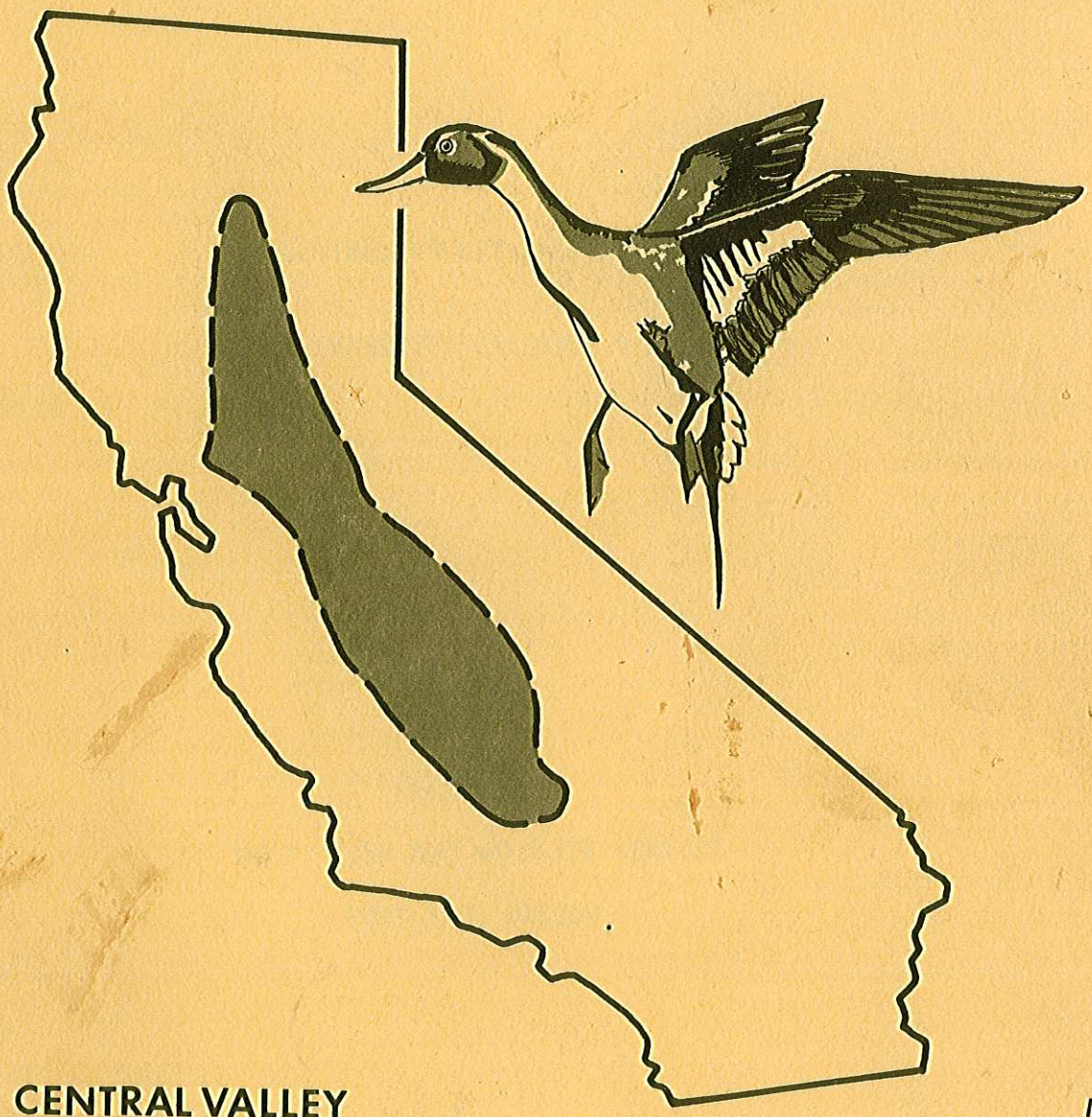
CONCEPT PLAN FOR WATERFOWL WINTERING HABITAT PRESERVATION



CENTRAL VALLEY

MAY 1978

DEPARTMENT OF THE INTERIOR
U.S. FISH AND WILDLIFE SERVICE

REGION ONE PORTLAND OREGON

CONCEPT PLAN

FOR

WATERFOWL WINTERING HABITAT PRESERVATION

CENTRAL VALLEY CALIFORNIA

PRIORITY CATEGORY 4

PREPARED BY

U. S. FISH AND WILDLIFE SERVICE

PORTLAND, OREGON

Regional Director

PREFACE

The Director of the U.S. Fish and Wildlife Service (FWS) on January 20, 1976, because of habitat preservation needs, set forth new policy guidance and procedures for implementing the Migratory Bird Land Acquisition Program, for the next 10-15 years. A national priority system has been developed for the program and will guide the acquisition efforts.

California's Central Valley provides wetland habitat critically important for Pacific Flyway wintering waterfowl. This habitat is ranked number four out of 33 on the national priority scale (Appendix A). It has the highest priority for wintering habitat preservation Nationally. It is being proposed that "key" wintering habitat, presently unprotected, be preserved with Migratory Bird funds by easement or fee acquisition if other preservation methods (e.g. State, private organizations) prove ineffective. The emphasis will be placed first on the protection of existing wintering habitat which requires little or no additional development to derive principal benefits. However, natural, unmanaged wetlands have been largely destroyed in California's Central Valley. As a result, strong emphasis also will be placed on development of new wetlands within the former boundaries of ancestral marsh areas or other areas where appropriate.

The Concept Plan presented herein for the Central Valley of California has been prepared in partial fulfillment of requirements for the Service's Migratory Bird Land Acquisition Program, and describes a wetland preservation program utilizing funds derived from the sale of Federal Migratory Bird Hunting and Conservation Stamps only. Other funding sources may compliment this program. The Plan also describes the wetland areas, their importance to waterfowl populations, and threats to their continued survival.

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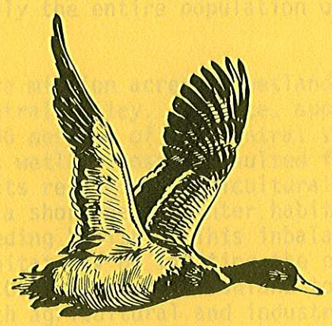


Summary

SUMMARY

California's Central Valley consists of the Sacramento Valley in the north and the San Joaquin Valley in the south. These units are subdivided into the Butte, Colusa, Sutter, Yolo, and American Basins in the north, and the San Joaquin and Tulare Basins in the south. The Sacramento-San Joaquin Delta and the Suisun Marsh are also included as separate units for this report. Each of these basins has wetland habitat important to wintering waterfowl of the Pacific Flyway.

Central Valley wetlands support 60 percent of the Pacific Flyway waterfowl population during the winter. Important species include wood duck, pintail, mallard, wigeon, shoveler, green-winged teal, gadwall, canvasback, ruddy duck, whistling swan, lesser snow goose, Ross' goose, white-fronted goose, and several races of the Canada goose. These wetlands support nearly the entire population of endangered Aleutian Canada geese.

California originally contained five million acres of wetlands--including about four million acres in the Central Valley. To date, approximately 91 percent of the State total and 96 percent of the Central Valley wetlands have been destroyed. Most wetland losses resulted from reclamation and water development projects related to agricultural development. This destruction has caused a shortage of winter habitat relative to the existing amount of breeding habitat. This inbalance has reached a point where wintering habitat may be limiting the populations of some Pacific Flyway waterfowl. Conversion of marshland to agriculture, competition for water (with agricultural and industrial interests), decreasing water quality, urban growth, rising taxes, and other problems are causing continued habitat loss.

Presently, 345,000 acres of private lands, 55,000 acres of Federal National Wildlife Refuges (NWRs), and 37,500 acres of State Wildlife Management Areas provide marsh and upland habitat important to waterfowl in the Central Valley. The private wetlands consist of either natural marsh or flooded harvested agricultural crops, such as rice or corn. Nearly all of the natural marsh wetlands are considered to be unprotected. It is proposed that, with certain exceptions, they be preserved with protective conservation and flowage easements utilizing Migratory Bird Hunting and Conservation Stamp funds. No action is proposed for flooded agricultural wetlands. A preservation priority list of existing wetlands (Table i) was developed by the FWS, California Department of Fish and Game (CDFG), and citizen conservation groups utilizing biological value and threat criteria. Approximately 115,000 acres is proposed for preservation in the initial program at a cost ranging from $27.9 million to $49.5 million. Preservation of another 59,000 acres is being deferred because the particular threats to the areas can not be eliminated with either fee or easement acquisition, or permanent protection implemented by local or State entities may make

Federal involvement unnecessary. These areas will be brought into the program if threats develop which could be effectively neutralized by easements.

Table i. Estimated costs for preservation and acreages of natural marsh and native pasture to be preserved in conjunction with the Central Valley easement program.

AREA	ACRES	COST (MILLIONS)
Butte Sink	10,000	5.0 to 9.0
Greenfield	800	0.2 to 0.4
Kern NWR-Wasco Area	5,000	1.4 to 2.5
East Grasslands-Crane Ranch Area	8,000	1.6 to 2.8
Outside Grasslands Water District	17,000	3.4 to 6.0
East Grasslands-Flynn Ranch Area	6,000	1.2 to 2.1
Suisun Marsh*	46,000*	11.0 to 19.3*
East Grasslands-Modesto Properties	5,500	1.1 to 1.9
Lurline Creek Area	3,500	1.1 to 2.0
Mendota WMA Area	700	0.1 to 0.3
Willow Creek Area	7,000	2.2 to 3.9
Grasslands Water District	47,000	9.4 to 16.5
Stone-Beach Lakes*	3,000*	1.2 to 2.1*
Faith-Mapes Ranches Area	4,000	1.2 to 2.1
Vina Plain*	10,000*	2.0 to 3.5*
RECOMMENDED PROGRAM TOTAL	114,500	27.9 to 49.5

*Suisun Marsh, Stone-Beach Lakes, and Vina Plain make up the Deferred Program:

DEFERRED PROGRAM TOTAL	59,000	14.2 to 24.9

Table ii. Potential New Wetland Development*

AREA	DESIRABILITY/POTENTIAL VALUE	FEASIBILITY
Delta	High	High
Yolo By-pass	High	High
Tulare Lake Bed	High	Low
Kern-Buena Vista Lake Beds	High	Low
American Basin (Southern)	Moderate to High	High
Sutter Basin (Southern)	Moderate	High
San Joaquin Basin (South)	Moderate	Moderate
San Joaquin Basin (North)	Moderate	Low to Moderate
Butte Basin (North)	Low to Moderate	High
Colusa Basin	Low	High
Suisun Marsh	Low	Moderate
San Joaquin Basin (Central)	Low	Low to Moderate
Butte Basin (South)	Low	Low
American Basin (North)	Low	Low
Sutter Basin (North)	Low	Low

Desirability/Potential Value: Is a NWR desirable in this area from a biological viewpoint relative to existing and ancestral conditions? Would a NWR aid in the wider distribution of waterfowl, increase food resources, and increase recreational opportunity relative to existing condition?

Feasibility: Can a NWR, practically speaking, be located in the area? Are water and land available? Will the local political situation help an effort to locate a refuge?

*This is an attempt to rank areas listed but should not be considered the final word. Specific ascertainment studies will be required to adequately determine value and feasibility, as well as costs for acquisition, development, and operation/maintenance.

Sacramento Valley Wetlands

I. Location & Description

WATERFOWL WINTERING HABITAT PRESERVATION
REGION 1
CENTRAL VALLEY CALIFORNIA

I. LOCATION AND DESCRIPTION

The Central Valley of California is included within the Pacific Flyway (Figure 1) and extends 400 miles from the City of Red Bluff in the north to Bakersfield in the south (Figure 2). The Valley is 60 miles in width at its widest point, with an average width of 40 miles. The Valley includes all or parts of 22 counties and encompasses 16,000 square miles representing 10 percent of the state's total area. Major drainages include the Sacramento, Feather, Yuba, and American Rivers, and Butte and Cottonwood Creeks in the north; the San Joaquin, Mokelumne, Toulumne, Cosumnes, Stanislaus, Merced, and Fresno Rivers in the central part of the Valley; the Kern, Tule, Kaweah, and Kings Rivers and Poso Creek in the south.

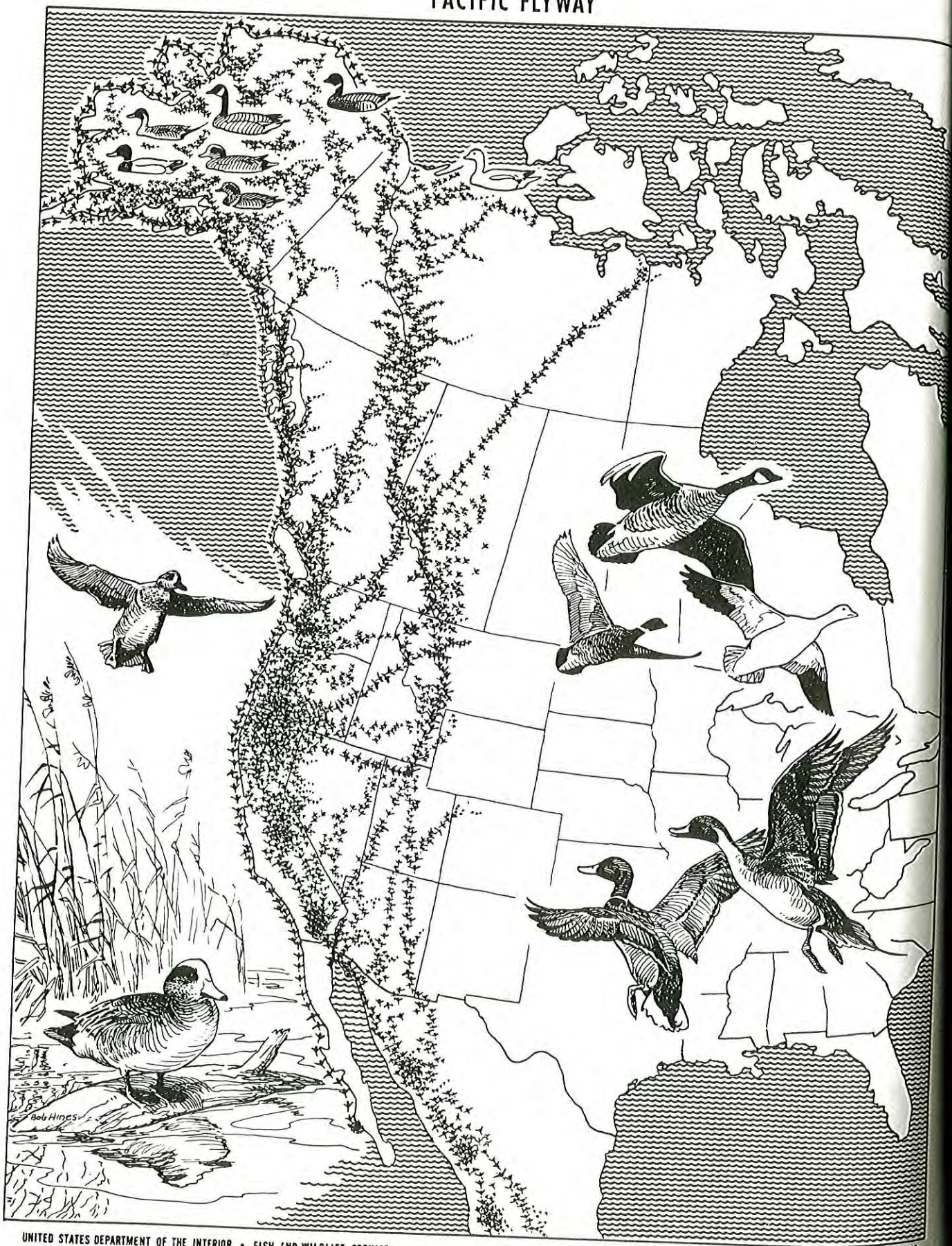
The Central Valley of California is made up of two lesser valleys, the Sacramento in the north and the San Joaquin in the south. The Sacramento Valley consists of five drainage basins (Butte, Sutter, Colusa, Yolo, and American), and the San Joaquin Valley includes two drainage basins (San Joaquin and Tulare) (Figure 2). Additionally, for the purposes of this report the Suisun marsh and the Delta region located at the junction of the Sacramento and San Joaquin Valleys, have been considered as separate units.

Each of these basins historically contained wintering waterfowl habitat and together they make up the areas of ecological concern for the purposes of the Concept Plan. The quantity and quality of habitat varies significantly among the basins reflecting differing degrees of past reclamation and flood control projects.

Native wetland habitat within the basins currently consists of Federal National Wildlife Refuges (NWRs), State Wildlife Management Areas (WMAs), and private wetlands principally owned or leased by organized duck hunting clubs, or ranchers and farmers. In addition, agricultural lands provide secondary habitat when flooded and/or left unplowed through the winter. Natural flooding provides extensive flood-plain habitat in wet years. Central Valley wetlands are primarily seasonal in nature--flooded only in fall, winter, and early spring months. Permanent marsh exists in a few isolated areas only. Central Valley wetlands provide the southernmost wintering areas for many waterfowl species and populations of the Pacific Flyway.

FIGURE 1

PACIFIC FLYWAY



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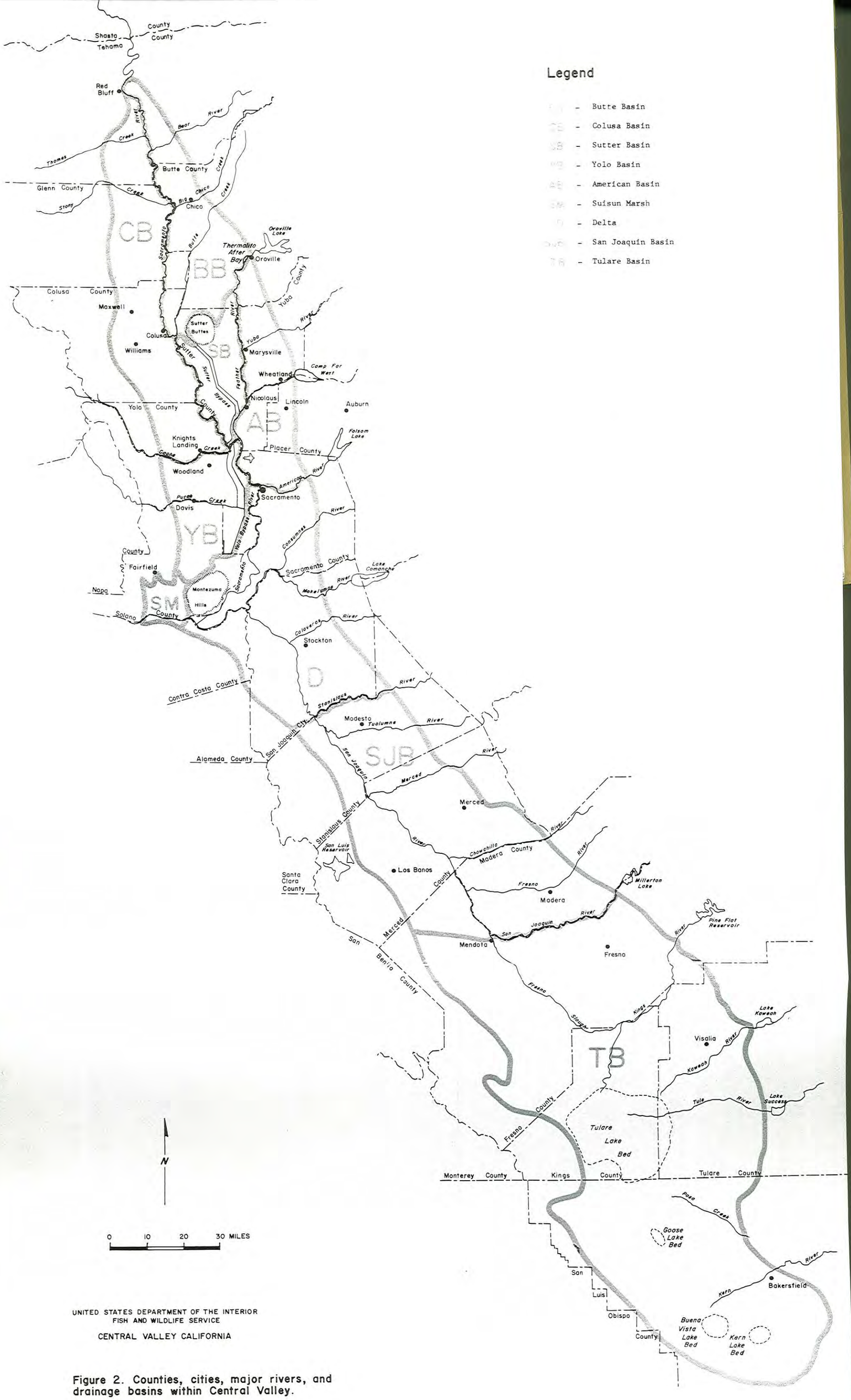

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CENTRAL VALLEY CALIFORNIA

Figure 2. Counties, cities, major rivers, and drainage basins within Central Valley.

Pintails - Sacramento Valley

II. Description of Waterfowl Populations

"Andy Burnett reached California in the autumn of 1832....Andy had never seen so many waterfowl; had never imagined there could be so many, anywhere. They covered the surface of the small lakes so thickly that.... Andy could discern but a gleam of water here and there. On a sudden impulse he extended the long rifle and fired it into the air. A blank instant silence followed....broken a half second later by the crash as of a mighty waterfall as the birds took wing. It seemed as if the dark earth were lifting to expose the hidden silver of the lake. The air was full of hurtling bodies. The very sky was darkened. And another great roar, and a third, like successive peals of thunder, rolled across the man's astonishment; and then a smooth high silence made up of the thin whistlings of thousands upon thousands of wings."

- Steward Edward White, The Saga of Andy Burnett

II. DESCRIPTION OF WATERFOWL POPULATIONS

A. Principal Habitat Function

The Pacific Flyway covers the western portion of the North American continent and portions of the Arctic in eastern Asia. Most Pacific Flyway waterfowl are produced in the prairies and parklands of western Canada and the river valleys and deltas of Alaska. Only about 15 percent of the Flyway's waterfowl are produced south of the Canadian border. Most Pacific Flyway waterfowl winter from Washington to Mexico. California's Central Valley provides vital winter wetland habitat for about 60 percent of the Flyway's total waterfowl population.

The principal habitat functions of Central Valley wetlands are: (1) to furnish wintering waterfowl with sufficient food, rest, and space to minimize natural mortality through the fall and winter months; (2) to return to the breeding grounds adequate numbers of birds in prime condition to insure maintenance of Flyway population levels consistent with population goals; (3) to provide migration habitat for birds wintering in Southern California and Mexico; (4) to provide a diversified environment for all water related wildlife as well as waterfowl; and (5) to prevent depredation of agricultural crops by waterfowl, primarily pintails, mallards, wigeons and geese.

The single most important role of California's Central Valley wetlands is to provide wintering, not breeding habitat, for waterfowl. This is demonstrated by Figure 3 which schematically portrays the average annual population build up through the fall/winter season compared with summer breeding populations in the Central Valley.

Most species of waterfowl have limited breeding and wintering ranges. The total number of waterfowl is dependent upon the extent and condition of the breeding range, quality and distribution of staging and migration habitat, and the carrying capacity of the wintering habitat. California originally contained between four and five million acres of prime coastal and inland wetlands and native pasture important to wintering waterfowl. Today over 90 percent of these wetlands have been destroyed, and in most cases remaining habitat has deteriorated. Waterfowl remain abundant, however, because of continued high productivity and stability of Pacific Flyway breeding grounds. Thus, the wintering grounds continue to support high populations but on less and less habitat. This continued degradation of wintering habitat in California has progressed to the point where

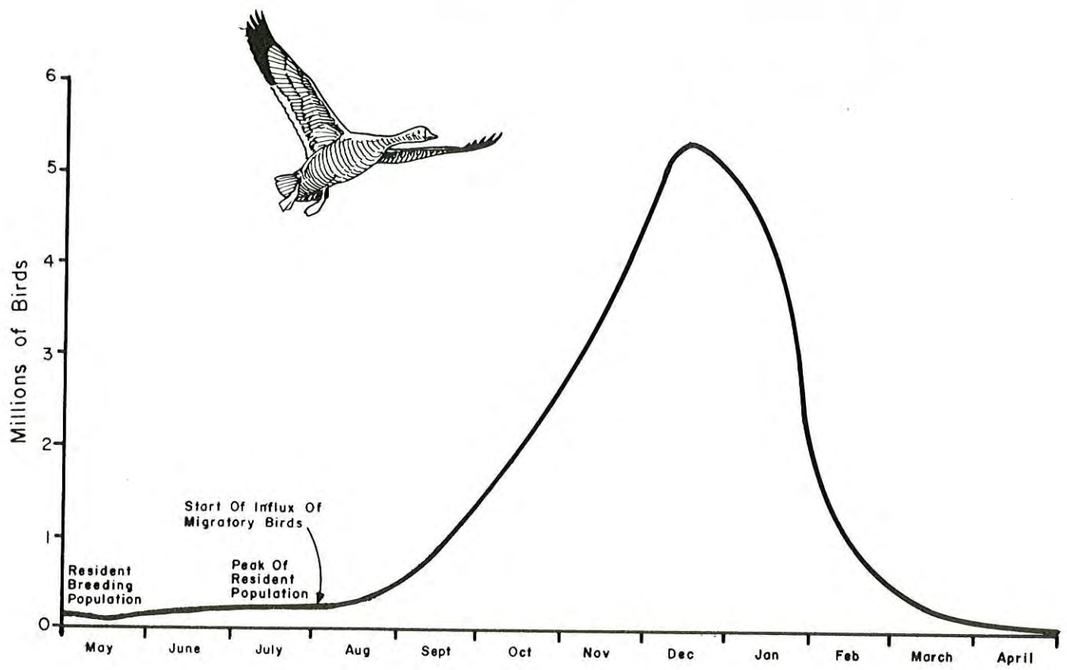


Figure 3. Buildup of wintering waterfowl populations compared to resident breeders in the Central Valley. (Adapted from Arend, 1967)

wintering, not breeding, habitat shortages are limiting flyway populations. This situation is not new. Albert Day, a past Director of the Fish and Wildlife Service, made this point in 1949. This view was echoed by the Director of the California Department of Fish and Game in 1965 (Shannon, 1965).

Maintenance of current waterfowl population levels in this Flyway depends upon a vigorous effort to preserve and enhance existing wetlands as well as develope new areas in California's wintering grounds.

B. Average and Peak Populations of Concern

Approximately, 10 to 12 million ducks and geese, accompanied by hundreds of thousands of shorebirds and other water related avifauna annually winter or pass through the Central Valley of California.

The most important species from a biological (numbers, impact on environment) and/or economic (hunting, birding) standpoint are whistling swans, lesser snow geese, Ross geese, Pacific white-fronted geese, several races of Canada geese, pintails, mallards, American wigeons, green-winged teals, shovelers, gadwalls, and canvasbacks. These species contribute significantly to the hunting harvest and/or make up the large concentration of birds of interest to nonconsumptive users. Other species present in significant numbers include wood ducks and ring-necked ducks. Small numbers of redheads also use the Central Valley at certain times. Cinnamon teals winter in small numbers and nest in the Valley. Common goldeneyes use the rivers and streams in the Valley for wintering habitat. Buffleheads, mergansers, and lesser scaups are present in limited numbers.

Most wintering waterfowl flocks in the Central Valley of California are not confined to any specific area throughout the fall and winter. Waterfowl move among the wetlands of the Sacramento and San Joaquin Valleys, the Delta, and Suisun Marsh in response to weather changes, water conditions, food availability, and season. These movements are largely predictable and certain patterns have been recorded. This distribution and movement pattern is broken only during very wet years when the amount of habitat increases significantly because of flooding and ponding on agricultural lands and in flood by-passes (Sutter and Yolo By-passes, Figure 2, are leveed channels which route flood water safely around urban and agricultural areas).

A variation of habitats are needed for the different species of waterfowl. Many dabbling ducks, especially pintails, mallards, and wigeons, utilize dry grain fields, as well as wetlands, in which to feed. Geese graze on grass in native uplands and feed in harvested grain and natural wetlands. Diving ducks and most dabblers are almost completely tied to wetlands during their whole life cycle.

Several rare or endangered animal species depend upon Central Valley wetlands for survival. These include Aleutian Canada geese, bald eagles, peregrine falcons, giant garter snakes, and yellow-billed cuckoos.

C. Relationship to Flyway and Continental Populations

California's Central Valley habitat is of vital importance to the existence of most waterfowl species in the Pacific Flyway. Mid-winter inventories for the 1973 to 1977 period (Table 1) recorded an average of 9.4 million waterfowl wintering in the Pacific Flyway, including Mexico's West Coast; of these, 4.7 million ducks and 570,000 geese were found in the Central Valley. Mid-September inventories (Table 2) demonstrate the importance of Central Valley wetlands for early migrant ducks. An average of 63 percent of the Pacific Flyway dabbling duck population, 12 percent of the diving ducks, and 69 percent of the goose population concentrates in the Central Valley in the winter. The mid-winter waterfowl population figures do not necessarily represent peak populations of ducks and geese, nor do they reflect the total population which utilizes Central Valley wetlands. Central Valley waterfowl habitat is also used by birds enroute to and from wintering grounds in Mexico and Central and South America as a migrational staging area. Figure 4 shows the average wintering waterfowl populations in Pacific Flyway states (includes coots). The importance of California is evident.

Population data for ducks and geese from the Central Valley are compiled from pre-hunting season (mid-September) surveys, bi-weekly surveys during the hunting season, and the mid-winter survey in January. Data are compiled separately for some organized duck clubs and agricultural areas in the Sacramento Valley, the Delta, Suisun Marsh, the West and East Grasslands of the San Joaquin basin, and the Tulare basin. Counts are made of waterfowl on each Federal NWR and State WMA. Counts are also made of concentrations on several reservoirs in the Sierra Mountain foothills and the Coast Range.

TABLE 1. MID-WINTER WATERFOWL INVENTORY DATA FOR PACIFIC FLYWAY AND CENTRAL VALLEY CALIFORNIA

SPECIES	AVERAGE PACIFIC FLYWAY POPULATION	AVERAGE CALIFORNIA POPULATION	AVERAGE CENTRAL VALLEY POPULATION	BUTTE BASIN (% OF CV)	SUTTER BASIN (% OF CV)	DISTRICT 10 (% OF CV)	COLUSA BASIN (% OF CV)	YOLO BASIN (% OF CV)	AMERICAN[f] BASIN (% OF CV)	SUISUN MARSH (% OF CV)	DELTA (% OF CV)	SAN JOAQUIN BASIN (% OF CV)	TULARE BASIN (% OF CV)
Whistling Swan	44,547(86)[a]	42,750(89)[b]	38,110[c]	2,140(6)[d]	486(1)	144(Tr)	1,725(5)	4,235(11)	933(2)	1(Tr)	27,833(73)	612(2)	1(Tr)
Great Basin Canada Goose	143,698(14)	38,381(54)	20,548	3,771(18)	2,866(14)	571(3)	1,746(8)	2,359(11)	940(5)	339(2)	475(2)	5,519(27)[g]	1,942(9)
Lesser Canada Goose	107,459(13)	13,504(100)	13,476	1,695(13)	1,768(13)	130(1)	1,827(14)	259(2)	427(3)	748(6)	728(5)	4,606(34)[g]	1,286(10)
Cackling Canada Goose	57,744(89)	56,819(91)	51,579	6,964(14)	4,583(9)	581(1)	6,522(13)	1,775(2)	1,702(3)	5,595(11)	5,077(10)	19,950(38)	140(Tr)
Lesser Snow/Ross Goose[e]	445,510(93)	429,267(97)	415,525	104,747(25)	30,560(7)	10,725(3)	180,994(44)	5,477(1)	7,703(2)	361(Tr)	20,772(5)	54,175(13)	11(Tr)
White-fronted Goose	69,824(93)	67,243(97)	65,012	7,259(11)	6,562(10)	581(1)	5,850(9)	887(1)	1,279(2)	7,460(11)	21,980(34)	13,199(20)	35(Tr)
Total Geese	824,235(69)	605,214(94)	566,140	124,436(21)	46,359(8)	12,588(2)	196,939(35)	9,677(2)	12,051(2)	14,193(3)	49,032(9)	97,149(17)	3,416(1)
Wood Duck	4,750(78)	4,381(84)	3,698	3,640(98)	38(1)	0(0)	0(0)	0(0)	16(Tr)	0(0)	0(0)	4(Tr)	0(0)
Mallard	1,468,332(28)	435,421(95)	414,872	183,327(44)	48,789(12)	4,788(1)	59,069(14)	24,561(6)	2,124(Tr)	6,238(2)	10,918(3)	69,142(17)	5,816(1)
Pintail	3,950,311(75)	3,157,192(94)	2,974,885	735,336(25)	221,159(7)	9,818(Tr)	521,609(18)	216,488(7)	12,572(Tr)	46,928(2)	371,232(12)	699,867(24)	139,876(5)
American Wigeon	807,764(58)	647,280(86)	472,116	225,587(48)	26,114(6)	8,526(2)	149,796(32)	14,624(3)	2,834(1)	2,168(Tr)	3,841(1)	36,132(8)	2,494(1)
Northern Shoveler	711,797(80)	617,125(93)	572,484	38,950(7)	6,242(1)	1,953(Tr)	4,078(1)	5,290(1)	229(Tr)	14,191(2)	2,069(Tr)	447,956(83)	21,526(4)
Cinnamon Teal	2,262(86)	2,152(90)	1,940	200(10)	55(3)	0(0)	1011 5)	2(Tr)	2(Tr)	19(1)	0(0)	394(20)	1,167(60)
Green-winged Teal	335,292(47)	158,826(99)	157,756	47,551(30)	10,085(6)	1,858(1)	8,061(5)	2,670(2)	288(Tr)	2,023(1)	493(Tr)	67,798(43)	16,929(11)
Gadwall	29,117(57)	17,892(93)	16,566	6,228(38)	264(2)	13(Tr)	641(4)	17(Tr)	27(Tr)	141(1)	15(Tr)	8,853(54)	357(2)
Total Dabblers	7,310,826(63)	4,940,269(93)	4,614,317	1,240,819(27)	312,746(7)	26,956(1)	743,355(16)	263,752(6)	18,092(Tr)	71,708(2)	388,568(8)	1,360,156(29)	188,165(4)
Canvasback	78,229(44)	60,550(57)	34,770	8,538(25)	7,001(20)	121(Tr)	118(Tr)	1,748(5)	2,308(7)	10,373(30)	3,578(10)	916(3)	69(Tr)
Ruddy	110,132(21)	80,486(28)	22,872	3,794(17)	3,207(14)	250(1)	478(2)	1,088(5)	1,068(5)	1,815(8)	660(3)	10,217(45)	303(1)
Ring-necked	4,042(32)	1,345(96)	1,294	656(51)	185(14)	44(3)	180(14)	29(2)	55(4)	0(0)	16(1)	125(10)	10(1)
Other Diver[h]	334,447(1)	65,714(5)	3,350	223(7)	113(3)	12(Tr)	188(6)	185(6)	38(1)	1,163(35)	435(13)	972(29)	11(Tr)
Total Divers	526,850(12)	208,095(30)	62,316	13,251(21)	10,506(17)	427(1)	964(2)	3,042(5)	3,469(6)	13,351(21)	4,683(8)	12,230(20)	393(1)
Mergansers	32,971(6)	4,743(41)	1,928	78(4)	61(4)	0(0)	830(43)	0(0)	0(0)	1(Tr)	1(Tr)	892(46)	65(3)
Total Ducks	7,870,447(59)	5,153,107(91)	4,678,561	1,254,148(27)	323,313(7)	27,383(1)	745,149(16)	266,794(6)	21,561(Tr)	85,060(2)	393,252(8)	1,373,278(29)	188,623(4)
Coot	608,777(61)	427,415(86)	369,380	39,000(11)	18,163(5)	7,542(2)	17,853(5)	15,221(4)	3,728(1)	28,434(8)	7,000(2)	216,623(59)	16,016(4)
Total Waterfowl	9,348,006(60)	6,228,486(91)	5,652,191	1,419,724(25)	388,321(7)	47,657(1)	961,466(17)	295,927(5)	38,273(1)	127,688(2)	477,117(8)	1,687,662(30)	208,056(4)

[a] Parenthesis: Central Valley percentage of Pacific Flyway; 1973-1977 mean; includes Mexico west coast
[b] Parenthesis: Central Valley percentage of California; 1973-1977 mean
[c] 1973-77 mean
[d] Parenthesis: Percentage of Central Valley
[e] Separate Survey data not available, but an average of 25,000 Ross is assumed. Recent studies indicate a Ross Goose population of at least 3 to 4 times original estimates.
[f] Separate Survey data not available; Interpolated from East Sacramento Valley survey data
[g] 80-90% in Sierra foothills, Folsom to Friant Dams
[h] Primarily Lesser Scaup and Common Goldeneye

TABLE 2. MID-SEPTEMBER WATERFOWL INVENTORY DATA

CENTRAL VALLEY CALIFORNIA 1973-1976

SPECIES	YR	BUTTE BASIN (Butte Sink) (Gray Lodge WMA) (Thermalito)	SUTTER BASIN (Sutter NWR)	UPPER AMERICAN BASIN (District 10)	COLUSA BASIN (Private Clubs) (Sacramento NWR) (Delevan NWR) (Colusa NWR)	YOLO BASIN (Yolo By-pass)	SUISUN MARSH	DELTA	SAN JOAQUIN BASIN (Volta WMA) (LosBanos WMA) (Grasslands) (San Luis NWR) (Merced NWR)	TULARE BASIN (Mendota WMA) (Tulare Lake)	CENTRAL VALLEY TOTAL
Pintail	76	49,260	159,685	7,260	472,430	20,430	19,860	80,195	113,105	329,935	
	75	81,595	50,025	2,405	109,705	24,770	33,690	29,195	136,590	635,665	
	74	51,690	28,725	375	121,445	32,110	48,210	29,225	88,140	231,805	861,288
	73	12,485	2,100	300	87,730	53,015	36,290	16,350	84,640	164,710	
	$\bar{X}$	48,758(6)[a]	60,134(7)	2,585(Tr)	197,828(23)	32,581(4)	34,513(4)	38,741(4)	105,619(12)	340,529(40)	
Mallard	76	7,315	21,390	105	2,280	1,615	1,390	355	3,570	3,170	
	75	5,975	2,435	235	6,820	1,205	2,115	635	10,425	3,130	
	74	5,680	8,600	10	8,360	1,350	2,025	410	4,960	745	36,649
	73	2,645	3,360	335	12,880	3,830	4,180	650	10,950	1,460	
	$\bar{X}$	5,404(15)	8,946(24)	171(Tr)	7,585(21)	2,000(5)	2,428(7)	513(1)	7,476(20)	2,126(6)	
Other & Unclass.	76	1,865	15	0	4,650	3,220	4,655	3,045	72,250	62,950	
	75	1,020	200	0	7,680	3,885	4,605	580	54,040	69,375	
	74	1,460	595	10	8,770	3,220	3,925	1,245	48,440	35,770	118,893
	73	990	500	0	5,195	1,230	3,545	2,620	36,705	27,305	
	$\bar{X}$	1,334(1)	328(Tr)	3(Tr)	6,574(6)	2,889(2)	4,183(4)	1,873(2)	52,859(44)	48,850(41)	
TOTAL		55,496 (5)	69,408 (7)	2,759 (Tr)	211,987 (21)	37,470 (4)	41,124 (4)	41,127 (4)	165,954 (16)	391,505 (39)	1,016,830

[a] Percentage of Central Valley Total in parenthesis

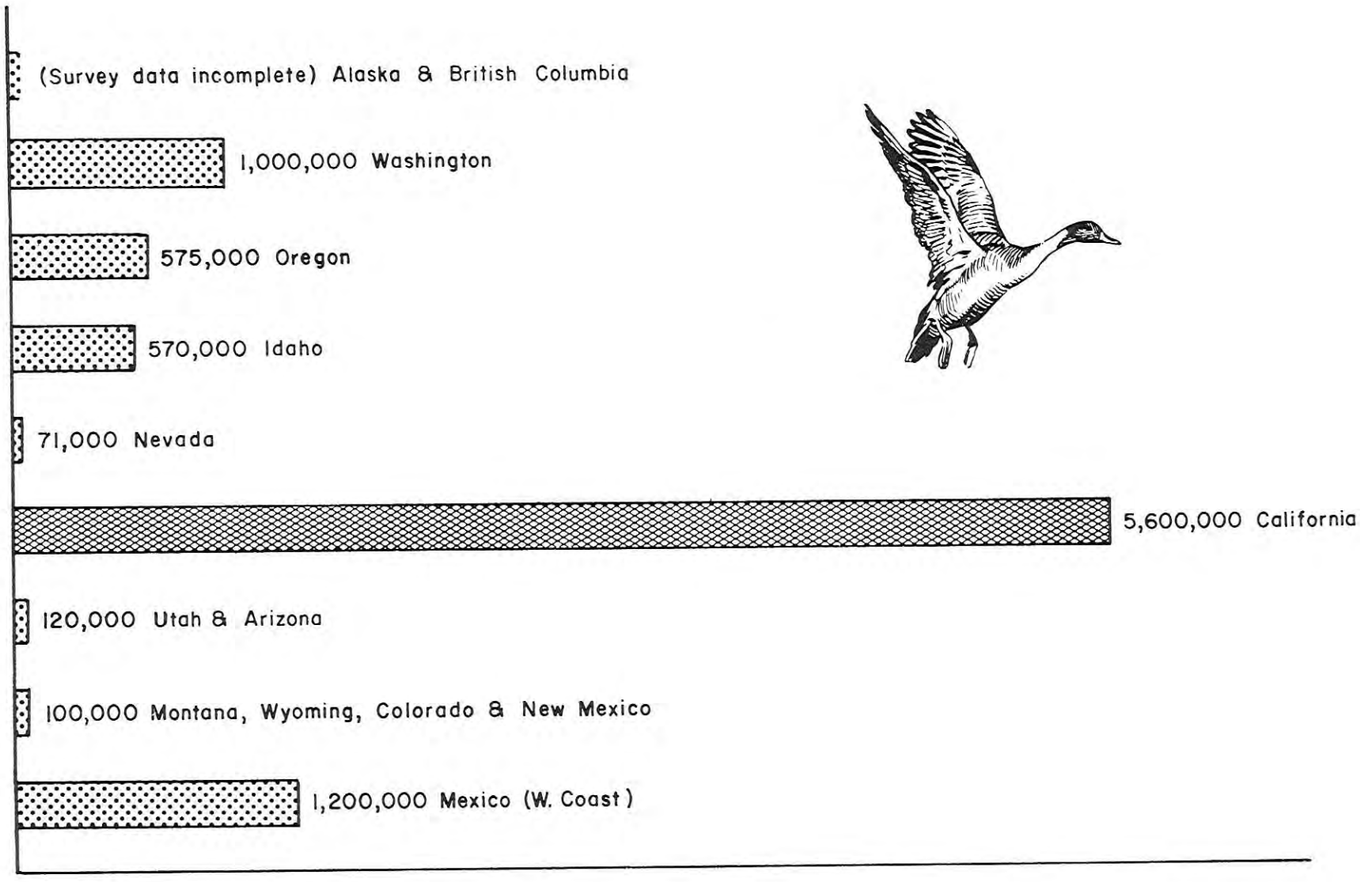


Figure 4. Pacific Flyway wintering waterfowl population
23 year average 1954 - 1976.

