Gulf Coast Joint Venture:

Chenier Plain Initiative

AUGUST 2001
(REVISED 2003)

NORTH AMERICAN
WATERFOWL
MANAGEMENT PLAN

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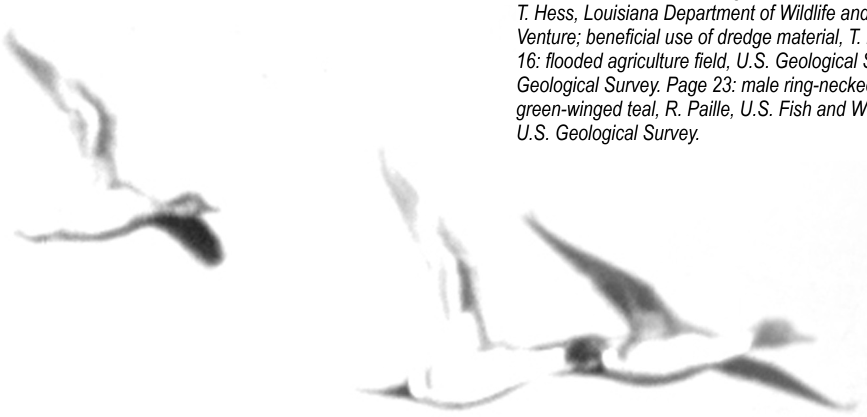

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North American Waterfowl Management Plan

This is one of six reports that address initiative plans for the entire North American Waterfowl Management Plan, Gulf Coast Joint Venture: the Chenier Plain Initiative, the Laguna Madre (Texas) Initiative, the Texas Mid-Coast Initiative, the Mississippi River Coastal Wetlands (southeast Louisiana) Initiative, the Coastal Mississippi Wetlands Initiative, and the Mobile Bay Initiative.

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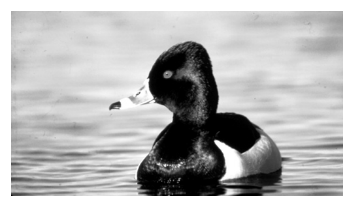

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Introduction

North American Waterfowl Management Plan

Faced with continuing wetland destruction and rapidly declining waterfowl populations, the Canadian and U.S. governments signed the North American Waterfowl Management Plan (NAWMP) in 1986, undertaking an intense effort to protect and restore North America's waterfowl populations and their habitats. Updated in 1994 and 1998 with Mexico as a signatory, the NAWMP recognizes that the recovery and perpetuation of waterfowl populations to levels observed in the 1970's, which is the baseline reference for duck population objectives under the plan, depends on restoring wetlands and associated ecosystems throughout the continent. The purpose of the NAWMP is to achieve waterfowl conservation while maintaining or enhancing associated ecological values in harmony with human needs. The benefits of such habitat conservation were recognized to be applicable to a wide array of other species as well. Six priority waterfowl habitat ranges, including the western U.S. Gulf of Mexico Coast (hereafter Gulf Coast), were identified in the 1986 document and targeted as areas to begin implementation of the NAWMP.

Transforming the goals of the NAWMP into actions requires a cooperative approach to conservation. The implementing mechanisms of the NAWMP are regional partnerships called joint ventures. A joint venture is composed of individuals, corporations, small businesses, sportsmen's groups, conservation organizations, and local, state, provincial, and federal agencies that are concerned with conserving migratory birds and their habitats in a particular physiographic region such as the Gulf Coast. These partners come together under the NAWMP to pool resources and accomplish collectively what is often difficult or impossible to do individually.

Gulf Coast Joint Venture

The Gulf Coast is the terminus of the Central and Mississippi Flyways and is therefore one of the most important waterfowl areas in North America, providing both wintering and migration habitat for significant numbers of the continental duck and goose populations that use both flyways. The coastal marshes of Louisiana, Alabama, and Mississippi regularly hold half of the wintering duck population of the Mississippi Flyway. Coastal wetlands of Texas are the primary wintering site for ducks using the Central Flyway, wintering more than half of the Central Flyway waterfowl population. The greatest contribution of the Gulf Coast Joint Venture (GCJV) region (Fig. 1) in fulfilling the goals of the NAWMP is as a wintering ground for waterfowl.

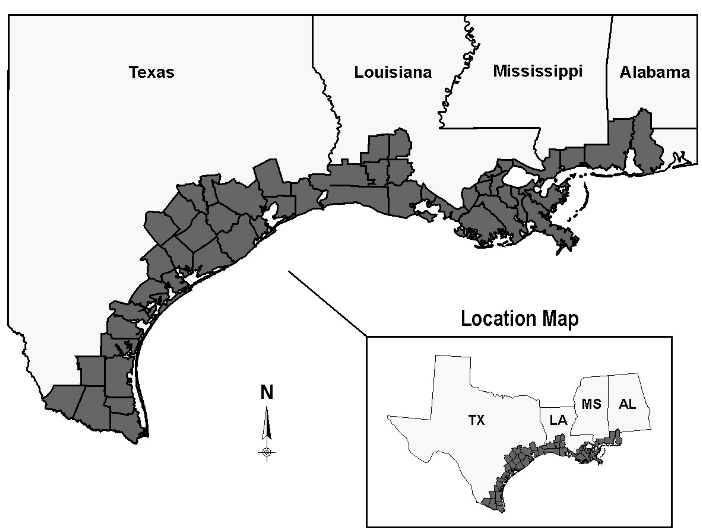


Figure 1. Location of the Gulf Coast Joint Venture region.

The GCJV area also provides year-round habitat for over 90% of the continental population of mottled ducks and serves as a key breeding area for whistling ducks. In addition, hundreds of thousands of waterfowl use the Gulf Coast as stopover habitat while migrating to and from Mexico and Central and South America. The GCJV region is the primary wintering range for several species of ducks and geese and is a major wintering area for every other North American duck except wood ducks, black ducks, cinnamon teal, and some sea ducks (Tribe Mergini).

Through its wetland conservation accomplishments, the GCJV is contributing to the conservation of biological diversity. While providing habitat for waterfowl, especially ducks, continues to be the major focus of the GCJV, a great diversity of birds, mammals, fish, and amphibians also rely on the wetlands of the Gulf Coast for part of their life cycles. Numerous species of shorebirds, wading birds, raptors, and songbirds can be found along the Gulf Coast. Of the 650 species of birds known to occur in the United States, nearly 400 species are found in the GCJV area. Muskrats and nutria have historically been important commercial fur species of the Gulf Coast. Many species of fish, shellfish, and other marine organisms also depend on the gulf coastal ecosystem. Almost all of the commercial fish and shellfish harvested in the Gulf of Mexico are dependent on the area's estuaries and wetlands that are an integral part of coastal ecosystems. The American alligator is also an important Gulf Coast region species and is sought commercially and recreationally for its hide and meat.

Gulf Coast Joint Venture Objectives

Conserving Gulf Coast habitats is critical to the overall success of the NAWMP because the area provides extensive wetlands that are vitally important to traditional wintering waterfowl concentrations. The primary goal of the GCJV is to provide for waterfowl in winter and ensure that they survive and return to the breeding grounds in good condition, but not exceeding levels commensurate with breeding habitat capacity as is the case with mid-continent lesser snow and Ross' geese. A secondary goal is to provide ample breeding and postbreeding habitat for resident waterfowl. Actions that will achieve and maintain healthy wetland ecosystems that are essential to waterfowl will be pursued. Wetland conservation actions that will provide benefits to species of fish and wildlife, in addition to waterfowl, will also be supported.

The emergence of the U.S. Shorebird Conservation Plan, Partners In Flight physiographic plans, and the Waterbird Conservation Plan, which address conservation of other North American migratory birds, present opportunities to broaden and strengthen joint venture partnerships for wetland conservation. As definitive population data and habitat needs are developed for the migratory birds represented in these emerging strategies, areas of mutual concern in wetland ecosystems can be identified. These wetland areas of overlapping interest in the GCJV will be candidate priority sites for the integrated design and delivery of habitat conservation efforts. Although wetland conservation projects cannot be designed to provide maximum benefits for all concerned species, they can be designed to maximize the overlap of benefits between the species groups. This joint venture will strive to balance its focus on waterfowl and wetlands with the need to expand coordination and cooperation with existing conservation initiatives that promote common purposes, strategies, or habitats of interest.

The GCJV is divided geographically into six initiative areas, each with a different mix of habitats, management opportunities, and species priorities. This document deals with planning efforts for the Chenier Plain Initiative area of southwest Louisiana and southeast Texas (Fig. 2). The goal of the Chenier Plain Initiative is to provide wintering and migration habitat for significant numbers of dabbling ducks, diving ducks, and geese (especially lesser snow and greater white-fronted), as well as year-round habitat for mottled ducks (Figs. 3 and 4).

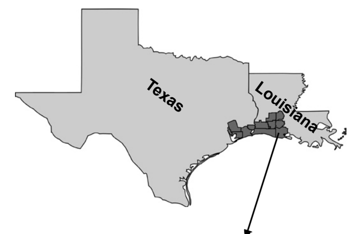


Figure 2. Chenier Plain Initiative area.

Midwinter Duck Population Objectives

To obtain objectives for midwinter duck populations in the GCJV Initiative

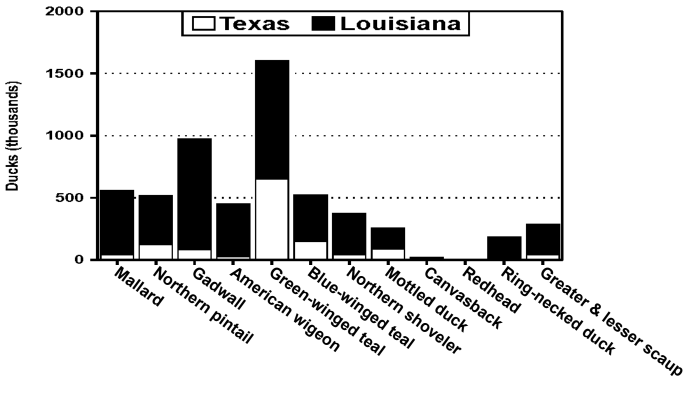


Figure 3. Chenier Plain midwinter duck objectives (see Table 1 for actual numbers).

