly Foxtail	*Setaria geniculata*	SC	✓
Spartina Borer Moth	*Spartiniphaga inops*	SC	
Least Tern	*Sterna antillarum*	SC	
Common Tern	*Sterna hirundo*	SC	
Eastern Box Turtle	*Terrapene carolina*	SC	✓
Mystic Valley Amphipod	*Crangonyx aberrans*	SC (proposed for de-listing)	

This focus area also includes BioMap Core Habitat for the Acidic Graminoid Fen, Coastal Forest/Woodland, Coastal Interdunal Marsh/Swale, Brackish Tidal Marsh, Coastal Salt Pond Marsh, Coastal Salt Pond, Kettlehole Wet Meadow, Maritime Beach Strand, Maritime Dune, Maritime Oak - Holly Forest/Woodland, and Maritime Shrubland natural communities.

Waterfowl:

American Black Duck winter throughout the river system, but especially in the southern portions of the East Branch around Big Ram Island. They also utilize nearby Allens Pond. Use on the West Branch is more pronounced in the upper reaches. Wintering Black Duck numbers are greater in severe winters when birds are frozen out of the North Shore marshes. The area also winters as many as 3,000 Canada Goose, many from the North Atlantic Population of maritime Canada. It is also an important wintering spot for Bufflehead and, to a lesser degree for Common Goldeneye. Some years several hundred Mute Swan winter in the system.

Table 1. Waterfowl species of the Westport Rivers Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal		X	
Gadwall	X	X	
Greater Scaup		X	

Common Goldeneye		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Canada Goose	X	X	X

Other Migratory Birds:

There is a coastal heron rookery in the area and nesting Osprey. Other species of special concern or threatened include King Rail, Least Tern and Piping Plover.

Threats:

With escalating property values in Massachusetts, the "South Coast", a long region of dairy farms and small towns, is being touted as the place to locate your new business. Development pressures are increasing. While *Phragmites* has invaded some inland ponds in the region, the Westport Rivers themselves are still relatively free of the pest plant, which is a European strain of Phragmites, not the North American variety (Conniff 2003).

Conservation Recommendations:

Land acquisition along the shore line and buffering upland area is recommended.

References:

Bailey, R. G. 1976. Ecoregions of the United States. U. S. Forest Service, Ogden, Utah. (Map only; scale 1:7,500,000).

Conniff, R. 2003. The beautiful invader. Yankee Magazine: Sept. 2003. pp:48-55.

U.S. Fish and Wildlife Service. 1988. Category Plan for Preservation of Black Duck Wintering Habitat – Atlantic Coast, Priority Category 20. Newton Corners, MA.

7.2.8 New Hampshire

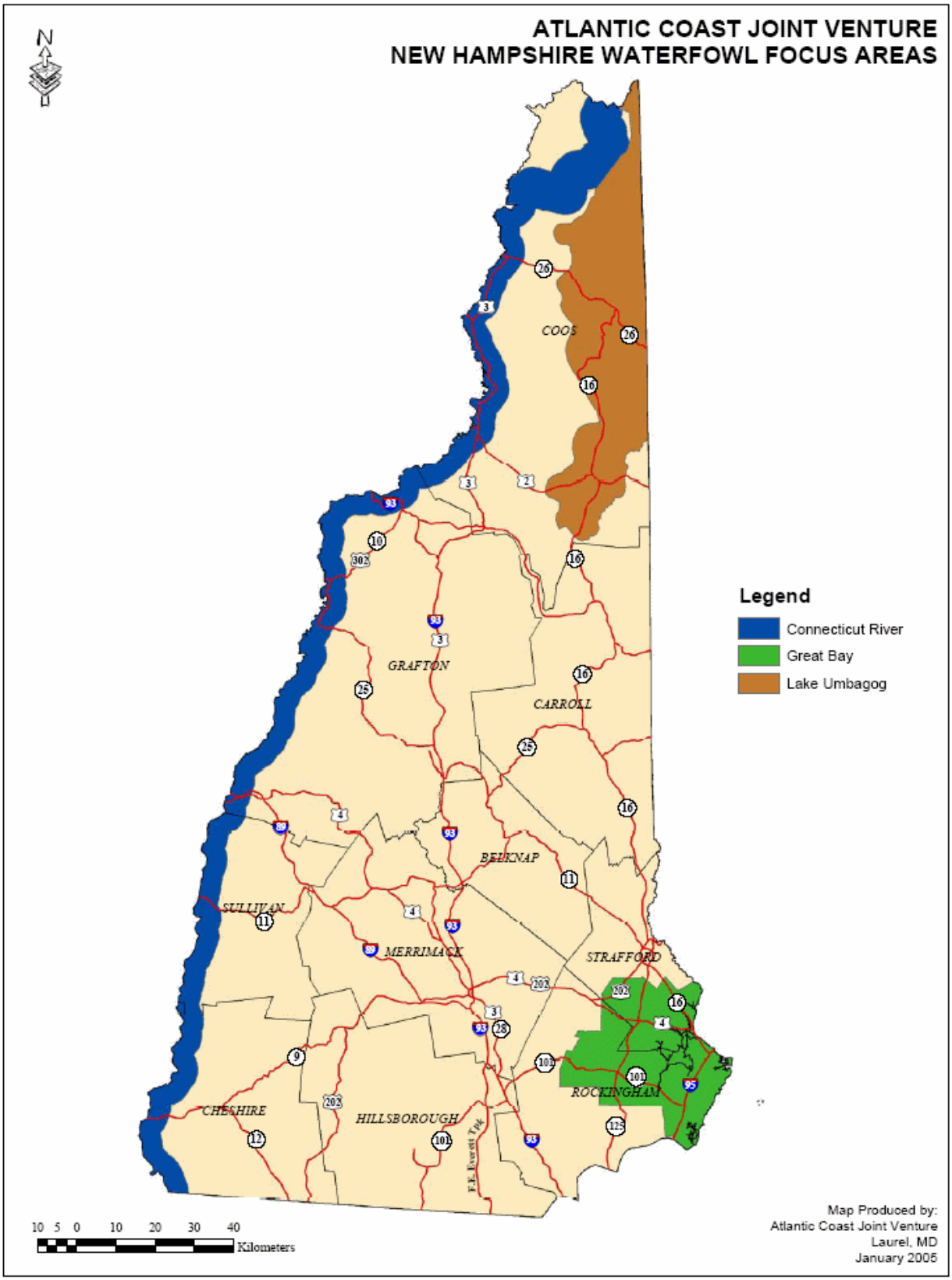

Figure 7.9. New Hampshire waterfowl focus areas.

Focus Area: Connecticut River, Vermont & New Hampshire
Sub-Focus Areas: None

Area Description:

The Connecticut River Focus Area is a shared focus area between Vermont and New Hampshire. It extends from Third Connecticut Lake on the New Hampshire/Quebec border to the Massachusetts state boundary. The focus area boundaries extend 5 kilometers (3 miles) from the centerline of the river into both Vermont and New Hampshire. The Connecticut River is the centerpiece of human settlement and early transportation in Northern New England. Early European settlers used the river as a means of penetrating the interior of the northeastern United States. The natural resources of the river and its watershed are rich. Although the Connecticut River valley is narrow, the watershed in the largest in New England at over 6,800 km^2 and the river accounts for over 70% of the freshwater inflow into Long Island Sound. Both sides of the river are punctuated by numerous oxbow wetlands, and extensive willow/alder swales, forested wetlands, and open, emergent marshes are adjacent to the river throughout much of its length. These wetlands provide important breeding and migratory stopover habitat several species of waterfowl and other priority bird species (e.g., American Woodcock, Canada Warbler). Although only 11% of the watershed is under agriculture, most of this lies adjacent to the river and within the focus area (U.S. Fish & Wildlife Service 1995). This agricultural area contains a concentration of diverse wetland habitats, as well as some of the richest, most productive soils in the eastern United States. Palustrine emergent and forested wetlands are both common in the valley. Forested wetlands are characterized by red maple with silver maple, cottonwood, and black willow in the floodplain forests, where they occur. Conifers include spruce-fir and northern white cedar. Agriculture is the dominant land use in the valley and includes fruits, grains, vegetables, dairy, and shade-grown tobacco. Agricultural crops often increase the value of sheet water habitats that commonly occur here, especially in the spring, and provide an important resource for migratory birds during their annual cycle.

Ownership/Protection:

Much of the Connecticut Valley is privately owned. However, many large tracts within and adjacent to the focus area are now either in conservation ownership or protected by conservation easements. The Vermont portion of the focus area includes 5,615 hectares (13,875 acres) of state land, 10,946 hectares (27,050 acres) of privately-owned conservation land, 2,610 hectares (6,450 acres) of municipally owned land, and 384 hectares (950 acres) of federal land. The focus area lies entirely within the approved boundaries of the Silvio O. Conte National Fish and Wildlife Refuge (SOC NFWR). Immediately to the west of the focus area in Vermont is the 8,903 hectare (22,000 acres) West Mountain Wildlife Management Area (WMA) and--further west--the 10,521 hectare (26,000 acres) Nulhegan Basin Division of the SOC NFWR. These lands are part of a contiguous 53,823 hectare (133,000 acres) block of land formerly owned by Champion International Paper Company and now held in easement or fee by conservation entities (33,993 hectares or 84,000 acres of which are on land owned by Essex Timber Company). Other large blocks of conservation land are on the New Hampshire side of the river, including a 69,403 hectare (171,500 acres) conservation easement brokered by the Trust for Public Lands, The Nature Conservancy (TNC) and the State of New Hampshire, and another 7,689 hectare (19,000 acres) parcel in conservation easement held by TNC. Several of these projects were supported by a 2001 North American Wetland Conservation Act grant. Vermont

state lands along the river include Roaring Brook, Fairlee Marsh and Skitchewaug WMA; Ascutney and Fort Dummer State Park; and Thetford Hill State Forest. In New Hampshire, public lands include the Lime Pond and Huntington Hill Conservation Easements; Fort Hill, Reeds, Hubbard Farms, Great Island, Cornish, and Wilder WMA; Hidden Valley Wildlife Conservation Area; Hubbard Hill, Cape Horn, and Connecticut River State Forest, and Wantastiquet Mountain Natural Area.

Special Recognition:

The Connecticut River is recognized as an American Heritage River through the Environmental Protection Agency. Its biodiversity values are recognized by the U.S. Fish and Wildlife Service with the entire Connecticut River Watershed identified under the Silvio O. Conte National Fish and Wildlife Refuge. Also, the U.S. Fish and Wildlife Services Regional Wetlands Concept Plan recognizes five wetland sites as priority wetlands (U.S.F.W.S. 1990). The Connecticut River was also designated into the New Hampshire Rivers Management and Protection Program.

Waterfowl:

The Connecticut River is a migratory corridor for many species of waterfowl. Ducks, including sea ducks, and geese use the corridor for both spring and fall migration. It contains prime breeding habitat for Wood Duck, Black Duck, Mallard, and Canada Goose. Other species nest within the focus area sporadically or in smaller numbers (Table 1), though many are commonly seen during migration (e.g., teal, Ring-necked Duck).

Table 1. Waterfowl species using the Connecticut River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Hooded Merganser	X	X	X
Common Merganser	X	X	X
Canada Goose	X	X	X
Wood Duck	X	X	
Blue-winged Teal	X	X	
Green-winged Teal	X	X	
Ring-necked Duck	X	X	
Common Goldeneye		X	X
Greater Snow Goose		X	
Atlantic Brant		X	

Other Migratory Birds:

The Connecticut River is rich with a diversity of migratory birds. Rails, grebes, Wilson's Snipe, and herons use the focus area for breeding and migration. Within the entire watershed, 181 passerine and raptor species have been identified (U.S Fish & Wildlife Service 1995). Priority species identified by Partners in Flight breeding within the Connecticut River Valley include Wood Thrush, American Woodcock, Olive-sided Flycatcher, Canada Warbler, Veery, Bobolink, Northern Harrier, Common Loon, and Belted Kingfisher. Other species identified by

various Continental and Regional Shorebird and Waterbird Conservation plans include Solitary Sandpiper (migration only) and breeding species such as American Bittern, Pied-billed Grebe, Virginia Rail, and Wilson's Snipe.

Threats:

The Connecticut River valley harbors some of the most intensive agriculture in the northeast. Pollution from agricultural runoff threatens the integrity of water quality and, thus, the value to wildlife. Recreation also is increasing on the river with as many as 400,000 people living within the watershed. Development is a threat with large, flat expanses of land available for second homes and other urban and suburban development. More non-native species (35) of fish live within the river than native species (33). Many of these species were introduced to provide more recreational opportunities. Fourteen functional dams are on the mainstem of the river and have significantly altered habitat throughout the river system and impeded natural fish migration. Within the watershed, 980 dams are located on the tributaries.

Conservation Recommendations:

The purpose of the Silvio O. Conte National Fish and Wildlife Refuge is to protect the native diversity of flora and fauna throughout the Connecticut River Watershed. The actions of the refuge include working with all partners within the watershed through a variety of federal and state programs to meet the goals set forth by the refuge. These programs, not limited to the refuge, include land acquisition, managing or regulating public use, control of exotic species, dam removal, and other programs designed to enhance and conserve the rich natural resources of the Connecticut River Valley.

References:

U.S. Fish and Wildlife Service. 1990. Regional wetlands concept plan: Emergency Wetlands Resources Act. U.S. Fish and Wildl. Serv., Hadley, MA.

U.S. Fish and Wildlife Service. 1995. The Silvio O. Conte National Fish and Wildlife Refuge: Final action plan and environmental impact statement. U.S. Fish and Wildlife Service, Hadley, MA 535 pp.

Focus Area: Great Bay, New Hampshire
Sub-Focus Areas: None

Area Description:

The Great Bay Focus Area encompasses approximately 110,000 hectares (271,814 acres) across twenty-four townships in southeastern New Hampshire surrounding the Great Bay Estuary. The estuary has been widely recognized as one of the most important estuarine systems and waterfowl habitat in the northeastern United States. Approximately 1,800 hectares (4,447 acres) are tidally influenced with shallow waters, mud flats, and extensive eelgrass beds. More than twenty species of waterfowl, twenty-seven species of shorebirds, and thirteen species of wading birds breed, migrate, or winter in the Great Bay Estuary (GBRPP 2000). The bay is also noted for its fishery resources, especially striped bass, shad, and shellfish. The wetlands of the focus area are characterized by several subclasses of marine intertidal, estuarine intertidal, riverine, lacustrine, and palustrine wetlands. Palustrine-forested wetlands are the dominant wetland type followed by scrub-shrub and emergent wetlands within the focus area. The estuary is characterized by approximately 1,800 hectares (4,447 acres) of tidal waters with broad eelgrass beds and mudflats as well as estuarine intertidal-emergent marshes with smooth cordgrass and salt meadow hay. The uplands are a transition zone between the deciduous forest to the south and the coniferous forest to the north. Common species include red oak, red maple, quaking aspen, white pine, red pine, and eastern hemlock. The migratory bird resources are as diverse as the vegetative communities. Over 280 species of birds breed, migrate through, or over-winter in the Great Bay Focus Area.

Ownership/Protection:

Much of the Great Bay Focus Area is under private ownership in relatively small parcels. However, the U.S. Fish and Wildlife Service owns the Great Bay National Wildlife Refuge adjacent to the estuary. In addition, a number of parcels throughout the focus area are under conservation protection through the efforts of the Great Bay Resource Protection Partnership with a variety of owners including the Audubon Society of New Hampshire, The Nature Conservancy, The U.S. Fish and Wildlife Service, and local towns. The Great Bay Estuarine Research Reserve was established in 1989 and encompasses over 4,000 hectares (9,884 acres) of tidal waters. The reserve is managed by the New Hampshire Fish and Game Department under the Marine Fisheries Division. As of January, 2004, the Great Bay Resource Protection Partnership has conserved over 2,428 hectares (6,000 acres) of wildlife habitat around the bay by acquiring or securing conservation easements on important properties.

Special Recognition:

A number of sites within the Great Bay Focus Area have been recognized for their resource value. The area is included in the Environmental Protection Agencies National Estuary's Program; it is recognized as a National Estuarine Research Reserve under the National Oceanic and Atmospheric Association; and the Lamprey River, a major tributary, is designated a National Wild and Scenic River. In addition the U.S. Fish and Wildlife Service recognizes six wetland sites within the focus area as important under the Regional Wetlands Concept Plan (U.S.F.W.S. 1990).

Waterfowl:

The Great Bay estuary is one of the most important waterfowl areas in New Hampshire and is the most important wintering area harboring virtually all of New Hampshire's wintering Black Duck. At least twenty species of waterfowl use the estuary and associated freshwater wetlands for breeding, migration, and wintering.

Table 1. Waterfowl using the Great Bay Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Red-breasted Merganser	X	X	X
Canada Goose	X	X	X
Northern Pintail		X	X
Green-winged Teal		X	X
Common Goldeneye		X	X
Bufflehead		X	X
Greater Scaup		X	X
Wood Duck	X	X	
Blue-winged Teal	X	X	
Common Merganser	X	X	
Hooded Merganser	X	X	
Northern Shoveler		X	
Gadwall		X	
American Wigeon		X	
Redhead		X	
Canvasback		X	
Ring-necked Duck		X	
Ruddy Duck		X	
Snow Goose		X	
Atlantic Brant		X	

Other Migratory Birds:

The complex of estuarine and freshwater wetlands and surrounding uplands contain a rich diversity of non-waterfowl migratory bird species. Many species identified as high priority in the Southern New England Partners in Flight Plan (Dettmers and Rosenberg 2000) are found within the focus area. These include Saltmarsh Sharp-tailed Sparrow, Seaside Sparrow, Alder Flycatcher, Cerulean Warbler, Wood Thrush, Golden-winged Warbler, Blue-winged Warbler, and Least Bittern. Shorebirds and waterbirds include Whimbrel, Black Tern, American Golden Plover, Stilt Sandpiper, Semipalmated Sandpiper, Great Blue Heron, and Virginia Rail. In addition, Bald Eagle are regular winter residents in the Great Bay Estuary and are increasing in numbers.

Threats:

The greatest threat to the Great Bay Focus Area is the intense development pressure surrounding the estuary. Development for residential areas in proximity to the estuary has been

rising at a tremendous pace resulting in habitat loss. The average size of parcels within the focus area is relatively small, resulting in a very patchy landscape bordered or fragmented by development. Recreational use of the estuary is also increasing which intensifies disturbances to migratory birds. Intense use of the uplands surrounding the estuary also adds to disturbance levels and increases runoff from development, degrading water quality critical to maintaining healthy eelgrass beds. In fact, one of the Great Bay Resource Protection Partnership's primary objectives is to maintain the water quality of the bay and its rivers. Poor water quality has been identified as a cause of wasting disease which causes eelgrass beds to die off.

Conservation Recommendations:

Partners with the Great Bay Resource Protection Partnership have been working successfully to protect priority parcels within the focus area. The Partnership has put together a Habitat Protection Plan outlining the priorities within the focus area and has been diligently pursuing plan objectives that address some of the conservation threats to the resource. Conservation of properties, especially those adjacent to other protected areas, is a priority with the Partnership to help stem development and create larger patches of habitat. Disturbance should be kept to a minimum in the higher priority areas of the estuary surrounding the eelgrass beds and mudflats. Restoration of eelgrass within the estuary should also be a priority.

References:

U.S. Fish and Wildlife Service. 1990. Regional wetlands concept plan: Emergency Wetlands Resources Act. U.S. Fish and Wildl. Serv., Hadley, MA.

Dettmers, R., and K.V. Rosenberg. 2000. Landbird conservation plan: southern New England. Cornell Lab of Ornithology, Cornell, NY 52 pp.

Great Bay Resource Protection Partnership. 2000. Habitat protection plan. Great Bay Resource Protection Partnership, Durham, NH. 83 pp.

7.2.9 New Jersey

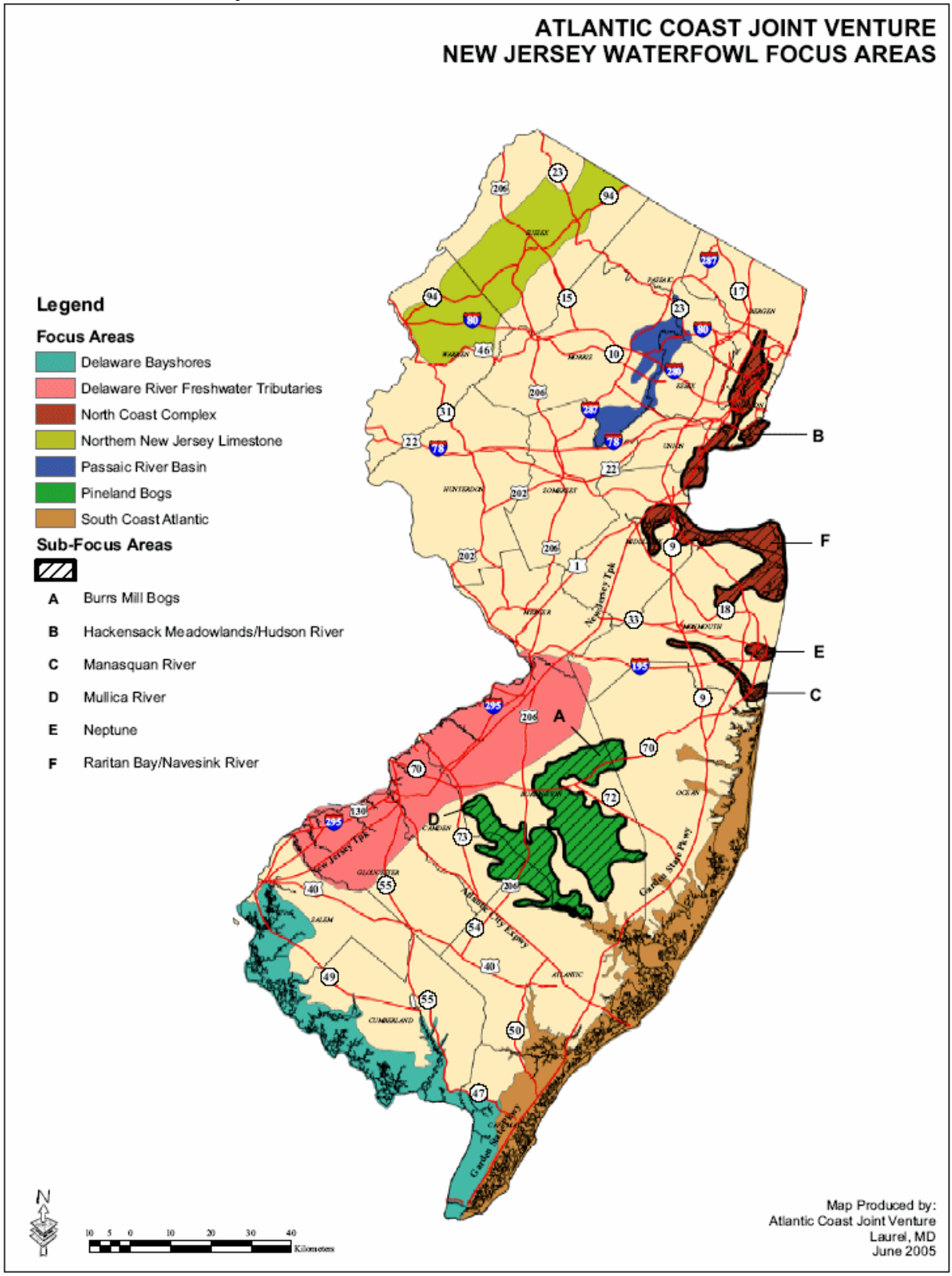

Figure 7.10. New Jersey waterfowl focus areas.

Focus Area: Delaware Bayshores, New Jersey
Sub-Focus Areas: None

Area Description:

The Delaware Bayshores focus area is one of the most important migratory bird habitats in the country providing a critical link between wintering and nesting grounds, especially for shorebirds. It is a large focus area located along the Delaware Bay coastline of New Jersey extending roughly 115 kilometers (71 miles) from the tip of Cape May to the town of Deepwater, NJ. It extends inland approximately 10-12 kilometers (6-7 miles) encompassing all the coastal wetlands as well as an upland buffer. The focus area extends up the Maurice River approximately 22 kilometers (13 miles) to Millville, NJ to include important wetland habitats associated with the river. The wetlands associated with the Delaware are a vast network of marshes and creeks ranging from high-salinity tidal saltmarshes to freshwater emergent and forested wetlands. Tidal marshes are characterized by saltmarsh hay, smooth cordgrass, big cordgrass, and water hemp with arrowhead, cattail, and yellow pond lily in the low salinity or freshwater zones. The focus area also contains unique and rare species of plants. It contains the largest stands of wild rice in New Jersey, the largest population of sensitive joint vetch in the world, and rare species such as swamp beggars tick and Parkers pipewort. Common reed or phragmites has invaded a number of wetlands and poses a serious threat to wetland diversity. The uplands are dominated by a mix of grain and vegetable farms with scattered forests fragments . Forested areas are predominately oak-pine. Over 250 species of migratory birds and over one million individuals pass through the Delaware Bayshores focus area. In addition the Delaware Bay supports the largest population of spawning horseshoe crabs in the world, which act as a keystone to the reproductive success of many spring-migrating shorebirds.

Ownership/Protection:

Much of the shoreline in New Jersey is under private ownership. However, the state of New Jersey owns over 16,000 ha within the general Delaware Bayshores area**.** The U.S. Fish and Wildlife Service owns the 1,100 ha Supawna Meadows National Wildlife Refuge as well as Cape May NWR, which maintains several parcels along the Delaware Bayshores. Other agencies such as The Nature Conservancy, New Jersey Natural Lands Trust, and Cape May County Park Commission also maintain holdings for conservation purposes.

Special Recognition:

The Delaware Bay has been recognized by numerous organizations for its rich biological diversity and importance to breeding, migrating, and wintering birds. It has been recognized as a wetland of international importance under the Ramsar Convention, it is only one of two Hemispheric Shorebird Reserves on the Atlantic coast, declared an estuary of national significance by the U.S. Environmental Protection Agency, and as one of the “Last Great Places” by The Nature Conservancy. In addition, the U.S. Fish and Wildlife Service recognizes a number of wetlands of the Delaware Bayshores as priority wetlands under the Regional Wetlands Concept Plan. The New Jersey Natural Heritage Program lists the river as a priority macrosite for conserving and maintaining biodiversity.

Waterfowl:

The waterfowl resources of the Delaware Bay are tremendous with over 55,000 ducks and 250,000 other waterfowl using the Delaware Bay and Bayshores marshes for breeding, migration, or wintering. The marshes of the bayshores winter over 40,000 American black ducks, 8,000 mallards, and 1,000 northern pintails. In addition to large numbers of ducks, the Delaware Bay including the bayshores area, host nearly 200,000 snow geese during the winter and as a spring staging area and approximately 80,000 Canada geese.

Table 1. Waterfowl species occurring in Delaware Bayshores Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail	X	X	X
American Wigeon		X	X
American Green-winged Teal		X	X
Gadwall		X	X
Wood Duck	X	X	X
Red-breasted Merganser		X	X
Hooded Merganser		X	X
Common Merganser		X	X
Canvasback		X	X
Redhead		X	X
Ring-necked Duck		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Surf Scoter		X	X
Bufflehead		X	X
Canada Goose	X	X	X
Snow Goose		X	X
Atlantic Brant		X	X

Other Migratory Birds:

Over 250 different species of birds and over one million individuals use the Delaware Bay and Bayshores marshes for critical habitat stopover or wintering habitat. The area is the second largest concentration of shorebirds in North America next to the Copper River Delta in Alaska. Over one million shorebirds of at least 10 species use the Delaware Bay and Bayshores area as a critical stopover site to re-fuel during spring migration. The migration is timed with the largest spawning of horseshoe crabs in the world providing the shorebirds with energy-rich eggs. Birds can double their body weight in less than two weeks. The most prevalent species of shorebirds are semipalmated sandpipers, dunlins, short-billed dowitchers, red knots, sanderlings, and ruddy turnstones. In addition to the tremendous numbers of shorebirds, the extensive and diverse saltwater, brackish, and freshwater marshes host thousands of other waterbirds including six species of herons, great and snowy egrets, glossy ibis, Virginia and clapper rails, soras, northern harriers, and sharp-tailed and seaside sparrows. Other species using the streamside and

riparian forests include Swainson's warblers, prothonotary warblers, and wood thrushes. Northern bobwhite, bobolink, vesper and grasshopper sparrows are found in upland areas..

Threats:

The Delaware Bayshores focus area faces a number of threats some of which are potentially catastrophic. The seaports in Wilmington, DE and Philadelphia, PA support some of the largest petro-chemical facilities in the U.S. Accidental oil or chemical spills into the Delaware Bay could prove to be disastrous depending on the time of year. Also, non-point and point source pollution from the industrial megalopolis along the Delaware River poses serious threats to the water quality and, thus, the integrity of the coastal wetlands. Residential and commercial development of the Bayshores area continues to increase resulting in fragmented habitats, increased disturbance, and increased pollution. Increased disturbance also is from increasing human activity along the Bayshores and beach for recreation. Shorebirds are dependent upon horseshoe crabs to complete their migration and return to the breeding grounds in reproductive shape. Continued decline of horseshoe crab populations poses a serious threat to the survival of many species of shorebirds.

Conservation Recommendations:

Oil and chemical spill contingency plans have been approved for the Delaware Bay. These plans should be kept current and periodically reviewed. Disturbance to shorebirds is a critical threat that should be eliminated. These birds have a very limited window to increase body reserves and continue the northward migration. The habitats of the Bayshores area are still relatively intact and functioning. Protection through fee acquisition and restoration of wetlands should be pursued through state and federal agencies.

Focus Area: Delaware River Tidal Freshwater Tributaries, New Jersey
Sub-Focus Areas: None

Area Description:

The Delaware River Tidal Freshwater Tributaries Focus Area is one of the most valuable focus areas in New Jersey. The focus area is located in southwestern New Jersey, within the Inner Coastal Plain physiographic province. The area encompasses portions of Salem, Gloucester, Camden, Burlington, and Mercer Counties and is located entirely within the Philadelphia, Pennsylvania metropolitan area. The focus area includes all of the major Delaware River tributaries in New Jersey between Penns Grove to the south and Trenton to the north. Major tributaries, from the south, include Oldmans, Raccoon, Mantua, Woodbury, Big Timber, Newton, Cooper, Pennsauken, Rancocas, and Crosswicks Creeks. Numerous other, yet smaller creeks are also included in the focus area. The dominant land use is industrial, primarily related to oil refinery, chemical production, and manufacturing. The area is also heavily residential given the proximity to Philadelphia. In the southern and northern portion of the focus area, intensive agriculture is practiced with many agricultural fields occurring within 25 meters (82 feet) of wetlands. Vegetable crops are the primary crops grown although small grains and fruit orchards are also common.

Despite the high human density, the majority of the wetlands in the focus area are productive, tidal, freshwater wetlands. Tidal wetlands are dominated by emergents including wild rice, arrow arum, bur marigold, spatterdock, smartweeds, rice cutgrass, and cattails. Invasive emergents, including *Phragmites* and purple loosestrife are also present. Both invasives are more abundant in wetlands excluded from tides. Salinities range from 0-0.5 parts per thousand in the southern tributaries (i.e.: Oldmans and Raccoon Creeks) while other tributaries are typically freshwater. Average tidal amplitudes are significant and range from 1.3-2.0 meters (2-6 feet). Several tributaries in the focus area are also impounded or restricted from tides with sluice gates. Wetlands restricted from tides and areas upstream from and adjacent to tidal marshes are typically scrub-shrub and/or forested wetlands. Scrub-shrub wetlands are dominated by buttonbush, water willow, sweet pepperbush, rushes and sedges. Red maple, black gum, and sweet gum dominate forested wetlands and wetland fringes. Yellow poplar, several species of oak, and American beech comprise the upland forests.

Ownership/Protection:

The majority of the focus area is under private ownership primarily for residential, industrial, and agricultural purposes. Although the state lays claim to ownership of all tidal wetlands through the New Jersey Wetlands Act of 1970, many individuals still pay property taxes on marshes that were previously diked for agricultural purposes. The New Jersey Division of Fish and Wildlife has three small Wildlife Management Areas within the focus area totaling 103 hectares (254 acres). Rancocas State Park, managed by the New Jersey Division of Parks and Forestry, totals 507 ha. The County Park Commissions of Gloucester, Camden, and Mercer also maintain holdings for conservation purposes. The New Jersey Audubon Society owns Monds and Chester Islands, which are situated in the Delaware River and are important sites for breeding and wintering birds. The fertile soils and strong agricultural traditions have resulted in a considerable amount of holdings in Farmland Preservation easements.

Special Recognition:

The Delaware Bay and its tributaries have been recognized by several conservation organizations for its rich biological diversity and importance to breeding, migrating, and wintering birds. The Delaware Bay Estuary, of which a portion of the focus area lies, has been recognized as a wetland of international importance under the Ramsar Convention.

Waterfowl:

The Delaware River Tidal Freshwater Tributaries Focus Area hosts a significant concentration of migratory waterfowl in the northeastern U.S. Tidal freshwater marshes in the focus area are renowned for their concentrations of dabbling ducks, most notably northern pintails, during the spring migration. In February 1990, 50,000 pintails were estimated in Oldmans and Raccoon Creeks (Walsh et al. 1999) while an aerial survey of focus area wetlands on 27 February 2004 yielded 31,300 dabbling ducks of which 23,400 were pintails (NJ Division of Fish and Wildlife, unpublished data). During 2004, a significant percent of pintails marked with satellite telemetry transmitters on Atlantic Flyway wintering grounds from Florida to New Jersey, staged in focus area wetlands during the spring migration (R. A. Malecki, pers. comm.). Periodically, tens of thousands of lesser scaup stage on the Delaware River within the focus area during spring (T.C. Nichols, pers. comm.). Band recovery data suggest that focus area wetlands and agricultural areas are important migration and wintering areas for Atlantic Population Canada geese (NJ Division of Fish and Wildlife, unpublished data).

Table 1. Primary waterfowl species using the Delaware River Tidal Freshwater Tributaries Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	X
American Green-winged Teal		X	X
Gadwall		X	X
Wood Duck	X	X	X
Hooded Merganser		X	X
Common Merganser		X	X
Lesser Scaup		X	X
Canvasback		X	X
Ruddy Duck		X	X
Ring-necked Duck		X	X
Atlantic Population Canada Goose		X	X

Other Migratory Birds:

Over 230 different species of birds use the focus area for breeding, migration, and wintering habitat. Several species of obligatory waterbirds breed in the focus area including pied-billed grebe, American bittern, least bittern, Great-blue heron, great egret, black-crowned

night-heron, green heron, king rail, Virginia rail, and common moorhen (Walsh et al. 1999). Several pairs of bald eagles nest in the focus area. In addition to the significant numbers and diversity of waterbirds, forested wetlands and adjacent uplands support over 100 species of passerines. American woodcock use wetlands and adjacent early successional sites in the focus area.

Threats:

The Delaware River Tidal Freshwater Tributaries Focus Area is situated entirely within the ports of Wilmington, Delaware and Philadelphia, Pennsylvania, which together support some of the largest petro-chemical facilities in the U.S. As such, the focus area faces a number of threats that could be potentially catastrophic. Indeed, since 1975, the focus area has the dishonor of being the site of 4 petroleum spills exceeding 250,000 gallons including the most recent spill of the Athos I during November 2004. Results of such large-scale spills are immediate, including mortality of oiled wildlife, and long term, including damages to the benthic and vegetative communities. Numerous smaller oil and chemical spills occur annually. Residential and commercial development of the uplands in the focus area continues to increase resulting in fragmented habitats, increased disturbance, and increased pollution. Point and non-point pollution from the industrial and residential megalopolis along the Delaware River poses serious threats to the water quality and, thus, the integrity of the focus area wetlands. Sea level rise and/or increased dredging for shipping operations could threaten the freshwater integrity of the valuable focus area emergent wetlands. Increasing human recreational activity, largely from jet skis, may result in additional marsh erosion and wildlife disturbance.

Conservation Recommendations:

Oil and chemical spill contingency plans are in place for the Delaware Bay and River. These plans should be periodically reviewed and updated to reduce the likelihood of future spills and improve the efficacy of oil spill response efforts. The proximity of the area to Philadelphia places tremendous commercial and residential development pressure on the few remaining open spaces. Protection through fee acquisition, land easements, and other cooperative agreements should be pursued through the various government and non-government agencies.

References:

Malecki, R.A. 2004. New York Cooperative Wildlife Research Unit, Cornell University. Personal Communication.

Nichols, T.C. 2005. New Jersey Department of Environmental Protection, Division of Fish and Wildlife. Personal Communication.

Walsh, J., V. Elia, R. Kane and T. Halliwell. 1999. Birds of New Jersey. New Jersey Audubon Society. 704 pp.

Focus Area: North Coast Complex, New Jersey
Sub-Focus Areas: Hackensack Meadowlands/Hudson River, Raritan Bay/Navesink River, Neptune, Manasquan River

Area Description:

The North Coast Complex focus area is comprised of four sub-focus areas. The Hackensack Meadowlands/Hudson River sub-focus area is located in northern New Jersey in the lower Hackensack River drainage near the northern end of Newark Bay with a small extension to the lower end of the Hudson River. It is the largest remaining brackish wetland complex in the New York-New Jersey Harbor estuary. The Raritan Bay/Navesink River Sub-Focus Area is located in the southern portion of the New York-New Jersey Harbor extending up the Raritan River to Sayreville, New Jersey and east and south along the shoreline approximately 40 kilometers (24 miles) to the Navesink River/Shrewsbury River. This sub-focus area also includes Sandy Hook Bay. The Neptune sub-focus area includes the open water bay of the Shark River around Shark River Hills and Neptune City. The Manasquan River sub-focus area extends approximately 30 kilometers (18 miles) up the Manasquan River from Manasquan Inlet to west of Adelphia, New Jersey. The habitats of the sub-focus areas of the North Coast Complex are diverse, benefiting large numbers of migratory birds and fish. Generally, the wetlands are large complexes of saltwater, brackish, and freshwater tidal emergent marshes with mixed areas of mudflats, sandflats, and large, open bays fed by many small tidal creeks. The emergent vegetation is characterized by saltmeadow cordgrass, smooth cordgrass, common reed, black grass, marsh elder, and common groundsel (U.S.F.W.S. 1996a,b). The associated uplands are characterized by pin oak, red maple, swamp white oak, black cherry, and tree-of-heaven. Most of the wetlands within the focus area have been altered primarily for mosquito and flood control through ditching, diking, and tidegates. This has altered much of the original diversity, especially with the invasion of common reed. The Hackensack Meadowlands are virtually a monoculture of common reed.

Ownership/Protection:

The majority of the land within the sub-focus areas is privately owned. Publicly owned lands include those managed by the New Jersey Department of Environmental Protection, New Jersey Meadowlands Commission, and the U.S. Department of Defense.

Special Recognition:

The Hackensack Meadowlands have received the most attention recently for habitat conservation. The Environmental Protection Agency in partnership with the U.S. Army Corps of Engineers, New Jersey Meadowlands Commission, and the New Jersey Department of Environmental Protection has developed a Special Area Management Plan for management and development of the wetland. In addition, the New Jersey Meadowlands Commission with federal partners has drafted an Environmental Improvement Plan to make recommendations on the remediation and restoration of contaminated lands. At least one area within the Hackensack Meadowlands, Kearny Marsh, has been designated a Priority Site for Biodiversity by the New Jersey Natural Heritage Program.

Waterfowl:

The North Coastal Complex harbors large numbers of waterfowl during migration and wintering with fewer birds breeding. As many as 60,000 birds winter or migrate through the North Coast Complex with Raritan and Sandy Hook Bays harboring most of the birds especially around the shoreline of southern Raritan Bay and the Navesink River. Significant concentrations of Canada Goose, American Black Duck, Mallard, and Greater Scaup are found in the focus area. Fewer numbers of birds nest in the focus area but include Canada Goose, American Black Duck, Mallard, Gadwall, and Green-winged and Blue-winged Teal.

Table 1. Waterfowl species using the North Coast Complex Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal	X	X	X
Blue-winged Teal	X	X	X
Gadwall	X	X	X
American Wigeon		X	X
Northern Pintail		X	X
Canvasback		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Ruddy Duck	X	X	X
Atlantic Brant		X	X
Bufflehead		X	X
Long-tailed Duck		X	X
Red-breasted Merganser		X	X
Common Goldeneye		X	X

Other Migratory Birds:

Many other non-waterfowl species use the wetlands of the North Coast Complex focus area. The tidal mudflats, sandflats, and impoundments are important for thousands of shorebirds during migration. Species include Semipalmated Sandpiper, Sanderling, Ruddy Turnstone, Lesser Yellowleg, Short-billed Dowitcher, and Dunlin. Raritan Bay alone may host up to 20,000 birds. Waterbirds also are prevalent in the focus area with nesting by King and Clapper Rail, Common Moorhen, Green Heron, and Black-crowned Night Heron, which roost in the maritime holly forest on Sandy Hook, a globally rare community. Sandy Hook is the only undeveloped barrier beach in the focus area and supports nesting colonies of Least and Common Tern, Piping Plover, and Black Skimmer. Other waterbirds include American Coot, Pied-billed Grebe, and Double-crested Cormorant. Many of these birds use these wetlands during post-breeding dispersal from other colonies located nearby but not in the focus area. The upland forests support a number of landbirds including breeding Wood Thrush, vireos, warblers, and flycatchers. Hawks are prevalent in the focus area, especially along Sandy Hook during migration, with American Kestrel, Sharp-shinned, Red-shouldered, Cooper's, and Red-tailed Hawk.

Threats:

This focus area is centered in the industrial heart of the New York – New Jersey harbor. Much of the shoreline and the wetlands have been negatively affected by industrial, commercial, and residential development. Potential contamination by discharge of heavy metals and oil and chemical spills is prevalent throughout the focus area. Contamination from landfills in the Hackensack Meadowlands is a constant threat with over 200 sites the subject of federal or state regulatory action. Point and non-point source pollution such as stormwater runoff continues to contaminate many wetlands. Invasive species, such as common reed, have a strong hold in most of the wetlands because of past disturbances. Disturbance to nesting beaches by increased human use threatens the integrity of these habitats and the success of beach nesting birds.

Conservation Recommendations:

Large portions of these marshes already have been lost to development or alteration of hydrology. Additional losses could have increasingly serious consequences. It is recognized that a practical approach to conservation is needed in these areas of dense human settlement and intense development. Further losses of wetlands through dredging or filling or altered hydrology should be curtailed as much as possible. Development should be re-directed to areas that have been previously developed but are underused. The New Jersey Meadowlands Commission has developed a draft Master Plan for comprehensive planning in the Hackensack Meadowlands. The goals and recommendations of the plan should be implemented to help protect and restore the valuable wetlands within this area. Discharge of toxics, oil, or other chemical should be monitored and reduced or curtailed completely, if possible. Human disturbance also should be held to a minimum or eliminated on beaches with active nesting colonies.

References:

U.S. Fish and Wildlife Service. 1996a. Raritan Bay – Sandy Hook Complex. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

U.S. Fish and Wildlife Service. 1996b. Hackensack Meadowlands. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

Focus Area: Northern New Jersey Limestone Valley, New Jersey
Sub-Focus Areas: None

Area Description:

The Northern New Jersey Limestone Valleys Focus Area contains some of the most productive and valuable inland freshwater wetlands in New Jersey. The focus area is located in northwestern New Jersey to the southeast of the Kittatinny Mountains encompassing portions of Warren and Sussex Counties. Wetlands in the northeastern section of the focus area drain into the Hudson River Drainage via the Wallkill River while the remaining portion of the focus area drains into the Delaware River. Major Delaware River tributaries in the focus area include the Paulins Kill and Pequest River. The focus area is entirely within the Ridge and Valley physiographic province. Soils are predominantly derived from sedimentary rock, largely limestone, resulting in fertile and high pH soils and wetlands (Robichaud and Buell 1973). The land use is a mosaic of agricultural, residential, and light manufacturing with patches of forested habitat. Small grain crops, pasture, and hay are the dominant agriculture although there are notable areas with dairy farms as well as fruit and vegetable crops. Focus area wetlands include limestone fens, floodplains, spring-fed wetlands, and a significant portion of New Jersey's glacial lakes. Emergent wetlands are dominated by cattail, burreed, pickerelweed, rushes, sedges, white water lily, and water willow. Many emergent wetlands also contain significant submerged aquatic vegetation including pondweeds and milfoil. The primary vegetation in scrub-shrub wetlands includes buttonbush, alder, willow, and witch hazel. *Phragmites* and purple loosestrife are common in some wetlands. Pin oak, red and silver maple, elm, ash, black gum, and sweet gum are common in wetter forests while several species of oaks, birch, ash, and hickories comprise the upland forests.

Ownership/Protection:

The majority of the focus area is privately owned. The New Jersey Division of Fish and Wildlife has seven Wildlife Management Areas within the focus area totaling 4,570 hectares (11,292 acres). The New Jersey Division of Parks and Forestry has three parks in the focus area totaling 3,995 hectares (9,871 acres). Wallkill River National Wildlife Refuge, located in the northern portion of the focus area, is comprised of 1,883 hectares (4,652 acres). The New Jersey Audubon Society and The Nature Conservancy also have land holdings. The fertile limestone valleys and strong agricultural traditions have resulted in a considerable amount of holdings in Farmland Preservation easements. Kittatinny Mountain, just west of the focus area, is predominantly public land.

Special Recognition:

The Upper Wallkill River Valley is considered as part of the "Significant Habitat Complexes of the New York Bight Watershed," by the U.S. Fish and Wildlife Service's Coastal Ecosystems Program. The northern part of the focus area was also identified as "crucial land" by the New Jersey Governor's Skylands Greenway Task Force. The U.S. Fish and Wildlife Service has designated the Wallkill River and Woodruff's Gap Fen as priority wetland sites under the federal Emergency Wetland Resources Act of 1986. The New Jersey State Natural Heritage Program recognizes several Priority Sites for Biodiversity within the focus area, most of which are wetlands.

Waterfowl:

The Northern New Jersey Limestone Valleys Focus Area hosts a diversity of breeding, migrating, and wintering waterfowl. Band recovery data suggest that focus area wetlands and agricultural areas are important migration and wintering areas for Atlantic Population Canada Goose (NJ Division of Fish and Wildlife, unpublished data).

Table 1. Primary waterfowl species using the Northern New Jersey Limestone Valleys Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	X
American Green-winged Teal		X	X
Blue-winged Teal		X	X
Wood Duck	X	X	X
Gadwall		X	X
Hooded Merganser	X	X	X
Common Merganser	X	X	X
Ruddy Duck		X	X
Ring-necked Duck		X	X
Atlantic Population Canada Goose		X	X

Other Migratory Birds:

Over 240 different species of birds use the focus area for breeding, migration, and wintering habitat. There are several Great-blue Heron rookeries in the focus area. Several species of waterbirds breed in the focus area including Pied-billed Grebe, American Bittern, Least Bittern, Green Heron, Sora, King Rail, Virginia Rail, and Common Moorhen (Walsh et al. 1999). In addition to the significant numbers and diversity of waterbirds, forested wetlands and adjacent uplands support over 170 species of passerines. American Woodcock breed in and migrate through wetlands and adjacent early successional sites in the focus area. The Wallkill River was one of the few sites where breeding Common Snipe were found in New Jersey (Walsh et al. 1999). Several pairs of Bald Eagle nest in the focus area. Kittatinny Mountain (west) and Highlands Province ridges (east) that flank the focus area are noteworthy for their fall raptor migrations. Regionally rare grassland nesting birds including Upland Sandpiper, Savannah Sparrow, Grasshopper Sparrow, Vesper Sparrow, and Bobolink inhabit focus area grassland habitats (Walsh et al. 1999).

Threats:

Although not directly within the New York metropolitan area, the focus area is within commuting distance of the city. As such, residential and commercial development pressures of woodlands and farmlands is alarming. Loss, alteration, and fragmentation of all habitat types within the focus area pose the greatest threats to wildlife in this region. Development of farmland results in a direct loss of grassland, early successional forest, and edge habitat along the emergent and forested wetlands that currently support a high diversity of species. Continued development of open space in the focus area will result in degraded water quality through point

and non-point sources. Sewage treatment plants feeding into the primary drainages of the focus area are currently a major source of nutrients and, during storm events, can release raw sewage. These problems will be exacerbated with increased development. Past and present alteration of wetlands for muck farming has resulted in negative impacts on wetlands and wildlife. Many wetlands throughout the focus area have significant problems with invasive species including purple loosestrife and common reed. Breeding mute swans are prevalent throughout the focus area. During mid-summer, breeding and sub-adult mute swans congregate in some of the most productive wetlands consuming copious quantities of submerged aquatic vegetation thereby making those sites less attractive to native waterfowl.

Conservation Recommendations:

Long-term planning for human population growth throughout the focus area is critical to deal with the existing development pressures. Land protection through fee acquisition, land exchanges, conservation easements, cooperative management agreements, purchase of development rights and comprehensive planning are needed to maintain the ecological integrity of focus area wild lands. Restoration of riparian habitats along some focus area tributaries could result in both improved habitat and improved water quality. Enhancement of wetlands that have been dominated by non-native, invasive plants should be a priority. Control of Mute Swan populations in the most productive wetlands should be considered.

References:

Robichaud, B. and M.F. Buell 1973. Vegetation of New Jersey. Rutgers University Press. New Brunswick, NJ, USA.

Walsh, J., V. Elia, R. Kane and T. Halliwell. 1999. Birds of New Jersey. New Jersey Audubon Society. 704 pp.

Focus Area: Passaic River Basin, New Jersey
Sub-Focus Areas: None

Area Description:

The Passaic River Basin Focus Area is one of the largest freshwater wetland complexes in the northeastern United States. However, the focus area is also located only 40 kilometers (25 miles) from downtown New York in one of the most heavily developed areas of New Jersey presenting a host of challenges. The focus area is located within the Piedmont physiographic province in portions of Somerset, Morris, Essex, and Passaic Counties. Focus area soils are largely lake sediments left by the remains of ancient glacial Lake Passaic. This ancient lake was formed as a result of melt water that was trapped between glacial till, surrounding ridges, and the retreating Wisconsin glacier (25,000 years ago) itself (Robichaud and Buell 1973). Wetlands in the focus area form the headwaters of the Passaic River Drainage and include the major tributaries of the Rockaway, Whippany, and Pompton Rivers. Many of the major wetland areas are preserved in public ownership although the surrounding landscape is dominated by suburban and urban development. Several major roads traverse the focus area. Focus area wetlands are predominantly palustrine, deciduous-forest wetlands followed by scrub-shrub wetlands and emergent marshes. Palustrine wetlands are dominated by red maple, pin oak, and ash with an understory of high-bush blueberry, spicebush, and swamp rose. Scrub-shrub sites are dominated by buttonbush, alder, sweet pepperbush, and willow while emergent marshes include cattail, bulrush, arrow arum, and burreed. *Phragmites* and purple loosestrife are common in many wetlands, and locally, can be dominant. American beech, various oaks, gray birch, sugar maple, black gum, and hickories are most abundant on upland sites, including the numerous small islands that are scattered throughout the focus area wetlands.

Ownership/Protection:

Although the majority of the focus area is privately owned as very small parcels, several large tracts of publicly owned lands are also present. Great Swamp National Wildlife Refuge, located in the headwaters of Passaic River, is the largest single parcel at 3,000 hectares (7,413 acres). Several municipal and county parks, including Lord Stirling Park, Loantaka Brook Park, the Somerset County Park and Environmental Education Center, Fairmount Park, and the Morris County Outdoor Education Center, are adjacent to the refuge. The New Jersey Division of Parks and Forestry manages Troy Meadows and Great Piece Meadows Natural Areas which total 3,000 hectares (7,413 acres) along the Passaic River floodplain. Wildlife Preserves, Inc. owns additional sections of Troy Meadows. The Essex County Park Commission manages West Essex Park, which is comprised of about 9 kilometers (5.5 miles) of undeveloped floodplain forest along the east side of the Passaic River. The New Jersey American Water Company and Commonwealth Water Companies operate three drinking water reservoirs on the east side of the Passaic River. The Jersey City Water Company operates Boonton Reservoir, along the Rockaway River.

Special Recognition:

The Passaic River Basin is considered as part of the "Significant Habitat Complexes of the New York Bight Watershed," by the U.S. Fish and Wildlife Service's Coastal Ecosystems Program. The U.S. Fish and Wildlife Service has designated the glacial Lake Passaic wetlands as a priority wetland site under the federal Emergency Wetlands Resources Act of 1986.

The New Jersey Natural Heritage Program recognizes four Priority Sites for Biodiversity within the focus area.

Waterfowl:

The Passaic River Basin hosts a diversity of breeding, migrating, and wintering waterfowl. Given the prevalence of palustrine and scrub-shrub wetlands, the focus area is clearly a significant production area for Atlantic Flyway wood ducks. Walsh et al. (1999) reported 5,000 Wood Duck young recruited during 1980 at Great Swamp National Wildlife Refuge alone.

Table 1. Primary waterfowl species using the Passaic River Basin Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	X
American Green-winged Teal		X	X
Blue-winged Teal		X	X
Wood Duck	X	X	X
Gadwall		X	X
American Wigeon		X	X
Hooded Merganser	X	X	X
Common Merganser		X	X
Ruddy Duck		X	X
Ring-necked Duck		X	X
Atlantic Population Canada Goose		X	X

Other Migratory Birds:

Over 225 different species of birds use the focus area for breeding, migration, and wintering habitat. Several species of waterbirds breed in the focus area including Pied-billed Grebe, American Bittern, Least Bittern, Great Blue Heron, Green Heron, Sora, King Rail, Virginia Rail, and Common Moorhen (Walsh et al. 1999). In addition to the significant numbers and diversity of waterbirds, forested wetlands and adjacent uplands support numerous species of passerines. American Woodcock breed in and migrate through wetlands and adjacent early successional sites in the focus area. Mature forest raptors, including Barred Owl and Red-shouldered Hawk, nest in the focus area.

Threats:

Flooding from numerous impermeable surfaces (i.e.: roads, parking lots, and rooftops) and channelized flow associated with development cause significant problems resulting in an increase in the duration and depth of water in focus area floodplains. Conversely, during dry periods, water levels in many of the focus area wetlands become alarmingly low due to the dependence of the human population on ground water supplies. Although much of the area has already been developed, there is intense development pressure for the few open spaces that remain. Additional development will exacerbate already serious problems associated with storm event flooding and dry period water deficits. Continued development of open space in the focus area will also result in degraded water quality through non-point pollution sources,

sedimentation, and increased nutrient loading. Sewage treatment plants feeding into the primary drainages of the focus area are currently a source of nutrients with inherent problems being more severe with increased development. Several inactive landfills occur throughout the focus area causing the inherent risk of contamination. Many potentially high quality wetlands throughout the focus area have significant problems with invasive purple loosestrife and *Phragmites*.

Conservation Recommendations:

Practices for reducing the impacts of flooding including filter strips, riparian forest buffers, enhanced and maintained detention basins, and conversion of mowed turfgrass to natural vegetation should be implemented and expanded. Long-term planning for human population growth throughout the focus area basin is critical to deal with the existing development pressures. Land protection through fee acquisition, land exchanges, conservation easements, cooperative management agreements, purchase of development rights and comprehensive planning are needed to reinstate the ecological integrity of focus area wetlands. Enhancement of wetlands that are dominated by non-native, invasive plants should be a priority.

References:

Robichaud, B. and M.F. Buell 1973. Vegetation of New Jersey. Rutgers University Press. New Brunswick, NJ, USA.

Walsh, J., V. Elia, R. Kane and T. Halliwell. 1999. Birds of New Jersey. New Jersey Audubon Society. 704 pp.

Focus Area: Pineland Bogs, New Jersey
Sub-Focus Areas: Burrs Mill Bogs, Mullica River

Area Description:

The Pineland Bogs focus area is located in southern New Jersey in the heart of the New Jersey Pinelands. Two sub-focus areas are recognized, Burrs Mill Bogs and Mullica River. The boundaries of the sub-focus areas encompass the highest concentration of bogs in the pinelands. It includes bogs along the Mullica River that drains into Great Bay, and along Burrs Mill Brook and Wading River that also drain into Great Bay. The New Jersey Pinelands is the largest pine barrens complex in the world and is a diverse mix of upland and wetland communities including several globally imperiled communities (U.S.F.W.S. 1996). Pine-oak forests with pitch and shortleaf pine and black, chestnut, scarlet, and white oak characterize the uplands. The understory is dominated by lowbush blueberry, black huckleberry, mountain laurel, and sweet fern (U.S.F.W.S. 1996). Wetlands make up about one-third of the pinelands area and are characterized by a diverse range of wetland types including Atlantic white cedar swamps, hardwood swamps, pitch pine lowland forests, marshes, bogs, open water, and pine barren savannas. The wetlands, including bogs, of the focus area are associated with lowland areas surrounding the Mullica River and the Burrs Mill and Wading Rivers. Generally, these waters are of high quality supporting abundant communities of fauna and flora. A number of cranberry bogs, both active and abandoned, are scattered throughout the focus area. Many of the abandoned bogs are succeeding back into shrub swamps with leatherleaf associated with highbush blueberry and inkberry on mats of sphagnum ((U.S.F.W.S. 1996). Forested wetlands are generally dominated by Atlantic white cedar or red maple.

Ownership/Protection:

The National Parks and Recreation Act of 1978 designated The New Jersey Pinelands as the country's first national reserve. A comprehensive management plan was written to balance protection and development interests throughout the reserve. Most of the pine barrens is privately owned, although private non-governmental conservation organizations, including The Nature Conservancy, have ownership in substantial holdings. However, roughly one-third is in public ownership (U.S.F.W.S. 1996). Public owners include the U.S. Fish and Wildlife Service with E.B. Forsythe National Wildlife Refuge, Department of Defense with Fort Dix, McGuire Air Force Base, and Lakehurst Naval Engineering Center, and the state of New Jersey with a number of state parks and wildlife management areas.

Special Recognition:

The New Jersey Pine Barrens is unique and, thus, has been recognized by a number of state, federal, and private organizations. The Pinelands National Reserve has been recognized by UNESCO as part of the Man and Biosphere program. The lower part of the Mullica River and Great Bay have been designated a National Estuarine Research Reserve. Great Egg Harbor river and its tributaries have been designated as National Wild and Scenic Rivers. All waters in the pinelands have been designated by the Environmental Protection Agency as Outstanding Natural Resource Waters that are to be protected from any change in water quality. Also, a number of wetlands sites have been identified by the U.S. Fish and Wildlife Service as priority wetlands under the Emergency Wetlands Resources Act of 1986. In addition the New Jersey natural Heritage Program recognizes numerous priority sites for biodiversity.

Waterfowl:

The extensive wetlands and abandoned cranberry bogs of the focus area provide habitat for a number of species of waterfowl during breeding, migration, and wintering. Perhaps the greatest benefit of the focus area is maintenance of water quality for Great Bay on the coast where thousands of waterfowl breed, migrate, and winter.

Table 1. Waterfowl species using the Pineland Bogs Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	
Mallard	X	X	
Northern Pintail		X	
Wood Duck	X	X	
Ring-necked Ducks		X	
Lesser Scaup		X	
Greater Scaup		X	
Canada Geese	X(resident)	X	

Other Migratory Birds:

The diversity and interspersion of habitat types throughout the Pinelands provides habitat for a number of other species of birds. In the uplands some of the species include eastern towhees, gray catbirds, several species of vireos and flycatchers, red-headed woodpeckers, and pine, prairie, and black and white warblers. The wetlands support a great diversity of breeding birds including green and great blue herons, wood thrush, eastern wood peewee, American woodcock, yellow warbler, and Acadian flycatcher. A few short-eared owls winter on the bogs and open habitats.

Threats:

The Pinelands focus area is under considerable threat from a number of fronts. Suppression of fires in a fire-maintained ecosystem because of development or fear could result in the reduction or loss of community types found only in this ecosystem. Increased development could result in increased use of herbicides and pesticides, which could degrade water quality directly in the Pine Barrens and indirectly in Great Bay. Exotic species always are a concern in areas of high development where exotics are used as ornamentals. New timber markets, especially for pitch pine, could result in the further loss of unique community types.

Conservation Recommendations:

The entire pine barrens ecosystem is of regional and national significance. Fire maintenance of the ecosystem through prescribed burning should be a priority not only to maintain unique communities and to prevent catastrophic ecological fires and, also, to prevent catastrophic residential damage. Water quality is vital to the migrant birds that breed, migrate, and winter in the pine barrens and for those that use the important coastal habitats directly

affected by the pine barrens. Activities associated with residential or commercial development, forestry, and agriculture should be closely monitored by the appropriate state and federal agencies for maintenance of water quality.

References:

U.S. Fish and Wildlife Service. 1996. New Jersey pinelands. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025pp.

Focus Area: South Atlantic Coast, New Jersey
Sub-Focus Areas: None

Area Description:

The South Atlantic Coast focus area of New Jersey is a very large focus area extending approximately 160 kilometers (99 miles) from Point Pleasant to Cape May. It extends inland to encompass important saltwater habitats including emergent saltmarshes and shallow, back barrier lagoon systems. Also, the focus area extends up the Mullica River from the mouth of Great Bay, the Great Egg Harbor River, Toms River, and several smaller tributaries into Little Egg Harbor and Barnegat Bay to the inland extent of the tidal influence. The focus area is a diversity of wetland communities including barrier beaches, back-barrier estuaries, emergent tidal saltmarshes, sand and mudflats, islands, submerged aquatic vegetation, brackish and freshwater emergent wetlands and open water. The saltmarsh wetlands are dominated by salt-meadow cordgrass in the high marsh and smooth cordgrass in the low marsh and along tidal creeks and ditches (U.S.F.W.S. 1996a,c,d,e). Common reed, narrow-leaved cattail, and bulrushes are typical in the brackish marshes along the mainland shoreline. Eelgrass and wigeon grass are the primary submerged aquatics and are found in Barnegat Bay, Great Bay, and other open, shallow water areas around inlets and the backside of barrier beaches (U.S.F.W.S. 1996d,e). Forested wetlands are characterized by Atlantic white cedar swamps along streams and low-lying areas transitioning into hardwood swamps dominated by sweet gum, red maple, and black gum. Uplands comprise a relatively small proportion of the focus area. Typical beach communities are characterized by American beachgrass, seaside goldenrod, sea rocket, and seaside spurge. The southern portion of the focus area abuts the New Jersey Pinelands, the largest pine barrens complex in the world (U.S.F.W.S. 1996b). Uplands are primarily a pine-oak association dominated by pitch pine and oaks such as black, chestnut, and scarlet oaks (U.S.F.W.S. 1996b,d).

Ownership/Protection:

All the underwater lands within the focus area are under public ownership either through state or federal agencies. The majority of saltmarsh as well is under public ownership. The shoreline and islands are a mix of public and private owners. Extensive saltmarshes and adjacent uplands along Barnegat and Brigantine Bays are owned and managed by the U.S. Fish and Wildlife Service as part of the Edwin B. Forsyth National Wildlife Refuge. In addition, the state of New Jersey owns and manages several wildlife management areas, state parks, and natural areas within the focus area. Privately owned lands, especially along the barrier beach, are heavily developed for summer and weekend homes.

Special Recognition:

The wetlands and associated uplands of this focus area are of regional, national, and international significance. The Edwin B. Forsythe NWR has been designated a Wetland of International Importance under the Ramsar Convention. Barnegat Bay has been recognized by the U.S. Environmental Agency as an estuary of national significance under the National Estuary Program. The U.S. Fish and Wildlife Service, under the Emergency Wetlands Resources Act, has recognized a number of sites within the focus area as priority wetlands. The state of New Jersey Natural Heritage program also recognizes a number of sites as Priority Sites for Biodiversity.

Waterfowl:

The South Coast Atlantic Focus Area is heavily used by many species of waterfowl for breeding, migration, and wintering. American black ducks, mallards, gadwall, blue-winged teal and Canada geese use the focus area for breeding. However, the focus area's importance lies in providing critical habitat for migrating and wintering waterfowl. The focus area provides habitat for the most significant American black duck and Atlantic brant wintering populations in the Atlantic Flyway with over 80,000 black ducks and nearly 100,000 Atlantic brant.

Table 1. Waterfowl using the South Coast Atlantic focus area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail	X	X	X
American Wigeon	X	X	X
American Green-winged Teal	X	X	X
Gadwall	X	X	X
Wood Duck	X	X	
Red-breasted Merganser		X	X
Hooded Merganser		X	X
Common Merganser		X	X
Lesser Scaup		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Long-tailed Duck		X	X
Ruddy Duck		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Surf Scoter		X	X
Tundra Swan		X	X
Canada Goose	X	X	X
Snow Goose		X	X
Atlantic Brant		X	X

Other Migratory Birds:

In addition to waterfowl, the diverse saltwater, brackish, and freshwater marshes provide critical habitat for many species of breeding, migrating, and wintering birds. Just on Edwin B. Forsythe NWR 289 species have been observed with at least 106 breeding. Over 300 species have been observed migrating along the Cape May peninsula including about 70,000 raptors. The habitats of the South Coast Atlantic focus areas are closely associated with those of the Delaware Bay, which hosts one of the most spectacular concentrations of migrating shorebirds in the world. Up to 1.5 million shorebirds use the Delaware Bay habitats and the Cape May shoreline with single-day counts up to 400,000 birds. Only six species make up 95% of the birds

staging in this area: semipalmated sandpipers, red knot, ruddy turnstone, sanderling, dunlin, and short-billed dowitcher. Fourteen other species are regularly documented. The focus area also provide nesting habitat for black skimmers, common terns, several species of gulls, clapper rails, soras, Virginia rails, and marsh wrens. Millions of landbirds of at least 75 species migrate along the coast and concentrate in the Cape May area. Most species are noted in greater abundance within 1.5 kilometers (.9 miles) of the coast. The most abundant species include yellow-rumped warblers, American redstarts, red-eyed vireos, black and white warblers, pine warblers and gray catbirds. A few species documented as nesting include pine warblers, gray catbirds, peregrine falcons, bald eagles, and grasshopper sparrows.

Threats:

The South Coast Atlantic focus area encompasses one of the northeast's most popular beach vacation destinations. Threats to the habitats include increased residential and commercial development, increased disturbance from recreational boaters and beach users (vehicles and people), degradation of water quality from point and non-point source pollution. Severe beach erosion and an increasing population of gulls threaten several nesting populations of terns. Extensive harvesting of horseshoe crabs threatens to reduce a vital energy source for spring migrating shorebirds.

Conservation Recommendations:

Protection of these habitats is critical to maintaining the integrity of many of the species that rely on them throughout the year. Acquisition and protection of these habitats should be a priority. The area is critically important to migrants, especially shorebirds. Shorebirds are dependent upon horseshoe crab eggs and this industry must be regulated to ensure adequate supplies to sustain both the shorebird migration and the horseshoe crab populations. Disturbance is a major problem with beach nesting birds and should be held to a minimum by restricting beach access near colonies during the breeding season.

References:

U.S. Fish and Wildlife Service. 1996a. Cape May peninsula. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

U.S. Fish and Wildlife Service. 1996b. New Jersey Pinelands. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

U.S. Fish and Wildlife Service. 1996c. Brigantine bay and marsh complex. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

U.S. Fish and Wildlife Service. 1996d. Mullica river-Great Bay estuary. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

U.S. Fish and Wildlife Service. 1996e. Barnegat bay complex. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI 1025 pp.

7.2.10 New York

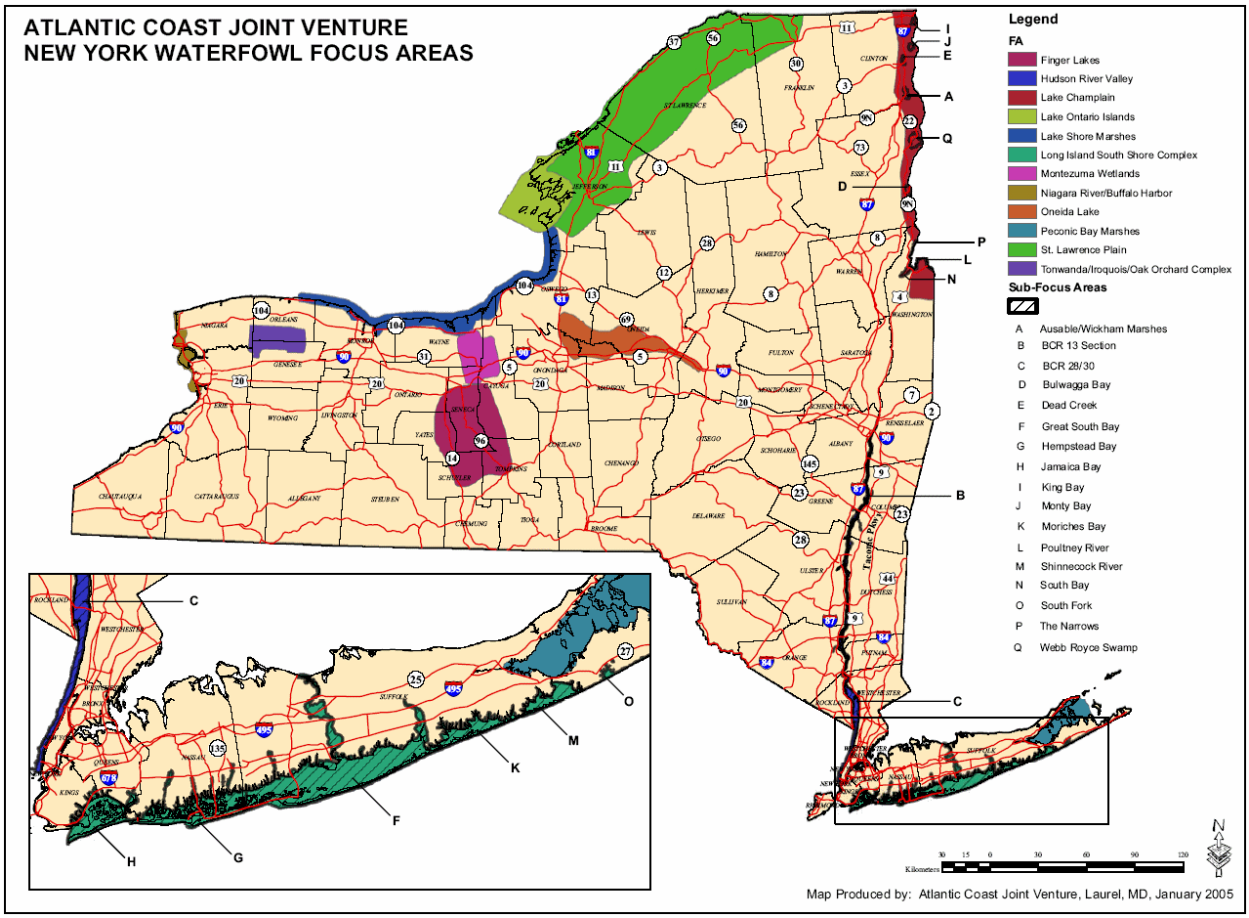

Figure 7.11. New York waterfowl focus areas.

Focus Area: Finger Lakes, New York
Sub-Focus Areas: None

Area Description:

The Finger Lakes Focus Area is located in central New York and encompasses two of the eleven Finger Lakes, Seneca and Cayuga. The Finger Lakes are long, narrow glacially-formed lakes that drain into Lake Ontario. The focus area extends from approximately the northern tip of Seneca and Cayuga Lakes to the southern terminus of both lakes just south of Ithaca on Cayuga Lake and Watkins Glen on Seneca Lake. The western boundary extends as far west as Penn Yan on the northern terminus of Keuka Lake and tapers toward the northern and southern extents of the focus area. The eastern boundary extends east to approximately Venice Center about halfway between Cayuga and Owasco Lake. The northern tip of the focus area on Cayuga Lake abuts the southern boundary of the Montezuma Focus Area. These lakes represent not only the two largest lakes in this region, but two of the largest lakes in the state of New York. The landscape of the focus area is dominated by agriculture, especially around the lake edges, and forests. Residential and industrial development is relatively sparse but concentrated near the edges of the lakes. Primary agricultural crops include corn, soybeans, wheat, oats, vineyards, and orchards (D. Odell, personal communication). Much, if not all, of the forest present in the focus area is second growth maple, beech and oak on agricultural land abandoned in the 1930s and 1940s. The Finger Lakes serve a number of purposes within the central New York region including water supply, recreation, and wastewater assimilation. The large expanse of deep, open water in Cayuga and Seneca Lakes provides habitat for migrating and wintering birds including waterfowl, grebes, loons, gulls, and terns.

Ownership/Protection:

The majority of the focus area is under private ownership. The underwater lands of the lakes are owned by the State of New York along with lands under the management of the New York Office of Parks, Recreation, and Historic Preservation and the New York Department of Environmental Conservation (Wells 1998). The USDA Forest Service owns and manages the Finger Lakes National Forest, a 5,400 hectares (13,343 acres) forest located between Seneca and Cayuga Lakes. It is the only land managed by the Forest Service in New York and was a series of abandoned farms purchased during the 1930's and 1940's that have reverted to forest, although significant grasslands are kept open through grazing practices (Smith ????, Wells 1998). The Seneca Army Depot has recently been de-commissioned and a large portion 3,035 hectares (7,500 acres) is planned to be used as a 'Conservation Area.' This land includes about 242 hectares (600 acres) of emergent wetland, large tracts of grassland and brushland, and mature hardwood forests.

Special Recognition:

The National Audubon Society has recognized six sites within the Finger Lakes Focus Area as Important Bird Areas; Cayuga and Seneca Lakes, Finger Lakes National Forest, Catherine Creek Marsh, Salmon Creek, and Connecticut Hill Wildlife Management Area (Wells 1998). In addition, Junius Pond has been recognized by the U.S. Fish and Wildlife Service's Regional Wetlands Concept Plan (U.S.F.W.S. 1990).

Waterfowl:

Mallard, Wood Duck and Canada Goose are the most common breeding species in the Finger Lakes Focus Area. However, a minimum of thirty seven species of waterfowl use the area for migration and wintering. Primary species during these periods include Redhead, Canvasback, American Black Duck, Mallard and Canada Goose. Common Goldeneye, scaup, Common Merganser and Bufflehead are also prevalent during migration and in the winter. The Finger Lakes winter over 50% of the Canada Goose in New York and over 30% of Redhead (Wells 1998; D. Odell, pers. comm.).

Table 1. Waterfowl species using the Finger Lakes Focus Area.

Species	**Breeding**	**Migration**	Wintering
American Black Duck		X	X
Mallard	X	X	X
Wood Duck	X	X	
AP Canada Goose		X	X
Canvasback		X	X
Redhead		X	X
Lesser Scaup		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Resident Canada Goose	X		X
Common Merganser		X	X

Italics indicate priority species identified by New York Department of Environmental Conservation.