D. Population Trends of Species of Concern

The Central Valley is of primary importance to several waterfowl species in relationship to Flyway and continental populations, and recent trends in their population levels in California and overall status are presented below. Bellrose (1976) was used as the source for continental populations and some other data, while Pacific Flyway and California populations were derived from the mid-winter surveys (Table 1) unless indicated otherwise. Pacific Flyway and continental population figures include Mexico's West Coast. Central Valley mid-winter population figures are derived from the 1973 to 1977 period.

Appendix B provides distribution and migration maps plus a summary of population data and trends for the species listed below.

1. Whistling Swan (Cygnus columbianus)

The Pacific Flyway population of whistling swans (45,000) makes up over one fourth of the continental population (157,000). Eighty-six percent of the Flyway total winters in the Central Valley. The Sacramento-San Joaquin River Delta is the most important wintering area. The mid-winter Central Valley population averages 38,000 birds. No clear population trends for swans are evident in the Pacific Flyway. No hunting of swans is allowed in California.

2. White-fronted goose (Anser albifrons frontalis)

The Pacific Flyway white-fronted goose population, as indicated by mid-winter inventories (70,000), makes up almost half of the continental population (200,000). Eighty-two percent of the Flyway total has wintered in the Central Valley in recent years, with the remainder in Mexico. The Central Valley population has averaged 65,000 birds during recent winters. These census data indicate that this species is apparently declining in the Flyway. However, spring counts in the Klamath Basin on the Oregon border indicate that the mid-winter figures are conservative.

3. Lesser Snow Goose (Anser caerulescens caerulescens)

The Pacific Flyway population of lesser snow geese (420,000) makes up about one third of the continental population (1,305,000). Ninety-three percent of the Flyway total winters in the Central Valley. The

average mid-winter Central Valley population is 390,000 birds. Census data indicate that goose flocks produced on Wrangle Island (U.S.S.R.) are declining, while other flocks are remaining stable. The blue phase of the snow goose appears in the Pacific Flyway only very rarely.

4. Ross Goose (Anser rossii)

The Pacific Flyway population of Ross geese makes up nearly 100 percent of the continental population (a few reported in Central Flyway). Nearly one hundred percent of the Flyway total winters in the Central Valley, primarily in the Butte, Colusa, and San Joaquin Basins. Recent research efforts have revised the population estimate from earlier estimates of 25,000 upward three to four times this number. Evidence suggests that Ross geese are increasing in the Flyway, but these new population estimates need additional verification.

5. Cackling Canada Goose (Branta canadensis minima)

The Pacific Flyway population of cackling Canada geese (58,000) makes up 100 percent of the continental population. Eighty-nine percent of this Flyway total winters in the Central Valley. The Central Valley mid-winter population averages 52,000 birds. Census data indicate that cackling geese have declined in the Flyway in recent years.

6. Lesser Canada Goose (Branta canadensis parvipes; B. C. taverneri)

The Pacific Flyway population of lesser Canada geese (107,000) makes up 100 percent of the continental population. Thirteen percent of the Flyway's total winters in the Central Valley. The Central Valley mid-winter population averages 13,500 birds. Census data indicate a stable population.

7. Great Basin Canada Goose (Branta canadensis moffetti)

The Pacific Flyway population of Great Basin Canada geese (144,000) makes up 100 percent of the continental population. Over half of the Flyway's total winters in California, while 14 percent winter within the Central Valley. The Central Valley mid-winter population averages 20,500 birds. Census data indicate an increasing population.

8. Wood Duck (Aix sponsa)

The Pacific Flyway winter population of wood ducks, about 100,000 (Robert Le Donne, CDFG, pers. comm.) makes up only six percent of the continental population (1,738,000) (Bellrose data from banding records). But 90 percent of the Flyway's total winters in the Central Valley. About 26,000 wood ducks, nest in the Central Valley. The average Central Valley mid-winter population as determined during aerial census for the period 1973 to 1977 was only 3,700 birds. However, aerial mid-winter inventories do not yield accurate population data because of the habitat preferences of this species. No trends are evident.

9. American Wigeon (Anas americana)

The Pacific Flyway winter population of American Wigeon has averaged 808,000 and makes up about one fourth of the continental winter population (about 3,500,000). Fifty-eight percent of the Flyway population wintered in the Central Valley in recent years. The Central Valley mid-winter population averages 472,000 birds. Census data indicate a stable population of wigeons.

10. Gadwall (Anas strepera)

The Pacific Flyway winter population of gadwalls has recently averaged 29,000 and makes up only a small fraction of the continental population (1,432,000). However, nearly two thirds of the Flyway population winters in the Central Valley with the rest in Mexico. The average Central Valley mid-winter population is 16,000 birds. Census data indicate a stable population of gadwalls in the Pacific Flyway.

11. Green-winged Teal (Anas crecca carolinensis)

The Pacific Flyway winter population of green-winged teals (336,300) makes up about one fifth of the continental winter population (about 2,000,000). Nearly half of the Flyway population winters in the Central Valley. The average Central Valley mid-winter population is 157,750 birds. Census data indicate a stable population of teal.

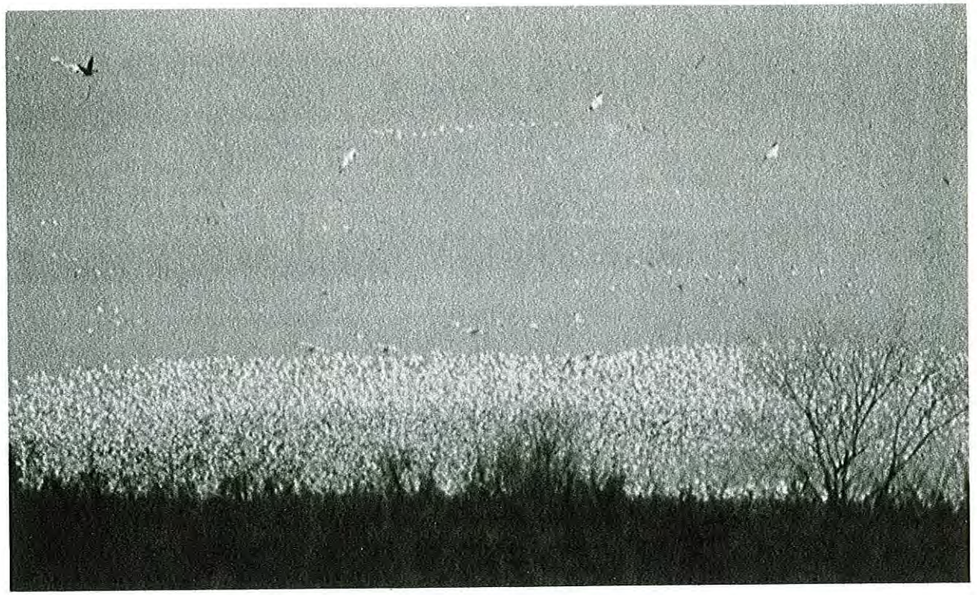
12. Mallard (Anas platyrhynchos platyrhynchos)

The Pacific Flyway winter population of mallards as shown by mid-winter inventories has averaged 1,500,000 and makes up 15 percent of the continental population (10,000,000).

Photo 1. Native upland is important waterfowl habitat - Cackling geese.

Photo 2. Pintails are the most abundant ducks in California. (Photo by J. Cowan)

Photo 3. Central Valley wetlands must accommodate large waterfowl populations - snow geese, Colusa Basin.



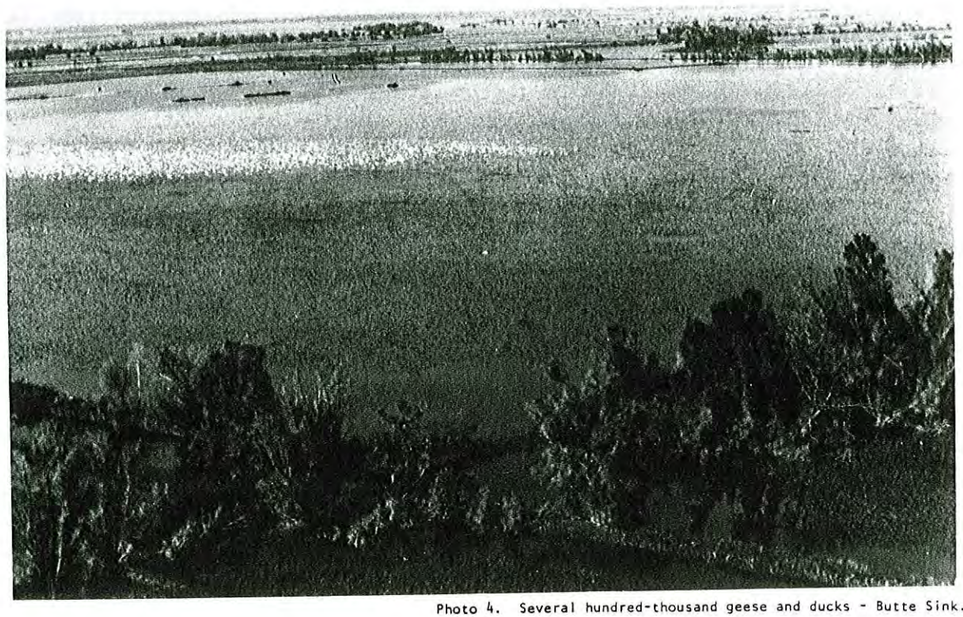


Photo 4. Several hundred-thousand geese and ducks - Butte Sink.

Over one fourth of the Flyway population winters in the Central Valley. The average Central Valley mid-winter population for the period 1973 to 1977 was 415,000 birds. Census data indicate an increasing population of mallards in California.

13. Pintail (Anas acuta acuta)

The Pacific Flyway winter population of pintails (3,950,300) makes up well over half of the continental population (7,000,000). Seventy-five percent of the Flyway population winters in the Central Valley, with the majority of the remainder in Mexico. The Central Valley mid-winter population averages 3.0 million birds. Census data indicate an increasing population of pintails in California.

14. Shoveler (Anas spatula)

The Pacific Flyway population of shovelers (712,000) makes up over one third of the continental population (2,000,000). Eighty percent of this Flyway total spends the winter in the Central Valley. The Central Valley population averages 572,000 birds. Census data indicate an increasing population of shovelers.

15. Ring-necked Duck (Aythya collaris)

The Pacific Flyway population of ring-necked ducks, as determined from mid-winter inventories (4,000), makes up only one percent of the continental population (300,000). One half of the Flyway population winters in California, and one third in the Central Valley. The Central Valley mid-winter population averages 1,300 birds. Census data indicate a stable population of ring-necked ducks. Mid-winter surveys of this species are not accurate, and actual Flyway and State population levels are much greater (Bellrose, 1976).

16. Canvasback (Aythya valisineria)

The Pacific Flyway mid-winter population of Canvasbacks has averaged 78,000 during the 1973 to 1977 period and makes up nearly one third of the mid-winter continental population of 290,000. Fourty-four percent of the Flyway population winters in the Central Valley. An average of 35,000 canvasbacks is present in the Valley during the mid-winter period. Census data indicate large population level fluctuations, but recent increases in numbers have occurred.

17. Ruddy Duck (Oxyura jamaicensis rubida)

The Pacific Flyway population of ruddy ducks during the mid-winter inventories has averaged 110,000 in recent years and makes up one fifth of the continental population (500,000). Well over two thirds of the Flyway's ruddies winter in California, and 21 percent of the Flyway population winters in the Central Valley. The Central Valley population averages 23,000 birds. Census data indicate a stable Flyway population.

18. Other Species

Cinnamon teals (Anas cyanoptera), redheads (Aythya americana), lesser scaups (Aythya affinis), goldeneyes and buffleheads (Bucephala sp.), and Mergansers (Mergus sp.) are present and recorded in population surveys in the Central Valley. However, Valley population levels of these species are very low, making up only small fractions of the Continental and Pacific Flyway populations. No trends in numbers have been determined.

E. Unique Waterfowl Species/Populations

Two waterfowl subspecies wintering in the Central Valley are considered unique because of their status.

Aleutian Canada Goose (Branta canadensis leucopareia)

The Aleutian Canada goose has been designated as an endangered species by the Federal Government because of its restricted breeding range and low numbers. It currently nests only on Buldir Island in the Aleutian Islands of Alaska. The breeding range historically was more extensive until Russian and, later, American trappers introduced arctic foxes to the nesting islands. Extensive recovery efforts are underway to increase population levels by removal of foxes from former nesting islands, protection of known staging and migration areas, propagation, and protection through hunting closures. Parts of the Colusa, Butte, and San Joaquin Basins have been closed to hunting of all Canada geese at varying times to protect the Aleutians. In the fall of 1977, 1,600 Aleutians were counted--a record number for this subspecies. When breeding populations are established on several more Aleutian islands and a sustaining population is achieved, this subspecies will be transferred to the threatened category and eventually delisted.

Tule White-fronted Goose (Anser albifrons elgasi, Delacour & Ripley, 1975)

The existence of this subspecies of the white-fronted goose has been a subject of controversy for many years. The breeding grounds have not been located, and all wintering areas have not been identified because of the difficulty encountered by most observers in separating the tule subspecies from the Pacific white-front in the field. Research efforts to try to delineate the population breeding and wintering areas are being implemented. Winter population numbers are estimated at 2,000. It is believed that the entire Pacific Flyway population winters in the Central Valley.

Photo 5. Aleutian Canada goose.

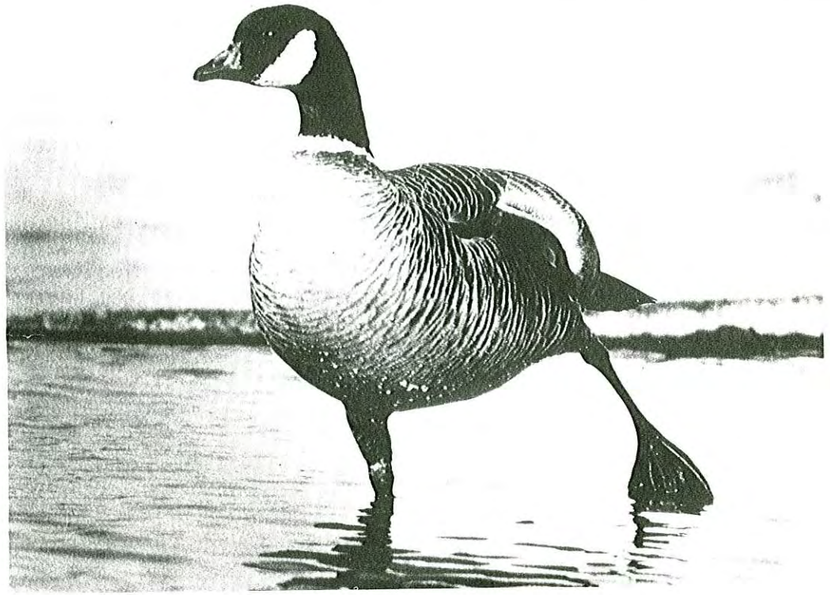
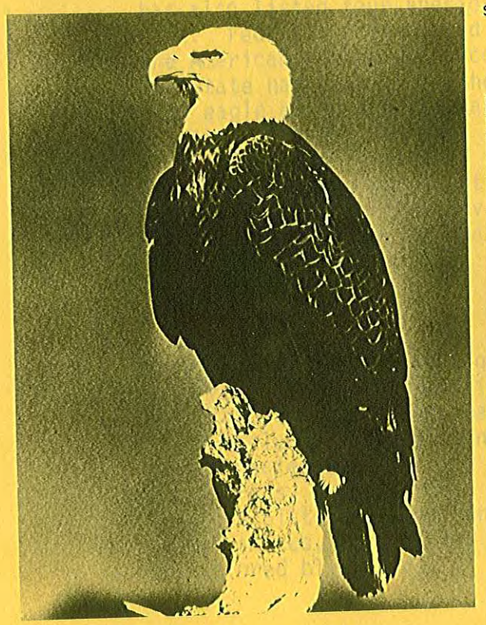
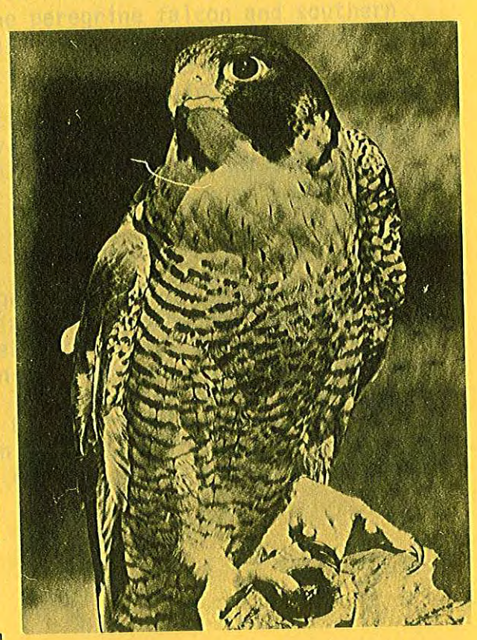


Photo 6. Pacific white-fronted goose (upper); tule white-fronted goose (lower).



Southern Bald Eagle



American Peregrine Falcon

III. Unique and/or Endangered Species other than Waterfowl

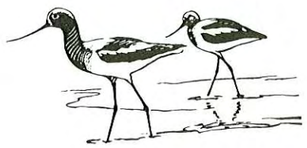
III. UNIQUE OR ENDANGERED SPECIES OTHER THAN WATERFOWL

A. Rare and Endangered

Wetland habitat in the Central Valley is important to several endangered or rare species. In addition to the Aleutian Canada goose, the Federal Government has designated two species which utilize California's Central Valley wetlands as endangered. The State of California has also listed four species as either endangered or rare. Federally designated endangered species include the American peregrine falcon and the southern bald eagle. The State has classified the peregrine falcon and southern bald eagle as endangered, and the yellow-billed cuckoo, and the giant garter snake as rare. Butte Basin is one of the last strongholds of the yellow-billed cuckoo. The few remaining permanent wetlands of the San Joaquin Basin are vital to the survival of the giant garter snake. The peregrine falcon and bald eagle use the wetland areas for feeding during winter.

B. Unique

Many unique, but not endangered, water and upland birds of high recognition are associated with remaining wetland and associated native upland habitat of the Central Valley. These include white pelicans, common and snowy egrets, three grebe species, greater and lesser sandhill cranes, great blue lerons, green herons, black-crowned night herons, American bitterns, American avocets, black-necked stilts, common snipes, long-billed curlews, other shorebirds, and tri-colored blackbirds.



IV. Habitat Description

....throughout the length and about the rim of the San Joaquin were a hundred or more oases, every one a veritable paradise, abundantly watered, shaded with beautiful trees, and filled to overflowing with game of all kinds....At all times these lakes and connecting sloughs as well as the San Joaquin River, were bounded with an almost impassable barrier of tules, willows, and mud flats. During times of high water the basin was filled to a great depth with flowing water, presenting a barrier passable with stock at probably not more than three places between the upper end of Kern Lake and San Francisco Bay."

- F. F. Latta (1933)

IV. HABITAT DESCRIPTION

A. Location, Description, Acreage, and Waterfowl Use of Wetland Habitat of Greatest Importance (Key Areas)

Each of the drainage basins in California's Central Valley has unique wetland areas with varying proportions in Federal, State, and private ownership. Each has different water sources and marsh management systems. Only in rare instances do truly natural unmanaged marshes exist. Without the intensive water and related marsh management techniques now employed, California wetlands would be largely unproductive.

Descriptions of Central Valley waterfowl habitat by drainage basin are presented below. Figure 5 shows the location of the most significant wetland areas (Federal, State, and private) in the Central Valley. Tables 1 and 2 should be referred to for detailed, comparative waterfowl population data from the mid-winter and mid-September surveys, respectively. Table 3 presents comparative data on Federal, State, and private wetland habitat acreage by basin.

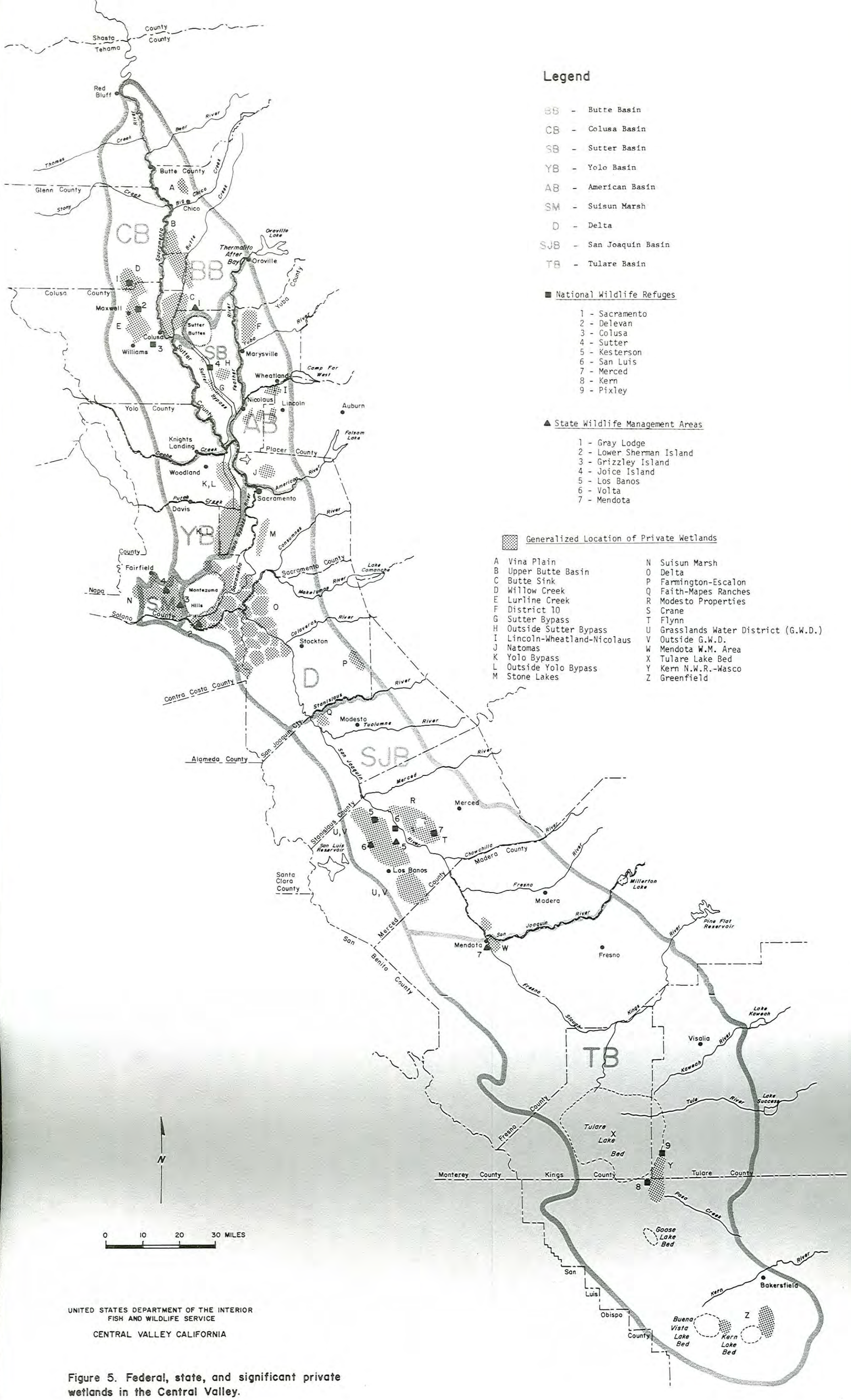
Sacramento Valley

1. Butte Basin (Figure 6)

A. Description:

Butte Basin extends from the city of Red Bluff in the north to Butte Slough, Morrison Slough, and Sutter Buttes in the south between the Sacramento River on the west and the Feather River on the east. The Basin is divided into the upper and lower basins. The lowest elevation in the latter is referred to as "Butte Sink".

The City of Chico is about the northern limit of wetlands in this basin, however, an extensive area of native pasture north of town, Vina Plain, is important goose habitat. Part of Butte Sink still remains comparatively unchanged from its original condition, although even here Federal and State water development projects have reduced flooding, and agriculture has reclaimed large areas. The natural portion of Butte Sink consists of a complex of natural and manmade levees, channels, permanent ponds, and winter flooded bulrush marshes and swamps maintained by repeated flooding from the Sacramento River, Butte Creek, and underground seepage. The land is low with rise and swale topography typical of sluggish flood plains. The upper basin is primarily riceland with manmade levees and irrigation and drainage canals. Extensive riparian habitat is present along the Sacramento River and Butte Creek. Oroville reservoir, together with Thermalito Fore and Afterbays, is present in the



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FISH AND WILDLIFE SERVICE

CENTRAL VALLEY CALIFORNIA

Figure 5. Federal, state, and significant private wetlands in the Central Valley.

Table 3. Acreages of Federal, State, and Private Waterfowl Habitat 1/ in California's Central Valley

	Federal	State	Private
Butte Basin	0	8,375	52,115
Colusa Basin	20,450	0	23,580
Sutter Basin	2,590	0	1,500
American Basin	0	0	12,277 2/
Yolo Basin	0	0	34,473
Delta	0	3,100	39,000 3/
Suisun Marsh	1,100 4/	10,487	46,000
San Joaquin Basin	15,561	6,000	109,910
Tulare Basin	14,944	9,444	27,591
Total	54,645	37,406	344,946 plus

1/ Uplands are included in above figures (see text).
2/ District 10.
3/ San Joaquin County portion only - actual total is larger but unknown. Includes Stone-Beach lakes.
4/ Ryer and Rowe Islands (1100 acres) are owned by Concord Naval Weapons Station, but leased to private hunting clubs.

upper basin in the foothills near the city of Oroville. No National Wildlife Refuges (NWRs) are present in Butte Basin but the State owns and manages the Gray Lodge Wildlife Management Area (WMA). Water for Gray Lodge comes from agricultural drainage canals and deep wells on the area.

Other than flood water, Butte Sink surface water is derived from several principal sources--Butte Creek, the Sacramento River, and agricultural drainage from the northeast. The latter water originates in the Feather River and deep wells. Most of the water that flows into the Basin from spring through fall is drain water coming off the extensive rice fields present in the Basin. Intensive marsh management techniques are used on Gray Lodge, including spring and summer irrigation to produce waterfowl foods; the private clubs, with exception of the Sink area, predominately flood in early fall and maintain water through late winter season only.

During wet winters, Butte Basin flood water spills into the Sutter By-pass flood control area then into the Sacramento River. From 30 to 150 square miles is flooded during these high water periods. The Basin drains directly into the Sacramento River as well as the Sutter By-pass. There is almost a complete absence of avian

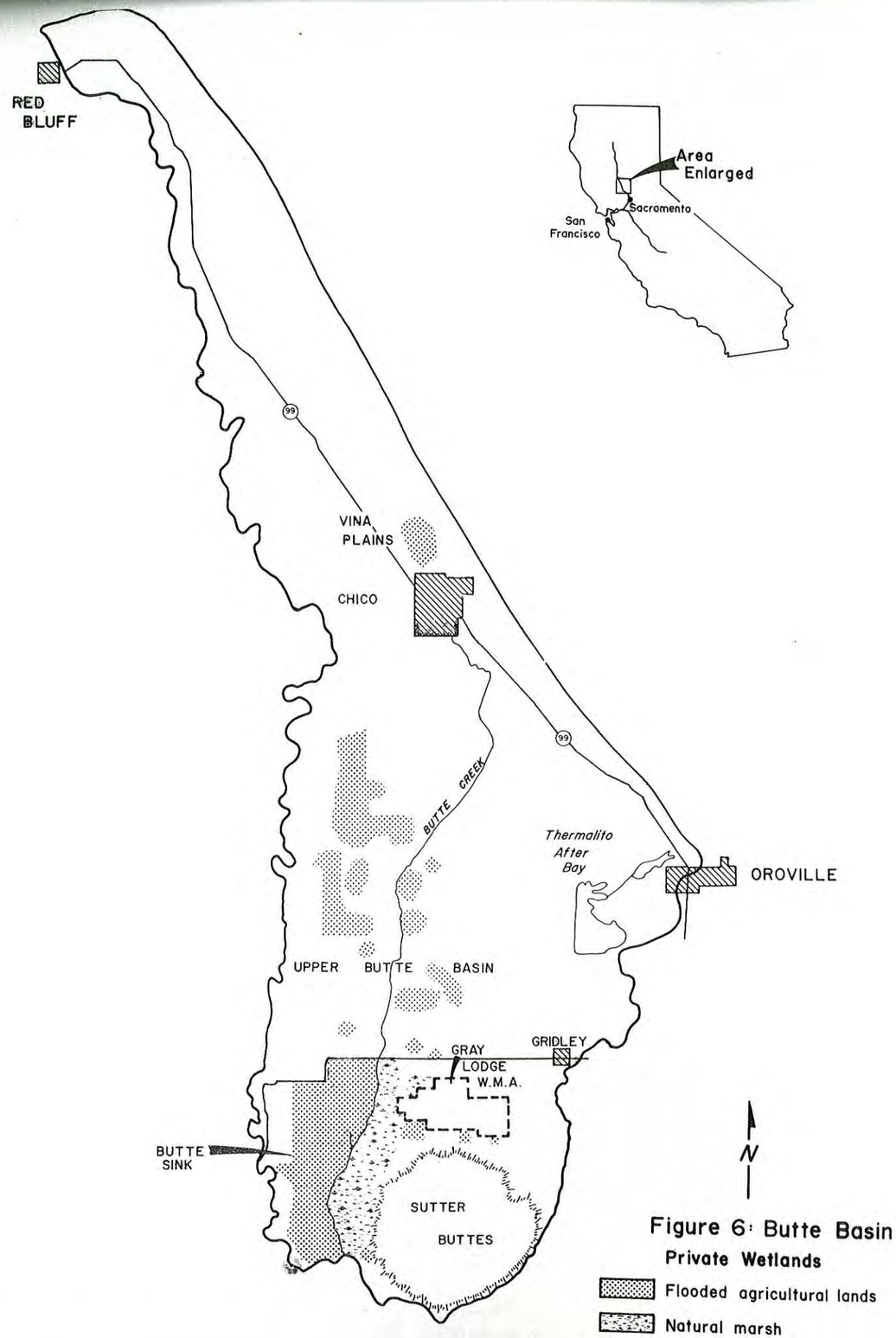


Figure 6: Butte Basin

Private Wetlands

Flooded agricultural lands

Natural marsh

Photo 7. Thermalito After-bay - Butte Basin.

Photo 8. Upper Butte Basin rice culture and riparian habitat.

Photo 9. Butte Sink wetlands

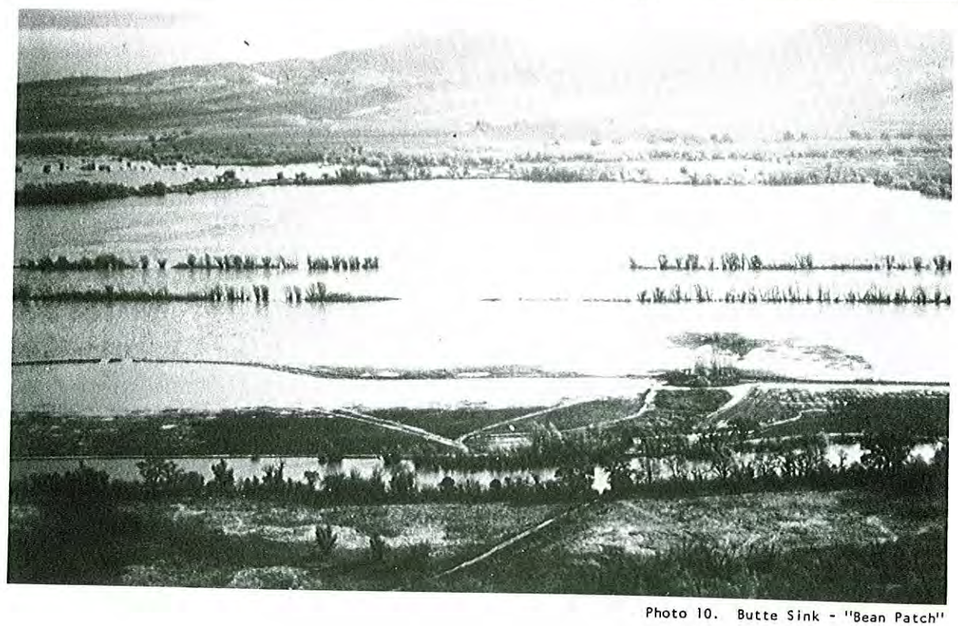


Photo 10. Butte Sink - "Bean Patch"

botulism in the Basin because of high flows of good quality water.

The climate of the Basin is typical Mediterranean, being cool and wet in winter, and warm and dry in summer. Average annual rainfall ranges between 15 and 22 inches; most rain occurs between November and March. There are less than 15 days of below-freezing temperatures in the Basin annually.

B. Habitat Acreage:

Gray Lodge WMA consists of 8,375 acres. The 67 organized duck clubs in Butte Basin maintain 52,115 acres of habitat with 22,190 acres flooded for waterfowl (Table 3). Of this total, half of the clubs have waterfowl hunting as the primary function (10,830 acres flooded), and half hunt waterfowl on rice fields flooded after the harvest (11,350 acres flooded). Twenty percent of the State's rice acreage is in the Basin. A total of 62,000 acre-feet of water is needed to flood waterfowl habitat on private clubs during the fall-winter months. An additional 30,000 acre-feet of water is needed by the Gray Lodge WMA.

C. Waterfowl Use:

Butte Basin winters the largest average annual concentrations of waterfowl within the Sacramento Valley. The Butte Sink portion frequently contains over one million ducks and thousands of geese; the mid-winter inventory of January 1971 recorded over two million ducks in the Sink. Butte Basin overall supported an annual average of 178,900,000 waterfowl use-days during the period 1954-1963. This was 53 percent of all waterfowl use in the Sacramento Valley. Butte Basin held an average of one fourth of all waterfowl recorded during mid-winter surveys in the Central Valley in the 1973 to 1977 period. This included one fourth of the pintails, canvasbacks, and white geese; half of the mallards, wigeons, and ring-necked ducks; almost all of the wood ducks; and about a third of the green-winged teals and gadwalls. Butte Basin is one of the most important wintering areas of the endangered Aleutian Canada goose. Eight hundred eighty-seven were recorded in the Butte Sink in November 1977. Gray Lodge WMA has attained peak populations of one million wintering waterfowl although normal populations are about 550,000. Butte Basin does not support large numbers of waterfowl during the mid-September surveys.

Within Butte Sink, a privately owned area of 760 acres, known as the "Bean Patch" has traditionally served as a sanctuary closed to hunting. This sanctuary contributes materially to the capacity of the Sink to attract and hold birds, and Butte Sink club owners support the hunting closure. The area's name derives from the crops occasionally grown, but it is flooded during the waterfowl season. Aerial surveys have recorded up to one million waterfowl.

A large percentage of waterfowl in the Butte Basin can be found on the Bean Patch at any given time. Pintail and mallard ducks are the most important species on this area, but American wigeons, green-winged teals, snow geese, cackling geese, and white-fronted geese use the area as well.

Vina Plain supports several thousand geese late in the winter in normal and heavy rain years. Thermalito Afterbay supports large concentrations of waterfowl at times.

2. Colusa Basin (Figure 7)

A. Description:

The Colusa Basin drainage area extends from Stony Creek in the north to Cache Creek in the south between the Sacramento River in the east and the Coast Range in the west. The lowest elevation in the Basin is known as the "Colusa Trough". Historically, overflow from the Sacramento River system joined with waters draining the eastside of the Coast Range and flooded the Colusa Basin marshes in winter and spring. These waters drained south through the Colusa Trough and re-entered the Sacramento River. This still occurs in high water years, but flood control projects have eliminated most flooding.

Seasonal rainfall and other meterological conditions are essentially the same as in Butte Basin.

There are significant areas of natural wetland habitat remaining in Colusa Basin, primarily within the "Trough", but most duck clubs consist of flooded rice fields. Significant riparian-ox bow remnants occur along the upper Sacramento River. The wetlands are predominately seasonal in nature with small areas of permanent marshes. Rice farming is the predominant agricultural practice in the Basin, but orchard fruits and nuts are also present in large acreages.

Three NWRs are present in the Colusa Basin--Sacramento, Delevan, and Colusa--consisting of permanent and seasonal wetlands, ponds, prairie uplands, and crops. Extensive private wetlands managed as duck hunting clubs exist east, south, and north of Sacramento NWR (Willow Creek area); and south of Delevan NWR and northwest of Colusa NWR (Lurline Creek Area). These clubs flood their marsh areas primarily during the hunting season, although a few small, permanent natural marsh areas exist as sumps for agricultural run off in the spring and summer. Some clubs practice intensive marsh management. Willow Creek clubs are flooded beginning in August and September. This early flooding is important to pintails arriving on these wintering grounds in early August.

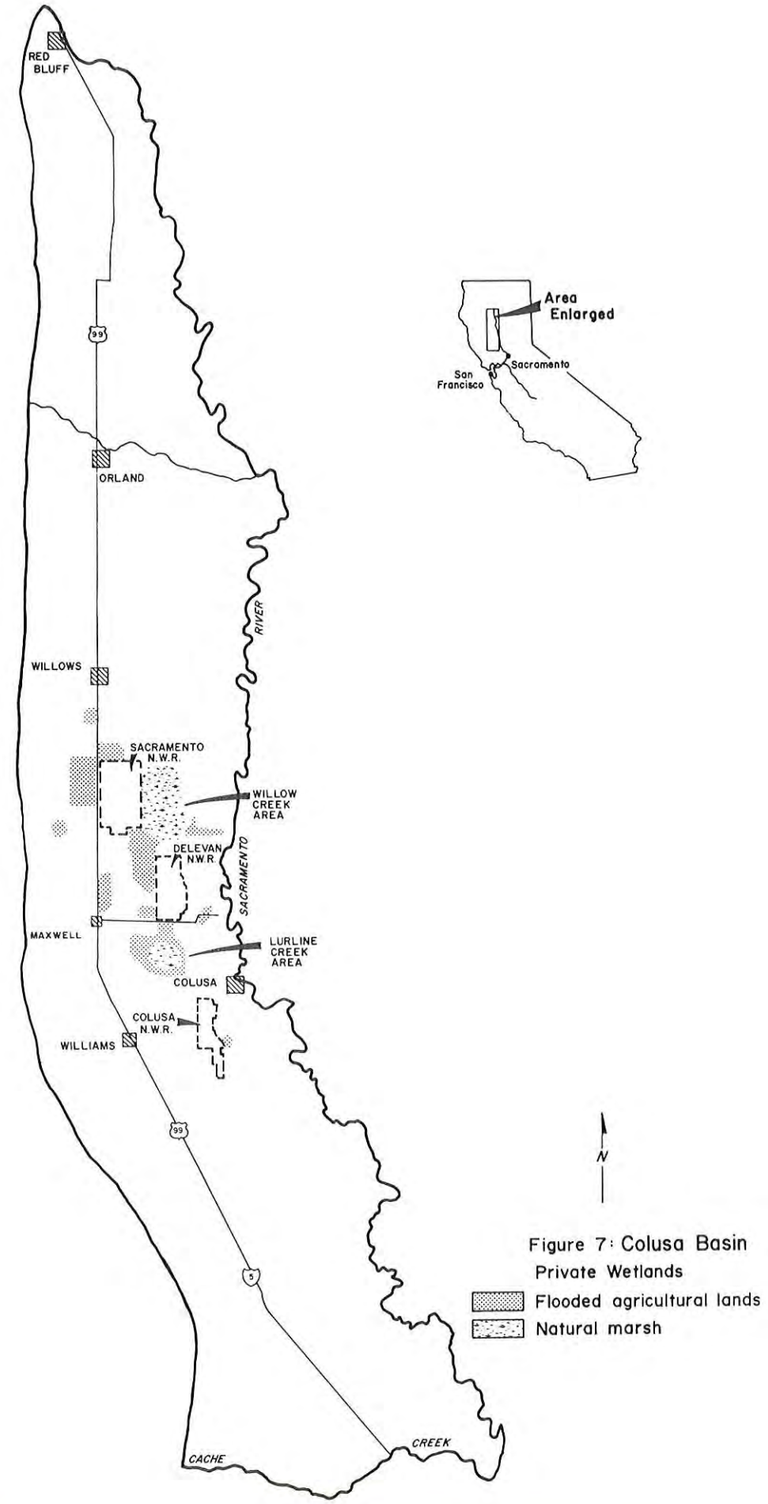


Figure 7: Colusa Basin
Private Wetlands
Flooded agricultural lands
Natural marsh

B. Habitat Acreage:

The Colusa Basin encompasses 1,700 square miles. Of this, the three NWRs total 20,450 acres. These refuges use an average of 65,000 acre-feet of water each year. The water is obtained through irrigation districts under Bureau of Reclamation contract. There are 163 duck clubs in the Basin totaling 23,580 acres. Of these, the 99 Willow Creek clubs east of Sacramento NWR provide about 6600 acres of seasonal marsh and some flooded rice fields. The Lurline Creek area between Delevan and Colusa NWRs includes native marsh and flooded rice lands totaling about 7000 acres. Another 10,000 acres of flooded rice-type wetlands exist adjacent to and in the vicinity of these two areas and three NWRs. Most water used on the Colusa Basin clubs is irrigation return flows derived from local irrigation districts and directly from the Sacramento River. The quantity of water used on the private clubs is unknown.

C. Waterfowl Use:

The Colusa Basin has held about one fifth of the Central Valley's total waterfowl during the mid-winter inventories for the period 1973 to 1977. Only the San Joaquin and Butte Basins held more birds. Sacramento, Delevan, and Colusa NWRs combined provide over 150 million waterfowl use-days annually. Colusa Basin wintered more geese than any other area in the Central Valley during the 1973 to 1977 period. About one third of all geese and half of the white geese (lesser snow and Ross) were recorded in the Colusa Basin. This basin wintered an average of one fifth of the pintails, during the 5-year period. The Colusa Basin has supported about one fourth of the Central Valley's pintails and mallards recorded during recent mid-September inventories.