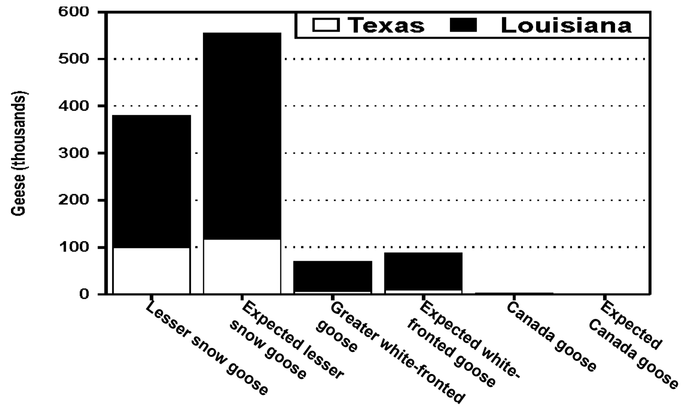


Figure 4. Chenier Plain midwinter goose objectives (see Table 1 for actual numbers).

areas, we started with the NAWMP continental breeding population goals, which total 62 million and are based on averages of 1970's breeding population surveys with adjustments for birds in nonsurveyed areas. We then estimated, from nationwide midwinter survey data proportions, the numbers of those 62 million breeding ducks that should return on spring flights from the Mississippi and Central Flyway wintering areas; we adjusted those numbers for 10% January-to-May mortality to obtain midwinter goals for the Mississippi and Central Flyways. Finally, using 1970's midwinter survey data proportions from the Mississippi and Central Flyways, we calculated how much of each of the two flyway goals should be derived from each GCJV Initiative area. Figure 5 provides an example of how this general process was applied at the species level in the Chenier Plain Initiative area. Exceptions to this methodology include derivation of blue-winged teal and redhead objectives and the expected number of mottled ducks (see Derivation of GCJV Waterfowl Objectives and Migration Patterns section, p. 23).

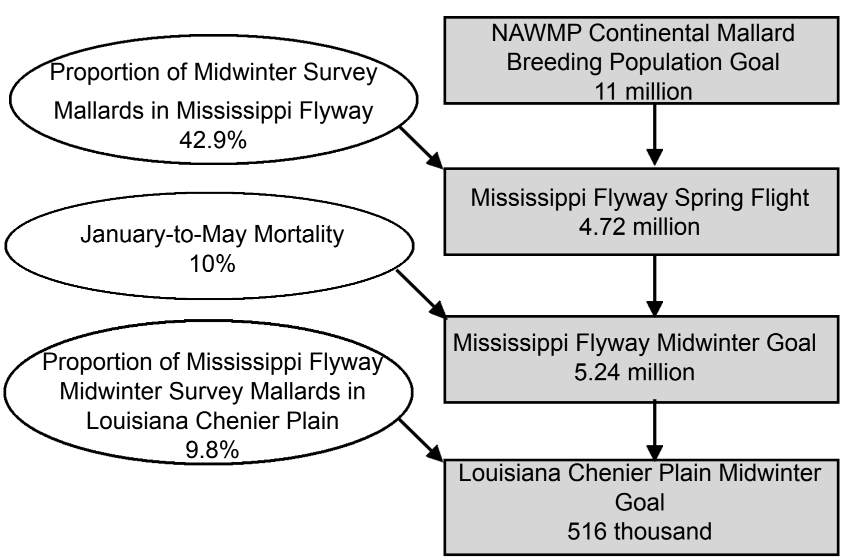


Figure 5. An example of how midwinter population objectives for a specific species, in this case mallards, were obtained in the Louisiana Chenier Plain.

Midwinter Goose Population Objectives

Midcontinent lesser snow and Ross' geese, many of which spend winters in the GCJV, are exceeding their Canadian breeding habitat capacity to the detriment of their long-term health and the health of a myriad of other birds that share this arctic/subarctic breeding habitat. Greater white-fronted geese, as well as Canada geese in some GCJV regions, are also experiencing population increases. Therefore, regional goose objectives are expressed two ways. Recent population data are used to estimate a quantity of geese "expected" to occur and compete to some extent for finite resources, whereas actual objectives indicate the desired regional goose population. Both are based on indices from midwinter (December) surveys. "Expected" numbers are derived by averaging recent December surveys (1995-97), and actual objectives are derived from the 1982-88 average (Table 1). Though objectives expressed in Table 1 are as described above for consistency with other species and regions, Canada geese on the Louisiana Chenier Plain are best indexed by late winter ground counts, which have documented recent averages of over 10,000.

Migration Chronology

Midwinter populations do not adequately represent the peak, or even the typical numbers of some waterfowl species common to the GCJV. Because of the variety of GCJV waterfowl and the interspecific variability in their migration patterns, incorporating species-specific migration patterns into population objectives is appropriate. Migrations differ regionally, even for the same species, so migration patterns were determined separately for each initiative area (see Migration Chronology for Waterfowl Species of GCJV Initiative Areas section, p. 26). Combining migration patterns and midwinter duck objectives (see Derivation of GCJV Waterfowl Objectives and Migration Patterns section, p. 23) yields semimonthly population objectives by species (Fig. 6). Similarly, combining goose migration patterns with expected numbers of midwinter geese yields semimonthly expected numbers of geese (Fig. 7).

Gadwall pair.

Table 1. Midwinter population objectives[1, 2] for initiative areas of the GCJV. (See Derivation of GCJV Waterfowl Objectives and Migration Patterns section of this report, p. 23, for information about the methods used in develop these goals).

	Laguna Madre	Texas Mid-Coast	Texas Chenier Plain	Louisiana Chenier Plain	Mississippi River Coastal Wetlands	Coastal Mississippi Wetlands	Mobile Bay	Total
Mallard	13,530	72,819	44,632	515,895	249,257	619	451	897,203
Northern pintail	173,355	775,755	124,193	396,313	99,967	0	1,236	1,570,819
Gadwall	46,200	224,926	84,039	888,456	714,356	268	2,286	1,960,531
American wigeon	100,377	93,841	29,147	423,845	264,119	191	1,711	913,231
Green-winged teal	35,160	293,574	650,395	951,853	537,313	413	2,544	2,471,250
Blue-winged teal	1,707	23,941	147,053	378,953	723,140	1,738	1,156	1,277,689
Northern shoveler	10,136	127,599	42,988	330,612	103,221	84	0	614,639
Mottled duck[3]	6,595	161,326	89,961	169,544	217,642	397	601	646,067
Canvasback	4,311	33,638	0	23,585	7,516	174	3,025	72,249
Redhead	392,650	92,944	402	0	13,731	0	0	499,727
Ring-necked duck	6,067	11,345	3,331	186,917	41,450	5,999	782	255,890
Greater & lesser scaup[4]	454,727	47,402	40,707	245,746	1,722,858	13,836	3,294	2,528,570
Total ducks	1,244,816	1,959,109	1,256,847	4,511,720	4,694,568	23,719	17,086	13,707,864
Lesser snow geese[3]	30,967	609,879	100,214	279,157	51,614			1,071,831
	25,766	737,403	117,555	437,841	72,250			1,390,815
Greater white-fronted geese[3]	7,759	97,636	7,457	62,529	0			175,381
	13,819	102,790	10,235	77,821	1,233			205,898
Canada geese[3]	6,155	63,043	996	2,000[5]	0			72,194
	430	12,768	957	1,052[5]	0			15,207
Total geese[3]	44,881	770,558	108,667	343,686	51,614	0	0	1,319,406
	40,015	852,961	128,747	516,714	73,483	0	0	1,611,920

[1] Objectives for ducks are based on 1970's winter distributions and breeding populations.

[2] Objectives for geese are based on 1982-88 averages of December Goose Surveys.

[3] Shaded values are "expected" numbers from 1994-97 (mottled ducks) or 1995-97 (geese) estimates.

[4] Scaup objectives exclude offshore populations.

[5] January ground counts indicate historical (1986-89) and recent (1996-98) averages of 5,273 and 10,267, respectively.

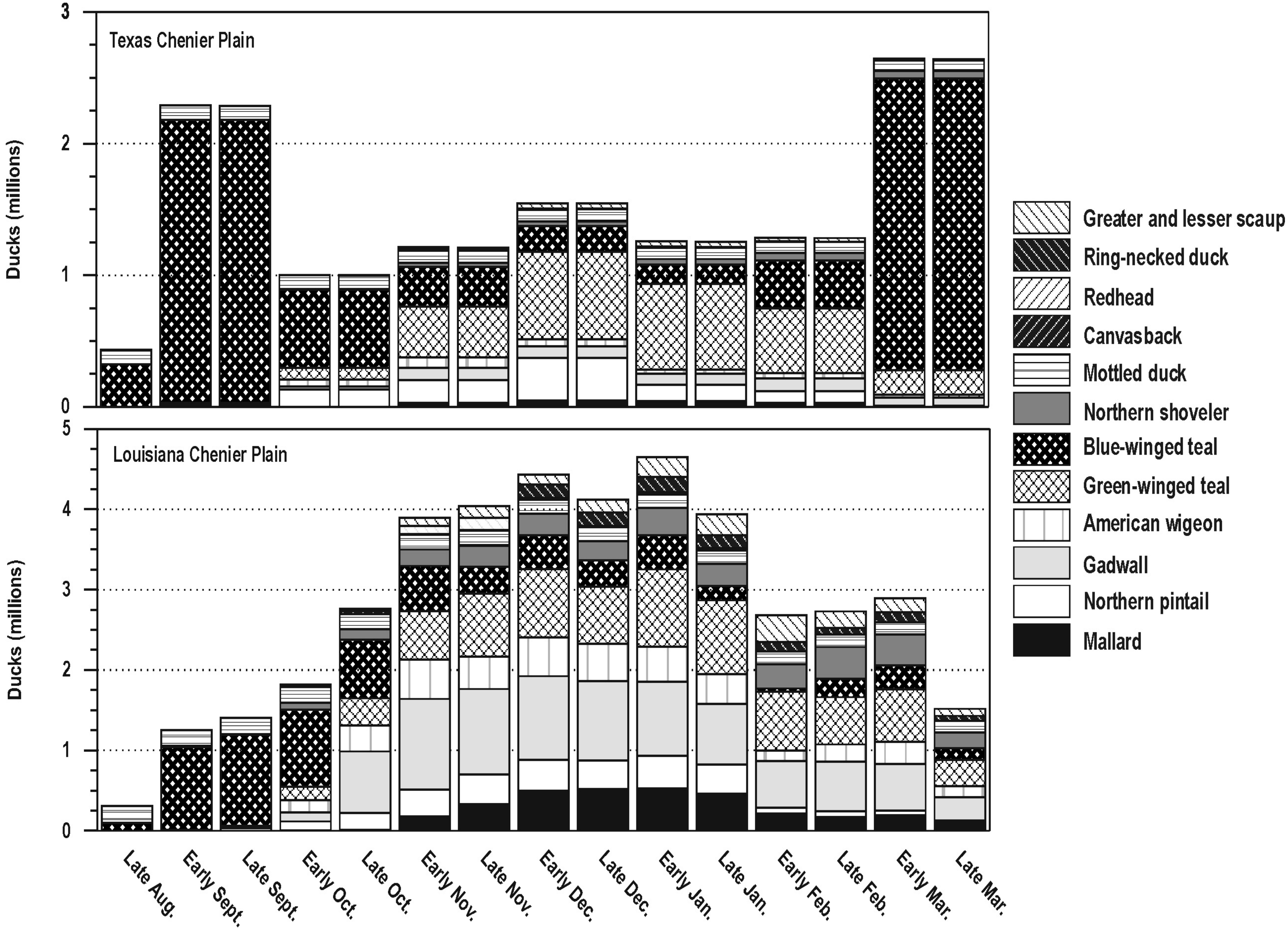


Figure 6. Semimonthly duck population objectives for the Texas and Louisiana Chenier Plain.