Other Migratory Birds:

The diversity of habitats in and around the Finger Lakes Focus Area provides habitat for a number of other migrant birds. Migrant birds of deep, open water, such as Common Loon, use the Finger Lakes during migration and with total counts of up to 10,000 birds during the fall and early winter. Grebes, such as Pied-billed, Horned, and Red-necked also use the open water as well as Ring-billed and Bonaparte's Gull and Caspian Tern. The mix of agricultural forested, and wetland habitats surrounding the lakes provide habitat for a number of species. The Finger Lakes Focus Area hosts over 100 species of breeding birds in a diverse mix of grasslands and forest (Wells 1998). Species include Northern Harrier, Henslow's Sparrow, Eastern Meadowlark, Bobolink, Least Bittern, American Bittern, Sora, Marsh Wren, Cerulean Warbler, Hooded Warbler, Wild Turkey, and many other species (Wells 1998).

Threats:

A number of activities threaten the integrity of the diverse habitats of the Finger Lakes Focus Area. The watershed of the Finger Lakes is laced with hundreds of tributaries draining the agricultural areas. Point and non-point source pollution from agricultural (nutrient loading) and industrial activities threaten the water quality of Cayuga and Seneca Lakes as well as the wetlands associated with the lakes and tributaries. Over one million people reside within easy commuting distance of the Finger Lakes. Recreational use of the lakes and surrounding area is

increasing with a concomitant increase in potential disturbance to breeding and migrating birds. Invasive species such as zebra mussels and exotic fishes also threaten the integrity of the lakes. Recently, another mussel, the quagga mussel, has been found in Seneca Lake and may have the potential for greater harm than the zebra mussel because it can occupy a greater range of water depths. Also, the effects of water level manipulation on waterfowl use are unknown and should be monitored. Residential development within the focus area, especially along the edge of the lakes and within critical forested areas, destroys potential habitat and can increase disturbance to breeding, migrating, and wintering birds.

Conservation Recommendations:

Research into the effects and control of exotic species should be encouraged. Monitoring use of the Finger Lakes Focus Area by breeding, migrating, and wintering birds should continue as well as monitoring of water quality. Disturbance to birds using the area should be held to a minimum during critical times of the year. The importance of this area for migrating and wintering waterfowl is significantly enhanced by the presence of waste grain (corn, soybeans) in adjacent upland fields. Programs that seek to protect farms and agriculture as a way of life should be encouraged and supported.

References:

New York Department of Environmental Conservation. ????. Water quality study of the Finger Lakes. http://www.dec.state.ny.us/website/dow/fingerlakes/.

Smith, C.R. ????. Use of public grazing lands by Henslow's sparrows, grasshopper sparrows, and associated grassland birds in central New York state. In P.D. Vickery and P.W. Dunwiddie, eds. Grasslands of northeastern North America: ecology and conservation of native and agricultural landscapes. Mass. Audubon Soc. 297pp.

U.S. Fish and Wildlife Service. 1990. Regional wetlands concept plan: Emergency Wetlands Resources Act. U.S. Fish and Wildl. Serv., Hadley, MA.

Wells, J.V. 1998. Important bird areas in New York state. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Hudson River Valley, New York
Sub-Focus Areas: None

Area Description:

The Hudson River Valley Focus Area stretches approximately 250 kilometers (155 miles) from the tip of Battery Park, Manhattan to the inland tidal extent at Troy Lock and Dam and encompasses 35,394 hectares (87,460 acres). The boundary generally follows the shoreline of the river. Habitats encompassed by the focus area include highly saline zones in the lower reaches of the river transitioning into brackish and then to tidal- freshwater riverine and palustrine emergent and forested habitats. The high variability in salinity influences the distribution of habitat types within the river. The lower reaches of the Hudson River approaches marine habitat characteristics with semi-diurnal tides and salinities ranging from 5-30 ppt. Most of the shoreline has been developed for industrial, commercial, and residential use. Vegetation and faunal communities are limited within this zone. The mid- and upper reaches of the Hudson River is characterized by brackish water ranging in salinity from 0.5–5 ppt to tidal freshwater. The distribution of vegetation and faunal communities depends on the river's depth and salinity. Generally, because of the turbidity of the Hudson, vegetation occurs in the shallow sub-tidal and tidal zones. The sub-tidal zone is characterized by sparsely distributed submerged aquatic vegetation. The tidal zone is characterized by brackish and freshwater marshes separated into upper and lower marsh zones. The lower marsh zone is flooded daily and is dominated by peltate-leaved plants including pickerel weed and arrow arum. The upper marsh zone is flooded only partially and is dominated by emergent plants such as narrow-leaved cattail and common reed. Forested tidal-freshwater swamps occur inland along the lower portions of some tributaries often in association with scrub-shrub swamps. These marshes are comprised of species such as green ash, black ash, and red maple.

Ownership/Protection:

The uplands and shoreline along the Hudson River is a mosaic of public and private owners. The lower reaches of the Hudson are owned by such entities as New York City, which owns much of the west side of Manhattan to the pierhead limit. Underwater lands beyond the pierhead limit are owned by the New York Department of State. The mid-extent of the Hudson River is a mix of public and private ownership. Much of the shoreline within the New York-New Jersey Highlands is under public ownership by state and federal agencies. However, the amount of private ownership increases substantially from the northern section of the mid-reaches of the Hudson River to the upper reaches. A few small state and federal parcels are scattered in the upper reaches. All underwater lands and formerly underwater lands in the mid- and upper reaches of the Hudson River Focus Area are owned by the New York Department of State.

Special Recognition:

A number of sites along the focus area are recognized for natural resource value. Within the Hudson River Focus Area, the New York Department of State has recognized a number of Significant Coastal Fish and Wildlife Habitats. In addition, four sites, Piermont Marsh in the lower reaches, Iona Island and Marsh Complex in the mid-reaches, and Tivoli Bays and Stockport Creek and Flats in the upper reaches are part of the Hudson River National Estuarine Research Reserve. The New York State Natural Heritage Program in conjunction with The

Nature Conservancy recognizes seventeen sites along the Hudson River as Priority Sites for Biodiversity.

Waterfowl:

The diversity of wetlands in the Hudson River Valley Focus Area support a diversity of waterfowl species for breeding, migration, and wintering. The Hudson River serves as a migration corridor for waterfowl, especially during the fall migration for birds using the tidal marshes of the Atlantic coastal states. Wintering is generally limited to the mid- to lower reaches of the Hudson River that remain ice free. The palustrine wetlands associated with the river in the mid- to upper reaches provide nesting habitat for a limited number of waterfowl species.

Table 1. Waterfowl species using the Hudson River Valley Focus Area (U.S. Fish and Wildlife Service, 1996).

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	X
Blue-winged Teal	X		
Mallard	X	X	X
Wood Duck	X	X	X
Canvasback		X	X
Common Goldeneye		X	X
Scaup		X	X
Merganser		X	X
Redhead		X	X
Canada Goose	X	X	X
Greater Snow Goose		X	

Other Migratory Birds:

A host of other migratory birds use the diverse and productive Hudson River Valley Focus Area for breeding, migration, and wintering. The palustrine marshes of the Hudson River provide nesting habitat for such species as Virginia Rail, Sora, Common Moorhen, Belted Kingfisher, Green Heron, and Swamp Sparrow. Many other species of shorebirds, waterbirds, and landbirds use the wetlands in this focus area for staging and migration during both the spring and fall migrations. In addition to providing important habitat for migratory birds, the Hudson River estuary provides spawning, wintering, and feeding habitat for anadromous fish such as alewife, blueback herring, tomcod, striped bass and Atlantic and shortnose sturgeon.

Threats:

The Hudson Valley Focus Area lies in one of the most densely-populated areas of the United States. Multiple threats exist along the entire length of the focus area. Extensive development for commercial and industrial use results in the loss of habitat and increases the threat of toxic point and non-point source pollution. Heavy use of freshwater can disrupt the salinity gradient within the Hudson River and degrade marshes located near or on the mouths of tributaries. Invasive species such as common reed, purple loosestrife, water chestnut, and zebra mussels reduce the diversity of vegetation and faunal communities in addition to the potential for

toxic contamination with use of herbicides. Channel dredging is a threat because of the disposal of spoil material and potential to change the salinity gradient. Dams prohibit anadromous fish species from using potential spawning areas.

Conservation Recommendations:

The Hudson River Valley Focus Area is under intense threat from many different sources. A comprehensive plan that recognizes the value of the aquatic and terrestrial resources of the river should be undertaken to better understand the individual and cumulative effects of actions within the estuary. Actions undertaken to improve the quality of the estuary should consider water quality improvement, minimizing the negative effects of dredging and spoil deposition, cumulative effects of piers and platforms, control of exotics, and the maintenance and building of railroads and highways adjacent to the river to maintain the hydrologic connection or restore connection to tidal wetlands. Currently, the U.S. Army Corps of Engineers is spearheading the Hudson River Estuary Habitat Restoration Project in partnership with the New York Department of Environmental Conservation and Department of State.

References:

U.S. Fish and Wildlife Service. 1996. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI

Focus Area: Iroquois, New York
Sub-Focus Areas: None

Area Description:

The Iroquois Focus Area is located in western New York between the cities of Buffalo and Rochester and encompasses 53,524 hectares (132,259 acres). The boundaries of the focus area extend from the eastern end of Niagara County near Wolcottsville eastward to approximately State Highway 237. The north-south boundary extends from approximately the town of Medina on the northern end, south to the town of Oakfield, including portions of the Tonawanda Indian Reservation. This area of western New York is dominated by agriculture of medium to high productivity interspersed with many wetlands, including several large and diverse wetlands (T. Carroll, unpublished report). The "Alabama" or "Oak Orchard Swamp" is a large complex of emergent and forested wetlands within the focus area. Palustrine-emergent marshes are characterized by cattail and burreed with open water areas dominated by Eurasian watermilfoil and coontail (U.S. Fish and Wildlife Service 2002). Virtually all emergent marshes are contained within the impoundments of Iroquois National Wildlife Refuge and Oak Orchard and Tonawanda Wildlife Management Areas. Red and silver maple and green ash are the more common species of trees found in the forested wetlands with American beech, sugar maple, and white ash found in the surrounding upland forests. The agricultural crops in this area are varied with the predominant crops being soybeans, corn, and wheat. Onions are grown in the eastern part of the focus area where mucklands are more abundant (D. Odell, personal communication). Other farming practices include dairy and truck farms (D. Odell, personal communication). Grasslands within the focus area are a mix of warm season grasses, primarily switchgrass, and cool season grasses with smooth brome, orchard, reed canary, and timothy.

Ownership/Protection:

Most of the focus area is under private ownership with public lands held by Iroquois National Wildlife Refuge (NWR), owned by the U.S. Fish and Wildlife Service, and Oak Orchard and Tonawanda Wildlife Management Areas (WMA), owned by the New York Department of Environmental Conservation. Much of the Oak Orchard swamp is under state or federal ownership. The focus area also includes sections of the Tonawanda Indian Reservation in the southwest corner.

Special Recognition:

The Iroquois NWR and Oak Orchard and Tonawanda WMA's have been recognized as Important Bird Areas by the National Audubon Society (Wells 1998). In addition, the U.S. Fish and Wildlife Service recognized Bergen Swamp as a priority wetland in the focus area in the Region 5 Regional Wetlands Concept Plan (U.S. Fish and Wildlife Service 1990) under the Emergency Wetlands Resources Act of 1986.

Waterfowl:

The wetland complexes within the Iroquois Focus Area provide productive habitat for breeding and migrating waterfowl. Over 250,000 ducks and geese use the Iroquois/Oak Orchard/Tonawanda wetland complex during the breeding and spring and fall migration (U.S.

Fish and Wildlife Service 2002). Much of the use by waterfowl occurs during the spring migration with a peak of about 125,000 birds.

Table 1. Waterfowl species using the Iroquois Focus Area.

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	
Blue-winged Teal	X	X	
Mallard	X	X	
Wood Duck	X	X	
AP Canada Goose		X	
Northern Pintail	X	X	
Northern Shoveler	X	X	
Gadwall	X	X	
American Wigeon	X	X	
Green-winged Teal	X	X	

Other Migratory Birds:

The mosaic of wetlands and uplands provide habitat for a number of shorebirds, waterbirds, and landbirds. Great Blue Heron are the most common wader and a rookery of approximately 300 nests is located on Iroquois NWR. Other waders include Least and American Bittern. Henslow's Sparrow and Upland Sandpiper are found within the focus area as well as several federal and state listed species including Bald Eagle, Black Tern, Osprey, Pied-billed Grebe, Northern Harrier, Sedge Wren, Cerulean Warbler, and Grasshopper Sparrow (P. Hess, personal communication, U.S. Fish and Wildlife Service 2002, Wells 1998). In addition the focus area is one of the few areas in New York with nesting Prothonotary Warbler.

Threats:

The location between two large metropolitan areas of Buffalo and Rochester make the Iroquois Focus Area a popular destination for outdoor recreation, especially on Iroquois NWR and Oak Orchard and Tonawanda WMA's. Disturbance is a cause for concern in the migration periods because of the number of birders attracted to the refuge and the wildlife management areas. Other threats include development, soil erosion and pesticide and nutrient runoff through poor farming practices, invasion of exotic plants such as purple loosestrife, and succession of wetlands and grasslands.

Conservation Recommendations:

Disturbance to nesting and migrating waterfowl should be minimized or eliminated. The spring migration period is critical for hens to gain the necessary energy reserves for successful nesting. Control of purple loosestrife through beetle releases should continue to help maintain the diversity and integrity of the wetland systems. Depending on the objectives, succession of wetlands and grasslands should be controlled with proper water level management on wetlands and mowing regimes for grasslands as well as early successional management for forests.

Recent habitat conservation within the focus area has been accomplished, in part, by two North American Wetlands Conservation Act grants that have acquired, restored, or enhanced

over 526 hectares (1,300 acres). Currently, Iroquois NWR has completed an Environmental Assessment to improve water control on two of its larger impoundments to create better habitat conditions for waterfowl and wetland-dependent wildlife. The conservation programs under the Farm Bill should be explored and utilized, where possible, to further habitat protection and enhancement within this focus area.

References:

Carroll, T. Undated. The New York State Oak Orchard and Tonawanda Wildlife Management Areas and Iroquois National Wildlife Refuge. Unpubl. Rep. 27pp.

Hess. P. 2003. U.S. Fish and Wildlife Service. Personal Communication.

U.S. Fish and Wildlife Service. 2002. Mohawk/Oneida pool rehabilitation project, Iroquois National Wildlife Refuge. Environmental Assessment. 41pp.

U.S. Fish and Wildlife Service. 1990. Regional Wetlands Concept Plan: Emergency Wetlands Resources Act. U.S. Fish and Wildl. Serv., Hadley, MA.

Wells, J.V. 1998. Important bird areas in New York State. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Lake Champlain Valley, Vermont/New York
Sub-Focus Areas: Vermont: East Creek, Cornwall Swamp, Lemon Fair River, Otter Creek, Sand Bar/Mallets Creek, Mud Creek, and Missisquoi River Delta. New York: Ausable/Wickam Marshes, Bulwagga Bay, Dead Creek, King Bay, Monty Bay, South Bay, and Webb Royce Swamp.
Shared sub-focus areas: Poultney River and The Narrows.

Area Description:

The Lake Champlain Valley Focus Area encompasses 155,678 hectares (384,687 acres) the narrow Lake Champlain Valley between the Adirondack Mountains of New York and the Green Mountains of Vermont. The valley is very different from the surrounding areas with a strong alliance to the St. Lawrence Valley and the Great Lakes lowlands (Thompson and Sorenson 2000). Historically, the valley was dominated by northern hardwoods (Laughlin and Kibbe 1985). However, fertile soils and gently rolling topography made the valley one of the most productive agricultural areas in the northeastern United States and one of the first inland areas to be colonized by Europeans. As a consequence, much of the forest was cleared for agricultural purposes. Currently, agriculture is the dominant land use with only small fragments of forest remaining; although, increasing farm abandonment is leading to increased reforestation. The wetlands of the Lake Champlain Valley form numerous and diverse communities. Much of the lakeshore wetlands are comprised of floodplain forests that are flooded every spring with the rise of water levels. In addition, highly productive forested-emergent, and scrub-shrub wetlands are associated with the deltas formed by several large rivers draining into the lake. Submerged aquatic vegetation is prevalent in the shallow bays, especially in the Missisquoi Bay on the northern end of the lake and South Bay in the extreme southern end. Also, several unique lakeside bogs are located in the northern one-third of the lake. Palustrine forested and emergent wetlands created through beaver activity make up most of the wetlands found throughout the valley and associated with the many tributaries that feed into Lake Champlain. Sub-focus areas total 15,753 hectares (38,927 acres)

Ownership/Protection:

Much of the Lake Champlain Valley is in private ownership. However, the states of Vermont and New York own a number of Wildlife Management Areas and State Parks along the shore of Lake Champlain. Much of the New York side of Lake Champlain forms the eastern boundary of the Adirondack Park extending from approximately Port Kent, New York to the southern tip of the lake, South Bay. Federally-owned properties include the Missisquoi National Wildlife Refuge, which encompasses the Missisquoi delta, the largest wetland delta on Lake Champlain.

Special Recognition:

Lake Champlain was designated a resource of national significance in 1990 by the Lake Champlain Special Designation Act (Public Law 101-596). The Lake Champlain Basin Program was established to help coordinate the activities envisioned by the Act. The diversity of Lake Champlain and the surrounding Adirondack Mountains were designated as a Biosphere Reserve in 1989 as part of the United Nations Man and the Biosphere Reserve program. Biosphere Reserves are "areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use". Biosphere Reserves serve in some ways

as 'living laboratories' for testing and demonstrating integrated management of land, water and biodiversity.

Waterfowl:

The Lake Champlain Valley provides breeding and, more importantly, staging and migration habitat for thousands of waterfowl. Aerial censuses conducted annually in October by the Vermont Fish and Wildlife consistently reports between 20,000 and 40,000 individuals of 30 or more species. The more numerous species include American Black Duck, Mallard, Wood Duck, Green-winged Teal, Greater and Lesser Scaup, Common Goldeneye, Ring-necked Duck, and Common Merganser. Many of the wetlands surrounding the lake contain highly preferred foods such as wild rice and duck potato. In addition, waste grain from the fertile farm fields surrounding Lake Champlain in both Vermont and Quebec, Canada provide ideal feeding habitat for ducks and for migrating Canada Goose (Atlantic Population) and Greater Snow Goose.

Table 1. Waterfowl species using the Lake Champlain Focus Area.

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	
Mallard	X	X	
Wood Duck	X	X	
Green-winged Teal		X	
Ring-necked Duck		X	
Lesser Scaup		X	
Greater Scaup		X	
Common Goldeneye	X	X	
Common Merganser		X	
AP Canada Goose		X	
Greater Snow Goose		X	

Other Migratory Birds:

The agricultural landscape interspersed with highly productive wetlands of the Lake Champlain Valley provide habitat for a number of breeding and migratory species. The emergent and forested wetlands of the Missisquoi National Wildlife Refuge support the largest breeding colonies of Great Blue Heron and Black Tern in Vermont. Other high priority wetland-dependent species breeding in the focus area include American Bittern, Least Bittern, Sora, Virginia Rail, Common Moorhen, and American Woodcock. The uplands of this agricultural landscape are the most important for Vermont's grassland species (Darmstadt et al. 1997). The focus area supports high priority landbirds such as Upland Sandpiper and Bobolink (Darmstadt et al. 1997, Rosenberg 2000). Farm abandonment and subsequent reforestation is increasing the number and size of forest patches in the Lake Champlain Valley. Species associated with these types of habitats, such as Cerulean Warbler and Wood Thrush, should be considered when planning conservation actions.

Threats:

The Lake Champlain Valley Focus Area faces a number of threats. Increasing residential development, especially in the northern one-third, and commercial and industrial development

threaten habitat loss and degradation of critical wetlands. Lakeside and deltaic wetlands found at the mouths of the major rivers are the most threatened. Water quality is a major issue in Lake Champlain with phosphorous as the most serious threat (Lake Champlain Basin Program 1996). Wastewater treatment and industrial discharge account for most of the point-source phosphorous loading into Lake Champlain. Non-point sources originate from runoff from the intensely developed residential shoreline of the lake and agricultural runoff. This nutrient loading causes algal blooms and rapid growth of plants especially exotic plants such as water chestnut, Eurasian milfoil, and purple loosestrife. Also, zebra mussels and sea lampreys represent a serious threat to the integrity of Lake Champlain.

Conservation Recommendations:

Disturbance to breeding and migrating birds should be minimized or eliminated, especially to the concentrations of Great Blue Heron and Black Tern. Efforts should be made to control point and non-point source pollution to improve the water quality of Lake Champlain. Control of invasive species is needed to maintain or improve the biodiversity and habitat quality of the lake and the associated wetlands and uplands. Also, effort should be made to support and engage the Lake Champlain Basin Program and its mission to coordinate the development of a comprehensive plan for the Lake Champlain Basin.

References:

Binhammer, J. 1992. Lake Champlain wetlands acquisition study. Vermont Nature Conservancy, 47pp.

Darmstadt, C., C. Rimmer, J. Peterson, and C. Fichtel. 1997. Grassland birds in Vermont: population status, conservation problems, and research needs. Pages 201-209 *in* P.D. Vickery and P.W. Dunwiddie, eds. Grasslands of Northeastern North America: Ecology and Conservation of Native and Agricultural Landscapes. Massachusetts Audubon Society.

Lake Champlain Basin Program. 1996. Opportunities for action: an evolving plan for the future of the Lake Champlain Basin. Lake Champlain Management Conference. 92pp.

Laughlin, S.B. and D.P. Kibbe, editors. 1985. The atlas of breeding birds of Vermont. University Press of New England, 456pp.

Rosenberg, K.V. 2000. The St. Lawrence Plain. Draft Partners in Flight Bird Conservation Plan. 40 pp.

Thompson, E.H., and E.R. Sorenson. 2000. Wetland, woodland, wildland: a guide to the natural communities of Vermont. University Press of New England, 456pp.

Focus Area: Lake Ontario Islands, New York
Sub-Focus Areas: None

Area Description:

The Lake Ontario Islands focus area is located within the eastern basin ecosystem of Lake Ontario. The boundaries run from Bartlett Point, New York just inside the mouth of the St. Lawrence River south to Southwick Beach State Park. The boundary extends from approximately 5 kilometers (3 miles) inland west offshore to the Canada- United States border. The focus area includes the islands of Carlton, Grenadier, Fox, Galloo, Little Galloo, Stony, and Calf Islands. The focus area also encompasses the important shoals associated with the islands. Agricultural fields predominantly pasture, with scattered shrub and woodlands dominate the mainland habitats. Many of the farms have been abandoned with fields reverting to forests. The habitat characteristics of the islands vary from rocky outcrops to islands dominated by woody species such as black willow, cottonwood, ash, staghorn sumac, and silky dogwood (NY DEC 2002).

Ownership/Protection:

The majority of the landscape of this focus area consists of open water of Lake Ontario. Ownership on the mainland is predominantly private. However, several public holdings of New York Department of Environmental Conservation dot the shoreline including Ashland Flats Wildlife Management Area (WMA), Dexter Marsh WMA, Long Point State Park, and Westcott Beach State Park. The islands as well are predominantly privately owned with a few publicly owned islands such as Gull and Little Galloo Islands and parts of Galloo Island. The U.S. Coast Guard maintains ownership of the Galloo Island lighthouse.

Special Recognition:

The islands and shoals of the focus area comprise a rare ecosystem in New York and are considered significant coastal fish and wildlife habitat by the New York Department of State. In addition, the New York Department of Environmental Conservation and Office of Parks Recreation and Historic Preservation list the eastern Lake Ontario islands as priority projects (NY DEC 1998). Two Important Bird Areas, designated by the National Audubon Society, are located in the focus area; Little Galloo Island and Point Peninsula. Much of eastern Lake Ontario, including this focus area, has been designated as a Biodiversity Investment Area by the U.S. Environmental Protection Agency (EPA 1998).

Waterfowl:

Most of the use by waterfowl of the Lake Ontario Islands focus area is for staging and migration. The shallow water habitats of the focus areas support large concentrations of waterfowl.

Table 1. Waterfowl species using the Lake Ontario Islands Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	

Blue-winged Teal	X	X	
AP Canada Goose		X	
Resident Canada Goose	X	X	X
Canvasback		X	X
Lesser Scaup		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Common Merganser		X	X
Redhead		X	
Long-tailed Duck		X	X
White-winged Scoter		X	X

Italics indicate priority species identified by New York Department of Environmental Conservation.

Other Migratory Birds:

The islands of the focus area host substantial colonies of waterbirds including the largest Ring-billed Gull colony in the world (80,000+ pairs); the largest Caspian Tern colony in Lake Ontario (New York's only colony); and the largest Double-crested Cormorant colony in the northeastern U.S. (Wells 1998). The area is a critical winter concentration areas for a number of raptors including Rough-legged Hawk; Northern Harrier, Red-tailed Hawk, Short-eared, Great Horned, Long-eared, and Snowy Owl; and Caspian, Black, and Common Tern (Wells 1998).

Threats:

Perhaps the greatest threat to this entire focus area is the continuing increase in public use for recreation and tourism. Second home and residential development is intense along the shoreline and promotes the development of more marinas and increased use of the nearshore waters by boaters, thus increasing potential disturbance to staging and migrating birds and the large nesting colonies on the nearshore islands. Succession of grasslands from farm abandonment is threatening the limited habitat for grasslands species in this focus area. Control of water levels continues to remain a concern as levels have been artificially held relatively stable and can reduce the diversity and health of shoreline wetland communities. Water quality issues in Lake Ontario also remain a concern. Although water quality in Lake Ontario has improved dramatically over the past 25 years, bioaccumulative toxics are still a concern especially with fish-eating migratory birds. Cormorants present social, political, and biological problems. Increasing populations threaten other waterbird colonies, have been linked to the reduction in certain fisheries in the lake, and can prove to be a nuisance in some areas.

Conservation Recommendations:

Most conservation efforts in eastern Lake Ontario have been small scale and local. The increasing pressure on this area for recreation demands a more comprehensive approach to conservation to maintain the integrity of the diversity of habitat types within the focus area. This includes private lands needs for grassland birds, reduction in potential disturbance of the waterbird colonies on the islands and staging areas on nearshore waters. Current cormorant management policy is to restrict cormorant nesting to Little Galloo Island within the eastern basin in the United States. Potentially damaging cormorant colonies should continue to be

monitored and controlled, if necessary. Also, monitoring of the long-term effects of contaminants on physiology and reproduction of migratory birds should continue.

References:

Environmental Protection Agency. 1998. Eastern Lake Ontario. State of the Lakes Ecosystem Conference: Biodiversity investment areas, nearshore terrestrial ecosystems. http://www.epa.gov/glnpo/solec/98/papers/bia.

New York Department of Environmental Conservation. 1998. New York state open space conservation plan. State of New York. pp.

New York Department of Environmental Conservation. 2002. Lake Ontario islands wildlife management area management plan. 12pp.

Wells, J.V. 1998. Important bird areas in New York state. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Lake Shore Marshes, New York
Sub-Focus Areas: None

Area Description:

The Lake Shore Marshes focus area encompasses a long narrow strip along the southern and eastern shores of Lake Ontario. The boundary runs from approximately Hamlin Beach State Park in Monroe County east through Rochester and Oswego to Southwick Beach State Park in Jefferson County along the eastern shore of Lake Ontario. The focus area extends approximately 3 km offshore. Land characteristics and, thus, land use in the focus area differ from west to east (NY DEC undated). The western portion of the focus area is characterized by a broad lake plain topography with low bluffs and large embayments. Small wetlands at the mouths of the tributaries comprise the majority of wetlands in this area and are dominated by cattail. Predominant land use is agriculture with fruit, grain, and vegetable farming. Residential development of the shoreline for homes is intensive as is recreational use. The central section of the focus area, located from west of Rochester to the eastern shore, is characterized by drumlins. The wetlands and bays in this section exist between the drumlins along the shore and extend inland. Land use in this section is predominantly agriculture with intensive fruit farming. Shoreline or waterfront development is mostly cottages and second homes. Fronting New York's only freshwater barrier beach system, eastern Lake Ontario has the largest and most diverse wetlands in the focus area. This section has substantial shoreline development of second homes, cottages, marinas, and associated recreation/tourism activities. Agricultural practices are limited to sparse dairy farming. However, the most important influence on habitat values in the focus area is lake level fluctuation. Lake Ontario experiences seasonal and long-term fluctuations in water levels. Seasonal fluctuations vary about two feet per year with high water in the spring and early summer and low water in the fall and winter. Long-term and seasonal water level changes act to maintain healthy wetland systems throughout the focus area. The degree of importance depends on the hydrological connection wetlands have with the lake. Large bays are the most heavily influenced with wetlands protected by barrier fronts less affected (NY DEC undated).

Ownership/Protection:

The majority of the focus area is privately owned. However, public ownership is scattered throughout the focus area with substantial public ownership in the eastern Lake Ontario section with much of the shoreline and wetlands owned and managed by the New York Department of Environmental Conservation as either state parks or wildlife management areas. The majority of the uplands in the focus area are in private ownership.

Special Recognition:

The New York Audubon Society recognizes four areas in the focus area as Important Bird Areas. These include Braddock Bay and Hamlin Beach west of Rochester, Derby Hill Bird Observatory in the southeast corner of Lake Ontario, and Eastern Lake Ontario Barrier Beaches.

Waterfowl:

The Lake Shore Marshes focus area provides habitat primarily for staging and migrating waterfowl. Waterfowl concentrate in many of the bays and wetlands in both the spring and fall. As many as 44,000 Greater Scaup, 76,700 White-winged Scoter, 20,000 Long-tailed Duck, and

31,000 Red-breasted Merganser migrate through the focus area during the spring/fall migrations (Wells 1998). Wintering birds are scarce but can be found in the nearshore waters, larger bays, mouths of rivers and tributaries, and power plant discharge areas. Much of the use depends on the extent of ice cover in the bays and nearshore areas. Most waterfowl overwintering in this focus area are diving ducks or sea ducks. Waterfowl nesting is limited and occurs predominantly in the central and eastern sections in large, structurally diverse, undisturbed wetland complexes with relatively constant water levels.

Table 1. Waterfowl species using the Lake Shore Marshes Focus Area (NY DEC undated).

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	X
Mallard	X	X	
Wood Duck	X	X	
Blue-winged Teal	X	X	
AP Canada Goose		X	
Ring-necked Duck		X	X
Lesser Scaup		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Common Merganser		X	X
Red-breasted Merganser		X	
Ring-necked Duck		X	X
Bufflehead		X	X
Long-tailed Duck		X	X
White-winged Scoter		X	X

Italics indicate priority species identified by New York Department of Environmental Conservation.

Other Migratory Birds:

The Lake Shore Marshes focus area provides significant habitat for a variety of species. Staging is perhaps the most important use of the focus area. More than 250 species of birds have been recorded at Hamlin State Beach during the spring and fall migration (Wells 1998). Shorebirds, raptors, waterbirds, and passerines use the wetlands and associated uplands extensively for staging before crossing the lake. Braddock Bay hosts one of the world's largest spring hawk migration with 144,000 birds counted in 1996 and nearly 17,000 Common Loon and 20,000 Red-throated Loon in 1997 (Wells 1998). Wintering birds include Snowy, Short-eared and Long-eared Owl, Saw-whet Owl, Common and Red-throated Loon, Horned Grebe, and Glaucous and Icelandic Gull. Some nesting species include Common and Black Tern, American and Least Bittern, Osprey, Northern Harrier, and several species of herons.

Threats:

A number of activities in the focus area threaten the integrity of the wetlands and the associated uplands. Intensive agriculture, residential development (waterfront housing), invasive plants such as purple loosestrife and phragmites, and overuse by tourism and recreational activities threaten the habitats supported within the focus area.

Conservation Recommendations:

Development along the shoreline probably would prohibit acquisition of large tracts of land (NY DEC 2002). However, where tracts of important wetlands, dune systems, and tributaries exist they should be protected through fee or easement acquisition to prevent development, loss of habitat, and potential disturbance to staging and migrating birds. Also, water quality of Lake Ontario should be improved through best management practices in agricultural areas and in residential areas by curtailing use of pesticide and herbicide thus reducing runoff. Control of invasive plants is important to maintain the diversity of wetlands

References:

New York Department of Environmental Conservation. 2002. New York state open space conservation plan. State of New York. 539pp.

New York Department of Environmental Conservation. Undated. Lake shore marshes focus area plan – Draft. Lower Great Lakes-St. Lawrence Basin Joint Venture. Unpubl. Rep.

Wells, J.V. 1998. Important bird areas in New York state. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Long Island South Shore Complex, New York
Sub-Focus Areas: Jamaica Bay, Hempstead Bay, Great South Bay, Moriches Bay, Shinnecock Bay, and South Fork

Area Description:

All sub-focus areas are located within the Long Island barrier beach/back-barrier lagoon system and encompass 79,094 hectares (195,447 acres). This system extends in an east-west direction for 145 kilometers (90 miles) along the south shore of Long Island, from Coney Island in New York City east to Southampton at the eastern end of Shinnecock Bay. The shallow water wetlands and back-barrier areas are highly productive, especially the salt marshes and mudflats that fringe the barrier islands and the estuarine habitats around the creek outlets. The deeper water habitats are composed of sandy shoals and eelgrass beds that provide cover and nursery habitat to many species.

Ownership/Protection:

The ownership pattern along the south shore of Long Island is variable including federal, tribal, state, county, and town. However, most of the shoreline is privately owned and developed for residences, marinas, and marine-related industries.

Special Recognition:

The U.S. Fish and Wildlife Service recognize a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986. Also, several beaches have been designated and mapped as undeveloped beach units as part of the Coastal Barrier Resources System pursuant to the federal Coastal Barrier Resources Act, prohibiting federal financial assistance or flood insurance within the unit. All sub-focus areas have been recognized as Significant Coastal Fish and Wildlife Habitats by the New York State Department of State. The New York State Natural Heritage Program, in conjunction with The Nature Conservancy, recognizes a number of sites within the focus areas as Priority Sites for Biodiversity. In addition, the South Shore Estuary Reserve includes most of the focus area from the back bay of Long Beach Island in Hempstead through the east end of Shinnecock Bay (D. Rosenblatt, personal communication).

Waterfowl:

The estuaries of the Long Island Sound Complex are highly productive habitats and significant waterfowl wintering areas. Between November and March, large concentrations of waterfowl use the marshes except when prohibited by ice cover. The bays also are used for migration stopover during the spring and fall migrations.

Table 1. Waterfowl species using the Long Island South Shore Complex Focus Area (U.S. Fish and Wildlife Service, 1996).

Species	Breeding	Migration	Wintering
American Black Duck		X	X
Mallard	X	X	X
Canvasback		X	X

Lesser Scaup		X	X
Greater Scaup		X	X
Long-tailed Duck		X	X
Atlantic Brant		X	X
Canada Goose	X	X	X
Bufflehead		X	X

Other Migratory Birds:

The estuaries as well as spoil islands and dredged areas support significant nesting colonies of terns, gulls, and wading birds. These species include Common and Roseate Tern (federally endangered), Black Skimmer, Herring and Great Black-backed Gull, several species of egrets and rails, and federally-threatened Piping Plover. The marshes, flats, and shallows in this complex of tidal wetlands are used extensively by migrating shorebirds. The undeveloped beach, dunes, and marshes on the barrier islands provide critical foraging and resting areas for thousands of migrating raptors each year.

Threats:

Development of remaining open space in the watershed is the most pressing problem; development activities adversely affect the bay and its biological productivity. Increasing development of the mainland shoreline to private residences, including high-density condominiums and townhouses, is altering and eliminating tidal and freshwater wetlands, thereby posing a threat to wildlife species dependent on these habitats. The expansion of marina facilities, increased human disturbance, proposed beach stabilization projects, and water quality degradation from road runoff and septic systems is negatively impacting the entire Long Island Complex.

Conservation Recommendations:

Disturbances to wintering and nesting bird populations need to be minimized or eliminated entirely; especially intrusion into beach nesting areas and critical wintering areas. The single most important factor to preserve the aquatic habitats is controlling waste and nonpoint source pollution entering the estuary to protect the bay fishery and maintain habitat quality. Efforts should be made to designate the bay as a "no discharge zone" for sewage from recreational boating. Dredging new boat channels should be avoided and alterations to the inlet should be minimal to preserve the present tidal pattern.

References:

Rosenblatt, D. 2003. New York Dept. of Env. Cons. Personal Communication.

U.S. Fish and Wildlife Service. 1996. Significant habitats and habitat complexes of the New York bight watershed. Southern New England - New York Bight Coastal Ecosystems Program, Charlestown, RI

Focus Area: Montezuma, New York
Sub-Focus Areas: None

Area Description:

The Montezuma Focus Area is one of the largest and most important wetland complexes in the northeastern United States encompassing 65,229 hectares (161,183 acres). The focus area is located in central New York in Wayne, Seneca, and Cayuga Counties about halfway between Syracuse and Rochester. The boundary of the focus area generally follows the 118 meter (390 foot) contour encompassing a diversity of habitat types around the wetland complex. The landscape is characterized by broad, flat basins interrupted by drumlin formations (Ducks Unlimited 2000). The dominant land use is agriculture with corn, potatoes, onions, beans, and wheat or hay as the major crops. Muck soils comprise a large portion of the wetlands and have long-term agricultural potential (Ducks Unlimited 2000). However, only a small portion of mucklands is used for agriculture because of the expense in preparing and maintaining these areas. Wetlands comprise the second largest habitat component in the focus area. Forested wetlands are the most prevalent type of wetland making up over 60% of the wetland types followed by emergent wetlands with 17% (Figure 1). The forested wetlands are characterized by red and silver maple, green ash, and swamp white oak; emergent wetlands by cattail, swamp loosestrife, wild rice, pond weeds, arrowheads, sedges, and rushes. Purple loosestrife, *Phragmites*, pale swallow-wort and white water lily are prevalent in the wetlands. Globally significant inland salt marshes are found within the focus area as well as non-vegetated mudflats important for shorebird migration (Ducks Unlimited 2000). Sugar and red maple, basswood, and several species of oaks and pines comprise the upland forests. Cool season grasses such as timothy and brome grass and warm season grasses such as switchgrass and big bluestem make up the grasslands. The mix of these habitat types and various successional stages contribute to the rich biodiversity of the focus area. Rural homesteads and small communities make up most of the developed land, which is a minor component of the land use.

Ownership/Protection:

The majority of the focus area is under private ownership dominated by dairy farms and muck farms. Public ownership is within the Montezuma National Wildlife Refuge, U.S. Fish and Wildlife Service and the Northern Montezuma Wildlife Management Area, New York Department of Environmental Conservation. In addition, the New York Department of Transportation owns significant acreage along the Seneca River/Barge Canal (U.S. Fish and Wildlife Service 1991) with much of these lands under Management Agreement with the U.S. Fish and Wildlife Service and the New York Department of Environmental Conservation. The New York Department of Transportation also owns the right-of-way along the New York State Thruway, but this is a minor component.

Special Recognition:

The Northern Montezuma Wetlands Complex, located within the focus area, is recognized as an Important Bird Area by the National Audubon Society (Wells 1998). In addition, the New York Natural Heritage and the National Natural Landmark and Research Natural Areas Program recognizes the unusual natural character of the ecological associations and rare plant and animal communities within the Montezuma Wetlands Complex (Ducks Unlimited, 2000).

Waterfowl:

The Montezuma Focus Area hosts one of the largest concentrations of migratory waterfowl in the northeastern United States. More than 500,000 Canada Goose (including Atlantic Population Goose), 100,000 snow Goose, 100,000 Mallard, and 25,000 Black Duck pass through the wetland complex of the focus area each year (D. Odell, personal communication). It provides a valuable migration habitat link between Lake Ontario and the Finger Lakes. Twenty-nine species are known to use the wetlands in the Montezuma Focus Area with at least ten species using the area for breeding (U.S. Fish and Wildlife Service, 1991).

Table 1. Selected waterfowl species using the Montezuma Focus Area (U.S. Fish and Wildlife Service 1991).

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	
Mallard	X	X	
AP Canada Goose		X	
Canvasback	X	X	
Redhead	X	X	
Greater Scaup		X	
Goldeneye		X	
Wood Duck	X	X	
Green-winged Teal	X	X	
Blue-winged Teal	X	X	
Northern Pintail	X	X	
Hooded Merganser	X	X	
Greater Snow Goose		X	
Resident Canada Goose	X		

Other Migratory Birds:

In addition to the large numbers of waterfowl, the wetlands of the Montezuma Focus Area support over 200 species of other migratory birds. The area is an important stopover site for thousands of shorebirds representing as many as twenty-five different species. Several rookeries of Great Blue Heron and Black-crowned Night-Heron are found within the wetland complex. Nesting species include American and Least Bittern, Black Tern, Osprey, Cooper's Hawk, Northern Harrier, Red-shouldered Hawk, Bald Eagle, Sandhill Crane and Common Tern. Sedge Wren, and Cerulean Warbler. Also, the focus area contains one of the largest fall concentrations of swallows in New York with numbers estimated between 50,000 – 100,000 individuals (Wells 1998).

Threats:

Threats to the integrity of the wetlands within the Montezuma Complex derive from the agricultural practices prevalent in the area and lost potential to restore these lands back to functioning wetlands. Mucklands that have become unprofitable revert back to wetlands (Ducks Unlimited 2000). The function and, thus, value of the subsequent wetlands may be compromised if allowed to revert back to fields of purple loosestrife or lower quality wetland (S. Hess, personal communication). The opportunity to restore abandoned or marginal agricultural lands

to high quality wetlands is prevalent throughout the focus area. In addition, mucklands that have reverted back to wetlands may harbor harmful concentrations of agricultural chemicals. The affect of agricultural runoff on water quality also is a concern especially for the source water for impoundments such as the Seneca River/Barge Canal. Invasive species such as purple loosestrife, white water lily, Eurasian water milfoil, and carp can be serious threats to the diversity and health of wetlands. Leachates from a large landfill adjacent to Montezuma National Wildlife Refuge, perhaps the largest in New York, pose a potential threat to the integrity of the wetlands near the landfill (Wells 1998). In addition, the Montezuma Focus Area is located within a one-hour drive of approximately three million people. Over 200,000 people visit the Montezuma wetlands for activities such as bird watching, canoeing, and deer hunting. Increased disturbance may interrupt important daily foraging activities of migratory birds potentially affecting survival.

Conservation Recommendations:

Restoration of marginal or abandoned farmlands, both wetland and upland, should be pursued where possible and followed with long-term management (S. Hess, personal communication). Agricultural runoff and potential leaching of harmful pollution from the landfill should be monitored. Water quality within the impoundments (i.e. Seneca River/Barge Canal) should be monitored for pollution from agricultural practices as well as the quality and integrity of restored mucklands. Public education is an important component of long-term management for the Montezuma wetlands complex and should be fostered to increase public awareness about the critical role this area plays in the annual cycle of migratory birds. Controlled access on the federal and state lands should continue to limit the number of people using the area at any one time to minimize disturbance to migrating and breeding birds and maintain the value of the complex. Purple loosestrife control should continue with control of other invasive species.

References:

Ducks Unlimited, Inc. 2000. Management Plan: Montezuma Wetlands Complex. Seneca Falls, NY. 48 pp.

Hess, S. 2003. Ducks Unlimited, Inc. Personal Communication.

U.S. Fish and Wildlife Service. 1991. Final environmental impact statement: northern Montezuma wetlands project. K.R. Wich and R.E. Lambertson, eds. U.S. Fish and Wildl. Serv., Hadley, MA and New York Dept. Env. Cons., Albany, NY. 223 pp.

Wells, J.V. 1998. Important bird areas in New York State. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Niagara River/Buffalo Harbor, New York
Sub-Focus Areas: None

Area Description:
The Niagara River/Buffalo Harbor Focus Area extends the length of the Niagara River corridor connecting Lakes Erie and Ontario on the United States side only. It includes Grand Island and extends approximately 3 kilometers (1.8 miles) offshore from Buffalo Harbor in the southern reaches of the focus area. Habitats of the Niagara River corridor range from large boulder beds with swift moving current to large open water areas. The river corridor contains a diverse abundance of flora and fauna. Over 1,600 plant species including unique old-growth miniature eastern white cedars and 50 mammal, 17 amphibian, 99 fish, and 17 reptile species have been identified. Inventories of birds have recorded 342 species. It is a significant migration and wintering area for gulls, especially Bonaparte's and Herring gulls, and waterfowl. A mix of industrial and urban development and agriculture characterizes much of the United States side with the city of Buffalo and Buffalo Harbor located in the southern reach of the corridor. Niagara Falls is located about midway through the corridor and is a major tourist destination with approximately 8-10 million visitors per year. The habitats of the Niagara River corridor have been severely degraded through a variety of human disturbances. Wooded riparian wetlands located adjacent to the river and emergent wetlands at the mouths of tributaries provided valuable habitat for migratory birds, mammals, reptiles, amphibians, and fishes. Most of these wetlands have been lost due to filling, contamination, dewatering through river diversion, and invasion of exotic plants such as purple loosestife. Some of these degraded wetlands are within or adjacent to publicly held parkland while others are adjacent to developed commercial lands. A productive and diverse sport fishery exists along the river corridor. Several important commercial fishes have declined or been extirpated from the corridor including blue pike, lake sturgeon, and northern pike (EPA 1994)."

Ownership/Protection:
The majority of the land along the river corridor is privately owned by municipal, corporate, or private interests. However, a number of state parks and national historic sites are scattered along the corridor. The area has significant cultural resources related to the history of the United States with the National Park Service maintaining three National Historic Landmarks along the river. Also, portions of the corridor are owned by the New York State Department of Parks, Recreation, and Historic Preservation and the New York State Department of Environmental Conservation.

Special Recognition:
The Niagara River corridor was the first globally significant Important Bird Area (IBA) identified by the United States and Canada**.** Also, it is identified as an IBA with the National Audubon Society (Wells 1998) and the National Park Service has identified the corridor as a National Heritage Area.

Waterfowl:
The Niagara River corridor hosts a large and diverse array of waterfowl. Waterfowl concentrations exceed 20,000 individuals of more than 20 species during the fall and winter Canvasbacks, Common Merganser, Common Goldeneye, and scaup make up the bulk of the

species in the fall and winter. Average mid-winter surveys over a 22-year period show approximately 15,000 individuals of these five species within the river corridor (Wells 1998).

Table 1. Waterfowl species using the Niagara River/Buffalo Harbor Focus Area.

Species	**Breeding**	**Migration**	Wintering
Mallard		X	X
American Black Duck		X	X
Canvasback		X	X
Redhead		X	X
Common Merganser		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Common Goldeneye		X	X
Long-tailed Duck		X	X
White-winged Scoter		X	X

Italics indicate priority species identified by New York Department of Environmental Conservation.

Other Migratory Birds:

The geography of the Niagara River lends itself to an exceptional diversity of landbird and raptor migration between Lakes Erie and Ontario. The Niagara River supports one of the world's largest concentrations of gulls (Wells 1998). Nineteen species have been observed with one-day counts of over 100,000 individuals. It is especially important for Bonaparte's and Herring Gull that occur in globally significant numbers. During the fall or early winter as many as 50,000 Bonaparte's Gull (10% global population) have been observed (Wells 1998). Ring-billed Gull are also prevalent with as many as 20,000 individuals observed in a single day. The area supports breeding colonies of Common Tern, Herring and Ring-billed Gull, Black-crowned Night Heron, Great Blue Heron, Double-crested Cormorant, and Great Egret (Wells 1998). Also, the focus area supports breeding Upland Sandpiper, Least Bittern, Northern Harrier, Sedge Wren, and Grasshopper Sparrow (Wells 1998).

Threats:

The extensive industrial development along the river corridor has led to severe contamination issues. Specific fish consumption advisories have been issued for fish originating from the Niagara River and for other predatory species feeding on the fish. In fact, statewide waterfowl consumption advisory has been issued to "eat no Mergansers since they are the most heavily contaminated waterfowl species" and to limit consumption of other waterfowl to two meals per month (EPA 1994). In the early 1950's an International Joint Commission was formed to begin reporting on the contamination of the river. In 1973 the International Joint Commission designated the Niagara River and Buffalo River as "Areas of Concern." Remedial Action Plans for both the U.S. and Ontario sides were developed to address the contaminants issue within the river corridor (EPA 1997). In 1987 Environment Canada, Ontario Ministry of Natural Resources, U.S. Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation signed a Declaration of Intent to "achieve significant reductions of toxic contaminants in the Niagara River", which led to the Niagara River Toxics Management

Plan (EPA 1999). This plan sets objectives for reduction in toxic chemical loading in the Niagara River. In addition to contaminants, loss of wetland habitat to urban and industrial development, tourism related disturbance, river alteration, dredging, and invasion of exotic species (purple loosestrife) threaten the long-term ability of the habitats within the focus area to support the large and diverse numbers of migrating, wintering, and breeding species.

Conservation Recommendations:

Although toxic contamination from PCBs and dioxins have been reduced and continue to be addressed, these contaminants represent a long-term threat to the integrity of the health of all wildlife using the focus area. Contaminants in the Niagara River should continue to be monitored with increased efforts to reduce the influx of long-term and injurious chemicals. This is especially important because of the high concentration of birds within this relatively small, but important, area. The remaining wetlands and shallow-water habitats should be protected and restored for use by migrating birds and other wildlife. Tourist-related disturbance of waterbird colonies should be eliminated or reduced to a minimum.

References:

Bird Studies Canada. Important bird areas. *www.bsc-eoc.org/iba/*.

Environmental Protection Agency. 1999. Niagara river toxics management plan. *www.epa.gov/glnpo/lakeont/nrtmp/pr&wp99/*.

Environmental Protection Agency. 1997. Niagara river remedial action plan. *www.on.ec.gc.ca/water/greatlakes/raps/connecting/niagara.intro.html*.

Environmental Protection Agency. 1994. Niagara river area of concern. *www.epa.gov/grtlakes/aoc/niagara.html*.

Wells, J.V. 1998. Important bird areas in New York state. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Oneida Lake, New York
Sub-Focus Areas: None

Area Description:

The Oneida Lake Focus Area encompasses Oneida Lake and portions of the Mohawk River/Erie Canal to Ilion, New York and includes 121,150 hectares (299,366 acres). The southern boundary extends to Syracuse, New York and runs east approximately along the New York State Thruway (I-90) where the eastern boundary tapers to its terminus in Ilion, New York. The southern portion of the focus area includes the large Cicero Swamp area. Oneida Lake is the largest lake wholly within the state of New York. It is a remnant of the much larger Lake Iroquois present about 12,500 years ago (Central New York Regional Planning and Development Board 2003). The lake is relatively shallow with a maximum depth of only 16.8 meters (55 feet). Nearly half of the lake is less than 7 meters (22 feet) in depth making it a very productive lake. In addition, the varied topography and soil types of the watershed provide for good diversity within the watershed and, thus, the focus area. The productivity is reflected in the diverse floral and faunal communities found throughout the lake and the associated watershed. Eel grass, coontail, Eurasian watermilfoil, and waterweed make up some of the submerged, emergent, and floating-leaf aquatic communities. Black gum and yellow popular make up the forest types of the poorer drained soils with elm, black ash, beech, birch, hemlock, oak, and red maple on the better-drained and drier sites. The wetlands associated with Oneida Lake and within the focus area are concentrated in the lowland areas, remnant areas of Lake Iroquois, immediately surrounding the lake and vary from forested, seasonally flooded swamps to open marshes of grasses and sedges. Some of the larger intact wetlands located within the focus area include Cicero Swamp approximately 1,300 hectares (3,212 acres), Toad Harbor approximately 1,000 hectares (2,471 acres), and Big Bay Swamp approximately 700 hectares (1,729 acres) (Central New York Regional Planning and Development Board 2003). Because of the productive wetland soils, agriculture is a dominant land use and has resulted in the substantial loss of wetlands. Most of the agriculture is dairy farms with vegetable, sheep, beef, and equine farming comprising the remaining non-dairy farming operations. Loss of some farming operations has resulted in many restoration opportunities within the focus area. The eastern portion of the focus area follows the Mohawk River/Erie Canal for approximately 60 kilometers from the eastern shoreline of Oneida Lake. The construction of the Erie Barge Canal in 1916 had a major effect on the ecology of Oneida Lake. The canal connected Lake Ontario (i.e. the Great Lakes) with the Atlantic Ocean via the Oswego River. This connection opened Oneida Lake to invasion from numerous exotic species from zebra mussels to water chestnut.

Ownership/Protection:

The majority of the ownership within the focus area is private either in residential or agriculture. Many seasonal homes are located along the shoreline of the lake, especially along the southern shore, which is the most heavily developed area of Madison County. The New York Department of Environmental Conservation, and the Department of Parks, Recreation, and Historic Preservation own and maintain several Wildlife Management Areas, State Parks, and State Forests within the focus area. Commercial and industrial ownership is based around the cities and villages and makes up a very small percentage of the ownership pattern.

Special Recognition:

The National Audubon Society recognizes two Important Bird Areas within the Oneida Lake Focus Area, Toad Harbor Swamp and Oneida Lake Islands. The U.S. Fish and Wildlife Service recognizes three important wetlands within the focus area; Muskrat Bay, Big Bay Wetland, and Toad Harbor (U.S.F.W.S. 1990).

Waterfowl:

The extensive wetlands and productive, shallow open-water habitat of the Oneida Lake Focus Area provide habitat for a diverse assemblage of waterfowl for migration and breeding. Use by waterfowl is increasing with farmlands reverting back to wetlands and the increased number of wetlands created by beaver activity.

Table 1. Waterfowl species using the Oneida Lake Focus Area.

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	
Mallard	X	X	
Wood Duck	X	X	
Blue-winged Teal		X	
Greater Scaup		X	
White-winged Scoter		X	
Goldeneye spp.		X	
Bufflehead		X	
Long-tailed Duck		X	
Red-breasted Merganser		X	
Atlantic Brant		X	

Other Migratory Birds:

The diverse habitats of the Oneida Lake Focus Area also support non-waterfowl species. The Oneida Lake Islands are important for nesting Common Tern along with Ring-billed Gull, Herring Gull, and Double-crested Cormorant. In addition the wetlands along the edges of the lake provide nesting habitat for American Bittern, Pied-billed Grebe, Northern Harrier, Cerulean Warbler, Virginia Rail, Sora, Green Heron, and a Great Blue Heron rookery (Wells 1998). Bonaparte's Gull uses the lake during migration. Double-crested Cormorant populations have increased dramatically since they were first recorded nesting on Oneida Lake in 1984 and have had a significant impact on the Oneida Lake fishery. In 2000, 365 pairs were recorded nesting on Oneida Lake. Cormorant populations on the lake begin to increase during the early fall and peak in late September and early October with the arrival of migrant birds. Cormorants are implicated in the decline of walleye and yellow perch in the lake. Other detrimental effects of cormorants include denuding island vegetation and competition for food and habitat with other colonial nesters. In 1998 a hazing program was initiated to prevent the build-up of large numbers of cormorants. This program has proven to be very successful in preventing an accumulation of large numbers of birds and forcing birds to leave as much as one month prior to normal fall migration.

Threats:

A number of threats face the Oneida Lake Focus Area. Residential, commercial, and industrial development threatens the integrity of many habitats in and around the lake. Much of the lakeshore is developed for summer and second homes not only resulting in habitat loss but potential disturbance to migrant and breeding birds and contamination of water by sewer systems, insecticides, and pesticides. Contaminants and habitat loss from industrial, commercial, and agricultural operations also threaten the water quality of the lake and the quality of habitats, both upland and wetland, in the focus area. Construction of the Erie Barge Canal has provided easy access for invasive organisms to invade the lake. Exotic species such as zebra mussels, purple loosestrife, and water chestnut have become or have the potential to become prolific. Zebra mussels perhaps have had the greatest direct and indirect impact on Oneida Lake than any other invasive species. Zebra mussels have caused the extinction of all native clams and may facilitate the spread of round gobies, an exotic bottom-feeding fish found in Lake Ontario and the western reaches of the Erie Barge Canal. The mussels have changed the patterns of water clarity, and subsequently light penetration. This has resulted in invasive aquatic plants growing in deeper water covering larger areas of the lake; growth of algal mats along the bottom of the lake; and increased predation of young fish by cormorants. Other threats include increased disturbance by recreational boaters, channelization of tributaries into the lake, and flooding caused by wetland loss and increased sedimentation in the tributaries.

Conservation Recommendations:

Monitoring the spread and potential direct and indirect effects of exotic species, especially zebra mussels, should be a priority for this focus area. Also, monitoring the effects and continued hazing and control of cormorants should be maintained as it relates to nesting of Common Tern and other colonial species. Disturbance from shoreline development and recreational boating should be held to a minimum, especially during breeding season for colonial nesting species. Wetlands should be protected and restored, where opportunities exist, to provide habitat for wildlife and other benefits.

References:

Central New York Regional Planning and Development Board. 2003. Oneida lake state of the lake watershed report. http://www.cnyrpdb.org/oneidalake/SOLW.asp.

U.S. Fish and Wildlife Service. 1990. Regional wetlands concept plan: Emergency Wetlands Resources Act. U.S. Fish and Wildl. Serv., Hadley, MA.

Wells, J.V. 1998. Important bird areas in New York state. Natl. Aud. Soc., Albany, NY. 243pp.

Focus Area: Peconic Bay Marshes, New York
Sub-Focus Areas: None

Area Description:

The Peconic Estuary is composed of diverse communities distributed among a series of interconnected bays between the north and south forks of eastern Long Island and encompasses 43,873 hectares (108,412 acres). The estuary contains over 100 'minor' bays with four 'major' bays; Flanders, Great Peconic, Little Peconic, and Gardiners (Suffolk County 1991). Most of the bays are shallow ranging between 6-12 meters (20 – 40 feet) in depth. The wetland habitats within the Peconic Estuary are diverse including emergent and rocky intertidal, freshwater, and brackish wetlands, mudflats, beaches and dunes, and beds of submerged aquatic vegetation such as eelgrass and wigeongrass. Most of the marshes are located in the numerous bays where tidal creeks flow into the estuary. More than 60 freshwater creeks flow into the estuary along the shores of the north and south forks (Suffolk County 1996). The emergent marshes are characterized by high and low marsh with saltmarsh cordgrass dominant in the low marsh and salt hay in the high marsh (Bortman and Niedowski 1998). Salt pannes are scattered throughout the marshes and contain such species as dwarf forms of saltmarsh cordgrass, glassworts, and marsh flea bane. Other species prevalent in the emergent marshes include saltmarsh bulrush, sea lavender, and spike grass (Bortman and Niedowski 1998). The freshwater and brackish wetlands are located at the west end where the Peconic River flows into the estuary.

Ownership/Protection:

Much of the land surrounding the estuary is held in private ownership. Approximately 60% is either in open space/recreational, agriculture, or is vacant; however, most of these lands are vulnerable to development (Suffolk County 1991, Suffolk County 1999). The remaining 40% is under residential, industrial, or commercial development. The Peconic Estuary Program as developed a Comprehensive Conservation and Management Plan that details strategies to protect the valuable resources of eastern Long Island and the estuary (Suffolk County 1999). The state of New York owns several state parks on the extreme eastern end of both the north and south forks. The U.S. Fish and Wildlife Service own several small refuges located within the Peconic Estuary.

Special Recognition:

The Peconic Estuary was recognized by the U.S. Environmental Protection Agency's National Estuary Program in 1992. Many of the wetlands within the estuary have been identified by the Regional Wetlands Concept Plan (USFWS 1990) for Region 5. Also, eight Important Bird Areas have been identified within the estuary (Wells 1998).

Waterfowl:

The Peconic Estuary provides, primarily, migration and wintering habitat for a number of waterfowl species. A minimum of twenty-nine species have been observed using the estuary throughout the year. A limited number of species use the estuary for breeding. Those include American Black Duck, Mallard, Canada Goose, Gadwall, and, to a very limited extent, Wood Duck (Andrle and Carroll 1988). The dominant use of the estuary by waterfowl is for migration and wintering especially by diving ducks and sea ducks using the shallow bays and mudflats.

Canvasback and Greater Scaup are the most numerous diving ducks with fewer Redhead, Lesser Scaup, and Ring-necked Duck. White-winged and Surf Scoter, Bufflehead, Red-breasted Merganser, Long-tailed Duck, Common Goldeneye, and Ruddy Duck are the most common sea ducks in the estuary during the wintering period. Other species of sea ducks using the estuary include Common Eider, Harlequin Duck, and Common and Hooded Merganser.

Table 1. Waterfowl species using the Peconic Bay Marshes Focus Area.

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Resident Canada Goose	X		X
Gadwall	X	X	X
Wood Duck	X	X	X
Canvasback		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Ring-necked Duck		X	X
White-winged Scoter		X	X
Surf Scoter		X	X
Bufflehead		X	X
Red-breasted Merganser		X	X
Common Merganser		X	X
Hooded Merganser		X	X
Long-tailed Duck		X	X
Common Goldeneye		X	X
Ruddy Duck		X	X
Common Eider		X	X
Harlequin		X	X

Other Migratory Birds:

The diverse habitat types and communities of the Peconic estuary provides extensive breeding, migration, and, to some extent, wintering habitat for many non-waterfowl species. The Peconics support at least eleven species of herons and egrets, twenty-five species of gulls, eight thrushes, thirty-eight warblers, and forty species of sparrows and finches during the year. As many as 9,000 pairs of Common Tern nest within the estuary including federally-listed species such as Piping Plover, Least Tern, and Roseate Tern. Other high priority species include Black Skimmer, American Bittern, Pied-billed Grebe, and Great Blue Heron.

Threats:

The Peconic Estuary is under threat from a myriad of sources. The population of some areas surrounding the estuary has increased by 67% since 1960 with year-round households increasing by 118% (Suffolk County 1999). Threats to the estuary include wetland loss from development, degradation of water quality through point and non-point source pollution, disturbance through increased use of beaches by humans and pets, increased boat traffic, and

introduction of invasive species. However, two of the more important threats to the integrity of the estuary are through the cumulative impacts of shoreline hardening and brown tide. Shoreline hardening results in conversion of wetlands to uplands and increased shoreline erosion leading to loss of wetlands and beaches and loss of important submerged aquatic vegetation thorough scouring of shallow areas. Brown tide, first encountered in the estuary in 1985, is a marine microalgae that 'blooms' at unpredictable times and can persist for long periods (Suffolk County 1999). These blooms have virtually eradicated the bay scallop and have lead to severe declines in eelgrass beds and hard clam populations.

Conservation Recommendations:

Protecting the integrity of the Peconic Estuary is critical to many species of migratory birds and other wildlife, especially finfish and shellfish, which depend on the estuary at some point during their life cycle. The Suffolk County Department of Health Services prepared a Comprehensive Conservation Management Plan (Suffolk County 1999) for the Peconic Estuary to address the conservation needs and outline the necessary strategies to protect the estuary in the face of the rapidly changing surrounding landscape. The Peconic Estuary Plan makes a number recommendations to conserve the integrity of the estuary. Some of these include reduce and restrict shoreline hardening, reduce non-point source pollution, and pursue acquisition of undeveloped parcels. Refer to the Peconic Estuary Program: Comprehensive Conservation Management Plan (1999) for a complete list of recommendations.

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Focus Area: St. Lawrence Plain, New York
Sub-Focus Areas: None

Area Description:

The St. Lawrence Plain is a mosaic of diverse habitat types supporting a broad array of waterfowl and non-waterfowl species. The landscape of the focus area is dominated by agriculture with croplands, hay fields, and pasture (Wells 2000). The area encompasses 713,871 hectares (1,764,006 acres). This agricultural landscape is interspersed with numerous forested, scrub-shrub, and emergent wetlands. A unique feature of the focus area is the presence of sheetwater wetlands (Northern Ecological Associates 1994). The flat to rolling topography of the landscape and poorly drained soils hold water from snowmelt and early spring rains. These wetlands are used extensively by migrating and breeding birds. Extensive farm abandonment has increased the amount of shrublands, both wetland and upland, throughout the focus area. Remnants of the once dominate northern-deciduous hardwoods are found interspersed among the agricultural fields and shrublands. Although generally small, these forest fragments still provide valuable habitat for several high priority breeding migratory birds.

Ownership/Protection:

Most of the St. Lawrence Plain is held in relatively small private holdings. However, numerous Wildlife Management Areas, State Parks, and other state-owned lands are located throughout the focus area. The New York State Power Authority operates the St. Lawrence/Franklin D. Roosevelt Hydroelectric Facility in conjunction with the Province of Ontario. The Power Authority has created a number of parks primarily on the St. Lawrence River within the towns of Waddington, Massena, Lisbon, and Louisville (Woodlot Alternatives, Inc. 1999, New York Power Authority 2002). The largest federal landowner is the U.S. Army at Fort Drum. Fort Drum is approximately 43,301 hectares (107,000 acres) and contains a rich diversity of upland and wetlands habitats. The U.S. Fish and Wildlife Service own the St. Lawrence Wetlands and Grasslands Management District, a small parcel of less than 202 hectares (500 acres) of grassland habitat. In addition, the U.S. Fish and Wildlife Service owns over 404 hectares (1,000 acres) of Farmers Home Administration transfer properties and numerous easements, primarily wetlands.

Special Recognition:

Although the St. Lawrence Plain Focus Area has not been formally recognized as a whole for its importance to migratory birds, many distinct areas within the focus area have been recognized. The National Audubon's Society Important Bird Areas Program has recognized nine sites as important to migratory birds (Wells 1998). In addition, eight sites have been recognized by the Regional Wetlands Concept Plan (U.S.F.W.S 1990) as priority wetlands in Region 5.

Waterfowl:

The St. Lawrence Plain provides nesting and migration habitat for a number of waterfowl species including Mallard, American Black Duck, Wood Duck, Green-winged Teal, Blue-winged Teal, Northern Pintail, Northern Shoveler, Gadwall, Ring-necked Duck, and Canada Goose (Northern Ecological Associates 1994, Losito 1993). The agricultural grasslands and their juxtaposition to numerous sheetwater and other wetlands, make this focus area the most

important breeding habitat for Mallard in the eastern United States. Other species such as Blue-winged Teal, Canada Goose, Wood Duck, and Ring-necked Duck also nest within the mosaic of habitat types in the focus area. In addition, scaup, Bufflehead, Hooded Merganser, Goldeneye, Long-tailed Duck, and scoters have been observed using larger bodies of open water, including Lake Ontario, during migration and wintering.

Table 1. Waterfowl species using the St. Lawrence Focus Area.

Species	**Breeding**	**Migration**	Wintering
American Black Duck	X	X	
Blue-winged Teal	X	X	
Mallard	X	X	
Wood Duck	X	X	
Ring-necked Duck	X	X	
Common Merganser		X	
AP Canada Goose		X	
Resident Canada Goose	X	X	
Green-winged Teal	X	X	
Northern Pintail	X	X	
Gadwall	X	X	
Northern Shoveler	X	X	
Bufflehead		X	
Scaup		X	
Barrows Goldeneye		X	X
Common Goldeneye		X	X
Hooded Merganser		X	
Long-tailed Duck		X	X

Other Migratory Birds:

The habitat diversity in the St. Lawrence Plain Focus Area provides habitat for numerous species of non-waterfowl migratory species. Perhaps the most important breeding species is the Bobolink with approximately 20% of the global population nesting within the focus area (Wells 2000, Bolsinger et al. undated). Other important grassland species include Henslow's Sparrow, Grasshopper Sparrow, Northern Harrier, and Upland Sandpiper. The shrublands created by succession of farmlands has created ideal habitat for priority species such as Golden-winged Warbler, Brown Thrasher, and American Woodcock. The remnant patches of deciduous northern hardwoods provides habitat for priority species such as Cerulean Warbler. The diverse assemblage of sheetwater and forested and emergent wetlands as well as deepwater ponds and lakes provide habitat for Pied-billed Grebe, American Bittern, Belted Kingfisher, Sedge Wren, and Bald Eagle.

Threats:

Many species of grassland birds are declining in the northeastern United States. Succession of grasslands from farm abandonment into shrublands and forests is threatening the agricultural grasslands that dominate the landscape in the St. Lawrence Plain Focus Area. Also, agricultural practices are moving towards larger farms and more intensive farm practices with

increased row cropping and earlier haying (I. Drew, pers. comm.). Residential, commercial, and industrial development is increasing in the suburban and rural areas threatening habitat loss. As with grasslands, shrublands could be lost to succession if not properly managed, potentially affecting Golden-winged Warbler. The high quality of wetlands could be adversely affected by runoff from point and non-point source pollution from agricultural and industrial practices.

Conservation Recommendations:

The primary conservation concern is keeping agricultural grasslands from succeeding into shrublands and eventually to forests. The Farm Bill sponsors many programs that could assist farmers keep their land agricultural, thus maintaining habitat for grassland species, and restore and maintain important wetlands. Some of these programs include the Conservation Reserve Enhancement Program, Wildlife Habitat Incentives Program, and Wetlands Reserve Program. The U.S. Fish and Wildlife Service have developed the Landowner Incentives Program that could be used to help manage private grasslands, shrublands, and forest patches for priority species. Pollution from agricultural and industrial runoff needs to be monitored and reduced or eliminated where it poses a threat to the health of priority habitats.

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7.2.11 North Carolina

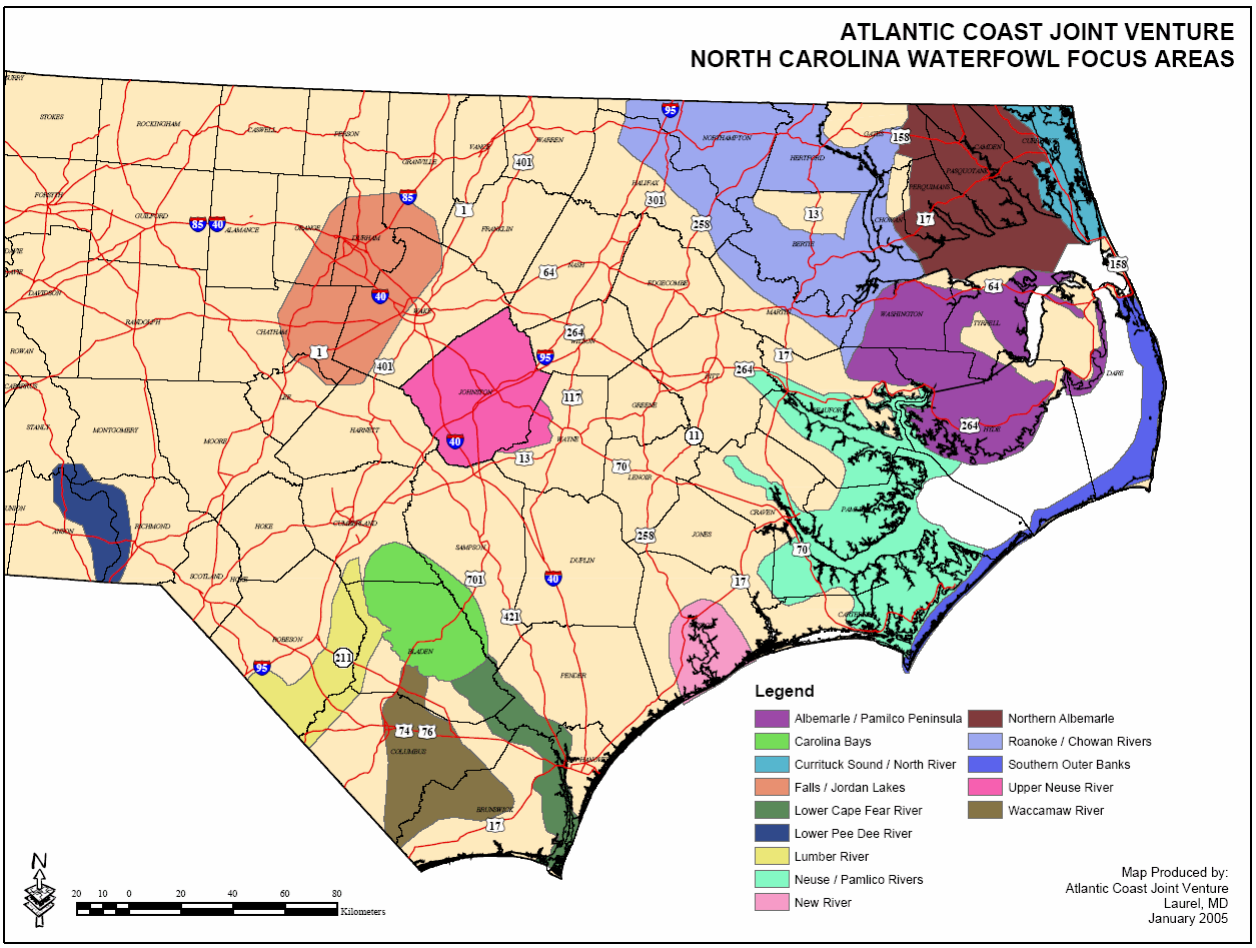

Figure 7.12. North Carolina waterfowl focus areas.

Focus Area: Carolina Bays, North Carolina
Sub-Focus Areas: None

Area Description:

The Carolina Bays Focus Area encompasses approximately 170,842 hectares (422,159 acres) in southeastern North Carolina and includes portions of Bladen, Cumberland, and Sampson Counties. This area of the coastal plain is characterized by numerous depressional wetlands called Carolina Bays. Hundreds of these depressions occur in the focus area, and many have been drained or altered. Some of the bays are filled by lakes while others support densely shrubby pocosin communities. A few, like Bushy Lake in southeastern Cumberland County, have both open water and pocosin communities. The bay rims support longleaf pine communities, and intervening flats support a mix of upland longleaf pine and wetland pocosin communities. Extensive floodplain swamp habitat is also present in this focus area, with brownwater communities along Cape Fear River, which originates in the Piedmont, and blackwater communities along the streams and rivers originating in the Coastal Plain. Many of the Carolina Bays are intact and do provide habitat for waterfowl and other wetland-associated species. Additionally, many can be restored to provide similar habitat. The bays that hold water are dominated by tupelo gum and bald cypress, those not holding water are dominated by dense pocosin communities. Much of the surrounding upland landscape is dominated by southern pine forests. These areas were historically important wintering and migration habitat for Ring-necked Duck and other diving ducks, but were also utilized heavily by Wood Duck, Mallard, Gadwall and Black Duck. Some of the remaining large bays are considered large lakes, and are named accordingly. A few examples are Singletary Lake, Baytree Lake, and Jones Lake.