Few sightings of the Aleutian Canada goose have been recorded in the Colusa Basin.

3. Sutter Basin (Figure 8)

A. Description:

Sutter Basin extends south from the Sutter Buttes to the confluence of the Feather and Sacramento Rivers. The Basin lies between the Sacramento River on the west and the Feather River on the east. The Sutter Basin is separated from the American Basin, to the south and east, by the Feather River.

Historically, overflow from the Sacramento River, Butte Sink, and the Feather River flooded a large portion of Sutter Basin in the winter and spring. A large portion of the Basin was flooded year around, providing a vast breeding and wintering area for waterfowl

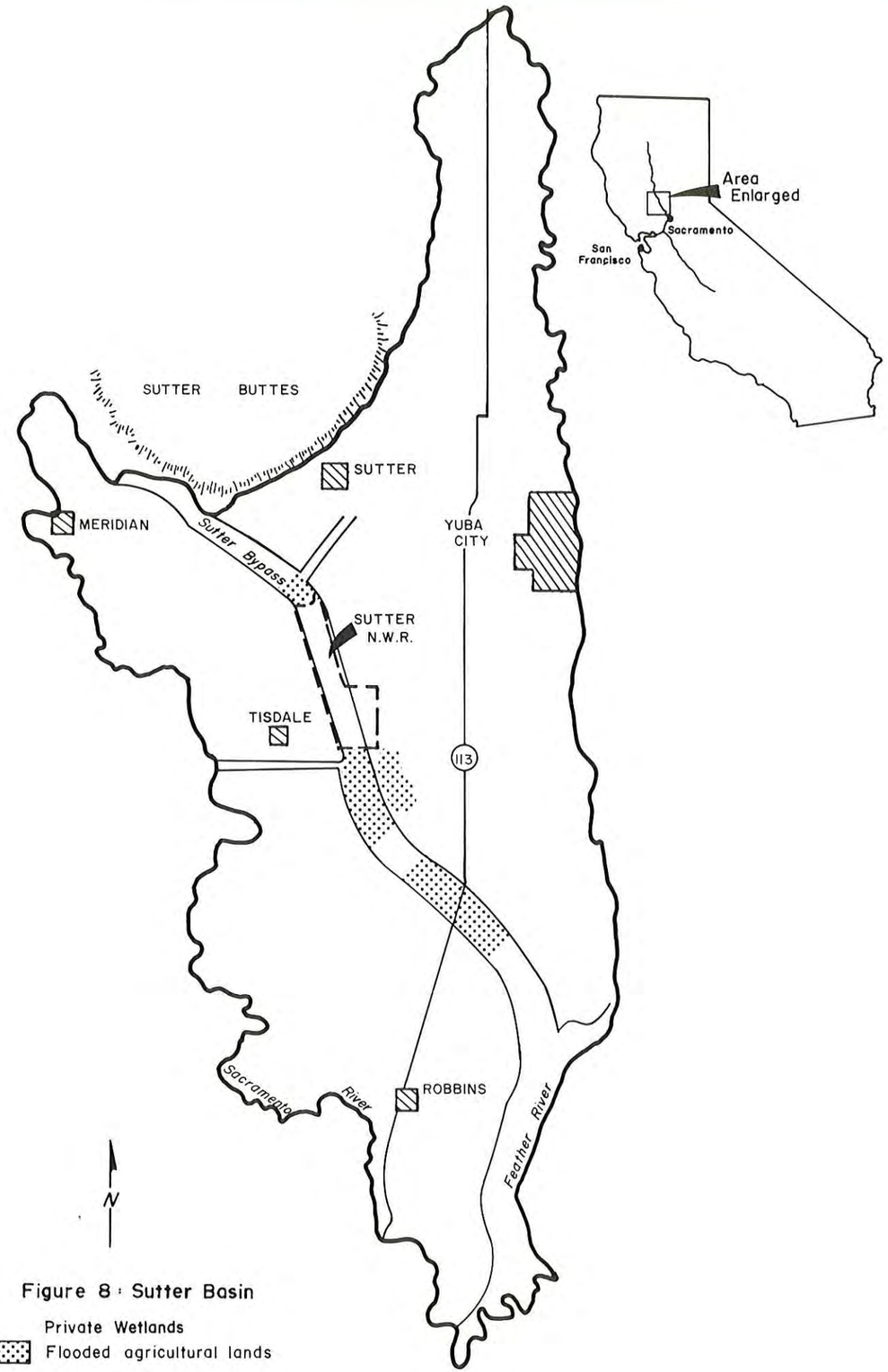


Figure 8 : Sutter Basin

Private Wetlands

Flooded agricultural lands

and other water related wildlife. Water not retained in the Basin drained south and re-entered the Sacramento River.

Seasonal rainfall and other meterological conditions are essentially identical to other Sacramento Valley areas.

The Sutter Basin contained some of the most significant waterfowl habitat in California prior to white settlement, but only Sutter NWR and a few private duck clubs provide marsh habitat today. There are no WMAs in the Basin. During wet winters and springs, the Sutter By-pass floods and provides significant resting habitat.

Rice is the predominant agricultural crop in the Basin and provides a good food source for wintering waterfowl, especially in wet years.

Most private duck clubs in Sutter Basin are located within the levees of the Sutter By-pass. Few permanent marsh areas exist. Most clubs consist of rice lands which are flooded in late October or early November after harvest. They provide good habitat, especially for geese and pintails.

B. Habitat Acreage:

The Sutter Basin totals about 90 square miles; 18 miles in length by 5 miles wide. The 40,000 to 50,000 acres of marsh once existing here have been eliminated in favor of agriculture. Sutter NWR totals 2,590 acres and the private duck clubs encompass about 1500 acres. Sutter NWR requires 17,000 acre-feet of water annually for operation. This water is obtained as agricultural drain water from irrigation districts. Water use on the private wetlands is unknown.

C. Waterfowl Use:

Sutter NWR averages 41.4 million waterfowl use-days annually, with peak populations of 900,000 occasionally achieved. The Sutter Basin as a whole has held about 7 percent of the wintering waterfowl of the Central Valley averaged over the past 5 years. On average, one fourth of the Valley's large Canada geese (great basin and lesser), one fifth of the canvasbacks, and smaller percentage (7-14) of the mallards, pintails, ruddy ducks, and ring-necked ducks were recorded in the Sutter Basin. Sutter Basin records very low numbers of waterfowl during the mid-September surveys. Over two thirds of the Pacific Flyway canvasback population has been recorded in Sutter Basin during mid-winter inventories when the Sutter By-pass is flooded (e.g., 1974). Sutter Basin is apparently not a major concentration area for Aleutian Canada geese, since no sightings have been made.

4. Yolo Basin (Figure 9)

A. Description:

The Yolo Basin lies west of the Sacramento River between Cache Creek in the north and the Montezuma Hills and the Sacramento-San Joaquin River Delta in the south. Historically, Yolo Basin received overflow water from the Sacramento and American Rivers, and Cache Creek. A large part of the Basin was under the influence of Pacific tidal fluxes. Old maps show the tidal marsh extending nearly to Sacramento. Yolo Basin marshes were permanent in the lowest, central section of the Basin. Marginal areas provided seasonal wetlands from winter and spring floods.

Seasonal rainfall and other meterological conditions compare with other Sacramento Valley areas. However, Yolo Basin is far enough south to receive marine air intrusions from the Delta. These cooling breezes in the summer moderate high temperatures.

There are only very small remnant areas of native marsh in the Yolo Basin. These areas are associated with irrigation and drainage canals, but few duck clubs. Most wetlands are seasonal. Agricultural crops in the Basin include rice, barley, corn, sorghum, and orchard fruits and nuts. Irrigated and dry grazing lands are maintained on large acreages.

There are no NWRs or state WMAs within the Yolo Basin. Most duck clubs exist within and adjacent to the Yolo By-pass. Intensive marsh management is practiced on very few Yolo By-pass duck clubs. Most clubs are superimposed over harvested agricultural crops and pasture.

B. Habitat Acreage:

The Yolo Basin totals 400 square miles; 35 to 40 miles long by 10 miles in width. There are 31 known duck clubs within the Yolo By-pass totalling 11,500 acres, and two additional clubs outside the By-pass totalling 23,000 acres. Total water use on these areas is unknown, but they are seasonal wetlands only. Of the 34,500 acres of By-pass area clubs not all are considered wetlands, because clubs maintain large upland acreage as well. When the Yolo By-pass floods in winter, the vast surface water available within the By-pass provides excellent resting habitat for waterfowl, and many hunters use the area to hunt from boats.

C. Waterfowl Use:

The Yolo Basin has held only about 5 percent of the Central Valley's waterfowl on average during the mid-winter surveys of the 1973 to 1977 period. Likewise, Yolo Basin is relatively unimportant

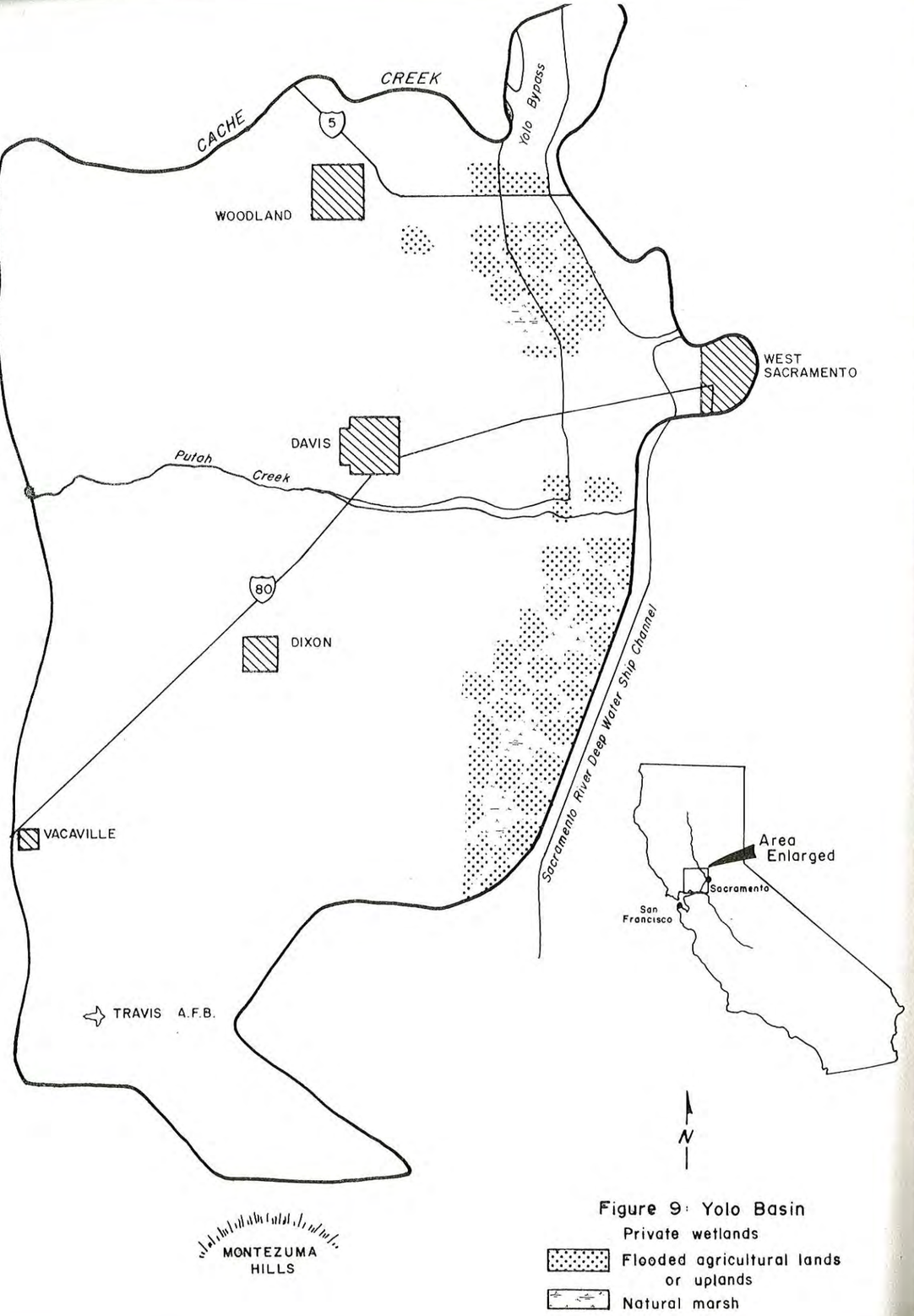


Figure 9: Yolo Basin

Photo 11. Wetland habitat maintained by Colusa Basin (Willow Creek) duck clubs - early September.

Photo 12. Geese and ducks feeding in rice fields - Colusa Basin.

Photo 13. Sutter By-pass duck clubs - flooded harvested rice fields. Uncontrolled flooding of this by-pass in late winter and spring provides additional habitat.

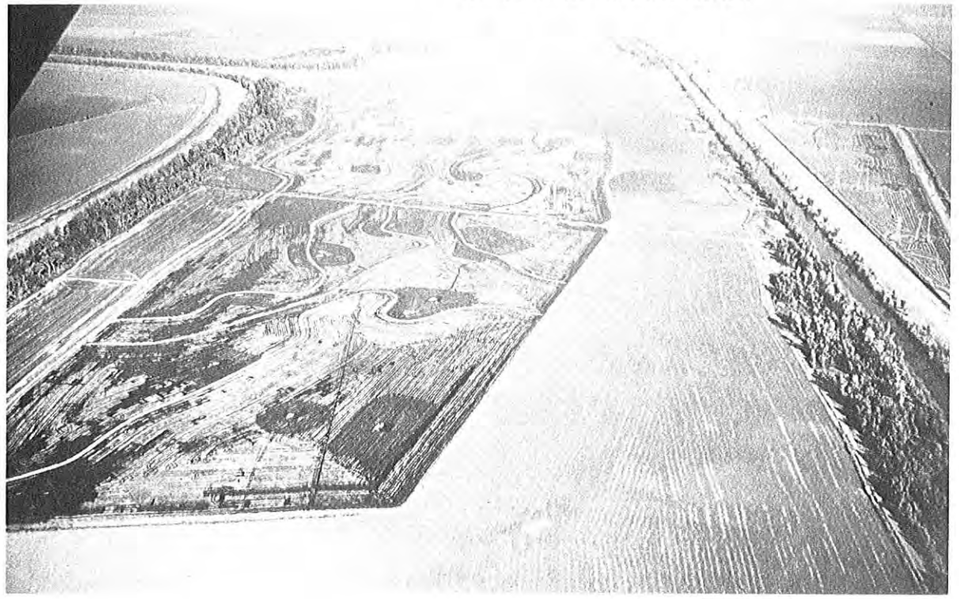


Photo 14. Habitat maintained by Yolo Basin duck clubs is primarily flooded agricultural lands - Yolo By-pass.

during the mid-September period. This Basin is, however, the second most important area next to the Delta, for wintering whistling swans. The mid-winter data do not always reflect total waterfowl use of the Yolo Basin. When the Yolo By-pass floods in winter and/or spring, large concentrations of pintails desert their traditional habitats and raft up on the vast surface water available. Almost 500,000 pintails were recorded on the By-pass in January of 1973.

The Yolo Basin may be a minor wintering area for the Aleutian Canada goose. A few sightings have been recorded here.

5. American Basin (Figure 10)

A. Description:

The American Basin lies east of the Sacramento and Feather Rivers and west of the Sierra foothills, between Oroville in the north and the American River in the south. An area north of the Yuba River and east of Hwy. 70 and the Feather River, referred to as "District 10", is included in the American Basin for purposes of this report and will be discussed separately below.

Historical flood flows supplying the American Basin with water originated in the American, Yuba, Feather, Sacramento, and Bear Rivers. Two permanent bodies of water, Bush Lake and Fisherman's Lake, were present in the southern end of the Basin near Sacramento at the turn of the century. The American Basin probably provided the least waterfowl habitat of any of the Valley's basins prior to white settlement, and the same is true today. Rice farming in the Nicolaus-Lincoln-Wheatland and Natomas areas provides wintering habitat, along with Camp Far West Reservoir southwest of Marysville.

There are no NWRs or State WMAs in the American Basin. Excluding District 10, there are few private duck clubs, but some farmers lease tracts of riceland for hunting purposes. Many of the clubs depend on rain water to fill harvested rice fields. The American Basin provides excellent feeding habitat for pintails which rest on Camp Far West Reservoir and the Yolo By-pass.

B. Habitat Acreage:

The American Basin totals approximately 300 square miles, excluding District 10; it is 30 miles in length by 10 miles wide. The exact acreage of private duck clubs in the Basin outside of District 10 is not known but is relatively small. The water requirements of these clubs is, likewise, unknown.

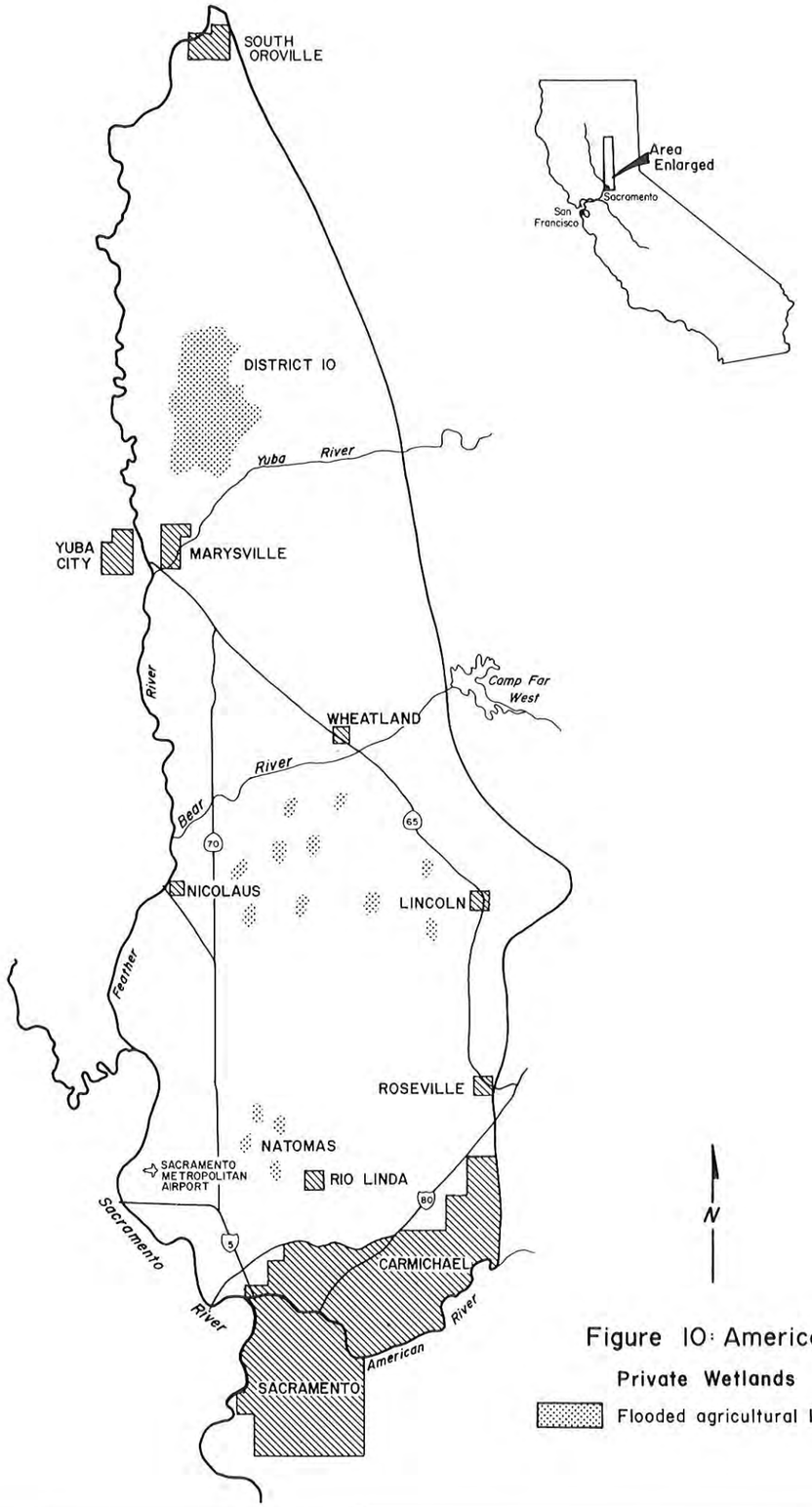


Figure 10: American Basin

Private Wetlands

Flooded agricultural lands

C. Waterfowl Use:

The American Basin, excluding District 10, winters only about 1 percent of the Central Valley waterfowl overall, and mid-September inventories account for only a trace of the Valley's waterfowl populations at that time. The Basin has held large numbers of canvasbacks on Camp Far West Reservoir at times. A small percentage of the Central Valley's Canada geese use this Basin during the mid-winter period. The Basin is an important feeding area for pintails, mallards, and geese. Since much feeding is done at night, the aerial surveys do not reflect the total importance of the Basin. Heavy use is recorded late in the year after the rains have started. Swans and white-fronted geese use the airport area heavily at times. The American Basin is not important to the Aleutian Canada Goose.

District 10

District 10 is located at the upper end of the American Basin, northeast of Marysville. It is a rice farming zone that provides excellent waterfowl hunting. A total of 40 clubs encompassing 12,277 acres are present in District 10. Their water is derived from the Feather River and agricultural return flows. The quantity of water used is unknown. Numerous ponds being developed in the foothills to the east and the existence of sanctuaries within the area add to District 10's attractiveness. Nearly all club lands are flooded, harvested rice fields. Virtually no natural marshes are present.

Waterfowl populations on District 10 lands can at times be large; 260,000 ducks, mostly pintails, and 26,000 geese, primarily lesser snows, were recorded during the mid-winter survey of 1976. The large number of pintails represented almost 10 percent of the Central Valley's total pintail population at that time. Recorded populations are generally well below these levels. On average, the area supports only about 1 percent of the Valley's waterfowl during the mid-winter inventory, but these data do not reflect the importance of District 10 to Central Valley waterfowl because surveys are conducted on Wednesdays - traditional shoot days. This area is vitally important as a feeding area, and on non-shoot days or at night, hundreds of thousands of ducks and geese use the area.

Mid-September inventories of the District have recorded only a trace of the Central Valley's waterfowl population present at that time. This results from the lack of early flooding on duck clubs and the absence of a State or Federal facility within the District. No sightings of the Aleutian Canada goose have been made in District 10.

Delta-Suisun Marsh

6. Suisun Marsh (Figure 11)

A. Description:

The Suisun is a brackish marsh which lies between the fresh water wetlands of the interior Valley and the salt water marshes of San Francisco Bay and the coast. It will be included in both the Central Valley and the Coastal Concept Plans. Although normally considered as a coastal estuary, it will be included in the Central Valley Plan because large waterfowl populations using the marsh also use the Delta and Sacramento Valley wetlands.

Suisun marsh is located south of the cities of Fairfield and Suisun. It is bounded in the south by the Sacramento River, in the east by the Montezuma Hills, and in the west by Interstate Hwy. 680. Suisun marsh is dominated by native marsh plants, although a small amount of barley is grown. Nine-tenths of the marsh is enclosed within water control levees. Most of the marsh is at or below sea level. Water quality varies with season as a result of changes in fresh water outflow from the Sacramento and San Joaquin Rivers.

Suisun marsh has been modified over the years by natural erosion, upstream hydraulic mining, agricultural reclamation projects, channel improvements, and reduced fresh water inflow with accompanying salinity increases. Agricultural developments were largely unsuccessful because of poor drainage and salt accumulation.

Two State wildlife areas, Grizzly Island and Joice Island, and private duck clubs encompass the marsh and together provide one of the most significant marshes in the Pacific Flyway. There are no NWRs in the marsh.

Although some habitat is flooded year around, most clubs flood seasonally for the hunting season and for salinity control after the hunting season.

The winters in the Suisun are mild and wet, and the summers warm and dry. The marsh is cooler than other Central Valley areas because of the influence of cool marine air intrusions during the summer months. Average rainfall is 20 inches annually.

B. Habitat Acreage:

The 216 private hunting clubs in the marsh total 45,710 acres. Together with the Grizzly Island WMA consisting of 8,600 acres, the 1,890 acre Joice Island WMA, and 1,110 acres of U.S. Navy property, a total of 57,310 acres of wetland and upland habitat is available for waterfowl use. The 27,000 acres of bays and waterways also provide habitat.

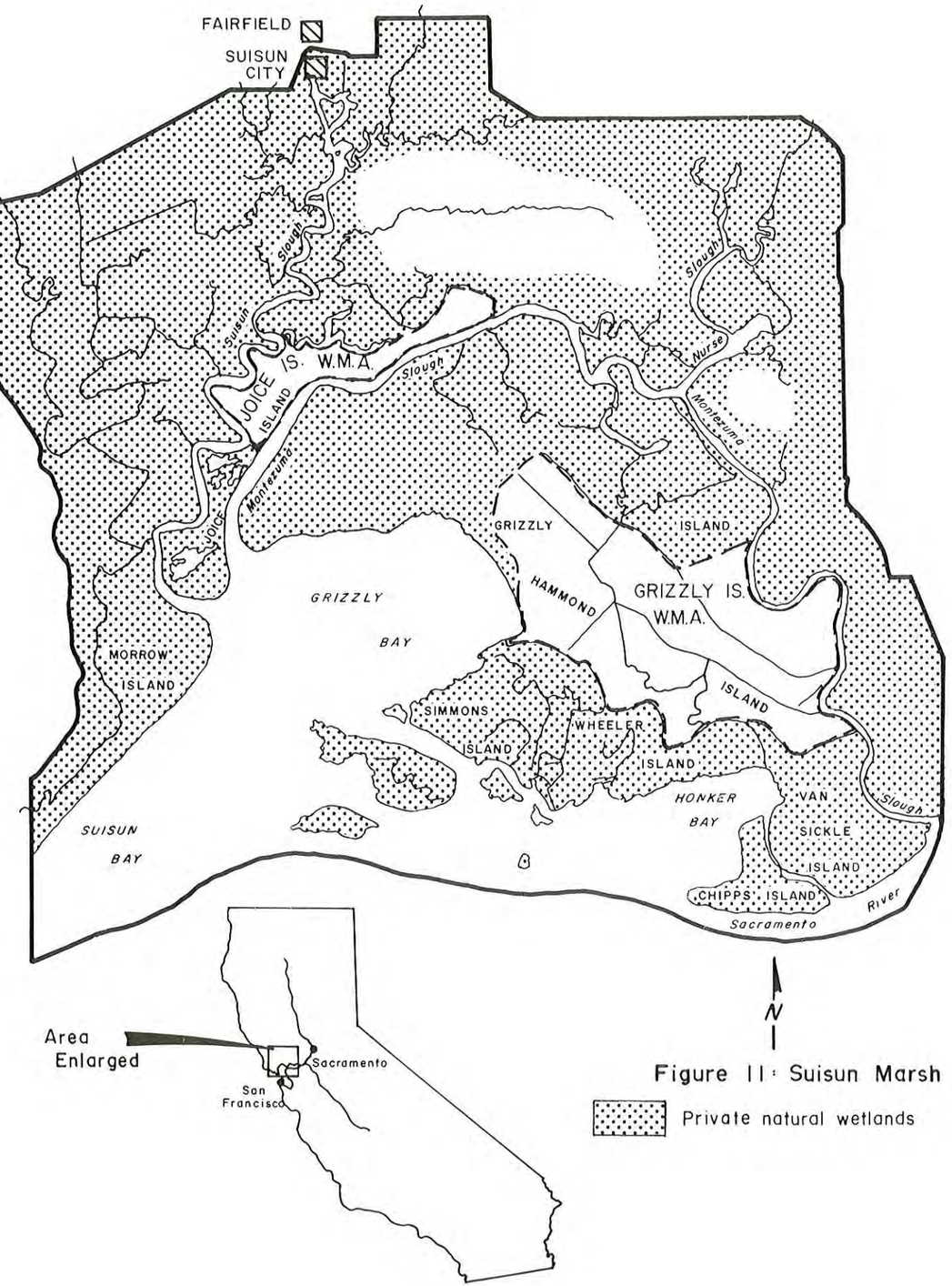


Figure 11: Suisun Marsh

Private natural wetlands

The primary value of Suisun marsh is in its support of wintering waterfowl, especially early in the fall. In past years, 1954-1972, at the time of the mid-September survey, about 10 percent of the Central Valley's waterfowl populations could be expected in the marsh. More recently, these early season surveys have recorded only 4 percent of the Valley's total in the marsh. The number of ducks using the marsh increases as fall progresses until 500,000 to 700,000 birds are using the area. With the coming of fall and winter rains, the ducks move out of the marsh to the Delta, and San Joaquin and Sacramento Valleys where new habitat and food sources become available. By the time of the mid-winter inventory, most birds have left the marsh and on average, only about 2 percent of the Valley's waterfowl are recorded here. Exceptions occur during dry years when up to one quarter of the Valley's ducks can be found on the marsh. Suisun supported 25 percent of the Central Valley's duck population during November and December of 1967 when rains did not begin until mid-winter.

Pintails are the most numerous species using the marsh, making up from 40 to 96 percent of all waterfowl recorded on the marsh during the fall-winter period. Other important waterfowl species utilizing the marsh include mallards, American wigeons, shovelers, green-winged teals, canvasbacks, and cackling and white-fronted geese. Recent mid-winter inventories of Suisun marsh have recorded about one third of the Valley's canvasbacks and other divers, and about 10 percent each of the Valley's cackling Canada and white-fronted geese.

Flocks of the endangered Aleutian Canada goose were seen regularly in the marsh in the winter of 1976-1977. Fifty-one were recorded in the marsh in December 1976 and remained through the middle of January. The birds used private duck clubs and the Grizzley Island WMA.

7. Sacramento-San Joaquin Delta (Figure 12)

A. Description:

The Delta lies in a central position in the Central Valley between the City of Sacramento in the north and the Stanislaus River in the south. The eastern boundary is the Sierra Mountain foothills and the western boundary is the Coast Range, Yolo Basin, and the Sacramento--San Joaquin River confluence.

The vast Delta of interior Central California consists of a complex network of intermingling sloughs, channels, and marshland at the confluence of the Sacramento, San Joaquin, Cosumnes, Mokelumne, and Calavaras Rivers, and numerous smaller streams. The water from these sources comingles in a complex hydrologic environment influenced by tidal action, stream flow, and water diversions and exports, prior to flowing out of the Delta into San Francisco

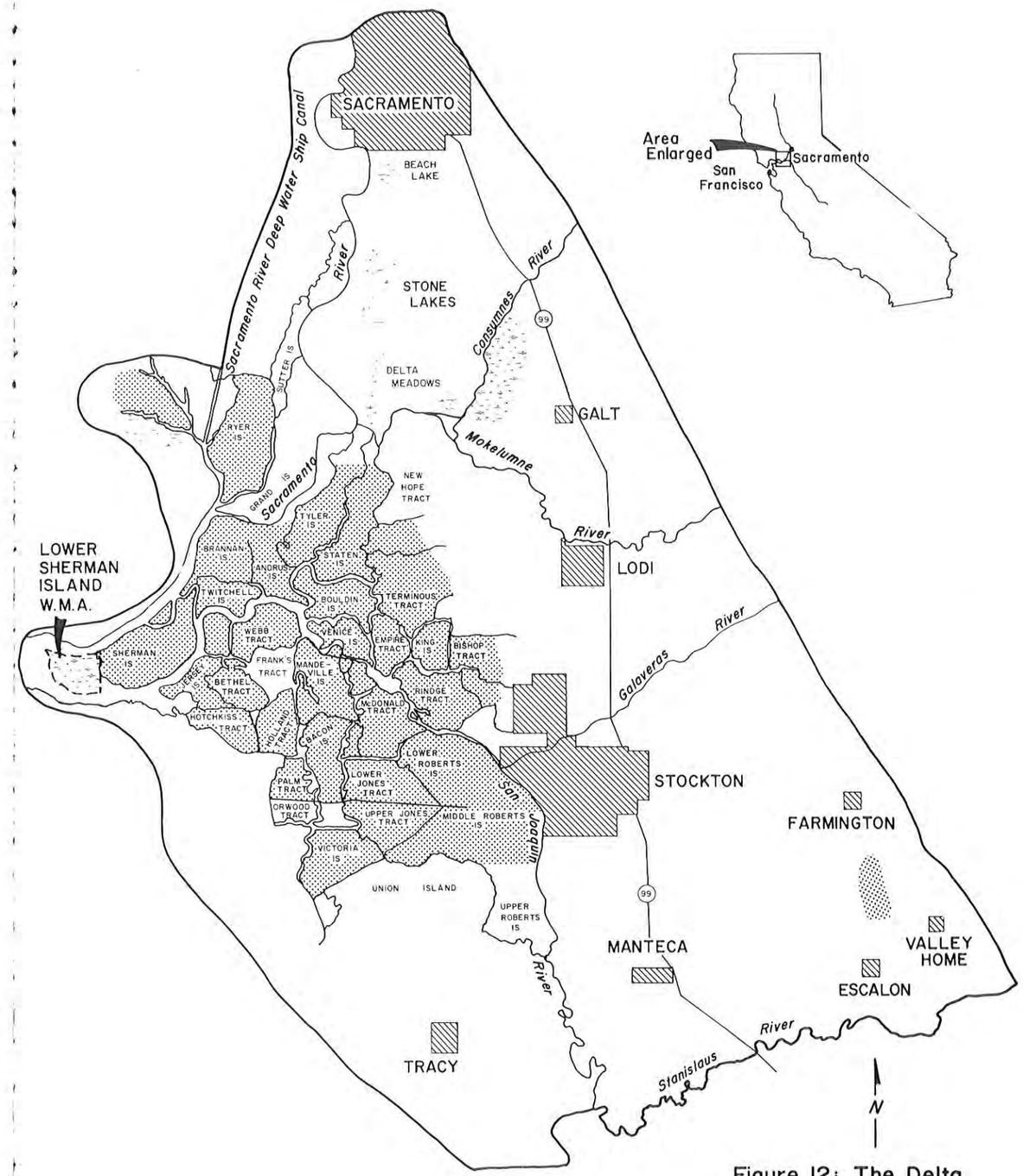


Figure 12: The Delta

Bay. The Delta is part of the largest estuary on the Pacific coast. Over half of the Delta land area lies between five feet above to 20 feet below sea level. Hundreds of miles of high levees crisscross the Delta to keep out the rivers and brackish water. This network of levees has created hundreds of islands separated by sloughs and major rivers. Delta islands are perennially endangered by levee breaks and flooding. Significant floods have occurred on over 20 islands.

Ancestrally, the Delta was one of the most significant waterfowl concentration areas in California. Reclamation and agricultural and industrial development have eliminated the marsh habitat from most of the region. Private duck clubs consist primarily of flooded harvested corn fields. Much of this habitat is provided by leach flooding, to control soil salinity, of harvested corn fields during December and January. In dry years, this leaching begins as early as October. Waterfowl normally associated with Suisun marsh move into the Delta in response to the new habitat. Several islands in the Delta receive very light hunting pressure and serve as sanctuaries holding several thousand waterfowl for long periods.

The Stone Lakes Basin in the northern Delta near Sacramento and Galt consists of several marshes, lakes, and riparian areas and will be discussed separately. Significant habitat consisting of flooded rice lands and pasture is present in the Farmington-Escalon area east of Stockton.

There are no NWRs in the Delta. The State maintains the lower Sherman Island WMA. This habitat is not intensively managed. Clifton Court Forebay and Franks Tract (reservoirs on Delta Islands) and Bethany Court, a water fluctuation reservoir for Central Valley Project water delivery facilities, provide open water resting habitat.

Major agricultural crops grown in the Delta include field corn, sorghum, pasture, alfalfa, and orchard fruits.

The climate of the Delta is similar to other areas of central California. The Delta is within the influence of marine air intrusion, and summer temperatures are moderated as a result. Rainfall is limited to the winter and spring, normally, and amounts to about 20 inches annually.

B. Habitat Acreage:

Ancestrally, the Delta consisted of a vast tidal marsh of 300,000 acres, plus periodically inundated areas at higher elevations. The statuatory Delta comprises about 700,000 acres or 1,100 square miles. It comprises 60 reclaimed islands and tracts surrounded by 700 miles of waterways. There is an estimated 550,000 acres of cultivated land within the Delta.

Photo 15. District 10 flooded rice fields - American Basin.

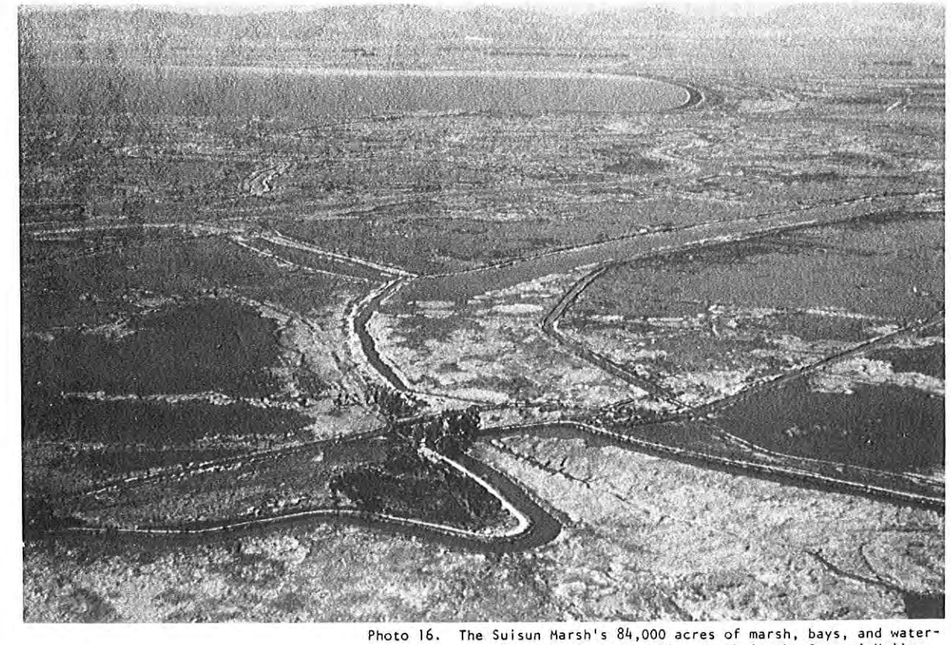
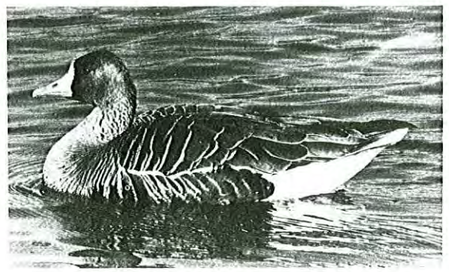


Photo 16. The Suisun Marsh's 84,000 acres of marsh, bays, and waterways form the largest native marsh in the Central Valley.

Photo 17. The Sacramento-San Joaquin Delta - flooded harvested corn fields.

Photo 18.
The Delta supports more white-fronted geese and whistling swans than any other Central Valley wetland area.



The lower Sherman Island WMA in the west central Delta consists of 3,100 acres and is reachable only by boat. Clifton Court Forebay consists of 2,000 acres, Franks Tract 5,500 acres, and Bethany Court 350 acres.

There are at least 84 private duck clubs in the San Joaquin County portion of the Delta, totalling over 36,000 acres. Of this figure, slightly over 12,000 acres are flooded. Duck club acreage in the remainder of the Delta is unknown. About 1,500 acres of flooded rice field habitat important to waterfowl are present in the Farmington Escalon area.

C. Waterfowl Use:

The Delta did not account for a large percentage of early migrant waterfowl, as shown by the mid-September inventories, during the 1973-1977 period. Most Delta habitat developes later in the fall and winter. Collectively, Delta habitat supports about 10 percent of the Central Valley's waterfowl population during the mid-winter period. The Delta is the most important whistling swan wintering area in the Pacific Flyway. The Delta supports one third of the Valley's white-fronted goose winter population. Only the San Joaquin Basin approaches the Delta in the numbers of this species supported during the winter period. The Delta has held about 10 percent of the cackling geese, pintails, canvasbacks and other divers, and a small percentage of the white geese and lesser Canada geese recorded during recent mid-winter inventories. Observations of Aleutian Canada geese have been sporadic in the Delta, and the importance of this area to this subspecies is still unknown. Bethany Court is not hunted and has held 250,000 ducks on shoot days. Large numbers of ducks use Clifton Court and Franks Tract for resting, but fisherman and other boaters reduce potential use by waterfowl.

Stone-Beach Lakes Basin

The Stone-Beach Lakes area is located just east of the Sacramento River south of the city of Sacramento. The area is comprised of about 8,000 acres and includes Beach, North Stone, and South Stone Lakes, and the Delta Meadows scenic area. The lakes themselves constitute about 1800 acres. Twelve hundred acres of ponds and sloughs are present along the Cosumnes River east of Stone Lakes, northwest of Galt. All of these wetlands are considered together.

The Basin was originally an overflow zone of the Sacramento River prior to levee construction along the River. Flows from the Basin discharge into the Mokelumne River. The Basin contains remnants of the diversified fresh water marsh and riparian plant communities which were once typical of California's Central Valley. Aerial waterfowl surveys in February 1972 recorded 5,700 birds, of which 4,200 were Canada geese. Between January 1970 and December

1971, 10,000 to 15,000 waterfowl used North Stone Lake. Up to 1,000 swans have been recorded. The Basin may support an average of one million waterfowl use days annually.

San Joaquin Valley

8. San Joaquin Basin (Figure 13)

A. Description:

The San Joaquin Basin is one of two large drainage basins comprising the San Joaquin Valley. The Valley floor portion of the San Joaquin Basin lies between the Coast Range in the west and the Sierra Mountain foothills in the east. The northern boundary is the Delta (the Stanislaus River), and the southern is the San Joaquin River.

Historically, the San Joaquin Basin's major wetland areas were found east and west of the San Joaquin River, presently in the general vicinity of the cities of Los Banos and Merced. Overflow wetlands were associated with the San Joaquin, Fresno, Chowchilla, Merced, Tuolumne, and Stanislaus Rivers which are the major drainages of this basin. Flood waters created an extensive wetland habitat consisting of permanent lakes, sloughs, ponds, and marshes as well as seasonal wetlands. Most of this habitat has been lost to agriculture.

The area of most significant marshes still remaining is termed the "Grasslands". It is divided into the West and East Grasslands with the San Joaquin River as the dividing line. The West Grasslands is further divided into the North and South Grasslands; the greatest proportion of each is included in the Grasslands Water District (GWD). The District's major purpose is to maintain existing wetlands for waterfowl hunting, conservation purposes, and cattle grazing. West Grassland duck clubs are also present outside the District. Most wetlands are seasonal, with some permanent marsh present. Natural marsh foods are encouraged in the grasslands. No flooded agricultural-type wetlands are present in this area. Water is obtained from the Federal government's Central Valley Project (CVP), pumped ground water, and irrigation drainage.