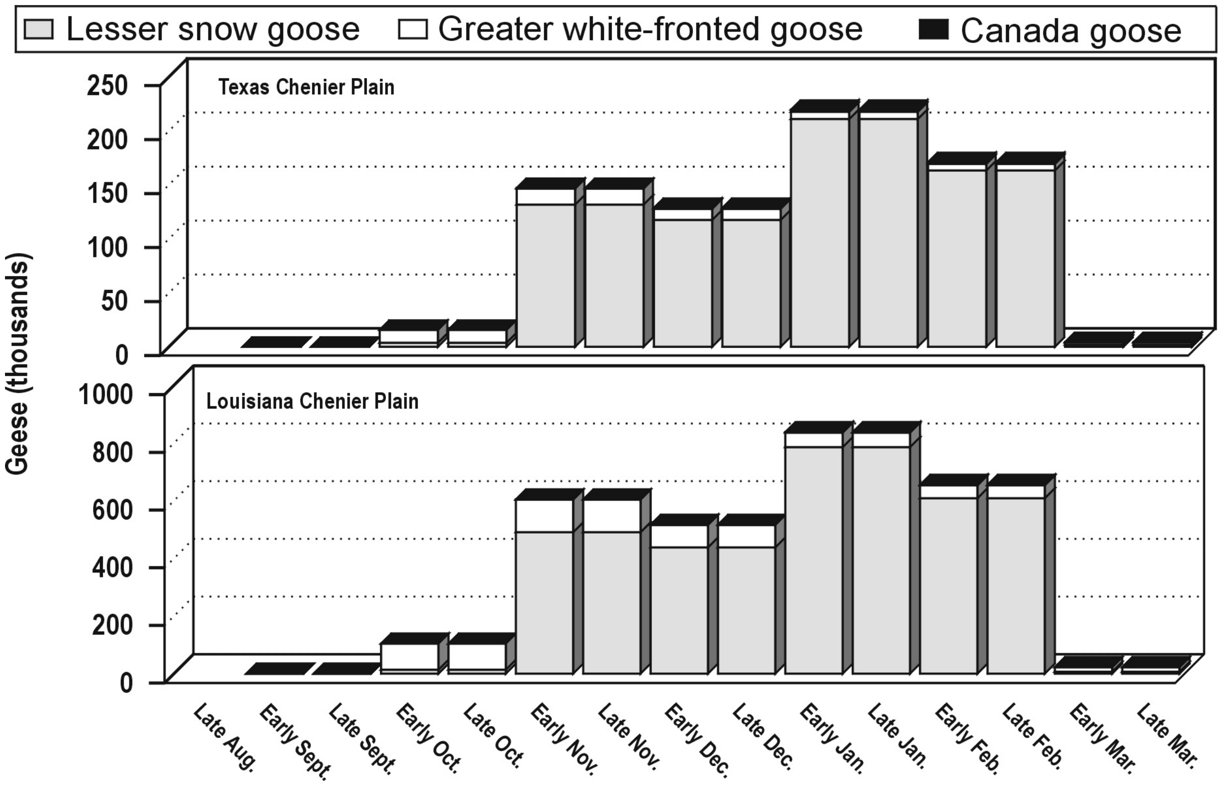


Figure 7. Semimonthly expected number of geese for the Texas and Louisiana Chenier Plain.

The Chenier Plain Initiative Area

The Chenier Plain Initiative area is a rich and complex mixture of wetlands, uplands, and open water that extends roughly 200 miles from Vermilion Bay, Louisiana, to Galveston Bay, Texas (Fig. 2). It runs from the expansive coastal marshes bordering the Gulf of Mexico shore, inland for 40 to 70 miles through the coastal prairie into areas of intensive rice cultivation. Geographically it includes the Louisiana parishes of Cameron, Calcasieu, Vermilion, Acadia, Jefferson Davis, Allen, and Evangeline, and the Texas counties of Chambers, Jefferson, Orange, and Liberty. Very small portions of Galveston and Harris Counties are also included at the western edge of the Texas segment. Paralleling the coastline are old beach ridges known as cheniers that are characteristic of the area and form natural levees, creating an immense marsh. Lying within this marsh zone are great estuarine lakes such as White, Grand, Calcasieu, and Sabine. The entire Chenier Plain Initiative area covers well over 10,000 square miles or approximately 6.5 million acres. See the June 1990 Chenier Plain Initiative Plan for a description of the area's geology, climate, and land use.

Although the Chenier Plain consists of a variety of land types and wildlife habitats, this plan focuses on the two major waterfowl habitats available, coastal marshes and the agricultural lands that are dominated by rice, soybeans, and pasture and lie north of the marsh zone.

Coastal Marsh

There are four distinct coastal marsh types in the Chenier Plain based on plant species composition, which is primarily influenced by species tolerance to water salinity. The four marsh type classifications are salt, brackish, intermediate, and fresh. These marsh types generally occur in bands paralleling the coast that correspond to salinity gradients moving inland from the Gulf of Mexico beginning with the salt type and followed by the brackish, intermediate, and fresh types. In addition to associations of plant species, each coastal marsh type has characteristic hydrological patterns, soils, and fish and wildlife resources.

Types of Coastal Marsh

Salt Marsh

Extensive salt marshes are absent from the Chenier Plain, and this marsh type is restricted to a narrow zone immediately adjacent to the shoreline of the Gulf of Mexico and associated bays. Salt marsh has the greatest tidal fluctuation of the four marsh types in the Chenier Plain and has a well-developed drainage system. Water salinity averages 18 parts per thousand (ppt), and this marsh type supports the least diverse vegetation. The predominant salt-tolerant plants are smooth cordgrass, seashore saltgrass, and needlegrass rush. Salt marsh is generally considered of only low value to waterfowl. The waterfowl value of this marsh type lies in how it buffers the more desired marsh types farther inland from the impacts of tide and salinity.

Mallard pair.

Brackish Marsh

Brackish marsh fringes the large water bodies of the Chenier Plain and lies behind the beach barriers. This marsh type is also subjected to daily tidal action and its water depths normally exceed that of salt marsh. Water salinity averages 8.2 ppt, and plant diversity is greater than that of salt marsh. This marsh type is dominated by saltmeadow cordgrass, seashore saltgrass, Olney bulrush, and widgeongrass. Brackish marsh is of high value to gadwalls and lesser scaup, and provides year-round habitat for mottled ducks. This marsh type represents the traditional wintering grounds for lesser snow geese.

Intermediate Marsh

Intermediate marsh, which lies inland from the brackish type, is somewhat influenced by tides, and water salinity averages 3.3 ppt. Water levels are slightly higher than in brackish marsh, and plant species diversity is high. This marsh type is also dominated by saltmeadow cordgrass, and other common plants include common reed, bulltongue arrowhead, and coastal waterhyssop. Submerged aquatics such as pondweeds and southern waternymph are abundant in intermediate marsh. This marsh type is used by many species of ducks for feeding and resting. This less saline zone of intermediate marsh provides habitat for mottled duck broods, and use of this marsh type by wintering ducks is second only to fresh marsh.

Male pintail.

Fresh Marsh

Fresh marsh in the Chenier Plain lies between the intermediate marsh and the rice prairies. This marsh type is normally free of tidal influence and has average water salinity of only 1.0 ppt and slow drainage. The greatest diversity of plants is supported by fresh marsh. Maidencane, spikerush, bulltongue arrowhead, and alligatorweed are the dominant plants. Many submerged and floating-leafed plants are present in this marsh type. Fresh marsh provides feeding and resting sites to many species of ducks and geese and is considered to be the most valuable marsh type to waterfowl.

Status and Trends

Growth and deterioration of coastal wetlands have been naturally occurring in the Gulf of Mexico region for thousands of years. As wetlands were degraded their loss was balanced by natural wetland building processes. Coastal wetlands of the Chenier Plain were created by 5,000 years of sediment deposition and erosion. Sediments were supplied by the Mississippi River and its distributaries and, to some extent, by the Gulf. During the early formation of the Chenier Plain, the river flowed in a westerly channel, depositing sediments which accumulated as vast mud flats to the west as a result of longshore currents. When the river shifted to an easterly course, the sediment supply decreased and erosive forces were greater than sediment deposition due to littoral draft. As a result, the shoreline converted to a more typical beach-like nature and gradually retreated. The repetitive occurrence of the pulses of sediment due to change in the course of the Mississippi River helped to build the systems of cheniers in the region. Inshore mudflats, cut off from wave action and saline Gulf water by the cheniers, developed into highly productive lakes and wetlands.

Over half of the coastal wetlands for the entire conterminous United States are in the Gulf of Mexico region. Total coastal wetlands for Louisiana and Texas account for 12% and 6%, respectively, of the national total and 24% and 12%, respectively, of the regional total (Field et al. 1991).

Louisiana has the highest coastal wetland loss rate of any state in the Nation with currently a loss rate of 25-35 square miles a year. Louisiana's average coastal land loss rate accounts for an estimated 80% of the national total. Coast-wide land loss rates for Louisiana from 1956 to 1978 were estimated to be 39.4 square miles per year. Although land loss rates in coastal Louisiana were decreasing, losses continued, and the loss rate remained high at 34.9 square miles per year for 1978-90. Coastal Texas wetlands also show decreasing trends. Coastal wetland loss in Texas is estimated at 8.9 square miles per year between the mid-1950's and the early 1990's (Moulton et al. 1997).