Ownership/Protection:

Land in this region is primarily privately owned, followed by various properties under stewardship of the State of North Carolina, including Bladen Lakes State Forest, Salters Lake and Baytree Lake State Natural Areas, and Suggs Mill Pond Game Land. Uplands are dominated by industrial forest interests and agriculture, interspersed with ridges of longleaf pine. The relatively low number of landowners in the region has helped retain the natural qualities of the region and limit development. Opportunities exist to restore drained and altered Carolina Bays, and to restore large areas to longleaf pine.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Horseshoe Lake Complex. Horseshoe Lake Complex has some of the best intact Carolina Bays in the world, and these support a variety of plant species of special concern, and is recognized as a black bear sanctuary. This site is also a priority wetland in the Statewide Comprehensive Outdoor Recreation Plan. There is tremendous potential to restore the natural hydrology of drained and altered Carolina Bays. This area has tremendous potential to restore the longleaf pine/wiregrass ecosystem in the southern United States. Outdoor recreation is popular here, dominated by deer and quail hunting. Wetlands in this region are dominated by Carolina Bays. These depressional wetlands are largely fed by rain and groundwater, and are found primarily in the Carolinas and Georgia. Origin of these bays is not known, and they vary in size from less than an acre to several hundred acres. These bays provide habitat for a variety of reptiles and amphibians, waterfowl, and waterbirds.

Waterfowl:

The various bay lakes along with the braided stream tributaries of the Cape Fear River provide one of the more important wintering areas for Wood Duck in North Carolina. In addition, Ring-necked Duck utilize heavily many of the bay lakes in the area. In total, 15 species of waterfowl are known to occur and can be found in "reasonable" numbers within the focus area.

Table 1. Selected waterfowl species routinely observed using the Carolina Bays Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
American Wigeon			X
Blue-winged Teal		X	
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Ring-necked Duck			X

Other Migratory Birds:

Carolina bays are very important to waterbirds, including Great Blue Heron, White Ibis, Wood Stork, Snowy Egret, and Little Blue Heron. Landbirds that are important here include Black-throated Green Warbler, Prothonotary Warbler, Worm-eating Warbler, Ovenbird, and Black-and-white Warbler. Priority species associated with the pine uplands are Red-cockaded Woodpecker, Bachman's Sparrow, Brown-headed Nuthatch, Red-headed Woodpecker, and Chuck-Will's-Widow.

Threats:

Current threats in this region are primarily and directed related to hydrology of Carolina Bays. Recent court decisions allowing the drainage and filling of these wetlands could significantly affect the floral and faunal resources of these wetlands, as well as water quality in the region. Continued drainage for agriculture, forestry, and peat mining affect the hydrology of the landscape and the biological resources. There is tremendous potential to restore the natural hydrology of these wetlands in the Carolina Bays Focus Area.

Conservation Recommendations:

Major conservation actions here are restoration of the natural hydrology of Carolina Bays, and protection of extensive bays and remaining wetlands. Major recommendations for this focus area are to limit development through conservation easements, and to provide incentives to landowners to protect and restore the longleaf pine/wiregrass ecosystem. This area has tremendous potential to restore the longleaf pine/wiregrass ecosystem in the southern United States. Prescribed fire should be reintroduced to restore and maintain the longleaf pine ecosystem.

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Focus Area: Currituck Sound - North River, North Carolina
Sub-Focus Areas: None

Area Description:

The dominant feature of the Currituck Sound – North River Focus area is the fresh and brackish water wetlands of the Currituck Sound. The Northwest River, which drains into the upper portion of Currituck Sound, and the North River along the western edge of the focus area, are the other major waterbodies included. The focus area is located in Camden and Currituck counties and encompasses 94,914 hectares (234,538 acres). The western edge of the area is composed of forested wetlands adjacent to the North River while the eastern edge is bordered by the Atlantic Ocean. Land use is a mixture of agricultural interests, corporate and private woodlots, and residential development. Primary agricultural crops include corn, soybeans, wheat, and a variety of fruits and vegetables grown for local sale. The area is still rural in nature with small communities dotting the landscape; however, strip development especially along the limited routes to the beach communities in Dare and Currituck counties has increased significantly in the last decade.

As one travels from south to north in Currituck Sound, the general coverage of irregularly- flooded emergent wetlands increases while amount of freshwater increases. The southern portion of the sound is comprised by a relatively homogenous marsh dominated by black needlerush. Marsh in the northern portion of the sound has a more heterogeneous mixture and includes: cattails, arrowheads, seashore mallow, smartweeds, three-square, salt grass, three-square, and black needlerush. Emergent wetlands adjacent to both the Northwest River and North River also include the above mentioned species. Extensive submerged aquatic vegetation (SAV) beds are also found in Currituck Sound. Primary SAV species include Eurasian water-milfoil, pondweeds, wild celery, redhead grass, sago pondweed, wigeon grass, muskgrass, and horned pondweed. Eurasian water-milfoil first appeared in the sound in 1965 and is now the dominant SAV species. Overall, the coverage of SAV has declined greatly throughout the sound since the 1970's. Forested wetlands are the other major wetland type and occur in an area known as the Maple Swamp in mainland Currituck County. Expansive forested wetlands also occur along the North River. Much of the forested wetland swamp is greatly influenced by wind tide and may be inundated at any time of the year. Dominant overstory species found in the forested swamp include bald cypress, tupelo gum, maples, and ashes.

Ownership/Protection:

Not withstanding the Currituck Sound and other waterbodies which are considered "public" waters, the majority of the focus area is under private ownership with a mixture of small woodlots, farming, and residential development. Public ownership occurs primarily with the U.S. Fish and Wildlife Service (USFWS) at the Mackay Island and Currituck National Wildlife Refuges and with the North Carolina Wildlife Resources Commission (NCWRC) at the North River Game Land and the Northwest River Marsh Game Land. Number of hectares under ownership by these entities exceeds 10,000 hectares (24,711 acres). Number of hectares under private ownership and with conservation easements approaches 1,000 hectares (2,471 acres) and includes 600 hectares (1,482 acres) of the Pine Island Audubon Sanctuary.

Special Recognition:

The U.S. Fish and Wildlife Service recognize three wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Currituck Outer Banks, Kitty Hawk Woods, and Nags Head Woods. The Currituck Outer Banks is largely an undeveloped coastal barrier island with associated freshwater wetlands. This is an important waterfowl and migratory bird area, as well as being important for fish habitat. This area also provides habitat for the threatened loggerhead turtle. Kitty Hawk Woods is the largest remaining tract of swamp forest on the Atlantic coast. Nags Head Woods are recognized as an outstanding example of ridge/swale coastal maritime forest/wetland system. This area supports a high diversity and populations of migratory birds and waterfowl. This site is also located next to the Nags Head woods Ecological Preserve owned by The Nature Conservancy. Several areas within Currituck Sound (Mackay Island, Pine Island, and Monkey Island) are recognized as Important Bird Areas by the National Audubon Society. The Currituck Banks National Estuarine Research Reserve is also located within the focus area. There are numerous Important Bird Areas (IBAs) located in this focus area, including Currituck Marshes-Pine Island, Mackay Island, Monkey Island, and Morgan Island.

Waterfowl:

Currituck Sound has a rich and widely recognized waterfowl heritage and has historically been recognized as one of the most important wintering areas for waterfowl in the Atlantic Flyway accounting for an average of 6% of the total waterfowl observed in the annual Atlantic Flyway mid-winter survey during the 1970's. As another indication of waterfowl importance, in the 1960's, Currituck County alone provided over 30% of the annual dabbling duck (Wood Duck excluded) harvest in North Carolina. From 1961 to 1980, the annual mid-winter waterfowl survey tallied an average of over 150,000 waterfowl observed. In contrast, the most recent five year average is 30,000 total waterfowl observed and the annual harvest of dabbling ducks in Currituck County has fallen to nearly 13% of the statewide dabbling duck harvest. The decline in waterfowl mirrors the dramatic decline in SAV coverage since the 1970's. Although waterfowl usage of the focus area has declined in recent years, it remains one of the most important wintering waterfowl areas in North Carolina. The area continues to winter approximately 2,000 Atlantic Population Canada Goose, a population that has greatly declined in North Carolina since the early 1960's. In total, at least 25 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species using the Currituck Sound – North River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X		X
Mallard			X
AP Canada Goose			X
Pintail			X
Lesser Scaup			X
American Wigeon			X
Blue-winged Teal		X	X
Canvasback			X
Redhead			X

Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Northern Shoveler			X
Ring-necked Duck			X
Greater Scaup			X
Bufflehead			X

Other Migratory Birds:

The wide range of habitats found in the focus area including beach/dunes, maritime shrub, freshwater marsh, and gum/cypress swamp allow for the presence of a large diversity of bird species. North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species known to breed in the area as species of Extremely High or High conservation concern: Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, Wood Thrush, American Woodcock, and Bald Eagle. In addition, the following bird species associated with emergent wetlands and known to breed in the area and are considered to be of Extremely High or High conservation concern: Black Rail, Least Bittern, Saltmarsh Sharp-tailed Sparrow, King Rail, Clapper Rail and Seaside Sparrow.

Threats:

Currituck County is one of the fastest growing counties in North Carolina with a 43% growth rate from 1990 to 2002. Development is associated with the beach tourism industry and single family residential housing. Development has occurred at the expense of agricultural lands adjacent to U.S. Highway 158 in mainland Currituck County and in the dune and swale system along Highway 12 on the outer banks portion of Currituck County. Agricultural foraging areas for swans and geese are declining in association with residential and business development. Reasons for large declines in SAV coverage since the 1970's in Currituck Sound are not entirely clear, but are likely human induced. Potential reasons include changes in water chemistry, i.e. salinity due to water diversion and withdrawal from the North Landing and Northwest River systems in metropolitan Tidewater Virginia. Increases in turbidity associated with an increase in year-round boat traffic along with non-point source pollution from hard surface runoff are also likely culprits. Whether SAV areas were lost to changes in water chemistry or clarity, the resulting increase in wave action make restoring the more "open" water areas to SAV difficult. With the exception of a several notable developed communities, the outer banks portion of Currituck County could be considered relatively remote through the late 1980's. Access was and continues to be a by one highway. Even with limited access, the housing boom of the 1990's has seen tremendous growth along both the oceanside and soundside of the Currituck Outer Banks. Future highway projects include plans for a bridge spanning approximately 5.5 km across the mid portion of Currituck Sound. This will likely bring even more development and tourist traffic to the area.

Conservation Recommendations:

Due to the tremendous increase in land value in the last decade, acquisition of habitat in Currituck County (especially adjacent to Currituck Sound) will be difficult and costly. However, conservation organizations should continue to look for and pursue key parcels of land for acquisition and/or for conservation easement. Annual or periodic monitoring of SAV's in

Currituck Sound has not been conducted in the past, but efforts are now underway to acquire consistent funding sources and to develop a strategy for long-term SAV monitoring. This should continue to be a high priority for all natural resource agencies and organizations. To offset long-term losses of SAV, restoration of prior-converted wetlands into high quality "managed" areas should receive high priority. The most likely locations for land acquisition where habitat development and restoration can be accomplished will be in the intensively farmed areas of northern Currituck County and Camden County. The North Carolina Partner's and/or similar programs (CRP, CREP and WHIP) that are a cooperative effort between natural resources agencies and private landowner should be encouraged and promoted in the area.

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Focus Area: Falls – Jordan Lakes, North Carolina
Sub-Focus Areas: None

Area Description:

The Falls – Jordan Lakes Focus Area encompasses portions of Chatham, Durham, Granville, Lee, Orange, and Wake Counties in the Piedmont of North Carolina. The focus area is 302,120 hectares (746,556 acres) in size. The notable wetland feature is the presence of Falls and Jordan Lakes, and Harris Reservoir. Both Falls and Jordan Lakes are managed by the U.S. Army Corps of Engineers for flood control, water supply, and recreation. Harris Reservoir was constructed to serve the Shearon Harris nuclear power plant. As mitigation for the loss of wetland/waterfowl habitat when both Falls and Jordan Lakes were created, a series of green-tree reservoirs were created at Jordan Lake while a combination of green-tree reservoirs and moist-soil type impoundments were constructed near Falls Lake. In addition to the lakes and managed areas, the relatively narrow hardwood floodplain fringing the numerous tributaries to each of the lakes is the other primary wetland feature. Bottomland hardwoods in this area are dominated by various oaks, red maple, black gum, sycamore, and ash. The Falls – Jordan Lakes Focus areas differs from all other focus areas in North Carolina in that it is situated in an urban/suburban environment. All or portions of the following city/towns are located within the focus area: Raleigh (pop. 307,000), Durham (pop. 196,000), Cary (pop. 98,000), and Chapel Hill (pop. 50,000).

Ownership/Protection:

The majority of the focus area is in private ownership; however, several large public landholdings include both Butner-Falls of Neuse 16,700 hectares (41,266 acres) and Jordan 17,300 hectares (42,749 acres) Game Lands. A large portion of these game lands are owned by the U.S. Army Corps of Engineers and managed by the North Carolina Wildlife Resources Commission. Two state parks, Eno River and William B. Umstead account for an additional 3,200 hectares (7,907 acres) in the focus area.

Special Recognition:

Several locations within the Falls – Jordan Lakes Focus area are recognized as Important Bird Areas by the National Audubon Society and include the Eno River Bottomlands, Falls Lake, and Jordan Lake. In addition, several sites near both Falls and Jordan Lakes are Registered Natural Heritage Areas due to their unique plant and/or animal communities.

Waterfowl:

The combination of the open water lakes, sheltered lake coves, bottomland streams and managed areas attract a variety of waterfowl species. Wood Duck and Mallard likely occur in highest number throughout the focus area. Extensive beds of hydrilla at Harris Reservoir annually attract large numbers of Ring-necked Duck.

Table 1. Selected waterfowl species using the Falls – Jordan Lakes Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Lesser Scaup			X
American Wigeon			X
Blue-winged Teal		X	X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Ring-necked Duck			X

Other Migratory Birds:

Bottomland hardwoods associated with the upper reaches of the lakes and their tributaries provide excellent habitat for those species dependent upon this habitat type. North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species likely to breed in the area as species of extremely high or high conservation concern: Bald Eagle, Hooded Warbler, Kentucky Warbler, Louisiana Waterthrush, Northern Parula, Prothonotary Warbler, and Wood Thrush. Jordan Lake contains one of the largest populations of Bald Eagle in North Carolina with 4 active nests and 10-20 individuals and Falls Lake contains one of the few known nesting sites in North Carolina for Cliff Swallow and Tree Swallow.

Threats:

The primary threat in the focus area is the continued urban sprawl from the Raleigh-Durham area. Forest fragmentation and increased urban stormwater runoff will likely increase over time.

Conservation Recommendations:

Conservation organizations should continue to look for opportunities to protect the remaining fringe of bottomlands along the lakes and tributaries. Admittedly, acquisition will be difficult as land prices are very high in this area. One purpose for the creation of this focus area is to recognize the important contribution the existing green-tree reservoirs and managed moist soil impoundments provide to waterfowl in the area. Opportunities do exist for the creation of additional managed wetland habitat on areas already owned by public entities and for enhancement of existing areas. These options should be pursued.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

Johns M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Focus Area: Lower Cape Fear River, North Carolina
Sub-Focus Areas: None

Area Description:

The Lower Cape Fear River Focus Area encompasses 117,840 hectares (291,189 acres) in Bladen, Pender, Brunswick, and New Hanover Counties, with smaller portions occupying Columbus and Sampson Counties. This focus area extends southeastward along the Cape Fear River from the Carolina Bays Focus Area eventually reaching the ocean. This portion of the Cape Fear River is navigable, and as the river nears the ocean, it becomes a slow moving coastal river, and eventually becomes a coastal estuary below Wilmington, North Carolina. This portion of the Cape Fear River is a brownwater river that is tidally influenced well inland upstream of New Hanover County. Over time, tidal-borne saltwater has advanced farther upstream. There are two causes for this: rising sea level and river dredging. Rising sea level is a natural phenomenon that has been occurring since the last ice age. In recent history, the rate of sea level rise has been about 1 foot per century, but this rate may be accelerating due to increased melting of the polar ice caps. River dredging has also contributed to an increase in tide water volume. In the past century, rising sea level and dredging together have raised the vertical reach of high tide in Cape Fear River by nearly 2 feet. The result is that salt-laden tide water currently moves much farther upstream than in the past. The effects of this increased salinity is most readily seen in the tributary creeks of the river, such as Barnards and Mott Creeks, where dead stands of cypress trees are stark indicators of rapid change. These effects have had considerable impact on the aquatic habitat at this site, particularly changes in salinity and tidal amplitude. The area has also been impacted by the long period of human settlement and development along the river's shores.

Estuarine open water communities are much less extensive in the southeastern part of the state, and are less well known than such areas in the Albemarle and Pamlico sounds. Although aquatic habitats have yet to be described as natural communities in North Carolina, it is known that Cape Fear River contains significant habitat in terms of the aquatic animals it supports. Aquatic habitat includes communities dominated by submerged vascular plants and sessile animals such as oysters. Other aquatic communities have no sessile organisms and are characterized by fish and mobile invertebrates.

The Lower Cape Fear landscape contains a broad range of Coastal Plain communities. Extensive stands of cypress-gum swamp and bottomland hardwoods grace the broad floodplains of the rivers and streams. Cypress stands along the lower Black include trees in excess of 1,700 years in age, the oldest recorded trees in eastern North America.

Ownership/Protection:

Ownership in this focus area is primarily in private holdings.

Special Recognition:

The U.S. Fish and Wildlife Service recognize three wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Black River Cypress Swamp Forest, Smith Island Complex, and Rocky Point Marl Forest. The Black River Cypress Swamp forest has the greatest concentration of old growth cypress trees in North America, with some trees being up to 1,200

years old. There are also a number of plant species of special concern that occur in this area. The Black River and several of its tributaries (most significantly the South River) were designated Outstanding Resource Waters (ORW) in 1994 by the NC Division of Water Quality due to their high water quality and diverse aquatic species composition (the rivers are home to several rare fish and mussel species). The Smith Island Complex is a barrier island ecosystem that includes high quality maritime forest. The Rocky Point Marl Forest is the only known occurrence of the wet marl forest community type in North Carolina. Of the 6,049 stream miles in the Lower Cape Fear Basin, only 2% are designated ORW and are located completely within the project area. Several Audubon Important Bird Areas (IBAs) occur here, including Bald Head Island, Battery Island, Ferry Slip Island, Masonboro Island, North Pelican Island, South Pelican Island, and Striking Island.

Waterfowl:

Table 1. Selected waterfowl species using the Lower Cape Fear River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck			**X**
Mallard			**X**
Pintail			**X**
Lesser Scaup			**X**
American Wigeon			**X**
Blue-winged Teal		**X**	**X**
Green-winged Teal			**X**
Wood Duck	**X**	**X**	**X**
Gadwall			**X**
Northern Shoveler			**X**
Ring-necked Duck			**X**
Greater Scaup			**X**
Bufflehead			**X**

Other Migratory Birds:

Lower Cape Fear River Bird Nesting Islands is one of the most important colonial water bird nesting areas in North Carolina, supporting breeding populations of seven species of birds rare in North Carolina, including state threatened Gull-billed Tern. The site also hosts nine colonies of waterbirds, and one occurrence of a wading bird rookery. Each of these special habitats provides critical breeding habitat for several colonial bird species. Among the birds breeding in these habitats are the rare Brown Pelican, Black Skimmer, and Gull-billed Tern. The wading bird rookery supports a large Heronry with breeding populations of four rare birds: Little Blue Heron, Snowy Egret, Tricolored Heron, and Glossy Ibis. Species of importance in the floodplain include Prothonotary Warbler and Swainson's Warbler. Other important species include American Oystercatcher and Painted Bunting. Most recently, Swallow-tailed Kite have been observed and suspected of nesting near Lock #1 on the Cape Fear River. Swallow-tailed Kite has not been previously known to nest in North Carolina.

Threats:

Nutrient input from hog lagoons that are infrequently breached during major storms releasing a sudden surge of nutrient wastes into the system is a major threat in this region. The waste is also routinely sprayed on fields' typically growing grass. This spraying does occur in low lying fields and when fields are saturated. Either over field flow or ditches serves as conduits of fertilizers and pesticides/herbicides into the river. Activities that affect water quality in the Cape Fear River include industrial effluents, agricultural runoff, and municipal treatment facility outfall.

Conservation Recommendations:

Protection of the aquatic habitat in Cape Fear River and its tributaries is difficult because it is affected by activities throughout the watershed. These include industrial effluents, agricultural runoff, and municipal treatment facility outfall. Some sources of pollution can be reduced by careful control of sedimentation and storm water runoff. A buffer zone of vegetated, undisturbed soil along river banks is also beneficial. Cape Fear River should be regularly monitored to gauge impacts to water quality over time. The following conservation actions have been identified in this region: acquire land and conservation easements, promote private lands management compatible with conservation goals for the targeted communities, implement prescribed fire program that simulates natural fire on the landscape, restore groundwater hydrology, reduce and mitigate impacts associated with livestock wastes, and reduce and mitigate impacts from incompatible forestry practices.

References:

Allen, D. 1999. Colonial waterbird database. N.C. Wildlife Resources Commission.

Hackney, C.T., and G.F. Yelverton. 1990. Effects of human activities and sea level rise on wetland ecosystems in the Cape Fear River estuary, North Carolina, USA. In: D.F. Whigham et al. (eds.), Wetland Ecology and Management: Case Studies: 55-61. Klewer Academic Publishers, Netherlands.

http://members.aol.com/mmcbs3/capefear.html

http://www.water.ncsu.edu/capefear.html

LeBlond, R.J. 1995. Inventory of the Natural Areas and Rare Species of Brunswick County, North Carolina. N.C. Natural Heritage Program, OCCA, DENR, Raleigh, NC.

Parnell, J.F., W.W. Golder, and T.M. Henson. 1995. 1993 Atlas of Colonial Waterbirds of North Carolina Estuaries. N.C. Sea Grant Program publication UNC-SG-95-02.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Lower Pee Dee River, North Carolina
Sub-Focus Areas: None

Area Description:

The Lower Pee Dee River Focus Area is located in Anson, Montgomery, Richmond and Anson Stanly counties, encompassing 81,389 hectares (201,115 acres) along the Pee Dee River, including Blewett Falls Lake. The Pee Dee River begins in North Carolina on the eastern escarpment of the Southern Appalachians near the Tennessee and Virginia boundaries. Known as the Yadkin River in upstate North Carolina, it becomes the Pee Dee River when it enters the lower piedmont below Badin Lakeand coastal plain of North Carolina and South Carolina. Because this river originates in the highlands and flows through the piedmont, it is considered a red water stream. Red river streams get their name because of the reddish muddy color of the water that results from brown-red piedmont lay sedimentation. Major tree, shrub and vine species associated with the red river system include: cherrybark oak, swamp chestnut oak, water oak, diamond leaf oak, American sycamore, river birch, red mulberry, American holly, sugarberry, red maple, boxelder, sweetgum, cypress, tuepelo, hickories, ashes, paw paw, hawthore, grapes, Alabama supplejack, and trumpet creeper. Cane, and Chinese privet are common understory components of these forests. The Lower Pee Dee bottomlands provide key habitat for species of concern such as Swainson's Warbler, Wayne's Black-throated Green Warbler, Wood Stork, spotted turtle, black swamp snake, and more than 20 species of plants.

Several significant wetland habitats such as oxbow lakes, beaver ponds and vernal ponds occur in the floodplain forests of the Great Pee Dee River. These wetlands provide key habitat for many wetland- dependant species, including waterfowl and many other wetland- associated birds.

Ownership/Protection:

Ownership in this focus area is primarily in private holdings, although the Pee Dee National Wildlife Refuge and Uwharrie National Forest are both located in this focus area. Property owned by Progress Energy Carolinas and managed by the North Carolina Wildlife Resources Commission as the Pee Dee River Game Lands (North Carolina Wildlife Resources Commission) is also located in this focus area.

Special Recognition:

The Pee Dee National Wildlife Refuge (NWR) and Uwharrie National Forest are located in this focus area. The Pee Dee NWR is a designated Important Bird Area (IBA) in North Carolina.

Waterfowl:

The wetlands and seasonally flooded bottomland hardwood forests along the Lower Pee Dee River provide wintering waterfowl habitat for Wood Duck, Hooded Merganser, Mallard, Green-winged Teal and Ring-necked Duck. Beaver ponds not only provide wintering habitat but also are critical Wood Duck production areas. The focus area also contains the famous Gaddy's Goose Pond. This location along with neighboring ponds historically wintered large flocks of Saint James Bay Population (SJBP) Canada Goose with estimates as high as 10 – 15 thousand occurring in the 1950's and 60's. Numbers have now declined to as few as 500 Canada Goose

thought to be of SJBP origin. Even with the decline, the area contains one of the larger, consistently wintering flocks of SJBP Canada Goose in North Carolina.

Table 1. Selected waterfowl species using the Lower Pee Dee River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
SJBP Canada Goose			X
American Wigeon			X
Blue-winged Teal		X	X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Ring-necked Duck			X

Other Migratory Birds:

Little quantitative data exists for the Lower Pee Dee River bottomlands and bird species lists are likely incomplete. However, North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species likely to breed in the area as species of Extremely High or High conservation concern: Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, and Wood Thrush. Several wading bird rookeries also exist in the vicinity of the Great Pee Dee River. Red-cockaded Woodpeckers are important at the Pee Dee NWR.

Threats:

The greatest threats to this Focus Area are residential/commercial development, increased recreational use, reduced water quality, deforestation, and hog farming.

Conservation Recommendations:

Conservation organizations should continue to look for opportunities to protect, through acquisition or easement, property which will complement and enhance both the aesthetic and natural qualities of the river. The North Carolina Partner's and/or similar programs (CRP, CREP and WHIP) that are a cooperative effort between natural resources agencies and private landowner should be encouraged and promoted in the area.

References:

Gaddy, H.R. 1954. Lockhart Gaddy With His Friends – The Wild Geese. Miller Printing Co., Asheville, N.C. 64pp.

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

http://ils.unc.edu/parkproject/visit/luri/home.html

Johns M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Focus Area: Lumber River, North Carolina
Sub-Focus Areas: None

Area Description:

The Lumber River is a winding blackwater river that originates in the Sandhills region of North Carolina then flows freely through the southern coastal plain and into the Pee Dee River in South Carolina. The Lumber River Focus Area encompasses 81,386 hectares (201,112 acres) primarily in Robeson County with smaller portions in Bladen, Columbus, and Cumberland Counties. The Lumber River bottomlands are primarily composed of second-growth oak-cypress-gum swamp forest. Dominant species include cypress, tupelo, black gum, and water oak. As one leaves the perennially flooded swamp, the slightly higher, seasonally-flooded first terrace is composed primarily of water hickory, overcup oak, laurel oak, willow oak, red maple, persimmon, cottonwood, green ash, American elm, loblolly pine, and river birch. The other dominant wetland feature in the area is the many poorly-drained depressions known as Carolina Bays and feature typical pocosin vegetation such as pond pine, loblolly pine, titi, wax myrtle, and red bay. The area is rural in nature with small communities dotting the landscape. The largest community is Lumberton with a population of approximately 21,000.

Ownership/Protection:

Ownership in this focus area is primarily in private holdings, the exception being the Lumber River State Park encompassing 3,212 hectares (7,937 acres).

Special Recognition:

In 1989, the river was designated a State Natural and Scenic River. In 1998, 130 kilometers (80 miles) of the Lumber River system was designated as a National Wild and Scenic River. The Lumber River bottomlands are recognized as an Important Bird Area by The Audubon Society.

Waterfowl:

The bottomland hardwood and cypress-gum swamp provides habitat for a variety of waterfowl species. The area provides optimal breeding habitat for Wood Duck and along with the Roanoke River bottomlands, the Lumber River provides the premier wintering Wood Duck habitat in North Carolina.

Table 1. Selected waterfowl species using the Lumber River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck			X
Mallard			X
American Wigeon			X
Blue-winged Teal		X	X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Ring-necked Duck			X

Other Migratory Birds:

Little quantitative data exists for the Lumber River bottomlands and bird species lists are likely incomplete. North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species likely to breed in the area as species of Extremely High or High conservation concern: Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, and Wood Thrush. In addition, the Red-cockaded Woodpecker is found in suitable upland sites in the northern portion of the focus area.

Threats:

Although some protection is afforded with the Wild and Scenic River designation, the primary threat is continued logging of the bottomland hardwoods. Nutrient input from the domestic swine industry is another threat to water quality in the region.

Conservation Recommendations:

The Lumber River is the only blackwater type stream with the wild and scenic designation in North Carolina. Conservation organizations should continue to look for opportunities to protect, through acquisition or easement, property which will complement and enhance both the ascetic and natural qualities of the river. The North Carolina Partner's and/or similar programs (CRP, CREP and WHIP) that are a cooperative effort between natural resources agencies and private landowner should be encouraged and promoted in the area.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

http://ils.unc.edu/parkproject/visit/luri/home.html

Johns M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Focus Area: Neuse – Pamlico Rivers, North Carolina
Sub-Focus Areas: None

Area Description:

The Neuse – Pamlico Rivers Focus area is largest in North Carolina, encompassing 498,000 hectares (1,230,607 acres) and representing a variety of wetland habitats. Along the Pamlico/Tar River, the focus area reaches upstream from near Greenville downstream to the Pamlico River's confluence with the Pamlico Sound. Likewise, the Neuse River reaches upstream from Fort Barnwell downstream to it's confluence with the Pamlico Sound. Also included in the focus area are the Pungo River and the complex of naturally formed lakes found in the Croatan National Forest. The focus area is located in portions of Beaufort, Carteret, Craven, Hyde, Jones, and Pamlico Counties. Forested wetlands comprised primarily of bald cypress and tupelo gum are the dominant feature along the Pamlico and Neuse above the towns of Washington, and New Bern respectively. As one travels downstream from these two towns, emergent marsh habitat increases with black needlerush, saltmarsh cordgrass, sawgrass, saltgrass, and three-square providing the majority of vegetative marsh species. Patches of submerged aquatic vegetation (SAV) can be found throughout the area and is generally composed of widgeon-grass. SAV coverage likely fluctuates, but anecdotal information suggested that coverage has declined over the long-term. Of important note is the presence of at least 800 hectares (1,976 acres) of managed, brackish water marsh impoundments. When managed properly, many of these areas provide dense stands of SAV comprised of widgeon-grass and muskgrass or beneficial moist soil plants. These areas are unique in their spatial location and that current environmental regulations prevent future construction of these areas in marsh habitat. In general the area is rural, but does include several towns approaching 10,000 people and two towns (Havelock & New Bern) with populations of approximately 23,000. In the rural areas, land use is a mixture of agricultural interests and corporate timberland. Primary agricultural crops are corn, soybeans, and wheat. The amount of farmland planted to cotton has increased in the last decade.

Ownership/Protection:

The majority of the focus area is under private ownership with a mixture of agricultural land, large holdings of corporate timberland and smaller, individually-owned woodlots. Ownership of those lands with either conservation protection or natural resource management emphasis is quite varied. Area under protection from the U.S. Fish and Wildlife Service and the North Carolina Wildlife Resources Commission approaches 10,000 hectares (24,711 acres) and includes the Cedar Island National Wildlife Refuge and the Goose Creek Game Lands. Approximately half of the 65,000 hectares (160,621 acres) Croatan National Forest is in the focus area.

Special Recognition:

Several locations within the Neuse-Pamlico Rivers Focus area are recognized as Important Bird Areas by the National Audubon Society and include: Cedar Island Marsh, Croatan National Forest, Hobucken marshes, and the Lower Neuse River Bottomlands. Portions of the Sheep Ridge and Pocosin Wilderness areas (Croatan National Forest) are located within the focus area.

Waterfowl:

Because of the wide range of habitats, the Neuse-Pamlico Rivers focus area likely provides the highest diversity of waterfowl in North Carolina. The western portion of the area provide excellent habitat for Wood Duck and Mallard, while the eastern portion (near the mouths of the Pamlico and Neuse Rivers) provide optimal wintering habitat for a multitude of species. Black Duck nest in the marshes of Pamlico and Carteret County. This represents the southernmost breeding range for this species. During the last 10 years, mid-winter survey estimates have averaged 13,000 dabbling ducks and 27,000 diving ducks observed. In total, at least 25 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species using the Neuse-Pamlico Rivers Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X		X
Mallard			X
Pintail			X
Lesser Scaup			X
American Wigeon			X
Blue-winged Teal		X	X
Canvasback			X
Black Scoter			X
Surf Scoter			X
Redhead			X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Northern Shoveler			X
Ring-necked Duck			X
Greater Scaup			X
Bufflehead			X

Other Migratory Birds:

The wide range of habitats found in the focus area allow for the presence of a large diversity of bird species. North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species that likely breed in the area as species of extremely high or high conservation concern: Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, Wood Thrush, American Woodcock, and Bald Eagle. In addition, the following bird species associated with emergent wetlands that likely to breed in the area and are considered to be of extremely high or high conservation concern include: Black Rail, King Rail, Clapper Rail, Least Bittern, and Seaside Sparrow.

Threats:

Historical threats to wetland habitat centered on the drainage and conversion of the native swamp and bottomland forest to monoculture pine stands and agricultural cropland. Conversion to cropland has largely ceased, but the expansion of planted pine for timber interests continues. Both the Tar/Pamlico and Neuse river systems are classified as Nutrient Sensitive Waters by the

North Carolina Division of Water Quality and as such are susceptible to a variety of land management issues relating to water quality. Sewage discharges from upstream municipalities, stormwater management, and nutrient management on agricultural lands are a few examples of threats relating to water quality. Residential development has increased tremendously in recent years along portions of both rivers affecting both water quality and forested shoreline habitat.

Conservation Recommendations:

Conservation efforts should focus on providing additional protection along portions of both rivers where development potential is greatest. Best Management Practices relating to land use/water quality issues should be strengthened and promoted within the area. The presence of brackish water marsh impoundments is a feature unique to this area and provides critical habitat for a variety of wetland dependent species. Continued availability and management of these areas is a high priority. Annual or periodic monitoring of SAV's in both rivers and Pamlico Sound has not been conducted in the past, but efforts are now underway to acquire consistent funding sources and to develop a strategy for long-term SAV monitoring. This should continue to be a high priority for all natural resource agencies and organizations. The North Carolina Partner's and/or similar programs (CRP, CREP and WHIP) that are a cooperative effort between natural resources agencies and private landowner should be encouraged and promoted in the area.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

http://h2o.enr.state.nc.us/

http://www.census.gov/

Johns M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Focus Area: New River, North Carolina
Sub-Focus Areas: None

Area Description:

The New River Focus area is located entirely within Onslow County and encompasses 85,420 hectares (211,078 acres). It includes the New River and its tributaries from Jacksonville downstream where it empties into the Atlantic Ocean. Much of the Camp Lejeune Marine Corps Base is located within the focus area. The New River found within this focus area should not be confused with the New River located in the northwestern portion of North Carolina. A variety of wetland habitats exist and include estuarine open water, estuarine emergent marsh, pocosin, and isolated forested wetlands. Emergent marsh in this area is dominated by black needlerush with some saltmarsh cordgrass while forested wetland habitats are dominated by tupelo and bald cypress. A number of green-tree reservoirs as well as a 31 hectares (76 acres) brackish water impoundment is located within Camp Lejeune and managed specifically for waterfowl. Land use in the focus area is varied. Part of the area may be considered urban/suburban as it includes the city of Jacksonville (population 66,000) and the Camp Lejeune infrastructure while much of the area is generally rural with land use being associated with Marine Corps activities.

Ownership/Protection:

The majority of the focus area is under public ownership with the Camp Lejeune Marine Corps Base the primary landholder. The Stones Creek Game Land, 1,015 hectares (2,508 acres) is located within the focus area and is managed by the North Carolina Wildlife Resources Commission.

Special Recognition:

Several locations within Camp Lejeune are registered Natural Heritage Areas due to the presence of rare animal and plant communities.

Waterfowl:

The forested wetland drainages provide habitat for a several species, especially Wood Duck. Scaup are very abundant in most years where they are observed on lower portions of the New River. Over the last 5 years, 13,000 scaup have been observed annually. Black Duck may nest in very low densities in the estuarine marsh.

Table 1. Selected waterfowl species using the New River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X		X
Mallard			X
Lesser Scaup			X
American Wigeon			X
Blue-winged Teal		X	X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X

Ring-necked Duck			X
Greater Scaup			X
Bufflehead			X

Other Migratory Birds:

The wide range of habitats found in the focus area allow for the presence of a large diversity of bird species. North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species known to breed in the area as species of extremely high or high conservation concern: Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, Wood Thrush, American Woodcock, and Bald Eagle. In addition, the following bird species associated with emergent wetlands and known to breed in the area and are considered to be of extremely high or high conservation concern: Black Rail, Least Bittern, King Rail, Clapper Rail and Seaside Sparrow. In 2001, 65 active Red-cockaded Woodpecker clusters were present at Camp Lejeune making it an integral part of restoration efforts for this species.

Threats:

The primary threat to wetland habitats within the focus area center on the loss and degradation of habitat in relation to increasing urbanization of Jacksonville and beach communities. In addition, the New River is classified as a Nutrient Sensitive Waters (NSW) by the North Carolina Division of Water Quality and as such is susceptible to a variety of land management issues relating to water quality. Sewage discharges from upstream municipalities, stormwater management, and nutrient management on agricultural lands are a few examples of threats relating to water quality.

Conservation Recommendations:

In recent years, large numbers of scaup have wintered on the New River. Whether birds are targeting submerged aquatic vegetation (SAV) or benthic invertebrates as a food source is unknown. Irregardless of food source, to ensure continued availability of preferred foods, Best Management Practices relating to land use/water quality issues should be strengthened and promoted within the area. Conservation efforts should focus on providing additional protection along the New River and its tributaries where development potential is greatest. Distribution and quantity of SAV in the New River is unknown. At a minimum, an initial investigation of SAV with future periodic monitoring should be considered.

References:

United States Census Data. http://www.census.gov/

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

Johns M.E. 2004. North Carolina Bird Species Assessment. 16pp.

MCB Camp Lejeune, NC. 2001. Integrated Natural Resources Management Plan (2002-2006), Marine Corps Base Camp Lejeune, Onslow County, North Carolina.

North Carolina Division of Water Quality. 1997. White Oak Basinwide Water Quality Management Plan

Focus Area: Northern Albemarle, North Carolina
Sub-Focus Areas: None

Area Description:

The Northern Albemarle Focus Area is characterized by three freshwater river systems (Perquimans, Little, and Pasquotank) whose drainage originates from the expansive Great Dismal Swamp. The area includes nearly all of the Albemarle Sound (except the extreme western portion). The focus area is located in northeastern North Carolina and includes all or portions of the following counties: Camden, Chowan, Currituck, Gates, Pasquotank, and Perquimans. Over the last 200 years, much of the area has been ditched, drained and converted to agricultural cropland. The primary land use is agricultural with corn, cotton, soybeans, peanuts and wheat the major crops. Acres planted to cotton have increased significantly in the last 15 years. Forested wetlands adjacent to the river systems are the dominant wetland type. Much of the river systems are greatly influenced by wind, tide and adjacent swamp may be inundated at any time of the year. The combination of wind tide and precipitation fluctuations routinely create brackish water conditions in the sound and lower reaches of each of the rivers. Dominant overstory species found in the adjacent forested swamp include bald cypress, tupelo gum, maples, and ashes. Submerged aquatic vegetation (SAV) can be found in the lower reaches of each of the river systems and also along the Albemarle Sound shoreline. Principal SAV species include Eurasian Water-milfoil, *Najas spp*., and *Potamogeton* species. Trends in SAV coverage are unknown, but anecdotal information suggests that coverage has increased in recent years. This development is encouraging in that overall SAV coverage in coastal habitats has declined over the long-term. The area is rural and developed land, is a minor component. Elizabeth City is the largest municipality with approximately 17,500 people. The focus area encompasses 339,790 hectares (839,638 acres).

Ownership/Protection:

The majority of the focus area is under private ownership dominated by farms and private woodlots. Public ownership occurs primarily with the U.S. Fish and Wildlife Service (USFWS), North Carolina Wildlife Resources Commission (NCWRC) and North Carolina State Parks. Number of acres under ownership by these three entities exceeds 20,600 hectares (50,904 acres) with over 14,000 hectares (34,595 acres) occurring at the Great Dismal Swamp National Wildlife Refuge and adjacent Dismal Swamp State Natural Area in the extreme northern portion of the area. Additional property under conservation easement accounts for an additional 375 hectares (926 acres) while Department of Transportation mitigation sites exceeds 364 hectares (900 acres).

Special Recognition:

The non-riverine Great Dismal Swamp forest is recognized as an Important Bird Area by the National Audubon Society (Golder 2004). The Little Flatty Creek area is recognized as a Registered Heritage area by the State Natural Heritage Program. The Great Dismal Swamp Important Bird Area (IBA) occurs in this focus area.

Waterfowl:

Due to the abundance of forested wetland habitats, census of waterfowl using this area is difficult. Riverine swamp provides optimal habitat for nesting and wintering Wood Duck, but an

estimate of wintering numbers of this species is not available. Aerial census data do exist for the open water habitats for the rivers and Albemarle Sound where the most recent ten year data averages over 13,000 ducks observed. The majority of ducks observed in recent years are scaup and Ring-necked Duck. Atlantic Population (AP) Canada Goose have declined greatly over the last four decades in North Carolina. The area routinely winters several flocks of AP Canada Goose interspersed with more numerous resident geese. Over 5,000 Tundra Swan and 1,500 Greater Snow Goose winter in the focus area. Numbers of Snow Goose fluctuate widely from year to year, but have generally declined over time. In total, at least 22 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species routinely observed using the Northern Albemarle Sound Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Lesser Scaup			X
AP Canada Goose			X
American Wigeon			X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Northern Shoveler			X
Greater Scaup			X
Ring-necked Duck			X
Bufflehead			X

Other Migratory Birds:

Excluding waterfowl, use of the area for other bird species is somewhat incomplete. Bird lists for the Great Dismal Swamp is likely representative of the entire area and inclusive of all other birds found in the focus area. Over 200 bird species have been sighted at or near the refuge with 96 nesting species listed. North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species known to breed in the area as species of Extremely High or High conservation concern: Cerulean Warbler, Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, Wood Thrush, American Woodcock, Wood Thrush, and Bald Eagle (Johns 2004).

Threats:

Historical threats to wetland habitat centered on the drainage and conversion of the native swamp and bottomland forest to monoculture pine stands and agricultural cropland. Conversion to cropland has largely ceased, but the expansion of planted pine for timber interests continues. With the increased practice of "shovel-logging", large tracts of mature cypress-gum are being harvested when it is determined economically feasible for a particular site. Although the area remains very rural in nature, it is experiencing rapid population growth. A portion of the growth is spillover from the metropolitan Hampton Roads area of Virginia while another portion is movement to the area for retirement purposes. Much of the new construction, especially from

retirees, tends to be located adjacent to the abundant watercourses in the area. Although large acreages of swamp typically border the upper portion of the river drainages, the lower portions are generally bordered by a narrow fringe of swamp that grades rapidly into uplands. Much of the construction is centered at the upland-swamp interface and in many instances a single use dock is constructed through the wetland to the river/creek channel. In addition, selective logging takes place in the narrow swamp band so that the view to the water from the dwelling is improved. Continued shoreline development in this area over time will certainly decrease both nesting and wintering habitat for Wood Duck and wintering habitat for other dabbling duck species. This focus area, like much of rural eastern North Carolina is also increasingly garnering the attention of industry or other interests that require large, sparsely populated landholdings. The U.S. Navy recently selected a site within the focus area for the potential location of a practice landing field. The landing strip would have been located in a preferred field feeding location for swans and Snow Goose in the focus area.

Conservation Recommendations:

With the exception of the Dismal Swamp complex, habitat conservation (acquisition, restoration, and enhancement) activities by public entities have been minimal. Protection of the remaining swamp (through acquisition or easement) adjacent to the lower portions of each of the river systems should be a high priority. However, protection will be difficult as much of the land is very expensive; prices having increased dramatically in recent years due to the explosion in housing development. In recent years, conservation organizations have acquired thousand of acres of wetland habitats in eastern North Carolina. The areas primarily consist of marsh habitat and/or large contiguous blocks of semi-permanently flooded swamp. Because of the "undevelopable" nature of these areas, cost/acre is relatively small. As an alternative, public and private conservation entities should consider acquisition or easement of land that is under a higher threat of residential or industrial development. Because these areas are generally characterized by a relatively small wetland fringe bordered by uplands, cost/acre will be much greater than those areas which cannot be developed due to existing environmental regulations. The conservation of these areas will not only protect wetlands but will also have greater water quality benefits than the acquisition of those areas already having de facto protection. Restoration of prior-converted wetlands in the area has great potential especially at those sites where agricultural production is marginal due to poor drainage conditions. The North Carolina Partner's and/or similar programs (CRP, CREP and WHIP) that are a cooperative effort between natural resources agencies and private landowner should be encouraged and promoted in the area.

References:

Johns, M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

Focus Area: Pamlico-Albemarle Peninsula, North Carolina
Sub-Focus Areas: None

Area Description:

The Pamlico-Albemarle Focus Area can be characterized as a large peninsula with Albemarle Sound to the north, Pamlico Sound to the south and Croatan Sound to the east. This region is also been designated by the U.S. Environmental Protection Agency as the second largest estuarine system in the United States with nationally significant aquatic and wetland resources. Alligator River is the major river drainage system in the area with the Scuppernong River, Little Alligator River and the Pungo River representing secondary natural drainage systems. Inland four large lakes dot the landscape. Mattamuskeet Lake, the largest natural lake in North Carolina, covers 15,600 hectares (38,548 acres). It is a freshwater lake averaging only 0.6 meters (1.9 feet) in depth. More than half of the lake bottom is covered by submerged aquatic vegetation (SAV). The dominant SAVs are wild celery, redhead grass, southern naiad, and muskgrass.

The focus area is located in northeastern North Carolina and includes all or portions of the following counties: Washington, Beaufort, Tyrrell, Hyde and Dare. Over the last 100 years, much of the area has been ditched, drained and converted to agricultural cropland. The primary land use is agricultural with corn, soybeans, cotton, and wheat the major crops. Acres planted to cotton have increased significantly in the last 5 years. Forested wetlands adjacent to the river systems are the dominant wetland type. More inland, nonriverine swamp and pocosin habitat dominate. Dominant overstory species found in the adjacent nonriverine swamps and pocosins include bald cypress, tupelo gum, blackgum, red maple, and pond pine. The area is rural and developed land, i.e., cities and towns, is a minor component. Columbia is the largest town with 700-1,000 people. The focus area encompasses 379,467 hectares (937,680 acres).

Ownership/Protection:

A large percent of the area is under federal and state ownership (approximately 186,000 hectares or 459,614 acres) comprised of Alligator River National Wildlife Refuge (NWR), Mattamuskeet NWR, Swanquarter NWR, Pocosin Lakes NWR, the Departments of the Navy and the Air Force, and State Gamelands (Alligtor River, J. Morgan Futch, Buckridge, Gull Rock, Pungo River, Long Shoal, New Lake and Lantern Acres). The remainder of the focus area is under private ownership dominated by farms, nonriverine swamps and pocosin habitat.

Special Recognition:

The U.S. Fish and Wildlife Service recognize five wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: U.S. 264 Low Pocosin, Scranton Hardwoods, Upper Alligator River Pocosin, Scuppernong River Swamp Forest, and East Dismal Swamp. The U.S. 264 Low Pocosin provides habitat for the black bear and several plant species of concern. Scranton Hardwoods is a designated black bear sanctuary and an example of a non-riverine wet hardwood forest, an endangered plant community type. The Upper Alligator River Pocosin contains some of the most extensive peat deposits in the southeastern U.S., and provides habitat for the Red-cockaded Woodpecker and Bald Eagle, and is an expansion area for the reintroduced red wolf. Scuppernong River Swamp Forest contains one of the largest tracts of swamp forest in the state, and supports intact stands of Atlantic white cedar. The area is also

important for black bear and waterfowl. The East Dismal Swamp is an important remnant of a non-riverine swamp and is considered critical habitat for the black bear. The area is also important as a link between the Upper Alligator River wetlands and the Lower Roanoke River wetlands. The Alligator River Lowlands, 103,893 hectares (256,724 acres), Palmetto-Peartree-Buckridge, 37,329 hectares (92,241 acres), Lake Mattamuskeet-Swanquarter, 68,748 hectares (169,879 acres) and Pungo-Pocosin Lakes, 128,134 hectares (316,624 acres) areas have been designated as Important Bird Areas by the National Audubon Society (Golder 2004).

Waterfowl:

This focus area represents the most important wintering area for waterfowl in the state. Aerial census and some ground census data exist for the open water habitats for the rivers and Albemarle, Pamlico and Croatan Sounds, managed impoundments, and flooded croplands. The most recent 10-year data averages are 52,000 dabblers; 8,000 divers; 5,000 for Canada Goose; 40,000 for Snow Goose and 50,000 for Tundra Swan. Of special note, is the importance of this area to the Eastern Population of Tundra Swan. In recent years this focus area has wintered over 70% of the statewide total for Tundra Swan and 50% of the entire continental population. The majority of ducks observed in recent years were Northern Pintail and Green-winged Teal. Atlantic Population (AP) Canada Goose has declined greatly over the last 4 decades in North Carolina. The area routinely winters several flocks of AP Canada Goose interspersed with more numerous resident geese. In addition, nonriverine swamp in the focus area provides optimal habitat for nesting and wintering Wood Duck, but an estimate of wintering numbers of this species is not available. In total, at least 22 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species routinely observed using the Albemarle-Pamlico Peninsula Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Lesser Scaup			X
AP Canada Goose			X
American Wigeon			X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Northern Shoveler			X
Greater Scaup			X
Ring-necked Duck			X
Bufflehead			X

Other Migratory Birds:

Excluding waterfowl, use of the area for other bird species is somewhat incomplete. Bird lists for Mattamuskeet, Swanquarter and Pocosin Lakes NWRs are likely representative of the entire area and inclusive of all other birds found in the focus area. Over 240 bird species have been sighted at or near these refuges. North Carolina Partners in Flight lists the following

wetland/swamp/pocosin habitat associated bird species known to breed in the area as species of extremely high or high conservation concern: Black-throated Green Warbler, Worm-eating Warbler, Wood Thrush, Cerulean Warbler, Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, Red-cockaded Woodpecker, Brown-headed Nuthatch, Henslow's Sparrow (winter), American Woodcock (winter), Wood Thrush, and Bald Eagle (Johns 2004).

Threats:

Historical threats to wetland habitat centered on the drainage and conversion of the native swamp forest to monoculture pine stands and agricultural cropland. Conversion to cropland has largely ceased, but the expansion of planted pine for timber interests continues. With the increased practice of "shovel-logging", large tracts of mature cypress-gum are being harvested when it is determined economically feasible for a particular site. Although the area remains very rural in nature, it is experiencing moderate population growth. This focus area, like much of rural eastern North Carolina is also increasingly garnering the attention of industry or other interests that require large, sparsely populated landholdings. Peat mining is also a potential threat to the wetlands in the pocosins.

Conservation Recommendations:

In recent years, conservation organizations have acquired thousand of acres of wetland habitats in eastern North Carolina, especially within the Albemarle-Pamlico Peninsula Focus Area. These areas primarily consisted of marsh habitat, pocosin habitat and/or large contiguous blocks of semi-permanently flooded swamp. Because of the "undevelopable" nature of these areas, cost/acre is relatively small. As an alternative, public and private conservation entities should consider acquisition or easement of land that is under a higher threat of residential or industrial development. With the increase in the wood products industry for hardwood species and improved logging practice (i.e. shovel-logging), the protection of the remaining nonriverine swamp (through acquisition or easement) should be a high priority. In addition, the restoration of prior-converted wetlands in the area has great potential especially at those sites where agricultural production is marginal due to poor drainage conditions. The North Carolina Partner's and/or similar programs (CRP and WRP) that are a cooperative effort between the Natural Resources Conservation Service and private landowner should be encouraged and promoted in this focus area.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

Johns, M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Focus Area: Roanoke-Chowan Rivers, North Carolina
Sub-Focus Areas: None

Area Description:

The Roanoke-Chowan Rivers Focus Area includes the Roanoke River basin which is recognized as one of the largest intact bottomland hardwood systems remaining in the Mid-Atlantic region. The focus area is located in northeastern North Carolina and includes all or portions of the following counties: Bertie, Chowan, Gates, Halifax, Hertford, Martin, Northampton, and Washington. The boundary roughly follows the drainage of the Roanoke and Chowan Rivers in North Carolina. The major land use is agricultural with tobacco, cotton, peanuts, corn, and soybeans the major crops. Forested wetlands adjacent to the Roanoke and Chowan Rivers as well as their major tributaries (Cashie, Meherrin and Wiccacon) are the dominant wetland type. The range expansion of beaver into this area has greatly increased this habitat type in the last 20 years. The river systems are generally characterized by natural river levees transitioning into bottomland flats that either grade into large interior back swamps or into a ridge and swale system found adjacent to the river levee. Ridges running parallel to the river channel may occur within the back swamp. Dominant overstory species found in the lower reaches of the rivers and in the back swamp include bald cypress, tupelo gum, swamp cottonwood, maples, sweetgum, and ashes. Various species of oak, hickory, and American beech become increasing important as one travels upstream along each of the rivers and along the ridges paralleling the river channels. Increases in submerged aquatic vegetation (SAV) have been noted in recent years in the western portion of the Albemarle Sound (at the confluence of the Chowan and Roanoke Rivers). This development is encouraging in that overall SAV coverage in coastal habitats has declined over the long-term. The area is rural and developed land, i.e., cities and towns, is a minor component. The focus area encompasses 590,098 hectares (1,458,159 acres) and includes only four towns of approximately 5,000 and one town of approximately 17,000.

Ownership/Protection:

The majority of the focus area is under private ownership dominated by farms, private woodlots and corporate timberlands. Public ownership occurs primarily with the U.S. Fish and Wildlife Service (USFWS)/Roanoke River National Wildlife Refuge and the North Carolina Wildlife Resources Commission (NCWRC). Number of hectares under ownership by the USFWS and NCWRC exceeds 15,000 hectares (37,066 acres). Management agreements of various time lengths exist with other public (N.C. Division of Parks and Recreation) and private landowners (The Nature Conservancy) and account for approximately 12,950 hectares (32,000 acres) under current protection. Other significant public ownership is by the North Carolina Department of Corrections which operates two farms encompassing approximately 3,600 hectares (8,895 acres) and Merchants Millpond State Park 485 hectares (1,200 acres).

Special Recognition:

The U.S. Fish and Wildlife Service recognize two complexes of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986. These are all now in the Roanoke River National Wildlife Refuge, or are targeted for acquisition for the refuge. This area is extremely important to waterfowl and migratory birds, with the most extensive alluvial ecosystem in the state. This area is important to the Bald Eagle and other species of federal and

state concern, and it is also very important as a striped bass spawning area. Bottomlands associated with both the Roanoke and Chowan Rivers are recognized as Important Bird Areas (IBAs) by the National Audubon Society (Golder 2004). In addition, the North Carolina Natural Heritage Program lists numerous sites along both drainages as Dedicated Nature Preserves or Registered Heritage Areas. The State Natural Heritage Program also recognizes the Roanoke River as the least disturbed, largest intact bottomland hardwood forest remaining on the mid-Atlantic slope.

Waterfowl:

Due to the forested habitat type, census of waterfowl using this area is difficult. Although exact numbers do not exist, the largely intact Roanoke River basin has historically been considered as perhaps the most important breeding and wintering area for Wood Duck in North Carolina. The area is also recognized as one of the most important wintering locations for Mallard in North Carolina as well as an important wintering area for Black Duck. Aerial census data do exist for a portion of the Chowan River where the most recent ten year data averages nearly 2,000 ducks observed. The count should be viewed as an index only and many ducks (mostly Wood Duck and Mallard) are likely not counted due to the difficulty in observing in forested habitats. Numbers of diving ducks have increased notably in the last 5 years most likely due to the establishment of SAV in the western portion of the Albemarle Sound. Atlantic (AP) and Southern James Bay Population (SJBP) Canada Goose have declined greatly over the last four decades in North Carolina. The Chowan River and adjacent farmland contain several flocks of AP Canada Goose while the western portion of the focus area (near Halifax) likely contains one of the larger, remaining flocks of SJBP Canada Goose found in North Carolina. Over 6,000 Tundra Swan winter in the focus area. In total, at least 18 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species routinely observed using the Roanoke-Chowan Rivers Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Canvasback			X
Lesser Scaup			X
AP Canada Geese			X
SJBP Canada Geese			X
American Wigeon			X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Northern Shoveler			X
Greater Scaup			X
Ring-necked Duck			X
Bufflehead			X

Other Migratory Birds:

Excluding waterfowl, the Roanoke and Chowan Rivers focus area has recorded sightings of approximately 200 bird species. A total of 88 species of are known to breed in the focus area (Manning 2004). The Roanoke River floodplain supports a significant diversity and abundance of neotropical migrants and likely supports not only locally sustainable populations, but also regionally important source populations (Sallabanks et. al. 2000). North Carolina Partner's in Flight lists the following wetland/bottomland associated bird species known to breed in the area as species of Extremely High or High conservation concern: Cerulean Warbler, Swainson's Warbler, Hooded Warbler, Prothonotary Warbler, Northern Parula, Wood Thrush, American Woodcock, Wood Thrush, and Bald Eagle (Johns 2004). The Roanoke River floodplain contains several rookeries of various sizes and includes one of the two most important inland rookeries in the state. This rookery contains approximately 2,500 nests of Great Blue Heron, Great Egret, and Anhinga. The upper Chowan river is also recognized as containing a small inland heronry.

Threats:

Historical threats to wetland habitat centered on the drainage and conversion of the native bottomland hardwood forest to monoculture pine stands and were the impetus for initial land protection efforts nearly two decades ago. Currently, with the increased practice of "shovel-logging", large tracts of mature cypress-gum are being harvested when it is determined economically feasible for a particular site. In recent years, shoreline development, primarily single family dwellings, has increased significantly along the western side of the Chowan River. If continued, this area will likely become less attractive to waterfowl over time. Also, the area has been the target (both successful and unsuccessful) for the development of heavy industry. The heavy industry generally prefers waterfront sites due to close proximity of ample supplies of water. The construction and management of several large dams in the upper portion of the Roanoke River present several significant problems for wetland wildlife in this river basin. Originally created for flood control, management of these dams is now dictated by power generation and recreational homeowner interests above the dams. Water releases during the last decade have not followed historical patterns and timing of flood and dry periods has not proven beneficial to wetlands and dependent wildlife downstream. Water is frequently not available to flood the back swamps and floodplain during the late winter and early spring when it is needed for use by waterfowl. Growing season flooding has become more frequent which has adversely affected regeneration of hardwoods and prematurely flooded moist soil vegetation before seed production has been assured. This asynchronous nature of the flood regime has made development of reasonably stable habitat conditions for wintering waterfowl and other wetland birds less likely to occur.

Conservation Recommendations:

Conservation activities in the past have largely centered on the acquisition of intact tracts of back swamp and hardwood ridges adjacent to the river systems. This should continue where opportunities exist with the goal of establishing a large wildlife corridor stretching from the Albemarle-Pamlico peninsula through the upper portion of the Roanoke and Chowan River basins in Virginia. The decline in the quality and the unpredictable nature of wetland habitat due to the asynchronous and untimely flooding regime along the Roanoke River calls for more intensive wetland creation, restoration, and enhancement activities than what has typically occurred in the past. The goal of this activity is to provide a stable habitat base available each

year for migratory waterfowl. The ability to intensively manage the large tracts of back swamp will be difficult, but opportunities do exist. This effort will require a close working relationship with those entities managing water flows and with other state and federal organizations including the North Carolina Division of Water Quality, North Carolina Division of Marine Fisheries and the Army Corp of Engineers. Restoration of marginal or abandoned farmlands, both prior-converted wetland and upland, should be actively pursued where possible and followed with long-term management. Recent efforts through the cooperative North Carolina Partner's program have restored over 34 hectares (85 acres) of wetlands on private lands and should continue.

References:

Johns M.E. 2004. North Carolina Bird Species Assessment. 16pp.

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

Sallabanks, Rex., Walters, Jeffery.R., Collazo, Jaime A. 2000. Breeding Bird Abundance in Bottomland Hardwood Forests: Habitat, Edge, and Patch Size Effects. The Condor 102:748-758.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Southern Outer Banks, North Carolina
Sub-Focus Areas: None

Area Description:

The Southern Outer Banks Focus Area can be characterized as a barrier island complex with the Croatan, Pamlico and Core Sounds to the west and the Atlantic Ocean to the east. This region can be divided into four distinct habitat zones: beach, shrub-scrub, maritime forest and marsh. Of these zones, the marsh and adjacent Sound waters are most important to waterfowl and marshbirds (i.e. rails). This focus area contains the most extensive area of submerged aquatic vegetation (SAV) in the state. Eelgrass, shoalgrass, and widgeon grass dominate these sounds. The estimated area of marine submerged aquatic vegetation in this area is approximately 81,000 hectares (200,154 acres) from Bogue Island to Oregon Inlet. Eighty percent (80%) of the SAV is in southern and eastern Pamlico Sound. Lesser areas occur west of Bogue Inlet, in western Pamlico Sound, Croatan Sound, and Roanoke Sound. The remaining zones provide habitat for Neotropical migratory landbirds, certain species of shorebirds and waterbirds. The focus area is located in eastern-most North Carolina (i.e. Outer Banks) and includes all or portions of the following counties: Dare, Hyde and Carteret. Over the last 400 years, much of the upland areas have been settled. The primary land use is residential and tourism. Wanchese is the largest village with 1,500 people. The focus area encompasses 122,000 hectares (301,467 acres).

Ownership/Protection:

A large percentage of the area is in private ownership. The remaining portion is under federal and state ownership approximately 26,400 hectares (65,235 acres) and is comprised of Pea Island National Wildlife Refuge, Cape Hatteras National Seashore, Cape Lookout National Seashore, and Roanoke Marshes Gameland.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one area as priority under the federal Emergency Wetlands Resources Act of 1986: Buxton Woods. Buxton Woods is a large tract of forest that is recognized as important for migratory passerines and raptors. Also, a total of 27 areas, over 60,000 hectares (148,262 acres) within the Southern Outer Banks Focus Area have been designated as Important Bird Areas by the National Audubon Society (Golder 2004). This demonstrates the great biological activity and significance of the area to migratory birds.

Waterfowl:

This focus area represents an important wintering area for waterfowl in the State. Aerial census data exist for the open water habitats for the Pamlico, Core and Croatan Sounds, managed impoundments, and natural marshes. The most recent 10-year data averages are 7,300 dabblers; 10,300 divers; 750 Canada Goose; 1,500 Greater Snow Goose and 1,100 for Tundra Swan. The majority of ducks observed in recent years were Northern Pintail and American Black Duck. This area encompasses the southernmost breeding range for the American Black Duck. Nesting of Blue-winged Teal and Gadwall has also been reported and likely occurs in very low numbers. North Atlantic and Atlantic Population Canada Goose are found in the area but have declined greatly over the last four decades in the area and throughout North Carolina. Numbers of Atlantic Brant likely exceed 1,500 and represent the southernmost wintering flock in the Atlantic Flyway. The Atlantic Brant population utilizes the Sound area predominantly from Ocracoke

Island to Avon (40 km). In total, at least 26 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species routinely observed using the Southern Outer Banks Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X		X
Mallard			X
Pintail			X
Lesser Scaup			X
AP Canada Goose			X
American Wigeon			X
Blue-winged Teal	X	X	X
Canvasback			X
Black Scoter			X
Surf Scoter			X
Redhead			X
NAP Canada Goose			X
Green-winged Teal			X
Gadwall	X		X
Northern Shoveler			X
Ring-necked Duck			X
Greater Scaup			X
Bufflehead			X

Other Migratory Birds:

The bird lists for Pea Island NWR and Cape Hatteras/Cape Lookout National Seashores are likely representative of the entire area and inclusive of all other birds found in the focus area. Over 300 bird species have been sighted at or near this refuge and/or seashores. The Partners in Flight South Atlantic Coastal Plain Bird Plan identifies all remaining maritime habitat for protection and/or restoration when possible. This habitat community type is important to Yellow-Throated Warbler and Northern Parula. In addition, this focus area likely plays an important role in transient (i.e. neartic-neotropical landbirds) migration as stopover habitat. The estuarine marshes are important habitat for Saltmarsh Sharp-tailed Sparrow, Nelson's Sharp-tailed Sparrow, Seaside Sparrow, Black Rail and Yellow Rail. Beach and dune habitat support migrating shorebirds, resident-colonial nesting birds, and migratory raptors year round. Priority species for this habitat include: Red Knot, Piping Plover, American Oystercatcher and Reddish Egret. In addition, the Sounds support large concentrations of wintering Red-throated and Common Loon.

Threats:

Historical threats to maritime community types were from settlement pressure as well as dredge and fill beach/dune and emergent marsh. Today the threats are from development pressure, dredge and fill of beach/dune accelerated beach erosion. Direct threats to individual

birds occur as a result of recreational disturbance to beach-nesting birds, and mortalities associated with the gill-net fisheries as by-catch.

Conservation Recommendations:

Environmental planning will be essential to conserve and protect the region's water quality, vital habitats, natural heritage, and fisheries. The need is to balance economic growth on the Southern Outer Banks with the need to secure the environmental future is the greatest conservation challenge for this focus area.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Southern Outer Banks, North Carolina
Sub-Focus Areas: None

Area Description:

The Southern Outer Banks Focus Area can be characterized as a barrier island complex with the Croatan, Pamlico and Core Sounds to the west and the Atlantic Ocean to the east. This region can be divided into four distinct habitat zones: beach, shrub-scrub, maritime forest and marsh. Of these zones, the marsh and adjacent Sound waters are most important to waterfowl and marshbirds (i.e. rails). This focus area contains the most extensive area of submerged aquatic vegetation (SAV) in the state. Eelgrass, shoalgrass, and widgeon grass dominate these sounds. The estimated area of marine submerged aquatic vegetation in this area is approximately 81,000 hectares (200,154 acres) from Bogue Island to Oregon Inlet. Eighty percent (80%) of the SAV is in southern and eastern Pamlico Sound. Lesser areas occur west of Bogue Inlet, in western Pamlico Sound, Croatan Sound, and Roanoke Sound. The remaining zones provide habitat for Neotropical migratory landbirds, certain species of shorebirds and waterbirds. The focus area is located in eastern-most North Carolina (i.e. Outer Banks) and includes all or portions of the following counties: Dare, Hyde and Carteret. Over the last 400 years, much of the upland areas have been settled. The primary land use is residential and tourism. Wanchese is the largest village with 1,500 people. The focus area encompasses 122,000 hectares (301,467 acres).

Ownership/Protection:

A large percentage of the area is in private ownership. The remaining portion is under federal and state ownership approximately 26,400 hectares (65,235 acres) and is comprised of Pea Island National Wildlife Refuge, Cape Hatteras National Seashore, Cape Lookout National Seashore, and Roanoke Marshes Gameland.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one area as priority under the federal Emergency Wetlands Resources Act of 1986: Buxton Woods. Buxton Woods is a large tract of forest that is recognized as important for migratory passerines and raptors. Also, a total of 27 areas, over 60,000 hectares (148,262 acres) within the Southern Outer Banks Focus Area have been designated as Important Bird Areas by the National Audubon Society (Golder 2004). This demonstrates the great biological activity and significance of the area to migratory birds.

Waterfowl:

This focus area represents an important wintering area for waterfowl in the State. Aerial census data exist for the open water habitats for the Pamlico, Core and Croatan Sounds, managed impoundments, and natural marshes. The most recent 10-year data averages are 7,300 dabblers; 10,300 divers; 750 Canada Goose; 1,500 Greater Snow Goose and 1,100 for Tundra Swan. The majority of ducks observed in recent years were Northern Pintail and American Black Duck. This area encompasses the southernmost breeding range for the American Black Duck. Nesting of Blue-winged Teal and Gadwall has also been reported and likely occurs in very low numbers. North Atlantic and Atlantic Population Canada Goose are found in the area but have declined greatly over the last four decades in the area and throughout North Carolina. Numbers of Atlantic Brant likely exceed 1,500 and represent the southernmost wintering flock in the Atlantic Flyway. The Atlantic Brant population utilizes the Sound area predominantly from Ocracoke

Island to Avon (40 km). In total, at least 26 species of waterfowl are known to occur within the focus area.

Table 1. Selected waterfowl species routinely observed using the Southern Outer Banks Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X		X
Mallard			X
Pintail			X
Lesser Scaup			X
AP Canada Goose			X
American Wigeon			X
Blue-winged Teal	X	X	X
Canvasback			X
Black Scoter			X
Surf Scoter			X
Redhead			X
NAP Canada Goose			X
Green-winged Teal			X
Gadwall	X		X
Northern Shoveler			X
Ring-necked Duck			X
Greater Scaup			X
Bufflehead			X

Other Migratory Birds:

The bird lists for Pea Island NWR and Cape Hatteras/Cape Lookout National Seashores are likely representative of the entire area and inclusive of all other birds found in the focus area. Over 300 bird species have been sighted at or near this refuge and/or seashores. The Partners in Flight South Atlantic Coastal Plain Bird Plan identifies all remaining maritime habitat for protection and/or restoration when possible. This habitat community type is important to Yellow-Throated Warbler and Northern Parula. In addition, this focus area likely plays an important role in transient (i.e. neartic-neotropical landbirds) migration as stopover habitat. The estuarine marshes are important habitat for Saltmarsh Sharp-tailed Sparrow, Nelson's Sharp-tailed Sparrow, Seaside Sparrow, Black Rail and Yellow Rail. Beach and dune habitat support migrating shorebirds, resident-colonial nesting birds, and migratory raptors year round. Priority species for this habitat include: Red Knot, Piping Plover, American Oystercatcher and Reddish Egret. In addition, the Sounds support large concentrations of wintering Red-throated and Common Loon.

Threats:

Historical threats to maritime community types were from settlement pressure as well as dredge and fill beach/dune and emergent marsh. Today the threats are from development pressure, dredge and fill of beach/dune accelerated beach erosion. Direct threats to individual

birds occur as a result of recreational disturbance to beach-nesting birds, and mortalities associated with the gill-net fisheries as by-catch.

Conservation Recommendations:

Environmental planning will be essential to conserve and protect the region's water quality, vital habitats, natural heritage, and fisheries. The need is to balance economic growth on the Southern Outer Banks with the need to secure the environmental future is the greatest conservation challenge for this focus area.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Upper Neuse River, North Carolina
Sub-Focus Areas: None

Area Description:

The Upper Neuse River Focus Area encompasses Johnston County in its entirety and a portion of Wayne County in east central North Carolina and comprises approximately 222,218 hectares (549,111 acres). This focus area is largely comprised of a complex of lakes, rivers, and tributaries, with extensive riparian areas between Goldsboro and Raleigh. Much of the upland area is forested or in agriculture. Upland forests consist of longleaf pine, loblolly pine, and mixed pine-hardwood forests. Bottomland forests here consist primarily of several oak species and cypress–gum swamps. Tobacco and hog farming are the major agricultural activities in this focus area.

Ownership/Protection:

Ownership in this focus area is largely privately-owned.

Special Recognition:

The Upper Neuse River Bottomlands Important Bird Area (IBA) is located in this focus area. The various habitats here support Mississippi Kite, Northern Bobwhite, Eastern Meadowlark, and Grasshopper Sparrow. This focus area also includes several protected natural areas, including Flower Hill, which are protected by the Triangle Land Conservancy. The Rudolph Howell and Son Environmental Learning Center (Howell Woods) is located here and comprises approximately 1,133 hectares (2,799 acres).

Waterfowl:

The complex of lakes, rivers, and tributaries in this focus area support a wide variety of waterfowl with as many as 14 species likely found in the area. The bottomland hardwood floodplain along this portion of the Neuse River provides optimal breeding habitat for Wood Duck and wintering habitat for Wood Duck, Mallard, and Black Duck.

Table 1. Selected waterfowl species using the Upper Neuse River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck			X
Mallard			X
Lesser Scaup			X
American Wigeon			X
Green-winged Teal			X
Wood Duck	X	X	X
Gadwall			X
Ring-necked Duck			X
Bufflehead			X

Other Migratory Birds:

This focus area has significant acreage in bottomland hardwood forests and cypress-gum

swamp forests, supporting a wide diversity of birds. This is one of the most important areas in the state for Mississippi Kite. Grasslands in this area support Northern Bobwhite, Eastern Meadowlark, and Grasshopper Sparrow (a CURE Focus Area is located in these two counties). Important landbird species here include Kentucky Warbler, Swainson's Warbler, Indigo Bunting, Prothonotary Warbler, Yellow-breasted Chat, Prairie Warbler, Wood Thrush and Red-headed Woodpecker. Important waterbirds along the Upper Neuse River include Great Blue Heron, Green Heron, Anhinga, and Black-crowned Night Heron.

Threats:

Threats in this focus area are urban sprawl from the Raleigh-Durham/Goldsboro area, urban stormwater runoff, agricultural runoff, and nutrient runoff from hog farms.

Conservation Recommendations:

Some recommendations for this focus area are to acquire land and conservation easements, reduce and mitigate impacts associated with livestock and other agricultural wastes, and reduce and mitigate impacts from incompatible forestry practices.

References:

Upper Neuse River Basin Association. 2003. Upper Neuse Watershed Management Plan, 116pp.

www.4042.com/claytonnews-star

www.nc.audubon.org

Focus Area: Waccamaw River, North CarolinaCarolina Bays
Sub-Focus Areas: None

Area Description:

The Waccamaw River Focus Area encompasses 183,979 hectares (454,622 acres) in Brunswick, Bladen, and Columbus counties. This area includes the upper Waccamaw River, a portion of Green Swamp, and Lake Waccamaw. The Waccamaw River is classified as a blackwater river system. The Waccamaw River is unique in that it is the only river originating from a Carolina Bay, beginning at Lake Waccamaw in Columbus County, North Carolina. The Waccamaw River has a large, relatively unbroken riverine bottomland hardwood ecosystem dominated by bald cypress, water tupelo, water oak, and willow oak. There are also several isolated stands of the relatively rare tree, Atlantic white cedar. Atlantic white cedar was once common in suitable habitat but today exists only in isolated pockets. The wood resists rot and was traditionally used for fence posts and boats. The flood plain also provides one of the best travel corridors for black bear in coastal North Carolina. Green Swamp is a vast swamp of dense, nearly impenetrable shrubby pocosin vegetation interspersed with open longleaf pine savannas.

Ownership/Protection:

Land in this region is primarily privately owned, followed by various properties under stewardship of the State of North Carolina, including Lake Waccamaw State Park, and The Nature Conservancy. Uplands are dominated by some of the best examples of longleaf pine forests and savanna communities remaining in the southeastern United States. The relatively low number of landowners in the region has helped retain the natural qualities of the region and limit development.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Waccamaw River Wetlands. This area has extensive bottomland hardwood forests and is adjacent to Green Swamp, and part of the state's largest Carolina Bay, Lake Waccamaw. This area supports many species of insectivorous plants, includes a black bear sanctuary, and provides habitat for the Red-cockaded Woodpecker. Several Important Birds Areas (IBAs) are located in this focus area, including Green Swamp, and Waccamaw River Bottomlands (Golder 2004).