The San Joaquin Valley is more arid than the Sacramento Valley. Seasonal rainfall ranges from 6.5 inches to 14 inches annually within the Basin. Most water used for agriculture and wildlife purposes is imported from the northern part of California via the State Water Project (SWP) and Federal CVP.

Major agricultural crops grown in the San Joaquin Basin include grapes, sugar beets, rice, alfalfa, cotton, fruits and nuts, melons, tomatoes and beans. Over 70 percent of the Basin is devoted to irrigated agriculture.

Figure 13: San Joaquin Basin

Private Natural Wetlands

There are several wildlife areas in the San Joaquin Basin. These include Kesterson, San Luis, and Merced NWRs, and the Los Banos and Volta State WMAs. The private duck clubs of the GWD are highly organized and their members form a strong political group.

San Luis Reservoir, part of the CVP, is a large impoundment in the Coast Range foothills. The lake supports large flocks of ducks which use the large surface area for a sanctuary.

B. Habitat Acreage:

The San Joaquin Basin, the valley floor portion, totals 3,600 square miles. Nearly all of this is currently in agriculture or urban-industrial uses.

Within the West Grasslands, the 164 private hunting clubs of the GWD total about 47,000 acres This figure includes 6,400 acres of permanent marsh and 31,000 of seasonal marsh. The remainder is uplands. A total of 59 unorganized duck clubs, comprising 16,750 acres, is present around the perimeter of the GWD or in other marginal areas. Of this figure, 1,700 is permanent marsh, 10,000 is seasonal marsh, and the remainder is upland.

The Soil Conservation Service has implemented the Water Bank program in the area, covering about 10,000 acres in the GWD and several hundred acres outside the district. The goal of this program is to increase nesting opportunities for waterfowl by providing permanent water for broods and reducing cattle grazing to increase upland cover.

The GWD uses from 3 to 4 acre-feet of water annually per acre of flooded ground. Winter water totaling 53,500 acre-feet is delivered from the Bureau of Reclamation CVP beginning September 15. This water is used to flood club habitat during the hunting season. Over 100,000 acre-feet of summer tailwater from several irrigation districts is used by the clubs for irrigating waterfowl food plants, providing nesting habitat, and producing native pasture for livestock. The unorganized duck clubs of the West Grasslands use approximately 4 acre-feet of water per acre of flooded land annually for a total of 47,000 acre-feet. The majority of these clubs have two or three water sources including deep wells, farm drain water, and water rights from the San Luis Canal Company.

All but one of the State and Federal wildlife areas are located west of the San Joaquin River. The Los Banos and Volta WMAs total 6,000 acres requiring 20,500 acre-feet of water annually. The San Luis and Kesterson NWRs total 13,000 acres and use 17,000 acre-feet of water per year.

Photo 21. East Grasslands native pasture and wetland habitat - Ross' and white-fronted geese.

Photo 22. The Mapes-Faith Ranch complex provides habitat for Aleutian Canada geese, as well as other goose species.

The East Grasslands includes large expanses of native pasture and native permanent and seasonal marshes. The 2,561 acre Merced NWR is located here and uses 15,000 acre-feet of water annually, mostly from deep wells. There are 46 private duck clubs in this area with a total acreage of approximately 45,000 acres of wetlands and native pasture. Of this total, 7,547 acres are flooded permanently or seasonally. Major clubs of the East Grasslands include the Modesto Properties area (4,030 total acres with 1,410 acres flooded), the Crane Ranch area (12,380 total acres with 3,065 acres flooded), and the Flynn Ranch area (13,050 total acres with 1,310 acres flooded). Most individual clubs have less than 300 flooded acres, and most range from five to 150 acres.

Another area within the San Joaquin Basin which is becoming significant because of its importance to the Aleutian Canada goose is the Faith and Mapes Ranches 10 miles west of Modesto. The main use area is the 2,900 acre Faith Ranch. This habitat is primarily flood-irrigated pasture. The Faith Ranch receives very little hunting pressure; only about 150 acres of wetland are maintained.

C. Waterfowl Use:

The San Joaquin Basin is an important concentration area for ducks early in the fall as shown by the mid-September inventories. Twelve percent of the pintails, one fifth of the mallards, and half of the "other and unclassified" species are present in the State, Federal, and private wetland areas at that time.

Likewise, the mid-winter inventories demonstrate the significant contribution of this area's wetlands to the support of Pacific Flyway waterfowl populations. One third each of the Great Basin, lesser, and cackling Canada geese, and one fifth of the white-fronted geese recorded in the Central Valley during the mid-winter period are found here. More coots, gadwalls, shovelers, and green-winged teals are recorded in this Basin than any of the others. The habitat of the Grasslands supports one fourth of the Central Valley's pintails and about one fifth of the mallards during the winter. Nearly one half of the ruddy ducks in the CV are found in the Grasslands. Collectively, the San Joaquin Basin has wintered 30 percent of the Central Valley's waterfowl during the 1973 to 1977 period.

Several areas in the Basin are important for the Aleutian goose. In January of 1977, virtually the entire flock of these birds present in the Valley was using the private pasture of the Faith and Mapes Ranches west of Modesto. An actual count of 917 Aleutians was made in late January. Two hundred eighty Aleutians used private wetland habitat south of the Los Banos WMA, and 64 were observed on Merced NWR in late January. The number of Aleutians peaked at 1,100 in February near the Los Banos WMA.

The West Grasslands supports many more ducks than the East Grasslands. However, the East Grasslands supports 20 times more geese than the West Grasslands. This is because of the excellent grazing forage available in the native pasture-slough areas.

Mid-Winter Inventory - Grasslands 1973 to 1977 Averages

	West	East
Ducks	754,063	141,751
Geese	2,368	52,889

San Luis Reservoir has held over one million ducks at one time on shoot days. Most of the ducks using the grasslands for feeding rest on the reservoir and fly out to the club lands after dark.

9. Tulare Basin (Figures 14A and 14B)

A. Description:

The Tulare Basin takes up the southern end of the San Joaquin Valley south of the San Joaquin Basin. The Tulare Basin is drained by the Kings, Kaweah, Tule, and Kern Rivers, but the Basin has no direct outlet to the sea. Prior to extensive irrigation development with attendant reclamation of Tulare Lake and surrounding marshes, water periodically flowed over into the San Joaquin Basin. This last happened in 1878 but is not likely to ever occur again because of the extensive reclamation. Major streams all originate in the Sierra Mountains and terminate in the Tulare or Buena Vista-Kern lakebeds. Under present conditions of irrigation development and river control, flood water from the Kern, Kaweah, Tule, and Kings Rivers rarely reaches the lakebeds.

Ancestrally, Tulare Lake, Buena Vista Lake, and Kern Lake, together with the surrounding overflow marshes, provided the largest single block of wetland habitat in California. Today, virtually none remains. The Mendota State WMA* and the Kern-Pixley NWR complex plus some private duck clubs provide habitat, but only a fraction of the once vast Tulare Basin wetlands. The marshes are largely seasonal, and marsh management techniques tend toward culture of native plants.

Agriculture is the primary industry in Tulare Basin. Major crops include barley, grapes, sugar beets, and cotton. Ninety-eight percent of the crops are irrigated.

*Administratively and politically Mendota WMA has always been included with the Grasslands area of the San Joaquin Basin. Physically, however, it is located on the northern boundary of the Tulare Basin as defined for purposes of this Plan.

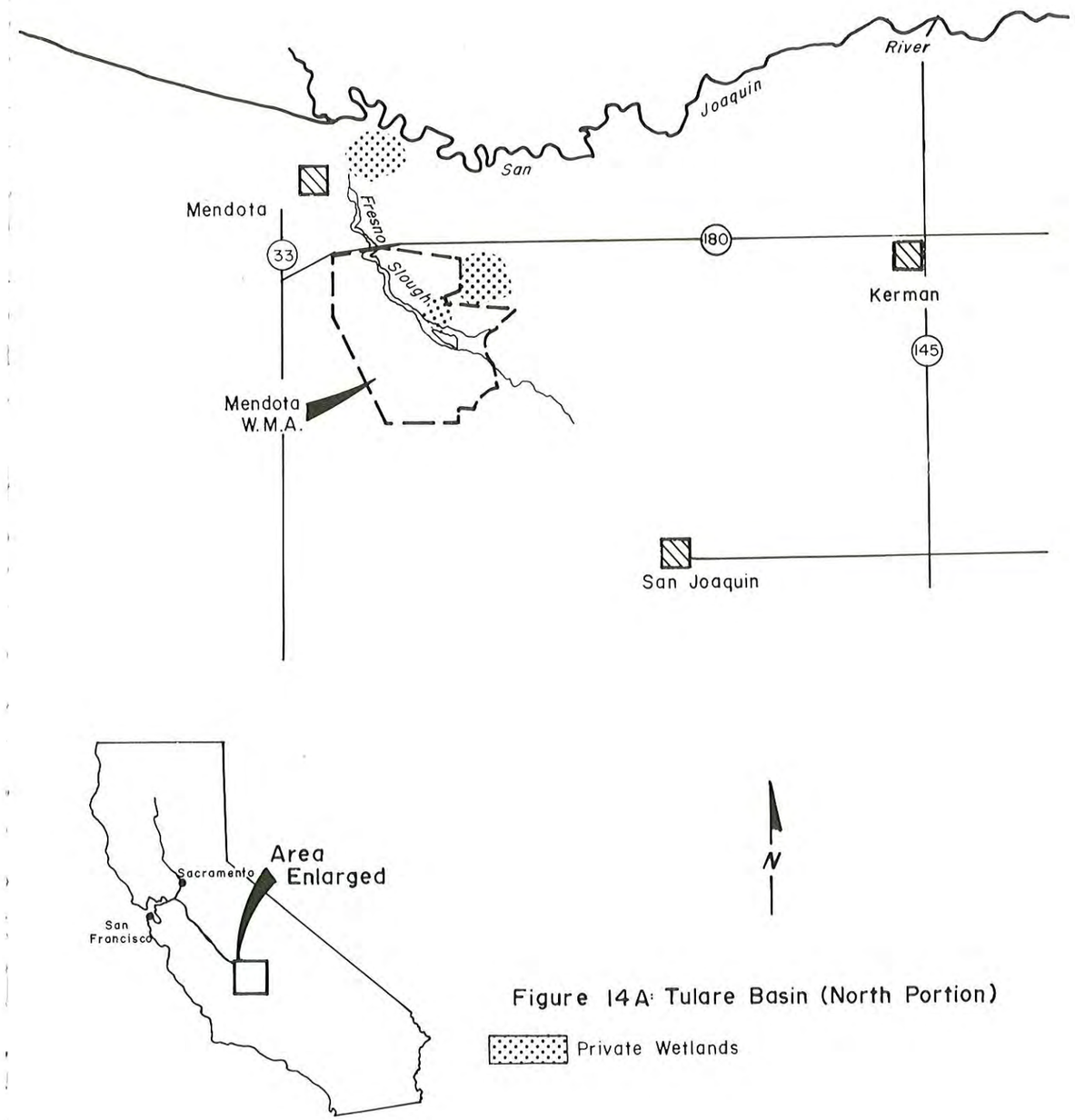


Figure 14A: Tulare Basin (North Portion)

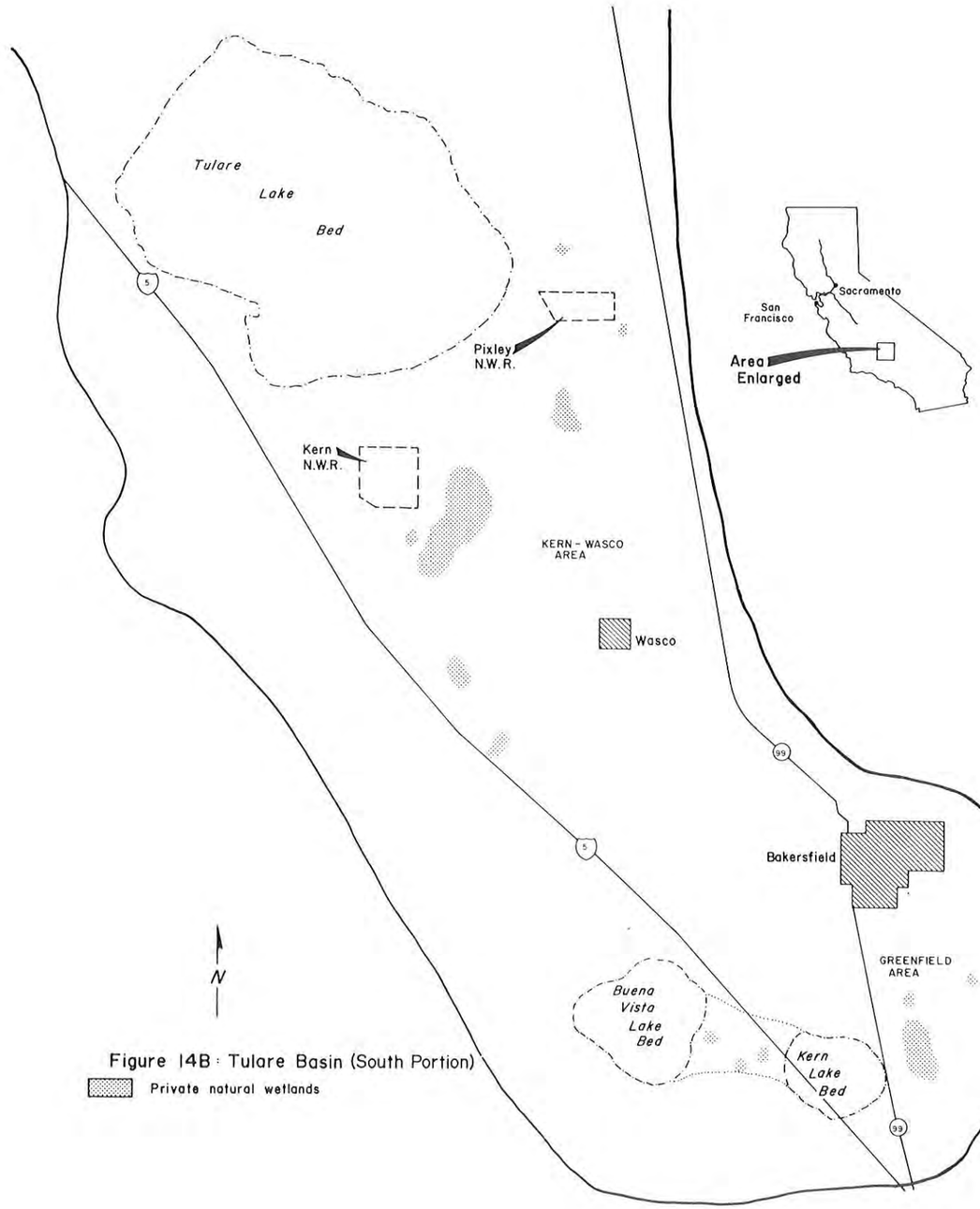


Figure 14B: Tulare Basin (South Portion)

Private natural wetlands

Average annual rainfall in the Tulare Basin is only about six inches. Nearly all rain falls between November and March with long, dry summers. Summer highs regularly exceed 100° F.

B. Habitat Acreage:

The entire Tulare Basin comprises about 12,500 square miles, but the valley floor portion is about 5,000 square miles. Tulare Lake, Goose Lake, Buena Vista Lake, and Kern Lake and their associated marshes dominated the Tulare Basin prior to 1900. Together they comprised over 625,000 acres.

The greater part of Kern NWR (10,616 acres) and Pixley NWR (4328 acres) is dry because no water is available for marsh development. Although up to 3,500 acres have been flooded in the past, in recent years Kern has had only about 800 to 1,200 acres of habitat, while Pixley has been nearly dry. Complete development of these refuges would require about 35,000 acre-feet of water annually. Pixley is largely devoted to endangered species habitat, but additional marsh will be developed as water becomes available. Kern refuge has deep wells for pumping ground water, but their capacity is not large and very high costs associated with pumping and the declining water table make long-term dependence on this source unlikely. The State's Mendota WMA consists of 9,444 acres and is the largest piece of public owned marsh in the San Joaquin Valley. It is intensively managed and of the 9,444 acres, nearly all is wetland. Mendota uses 24,000 acre-feet of water annually.

Private duck clubs in the Tulare Basin total 27,766 acres, but only 5,800 acres are flooded during the waterfowl season. Virtually no permanent water exists. Of this total acreage, 1,270 (690 flooded) acres in 13 clubs are in the Mendota WMA area; 270 acres (245 flooded) in the two clubs in the Visalia area; 24,916 (4,127 flooded) acres in 51 clubs are located near Kern NWR; and 1,310 (740 flooded) acres in 22 clubs are located south of Bakersfield (Buena Vista-Kern Lake). The latter is referred to as the Greenfield area.

C. Waterfowl Use:

The Tulare Basin, especially the ancestral Tulare Lake bed area, is the most important concentration area for pintails during the mid-August through September period as shown by the mid-September inventory. An average of 340,000 pintails representing 40 percent of the Central Valley total has been recorded in this area over recent years. The birds utilize vast agricultural croplands which have been shallow flooded for "pre-irrigation" purposes prior to and during fall planting of barley and safflower. Tens of thousands of acres can be flooded at one time. Significant crop depredation results mainly from the "puddling" of the ducks, which compacts the soil, and their feeding on newly sprouted grain. This annual concentration of pintails demonstrates the ancestral tie to the Tulare

Lake area, as well as the availability of feeding habitat. Perennial botulism outbreaks occur with the flooding practices.

The importance of Tulare Basin to the overall waterfowl population normally declines as the winter progresses. At the time of the mid-winter inventories, only a fraction of the Valley's waterfowl can be found here. This includes about 10 percent of the Canada geese, excluding cacklers, and green-winged teals, and a small percentage of the pintails. Aleutian Canada geese have not been observed in the Tulare Basin. Mid-winter populations of ducks are not always low. When winter rains are delayed, restricted habitat prevents waterfowl use of Tulare Basin. When the rains finally begin, pintails and other duck species move to the Tulare Basin in large numbers.

Photo 23. Tulare Lake bed pre-irrigation flooding practice creates habitat which supports several hundred-thousand pintails.

Photo 24. Pintails and gulls feeding in pre-irrigated Tulare Lake bed croplands.

V. HABITAT THREA

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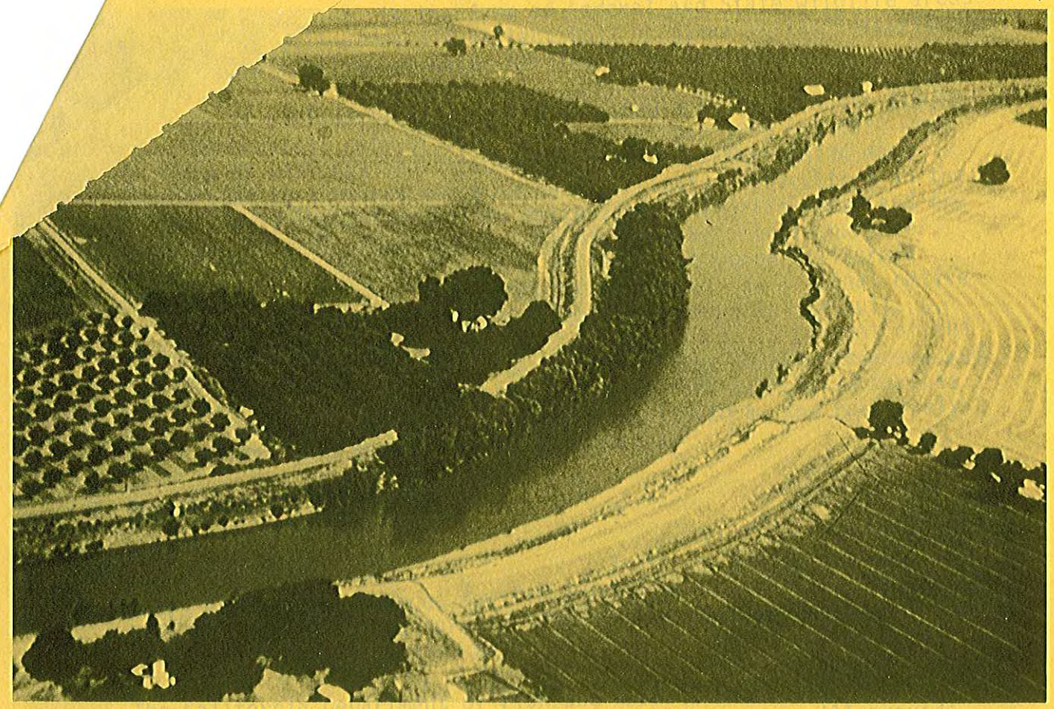
Former Marshland - Sacramento Valley



V. Habitat Threats

V. HABITAT THREATS AND ASSOCIATED PROBLEMS

A. Historical Wetland Loss

Prior to settlement by pioneers, California had an estimated five million acres of permanent, seasonal, and tidal wetlands. The majority of this total, about four million acres, was in the Central Valley. An 1873 Army map showing "overflow" lands within the valley delineates reasonably well the original extent of marshes (Figure 15). It is readily apparent that the Delta-Suisun area and the Tulare Lake Basin contained the most extensive wetlands. To date, habitat preservation efforts in the form of Federal and State wildlife areas and private wetlands do not reflect this original wetland distribution. Instead, availability of water has indicated location.

The rate of wetland loss since the mid 1800's is depicted in Figure 16. The greatest rate of loss occurred between 1906 and 1922 when drainage of wetlands and impoundment of flood water behind dams accelerated to increase the acreage of irrigated agriculture in the Valley. Only the Suisun Marsh, Butte Sink, the Grasslands, and the State and Federal areas retain some of their ancestral character. Wetland destruction has proceeded to the point where California retains only 9 percent, about 450,000 acres, of its original native marsh area, not including lands primarily devoted to agriculture. Of this statewide total, only about 250,000 acres (6 percent of the original 4 million) exist in the Central Valley (State, Federal, and private). The vast permanent lakes, ponds, and associated marshes have been replaced with cities, roads, agriculture, and relatively small intensively managed seasonal wetlands.

B. Recent Habitat Losses/Gains

<u>Data sources</u>

There are several sources for information on recent (since the first National Wetlands Inventory in 1954) changes in wetlands in California. All sources have proven to be incomplete.

The California Department of Fish and Game is conducting a duck club inventory of the State. When completed, this survey will provide the best estimate available of changes in wetland acreages since about 1958 when the State's first duck club survey was conducted. However, final results of the survey were not completed in time for inclusion in the Concept Plan. Progress reports of the survey were used with some degree of success. Miscellaneous State reports through the years occasionally provided information on wetland acreages.

Information from the Service's first wetland inventory in 1954 was also used by comparing county estimates of wetland acreage at that time with the latest information on duck club habitat. The new

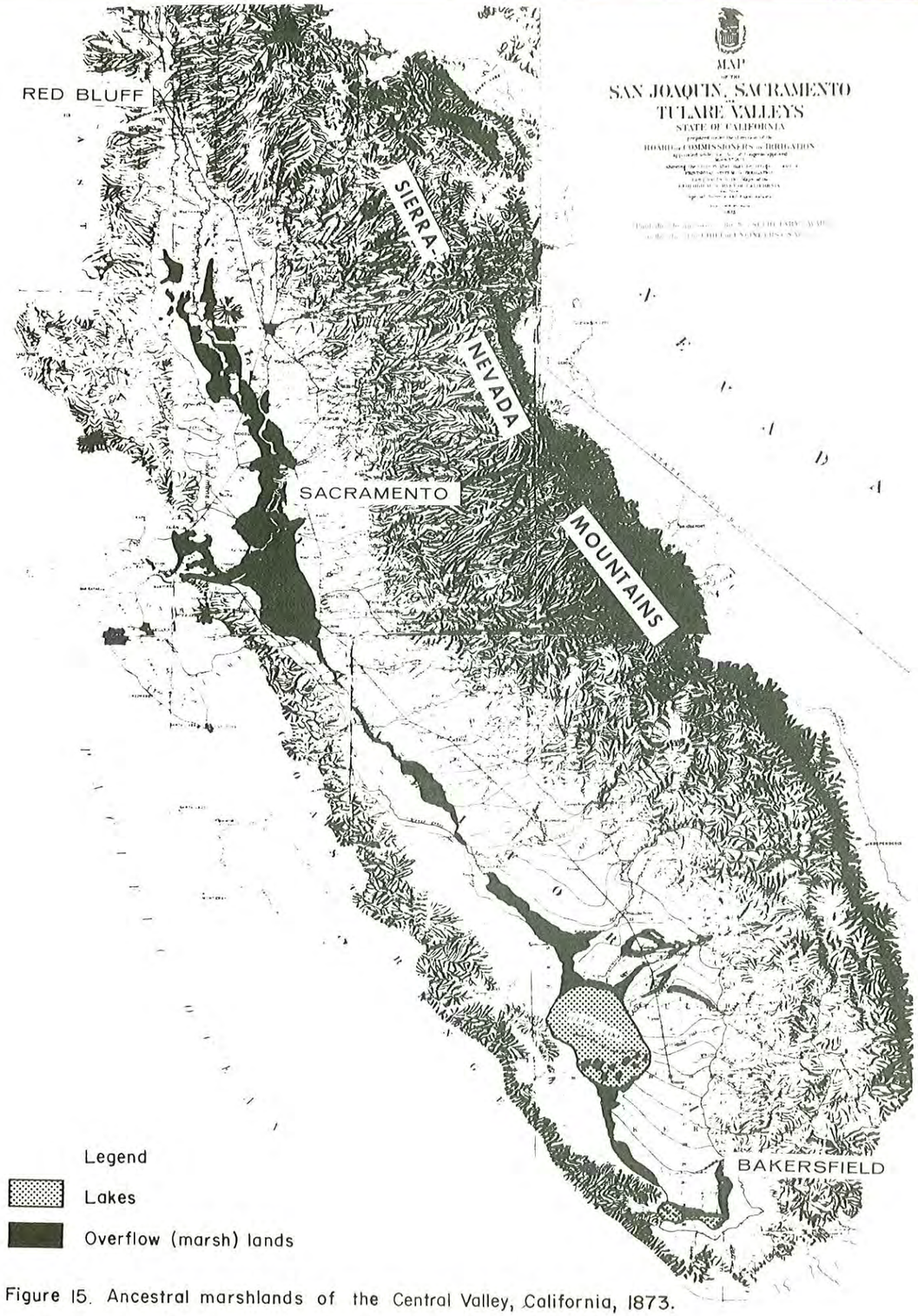


Figure 15. Ancestral marshlands of the Central Valley, California, 1873.

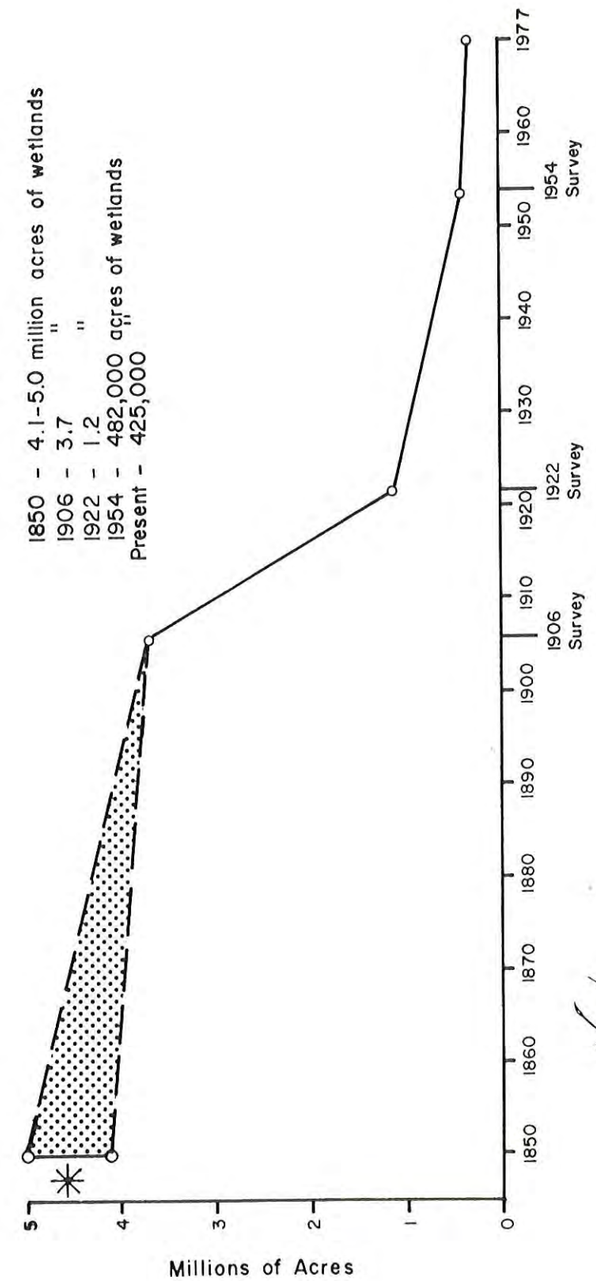


Figure 16. Graphic display of wetland losses in California.

* Estimates prior to 1900 range from 4.1 to 5 million acres.

National Wetland Inventory is just getting started, and no data are available for California as yet.

The State Department of Water Resources has conducted land use surveys since 1954, but it has emphasized agriculture, and the surveys did not prove entirely useful for monitoring marshland acreage changes because of yearly differences in the definition of native vegetation (marsh). The Soil Conservation Service provided some information, but no data were available from the Agriculture Extension Service.

General

There have been significant losses of native pasture, wetlands, and riparian habitat throughout the Central Valley during the past 25 years. Native pasture and riparian habitat flood--in some cases, every winter--and provide excellent winter habitat for waterfowl. Riparian losses have been exceptionally heavy in the Sacramento Valley, while losses of native pasture in the San Joaquin Valley are of most concern to waterfowl.

The California Department of Water Resource's (CDWR) land-use information for the Sacramento River corridor north of Sutter Buttes (Colusa and Butte Basins) shows that native vegetation on high-terrace lands which floods during periods of very high water has decreased 53 percent since 1952 (from 16,470 to 7810 acres). Low-terrace climax riparian habitat which floods every winter has declined 21 percent (from 3870 to 2720 acres), while Oxbow Lakes have declined 23 percent (from 390 to 300 acres) during this same period. These flooded lands were particularly important to mallards and wood ducks.

Unfortunately, reliable quantitative information from the CDWR surveys is not available for the San Joaquin Valley, because land use categories were not consistent year to year. However, based on the personal observations of FWS and CDFG field personnel, it is apparent that losses have been just as severe. Native pasture, providing excellent goose and duck habitat, has been converted to irrigated crops at a high rate in recent years in the San Joaquin Valley's Grasslands area. Soil Conservation Service information indicates that since about 1950, 25 percent of the native grasslands in western Merced County has been converted to irrigated crops. Marsh losses have accelerated in the grasslands area in the last four years.

1. Butte Basin

There has been little change in marsh acreage since 1967 when 52,115 acres (22,190 flooded) were recorded for Butte Basin. The latest information is provided by the current duck club survey which shows 52,264 acres in the Basin. No data are yet available for the amount of flooded acreage.

There have been no Federal NWR's established in Butte Basin. There has been an increase of 1,615 acres (1,000 flooded) to Gray Lodge Wildlife Management Area, since 1967. Thus, there has been a net gain of 1,764 acres to Butte Basin, in recent years, but the percentage of this increase actually flooded is unknown. The increase in private clubs is flooded riceland, not natural wetland. There have been conversions of natural marsh to flooded rice, orchards, and other crops in recent years.

2. Colusa Basin

There is not adequate information on recent changes in wetland habitat in the Colusa Basin. The duck clubs peripheral to Sacramento, Delevan, and Colusa NWRs have been reduced only slightly in recent years. There appears to be a slight increase in the number of clubs which flood harvested rice land, but the magnitude is unknown. Several farms have converted native marsh into rice culture recently, but they still flood in the fall. All wetland value is not lost under these circumstances, but the overall benefits are reduced significantly. There have been no changes in publicly owned marsh in this Basin recently.

3. Sutter Basin

Data on wetland acreage is limited for this area. Duck club information is lacking since the Fish and Game survey is not complete, and no historical data are available to permit recent trends to be identified for private wetlands. There have been no changes to Sutter NWR in recent years, and no WMAs have been acquired. Most private wetlands consist of flooded rice land in the Sutter By-pass. There have been few changes in these acres in recent years.

4. Yolo Basin

Most private wetlands are in or immediately adjacent to the Yolo By-pass. No significant changes have been detected recently. There have been efforts made to improve habitat on some areas. No Federal or state areas have been acquired in this Basin

5. American Basin

Private hunting clubs are being developed in the Nicolaus-Lincoln-Wheatland area on harvested rice lands. The extent of this development remains unknown, but the rate of development has been slow. The Natomas area in the airport vicinity has lost clubs recently. District 10 wetland acreages, consisting almost entirely of flooded rice land, have remained stable since 1958.

6. Suisun Marsh

The total wetland acreage of Suisun Marsh has not changed significantly since the 1954 wetlands inventory. Recent urban expansion and industrial development have eliminated several acres of buffer lands adjacent to and within the marsh.

7. Delta

Wetland information on the Delta is incomplete. Leach (1960) reported that 36,900 acres of duck clubs were present in the Delta in 1960, but this was the San Joaquin County portion only. The CDFG duck club survey has not been completed in the Delta, and no recent information is available on losses or gains. The amount of habitat present in the Delta in any given year depends upon the weather and irrigation practices. Virtually all wetlands are of the flooded agricultural lands type.

8. San Joaquin Basin

In 1960, wetland habitat provided by duck clubs included 108,136 total acres with 68,945 acres flooded permanently or seasonally. In 1973, 109,910 total acres were in duck clubs, with 56,707 acres flooded. Thus, in 13 years there was a slight increase in total acreage held by clubs, but the amount of wetland habitat maintained on these clubs declined significantly (18 percent). There has been a severe loss of marsh areas on lands held by agricultural interests adjacent to San Luis NWR in the past four years. About 2,200 acres have been lost to row crops and irrigated pasture in this area. Several duck clubs within the Grassland Water District have folded since 1973 for a loss of 1590 acres.

There has been a large increase in the amount of wetlands controlled in NWRs since 1960. Two new refuges, San Luis and Kesterson, have been created. These additions increased the total amount of acreage from 2,561 (1,410 flooded) acres in 1960 to 15,891 (5,300 acres flooded) acres presently.

There have been no additions to the State WMA system since 1960, but the amount of developed habitat has increased from 2,200 acres to 4,975 on Volta and Los Banos WMAs, for a gain of 2,775 acres.

Combining Federal and State gains and private losses, there has been a net loss of 9,363 acres of wetlands (actual flooded habitat) since 1960. This loss has not been mitigated with an increase in flooded agricultural type wetlands.

9. Tulare Basin

Private duck clubs provided 26,900 acres (6,660 acres flooded) in 1960 in the Tulare Basin. By 1973, there had been a slight increase

in total club holdings to 27,591 acres, but the actual flooded acreage had declined to 5,745 - a 14 percent decline. Losses and gains have not been uniform throughout the Basin. The Kern NWR area contained 64 duck clubs and 3,133 flooded acres in 1960. There are now 51 clubs, and 4,129 acres. The Bakersfield (Greenfield) area contained 28 clubs and 1,755 flooded acres in 1960, but now has only 12 clubs and 740 acres. The loss of clubs is significant, because it indicates an erosion of interest or ability to maintain habitat.

In 1960, Kern NWR had been purchased but not developed. A maximum of 3,500 acres has been flooded in recent years, but contractual problems have reduced water availability. No more than 1,500 acres can be counted on at Kern. Pixley NWR still remains largely dry.

Mendota WMA has increased its wetland acres from 6,536 in 1960 to 7,000 presently, for a gain of 364 acres.

Collectively, there has been a net gain of 950 acres of wetlands in the Tulare Basin since 1960, because of Kern NWR. However, the loss of private wetlands in the Bakersfield area overshadows this apparent gain.

Summary:

There have been dramatic losses of duck club habitat in the Tulare Basin and San Joaquin Basin within the past 20 years, but few changes have occurred in duck club acreage elsewhere. This is significant when considering the fact that the Tulare Basin (Tulare Lake, Buena Vista Lake, and Kern Lake) ancestrally was the most important wintering area for waterfowl in California. Tulare Basin now has the least managed habitat in the Central Valley. Pre-irrigation practices in the Tulare Lake bed still provide significant habitat for early migrant pintails in most years. These agricultural practices could change. There have been extremely high losses of natural marsh and pasture not associated with duck clubs in the past four years in the San Joaquin Basin.

C. Overall Land-Use Pattern And Current Threats To Waterfowl Habitat

Virtually the entire Central Valley is devoted to irrigated agriculture and urban-industrial development. The small amount of remaining waterfowl habitat competes directly with these land uses for simple physical existence and water supplies. While private wetlands have not suffered severe loss in recent years, except in the San Joaquin Valley, they face an uncertain future because of potential threats which could eliminate vast areas. The probability that these threats will materialize is increasing.

The major threats to remaining wetland habitat in the Central Valley include:

1) Increasing taxes - Many clubs, classed as recreation land, are taxed at a higher rate than surrounding agriculture. This will cause an increase in the conversion of natural marsh to flooded agricultural type wetlands as well as direct conversion to cropland;

2) Market pressure - Economic incentive to convert marsh to croplands is strong;

3) Competition between wetlands and agriculture for limited water supplies currently utilized for marsh management - This threat includes major flood control and water development projects;

4) Erosion of hunting incentive - Reduction in willingness to spend large sums of money for hunting leases or maintenance of habitat on hunter owned wetlands is a problem in some areas;

5) Lack of organization by wetland habitat owners to meet anticipated challenges - The strong desire on the part of waterfowl hunters to perpetuate their sport via preservation of the wetland habitat that supports the sport is a key factor in long term preservation of private marshlands in California. A strong organization of clubs will be more successful than unorganized clubs in resisting increased taxes, market pressures to convert marsh to cropland, or threats to water supply;

6) Decreases in rice and grain crop acreage and reliance on early maturing rice varieties - This allows early fall plowing which reduces available food;

7) Increased leveling of agricultural lands - This eliminates habitat created by depressions and natural sump areas which collect rain and flood water;

8) Pollution of marsh waters by pesticides, high salt concentrations, nutrients, oil, and other agricultural and industrial wastes.

These threats are present and applicable to all major wetland areas in California. However, each has variable significance in each major basin in the valley. Conversion of marsh acreage existing on lands owned by agricultural interests is a continuing threat but is declining in importance, because virtually all such wetlands have already been reclaimed, except in the San Joaquin Basin. Continual development of flood control projects each year reduces the chances for flooding in ancestral overflow basins and reduces the extent and/or duration of those that do occur.

1. Butte Basin

Upper Butte Basin - This portion of the Basin has been largely reclaimed for rice and other agricultural crops. Most duck clubs consist of flooded harvested rice lands. Agriculture will remain the land's prime use, with waterfowling a secondary function. Rice culture is important to wintering waterfowl as a food source and as a source of large quantities of drainage water to flood Basin wetlands in the fall and winter. Reductions in rice acreage and early fall plowing of early harvested rice on non-club lands has reduced food sources. This is expected to continue. Intensified land leveling has eliminated natural ponding areas on agricultural land. If rice land is converted to some other crop which does not provide drainage water at the right time of year for flooding of duck clubs, waterfowl habitat will suffer seriously. In this regard, the major threat to upper Butte Basin wetlands is the proposed Butte Basin By-pass (Corps of Engineers) which would effectively confine flood waters through the upper basin, thus reclaiming most of the basin for probable conversion to orchards. Local opposition to the By-pass has deterred the project for the present. Riparian habitat along Butte Creek and the Sacramento River is threatened with harvest and conversion to orchards, and loss of flood water due to upstream water diversions for agriculture and the proposed enlargement of Shasta Dam.

Lower Basin (Butte Sink)

The major threat here is the Corps of Engineers Cottonwood Creek project north of Red Bluff. This project will reduce the number of major floods in the lower basin, but a greater number of smaller floods of longer duration will occur. This could mean that the duck clubs within Butte Sink will be flooded out more days than previously, and the resulting loss of hunting days may pressure marginal clubs to convert their wetlands to other uses. In addition, the Butte Basin By-pass would terminate at the upper end of the Sink, and this would pour a massive flow of water into the area, again to the detriment of duck hunting and the incentive to maintain habitat. Butte Sink wetlands are taxed at a higher rate than neighboring agricultural lands because the duck clubs are taxed as recreational, not agricultural, land. Rising tax assessments in the future could force smaller clubs out of business.

To date, Butte Sink duck clubs remain unorganized; as a result they have not made a joint application to the State Water Resources Control Board for appropriations of water required for duck club operations. Water rights appear to be largely dependent upon agreements made in 1922 and 1937 with the then Western Canal Company, later taken over by Pacific Gas and Electric. The latter has honored the earlier agreements to date, but the future is uncertain. An organization of Butte Sink clubs could facilitate

application for State and Federal Funds to assist in management of the Basin and aid in influencing the plans of public agencies for developments which could affect the Sink.

2. Colusa Basin

The Colusa Basin contains significant natural marsh areas as well as providing secondary waterfowl habitat on flooded rice fields. Farmers lease the latter to duck clubs during the hunting season. This practice will continue as long as it is profitable for landowners. Profitability is dependent upon sufficient incentive to interest hunters in paying large fees. Some natural marsh areas between Delevan and Colusa NWRs (Lurline Creek area) have been converted to rice culture in recent years. They still continue to be flooded for hunting purposes, but their overall waterfowl value is drastically reduced. This sort of conversion is likely to increase in the future with rising taxes and other economic incentives to grow a crop. This threat should not be minimized, and the consequences give reason for concern.

Security of water supplies for private wetlands in the Colusa Basin appears to be good. The clubs in the Delevan-Colusa NWR area get water from the Maxwell Irrigation District which is controlled by rice farming and waterfowl club interests. The Willow Creek Clubs near Sacramento NWR obtain water from Glenn-Colusa Irrigation District. Since most water is run off from rice lands, changes in crop patterns could reduce the quantity and alter the timing of water availability in the future. Even today, early fall plowing of harvested rice is reducing food resources for waterfowl on agricultural lands. Intensified land leveling for rice production has also eliminated natural depressions which collected rain and retained flood water.