The Chenier Plain in Louisiana has suffered continued loss, accounting for almost 20% of the state's coastal land loss rate for 1978-90. Most of the decrease is due to large areas of internal loss. Additionally, shoreline erosion along the coastline accounts for beach encroachment rates of up to 40 feet per year. Wetland area in the Chenier Plain in Texas declined 16% between 1964-66 and 1989-90. The largest losses of wetland habitat were interior losses of coastal emergent marsh and rice field wetlands (Tacha et al. 1992). Most of the loss of emergent wetlands was attributed to the conversion to open water, a much less productive habitat of far less value to ducks. Shoreline erosion is also a factor in Texas, with beach encroachment rates of up to 32 feet per year.

Wetland Loss Factors and Threats

Wetland loss in the Chenier Plain can be divided by location into two broad categories: shore and bank erosion and interior loss. Shore and bank erosion is the breakdown of the shorelines of the Gulf Coast and interior lakes and the banks of navigation channels and petroleum access canals. This breakdown is caused by the actions of forces such as natural wave energy, tides, currents, boat wakes, and water surges associated with the passage of large vessels and storms. Erosional forces are exacerbated by relative sea-level rise and hydrologic alterations affecting coarse sediment distribution. The continued effect of these forces gradually wears down the shoreline and bank soils and eventually blows or washes them away. The erosion can be particularly rapid and can cause the direct loss of significant wetland acreage; in fact, along some areas of the Gulf Coast, the shoreline is retreating at a rate of 20-40 feet per year. Shoreline and bank erosion also can dramatically affect wetland loss when it causes hydrologic connections between relatively isolated marsh systems and dynamic water bodies such as navigation channels and large bays.

Mottled duck pair.

Interior marsh loss is caused by a variety of factors. Subsidence and sea-level rise are natural processes that contribute to marsh deterioration and loss but in some cases have probably been exacerbated by human intervention. Part of the decrease of emergents has been due to conversion to scrub-shrub habitats, resulting from invasion of the exotic Chinese tallow tree. Reservoir construction has also contributed to loss of interior marsh by altering downstream freshwater flows and sediment transport, and increasing saltwater encroachment.

Flood control projects on the Mississippi and Atchafalaya Rivers have been major contributors to the net decrease in Chenier Plain marsh. Flood control levees have disrupted the natural cycle of Chenier Plain marsh building and erosion by permanently directing the sediments and nutrients of Mississippi River waters to the deep water of the Gulf of Mexico.

Lesser snow geese.

The numerous dredged navigation channels and access canals that criss-cross the coastal marshlands are another cause of interior marsh loss because they have disrupted the natural hydrology of the area. The effects of the disruptions vary, but generally they have created artificial barriers between wetlands and wetland building and maintenance processes, or they have removed natural barriers between wetlands and wetland deterioration processes. The canals and channels that have created additional connections between the Gulf of Mexico and area marshes facilitate the penetration of salt water far inland into previously fresh marshes, resulting in the death of marsh plants and the eventual erosion or oxidation of the organic substrate. Erosion of the substrate is accelerated by the increased waterflow through the marsh as a result of the canals. In addition, the construction of straight canals in areas previously drained by natural channels has increased the speed by which the limited amount of fresh water provided by local rainfall drains seaward. Many canals have high spoil banks that can restrict both the drainage of water from the marsh, which results in excessive ponding, and the delivery of fresh water and sediments to the marsh that are essential for marsh nourishment and maintenance.

Herbivory by muskrats, nutria, and occasionally geese is believed to be related to some interior wetland loss. The impact of moderate herbivory alone is not enough to cause wetland loss; however, its impact is more pronounced in marshes experiencing additional stresses such as excessive ponding or saltwater intrusion.

Agricultural Land

Immediately inland from the coastal marshes are the agricultural lands of the coastal prairie, the other major waterfowl habitat included in the Chenier Plain Initiative. The original plant community in the coastal prairie was mostly tallgrass prairie with some post oak savanna on the upland areas. This prairie landscape was interspersed with numerous small depressional wetlands important to migratory birds. However, the prairie's high average annual rainfall, 270-day growing season, and fertile soils resulted in extensive areas being converted (e.g., plowed, levelled, and/or drained) for agricultural use. Especially valuable to waterfowl are those agricultural lands devoted to rice production. When they are flooded with a few inches of water during the fall and winter, harvested rice fields and fallow fields that are part of traditional rice field rotation are excellent sources of waste rice, natural waterfowl foods, and invertebrates. Lands devoted to rice production have contour levees and other water control structures already in place that can be managed during the winter with minimal cost and effort to make feeding and roosting habitat available to waterfowl.

Status and Trends

The acres of planted rice accounted for by the Chenier Plain during the 1970's averaged 625,306 acres (469,180 acres in Louisiana; 156,126 acres in Texas). The combination of a world rice surplus and poor economic conditions in the early 1980's dealt the Chenier Plain rice industry a severe blow. The area's rice acreage dropped considerably (about 25%) during the 1980's, when planted rice acreage averaged 461,070 acres (356,710 acres in Louisiana; 104,360 acres in Texas) (Fig. 8). The situation improved in Louisiana with planted rice acreage for 1990-98 averaging 395,689 acres. The decline in Texas rice acreage of the 1980's, however, has continued in the 1990's. Planted rice acreage for the Texas Chenier Plain 1990-98 averaged 80,278 acres. Between 1988 and 1998, Texas lost 130,300 acres (34%) of rice. Recent changes in federal agriculture policy are expected to hasten a decline in rice acreage in both states. The soil type of many of the lands retired from rice production in the Chenier Plain area prohibit the planting of alternative crops, and in many of these situations the use of the land for cropping is abandoned. Therefore the potential for moist-soil management on these lands is high. However, the ready invasion of abandoned cropland by baccharis and Chinese tallow trees, a fast-growing and expanding exotic tree degrading the coastal prairies, is a significant threat to the land's value as waterfowl habitat.

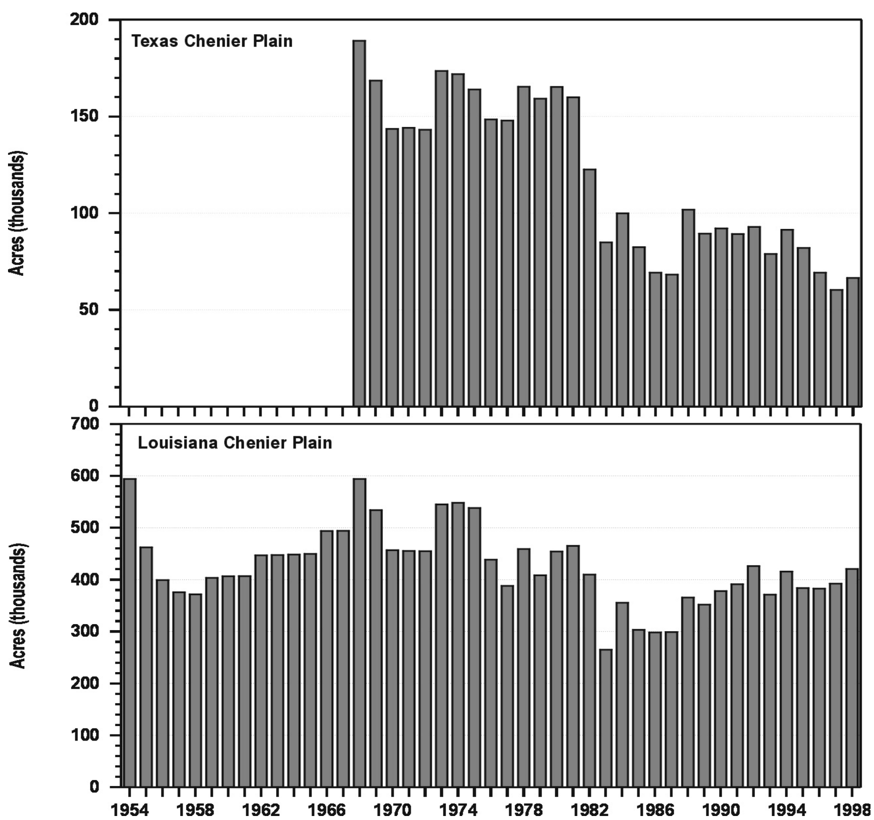


Figure 8. Planted rice acreage for the Texas and Louisiana Chenier Plain (U.S. Department of Agriculture 1999).

Habitat conservation is imperative for meeting waterfowl population objectives of both the NAWMP and the GCJV. The critical habitat conservation needs on public and private lands of the GCJV are to stop and reverse the deterioration and loss of wetlands, especially coastal marshes, and to improve the waterfowl value of agricultural lands. Loss of coastal marsh can be addressed by actions that either reduce the rate of loss or that build land. In the Chenier Plain, actions addressing the loss of coastal marsh must be based largely on prevention of predictable loss, restoration of degraded areas, and wetland construction. The private agricultural lands of the Chenier Plain are working landscapes, used to produce economic returns; therefore, the impact of GCJV actions must be beneficial or neutral with respect to agricultural land uses.


Oil-drilling access canal plug.

The availability of food resources is the most likely effect of winter habitat on survival and recruitment of waterfowl populations. Availability of food can be affected by production of foods (submerged aquatics, annual seeds, or invertebrates), flooding at appropriate times and depths for foraging, and access to food influenced by floating exotics, human disturbance, or other factors. In addition to fall and winter food resources, mottled duck populations are also influenced by breeding and postbreeding habitat in the Chenier Plain. Availability of fresh or intermediate shallow water in brood-rearing and molting areas is critical during the spring and summer. Therefore, the habitat conservation actions outlined in this plan intend to influence one or more of these habitat parameters.


Breakwater structures.


Erosion control vegetation.

Conservation Strategies

Four broad strategies of wetland conservation are important for achieving the goals and objectives of the GCJV. These strategies are maintenance (i.e., loss prevention), restoration, enhancement, and creation of wetland habitat. Conservation actions under each of these strategies take several forms. The types of wetland conservation actions identified in each initiative area reflect the differences previously discussed that characterize each area. A description of the strategies applicable to the Chenier Plain is presented below.