Waterfowl:

The seasonally flooded bottomland hardwood forests on the Waccamaw River provide wintering waterfowl habitat for a variety of waterfowl including Wood Duck, Hooded Merganser, Mallard, Green-winged Teal and Ring-necked Duck. The various bay lakes and wetlands of the Green Swamp provide one of the more important wintering areas for Wood Duck in North Carolina. In many years, large numbers of Ring-necked Duck, scaup, and Ruddy Duck are observed on Lake Waccamaw itself.

Table 1. Selected waterfowl species observed using the Waccamaw River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Lesser Scaup			X
American Wigeon			X
Blue-winged Teal		X	
Green-winged Teal			X
Wood Duck	X	X	X
Ring-necked Duck			X
Hooded Merganser			X

Other Migratory Birds:

This focus area supports a wide variety of birds in the bottomlands and swamps of the Waccamaw River. The longleaf pine and associated savannas support Red-cockaded Woodpecker, Bachman's Sparrow, and Henslow's Sparrow. The pocosin communities support Black-throated Green Warbler, Prairie Warbler, and Worm-eating Warbler. The bottomland hardwood forests provide habitat and support Swainson's Warbler, Prothonotary Warbler, Yellow-throated Warbler, Hooded Warbler, and White Ibis. Most recently, Swallow-tailed Kite have been observed and suspected of nesting near Lock #1 on the Cape Fear River, just north of this focus area. The Waccamaw Region of South Carolina has the densest population of Swallow-tailed Kite in South Carolina, and many kites are observed during the nesting season in the Green Swamp and Waccamaw regions of North Carolina.

Threats:

Some of the threats in this region include draining of surrounding lands for intensive pine plantation forestry, exclusion of fire in longleaf pine communities, invasion of introduced species, and industrial and commercial development. Another threat in this region is also related to hydrology of Carolina Bays. Recent court decisions allowing the drainage and filling of these wetlands could significantly affect the floral and faunal resources of these wetlands, as well as water quality in the region. Continued drainage for agriculture, forestry, and peat mining affect the hydrology of the landscape and the biological resources.

Conservation Recommendations:

Major conservation actions here are restoration of the natural hydrology of Carolina Bays, and protection of extensive swamps and remaining bottomland hardwood forests. Major recommendations for this focus area are to limit development through conservation easements, and to provide incentives to landowners to protect and restore the longleaf pine/wiregrass ecosystem. Prescribed fire should be reintroduced to restore and maintain the longleaf pine ecosystem.

References:

Golder, W. 2004. Important bird areas in North Carolina. Audubon North Carolina, Chapel Hill, NC.

http://nature.org/wherewework/northamerica/states/northcarolina/preserves/

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

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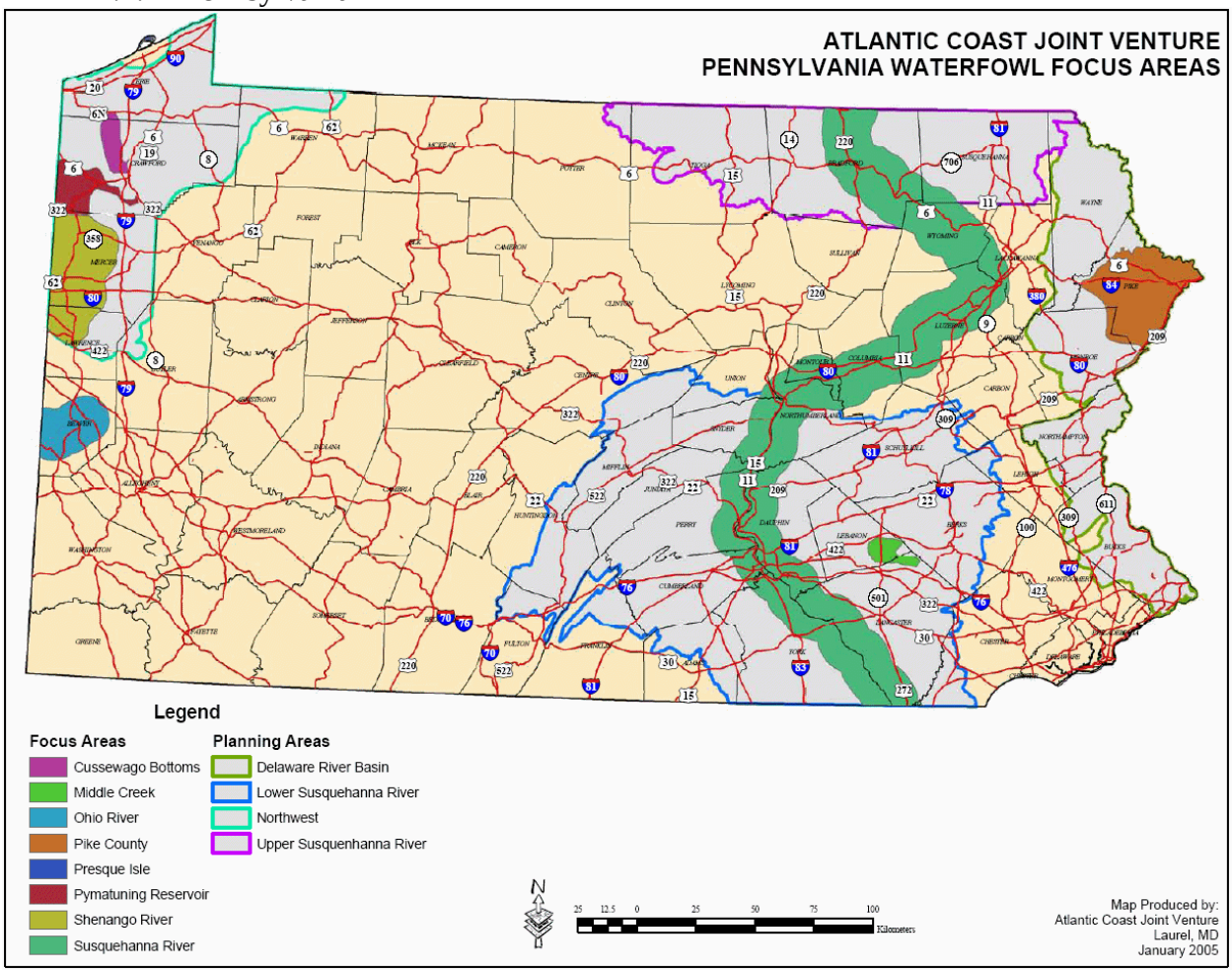

Figure 7.13. Pennsylvania waterfowl focus areas.

Focus Area: Cussewago Bottoms, Crawford County, Pennsylvania
Sub-Focus Area: None

Area Description:

Cussewago Bottoms lies within the glaciated Pittsburgh plateau section of the Appalachian Plateau physiographic province and is within the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR 13). Cussewago Creek is within the French Creek watershed and its associated bottomlands and uplands comprise about 5,260 hectares (13,000 acres) in north central Crawford County. Cussewago Creek is a low gradient stream subject to frequent flooding. This creates numerous seasonally flooded wetlands and pasturelands within the floodplain. Much of the site is composed of bottomland-hardwood forest and scrub/shrub wetlands, with smaller acreages of emergent wetlands. Meanders within the creek, oxbows and beaver dams have created many high quality wetlands for waterfowl and other wetland dependent wildlife.

Ownership/Protection:

Most of the area is in private ownership with land use being composed primarily of agriculture, forest uses and rural housing. State Game Lands 269 is a 267-hectare (660 acre) tract owned and managed by the Pennsylvania Game Commission. It is composed of a large wetland complex with a small impoundment and adjacent uplands.

Special Recognition:

Audubon has designated Cussewago Bottoms and Important Bird Area (IBA) due to its many unique habitats and diversity of migratory birds (Crossley, 1999).

Waterfowl:

The abundance and diversity of wetland types in Cussewago Bottoms provide important breeding habitat for Mallard, Hooded Merganser, Wood Duck and Canada Goose. During migration the seasonally flooded crop fields and pasturelands provide feeding habitat for Canada Goose including both resident and the migratory Southern James Bay Population, Tundra Swan and various species of dabbling ducks.

Table 1. Primary waterfowl species in the Cussewago Bottoms Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Wood Duck	X	X	
Mallard	X	X	X
Hooded Merganser	X		
Green-winged Teal	X	X	
Tundra Swan		X	

Canada Goose -resident	X		X
Canada Goose - SJBP		X	

Other Migratory Birds:

The bottomland-hardwood forest and scrub/shrub wetlands provide habitat for a diversity of migratory bird species. The area is used by breeding forest dwelling neotropical species such Ovenbird, Wood Thrush, Scarlet Tanager and Rose-breasted Grosbeak (Tautin 2004). The Cerulean Warbler, a species of continental importance in the Partners in Flight Conservation Plan (Rich et al. 2004) also occurs in the bottoms. The area has many acres of old fields and brushy habitats that provide important habitat for American Woodcock, Prairie and Golden-winged Warblers and other early successional forest dependent species. Bald Eagle winter in the bottoms and at least one pair has been confirmed nesting (Tautin 2004). Shorebirds and Common Snipe utilize the flooded crop fields during spring and fall migration.

Threats:

Except for State Game Lands 269 the remainder of the Cussewago Bottoms is in private ownership and potentially could be developed as small land holdings and farms are subdivided for residential uses. Agricultural runoff and pollution from farms, gas wells, timbering and gravel mining, could cumulatively affect the bottoms and its wildlife. Invasive species such as common reed and purple loosestrife could threaten the diversity of habitats and the species that are dependent upon them.

Conservation Recommendations:

Efforts to protect existing lands within the Bottoms from development should be undertaken through acquisition and conservation easement or through local land use zoning laws. Conservation practices should be implemented on farmland through the Conservation Reserve Enhancement Program (CREP) and other USDA, NRCS and State programs. Monitoring and control of invasive plant species such as purple loosestrife, common reed and reed canary grass should be undertaken.

References:

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society. Harrisburg, Pennsylvania, USA.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rutay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, NY. USA.

Tautin, J. 2004. Pennsylvania Important Bird Area, Cussewago Bottom. Conservation Plan Phase 1. Audubon Pennsylvania. Harrisburg. PA. USA.

Planning Area: Delaware River Basin, Pennsylvania
Focus Area: Pike County

Area Description:

The Delaware River is the longest free-flowing river in the eastern United States. The Delaware River Basin Planning Area encompasses 749,943 hectares (1,853,142 acres) and includes the entire non-tidal Pennsylvania portion of the Delaware (Morrisville and north), as well as the eastern half of the Pennsylvania portion of the river's drainage basin. The western half of the basin is not included in the Planning Area because of its lower value to waterfowl due to the presence of more intensive urban and agricultural land use as well as some more mountainous areas. The portion of the planning area north of the Kittatinny Ridge is in the Appalachian Plateau (Glaciated Low Plateau and Pocono Plateau Sections) and Ridge and Valley Physiographic Provinces, and is characterized by a rolling to mountainous, predominantly forested landscape with an abundance of natural wetlands. The portion of the planning area south of the Kittatinny Ridge is part of the Piedmont Physiographic Province with relatively level topography and a predominance of agricultural and suburban land use, which has led to severe historical losses of wetlands. Both portions of the Delaware River Basin include large, unique intact natural wetlands (e.g. Long Pond Swamp and Quakertown Swamp) and agricultural areas predominantly in private ownership with high potential for wetland restoration and other waterfowl habitat projects (e.g. Calkins Creek, Bushkill Creek Watershed, Monocacy Creek, and Tohickon Creek). In the northern portion of the planning area are several predominantly forested and publicly owned areas with high wetland densities such as Game Lands 70/299, Tobyhanna Area, and Pike County. Pike County has been identified as a waterfowl focus area because of its especially high concentration of exceptional quality wetlands.

Ownership/Protection:

Approximately 15-20% of the northern portion of the planning area is in public ownership (Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, and National Park Service), including a substantial portion of the large intact wetland complexes in the Pike County Focus Area. In addition, much of Long Pond Swamp is secure under the ownership of The Nature Conservancy. Several water authorities, timber companies, and hunting clubs control large unfragmented parcels, while remaining private lands include residential developments, lower-density residential areas, and some farmland.

South of the Kittatinny Ridge, public landholdings are limited to a few small, isolated state game lands (Quakertown Swamp is included in SGL 139) and state / county parks surrounded by privately owned farmland and residential developments.

Special Recognition:

Most of the Pennsylvania portion of the Delaware River is included in the National Wild & Scenic Rivers System. Audubon Pennsylvania recognizes eight Important Bird Areas within the Planning Area (Crossley 1999), including Long Pond Swamp, Quakertown Swamp, and two locations (Shohola Waterfowl Management Area and Promised Land State Park / Bruce Lake Natural Area) within the Pike County Focus Area.

Waterfowl:

North of the Kittatinny Ridge, the primary importance of the planning area to waterfowl is as breeding habitat. This area supports the highest concentrations of breeding Wood Duck and Black Duck in Pennsylvania, although Black Duck are reduced in numbers relative to historical levels, and more patchily distributed. Breeding Mallard and resident Canada Goose are widespread in the Planning Area and Common and Hooded Merganser also occur. Aggregate waterfowl production across the region is substantial because of the high wetland densities. The abundance and diversity of small wetlands, as well as larger waterbodies such as Shohola Lake and Lake Wallenpaupack, offer habitat for these and other waterfowl species during migration, and the Delaware River is an important spring and fall migration corridor for ducks and geese.

The portion of the planning area south of Kittatinny Ridge is of moderate importance for breeding waterfowl (primarily Mallard, Wood Duck, and resident Canada Goose) and high importance to wintering waterfowl. The Delaware River and reservoirs in this region support tens of thousands of overwintering Canada Goose (both migratory Atlantic Population and Atlantic Flyway Resident Population), as well as substantial numbers of Mallard and mergansers, and some Black Duck and diving ducks.

Table 1. Waterfowl species identified in the Delaware River Basin Planning Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Wood Duck	X	X	
Mallard	X	X	X
Common Merganser	X	X	X
Hooded Merganser	X	X	
Canada Goose	X	X	X

Other Migratory Birds:

The largest breeding concentrations of Osprey (state threatened) in Pennsylvania are on the Pocono Plateau in the northern portion of the planning area. Bald Eagle (federal threatened, state endangered) nest at several locations, and the middle and upper Delaware River and the lower Lackawaxen River provide important wintering habitat for eagles. Several forested wetlands in the planning area contain Great Blue Heron rookeries. Other wetland birds such as grebes, rails, and bitterns breed at scattered locations within the planning area (Brauning 1992), and large waterbodies in the southern portion support large numbers of wintering gulls. The broad diversity of forests, agricultural areas, and wetlands support a wide variety of breeding passerines. A cooperative task force of natural resource agencies and other local interests formed in 2001 is seeking to identify, maintain and improve habitat for American Woodcock and other early successional species on public and private lands in and around the Pike County Focus Area.

Threats:

The predominant threats to waterfowl habitat in this planning area are tied to rapid human

population growth and associated residential sprawl and recreational overuse. The proximity of the southern portion of the Planning Area to Philadelphia and of the northern portion to New York City have made the entire region attractive for commuter and vacation homes: Pike, Monroe, and Wayne Counties were the three fastest growing in Pennsylvania during the 1990s. As a result, wetlands have been impacted or are threatened by fragmentation, isolation, eutrophication, and conversion to lower-quality open water habitats. Disturbance of waterfowl pairs and broods by boaters and other recreational users is an increasing problem. Increasing development and human activity are of particular concern for remaining Black Duck breeding populations because they are less adaptable than most other waterfowl species to negative habitat changes. Invasive species such as *Phragmites,* purple loosestrife, and Mute Swan are negatively affecting waterfowl habitat especially in the southern portion of the Planning Area.

Conservation Recommendations:

There is an urgent need throughout the planning area for coordinated municipal and regional planning to ensure that ongoing development is conducted in an environmentally sensitive manner. Waterfowl habitat partners should work with local authorities and developers to ensure the protection of existing wetlands (including preventing the conversion of emergent wetlands to open-water habitats), the maintenance of adequate connectivity and upland buffers to minimize the effects of disturbance and non-point pollution, and the preservation of agricultural lands as feeding areas for migrating and wintering waterfowl. Carefully targeted acquisitions and easements will be important tools in securing the most vulnerable high-quality wetland systems.

Wetland restoration and enhancement on both public and private lands should also be a high priority in this planning area. In agricultural areas, these efforts should be linked to the Pennsylvania Conservation Reserve Enhancement Program and other Farm Bill programs that promote expansion of perennial nesting cover. Technical assistance should be provided to lake associations and other private landowners who wish to restore or enhance waterfowl habitat on recreational lakes and other wetlands. Where possible, especially on public lands, recreational use should be managed through use of restricted-entry propagation areas and other means to minimize disturbance to breeding waterfowl. Increased control efforts for invasive species would result in marked habitat improvements in many areas.

References:

Brauning, D. W., editor. 1992. Atlas of Breeding Birds in Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania, USA.

Crossley, G. A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society, Harrisburg, Pennsylvania. USA.

Planning Area: Lower Susquehanna River, Pennsylvania
Focus Areas: Middle Creek, Susquehanna River

Area Description:

The Lower Susquehanna River Planning Area (LSRPA) is contained within the Ridge and Valley and Piedmont physiographic provinces and extends from Sunbury down the Susquehanna River to the Maryland state line and includes many tributary creeks and reservoirs. The planning area encompasses 2,100,206 hectares (5,189,701 acres). The Susquehanna River corridor is an important migratory pathway for migratory birds bound for the Chesapeake Bay. The LSRPA and its productive shallow waters, lakes, islands, wetlands, gravel bars and mudflats provide important feeding and resting habitat for waterfowl.

Ownership/Protection:

Less than 5% of the total acreage of the LSRPA is in public ownership. Many of the river islands within the LSRSPA are owned and managed by Pennsylvania Game Commission (PGC), Pennsylvania Deptartement of Conservation and Natural Resources (DCNR) or public utilities. Many islands in the LSRPA are managed specifically for waterfowl and are designated refuges by the PGC. Middle Creek Focus Area (FA) contains the 2,529 hectares (6,250 acres) Middle Creek Wildlife Management Area, which is managed for waterfowl and other wildlife by the PGC. Lake Ontelaunne-Maiden Creek and the Octoraro Creek regions contain reservoirs owned and managed by water authorities and public utilities and are important areas for wintering waterfowl. The Tuscarora Creek, Adams County, and Tulepehocken Creek regions contain numerous small wetland and riparian areas that are primarily in private ownership and have the potential for significant wetland restoration efforts that would benefit breeding waterfowl.

Special Recognition:

Audubon has designated eight areas within the LSRPA as Important Bird Areas (IBA) with special focus on waterfowl (Crossley, 1999). These include the Blue Marsh Lake, Cordorus State Park, Conejohela Flats, Conowingo Reservoir, Lake Ontelaunee, Middle Creek Wildlife Management Area (WMA), Octoraro Reservoir and Sheets Island Archipelago. The Pennsylvania DCNR has designated Yellow Breeches Creek, Letort Spring Run, Octoraro Creek and Stony Creek as Pennsylvania scenic rivers.

Waterfowl:

The LSRSPA is an important wintering and migration area for waterfowl. Thousands of Canada Goose, Snow Goose, ducks and Tundra Swan rest and feed on the Susquehanna River and nearby reservoirs and adjacent agricultural lands. In some years approximately 25% of the Eastern Population of Tundra Swan stage during spring migration within the Middle Creek Focus Area and nearby agricultural fields in Lancaster and Lebanon Counties. Atlantic Population Canada Goose also stage in the planning and focus area during spring and fall migration and winter at key waterfowl areas. Wintering concentrations of Common Merganser, Goldeneye, Bufflehead, Black Duck and Canada Goose occur on the Susquehanna River, Octoraro Reservoir, Muddy Run, Middle Creek, Blue Marsh and Lake Ontelaunee. The area is also used for breeding habitat by Mallard, Wood Duck, and resident Canada Goose. The

numerous small wetlands and riverine habitats provide breeding habitat for these species and across the region contribute significantly to Pennsylvania's annual waterfowl production.

Table 1. Waterfowl species identified in Lower Susquehanna River Planning Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck		X	X
Wood Duck	X	X	
Mallard	X	X	X
Common Merganser			X
Goldeneye			X
Bufflehead			X
Hooded Merganser			X
Canada Goose	X	X	X
Snow Goose		X	X
Tundra Swan		X	X

Other Migratory Birds:

The LSRPA is a major migration corridor for migratory birds. Concentrations of wintering Bald Eagle occur on the Lower Susquehanna River and nearby lakes. Breeding Bald Eagle and Osprey have been recorded on the river islands and at Middle Creek WMA and are increasing throughout the region. The Susquehanna River islands and adjacent floodplain provide habitat for nesting herons and egrets including the only known breeding location in the Commonwealth for Great Egret, Yellow-crowned Night Heron, and Black-crowned Night-Heron. Exposed mud flats and islands behind the hydroelectric dams provide feeding and stopover habitat for numerous migrating shorebirds, making it one of the more important shorebird sites in the Commonwealth (McWilliams and Brauning 2000).

Threats:

Water level changes from operation of hydroelectric dams and proposed new dams pose a threat to productive shallow water areas, mud flats and island habitats. Development and encroachment on wetlands and feeding and resting sites for migratory waterfowl are also of concern. Increasing human population growth in this region will increase disturbance to feeding and resting areas used by waterfowl. Industrial contaminants and excessive nutrients from residential and agricultural pollution impact water quality and aquatic habitats. Introduction of invasive, exotic plants and animals (e.g. Purple loosestrife, Japanese knotweed, common reed, Mute Swan, zebra mussel) threatens habitat and migratory bird populations. In particular, increasing numbers of Mute Swan could negatively impact waterfowl using the LSRPA and potentially threaten efforts to restore submerged aquatic vegetation in nearby Chesapeake Bay.

Conservation Recommendations:

Efforts should continue and be expanded to prevent the loss and degradation of wetland habitat in support of the goals of the Chesapeake Bay 2000 agreement (Environmental Protection Agency, 2000). Nutrient reduction and wetland restoration efforts should be expanded to improve water quality and wetland habitat for waterfowl. Enrollment of private farmlands in the Conservation Reserve and Enhancement Program (CREP) should be encouraged to provide benefits to water quality and upland nesting habitat. Refuge areas should be acquired to provide disturbance free habitat to breeding, migrating and wintering waterfowl. Acquisition, restoration and enhancement of wetland habitats within the LSRPA should be actively pursued and funding sources secured for these programs.

References:

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society. Harrisburg, Pennsylvania, USA.

Environmental Protection Agency. 2000. Chesapeake Bay agreement 2000. Annapolis, Maryland. U.S.A.

McWilliams, G. M. and D.W. Brauning. 2000. The birds of Pennsylvania. Cornell University Press, Ithaca, New York. U.S.A.

Focus Area: Middle Creek, Lancaster, Lebanon Counties, Pennsylvania
Sub-Focus Area: None

Area Description:

The Middle Creek Focus Area is located within piedmont physiographic province and is also within Bird Conservation Region 29. Middle Creek provides important wintering and migration habitat for migratory birds, especially waterfowl. The Middle Creek Wildlife Management Area (WMA) contains a 161-hectare (400-acre) impoundment along with smaller shallow water wetlands and moist soil areas managed for waterfowl and other wetland birds. The surrounding privately owned lands are primarily agricultural, and provide waste grain and forage for ducks, geese and swans during spring and fall migration.

Ownership/Protection:

The 2,509-hectare (6,200-acre) Middle Creek WMA is managed for wildlife by the Pennsylvania Game Commission. The remaining lands in the focus area are in private ownership with land use composed primarily of agriculture, rural residential and small residential communities.

Special Recognition:

Audubon has designated Middle Creek an Important Bird Area (IBA) with special focus on migratory birds including exceptional habitat for waterfowl (Crossley, 1999).

Waterfowl:

The extensive wetlands at Middle Creek WMA and surrounding agricultural lands provide important habitats for migrating and wintering waterfowl. Middle Creek serves as important staging and migration habitat for Eastern Population Tundra Swan. Results from radio-telemetry studies suggest that in some years as much as 26% of the entire eastern population stops during spring migration at Middle Creek WMA and lower Susquehanna River. (Gregg et al. 2001; K.A. Wilkins, Cornell University, unpublished data). Over 125,000 Greater Snow Goose have been recorded at Middle Creek during spring migration (McWilliams and Brauning 2000). The extensive croplands of wheat, corn and other grains provide an important food source for migratory waterfowl. Atlantic Population Canada Goose, Mallard, Black Duck, Pintail and other ducks species utilize the many wetlands and crop fields during migration and some also over winter. Shallow impoundments provide feeding habitat for Blue-winged Teal, Green-winged Teal, Shoveler, and Wigeon. Mallard, Wood Duck and Canada Goose also nest in the many wetland and associated grasslands.

Table 1. Waterfowl species frequently occurring in the Middle Creek Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck		X	X
Wood Duck	X	X	
Mallard	X	X	X

Shoveler		X	
Pintail		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
American Wigeon		X	
Canada Goose	X	X	X
Snow Goose		X	
Tundra Swan		X	X

Other Migratory Birds:

Middle Creek contains many diverse habitats that provide habitat for a host of migratory birds. Middle Creek supports several special concern species including state and federally endangered and threatened birds. Bald Eagle regularly occur on the area and a resident pair has been nesting since 1999. Osprey occur regularly during migration. The extensive grasslands provide habitat for Short-eared Owl, Eastern Meadowlark, Bobolink, Dickcissel and Grasshopper Sparrows. The numerous shallow wetlands and moist soil areas provide habitat for migrating shorebirds including; Semi-palmated Plover, Greater Yellow Legs, Lesser Yellow Legs, Solitary Sandpiper, Spotted Sandpiper, Pectoral Sandpiper, and Semi-palmated sandpiper (Blye and Hoffman 2004). Emergent Marsh birds recorded include Virginia Rail, Common Moorhen. Woodcock have been documented breeding and are regular visitors during migration.

Threats:

The single biggest threat to the area is from residential and commercial development of farmland within the focus area. This region of Pennsylvania is under increasing development pressure as farmland is converted to non-farm uses. This threatens the food resources for migratory waterfowl and increases disturbance to feeding and roosting birds. Most of the existing wetlands are protected, but water quality is threatened from agricultural and residential runoff into streams. Invasive plant species such as purple loosestrife and common reed threaten habitat quality.

Conservation Recommendations:

There is an urgent need to develop land use planning efforts to protect the remaining open space and farmland surrounding the Middle Creek WMA. Conservation easements should be acquired and where possible acquisition of key areas should be a priority. Enrollment of private farmland in the Conservation Reserve and Enhancement Program (CREP) should be encouraged to provide benefits to water quality and upland nesting habitat. Acquisition, restoration and enhancement of wetland habitats within the focus area should be actively pursued and funding sources secured for these programs. Monitoring and control of invasive plant and animal species should be expanded.

References:

Blye, R. and S. Hoffman 2004. Pennsylvania Important Bird Area, Middle Creek Wildlife Management Area. Conservation Plan Phase 1. 10pp. Audubon Pennsylvania. Harrisburg. PA. USA.

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society. Harrisburg, Pennsylvania, USA.

Gregg, I.D. 2001. Migration and wintering ecology of Eastern Population tundra swans in Pennsylvania. Pennsylvania Game Commission Annual Report, Project No. 51901, Harrisburg, Pennsylvania, USA.

McWilliams, G. M. and D.W. Brauning. 2000. The birds of Pennsylvania. Cornell University Press, Ithaca, New York. U.S.A.

Planning Area: Northwest Planning Area, Pennsylvania
Focus Areas: Preque Isle, Cussewago Bottoms, Pymatuning Reservoir, Shenango River Valley

Area Description:

The Northwest Planning Area lies within the Glaciated Pittsburgh Plateau Section of the Appalachian Plateau Physiographic province and encompasses 120,041 hectares (296,628 acres). The glaciated plateau is defined by rolling topography smoothed by glacial action. The Planning Area includes the Shenango River Valley Focus Area and Shenango Reservoir from Jamestown Borough to the city of Sharon. The Shenango River Valley Focus Area supports a variety of land uses, including crop fields, pastures, quarries and recently timbered forest and contributes to habitat discontinuities along this riparian corridor (Coxe 2003). The Shenango River Valley Focus Area is dominated by riverine species such as sycamore, boxelder and silver maple. Shenango Lake is a 1,440 hectare (3,560 acres) impoundment of the Shenango River and Pymatuning Creek. The United States Army Corps of Engineers manages the lake primarily for flood control and recreation, fish and wildlife enhancement, low flow augmentation and water quality. The southwest portion of the planning area (the Moraine portion) includes Moraine State Park, Preston Conservation Area and Jennings Environmental Education Center. Moraine State Park includes Lake Arthur a 1,305 hectares (3,225 acres) manmade lake.

Ownership/Protection:

The river valley from Jamestown to Greenville is privately owned. Below Greenville, most of the river floodplain, including Shenango Lake is largely in public ownership through the U.S. Army Corps of Engineers and has a forested buffer along most of the length. The Moraine portion of the Planning Area is under public ownership through the Pennsylvania Department of Conservation and Natural Resources.

Special Recognition:

Shenango River Valley Focus Area and Shenango Lake are classified as having exceptional significance in the Mercer County Natural Heritage Inventory (Coxe 2003) due to the quality of habitat and assemblage of rare species. Additionally, Shenango Lake and Moraine State Park are designated Important Bird Areas (IBA) by the Audubon Society (Crossley, 1990) to recognize the use of the lake by migratory birds and those of special concern.

Waterfowl:

Lake Arthur, part of Moraine State Park, and Shenango Lake are key migratory stopovers for waterfowl in Northwestern Pennsylvania. Numerous small wetlands, beaver flowages, and riparian areas provide good breeding habitats for Mallard, Black Duck, Wood Duck, Common Merganser, Hooded Merganser, Blue-winged Teal and resident Canada Goose.

Table 1. Waterfowl species identified in the Northwest Planning Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X		
Wood Duck	X		

Mallard	X		
Common Merganser	X		
Blue-winged Teal	X		
Hooded Merganser	X		
Canada Goose	X	X	X

Other Migratory Birds:

Confirmed breeding birds include Bald Eagle, Osprey, and Great Blue Heron. Shenango Reservoir serves as an important staging area for migratory shorebirds because of extensive mudflat habitat provided through water level fluctuations

Threats:

Major issues on the river stem mostly from runoff and nutrients inputs (Coxe 2003). The Shenango River is impounded at Pymatuning Lake just above the Mercer County line. Sewage outflows are present at Jamestown, Greenville and Reynolds Heights and contribute to the total nutrient load going into the river. Added to the sewage is runoff from fertilizers, pesticides and herbicides from agricultural land uses and urban runoff. By the time the river reaches Shenango Lake, it is carrying substantial nutrients and silt loads that settle out in the lake.

Invasive species such as Japanese knotweed, common reed, multiflora rose, garlic mustard, and purple loosestrife are present in many spots along the river (Coxe 2003). These species stand to threaten the diversity of life along the riverbank and adjacent habitats.

One of the most important issues that face the planning area, including the Shenango River Valley Focus Area, is fragmentation of the landscape that results in loss of habitat connections and vegetation cover (Coxe 2003). The predominantly rural and agricultural areas in the upper watershed will face development pressure and the developed areas around Jamestown, Greenville and Reynold's Heights will expand. The Moraine Sub-Focus Area receives heavy recreational use during the spring and summer with resulting disturbance to breeding waterfowl. Development pressure surrounding the park is increasing and poses threats to migratory bird habitats.

Conservation Recommendations:

Water levels in the Shenango River are now regulated by releases from Pymatuning Reservoir, which help feed municipal water supplies downstream and maintain water levels in the Beaver River (Coxe 2003). Along with the imperatives given these uses, the maintenance of natural communities and ecological systems need to be taken into consideration with the release of water from the reservoir. The requirements of these natural systems will need to be better researched and evaluated.

Activities upstream in the watershed need to be evaluated for their impact in increasing nutrients and runoff flowing into the Shenango River Focus Area (Coxe 2003). Efforts to decrease the non-point pollution through streambank fencing programs and upgrades to sewage treatment plants would be key to reducing nutrient loads in the river. Substantial and contiguous

riparian buffers (forest and shrubland) would not only assist in reducing non-point source pollution but also add to natural habitat within stream valleys. Invasive species need to be monitored along the length of the river and efforts taken to prevent their spread to other parts of the river. Landowner(s) should be made aware of the significance of what they own and be given information on how to manage for the plants, animals and habitats present here. It may be possible for groups like the Shenango Conservancy or the Shenango River Watchers to help in educating landowners and users of the corridor as to the significance of the habitats and requirements of the animals and plants of special concern. Increasing the amount of forested riparian areas along the Shenango River would encourage the development of more viable natural communities, both instream and out. Intact woodlands are also better able to resist invasive species, which are prevalent along the river. Monitoring of invasive species would help in tracking their spread and ultimately in control efforts.

Wetland restoration and enhancement activities should be implemented on private lands within the Planning Area, to provide quality habitat for waterfowl and other wetland dependent wildlife. Landowners should also be encouraged to participate in the Conservation Reserve Enhancement Program (CREP) for the Ohio River basin, which will improve water quality and provide upland nesting cover for breeding waterfowl.

Careful planning within the Planning Area and the Shenango River Focus Area would benefit both the ecological resources and people living on the land. Recognizing the river and surrounding landscape, as a prime ecological and recreational resource may be an initial step in this planning (Coxe 2003). The U.S. Army Corps of Engineers, the many private landowners and the municipalities included in the focus area should come together to consider comprehensive planning. Resources available through the county, state, and federal governments such as agency management plans, Rivers Conservation Plans, and other initiatives may help in defining issues and providing some guidance in developing community-based conservation plans.

References:

Crossley, G. A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society, Harrisburg, Pennsylvania. U.S.A. 217pp.

Coxe, R. B. 2003. Mercer County Natural Heritage Inventory. Western Pennsylvania Conservancy. 197 pp.

Planning Area: Ohio River Valley, West Virginia
Focus Areas: Ohio River (West Virginia and Pennsylvania)

Area Description:

This planning area consists of the islands of the Ohio River, the back channels and riverine habitats associated with these islands, and adjacent wetland, embayment and bottomland habitat within the Ohio River floodplain in West Virginia (WV), and the Ohio River Focus Area in Pennsylvania. In WV, the planning and focus area spans 450 kilometers (280 miles) of the Ohio River corridor and includes 401,714 hectares (992,653 acres). In Pennsylvania, the focus area incorporates 58,462 hectares (144,462 acres). Most of the habitats within this area have been classified as Resource Category I under the United States Fish and Wildlife Mitigation Policy. These areas, particularly the islands, back channels, and embayments, have long been recognized by state, federal, and private organizations as having high quality fish and wildlife, recreational, scientific and natural heritage value.

Ownership/Protection:

The majority of the Ohio River floodplain area is privately owned. The Ohio River Islands National Wildlife Refuge (NWR), established in 1990, protects 22 islands and 3 mainland tracts totaling approximately 1,416 hectares (3,500 acres) of floodplain habitats. A total of 30 islands are targeted for acquisition or protection, and over 809 hectares (2,000 acres) of embayments and wetlands in West Virginia are identified for protection. The West Virginia Division of Natural Resource owns over 404 hectares (1,000 acres) of lands and open water along the Ohio River at Green Bottom Wetland Management Area.

Special Recognition:

The islands, wetlands, and backwater embayments of the Ohio River were identified as high quality habitats in the Unique Ecosystem Concept Plan for the State of West Virginia (USFWS 1979), Regional Wetland Concept Plan (USFWS 1980), the Corps of Engineers' Ohio River Ecosystem Restoration Program (2000), and the State of West Virginia's Ohio River Fund Plan (1993).

Waterfowl:

Twenty-eight species of waterfowl use the planning and focus areas during migration, wintering and/or nesting. Other waterbird species (such as loons, grebes, gulls, terns, plovers, sandpipers, and wading birds) depend on the river, embayment, and wetland areas for migration, nesting, or wintering habitat. Southern James Bay Population Canada Goose are regularly sighted along the Ohio River in the winter. The combination of deep water (mostly ice-free), shallow water wetlands, submerged aquatic beds, and adjacent farm fields makes the Ohio River corridor valuable migration and wintering habitat.

Table 1. Waterfowl species using the Ohio River Valley Planning Area and Ohio River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	X
Gadwall		X	X
American Wigeon		X	X
Canvasback		X	X
Redhead		X	X
Wood Duck	X	X	X
Ring-necked Duck		X	X
Lesser Scaup		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Bufflehead		X	X
Hooded Merganser	X	X	X
Common Merganser		X	X
Red-breasted Merganser		X	X
Northern Shoveler		X	X
Ruddy Duck		X	X
Surf Scoter		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Blue-winged Teal	X	X	X
Green-winged Teal		X	X
Long-tailed Duck		X	X
Canada Goose	X	X	X
Snow Goose		X	X
Tundra Swan		X	X
Trumpeter Swan		X	X

Other Migratory Birds:

Over 250 species of birds use the floodplain habitats of the Ohio River. Of the 20 species on the West Virginia and Pennsylvania Partners in Flight Priority Species Lists, at least 16 are known to nest along the Ohio River Valley. Osprey, which have been reintroduced into the valley by a cooperative effort of state, federal, and private partners, are now nesting successfully along the Ohio River. The largest Great Blue Heron rookeries in West Virginia are also located within the Ohio River Valley. In the West Virginia portion of the Ohio River valley, a Bald Eagle began a nest in 1999, the first such nest recorded

Threats:

There are compelling reasons to be concerned about the future of these focus areas. Since the early 1900's 14 islands have been eliminated from the West Virginia section of the Ohio River through inundation for navigation and commercial dredging. Commercial sand and gravel dredging, barge mooring, navigation related activities, industrial development, dredged spoil disposal, and recreational and residential development have all contributed to the destruction and degradation of the valuable wetland and associated habitats found in these focus areas.

Conservation Recommendations:

Restoration of floodplain wetlands previously altered by agriculture; conservation easements or acquisition of embayments and other important riparian habitats; continued acquisition of islands; reduction of non-point source pollution loading which affects aquatic bed habitat; minimization of dredging and spoil disposal in productive wetland habitats.

References:

Ohio River Islands NWR Comprehensive Conservation Plan. November 2001. USFWS, Region 5.

Mountwood Bird Club, The Birds of Wood County, WV.

Focus Area: Pike County, Pennsylvania
Sub-Focus Area: None

Area Description:

The Pike County Waterfowl Focus Area lies within the Glaciated Low Plateau Section of the Appalachian Plateau physiographic province and is within the Appalachian Mountains Bird Conservation Region (BCR 28) and the Delaware River Basin Waterfowl Planning Area. Pike County has been identified as a waterfowl focus area within the Delaware River Basin Planning Area because of its especially high concentration of exceptional quality wetlands; Pike County is the most heavily forested portion of the wetland-rich glaciated region of Pennsylvania, and therefore the premier area in the state for those avian species that thrive in this combination of habitats. The focus area includes all but the extreme northern and western portions of Pike County (which contain fewer wetlands and less public land); it is bordered on the northeast and southeast by the Delaware River, on the northwest by the Lackawaxen River, and on the southwest by the higher elevations of the Pocono Plateau. The focus area consists of about 12,140 hectares (30,000 acres) of freshwater wetlands within a forested (primarily deciduous) habitat matrix of approximately 121,400 hectares (300,000 acres). Wetland types present are diverse and often interspersed. They include bogs, slow-moving streams, beaver ponds, emergent marshes, shallow lakes, and scrub-shrub and forested swamps. The forested matrix is a vital accompaniment to these wetlands because it provides a buffer zone that helps maintain wetland water quality, reduce human disturbance, and provide breeding habitat for cavity nesting species.

Ownership/Protection:

Approximately 35% of the land within the focus area is in public ownership (Pennsylvania Game Commission, Pennsylvania Department of Conservation and Natural Resources, and National Park Service). Several additional large, unfragmented parcels are controlled by private hunting clubs. Other private lands include large second home developments in primarily forested settings, lower density residential areas, and numerous small tracts of privately owned forestland.

Special Recognition:

Audubon Pennsylvania has designated two Important Bird Areas (IBAs) with importance to migratory birds, including waterfowl, within the focus area: Shohola Waterfowl Management Area and Promised Land State Park / Bruce Lake Natural Area (Crossley 1999). Most of the Delaware River is included in the National Wild and Scenic Rivers System.

Waterfowl:

The primary value of the focus area to waterfowl is as breeding habitat. Densities of breeding Wood Duck and Black Duck are higher in the Pike County Focus Area than in any other area of comparable size in Pennsylvania, although Black Duck numbers are reduced from historical levels. Mallard, Hooded Merganser, and Canada Goose (Atlantic Flyway Resident Population [AFRP]) also breed throughout the focus area, while the riverine habitats support breeding Common Merganser. Aggregate waterfowl production in the focus area is substantial because of the high wetland density. The abundance and diversity of small wetlands, as well as the presence of larger water bodies such as Shohola Lake and nearby Lake Wallenpaupack,

provide important stopover habitat for these and numerous other waterfowl species during migration, and the Delaware River is an important spring and fall migration corridor for ducks and geese. Small numbers of wintering Canada Goose, Mallard, and Common Merganser utilize the Delaware River, but the overall importance of the focus area to wintering waterfowl is low.

Table 1. Waterfowl Species frequently occurring in the Pike County Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	
Wood Duck	X	X	
Mallard	X	X	
Common Merganser	X	X	
Hooded Merganser	X	X	
Canada Goose -AFRP	X	X	

Other Migratory Birds:

Thanks in large part to reintroduction efforts in the focus area during the 1980's, Pike County supports one of the highest breeding concentrations in Pennsylvania of Bald Eagle (federal threatened, state endangered) and Osprey (state threatened) (McWilliams and Brauning 2000), and both species have increased in the focus area over the past decade. The Delaware and Lackawaxen Rivers on the northern and eastern edges of the focus area provide important habitat for wintering Bald Eagle and have been designated "essential habitat" in the Northern States Bald Eagle Recovery Plan (Nye et al. 1998). Several of the forested wetlands contain great blue heron rookeries. The focus area supports a diverse assemblage of breeding passerines including Partners in Flight priority species such as Wood Thrush, Cerulean Warbler, Golden-winged Warbler, and Canada Warbler (Rich et al. 2004, Brauning 1992). There is high potential for American Woodcock habitat management due to the large extent of poorly drained soils and public owned forestland. A cooperative task force of natural resource agencies and other local interests formed in 2001 is seeking to identify, maintain and improve habitat for American Woodcock and other early successional species on public and private lands in and around the Pike County Focus Area.

Threats:

The predominant threats to waterfowl habitat in this focus area are related to rapid human population growth and associated residential sprawl and recreational overuse. The proximity of the focus area to New York City and other metropolitan areas has made it attractive for commuter and vacation homes; Pike County was the fastest growing county in Pennsylvania during the 1990's with a 65% population increase. As a result, wetlands have been impacted or are threatened by fragmentation, isolation, sedimentation, eutrophication, and conversion to lower-quality open water habitats. Incremental losses of upland nesting habitat are occurring, which could potentially reduce waterfowl nest success through increased efficiency of native predators in the remaining tracts. Human disturbance from boaters and other recreational users is an increasing threat to both breeding and migrating birds. Development and disturbance

activities are of particular concern for remaining Black Duck breeding populations because they are more sensitive to negative habitat changes than most other waterfowl species. Invasive species, while less prevalent than in more highly altered regions of Pennsylvania, are an emerging threat; for example, purple loosestrife has appeared at the Shohola Waterfowl Management Area IBA in the past few years. The invasive species threat can be expected to worsen as additional habitat becomes fragmented by development activities.

Conservation Recommendations:

The most urgent conservation need in the focus area is coordinated planning to ensure that ongoing development is conducted in an environmentally sensitive manner. Waterfowl habitat partners should work with local authorities and developers to ensure the protection of existing wetlands (including preventing the conversion of emergent wetlands to open-water habitats) and the maintenance of adequate connectivity and upland buffers to minimize the effects of nest predation, human disturbance, and non-point pollution. Carefully targeted acquisitions and easements will be important tools in securing the most vulnerable high-quality wetland systems. Technical assistance should be provided to hunting clubs, lake associations, and other landowners who wish to enhance waterfowl habitat on their properties. Recreational use should be managed to minimize disturbance to waterfowl, especially during critical nesting and brood-rearing periods in spring and early summer, through use of restricted-entry propagation areas, educational materials, and other means. For invasive species, monitoring efforts should be increased and aggressive prevention and control measures implemented to address incipient threats while they remain at manageable levels.

References:

Brauning, D. W., editor. 1992. Atlas of Breeding Birds in Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania. USA.

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society. Harrisburg, Pennsylvania. USA.

McWilliams, G. M. and D.W. Brauning. 2000. The birds of Pennsylvania. Cornell University Press, Ithaca, New York. U.S.A.

Nye, P. , J.E. Mathisen, W. Bowerman, A. Jenkins, M. Martell, C. Todd, and J. Millar. 1998. Northern States Bald Eagle Recovery Plan. U.S. Fish and Wildlife Service, Hadley, Massachusetts, U.S.A.

Rich, T.D., C.J. Beardmore, H. Berlanga, P.J. Blancher, M.S.W. Bradstreet, G.S. Butcher, D.W. Demarest, E.H. Dunn, W.C. Hunter, E.E. Inigo-Elias, J.A. Kennedy, A.M. Martell, A.O. Panjabi, D.N. Pashley, K.V. Rosenberg, C.M. Rutay, J.S. Wendt, T.C. Will. 2004. Partners in Flight North American Landbird Conservation Plan. Cornell Lab of Ornithology, Ithaca, NY. USA.

Focus Area: Presque Isle, Erie County, Pennsylvania
Sub-Focus Area: None

Area Description:

Presque Isle is a narrow sand spit of land extending into Lake Erie. It lies within the Eastern Lake Section of the Central Lowland physiographic province and is within the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR). Presque Isle contains about 1,294 hectares (3,200 acres) of deciduous woodlands, freshwater wetlands and lakeshore habitat. There are approximately 185 hectares (458 acres) of freshwater wetlands.

Ownership/Protection:

All 1,294 hectares (3,200) acres of Presque Isle are owned by the Commonwealth of Pennsylvania as Presque Isle State Park (PISP) and managed by the Pennsylvania Department of Conservation and Natural Resources. Gull point, the eastern tip of the peninsula was designated a migratory bird sanctuary in 1927.

Special Recognition:

Audubon has designated PISP as an Important Bird Area (IBA) with special focus on migratory birds including waterfowl (Crossley, 1999). A Purple Martin roost site containing up to 100,000 birds has also obtained IBA status at Presque Isle.

Waterfowl:

The interior of PISP contains freshwater emergent wetlands that are used by breeding Black Duck, Mallard and Wood Duck. Presque Isle provides important habitat for diving ducks and other waterfowl during migration with thousands of Lesser Scaup, Canvasback, Goldeneye, and Red-breasted Merganser utilizing the littoral zone of lake Erie and Presque Isle Bay. Several hundred Tundra Swan also stage and/or winter in Presque Isle Bay during spring and fall migration. The largest concentrations of American Coot in Pennsylvania occur at PISP during spring and fall migration.

Table 1. Waterfowl species frequently occurring in the Presque Isle Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Wood Duck	X	X	
Mallard	X	X	X
Red-breasted Merganser		X	
Canvasback		X	X
Lesser Scaup		X	X
Canada Goose	X	X	X
Tundra Swan		X	

Other Migratory Birds:

PISP is a unique habitat due to its strategic location on Lake Erie. Migratory birds are funneled onto PISP during spring migration. Southbound birds during the fall migration find PISP the first landfall after crossing Lake Erie. PISP provides critical feeding and resting habitat for many species of migratory birds (Williams and Brauning 2000). No other site in Pennsylvania contains such a diversity of species during migration with over 320 species being recorded. The sandy beaches of PISP provide important migration habitat for species such as Common Tern, Purple Sandpiper and the federally endangered Piping Plover. Forty–five species identified as Pennsylvania breeding birds of special concern have been recorded at PISP and the Common Moorhen, Sora Rail, Least Bittern and Marsh Wren have been documented breeding (Tautin 2004). Black and Common Tern have nested sporadically over the past decade (McWilliams and Brauning 2000).

Threats:

PISP is one of the most heavily visited parks in the nation. Human disturbance from recreational users is a threat to both breeding and migrating birds. Gull Point, a 25-hectare (65-acre) migratory bird sanctuary is closed to human activity during migration and nesting periods, but recreational impacts are continuing. Invasive species threaten habitat quality for migratory birds. Purple loosestrife, Japanese knotweed, common reed, mute swan, zebra mussel, quagga mussel and round goby are some of the more common threats from invasive species. Water level rise and erosion to shoreline also are potential threatens to these unique habitats. Avian botulism (type E) has resulted in deaths of thousands of loons, gulls, mergansers and other avian species. Environmental contaminants such as PCBs and selenium have been implicated in scaup population declines (Custer et al. 2003, Petrie 2004, Fox et al. 2005)

Conservation Recommendations:

Efforts should continue to manage and reduce human disturbance to migrating and nesting birds. Aggressive control of invasive plant and animal species on PISP should be implemented. Research into understanding the relationship of botulism to zebra mussels, and round goby and the effects of selenium and other contaminants on waterfowl and waterbird population is needed.

References:

Custer, C.M., T.W. Custer, M.J. Anteau, A.D. Afton, and D.E. Wooten. 2003. Trace elements in lesser scaup (*Athya affinis*) from the Mississippi flyway. Ecotoxicology 12:47-54.

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society. Harrisburg, Pennsylvania, USA.

Fox, G.A., M.C. MacCluskie and R.W. Brooke. 2005. Are current contaminant concentrations in eggs and breeding female lesser scaup of concern? The Condor 107:50-61.

McWilliams, G. M. and D.W. Brauning. 2000. The birds of Pennsylvania. Cornell University Press, Ithaca, New York. U.S.A.

Petrie, S. 2004. Selenium in Scaup: A disturbing trend in the Great Lakes. Bird Watch Canada

28:9-11.

Tautin, J. 2004. Pennsylvania Important Bird Area, Presque Isle State Park. Conservation Plan Phase 1. 12pp. Audubon Pennsylvania. Harrisburg. PA. USA.

Focus Area: Pymatuning, Crawford County, Pennsylvania
Sub-Focus Area: None

Area Description:

The Pymatuning Focus Area lies within the glaciated Pittsburgh plateau section of the Appalachian Plateau physiographic province and is within the Lower Great Lakes/St. Lawrence Plain Bird Conservation Region (BCR 13). The Pymatuning-Hartstown wetland complex (Pymatuning-Hartstown) and Conneaut Outlet wetlands (Conneaut Outlet) are located within the Shenango River and French Creek Watersheds, respectively. Pymatuning-Hartstown comprises 12,132 hectares (29,978 acres) in a diverse, horseshoe-shaped wetland complex (Tautin 2004*a*). Pymatuning State Park encompasses most of the lower 8,304 hectares (20,442 acres) and is mainly open water with upland buffer for public recreation (boating, fishing, swimming, camping, etc.) although 356 hectares (886 acre) of Blackjack Swamp and Clark Island have been designated a natural area. The upper portion of Pymatuning-Hartstown is separated from the lower portion by a causeway dam. The upper portions of approximately 3,828 hectares (9,536 acres) are largely palustrine (submerged, emergent, shrub-scrub and forested wetlands), although open water, upland field and forest buffer areas also fall within Pymatuning. Much of this area (approximately 40%) is either wildlife sanctuary or restricted from human use. Conneaut Outlet is a large 2,237-hectare (5,574 acres) wetland complex running approximately 20 kilometers (13 miles) from Conneaut Lake to French Creek (Tautin 2004*b*). Approximately 30% of the site is emergent marsh, 25% is forested wetlands and 20% is scrub-shrub wetlands with remaining area as open water, mixed forest and reverting fields.

Ownership/Protection:

Much of Pymatuning and immediate buffer areas are under State jurisdiction and thus afforded a significant measure of protection. The Pennsylvania Department of Conservation and Natural Resources manages Pymatuning State Park. The Pennsylvania Game Commission (PGC) owns and manages 2,164 hectares (5,391 acres) of State Game Lands (SGL) 214 and 1,664 hectares (4,145 acres) of Pymatuning State Park land through lease agreement. Conneaut Outlet is managed as SGL 213 by the PGC, while adjoining buffer lands remain in private ownership.

Special Recognition:

Audubon has designated Pymatuning and Conneaut Marsh Important Bird Area's (IBA) due to many unique habitats and diversity of migratory birds including many state and federally threatened and endangered species (Crossley 1999). Pymatuning-Hartstown has also been identified as and Important Mammal Area by the Pennsylvania Biological Survey.

Waterfowl:

The abundance and diversity of wetland types at Pymatuning-Hartstown and Conneaut Outlet provide important breeding habitat for Canada Goose, Wood Duck, Mallard, Black Duck, Hooded Merganser and Blue-winged Teal. Thousands of geese, ducks, and swans are found during migration. Notable numbers of migrants include up to 18,000 Common Goldeneye, 5,000 Tundra Swan, and 4,000 Hooded Merganser. Some 18,000 Canada Goose winter at Pymatuning, including a substantial portion of the Southern James Bay Population. American Black Duck, another species well below population objectives, winter at Pymatuning and also use the

complex during migration. Other ducks regularly observed during migration include Gadwall, American Wigeon and American Green-winged Teal.

Table 1. Primary Waterfowl Species at Pymatuning Reservoir Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Wood Duck	X	X	
Mallard	X	X	X
Hooded Merganser	X	X	
Blue-winged Teal	X	X	
Green-winged Teal	X	X	
Gadwall		X	
American Wigeon		X	
Ring-necked Duck		X	
Goldeneye		X	
Tundra Swan		X	
Canada Goose -resident	X		X
Canada Goose - SJBP		X	X

Other Migratory Birds:

Shorebird use of the Pymatuning Focus Area is not well documented, but 400 to 700 individuals of several species are estimated conservatively to use the complex during migration (Tautin 2004*a*). American Woodcock migrate through and nest commonly within the focus area. Other wetlands dependent species include Marsh Wren, Common Moorhen, American Bittern, Least Bittern, Sora, Virginia Rail, Black Tern, Pied-billed Grebe, Prothonotary Warbler and possibly King Rail. Approximately 10 pairs of Bald Eagle regularly nest in the Pymatuning Focus Area. At least 10 of the 16 species on the BCR 13 Birds of Conservation Concern (http://migratorybirds.fws.gov/reports/bcc2002.pdf) occur at the Pymatuning. These are: Peregrine Falcon, Upland Sandpiper, Common Tern, Black-billed Cuckoo, Whip-poor-will, Red-headed Woodpecker, Golden-winged Warbler, Cerulean Warbler, Canada Warbler, and Bobolink. The Bobolink commonly nests on the managed grasslands of SGL No. 214 (Tautin 2004*a*).

Threats:

Agricultural runoff and pollution from farms, gas wells, timbering and gravel pits, could cumulatively affect adjoining buffer habitats (Tautin 2004*a*). Invasive species such as common reed, purple loosestrife, reed-canary grass, multiflora rose and narrow-leaved cattail are common and threaten the diversity of habitats and the species that are dependent upon them. Watershed

protections from highly developed and eutrophic Conneaut Lake, as well as potential industrial development of groundwater wells, are concerns at Conneaut Marsh.

Conservation Recommendations:

Monitoring and control of invasive plant species such as purple loosestrife, common reed, mutliflora rose and reed canary grass should be maintained and/or intensified. Continued management of wetlands through periodic wetland draw-downs and use of aquatic vegetation cutter to maintain habitat diversity and productivity. Maintain and enhance existing grasslands and early succession habitats. Replace old or non-functioning water control structures to improve wetland management opportunities. Acquire a high volume water pump to improve water management capabilities. Acquire important adjoining buffer habitats as opportunities arise. Wetland restoration and enhancement activities should be implemented on private lands within the Focus Area, to provide quality habitat for waterfowl and other wetland dependent wildlife. Landowners should also be encouraged to participate in the Conservation Reserve Enhancement Program (CREP) for the Ohio River basin, which will improve water quality and provide upland nesting cover for breeding waterfowl. Continue wildlife nest structure programs.

References:

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society. Harrisburg, Pennsylvania, USA.

Tautin, J. 2004 *a*. Pennsylvania Important Bird Area, Pymatuning. Conservation Plan Phase 1. Audubon Pennsylvania. Harrisburg. PA. USA.

2004 *b*. Pennsylvania Important Bird Area, Conneaut Marsh / Geneva Marsh. Conservation Plan Phase 1. Audubon Pennsylvania. Harrisburg. PA. USA.

Focus Areas: Shenango River Valley, Mercer County, Pennsylvania
Sub-Focus Area: None

Area Description:

The Shenango River Vallely Focus Area lies within the Glaciated Pittsburgh Plateau Section of the Appalachian Plateau Physiographic province and Bird Conservation Region (BCR) Lower Great Lakes/St. Lawrence Plain # 13. The glaciated plateau is defined by rolling topography smoothed by glacial action. The Shenango River represents the main watershed and the Focus Area encompasses approximately 4,775 hectares (11,800 acres). The Shenango River Focus Area includes the Shenango River and Shenango Reservoir from Jamestown Borough to the city of Sharon. The Shenango River Valley Focus Area supports a variety of land uses, including crop fields, pastures, quarries and recently timbered forest and contributes to habitat discontinuities along this riparian corridor (Coxe 2003). The Shenango River Valley Focus Area is dominated by riverine species such as sycamore, boxelder and silver maple. Shenango Lake is a 1,440-hectare (3,560 acres) impoundment (normal summer pool) of the Shenango River and Pymatuning Creek. The United States Army Corps of Engineers manages the lake primarily for flood control and recreation, fish and wildlife enhancement, low flow augmentation and water quality.

Ownership/Protection:

The river valley from Jamestown to Greenville is privately owned. Below Greenville, most of the river floodplain, including Shenango Lake is largely in public ownership through the U.S. Army Corps of Engineers and has a forested buffer along most of the length. The Pennsylvania Game Commission leases and manages 1,255 hectares (3,100 acres) of Shenango Lake and buffer lands for wildlife, principally migratory birds.

Special Recognition:

Shenango River Valley Focus Area is classified as having exceptional significance in the Mercer County Natural Heritage Inventory (Coxe 2003) due to the quality of habitat and assemblage of rare species. Additionally, Shenango Lake is designated an Important Bird Area (IBA) by the Audubon Society (Crossley, 1990) to recognize the use of the lake by migratory birds and those of special concern.

Waterfowl :

Shenango Lake provides key migratory stopovers for waterfowl (2,000+ fall and spring) in Pennsylvania. Numerous small wetlands, beaver flowages, and riparian areas provide good breeding habitats for Mallard, Black Duck, Wood Duck, Common Merganser, Hooded Merganser, Blue-winged Teal and resident Canada Goose.

Table 1. Waterfowl species identified in the Shenango River Valley Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Wood Duck	X	X	

Mallard	X	X	X
Common Merganser	X	X	
Blue-winged Teal	X	X	
Hooded Merganser	X	X	
Canada Goose	X	X	X

Other Migratory Birds:

Confirmed breeding birds include Bald Eagle, Osprey, and Great Blue Heron. Shenango Reservoir serves as an important staging area for migratory shorebirds (2,000+ during migration) because of extensive mudflat habitat provided through water level fluctuations (Tautin 2004). Considerable portions of upland buffers contain early successional habitats that are important for migrating and breeding landbirds such as American Woodcock.

Threats:

Major issues on the river stem mostly from runoff and nutrients inputs (Coxe 2003). The Shenango River is impounded at Pymatuning Lake just above the Mercer County line. Sewage outflows are present at Jamestown, Greenville and Reynolds Heights and contribute to the total nutrient load going into the river. Added to the sewage is runoff from fertilizers, pesticides and herbicides from agricultural land uses and urban runoff. By the time the river reaches Shenango Lake, it is carrying substantial nutrients and silt loads that settle out in the lake.

Invasive species such as Japanese knotweed, common reed, multiflora rose, garlic mustard, and purple loosestrife are present in many spots along the river (Coxe 2003). These species stand to threaten the diversity of life along the riverbank and adjacent habitats.

One of the most important issues in the focus area is fragmentation of the landscape that results in loss of habitat connections and vegetation cover (Coxe 2003). The predominantly rural and agricultural areas in the upper watershed will face development pressure and the developed areas around Jamestown, Greenville and Reynolds Heights will expand. The focus area receives heavy recreational use during the spring and summer with resulting disturbance to breeding waterfowl.

Conservation Recommendations:

Water levels in the Shenango River are now regulated by releases from Pymatuning Reservoir, which help feed municipal water supplies downstream and maintain water levels in the Beaver River (Coxe 2003). Along with the imperatives given these uses, the maintenance of natural communities and ecological systems need to be taken into consideration with the release of water from the reservoir. The requirements of these natural systems will need to be better researched and evaluated.

Activities upstream in the watershed need to be evaluated for their impact in increasing nutrients and runoff flowing into the Shenango River Focus Area (Coxe 2003). Efforts to decrease the non-point pollution through streambank fencing programs and upgrades to sewage treatment plants, is key to reducing nutrient loads in the river. Substantial and contiguous

riparian buffers (forest and shrubland) would not only assist in reducing non-point source pollution but also add to natural habitat within stream valleys. Invasive species need to be monitored along the length of the river and efforts taken to prevent their spread to other parts of the river. Landowner(s) should be made aware of the significance of what they own and be given information on how to manage for the plants, animals and habitats present here. It may be possible for groups like the Shenango Conservancy or the Shenango River Watchers to help in educating landowners and users of the corridor as to the significance of the habitats and requirements of the animals and plants of special concern. Increasing the amount of forested riparian areas along the Shenango River would encourage the development of more viable natural communities, both instream and out. Intact woodlands are also better able to resist invasive species, which are prevalent along the river. Monitoring of invasive species would help in tracking their spread and ultimately in control efforts.

Wetland restoration and enhancement activities should be implemented on private lands within the Focus Area, to provide quality habitat for waterfowl and other wetland dependent wildlife. Landowners should also be encouraged to participate in the Conservation Reserve Enhancement Program (CREP) for the Ohio River basin, which will improve water quality and provide upland nesting cover for breeding waterfowl.

Careful planning within the Shenango River Focus Area would benefit both the ecological resources and people living on the land. Recognizing the river and surrounding landscape, as a prime ecological and recreational resource may be an initial step in this planning (Coxe 2003). The U.S. Army Corps of Engineers, the many private landowners and the municipalities included in the focus area should come together to consider comprehensive planning. Resources available through the county, state, and federal governments such as agency management plans, Rivers Conservation Plans, and other initiatives may help in defining issues and providing some guidance in developing community-based conservation plans.

Other specific recommendations (Tautin 2004) include maintaining nesting structures for waterfowl and osprey, continued maintenance and management of wetlands, maintaining grasslands and early successional habitats, planting food producing trees, shrubs and cover crops, maintaining human restrictions around bald eagle nests, continue banding programs, enhance and create existing shorebird habitat, and promote more intensive bird monitoring surveys.

References:

Crossley, G. A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society, Harrisburg, Pennsylvania. U.S.A. 217pp.

Coxe, R. B. 2003. Mercer County Natural Heritage Inventory. Western Pennsylvania Conservancy. 197 pp.

Tautin, J. 2004. Pennsylvania Important Bird Area, Shenango Reservoir. Phase I Conservation Plan. Audubon Pennsylvania. Harrisburg. PA. USA.

Focus Area: Susquehanna River, Pennsylvania
Sub-Focus Area: None

Area Description:

The Susquehanna River drains 27,500 square miles in New York, Pennsylvania, and Maryland. It provides half of the freshwater input to the Chesapeake Bay and is an important migration corridor for many avian species that winter on the Chesapeake and along the mid-Atlantic Coast. The Pennsylvania portion of the Susquehanna River Waterfowl Focus Area includes approximately 300 river miles of the North Branch and main stem Susquehanna River, from Sayre to the Maryland line, along with all adjacent uplands. A small portion of the West Branch, just above its confluence with the North Branch at Sunbury, is also included. Throughout its length, the river is wide, shallow, and slow-moving, with numerous islands, gravel bars, and mudflats. The northern three-fourths of the focus area is within the Appalachian Plateau and Ridge and Valley physiographic provinces and is included in the Appalachian Mountains Bird Conservation Region (BCR 28). Land use adjacent to this portion of the river is about equally divided between agriculture and forest, and human population density is low to moderate. The southern one-fourth of the focus area is within the Piedmont physiographic province / Bird Conservation Region (BCR 29), a primarily agricultural landscape with medium to high human population density. There are several hydroelectric dams in this lower section of the river.

Ownership/Protection:

Over 95% of the uplands adjacent to the Susquehanna River are in private ownership. However, many islands within the river are owned by the Pennsylvania Game Commission (PGC), Pennsylvania Department of Conservation and Natural Resources (DCNR), or public utilities, with several of the PGC-owned islands managed specifically for waterfowl and designated as refuge areas.

Special Recognition:

Audubon Pennsylvania has designated 4 Important Bird Areas (IBAs) within the focus area (Crossley 1999): Susquehanna Riverlands in the BCR 28 portion and Sheets Island Archipelago, Conejohela Flats, and Lower Susquehanna River Gorge in the BCR 29 portion. Portions of 4 tributaries (Stony Creek, Yellow Breeches Creek, Tucquan Creek, and Octoraro Creek) have been designated Pennsylvania Scenic Rivers.

Waterfowl:

The Susquehanna River Focus Area is a major spring and fall migration corridor for many waterfowl species. Each year thousands of migrating Tundra Swan, Canada Goose, Greater Snow Goose, and ducks rest and feed on the Susquehanna River, nearby reservoirs, and adjacent agricultural lands. In most years, hundreds of Tundra Swan use the Lewisburg area along the Susquehanna's West Branch as a final spring staging area before progressing across the Allegheny Mountains to the Great Lakes. The southern portion of the focus area is of high importance to wintering waterfowl, supporting large concentrations of Tundra Swan, Canada Goose (both resident and migrant populations), Snow Goose, Black Duck, Mallard, Common Merganser, Bufflehead, and Common Goldeneye. In addition to its importance for migrating and wintering waterfowl, the Susquehanna River and surrounding areas contribute significantly to

Pennsylvania's annual production of Mallard, Wood Duck, and Canada Goose (Atlantic Flyway Resident Population [AFRP]), as these species breed throughout the focus area, with high densities occurring in some localized areas such as PGC-managed river islands and remnant sections of bottomland hardwood forest. Also breeding within the focus area, but generally restricted to the northern portion, are Common Merganser and limited numbers of Black Duck.

Table 1: Waterfowl species frequently occurring in the Susquehanna River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck		X	X
Mallard	X	X	X
Wood Duck	X	X	
Common Merganser	X	X	X
Bufflehead		X	X
Common Goldeneye		X	X
Greater Snow Goose		X	X
Canada Goose - AFRP	X	X	X
Canada Goose – Atlantic Population (migrant)		X	X
Tundra Swan		X	X

Other Migratory Birds:

The Susquehanna River is an important migratory pathway for numerous species of shorebirds, wading birds, gulls, terns, raptors, and passerines. At least 27 species of shorebirds regularly utilize the Conejohela Flats IBA as a staging area (Cohen 2004). Warm-water discharges and other unfrozen areas along the lower reaches of the river support thousands of overwintering gulls (McWilliams and Brauning 2000). The lower Susquehanna River Islands, floodplain forests, and associated tributaries provide nesting habitat for herons and egrets including Great Egret, Yellow-crowned Night-Heron, and Black-crowned Night-Heron (all state endangered). All 3 species occur together at the Sheets Island Archipelago IBA, which supports the largest concentration of breeding wading birds in Pennsylvania (Johnson and Cohen 2004). In the southern portion of the focus area, Bald Eagle (federal threatened, state endangered) are year-round residents and Osprey (state threatened) regularly nest. Both species are apparently increasing in the focus area (McWilliams and Brauning 2000).

Threats:

The most pervasive threat throughout the focus area is nutrient and sediment pollution from point and nonpoint agricultural, residential, and municipal sources. These pollutants negatively affect submerged aquatic vegetation (SAV) in both the Susquehanna River and Chesapeake Bay. Industrial pollution in the focus area has lessened considerably over the past 30 years, but remains a problem in localized areas, such as acid mine drainage sources along the

North Branch. Human population growth in and around the focus area, in addition to exacerbating nutrient and sediment pollution, has resulted in increased encroachment of development activity and disturbance on wetlands and associated habitats important to waterfowl. Proposed water level increases related to dam operations would threaten key mudflat and shallow water foraging habitats and could result in additional human disturbance by making many areas more accessible to powerboats. Invasive plant and animal species including purple loosestrife (Cohen 2004), Japanese knotweed (Gross 2004) and Mute Swan threaten or have already reduced habitat quality for wetland birds, especially in the southern portion of the focus area.

Conservation Recommendations:

Necessary improvements in water quality cannot be achieved within the focus area alone, but will require coordinated efforts throughout the Susquehanna River watershed (e.g., Upper and Lower Susquehanna River Waterfowl Planning Areas) to both increase filtering capacity – through protection and restoration of wetlands, bottomland forest, and other vegetated riparian buffers adjacent to the Susquehanna and its tributaries – and reduce pollutant sources – through improved wastewater treatment, stabilization of erodible land, and education of resource users. Many of these actions are doubly beneficial to waterfowl because they improve local feeding and nesting habitat as well as downstream / Chesapeake Bay water quality. For example, the Conservation Reserve Enhancement Program (CREP) retires highly erodible cropland from production, both reducing sediment loads and providing nesting habitat. Funding and technical assistance to implement this and other Farm Bill conservation programs should be expanded.

On existing public lands within the focus area, human disturbance should continue to be carefully regulated, and further reduced where necessary. Acquisition of additional key concentration points for breeding, migrating, and wintering waterfowl, and areas with high potential for waterfowl habitat restoration, should be pursued. Monitoring and control efforts for invasive species should be increased on both public and private lands.

References:

Cohen, M. 2004. Conservation Plan Phase 1 for Pennsylvania Important Bird Area, Conejohela Flats. Audubon Pennsylvania, Harrisburg, Pennsylvania. USA.

Crossley, G.A. 1999. A guide to critical bird habitat in Pennsylvania. Audubon Pennsylvania, Harrisburg, Pennsylvania. USA.

Gross, D. 2004. Conservation Plan Phase 1 for Pennsylvania Important Bird Area, Susquehanna Riverlands. Audubon Pennsylvania, Harrisburg, Pennsylvania. USA.

Johnson, J., and M. Cohen. 2004. Conservation Plan Phase 1 for Pennsylvania Important Bird Area, Sheets Island Archipelago. Audubon Pennsylvania, Harrisburg, Pennsylvania. USA.

McWilliams, G. M. and D.W. Brauning. 2000. The birds of Pennsylvania. Cornell University Press, Ithaca, New York. U.S.A.

Planning Area: Upper Susquehanna River, Pennsylvania
Focus Area: Susquehanna River

Area Description:

Most of this planning area is part of the Glaciated Low Plateau Section of the Appalachian Plateau Physiographic Province and is characterized by a rolling landscape that historically contained an abundance of small natural swamps, bogs, beaver ponds, and marshes. Many of these wetlands remain, but many others have been drained for agricultural production or converted to lower-quality open water habitats (farm ponds, recreational lakes, etc.). The area encompasses 727,624 hectares (1,797,991 acres). Overall, approximately two-thirds of the planning area is forested, but with the exception of some more mountainous sections in the western portion, agricultural lands are extensively interspersed throughout. The only large lakes in the focus area are the three flood control reservoirs comprising the Tioga-Cowanesque region. The Susquehanna River Focus Area includes the entire Pennsylvania portion of the North Branch of the Susquehanna River focus area below Sayre, the lower portion of the West Branch, and adjacent uplands. Both branches are generally wide, shallow, and slow-moving. The upper reaches of the North Branch flow through the Glaciated Low Plateau, while the West Branch and lower reaches of the North Branch flow through the Ridge and Valley Physiographic Province, where there is a greater preponderance of agricultural, industrial, and urban land use.

Ownership/Protection:

Overall, only about 5% of the planning area is in public ownership (predominantly state forest, state game lands, and state parks), and many of these parcels are concentrated in the more heavily forested mountainous areas with lower wetland densities. Two areas are notable exceptions: a 56 hectares (140 acres) portion of Marsh Creek is owned and managed by the Pennsylvania Game Commission as State Game Lands 313, and Tioga, Hammond, and Cowanesque Lakes in the Tioga-Cowanesque region are owned and managed by the U. S. Army Corps of Engineers. The majority of the planning and focus areas are in private ownership as small family farms, woodlots, and low-density residential areas, with some urbanized / industrial areas along the Susquehanna River.

Special Recognition:

Marsh Creek and the PPL Susquehanna Riverlands Recreation Area (along the North Branch Susquehanna River in Luzerne Co.) are recognized as Important Bird Areas by Audubon Pennsylvania (Crossley, 1999).

Waterfowl:

The primary importance of the planning and focus areas to waterfowl is as breeding habitat. Although most individual wetlands do not have high waterfowl concentrations, aggregate production across the region is substantial because of the high wetland densities. Wood Duck, Mallard, and resident Canada Goose are common breeders throughout the area. American Black Duck, Common and Hooded Merganser, and Green-winged and Blue-winged Teal breed in smaller numbers; Black Duck were likely more abundant historically than at present. The abundance and diversity of small wetlands offers habitat for these and other duck species during migration, and the Susquehanna River Focus Area is a major spring and fall migration corridor for ducks and geese. In most years, hundreds of Tundra Swan use the

Lewisburg area along the Susquehanna's West Branch as a final spring staging area before progressing across the Allegheny Mountains to the Great Lakes. The planning area has lower importance as a waterfowl wintering area, although the Susquehanna River focus area supports low concentrations of wintering Mallard, Black Duck and Canada Goose.

Table 1. Waterfowl species identified in the Upper Susquehanna River Planning Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X		X
Wood Duck	X		
Mallard	X		X
Common Merganser	X		
Green-winged Teal	X		
Blue-winged Teal	X		
Hooded Merganser	X		
Canada Goose	X	X	X
Tundra Swan		X	

Other Migratory Birds:

In Pennsylvania, this planning area is second in importance only to the glaciated Northwest in providing breeding habitat for many wetland-dependent birds such as rails, Snipe, and Great Blue Heron (Brauning 1992). Bald Eagle (federal threatened, state endangered) and Osprey (state threatened) nest at several locations within the planning area and have been increasing in recent years. The interspersion of forests, wetlands, and agricultural areas supports a wide variety of breeding passerines and provides many areas with excellent potential for management as American Woodcock habitat.

Threats:

The main threats in both the planning and focus areas are incremental loss and degradation of existing wetlands due to various factors: agricultural conversion and runoff, conversion of emergent wetlands to open-water habitats, and residential construction (although the rate of human population growth is less than in much of the rest of eastern Pennsylvania). Encroachment of development and human activity on the fringes of wetlands is of concern because of the sensitivity of remaining Black Duck breeding populations to disturbance. Industrial pollution is a threat in the lower reaches of the North and West branches of the Susquehanna River, below Scranton/Wilkes-Barre and Williamsport, and invasive species negatively affect some localized areas.