3. Sutter Basin

The Sutter Basin has been almost entirely reclaimed for rice culture, orchards and other crops. Significant duck club habitat exists within the Sutter By-pass along with Sutter NWR. Nearly all of these clubs consist of flooded, harvested rice lands, so the major threats in this region involve loss of water supplies for fall and winter flooding. The clubs in this area are not organized, but there appears to be no reason why duck clubs will not continue to be promoted in the region as long as landowners continue to receive the high lease fees they are currently enjoying. Reliance on early maturing rice will continue to reduce availability of food on agricultural lands. Intensified land leveling has eliminated natural ponding areas on agricultural lands.

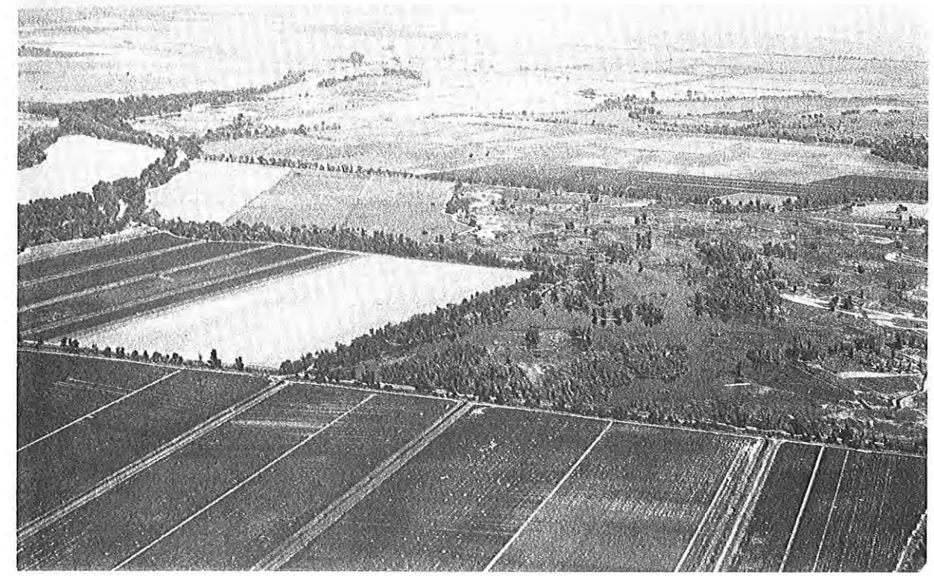


Photo 25. Conversion of natural marsh to agriculture is a continuing threat - Butte Sink (upper) and Colusa Basin (Lurline Creek) (lower).

Photo 26. Early fall plowing of harvested rice eliminates this food source from use by waterfowl.

Photo 27. Power lines cause direct waterfowl mortality from collision, and reduce habitat availability.

4. Yolo Basin

Most Yolo Basin wetlands are on flooded rice or other grain crops, and flooded irrigated pasture. Much habitat is on flooded alkaline soils too poor for agriculture. Unless drastic changes occur to flood control systems, the Yolo By-pass will continue to provide habitat when flooded. Early fall plowing of rice lands not associated with duck clubs will continue to reduce food availability except in years of early rains. Intensified land leveling has had an impact in several areas recently in reducing natural low areas in agricultural lands. Threats to this area, then, center on retaining hunter interest and profitability of the enterprise to landowners. As long as run-off or pumped water is available in the fall and landowners allow lease of their lands for duck clubs, Yolo Basin wetlands will be secure.

5. American Basin

District 10 duck clubs are nearly all on flooded rice land. This habitat depends upon the continued availability of water and the continuation of rice farming. Changes in either of these factors will cause a loss of habitat. Conversion to rice culture has eliminated natural marsh in the Natomas and Lincoln-Wheatland-Nicolaus areas. Flooded agricultural wetland types have not compensated for this loss.

6. Suisun Marsh

The biggest problem facing the wetlands of Suisun Marsh is declining water quality. The marsh as a whole has received sufficient State and Federal interest recently to assure preservation of marsh lands against urban-industrial encroachment which has been another prime threat. The Suisun Marsh has been a classic brackish estuarine marsh, and its biological productivity depends on the water quality being a fine balance between fresh and salt. Unless a replacement fresh water supply is provided, this productivity will be lost. Reductions in Delta out-flow caused by present and future predicted water diversions from the Sacramento-San Joaquin River system is causing naturally occurring water supplies for the marsh to become more saline. Carrying capacity for waterfowl on the marsh will decline as salinity of marsh waters increases, eliminating most productive waterfowl food plants. Reduction of Suisun Marsh carrying capacity would place added strain on other Central Valley wetlands to the detriment of the resource. The Fish and Wildlife Service, U.S. Bureau of Reclamation (USBR), California Department of Water Resources (DWR), and CDFG are jointly seeking solutions to the salinity problems in the marsh. The outlook is uncertain. In addition, pollution from oil refineries and petro-chemical plants is a continuing threat.

7. Delta

The Delta habitat is limited to scattered small islands of natural habitat and large blocks of flooded grain fields, primarily corn. The quality of this habitat depends upon good quality water. Like Suisun Marsh, the value of these lands will decline with increasing salinities. The Lower Sherman Island WMA will be especially vulnerable since it is nearest the sea. Agricultural practices could shift to more salt-tolerant crops which are generally less favorable to feeding waterfowl. The Peripheral Canal project, likely to be implemented, could either aid or deteriorate water quality in the Delta and Suisun Marsh, depending on the water availability to operate the canal for salinity repulsion as planned. Increasing harvest efficiency is reducing the amount of corn and other grains for wintering waterfowl in the Delta because little waste grain is left in the fields.

8. San Joaquin Basin

The East Grasslands area is one of the last areas in California with large tracts of native pasture and marshes which are not owned or controlled by duck hunting interests. As such, it is highly vulnerable to reclamation. Large acreages of pasture have been leveled recently and put into irrigated pasture far less valuable to waterfowl. The Merced County streams flood control project (Corps of Engineers) is threatening the supply of annual flood waters which rejuvinate the wetlands and flood shallow basins in the area. Hunting clubs are controlled by the land owners, not the hunters, are not well organized, and do not present a united front against land use changes. Most clubs are operated secondarily to agriculture. Rising taxes are forcing owners of native lands to convert to irrigated crops at a faster rate. Water rights in the area have not been researched, and the security of supply for private wetlands is unknown. Reclamation of the entire grasslands east of the San Joaquin River is a very real possibility within a comparatively short time.

The West Grasslands, including the GWD, is somewhat more secure than the East. Duck clubs outside the strong GWD are much more vulnerable to conversion to agricultural use than the District itself, although the latter has lost some clubs recently. Major problems facing the GWD include deteriorating quality of spring and summer water, availability of water from U.S. Bureau of Reclamation (USBR), economic incentives to convert wetlands to agriculture, and decreasing incentives to maintain habitat. The District has a water agreement with the USBR for fall flood water which is assured "if and when available." Water normally has been available, but the current drought demonstrates that it won't always be. Clubs outside the District use ground water or spillage from agriculture or the District clubs. Non-District clubs face a gloomy future, since they are almost certain to be reclaimed for agriculture.

Kesterson NWR will become a regulating reservoir for USBR's San Luis Drain project in the near future. Highly saline subsurface tile drain water will fill Kesterson to a depth of 4 feet. The value of the refuge to waterfowl will be lost. This will increase the importance of the adjacent private wetlands and the need for their preservation.

9. Tulare Basin

Habitat sufficient to hold large numbers of waterfowl in the Basin throughout the winter is lacking. Kern NWR has been nearly dry in recent years. Mendota WMA is on the northern edge of the Basin and doesn't appear to influence bird populations in the southern areas. The loss of duck clubs has been drastic in recent years due to loss of incentive to maintain clubs and rising taxes forcing conversion to cropland to meet financial obligations. Most water is pumped ground water, and rising power costs for pumping may be contributing to the decline of clubs also. The loss of private wetlands to agriculture in the Tulare Basin is expected to continue since no united front of organized resistance is evident yet.

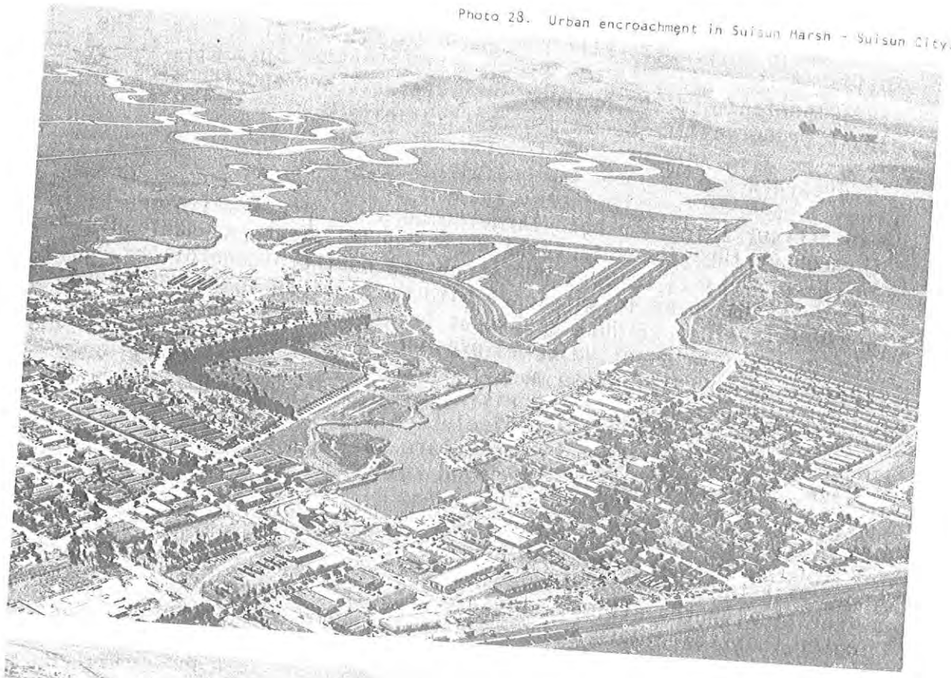
General

The past two years of drought in California demonstrate quite dramatically the ultimate waterfowl habitat problem in California - water shortage. More independent water supplies for refuges and private wetlands should be developed for the future, along with habitat acquisition. Until wildlife uses receive a priority for water consistent with or higher than agricultural and industrial uses, the potential will always exist for habitat losses.

Other major competitors for waterfowl water in the near future may be nuclear and fossil-fueled power plants. Large quantities of water are required for cooling purposes. Since wildlife water is of lower priority than industrial uses, losses of present sources can be expected. Power plants are currently competing with wetlands for the potential use of agricultural tile (subsurface) drainage water. This water exiting power plants is so saline that it is of no use in marsh management. The proposed nuclear plants in Stanislaus County and Kern County are of special concern because of their proximity to waterfowl areas. USBR has already committed 50,000 acre-feet of tile drainage water to Pacific Gas & Electric. Tile drainage may prove very beneficial to waterfowl habitat management in the future, but it will need to be reserved now.

Agricultural crop changes may reduce habitat in the future. There has been interest in recent years to reduce or eliminate rice farming in California because of the great quantities of water used. If this should occur, fully half of the waterfowl habitat now available would be lost. Already, conversion to earlier maturing rice has eliminated significant food sources, because harvested field can be burned, disced, and plowed prior to the onset of rains.

Photo 28. Urban encroachment in Suisun Marsh - Suisun City.



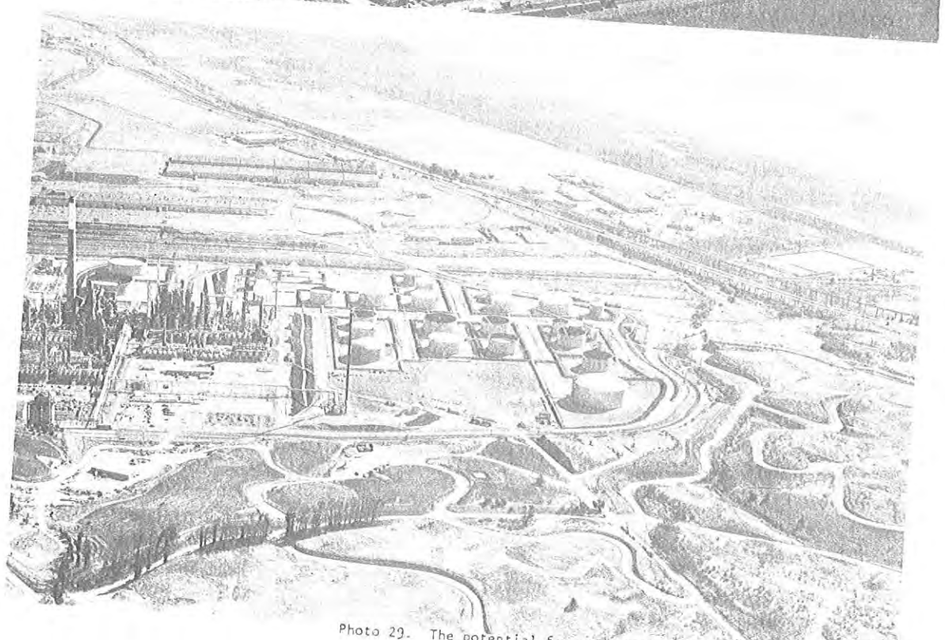


Photo 29. The potential for waterfowl losses and habitat deterioration resulting from oil spills is a continuing threat - Oil refinery, Suisun Marsh.

Photo 30. Rapid turnover of wetlands by a succession of owners promotes poor habitat management.

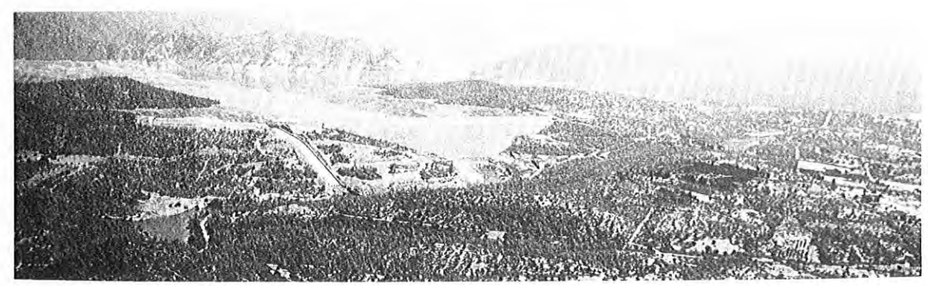


Photo 31. State and Federally sponsored water projects have eliminated the sources of water for natural marshes. Mitigation measures have fallen short of need - Oroville Dam and San Luis Drain.

Photo 32. Physical destruction of wetlands to make room for farming is continuing at a rapid pace in the San Joaquin Basin - West Grasslands (upper), East Grasslands (lower).

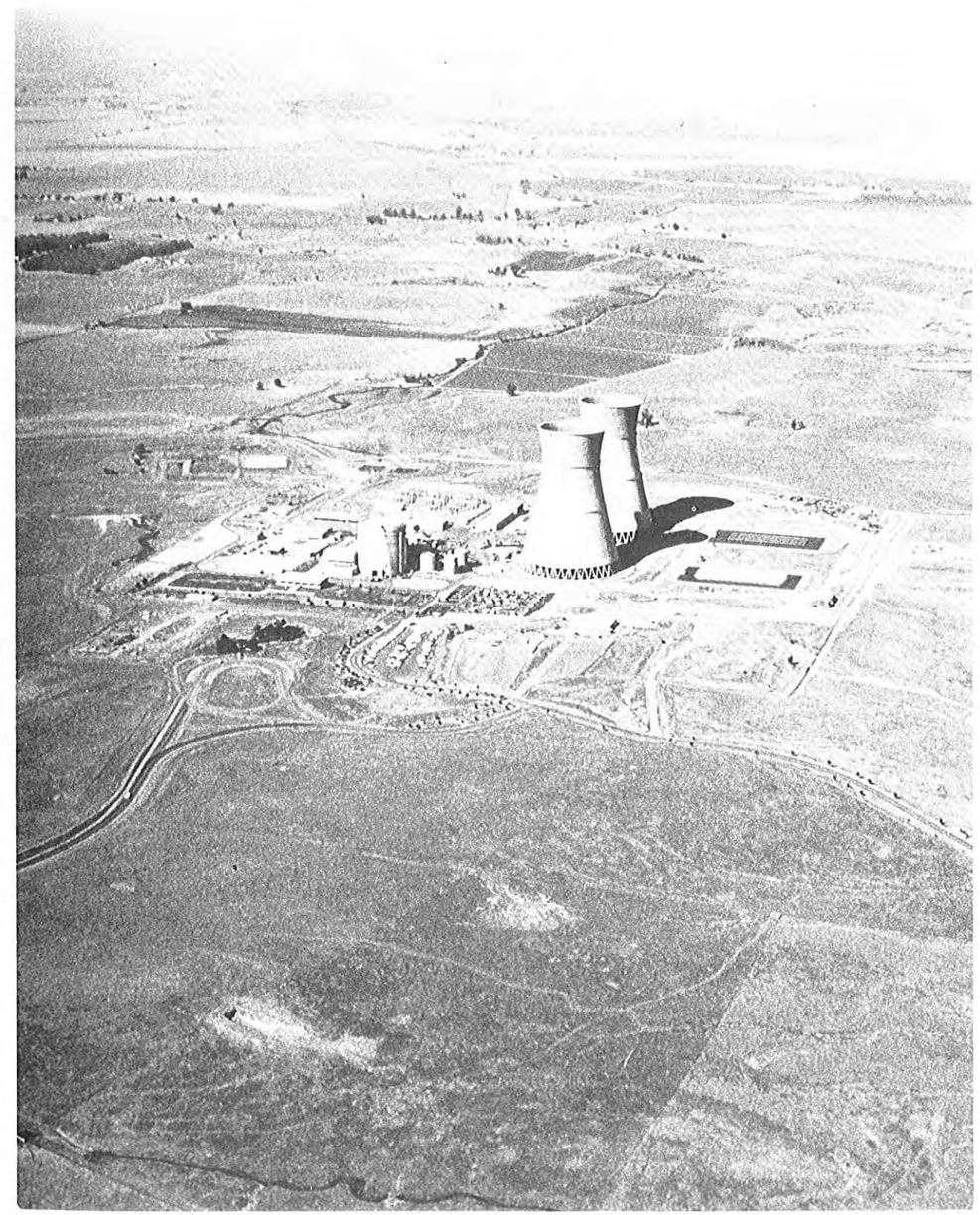


Photo 33. Nuclear and fossil fueled power generation plants compete against wetlands for limited water - Rancho Seco nuclear power plant.

Botulism - Tulare Basin

VI. Habitat Related Impacts

- - "Our efforts were confined to gathering all the dead ones, loading them in flat-bottom boats with pitchforks, and hauling them to the nearest land to be piled up and buried or burned."

- D. H. Madsen

VI. INDICATORS OF HABITAT RELATED IMPACTS ON WATERFOWL

A. How Habitat Losses and Land Use Changes Impact on Waterfowl Use

1. Habitat Loss

Waterfowl are biologically tied to the aquatic ecosystem. It provides food and water, escape from predators, sanctuary, space for normal living activities, and resting and nesting areas. Elimination of this habitat reduces the amount of these resources available to the waterfowl populations dependent upon them, and a reduction in carrying capacity results. Unless neighboring habitat can absorb the displaced birds, which normally results in overcrowding, the total population is reduced by starvation, disease, and reduced breeding output.

2. Changes in Land Use

Rice culture currently provides large quantities of waste grain and roughage which serves as waterfowl food, especially for geese, mallards, pintails, and wigeons. More habitat acreage is provided by privately owned flooded and dry rice fields than is maintained in State, Federal, and private natural wetlands in the Central Valley. Reductions in the rice acreage, if replaced by non-grain crops such as orchard fruits and nuts, melons, tomatoes, cotton, grapes, etc., will reduce the food supply of wintering waterfowl and cause significant reductions of Pacific Flyway populations. Conversion of rice culture to other crops will also eliminate fall flooding waters used by private duck clubs.

Raising earlier maturing varieties of rice allows fall discing of non-hunted farms which eliminates foods for wintering waterfowl. This loss of food may reduce Flyway populations of geese, pintails, mallards, and wigeons. Elimination of native pasture habitat in the San Joaquin Basin is significantly reducing goose grazing habitat in favor of melons, cotton, sugar beets, and irrigated pasture. This habitat loss is continuing and is causing population shifts of geese.

B. Impacts on Waterfowl Populations

Shortages of waterfowl habitat in California are no more strikingly demonstrated than by the perennial waterfowl disease problems in Central Valley wetlands. Early season avian botulism annually causes large losses of ducks in the Tulare Basin and certain parts of the Sacramento Valley. As many as 250,000 ducks have died in the Tulare Lake area during pre-irrigation seasons. Statewide losses for 1969 and 1970 were estimated at 140,000 and 23,000, respectively. As many as 65,000 birds have died of botulism in the Sacramento Valley in one year. Fowl cholera is an annual

problem in the Central Valley as far south as Los Banos during the winter months. In the winter of 1975 - 76, 14,000 ducks, 9,600 geese, 5,000 swans, and 10,500 coots that had died of cholera in the Central Valley of California were collected and destroyed during disease control work. Actual losses were likely at least 20 percent higher than the numbers actually picked up. Most of these losses occurred in the Sacramento Valley and the Delta region.

Crowding of waterfowl in small areas increases the likelihood of severe disease outbreaks. Poor habitat conditions resulting from inadequate water supplies and poor water management contribute to the frequency and severity of outbreaks. Recent management techniques to control outbreaks have included drying up infected marsh areas. While controlling the outbreak locally, this practice forces the birds onto already crowded adjacent areas. Crowding of waterfowl in small habitat areas may cause stress which lowers resistance to diseases such as cholera. Lead poisoning is likely increased by crowded conditions, because greater hunting pressure on few areas increases availability of pellets to larger numbers of birds.

The FWS has recently initiated intensive long-term studies of the waterfowl disease problem in California. The studies are designed to determine total disease mortality, causes for disease outbreaks, and eventually, management schemes to minimize losses.

Direct starvation and disease mortality induced by poor physical condition resulting from food and habitat shortages are difficult to ascertain in the field. It is probable that this mortality does occur, especially late in the winter of dry years when energy requirements of the birds are high preperatory to northward migration, cold weather places added nutritional requirements on the birds, and good quality habitat with adequate food is at a premium. It is likely that poor physical condition contributes to lowered nesting success.

Crop depredation in the Central Valley is also an indication that food resources produced on refuges and private duck clubs are not sufficient. Depredations by waterfowl on farm crops in California, principally grain and pasture, have occurred regularly since the first white settlers began reclaiming wetlands and growing small grains. The problems became acute in the late 1940's, and several NWRs and State WMAs were established to provide food to keep the birds out of nearby farms. The fact that depredations still occur reflects the inability of the present habitat base, especially in the Tulare Basin, to maintain present waterfowl populations without dependence on agricultural crops.

Photo 34. Ross' geese killed by fowl cholera.

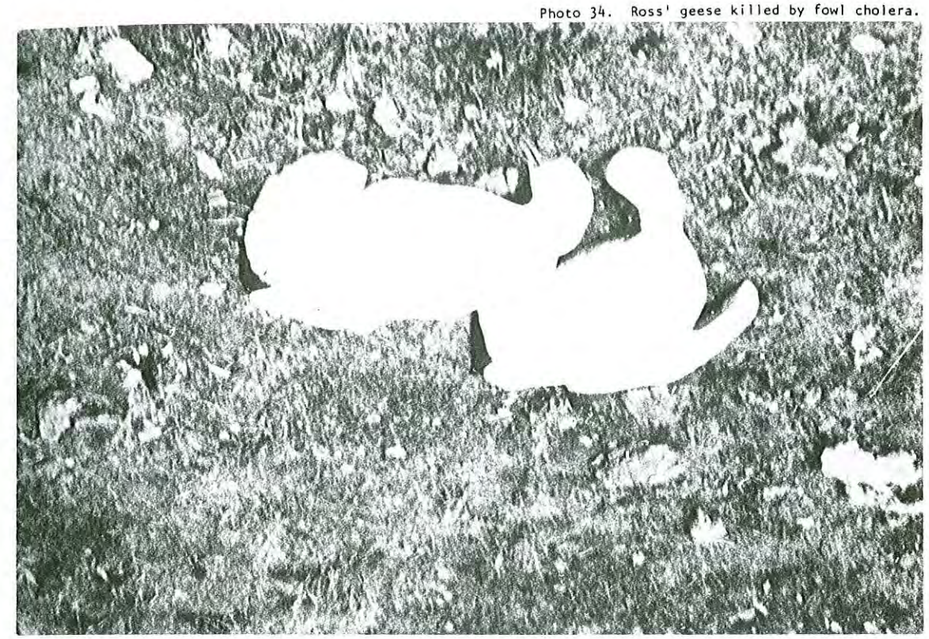


Photo 35. Crowding increases the frequency and severity of disease outbreaks.

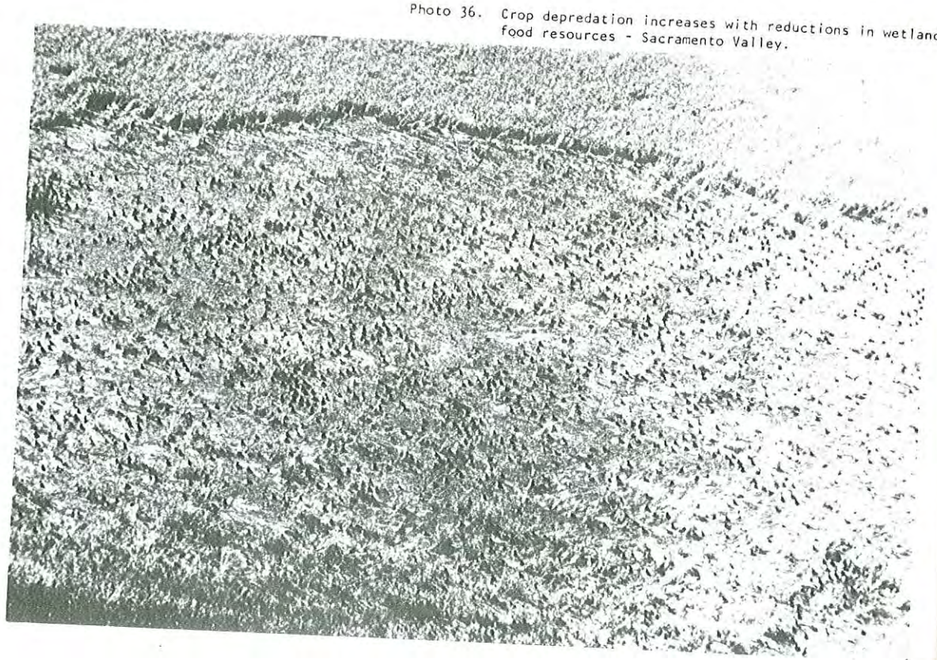
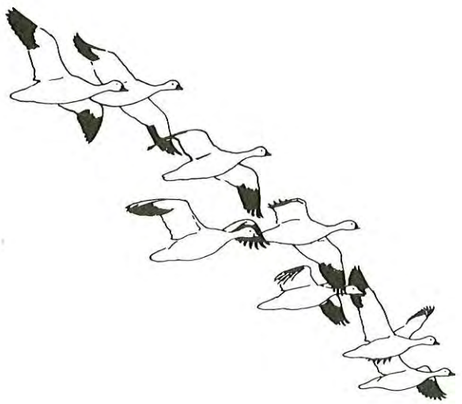


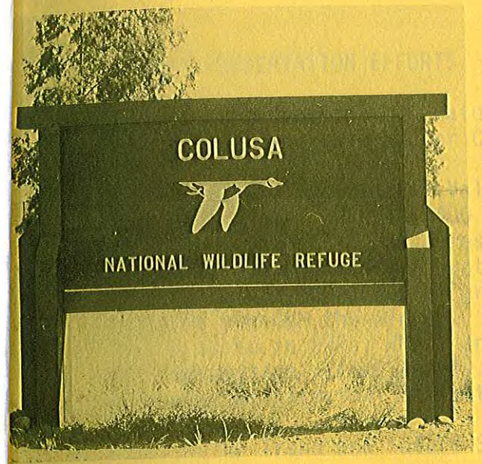
Photo 36. Crop depredation increases with reductions in wetland food resources - Sacramento Valley.

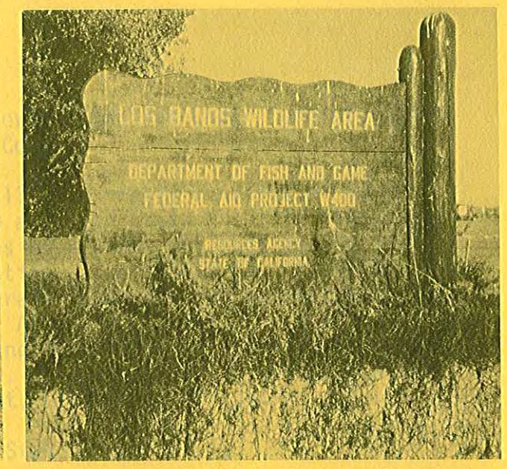
Photo 37. Reductions in private habitat have increased the demand for hunting and wildlife observation on public wetlands. (Photo by J. Cowan)

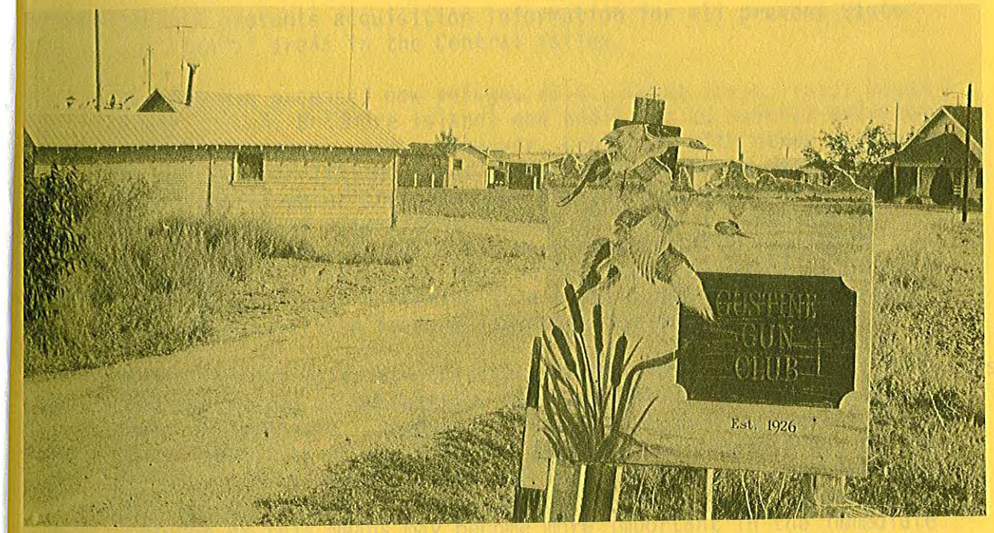
Limited habitat is also reflected in the unmet high demand for public waterfowl hunting. Hunting opportunity on both public and private wetlands will decline in the future if private habitat is not preserved, because hunters displaced from destoryed private wetlands will seek hunting opportunity on public areas.

Starvation, disease, and crop depredation are symptoms which indicate that inadequate wintering habitat in the Central Valley is limiting waterfowl populations of the Pacific Flyway.









VII. Habitat Preservation Efforts

"Pioneers usually scoff at any efforts to perpetuate pioneering."

- Aldo Leopold (1949)

VII. HABITAT PRESERVATION EFFORTS

A. Acres (and proportion) of Waterfowl Habitat under Federal, State, and Private Ownership and/or Control

Habitat within the Central Valley currently consists of 53,500 acres of Federal NWRs, 37,400 acres of State Wildlife Management Areas, and about 345,000 acres of private wetlands and uplands primarily managed as duck hunting clubs (Table 1). Additionally, 200,000 to 400,000 acres of grain lands provide habitat when left unplowed through the winter. About 75 percent of the total acreage listed above in NWRs, WMAs, and duck clubs is actually flooded. This percentage varies yearly. The remainder is uplands, which also provide waterfowl habitat, especially for geese.

B. Acquisition Trend and Future State Plans

Table 4 presents acquisition information for all present State and Federal areas in the Central Valley.

The FWS has proposed new refuges (e.g., Cache Creek, Yolo, Rough & Ready Island, Bradmore Island) and additions to several existing refuges in recent years. However, conflicts with other National priorities for limited funds and/or elimination of refuge proposals from Federal water projects have precluded establishment. The State has added significant acreage to its Gray Lodge WMA in recent years, but no new areas have been acquired because of Department priorities and limited funding. Availability of operation and maintenance funding is a significant factor hindering wetland acquisition in many instances for both agencies.

Major Federal water projects sponsored by the Army Corps of Engineers and the Bureau of Reclamation may have NWRs or WMAs incorporated into the projects. However, in the past such recommendations made under authority of the Fish and Wildlife Coordination Act by the Service's Division of Ecological Services have not been implemented due to decisions by the sponsoring agencies. Establishment of refuges by this means may become more important in the immediate future, especially with respect to water project mitigation requirements. Refuges developed as enhancement areas in conjunction with water projects face a less certain future.

The State is currently implementing the Suisun Marsh protection plan initiated by State Senate Bill 1981. Action centers around acquisition of lands surrounding the marsh to provide a "buffer" area against industrial and urban development. Acquisition appears to be proceeding without major problems.

Table 4. Acquisition of Federal NWRs and State Wildlife Management Areas, Central Valley, California

Federal	Established	Authority/Funding	Additions
Sacramento NWR	1937	Executive Order/ Duck Stamp	1971
Delevan NWR	1962	Duck Stamp	1963
Colusa NWR	1945	Duck Stamp Lea Act	1949, 1952
Sutter NWR	1944	Duck Stamp Lea Act	1953, 1956
San Luis NWR	1967	Duck Stamp	1970
Merced NWR	1951	Lea Act	0
Kesterson NWR	1970	Coop Agreement with BR+	0
Kern NWR	1960	Duck Stamp	0
Pixley NWR	1959	Executive Order (Withdrawal from Forest Service)	0
State			
Gray Lodge WMA	1931	GCF*	1971 (PR)**
Grizzley Island WMA	1950	WCB***	0
Joice Island WMA	1931	GCF	0
Lower Sherman Island WMA	1965	State Land Comm. Donation	0
Los Banos WMA	1929	GCF	1966
Volta WMA	1965	Leased from BR	0
Mendota WMA	1954	WCB	1955, 1965

* GCF = Governor's Conservation Fund
** PR = Pittman - Robertson
*** WCB = Wildlife Conservation Board
\+ BR = Bureau of Reclamation

CDFG currently depends on several sources for wetland acquisition funding. The Fish and Game Preservation Fund is derived from hunting license sales. The State Wildlife Conservation Act of 1947 authorizes acquisition of wildlife habitat and is administered by the Wildlife Conservation Board (WCB). The program is financed by an annual appropriation of the State's share of parimutual revenues. The Marks-Badham Environmental Protection and Research Act of 1970 established the California Environmental Protection Program Fund, with revenue derived by the sale of personalized motor vehicle license plates. This source is used primarily for unique or critical wildlife habitat for ecological reserves. The State Duck Stamp Act of 1970 requires waterfowl hunters to purchase a State Duck Stamp before hunting. The funds are used for the acquisition and development of waterfowl habitat. Nearly all monies have been used for production habitat in Canada; however, the Governor recently signed a bill to increase the cost of the stamp with a 50/50 split of funds between Canada and California. The Bagley Conservation Fund, established in 1971, can be used for wildlife areas. The State Beach, Park, Recreational, and Historical Bond Act of 1974 authorizes issuance of general obligation bonds to acquire and develop recreation and open space land. The Federal Aid in Wildlife Restoration Act of 1937 (Pittman-Robertson or PR) provides funds to the States for wetland acquisition and development, but the State has relied heavily on WCB monies for acquisition of State WMAs.

Acquisition of WMAs for waterfowl have been given a lower priority in recent years by CDFG in favor of expanded funding on big game projects. Major new waterfowl habitat projects in the Central Valley have not been planned by the State at this point, but the increase in State duck stamp revenues will allow such planning in the near future.

C. Effectiveness of State and Federal Legislation/Regulations Designed to Protect Waterfowl Habitat

The Fish and Wildlife Service, through its Division of Ecological Services, reviews proposals for work and activities in or affecting navigable waters that are sanctioned, permitted, assisted, or conducted by the Federal Government. These review functions delegated to the Service by the Secretary of the Interior are prescribed by the Fish and Wildlife Coordination Act, the National Environmental Policy Act of 1969, the Estuary Protection Act, the Department of Transportation Act, The Federal Aid Highway Act, the Airport and Airway Development Act of 1970, the Watershed Protection and Flood Protection Act, and the Endangered Species Act.

Permit activity under Section 10 of the Rivers and Harbors Act of 1899, and Section 208, 402, and 404 of the Federal Water Pollution Control Act Amendments of 1972 are the most common activities to which the FWS applies its review function.

Rivers and Harbors Act of 1899

Section 10 declares it unlawful to build in any water of the United States or to excavate or fill or in any manner to alter or modify the course, location, condition, or capacity of any navigable water of the United States unless recommended by the Chief of the Army Corps of Engineers and authorized by the Secretary of the Army.

Section 10 permits now also require approval by the Environmental Protection Agency as a result of the Federal Water Pollution Control Act of 1972. Navigable Waters of the United States is defined in common and case law as any water that is or has been navigable in fact or is capable of being made navigable through reasonable improvements, including any shoals, falls, rapids, or other interruptions requiring land portage, and which is used or useful in interstate or foreign commerce. The Federal jurisdiction on such waters extends throughout their length (in some decisions including non-navigable tributaries) and laterally to the limit of the plane of the ordinary high water, defined on rivers as neither the flood nor lowest flow stage but the usual high water stage, and on tidal waters as the mean high tide line or on the Pacific Coast the mean higher tide line.

It is Service policy to object to any activity which will destroy wetlands without adequate mitigation and which is not water dependent.

The inland wetlands of the Central Valley, for the most part, receive no protection from Section 10. Some Delta waterways and sloughs have received and will continue to receive reasonably good protection under this program provided the aggressive Ecological Services program is maintained. Unfortunately, Delta habitat will continue to be lost to development on a piecemeal basis because Service recommendations do not have to be followed by the Corps.

Federal Water Pollution Control Act Amendments of 1972 (PL 92-500)

This Act sets up a Federal permit system to carry out certain pollution discharge activities in navigable waters. The Act is administered by the Environmental Protection Agency (EPA) and proclaims two goals for the United States--to achieve swimmable, fishable waters wherever attainable by 1983 and, by 1985, to eliminate the discharge of pollutants into navigable waters.

Section 208 of the Act (Water Quality Management) ties together various water pollution control and abatement requirements, including municipal, industrial, residual waste, run-off and ground water pollution control. The Act places the responsibility for developing and carrying out solutions to these problems with State and local

governments. Under Section 208, geographic areas with significant water quality problems are singled out for areawide planning. EPA provides funding to develop the plan to control all point and non-point source pollution, and land-use as it relates to water quality. Although there is potential to incorporate wetland protection in 208 management plans, 208 planning relates primarily to water pollution and water quality. Nothing in the Act would prevent landowners from draining wetlands and growing crops, unless a water pollution problem would be the result. It is too early to determine what the effect of 208 planning will have on wetland preservation efforts.

Section 402 of the Act requires permits from EPA for the discharge of any pollutant into navigable waters, the so-called National Pollutant Discharge Elimination System permits. Basically, under this program, it is illegal to discharge any refuse into any navigable waters of the United States. Permits processed under this program have been few, and its value to the protection of wetlands is not presently clear.

Section 404 of the Act greatly expands the traditional Corps of Engineers' permit program (Section 10) to cover all waters of the United States. The Corps, with EPA oversight, regulates the discharge of dredged or fill material in coastal and inland waters and wetlands. Recent amendments to the Act provide for States, if they meet certain requirements, to take over jurisdiction of 404 activities in other than traditional navigable waters (covered by Section 10). The Fish and Wildlife Service's effectiveness in preventing wetland loss under these new amendments remains to be tested. Presently, Section 404 applies to most wetlands of the Central Valley, and an aggressive posture by the Service will insure that no wetlands are lost as a result of granting poorly-conceived developments under the 404 program. As with Section 10, the Army has the final decision and is only required to consider FWS recommendations. Therefore, the 404 program is not an absolute barrier against wetland loss, and it is to be expected that losses will occur under both of these programs.

Executive Orders

Executive Orders are issued, periodically, to formally state executive policy and promulgate executive directives to Federal agencies on current issues, thus implementing statuatory law. Such policy directives provide an important source of guidance for Federel agency actions. The most recent example of such an order was issued on May 24, 1977 by President Carter and entitled "Protection of Wetlands."

Section 1 (a) reads in part: "Each agency shall provide leadership and shall take action to minimize the destruction, loss, or degradation of wetlands, and to preserve and enhance the natural and

beneficial values of wetlands in carrying out the Agency's responsibilities...."; and ".. each agency, to the extent permitted by law, shall avoid undertaking or providing assistance for new construction located in wetlands unless the head of the agency finds (1) that there is no practicable alternative to such construction, and (2) that the proposed action includes all practicable measures to minimize harm to wetlands which may result from such use." This order will not preserve Central Valley wetlands from other than Federal activity, and even Federally sponsored destruction is permissable if "no practicable alternative" exists.

Legislation/Contracts

Land acquisition under the Suisun Marsh protection plan developed in response to State SB 1981 is being implemented presently. The high level of activity by Federal, State, and Regional (SF Bay Conservation & Development Commission) agencies related to Suisun Marsh protection will insure preservation of the Marsh proper. Water supplies for the Marsh, however, have not been protected.

The Grassland Water District (GWD) in the San Joaquin Basin has received a considerable amount of legislative interest. As the result of a lawsuit, water is delivered to the District by USBR, "if and when available", each fall from Central Valley Project (CVP) sources (40 year contract). The current drought has demonstrated that water will not always be available, and future industrial and urban development may permanently deprive the District of water. Presently, however, the water supply per se appears secure for the near future. Further cooperative agreements with USBR have reduced the cost of the water and increased assistance to the GWD for maintenance of canals, ditches, and equipment. Current legislation pending before congress would reduce water costs, subsidize operation and maintenance, and provide for transfer of the water and GWD conveyance facilities to the Service if the District should disband.

The State legislature passed the Carpenter Act in 1973 which stabilized tax assessments on duck clubs of the GWD. The Act is an amendment to the California Revenue and Taxation Code. It provides for the assessment of lands as open space when such lands are subject to a "wildlife habitat contract" which restricts the use of the lands to wildlife habitat and native pasture. Such lands must be eligible to receive water for waterfowl management purposes from the Federal government. The act applies to tracts of 150 acres or more. Presently, only GWD clubs get the benefits of the act. Clubs outside the District do not have restrictive habitat plans and/or do not receive Federal water. A 1965 Congressional Act, amended the Internal Revenue Code to exempt private shooting and fishing preserves from paying an excise tax on club dues.