Maintenance of Habitat

Maintenance involves preserving existing functions and values of the habitat. The intent is to prevent additional loss and degradation of wetlands, particularly in remaining coastal marshes that are most vulnerable to erosion or conversion to more saline types through saltwater intrusion. Examples of conservation actions under this strategy include the following:

(1) plugging of abandoned oil-drilling access canals to prevent further widening of the canal into emergent marsh,
(2) placing nearshore breakwater structures to reduce or reverse wave erosion on beachfronts into adjacent marsh,
(3) constructing earthen terraces or vegetative barriers (e.g., California bulrush) within opened, degraded marshes to reduce fetch which would eventually erode the perimeter and result in larger open water areas,
(4) planting erosion control vege-tation at key points protecting the

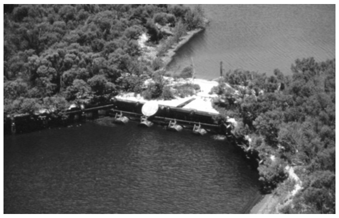
hydrologic integrity of vulnerable marshes,
(5) replacing structures and maintaining levees critical to protecting the hydrologic integrity of vulnerable marshes,
(6) implementing managed fire to maintain vegetative communities susceptible to invasion by woody exotics (carefully implemented prescribed burns also increase the availability of belowground foods for geese in their historic marsh range, potentially reducing competition with ducks for food in other habitats),
(7) controlling floating or submersed exotic vegetation to maintain natural plant communities,
(8) providing technical guidance to achieve the above maintenance measures, and
(9) securing vulnerable tracts through fee title acquisition, conservation easement, or management agreement for implementing the above maintenance measures.

Restoration of Habitat

Restoration involves conservation actions necessary to reestablish a naturally occurring but degraded wetland ecosystem. The goal is to restore or mimic the original wetland functions and values of the site. Examples of conservation actions under this strategy include the following:
(1) restoring historic salinities and hydrology via freshwater diversions,
(2) restoring historic salinities and hydrology to degraded systems through hydrologic structures and levees,
(3) restoring water quality, and subsequently submerged aquatic vegetation productivity, by reducing fetch and turbidity,
(4) restoring areas suffering from Chinese tallow invasions to a native-like prairie habitat attractive to nesting mottled ducks,
(5) constructing earthen terraces or vegetative barriers (e.g., California bulrush) within opened, degraded marshes to aid in restoring emergent vegetation,
(6) backfilling oil-drilling location canals to return emergent wetland to where it once existed naturally,
(7) directing and/or trapping fallout from sediment-laden water to restore mudflats, and ultimately emergent vegetation, on degraded areas,
(8) implementing managed fire to restore vegetative communities altered by woody exotics,
(9) conducting floating or submersed exotic vegetation control to restore natural plant communities,
(10) beneficially using dredge material from navigation projects to restore emergent wetlands and associated mudflats,
(11) scraping down previously disposed dredge material in historic wetlands to more naturally mimic prior wetland conditions,
(12) providing technical guidance to achieve the above restorative measures, and
(13) securing degraded tracts through fee title acquisition, conservation easement, or management agreement for the purpose of implementing the above restorative measures.


Marsh burning.


Earthen terraces.


Hydrologic structure.


Beneficial use of dredge material.

Flooded agriculture field.

Enhancement of Agricultural Habitat

Enhancement of agricultural areas such as croplands, pasture, and fallow fields is an attempt to restore the historic wetland functions of that broad region, which was formerly dotted with small seasonal and semipermanent wetlands. But the agricultural prairie is so highly altered that it is not necessary and often very difficult to ascertain the historic condition of each specific site. Consequently, actions under this strategy may actually be restoration of a former depressional wetland or creation of new wetland habitat. Enhancement actions under this strategy provide capabilities, management options, structures, or other actions to influence one or several functions or values of the site:

(1) providing structures and/or water delivery sufficient to flood agricultural wetlands for early migrating ducks, wintering waterfowl, or summer brood habitat,
(2) providing structures and/or water delivery sufficient to flood fallow fields or moist soil wetlands for early migrating ducks, wintering waterfowl, or summer brood habitat,
(3) altering vegetation and substrate with mechanical implements or livestock grazing to maximize food availability to waterfowl,
(4) providing technical guidance to achieve the above enhancements, and
(5) securing tracts through fee title acquisition, conservation easement, or management agreement for the purpose of implementing the above enhancements.

Because agricultural habitat in the Chenier Plain is subject to heavy disturbance from a variety of activities, sanctuary in combination with the above actions are expected to provide additional foraging habitat value to waterfowl.

Creation of Habitat

Creation of habitat is the construction of wetlands where none previously existed in recent geological terms. Conservation actions develop the hydrological, geochemical, and biological components necessary to support and maintain a wetland. Examples of conservation actions under this strategy include the following:

(1) beneficially using dredge spoil from navigation projects to create emergent wetlands and associated mudflats, and
(2) implementing sediment diversions to create emergent wetlands and associated mudflats.

Habitat Objectives

The two major waterfowl habitats available in the Chenier Plain Initiative area are coastal marshes and agricultural lands lying north of the marsh zone. Habitat objectives are based on the assumption that food availability is the most likely limiting factor for wintering ducks in the GCJV. Food availability is potentially influenced by factors that affect food production (e.g., marsh health, farming practices, etc.) and access (e.g., disturbance, water at appropriate depths, etc.).

Coastal Marsh

Food density data are not available for coastal marsh habitats of the GCJV, precluding quantitative modeling of habitat needs. However, given the importance of this habitat and its food resources to waterfowl, the enormous loss of coastal marsh, and the limited opportunities for restoration and creation, the GCJV supports all projects that seek to restore lost or degraded marshes to sustainable historic or more natural conditions. Additionally, the GCJV supports all protective measures that maintain current habitat values that would otherwise be predictably lost.

Agricultural Habitats

Estimates are available for the density of desirable plant seeds for waterfowl in agricultural habitats, so we can model the waterfowl habitat requirements for that particular habitat. Based on food habit research and general knowledge of habitat use by various species, we estimated the proportion of each species' energetic needs that we should provide for in these agricultural habitats to be as follows: 50% for most dabbling ducks (e.g., mallard, Northern pintail, green-winged teal, blue-winged teal, Northern shoveler, and mottled duck), 10% for dabblers that specialize on submerged aquatic vegetation (e.g., gadwall and American wigeon), and 10% for most diving ducks (e.g., ring-necked ducks and greater and lesser scaup). We assume redheads and canvasbacks obtain no food items from this habitat. We estimate 90% of Chenier Plain geese occur in these habitats, utilizing food sources with equal preference for both flooded and unflooded fields. These estimates result in population objectives for Chenier Plain agricultural habitats (Figs. 9 and 10).

We modeled the habitat requirements for this portion of our population objectives based on the dietary energy supply necessary to sustain them. Researchers estimate energetic requirements of mallards to be 290 kcal per day (Petrie 1994), with other species having energetic needs in proportion to their body weight (Kendeigh 1970). We therefore used average body weights of each species in conjunction with semimonthly population objectives and expected numbers of geese in flooded habitats to arrive at an energy demand curve, in terms of mallard-use-days, through the wintering waterfowl period (Fig. 11).

Seed density estimates for rice fields harvested in southwest Louisiana are 64.6 kg per acre of rice and 14.3 kg per acre of other waterfowl food seeds (Harmon et al. 1960). In southwest Louisiana, moist soil seed densities of idle fields in rice rotations have been estimated at 149 kg per acre (Davis et al. 1960). Rice specialists estimate that the yield of second-crop rice, which is occasionally left unharvested, is 30% of normal yields, or 600 kg per acre. A minimum seed density threshold has been estimated at 20 kg per acre, below which we assume waterfowl foraging becomes too energetically costly to benefit them (Reinecke et al. 1989). Flooded waste rice and moist soil seeds decompose at a rate of approximately 5% per month (Neely 1956). True metabolizable energy for rice and seeds of moist-soil plants has been estimated at 2.81 and 3.0 kcal per g, respectively

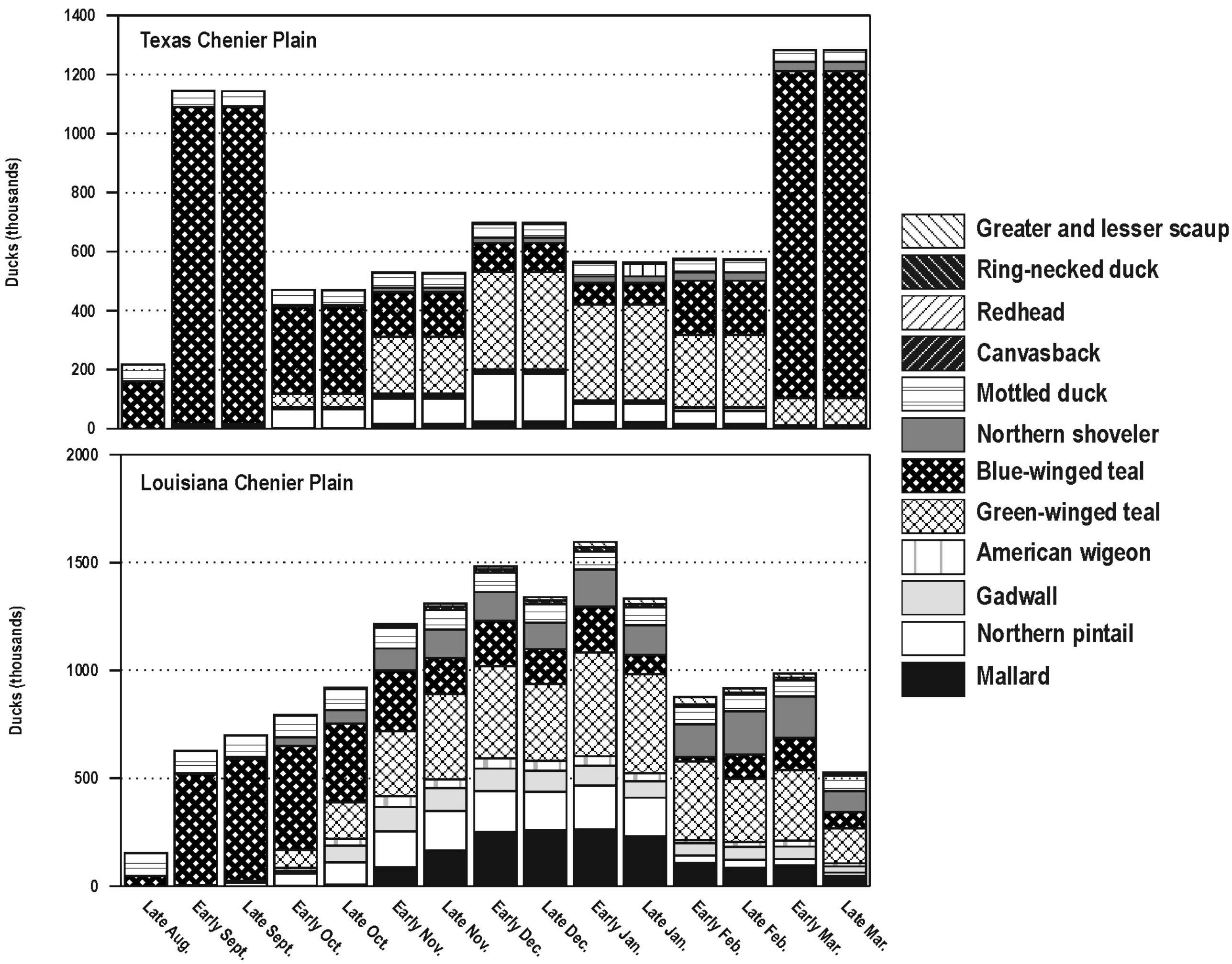


Figure 9. Semimonthly duck population objectives for the agricultural portion of the Texas and Louisiana Chenier Plain.