Conservation Recommendations:

Wetland restoration and enhancement on private lands should be a high priority in this focus area. The benefits of these efforts can be compounded by linking them to the enrollment of

marginal farmland into the Pennsylvania Conservation Reserve Enhancement Program, which has recently been expanded into this area and can be expected to benefit breeding waterfowl through improved water quality and expanded upland nesting cover. Acquisition of high-quality wetland complexes, especially those known to support breeding Black Duck, should also be pursued to secure such areas while lands in the focus and planning areas remain relatively affordable. In the Susquehanna River Focus Area , bottomland forest and other vegetated riparian buffers adjacent to the Susquehanna River should be maintained and / or restored to enhance water quality and provide feeding and nesting habitat for waterbirds utilizing the river. It should be recognized that wetland conservation actions in this focus area provide not only local benefits, but have a positive effect on important waterfowl / wetland habitats downstream, including the Chesapeake Bay.

References:

Brauning, D. W., editor. 1992. Atlas of Breeding Birds in Pennsylvania. University of Pittsburgh Press, Pittsburgh, Pennsylvania, USA.

Crossley, G. A. 1999. A guide to critical bird habitat in Pennsylvania. Pennsylvania Audubon Society, Harrisburg, Pennsylvania. U.S.A. 217pp.

7.2.13 Puerto Rico

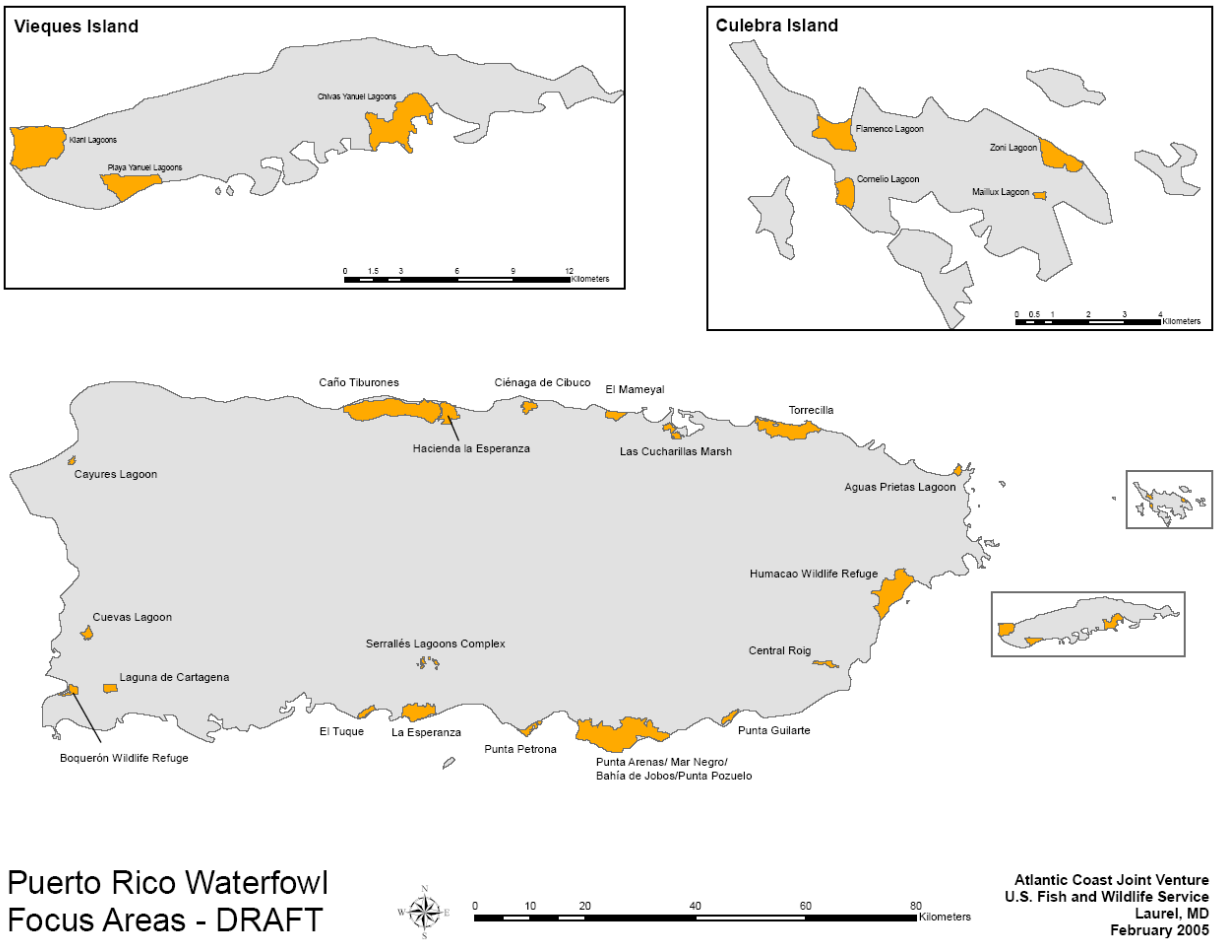

Figure 7.14. Puerto Rico waterfowl focus areas.

Focus Area: Torrecillas, Loiza, Puerto Rico
Sub-Focus Areas: Piñones and Torrecilla Alta

Area Description:

The Torrecillas complex is located in $18^0$26'N, $65^0$58'W; 10 km west of San Juan, Carolina municipality. Altitude at sea level is 0-1 meters (0-2 feet) above sea level. It is a complex of estuarine lagoons, including open water and salt water lagoons, mangroves, *Pterocarpus* forests and herbaceous swamp, surrounded by savanna and divided to the sea by a fringe of coastal sand. More than 4,000 hectares (9,884 acres) in area, its vegetation is dominated by mangrove forests, but other vegetative communities occur, such as littoral, freshwater swamp, and coconut plantations.

In the southeast part of the area, in Torrecilla Alta, is a low depth fresh water lagoon with abundant emergent vegetation. It's a large freshwater swamp located west of the Loiza River, near its mouth, in Carolina. The area is composed, to a large extent, of cattails. In addition, several *Pterocarpus* stands are located near the center and near the base of haystack hills to the south of the area. The eastern and western margins of this area are largely surrounded by abandoned agricultural lands and pastures for cattle grazing.

General vegetation includes mangrove forest, *Pterocarpus officinalis* wetland forest, herbs species like *Typha domingensis, Cladium jamaicensis, Acrostichum* spp. and *Cyperus giganteus*. Others sectors support *Eichhornia crassipes, Pistia stratiotes, Nymphaea* spp. and *Lemna perpusilla*. In the sandbar is a littoral evergreen forest with a coconut field.

Ownership/Protection:

A portion of the area is owned by the Commonwealth's Land Administration and the rest is privately owned.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Torrecilla Baja/Alta. This system supports the federally endangered hawksbill and leatherneck turtles, and is home to several other federally-endangered species, including the West Indian manatee, Yellow-shouldered Blackbird, and Brown Pelican. Much of this area is included in Unit PR-87 of the Coastal Barrier Resources Program. Additionally, a portion of this large and complex area was designated a Natural Reserve in 1979.

Waterfowl:

Table 1. Waterfowl species using the Piñones and Torrecilla Alta Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
Green-winged Teal		X	X

Ring-necked Duck		x	x
Lesser Scaup		x	x
Masked Duck	x	x	
Ruddy Duck	x	x	
Northern Pintail		x	x
White-cheeked Pintail	x	x	
West Indian Whistling-Duck	x	x	
American Widgeon		x	x
Fulvous Whistling Duck		x	

Other Migratory Birds:

The avian richness of Piñones and Torrecillas Alta Focus Areas is well documented, supporting a large number of herons and egrets. Eleven species of ducks are reported, and four species of tern visit the area, including the threatened Roseate Tern. Four species of coots, including the threatened Caribbean Coot, use these lagoons. Also, the endangered Yellow-shouldered Blackbird and the Peregrine Falcon are reported in this habitat.

A variety of migrant birds such as Waterthrush, Kingfisher, Osprey, and warblers are abundant during the winter months.

Threats:

The construction of a bridge over the Loiza River and the widening and paving of road 187 connecting Loiza and Piñones have greatly increased vehicular traffic movement through the area. There is great pressure for development of large tracts of privately owned lands, especially in the eastern end of the Forest and the Vacía Talega sector.

Upscale urbanization developments and hotels are being proposed for private sectors within the eastern portion of the proposed Natural Reserve of Torrecilla Alta. These projects receive public and political support, apparently because they believe the Natural Reserve is limiting that town's economic development.

Conservation Recommendations:

Designation of Torrecilla Alta as a Natural Reserve is highly desirable for its adequate management and protection.

References:

Cardona, J. E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

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Departamento de Recursos Naturales y Ambientales. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.

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Raffaele, H. A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

Focus Area: Las Cucharillas Marsh, Cataño, Guaynabo and Bayamón, Puerto Rico
Sub-Focus Areas: None

Area Description:

Las Cucharillas Marsh is located in the municipalities of Cataño, Guaynabo, and Bayamón. It covers approximately 500 hectares (1,235 acres), consisting mostly of herbaceous wetlands. It also includes some mangroves and open water areas. The marsh serves as a floodplain for the Santa Catalina, Lajas, and San Diego creeks that are connected to San Juan Bay through the Malaria Channel. The Aguas Frías Channel, which connects to the original Bayamón River Channel and the San Fernando Channel, also drain the marsh. The Cucharillas Marsh also serves an important role in flood control and water quality improvement. The marsh also serves as a filter, treating contaminants before they reach estuarine waters.

Ownership/Protection:

Part of the marsh is Commonwealth property, but the remaining area is in private ownership or in the municipalities of Cataño, Guaynabo, and Bayamón.

Special Recognition:

In 1979, the Department of Natural and Environmental Resources designated part of Las Cucharillas Marsh as a Wildlife Reserve. There is a project in the Legislature to designate the Las Cucharillas Mars as a Natural Reserve.

Waterfowl:

This marsh contains the highest diversity of waterfowl documented in all the San Juan Bay Estuary. Migratory species such as the American Black Duck, the Green-winged Teal, and the Ruddy Duck have been reported. Native and critical species include the West Indian Whistling-Duck and the Caribbean Coot.

Table 1. Waterfowl species using the Las Cucharillas Marsh Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck		X	X
Ruddy Duck	X	X	
Green-winged Teal		X	X
Blue-winged Teal		X	X
Northern Shoveler		X	X
White-cheeked Pintail	X	X	
West Indian Whistling-Duck	X	X	
Lesser Scaup		X	X
Ring-necked Duck		X	X
Masked Duck		X	

American Wigeon	X	X

Other Migratory Birds:

The Yellow-shouldered Blackbird, an endemic and endangered bird, has been consistently observed in the marsh. Also, the endangered Brown Pelican and the Commonwealth threatened Caribbean Coot use this habitat. The migratory Osprey feed in the marsh.

Threats:

In 1979, the Department of Natural and Environmental Resources designated part of Las Cucharillas Marsh as a Wildlife Reserve. However, such a designation has not protected the Marsh from being filled in due to Cataño's urban and industrial development pressures. In addition to such pressures, Las Cucharillas Marsh is being fragmented and endangered by the illegal disposal of solid wastes. Present threats include proposed hydrological changes to the Malaria Channel that would drain part of the Marsh to give pace to industrial developments, urban sprawl and other human-induced changes.

Conservation Recommendations:

In 1999, the Project of "Las Cucharillas Marsh: Protection, Restoration and Management Plan" was implemented on behalf of the Puerto Rico Power Authority and the School of Environmental Affairs at the Universidad Metropolitana. Its goals are to establish a Land Acquisition Plan, and to restore, protect and manage the Las Cucharillas Marsh.

References:

Bonilla, Gilbert; M. Vázquez, y E. Berríos. 1992. Status, estimado poblacional y distribución de cuatro aves acuáticas nativas en Puerto Rico. Departamento de Recursos Naturales de Puerto Rico. Simposio XVIII de los Recursos Naturales de Puerto Rico. Vol. XVIII.

Morales, Carlos; Ch. Batista, T. Marrero, A. Díaz. G. Ortiz and C. Padín. 2003. Documento de Designación de la Reserva Natural Ciénaga Cucharillas. Ana G. Méndez University System, Universidad Metropolitana.

Rivera Rentas, Alberto. 2003. First Annual Report Las Cucharillas Marsh: Protection, Restoration and Management Project. Ana G. Méndez University System, Universidad Metropolitana. Submitted to the Puerto Rico Power Authority.

Focus Area: El Mameyal, Dorado, Puerto Rico
Sub-Focus Areas: None

Area Description:

This wetland is located south of road 165, Barrio Mameyal, in the Municipality of Dorado. It is adjacent to a shrimp farm called Eureka Marine Products. The area is dominated by a mature mangrove forest, with some lagoons and saline ponds. Three species of mangrove are present: red, black and white mangroves. The forest appears to be in healthy condition and apparently, a mitigation project is conducted in some lagoons. This project consists of planted red mangroves in one saline pond.

Ownership/Protection:

Some parts are owned by the Puerto Rico Land Authority and others are leased for private use.

Special Recognition:

None.

Waterfowl:

Table 1. Waterfowl species using the El Mameyal Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
West Indian Whistling-Duck		X	

Other Migratory Birds:

Common Snipe are present in this focus area. Gallinules also are common. Spotted Sandpiper, Semi-palmated Plover, Killdeer, and the Greater Yellowleg are common in the saline areas. In a recent visit by PRDNER personnel, a high population of White-winged Dove (+/- 300) was found flying in this Focus Area. The Green Heron, Little Blue Heron, and the Black-crowned Heron are common in this wetland. Also, Pied-billed Grebe, Least Bittern, and the Great Egret are found in the area. Duck hunters identified this area as an important hunting ground for the Blue-winged Teal.

Threats:

The impact of industrial growth and the urban development on wetlands is a serious concern along the north coast of Puerto Rico. Threats to this region, in general, are remaining attempts to drain and develop the area.

Conservation Recommendations:

The property should be acquired by the Puerto Rico Commonwealth in order to conserve this important waterfowl wetland.

Focus Area: Hacienda la Esperanza, Manatí, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Natural Reserve Hacienda la Esperanza is located in the north coast of Puerto Rico at $18^0$27'N, $66^0$30'W. It is approximately 6.3 kilometers northwest Manatí and 56.3 kilometers west of San Juan. The Hacienda Esperanza Focus Area is about 1,005 hectares (2,483 acres), in the north is the Atlantic Ocean, and west is the Rio Grande de Manatí. Average of annual precipitation is 1,448.2 millimeters. Average annual temperature is 28.8^{o}C. The Hacienda Esperanza covers about 892 hectares (2,204 acres), and is part of the Río Grande de Manatí estuarine. It has a historical importance in the sugar cane industry of the 19 century.

Ownership/Protection:

In 1974 Hacienda La Esperanza was acquired by the Puerto Rico Conservation Trust. It is designated as a Natural Reserve in 1987.

Special Recognition:

It was recognized in 1976 by the National Park Service as a National Monument and added to the National Register of Historic Places.

Waterfowl:

Table 1. Waterfowl species using the Hacienda la Esperanza Focus Area.

Species	Breeding	Migration	Wintering
Ruddy Duck	X	X	
Blue-winged Teal		X	X
American Wigeon		X	X
Lesser Scaup		X	X
White-cheeked Pintail	X	X	
West Indian Whistling-Duck	X	X	
Green-winged Teal		X	X
Ring-necked Duck		X	X

Other Migratory Birds:

Five species of herons and three species of egrets are reported in Hacienda La Esperanza Focus Area. The endangered Brown Pelican and the Peregrine Falcon use this habitat. Six species of rails and one grebe also are present. A high diversity of plovers and sandpipers visit this area. Also, the endangered Roseate Tern is reported from this Focus Area. Common Snipe are present during winter.

Threats:

Unknown

Conservation Recommendations:

To prepare a wetland management plan in order to optimize the lagoon for waterfowl.

References:

Departamento de Recursos Naturales. 1986. Documento Designación Reserva Natural Hacienda la Esperanza. Programa de Manejo de la Zona Costanera.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Focus Area: Ciénaga de Cibuco, Vega Baja, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Ciénaga de Cibuco (CC) is located at $18^0$28'N, $66^0$23'W; 30 km west of San Juan, Vega Baja municipality, at 0-1 meters sea level. The CC is part of a system of lagoons, swamps, and other wetlands located in the north part of Puerto Rico. This area has changed compared to 1979. Inspection of aerial photographs taken in January 1987 revealed that portions near the center, which in the 1977 aerial photograph showed dense mangrove stands, now consist of open freshwater, dense cattails, and stands of the freshwater fern *Achrosticum* sp.

The habitats of the area consist of fresh water, lacustrine and estuarine lagoons. The vegetation consists of mangrove forests and swamp with *Typha domingensis* and *Acrostichum* spp. Some vegetative communities are mangroves, herbaceous swamp, mixed shrub and grass. This focus area is used for outdoor recreation (hunting and fishing). It is considered good hunting grounds for ducks and other waterfowl. It is an important wildlife area, and has potential for educational, recreational, and research activities.

Ownership/Protection:

Cibuco Swamp is property of the Commonwealth of Puerto Rico.

Special Recognition:

In 1993, Cibuco Swamp was designated as a Natural Reserve by the Puerto Rico Department of Natural and Environmental Resources.

Waterfowl:

Table 1. Waterfowl species using the Ciénaga de Cibuco Focus Area.

Species	Breeding	Migration	Wintering
Fulvous Whistling-Duck		X	
Ruddy Duck	X	X	
Blue-winged Teal		X	X
West Indian Whistling-Duck	X		
White-cheeked Pintail	X	X	
Lesser Scaup		X	X
Ring-necked Duck		X	X
Green-winged Teal		X	X

Other Migratory Birds:

Six species of herons and three species of egrets are reported in Ciénaga Cibuco. Also, the endangered Brown Pelican and Peregrine Falcon are reported. Eleven species of shorebirds

are reported to visit the swamp. The endemic Puerto Rican Woodpecker and Puerto Rican Flycatcher use this focus area. Three migratory warblers and two migratory waterthrushes also are reported from the area.

Threats:

Urban sprawl and urban encroachment are occurring in the southwestern portion of the fresh water swamp. Houses are built on stilts in areas formerly occupied by the cattail. Drainage of these areas is accomplished by residents by digging narrow ditches along the margins of each lot. These procedures result in reduction of the freshwater swamp area and in degradation of the remaining system, also due to direct domestic discharges.

Conservation Recommendations:

To eliminate or control contaminant discharges into the Cibuco River should be a priority. To implement an educational program about the importance of the Cibuco Swamp at school and community level is also important. Law enforcement is also a priority.

References:

Cardona, J. E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Fuentes, G. I., L. Encarnación, M. Rivera. 1992. Documento de designación Reserva Natural Pantano Cibuco. Departamento Recursos Naturales. Área de Manejo Zona Costanera.

Raffaele, H. A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

Focus Area: Caño Tiburones, Arecibo, Puerto Rico
Sub-Focus Areas: NA

Area Description:

The Caño Tiburones Focus Area (CT) was once the biggest freshwater wetland in Puerto Rico 6,000 hectares (14,826 acres) in the first quarter of the 20th century. The CT is part of the north wetland systems and is considered the most extensive herb swamp of the island. It is located at 18028'N, 66041'W; 60 km west San Juan, in the municipality of Arecibo. It has an area of 2,266 hectares (5,599 acres) with an altitude at sea level of 0 meters. It is a narrow and long depression about 15 kilometers long by 1.5 kilometers wide. Confined between the estuaries of the Arecibo and Manatí Rivers on its western and eastern ends, significant portions lie below sea level.

This wetland, the largest in the northern portion of the island, has been drained and modified for agricultural since early last century. An extensive canal and pumping system has been in operation since 1949. Poor yields and soil management difficulties, along with other socioeconomic and political factors have caused the abandonment of cultivation throughout most of the area. The only agricultural activity at present is cattle grazing. This focus area is a superficial coastal lagoon, with large swamps of herbs, and is mainly between fresh and salt water. Some habitats are mangrove forests, herbs swamps, salt flats, dunes and coastal shrub forests.

The Puerto Rico Department of Natural and Environmental Resources (PRDNER) has identified the areas as critical for the wildlife and it represents optimal habitat for native, endemic, rare and migratory birds. Also, it has been identified as important for waterfowl species. In 1998, the CT was designated as a Natural Reserve by the Commonwealth of Puerto Rico. The CT Natural Reserve is an area of 1,335 ha (3,298 acres) administered by the PRDNER.

Ownership/Protection:

Caño Tiburones is property of the Commonwealth of Puerto Rico.

Special Recognition:

The PRDNER has identified the areas as critical for the wildlife and its represent optimal habitat for native, endemic, rare and migratory birds. Also it had been identified as important for waterfowl species. In 1998, the CT was designated as a Natural Reserve by the Commonwealth of Puerto Rico. The CT Natural Reserve is an area of 1,298 hectares (3,458 acres) administrated by the PRDNER and a Management Plan was developed.

Waterfowl:

Table 1. Waterfowl species using the Caño Tiburones Focus Area.

Species	Breeding	Migration	Wintering
Snow Goose		X	X
Fulvous Whistling-Duck		X	
West Indian Whistling-Duck	X	X	
Black-bellied Whistling-Duck		X	X
Muscovy Duck	X	X	
American Wigeon		X	X
White-cheeked Pintail	X	X	
Mallard		X	X
Blue-winged Teal		X	X
Northern Shoveler		X	X
Northern Pintail		X	X
Green-winged Teal		X	X
Ring-necked Duck		X	X
Lesser Scaup		X	X
Hooded Merganser		X	X
Masked Duck		X	X
Ruddy Duck	X	X	

Other Migratory Birds:

Caño Tiburones is the Focus Area with the most avian diversity in Puerto Rico (196 species). Caño Tiburones provides habitat for the federally endangered Yellow-shouldered Blackbird, Brown Pelican and the threatened Roseate Tern, the locally endangered Masked Duck, the Peregrine Falcon, the locally threatened West Indian Whistling-Duck, the White-cheeked Pintail, the Ruddy Duck and the Caribbean Coot. Twenty-one species of migratory warbler are reported from Caño Tiburones. Twenty-nine species of plovers and sandpiper use this focus area. Common Snipe are present during winter. Glossy Ibis, White Ibis, Roseaste Spoonbill, Double-crested Cormorant, and Osprey are present in Caño Tiburones.

Threats:

Parts of the area are moderately populated, and others areas are utilized for agriculture. It was formerly a productive wetland, and pumping is still required to maintain it for its present purposes.

Conservation Recommendations:

To improve the wetland, a cattail control program should be done in selected areas. This can be done by increasing salinity in some lagoons, creating open areas with some vegetation, thus, allowing favorable conditions for waterfowl. There is a need to manage this valuable wildlife reserve. A management plan is needed to prevent further habitat degradation. Typha and mangrove forest has become a dominant plant in the marsh, replacing other vegetation and open

areas, which would probably continue to expand vegetatively if stable water levels persist. In the absence of active management the marsh will deteriorate. Careful regulation of the water level should be implemented. Waterfowl management should be a priority objective for Caño Tiburones.

References:

Cardona, J. E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program

Cardona, J. E. 1991. Viabilidad de restauración del Caño Tiburones en Arecibo-Barceloneta, Puerto Rico. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. Programa de Manejo de la Zona Costanera. 24 pp.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

Departamento de Recursos Naturales, Borrador Documento de Designación Reserva Natural, Caño Tiburones, 1990.

Departamento de Recursos Naturales y Ambientales. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.

Salles, R., M del Llano, J. Rodríguez, J. Toro, G. Morris, E. Agosto, and B. Cintrón. 1983. Suplemento Técnico para el plan de manejo de la Reserva Natural de Caño Tiburones. Departamento de Recursos Naturales. División de Asesoramiento Técnico, Área de Investigaciones Científicas. 70 pp.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

Focus Area: Cayures Lagoon, Añasco, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Cayures Lagoon is located within the Coloso Sugar mill and is bounded on its north side by road 115, in Tablonal sector, municipality of Aguada. It is made up of a series of oxidation ponds operated by the sugar mill and a relatively large pond with abundant open water fringed by cattails. The oxidation ponds are managed for weed control and their drainage during the duck breeding season undoubtedly affects the successful rearing of young. The Commonwealth's Land Authority owns the lands encompassing the Cayure area. Those habitats are under high pressure for agricultural purposes.

Ownership/Protection:

The Land Authority of the Commonwealth of Puerto Rico owns the lands encompassing the Cayure area.

Special Recognition:

This area was included in the Supplement to the Critical Wildlife Areas Document. The Natural Heritage of the Puerto Rico Department of Natural and Environmental Resources classified the lagoon as a Priority Area for Conservation.

Waterfowl:

Table 1. Waterfowl species using the Cayures Lagoon Focus Area.

Species	Breeding	Migration	Wintering
Masked Duck	X	X	X
Ruddy Duck	X	X	
West Indian Whistling-Duck	X	X	
Blue-winged Teal		X	X
Ring-necked Duck		X	X
Mallard		X	X
Lesser Scaup		X	X

Other Migratory Birds:

Four species of egrets and four species of herons are reported. Such rare waterfowl as the Masked Duck, the Ruddy Duck and the West Indian Whistling-Duck, as well as the Purple Gallinule are frequently observed in the area. Common Moorhen are easily found. Also, the endangered Brown Pelican has been seen near the fringes of the large pond.

Threats:

The oxidation ponds are managed for weed control and their drainage during the duck breeding season undoubtedly affects the successful rearing of young. Although the Coloso Sugar

Mill is not in operation, the lack of management in the ponds will affect its quality.

Conservation Recommendations:

It's a remaining prime wildlife area, and a coordinated management program to minimize breeding losses may enhance its value. Since the area is utilized by a number of waterfowl species that occur in Puerto Rico in extremely low numbers, hunting should be prohibited in this area.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

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Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.

Focus Area: Cuevas Lagoon, Cabo Rojo, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Cuevas Lagoon is located in the southwestern part of the Island, near roads 103 and 311, municipality of Cabo Rojo. It is used principally for cattle grazing. Water levels vary greatly, and the surrounding areas become inundated during heavy rains. Ruddy Duck and migrant Blue-winged Teal are relatively common in winter.

The area is hunted intensively, especially near road 103. There area formerly supported the West Indian Whistling-Duck. Small numbers of the Whistling-Duck, the Ruddy Duck, and the White-cheeked Pintail are observed using Cuevas Lagoon at irregular intervals. The area is of some importance to migrant and resident threatened waterfowl.

Ownership/Protection:

This area is in private ownership.

Special Recognition:

Unknown.

Waterfowl:

Table 1. Waterfowl species using the Cuevas Lagoon Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
Green-winged Teal		X	X
Ruddy Duck	X	X	
Ring-necked Duck		X	X
Lesser Scaup		X	X
White-cheeked Pintail		X	
Northern Shoveler		X	X
Masked Duck		X	

Other Migratory Birds:

No bird inventories other than waterfowl are available from this area. The Pied-billed Grebe, the Common Moorhen and the Common Snipe are reported.

Threats:

Constant drainage for cattle and long periods of drought are the main threats of the lagoon.

Conservation Recommendations:

The property should be acquired by the Puerto Rico Commonwealth in order to restore this important waterfowl wetland.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Focus Area: Boquerón Wildlife Refuge, Cabo Rojo, Puerto Rico
Sub-Focus Areas: None

Area Description:

It is located at $18^0$01'N, $67^0$10'W; 20 kilometers south Mayagüez. The Boquerón Wildlife Refuge (BWR) is located in road # 301, kilometers. 1.1 of Boquerón, about 97 kilometers southwest of San Juan, Puerto Rico and one kilometer from the village of Boquerón. The BWR is a 187 hectares (462 acres) facility established on the southwest coast in 1963 as a waterfowl hunting and sport fishing refuge. The impoundment was constructed to replace the loss of the wetland habitat caused be the eutrophication of Cartagena Lagoon and the loss of the natural lagoons, Guánica and Anegado, which were being drained for agriculture purposes at the time.

The BWR impoundment presents typical characteristics of a tropical brackish-water lagoon. It is surrounded by three dikes converging at almost right angles to one another to form three sides of a square. On the fourth side, upland from the south, no dike is necessary. The impoundment vegetation consists mainly of mangroves and cattail, the dominant fresh water plant. Mangroves are represented by red mangrove, black mangrove, and white mangrove. Robust submerged plant communities (*Ruppia* sp. and *Najas* sp.) are responsible in part for the refuge's high wildlife value.

More then 140 species of birds have been listed. Waterfowl hunting is permitted in the system. The most common hunting species are Blue-winged Teal, Common Moorhen and Common Snipe. The number of hunter visits average about 1,000 per year.

Ownership/Protection:

Boquerón Wildlife Refuge is under the ownership of the Commonwealth of Puerto Rico.

Special Recognition:

This wetland is a wildlife management area of the Department of Environmental and Natural Resources.

Waterfowl:

Table 1. Waterfowl species using the Boquerón Wildlife Refuge Focus Area.

Species	Breeding	Migration	Wintering
American Wigeon		X	X
White-cheeked Pintail	X	X	
Blue-winged Teal		X	X
Northern Shoveler		X	X
Northern Pintail		X	X
Green-winged Teal		X	X

Ring-necked Duck		X	X
Lesser Scaup		X	X
Ruddy Duck	X	X	

Other Migratory Birds:

Almost 150 bird species are reported in Boquerón Wildlife Refuge Focus Area. The refuge supports at least six bird species endemic to Puerto Rico, and it supports 32 species that nest within refuge boundaries. The Roseate Spoonbill and the Greater Flamingo are reported in the area.

Threats:

Over the years sedimentation and exclusion of salt water have caused cattails to become a problem. A culvert and sluice gate system help to alleviate this problem.

Conservation Recommendations:

Control cattail incursion into the wetland.

References:

Cardona, J. E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

Departamento de Recursos Naturales y Ambientales. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

Focus Area: Laguna de Cartagena, Lajas, Puerto Rico
Sub-Focus Areas: None

Area Description:

It is located at $18^{0}01$'N, $67^{0}06$'W; 22 kilometers southeast of Mayagüez. The Laguna Cartagena Focus Area is located in the municipality of Lajas, Puerto Rico on Route 305, near Hacienda Desengaño, Bo. Maguayo, south of road 101. It has an area of 325 hectares (842 acres) with an altitude of 10 meters (33 feet) above sea level. It is in the floodplain north of the Sierra Bermeja mountain range, in Puerto Rico's southwestern coast. More than half of Puerto Rico's bird species have been recorded at one time or another from the area and the adjacent Sierra Bermeja. In addition to the lagoon, there are uplands that include pastureland, abandoned sugar cane fields, and 106.4 ha (261 acres) in the foothills of the Sierra Bermeja. These hills, geologically the oldest in the Caribbean, protect native dry forest with many endemic plant species.

Historically, this lagoon was said to have supported perhaps more ducks than the entire Island presently does. Danforth (1926) describes the lagoon as "the most important breeding ground for the resident waterfowl as well as the most important refuge for migrant waterbirds in Porto Rico. It also supplies food for thousands of other birds. There is probably no other spot in the Island where so large an as semblance of birds of so many species can be found".

The lagoon suffered deterioration following the agricultural development of the Lajas Valley in the 1950's and the conversion of the area from a polyculture to one of almost exclusive culture of sugarcane. Open water areas are minimal, and the area's importance as a hunting ground has declined. It is currently of little use to many of the species the area was known for.

It was established as a National Wildlife Refuge in 1989 and it is administered under Caribbean Island National Wildlife Refuge (United States Fish and Wildlife Service). The present lagoon is a remnant of what was once a large open expanse of water and one of the most important freshwater habitats for migrating waterfowl and aquatic birds in Puerto Rico. Due to agricultural practices, about 90 % of the lagoon is covered with cattail.

Ownership/Protection:

Laguna Cartagena is under the ownership of the U.S. Fish and Wildlife Service and it is administered under Caribbean Island National Wildlife Refuges office.

Special Recognition:

Laguna Cartagena is a National Wildlife Refuge. It is classified as a Priority Area for Conservation by the Natural Heritage of the Puerto Rico Department of Natural Resources.

Waterfowl:

Table 1. Waterfowl species using the Laguna Cartagena Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Ring-necked Duck		X	X
American Black Duck		X	X
Lesser Scaup		X	X
American Wigeon		X	X
Blue-winged Teal		X	X
Green-winged Teal		X	X
Ruddy Duck	X	X	
White-cheeked Pintail	X	X	
Northern Shoveler		X	X

Other Migratory Birds:

The primary species noted at Laguna Cartagena are secretive marsh birds and shorebirds. Species such as Black Rail, Yellow-breasted Crake and the Caribbean Coot utilize the area. Five species that occur in the lagoon are classified as Threatened by the Commonwealth and two species as Federally Endangered. Historically, over 100,000 shorebirds used the lagoon during migration, as did the resident Wilson's Plover. All of Laguna Cartagena is included as critical habitat for the Yellow-shouldered Blackbird. Another Commonwealth listed species, Least Grebe, also occurs at Laguna Cartagena.

Threats:

Do to past agricultural practices; most of the lagoon is now choked with vegetation which impedes the normal flow of water and restricts nesting and feeding for waterfowls. The primary threat to this area now is a boom in housing development and second home construction.

Conservation Recommendations:

The primary conservation recommendations are to protect additional areas within the Lajas Valley from residential developments, allowing restoration of the large Lajas Valley ecosystem to proceed. The major recommendation for Laguna Cartagena is to restore water management capabilities, remove cattail, and increase the amount of open water in the lagoon (similar to historical area).

In 1995, the USFWS initiated a challenge-cost-share restoration project. The objective of this effort is to restore and maintain this locally important wetland ecosystem for the benefit of endangered species and migratory birds. To date, accomplishments include construction of a water control structure, removal of some vegetation using a dragline, and partial completion of a water diversion canal in the lagoon.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

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U.S. Fish and Wildlife Service. 2004. Cabo Rojo and Laguna Cartagena National Wildlife Refuge's Bird List.

U.S. Fish and Wildlife Service. 2003. Laguna Cartagena National Wildlife Refuge. Southeast Region 4. http://southeast.fws.gov/LagunaCartagena/index.html.

Focus Area: El Tuque, Ponce, Puerto Rico
Sub-Focus Areas: None

Area Description:

It is located at 17^0 58'16"N and 66^0 40'15"W, at 6 kilometers west of the town of Ponce, in the Punta Cuchara sector. It is in the littoral and sub-littoral zone, south of Barrio Canas, Municipality of Ponce. It is in the coastal plain with elevations above sea level from 0 to 10 meters (0-33 feet). Annual precipitation and average temperature is 89.2 millimeters and 26.4^0 (Celsius) respectively.

Its composition include a saline lagoon called Laguna Salinas, with an extension of 35 hectares (86 acres) forest (mangroves and coastal) and different types of wetlands, including estuarine and palustrine. Also, extensive areas of sand dunes covered by herbs and grass are in this area.

Ownership/Protection:

This area is in private ownership.

Special Recognition:

In June of 2004, the Puerto Rico Department of Natural & Environmental Resources prepared a document about the natural value of this area. The purpose of this document is to start the documentation in order to classify this important Waterfowl Focus Area as the Punta Cucharas Natural Reserve.

Waterfowl:

Table 1. Waterfowl species using the El Tuque Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
White-cheeked Pintail		X	

Other Migratory Birds:

Five endemics species and six migratory birds are reported in this focus area. The endangered Peregrine Falcon and the Brown Pelican use this wetland. Four species of resident egrets and four species of resident herons are present. Eleven species of sandpipers forage in this wetland.

Threats:

Aerial photos show that some dunes heavily impacted for land cover extraction. Over 70% of the sand dunes where removed. Now there is a series of saline ponds with an apparent connection with the sea. Some industrial and commercial developments are proposed adjacent to this area.

Conservation Recommendations:

This area should be designated as Punta Cucharas Natural Reserve and elaborate a

Management Plan. Some management recommendations are to restore the natural hydrology of the area and to reforest the zone with mangroves in the lagoons and woody species in the coastal forest.

References:

Departamento de Recursos Naturales y Ambientales. 2004. Informe sobre valor natural Área Natural Punta Cucharas, Barrio Canas, Ponce. Área de Planificación Integral, División de Patrimonio Natural.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: La Esperanza, Ponce, Puerto Rico
Sub-Focus Areas: None

Area Description:

The La Esperanza is located at 17^0"N, 66^0"W; 5 kilometer south of Mercidita Airport in Barrio Vayas, Municipality of Ponce. This wetland covers an area approximately of 480 hectares (1,186 acres). La Esperanza is an estuarine wetland consisting of a mangrove forest with grassland usually flooded by heavy rains. The artificial ponds are product of sand extraction for human activities. Hunter groups identify this wetland as an important hunting area.

Ownership/Protection:

This area is in private ownership by different private partnership.

Special Recognition:

Not known. A private group called "Consejo Ecológico de Conservacion de Caza y Pesca" and the local government have the intention to start the process to declare this wetland as a Conservation Area.

Waterfowl:

Table 1. Waterfowl species using the La Esperanza Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
Green-winged Teal		X	X
White-cheeked Pintail		X	
Lesser Scaup		X	X
Ring-necked Duck		X	X

Other Migratory Birds:

No bird inventory is available for this area. PRDNER personnel have identified various species using this area: Caribbean Coot, Common Moorhen, Clapper Rail, Sora Rail, and the Common Snipe. Also, a wide variety of sandpipers and egrets are reported.

Threats:

There is a high pressure for touristy development in this zone. A mega hotel and a golf course are some of the proposed activities that threaten this waterfowl focus area.

Conservation Recommendations:

This area should be considered to be declared as a Natural Reserve. Lease or other types of agreements should be developed between Conservation agencies and/or private groups with landowners in order to protect this important waterfowl wetland from real developments

pressures. Some management recommendations are to restore the natural hydrology of the area and to reforest the zone with appropriate shrubs and woody species.

References:
None available.

Focus Area: Serrallés Lagoons Complex, Ponce, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Serrallés Lagoons Complex (SLC) are located at $18^0$04'N, $66^0$33'W; 10 kilometers northwest Ponce. This area covers 600 hectares (1,482 acres) between the Cerrillos and Callado sectors in the municipalities of Ponce and Juana Díaz. It is at 100 meters (350 feet) above sea level and it covers an area of more than 100 hectares (259 acres). The SLC are composed specifically by Lago Ponceña, Lago Vista Alegre, Lago Moline, Lagos # 1, 2 and 5, and the lake located at southeast Hacienda Ana María. All of the lakes are in private properties. The SLC is considered as important habitat for native waterfowl. Some of these are the Caribbean Coot, Least Grebe, and Ruddy Duck.

The SLC consist of open water areas, with emergent and submergent vegetation that offer feeding and refuge areas for waterfowl. Those lakes are manmade for irrigation purposes for the sugar cane industry. For this reason, it can be exposed to high water level fluctuations or completely drainage. The maintenance and undergrowth control in the outlying areas of the dams will avoid the proliferation of grasses that can provide breeding areas.

Ownership/Protection:

All properties are in private ownership.

Special Recognition:

The Natural Heritage of the Puerto Rico Department of Natural and Environmental Resources classified the lagoon as a Priority Area for Conservation. These lagoons are the most important habitat for Ruddy Duck in the south portion of the Island.

Waterfowl:

Table 1. Waterfowl species using the Serrallés Lagoons Complex Focus Area.

Species	Breeding	Migration	Wintering
Ruddy Duck	X	X	
Lesser Scaup		X	X

Other Migratory Birds:

No bird inventories other than waterfowl are available. The threatened Caribbean Coot and the Least Grebe are reported from here.

Threats:

Because the sugar cane industry is not active at this moment, these ponds are under drainage pressure for urban development.

Conservation Recommendations:

Weed control in the ponds fringe will provide waterfowl nesting areas. A "lease

agreement" with the owners will help in the conservation of this important waterfowl area.

References:

Bonilla, Gilbert; M. Vázquez, y E. Berríos. 1992. Status, estimado poblacional y distribución de cuatro aves acuáticas nativas en Puerto Rico. Departamento de Recursos Naturales de Puerto Rico. Simposio XVIII de los Recursos Naturales de Puerto Rico. Vol. XVIII.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.

Focus Area: Punta Petrona, Santa Isabel, Puerto Rico
Sub-Focus Areas: None

Area Description:

Punta Petrona Waterfowl Focus Area is located south-east of the town of Santa Isabel. It has an area approximately of 231 hectares (570 acres). It is a fairly extensive and undisturbed area whose physical characteristics appeared to be excellent for a diverse fauna that include the endangered Brown Pelican. It is composed of mangrove forest with ponds, channels and various cays, surrounded by relatively tranquil and shallow waters. In aerial surveys performed in 1984-1985, Punta Petrona mangroves and the coastal zone surrounding the area was a premier habitat for the West Indian manatee (Rathbun et al 1985).

Ownership/Protection:

Public land administered by the Commonwealth of Puerto Rico.

Special Recognition:

Punta Petrona was designated a Natural Reserve in 1979. In the same year, was classified as a Critical Wildlife Area by the PRDNE. Also, in 1988 the PRDNER classified this zone a Critical Coastal Wildlife Area.

Waterfowl:

Table 1. Waterfowl species using the Punta Petrona Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
Green-winged Teal		X	X
Ruddy Duck	X	X	
White-cheeked Pintail		X	

Other Migratory Birds:

Brown Pelican has been seen foraging and roosting on mangroves trees. West Indian Nighthawk, Green-backed Heron, Great Blue Heron, Yellow-crowned Night Heron and Cattle Egret are commonly seen in this wetland. The Common Moorhen and the uncommon White-cheeked Pintail were regularly observed in the area. Osprey is also observed and the American Oystercatcher can be found in the cays.

Threats:

Although apparently no urban development pressure is acting in Punta Petrona, threats to the integrity of the wetland derive from the agricultural practices prevalent in the area.

Conservation Recommendations:

Restoration of marginal or abandoned farmlands, both wetland and upland, should be pursued where possible and followed with long-term management. Agricultural runoff and

potential leaching of pollution should be monitored. Water quality within the impoundments should be monitored for pollution from agricultural practices, as well as the quality and integrity of the mangrove forest, channels and cays.

Public education is an important component of long-term management for the Punta Petrona Natural Reserve and should be fostered to increase public awareness about the role this area plays in waterfowl and migratory bird conservation.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Rathbun, G. B; Carr, T. and C. A. Woods. 1985. The distribution of Manatees and Sea turtles in Puerto Rico, with emphasis on Roosevelt Roads Naval Station. Installation Planning Division, Engineering Command. Atlantic Division Naval Facilities.

Focus Area: Punta Arenas, Mar Negro, Bahía de Jobos and Punta Pozuelo, Guayama and Salinas, Puerto Rico
Sub-Focus Areas: None

Area Description:

Jobos Bay National Estuarine Research Reserve (JOBNERR) lies along the south-central coast, east of Ponce, between the municipalities of Salinas and Guayama. The entire Reserve covers an area of 1,133 hectares (2,799 acres). The Reserve is composed of two major areas:

1) Mar Negro, a mangrove-wetlands forest complex, located on the land side at the mouth of Jobos Bay, and

2) Cayos Caribe, a linear formation of 15 tear-shaped, reef fringed, mangrove islands extending westward from the southern tip of the mouth of Jobos Bay.

Jobos Bay is a well-protected natural harbor that extends eastward from the two areas of the Reserve guarding its entrance. Further protection from the offshore winds and waves is provided by Cayos de Barca, located south of Mar Negro and west of Cayos Caribe. Estuaries are scattered along the shores of all the oceans and vary widely in origin, type and size. Jobos Bay can be classified as a coastal plain estuary formed approximately the last ice age. Jobos Bay is the second largest estuary in Puerto Rico, covering an area of approximately eight square kilometers but with three times as much shoreline as any other estuarine zone on the Island. It is a shallow embayment with maximum depths of around 10 meters (35 feet).

Ownership/Protection:

Jobos Bay National Estuarine Reserve is under the ownership of the Commonwealth of Puerto Rico.

Special Recognition:

The Jobos Bay National Estuarine Research Reserve was designated in September 1981 by agreement between the Commonwealth of Puerto Rico Department of Natural Resources and the National Oceanic and Atmospheric Administration. Designation established Jobos Bay as the eleventh site in the National Estuarine Research System.

Waterfowl:

Table 1. Waterfowl species using the Bahía de Jobos, Punta Pozuelo and Mar Negro Focus Area.

Species	Breeding	Migration	Wintering
White-cheeked Pintail		X	
Blue-winged Teal		X	X
Green-winged Teal		X	X

Other Migratory Birds:

A total of 97 bird species had been reported in this Focus Area. Here we can find five different species of herons, four of egrets, three of rails, five of plovers, eleven of sandpipers, four of terns, and ten species of migratory warblers. Well established populations of the endangered endemic Yellow-shouldered Blackbird use this focus area.

Threats:

The impact of industrial growth and the urban development on groundwater levels is a serious concern in the Jobos Bay watershed. More than 500 housing units have been constructed in the last four years, increasing the volume of groundwater extraction. New projects, like the golf course, hotel and its Villas Complex, and the AES coal energy generating plant, also require vast amount of fresh water for their operations. The regional BFI landfill is under expansion. Leechate from this landfill may be reaching the aquifer and the bay. The Aguirre Power Plant has also undergone considerable expansion. Other mayor industries like Chevron Phillip Core, Ayers-Wheth, IPR Pharmaceuticals, Baxter Caribe, Inc., Colgate-Palmolive and ProChem continue their operations while the long-term effects of effluents and emissions on human and natural resources are still unknown.

Conservation Recommendations:

In order to determine possible sources of pollution in the different ecosystems, a monitoring program to detect organic compounds should be addressed. Also, it is important to develop a monitoring program for metals and assess the effects of these compounds on the flora, fauna and water resources of Jobos Watershed.

References:

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

Robles, P., C. González, E. Laboy, J. Capella. 2002. Jobos Bay Estuarine Profile: A National Estuarine Research Reserve. Jobos Bay NERR, DNER, and NOAA.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.

Focus Area: Humacao Wildlife Refuge, Naguabo and Humacao, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Humacao Wildlife Refuge (HWR) is located in eastern Puerto Rico ($18^0$10'N, $65^0$46'W); 56 kilometer southeast San Juan, in the municipalities of Naguabo and Humacao. The HWR is within a historic coastal plain estuary formed by three interconnected valleys and drainages. It had an area of 1,000 hectares (2,471 acres) with an altitude at sea level of 0-2 meters (0-4 feet). The HWR was established in 1986 as a wetland and waterfowl reserve. Six habitats types occur at HWR: 1) coastal lagoon, 2) herbaceous marsh, 3) mangrove forest, 4) *Pterocarpus* forest, 5) secondary coastal forest, and 6) beach scrub. Puerto Rico Department of Natural and Environmental Resources (DNER) has management jurisdiction of HWR. The HWR consist of three distinct units: Santa Teresa, Mandri, and Pterocarpus.

Six lagoons have formed on HWR. These lagoons store water carried from rivers. However, they also receive runoff from landscape sheet flow and several communities storm drains. These waters may contain contaminants, pesticides, herbicides, and nutrients. Some area still listed as an Environmental Protection Agency Superfund Site, because of heavy metal contamination. For a complete description of the HWR, see Vilella and Gray 1997.

Waterfowl hunting is currently allowed. Hunting is only permitted in Mandri unit, because Santa Teresa unit is designated as sanctuary. Currently, only migratory waterfowl species (e.g., Blue-winged Teal, Lesser Scaup and Common Moorhen) can be legally harvested because population levels of most resident species are considered to be low.

Ownership/Protection:

Puerto Rico Land Authority and Land Administration own Santa Teresa and Mandri units, respectively. DNER leases the government land, and has management jurisdiction. The Pterocarpus unit is owned by several entities including DNER, Puerto Rico Conservation Trust, and private landowners.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Humacao *Pterocarpus* Forest.

Waterfowl:

Table 1. Waterfowl species using the Humacao Wildlife Refuge Focus Area.

Species	Breeding	Migration	Wintering
West Indian Whistling-Duck	X	X	
White-cheeked Pintail	X	X	
Northern Pintail		X	X
Northern Shoveler		X	X

Blue-winged Teal		X	X
Green-winged Teal		X	X
Lesser Scaup		X	X
Hooded Merganser		X	X
Ring-necked Duck		X	X
Masked Duck	X	X	
Ruddy Duck	X	X	
American Wigeon		X	X
Snow Goose		X	X
Trumpeter Swan		X	X

Other Migratory Birds:

A total of 106 bird species are reported in the HWR. About eight bird species classified as threatened or endangered use this Refuge. Some of them are the Caribbean Coot, the Least Tern, the Least Grebe, the Brown Pelican and the Peregrine Falcon.

Threats:

Degradation of the habitat is one of the factors responsible of the waterfowl population decline.

Conservation Recommendations:

Both forests are old growth, and collectively represent one of Puerto Rico's largest pristine wetland systems. In addition, several unique and protected species (e.g., West Indian Whistling-Duck, Mangrove Cuckoo, and Puerto Rican Screech Owl) use this forest. Water quality in HWR lagoons is affected by precipitation, runoff, and effluents. Water chemistry in the drainage should be continuously monitored to prevent fish kills. Management should include water level manipulation in managed cells and vegetation control on selected areas.

References:

Bonilla, Gilbert; M. Vázquez, y E. Berríos. 1992. Status, estimado poblacional y distribución de cuatro aves acuáticas nativas en Puerto Rico. Departamento de Recursos Naturales de Puerto Rico. Simposio XVIII de los Recursos Naturales de Puerto Rico. Vol. XVIII.

Chabert, J. L., M. Corbet, A. Molinaris y E. Nieves. 1984. Informe de status de las aves acuáticas de caza y sus hábitats. Departamento de Recursos Naturales, Área de Investigaciones Científicas. 46 pp.

Departamento de Recursos Naturales y Ambientales. 1996. Plan estratégico de los recursos naturales de pesca y vida silvestre. Borrador. Gobierno de Puerto Rico, DRNA, Administración de Recursos Naturales, Negociado de Pesquería y Vida Silvestre.

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge

Vilella, F. J. and M. J. Gray. 1997. Ecological Assessment and Management Plan for the Humacao Wildlife Refuge. Final Report Project FW-10. Mississippi Cooperative Fish and Wildlife Research Unit.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Ceiba Mangrove forest and lagoons (Roosevelt Roads), Puerto Rico
Sub-Focus Areas: None

Area Description:

The importance of the coast of Ceiba lies on the presence of many bays and coves that provides refuge for waterfowl species. Also there is extensive mangrove stands interspersed with salt flats, shallow ponds and forested hills. These areas are of great importance for resident and migratory bird species.

Ownership/Protection:

Commonwealth of Puerto Rico.

Special Recognition:

None known.

Waterfowl:

This mangrove habitat harbors native waterfowl such as the White-checked Pintail, Ruddy Duck, and the West Indian Whistling-Duck. Migratory species such as the Blue-winged Teal, Green-winged Teal, and Lesser Scaup are common in winter.

Table 1. Waterfowl species at Ceiba Mangrove Forest and lagoons

Species	Breeding	Migration	Wintering
Ruddy Duck	X	X	X
White-cheeked Pintail	X		X
West Indian Whistling-Duck	X		
Lesser Scaup		X	X
Blue-winged Teal		X	X

Other Migratory Birds:

Brown Pelican, Magnificent Fregatebird, Green Backed Heron, Tricolored Heron, Little Blue Heron, Common Moorhen, Caribbean Coot, Clapper Rail, American Oystercatcher.

Threats:

Unknown

Conservation recommendations:

Habitat protection.

References:

Department of Natural and Environmental Resources, Division of Terrestrial Resources.

Focus Area: Aguas Prietas Lagoon, Fajardo, Puerto Rico
Sub-Focus Areas: None

Area Description:

The Aguas Prietas Lagoon is located in northeastern Puerto Rico ($18^0$22'28" N, $65^0$38'35" W), in the Municipality of Fajardo. It has an area of 52 hectares (128 acres) and the lagoon is connected to the sea by a channel 50 meters wide. North of Aguas Prietas, there is a Natural Reserve called Las Cabezas de San Juan. It was established in 1986 and is administered by the Puerto Rico Conservation Trust. This lagoon and Laguna Grande are important because they are surrounded by mangrove forest, producing a buffer zone for bird species to roost and reproduce, including perching birds and waterfowl.

Ownership/Protection:

The area is owned by the Commonwealth of Puerto Rico.

Special Recognition:

This lagoon was classified a Critical Wildlife Area by the PRDNR.

Waterfowl:

Table 1. Waterfowl species using the Aguas Prietas Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
Green-winged Teal		X	X
Rudy Duck	X	X	
White-cheeked Pintail	X	X	
West Indian Whistling-Duck	X		

Other Migratory Birds:

The mangroves serve as a refuge for the rare White-crowned Pigeon and the endangered Brown Pelican. At least four heron species were found nesting in the mangrove forest that surrounds Aguas Prietas Lagoon (Rivera-Ortiz et al., 1981). Thirty-two bird species were reported by Molinaris (1981). Common Gallinule, Pied-billed Grebe, Caribbean Coot, and the American Coot are reported in this lagoon.

Threats:

Aguas Prietas Lagoon is fairly well protected from human disturbance. The eastern portion of the area is adjacent to a fairly large camping ground administered by National Park Company.

Conservation Recommendations:

Because this lagoon is an important waterfowl focus area, the principal recommendation

is to add the Aguas Prietas Lagoon as part of the Cabezas de San Juan Natural Reserve.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Rivera-Ortiz, M.; Villamil, J.; Molinares, A.; Berrios, J. y W. Ortiz. 1981. Suplemento de información técnica para la Reserva Natural de las Cabezas de San Juan, Fajardo, Puerto Rico. Área de Investigaciones Científicas, Departamento de Recursos Naturales. San Juan, Puerto Rico.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Vieques lagoons, Vieques, Puerto Rico
Sub-Focus Areas: Kiani Lagoon Complex

Area Description:

The Kiani Lagoon Sub-Focus Area is located in the northwest part of Vieques Island. This complex includes the Pobre and Arenas Lagoons. It is probably the most remote and best protected tract of swamp anywhere in Puerto Rico and consequently species rare elsewhere can survive here. Around the lagoon, the dominant tree species is the red mangrove, followed by the black mangrove and the white mangrove. In the driest areas, the white mangrove and button mangrove are common.

The endangered White-cheeked Pintail is a fairly common resident of the swamp and the West Indian Tree Duck, Puerto Rico's rarest species of native waterfowl, has been observed here and probably nests. In fact, this is the most suitable site for the nesting of this species anywhere in Puerto Rico. There are several brackish water lagoons surrounded by fairly well developed mangrove systems that support the rare White-cheeked Pintail.

The west side of Mosquito Pier in the northwestern area of Vieques is a prime locality for the endangered West Indian manatee. The whole area contains marine, aquatic and upland forest systems supporting a great variety of wildlife making it a primary wildlife area.

Ownership/Protection:

Part of the Vieques National Wildlife Refuge, administered by the United States Fish and Wildlife Service, Caribbean Island National Wildlife Refuges.

Special Recognition:

Not known.

Waterfowl:

Table 1. Waterfowl species using the Kiani Lagoon Sub-Focus Area.

Species	Breeding	Migration	Wintering
West Indian Whistling-Duck		X	
Blue-winged Teal		X	X
White-cheeked Pintail		X	
Ruddy Duck		X	

Other Migratory Birds:

Raffaele (1979) identified 20 bird species in Kiani Lagoon. Four of them are classified as rare or endangered. Herons, such as Yellow-crowned Night Heron and Great Blue Heron use these habitats. Great Egret, Clapper Rail and the uncommon White-crowned Pigeon had been reported in Kiani Lagoon.

Threats:

The area at this moment is well protected.

Conservation Recommendations:

To monitor wildlife populations in the lagoons complex.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Raffaele, H. A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Vieques Lagoons, Vieques, Puerto Rico
Sub-Focus Areas: Playa Grande Lagoon

Area Description:

The Playa Grande Lagoon Sub-Focus Area is on the southwest part of Vieques Island. It has an extension of 19.7 hectares (48 acres) and is located 3.6 kilometers west of Esperanza Town. Littoral vegetation is dominated by the fours species of mangroves. These mangroves systems provide nesting substrate and refuge to many of the species that use the area.

This focus area once supported Roseate Flamingo which are now extirpated from Puerto Rico. However Playa Grande Lagoon is still an important site for shorebirds and rare waterfowl and contains a large roost made up of a number of heron species. Raffaele (1979) considered the lagoon as an important breeding area for the White-crowned Pigeon, the Great Blue Heron and the Black-crowned Night-Heron. He also recommends the Playa Grande Lagoon as a possible area for the reintroduction of the Greater Flamingo. On a recent visit, a group of adults and juveniles of the Blue-winged Teal where observed.

Ownership/Protection:

Part of the Vieques National Wildlife Refuge, administered by the USFWS, Caribbean Island National Wildlife Refuges.

Special Recognition:

Not known.

Waterfowl:

Table 1. Waterfowl species using the Playa Grande Lagoon Sub-Focus Area.

Species	Breeding	Migration	Wintering
Blue-winged Teal		X	X
White-cheeked Pintail		X	
Ruddy Duck		X	

Other Migratory Birds:

Raffaele identified 23 bird species here, including the rare White-crowned Pigeon, Great Blue Heron, Black-crowned Night-Heron, and the Great Egret. Other wading bird species had been observed, such as the Tricolored Heron, the Snowy Egret, and the Little Blue Heron (Cardona and Rivera, 1988).

Threats:

The wildlife areas in the west end of Vieques as a whole appear to be in good condition.

Conservation Recommendations:

Wildlife monitoring should be implemented to detect population's trends and to provide

insights into their causes, if any. Channels to the lagoons should be kept operational to prevent degradation of the mangrove systems.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Raffaele, H. A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Vieques Lagoons, Vieques, Puerto Rico
Sub-Focus Areas: Chivas Swamp

Area Description:

Chivas Swamp Sub-Focus Area is located in Vieques Island's southern coast, within the U.S. Navy Base of Camp García. At the south and southwest part of the swamp, the dominant tree species is the red mangrove. In the north and southeast, black mangrove and white mangrove are the dominant species. The swamp has an area of 13.3 hectares (32 acres).

Its inaccessibility and physical characteristics appear ideally suited for species such as West Indian Whistling-Duck and the rare White-cheeked Pintail. Raffaele (1979) described the swamp as a protected habitat for the West Indian Whistling-Duck, Puerto Rican Woodpecker and the Kestrel. Also, the White-cheeked Pintail has been observed in the lagoon. At present, the area remains inaccessible, and still could potentially harbor some of the rare species that are suspected from it.

Ownership/Protection:

Part of the Vieques National Wildlife Refuge, administered by the USFWS, Caribbean Island National Wildlife Refuges.

Special Recognition:

None known.

Waterfowl:

Table 1. Waterfowl species using the Chivas Swamp Sub-Focus Area.

Species	Breeding	Migration	Wintering
White-cheeked Pintail	X	X	
Blue-winged Teal		X	X
Ruddy Duck		X	

Other Migratory Birds:

Common Moorhen and the threatened Least Tern have been seen at Chiva Swamp. The Magnificent Frigatebird roosts in this area. According to Raffaele (1979), the area is important for the locally endangered West Indian Whistling-Duck, the endemic Puerto Rican Woodpecker and the Kestrel.

Threats:

Because the area remains inaccessible, no threats are identified at this moment. On the other hand, this area has been under continually bombing from the U.S. Navy practice maneuvers for over forty years and most of the area is known to be contaminated. The area should be decontaminated.

Conservation Recommendations:

Because military practices are not longer allowed, the swamp should be restored.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Raffaele, H. A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Vieques Lagoons, Vieques, Puerto Rico
Sub-Focus Areas: Yanuel Lagoon

Area Description:

The Yanuel Lagoon Sub-Focus Area is in the southeastern portion of Vieques Island, south Algodones Lagoon. It has an extension of 9.9 hectares (24 acres). The lagoon is surrounded by three species of mangrove (red, black and white mangroves). At present, the area remains inaccessible, and still could potentially harbor some waterfowl species.

Ownership/Protection:

Part of the Vieques National Wildlife Refuge, administered by the USFWS, Caribbean Island National Wildlife Refuges.

Special Recognition:

None.

Waterfowl:

Table 1. Waterfowl species using the Yanuel Lagoon Sub-Focus Area.

Species	Breeding	Migration	Wintering
White-cheeked Pintail		X	
Blue-winged Teal		X	X

Other Migratory Birds:

This brackish water lagoon supports a variety of bird species, including doves and pigeons, and a number of wading birds. During the migratory bird season, plovers and sandpipers occur in large concentrations around the shallow fringes of the lagoon and surrounding salt flats. White-crowned Pigeon are reported, and several species of heron had been observed feeding in the open water.

Threats:

Because the area remains inaccessible, no threats are identified at this moment. Probably the area is contaminated as a result of the U.S. Navy bombing activities for longer than forty years.

Conservation Recommendations:

Because military practices are not longer allowed, the lagoon should be restored.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

Raffaele, H. A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and

Wildlife Planning, Dept. of Natural Resources, Puerto Rico.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Culebra Lagoons, Culebra, Puerto Rico
Sub-Focus Areas: Flamenco Lagoon

Area Description:

Flamenco Lagoon Sub-Focus Area is located in the northwestern portion of Culebra Island, near the base of Flamenco Peninsula ($18^0$19'36"N, $65^0$19'00"W). Wetmore (1917) attributes this name by the presence of the Greater Flamingo. Flamenco Lagoon is the largest coastal lagoon in Culebra Island and it has an area of 30 hectares (74 acres). This lagoon supports the largest remaining population of the uncommon White-cheeked Pintail. It may dry up completely during seasons of severe drought, but usually has enough water to sustain a diversity of waterfowl.

Raffaele (1979) had observed about 400 White-cheeked Pintail with other waterfowl in the lagoon. It is arguably the best area for waterfowl in Culebra Island. This fairly large lagoon, surrounded by mangrove and other woody vegetation, depends entirely on rainfall. It may dry up completely during seasons of severe drought, but usually has enough water to sustain a diversity of waterfowl. Chabert, reported on March, 1987 that the lagoon harbored over 300 hundred Ruddy Duck and over 600 hundred White-cheeked Pintail.

Ownership/Protection:

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: Flamenco Lagoon. The DNER classified Flamenco Lagoon as a Critical Wildlife Area.

Waterfowl:

Table 1. Waterfowl species using the Flamenco Lagoon Sub-Focus Area.

Species	Breeding	Migration	Wintering
Ruddy Duck		X	
Blue-winged Teal		X	X
White-cheeked Pintail	X	X	

Other Migratory Birds:

Other wildlife using the area includes the Common Moorhen, Black-necked Stilt, and a variety of herons and migrant shorebirds, such as plovers and sandpipers. Birds in the Peninsula include Bridled Tern and Brown Noddy.

Threats:

The development of recreational facilities at nearby Flamenco Beach and the increase of human presence on its access road, which borders the lagoon, may adversely affect wildlife use

of the area. Other threats in the area include the increase in size of a nearby garbage dump and the construction of several additional houses in the strip of land between the lagoon and Flamenco Bay.

Conservation Recommendations:

Not known.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Ortiz-Rosas, P. and V. Quevedo-Bonilla. 1987. Áreas con prioridad para la conservación en Puerto Rico. Programa Pro-Patrimonio Natural. Estado Libre Asociado de Puerto Rico, Departamento Recursos Naturales. 217 pp.

Raffaele, H.A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Wetmore, A. 1917. The Birds of Culebra Island, Porto Rico. Auk 34:51-62.

Focus Area: Culebra Lagoons, Culebra, Puerto Rico
Sub-Focus Areas: Zoni Lagoon

Area Description:

This area is located in the northeast coast of Culebra Island (18^0, 19'39" N and 65^0, 15'44"W. Zoni lagoon has an area of 4.54 hectares (11 acres). It is composed of a shallow lagoon surrounded by mangrove and a relative long narrow stripe of sandy beach. An area on the southeastern portion of the lagoon is used intensively by cattle. The lagoon is publicly owned, but the surrounding hills are private. It is surrounded by dead mangrove in the interior, and inland, there is a fringe of black and white mangrove.

Shrubby vegetation has developed in the sloping area formerly dominated by grasses around parts of Zoni Lagoon. Reduced cattle grazing has possibly promoted the development of the shrubby vegetation.

This area has supported breeding of the White-cheeked Pintail in the past. White-cheeked Pintail are known to nest in the shrubby pastures on the hills surrounding the lagoon to the southeast. Coots, Pied-billed Grebe, Common Moorhen, and the Ruddy Duck are regularly observed at Zoni Lagoon. The beach located north of the lagoon, is an important breeding area for endangered turtles.

Ownership/Protection: Puerto Rico Commonwealth.

Special Recognition:

The Puerto Rico Department of Natural and Environmental Resources classified the Zoni Lagoon as a Critical Wildlife Area of primary importance.

Waterfowl:

Table 1. Waterfowl species using the Zoni Lagoon Sub-Focus Area.

Species	Breeding	Migration	Wintering
White-cheeked Pintail	X	X	
Ruddy Duck		X	

Other Migratory Birds:

Shorebirds, egrets, herons, Gallinule, coots and Brown Pelican occur here.

Threats:

Urban sprawl is the primary threat here. The hills to the south-east of the lagoon are privately owned and new unpaved roads have been built. Some of the land has been divided into small lots. The area is under threat of development, as the zoning classification allows for the construction of housing, albeit with certain restrictions.

Conservation Recommendations:

It is necessary to designate the area surrounding Zoni Lagoon with a more restrictive

classification. Otherwise, its value for threatened or endangered native avifauna and for migratory waterfowl may decrease or be lost in the near future.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Raffaele, H.A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR. 248 pp.

Focus Area: Culebra Lagoons, Culebra, Puerto Rico
Sub-Focus Areas: Cornelio Lagoon

Area Description: Small, water intermittent lagoon. Seasonally dry.

Ownership/Protection: Puerto Rico Commonwealth.

Special Recognition: None

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Waterfowl:

Table 1. Waterfowl species using the Cornelio Lagoon Sub-Focus Area.

Species	Breeding	Migration	Wintering
White-cheeked Pintail	X	X	
Ruddy Duck		X	
Blue-winged Teal		X	X

Other Migratory Birds: Sanderlings, plovers, and other shorebirds occur here.

Threats:
Unknown.

Conservation Recommendations:
None.

References:

Cardona, J.E., and M. Rivera. 1988. Critical Coastal Wildlife Areas of Puerto Rico. Commonwealth of Puerto Rico, Department of Natural Resources. Coastal Zone Management Program.

National Oceanic and Atmospheric Administration, U.S. Environmental Protection Agency, U.S. Coast Guard, Departamento de Recursos Naturales y Ambientales, and U.S. Department of the Interior. 2000. Sensitivity of Coastal and Inland Resources to Spilled Oil; Puerto Rico Atlas. Published in Seattle, Washington. Hazardous Materials Response Division of NOAA.

Raffaele, H.A. 1979. Critical wildlife areas of Puerto Rico. Division of Fish and Wildlife Planning, Dept. of Natural Resources, Puerto Rico

Scott, Derek A., and M. Carbonell. 1986. Inventario de Humedales de la Región Neotropical. IWRB Slimbridge and UICN Cambridge.

Vivaldi, José and C. Paniagua. 1988. Compendio de los Recursos Naturales de Puerto Rico # 3. Volumen IX, Las Lagunas de Puerto Rico. Editorial Librotes, Inc, Río Piedras, PR.

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Rodríguez, Sergio E. 2003. Resumen Avistamientos de Especies de Aves, Laguna Tamarindo, Culebra. Unpublished data.

7.2.14 Rhode Island

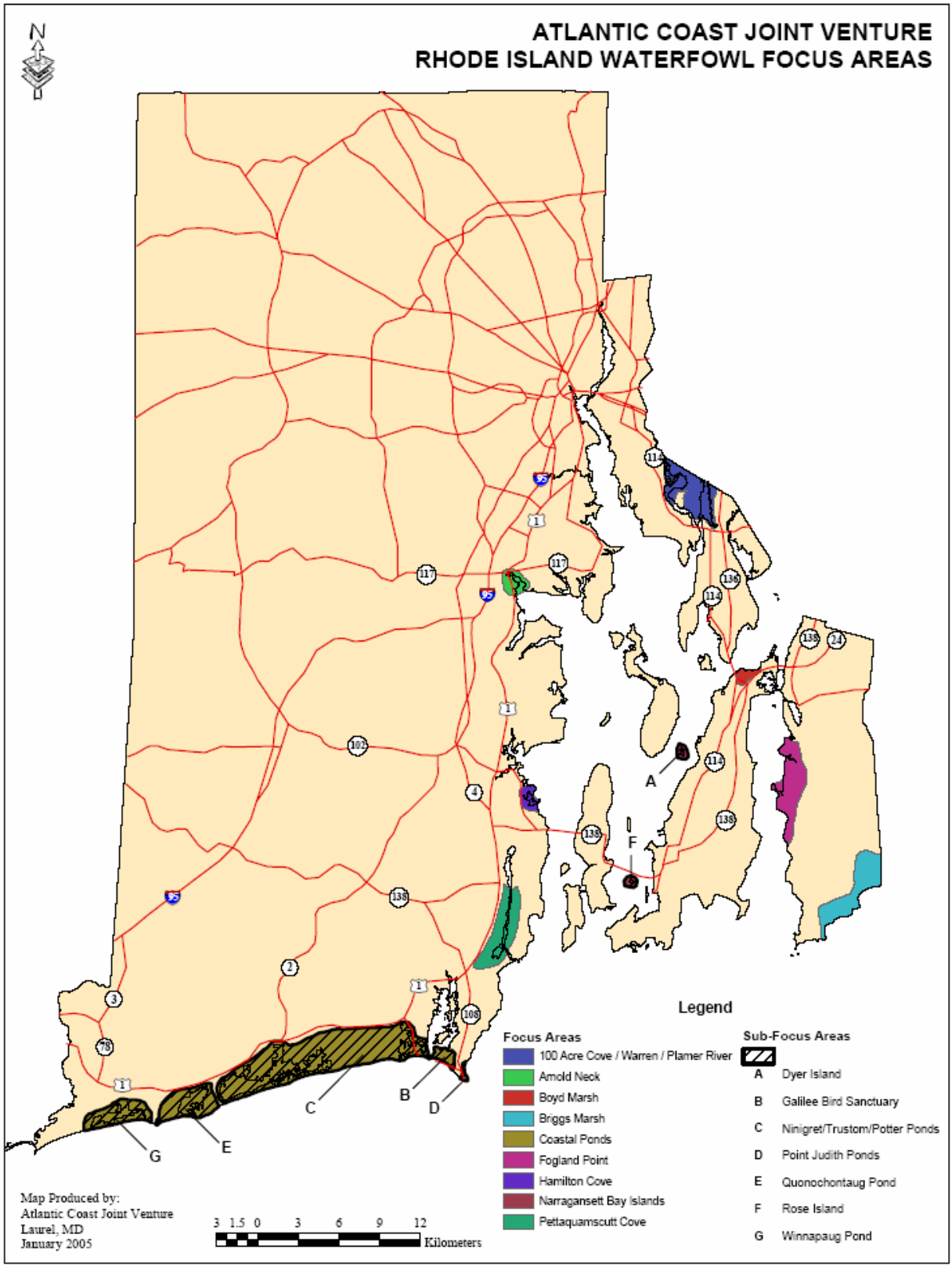

Figure 7.15. Rhode Island waterfowl focus areas.

Focus Area: 100-Acre Cove & Warren-Palmer Rivers, Rhode Island
Sub-Focus Areas: None

Area Description:

The Hundred-Acre Cove and Warren-Palmer Rivers Focus Area is a large area located in the northeastern portion of Narragansett Bay, Rhode Island (latitude 41º 43', longitude 71º 17') and encompasses 1,058 hectares (2,614 acres). This area includes the wetlands generally associated with cove and the Palmer River including Belcher Cove and extending into Bristol County, Massachusetts. This estuarine wetland system flows in a southerly direction into Narragansett Bay. Extending from Narragansett Bay towards Bristol County, a transition occurs from salt to freshwater marsh habitats located adjacent to the river channels. A major feature of the marshes found here is the presence of four large permanent non-tidal ponds. Three of the ponds are on the Tongue, the fourth is on the mainland and is unique due to the presence of a wide band of salt marsh which surrounds the pond. The Palmer River marshes are high quality and are largely unditched.

At the present time, development is relatively sparse along the adjacent upland habitat associated with this wetland system. However, in general, rates of development in Rhode Island are very high and there is indication of this area as an attractive location for development, especially as a result of its proximity to the Bay and distance to two major metropolitan areas (i.e., Providence, Rhode Island and Boston, Massachusetts). The river delineates the boundary of two towns, Warren and Barrington. Currently, the abutting portion of the river associated with the town of Barrington is more densely developed than that associated with the Warren side. A relatively large golf course is found straddling the state boundary between Warren, Rhode Island and Swansea, Massachusetts.

Ownership/Protection:

The majority of the focus area is under private ownership. However, several small (< 2 hectares/5 acres) tracts of land in Barrington, and located directly adjacent to the Palmer River, are protected by organizations such as the Audubon Society of Rhode Island and local land trusts. In addition, Rhode Island Department of Environmental Management owns a small portion of mainly salt marsh habitat located within Hundred-Acre Cove. The total area protected by all of these tracts is comparatively small (~40 hectares/100 acres) relative to the overall size of the focus area. In addition, the locations of the protected land is largely scattered along the river corridor.

Special Recognition:

A joint effort in preserving these valuable habitats may be made with the applicable local land trusts and potentially the local Audubon Society. A significant portion of the wetland system extends into Massachusetts. As a result, preservation of this area may be suited for a joint effort with the appropriate agencies in Massachusetts, who will also benefit from conservation efforts. This area has been recognized by the U.S. Fish and Wildlife Service as a Significant Coastal Habitat (U.S. Fish and Wildlife Service 1991). Hundred Acre Cove and the Palmer River have been identified as important wetlands under the Emergency Wetlands Resources Act.

Waterfowl:

The Hundred-Acre Cove and Warren-Palmer River Corridor provide breeding, wintering and migratory habitat for waterfowl located in the Atlantic Flyway. Because of the extent and diversity of this estuarine system a variety of waterfowl species utilize this area. Nesting species of special emphasis in addition to those previously mentioned include Canada Goose, Mallard, and American Black Duck.

Table 1. Selected waterfowl species that utilize Hundred Acre Cove and Warren-Palmer Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal*		X	X
Blue-winged Teal*		X	
Northern Pintail		X	X
Ruddy Duck		X	X
Gadwall*		X	X
Canvasback		X	X
Red-breasted Merganser		X	X
Common Merganser		X	X
Hooded Merganser		X	X
Bufflehead		X	X
Goldeneye		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

* indicate priority species identified by Rhode Island Department of Environmental Management.