Unfortunately, there have been no perpetual agreements to maintain the land in wetlands. Recent conversions of duck clubs to agriculture within the District demonstrate this fact. Present laws, State and Federal, will not protect the wetlands of the GWD against economic pressures.

No special legislation, State or Federal, has been enacted to protect wetlands in California other than Suisun Marsh and the Grasslands. It can be expected that as the owners of significant wetlands in other areas become sufficiently concerned with the potential loss of their areas, they may organize along the lines of the GWD to form political action groups to initiate protective legislation.

Public Trust

Many wetlands are protected under "Public Trust" and/or "Navigational Servitude." Most of these are located along the coastal areas and may directly affect the status of Suisun Marsh and the Delta Areas. Public trust is usually claimed in tidal areas, but its application in navigable lakes and nontidal navigable rivers and associated wetlands is in dispute.

Identification of wetlands protected under public trust will be a major Service effort in the near future and will have a bearing on future wetland preservation by the State and Federal governments Presently, the situation is by no means clear as it pertains to wetlands in the Central Valley.

Protection under the Public Trust would not necessarily rule out acquisition in any case because only under acquisition can management to increase wildlife carrying capacity or recreational use be applied.

In summary, Fish & Wildlife Service involvement in the Section 10, 208, 402, and 404 programs and enforcement of public trust has been reasonably successful in regulating development in wetlands, especially along the coast. Preservation of inland wetlands with these programs is less certain. This involvement has not prevented wetland loss, but it has at least obtained suitable mitigation in many instances. At present, reliance on these permit programs for wetlands protection would not be advisable. Preservation cannot be guaranteed since the final decision rests with the permitting agency; most wetlands are not covered by permitting agencies; implementation of protective programs is subject to change by Congress (witness recent efforts to reduce section 404 effectiveness); management of wetlands is not possible without acquisition; and land owner decisions to drain wetlands and convert to farming operations are not generally prevented by the permits.

Some form of Federal and/or State involvement in cooperation with private interests in the preservation of unprotected wetlands in California's Central Valley appears to be appropriate.

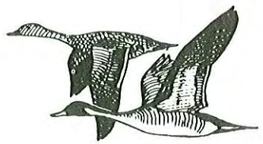
D. Total Acres of Waterfowl Habitat Remaining Unprotected

At least 350,000 acres of privately held natural and agricultural-type wetland-upland habitat is maintained in the Central Valley. Of this, about 75 percent is actually flooded during the fall and winter and can be considered moderate to high value waterfowl habitat. Most uplands are also important to wintering waterfowl, especially grazing geese, and to nesting birds in spring and summer. Essentially, all of this habitat is unprotected, but only the natural habitat, about 173,500 acres, requires preservation.

E. Conclusions Concerning Long-Term Protection of Habitat

The only sure way of protecting California's private wetlands in perpetuity is through some form of State or Federal involvement. Outright fee acquisition will be considered only as a last resort and where necessary to protect existing wetlands, for development of new areas, or under special circumstances of "willing sellers" and special need. With a vigorous program of protective easements, much of the remaining habitat in the Central Valley can be protected, given enough time and money, without fee acquisition. California has already lost 91 percent of its wetlands, and maintenance of the Pacific Flyway is dependent upon maintenance of all remaining habitat. Development of additional habitat will also be important in the future to maintain and/or increase present population levels, especially if crop patterns change to reduce rice acreage.

All remaining natural wetland habitat in the Central Valley is in critical need of preservation. Quality of wetlands, of course, varies greatly, but the losses have been so great as to elevate the importance of all marsh types exclusive of the intensity of management.



Grasslands - San Joaquin Valley

VIII. Proposed FWS Habitat Preservation Objectives

VIII. PROPOSED FWS HABITAT PRESERVATION OBJECTIVES AND STRATEGY FOR THE CENTRAL VALLEY

A. Preservation Objectives

1. General

The U.S. Fish & Wildlife Service has initiated the new Migratory Bird Wetland Preservation Program for the Pacific Flyway, including the Central Valley of California. The first phase of the program identified, evaluated, and prioritized wintering waterfowl habitat in the Valley. This evaluation was directed toward existing habitat, primarily in organized duck clubs, and areas where opportunity exists to develop new marsh habitat in ancestral wetland areas reclaimed for agriculture. Waterfowl habitat within each of the Central Valley's drainage basins was identified and evaluated, and a priority ranking system for preservation was developed. Federal and State waterfowl biologists participated in the evaluation sessions. Additionally, private conservation organizations' views and comments were solicited and incorporated in the ranking (See Appendix C for a list of participants).

It is believed that all wetlands significant to waterfowl have been identified, for inclusion in this Plan. However, if the upcoming FWS National Wetlands Inventory or other source of information discloses additional wetlands of importance to waterfowl, they will be incorporated in the long-term planning for habitat preservation.

The second phase of the evaluation process was to determine which areas required Federal involvement for preservation, and if required, the manner of the involvement.

The third phase was a determination of efforts required for wetland preservation other than acquisition. The results of this analysis produced a three-pronged approach to the problem and, together, are the program objectives. These are:

(1) To preserve as much of the remaining unprotected wetlands in the Central Valley as possible--either by easements obtained on private natural wetlands, or by fee acquisition where warranted.

(2) To restore, create, and/or develop new wetlands as NWRs where appropriate.

(3) To develop firm water supplies and examine alternative water sources for existing and potential wetlands.

Criteria used to rank wetlands, data forms used, and evaluation results are presented in Appendix C.

2. Acquisition Objective

Table 5 lists all Central Valley wetlands in order of biological value and threat of loss. This list includes both natural marshes and those wetlands consisting primarily of flooded agricultural lands (harvested corn, rice, etc.). The Service preservation program will be based on the wetlands listed in Table 5.

The FWS has determined that the most efficient and equitable program for preserving existing private wetlands in the Central Valley should be based almost entirely on a conservation easement approach, with maintenance of the land in private ownership, rather than fee acquisition with eventual incorporation into the NWR System. This will encourage private wetland owners to maintain and manage their lands for waterfowl. The Fish & Wildlife Service should help wetland owners maintain their habitat, wherever possible, rather than place the burden of wetland maintenance on the taxpayer.

Under this type of mechanism, the wetlands would remain in private ownership, but easement requirements would insure that the area would remain as waterfowl habitat in perpetuity. Easements would be designed to preserve the existing land use condition. To comply fully with easement stipulations, the landowner could not alter the land in any way that would be detrimental to waterfowl use. This would preclude converting marsh to any kind of agricultural use. The right of landowners to hunt their property during regular hunting seasons would not change. Present landowners would be able to sell their property as before, but the easements would apply to new owners. Easements would not be acquired on building sites or buildings. If landowners planned to replace old buildings or construct new areas on these sites, they could do so. Landowners would retain the right to graze cattle or lease their lands for grazing purposes, as they may be doing presently.

Acquisition in fee of existing wetlands will be considered only in cases of willing sellers who won't accept easements; for wetlands consisting of flooded agricultural lands which are imminently threatened with loss and a willing seller situation exists; and for properties currently in agriculture or other non-wetland use which can be restored as a marsh area only if acquired in fee and brought into the NWR System (assuming the State has no interest in acquiring the area for a WMA; see Development Objectives below). Fee acquisition will be considered only as a last resort after a determination has been made that easements will not protect the habitat, and the State has no interest in acquiring the property.

Not all wetlands in Table 5 qualify for preservation under the easement program. The FWS is primarily interested in preserving the "natural" wetlands, defined as those consisting of native marsh or native pasture vegetation and foods, as contrasted with flooded agricultural lands (corn, rice) which provide waste grain for food. Natural does not imply an unmanaged water supply.

Table 5. Biological and Threat Ranking of all Central Valley Wetlands Including Natural Marsh and Flooded Agricultural Areas

Biological Ranking

AREA	SCORE
Butte Sink	265
Delta	222
Suisun Marsh	206
Grassland Water District	201
Yolo By-pass Area	185
Crane Ranch Area	184
Flynn Ranch Area	182
District Ten	181
Upper Butte Basin	176
Sutter By-pass	174
Outside Grassland Water District	171
Willow Creek Area	165
Lurline Creek Area	161
Modesto Properties Area	161
Faith-Mapes Ranch Area	159
Kern NWR-Wasco Area	157
Outside Yolo By-pass	155
Outside Sutter By-pass	147
Tulare Lake Bed	137
Natomas	134
Vina Plain	126
Greenfield	116
Farmington-Escalon	115
Stone Lakes	115
Lincoln-Wheatland-Nicolaus	106
Mendota WMA Area	101

Threat Ranking*

AREA	SCORE
Greenfield	176
Outside Sutter By-pass	176
Upper Butte Basin	160
Mendota WMA Area	156
Kern NWR-Wasco Area	152
Natomas	146
Outside Grasslands Water District	145
Modesto Properties Area	140
Sutter By-pass	139
Crane Ranch Area	139
Lurline Creek Area	139
Outside Yolo By-pass	139
Flynn Ranch Area	138
Farmington-Escalon	136
Lincoln-Wheatland-Nicolaus	134
District Ten	122
Stone Lakes	121
Willow Creek Area	121
Suisun Marsh	118
Delta	107
Butte Sink	102
Yolo By-pass Area	98
Faith-Mapes Ranch Area	97
Grasslands Water District	96
Tulare Lake Bed	76
Vina Plain	71

*There are 288 potential Biological points and only 240 potential Threat points. Therefore, to equalize potential final scores, assigned Threat socres were multiplied by 1.2 to arrive at the adjusted scores listed.

Note: See Appendix C for a description of biological and threat criteria, and point values used to arrive at the above scores.

Wetlands consisting primarily of flooded agricultural lands, such as District 10 or the Yolo By-pass clubs, will not be considered in the present easement program. Although these areas are important to waterfowl, it would not be possible for the FWS to justify the use of Duck Stamp Funds to, in effect, preserve agriculture. Other preservation techniques will be required for these areas. Presently, it appears that habitat consisting of flooded agricultural lands is relatively secure. If changes in farming practices or reduced hunter interest cause a decline of this habitat type in the future, it may be possible to develop a FWS program conjunctively with the Agricultural Stabilization and Conservation Service's (ASCS) existing administrative mechanisms to pay rice farmers to maintain flooding on harvested fields, or not to winter-follow their stubble fields. Additional payments such as this may be enough, coupled with hunter fees, to encourage rice landowners to stay in the wetland business.

Wetlands consisting of flooded agricultural lands would become eligible for the easement program if they were restored to natural marsh status. The Service encourages this restoration where landowners find it economically feasible.

Table 6 lists the natural marsh areas in order of their biological, threat, and final ranking. The numerical values were taken directly from Table 5. Most of these natural areas are determined to be of such high value to waterfowl and/or are under such threat of loss that FWS action is considered appropriate to insure preservation. Areas with similar point totals are grouped because the ranking system encouraged subjective interpretation. Each area within any given grouping is assumed to have a similar preservation priority, although work will begin on the higher-ranked areas first. It was the evaluation team's consensus of opinion that threat should be twice as important as biological value when calculating the final ranking. Therefore, the Final Rank is the sum of two times the threat score, plus the biological value score.

Appendix D provides a photo of each natural area, ranking score for each, a comprehensive priority list, and other information. Each area is discussed below (Refer to Figure 5 for area locations).

a. Butte Sink

Although Butte Sink is relatively secure in the immediate future, its overwhelming biological value and unique habitat characteristics require that a preservation program be initiated. An easement approach is proposed. Fee acquisition may be appropriate for the Bean Patch if ongoing private efforts to save the area as a sanctuary fail.

Table 6. Biological, Threat, and Final Ranking of Central Valley Wetlands, Natural Marshes Only 1/ & 2/

Biological Ranking		Threat Ranking 3/		Final Ranking 4/	
Area	Score	Area	Score	Area	Score
Butte Sink	265	Greenfield	176	Butte Sink	469
		Kern NWR-Wasco Area	164	Greenfield	468
Suisun Marsh	206	Mendota WMA Area	156		
Grasslands Water District	201			Kern NWR-Wasco Area	462
		Outside Grasslands Water Dist.	145	Crane Ranch Area	462
Crane Ranch Area	184			Outside Grasslands Water Dist.	461
Flynn Ranch Area	182	Modesto Properties	140	Flynn Ranch Area	458
		Crane Ranch Area	139		
Outside Grasslands Water Dist.	171	Lurline Creek Area	139		
Willow Creek Area	165	Flynn Ranch Area	138	Suisun Marsh	442
Lurline Creek Area	161			Modesto Properties	441
Modesto Properties	161	Stone Lakes	121	Lurline Creek Area	439
Faith-Mapes Ranch	159	Willow Creek Area	121		
Kern NWR-Wasco Area	157	Suisun Marsh	118	Mendota WMA Area	413
				Willow Creek Area	407
Vina Plain	126	Butte Sink	102	Grasslands Water District	393
Greenfield	116	Faith-Mapes Ranch	97		
Stone Lakes	115	Grasslands Water Dist.	96	Stone Lakes	357
				Faith-Mapes Ranch	353
Mendota WMA Area	101	Vina Plain	71		
				Vina Plain	268

1/ Small acreages of natural marsh are present in Upper Butte Basin, Sutter By-pass, Yolo By-pass, and the Delta; these are insignificant relative to those areas listed above and relative to flooded agricultural habitat.

2/ Areas with similar point totals are grouped. Areas within the groupings are assumed to be of equal preservation priority.

3/ See footnote - Table 5

4/ Final Rank = 2 x Threat score, plus Biological score

b. Greenfield

The Greenfield area south of Bakersfield represents only a remnant of the once vast Kern-Buena Vista Lake marshes that once existed. There has been a precipitous loss of habitat in recent years, and preservation efforts are required to save the remainder. An easement approach is recommended. The biological value of the area is low, relative to other wetlands, but it contributes to a wider distribution of birds and is important locally. With an easement program, the biological value could be enhanced by management recommendations from the Service.

c. Kern NWR-Wasco Area

This area represents only a remnant of the once vast Tulare Lake and associated marshes once existing in the general area. It is a relatively large area and is very important from a bird distribution viewpoint. It is essential that this area be preserved, and an easement program is proposed. No fee acquisition is being recommended.

d. East Grasslands-Crane Ranch Area

The Crane Ranch area is extremely important for geese, including Ross' geese. Both marsh and native pasture are present and important to the continuing existence of geese in the San Joaquin Valley. This area is threatened and must be preserved. It is proposed that easements be used to preserve this area. The Crane Ranch area falls within the project boundary of a Corps of Engineers' flood control project and may be preserved as part of the mitigation package. The Service should be ready to act should these efforts fail.

e. West Grasslands-Outside Grasslands Water District

This area is essentially contiguous with the GWD but is more threatened with loss because water availability is less secure. The habitat is of similar quality and needs to be preserved because of the high biological value of the whole grasslands area. The grasslands area is the most important wetland area in the San Joaquin Valley. It is proposed that easements be acquired to preserve the habitat.

f. East Grasslands-Flynn Ranch-Merced NWR Area

The Flynn Ranch area is critical goose habitat, including Ross' geese. Together with the Crane Ranch area, it provides a large block of natural marsh and native pasture critical to geese in the San Joaquin Valley. The west grasslands could not take up

the slack if the east grasslands were lost. The threat to habitat loss is high in the Flynn area owing to conversion to agriculture. Easements are recommended to save the habitat.

g. Suisun Marsh

Suisun Marsh is ranked very high biologically, second only to Butte Sink and, as such, requires preservation. However, the principal threat to the marsh is from degradation of water quality, not physical elimination of habitat by agriculture, or other land use changes. As a result, an easement program designed to prevent land use change would not contribute to the area's preservation. At such time as the water quality problem is solved and it appears that the marsh is still in danger of loss, or if the water problem is not solved and hunting clubs begin to sell out, then the Service will act to save the area. An easement program may be appropriate at that time, but at present, it is proposed that action be deferred.

h. East Grasslands-Modesto Properties

The Modesto Properties area is important for ducks and geese and rated moderate biologically. The threat to the area is high, resulting primarily from conversion of marsh and native pasture to irrigated pasture. Together with the Crane and Flynn Ranch area, this constitutes the only significant remaining habitat east of the San Joaquin River. It is proposed that easements be acquired to preserve the habitat.

i. Lurline Creek Area

The Biological value and threat of loss of the Lurline Creek wetlands are relatively moderate overall. This area is important to geese and ducks. The threat of loss stems primarily from conversion of natural marsh to rice culture. This land conversion has occurred in several areas recently. The danger of continued conversion is high, and preservation efforts are required to save the habitat. It is proposed that protective easements be acquired.

j. Mendota WMA Area

This area consists of a small acreage within and adjacent to the State-owned Mendota WMA. The clubs contribute to the overall value of the area; because of the small size, the biological value is low relative to the whole Central Valley. Nonetheless, these wetlands are important locally and should be preserved. The threat of loss is very high, owing to land conversion threats and operational costs. It is proposed that protective easements be acquired.

k. Willow Creek-Sacramento NWR Area

The Willow Creek area duck clubs are very important to the resource. All species benefit from these areas. The threat of loss is moderate, but the area is of sufficient importance to justify preservation efforts. It is proposed that protective easements be acquired to preserve the natural marsh existing in this area.

l. Grasslands Water District (GWD)

The GWD is the most important wetland in the San Joaquin Valley and number three, overall, in the Central Valley. It is imperative that this area be preserved. Relative to many other areas, the GWD seems secure, but its high biological value requires that preservation efforts be continued. It is proposed that easements be acquired to protect the habitat.

m. Stone-Beach Lakes Basin

Beach Lake, the two Stone Lakes, and the Delta Meadows area contain remnants of the once extensive delta wetlands. These lakes are important to waterfowl on a small scale and are threatened with urban encroachment. There has been considerable local interest in the preservation of the lakes, and they have been included in the mitigation/enhancement package of the Corps of Engineers Morrison Creek flood control project. It appears at this point that Stone-Beach Lakes will be preserved without a FWS easement program, and it is proposed that action be deferred. If the situation changes, the easements will be considered. Fee acquisition may be appropriate also, since the lakes themselves may be protected, but urbanization could encroach to their shores.

n. Faith-Mapes Ranches Area

This area is currently important to geese in general, and to the Aleutian goose in particular. Extensive native pasture, some natural marsh, and extensive riparian habitat exist here. The area is of sufficient biological importance and under sufficient threat of conversion to other uses to go ahead with a preservation effort. It is proposed that easements be acquired.

o. Vina Plain

This large expanse of native pasture north of Chico is very important to northward migrating and wintering geese and some ducks when the heavy rains fill the many depressions in the hill and swale topography. As such, it is not a wetland per se but is still waterfowl habitat. The threat to the area is

apparently minimal. At this point, it is proposed that action be deferred in this area until a threat materializes, and the higher priority wetlands listed above are protected by easements.

3. Development Objectives (Marsh Restoration)

Development of new NWRs on presently non-wetland habitat--i.e., restoration of former marshland--is currently of somewhat lower priority than preservation of existing private wetlands. However, in the near future, expenditures of Migratory Bird Funds for creation of new wetlands will be warranted, depending on the progress of the easement program. Either delays or a very fast pace for this program will provide an opportunity to consider development areas at an early date. Preservation of existing wetlands alone will not provide enough high-quality habitat carrying over into the twenty-first century. Existing habitat is now limiting population levels below those attainable, given current breeding ground capacities. Creation of NWRs or WMAs often stimulates development of adjacent private wetlands thereby resulting in an added increase in habitat acreage. Creation of NWRs will provide opportunities not now available for hunting and bird watching by the public.

The FWS and CDFG have identified several broad areas where creation and development of new NWRs and/or WMAs is biologically appropriate. These include the American Basin, Yolo Basin, the Delta region, and the Tulare Lake Bed area. Upper Butte Basin (Upper Sacramento River Corridor), Colusa Basin, and San Joaquin Basin are of lesser priority. These are all areas which, at one time, contained significant wetlands subsequently lost to reclamation for agriculture. Duck clubs do not presently exist on lands being considered. Table 7 presents a list of the Central Valley basins and their relative potential for wetland development as NWRs.

Basically, the areas are sorted into three groups. Each separate area within each group can be considered to have a similar priority with the others. No attempt has been made to refine a priority ranking system, specific locations, or project acreages required for each new wetland area. Ascertainment studies will develop this information. At this point, it is most critical to recognize the need. Each area is discussed below.

Group I

a. Delta

No NWRs or intensively managed WMAs presently exist in the Delta. This was one of the largest expanses of marsh, ancestrally. Creation of a large refuge or several smaller ones in this region would go a long way toward restoring a remnant of ancestral marshes, contribute significantly to waterfowl distribution,

Table 7. Potential New Wetland Development*

AREA	DESIRABILITY/POTENTIAL VALUE	FEASIBILITY
Delta	High	High
Yolo By-pass	High	High
Tulare Lake Bed	High	Low
Kern-Buena Vista Lake Beds	High	Low
American Basin (Southern)	Moderate to High	High
Sutter Basin (Southern)	Moderate	High
San Joaquin Basin (South)	Moderate	Moderate
San Joaquin Basin (North)	Moderate	Low to Modera
Butte Basin (North)	Low to Moderate	High
Colusa Basin	Low	High
Suisun Marsh	Low	Moderate
San Joaquin Basin (Central)	Low	Low to Modera
Butte Basin (South)	Low	Low
American Basin (North)	Low	Low
Sutter Basin (North)	Low	Low

Desirability/Potential Value: Is a NWR desirable in this area from a biological viewpoint relative to existing and ancestral conditions? Would a NWR aid in the wider distribution of waterfowl, increase food resources, and increase recreational opportunity relative to existing condition?

Feasibility: Can a NWR, practically speaking, be located in the area? Are water and land available? Will the local political situation help an effort to locate a refuge?

*This is an attempt to rank areas listed but should not be considered the final word. Specific ascertainment studies will be required to adequately determine value and feasibility, as well as costs for acquisiton, development, and operation/maintenance.

and increase management flexibility in the Central Valley as a whole. Public hunting opportunities would be provided where none currently exist. It is proposed that ascertainment studies proceed as time and circumstances allow.

b. Yolo By-pass

No NWRs or WMAs are present in this area of ancestral marshes. Creation of a wildlife refuge in this area would greatly aid in bird distribution and provide public hunting and bird watching opportunities presently unavailable. Management of Pacific Flyway waterfowl populations would be greatly aided with a refuge in this area. It is proposed that ascertainment studies proceed as time and circumstances allow.

c. Tulare Lake Bed

Ancestrally, this area was the most important wintering habitat in California. Its huge expanse of water and marsh has been completely eliminated. Late summer-early fall depredations occur, and botulism losses are high. Creation of a large refuge, or several smaller ones, would greatly aid solutions to both problems plus help restore this formerly impressive area. It is proposed that ascertainment studies proceed as time and circumstances allow. The feasibility of establishing a refuge needs to be examined in detail.

d. Kern-Buena Vista Lake Beds

This area would be an appropriate location for a refuge for the same reasons as for the Tulare Lake Bed. Both of these areas have very low incidences of fowl cholera in the winter. It would aid winter management of waterfowl if refuges existed which did not contribute to disease problems. It is proposed that ascertainment studies proceed as time and circumstances permit. The feasibility needs to be investigated critically.

Group II

a. American Basin (Southern)

The American Basin, south of Marysville and north of Sacramento, once contained significant wetland habitat, nearly all of which has been converted to rice culture and other crops. A refuge in this area would greatly contribute to a wider distribution of birds and provide hunting and bird observation opportunities presently unavailable. The area's close juxtaposition to Sacramento would provide a needed, close-in wetland area. Currently, residents must travel long distances to view waterfowl or participate in public hunting. It is proposed that ascertainment studies proceed after Group I areas have been ascertained.

b. Sutter Basin (Southern)

The Sutter Basin was one of the most extensive marsh areas in the Sacramento Valley. It has been entirely reclaimed, with the exception of Sutter NWR in the northern part of the Basin. Creation of a refuge in the Southern Basin would be appropriate. Bird distribution would be facilitated, and public hunting and bird watching opportunities would be provided which are not available presently. It is proposed that ascertainment studies proceed after Group I areas are completed.

c. San Joaquin Basin (South)

An area south of the Grasslands near the San Joaquin River provides a good location for a NWR. Reclamation has proceeded to almost complete elimination of wetlands, although some remain. The area would be generally cholera-free and, thus, be a benefit in late winter management. Public opportunities for hunting and bird watching would be improved, and some pressure would be alleviated on the Mendota WMA. It is recommended that ascertainment studies proceed after Group I areas have been completed.

d. San Joaquin Basin (North)

The area north of the Grasslands near the Stanislaus-Tuolumne Rivers offers a fair location for a refuge. If the Faith-Mapes Ranch area can be preserved, a new refuge would be less justified; however, the area is an ancestral overflow marsh area. The flooding has essentially been controlled and the wetland habitat lost. There is room for a refuge in this area which would aid waterfowl management in the Central Valley. The close location of the town of Modesto would assure high public use of a refuge. There is extensive riparian-oxbow habitat along the San Joaquin River which could be saved and enhanced if acquired as a refuge. It is recommended that ascertainment studies proceed after Group I areas have been completed.

e. Butte Basin (North)

The Upper Butte Basin has been almost completely reclaimed for rice culture, orchards, and other uses. Current habitat is primarily flooded rice lands. The upper Sacramento River riparian-oxbow habitat is being eliminated at a fast pace, and local efforts may not save it. A NWR in this area could protect and enhance Sacramento River riparian habitat and allow restoration of some of the ancestral wetlands once existing. The refuge would provide additional public hunting and non-consumptive activities, easing the pressure on Gray Lodge WMA. It is recommended that ascertainment studies be initiated after Group I areas are completed.

Group III

a. Colusa Basin

A new NWR is not desirable in this area because there are already three. Another would not materially aid management or benefit the waterfowl resource relative to the needs of other areas. No action is recommended.

b. Suisun Marsh

There are two State areas in the marsh. Private interests are doing a good job of managing the habitat, and there is no reason to supplant their efforts with a Federal facility at the taxpayers' expense. There are few areas within the general vicinity of the marsh which are not wetlands. Creation of a NWR would necessitate elimination of private duck clubs. No action is recommended.

c. San Joaquin Basin (Central)

This area includes the Grasslands (East and West), four NWRs and two State WMAs. Relative to other Central Valley areas, the need is not great for any more public areas. No action is recommended.

d. Butte Basin (South-Butte Sink)

Because of the easement program which is designed to preserve the natural marsh in Butte Sink and the reasonably close position of Gray Lodge WMA and the Colusa Basin refuges, another NWR would not be justified. However, acquisition of the Bean Patch may be necessary if private efforts to preserve the sanctuary status of this area fail.

e. American Basin (North)

This is the District 10 area. Sutter NWR and Gray Lodge WMA are close-by. The District 10 clubs, themselves, contribute to wider bird distribution. A new NWR in this area is not now justified, and no action is recommended.

f. Sutter Basin (North)

Sutter NWR is already present here; another NWR would not be justified. Sutter is relatively small, and additions to the existing area would be justified--but not relative to needs in the Central Valley overall. No action is recommended.

4. Water Development Objective

Water shortage is the ultimate limiting factor for California's Central Valley wetlands. Intense competition for existing supplies is reducing the likelihood that adequate water will be available for optimum habitat maintenance in the near future. Virtually no wetlands exist in the Central Valley which do not require imported or pumped ground water for maintenance. The cost of these sources is increasing steadily.

The FWS is engaged in two projects which may provide solutions to the water problem. The first project includes a compilation of present water use on ten NWRs and private wetlands in the Central Valley, comprising about 125,000 acres; and an assessment of the availability of water to fully develop these areas for waterfowl habitat. The assessment includes the study of alternative sources of water (both surface and ground) to determine whether or not an ample supply is available. Costs of acquisition, development, and operation and maintenance will be estimated. This study is being conducted under private contract, and the final report will be completed in February, 1978.

The second project is still in the developmental stage and will involve the field testing of agricultural subsurface tile drainage water for marsh management. Upwards of 600,000 acre-feet of this water will be available in the San Joaquin Valley by the year 2020 and, if usable for marsh management, will help relieve water shortages. The major problem with the water is its high salinity--up to 15,000 ppm Total Dissolved Solids, on average, in the worst areas.

Development of firm water supplies will complement and be a part of the habitat preservation program in Region 1.

B. Estimated Cost to Achieve Objective

1. Acquisition Objective

Figures presented herein (Table 8) must be considered as very rough estimates subject to significant changes during ascertainment studies. Specific percentages of fee to be paid for easements have yet to be worked out and will depend upon the type and location of lands involved and the rights acquired. The estimated cost for the proposed program of conservation easements on 114,500 acres ranges from $27.9 million to $49.5 million. The deferred program of 59,000 acres would cost from $14.2 to $24.9 million if implemented.

The acreages of natural marsh, likewise, are estimates which largely have not been verified with aerial photography. The

Table 8. Estimated costs for preservation and acreages of natural marsh and native pasture to be preserved in conjunction with the Central Valley easement program.

AREA	ACRES	COST (MILLIONS)
Butte Sink	10,000	5.0 to 9.0
Greenfield	800	0.2 to 0.4
Kern NWR-Wasco Area	5,000	1.4 to 2.5
East Grasslands-Crane Ranch Area	8,000	1.6 to 2.8
Outside Grasslands Water District	17,000	3.4 to 6.0
East Grasslands-Flynn Ranch Area	6,000	1.2 to 2.1
Suisun Marsh*	46,000*	11.0 to 19.3*
East Grasslands-Modesto Properties	5,500	1.1 to 1.9
Lurline Creek Area	3,500	1.1 to 2.0
Mendota WMA Area	700	0.1 to 0.3
Willow Creek Area	7,000	2.2 to 3.9
Grasslands Water District	47,000	9.4 to 16.5
Stone-Beach Lakes*	3,000*	1.2 to 2.1*
Faith-Mapes Ranches Area	4,000	1.2 to 2.1
Vina Plain*	10,000*	2.0 to 3.5
RECOMMENDED PROGRAM TOTAL	114,500	27.9 to 49.5

*Suisun Marsh, Stone-Beach Lakes, and Vina Plain make up the Deferred Program:

DEFERRED PROGRAM TOTAL	59,000	14.2 to 24.9

ascertainment process will determine specific project boundaries. The figures in Table 8 should be used for planning purposes only, keeping in mind that the final figures will change, in most cases, during ascertainment proceedings.

2. New Development

It is not possible to estimate costs at this point for new refuge development, because definite refuge sizes and locations have not been determined. Ascertainment studies will develop the acreage figures and the costs for acquisition, development, and operation/maintenance after locations and sizes have been delimited.

C. Criteria Used to Evaluate and Rank Habitat

The criteria used to evaluate and rank Central Valley wetlands included biological value for waterfowl, present and future threats to the wetlands existence, and the overall survivability without FWS intervention.

The biological value assigned to any given wetland complex was largely dependent upon the numbers and species of waterfowl supported. Areas supporting large population levels and/or many species were rated higher over areas supporting low numbers and few species. The mid-September, mid-winter, biweekly, and special waterfowl surveys provided this information. These data were tempered with professional judgment to take advantage of localized conditions and special cases not adequately covered by the broad survey data. Biological value also was based upon the type of wetlands present (natural versus flooded agricultural); the size of the habitat complex; its relationship to existing NWRs, WMAs, and other private wetlands; hunting pressure; and location with respect to agricultural food sources. Presence of the endangered Aleutian goose increased a wetland's value.

Determination of habitat threats was largely based upon recent events in land use change in the area of the wetland; taxes; and estimates of potential future problems with urban-industrial encroachment; water supply; and expense of operation. Most often, the local CDFG biologist had the best information on potential and ongoing local threats to the habitat.

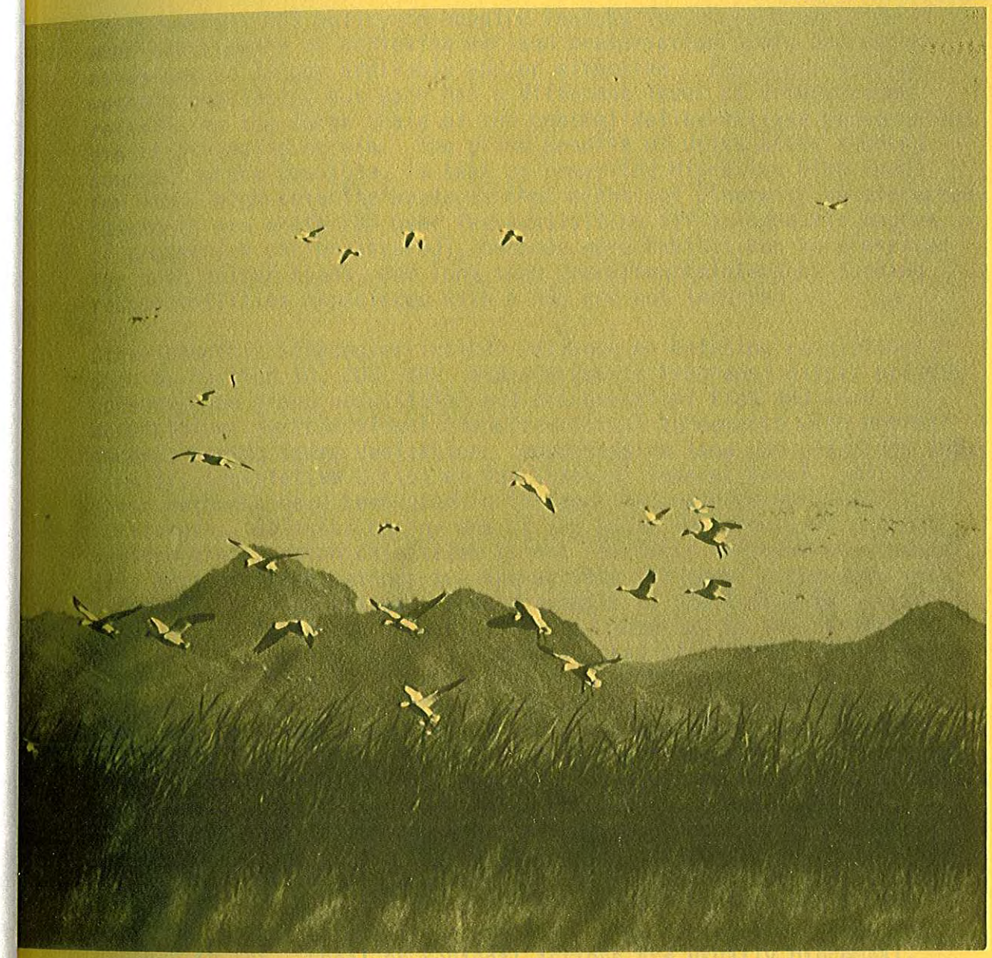
Appendix C presents a detailed description of the criteria and an explanation of how they were applied to arrive at the final ranking.

D. State Views on FWS Program

The California Department of Fish and Game (CDFG) supports the wetland preservation program presented herein. State biologists

have devoted a significant amount of time and effort in aiding the Service in its development of the Concept Plan. We expect that the State's own preservation efforts of the future, utilizing the increased revenues from their State Duck Stamp, will fall within the framework of the FWS program. This will greatly help to attain overall preservation goals for the Valley. The CDFG will be involved at the outset in all easement and fee acquisition efforts by the FWS described in this plan. We anticipate that FWS and CDFG preservation efforts will be highly complementary in the foreseeable future.

Sutter Buttes - Snow Geese



IX. Alternative Strategies

Put all your eggs in the one basket and - WATCH THAT BASKET.

- Mark Twain

IX. ALTERNATIVE STRATEGIES FOR WETLAND PRESERVATION

It is current FWS policy to acquire land by fee or easement only when other means of achieving wetland preservation goals and objectives are no longer available and/or effective. There are several methods available, but each has a different level of effectiveness relative to the large scale of the Central Valley wetland preservation effort presented herein. The prime benefit of using other funding sources, where possible, is that of reserving Migratory Bird Funds for other high-priority wetlands that might not otherwise be protected. Easements are preferred over fee acquisition (if an adequate degree of protection can be assured), because more habitat can be preserved for each dollar spent, and long term operation/maintenance funding responsibilities associated with a NWR are not incurred.

Other possible strategies include reliance on existing regulations, such as Section 10, 208, 402, and 404 Permit Programs; gifts; private conservation group acquisition and preservation; Fish and Game acquisition; jurisdictional transfer; formal agreements with wetland owners; zoning laws; dedication; comprehensive land use planning; and, finally, legislative action at the State or Federal level. All of these methods, have been used in the past to preserve wetlands in California. Reliance on any one of the above to accomplish the FWS wetland preservation objectives is not realistic for several reasons: (1) Most of these methods are appropriate for local situations when a specific problem arises. A good example is the Suisun Marsh Protection Plan contained in a bill enacted into law by the California Legislature. Suisun Marsh is a special case of a large, relatively natural marsh with an international reputation, being adjacent to the second largest urban area in the State and in imminent danger from deteriorating water quality and urban-industrial development; (2) There is not enough money in these other programs to achieve the FWS preservation goals; (3) Most methods--such as donations, transfers, agreements, and legislation--are erratic in their applicability, while implementation of the Service program depends upon a planned, organized approach; (4) The Service has ultimate responsibility for the nation's waterfowl resources, and the present program reflects a Flyway-wide perspective. Local governmental bodies cannot be expected to have this same perspective so do not feel the required urgency to act. Local or regional actions are usually piecemeal, with no overall plan. Past history has shown that while some communities value their wetlands, most do not, and the wetlands have been lost; (5) While comprehensive land use planning could protect wetlands, development and agricultural interests usually dominate planning. Zoning laws change and cannot guarantee preservation of wetlands forever.

California's Williamson Act is used to place agricultural lands in more favorable tax status as agricultural preserves. This law could be strengthened to include relief for wetland preservation. The FWS supports such amendments, and this act should be used where possible. However, the Act has not worked as well as it should even for agricultural lands in some areas. Also, it is not a permanent solution. It would not insure that a piece of habitat would remain as wetlands--only that such land would be taxed at a lower rate while kept as wetlands. Total reliance on strengthening the Williamson Act to preserve wetlands is not advisable.

The Service encourages and supports all of the above wetland preservation strategies and will incorporate them into its overall program. But reliance on any one as "the" strategy is not realistic. The one strategy which will guarantee to protect marshlands in perpetuity and which is sufficiently well funded to provide for significant acreage protection is the FWS Wetland Preservation Program funded with Migratory Bird Funds. The scope and magnitude of the present program requires a heavy dependence on Service involvement. In the final analysis, however, the overall strategy depends upon utilization of all the preservation techniques described above, where appropriate.

A summary of potential funding sources for wetlands protection in the Central Valley of California is presented below for reference:

Federal

1. Migratory Bird Hunting and Conservation Stamp Act (Federal sale of duck stamps used primarily for acquisition of waterfowl lands).

2. Land and Water Conservation Fund (Prior to the passage of the Endangered Species Act of 1973, such funds were only available to the Bureau for endangered species land acquisition. The 1973 Act provides up to two-thirds Federal share of the acquisition cost for State projects).

3. Pittman-Robertson Wildlife Restoration Act (State's share of Federal Excise Taxes on sale of guns and ammunition).

4. Special Appropriations by Congress.

State

1. Environmental Protection Program Act (State sale of personalized auto licenses).

2. Wildlife Conservation Board (State's share of Paramutual Funds and other appropriations to Board, such as Land and Water Conservation Funds for park acquisition).

3. Special legislative appropriations.

4. Wildlife Preservation Fund (State sale of licenses, tags, stamps, etc., for management of State wildlife resources).

5. State Duck Stamp Act of 1970.

6. Williamson Act (California Land Conservation Act).

Private

1. Land Exchange (Federal and State lands can be used for exchange with private lands or with other Federal and State agency lands).

Miscellaneous

1. Private Funding Sources such as Nature Conservancy, Audubon Society, Conservation Foundary, etc., and from local special interest groups and private donations and gifts.

Snow Geese Feeding in Harvested Rice

X. Selected Bibliography

X. SELECTED BIBLIOGRAPHY

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Butte Basin Wetlands (Photo by J. Cowan)

XI. Appendices

APPENDIX A

PROPOSED U.S. FISH AND WILDLIFE SERVICE

MIGRATORY BIRD LAND ACQUISITION PROGRAM

NATIONAL PRIORITY CATEGORIES, FY 1977-1986

APPENDIX A. PROPOSED U.S. FISH AND WILDLIFE SERVICE MIGRATORY BIRD LAND ACQUISITION PROGRAM NATIONAL PRIORITY CATEGORIES, FY 1977-86

Priority	Flyway[1]	Geographic Location	Habitat Type[2]
1	C	Prairie Pothole (ND, SD, MT)	B
2	C	Western Prairie Pothole (ND, SD, NE, MT)	B
3	M	Eastern Prairie Pothole (MN)	B
4	P	California Central Valley	W
5	A	Mid-Atlantic Coast (NC to MA)	W
6	P	Coastal California	W
7	M	Mississippi Delta, Hardwoods (AR, MS, LA)	W
8	C	Coastal Texas	W
9	M	Central Gulf Coast (Primarily LA)	W
10	P	Great Basin (ID, UT, NV)	B
11	M	Outside Prairie Pothole (WI, MI, MN)	B
12	A	Atlantic Coast, Eastern Gulf (Ches. Bay, Del. Bay, GA, NC, SC, FL)	W
13	C	Outside Prairie Pothole (NE, CO, MT, WY)	B
14	P	Coastal Washington	W
15	P	Coastal Oregon	W
16	A	Inland (Primarily NC, SC, GA)	W
17	P	Inland (Primarily CA, WA, OR, ID)	B
18	A	Inland New England	B
19	M	Inland	W
20	P	Inland	W
21	P	Great Basin	B
22	A	Inland (Mostly VA)	W
23	C	Inland (TX, CO, NM, OK, KA)	W
24	P	Coastal (OR, WA)	M
25	A	Coastal (NJ to ME)	M
26	M	Inland	B
27	C	Inland	B
28	C	Coastal	M
29	P	Inland	M
30	M	Inland (Upper Mississippi & Illinois Rivers)	M
31	A	Inland	M
32	C	Inland	M
33	All		R

[1]Flyway Symbols:
P - Pacific
C - Central
M - Mississippi
A - Atlantic

[2]Habitat Type:
B - Breeding
M - Migration
W - Wintering
R - Recreation

APPENDIX B

DISTRIBUTION AND MIGRATION MAPS AND POPULATION DATA

We gratefully acknowledge the cooperation of Stackpole Books, Harrisburg, PA and Frank Bellrose, Jr. in granting permission to reproduce the migration maps from "Ducks, Geese, and Swans of North America", Bellrose, 1976.