(Petrie 1994). These estimates result in the prespoilage foraging values for the three major habitat types of the Chenier Plain agricultural lands seen in Table 2.

Acreage estimates of planted rice in the Chenier Plain for 1998 were 66,500 for Texas and 420,500 for Louisiana. A first crop is usually harvested in late July and early August, with some occurring slightly later where no second crop is intended. Some rice fields are cultivated for a second harvest, which usually occurs late October through early November.

Using these assumptions of energetic demand, seed availability, caloric value of seed, and farming practices, we modeled habitat needs in the agricultural belt of the Chenier Plain based on two target flooding periods. The early flooding period (late August through October) would serve the habitat needs of early migrants (Fig. 9) and several shorebird species. This period is typically characterized by relatively dry conditions, with less incentive for landowners to provide managed habitat for duck hunting season. Also, due to decomposition of flooded seeds and sprouting and depredation of unflooded seeds, rice fields not targeted for a second harvest have their highest potential as duck habitat during this period. Therefore, single-cut rice and moist soil and/or idle fields are the targeted habitats modeled for early flooding.

The late flooding period (November through March) is typically characterized by more available water on the agricultural landscape, due to both rainfall and the incentive to flood provided by hunting seasons. However, this period coincides with the greatest habitat need (Fig. 11), and is sometimes accompanied by some coastal marsh habitats becoming too deep for optimal dabbling duck foraging. Rice fields cultivated for a second crop (both harvested and not)

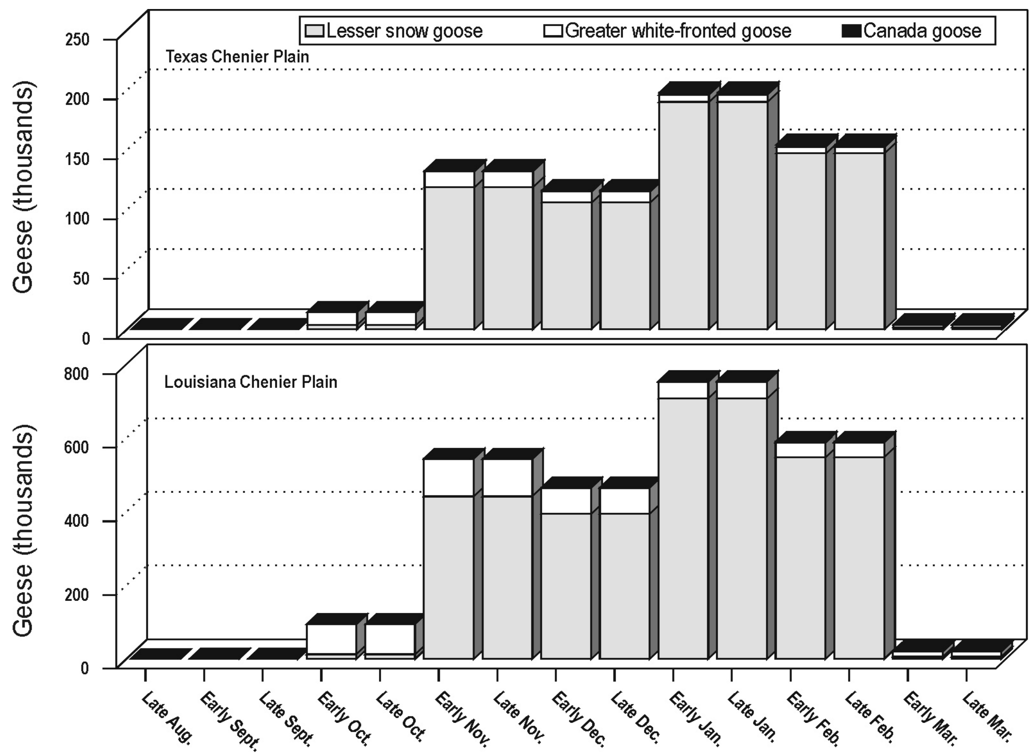


Figure 10. Semimonthly expected numbers of geese for the agricultural portion of the Texas and Louisiana Chenier Plain.

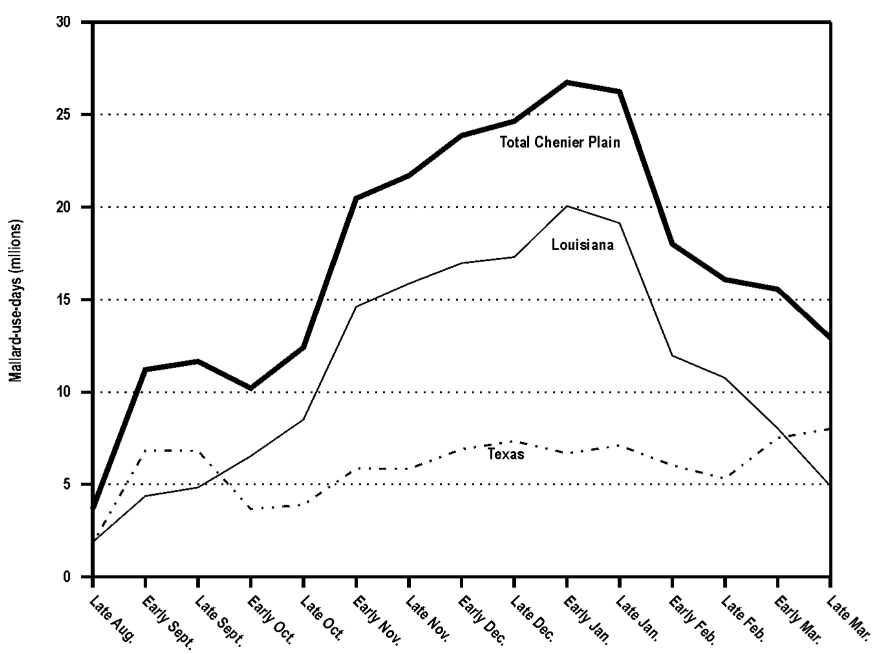


Figure 11. Energetic demands of all waterfowl objectives (mallard-use-days) in flooded habitats of the agricultural portion of the Chenier Plain. Figure includes ducks and a percentage of geese expected to occur in flooded habitats (46% Texas, 25% Louisiana) equal to the proportion of flooded habitats required to meet this demand.

Table 2. Prespoilage foraging values (mallard-use-days per acre) of the major habitat types of Chenier Plain agricultural lands.

Habitat Type	Foraging Value
Harvested rice	576
Moist soil	1,332
Unharvested second crop rice	5,618

and moist soil and/or idle fields are the targeted habitats modeled for late flooding.

The relative availability, and thus the management potential, for each habitat type was assessed based on the following assumptions. Texas Chenier Plain rice is usually grown on 3-year rotations, with approximately 10% cultivated for a second crop. Louisiana Chenier Plain rice is usually grown on 2-year rotations, with approximately 40% cultivated for a second crop. Rice specialists estimate 90% (Texas) and 10% (Louisiana) of the rotation fields out of current rice production are left idle, with potential for moist soil management. These assumptions, combined with recent rice acreages, yield rough acreage estimates for moist soil (119,700 and 42,050), once-harvested rice (59,850 and 252,300), and second-cropped rice (6,650 and 168,200) in Texas and Louisiana, respectively. Additionally, we estimate half of second crops are left unharvested for various reasons. We used these potential habitat proportions as ratios in our energetics model to determine acreages of flooded agricultural habitats necessary to sustain our objective waterfowl populations (Table 3a).

We emphasize that the acreages in Table 3a include both intentional managed flooding for waterfowl as well as flooding that otherwise occurs as a result of precipitation, crawfish culture, or farming practices. Because our goal is to consistently provide waterfowl foraging habitat, these acreages should be viewed as minimum amounts of managed and unmanaged habitat (combined) that should be available in the driest of years. Until we are able to estimate the amount of flooded habitat that has occurred in the recent past during dry years, we suggest that 50% of this need represent flooding objectives for new agricultural enhancement (Table 3b).

Table 3a. Total agricultural flooding acreage need for the Chenier Plain Initiative area.

	Texas		Louisiana	
	Early[1]	Late[2]	Early[1]	Late[2]
Harvested rice	7,484	-	35,007	
Harvested second rice	-	1,560	-	22,768
Unharvested second rice	-	1,560	-	22,768
Moist soil	14,968	49,137	5,835	9,804

Table 3b. Flooding objectives for new agricultural enhancement acreage within the Chenier Plain Initiative area.

	Texas		Louisiana	
	Early[1]	Late[2]	Early[1]	Late[2]
Harvested rice	3,742	-	17,504	-
Harvested second rice	-	780	0	11,384
Unharvested second rice	-	780	-	11,384
Moist soil	7,784	24,569	2,918	4,902

[1] Late August through October flooding to target early migrant waterfowl and some shorebirds.
[2] November through March flooding for wintering waterfowl.