Other Migratory Birds:

In addition to the large numbers of waterfowl, the wetlands of the Warren/Palmer River Focus Area support habitat for many other migratory birds. More than 56 bird species have been observed using the marshes for feeding and resting during migration. This area provides important foraging habitat for breeding wading birds such as Great Egret, Snowy Egret, and Great Blue Heron. Given its geographic location along the coast and the fact that migratory passerines become concentrated along the southern New England coastline during migration, the site also serves as important stopover habitat for *en route* migratory passerines including Sharp-tailed Sparrows. The Palmer River marshes provide important nesting habitat for Seaside Sparrow.

Threats:

The major threat to this area is that which is also the leading threat to the rest of Rhode Island and most of the northeast and that is development. Rhode Island is a small state with a considerable amount of coastline in high demand for residential development. Increased development would negatively impact the wildlife value in several ways including fragmentation leading to loss of habitat, increased visual and aural disturbance, and potential pollution (i.e., erosion and sedimentation, increased nutrients, increased heavy metals) leading to degradation of the functions and values of the wetlands. Unlike other practices (e.g., agricultural) once these habitats are developed with residential buildings, it is for all intents and purposes, lost, therefore, heightening the conservation priority of these areas.

Conservation Recommendations:

Recommendations include the purchase of surrounding upland habitat and wetlands associated with the Hundred-Acre Cove and the Warren-Palmer River. Upland acquisition should be extensive enough to serve as an adequate buffer from visual and aural disturbance as well as physical disturbance. Controlled access may be necessary depending on the accessibility of protected lands. Land acquisition should be considered in pursued along the entire extent of the Palmer River, including the headwaters located in Massachusetts. This will insure that the integrity of this wetland system is not compromised by upstream pollution. Finally, invasive species, particularly *Phragmites* have encroached along the fringe salt marsh and degraded the habitat quality in these areas. A management plan should be developed and implemented to restore and enhance the habitat quality provide in these areas.

Focus Area: Arnold Neck and Hamilton Cove, Rhode Island
Sub-Focus Areas: None

Area Description:

Located on the west side of Narragansett Bay are Arnold Neck Cove and Hamilton Cove. These coves are similar in habitat type and waterfowl use; therefore, are discussed together in this description.

Arnold Neck Salt Marsh, Warwick at 41° 41' and 71° 27'is located along the east side of Amtrak Rail Line and draining eastward to Greenwich Bay. This Cove encompasses 287 hectares (709 acres) and is located in a heavily developed area within Warwick. In addition, a railway has physically divided the wetland. The portion of the cove on the west side of the tracks is fresh water and is adjacent to US Route 1.

Hamilton Cove, North Kingstown is located at 41° 33' and 71° 26' 30" east of US Route 1, north of the Jamestown Bridge and south of Wickford Harbor. The cove encompasses 204 hectares (504 acres) and has fringe salt marsh protected by a peninsula with some upland hardwoods. The bay side of the peninsula is a cobble beach. There are indications that wave action may cause the peninsulas to become isolated, hence forming an island.

Ownership/Protection:

The majority of the focus area is under private ownership. However, several small (< 2 hectares/5 acres) tracts of land are undeveloped and have acquisition potential. A large contiguous parcel of open space in the southeastern portion of the Hamilton Cove focus area was recently donated to Rhode Island Department of Environmental Management (DEM) by Narragansett Electric Company. This area of open space is managed by Rhode Island Division of Parks and Recreation and allows for a variety of public use activities (biking and hiking trails, picnicking etc).

Waterfowl:

Arnold Neck and Hamilton Cove provided excellent breeding, wintering and migratory habitat for waterfowl located in the Atlantic Flyway. Waterfowl species that utilize these habitats are listed below.

Table 1. Selected waterfowl species that utilize the Arnold Neck and Hamilton Cove focus area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
American Green-winged Teal*		X	X
Gadwall*		X	X
American Wigeon		X	X
Red-breasted Merganser		X	X
Common Merganser		X	X
Hooded Merganser		X	X
Bufflehead		X	X

Goldeneye		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

* indicate priority species identified by Rhode Island Department of Environmental Management.

Other Migratory Birds:

In addition to the large numbers of waterfowl, Arnold Neck and Hamilton Cove Focus Areas support habitat for many other migratory birds. These areas are important foraging area for breeding wading birds such as Great egret, snowy Egret, and Great Blue Heron; as well as migratory passerines.

Threats:

The major threat to these areas is not only increased development, although few parcels are left, but increased pollution resulting in degradation of habitat. Pollution may also negatively impact prey abundance and quality in these areas.

Conservation Recommendations:

Recommendations include the purchase of surrounding upland habitat and wetlands associated with the Arnold Neck and Hamilton Cove Focus Areas. Upland acquisition should be extensive enough to serve as an adequate buffer from visual and aural disturbance as well as physical disturbance. The undeveloped portions of the upland habitat surrounding the salt and fresh water pond draining into Arnold Neck are in need of protection from any future development. In addition, enhancement actions should be taken to improve the water quality and therefore habitat quality of these wetlands. Finally, the spread of non-native invasive species such as, *Phragmites* has negatively impacted the habitat quality off these wetlands. A management plan should be developed and implemented to restore and enhance the habitat quality provide in these areas.

Focus Area: Boyd Marsh and Fogland Point, Rhode Island
Sub-Focus Areas: None

Area Description:

Boyd Marsh is located at the north end of Portsmouth along Mt. Hope Bay at 41° 38' and 71° 15' and encompasses 129 hectares (319 acres). The marsh is isolated to the east, south, and west by roads and development. An abandon railway is located to the north of the marsh; yet, a connection exists to the Mount Hope Bay allowing tidal intrusion into the marsh creating brackish conditions. The marsh was partially filled by the Army Corps of Engineers (circa 1945). In addition, the town of Portsmouth and the Rhode Island Department of Environmental Management permitted the construction of a golf course on the fill site.

Fogland Point and associated wetlands are located in the towns of Little Compton and Tiverton (41º 34') and 71º 13'). Fogland Point marsh consists of 14 hectares (37 acres) salt marsh, 39 hectares (97 acres) of upland hardwoods and brush adjacent to the Sakonnet River. Associated wetlands include a forested swamp on the west side of Puncatest Neck Road and unnamed pond on the east side of the road. In addition, Nonquit Pond, a public drinking water supply area, is located within the Fogland Point Focus Area. Adjacent uplands include pasture and row crop agriculture and residential areas. Total area size is 982 hectares (2,427 acres).

Ownership/Protection:

The Rhode Island Department of Environmental Management's (RI DEM) Division of Fish and Wildlife owns a 22-hectare (56 acres) parcel in the center of Boyd's Marsh. In addition, RI DEM Division of Parks and Recreation owns a 2 hectare (5 acres) parcel located at the northern end of the marsh and including part of the coastline. However, the majority of the Boyd's Marsh Focus Area is under private ownership. Several moderate to large (4 - >40 hectare/10 - >100 acres) tracts of land are located directly adjacent to the marsh, including a golf course and contain conservation action potential. Surrounding uplands associated with the Fogland Point Focus Area are privately owned in large landholdings. However, over 202 hectares (500 acres) within this area are currently preserved in some fashion (e.g., outright sale, development rights).

Special Recognition:

As previously mentioned the Fogland Point Focus Area includes Nonquit Pond, a public drinking water supply. Although the pond and limited adjacent land is protected, more land is in need of preservation. There appears to be opportunity for a joint effort with the Newport Water District, The Nature Conservancy, local land trust, and the Audubon Society of Rhode Island, all of which own parcels within or directly adjacent to the delineated focus area. Fogland Point Marsh was identified as an important wetland by the U.S. Fish and Wildlife Service under the Emergency Wetlands Resources Act.

Waterfowl:

Boyd Marsh and Fogland Point provide excellent breeding, wintering and migratory habitat for waterfowl located in the Atlantic Flyway.

Table 1. Selected waterfowl species that utilize the Boyd Marsh and Fogland Point Focus Areas.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal*		X	X
Gadwall*		X	X
Canvasback		X	X
Hooded Merganser		X	X
Common Merganser		X	X
Lesser Scaup		X	X
Ringed-necked Duck		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

* indicate priority species identified by Rhode Island Department of Environmental Management.

Other Migratory Birds:

In addition to providing excellent coastal marsh waterfowl habitat, Boyd Marsh and Fogland Point also provide important habitat to many other migratory species including, but not limited to: Tree Swallow, Barn Swallow, Sharp-tailed Sparrow, Common Yellowthroat, Great Blue Heron, Great Egret, and Snowy Egret.

Threats:

The major threat to these focus areas is habitat degradation resulting from increased development. Rhode Island is a small state with a considerable amount of coastline in high demand for residential development. Increased development would negatively impact the wildlife value in several ways including fragmentation leading to loss of habitat, increased visual and aural disturbance, and potential pollution (i.e., erosion and sedimentation, increased nutrients, increased heavy metals) leading to degradation of the functions and values of the wetlands. Once these habitats are developed with residential buildings it is for all intents and purposes lost, therefore, heightening the conservation priority of these areas. Non-native and invasive species are another major threat, particularly to Boyd Marsh. Specifically, *Phragmites* has encroached into the wetland and poses a significant threat to the community composition of both the flora and fauna associated with this marsh.

Conservation Recommendations:

Recommendations include the purchase of surrounding upland habitat and wetlands associated with Boyd Marsh. Upland acquisition should be extensive enough to serve as an adequate buffer from visual and aural disturbance as well as physical disturbance. Finally, restoration efforts are necessary to control and eliminate the spread of invasive species, particularly *Phragmites australis.*

Many large parcels remain within the Fogland Point focus area including farms. Acquisition of these parcels or development rights would be integral in preserving the integrity of the wetlands within this focus area.

Focus Area: Briggs Marsh, Rhode Island
Sub-Focus Areas: None

Area Description:

Briggs Marsh, an 84.6-ha (209 acres) shallow coastal pond, is located in Little Compton, Rhode Island (41o29'N, 71o9'W) and encompasses 1,001 hectares (2,474 acres). The wetland (historically recorded as Awaskonk Marsh) is unique in that prior to 1920 it was a salt marsh open to the Atlantic Ocean via a navigable outlet. At some point in time after 1920, a barrier beach formed across the outlet's opening. Water levels in the marsh now vary depending on freshwater inflow of three seasonal streams and periodic breaching. Annual breaching of Briggs Marsh occurs in the southwest section of the barrier beach during spring and after storms. Salinity levels in the marsh range between 7 to 12 parts per thousand (ppt). Water levels in the marsh range to ≤1.5 meters (5 feet). Shoreline vegetation on the marsh consists primarily of *Phragmities* intermixed with narrow leaf cattail and traces of bulrush. Three islands are located in the west end of the marsh and contain native trees and ground cover of trout lilies. Uplands surrounding the area contain stands of mixed hardwoods, pastures, cornfields, and lawns. Submerged aquatic vegetation observed, in order of decreasing abundance, included wigeon grass, sago pondweed, muskgrass, horned pondweed and clasping leaf pondweed.

Ownership/Protection:

The majority of the focus area is under private ownership. However, several areas are protected including the eastern portions of Briggs Marsh and the southern section of Quicksand Pond. In addition, several smaller parcels are under ownership by The Nature Conservancy and the local land trust.

Special Recognition:

Briggs Marsh is part of the Rhode Island Sound - Buzzards Bay Beach Complex recognized by the U.S. Fish and Wildlife Service in the Northeast Coastal Areas Study (U.S. Fish and Wildlife Service 1991). The Coastal Ponds (Briggs, Long and Quicksand Ponds) are all recognized as important wetlands under the Emergency Wetland Resources Act.

Waterfowl:

The wetlands associated with the Briggs Marsh Focus Area provide excellent breeding, wintering and migratory habitat for waterfowl located in the Atlantic Flyway. Because of the extent and diversity of this estuarine system a variety of waterfowl species utilize this area.

Table 1. Selected waterfowl species that utilize the Briggs Marsh Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Green-winged Teal*	X	X	X
Blue-winged Teal*		X	
Northern Pintail		X	X
American Wigeon		X	X

Gadwall*		X	X
Canvasback		X	X
Common Merganser		X	X
Hooded Merganser		X	X
Ring-necked Duck			X
Lesser Scaup		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

* indicate priority species identified by Rhode Island Department of Environmental Management.

Other Migratory Birds:

This area is an important foraging area for breeding wading birds such as Great Egret, Snowy Egret, and Great Blue Heron. Given its geographic location along the coast and the fact that migratory passerines become concentrated along the southern New England coastline during migration, the site also serves as important stopover habitat for *en route* migratory passerines. These coastal habitats are particularly critical during fall migration when high concentrations of migratory birds find themselves at these sites desperate to replenish energy reserves prior to embarking on flights over the ocean. Finally, these coastal wetlands and their associated shorelines are important for many species of shorebirds and terns. Of considerable interest, the beaches along most of this shoreline complex are important nesting areas for the U.S. Threatened Piping Plover. The nesting population of Piping Plover at Goosewing Beach has been the largest concentration in Rhode Island during some years.

Threats:

The major threat to this area is fragmentation resulting from development. Rhode Island is a small state with a considerable amount of coastline in high demand for residential development. Furthermore, the positive economic climate in southern New England has made development along the coast particularly appealing for residential development in recent years. Increased development results in habitat loss, increased visual and aural disturbance, and potential pollution (i.e., erosion and sedimentation, increased nutrients) leading to degradation of the functions and values of the wetlands. Unlike other practices (e.g., agricultural) once these habitats are developed with residential structures it is for all intents and purposes lost, therefore, heightening the conservation priority of these areas.

In addition, invasive species are a major concern. *Phragmites* and purple loosestrife are two exotic species of special concern because of their invasive nature and ability to degrade native wetland habitats. Non-native and invasive submergent aquatic vegetation is also a concern.

Conservation Recommendations:

There is a considerable amount of land in rather large parcels within the focus area and are prime areas for conservation acquisition either through outright sale, conservation easement, development rights or other avenues. Conservation actions could include assisting the local land-trust to acquirer development rights of those properties not currently in holding.

Finally, restoration efforts are necessary to control and eliminate the spread of invasive species, particularly *Phragmites* and purple loosestrife.

Reference:

U.S. Fish and Wildlife Service. 1991. Northeast Coastal Areas Study, Significant Coastal Habitats of Southern New England and Portions of Long Island, New York. Southern New England - Long Island Sound Coastal and Estuary Office , Charlestown, Rhode Island

Focus Area: Coastal Ponds, Rhode Island
Sub-Focus Areas: Winnapaug Pond, Quonochontaug Pond, Ninigret Pond/Trustom Pond/Potter Pond, Galilee Bird Sanctuary, Point Judith Ponds

Area Description:

Rhode Island's southern coastline hosts a string of barrier beaches and backbarrier coastal lagoons known locally as salt ponds. These ponds are similar in their general size and habitat types but vary in terms of level of development and tidal connection. Quonochontaug Pond, Winnapaug Pond, Ninigret Pond, Potter Pond, and the Galilee Bird Sanctuary maintain a permanent connection to the ocean through breachways and thus have plants and animals associated with marine and estuarine ecosystems including extensive backbarrier salt-marshes and floodtidal deltas and sand flats. Trustom Pond is breached annually or as needed for water quality and wildlife management and the wetlands retain brackish conditions. Several smaller freshwater ponds are located within the Point Judith Ponds Sub-Focus Area. Total area size is 5,684 hectares (14,045 acres)

Special Recognition:

Maschaug Pond and the areas north and east of Trustom Pond have been recognized by the U.S. Fish and Wildlife Service as a Significant Coastal Habitat (U.S. Fish and Wildlife Service 1991). All of the ponds and surrounding wetlands have been identified as important wetlands under the Emergency Wetlands Resources Act.

Ownership/Protection:

The majority of the focus area is under private ownership. However, several large tracts of land are under state and federal protection. Included in these is the South Shore Management Area (SSMA) owned by the Rhode Island Department of Environmental Management (RI DEM). This includes a network of coastal agricultural fields managed for Canada Goose hunting. RI DEM also owns portions of the Galilee Bird Sanctuary, which is a recently restored salt marsh and operates several state beaches. In addition, the United States Fish and Wildlife Service (USFWS) owns two relatively large refuges within the Ninigret Pond and Trustom Pond Sub-Focus Area.

Waterfowl:

The numerous coastal ponds, salt marshes, and mudflats within southern Rhode Island provide highly valuable breeding, wintering and migratory habitat for waterfowl located in the Atlantic Flyway. Because of the extent and diversity of these ponds and associated wetland systems a variety of waterfowl species utilize these areas.

Table 1. Selected waterfowl species that utilize southern Rhode Island's coastal pond and marsh habitat.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
American Green-winged Teal*	X	X	X
Blue-winged Teal*		X	
Northern Pintail		X	X
American Wigeon		X	X
Ruddy Duck		X	X
Gadwall*	X	X	X
Canvasback		X	X
Redhead			X
Red-breasted Merganser		X	X
Common Merganser		X	X
Hooded Merganser		X	X
Bufflehead		X	X
Common Goldeneye		X	X
Ring-necked Duck		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

* indicate priority species identified by Rhode Island Department of Environmental Management.

Other Migratory Birds:

In addition to the large numbers of waterfowl, the wetlands associated with this general focus area support habitat for many other migratory birds. This area provides important foraging habitat for breeding wading birds such as Great Egret, Snowy Egret, Black-crowned Night-Heron and Great Blue Heron. Terns, including the state-endangered Least Tern, also utilize the habitat provided within this focus area. Given its geographic location along the coast and the fact that migratory passerines become concentrated along the southern New England coastline during migration, the habitat located within the focus area includes important stopover habitat for *en route* migratory passerines including Sharp-tailed Sparrow. These coastal habitats are particularly critical during fall migration when high concentrations of migratory birds find themselves at these sites desperate to replenish energy reserves prior to embarking on flights over the ocean (e.g., Blackpoll Warbler – non-stop transatlantic flight to South America). Finally, as a result of the tidal nature of many of these ponds, mudflat and sand flats occur just inside the breachways in the form of floodtidal deltas habitat that provide important habitat for shorebirds including the federally-endangered Piping Plover. Piping Plover also nest on the beaches in front of these ponds.

Threats:

The southern Rhode Island Coast has been particularly appealing for residential development. The economic climate in recent years has resulted in increased development in Rhode Island. As such, large areas of the coast have been fragmented, especially adjacent to the edge of many of these ponds resulting in direct habitat loss, visual and aural disturbance, and potential pollution (i.e., erosion and sedimentation, increased nutrients, increased heavy metals) leading to degradation of the functions and values of the wetlands. In addition, water quality within some of these ponds has been degraded as a result of development. Furthermore, it is suspected that the intrusion of invasive species within these ponds (e.g., submergent aquatic vegetation), resulting in part by boater use and adjacent development, may be contributing to decreased numbers of waterfowl frequenting these ponds in recent years.

These ponds hold high habitat values for waterfowl and many other migratory species. Housing density within many areas of the focus areas, and directly adjacent to some of these ponds, is quite high (0.25 acre lots). However, despite the recent intense development pressure, there is still a significant amount of opportunity to preserve associated upland and wetland habitat and an urgency to do so.

As is most often the case with many protected areas, especially within Rhode Island, encroachment by development not only has a negative impact on the quality of the subject and adjacent habitat but also, in some instances, creates hunting restrictions and limitations. This is the case with SSMA fields owned by the RI DEM. As a result of surrounding development hunters are in some cases restricted to the center of the field to maintain a 500 foot safe hunting distance from residences.

Conservation Recommendations:

Recommendations include the purchase of surrounding upland habitat and wetlands associated with the Coastal Ponds focus area. Upgrading septic systems for houses around the ponds may be needed to limit the nutrient input and eutrophication of the ponds. Upland acquisition should be extensive enough to serve as an adequate buffer from visual and aural disturbance as well as physical disturbance and to protect the water quality of the ponds. Controlled access may be necessary depending on the accessibility of protected lands. Grasslands adjacent to Winnapaug, Trustom and Ningret Ponds should continue to be managed for grassland early successional bird species. Finally, many of the wetlands associated with this focus area have been subjected to the spread of non-native invasive species such as *Phragmites* purple loosestrife, and coontail. A management plan should be developed and implemented to restore and enhance the habitat quality provide in these areas.

Reference:

U.S. Fish and Wildlife Service. 1991. Northeast Coastal Areas Study, Significant Coastal Habitats of Southern New England and Portions of Long Island, New York. Southern New England - Long Island Sound Coastal and Estuary Office, Charlestown, Rhode Island

Focus Area: Narragansett Bay Islands, Rhode Island
Sub-Focus Areas: Dyer Island, Gould Island, & Rose Island

Area Description:

The islands located within Narragansett Bay are similar in their geological formation and bedrock composition. However, three of these islands are unique in that they contain "predator-free" habitat. That is to say, that these islands contain no known mammalian predator populations (e.g., fox, coyote, raccoon).

Rose Island is approximately 16 acres, located south of the Claiborne Pell Bridge at 41° 29' and 71° 21' between Jamestown and Newport. This focus area falls within Zone 2 of the Midwinter Waterfowl Survey (MWS). Rose Island contains the remains of historic Fort Hamilton (1770s).

Gould Island (West Passage) is located in Narragansett Bay north of the Claiborne Pell Bridge between Jamestown and Middletown at 41° 32' and 71° 20'30". Gould Island is dominated by exotic deciduous species including autumn olive, asiatic bittersweet, Japanese black pine, and Sycamore maple.

Dyer Island is a 32-acre island located west of Melville, Portsmouth and southeast of Prudence Island at 41° 35' and 71° 16'30". Habitat consists of a 2 acre salt marsh, with upland comprised of, but not limited to, blackberries, staghorn sumac, asiatic bittersweet, northern bayberry, black chokeberry, eastern red cedar, Japanese black pine, and tree-of-heaven.

Ownership/Protection:

The Rose Island Lighthouse Foundation (RILF) currently owns Rose Island. The RILF has restored the Rose Island Lighthouse and uses it as a museum and guest house. The surrounding portions of the island are overgrown with multiflora rose and contain dilapidated brick structures.

The Rhode Island Department of Environmental Management (RI DEM) currently owns approximately 66 % of the 23-hectare (57-acres) island known as Gould Island. The remaining portion of the island is owned by the Federal Government Department of Defense. The Navy expropriated the island in 1919 and it became a major seaplane base and torpedo testing station during WWII. Abandoned in the 1970s, a segment of the island was turned over to RI DEM during the mid-1970s. Unfortunately the island remains listed as a biohazard dumpsite waiting to be cleaned up by the Navy. In addition, a coal dump remains on the southern portion of the island

The state of Rhode Island purchased Dyer Island as part of its Estuarine Sanctuary in 2001. The island has an elevation of 4 meters (13 feet) above sea level, making it vulnerable to storm surges.

Special Recognition:

These areas have been recognized for the unique predator free habitat that they provide. A joint effort in preserving these valuable habitats may potentially be made with the local Audubon Society, local land trust, and The Nature Conservancy.

Waterfowl:

The islands, their adjacent shoreline and nearshore areas of Narragansett Bay provide excellent habitat for many species including many waterfowl species.

Table 1. Selected waterfowl species that utilize the Narragansett Bay Islands including Rose Island, Gould Island, and Dyer Island.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Red-breasted Mergansers		X	X
Bufflehead		X	X
Goldeneye		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Common Eider		X	X
Surf Scoter		X	X
Black Scoter		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

Other Migratory Birds:

In addition to the large numbers of waterfowl, the Narragansett Bay islands provide excellent habitat for several other species including some species of concern. These predator-free islands are heavily used as rookeries by Great Egret, Snowy Egret, Cattle Egret, Black-crowned Night-Heron, Great Blue Heron, Little Blue Heron, Green Heron, and Glossy Ibis. In addition, other species that heavily utilize the habitat include American Oystercatcher, Common Tern, Greater Black-backed Gull, Herring Gull, Song Sparrow, Common Yellowthroat, Red-winged Black Bird, Common Grackle, and Gray Catbird.

Threats:

The main concerns for wildlife using these islands include private ownership and encroachment of exotic and invasive flora, hence eliminating nesting habitat. Recent increase of the predatory Greater Black-backed Gull is also of concern.

Although Gould Island is protected by federal and state government ownership, there is a need to restore habitat on the island including the removal of structures and revegetation of native species flora. This would allow the continued use of the island by colony nesting wading birds and improve areas for native waterfowl nesting.

It should be noted that Rose Island also supports reptile populations including smooth green snakes. The smooth green snake is considered to be declining in southern New England.

Conservation Recommendations:

Recommendations include the purchase of the islands as well as habitat restoration. Restoration in the form of clean up of waste, potential demolition and removal of some, non-historic structures, invasive species control and revegetation with native species.

Focus Area: Pettaquamscutt Cove, Rhode Island
Sub-Focus Areas: None

Area Description:

Pettaquamscutt Cove is located in southern Rhode Island at the southern end of the Narrow River estuary where it feeds into Rhode Island Sound at the mouth of Narragansett Bay. The cove encompasses 971 hectares (2,399 acres) and is bordered by South Kingstown to the west and Narragansett to the east. This shallow estuarine system receives freshwater influence from an extensive wetland system including Carr Pond to the north. This tidal cove is bordered on all sides by fringing salt-marsh habitat.

Ownership/Protection:

The majority of the focus area is under private ownership. However, several tracts of land are under state and federal protection. The U.S. Fish and Wildlife Service (USFWS) owns a refuge located along Pettaquamscutt Cove known as the John Chafee National Wildlife Refuge. In addition, the Rhode Island Department of Environmental Management and the Audubon Society of Rhode Island own several scattered parcels within the focus area.

Waterfowl:

Pettaquamscutt Cove provides excellent breeding, wintering and migratory habitat for waterfowl located in the Atlantic Flyway.

Table 1. Selected waterfowl species that utilize the Pettaquamscutt Cove Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Gadwall*		X	X
Red-breasted Merganser		X	X
Common Merganser		X	X
Hooded Merganser		X	X
Bufflehead		X	X
Common Goldeneye		X	X
NAP Canada Goose		X	X
Resident Canada Goose	X	X	X

* indicate priority species identified by Rhode Island Department of Environmental Management.

Other Migratory Birds:

In addition to the large numbers of waterfowl, the wetlands associated with the Pettaquamscutt Cove focus area support habitat for many other migratory birds. This area provides important foraging habitat for breeding wading birds such as Great Egret, Snowy Egret, Tricolored Heron, and Great Blue Heron. Given its geographic location along the coast and the fact that migratory passerines become concentrated along the southern New England coastline during migration, the habitat located within the focus area includes important stopover habitat for

en route migratory passerines. The saltmarsh habitat provided within this cove serves as excellent habitat for Sharp-tailed Sparrow and hence is utilized greatly by this species. These coastal habitats are particularly critical during fall migration when high concentrations of migratory birds find themselves at these sites desperate to replenish energy reserves prior to embarking on flights over the ocean (e.g., Blackpoll Warbler – non-stop transatlantic flight to South America). Terns, including the state-endangered Least Tern, also utilize the habitat provided within this focus area. Finally, as a result of the tidal nature of this cove, mudflat habitat is provided and utilized greatly by shorebirds. The federally-listed endangered Piping Plover nest on the northern end of Narragansett Beach at the mouth of the Narrow River.

Threats:

The southern Rhode Island coast has been particularly appealing for residential development. This is particularly true in recent years where residential development has greatly increased. As such, large areas of the coast have been fragmented particularly adjacent to the edge of the Narrow River and Pettaquamscutt Cove. This results in direct habitat loss, visual and aural disturbance, and potential pollution (i.e., erosion and sedimentation, increased nutrients, increased heavy metals) leading to degradation of the functions and values of the wetlands.

Housing density within many areas of the focus area and directly adjacent to the cove, is quite high (0.25 acre lots). However, despite the recent intense development pressure, there remain several large parcels and opportunity to preserve associated upland and wetland habitat. There is a real sense of urgency to preserve these parcels prior to any future subdivision and further development of remaining adjacent habitat.

Encroachment by development not only has a negative impact on the quality of the subject habitat and its ability to provide suitable habitat for its associated species but also, in some instances, creates hunting restrictions and limitations. This is the case with many parts of Pettaquamscutt Cove. As a result of surrounding development hunters are restricted to several protected areas of the cove.

Conservation Recommendations:

Recommendations include the purchase of surrounding upland habitat and wetlands associated with the Pettaquamscutt Cove Focus Area. Upland acquisition should be extensive enough to serve as an adequate buffer from visual and aural disturbance as well as physical disturbance.

Finally, invasive species, particularly Phragmites have encroached along the fringe salt-marsh and degraded the quality of habitat in these areas. A management plan should be developed and implemented to restore and enhance the habitat quality provided in these areas.

7.2.15 South Carolina

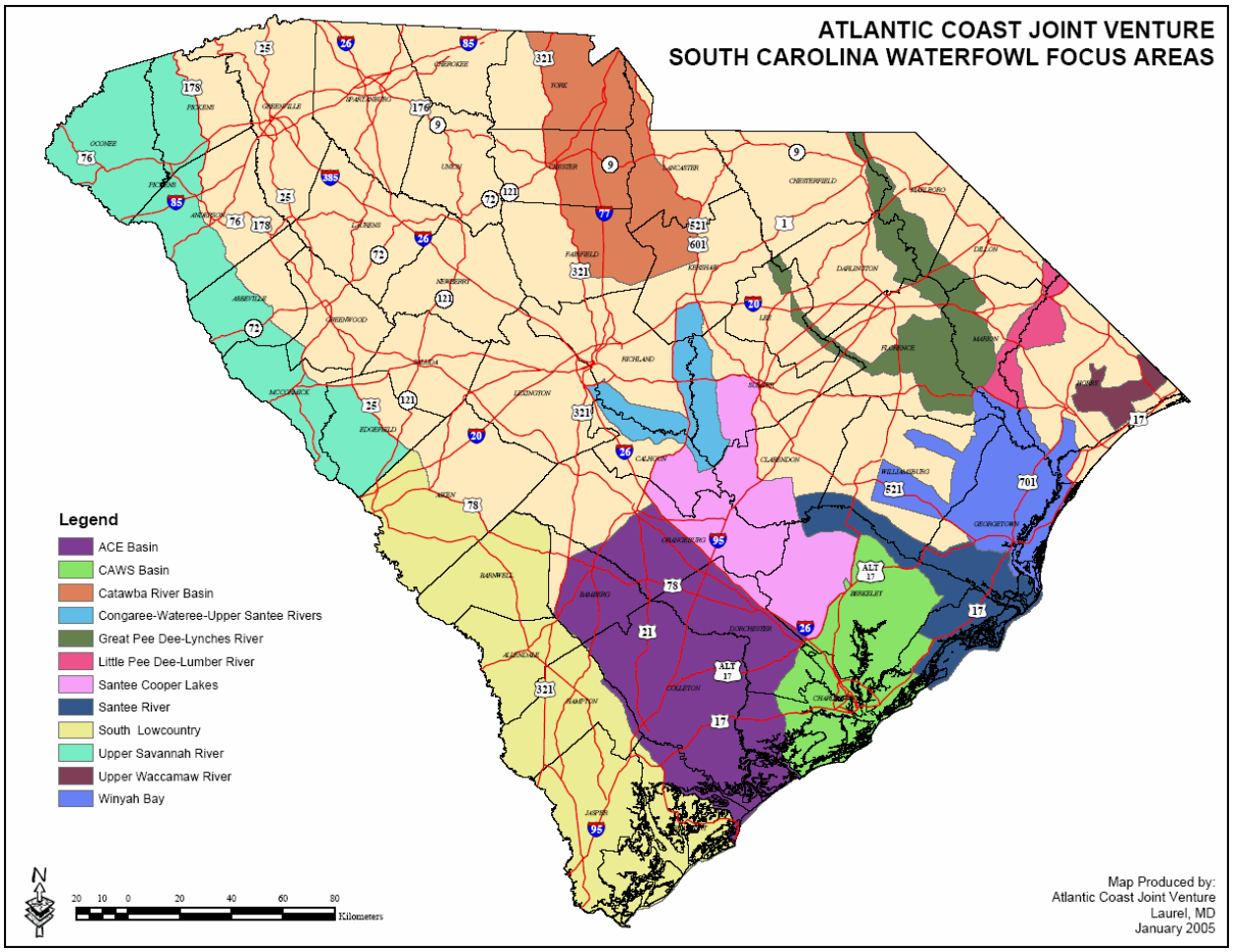

Figure 7.16. South Carolina waterfowl focus areas.

Focus Area: ACE Basin, South Carolina
Sub-Focus Areas: None

Area Description:

The ACE Basin Focus area is located in the southern coastal region of South Carolina and includes 675,221 hectares (1,668,501 acres) of the drainage basins of the Ashepoo, Combahee and Edisto Rivers. The focus area includes all of Colleton County and portions of Charleston, Beaufort, Hampton, Dorchester, Orangeburg and Bamberg Counties. Extending inland from the Atlantic Ocean, the area consists primarily of managed wetland impoundments, fresh and saltwater tidal marsh, and forested wetlands. Managed wetlands provide migration and wintering habitat for large numbers of dabbling ducks, and the tidal creeks, sounds, and offshore waters adjacent to the barrier island complexes provide extensive habitats for large numbers of diving and sea ducks. The forested wetlands provide extensive breeding, migration, and wintering habitat for resident and migratory Wood Duck populations.

Ownership/Protection:

Ownership patterns of the area include state, federal and local government owned lands, with a large component of privately-owned lands, including forest industry lands. In the lower portion of the focus area, nearly 64,753 hectares (160,007 acres) have been protected from development by various conservation mechanisms including over 25,000 hectares (61,776 acres) in conservation easements. Over 20,235 hectares (50,001 acres) of public land have been protected through state parks, state wildlife management areas, a national wildlife refuge (ACE Basin National Wildlife Refuge) and a national estuarine research reserve (ACE Basin Reserve).

Special Recognition:

The U.S. Fish and Wildlife Service recognize a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: ACE River Basin, Four Hole Swamp, and Branchville Bay. The St. Helena Sound in the lower ACE Basin is recognized as a one of the most pristine estuaries on the eastern seaboard and is designated a National Estuarine Research Reserve. The Nature Conservancy designated the area as one of its “Last Great Places.” The area was recognized early on as a Flagship Project for the Atlantic Coast Joint Venture.

Waterfowl:

The managed wetland complexes and tidal marshes provide migration and wintering habitat for Northern Pintail, Blue-winged Teal, Green-winged Teal, Gadwall, American Widgeon, Northern Shoveler, Mallard, Black Duck, Ring-necked Duck, Ruddy Duck, Bufflehead, Lesser Scaup, Canvasback, and Redhead. Small groups of Tundra Swan and Snow Goose winter in the area. Wood Duck and Mottled Duck are found year round. The forested wetlands are important Wood Duck breeding habitat.

Table 1. Waterfowl species using the ACE Basin Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck			X
Mallard			X
Wood Duck	X	X	X

Green-winged Teal		X	
Ring-necked Duck			X
Lesser Scaup			X
Northern Pintail			X
Blue-winged Teal		X	
Gadwall			X
American Wigeon			X
Canvasback			X
Redhead			X
Bufflehead			X
Ruddy Duck			X
Tundra Swan			X
Snow Goose			X
Mottled Duck	X		X

Other Migratory Birds:

The area provides important habitat to a large variety of wetland and upland birds. The beaches, tidal marshes and managed wetlands are important stopovers for breeding and migrating shorebirds and wading birds, including Wilson's Plover, Red Knot, Black-bellied Plover, Black Rail, Yellow Rail, King Rail, Black Skimmer, Least Bittern, and Little Blue Heron. Undeveloped beaches are especially important for migration loafing areas. Scrub-shrub habitat on barrier islands is especially important for breeding and migrating passerine species such as Painted Bunting, Prairie Warbler, and Common Ground Dove. A number of wading bird (including Wood Stork) rookeries are located in the forested wetlands. Over 25 Bald Eagle nests are located in the region. The forested wetlands and uplands provide important nesting and migration habitat for a variety of passerine species, including, Swainson's Warbler, Prothonotary Warbler, Northern Parula, Louisiana Waterthrush, and Yellow-throated Warbler. Swallow-tailed Kite also use the forested wetlands as breeding and foraging habitat. The extensive salt marshes are extremely important to Seaside Sparrow, Nelson's Sharp-tailed Sparrow, and Saltmarsh Sharp-tailed Sparrow.

Threats:

Commercial, residential, and resort development pressure from Charleston, Beaufort and Dorchester counties is a threat to the integrity of the area. As development spreads into the countryside, greater pressure will be placed on remaining open lands.

Conservation Recommendations:

Strategic tracts should be protected through acquisition by state, federal and non-governmental conservation organizations. Conservation easements will continue to be a major protection method in the region. Protection of wetlands along river corridors will be a major focus in the future.

References:

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: CAWS Basin, South Carolina
Sub-Focus Areas: Sea Islands, Cooper/Wando Rivers, and Ashley River

Area Description:

The CAWS Basin (Cooper, Ashley, Wando, and Stono) Focus Area is located in the central coastal region of South Carolina and includes the Charleston Metropolitan Area. Approximately 329,887 hectares (815,165 acres) in size, it includes major portions of Berkeley and Charleston Counties and a small portion of Dorchester County. The CAWS Basin Focus Area encompasses the drainages of the Ashley, Cooper, Stono, and Wando Rivers which form the Charleston Harbor Estuarine Drainage Area. These rivers originate as short blackwater streams in the lower coastal plain. The Santee-Cooper Hydroelectric Project, upstream on the Cooper River, diverts some water flow from the Santee River watershed to the Cooper River Watershed for hydroelectric and flood control purposes. Because of its large size, the CAWS Basin Focus Area was subdivided into three sections (sub-focus areas) in 1997: Stono/Sea Islands, Cooper/Wando Rivers, and Ashley River.

Ownership/Protection:

Ownership patterns within the focus area include federal, state, county, and city, as well as numerous private properties. Large private plantations exist along all of the river systems and on the barrier islands. This area consists of former rice plantations which are largely undeveloped and harbor important natural habitats including tidal, managed, and forested wetlands, as well as upland forests and agricultural areas. The area also has important historical and archeological sites which are relatively intact and well documented. Vital farmland is also located inland and is rapidly becoming extinct.

Special Recognition:

A large historical district (200 archeological sites & 150 historical sites) encompasses much of the Cooper River system. The Ashley River system contains many historical plantation sites. Many sites, especially within the 101,175 hectares (250,000 acres) Francis Marion National Forest contain threatened and endangered plants, animals, and habitat communities.

Waterfowl:

Many of the old rice fields located in the Cooper River have historically held large numbers of migrating birds. Several of the marshes along the coast also hold wintering waterfowl. Many of the inland ponds, swamps, and back water river systems provide important nesting and brood rearing habitat for the local Wood Duck population. Waterfowl wintering in the area include: Black Duck, Mallard, Wood Duck, Ring-necked Duck, Green-winged Teal, Blue-winged Teal, Scaup, American Wigeon, Gadwall, Mottled Duck, Northern Shoveler, Redhead, Canvasback, Hooded Merganser, and Northern Pintail. Nesting species include Mottled Duck and Wood Duck.

Table 1. Waterfowl species using the CAWS Basin Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Black Duck			X
Mallard			X
Ring-necked Duck			X
Green-winged Teal		X	
Blue-winged Teal		X	
Lesser Scaup			X
American Wigeon			X
Gadwall			X
Mottled Duck	X		X
Northern Shoveler			X
Redhead			X
Canvasback			X
Hooded Merganser			X
Northern Pintail			X

Other Migratory Birds:

The estuaries support nesting and foraging sites for numerous waterbirds, including Great Egret, Snowy Egret, Great Blue Heron, Tri-colored Heron, Little Blue Heron, Cattle Egret, Anhinga, Black-crowned Night-Heron, Yellow-crowned Night-Heron, Green Heron, Eastern Brown Pelican, Laughing Gull, Black Skimmer, Royal Tern, Plovers, and The Gull-billed Tern. Clapper rail, Black Rail, King Rail, and Common Snipe use the marsh areas significantly. Swallow-Tailed Kite nest in the focus area. One of the largest populations of Red-cockaded Woodpecker occurs on the uplands.

Threats:

Development extending from the large cities (Charleston, Summerville, etc.) continues to threaten habitats on the remaining undeveloped land. Two counties in the area (Dorchester (21%) and Berkeley (18.4%)) are growing faster than the state average of 7.3%. Developers are continually trying to develop the pristine shorelines, barrier islands, river banks, and the secluded uplands into housing communities. This development also contributes to pollution of the waterways as well as disturbance of important nesting, foraging, and wintering habitats all along the coast as well as the inland rivers and associated uplands. Charleston already has the largest containerized port in the Southeast Atlantic and Gulf Coasts. Along with this development come industries, commercial and residential development. Increased tourism has encouraged more golf courses, hotels, restaurants, etc., to be constructed, especially along the coast. Large land holdings held by timber companies are being sold off to the high bidder and many of these areas are becoming subdivisions which results in more land needed for schools, hospitals, stores, and other infrastructure.

Conservation Recommendations:

Important wintering, nesting, and foraging habitats need to protected from destruction and disturbance. As many of these areas need to be protected via conservation easement or purchase and they need to be done on a large landscape scale. Disturbance from the increasing number of residents, industries, and development along with the pollution that accompanies them need to be kept in check. A major effort should be to protect the large tracts on both the riverine systems and adjacent uplands that are being sold off by the large timber companies.

References:

South Carolina Forest Legacy Assessment of Need. 1999. South Carolina Department of Natural Resources.

Focus Area: Santee River, South Carolina
Sub-Focus Areas: None

Area Description:

The focus areas includes the floodplain of the Santee River from the Santee Dam to the Atlantic Ocean at Cedar Island, involving portions of Berkeley, Charleston, Clarendon, Georgetown, and Williamsburg Counties. The coastal marshes of this focus area occupies 221,692 hectares (547,813 acres), including significant areas of managed wetlands. This marsh area represents 32% of the state's total marsh area. A significant portion of this focus area also encompasses the Francis Marion National Forest, one of the largest remaining remnants of the fire dependent longleaf pine ecosystem. The USDA Forest Service is moving towards restoration of this ecosystem on public lands in the focus area.

Ownership/Protection:

Much of this focus area is protected in public ownerships: the Francis Marion National Forest (established in 1936), and the Cape Romain National Wildlife Refuge (established in 1932). There are numerous state wildlife management areas in the focus area, as well as a large number of private properties protected through conservation easements.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: the Santee Delta. This river delta encompasses the Santee Coastal Reserve, which serves as the largest concentration of wintering waterfowl in South Carolina (36% of the total). Additional important areas include the Cape Romain National Wildlife Refuge, Francis Marion National Forest, Tom Yawkey Wildlife Center, and the Santee-Delta Wildlife Management Area. Cape Romain National Wildlife Refuge is a designated Western Hemispheric Reserve Shorebird Network site. An area between the Francis Marion National Forest and Cape Romain National Wildlife Refuge is the focus of conservation by The Nature Conservancy's Sewee to Santee Initiative.

Waterfowl:

Thirty-six percent of the total South Carolina migratory waterfowl population over-winters here. Seventy percent of the Mottled Duck population occurs here, and the area provides breeding, migration and wintering habitat for tens of thousands of Wood Duck. The southern most population of Lesser Snow Goose in the Atlantic Flyway spends the winter on Santee Coastal Reserve.

Table 1. Waterfowl species using the Santee River Focus Area.

Species	Breeding	Migration	Wintering
Wood Duck	X	X	X
Mottled Duck	X		X
Snow Goose			X
Mallard			X

Black Duck			X
American Wigeon			X
Gadwall			X
Northern Pintail			X
Ring-necked Duck			X
Hooded Merganser			X

Other Migratory Birds:

This focus area provides nesting habitat for 38 species of neotropical migratory birds, including Yellow-throated Warbler, Painted Bunting, Black-throated Green Warbler, Bachman's Sparrow, Swainson's Warbler, and Hooded Warbler. It is a major wintering area for American Oystercatcher in North America, and a major wintering area for Marbled Godwit. Additionally, the beaches in this focus area serve as one of the major east coast staging areas for Red Knot. A significant portion of the northernmost populations of Swallow-tailed Kite nest in this focus area. Numerous waterbirds are important here, including Black Skimmer, Gull-billed Tern, Least Tern, and Little Blue Heron.

Threats:

Although a large percentage of the area is protected by state and federal ownership, much of the river swamp is in private ownership and is being placed on the market as paper companies consolidate their holdings. These ownerships should be protected through conservation easements or acquisitions by federal or state entities. The beaches, dune systems, and maritime forests are continually under threat from development and should be protected through acquisition, conservation easements, and adequate land planning by county governments. There is a threat of water quality degradation from non-point source pollution.

Conservation Recommendations:

It is recommended that wetland habitat in this focus area continue to be protected by the active pursuit of conservation easements, deed restrictions, Memoranda of Understanding, management agreements, gifts, and purchase.

References:

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: South Lowcountry, South Carolina
Sub-Focus Areas: None

Area Description:

South Carolina's South Lowcountry Focus Area contains approximately 860,993 hectares (2,127,552 acres) located along the lower Savannah River, encompassing the western portion of Aiken County, all of Barnwell, Allendale, and Jasper Counties, and the majority of Hampton and Beaufort Counties. The goal of the South Lowcountry Focus Area task force is to protect all properties along the Savannah River from the Savannah National Wildlife Refuge, including the Savannah River Site, northward along the river until it meets with the Upper Savannah River Focus Area at the Fall Line. The task force is also focusing on protection of other drainages flowing into and parallel to the Savannah River. Wildlife habitat types range from gently rolling hills with longleaf pines and turkey oaks to rich alluvial floodplains with bottomland hardwoods bisected by at least 19 rivers and extensive tidal marshes bridging the mainland with numerous barrier islands. Numerous lakes, ponds, and river drainage systems provide opportunities for fishermen and waterfowlers. There are 50 public boat ramps in the area to facilitate access. Nine saltwater reefs and wrecks offer additional enjoyment for sportfishing. The area provides habitat for various nongame and endangered species including Wood Stork, Bald Eagle, and Red-cockaded Woodpecker. Upland and wetland plants and plant communities of national, regional, and state concern are found in this focus area.

Ownership/Protection:

The landownership patterns of the South Lowcountry Focus Area are still relatively unfragmented and rather large with most landowners along the Savannah River owning anywhere from several hundred to several thousand acres. Protected areas on the Savannah River include the Savannah National Wildlife Refuge, Webb Wildlife Management Area, Palachucola Wildlife Management Area (United States Army Core of Engineers), and the Savannah River Site. Land ownership patterns are unique to this area, with 60 private plantations contributing significantly to the natural landscape of the area. Wildlife and forest management are emphasized on most of these plantations. These large landownerships are a tremendous benefit to the habitat protection strategy of the South Lowcountry Focus Area.

Special Recognition:

The U.S. Fish and Wildlife Service recognize a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Ashleigh Bay, Barton Bay, and Ducks Bay. These bays are excellent examples of pond cypress plant communities, an increasingly rare habitat type in the southeastern coastal plain. Recent radar tracking studies by Clemson University have shown the Savannah River corridor to be a primary flight path for many neotropical migrants.

Waterfowl:

This focus area encompasses the South Carolina side of the Savannah River Basin and forested floodplain, highly important to breeding, migrating, and wintering Wood Duck, and to wintering species such as Mallard and Black Duck. Many of the plantations in the area support significant numbers of migrating and wintering species such as Blue-winged Teal, American Wigeon, Gadwall, and Ring-necked Duck.

Table 1. Waterfowl species using the South Lowcountry Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Black Duck			X
Mallard			X
American Wigeon			X
Blue-winged Teal		X	X
Ring-necked Duck			X
Wood Duck	X	X	X
Gadwall			X

Other Migratory Birds:

The primary habitat of the lower Savannah River corridor consists of bottomland hardwoods. This habitat serves as a vital travel corridor to many neotropical migrants such as Northern Parula, Swallow-tailed Kite, Wood Thrush, Hooded Warbler, Worm-eating Warbler, Swainson's Warbler, Prothonotary Warbler, Painted Bunting, Eastern Wood Pewee, Yellow-billed Cuckoo, and Little Blue Heron.

Threats:

Loss of habitat due to fragmentation and development is currently the greatest threat in the South Lowcountry Focus Area. Most of the development is occurring in Beaufort and Jasper Counties. South Carolina ranks tenth nationally and fifth regionally in terms of population growth annually, with most of this growth occurring in coastal areas. Although SC ranks fortieth in total land area, the state ranks ninth in terms of total land area developed annually (United States Department of Agriculture, 1997). For each new South Carolinian added, approximately 1-3 hectares of land is developed. Other threats include non-point source pollution (forestry, agriculture, urban land use), Savannah River Site discharges and releases, dam release impacts (low dissolved oxygen, fish kills, cold water releases), habitat alteration/destruction (dredging, salinity changes, sedimentation, development, hydropower releases), modification and physical changes is estuary, and urban stormwater runoff. The South Lowcountry Focus Area must work quickly to offset such threats on development and protect the large tracts of unfragmented habitat that remain along the Savannah River Corridor.

Conservation Recommendations:

Efforts should be made to increase private landowner participation in the South Lowcountry Focus Area and to increase the number of properties protected by conservation easements. State and Federal officials should also work to leverage funding for habitat protection projects along the Savannah River Corridor. One of the major conservation actions in this focus area is the protection of remaining bottomland hardwood forests. From the Savannah River Site to the Atlantic Ocean, significant tracts of undeveloped forested wetlands remain. These lands should be acquired or protected through conservation easements by federal, state, or private conservation organizations. The pine uplands have great potential for restoration to longleaf pine. Significant issues are associated with the three major reservoirs and the Savannah River Site, and actions should be taken to reduce and minimize all activities that impact water quality. In the upper portion of the focus area, measures should be taken to reduce impacts to water quality from timber production and excessive recreational use. Riparian areas and associated watersheds should be protected.

References:

United States Department of Agriculture, 1997. Natural Resources Conservation Service. Natural Resources Inventory (web site).

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

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U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Winyah Bay, South Carolina
Sub-Focus Areas: None

Area Description:

The Winyah Bay Focus Area includes the lower drainages of the Black, Pee Dee, Sampit and Waccamaw rivers, as well as Winyah Bay, and includes a large portion of Georgetown County and small portions of Florence, Horry, Marion and Williamsburg Counties. Approximately 278,062 hectares (687,104 acres) are included in this focus area, with significant lands being tidally-influenced wetlands, river swamp, or open water, including the vast freshwater marshes of the Black, Pee Dee and Waccamaw Rivers which were cleared for rice culture in the 18th and 19th centuries (Field et al. 1991). This focus area encompasses a valuable and dynamic wetland landscape along the northern coast of South Carolina important to many fish and wildlife species. It includes the lower end of the third largest estuarine drainage area on the Atlantic Coast, surpassed only by the drainage areas of Chesapeake Bay and Albemarle/Pamlico Sounds (NOAA 1995). The largest block of contiguous tidal freshwater wetlands in South Carolina occurs in the Winyah Bay Focus Area.

Ownership/Protection:

Ownership within the focus area is predominately private, including significant antebellum historical properties in contiguous blocks along the river corridors. Industrial forestland dominates private uplands, with high quality farmland along the western edge of the focus area. Additional ownership includes State lands deeded to the Department of Natural Resources, the Department of Parks, Recreation and Tourism, and major state universities. Federal ownership includes the new Waccamaw National Wildlife Refuge. Significant protection is in place through State Wildlife Management Areas, and on private lands through permanent conservation easements.

Special Recognition:

The U.S. Fish and Wildlife Service recognize a number of wetlands as priority under the federal Emergency Wetlands Resources Act of 1986: Upper Winyah Bay, Bare Bone Bay Complex, and Little Pee Dee. These areas support some of the largest freshwater marshes left in South Carolina, undisturbed Carolina Bays, and undisturbed wilderness of both the State Scenic Rivers Program and the National Wild and Scenic River Program. The North Island beachfront is an undeveloped beach wilderness as part of the Tom Yawkey Center, a SCDNR Heritage Preserve. The North Inlet/Winyah Bay National Estuarine Research Reserve provides protection and national recognition to approximately 4,500 hectares (11,119 acres) of salt marsh, riparian habitats, and portions of open water of North Inlet Estuary and Winyah Bay. The North Inlet Estuary, protected from the ocean by North Island, is considered to be pristine (Bildstein et al. 1982).

Waterfowl:

Approximately 14,000 hectares (34,594 acres) of freshwater tidal wetlands in the focus area were converted to rice culture during the antebellum era, and over 2,400 hectares (5,930 acres) of rice fields currently are managed intensively as wintering waterfowl habitat (Hilliard 1975, Tiner 1977). Approximately 8,000 hectares (19,768 acres) of tidal freshwater marsh formerly in ricefields, as evidenced by remnant broken dikes characterizing this system (Aichele 1984), provide additional high quality habitat for wintering waterfowl as well as production habitat for Wood Duck. Managed wetlands in this focus area winter more migratory waterfowl

per hectare than any other comparable habitat in South Carolina (unpublished SCDNR data). The Winyah Bay Focus Area annually hosts peak migratory and wintering waterfowl populations of 20,000 to 40,000 birds. These are conservative estimates as many waterfowl use the vast bottomland hardwood areas, and low visibility rates in this habitat render accurate census difficult.

Table 1. Waterfowl species using the Winyah Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Wood Duck	X	X	X
Mallard			X
American Wigeon			X
Gadwall			X
Northern Pintail			X
Northern Shoveler			X
Blue-winged Teal		X	
Ring-necked Duck			X
Lesser Scaup			X
Ruddy Duck			X
Hooded Merganser			X

Other Migratory Birds:

Neotropical migratory landbirds make extensive use of the focus area, including 66 of 143 species breeding in North America and spending the non-breeding period in southern latitudes (Gauthreaux 1991). Another 39 of 72 species breeding and wintering extensively in North America, but also having populations in southern latitudes also occur in the focus area. The largest concentrations of nesting Osprey in South Carolina occur along the waterways of the focus area, as do many important colonial wading bird rookeries. One of the largest traditional wading bird colony sites in the coastal southeastern United States (Osborn and Custer 1978, Bildstein et al. 1990), Pumkinseed Island, is in Winyah Bay. Of 39 species of shorebirds present in the Atlantic Region of North America, 29 of these occur in the focus area (Helmers 1992). The area is important to several threatened and endangered species, and species of special concern, including Bald Eagle, Red-cockaded Woodpecker, Swallow-tailed Kite, Glossy Ibis, Least Bittern and American Osprey. This focus area supports a significant high density population of Swallow-tailed Kite in South Carolina, previously unknown to the area.

Threats:

Development, road construction and pollution continue to be the most pressing treats to wetlands, fish and wildlife resources and resource values associated with the focus area. Resident and tourist population increases, and related anthropogenic habitat stressors in the area are projected to increase 5-fold during the period 1995-2020 (Waccamaw Regional Planning and Development Council 1993).

Conservation Recommendations:

Habitat protection objectives for the focus area include the permanent protection of wetlands and associated upland habitats, as well as the enhancement of wetlands managed for wildlife. Specific objectives for habitat protection in the focus area will include (1) prevention of

further loss and degradation of the ecosystem through the protection, restoration, and enhancement of critical wetland and upland habitats, (2) initiation of a strategic planning effort to develop and implement a long term ecosystem/watershed stewardship plan, and (3) involvement of public understanding of the area's natural resources, their protection and stewardship needs, and their role in maintaining quality of life. The primary method of habitat protection in the Winyah Bay Focus Area will be through conservation easements on private lands. Opportunities for fee-title acquisitions in the focus area are limited, but will be pursued by SCDNR through grants and through U.S. Fish & Wildlife Service acquisitions to the Waccamaw National Wildlife Refuge. Enhancement of wetland habitats, specifically those that are intensively managed, will be accomplished through partnerships and technical assistance programs directed at improving wetland management capability on both private and public lands.

References:

Aichele, F. 1984. An addendum to "An Inventory of South Carolina's Coastal Marsher." South Carolina Coastal Council, Charleston. Unpubl. Rept. 8pp.

Bildstein, K.L., R. Christy, and P. DeCoursey. 1982. Size and structure of a South Carolina salt marsh avian community. Wetlands 2:118-137.

Bildstein, K.L., W. Post, P. Frederick, and J. Johnston. 1990. Freshwater wetlands, rainfall, and the breeding ecology of White Ibises in coastal South Carolina. Wilson Bull. 102:84-98.

Field, D.W., A.J. Reyer, P.V. Genovese, and B.D. Shearer. 1991. Coastal wetlands of the United States; an accounting of a valuable natural resource. U.S. Dept. Commerce nat. Oceanic Atmosph. Admin. and U.S. Dept. Inter. Fish and Wildl. Serv. 59pp.

Gauthreaux, S.A., Jr. 1991. Workplan of the Research Needs Subgroup of the Research Working Group of the Neotropical Migratory Bird Conservation Program. Unpubl. Rept. 10pp.

Helmers, D.L. 1992. Shorebird Management Manual. Western Hemisphere Shorebird Reserve Network. Manomet, Massachusetts. 58pp.

Hilliard, S.B. 1975. The tidewater rice plantation: an ingenious adaptation to nature. Pages 57-66 in H.J. Walker, ed., Geoscience and man. Vol. 12. Louisiana State Univ., Baton Rouge.

National Audubon Society, Important Bird Areas.

NOAA (National Oceanic and Atmoshperic Administration). 1992. North Inlet-Winyah Bay National Estuarine Research Reserve: final environmental impact statement and draft management plan. Off. Ocean Coastal Resour. Manage., Nat. Oceanic Atmospheric Admin., Washington D.C. 93pp + app.

Osborn, .R.G., and T.W. Custer. 1978. Herons and their allies: atlas of Atlantic Coast colonies, 1975 and 1976. FWS/Qbb-77/08, U.S.F.W.S., Washington, D.C.

Tiner, R.W., Jr. 1977. An inventory of South Carolina's coastal marshes. South Carolina Mar. Resour. Centr. Tech. Rep. No. 23. 33pp.

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast

Region, Regional Wetlands Concept Plan.

Focus Area: Santee Cooper Lakes, South Carolina
Sub-Focus Areas: None

Area Description:

The Santee Cooper Lakes system consists of Lake Marion and Lake Moultrie in the coastal plain of South Carolina. The entire focus area comprises 349,417 hectares (863,427 acres). Interstate 95 divides the Santee Cooper Lakes Focus Area from the Congaree-Wateree-Upper Santee Rivers Focus Area. These inland, freshwater lakes were formed in 1941 for hydro-electric power production. Both lakes are generally shallow and support extensive stands of submerged and floating-leaved aquatics, such as hydrilla and watershield. The Santee Cooper Lakes serve as a major wintering area for migratory and resident waterfowl. Up to 200,000 waterfowl, Mallard being the primary species, have wintered on the lakes. However, estimates have declined to 25,000 with Ring-necked Duck being the primary species. The Santee Cooper Lakes also serves as the primary wintering area for South Carolina's migrant Canada Goose population. Estimates have ranged from a high of 40,000 in 1963 to a low of less than 1,000 in 1991. In addition to wintering habitat, the system provides valuable breeding and brood-rearing habitat for resident Wood Duck and Hooded Merganser. Important foraging and nesting habitat for Osprey, Bald Eagle, wading birds, and American alligators is found within the Santee Cooper region. The system supports a 1 million dollar commercial catfish harvest and provides a recreational fishery valued at 80 million dollars. Further, the lakes maintain a run of anadromous shad, herring, and striped bass, and provide important habitat for endangered shortnose sturgeon.

Ownership/Protection:

Lands in this focus area are a mix of federal, state, and private ownerships. Significant lands are held by a major quasi-governmental utility company, Santee-Cooper. There are also significant state land holdings in state parks, state forests, and wildlife management areas. A portion of the Santee National Wildlife Refuge is located within this focus area.

Special Recognition:

None known.

Waterfowl:

Historically, this focus area wintered up to 200,000 ducks, mostly Mallard and migrant Canada Goose. The presence of hydrilla and watershield provided excellent habitat on Lake Marion until grass carp were introduced to reduce the presence of these plants on the lake. Hydrilla and watershield were drastically reduced, reducing habitat for waterfowl, and subsequently, numbers of wintering waterfowl have declined. Much of the wintering population of waterfowl now consists of Ring-necked Duck.

Table 1. Waterfowl species using the Santee Cooper Lakes Focus Area.

Species	Breeding	Migration	Wintering
Wood Duck	X	X	X
Mallard			X
American Wigeon			X
Gadwall			X
Northern Pintail			X
Northern Shoveler			X

Blue-winged Teal		X	
Ring-necked Duck			X
Lesser Scaup			X
Ruddy Duck			X
Hooded Merganser			X

Other Migratory Birds:

This focus area supports a wide diversity of habitats, and thus, a wide diversity of avian species. Open water areas are important for not only waterfowl, but for other species such as Pied-billed Grebe, Caspian Tern, Osprey, and Common Loon. The agricultural areas support high densities of Painted Bunting, and are highly important for Northern Bobwhite, Loggerhead Shrike, Indigo Bunting, Common Yellowthroat, and Eastern Kingbird. Forested wetlands are important for Yellow-Throated Warbler, Northern Parula, Prothonotary Warbler, Swainson's Warbler, Red-eyed Vireo, and Wood Thrush. Hooded Warbler and White-eyed Vireo are found in forested stands with dense understories. Almost every heron and egret species inhabiting South Carolina can be found in the wide variety of habitats in this focus area.

Threats:

The primary threat to this focus area is urbanization, and increased recreational activity in areas traditionally used by waterfowl and other high priority bird species.

Conservation Recommendations:

The long range conservation of wetlands and important adjacent uplands in this focus area should promote traditional uses of the land such as forestry, agriculture and wildlife management, through the implementation of plans for the stewardship and protection of the individual properties. It is important to create and maintain natural upland buffers along the margins of all wetlands, and to create and maintain wildlife corridors between important wetlands in the project area and adjacent focus areas. The goal will be to enhance and maintain as much of the high quality wetland and adjacent upland habitat in the focus area as possible. This will be accomplished by establishing protected blocks and/or strips of upland habitat along the margins of all wetlands, and wide bands and blocks of protected upland habitat between important wetland units. All aspects of this work will be accomplished through voluntary, mutually beneficial agreements between land owners within the project area.

References:

U.S. Fish & Wildlife Service. 1992. Emergency Wetlands resources Act, Southeast Region, Regional Wetlands Concept Plan.

Focus Area: Upper Waccamaw River, South Carolina
Sub-Focus Areas: None

Area Description:

The Waccamaw River is classified as a blackwater river system. Blackwater rivers typically originate in the coastal plain and have a dark tint because of tannic acid leached from organic matter. The Waccamaw River is also unique in that it is the only river originating from a Carolina Bay, beginning at Lake Waccamaw in Columbus County, North Carolina. The Waccamaw River has a large, relatively unbroken riverine bottomland hardwood ecosystem dominated by bald cypress, water tupelo, water oak, and willow oak. There are also several isolated stands of the relatively rare tree, Atlantic white cedar. Atlantic white cedar was once common in suitable habitat but today exists only in isolated pockets. The wood resists rot and was traditionally used for fence posts and boats. The flood plain also provides one of the best travel corridors for black bear in coastal South Carolina. This focus area encompasses 43,433 hectares (107,320 acres) in Horry County.

Areas surrounding the river contain some of the best examples of Carolina bays in the state. Carolina bays are oval or elliptical depressions of uncertain origin. Some authorities speculate they were formed by shallow ocean currents while others argue they are comet and meteor impact craters. The bays on the preserve are a type of isolated, freshwater wetland. The water trapped in the bays comes entirely from rainfall. This isolated system is home to a pocosin vegetative community. Plant species such as gallberry, fetterbush, and blueberry that are adapted to the wet, acidic conditions occur in the bays interior. Many Carolina bays have a xeric sand rim along the northwestern edge. These rims are composed of fine, white sands that hold little water. They are stark contrast to the wetlands of the central bay. Plant species adapted to dry conditions such as turkey oak, wire grass, longleaf pine, and prickly pear are found on the rims. The transition zone between the bay and the sand rim is called an ecotone and is perhaps the most diverse area in the system. It harbors numerous carnivorous plant species such as Venus' fly-traps, pitcher plants, and sundews. These plants trap and digest insects as an additional source of nutrients.

Ownership/Protection:

Many key tracts within the focus area currently owned by forest industry or non-industrial forest landowners. However, significant holdings by state government do exist. The South Carolina Department of Natural Resources owns the Waccamaw River Heritage Preserve and Lewis Ocean Bay Heritage Preserve. At least one conservation easement has been placed on a private tract.

Special Recognition:

The Waccamaw River from the North Carolina line to the City of Conway has been designated as a Large Areas Protection Project by the SC Department of Natural Resources Heritage Trust Program.

Waterfowl:

Several managed impoundments along the Waccamaw River and seasonally flooded bottomland hardwood forests provide wintering waterfowl habitat for Wood Duck, Hooded

Merganser, Mallard, Green-winged Teal and Ring-necked Duck. Beaver ponds provide wintering habitat and also are critical Wood Duck production areas.

Table 1. Waterfowl species using the Upper Waccamaw River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Wood Duck	X	X	X
Green-winged Teal			X
Ring-necked Duck			X
Hooded Merganser			X

Other Migratory Birds:

The forested wetlands provide important nesting and migration habitat for a large assemblage of passerines. Research by the South Carolina Department of Natural Resources documented breeding of 15 species of neotropical migratory birds and 34 species of other land birds on the Waccamaw River HP. Two large Wood Stork rookeries and two Bald Eagle nests occur with the focus area. These areas also provide nesting and foraging habitat for Swallow-tailed Kite.

Threats:

The expansion of Myrtle Beach and its surrounding communities is placing pressure on lands surrounding the floodplain for residential development. There are also several large highway projects that might impact the floodplain.

Conservation Recommendations:

Strategic tracts should be protected through acquisition by state and non-governmental conservation organizations. The pursuit of conservation easements will be a major protection method in the region. Protection of wetlands along river corridors will be a major focus in the future.

References:

Cely, J.E and B.A. Glover. 1996. Breeding Bird Survey of the Waccamaw and Little Pee Dee Heritage Preserves. South Carolina Department of Natural Resources Report.

Dozier, J.H. and J.P. Stowe. Waccamaw River Heritage Preserve Management Plan. 2000.

Nelson, J.B. 1986. Natural Communities of South Carolina. South Carolina Wildlife and Marine Resources Report.

Focus Area: Little Pee Dee-Lumber Rivers, South Carolina
Sub-Focus Areas: None

Area Description:

This focus area encompasses 65,256 hectares (161,251 acres) in portions of Marion, Dillon, and Florence Counties. The Little Pee Dee and Lumber Rivers are classified as blackwater river systems. Blackwater rivers typically originate in the coastal plain and have a dark tint because of tannic acid leached from organic matter. The Little Pee Dee and Lumber Rivers are bounded by classic blackwater river floodplain forest consisting primarily of bald cypress, water tupelo, swamp tupelo, and red maple. Floodplain forests are seasonally inundated by the river and represent the most deeply flooded of all southeastern United States forest types. The midstory and forest floor are sparse of vegetation as a result of periods of deep flooding. The exception is floating logs and stumps, which often have well established herbaceous communities.

Bottomland hardwood forests on the Little Pee Dee and Lumber Rivers typically occur between the floodplain forest and drier upland sites. Unlike floodplain forests and longleaf pine uplands, bottomland hardwoods are quite diverse in terms of the number of species in the overstory. This ecotype is dominated by a well-developed canopy of water oak, overcup oak, willow oak, sweetgum, water hickory and loblolly pine. Bottomland hardwood forests are inundated regularly by the river, but do not typically contain standing water for extended periods of time. The drier conditions result in a better developed herbaceous layer. Loose spangle grass often develops thick stands in open areas. Oxbow lakes are often associated with floodplain forests. Oxbow lakes are former sections of river channel that became isolated when the river changed course. There are several excellent examples of oxbow lakes along the Little Pee Dee River.

Elevated xeric sand ridges run parallel to the rivers throughout the floodplain. This ecosystem is associated with fluvial sand deposited by river currents. The soils are sandy and well-drained. Longleaf and sparse loblolly pines dominate the canopy. The midstory consists primarily of turkey oak, sand live oak, and persimmon. Common understory plants include wiregrass, dropseed, and prickly-pear. The protection of these ridges is essential to the health of the overall aquatic system.

The Little Pee Dee and Lumber River drainages contain several species of state or regional concern. Rare plant species include Sarvis holly, Well's pixie moss, riverbank quillwort and Pickering's morning-glory. The floodplain provides nesting and foraging habitat for Bald Eagle, Swallow-tailed Kite, and Wood Stork. The drainage also provides a travel corridor for black bear.

Ownership/Protection:

Many key tracts within the focus area currently owned by forest industry or non-industrial forest landowners. However, significant holdings by state government do exist. The South Carolina Department of Natural Resources owns the Little Pee Dee River Heritage Preserve in Marion and Horry counties adjacent to the Little Pee Dee and Lumber Rivers, and Cartwheel Bay Heritage Preserve.

Special Recognition:

The U.S. Fish and Wildlife Service recognize one wetland as priority under the federal Emergency Wetlands Resources Act of 1986: the Little Pee Dee River. Fourteen miles of the Little Pee Dee River from Highway 378 to the confluence with the Great Pee Dee River were designated as a State Scenic River in March of 1990. An additional 103 kilometers (64 miles) of the river extending upstream from Highway 378 were determined eligible for scenic river status in 1997 but have not yet been formerly designated. The Little Pee Dee River has also been designated as a Large Areas Protection Project by the SC Department of Natural Resources Heritage Trust Program.

Waterfowl:

Several managed impoundments along the Little Pee Dee River and seasonally flooded bottomland hardwood forests provide wintering waterfowl habitat for Wood Duck, Hooded Merganser, Mallard, Green-winged Teal and Ring-necked Duck. Beaver ponds provide wintering habitat and also are critical Wood Duck production areas.

Table 1. Waterfowl species using the Little Pee Dee-Lumber River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Wood Duck	X	X	X
Green-winged Teal			X
Ring-necked Duck			X
Hooded Merganser			X

Other Migratory Birds:

The forested wetlands provide important nesting and migration habitat for a large assemblage of passerines. Research by the South Carolina Department of Natural Resources documented breeding of 15 species of neotropical migratory birds and 35 species of other land birds on the Little Pee Dee River HP. These areas also provide nesting and foraging habitat for Bald Eagle, Swallow-tailed Kite and Wood Stork. Several wading bird rookeries also exist in the vicinity of the Little Pee Dee River.

Threats:

The expansion of Myrtle Beach and its surrounding communities is placing pressure on lands surrounding the floodplain for residential development. There are also several large highway projects that might impact the floodplain.

Conservation Recommendations:

Strategic tracts should be protected through acquisition by state and non-governmental conservation organizations. The pursuit of conservation easements will be a major protection method in the region. Protection of wetlands along river corridors will be a major focus in the future.

References:

Cely, J.E and B.A. Glover. 1996. Breeding Bird Survey of the Waccamaw and Little Pee Dee

Heritage Preserves. South Carolina Department of Natural Resources Report.

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Nelson, J.B. 1986. Natural Communities of South Carolina. South Carolina Wildlife and Marine Resources Report.

South Carolina Water Resources Commission. 1982. Little Pee Dee River: Management survey for the state Scenic River Program.

The Little Pee Dee River: Status for Scenic Designation. 1990. South Carolina Department of Natural Resources publication.

Focus Area: Great Pee Dee – Lynches Rivers, South Carolina
Sub-Focus Areas: None

Area Description:

The Great Pee Dee-Lynches Focus Area is 254,044 hectares (627,756 acres) and includes portions of Chesterfield, Darlington, Dillon, Florence, Lee, Marion, Marlboro and Sumter Counties. All of the upper portions of the Great Pee Dee River floodplain and the entire lower portion of the Lynches Rivers floodplain are included, as well as significant portions of Jefferies Creek.

Red river bottomland hardwood is the main wetland type along the Great Pee Dee flood plain. The Lynches River and Jefferies Creek systems are considered black river systems. Intact bottomland hardwood forests provide significant ecosystem benefits. They remove major percentages of sediments and pollutants (Kuenzler 1989).

The Great Pee Dee River begins in North Carolina on the eastern escarpment of the Southern Appalachians near the Tennessee and Virginia boundaries. Known as the Yadkin River in upstate North Carolina, it becomes the Great Pee Dee River when it enters the lower Piedmont and coastal plain of North Carolina and South Carolina. Because this river originates in the highlands and flows through the Piedmont, it is considered a red water stream. Red river streams get their name because of the reddish muddy color of the water that results from brown-red piedmont lay sedimentation. Major tree, shrub and vine species associated with the red river system include: cherrybark oak, swamp chestnut oak, water oak, diamond leaf oak, American sycamore, river birch, red mulberry, Ameican holly, sugarberry, red maple, boxelder, sweetgum, cypress, tuepelo, hickories, ashes, paw paw, hawthore, grapes, Alabama supplejack, and trumpet creeper. Cane, and Chinese privet are common understory components of these forests. The Great Pee Dee bottomlands provide key habitat for species of concern such as Swainson's Warbler, Wayne's Black-throated Green Warbler, Swallow-tailed Kite, Wood Stork, spotted turtle, black swamp snake, and more than 20 species of plants.

Several significant wetland habitats such as oxbow lakes, beaver ponds and vernal ponds occur in the floodplain forests of the Great Pee Dee. These wetlands provide key habitat for many wetland dependant species. Of these wetland types the vernal ponds are probably are the most unique and significant. Vernal ponds are temporary bodies of water that are usually filled during the spring. These ponds generally dry up in the summer so it is impossible for these wetlands to support fish populations. The absence of fish in these ponds is a unique ecological situation that is critical for many amphibians such as spotted salamanders, mole salamanders, and upland chorus frog and northern cricket frog; two species that are of concern in the coastal plain (Dr. Jeffery Camper, 2004 Francis Marion University, personal communication).

The Lynches River is classified as a blackwater river system. Blackwater rivers typically originate in the coastal plain and have a dark tint because of tannic acid leached from organic matter. The Lynches River is bounded by classic blackwater river floodplain forest consisting primarily of bald cypress, water tupelo, swamp tupelo, and red maple. Floodplain forests are seasonally inundated by the river and represent the most deeply flooded of all southeastern United States forest types. The midstory and forest floor are sparse of vegetation as a result of periods of deep flooding. The exception is floating logs and stumps, which often have well-

established herbaceous communities.

Bottomland hardwood forests on the Lynches River typically occur between the floodplain forest and drier upland sites. Unlike floodplain forests and longleaf pine uplands, bottomland hardwoods are quite diverse in terms of the number of species in the overstory. This ecotype is dominated by a well-developed canopy of water oak, overcup oak, willow oak, sweetgum, water hickory and loblolly pine. The river inundates bottomland hardwood forests regularly but do not typically contain standing water for extended periods of time. The drier conditions result in a better-developed herbaceous layer. Loose spangle grass often develops thick stands in open areas.