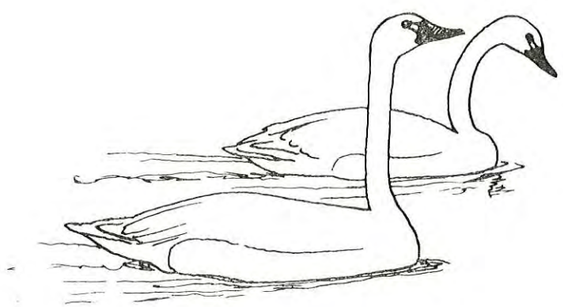
MID-WINTER INVENTORY: WHISTLING SWAN

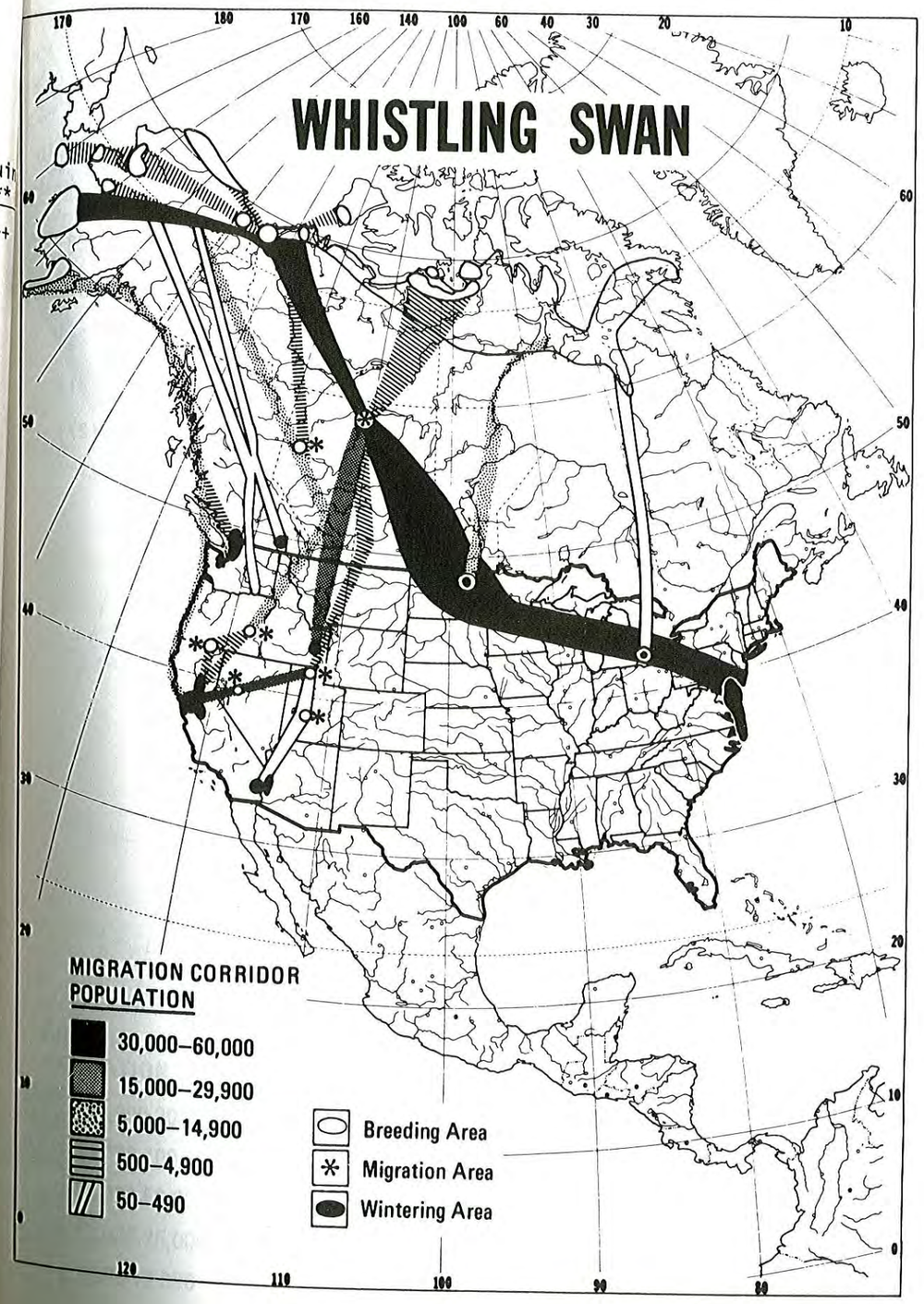
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	47,272	36,485 (77)+	3,395 (9)++	31,465 (86)++	1,625 (5)++
1976	51,350	34,440 (67)	4,480 (13)	29,655 (85)	305 (1)
1975	54,347	44,585 (81)	7,565 (17)	36,735 (82)	285 (1)
1974	69,768	60,300 (87)	28,285 (47)	31,600 (52)	415 (1)
1973	33,917	25,855 (76)	15,705 (62)	9,715 (36)	435 (2)

Flyway population 1954 - 1976 Average: 48,650

Continental Population 1973 - 1977 Average: 113,110

*Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
**San Joaquin and Tulare Basins
+% of Pacific Flyway
++% of Central Valley





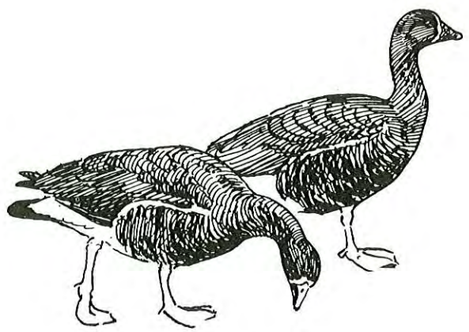
MID-WINTER INVENTORY: WHITE-FRONTED GOOSE

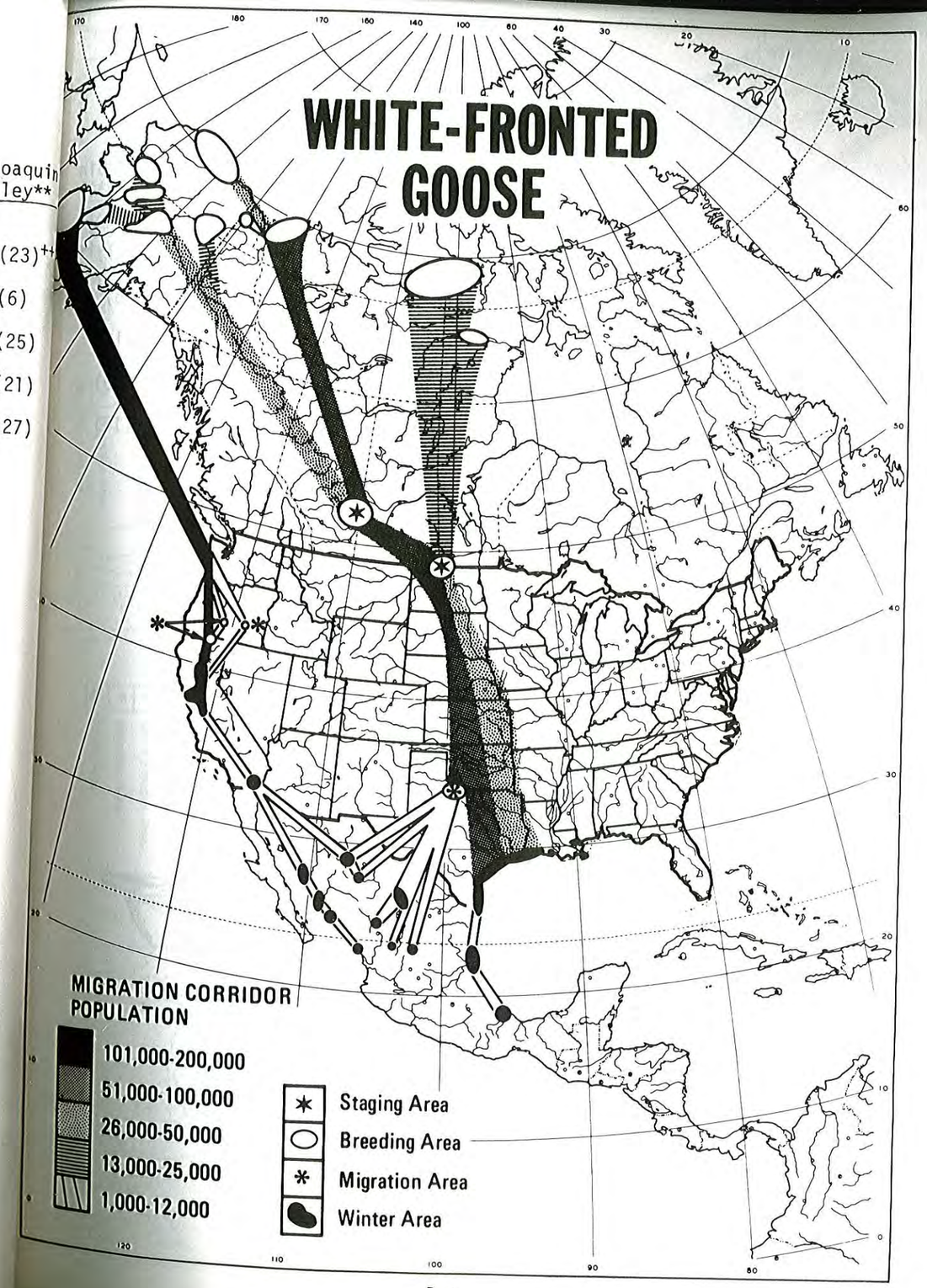
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	50,026	46,815 (94)+	10,300 (22)++	25,900 (55)++	10,615 (23)++
1976	83,071	76,520 (92)	19,785 (26)	52,000 (68)	4,735 (6)
1975	74,490	63,525 (85)	26,750 (42)	20,300 (32)	16,475 (25)
1974	86,718	84,925 (98)	32,700 (38)	34,000 (40)	18,225 (21)
1973	54,815	51,564 (94)	22,400 (43)	15,044 (29)	14,120 (27)

Flyway population 1954 - 1976 Average: 132,378

Continental population 1973 - 1977 Average: 156,500

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





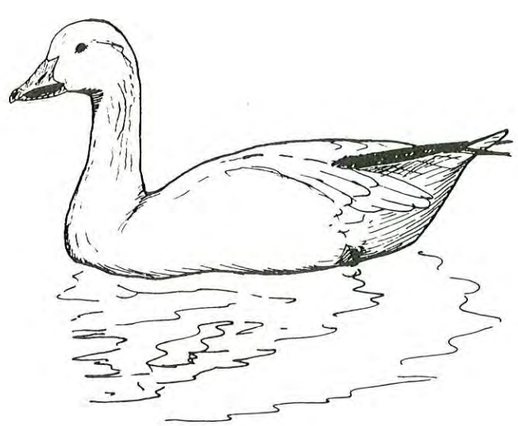
MID-WINTER INVENTORY: LESSER SNOW/ROSS GOOSE+

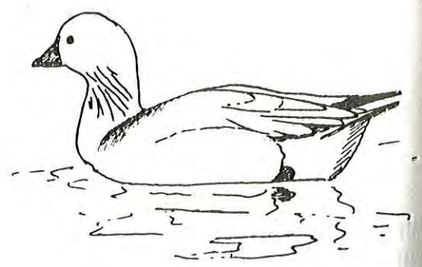
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	507,347	469,055 (92)++	368,870 (78)+++	2,300 (Tr)+++	97,885 (21)+++
1976	487,078	447,395 (92)	362,825 (81)	55,200 (12)	29,370 (6)
1975	446,540	425,380 (95)	353,820 (83)	22,425 (5)	49,135 (12)
1974	443,138	422,175 (95)	355,425 (84)	24,200 (6)	42,550 (10)
1973	343,445	313,610 (91)	263,755 (84)	1,540 (Tr)	48,315 (15)

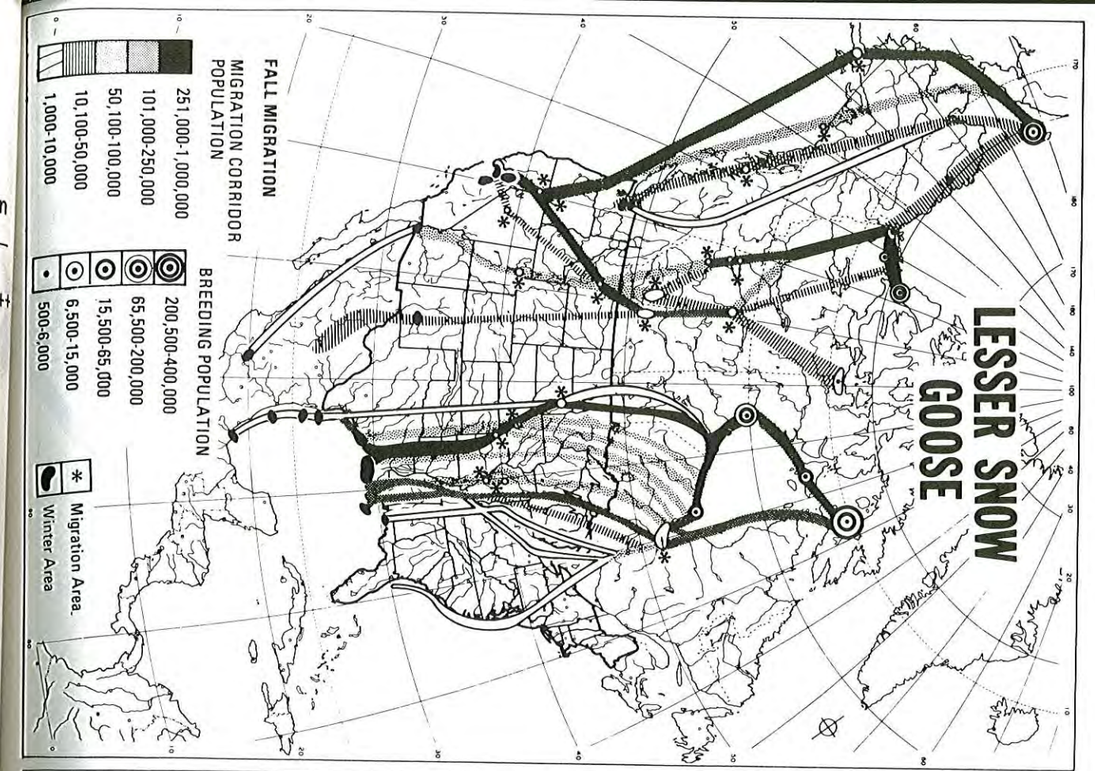
Flyway population 1954 - 1976 Average: 441,056

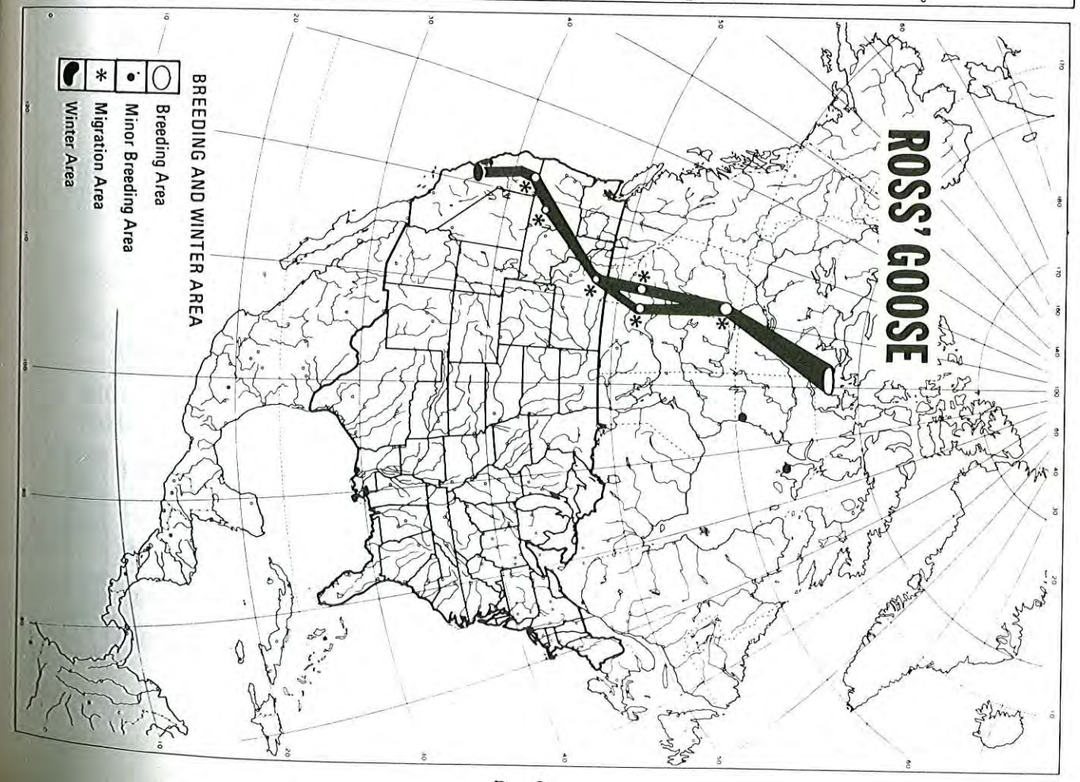
Continental population 1973 - 1977 Average: 1,766,315

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ Data not separated by species; approximately 25,000 Ross Pacific Flyway average
++ % of Pacific Flyway
+++ % of Central Valley









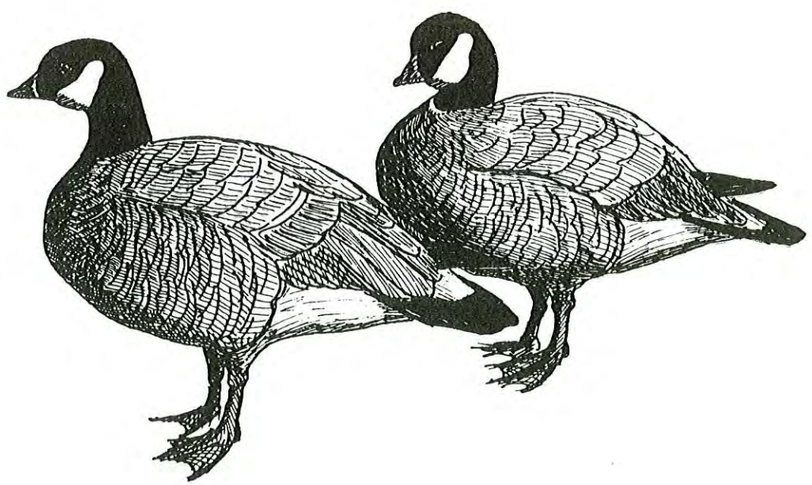
MID-WINTER INVENTORY: CACKLING CANADA GOOSE

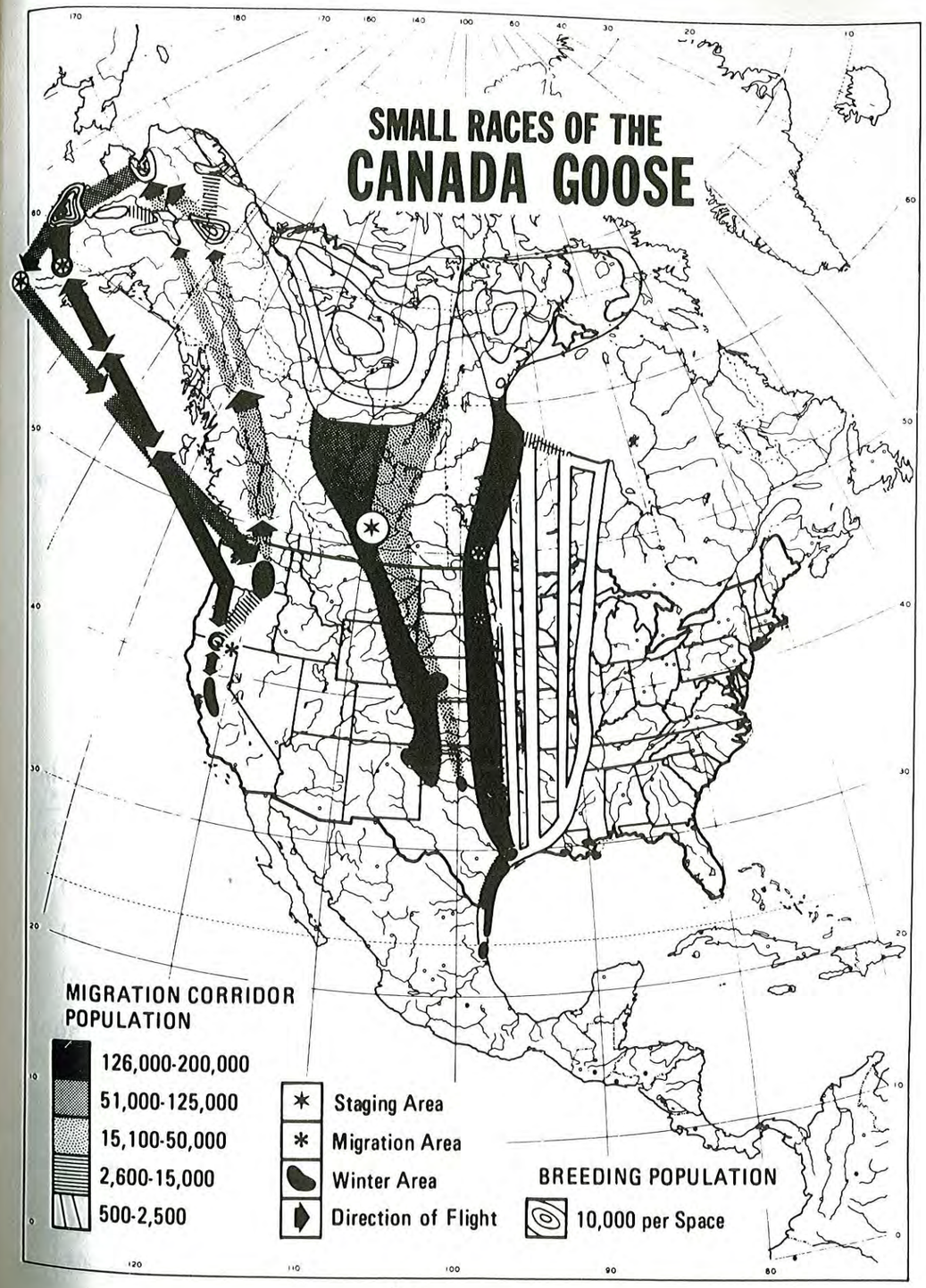
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	56,362	54,900 (97)+	14,625 (27)++	23,400 (43)++	16,875 (31)++
1976	51,250	42,450 (83)	20,750 (49)	11,800 (28)	9,900 (23)
1975	40,794	37,710 (92)	17,950 (48)	8,210 (22)	11,550 (31)
1974	85,872	81,410 (95)	44,860 (55)	2,900 (4)	33,650 (41)
1973	54,440	51,030 (94)	19,750 (39)	7,000 (14)	24,280 (48)

Flyway (Continental) population 1954 - 1976 Average: 125,958

Continental population 1973 - 1977 Average: 57,744

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





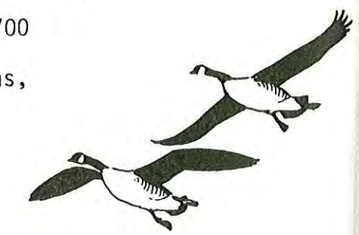
MID-WINTER INVENTORY: GREAT BASIN CANADA GOOSE

	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	143,319	20,270 (14)+	12,365 (60)++	690 (3)++	7,215 (37)++
1976	218,239	16,815 (8)	7,640 (44)	535 (3)	8,640 (53)
1975	133,550	18,630 (14)	6,770 (36)	2,180 (12)	9,680 (52)
1974	111,383	29,490 (26)	22,240 (75)	120 (Tr)	7,130 (24)
1973	112,001	14,160 (13)	12,355 (87)	555 (4)	1,250 (9)

Flyway (Continental) population 1954 - 1976 Average: 84,311

Continental population 1973 - 1977 Average: 143,700

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley



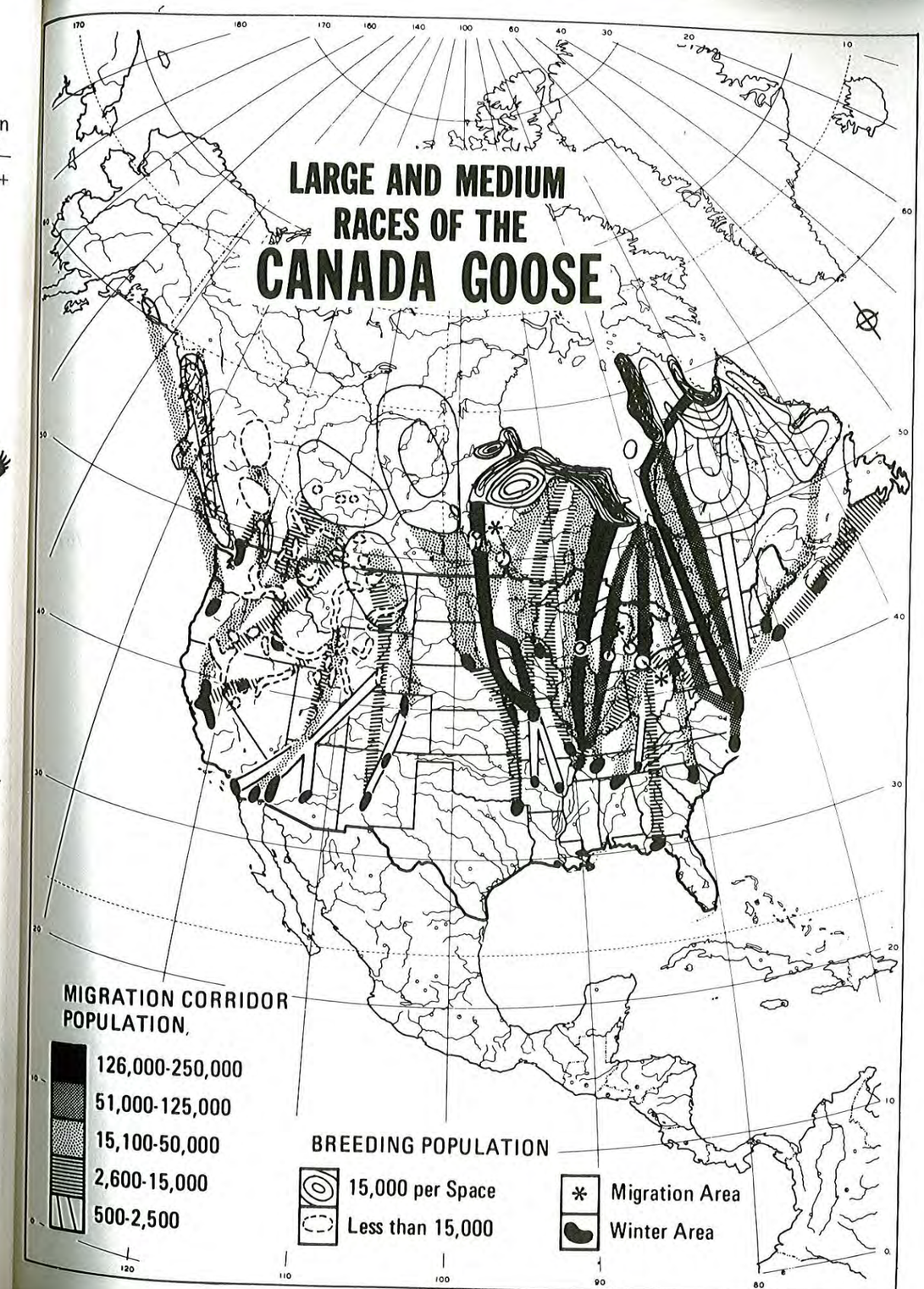
MID-WINTER INVENTORY: LESSER CANADA GOOSE

	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	116,418	12,775 (11)+	4,945 (39)++	2,315 (18)++	5,515 (43)++
1976	101,958	7,805 (8)	4,940 (63)	705 (9)	2,160 (28)
1975	153,408	17,940 (12)	9,075 (51)	2,525 (14)	6,340 (35)
1974	64,452	11,625 (18)	6,590 (57)	875 (8)	4,160 (36)
1973	101,058	14,730 (15)	4,975 (34)	960 (7)	8,795 (60)

Flyway (Continental) population 1954 - 1976 Average: 84,311

Continental population 1973 - 1977 Average: 107,460

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley



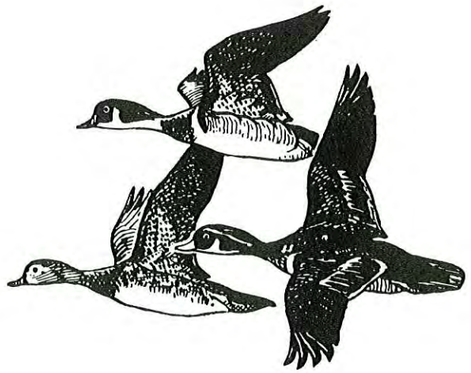
MID-WINTER INVENTORY: WOOD DUCK

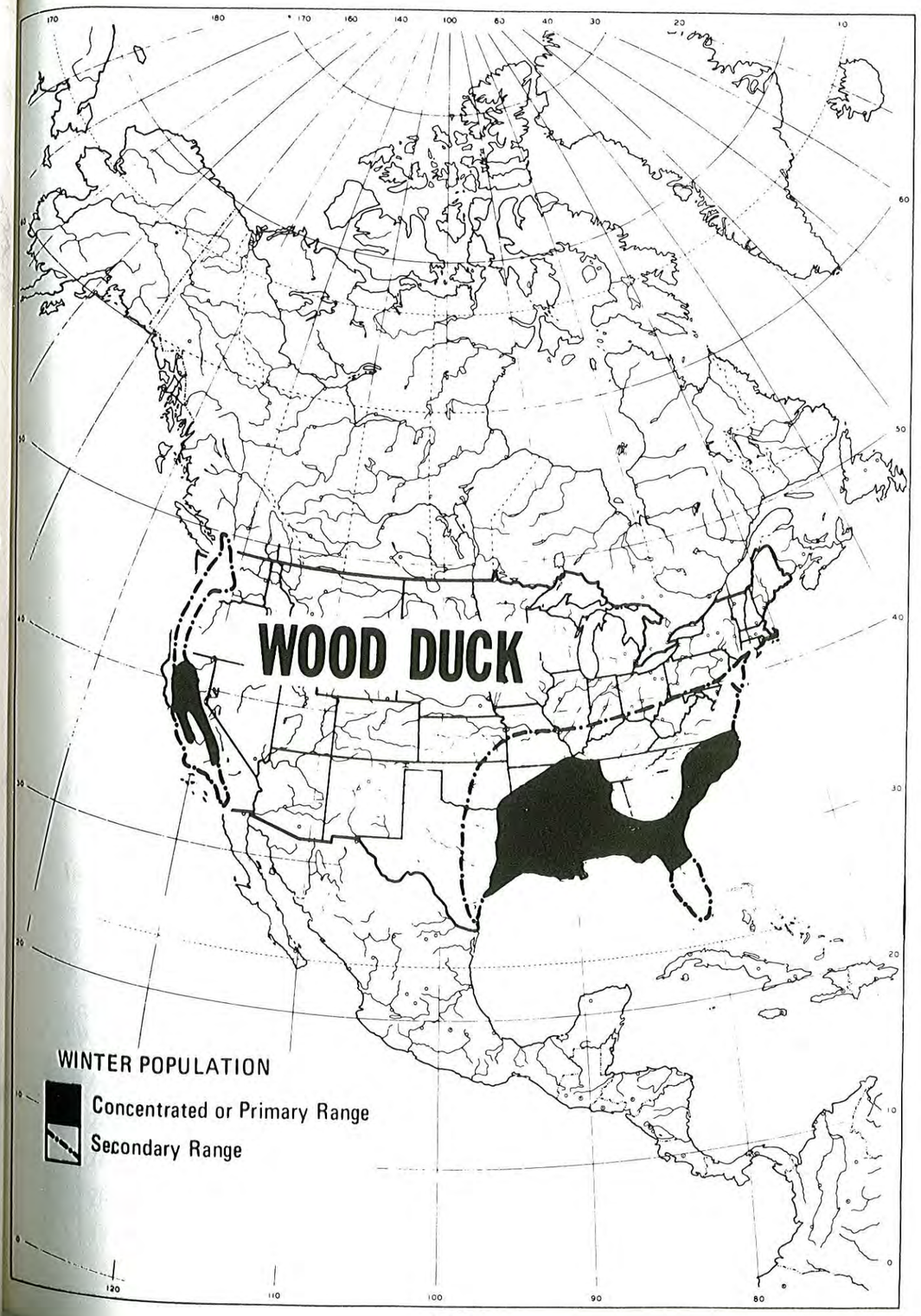
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	1,887	1,660 (88)+	1,650 (99)++	0 (0)++	10 (Tr)++
1976	1,946	1,770 (91)	1,770 (100)	0 (0)	0 (0)
1975	12,099	11,865 (98)	11,865 (100)	0 (0)	0 (0)
1974	3,897	3,630 (93)	3,620 (99)	0 (0)	10 (Tr)
1973	3,919	2,960 (76)	2,960 (100)	0 (0)	0 (0)

Flyway population 1954 - 1976 Average: 3,213

Continental Population Calculated from Banding Data: 1,738,000 (Bellrose 1976)

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





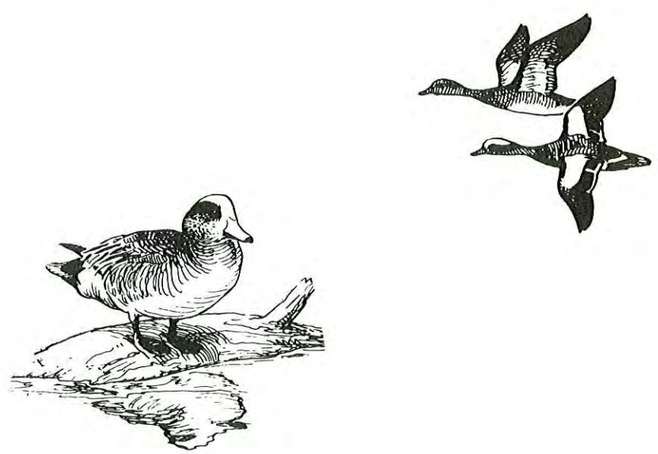
MID-WINTER INVENTORY: AMERICAN WIGEON

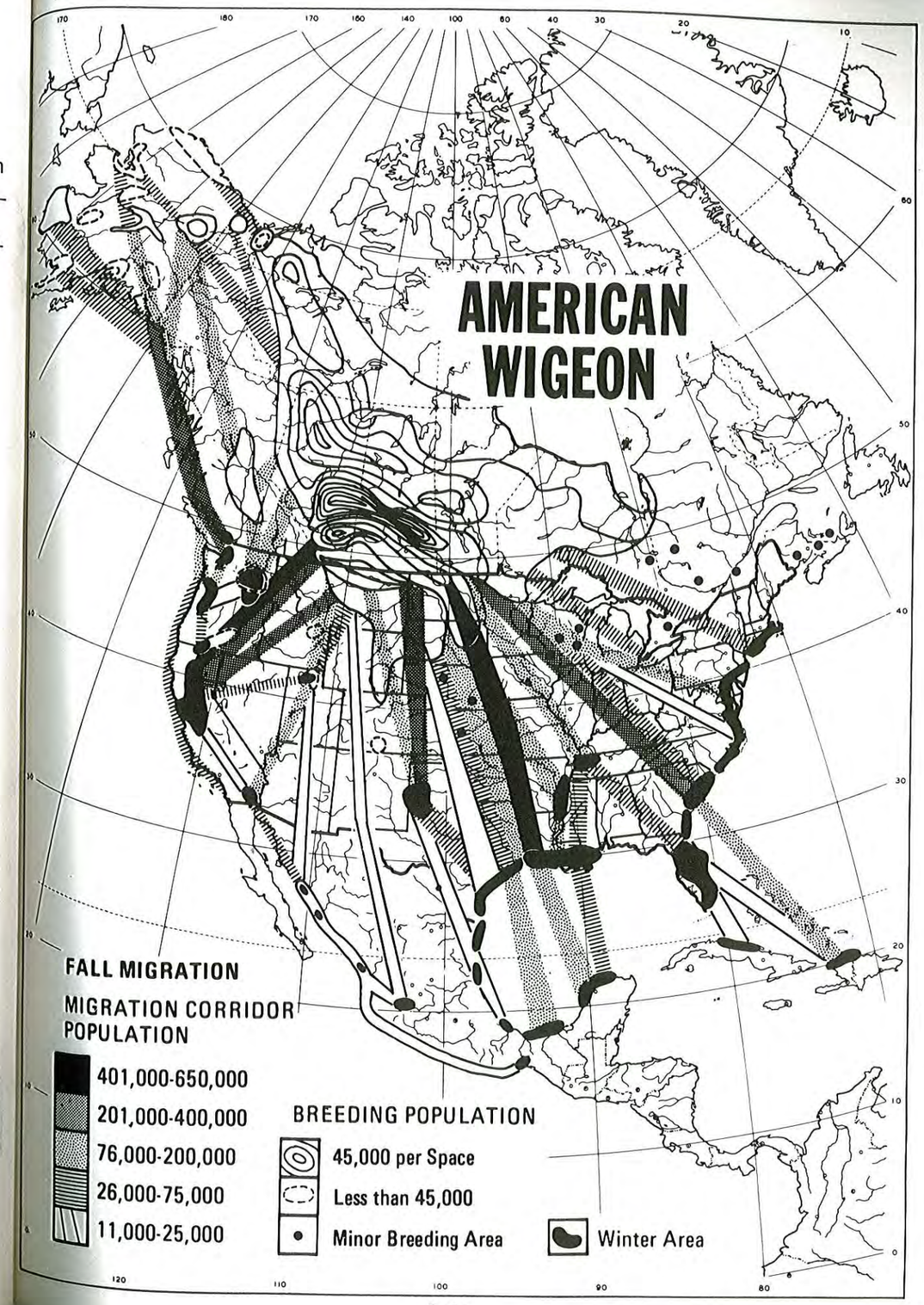
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	713,519	393,455 (55)+	322,890 (82)++	24,915 (6)++	45,650 (12)++
1976	850,315	337,610 (40)	322,925 (96)	8,930 (3)	5,755 (2)
1975	767,318	462,945 (60)	446,880 (97)	600 (Tr)	15,465 (3)
1974	890,135	689,475 (77)	652,120 (95)	1,925 (Tr)	35,430 (5)
1973	817,531	572,625 (70)	482,930 (84)	50 (Tr)	89,645 (16)

Flyway population 1954 - 1976 Average: 940,269

Continental Population 1973 - 1977 Average: 1,466,904

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





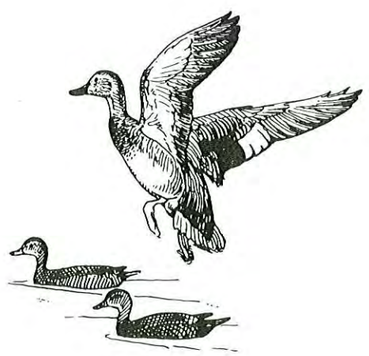
MID-WINTER INVENTORY: GADWALL

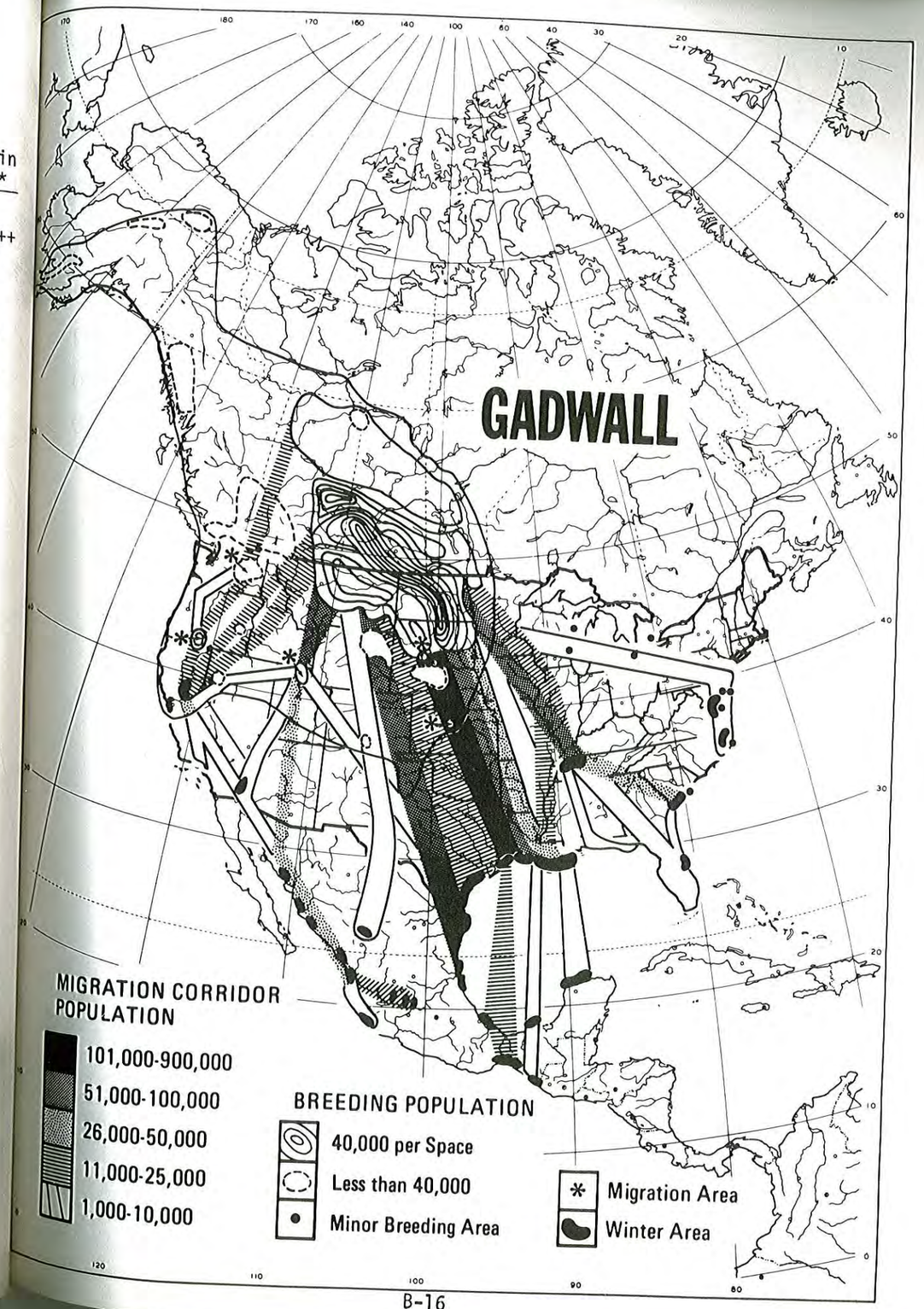
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	29,293	17,165 (59)+	4,120 (24)++	225 (1)++	12,820 (75)++
1976	38,693	12,740 (33)	2,265 (17)	200 (1)	10,275 (79)
1975	34,685	24,350 (70)	16,265 (67)	35 (Tr)	8,050 (33)
1974	28,603	20,475 (72)	12,895 (64)	225 (1)	7,355 (36)
1973	14,312	9,090 (64)	390 (4)	100 (1)	8,600 (95)