Specific Activities

The wetland habitat objectives of the GCJV will be addressed through various projects that focus on coastal marsh and agricultural lands. Coastal marsh projects will involve protecting critical shorelines and banks, improving or restoring more natural hydrological conditions (to stabilize water and salinity levels and to reduce tidal scour), trapping sediments (to accelerate natural wetland building), and creating marsh with dredged material. Many of these projects will be designed to address localized problems, while others will be designed to provide benefits to coastal wetlands far beyond the construction footprint. The focus of projects will be reducing interior wetland loss, rebuilding wetlands in open water areas, and maintaining the geologic framework of the coast by addressing shoreline and bank erosion. Projects on agricultural lands will be designed to provide landowners with financial and technical assistance to hold winter water on harvested crop lands, set-aside lands, and natural wetlands and will be compatible with sustainable agriculture. Additionally, partners will initiate activities described herein as other opportunities become available. An evolving package of actions designed to meet some of the Chenier Plain Initiative/GCJV objectives as well as contribute to the fulfillment of the NAWMP goals has been developed and will be continually updated.

Other Programs

We recognize and support other conservation efforts that contribute to goals of this plan. Coastal marsh projects implemented under the Coastal Wetlands Planning, Protection and Restoration Act contribute significantly to the maintenance and restoration objectives of this plan through the Louisiana planning effort known as "Coast 2050." And the National Coastal Wetlands Conservation Grant Program in Texas. Similarly, shallow flooding provisions of some Natural Resources Conservation Service programs contribute to agricultural enhancement objectives, as does voluntary field flooding by rice farmers (e.g., Operation Quackback).

Communication and Education

Public awareness of the importance of the Gulf Coast to waterfowl and other renewable resources is key to the success of the GCJV. Communication efforts will be developed to educate decision makers, resource managers, landowners, conservation organizations, and the general public about wetland conservation in the Chenier Plain Initiative area.

Relationship to Evaluation Plan

Objectives and strategies outlined in this document represent a compliation of the best available information regarding the habitat needs of waterfowl in this region. However, information gaps require numerous assumptions about both the basic framework for planning habitat conservation (i.e., food limitation) and specific variables used in energetic modeling of habitat needs (e.g., relative importance of habitat types by species). Testing of the most critical of these assumptions will be addressed in the GCJV Evaluation Plan, which is being developed simultaneously with this plan. The GCJV Evaluation Plan will provide a mechanism for feedback to, and refinement of, Initiative Area Implementation Plans. Initiative Area Implementation Plans will therefore be updated periodically, as evaluation feeds the planning and implementation processes.

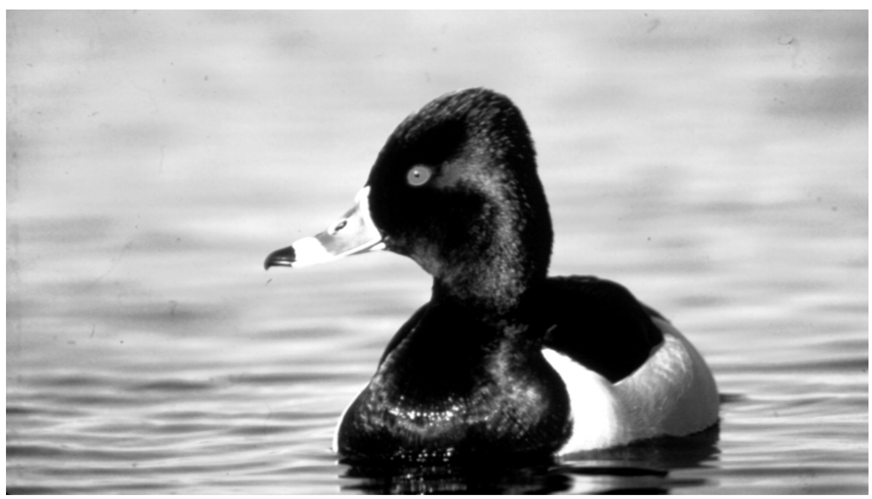
Northern shovelers and blue-winged teal.

Midwinter Duck Population Objectives

Although the coordinated midwinter survey is an inaccurate count of total wintering birds, and not corrected for visibility bias, it provides a reasonable approximation of the relative distribution of birds across broad regional and temporal scales. Therefore, we used averages from the 1970-79 midwinter surveys for each species to determine the proportion of surveyed ducks that occurs in each of the initiative areas. (For scaup, offshore counts were excluded due to inconsistent survey coverage, resulting in "inland-only scaup" objectives.) We then applied those species-specific proportions to the NAWMP continental breeding population objectives for each species to arrive at the number of birds each initiative area should supply to the breeding population. We assume 10% mortality between midwinter (January) and breeding (May) periods to arrive at midwinter objectives (Table 1).

Using mallards as an example, during 1970-79, 42.9% of all continental mallards counted during the midwinter survey were in the Mississippi Flyway (see also Fig. 5). The NAWMP continental breeding population objective for mallards is 11 million, so we estimate the portion of the continental breeding population objective from the Mississippi Flyway to be 42.9% of that, or 4.72 million. Expanding this number to account for 10% mortality between January and May yields a midwinter objective of 5.24 million in the Mississippi Flyway. Because 9.8% of all Mississippi Flyway mallards were counted in the Louisiana Chenier Plain, we apply that percentage to the flyway goal and obtain a midwinter population objective of about 516,000 for mallards in the Louisiana Chenier Plain. This method yields midwinter objectives for most species of ducks that commonly occur in the GCJV area (Table 1).

Exceptions to this method include derivations for blue-winged teal and redhead objectives, and estimation of the expected number of mottled ducks. For blue-winged teal, the continental breeding population was first reduced by 79% to account for the proportion estimated to winter outside the range of the U.S. midwinter survey, mainly in Mexico and both Central and South America.



Male ring-necked duck.

Population objectives for redheads were determined directly from average winter population estimates from the Special Redhead Cruise Survey for the same time period (1970-79). Using direct estimates from aerial winter surveys is appropriate for determining objectives for redheads, but not other ducks, because (1) wintering redheads occur almost exclusively in known locations of offshore seagrass habitat with good visibility, (2) visibility bias has been estimated and found negligible for portions of this special survey, and (3) redhead habitats are not consistently surveyed during the midwinter survey, precluding the methodology applied for most species.

To estimate the number of mottled ducks expected to occur during winter, we used mark-recapture analyses of direct recoveries from bandings in Louisiana and Texas during 1994-97. Preseason population estimates were derived from the assumption that the ratio of the total population to the total harvest (U.S. Fish and Wildlife Service estimate) equals the ratio of the banded population to the banded harvest (direct recoveries/band reporting rate estimate. Band reporting rates are assumed to be 33% for 1994-95 and 59% for 1996-97). Preseason population estimates were then averaged, and an estimated fall/winter mortality rate of 30% was assumed to be evenly distributed September through March. The resulting midwinter estimate was then apportioned to initiative areas by the midwinter survey (Table 1).

Male green-winged teal.

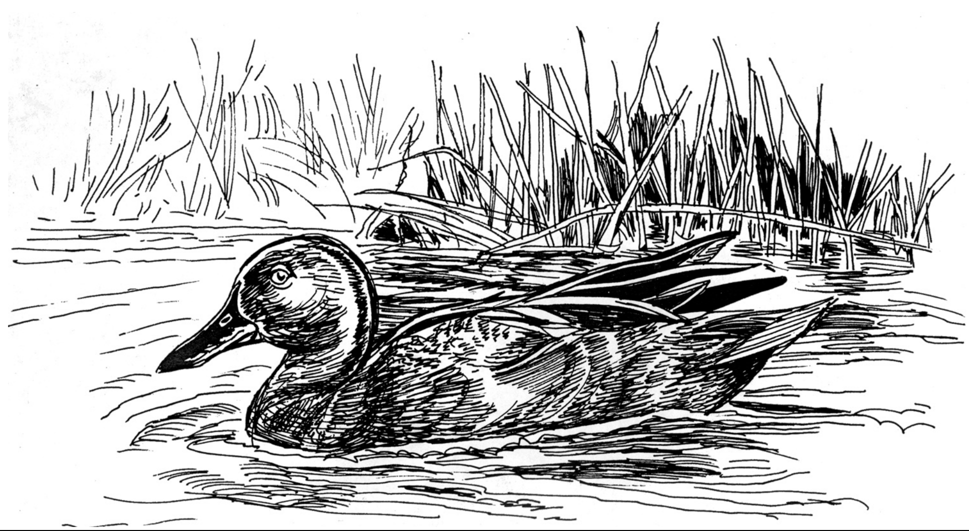
Migration Patterns

Louisiana migration patterns for ducks were determined by using periodic coastwide aerial surveys along established transects that generally were flown one to two times per month September through March, 1970-98 (Louisiana Department of Wildlife and Fisheries coastal transect survey, unpublished data). Chandeleur Sound, the primary redhead area in Louisiana, is not covered by these coastal transects, so for Louisiana redheads we instead used 1987-92 periodic redhead surveys from that region (Thomas C. Michot, U.S. Geological Survey, unpublished data). Each survey was assigned to a half-month period. For each species, each survey of a given year was expressed as a proportion of that year's peak. These proportions were averaged across all years to yield the average proportion of the annual peak for each half-month period. All proportions were then expressed relative to the midwinter (January) proportion (see Migration Chronology for Waterfowl Species of GCJV Initiative Areas section, p. 26).