Elevated xeric sand ridges run parallel to the river throughout the floodplain. This ecosystem is associated with fluvial sand deposited by river currents. The soils are sandy and well drained. Longleaf and sparse loblolly pines dominate the canopy. The midstory consists primarily of turkey oak, sand live oak, and persimmon. Common understory plants include wiregrass, dropseed, and prickly-pear. The protection of these ridges is essential to the health of the overall aquatic system.

The area outside the bottomlands is largely rural and dominated by forests followed by agricultural and shrub-scrub habitats. Historically, these lands have been heavily influenced by man and most uplands in the area were cleared for agriculture during the 18th and 19th centuries. Unfortunately, in the upland areas of the focus area, there is very little land that has not been significantly influenced by man.

Ownership/Protection:

Most key areas within the focus area currently owned by forest industry or non-industrial forest landowners. However, significant holdings by state and local governments do exist. South Carolina Department of Natural Resources owns one property in Darlington County adjacent to the Great Pee Dee River. Other government entities include Lee State Natural Area on the Lynches River in Lee County, and the Lynches River County Park and Pee Dee Station Wildlife Management Areas, both in Florence. Several State Natural Heritage Preserves are located within this focus area. The Carolina Sandhills National Wildlife Refuge is located adjacent to this focus area.

Special Recognition:

The Carolina Sandhills National Wildlife Refuge, an Important Bird Area (IBA), is located adjacent to this focus area. The refuge supports approximately 190 species of birds, 42 species of mammals, 41 species of reptiles, 25 species of amphibians, and innumerable species of plants. Among this diverse group of fauna and flora are several species that are listed as threatened or endangered. These include the Swainson's Warbler, Red-cockaded Woodpecker, pine barrens treefrog, white wicky, Well's pixie moss, and the sweet pitcher plant. The 112,056 hectares (45,348 acres) refuge now serves as a demonstration site for land management practices, which preserve and enhance the longleaf pine/wiregrass ecosystem.

Waterfowl:

Several managed impoundments along the Great Pee Dee River and seasonally flooded bottomland hardwood forests provide wintering waterfowl habitat for Wood Duck, Hooded

Merganser, Mallard, Green-winged Teal and Ring-necked Duck. Beaver ponds not only provide wintering habitat but also are critical Wood Duck production areas.

Table 1. Waterfowl species using the Great Pee Dee-Lynches River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Wood Duck	X	X	X
Green-winged Teal			X
Ring-necked Duck			X
Hooded Merganser			X

Other Migratory Birds:

The forested wetlands provide important nesting and migration habitat for a large assemblage of passerines. These areas also provide nesting and foraging habitat for Swallow-tailed Kite and Wood Stork. Several wading bird rookeries also exist in the vicinity of the Great Pee Dee River.

Threats:

Commercial and residential development from the greater Florence area as well as smaller municipalities are the primary development threats. Also, there is great interest among locals to construct weekend retreat facilities along both the Great Pee Dee and the Lynch River.

Conservation Recommendations:

Strategic tracts should be protected through acquisition by state and non-governmental conservation organizations. The pursuit of conservation easements will be a major protection method in the region. Protection of wetlands along river corridors will be a major focus in the future.

References:

Kuenzler, E.J. 1989. Value of Forested Wetlands as Filters for Sediments and Nutrents. Pages 85-96 in D.D. Hook and R. Lea editors. Proceedings of the Symposium: The Forest Welands of the United States; 1988 July 12-14; Orlando, FL. General technical Report SE-50. Southeastern Forest Experiment Station.

www.scdhec.com/water/shed/peedee.html

Focus Area: Upper Savannah River, South Carolina
Sub-Focus Areas: None

Area Description:

The Upper Savannah Focus Area comprises 586,148 ha (1,448,399 acres) in portions of Oconee, Pickens, Anderson, Abbeville, McCormick and Edgefield Counties, and is located in the northwestern section of South Carolina. The area encompasses the Savannah River drainage area. The section is primarily mountain, foothills, and piedmont-type terrain. Elevations vary from 40 msl to 1,150 msl. Major Lakes in the area include Lake Hartwell, Lake Keowee, Lake Jocassee, Lake Russell, Lake Thurmond, Lake Succession and Tugaloo Lake. Major river systems include the Chauga, Chattooga and Savannah. Other important wetlands in this area are in beaver pond complexes. The majority of the wetlands are found in creek and river bottoms, frequently in conjunction with beaver ponds, and along the shoreline of the major reservoirs. Some of the most important wetlands ecologically are seeps, bogs and springs occurring in the mountains and piedmont. These smaller wetlands often support species of concern, particularly plants. Many farm ponds and other small impoundments create wetland habitats in the focus area.

Ownership/Protection:

Land ownerships in this focus area are a mix of federal, state, and private lands. There are significant land holdings in State Wildlife Management Areas, State Parks, Heritage Preserves, and Clemson University lands. Sections of the Sumter National Forest (USDA Forest Service) and U.S. Army Corps of Engineers lands along the river corridors contribute significant lands in federal ownership. Additionally, Duke Energy owns large tracts within the Upper Savannah Focus Area.

Special Recognition:

Four state-managed waterfowl areas and at least 12 privately-managed impoundments encompassing approximately 165 hectares (410 acres) have been identified as occurring in the USFA. State managed areas include Beaverdam Creek, Clemson Waterfowl Demonstration/Research and Russell Creek Wildlife Management Areas. Several hundred acres of beaver ponds are also located within the area. Several of these beaver ponds were being cooperatively managed due to an agreement between local landowners, the U.S. Fish and Wildlife Service (USFWS) and the South Carolina Waterfowl Association (SCWA). The USFWS and the South Carolina Department of Natural Resource have cooperated to construct 35 Clemson Beaver Pond levelers to enhance beaver ponds for wildlife on private lands. This is included in the Partners for Wildlife Program. Clemson Beaver Pond Levelers have been placed in 7 ponds on Clemson University (CU) and Corps of Engineers (COE) property managed by South Carolina Department of Natural Resource. Many state and some federally endangered species occur in the USFA.

Waterfowl:

The most important waterfowl in this focus area is the Wood Duck. However, other dabbling and diving ducks utilize the lakes and reservoirs as wintering habitat.

Table 1. Waterfowl species using the Upper Savannah River Focus Area.

Species	Breeding	Migration	Wintering
Wood Duck	X	X	X
Mallard			X
American Wigeon			X
Gadwall			X
Ring-necked Duck			X
Lesser Scaup			X
Ruddy Duck			X
Hooded Merganser			X
Black Duck			X
Green-winged Teal		X	X
Common Goldeneye			X
Blue-winged Teal		X	X
Canada Goose	X		X

Other Migratory Birds:

Aside from this area's importance to Wood Duck, the Upper Savannah Focus Area is extremely important to a high diversity and large number of breeding, migrating, and neotropical migrants. The area is largely forested, and important species here include Swainson's Warbler, Louisiana Waterthrush, Acadian Flycatcher, Veery, Ovenbird, Prairie Warbler, Field Sparrow, Northern Bobwhite, Wood Thrush, Kentucky Warbler, Yellow-throated Vireo, Blue-headed Vireo, Red-eyed Vireo, Indigo Bunting, Ruffed Grouse, and Grasshopper Sparrow. Great Blue Heron rookeries and Green Heron are present on several of the beaver pond complexes. Five Bald Eagle nesting territories have been identified in the area. Over 20 eagles were found dead on Lake Thurmond during the past 2 years. Several were confirmed avian vacuolar myelinopathy (AVM) cases and AVM was suspected in the others. Only two of these nesting territories were active in 2003. Wetlands also provide habitat for the following migratory birds in the focus area: American Woodcock, Little Blue Heron, Red-shouldered Hawk, Blue-gray Gnatcatcher, Belted Kingfisher, Wood Stork, and Prothonotary Warbler. Little habitat is available for shorebirds, but shorelines and streambanks are utilized by Spotted and Solitary Sandpiper.

Threats:

The primary threats to this area is urbaninzation, loss of habitat for development of second homes, and loss of habitat for increased agriculture and intensive forestry.

Conservation Recommendations:

The primary conservation recommendations are to protect existing priority habitats through fee-title acquisition to be placed in public ownership, portect private lands through conservation easements, and to restore priority habitats to native plant communities through landowner incentive programs. Partnerships should be developed with local governments and utility companies to protect and restore priority habitats.

Focus Area: Catawba River Basin, South Carolina
Sub-Focus Areas: None

Area Description:

The Catawba Focus Area consists of 386,524 hectares (955,119 acres) bordering both sides of the Catawba River from the North Carolina line to the Wateree Dam. The east boundary of the property extends from the North Carolina line south on Hwy 521 to Dekalb. The boundary then shoots across country to the Wateree Dam and again across country to Hwy 34. The boundary then follows Hwy 321 North and then Hwy 161 to the North Carolina line. The northern boundary of this focus area is the North Carolina / South Carolina line. This focus area includes parts of York, Chester, Lancaster, Fairfield, and Kershaw Counties. While the Piedmont area does not consist of the typical wetlands as found in the Coastal Plain, the forested wetlands provide extensive breeding, migration, and wintering habitat for resident and migratory Wood Duck populations. This area is also a principle migration route for the Atlantic Coast Flyway.

Ownership/Protection:

Ownership patterns of the area include state and local government-owned lands, with a large component of privately-owned lands, including forest industry and energy subsidiary lands. Examples of protected lands include Landsford Canal State Park, Landsford Forest Legacy Area, Historic Brattonsville, Lake Wateree State Recreational Area, and Draper Wildlife Management Area.

Special Recognition:

Parts of this Focus Area are extremely significant from a Revolutionary War standpoint. In key areas such as Rocky Mount on Dearborne Island, work is being done to secure historic ruins and artifacts.

Waterfowl:

The Catawba River along with its tributaries provides important habitat for waterfowl. The most common waterfowl species of this area is the Wood Duck which utilizes the tributaries and surrounding wetlands for breeding. Many other species of waterfowl can be observed, however, as they are migrating toward the coastal areas.

Table 1. Waterfowl species using the Catawba River Basin Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Wood Duck	X		X
Green-winged Teal			X
Ring-necked Duck			X
Lesser Scaup			X
Northern Pintail		X	
Blue-winged Teal			X
Gadwall			X

American Wigeon		X	
Canvasback			X
Redhead		X	X
Bufflehead			X
Ruddy Duck		X	
Tundra Swan			X
Snow Goose			X
Mottled Duck	X	X	X

Other Migratory Birds:

The area provides important habitat to a large variety of wetland and upland birds. The river, tributaries, and managed wetlands are important stopovers for breeding and migrating birds, including Pied-billed Grebe, Double-crested Cormorant, Great Blue Heron, Great Egret, Little Blue Heron, Green Heron, Bonaparte's Gull, Ring-Billed Gull, Herring Gull, Ruby-throated Hummingbird, and Prothonotary Warbler. Many other predatory birds such as Osprey, Bald Eagle, and numerous hawks can be found in the river corridor. Other commonly occurring summer residents include Acadian Flycatcher, Red-eyed Vireo, Northern Parula, Yellow-throated Warbler, and Louisiana Waterthrush. There is also evidence to suggest an increase in Cliff Swallow breeding along the river.

Threats:

Commercial and residential development pressure from the Charlotte, York and Rock Hill areas are a threat to the integrity of the focus area. As development spreads into the countryside, greater pressure is being placed on remaining open lands. With tremendous opportunities for water-based recreation, the Catawba River corridor is viewed as a prime site for new developments.

Conservation Recommendations:

Strategic tracts should be protected through acquisition by state, federal and non-governmental conservation organizations. Conservation easements will continue to be a protection method in the region. Protection of wetlands along river corridors will be a major focus in the future.

References:

Landsford Canal State Park: The Landsford West Expansion Tract, Summary: Assessment and Need for Purchase. Katawba Valley Land Trust.

Focus Area: Congaree-Wateree-Upper Santee Rivers, South Carolina
Sub-Focus Areas: None

Area Description:

The focus area encompasses 127,264 hectares (314,475 acres) in the floodplain and adjoining uplands associated with the Congaree River, the Wateree River, and the upper portion of the Santee River. The majority of the focus area is located in the Upper Coastal Plain Physiographic region. The northern ends of the Congaree and Wateree Rivers pass through the Carolina Sandhills Ecoregion. The Congaree River begins at the confluence of the Saluda and Broad Rivers in Columbia, South Carolina and runs southeasterly until its confluence with the Wateree River near Ft. Motte, South Carolina where it becomes the Santee River. The upper stretch of the Santee River has been impounded to form Lake Marion. The focus area boundary is limited to the upper portion of the Santee River, including the head of Lake Marion as delineated by the Seaboard Coast Line Railroad at Rimini, South Carolina. The focus areas river have broad flood plains compared to other rivers within the state. This bottomland system consists of more than 80,000 hectares (197,683 acres). The area supports a great abundance and diversity of wetland-associated wildlife species. These flood plains were historically dominated by magnificent cypress-tupelo swamps and bottomland hardwood forests. Despite habitat alterations throughout much of the focus area, significant amount of old growth forest still occurs here. The Congaree River is influenced upstream by Lake Murray and Parr Reservoir. The Wateree River is influenced upstream by Wateree Lake. Other influences include urban storm water run-off, mining, agriculture, and forestry practices.

Ownership:

The ownership of properties within the focus area is mostly private. There are, however, several notable parcels of publicly owned property. The Congaree Swamp National Park located on the eastern side of the Congaree River, was established to preserve old growth bottomland forest. On the eastern side of the Wateree River is the Manchester State Forest. The upper reaches of the Santee River are actually the swampy head of Lake Marion. This area, referred to as the upper Santee Swamp, is publicly owned by the S.C. Public Service Authority. State Heritage Preserves protect significant ecological areas at Congaree Creek and Congaree Bluff. Most of the privately owned land in the focus area is managed as timberland or agricultural land. Management for waterfowl and other wildlife species and wildlife-associated recreation are primary objectives of many landowners within the focus area. Because of the proximity of these bottomlands to the Columbia Metropolitan Area, many of the properties are owned by land consortiums as recreational properties. A limited number of the private lands in the focus area are under legal conservation easements. A portion of the Santee National Wildlife Refuge is within this focus area.

Special Recognition:

The Congaree/Wateree/Upper Santee Focus Area has several areas of ecological significance. Habitat created by seasonally-flooded bottomland hardwoods, numerous oxbow lakes and beaver ponds once supported one of the states highest wintering Mallard populations. Because of the diversity and abundance of neotropical migrants in the old growth forest preserved by the Congaree National Park, it has been designated as a "Globally Important Bird Area" by the National Audubon Society and the American Bird Conservancy. Finally, the

unique geologic formations and plant communities associated with the Congaree River Bluffs along the south side of the Congaree River have been defined by the University of South Carolina Herbarium as one of the most significant natural areas in the region. (John B. Nelson, personal communication) With the exception of one Heritage Trust site, the entire Bluff system is in private ownership.

Waterfowl:

The Wateree and Congaree Rivers have long been recognized as significant migratory corridors for waterfowl utilizing the Atlantic Flyway. Recognizing the value of this region to wintering waterfowl, the U.S. Fish and Wildlife Service created the Santee National Wildlife Refuge in 1942 to enhance the area as a waterfowl wintering ground. This area has supported large numbers of ducks and geese and is one of the most popular public waterfowl hunting areas in the state second only to the coastal tidal marshes.

In the 1970s, waterfowl numbers on the Santee National Wildlife Refuge exceeded 100,000 annually. These numbers were the result of a combination of habitat enhancements at the refuge and natural high quality waterfowl habitat on seasonally-flooded bottomlands on private properties throughout the focus area. A number of factors combined to negatively impact waterfowl habitat in the area during the 1980s and 90s resulting in a corresponding decline in waterfowl numbers. In recent years mid-winter waterfowl surveys have revealed fewer than 10,000 waterfowl using the Santee National Wildlife Refuge (Purcell, unpublished data). This has left waterfowl enthusiasts perplexed and looking to state and federal wildlife agencies for remedies to the situation.

Waterfowl surveys in the focus area reveal the presence of most species of North American puddle ducks during the winter months (Table 1.) (Baker, unpublished data). Wood Duck and Mallard are by far the most common puddle duck species wintering here. Ring-necked Duck are the only significant diving duck species, and occur in large numbers in years where food availability is good on Lake Marion. Ring-necked Duck are showing up in increasing numbers on private waterfowl impoundments in the area. Habitats in the river flood plains and in the Upper Santee Swamp are ideal breeding areas for Wood Duck and Hooded Merganser.

Table 1. Waterfowl species using the Congaree-Wateree-Upper Santee Rivers Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck			X
Mallard			X
Wood Duck	X	X	X

Green-winged Teal		X	X
Ring-necked Duck			X
Northern Pintail			X
Blue-winged Teal		X	
Gadwall			X
American Wigeon			X
Tundra Swan			X
Hooded Merganser	X		X

Other Migratory Birds:

Because of the vast acreage of bottomlands in the focus area, it supports a higher number of species of birds than many other similar habitats in the country. Studies have shown that many migratory birds are area sensitive, meaning that they require large tracts in order to sustain long-term population viability. The acreage of unfragmented bottomland forest in this focus area is a real highlight. Winter bird densities in excess of 800 birds per 40 hectares (100 acres) have been documented in areas of the Congaree River flood plain. (Cely, unpub. data). These are some of the highest songbird densities ever recorded for any forest type in North America. Neotropical migrants include warblers, vireos, tanagers, orioles, grosbeaks, thrushes, and flycatchers.

For many raptor species, the Congaree and Wateree River Corridors are part of the annual migration route towards the tropics in the fall and back to the North American breeding grounds in the spring. Osprey, Mississippi Kite, Swallow-tailed Kite, and Broad-winged Hawk are common migrants. Bald Eagle, Osprey and Red-tailed Hawk use the focus area as nesting grounds (Darr 2004).

Threats:

Waterfowl population declines in this once important wintering area have resulted partially due to habitat alterations since the 1970s. One of the most significant of these habitat influences has been the acceleration of short rotation clear-cutting as a timber management strategy. One study by the South Carolina Department of Natural Resources demonstrated that between 1979 and 1989, 24.6% of the bottomlands in the Congaree/Wateree/Santee system were clear-cut (Cely & Ferral 1990). Historically the Congaree and Wateree River bottoms provided excellent loafing and feeding areas for waterfowl due to the vast expanses of seasonally-flooded mast-producing hardwoods. Since most of the private lands in this forest system are now being managed on a 40-year timber rotation, mast production potential has declined. Short-rotation management has also lead to a shift in tree species composition that does not favor the oaks historically critical to waterfowl in this area.

The potential for fragmentation of the focus area's expansive bottomland hardwoods is a threat to the wildlife abundance and species richness found there. Maintenance of this large contiguous forest is vital for management of area-sensitive neotropical migrants.

Because of the proximity to the Columbia Metropolitan Area, the Congaree Bluffs along the western edge of the Congaree River are subject to rapid development. Several sections of the bluffs have been developed in recent years and real estate developers have proposals for more

development. Immediate action is needed to preserve these unusual land formations and to avoid the deterioration of this vital avian migratory corridor.

Conservation Recommendations:

Conservation needs for the Congaree/Wateree/Upper Santee Focus Area should be centered on preserving the integrity of this large undeveloped forested wetland. Incentives for private landowners to manage for longer rotations of timber should be sought. Portions of the area must be preserved for older growth forest management through acquisition or easements. A strategy to protect against fragmentation of this unique bottomland is vital. Measures should be taken to reduce impacts to water quality from non-point source pollution, leveeing, agriculture, and logging activity.

References:

Cely, J.E. and P. Ferral 1990. Bottomland Hardwood Clearing in the Congaree-Wateree-Santee River System, South Carolina. S.C. Department of Natural Resources.

Cely, J.E. 2003. South Carolina Department of Natural Resources. Unpublished Data.

Baker, O.E. 2004. South Carolina Department of Natural Resources. Unpublished Data.

Darr, A. 2004. Congaree Bluffs Heritage Preserve. Educational Bulletin, South Carolina Department of Natural Resources.

National Audubon Society, 2004. Important Bird Areas.

Purcell, M. 2004. U.S. Fish and Wildlife Service, Santee National Wildlife Refuge. Unpublished Data.

7.2.16 Vermont

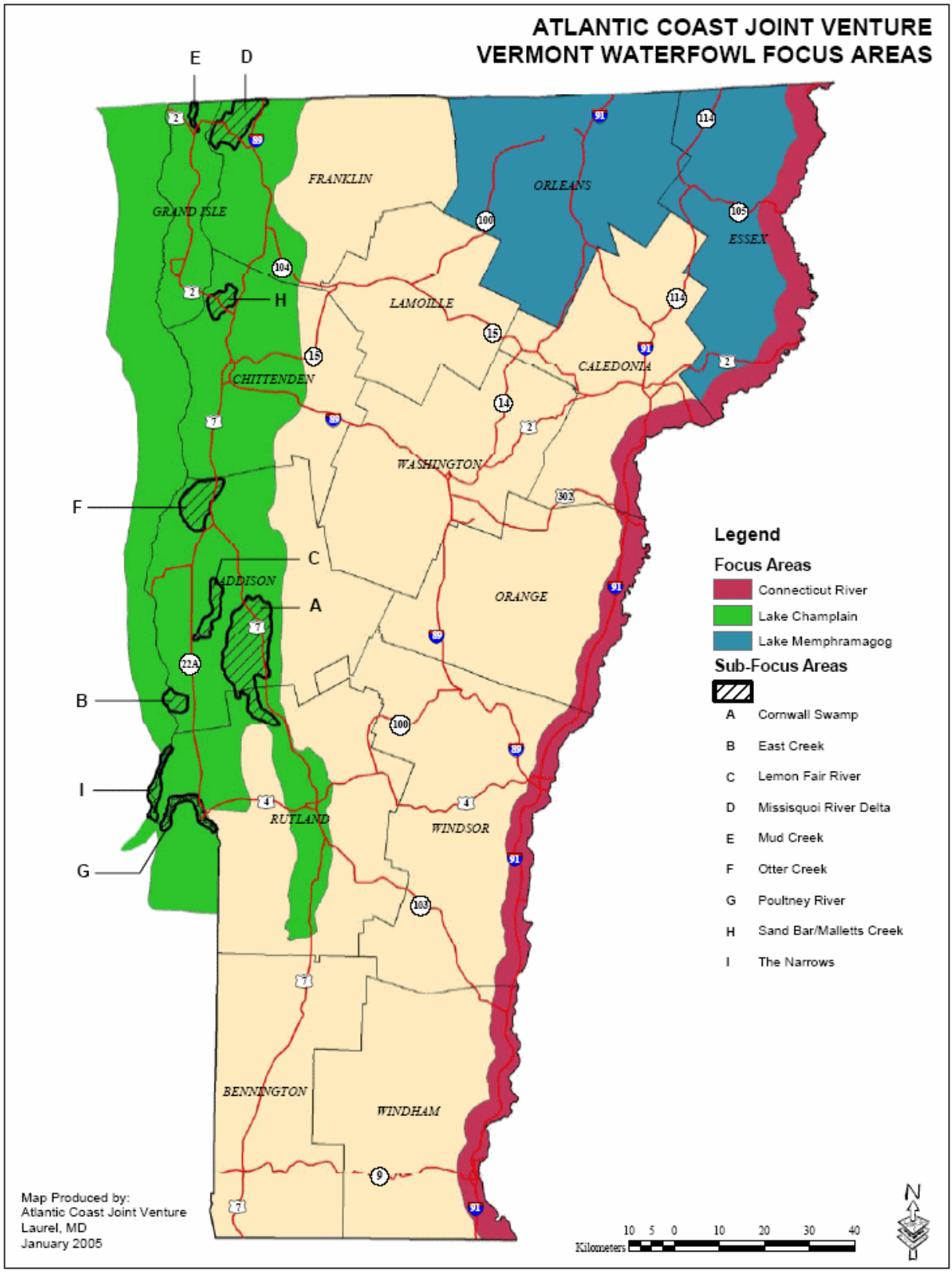

Figure 7.17. Vermont waterfowl focus areas.

Focus Area: Connecticut River, Vermont & New Hampshire
Sub-Focus Areas: None

Area Description:

The Connecticut River Focus Area is a shared focus area between Vermont and New Hampshire. It extends from Third Connecticut Lake on the New Hampshire/Quebec border to the Massachusetts state boundary. The focus area boundaries extend 5 kilometers (3 miles) from the centerline of the river into both Vermont and New Hampshire. The Connecticut River is the centerpiece of human settlement and early transportation in Northern New England. Early European settlers used the river as a means of penetrating the interior of the northeastern United States. The natural resources of the river and its watershed are rich. Although the Connecticut River valley is narrow, the watershed in the largest in New England at over 6,800 km^2 and the river accounts for over 70% of the freshwater inflow into Long Island Sound. Both sides of the river are punctuated by numerous oxbow wetlands, and extensive willow/alder swales, forested wetlands, and open, emergent marshes are adjacent to the river throughout much of its length. These wetlands provide important breeding and migratory stopover habitat several species of waterfowl and other priority bird species (e.g., American Woodcock, Canada Warbler). Although only 11% of the watershed is under agriculture, most of this lies adjacent to the river and within the focus area (U.S. Fish & Wildlife Service 1995). This agricultural area contains a concentration of diverse wetland habitats, as well as some of the richest, most productive soils in the eastern United States. Palustrine emergent and forested wetlands are both common in the valley. Forested wetlands are characterized by red maple with silver maple, cottonwood, and black willow in the floodplain forests, where they occur. Conifers include spruce-fir and northern white cedar. Agriculture is the dominant land use in the valley and includes fruits, grains, vegetables, dairy, and shade-grown tobacco. Agricultural crops often increase the value of sheet water habitats that commonly occur here, especially in the spring, and provide an important resource for migratory birds during their annual cycle.

Ownership/Protection:

Much of the Connecticut Valley is privately owned. However, many large tracts within and adjacent to the focus area are now either in conservation ownership or protected by conservation easements. The Vermont portion of the focus area includes 5,615 hectares (13,875 acres) of state land, 10,946 hectares (27,050 acres) of privately-owned conservation land, 2,610 hectares (6,450 acres) of municipally owned land, and 384 hectares (950 acres) of federal land. The focus area lies entirely within the approved boundaries of the Silvio O. Conte National Fish and Wildlife Refuge (SOC NFWR). Immediately to the west of the focus area in Vermont is the 8,903 hectare (22,000 acres) West Mountain Wildlife Management Area (WMA) and--further west--the 10,521 hectare (26,000 acres) Nulhegan Basin Division of the SOC NFWR. These lands are part of a contiguous 53,823 hectare (133,000 acres) block of land formerly owned by Champion International Paper Company and now held in easement or fee by conservation entities (33,993 hectares or 84,000 acres of which are on land owned by Essex Timber Company). Other large blocks of conservation land are on the New Hampshire side of the river, including a 69,403 hectare (171,500 acres) conservation easement brokered by the Trust for Public Lands, The Nature Conservancy (TNC) and the State of New Hampshire, and another 7,689 hectare (19,000 acres) parcel in conservation easement held by TNC. Several of these

projects were supported by a 2001 North American Wetland Conservation Act grant. Vermont state lands along the river include Roaring Brook, Fairlee Marsh and Skitchewaug WMA; Ascutney and Fort Dummer State Park; and Thetford Hill State Forest. In New Hampshire, public lands include the Lime Pond and Huntington Hill Conservation Easements; Fort Hill, Reeds, Hubbard Farms, Great Island, Cornish, and Wilder WMA; Hidden Valley Wildlife Conservation Area; Hubbard Hill, Cape Horn, and Connecticut River State Forest, and Wantastiquet Mountain Natural Area.

Special Recognition:

The Connecticut River is recognized as an American Heritage River through the Environmental Protection Agency. Its biodiversity values are recognized by the U.S. Fish and Wildlife Service with the entire Connecticut River Watershed identified under the Silvio O. Conte National Fish and Wildlife Refuge. Also, the U.S. Fish and Wildlife Services Regional Wetlands Concept Plan recognizes five wetland sites as priority wetlands (U.S.F.W.S. 1990). The Connecticut River was also designated into the New Hampshire Rivers Management and Protection Program.

Waterfowl:

The Connecticut River is a migratory corridor for many species of waterfowl. Ducks, including sea ducks, and geese use the corridor for both spring and fall migration. It contains prime breeding habitat for Wood Duck, Black Duck, Mallard, and Canada Goose. Other species nest within the focus area sporadically or in smaller numbers (Table 1), though many are commonly seen during migration (e.g., teal, Ring-necked Duck).

Table 1. Waterfowl species using the Connecticut River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X
Hooded Merganser	X	X	X
Common Merganser	X	X	X
Canada Goose	X	X	X
Wood Duck	X	X	
Blue-winged Teal	X	X	
Green-winged Teal	X	X	
Ring-necked Duck	X	X	
Common Goldeneye		X	X
Greater Snow Goose		X	
Atlantic Brant		X	

Other Migratory Birds:

The Connecticut River is rich with a diversity of migratory birds. Rails, grebes, Wilson's Snipe, and herons use the focus area for breeding and migration. Within the entire watershed, 181 passerine and raptor species have been identified (U.S Fish & Wildlife Service 1995). Priority species identified by Partners in Flight breeding within the Connecticut River Valley include Wood Thrush, American Woodcock, Olive-sided Flycatcher, Canada Warbler, Veery,

Bobolink, Northern Harrier, Common Loon, and Belted Kingfisher. Other species identified by various Continental and Regional Shorebird and Waterbird Conservation plans include Solitary Sandpiper (migration only) and breeding species such as American Bittern, Pied-billed Grebe, Virginia Rail, and Wilson's Snipe.

Threats:

The Connecticut River valley harbors some of the most intensive agriculture in the northeast. Pollution from agricultural runoff threatens the integrity of water quality and, thus, the value to wildlife. Recreation also is increasing on the river with as many as 400,000 people living within the watershed. Development is a threat with large, flat expanses of land available for second homes and other urban and suburban development. More non-native species (35) of fish live within the river than native species (33). Many of these species were introduced to provide more recreational opportunities. Fourteen functional dams are on the mainstem of the river and have significantly altered habitat throughout the river system and impeded natural fish migration. Within the watershed, 980 dams are located on the tributaries.

Conservation Recommendations:

The purpose of the Silvio O. Conte National Fish and Wildlife Refuge is to protect the native diversity of flora and fauna throughout the Connecticut River Watershed. The actions of the refuge include working with all partners within the watershed through a variety of federal and state programs to meet the goals set forth by the refuge. These programs, not limited to the refuge, include land acquisition, managing or regulating public use, control of exotic species, dam removal, and other programs designed to enhance and conserve the rich natural resources of the Connecticut River Valley.

References:

U.S. Fish and Wildlife Service. 1990. Regional wetlands concept plan: Emergency Wetlands Resources Act. U.S. Fish and Wildl. Serv., Hadley, MA.

U.S. Fish and Wildlife Service. 1995. The Silvio O. Conte National Fish and Wildlife Refuge: Final action plan and environmental impact statement. U.S. Fish and Wildlife Service, Hadley, MA 535 pp.

Focus Area: Lake Champlain Valley, Vermont/New York
Sub-Focus Areas: Vermont: East Creek, Cornwall Swamp, Lemon Fair River, Otter Creek, Sand Bar/Mallets Creek, Mud Creek, and Missisquoi River Delta. New York: Ausable/Wickam Marshes, Bulwagga Bay, Dead Creek, King Bay, Monty Bay, South Bay, and Webb Royce Swamp
Shared sub-focus areas: Poultney River and The Narrows

Area Description:

The Lake Champlain Valley Focus Area encompasses 398,851 hectares (985,577 acres) and includes the narrow Lake Champlain Valley between the Adirondack Mountains of New York and the Green Mountains of Vermont. The valley is very different from the surrounding areas with a strong alliance to the St. Lawrence Valley and the Great Lakes lowlands (Thompson and Sorenson 2000). Historically, the valley was dominated by northern hardwoods (Laughlin and Kibbe 1985). However, fertile soils and gently rolling topography made the valley one of the most productive agricultural areas in the northeastern United States and one of the first inland areas to be colonized by Europeans. As a consequence, much of the forest was cleared for agricultural purposes. Currently, agriculture is the dominant land use with only small fragments of forest remaining, although, increased farm abandonment is leading to reforestation of agricultural lands. The wetlands of the Lake Champlain Valley form numerous and diverse communities. Much of the lakeshore wetlands are comprised of floodplain forests that are flooded every spring with the rise of water levels. In addition, highly productive forested, emergent, and scrub-shrub wetlands are associated with the deltas formed by several large rivers draining into the lake. Submerged aquatic vegetation is prevalent in the shallow bays especially in the Missisquoi Bay on the northern end of the lake and South Bay in the extreme southern end. Also, several unique lakeside bogs are located in the northern one-third of the lake. Palustrine forested and emergent wetlands created through beaver activity make up most of the wetlands found throughout the valley and associated with the many tributaries that feed into Lake Champlain. Sub-focus areas encompass 45,248 hectares (111,809 acres).

Ownership/Protection:

Much of the Lake Champlain Valley is in private ownership. However, the states of Vermont and New York own a number of Wildlife Management Areas and State Parks along the shore of Lake Champlain. Much of the New York side of Lake Champlain forms the eastern boundary of the Adirondack Park extending from approximately Port Kent, New York to the southern tip of the lake, South Bay. Federally-owned properties include the Missisquoi National Wildlife Refuge, which encompasses the Missisquoi Delta, the largest wetland delta on Lake Champlain.

Special Recognition:

Lake Champlain was designated a resource of national significance in 1990 by the Lake Champlain Special Designation Act (Public Law 101-596). The Lake Champlain Basin Program was established to help coordinate the activities envisioned by the Act. The diversity of Lake Champlain and the surrounding Adirondack Mountains were designated as a Biosphere Reserve in 1989 as part of the United Nations Man and the Biosphere Reserve Program. Biosphere Reserves are "areas of terrestrial and coastal ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use." They are areas of terrestrial and coastal

ecosystems promoting solutions to reconcile the conservation of biodiversity with its sustainable use. Biosphere Reserves serve in some ways as 'living laboratories' for testing and demonstrating integrated management of land, water and biodiversity.

Waterfowl:

The Lake Champlain Valley provides breeding and, more importantly, staging and migration habitat for thousands of waterfowl. Aerial censuses conducted annually in October by the Vermont Fish and Wildlife consistently reports between 20,000 and 40,000 individuals of thirty or more species. The more numerous species include American Black Duck, Mallard, Wood Duck, Green-winged Teal, Greater and Lesser Scaup, Common Goldeneye, Ring-necked Duck, and Common Merganser. Many of the wetlands surrounding the lake contain highly preferred foods such as wild rice and duck potato. In addition, waste grain from the fertile farm fields surrounding Lake Champlain in both Vermont and Quebec, Canada provide ideal feeding habitat for ducks and for migrating Canada Goose (Atlantic Population) and Greater Snow Goose.

Table 1. Waterfowl species using the Lake Champlain Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	
Mallard	X	X	
Wood Duck	X	X	
Green-winged Teal		X	
Ring-necked Duck		X	
Lesser Scaup		X	
Greater Scaup		X	
Common Goldeneye	X	X	
Common Merganser		X	
AP Canada Goose		X	
Greater Snow Goose		X	

Other Migratory Birds:

The agricultural landscape interspersed with highly productive wetlands of the Lake Champlain Valley provide habitat for a number of breeding and migratory species. The emergent and forested wetlands of the Missisquoi National Wildlife Refuge support the largest breeding colonies of Great Blue Heron and Black Tern in Vermont. Other high priority wetland-dependent species breeding in the focus area include American Bittern, Least Bittern, Sora, Virginia Rail, Common Moorhen, and American Woodcock. The uplands of this agricultural landscape are the most important for Vermont's grassland species (Darmstadt et al. 1997). The focus area supports high priority landbirds such as Upland Sandpiper and Bobolink (Darmstadt et al. 1997, Rosenberg 2000). Farm abandonment and subsequent reforestation is increasing the number and size of forest patches in the Lake Champlain Valley. Species associated with these types of habitats, such as Cerulean Warbler and Wood Thrush, should be considered when planning conservation actions.

Threats:

The Lake Champlain Valley Focus Area faces a number of threats. Increasing residential development, especially in the northern one-third, and commercial and industrial development lead to habitat loss and degradation of critical wetlands. Lakeside and deltaic wetlands found at the mouths of the major rivers are the most threatened. Water quality is a major issue in Lake Champlain with phosphorous as the most serious threat (Lake Champlain Basin Program 1996). Wastewater treatment and industrial discharge account for most of the point-source phosphorous loading into Lake Champlain. Non-point sources originate from runoff from the intensely developed residential shoreline of the lake and agricultural runoff. This nutrient loading causes algal blooms and rapid growth of plants especially exotic plants such as water chestnut, Eurasian milfoil, and purple loosestrife. Also, zebra mussels and sea lampreys represent a serious threat to the integrity of Lake Champlain.

Conservation Recommendations:

Disturbance to breeding and migrating birds should be minimized or eliminated, especially to the concentrations of Great Blue Heron and Black Tern. Efforts should be made to control point and non-point source pollution to improve the water quality of Lake Champlain. Control of invasive species is needed to maintain or improve the biodiversity and habitat quality of the lake and the associated wetlands and uplands. Also, effort should be made to support and engage the Lake Champlain Basin Program and its mission to coordinate the development of a comprehensive plan for the Lake Champlain Basin.

References:

Binhammer, J. 1992. Lake Champlain wetlands acquisition study. Vermont Nature Conservancy, 47pp.

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Lake Champlain Basin Program. 1996. Opportunities for action: an evolving plan for the future of the Lake Champlain basin. Lake Champlain Management Conference. 92pp.

Laughlin, S.B. and D.P. Kibbe, editors. 1985. The atlas of breeding birds of Vermont. University Press of New England, 456pp.

Rosenberg, K.V. 2000. The St. Lawrence Plain. Draft Partners in Flight Bird Conservation Plan.
40 pp.

Thompson, E.H., and E.R. Sorenson. 2000. Wetland, woodland, wildland: a guide to the natural communities of Vermont. University Press of New England, 456pp.

Focus Area: Lake Memphremagog, Vermont
Sub-Focus Areas: None

Area Description:

The Lake Memphremagog Focus Area encompasses 313,816 hectares (775,452 acres) and includes the entire county of Orleans and parts of Essex. The eastern border is adjacent to the Connecticut River Focus Area, which extends 5 kilometers (3 miles) from the center of the river. The topography of the focus area varies from gently rolling hills in the valleys and around the lake to a number of peaks reaching over 1,000 meters (3,280 feet) on the eastern edge near the Connecticut River. The area is mostly forested with spruce-fir forests dominated by balsam fir and red spruce with black spruce in the wetter areas (Laughlin and Kibbe 1985). At lower elevations, hardwood forests dominate the landscape made up of sugar maple, yellow birch, and beech with hemlock on the steeper slopes (Thompson and Sorenson 2000). Silver maple is dominant in the floodplain forests where they occur. Agriculture is limited and is concentrated around the flatter topography of southern Lake Memphremagog, which has characteristics similar to the Lake Champlain lowlands (Laughlin and Kibbe 1985). The focus area is laced with rivers and creeks. Remote wooded swamps, bogs, and beaver flowages are prevalent over the Lake Memphremagog area. The area is poorly drained over large expanses and generally less productive with more acidic water than Lake Champlain. However, the value of the area lies in the aggregate of the many remote wetlands that have high value for Black Duck and other waterfowl and waterbirds. A few relatively large wetlands occur around the Black and Barton Rivers at South Bay in Lake Memphremagog and along the Clyde River, also near the southern end of the lake. Several large lakes, including Memphremagog, occur in the focus area and include Seymour, Averill, and Caspian Lakes and Lake Willoughby. These areas provide important deep-water habitat for species such as Common Loon.

Ownership/Protection:

The majority of the focus area is privately owned. However, over 40,480 hectares (100,027 acres) of private forest lands are publicly accessible. The State of Vermont manages six Wildlife Management Areas including the 4,170 hectare (10,374 acres) Bill Sladyk and the 9,190 hectare (22,708 acres)) West Mountain Areas. In addition several state parks and state forests are within the boundaries of the focus area including Groton State Forest, Vermont's second largest parcel of state-owned land at 10,580 hectares (26,143 acres). The U.S. Fish and Wildlife Service's Silvio O. Conte National Fish and Wildlife Refuge manages the Nulhegan Basin, a 10,520 hectare (25,995 acres) National Wildlife Refuge adjacent to West Mountain Wildlife Management Area.

Special Recognition:

Nine wetland sites are recognized by the U.S. Fish and Wildlife Services Regional Wetlands Concept Plan as priority wetlands (U.S. Fish and Wildlife Service 1990). These sites include Black River Marsh, Buck Flat Marsh, Hall's Creek Marsh, John's River Marsh, Southern Lake Memphremagog Wetlands, Clyde River Marshes, Ferdinand Bog, Nulhegan Pond, and Victory Basin.

Waterfowl:

The value of this focus area lies in the remote, relatively undisturbed wooded wetlands available to breeding Black Duck. It also provides important habitat needs during migration for a high diversity of species, including several species of diving ducks (e.g., scaup).

Table 1. Waterfowl species using the Lake Memphremagog Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	
Wood Duck	X	X	
Blue-winged Teal	X	X	
American Green-winged Teal	X	X	
Hooded Merganser	X	X	
Common Merganser	X	X	
Ring-necked Duck	X	X	
Canada Goose	X	X	
Mallard	X	X	
Common Goldeneye		X	
Bufflehead		X	
Lesser Scaup		X	
Greater Scaup		X	

Other Migratory Birds:

A number of other species of migratory birds use the Lake Memphremagog Focus Area. This is an important nesting area for a number of priority species including Common Loon, American Bittern, Spruce Grouse, Veery, American Woodcock, and Olive-sided Flycatcher. High priority warblers include Blackburnian, Cape May, Bay-breasted, Black-throated Blue, Canada, and Chestnut-sided. The focus area includes parts of the breeding range for Bicknell's Thrush, one the highest priority birds in the northeastern United States

Threats:

Commercial timber harvesting and production has had a profound impact on the forested landscape in this area. Loss of timber production could result in the conversion to urban development and loss of valuable habitat and increased disturbance. Also, timber harvesting operations can result in degraded habitat quality of wetlands important to breeding and migrating waterfowl. Recreational use of the focus area is extensive. Many of the remote wetlands valuable for breeding Black Duck are subject to disturbance with hikers and other recreational enthusiasts. Second home and camp development on the larger lakes is increasing with a concomitant increase in disturbance to breeding birds.

Conservation Recommendations:

Although timber harvesting can be detrimental to wetland quality, it is extremely valuable to the local and regional economy. Loss of the economic sustainability of the industry could result in permanent loss of wetlands through development. Long-term maintenance of the forest habitat should be ensured through careful planning (Rosenberg and Hodgman 2000). Disturbance to remote wetlands and water bodies important for waterfowl and waterbird nesting

should be minimized, through buffer zones that limit harvest intensity. Further development (shoreline or adjacent) of remote lakes and ponds should be minimized through fee or easement acquisitions of property that provides high quality habitat.

References:

Laughlin, S.B., and D.P. Kibbe. 1985. The atlas of breeding birds of Vermont. Univ. Press of New England, Hanover, NH. 456pp.

Rosenberg, K.V., and T.P. Hodgman. 2000. Eastern spruce-hardwood forest: Partners in Flight Bird Conservation Plan – Draft 1.0. American Bird Conservancy. 48pp.

Thompson, E.H., and E.R. Sorenson. 2000. Wetland, woodland, wildland: a guide to the natural communities of Vermont. Univ. Press of New England, Hanover, NH. 456pp.

U.S. Fish and Wildlife Service. 1990. Regional wetlands concept plan: Emergency Wetlands Resources Act. U.S. Fish and Wildlife Service, Hadley, MA.

7.2.17 Virginia

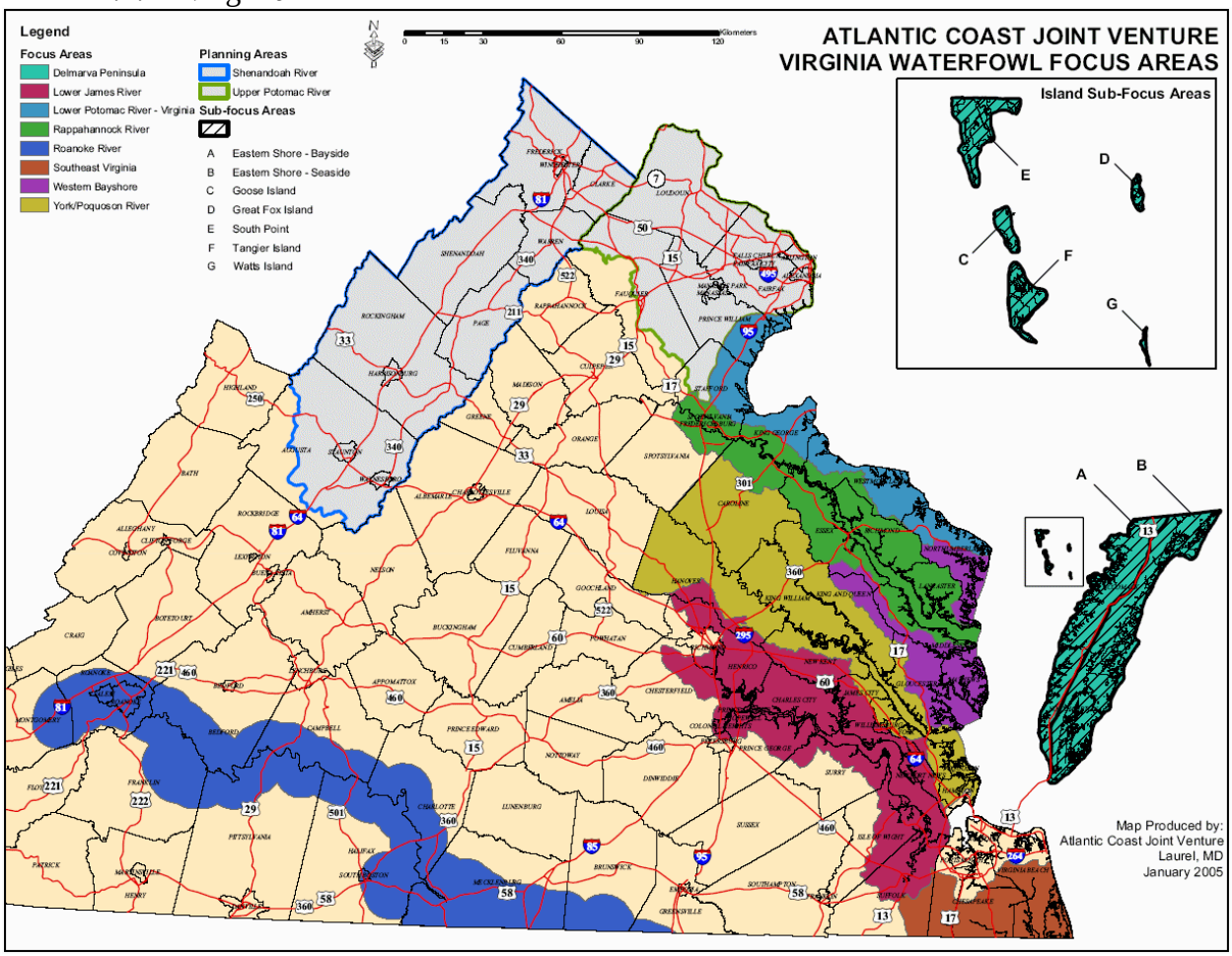

Figure 7.18. Virginia waterfowl focus areas.

Focus Area: Delmarva Peninsula, Virginia
Sub-Focus Areas: Islands, Eastern Shore-Bayside, Eastern Shore-Seaside

Area Description:

The Eastern Shore of Virginia contains a wide diversity of waterfowl habitats. An extensive set of coastal salt marshes and series of undeveloped barrier islands run the length of the Eastern Shore from Maryland to Fishermans' Island National Wildlife Refuge (NWR). On the Bayside of the Shore, brackish tidal marshes abound from Saxis Island to Hacks Neck encompass 102,225 hectare (252,601 acres). A series of islands occurs in the Chesapeake Bay along these brackish marshes. The Eastern Shore is primarily a rural agricultural, aquacultural community and includes 149,661 hectare (369,819 acres). Many individuals earn their living from the wetland community, including oystermen, crabbers, clammers, and commercial fishermen. Historically, the Eastern Shore was a hardwood-dominated mosaic of upland and wetland interspersed with freshwater, brackish, and saltwater emergent marshes. The high quality agricultural soil types resulted in the clearing and draining of much of these areas for production. In recent times, an agricultural shift has occurred from row crops to commercial vegetable production, resulting in a loss of foraging habitat for many waterfowl species. Additionally, many individuals have taken to purchasing tracts of former wetlands and restoring these sites to emergent marsh systems, resulting in the concentration of waterfowl on managed wetland habitats. The total area of this focus area is 251,886 hectares (622,420 acres).

Ownership/Protection:

Several groups are working to protect the valuable habitats on the Eastern Shore. Three National Wildlife Refuges (NWR's) are located in this focus area. Chincoteague National Wildlife Refuge NWR is located on the Maryland border, and the Eastern Shore NWR and Fishermans' Island NWR are located on the extreme southern end of the Shore. The Nature Conservancy owns several of the seaside barrier islands, and owns or holds conservation easements on a number of seaside farms. The Virginia Department of Game and Inland Fisheries owns four wildlife management areas, two on the bayside and two on the seaside (The GATR tract, Mockhorn Island Wildlife Management Area (WMA), Saxis WMA and Guard's Shore WMA) The Virginia Department of Conservation and Recreation owns one state park and two natural areas and a barrier island (Wreck Island) on the bayside of the eastern shore. Additionally, many individuals have taken to purchasing tracts of former wetlands and restoring these sites to emergent marsh systems, resulting in the concentration of waterfowl on managed wetland habitats.

Special Recognition:

In 1979, the Eastern Shore was designated as an International Biosphere Reserve by the United Nations, a site where globally important natural resources have been preserved largely intact through compatible human uses of the landscape. In 1990, the seaside barrier islands and associated beach habitat was designated as a Western Hemisphere Shorebird Network Site due to the overwhelming amount of habitat and shorebird utilization of the area.

Waterfowl:

Five High Priority Species (Black Duck, Mallard, Pintail, Greater and Lesser Scaup) benefit from habitats located within the focus area. Managed wetland impoundments located throughout the peninsula will be heavily utilized by Black Duck, Mallard, and Northern Pintail and other dabbling ducks during the fall, winter and migration periods. The natural emergent marshes are also heavily used by Black Duck and moderately used by the other species in the same time frame. The broad shallow flats of the Bayside Islands Sub-Focus Area are heavily populated with diving ducks, including Greater and Lesser Scaup during the wintering period. Other priority species that benefit from the habitat in this focus area are Atlantic Brant, Wood Duck, Redhead, Canvasback, and American Wigeon. The seaside marshes and bays are one of the major concentration areas for Atlantic Brant along the east coast. Between 15-20,000 Atlantic Brant winter here each year, primarily on the mudflats interspersed among the seaside barrier islands. These birds feed upon the underwater grasses (sea lettuce) that abounds in these habitats. Redhead and Canvasback winter in the same areas as the Greater and Lesser Scaup, feeding upon submerged aquatic vegetation (SAV) upon the broad, shallow flats. American Wigeon utilize the managed impoundment and natural emergent marshes for wintering habitat. Wood Duck utilize the abundant freshwater marshes during migration. Other waterfowl species that stage or winter in this area include, Atlantic Population Canada Goose, Tundra Swan, Greater Snow Goose, Gadwall, resident Canada Goose, Blue-winged Teal, and Green-winged Teal.

Species that will benefit during the breeding season include the Mallard, Black Duck and Wood Duck. The coastal islands provide relatively undisturbed nesting habitat for the majority of Black Duck nesting in Virginia. Mallard are increasing utilizing these sites as well, and also nest in more disturbed areas inland. Wood Duck nest in a variety of areas adjacent to the natural freshwater wetlands. Resident Canada Goose have dramatically increased use of the bay islands as nesting habitat. The importance of these marshes and associated open water habitat for Atlantic Brant, sea ducks, Tundra Swan, diving ducks, American Wigeon and Black Duck cannot be overstated.

Table 1. Waterfowl species using the Delmarva Peninsula Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
American Wigeon		X	X
Canvasback		X	X
Redhead		X	X
Wood Duck	X	X	
Tundra Swan		X	X
Atlantic Brant		X	X

Greater Snow Goose		X	X
Blue-winged Teal		X	
Green-winged Teal		X	X
AP Canada Goose		X	X

Other Migratory Birds:

This focus area is recognized as a globally-important coastal migration corridor for passage of millions of songbirds, shorebirds, raptors, seabirds, waterfowl, and wading species. Additionally, this area supports more than 90 % of the breeding colonial waterbirds (other than Great Blue Heron) in Virginia including but not limited to; the Snowy Egret, Tricolored Heron, Little Blue Heron, and Black-crowned Night-Heron, Forester's Tern and Common Tern, and a higher percentage of the non-colonial beach nesting species within the region. High priority beach nesting species such as the Piping Plover, Wilson's Plover, and Least Tern require sandy beaches with sparse vegetation that are close in proximity to foraging areas. American Oystercatcher, Gull-billed Tern, and Black Skimmer use similar habitats but also nest on shell rakes within lagoon systems, sandy bay islands, and high berms within marshes.

Populations of Piping Plover and Wilson's Plover have remained somewhat stable around 100 pairs and 40 pairs respectively. American Oystercatcher has declined 40 % in the past twenty years. Nearly 500 breeding pairs of American Oystercatcher currently nest in this focus area and constitute over 80 % of the total breeding population in Virginia. Black Skimmer and Gull-billed Tern have declined nearly 75 % from highs in the late 1970's. Populations of these species within the focus area represent 80-85 % of all breeding individuals in Virginia.

The extensive complex of high salinity marshes supports a number of species with elevated conservation concerns. Seaside Sparrow and Clapper Rail use low and high marsh zones but reach their highest densities in lower portions of the marsh. Other species such as Black Rail, Sedge Wren, Prairie Warbler, Salt Marsh Sharp-tailed Sparrow, and Henslow's Sparrow are primarily associated with high marsh zones. The size and physiognomy of high marsh zones are important features that determine the incidence of each of these species. Sedge Wren and Salt Marsh Sharp-tailed Sparrow reach the southern limit of their breeding distribution in Accomack County, Virginia and reach only 50 % incidence in even the largest marshes. In winter, these species along with Nelson's Sharp-tailed Sparrow are more abundant and occur across a wider breadth of marsh conditions. The historical Atlantic Coast population of Henslow's Sparrow has drastically declined and is currently only known to occur at a few sites including Saxis Wildlife Management Area. Black Rail are restricted to high marsh zones composed of saltmeadow hay and at least 50 % saltgrass. The greatest amount of this type of marsh in Virginia is located within this focus area.

Small fragments of bottomland and swamp habitats are scattered across the Delmarva Peninsula. These habitats support small populations of Acadian Flycatcher, Yellow-throated Vireo, and Prothonotary Warbler. Additionally, six percent of the Virginia breeding population of Bald Eagle nest on the eastern shore.

Threats:

Recently, properties along the waterfront on both sides of the shore have been increasingly developed. Continued conversion of agricultural and forestland to urban uses is a threat to this area. The conversion of agricultural row crops to commercial truck farming reduces foraging habitat for migratory birds. New introduction and spread of existing exotic invasives in this area continues to reduce available wildlife habitat. Declining water quality in the Chesapeake Bay and seaside marshes continue to be a threat to submerged aquatic vegetation (SAV). Increased aquaculture and the corresponding reduction in wetland habitats continue to be a threat.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Exotic invasives, such as *Phragmites* are continuing to gain a foothold in the area, and treatment of these sites needs to be continued. Future zoning of lands to reduce development will ensure the continued rural setting of this community.

Planning Area: Lower Potomac River, Virginia
Focus Areas: None

Area Description:

The Potomac River focus area is located in Northeast Virginia encompassing 168,573 hectares (416,551 acres). The area as a whole is considerably developed, as would be expected in Northern Virginia. The brackish and freshwater tidal wetlands are relatively undeveloped, and provide a wide diversity of habitat for many waterfowl species. The Potomac River proper is owned by the State of Maryland, and is not included in the focus area. The adjacent marshes are located in Virginia and are included. These marshes are composed of highly brackish *Spartina* marshes near the mouth of the Potomac to freshwater *Peltandra, Lotus* and wild rice marshes inland. Historically, hardwood forests dominated areas beyond the river. These forests have given way to row crop agriculture, truck farms, horse/hobby farms, loblolly pine plantations, and residential and industrial development. In recent historical times, the shallow water areas of the Potomac have a history of high-density submerged aquatic vegetation (SAV) beds (*Hydrilla*).

Ownership/Protection:

The majority of land in this focus area is in private ownership. The U.S. Fish and Wildlife Service owns Masons Neck National Wildlife Refuge (NWR) and Marumsco NWR, The Virginia Department of Conservation and Recreation owns several state parks, Mason Neck State Park, Leesylvania State Park, Caledon Natural Area, and Westmoreland State Park, as well as several small natural area preserves. Additional federal ownership in the area includes Quantico Marine Corps Base, Dahlgren Laboratory, George Washington Birthplace National Monument, and Fort Belvoir Military Reservation.

Special Recognition:

The Chesapeake Bay Estuarine Complex received Ramsar designation in1987.

Waterfowl:

Six high priority species, (Black Duck, Mallard, Pintail, Greater and Lesser Scaup, Southern James Bay Population Canada Goose) utilize this area for wintering and migration habitat. The puddle duck species and Canada Goose utilize flooded marshes and the adjacent rivers and lakes for food in the form of invertebrates, plant material and seeds. The scaup use the adjacent open-water marshes to feed on submerged aquatic vegetation (SAV), and other invertebrates. Other priority species, including the Wood Duck, American Wigeon, Redhead, Canvasback and Ring-necked Duck heavily utilize these same areas for foraging and loafing. Wood Duck and both teal species abound in the emergent marshes for brood rearing (Wood Duck) and staging in the early fall.

Table1. Waterfowl species using the Potomac River Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X

Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
Ring-necked Duck		X	X
Tundra Swan		X	X
AP/SJBP Canada Goose		X	X
Gadwall		X	X
Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X

Other Migratory Birds:

This area supports nearly 25 % of the coastal population of Bald Eagle in Virginia. Waterfront development and increased urbanization is the most important limiting factor on the distribution and future population trends of Bald Eagle and many other species in this focus area. Small, narrow fragments of bottomland and swamp forest border Potomac River tributaries but represent a relatively minor component of this area compared to other focus areas in coastal Virginia. However, these forested wetlands provide habitat for Acadian Flycatcher, Yellow-throated Vireo, Northern Parula, and Prothonotary Warbler. Small, isolated populations of Swainson's Warbler and Worm-eating Warbler may be found in forested wetlands with dense understory vegetation. Tidal marshes are irregularly distributed along the shores of the Potomac River but are extensive along some of the associated creeks and tributaries. These habitats are important for Virginia Rail, Sora, American Bittern, and Least Bittern. Marshes in the lower salinity zones and upper reaches of the Potomac River also support King Rail. Historical records indicate that the coastal plain Swamp Sparrow inhabited these areas as well. However, their complete distribution among the marshes in this focus area is unknown.

Threats:

Additional development of riparian and forested areas remains a large threat. Increasing stormwater runoff, with increased siltation and chemicals associated with urbanization degrade water quality. Increasing boat traffic, both recreational and work related, reduce refuge areas and push waterfowl to less favorable sites.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields and farmed

wetland pasture that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Preservation of bottomland hardwood forest for nesting Wood Duck and other cavity nesting passerines needs to be addressed.

Focus Area: Lower James River, Virginia
Sub-Focus Areas: N/A

Area Description:

The Lower James River Focus Area encompasses 445,277 hectares (1,100,299 acres) and includes the James River and it's tributaries from its mouth in the Chesapeake Bay to the non-tidal fall line near Richmond Virginia. It includes the Nanesmond River, the Chickahominy River, the Appomattox River and other tributaries. The area is known for its extensive brackish and freshwater tidal marshes along the expanse of the river. Extensive freshwater wetlands are found adjacent to tributary streams, and beaver ponds abound in the vicinity. Historically, hardwood forests covered the upland and interior wetland areas. This site was one of the first and most highly developed during colonial times. Currently, the area is highly developed, intermixed with low-density rural sites. Agricultural row-crops are giving way to development and planting of loblolly pine plantations.

Ownership/Protection:

The vast majority of land in this watershed is in private ownership. The U.S. Fish and Wildlife Service own the James River/Presquile National Wildlife Refuge. The federal government also owns other lands including Fort Eustis Military Reservation and Jamestown Island National Historic Site. The Virginia Department of Game and Inland Fisheries owns three sites, The Chickahominy Wildlife Management Area (WMA), Hog Island WMA, and Ragged Island WMA, each which have a large component of wetland habitat. Dutch Gap Conservation Area is owned and managed by Chesterfield County. The Virginia Department of Conservation and Recreation owns Chippokes Plantation State Park. A few large historic farms in private or corporate ownership provide the most area on private land managed for waterfowl.

Special Recognition:

The Chesapeake Bay Estuarine Complex received Ramsar designation in 1987.

Waterfowl:

Six priority waterfowl species (Black Duck, Mallard, Northern Pintail, Greater and Lesser Scaup, Southern James Bay Population Canada Goose) benefit from habitats located within the focus area. Emergent marshes along the James are heavily used by Black Duck and Mallard, and moderately used by Pintail and other dabbling ducks during the fall, winter and migration periods. Diving ducks including Greater and Lesser Scaup, Canvasback, and Ring-necked Duck use the lower James for feeding and resting during the migration and wintering period. Large numbers of Atlantic Population and Southern James Bay Population Canada Goose use the marshes and adjacent agricultural fields during the migration and wintering periods. Other priority species, which utilize this area for migration and wintering habitat, include Wood Duck, Redhead, Canvasback, Ring-necked Duck, and American Wigeon. Wood Duck and American Wigeon utilize the emergent marshes for foraging habitat, while Redhead, Canvasback, and Ring-necked Duck utilize submerged aquatic vegetation (SAV) beds for foraging. Other waterfowl species found in these habitats include Tundra Swan, Blue-winged and Green-winged Teal, Gadwall, and Merganser. Species that will benefit during the breeding season include the Mallard and Wood Duck.

Table 1. Waterfowl species using the Lower James Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck		X	X
Mallard	X	X	X
Northern Pintail		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
American Wigeon		X	X
Canvasback		X	X
Redhead		X	X
Ring-necked Duck		X	X
Wood Duck	X	X	
Tundra Swans		X	X
Greater Snow Goose		X	X
Blue-winged Teal		X	
Green-winged Teal		X	X
AP Canada Goose		X	X
Gadwall		X	X
Northern Shoveler		X	X
Bufflehead		X	X
Ruddy Duck		X	X

Other Migratory Birds:

This focus area is vital for recovery of the Chesapeake Bay Bald Eagle population and is recognized as having the largest summer concentration of non-breeding Bald Eagle east of the Mississippi River. Nearly 30 % of the breeding territories of the Virginia portion of the Chesapeake Bay Bald Eagle population are found in this area. Waterfront development is the most important limiting factor on the distribution and future population trends of Bald Eagle in this focus area. The forested wetlands of the James and Chickahominy Rivers support significant populations of Acadian Flycatcher, Yellow-throated Vireo, and Prothonotary Warbler. Although Acadian Flycatcher and Yellow-throated Vireo are found in upland habitats, they reach their highest density in riverine wetlands of this area. The Prothonotary Warbler is a secondary cavity nester so cavity availability limits habitat use. Prothonotary Warbler require a low, open canopy and moderate to high density of small stems and reach their highest densities in the flooded portions of these floodplains. Emergent wetlands are irregularly distributed along these tributaries and vary in suitability for different birds species based on salinity and associated physiognomic conditions. Marshes in tidal fresh and oligohaline zones (nearer to the fall line) are important breeding areas for King Rail whereas marshes in mesohaline zones and higher salt concentrations (nearer to the Chesapeake Bay) are more suitable for species such as Seaside

Sparrow. Least Bittern are distributed across the entire range of salinity conditions and reach high densities within marshes of this focus area.

Threats:

Continued conversion of agricultural and forestland to urban uses is the greatest threat to this area. Changing habitats from high quality hardwood forests to loblolly pine plantations impact habitat quality. The lack of high quality riparian buffers impacts water quality. New introduction and spread of existing exotic invasives in this highly populated area can reduce available wildlife habitat.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior converted crop fields that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Restoration of streamside riparian buffers will improve water quality in the James River and the Chesapeake Bay. Exotic invasives, such as *Phragmites* are continuing to gain a foothold in the area, and treatment of these sites needs to be continued.

Focus Area: Rappahannock River, Virginia
Sub-Focus Areas: None

Area Description:

The Rappahannock River Focus Area is located in east-central Virginia covering portions of the Counties of Richmond, Lancaster, King George, Spotsylvania, Essex, and Middlesex. Encompassing 299,296 hectares (739,575 acres), the Lower Rappahannock Valley is within the Coastal Plain Province. Major physiographic units within the area include coastal plain uplands, low marine terraces, and fluvial river terraces. These terraces flank the River and are part of the Essex Escarpment. Historically the ocean floor, these lowlands follow the 15 meter (50 feet) contour line and are separated from adjacent uplands by the Essex Scarp. In some locations the Essex Scarp borders the river forming high bluffs and steep cliffs that attract large concentrations of federally threatened Bald Eagle. Much of the remaining land above the Essex Escarpment in the area is coastal plain uplands.

Most of the Rappahannock River Valley is dominated by forested uplands. These habitats are found on dry, well-drained sites and are vegetated by oak, yellow poplar, hickory, beech, and loblolly pine. A major habitat component of the area includes fresh, brackish, and saltwater tidal marshes, which provide some of the highest wildlife values in the estuarine ecosystem. The Rappahannock River's freshwater tidal marshes are usually eutrophic or hypereutrophic and occur at salinities from 0.0 parts per thousand to 0.5 parts per thousand. Plant diversity is high and includes federally threatened sensitive joint vetch, and other species such as wild rice, arrow arum, bur marigold, and smartweeds. Marshes located in the middle and downstream portion of the River are dominated by those vegetative species more adapted to higher salinities. Vegetative communities are primarily composed of big cordgrass, saltmarsh cordgrass, and brackish mixed communities. Interspersed throughout these marshes are tidal guts, creeks, ponds, and potholes. Salt marshes are major producers of detritus and they serve as a growth substrate for algae and other organisms. Marshes, with the dense mat of vegetation found in them, serve to control erosion by buffering wave energy and binding up the marsh substrate. Bottomland hardwood wetlands present on the river were formed from the deposition of alluvial material and downcutting of surface geology over time. These systems are dependent upon waterborne sediments to maintain substrate elevation relative to the river. Dominant tree species in these wetlands include river birch, sycamore, red maple, green ash, and black gum, with some bald cypress. Much of the land surrounding the Rappahannock River is in agricultural use. Major components of this land use type include cropland and to a much lesser degree, pastureland. Major crops include corn, soybeans, wheat, and barley. Most pastureland is used for grazing by beef cattle.

Ownership/Protection:

The U.S. Fish and Wildlife Service (USFWS) have an active acquisition effort to purchase property for the Eastern Virginia Rivers National Wildlife Refuge (NWR) Complex in this focus area. The USFWS is currently purchasing fee title and easements on a series of properties within their acquisition boundary. These tracts are not contiguous, but are acquired based on their value to wildlife. The Virginia Department of Game and Inland Fisheries own two properties, Lands End Wildlife Management Area, which is managed as a waterfowl refuge,

and Pettigrew Wildlife Management Area. Fort A.P. Hill Military installation is also located in this focus area.

Special Recognition:

The Chesapeake Bay Estuarine Complex, Ramsar site was designated in 1987.

Waterfowl:

Six priority waterfowl species, (Black Duck, Mallard, Pintail, Greater and Lesser Scaup, Southern James Population Canada Goose) are found in this focus area. Mallard and Black Duck utilized this area for breeding, wintering and migration habitat. These species utilize flooded marshes and the adjacent rivers and lakes for food in the form of invertebrates, plant material and seeds. Northern Pintail utilize the area for wintering and migration habitat. Southern James Population Canada Goose use the river for loafing and feeding areas, and the adjacent open farm fields for foraging habitat. Scaup species utilize the open water on the river for migration and wintering habitat. Other priority species, including the Wood Duck, American Wigeon, Redhead, Canvasback, and Ring-necked Duck heavily utilize this area. The large expanses of open water provided by the Rappahannock provide optimum feeding for diving ducks, especially when submerged aquatic vegetation (SAV) is prevalent. Other waterfowl, including Tundra Swan, Atlantic Population Canada Goose, Blue and Green-winged Teal, Gadwall, and Northern Shoveler utilize this area extensively for wintering and migration habitat.

Table 1. Waterfowl species using the Rappahannock River Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	
Greater Scaup		X	X
Lesser Scaup		X	X
Ring-necked Duck		X	X
Redhead		X	X
Canvasback		X	X
Blue-winged Teal		X	
Green-winged Teal		X	X
Gadwall		X	X
Northern Shoveler		X	X
AP Canada Goose		X	X
SJBP Canada Goose		X	X
Tundra Swan		X	X
American Coot		X	X

Ruddy Duck		X	X
Bufflehead		X	X
Merganser		X	X

Other Migratory Birds:

This area supports nearly 30 % of the coastal population of Bald Eagle in Virginia. Waterfront development is the most important limiting factor on the distribution and future population trends of Bald Eagle in this focus area. The tidal fresh marshes of the upper reaches of the Rappahanock River are important for breeding King Rail, Virginia Rail, and Least Bittern. These marshes also appear extremely important for migrating Sora and wintering American Bittern. Marsh habitats of this area have become degraded as a result of *Phragmites* invasion although its effect on these bird populations is unknown. In addition, the small tributaries of the Rappahanock River provide small, sometimes isolated forested wetlands used by Acadian Flycatcher, Yellow-throated Vireo, and Prothonotary Warbler.

Threats:

Development of adjacent shoreline is a major threat to this region. Waterfront parcels with deep-water access have extremely high development value. The lack of adequate riparian buffers and access of livestock to creeks and streams allow the continued degradation of water quality, affecting the composition of SAV in the watershed. The spread of exotic invasives continues to be a problem. The conversion of hardwood forest habitat to planted loblolly pine plantations reduces water quality and cavities for cavity nesting species. Over-application of chemicals for agricultural row-crops continues to degrade water quality, exacerbated by the lack of adequate farmland buffers.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields and farmed wetland pasture that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Preservation of bottomland-hardwood forest for nesting Wood Duck needs to be addressed. The use of Department of Agriculture conservation programs will help install needed buffers.

Focus Area: Roanoke River, Virginia
Sub-Focus Areas: None

Area Description:

The Roanoke River Focus Area includes 656,490 hectare (1,622,215 acres) and is located in south-central Virginia covering portions of the Counties of Campbell, Charlotte, Halifax, Mecklenburg, and Pittsylvania. The area contains the Kerr Reservoir, which is a United States Army Corps of Engineers flood protection project. This area remains relatively undeveloped, and current development is slow. Two major river systems, The Roanoke and the Dan, feed into John H. Kerr Reservoir. These rivers are characterized by wide floodplains currently utilized for agricultural or forest product production. Historically, these floodplains were dominated by large expanses of bottomland hardwood forest.

Ownership/Protection:

The majority of land in this focal area is in private ownership. The United States Army Corps of Engineers owns several tracts of land adjacent to Kerr Reservoir. The Virginia Department of Game and Inland Fisheries have one wildlife management area (Dick Cross Wildlife Management Area) and The Virginia Department of Conservation and Recreation owns two State parks in the focus area.

Special Recognition:

None known.

Waterfowl:

Two high priority species, Mallard and Black Duck utilized this area for breeding, wintering and migration habitat. These species utilize flooded marshes and the adjacent rivers and lakes for food in the form of invertebrates, plant material and seeds. Other priority species, including the Wood Duck and Ring-necked Duck and Northern Pintail utilize this area. The large expanses of open water provided by Kerr Reservoir provide optimum feeding for diving ducks, especially when submerged aquatic vegetation (*Hydrilla*) is prevalent. Wood Duck thrive in the area where the old growth bottomland hardwoods remain, and also utilize open water and emergent marshes for brood rearing and staging. American Coot can be found in and around the marshes of Kerr Reservoir feeding on aquatic vegetation. This area is not surveyed during the Mid-winter waterfowl survey and only presence or absence of individual species is presented.

Table 1. Waterfowl using the Roanoke River Focus Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	X
Greater Scaup		X	X
Lesser Scaup		X	X

Ring-necked Duck		X	X
American Coot		X	X

Other Migratory Birds:

This focus area is not significantly important to other high priority migratory species that are dependent upon wetland habitats when compared to coastal areas. Due to its geographic location and associated topography, there are very few forested or emergent wetlands available for such species. Wooded riparian habitats and small streams provide habitat for Louisiana Waterthrush. This species is generally more abundant in this area compared to coastal regions. Other species exist in scattered locations or represent disjunct populations. A colony of Yellow-crowned Night-Heron nests along the Roanoke River in the city of Roanoke that is separated from its regular distribution on the coastal plain by nearly 320 kilometers (200 miles). The Roanoke River and the Kerr Reservoir support small but increasing populations of Bald Eagle.

Threats:

Continued conversion of bottomland hardwood forest to loblolly pine plantations is a major threat in this region. The allowed access of livestock to streams and rivers in this watershed continues to degrade water quality in the region.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields and farmed wetland pasture that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Preservation of Bottomland hardwood forest for nesting Wood Duck needs to be addressed. United States Department of Agriculture programs such as Conservation Reserve Program and Conservation Reserve Enhancement Program will help install riparian buffers and fences on streams and rivers, enhancing water quality.

Planning Area: Shenandoah River, Virginia
Focus Areas: None

Area Description:

The Shenandoah River Planning Area is located in northwest Virginia covering 848,291 hectares (2,096,164 acres) of the Shenandoah River Valley. The Shenandoah Valley is extremely important to Virginia Waterfowl populations due to its impact on water quality concerns in the Chesapeake Bay. The Valley is an area of intense row crop agriculture and beef cattle pastureland, flowing directly into the Potomac River and the Chesapeake Bay. The area is also known for mass poultry production. Chicken and turkey houses abound in the vicinity, close to sources of cheap feed. Headwater wetlands are very important to water quality. The nutrients and chemicals, which flow into these sites, if not treated, can make their way over long distances, and have impacts far from the originating source. Habitat improvements conducted in this area can have large, beneficial impacts on Virginia's waterfowl populations.

Ownership/Protection:

Much of the non-agricultural land surrounding the Valley is in public ownership. The George Washington National Forest borders the Focus Area on the west and the Shenandoah National Park, including the Appalachian National Scenic Trail, borders the area on the East. The Virginia Department of Game and Inland Fisheries own, Goshen-Little North Mountain Wildlife Management area in the southern portion of the Focus Area. Of the agricultural lowlands, essentially all are in private ownership.