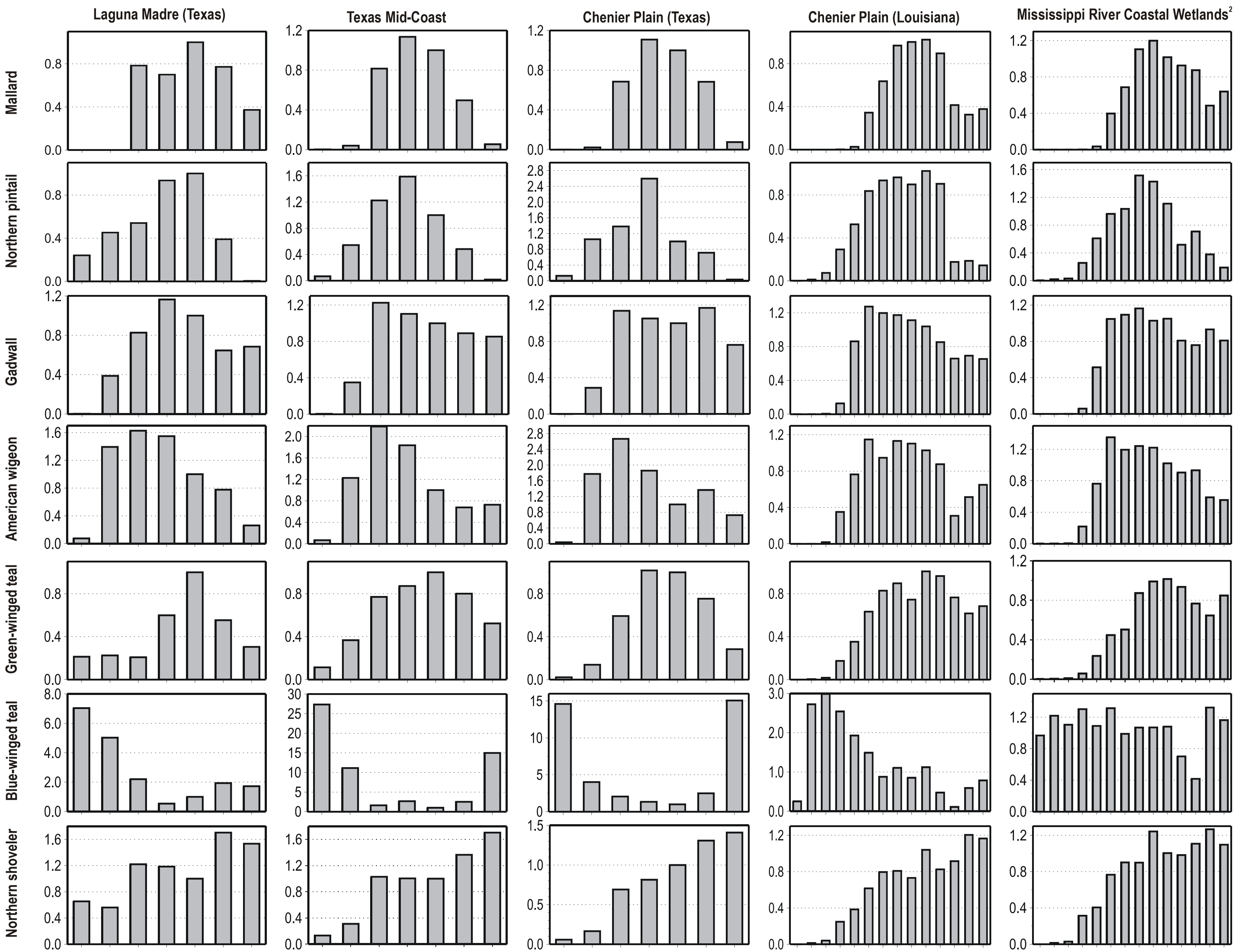
For Texas, aerial surveys of federal refuges and select other properties provide the basis for determining migration patterns (U.S. Fish and Wildlife Service's Coastal Waterfowl Survey Data, unpublished data). These monthly Texas surveys were conducted September through March of 1984-97, and data from all sites that were consistently surveyed within a given year were used. Analyses were conducted as above, except each survey represented an entire month (see Migration Chronology for Waterfowl Species of GCJV Initiative Areas section, p. 26).

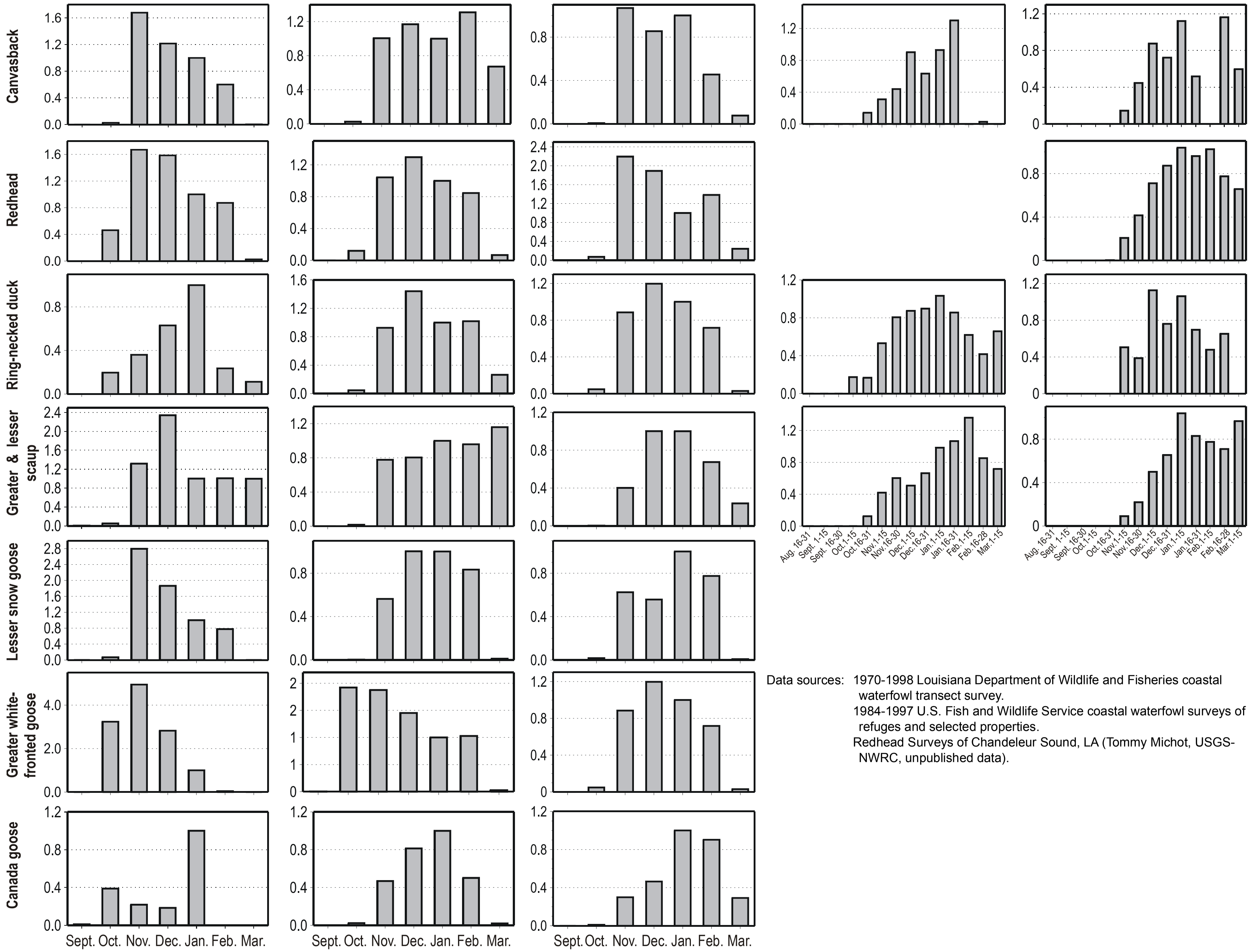
Multiplying these semimonthly proportions by the midwinter population objectives yields semimonthly population objectives by species and initiative area (Figs. 6-7). Because Louisiana surveys were never conducted in late March, we assumed late March values for all species were 50% of early March values. Because Texas surveys were never conducted in late August, we assumed late August blue-winged teal values were 15% of early September values. Because geese are not periodically surveyed in Louisiana, we applied migrational information from the Texas Chenier Plain to all eastward initiative areas. For the Coastal Mississippi Wetlands and Mobile Bay Initiative areas, we applied duck migrational information from the Mississippi River Coastal Wetlands Initiative area (southeast Louisiana).

Male blue-winged teal.



Migration Chronology for Waterfowl Species of GCJV Initiative Areas[1].





Data sources: 1970-1998 Louisiana Department of Wildlife and Fisheries coastal waterfowl transect survey.
1984-1997 U.S. Fish and Wildlife Service coastal waterfowl surveys of refuges and selected properties.
Redhead Surveys of Chandeleur Sound, LA (Tommy Michot, USGS-NWRC, unpublished data).

[1] ***Average proportion of the annual peak, relative to January (midwinter) survey. Data are not available for Coastal Mississippi Wetlands and Mobile Bay Initiative areas.***
[2] ***Southeast Louisiana.***

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Appendix

Scientific Names of Plants and Animals Mentioned in This Plan

I. Plants alphabetical by common name.

Common Name	Scientific Name
Alligatorweed	*Alternanthera philoxeroides*
Baccharis	*Baccharis* sp.
Bulltongue arrowhead	*Sagittaria lancifolia*
California bulrush	*Schoenoplectus californicus*
Chinese tallow	*Sapium sebiferum*
Coastal waterhyssop	*Bacopa monnieri*
Common reed	*Phragmites australis*
Maidencane	*Panicum hemitomon*
Needlegrass rush	*Juncus roemerianus*
Olney bulrush	*Schoenoplectus americanus*
Pondweed	*Potamogeton* sp.
Rice	*Oryza* sp.
Saltmeadow cordgrass	*Spartina patens*
Seashore saltgrass	*Distichlis spicata*
Smooth cordgrass	*Spartina alterniflora*
Southern waternymph	*Najas guadalupensis*
Spikerush	*Eleocharis* sp.
Widgeongrass	*Ruppia maritima*

II. Waterfowl alphabetical by common name.

Common Bird Name	Scientific Name
American wigeon	*Anas americana*
Black-bellied whistling-duck	*Dendrocygna autumnalis*
Black duck	*Anas rubripes*
Blue-winged teal	*Anas discors*
Canada goose	*Branta canadensis*
Canvasback	*Aythya valisineria*
Cinnamon teal	*Anas cyanoptera*
Fulvous whistling-duck	*Dendrocygna bicolor*
Gadwall	*Anas strepera*
Greater scaup	*Aythya marila*
Greater white-fronted goose	*Anser albifrons*
Green-winged teal	*Anas crecca*
Lesser scaup	*Aythya affinis*
Mallard	*Anas platyrhynchos*
Mottled duck	*Anas fulvigula*
Northern pintail	*Anas acuta*
Northern shoveler	*Anas clypeata*
Redhead	*Aythya americana*
Ring-necked duck	*Aythya collaris*
Ross' goose	*Chen rossii*
Lesser snow goose	*Chen caerulescens*
Wood duck	*Aix sponsa*

III. Other animals alphabetical by common name.

Common Name	Scientific Name
Alligator	*Alligator mississippiensis*
Muskrat	*Ondatra zibethicus*
Nutria	*Myocastor coypus*

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