Special Recognition:

None known.

Waterfowl:

Three high priority species, Mallard, Pintail, and Black Duck utilize this area for wintering and migration habitat. These species utilize flooded marshes adjacent to the Shenandoah River and tributaries for food in the form of invertebrates, plant material and seeds. Wood Duck utilize this area for breeding habitat, using the wooded areas next to streams for nesting and brood rearing. This area is not surveyed during the mid-winter waterfowl survey. In addition to species listed in Table 1, conservation in this planning area would have benefits to many other waterfowl species using Chesapeake Bay.

Table 1. Waterfowl using the Shenandoah River Planning Area.

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck		X	X
Wood Duck	X		
Northern Pintail		X	X

Other Migratory Birds:

This area is not significantly important to other high priority migratory species that are dependent upon wetland habitats when compared to coastal areas. This is mostly due to a lack of appropriate habitat. Louisiana Waterthrush are relatively more abundant in this planning area compared to coastal locations. This species is distributed within wooded riparian areas and along small streams. A few isolated forested wetlands provide habitat for Acadian Flycatcher, Prothonotary Warbler, and Northern Parula. Virginia Rail, Sora and Least Bittern are known to occur within a limited number of small freshwater marshes in the northern reaches of this planning area. Beaver ponds and sinkhole habitats may provide habitat for Golden-winged Warbler but the extent of use is unknown. Golden-winged Warbler requires shrubby, early successional habitats and are not entirely dependent of wetland habitats. The Shenandoah River harbors a relatively small, but increasing population of Bald Eagle.

Threats:

Agriculture plays a key role in the economics of this region. Continued fencerow-to-fencerow farming, lack of riparian buffers, and lack of fencing livestock from streams will continue impairing water quality. The practice of utilizing highly-concentrated fowl waste as fertilizer for agriculture increasingly allows nutrients in runoff. A large portion of this planning area is located in Northern Virginia, one of the fastest growing regions in the nation. Development of these sites will forever remove groundwater recharge areas and increase runoff into the river systems.

Conservation Recommendations:

Agricultural conservation groups are very active in the region. Continued utilization of programs such as Conservation Reserve Enhancement Program (CREP), The Conservation Reserve Program (CRP), Environmental Quality Incentives Program (EQIP) and others will help relieve pressure to intensively farm sites. Private non-profit groups such as Ducks Unlimited and The Chesapeake Bay Foundation and state groups such and the Virginia Department of Game and Inland Fisheries and the Virginia Department of Conservation and Recreation work with landowners in the region to develop environmentally-friendly land management plans to alleviate some of these problems.

Focus Area: Southeast Virginia, Virginia
Sub-Focus Areas: None

Area Description:

The Southeast Virginia Focus Area is located in portions of the Counties/Cities of Virginia Beach, Chesapeake, and Suffolk, excluding highly-developed areas. The area contains The Great Dismal Swamp, Back Bay, The North Landing River and Northwest River systems and encompasses 138,879 hectares (343,176 acres). This area is developing at a rapid pace, in spite of zoning protections put in place by the localities. Historically, the area was forested wetland habitat, primarily Atlantic white cedar, bald cypress and gum trees. There is a long history of draining these areas, beginning with George Washington, initially for agriculture and currently for urbanization. The farm fields found in this region are undoubtedly the most productive in Virginia, and are utilized for traditional agricultural crops as well as truck farm produce. The large open water wetlands of Back Bay were renowned in the 1960's for their abundance of submerged aquatic vegetation (SAV). Currently, the amounts of SAV are greatly reduced. The reduction is believed linked to water quality degradation linked to agricultural and residential runoff to Back Bay.

The four systems located within the focus area provide vital linkages for migrating birds following Virginia's river systems and the Atlantic Coast. The location of the project area, directly south of the Delmarva Peninsula, provides the first suitable habitat for migratory species funneled into the area across the Chesapeake Bay. The project location between two sites recognized for their global significance to birds, the Outer Banks of North Carolina and the Atlantic shoreline-barrier island system of the Delmarva Peninsula, further indicates its ecological value.

Ownership/Protection:

A patchwork of land is held for conservation purposes. The U.S. Fish and Wildlife Service has Great Dismal Swamp, Back Bay, and Mackay Island National Wildlife Refuges. The State of Virginia owns Princess Anne Wildlife Management Area, False Cape State Park, and several dedicated Natural Area Preserves. The City of Virginia Beach currently has an agricultural reserve program, which purchases development rights on property, and The Nature Conservancy has an active easement and land acquisition program on the North Landing River. Although these holdings seem impressive, a large majority of the land in this focus area is in private ownership. This land is highly sought for development in one of the fastest growing regions on the east coast.

Special Recognition:

This focus area occurs within the South Atlantic Migratory Bird Initiative (SAMBI) project area. The area includes Virginia, North Carolina, South Carolina, Georgia and Florida. In 1999, SAMBI was created from a coalition of federal, state and non-governmental partners to work toward long-term conservation of waterfowl, shorebirds, wading birds, songbirds and other vulnerable bird populations. Realizing that wildlife does not recognize political boundaries, SAMBI brings together a group of partners with similar issues to resolve wildlife issues at a larger scale. To date, SAMBI has worked with states in the partnership to further conservation issues important to all.

W*aterfowl:*

Six priority waterfowl species (Black Duck, Mallard, Pintail, Greater and Lesser Scaup, Saint James Bay Population Canada Goose) benefit from habitats located within the focus area. Emergent marshes along Back Bay are heavily used by Black Duck and Mallard, and moderately used by Northern Pintail and other dabbling ducks during the fall, winter and migration periods. The marshes provide food in the form of plants and invertebrates, and serve as resting/roosting areas that are relatively free of disturbance. Restored, managed impoundments located on Back Bay National Wildlife Refuge, Virginia Department of Game and Inland Fisheries property and on private lands are heavily utilized by dabbling ducks and geese for foraging in this area during the staging and wintering periods. One to two thousand Greater and Lesser Scaup use the bay adjacent to these marshes and will benefit from protection and the water quality improvements that will result. The number of scaup and other diving ducks using Back Bay has declined in the past couple of decades because of the loss of submerged aquatic vegetation.

Species that will benefit during the breeding season include the Mallard, Wood Duck, and Black Duck. The Back Bay area is near the southern edge of the Black Duck breeding range, and small numbers still nest here. These habitats provide emergent plants/seeds, invertebrates, and SAV, which will benefit both dabbling and diving ducks. The forested wetlands will be moderately used by Black Duck, Mallard and to a lesser degree by Pintail during the fall, winter and migration periods. Scaup and Southern James Bay Canada Goose will use these areas only to a limited extent. Forested wetlands can serve as feeding areas for Black Duck and Mallard and can provide secure and undisturbed roosting areas.

Table 1. Waterfowl species using the Southeast Virginia Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
American Black Duck	X	X	X
Mallard	X	X	X
Northern Pintail		X	X
Gadwall		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
American Wigeon		X	X
Canvasback		X	X
Redhead		X	X
Ring-necked Duck		X	X
Wood Duck	X	X	X
Tundra Swan		X	X
Greater Snow Goose		X	X
Blue-winged Teal		X	X
Green-winged Teal		X	X

SJBP Canada Goose		X	X
American Coot		X	X

Other Migratory Birds:

Due to its geographic position this focus area represents a transition zone between southern humid forested wetlands and northern archetypes and is also recognized as the distributional limit for a number of high priority bird species for conservation in the southeastern United States. Swainson's Warbler, Prothonotary Warbler, Worm-eating Warbler, and Wayne's Black-throated Green Warbler are largely restricted to forested wetlands or pocosin habitats. All of these species (except for the Prothonotary Warbler) are isolated from their Appalachian population centers. Wayne's Black-throated Green Warbler is found in the Dismal Swamp and associated with mature cypress and Atlantic white cedar. Populations of this species have declined drastically with the loss of historic Atlantic white cedar stands within this area. Swainson's Warbler and Worm-eating Warbler require dense under story vegetation such as switch cane or sweet pepperbush and are restricted to the Dismal Swamp and some surrounding areas.

The extensive barrier island/lagoon complex in this focal area forms a diverse array of beach habitats, intertidal mudflats, and marshlands that represent significant breeding, stopover, and wintering habitats for a number of bird species. Significant concentrations of migrating shorebirds can be regularly found at Back Bay National Wildlife Refuge and environs. Oligohaline marshes of this area support a significant population of King Rail and a number of high concern breeding species such as Marsh Wren, Seaside Sparrow, and Virginia Rail and regularly harbor high concern wintering species such as Nelson's Sharp-tailed Sparrow, Salt Marsh Sharp-tailed Sparrow, and Sedge Wren. Surprisingly, populations of colonial wading species (other than Great Blue Heron) and beach nesting species are extremely low in this focus area. Colonial beach nesting species are unable to colonize the primary dune habitats that constitute most of eastern shorelines of Back Bay NWR and False Cape State Park. Reasons for low numbers of other colonial-nesting species remain unclear.

Threats:

Continued conversion of agricultural and forestland to urban uses is the greatest threat to this area. The high-density livestock feeding operations located in this area can be detrimental to Back Bay water quality. New introduction and spread of existing exotic invasives in this highly populated area can reduce available wildlife habitat. The continued loss of water quality and the resulting loss of SAV impact numerous species on Back Bay.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior converted crop fields that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations. Exotic invasives, such as *Phragmites* are continuing to gain a foothold in the area, and treatment of these sites needs to be continued.

Focus Area: Western Bayshore, Virginia
Sub-Focus Areas: None

Area Description:

The Western Bayshore Marshes are abundant tidal brackish-water systems similar in character to the bayside marshes of the Eastern Shore. They include Mobjack Bay, the Guinea Marshes, The Piankatank River, Fleets Bay, Dividing Creek and the Great Wicomico River. The marshes open directly to the Chesapeake Bay and take their character from the Bay. The marshes consist mainly of *Spartina*, *Juncus*, and other salt tolerant species. Total waterfowl numbers are modest in this area; however, these are important habitats for many species. Development in this area is moderate, but increasing as the demand for waterfront property becomes more pronounced. Local watermen depend upon these marshes for a variety of species utilized for commercial gain. Adjacent lands are typically forested, intermixed with agricultural row-crops. The focus area encompasses 161,150 hectares (398,209 acres).

Ownership/Protection:

Public lands in this area are very limited. The Virginia Department of Conservation and Recreation owns a few small natural area preserves in the focus area, including Dameron Marsh Natural Area Preserve. The Virginia Institute of Marine Science owns a small tract of research land on the Dragon Run. The Virginia Department of Forestry also owns a small parcel on Dragon Run.

Special Recognition:

The Chesapeake Bay Estuarine Complex was a Ramsar designation in 1987.

Waterfowl:

Black Duck and Mallard utilize these marshes year-round, but especially heavy during the migration and winter periods. They feed upon the vegetation and invertebrates produced in quantity in these areas. Scaup spp. feed in the submerged aquatic vegetation (SAV) beds and invertebrates located in the Chesapeake Bay adjacent to these marshes. Atlantic Brant feed upon tidal mudflats adjacent to these marshes during the migration and wintering periods. Puddle ducks such as American Wigeon, Gadwall and teal utilize these areas for feeding and loafing during migration and wintering. Tundra Swan are found throughout the area during migration periods.

Table 1. Waterfowl using the Western Bayshores Focus Area

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Pintail		X	X
Tundra Swan		X	X
American Wigeon		X	X

Gadwall		X	X
Blue-winged Teal		X	X
Green-winged Teal		X	X
Atlantic Brant		X	X
AP Canada Goose		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Ring-necked Duck		X	X
Canvasback		X	X

Other Migratory Birds:

A number of high priority bird species that utilize forested wetlands benefit from the expansive bottomland hardwood forests of the Piankatank River and Dragon Swamp. This swamp provides the most exemplary example of this habitat for Acadian Flycatcher, Prothonotary Warbler, and Northern Parula north of the James River. Tidal salt marshes within this area provide breeding habitat for Prairie Warbler, Virginia Rail, and Clapper Rail and for wintering Sedge Wren, Nelson's Sharp-tailed Sparrow, and Salt Marsh Sharp-tailed Sparrow. Black Rail occur in only a few marshes that meet their size and physiognomy requirements. Sandy beach habitat of the Bethel Beach Natural Area Preserve supports a small colony of Least Tern along with low numbers of American Oystercatcher. In addition to this site, American Oystercatcher use sandy portions and shell rakes of marsh islands in the surrounding area.

Threats:

As is common in coastal Virginia, urban and residential development remains a constant threat. Waterfront property is at a premium. Extreme demands exist for waterfront property with deepwater access provided by the creeks and rivers even in areas disjunct from large urban centers. Declining water quality in the Chesapeake Bay, stemming from over fertilization, sewage treatment, and the lack of adequate riparian buffers continues to affect quality waterfowl habitat.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields and farmed wetland pasture that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations.

Focus Area: York/Poquoson, Virginia
Sub-Focus Areas: None

Area Description:

The York/Poquoson Focus Area is located in east-central Virginia following the York River up to and containing the Mattaponi and Pamunkey River systems. The area encompasses 473,472 hectares (1,169,970 acres). These systems contain significant acres of tidal freshwater and brackish marsh, emergent, shrub-scrub, and forested wetalnds. The York River has vast expanses of shallow, brackish, tidal areas heavily utilized by diving duck species. The adjacent uplands are primarily agricultural row-crops or loblolly pine plantations. The area has a rich cultural diversity, with both the Mattaponi and Pamunkey Indians Tribes utilizing the area. These areas are currently becoming developed to urban/residential at a very fast rate. The Mattaponi and Pamunkey River systems are key dabbling duck areas. Both river systems have abundant tidal gum swamps.

Ownership/Protection:

The majority of land in this focus area is in private ownership. The U.S. Fish and Wildlife Service owns Plum Tree Island National Wildlife Refuge (NWR). The Colonial National Historic Park is located adjacent to the lower York River. The U.S. Naval Weapons Station, Cheatham Annex and Camp Peary Naval Reservation are also all located on the lower York. The Virginia Department of Conservation and Recreation owns York River State Park, as well as several natural areas within the watershed. Both the Mattaponi and Pamunkey Indian Tribes have reservations within the focus area. The Virginia Department of Forestry owns two properties in the focus area.

Special Recognition:

The Chesapeake Bay Estuarine Complex was a Ramsar designation in 1987.

Waterfowl:

Six high priority species, Mallard, Black Duck, Northern Pintail, Southern James Bay Population (SJBP) Canada Goose, Greater and Lesser Scaup utilize this area for wintering and migration habitat. These species feed on invertebrates, plant material and seeds in the marshes. Other priority species, including the Wood Duck, Ring-necked Duck, Redhead, Canvasback, and American Wigeon heavily utilize this area. Other waterfowl, Green and Blue-winged Teal, Gadwall, and American Coot also utilize these areas for wintering and migration habitat. Atlantic Population (AP) and SJBP Canada Goose utilize the agricultural fields and adjacent marshes heavily during the wintering and migration periods.

Table 1. Waterfowl using the York River Focus Area

Species	Breeding	Migration	Wintering
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	

Northern Pintail		X	X
Greater Scaup		X	X
Lesser Scaup		X	X
Ring-necked Duck		X	X
Redhead		X	X
Canvasback		X	X
American Wigeon		X	X
Green-winged Teal		X	X
Blue-winged Teal		X	
Gadwall		X	X
Bufflehead		X	X
American Coot		X	X
AP Canada Goose		X	X

Other Migratory Birds:

The regular distribution of tidal-fresh marshes along the Pamunkey and Mattoponi Rivers (i.e., York River tributaries) support the most extensive breeding population of King Rail and Least Bittern in Virginia. These sites also appear to be important for migratory or wintering American Bittern, Sora, Short-eared Owl, and Sedge Wren. Polyhaline marshes within lower reaches of the York and Poquoson Rivers, the Chesapeake Bay, and the mouths of other tributaries support a number of high concern bird species that are exclusively dependent on tidal salt marshes (>18.0 ppt). Clapper Rail and Seaside Sparrow are highly abundant in low salt marsh zones of this area. Seaside Sparrow use nesting habitat that is above tidal flooding zones for incubation and brood rearing and require openings in the vegetation to forage on bare ground. Clapper Rail are dependent upon access to open water such as tidal creeks and ditches. Remaining priority species within salt marshes are those that use high marsh zones above regular spring tides. Black Rails are probably the most restrictive species and require marshes less than 10 hectares (24 acres) that contain a significant zone of high marsh composed of salt meadow hay and at least 50 % salt grass. The overall distribution of Black Rail is very limited in the state because of the low availability of marshes with the required physiognomy. Black Rail are only known to occur on the Plum Tree National Wildlife Refuge and a few other sites within this focus area. Prairie Warbler also use high marsh zones in this focus area during the breeding season, as do Henslow's Sparrow, Sedge Wren, Nelson's and Salt Marsh Sharp-tailed Sparrow during migration and winter. Forested swamps along these rivers provide habitat for Acadian Flycatcher, Prothonotary Warbler, and Northern Parula. The York River and tributaries are also important for breeding and non-breeding Bald Eagles. Nearly 12 % of the Bald Eagle nesting territories in the Virginia portion of the Chesapeake Bay is located in this focus area. A small population of American oystercatcher is distributed among beach habitats or shell rakes of the peninsular landform and marsh islands.

Threats:

The increase in residential development, thought not yet at rates commensurate with other portions of the state, is the greatest threat to habitats in the focus area. Anecdotal information from landowners in the area suggests that some marshes have changed vegetative types over the past twenty years, possibly due to sea level rise in the area. Although the area does not have large amount of exotic invasives at present, concerns continue that these species may gain a foothold in the area.

Conservation Recommendations:

Continued acquisition and protection of land in a series of conservation corridors will help this area retain its usefulness for migratory birds. Prior-converted crop fields and farmed wetland pasture that are restored to wetland habitat provide excellent waterfowl habitat and receive high use in these areas. Continued restoration of these sites will help wintering and staging waterfowl populations.

7.2.18 West Virginia

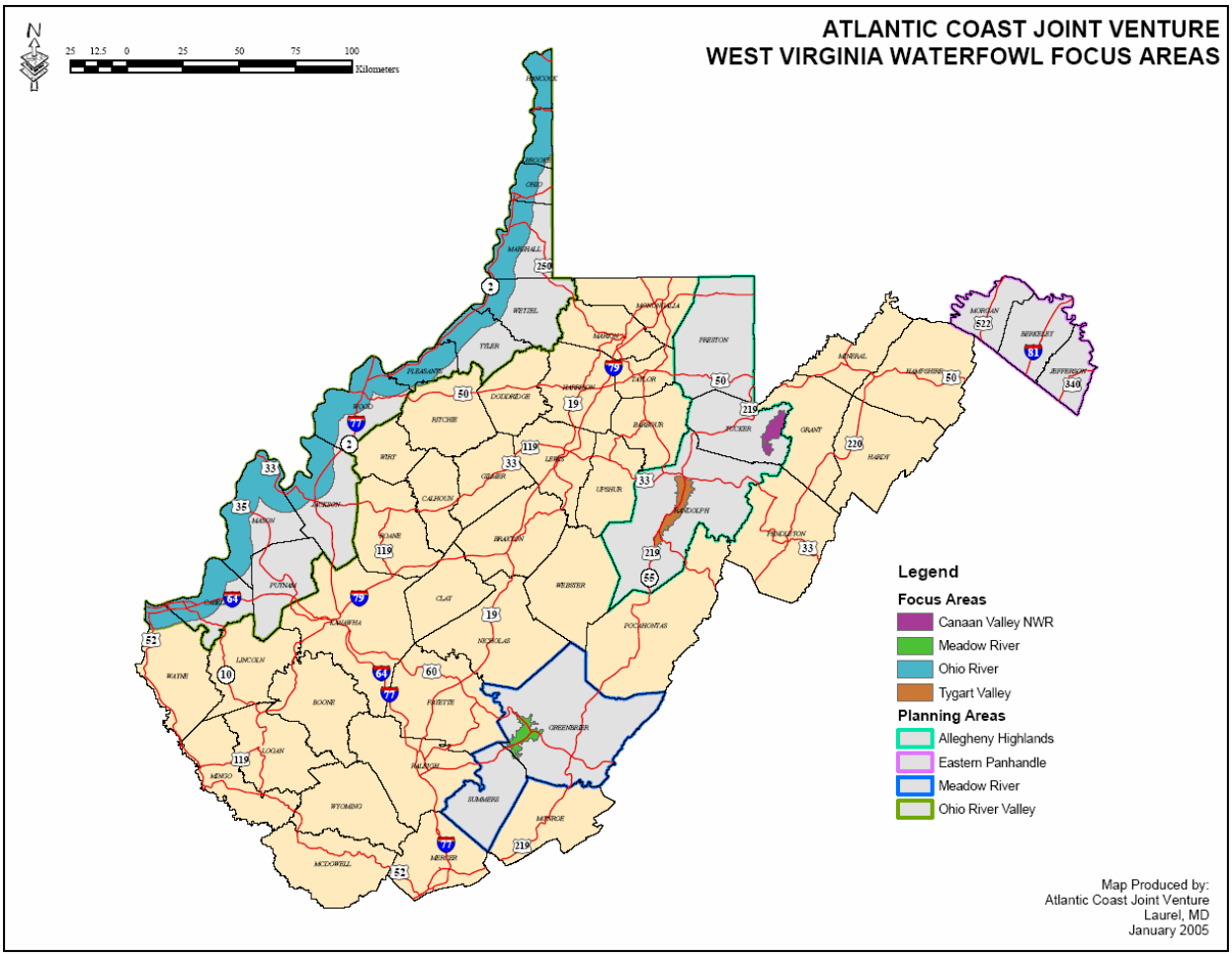

Figure 7.19. West Virginia waterfowl focus areas.

Planning Area: Allegheny Highlands
Focus Areas: Canaan Valley National Wildlife Refuge, Tygart Valley Wetlands

Area Description:

Canaan Valley, the major component of the Allegheny Highlands Planning Area, contains the largest wetland area in West Virginia, making up 39% of the state's wetlands. The total planning area encompasses 24,974 hectares (61,713 acres). It contains the one of the largest shrub swamp and bog complexes in the eastern United States. With an average elevation of 975 meters (3,200 feet) above sea level and a 14,164 hectares (35,000 acres) watershed, Canaan Valley is the highest valley of its size east of the Rocky Mountains. The Valley's high altitude and cold, humid climate has maintained a unique relict boreal ecosystem that supports many plant and animal communities typical of areas far to the north. Forty different plant communities exist in the valley, consisting of more than 580 different species of plants. One hundred and nine species have distinctively northern ranges and twenty-five are listed as rare in West Virginia. The area's diverse habitat supports equally diverse wildlife populations, with 280 species of mammals, birds, reptiles, amphibians, and fishes known or expected to occur there. This includes populations of federally-threatened Cheat Mountain salamander and endangered West Virginia northern flying squirrel, and migratory Indiana bat and Bald Eagle.

Ownership/Protection:

There are 9,712 hectares (24,000 acres) identified for protection in the Canaan Valley alone for this planning area. Currently 6,169 hectares (15, 245 acres) are protected on the Canaan Valley National Wildlife Refuge (NWR). This includes 2,245 hectares (5,549 acres) of wetland habitat. The wetlands include those in the valley proper and numerous perched wetlands, springs and beaver ponds in the uplands surrounding the valley. There are currently 3,543 hectares (8,755 acres) within the refuge acquisition boundary owned by either large power companies or private individuals. Almost all of the wetlands and riparian habitat in Preston and Randolph Counties is privately owned.

Special Recognition:

The U.S. Fish and Wildlife Service recognized Canaan Valley as a significant wetland and a priority for protection under the federal Emergency Wetlands Resources Act of 1986. This act was part of the founding legislation for the Canaan Valley NWR. The Canaan Valley was recognized under the National Natural Landmark Program (National Park Service) in 1974 because of its diverse assemblage of relict boreal plant communities and wetlands. The Emergency Wetland Resources Act identifies five additional priority wetlands in Preston and Randolph counties.

***Waterfowl**:*

Canada Goose were introduced in Canaan Valley during the late sixties and early seventies and although considered resident population Canada Goose they are migratory. This flock winters in North Carolina, an area that has experienced a decline in their wintering goose populations. The Allegheny Highlands Planning Area supports nesting Black Duck, Mallard and Wood Duck, and is a stopover point for migrating Black Duck, Mallard, Green-wing Teal, Ring-necked Duck, Hooded Merganser and other species.

Table 1. Waterfowl Species Using the Allegheny Highlands Planning Area.

Species	Breeding	Migration	Wintering
Mallard	**X**	**X**	**X**
Black Duck	**X**	**X**	**X**
Wood Duck	**X**	**X**	**X**
Canada Goose	**X**		**X**
Green-winged Teal		**X**	
Blue-winged Teal		**X**	
Ring-necked Duck		**X**	
Hooded Merganser		**X**	
Gadwall		**X**	
American Wigeon		**X**	
Northern Shoveler		**X**	
Pintail		**X**	
Bufflehead		**X**	
Common Goldeneye		**X**	
Lesser Scaup		**X**	

Other Migratory Birds*:*
The Allegheny Highlands Planning Area is adjacent to the Allegheny Front, an important interior migratory pathway for land birds. Canaan Valley is nationally recognized as a breeding and fall migration staging area for the American Woodcock, and supports many other migratory species, including waterfowl, wading birds, shorebirds, and neotropical migrants. Common Snipe and Northern Goshawk nest in the valley, representing the southeastern most extension of their breeding range; Rough-legged Hawk winter in the Valley. Other species found in the Valley listed as rare or of special concern at both the federal and state levels including: Bald Eagle, Peregrine Falcon and Golden Eagle.

Threats:
Threats to the Canaan Valley Focus Area include residential and commercial development, peat mining operations, draining and ditching wet meadows for agricultural production and logging operations. Large portions of land in Canaan Valley are still owned by Allegheny Power Company which could be sold for development. All terrain vehicle (ATV) use throughout the valley continues to degrade wetlands and alter hydrologic flows. Exotic pests currently threaten both the balsam fir and American beech stands in the valley. Agriculture, logging, and development threaten upland buffer and riparian habitat in Randolph and Preston Counties.

Conservation Recommendations:
Opportunities for habitat restoration and preservation are numerous in the Allegheny Highlands Planning Area. Partnerships with private landowners and businesses could address wetland protection and water quality issues. Other actions could include eliminating ditches for agriculture in wet meadows to restore the natural hydrology of the area and enhance wetland values. Reforestation could occur in logged upland areas of the surrounding watershed to prevent erosion and reestablish red spruce and northern

hardwood forest communities. Extensive work is required to reestablish historic water flows throughout the Canaan Valley where they have been interrupted and diverted through road construction and ATV damage. The remaining privately-owned land with the Canaan Valley NWR acquisition boundary should be purchased. Specific wetlands along with sufficient upland buffer should be acquired in Randolph and Preston counties. Riparian habitat along the Tygart Valley River in Randolph County should be protected through acquisition or easement.

Planning Area: Eastern Panhandle, West Virginia
Focus Areas: None

Area Description:

The planning area, approximately 197,567 hectares (488,197 acres) is made up of the three easternmost counties in West Virginia, Berkeley, Jefferson and Morgan bordering the Potomac River to the north and the Shenandoah River to the east. These large rivers in addition to numerous spring fed streams and wetlands interspersed in an area dominated by agriculture provide abundant productive habitat for many species including waterfowl.

Ownership/Protection:

The ownership pattern in the region is federal, state, county and town. The majority of property in the region is privately owned. The region is dominated by agriculture and possesses some of the best farmland in West Virginia. Orchards, grain crops, cattle and horses are all raised in the region.

Special Recognition:

The U.S. Fish and Wildlife Service recognize six major wetland complexes as priority wetlands under the federal Emergency Wetland Resources Act. The majority of these wetlands are characterized as alkaline fens and support many state rare species. The Service recognizes that some of the small open water systems in Berkeley County support populations of endangered Northeastern bulrush and several streams in Morgan and Berkeley Counties support populations of the endangered Harperella. The Nature Conservancy has protected several wetlands/wetland complexes in the region and is actively working to several others.

Waterfowl:

The region has many wetlands, streams, and rivers. Many of these are spring-fed and flow year-round providing excellent nesting, rearing, and wintering habitat. Species breeding in the area include Wood Duck, Mallard, Hooded Merganser, and Canada Goose. These areas are also used by many waterfowl species, including Black Duck, for migration stopover during the spring and fall migrations.

Table 1. Waterfowl species using the Eastern Panhandle Planning Area.

Species	Breeding	Migration	Wintering
Mallard	**X**	**X**	**X**
Black Duck		**X**	**X**
Wood Duck	**X**	**X**	**X**
Canada Goose	**X**		**X**
Canvasback		**X**	
Green-winged Teal		**X**	
Blue-winged Teal		**X**	
Ring-necked Duck		**X**	**X**
Bufflehead		**X**	**X**
Lesser Scaup		**X**	**X**

Other Migratory Birds:

The variety of habitats in the region results in a diverse assemblage of birds. Non-waterfowl species include wading birds, raptors (including Bald Eagle and Osprey), neotropical migrant songbirds, and year-round resident songbirds.

Threats:

The region is the fastest developing region in West Virginia. Farms and natural habitats utilized by wildlife are being developed for residential and commercial purposes at a rapid pace. Riparian habitat in the region continues to deteriorate due to unrestricted livestock grazing and clearing by residential landowners. Non-point and point-source pollution sources continue to affect water quality in some surface and groundwater systems.

Conservation Recommendations:

Disturbances to wintering and nesting bird populations need to be minimized or eliminated entirely, especially in riparian areas and around wetlands. This can be accomplished by acquiring conservation easements and/or excluding livestock from sensitive habitats.

Planning Area: Meadow River, West Virginia
Focus Area: Meadow River Wetlands

Area Description:

This planning area encompasses 360,558 hectares (890,955 acres) of Greenbrier and Summers Counties in southeastern West Virginia. The planning area includes the Meadow River wetlands which is West Virginia's second largest contiguous wetland complex making up 8 % of the state's total nonchannel wetland acres. The area is known for its botanical significance as the most northerly extension of a southern pin oak forest in the United States. The area seasonally floods providing excellent waterfowl nesting and migratory habitat and is a wintering area for Black Duck and Mallard when not frozen. Additionally, the area's unique hydrological situation provides varied palustrine-emergent systems to numerous game and nongame species both resident and migratory. Also included in this planning area are portions of the New and Greenbrier River corridors and Bluestone Lake. These rivers and their riparian zones are very important to wintering waterfowl because they often have the only open water in the area during freezing weather. Bluestone Lake is part of the mid-winter waterfowl survey in West Virginia. Total waterfowl counts in this segment range from the 150 when much of the lake is frozen to over 1,000 in milder weather.

Ownership/Protection:

Land ownership within the planning area is predominately private including both individual and corporate holdings. There is also a significant amount of land in public ownership including portions of the focus areas. The West Virginia Division of Natural Resources owns 1,009 hectares (2,495 acres) in the Meadow River wetlands complex. The U.S. Army Corps of Engineers owns Bluestone Lake and the National Park Service owns 24 hectares (60 acres) of riparian habitat and islands on the New River below Bluestone Lake.

Special Recognition:

The U.S. Fish and Wildlife Service recognize the Meadow River wetlands as a priority wetland under the Federal Emergency Wetlands Resources Act of 1986. It is also identified as a priority wetland by the U.S. Environmental Protection Agency. Six federal species of concern (formerly C2), 9 West Virginia listed species of special concern, and more than 30 species or plant communities listed as rare by the West Virginia Natural Heritage Program, are found in the focus area.

Waterfowl:

The Meadow River Planning Area and Meadow River Wetlands Focus Area provide breeding, migration and/or wintering habitat for many species of waterfowl. Snow and ice cover can limit wintering capacity in severe winters. Wetland restoration in the Meadow River wetlands could significantly increase nesting.

Table 1. Waterfowl Species Using the Meadow River Wetlands Focus Area.

Species	**Breeding**	**Migration**	**Wintering**
Mallard	X	X	X
Black Duck	X	X	X
Wood Duck	X	X	X
Canada Goose	X		X
Blue-winged Teal		X	
Green-winged Teal		X	
Pintail		X	
Gadwall		X	
Goldeneye		X	X
Bufflehead		X	X
Lesser Scaup		X	X
Hooded Merganser		X	
Common Meganser		X	
Ring-necked Duck		X	X
Ruddy Duck		X	X

Other Migratory Birds:

The riparian corridor of the Greenbrier and New River Valleys, along with the adjacent uplands provide habitat for a variety of species. Many of the high priority species identified for the Appalachian Bird Conservation Region (BCR 28) can be found breeding in these areas. Among these are the Cerulean Warbler, Golden-winged Warbler, Wood Thrush, Worm-eating Warbler, and Acadian Flycatcher. The Meadow River wetland complex supports some of the highest densities of breeding Swainson's Warbler in West Virginia. Other priority species that can be found within this wetland complex include the Kentucky Warbler, Louisiana Waterthrush, and the Virginia Rail. In addition, this planning area provides key stopover sites for both migrating landbirds as well as wetland dependent species.

Threats:

Agriculture and development continue to erode the quality of riparian habitat along the Greenbrier River. Logging impacts the pin oak overflow forest in and the upland buffer around, the Meadow River wetlands. Point and non-point source pollution impacts water quality.

Conservation Recommendations:

The remaining private lands within the Meadow River wetlands purchase area boundary, both wetlands and upland buffer, should be purchased. Prior converted wetlands in the Meadow River area should be restored once acquired. Riparian habitat along the Greenbrier and New rivers should be protected and/or restored by a combination of easements, purchase, and fencing.

Planning Area: Ohio River Valley, West Virginia
Focus Areas: Ohio River

Area Description:

This planning area consists of the islands of the Ohio River, the back channels and riverine habitats associated with these islands, and adjacent wetland, embayment and bottomland habitat within the Ohio River floodplain in West Virginia. The planning and focus area spans 450 kilometers (280 miles) of the Ohio River corridor and includes 401,714 hectares (992,653 acres). Most of the habitats within this area have been classified as Resource Category I under the United States Fish and Wildlife Mitigation Policy. This area, particularly the islands, back channels, and embayments, have long been recognized by state, federal, and private organizations as having high quality fish and wildlife, recreational, scientific and natural heritage value.

Ownership/Protection:

The majority of the Ohio River floodplain area is privately owned. The Ohio River Islands National Wildlife Refuge (NWR), established in 1990, protects 22 islands and 3 mainland tracts totaling approximately 1,416 hectares (3,500 acres) of floodplain habitats. A total of 30 islands are targeted for acquisition or protection, and over 809 hectares (2,000 acres) of embayments and wetlands in West Virginia are identified for protection. The West Virginia Division of Natural Resource owns over 404 hectares (1,000 acres) of lands and open water along the Ohio River at Green Bottom Wetland Management Area.

Special Recognition:

The islands, wetlands, and backwater embayments of the Ohio River were identified as high quality habitats in the Unique Ecosystem Concept Plan for the State of West Virginia (USFWS 1979), Regional Wetland Concept Plan (USFWS 1980), the Corps of Engineers' Ohio River Ecosystem Restoration Program (2000), and the State of West Virginia's Ohio River Fund Plan (1993).

Waterfowl:

Twenty-eight species of waterfowl use the planning and focus areas during migration, wintering and/or nesting. Other waterbird species (such as loons, grebes, gulls, terns, plovers, sandpipers, and wading birds) depend on the river, embayment, and wetland areas for migration, nesting, or wintering habitat. Southern James Bay Population Canada Goose are regularly sighted along the Ohio River in the winter. The combination of deep water (mostly ice-free), shallow water wetlands, submerged aquatic beds, and adjacent farm fields makes the Ohio River corridor valuable migration and wintering habitat.

Table 1. Waterfowl species using the Ohio River Valley Planning Area and Ohio River Focus Area.

Species	Breeding	Migration	Wintering
American Black Duck	X	X	X
Mallard	X	X	X

Northern Pintail		X	X
Gadwall		X	X
American Wigeon		X	X
Canvasback		X	X
Redhead		X	X
Wood Duck	X	X	X
Ring-necked Duck		X	X
Lesser Scaup		X	X
Greater Scaup		X	X
Common Goldeneye		X	X
Bufflehead		X	X
Hooded Merganser	X	X	X
Common Merganser		X	X
Red-breasted Merganser		X	X
Northern Shoveler		X	X
Ruddy Duck		X	X
Surf Scoter		X	X
Black Scoter		X	X
White-winged Scoter		X	X
Blue-winged Teal	X	X	X
Green-winged Teal		X	X
Long-tailed Duck		X	X
Canada Goose	X	X	X
Snow Goose		X	X
Tundra Swan		X	X
Trumpeter Swan		X	X

Other Migratory Birds:

Over 250 species of birds use the floodplain habitats of the Ohio River. Of the 20 species on the WV Partners in Flight Priority Species List, at least 16 are known to nest along the Ohio River Valley. Osprey, which have been reintroduced into the valley by a cooperative effort of state, federal, and private partners, are now nesting successfully along the Ohio River. The largest Great Blue Heron rookeries in the state are also located within the Ohio River Valley. Bald Eagle began a nest in the Ohio River valley in 1999, the first such nest recorded in the WV portion of the Ohio River.

Threats:

There are compelling reasons to be concerned about the future of this focus area. Since the early 1900's 14 islands have been eliminated from the West Virginia section of the Ohio River through inundation for navigation and commercial dredging. Commercial sand and gravel dredging, barge mooring, navigation related activities, industrial development, dredged spoil

disposal, and recreational and residential development have all contributed to the destruction and degradation of the valuable wetland and associated habitats found in this focus area.

Conservation Recommendations:

Restoration of floodplain wetlands previously altered by agriculture; conservation easements or acquisition of embayments and other important riparian habitats; continued acquisition of islands; reduction of non-point source pollution loading which affects aquatic bed habitat; minimization of dredging and spoil disposal in productive wetland habitats.

References:

Ohio River Islands NWR Comprehensive Conservation Plan. November 2001. USFWS, Region 5.

Mountwood Bird Club, The Birds of Wood County, WV.

7.3 Waterfowl Habitat Conservation Strategies

The extent of the geographic area of the Atlantic Coast Joint Venture, the variety of wetland types, the threats to those habitats, and the complexity of the issues involved with protecting, restoring, and enhancing those habitats encompass a wide variety of strategies that need to be employed to achieve effective conservation in the joint venture. Because of this complexity, careful planning and coordination among federal, state, and local agencies and organizations will play a key role in the success of the actions that needed to be implemented in individual focus areas and throughout the flyway. Specific conservation strategies which may meet one or more of the stated objectives have been identified and listed below.

Habitat Protection

1. Fee title acquisition: Acquisition of lands to be owned by a conservation agency or organization and managed for wildlife conservation in perpetuity, especially in focus areas and in areas where acquisition of lands builds upon networks of contiguous existing protected lands. Major partners include the state fish and wildlife and land conservation agencies, National Wildlife Refuges, national Forests, The Nature Conservancy, land trusts, and state Audubon chapters.

2. Conservation easements: Conservation easements with private landowners and local governments will be used to acquire legal interests to conserve and manage important wetlands and associated upland habitats and limit development while allowing some use by the landowner consistent with the easement conditions. These easements may be particularly effective in working landscapes including working forests and farms where the use of the land is consistent with wildlife habitat conservation. Habitat management plans are important tools to guide the use of the land consistent with the easement conditions. Easements to be generally held by a federal, state or regional conservation agency or organization with the resources to monitor and enforce the easement conditions.

3. Cooperative agreements: Agreements with corporations, government agencies, private landowners, and other organizations will be used to protect wetlands and integrate compatible land use practices that benefit wetlands and associated upland habitats.

4. Leases: Long-term leases with private landowners, corporations, and other private entities can be used to implement wetland protection and management activities.

5. Financial incentives: Develop state and local legislation that would provide financial benefits, i.e., alteration in property taxes to individual landowners, to encourage protection and conservation of wetlands and associated upland habitats.

Habitat Restoration

6. Restore tidal wetland hydrology: Restore flow to tidal creeks and marshes that has been cutoff or reduced by placement of roads, dikes, and undersized culverts resulting in a major change in the marsh structure and often resulting in the invasion by *Phragmites*.

7. Restore drained wetlands : Restore drained and ditched freshwater wetlands by eliminating drains and ditches, restoring hydrology and planting or seeding wetland plants where needed.

8. Restore Riparian Systems: Restore the natural flow of streams and floodplain wetlands that have been straightened or altered.

Habitat Enhancement and Management

9. Improve water level management on managed wetlands: Upgrade existing federal, state, and other managed wetlands areas by providing adequate water control structures, dikes, etc., to maximize management opportunities and improve the quality of waterfowl breeding, wintering, and migration habitats as well as to provide for seasonal waterfowl, waterbird and shorebird needs. Impoundment management is particularly important in the southeast Atlantic Coastal Plain where there are thousands of acres of former rice plantations;

10. Restore vegetation to impacted wetlands: Implement measures to restore natural vegetation and improve the health and productivity of wetland habitats that have deteriorated due to human impact and overgrazing by snow geese and other impacts resulting in loss of vegetation;

11. Restore converted wetlands: Where appropriate, restore forested wetlands that have been converted to other wetland types through planting and management;

12. Open marsh water management: Implement management measures to improve water surface and tidal exchange in salt marsh ecosystems by plugging ditches and creating ponds and channels for the benefit of waterfowl and waterbirds as well as the control of mosquitoes.

13. Restore and Manage Riparian Buffers: Establish and restore riparian buffers through planting, streambank fencing and other techniques.

14. Beaver management: Where applicable, encourage, develop, and support state beaver management policies and programs that would manipulate beaver populations to improve habitat for black ducks, other waterfowl, and wildlife. Also, install devices that allow for beaver-enhanced wetlands but prevent flooding of roads.

15. Control exotic and invasive species: Eliminate or suppress the spread of invasive and exotic plants in wetlands through the use of physical, biological, or chemical agents.

Eliminate or suppress population growth of invasive animal species through the use of trapping, egg addling or hunting.

16. Prescribed burning: Use prescribed fire to restore natural fire-dependent ecological communities such as coastal grasslands and heathlands.

17. Implement Farm Bill: Work with NRCS to implement Farm bill conservation programs including Conservation Reserve Program, Conservation Reserve Enhancement Program, Wetland Reserve Program, Wildlife Habitat Incentive Program and others to enhance wetlands and buffers in agricultural areas of the ACJV.

18. Enhance habitats on Federal lands: Work with federal agencies such as the U.S. Fish and Wildlife Service, U.S. Forest Service and the Department of Defense to develop and assist in the implementation of programs that would better manage and enhance waterfowl habitats on federal lands.

Other Conservation Actions Benefiting Waterfowl Habitat

19. Review regulatory legislation and enforcement: Evaluate existing wetland protection legislation and work with ongoing programs to strengthen or improve existing federal-state wetland protection efforts and to facilitate wetland management activities. Coordinate with the EPA, the Corps of Engineers, and appropriate state agencies to implement wetland protection provisions of the Federal Water Pollution Control Act.

20. Streamline regulations for beneficial projects: Encourage and support measures that would facilitate implementation of management actions in wetlands to benefit waterfowl and other wildlife.

21. Mitigation: Work with federal and state regulatory agencies to ensure mitigation policies and mitigation actions resulting from development projects result in enhanced wetland management opportunities.

22. Information and education: Develop informational-educational leaflets/brochures, audio-visual programs, and other techniques to generate public interest and support for waterfowl and wetlands conservation.

23. Extension education on best management practices: Develop "how to" information for private landowners. Utilize existing network or develop and implement an extension education program to encourage private individuals to conserve and manage wetlands and associated habitats and utilize best management practices.

24. Public use management: Carry out public education efforts and provide public use opportunities in a manner compatible with reducing or eliminating disturbance to feeding or loafing waterfowl during critical winter periods.

25. Watershed protection and management: Eliminate degradation of wetland health and productivity by municipal waste, agricultural runoff, sedimentation, and industrial contaminants by developing guidelines and providing input to watershed management and estuary plans.

26. Predator management: Monitor predator populations on federal and state waterfowl management areas and implement appropriate programs to reduce depredation in problem areas.

27. Eliminate waterfowl release: Eliminate releases of captive waterfowl to the wild to reduce competition for wintering habitat between released birds and wild birds. Eliminate state and private release programs to reduce potential for pair bonding between wild and released stocks within a species, reduce the likelihood of pair bonding and hybridization between released mallards and mottled or black ducks, and reduce the potential for spread of disease between released birds and wild stocks.

8. HABITAT ACCOMPLISHMENTS FOR THE ATLANTIC COAST JOINT VENTURE

The partners of the Atlantic Coast Joint Venture have conserved significant acreages of wetland, wetland-associated and other important wetland habitat from the inception of the joint venture in 1988 through the end of 2004. Tables 8.1 and 8.2 summarize these accomplishments by state and year. For those states that joined the joint venture after 1988, the accomplishments were only compiled since the date that state joined. These accomplishments represent acres protected, restored or enhanced in the joint venture area with a major benefit for waterfowl through the following funding sources or partner programs: North American Wetland Conservation Act grants, National Coastal Wetland Conservation Act grants, National Wildlife Refuge acquisitions, National Forest habitat conservation, Partners for Fish and Wildlife habitat restoration, Ducks Unlimited habitat conservation, The Nature Conservancy habitat conservation, State Fish and Wildlife agency projects, and Atlantic Coast Joint Venture funded projects (Table 8.3). Although many of these projects were completed in Atlantic Coast Joint Venture Focus Areas, the total acres represent projects completed throughout the entirety of the Atlantic Coast Joint Venture area.

Table 8.1. Yearly conservation accomplishments (acres) of all partners in the ACJV.

Year	Protected	Restored	Enhanced	**Total**
1988	44,938	6,088	7,620	58,645
1989	35,259	7,211	11,536	54,007
1990	146,612	3,017	27,863	177,492
1991	115,369	8,677	25,626	149,672
1992	72,297	25,839	21,506	119,641
1993	122,494	6,452	34,405	163,351
1994	56,849	24,635	41,358	122,841
1995	37,736	30,830	25,425	93,992
1996	25,065	17,530	23,020	65,614
1997	36,665	11,716	12,318	60,698
1998	49,085	10,505	15,348	74,938
1999	177,401	34,185	11,800	223,386
2000	93,687	17,987	7,170	118,844
2001	175,012	28,044	17,053	220,109
2002	367,948	53,745	12,297	433,990
2003	141,686	32,211	18,565	192,461
2004	56,847	13,982	18,231	89,060
Unknown	432,867	12,932	85,823	531,622
Total	2,187,817	345,583	416,963	2,950,364

The sources of information were: the International Tracking System (ITS) database records for the Atlantic Coast Joint Venture, the NAWCA databases maintained by the USFWS Division of Bird Habitat Conservation and the Atlantic Coast Joint Venture, the National Coastal Wetland Conservation Act grant FAIMS database and project files, the National Wildlife Refuge System Realty database of Lands Under the Control of the NWRs, the Ducks Unlimited, Inc. national accomplishment database, the USFWS habITS database, the Nature Conservancy accomplishment database, contributions from state Waterfowl Technical Committee members for activities accomplished by their agencies, contributions from National Forest Service biologists, contributions from regional and state Partners for Fish and Wildlife Coordinators, and other sources. Although significant efforts were made to avoid double-counting acreage accomplishments that were shared among these programs, limited information on some of these projects make it likely that some double-counting occurred.

Table 8.2. Cumulative habitat accomplishments of all partners participating in the joint venture by state.

State	Protected	Restored	Enhanced	**Total**
CT	9,889	2,863	3,893	16,645
DE	15,805	7,331	91,092	114,228
FL	288,702	30,772	33,808	353,282
GA	35,591	12,846	25,245	73,682
ME	334,684	10,293	13,658	358,635
MD	155,627	97,749	15,314	268,690
MA	14,776	1,095	831	16,702
N/A	0	1,250	0	1,250
NH	60,280	3,533	2,323	66,136
NJ	119,533	7,178	11,050	137,762
NY	48,657	38,165	30,142	116,964
NC	347,139	57,966	71,964	477,070
PA	27,677	18,525	19,257	65,460
PR	25,530	634	718	26,882
RI	13,387	1,008	688	15,082
SC	376,550	13,979	45,739	436,268
VA	109,629	33,164	44,674	187,467
VI	301	0	0	301
VT	182,604	6,338	4,547	193,488
WV	21,456	895	2,020	24,372
Total	2,187,817	345,583	416,963	2,950,364

The sources of information were: the International Tracking System (ITS) database records for the Atlantic Coast Joint Venture, the NAWCA databases maintained by the USFWS Division of Bird Habitat Conservation and the Atlantic Coast Joint Venture, the National Coastal Wetland Conservation Act grant FAIMS database and project files, the National Wildlife Refuge System Realty database of Lands Under the Control of the NWRs, the Ducks Unlimited, Inc. national accomplishment database, the USFWS habITS database, the Nature Conservancy accomplishment database, contributions from state Waterfowl Technical Committee members for activities accomplished by their agencies, contributions from National Forest Service biologists, contributions from regional and state Partners for Fish and Wildlife Coordinators, and other sources. Although significant efforts were made to avoid double-counting acreage accomplishments that were shared among these programs, limited information on some of these projects make it likely that some double-counting occurred.

Table 8.3. Cumulative habitat conservation accomplishments (acres) within the ACJV by program.

Program	Protected	Restored	Enhanced	**Total**
Coastal	55,477	4,823	0	60,300
DU	119,732	89,716	92,080	301,528
NAWCA	631,847	71,688	26,330	729,865
NWR	588,163	29,621	46,798	664,582
Other	6,643	7,496	52	14,191
PFW	6,147	126,896	88,192	221,234
ST	567,008	15,111	161,477	743,596
TNC	211,441	0	0	211,441
USFS	1,359	232	2,035	3,626
Total	2,187,817	345,583	416,963	2,950,364

The sources of information were: the International Tracking System (ITS) database records for the Atlantic Coast Joint Venture, the NAWCA databases maintained by the USFWS Division of Bird Habitat Conservation and the Atlantic Coast Joint Venture, the National Coastal Wetland Conservation Act grant FAIMS database and project files, the National Wildlife Refuge System Realty database of Lands Under the Control of the NWRs, the Ducks Unlimited, Inc. national accomplishment database, the USFWS habITS database, the Nature Conservancy accomplishment database, contributions from state Waterfowl Technical Committee members for activities accomplished by their agencies, contributions from National Forest Service biologists, contributions from regional and state Partners for Fish and Wildlife Coordinators, and other sources. Although significant efforts were made to avoid double-counting acreage accomplishments that were shared among these programs, limited information on some of these projects make it likely that some double-counting occurred.

Table 8.4. Comparison of accomplishments to goals within the ACJV. Table is under preparation and will be available soon.

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APPENDIX A.

Waterfowl Conservation Region Species Prioritization

Table A.1. Conservation prioritization for breeding and nonbreeding ducks by Waterfowl Conservation Region (WCR) in the ACJV. Blank cells indicate low or absent conservation needs. Taken from the 2004 Update of the North American Waterfowl Management Plan.

WCR	Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
13	**American Black Duck**	HIGH	MOD HIGH	HIGH	MOD HIGH	HIGH
	Common Eider	HIGH			MOD LOW	MODERATE
	Lesser Scaup	HIGH			HIGH	HIGHEST
	Mallard	HIGH	MOD HIGH	HIGH	MOD LOW	MODERATE
	Northern Pintail	HIGH			MOD LOW	MODERATE
	Wood Duck	HIGH	MOD LOW	MODERATE		
	American Wigeon	MOD HIGH	MOD LOW	MOD LOW		
	Black Scoter	MOD HIGH			MOD HIGH	MOD HIGH
	Blue-winged Teal	MOD HIGH	MOD LOW	MOD LOW		
	Canvasback	MOD HIGH	MOD LOW	MOD LOW	MOD HIGH	MOD HIGH
	Common Goldeneye	MOD HIGH	MOD LOW	MOD LOW	HIGH	HIGH
	Long-tailed Duck	MOD HIGH			HIGH	HIGH
	Redhead	MOD HIGH	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Surf Scoter	MOD HIGH			HIGH	HIGH
	White-winged Scoter	MOD HIGH			MOD HIGH	MOD HIGH
	Bufflehead	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Gadwall	MODERATE			MOD LOW	MOD LOW
	Greater Scaup	MODERATE			MOD HIGH	MOD HIGH
	Green-winged Teal	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Ring-necked Duck	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Common Merganser	MOD LOW			MOD HIGH	MODERATE
	Hooded Merganser	MOD LOW	MOD HIGH	MODERATE		
	Red-breasted Merganser	MOD LOW			HIGH	MODERATE
14	**American Black Duck**	HIGH	HIGH	HIGHEST	MOD HIGH	HIGH
	Common Eider	HIGH	HIGH	HIGHEST	HIGH	HIGHEST
	Lesser Scaup	HIGH			MOD LOW	MODERATE
14	**Mallard**	HIGH	MOD LOW	MODERATE	MOD LOW	MODERATE
	Northern Pintail	HIGH	MOD LOW	MODERATE	MOD LOW	MODERATE
	Wood Duck	HIGH	MOD HIGH	HIGH	MOD LOW	MODERATE

WCR	Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
	American Wigeon	MOD HIGH	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Black Scoter	MOD HIGH			MOD LOW	MOD LOW
	Blue-winged Teal	MOD HIGH	MOD LOW	MOD LOW		
	Common Goldeneye	MOD HIGH	MOD HIGH	MOD HIGH	MOD HIGH	MOD HIGH
	Long-tailed Duck	MOD HIGH			HIGH	HIGH
	Surf Scoter	MOD HIGH			HIGH	HIGH
	White-winged Scoter	MOD HIGH			MOD HIGH	MOD HIGH
	Barrow's Goldeneye	MODERATE			MOD HIGH	MOD HIGH
	Bufflehead	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Gadwall	MODERATE	MOD LOW	MOD LOW		
	Green-winged Teal	MODERATE	MOD HIGH	MOD HIGH	MOD LOW	MOD LOW
	Harlequin Duck	MODERATE			MOD HIGH	MOD HIGH
	Ring-necked Duck	MODERATE	MOD HIGH	MOD HIGH		
	Common Merganser	MOD LOW			MOD HIGH	MODERATE
	Hooded Merganser	MOD LOW	MOD HIGH	MODERATE		
	Red-breasted Merganser	MOD LOW			MOD HIGH	MODERATE
27	**American Black Duck**	HIGH			MOD HIGH	HIGH
	Lesser Scaup	HIGH			MOD HIGH	HIGH
	Mallard	HIGH			MOD HIGH	HIGH
	Wood Duck	HIGH	MOD HIGH	HIGH	MOD HIGH	HIGH
	American Wigeon	MOD HIGH			MOD LOW	MOD LOW
	Canvasback	MOD HIGH			MOD LOW	MOD LOW
	Common Goldeneye	MOD HIGH			MOD HIGH	MOD HIGH
	Redhead	MOD HIGH			MOD LOW	MOD LOW
	Bufflehead	MODERATE			MOD HIGH	MOD HIGH
	Gadwall	MODERATE			MOD LOW	MOD LOW
	Greater Scaup	MODERATE			MOD HIGH	MOD HIGH
27	**Ring-necked Duck**	MODERATE			MOD HIGH	MOD HIGH
	Ruddy Duck	MOD LOW			MOD HIGH	MODERATE
27.1	**American Black Duck**	HIGH	MOD LOW	MODERATE	HIGH	HIGHEST
	Lesser Scaup	HIGH			HIGH	HIGHEST
	Mallard	HIGH			MOD HIGH	HIGH
	Northern Pintail	HIGH			MOD HIGH	HIGH

WCR	Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
	Wood Duck	HIGH	MOD HIGH	HIGH	MOD HIGH	HIGH
	American Wigeon	MOD HIGH			MOD HIGH	MOD HIGH
	Black Scoter	MOD HIGH			MOD HIGH	MOD HIGH
	Blue-winged Teal	MOD HIGH			MOD HIGH	MOD HIGH
	Canvasback	MOD HIGH			HIGH	HIGH
	Common Goldeneye	MOD HIGH			MOD HIGH	MOD HIGH
	Long-tailed Duck	MOD HIGH			MOD LOW	MOD LOW
	Redhead	MOD HIGH			MOD HIGH	MOD HIGH
	Surf Scoter	MOD HIGH			HIGH	HIGH
	White-winged Scoter	MOD HIGH			MOD HIGH	MOD HIGH
	Bufflehead	MODERATE			HIGH	HIGH
	Fulvous Whistling Duck	MODERATE			MOD LOW	MOD LOW
	Gadwall	MODERATE			MOD HIGH	MOD HIGH
	Greater Scaup	MODERATE			HIGH	HIGH
	Green-winged Teal	MODERATE			MOD HIGH	MOD HIGH
	Mottled Duck	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Northern Shoveler	MODERATE			MOD HIGH	MOD HIGH
	Ring-necked Duck	MODERATE			MOD HIGH	MOD HIGH
	Hooded Merganser	MOD LOW			MOD HIGH	MODERATE
	Red-breasted Merganser	MOD LOW			MOD HIGH	MODERATE
	Ruddy Duck	MOD LOW			HIGH	HIGH
27.2	**Lesser Scaup**	HIGH			HIGH	HIGHEST
	Mallard	HIGH			MOD LOW	MODERATE
	Northern Pintail	HIGH			MOD LOW	MODERATE
27.2	**Wood Duck**	HIGH	MOD HIGH	HIGH	MOD HIGH	HIGH
	American Wigeon	MOD HIGH			MOD HIGH	MOD HIGH
	Blue-winged Teal	MOD HIGH			MOD HIGH	MOD HIGH
	Canvasback	MOD HIGH			MOD HIGH	MOD HIGH
	Common Goldeneye	MOD HIGH			MOD LOW	MOD LOW
	Redhead	MOD HIGH			HIGH	HIGH
	Bufflehead	MODERATE			MOD HIGH	MOD HIGH
	Gadwall	MODERATE			MOD HIGH	MOD HIGH
	Greater Scaup	MODERATE			MOD HIGH	MOD HIGH

WCR	Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
	Green-winged Teal	MODERATE			MOD HIGH	MOD HIGH
	Mottled Duck	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Northern Shoveler	MODERATE			MOD HIGH	MOD HIGH
	Ring-necked Duck	MODERATE			MOD HIGH	MOD HIGH
	Hooded Merganser	MOD LOW			MOD HIGH	MODERATE
	Red-breasted Merganser	MOD LOW			MOD HIGH	MODERATE
	Ruddy Duck	MOD LOW			MOD HIGH	MODERATE
28	**American Black Duck**	HIGH			MOD HIGH	HIGH
	Mallard	HIGH			MOD LOW	MODERATE
	Wood Duck	HIGH	MOD LOW	MODERATE	MOD LOW	MODERATE
	Canvasback	MOD HIGH			MOD LOW	MOD LOW
	Common Goldeneye	MOD HIGH			MOD LOW	MOD LOW
	Bufflehead	MODERATE			MOD LOW	MOD LOW
	Gadwall	MODERATE			MOD LOW	MOD LOW
29	**American Black Duck**	HIGH			MOD HIGH	HIGH
	Lesser Scaup	HIGH			MOD LOW	MODERATE
	Mallard	HIGH			MOD LOW	MODERATE
	Wood Duck	HIGH	MOD LOW	MODERATE	MOD HIGH	HIGH
	Canvasback	MOD HIGH			MOD LOW	MOD LOW
	Common Goldeneye	MOD HIGH			MOD LOW	MOD LOW
	Redhead	MOD HIGH			MOD LOW	MOD LOW
29	**Bufflehead**	MODERATE			MOD LOW	MOD LOW
	Greater Scaup	MODERATE			MOD LOW	MOD LOW
	Ring-necked Duck	MODERATE			MOD LOW	MOD LOW
	Hooded Merganser	MOD LOW			MOD HIGH	MODERATE
30	**American Black Duck**	HIGH	MOD HIGH	HIGH	HIGH	HIGHEST
	Common Eider	HIGH			HIGH	HIGHEST
	Lesser Scaup	HIGH			MOD HIGH	HIGH
	Mallard	HIGH	MOD LOW	MODERATE	MOD HIGH	HIGH
	Northern Pintail	HIGH			MOD LOW	MODERATE
	Wood Duck	HIGH	MOD LOW	MODERATE	MOD LOW	MODERATE
	American Wigeon	MOD HIGH			MOD LOW	MOD LOW
	Black Scoter	MOD HIGH			HIGH	HIGH

WCR	Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
	Blue-winged Teal	MOD HIGH			MOD LOW	MOD LOW
	Canvasback	MOD HIGH			HIGH	HIGH
	Common Goldeneye	MOD HIGH			MOD HIGH	MOD HIGH
	King Eider	MOD HIGH			MOD HIGH	MOD HIGH
	Long-tailed Duck	MOD HIGH			HIGH	HIGH
	Surf Scoter	MOD HIGH			HIGH	HIGH
	White-winged Scoter	MOD HIGH			HIGH	HIGH
	Bufflehead	MODERATE			HIGH	HIGH
	Gadwall	MODERATE			MOD LOW	MOD LOW
	Greater Scaup	MODERATE			HIGH	HIGH
	Green-winged Teal	MODERATE			MOD LOW	MOD LOW
	Harlequin Duck	MODERATE			HIGH	HIGH
	Hooded Merganser	MOD LOW			MOD HIGH	MODERATE
	Red-breasted Merganser	MOD LOW			MOD HIGH	MODERATE
	Ruddy Duck	MOD LOW			MOD HIGH	MODERATE
31	**Lesser Scaup**	HIGH			MOD HIGH	HIGH
	Northern Pintail	HIGH			MOD LOW	MODERATE
	Wood Duck	HIGH	MOD LOW	MODERATE		
31	**American Wigeon**	MOD HIGH			MOD HIGH	MOD HIGH
	Blue-winged Teal	MOD HIGH			MOD HIGH	MOD HIGH
	Canvasback	MOD HIGH			MOD LOW	MOD LOW
	Redhead	MOD HIGH			MOD LOW	MOD LOW
	Bufflehead	MODERATE			MOD LOW	MOD LOW
	Fulvous Whistling Duck	MODERATE	MOD LOW	MOD LOW	MOD LOW	MOD LOW
	Green-winged Teal	MODERATE			MOD LOW	MOD LOW
	Mottled Duck	MODERATE	HIGH	HIGH	HIGH	HIGH
	Northern Shoveler	MODERATE			MOD LOW	MOD LOW
	Ring-necked Duck	MODERATE			HIGH	HIGH
	Hooded Merganser	MOD LOW			MOD HIGH	MODERATE

Table A.2. Conservation prioritization for breeding and nonbreeding geese and swans by Waterfowl Conservation Region (WCR) in the ACJV. Blank cells indicate low or absent conservation needs. Taken from the 2004 Update of the North American Waterfowl Management Plan.

WCR	Species/Population	Continental Priority	Breeding Importance	Breeding Need	Nonbreeding Importance	Nonbreeding Need
13	**Canada Goose - Giant**	Above Objective	HIGH	HIGH	MOD HIGH	MODERATE
	Greater Snow Goose	Above Objective			HIGH	HIGH
	Canada Goose - Atlantic	HIGH			HIGH	HIGHEST
	Canada Goose - Southern James Bay	HIGH			HIGH	HIGHEST
	Atlantic Brant	MOD LOW			MOD LOW	MOD LOW
	Tundra Swan - Eastern	MOD LOW			MOD HIGH	MODERATE
14	**Canada Goose - North Atlantic**	MOD HIGH			HIGH	HIGH
	Atlantic Brant	MOD LOW			MOD HIGH	MODERATE
27	**Canada Goose - Southern James Bay**	HIGH			MOD LOW	MODERATE
27.1	**Greater Snow Goose**	Above Objective			HIGH	HIGH
	Canada Goose - Atlantic	HIGH			MOD HIGH	HIGH
	Atlantic Brant	MOD LOW			MOD HIGH	MODERATE
	Tundra Swan - Eastern	MOD LOW			HIGH	HIGH
28	**Canada Goose - Atlantic**	HIGH			MOD HIGH	HIGH
29	**Canada Goose - Atlantic**	HIGH			MOD HIGH	HIGH
30	**Canada Goose - Giant**	Above Objective	MOD HIGH	MODERATE	MOD HIGH	MODERATE
	Greater Snow Goose	Above Objective			HIGH	HIGH
	Canada Goose - Atlantic	HIGH			HIGH	HIGHEST
	Canada Goose - North Atlantic	MOD HIGH			HIGH	HIGH
	Atlantic Brant	MOD LOW			HIGH	HIGH
	Tundra Swan - Eastern	MOD LOW			HIGH	HIGH

Appendix B

Stepping Continental NAWMP Population Objectives in Joint Venture Habitat Goals

As part of its responsibility in implementing the goals stated by NAWMP, joint ventures are developing habitat goals that are biologically linked to the breeding population goals. Ultimately, these goals are to be expressed as an amount of habitat that needs to be protected, enhanced or restored in the ACJV area in order to contribute to achieving NAWMP waterfowl population objectives at the regional and continental scales. At this time there is no consensus on how migratory or wintering waterfowl populations and habitat relate to the breeding objectives of NAWMP. The NAWMP National Science Support Team (NSST) has therefore recommended an interim method that uses a combination of MWS and harvest data to proportionally allocate the continental objectives between the various joint ventures. An evaluation of these methods indicates that this allocation works reasonably well for most duck species (exceptions include: Mottled Duck, whistling-ducks, Blue-winged Teal and Wood Ducks) but not for geese in general (M. Koneff, pers. comm.).

Implicit in such an endeavor is the assumption that local or regional actions are hierarchical in nature and can be aggregated to, in this case, a larger spatial scale. Although intuitive, there is no clear consensus on the functional form of such a relationship. In the absence of a clear analytical solution to the problem, the NSST reviewed alternative approaches and reached consensus in November 2003. As the official technical advisory committee of NAWMP, the NSST recommendations are being followed by non-breeding joint ventures in North America. The method being recommended by the NSST is a three-step approach that allows non-breeding joint ventures to "step-down" the continental population goals into regional goals that can be used for planning habitat delivery programs. The NSST recommends that these numbers not be used as a performance metric per se, but only for baseline planning purposes. As such the first step of the process is to determine the proportion of the continental population goals a joint venture might be responsible for over-wintering. The second step is to explicitly state the assumptions being made as to the regional requirements of waterfowl, resource availability and assess trends of the resource. Lastly, joint ventures need to evaluate the validity of the assumptions made in the second step.

The NSST recommendations only concern the first of this process: determination of the proportional allocation of continental objectives to the regional scale. The NSST is advocating the use of MWS and county level, species specific harvest data as a reasonable first approximation of the wintering distribution of waterfowl. It was noted that use of this approach incorporates all the potential biases that have been identified regarding the MWS data (Heusmann, Eggemann and other citations here). Although there are local data sets that might overcome some of these limitations, there is no other data set that covers the entire joint venture that could be used as a surrogate. Likewise, the county level-harvest data contain their own biases but lack of an alternate surrogate argues in favor of their use.

As a first approximation of objectively determining how many acres the ACJV needs to protect, restore or enhance, we used the NSST approach to calculate what the Waterfowl Technical Committee has termed a Wintering Habitat Capability Index (WHCI). MWS data for all four flyways from 1955 - 2001 were obtained from the U.S. Fish and Wildlife Service, Division of Migratory Bird Management. These data were used to determine the proportion of the total wintering population index counted within each state of the ACJV between 1990 and 2001. These years were used to account for observed shifts in resource availability and use and

changes in the MWS population index since the mid-1970s (Tables B.1 and B.2). The mean proportion for each state was then multiplied by the NAWMP population goal for each duck species. The resulting value is the WHCI for a given state and species combination (Table B.3). To reiterate, the WHCI values do not represent actual population numbers, they are only intended to be numbers that can be converted into habitat goals at a time when we have the necessary information.

An alternative to the use of MWS data is to use just the county-level harvest data. Although this might reduce the bias thought to exist in the MWS data, the county-level harvest data is not without its own biases and assumptions. However, it is possible to use the county-level harvest data to estimate a proportional allocation of the continental population goal to every county within the ACJV. Harvest data from December through February were used to reduce the effect of migration on the proportion of total harvest estimated for each county. The state-level WHCI index is derived by then summing county-level objectives within a state (Table B.3).

Unfortunately, there are numerous technical issues with both of the approaches explored as part of these analyses. In addition to the obvious biases associated with using the MWS and harvest survey data in ways they were never designed to be used we have identified the following issues that need to be resolved before we can quantitatively determine habitat objectives for the ACJV.

1. What do the continental NAWMP goals actually represent? Are they breeding population numbers, fall flight or ½ maximum sustained yield. Until this is answered it is not clear what we are stepping down to a regional level.

2. Determine spatial biases in both MWS and harvest survey data; determines how representative the proportional allocation is and identifies potential biases that we believe exist,

3. There is a general lack of information regarding energetic carrying capacities of most habitat types with the ACJV. Unlike other wintering joint ventures, waterfowl in the ACJV rely on a wide range of natural foods in addition to agricultural wastes. Although some of this work has been done in the Southeast and during the breeding season, there is not enough information to parameterize models to convert either numbers of ducks or duck-use days into required amount of habitats,

Table B.1. Mean (1970 -1979) Mid-winter Survey counts for selected species in the Atlantic Coast Joint Venture. Mean totals are averages of yearly totals for the entire U.S. portion of the Atlantic Flyway. Species abbreviations are 4-letter ABA codes.

	Species										
State	**ABDU**	**AGWT**	**AMWI**	**CANV**	**GADW**	**MALL**	**NOPI**	**NSHO**	**REDH**	**RNDU**	**RUDU**
Connecticut	5,573	6	254	560	13	1,217	8	2	4	0	0
Delaware	15,014	342	181	1,313	250	13,411	987	292	1	2	4,385
Florida	810	3,590	11,950	4,010	870	1,630	11,610	2,020	82,130	24,250	5,700
Georgia	830	2,140	1,090	1,360	1190	5,390	210	260	40	2,740	20
Maine	21,529	0	0	0	0	99	0	0	0	0	0
Maryland	31,360	390	1,720	51,610	250	29,440	830	50	8,800	130	10,840
Massachusetts	19,041	63	20	648	0	994	0	0	57	0	0
New Hampshire	1,578	0	0	0	0	76	0	0	0	0	0
New Jersey	72,117	3,040	3,040	11,809	285	13,867	1,215	740	189	65	5,696
New York	23,258	566	566	7,253	1	7,664	6	14	6,110	0	40
North Carolina	23,310	16,800	21,670	21,340	7050	21,340	40,350	680	19,440	8,380	19,860
Pennsylvania	6,445	70	56	1,980	65	10,742	413	43	146	69	3,430
Rhode Island	3,423	0	56	292	3	350	0	0	2	0	5
South Carolina	14,170	33,360	21,970	2,300	7030	89,780	37,140	6,880	190	14,700	2,080
Vermont	148	0	0	835	0	16	0	0	0	0	0
Virginia	23,258	1,389	6,308	11,543	4135	18,167	3,362	827	2,699	984	7,206
West Virginia	791	1	1	1	1	998	0	0	0	1	0
Mean Totals	262,426	60,171	68,882	116,854	21,143	215,181	96,131	11,808	119,808	51,321	59,262

Table B.2. Mean (1990-2001) Mid-winter Survey counts for selected species in the Atlantic Coast Joint Venture. Mean totals are averages of yearly totals for the entire U.S. portion of the Atlantic Flyway. Species abbreviations are 4-letter ABA codes.

	Species										
State	**ABDU**	**AGWT**	**AMWI**	**CANV**	**GADW**	**MALL**	**NOPI**	**NSHO**	**REDH**	**RNDU**	**RUDU**
Connecticut	3,000	0	0	1,000	0	1,000	0		0	0	
Delaware	11,000	5,000	0	1,000	1,000	8,000	4,000	1,000		1,000	1,000
Florida	0	12,000	14,000	2,000	1,000	1,000	6,000	4,000	90,000	48,000	4,000
Georgia	0	2,000	1,000	3,000	1,000	2,000	0	0	0	11,000	0
Maine	17,000	0				1,000	0				0
Maryland	23,000	2,000	2,000	44,000	2,000	47,000	2,000	0	2,000	3,000	33,000
Massachusetts	21,000	0	0	0	0	3,000	0				0
New Hampshire	1,000	0		0		1,000				0	
New Jersey	80,000	3,000	2,000	6,000	1,000	29,000	2,000	0	0	0	1,000
New York	21,000	0	0	9,000	0	20,000	0	0	7,000	0	1,000
North Carolina	10,000	29,000	12,000	11,000	6,000	14,000	25,000	1,000	8,000	9,000	12,000
Pennsylvania	3,000	0	0	0	0	6,000	0	0	0	0	0
Rhode Island	2,000		0	0	0	1,000			0		0
South Carolina	3,000	29,000	14,000	0	5,000	12,000	9,000	4,000	0	24,000	1,000
Vermont	0			0		0	0				
Virginia	22,000	2,000	3,000	18,000	3,000	19,000	1,000	0	1,000	5,000	13,000
West Virginia	1,000	0	0	0	0	4,000	0		0	0	0
Mean Totals	221,000	81,000	49,000	96,000	19,000	169,000	49,000	11,000	109,000	101,000	66,000

Table B.3. Atlantic Flyway totals for duck species that have established NAWMP population objectives. Mid-winter Survey means are shown for the 1970s (NAWMP baseline) and the 1990s. Flyway wide wintering habitat capability indices (WHCI) are shown for two different methods. The first, NSST, shows the National Science Support Team's recommended method of using MWS to determine proportional allocation of individuals by state. The second, Harvest, uses only harvest survey data to determine the proportional allocation between counties which are then summed to the state level.

	MWS Means		Step-down Method	
Common Name	1970s	1990s	NSST	Harvest[b]
American Black Duck [a]	262,426	219,949	268,433	232,953
American Wigeon	68,880	50,904	149,000	382,000
Canvasback	116,853	97,639	194,000	140,000
Gadwall	21,144	16,929	19,000	96,000
Green-winged Teal	60,169	83,066	93,000	167,000
Mallard	215,180	169,471	303,000	987,000
Northern Pintail	96,131	50,760	129,000	387,000
Northern Shoveler	11,807	10,694	22,000	129,000
Redhead	119,806	108,143	115,000	90,000
Total Ducks	972,396	807,554	1,292,433	2,610,953

[a] – Population objective used for step-down methods corresponds to 1986 wintering objective of 385,000 ducks in the Atlantic (260,000) and Mississippi (125,000) Flyways. This objective is approximately 46% of the population objective published in the 2005 NAWMP Update (640,000).

[b] – Uses harvest data for December through February only.

4. Method must allow for development of sound evaluation plan. At this time that would not be possible.

The Waterfowl Technical Committee and staff of the ACJV are resolved to pursue further development of scientifically sound, objective method to determine the amount of habitat that is necessary to protect, enhance and restore to meet our responsibilities under the North American Waterfowl Management Plan. However, we believe there are too many biases and information gaps to begin designing conservation plans based on the analyses that have been presented here.