Flyway population 1954 - 1976 Average: 40,654

Continental Population 1973 - 1977 Average: 1,289,060

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





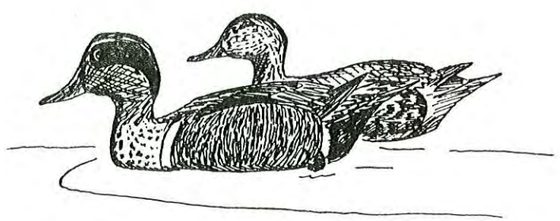
MID-WINTER INVENTORY: GREEN-WINGED TEAL

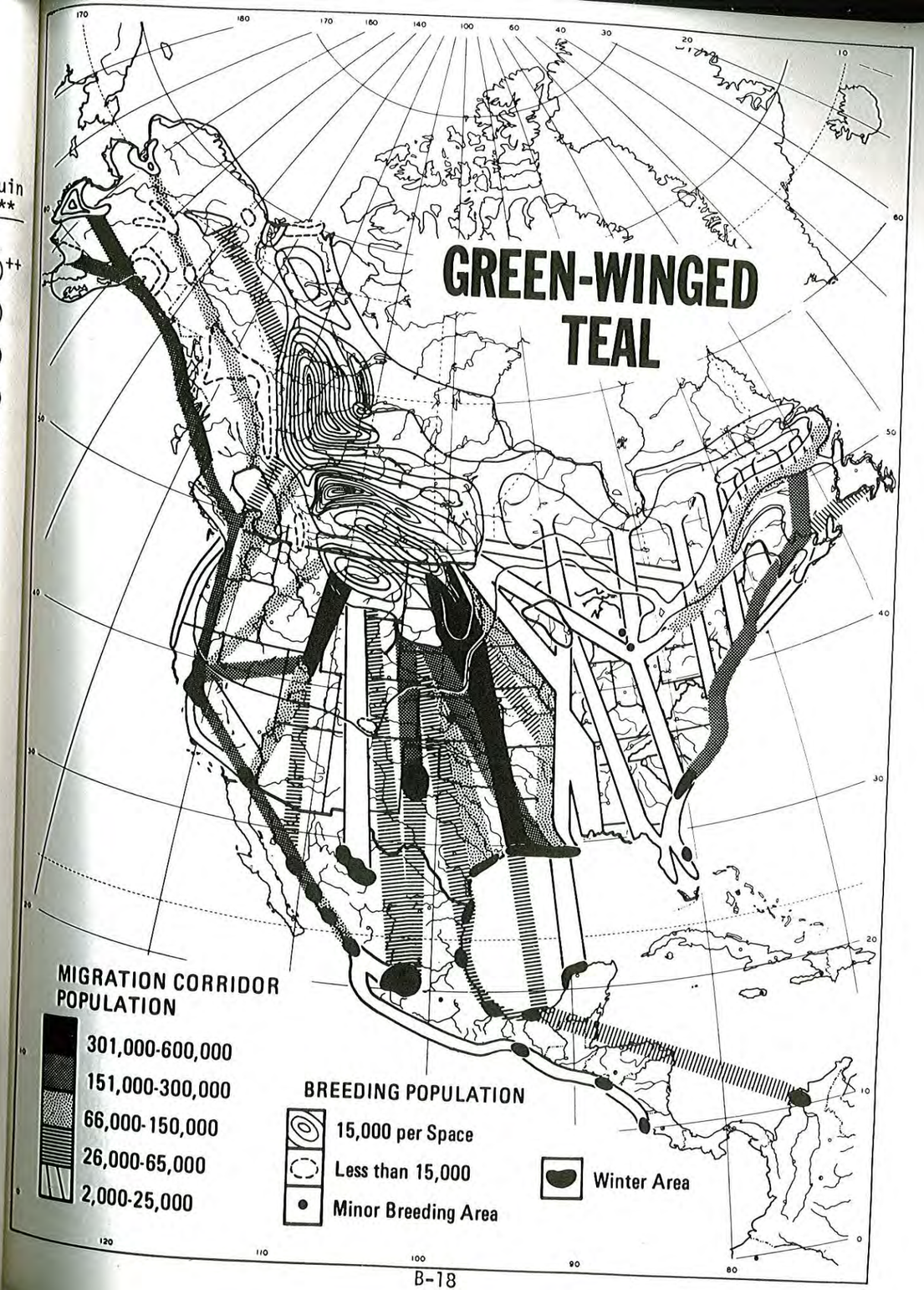
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	367,834	128,550 (35)+	45,900 (36)++	2,985 (2)++	79,665 (62)++
1976	397,691	126,105 (32)	52,125 (41)	7,140 (6)	66,840 (53)
1975	406,695	150,090 (37)	41,660 (28)	140 (Tr)	108,290 (72)
1974	281,133	226,550 (81)	123,145 (54)	675 (Tr)	102,730 (46)
1973	228,109	126,118 (55)	57,500 (46)	2,883 (2)	65,735 (52)

Flyway population 1954 - 1976 Average: 340,978

Continental Population 1973 - 1977 Average: 1,824,830

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





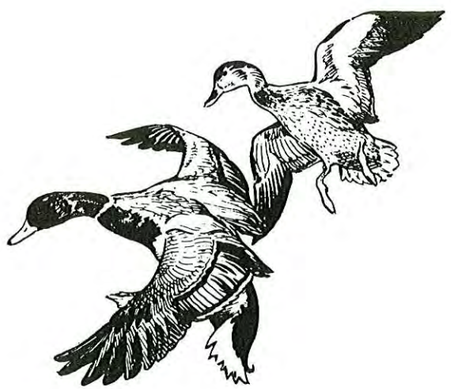
MID-WINTER INVENTORY: MALLARD

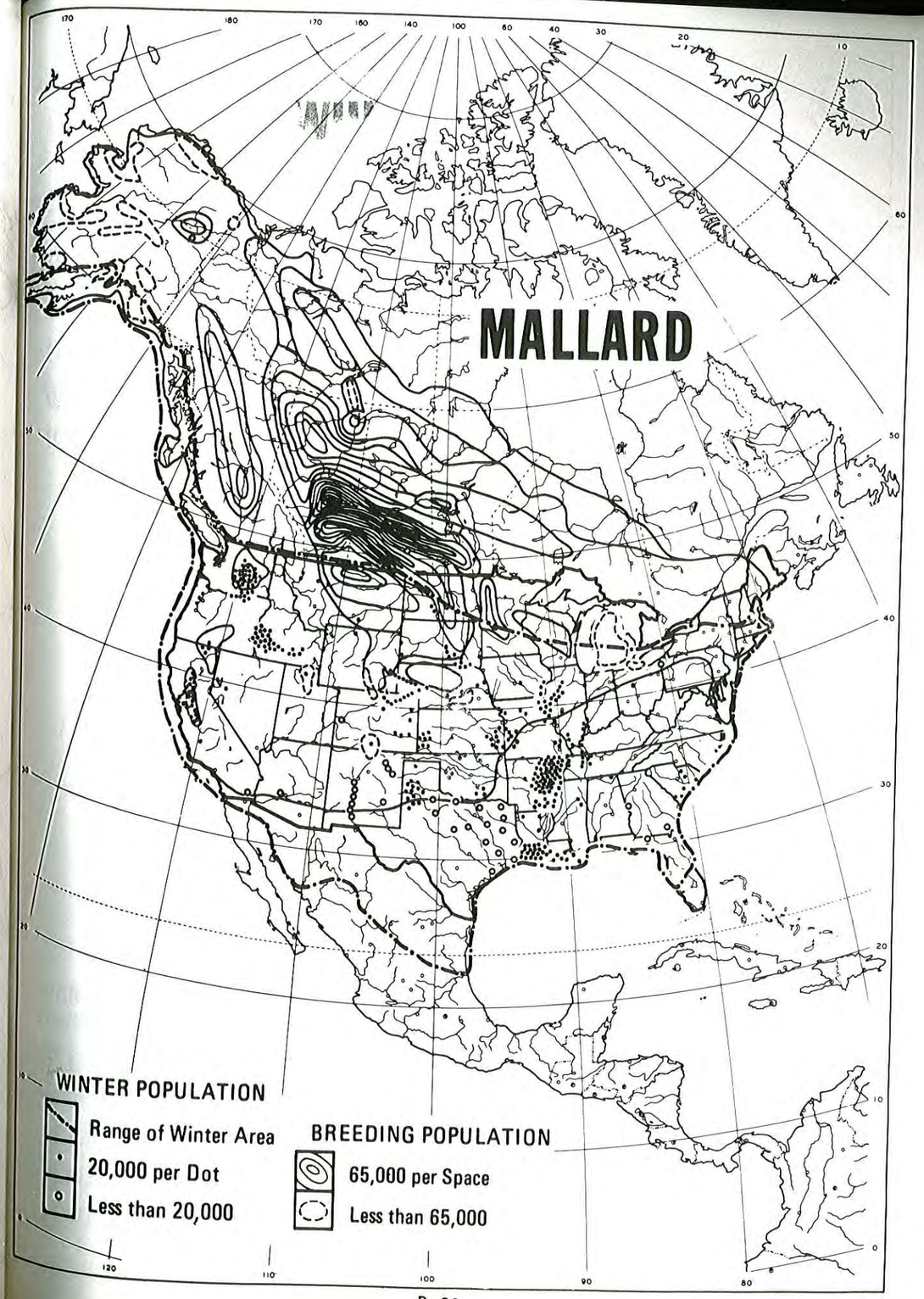
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	1,314,455	348,330 (26)+	204,220 (59)++	48,920 (14)++	95,190 (27)++
1976	1,402,850	346,405 (25)	273,175 (79)	8,095 (2)	65,135 (19)
1975	1,323,010	520,885 (39)	414,470 (80)	20,175 (4)	86,240 (17)
1974	1,519,389	538,336 (35)	474,110 (88)	6,695 (1)	57,530 (10)
1973	1,781,956	319,632 (18)	247,735 (78)	1,407 (Tr)	70,490 (22)

Flyway population 1954 - 1976 Average: 1,937,312

Continental Population 1973 - 1977 Average: 6,672,044

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





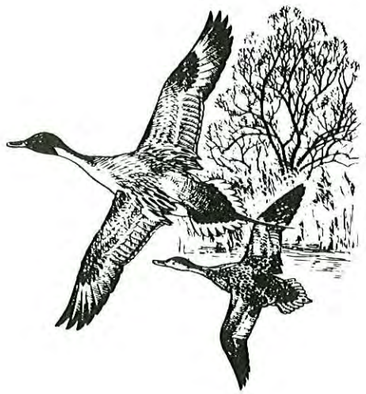
MID-WINTER INVENTORY: PINTAIL

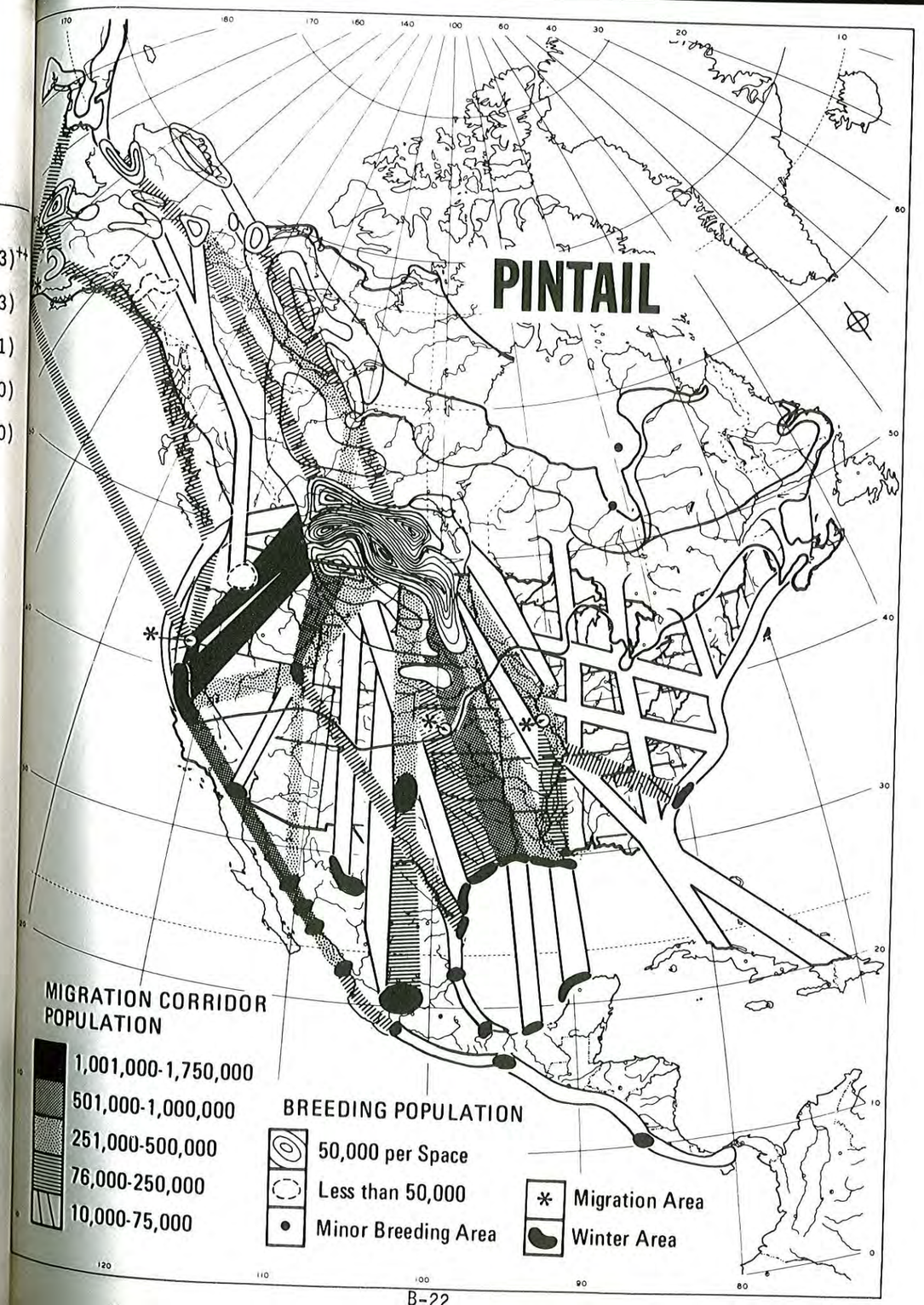
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	4,163,783	3,329,705 (80)+	1,278,530 (38)++	961,485 (29)++	1,089,690 (33)++
1976	4,013,611	2,806,155 (70)	1,365,355 (49)	502,670 (18)	938,130 (33)
1975	4,325,704	3,046,680 (70)	1,865,955 (61)	537,465 (18)	643,260 (21)
1974	3,655,666	3,264,470 (89)	2,218,465 (68)	75,715 (2)	970,290 (30)
1973	3,592,792	2,704,812 (75)	2,142,160 (79)	11,262 (Tr)	551,390 (20)

Flyway population 1954 - 1976 Average: 2,848,196

Continental Population 1973 - 1977 Average: 5,789,503

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





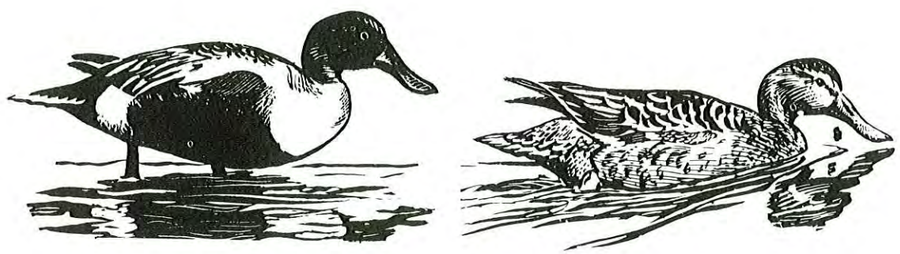
MID-WINTER INVENTORY: SHOVELER

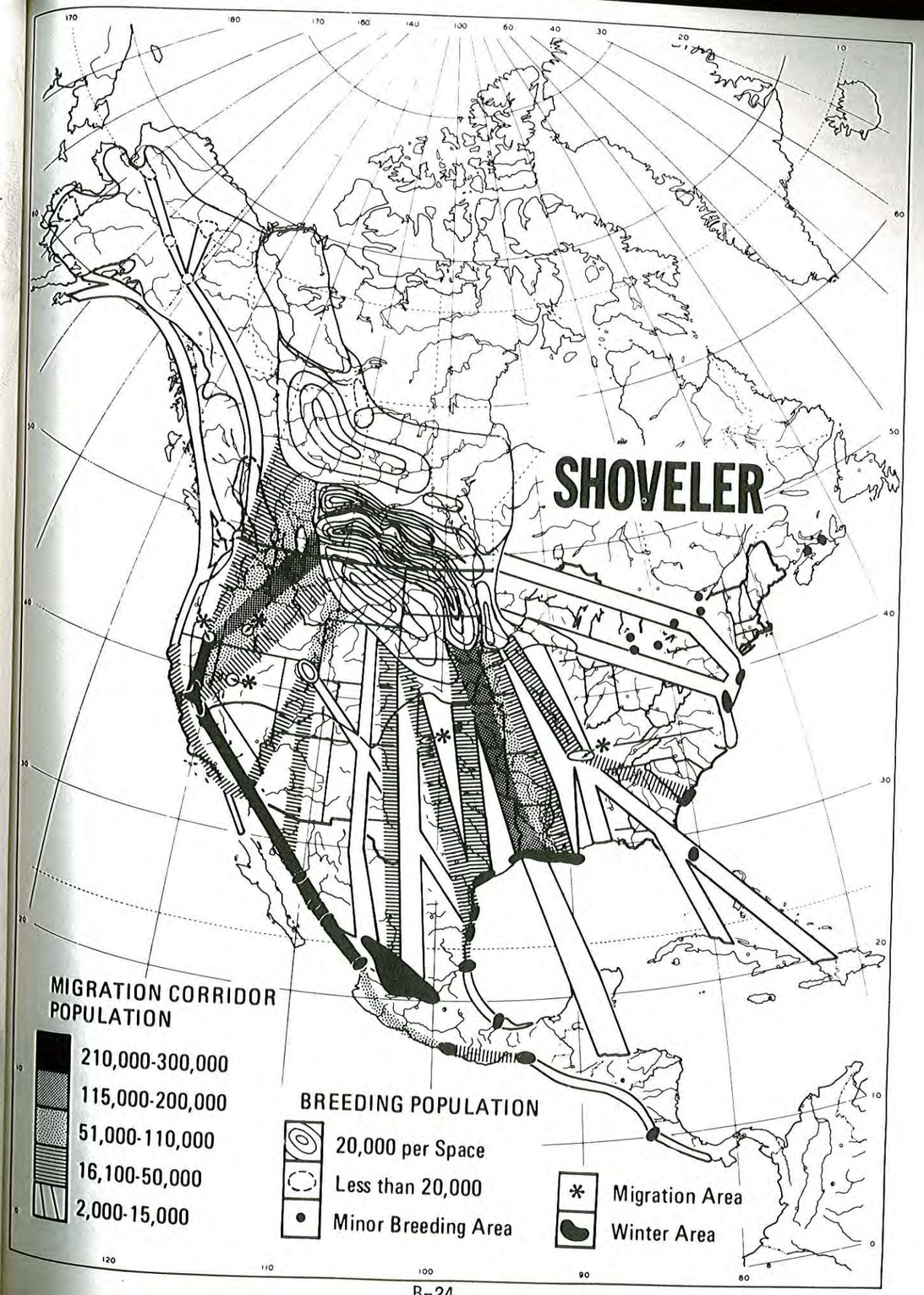
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	847,374	700,900 (83)+	41,655 (6)++	44,190 (6)++	615,055 (88)++
1976	681,868	565,345 (83)	51,120 (9)	20,335 (4)	493,890 (87)
1975	823,982	586,715 (71)	27,300 (5)	8,375 (1)	551,040 (94)
1974	509,794	453,720 (89)	146,075 (32)	4,705 (1)	302,940 (67)
1973	695,967	603,895 (87)	67,655 (11)	3,825 (1)	532,415 (88)

Flyway population 1954 - 1976 Average: 381,167

Continental Population 1973 - 1977 Average: 996,915

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





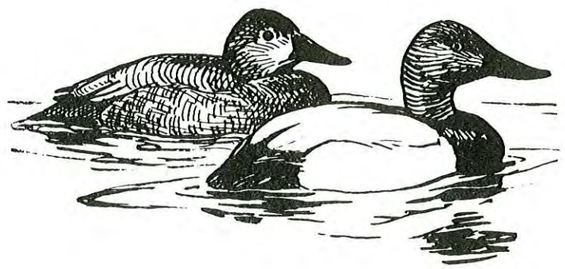
MID-WINTER INVENTORY: CANVASBACK

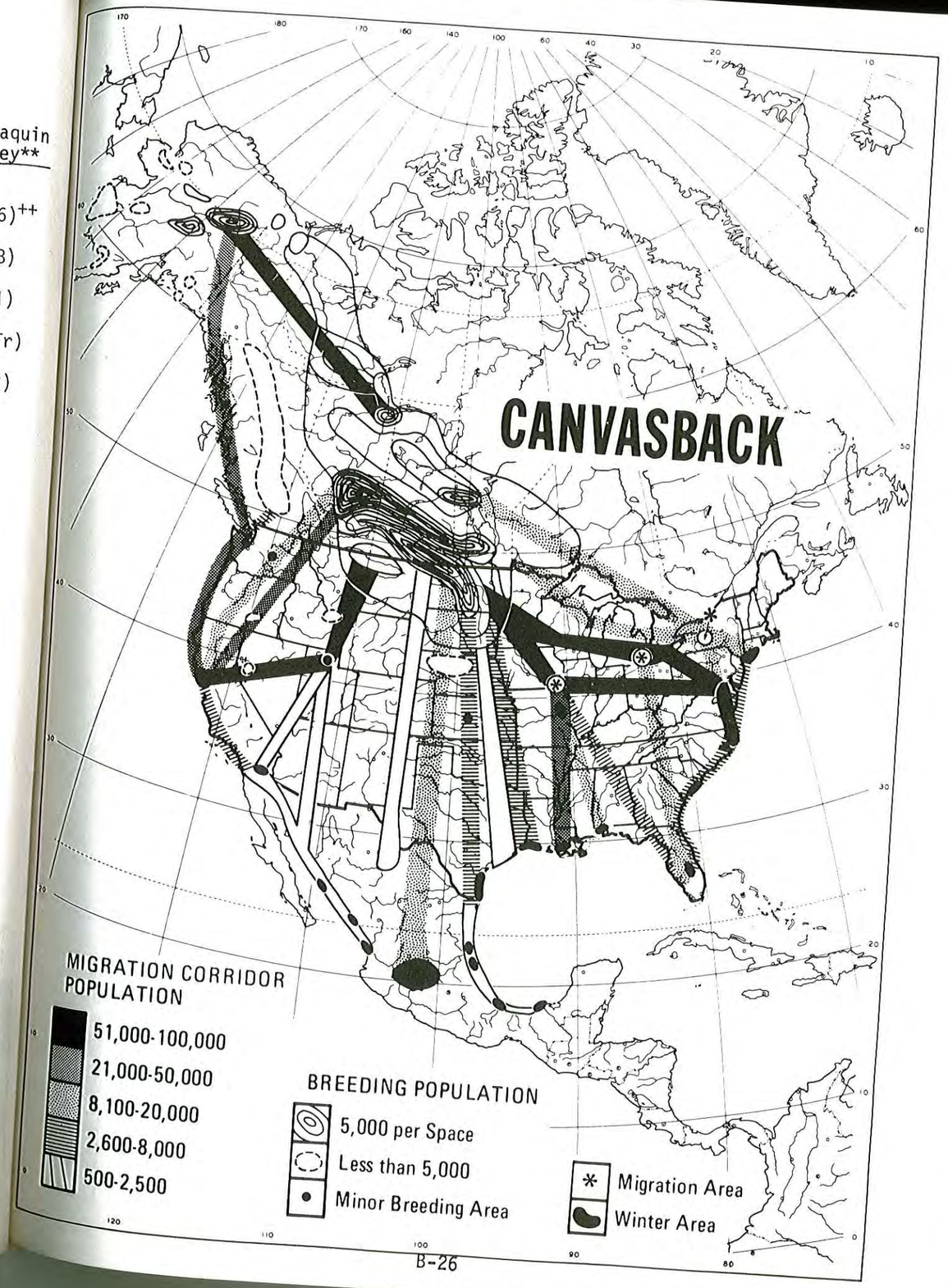
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	90,420	44,005 (49)+	8,650 (20)++	32,680 (74)++	2,675 (6)++
1976	83,711	20,395 (24)	10,685 (52)	8,075 (39)	1,635 (8)
1975	78,933	47,170 (60)	26,895 (57)	19,895 (42)	380 (1)
1974	83,360	52,735 (63)	50,190 (95)	2,495 (5)	50 (Tr)
1973	54,719	9,745 (18)	2,610 (27)	6,950 (71)	185 (2)

Flyway population 1954 - 1976 Average: 74,094

Continental Population 1973 - 1977 Average: 217,650

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





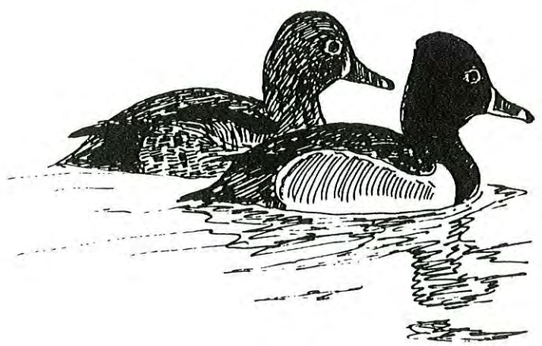
MID-WINTER INVENTORY: RING-NECKED DUCK

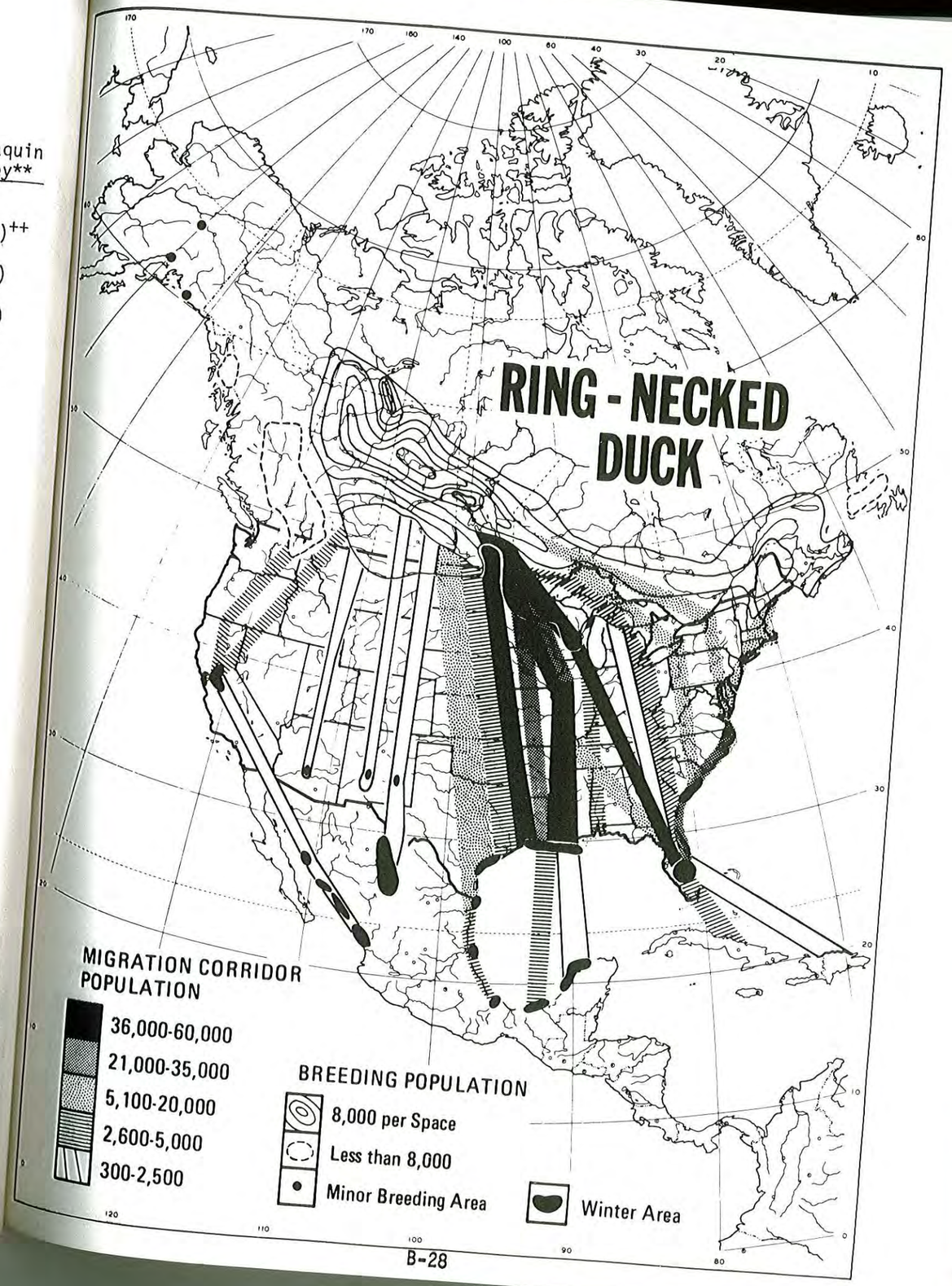
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	2,699	220 (8)+	155 (70)++	0 (0)++	65 (30)++
1976	4,628	1,440 (28)	1,300 (90)	0 (0)	140 (10)
1975	3,392	1,285 (38)	1,025 (80)	50 (3)	210 (17)
1974	3,173	1,855 (58)	1,745 (94)	0 (0)	110 (6)
1973	6,317	1,630 (26)	1,480 (91)	0 (0)	150 (9)

Flyway population 1954 - 1976 Average: 5,365

Continental Population 1973 - 1977 Average: 144,960

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





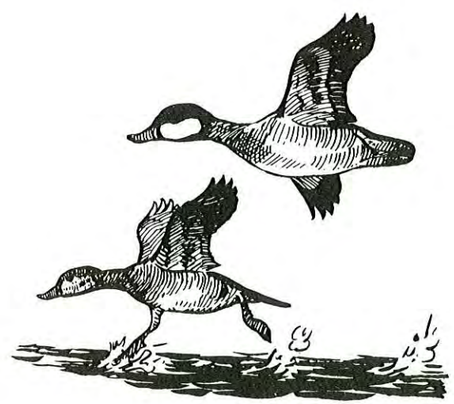
MID-WINTER INVENTORY: RUDDY DUCK

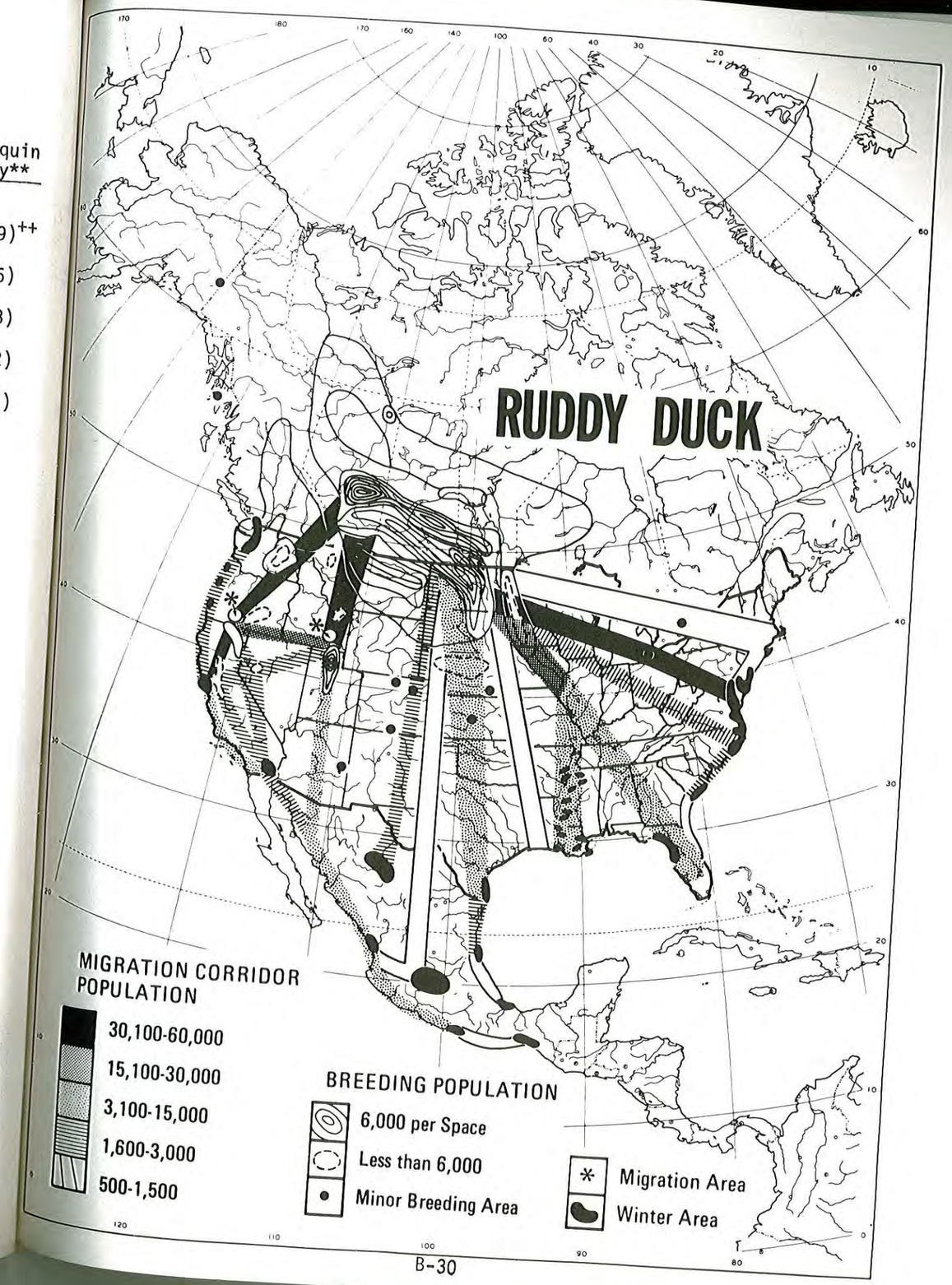
	Pacific Flyway	Central Valley	Sacramento* Valley	Delta-Suisun	San Joaquin Valley**
1977	141,560	21,815 (15)+	1,900 (9)++	9,175 (42)++	10,740 (49)++
1976	108,443	22,610 (21)	4,815 (21)	2,710 (12)	15,085 (66)
1975	73,861	9,575 (13)	2,220 (23)	1,380 (14)	5,975 (63)
1974	126,504	48,935 (39)	36,035 (74)	1,910 (4)	10,990 (22)
1973	100,292	14,290 (14)	3,660 (26)	820 (6)	9,810 (68)

Flyway population 1954 - 1976 Average: 117,426

Continental Population 1973 - 1977 Average: 180,116

* Butte, Sutter, Colusa, Yolo, and American Basins, plus District 10
** San Joaquin and Tulare Basins
\+ % of Pacific Flyway
++ % of Central Valley





APPENDIX C

HABITAT EVALUATION CRITERIA, SAMPLE COMPLETED FORM USED TO RANK WETLANDS, AND EVALUATION SESSION PARTICIPANTS

WETLAND EVALUATION - PARTICIPANTS

U.S. Fish & Wildlife Service
- William Sweeney, Area Manager, Sacramento
- Edward Collins, Area Office, Sacramento
- Pat O'Halloran, Area Office, Sacramento
- Richard Bauer, Regional Office, Portland
- Michael Miller, Regional Office, Portland
- Frank Michny, Ecological Services, Sacramento
- Dianne Weinrich, Ecological Services, Sacramento

California Department of Fish & Game
- Fred Worthley, Wildlife Mgt. Supervisor, Sacramento
- Frank Kozlik, Waterfowl Coordinator, Sacramento
- Bob LeDonne, Asst. Waterfowl Coordinator, Sacramento
- Jerry Cawthon, Manager, Los Banos WMA
- Clyde Edon, Manager, Grizzly-Joice Islands WMAs
- Trev Wright, Wildlife Mgt. Supervisor (Region II), Sacramento

California Waterfowl Association
- Dan Chapin, Executive Secretary

National Audubon Society
- Glenn Olson, Asst. Western Regional Director

National Wildlife Federation/California Natural Resource Federation
- Jim Scarff

Waterfowl Habitat Owners' Alliance
- Martin Winton

Sierra Club
- Tammy Niday and Susan Dong

Butte Lodge Outing Club
- Dr. Andrew Henderson

RANKING SYSTEM FOR CALIFORNIA WINTERING WATERFOWL HABITAT

General

A ranking system has been developed to assist in the evaluation of significant wetlands of importance to wintering waterfowl in the Central Valley. Wetland areas are categorized by major drainage basin.

The ranking system covers existing wetlands and areas potentially of value for development of new wetlands. Existing wetlands will be evaluated under three basic groups of criteria: (1) Biological value of the area to waterfowl; (2) Socio-economic and political environment affecting each area; and (3) The overall survivability of the wetland without Federal or State intervention. Areas for potential development will be identified and evaluated as to their desirability and potential biological value.

A point system has been developed to aid in quantification of biological value, threats to the habitat, and survivability. Each major category will be tabulated separately, and professional judgment will be used to arrive at a final ranking. The final ranking will take into account the biological importance of the area, the threats to the habitat, and overall survivability. Values arrived at are strictly for guidance purposes, to be used as an aid in decision-making. Final rankings are still subject to change because of potential for changing biological conditions and/or changes in the socio-economic and political situation.

Description of Ranking Factors

I. Existing Wetlands

A. BIOLOGICAL VALUE TO WATERFOWL

1. Habitat Quality

Each wetland area is to be evaluated as to the quality of seasonal and permanent wetlands present in providing waterfowl food and rest. Natural marshes receive an automatic 10 points to emphasize their value over and above these wetlands consisting primarily of flooded agricultural fields.

a. Natural Marsh: 10 points

b. All wetlands:

Food: High (10-15), Moderate (5-10), Low (0-5) (3x multiplier)
Rest: High (10-15), Moderate (5-10), Low (0-5)
Disease Potential: High (0-5), Moderate (5-10), Low (10-15)

2. Size of Habitat

In general, the larger a block of habitat, the more value it has.

a. Large (15,000 acres or more): 10-15 points

b. Medium (1000 to 15,000 acres): 5-10 points

c. Small (less than 1000 acres): 0-5 points

3. Location of Habitat

The relationship of important wetlands to existing National Wildlife Refuges (NWRs) and Wildlife Management Areas (WMAs) and agricultural food sources influences its value. Preservation of wetlands adjacent to existing refuges will preserve additional roosting and feeding grounds, thus guaranteeing waterfowl use over a larger area in perpetuity. Conversely, it is desirable to increase the distribution of waterfowl so wetlands which enlarge the range of waterfowl populations will receive higher values than those which are in an area "saturated" with habitat. Wetlands close to agricultural food sources will receive a higher value than those at considerable distance.

a. Benefits to existing NWRs and WMAs: High (10-15), Moderate (5-10), Low (0-5)

b. Aids in wider distribution of populations: High (10-15), Moderate (5-10), Low (0-5) (2x multiplier)

c. Relationship to agricultural food sources: Adjacent (10-15), Near (5-10), Far (0-5)

4. Principal Species of Concern

All waterfowl species wintering in the California Central Valley are important. However, several species winter in higher numbers elsewhere or use California primarily for breeding. The following list includes those species of which major populations winter in California's Central Valley. The "other dabbler" and "other diver" categories take into account species whose major populations winter in other parts of California or the Pacific Flyway. Population data from mid-winter, mid-September and biweekly inventories will provide the basis for evaluation.

a. Total Population: High (10-15), Moderate (5-10), (Numbers of Birds) Low (0-5)

b. Swans: High (10-15), Moderate (5-10), Low (0-5)

c. Final Geese: High (10-15), Moderate (5-10), Low (0-5) (1.5x multiplier)
   - Ross Goose
   - Lesser Snow
   - Cackling Goose
   - Lesser Canada
   - Great Basin Canada
   - White fronted

d. Final Dabblers: High (10-15), Moderate (5-10), Low (0-5) (3x multiplier)
   - Pintail
   - Mallard
   - American Wigeon
   - Gadwall
   - Green-winged teal
   - Shoveler
   - Others

e. Final Divers: High (10-15), Moderate (5-10), Low (0-5)
   - Canvasback
   - Ruddy
   - Ring-necked
   - Other

5. Endangered/Threatened/Rare Species

A particular wetland area will be considered to have added value if it supports Aleutian Canada Geese.

a. Aleutian Canada Goose: High (10-15), Moderate (5-10) Low (0-5)

B. THREATS TO THE HABITAT (SOCIO-ECONOMIC) - In all cases, short term values reflect problems arising over a period of less than five years; moderate term implies problems arising over a five-to-ten year period, and long term implies greater than ten years.

1. Taxes

The present tax burden and future tax increases will be a factor in the wetlands' survival.

2. Water Availability to Maintain Wetlands

The greater the threat to the water supply, and the sooner the threat will materialize, the higher the score:

a. Present Problem: High (10-15), Moderate (5-10), Low (0-5)

b. Future Problem: Short Term (10-15), Moderate (5-10), Long Term (0-5)

(5x multiplier applied to a. and b.)

3. Economic Incentives and Practicability to Convert Wetlands to Agriculture (i.e., Probability)

a. High (10-15)
b. Moderate (5-10)
c. Low (0-5)

4. Current Operational Expense

In general, those wetlands requiring a great expenditure of money to operate and maintain will receive a higher score than wetlands with little O/M requirements, because the former are most likely to be lost first.

Operational/Maintenance Expense

a. Present Problem: High (10-15), Moderate (5-10), Low (0-5)
b. Future Problem: High (10-15), Moderate (5-10), Low (0-5)

5. Likelihood of Industrial/Urban Development

The probability for industrial/urban development, such as oil/gas, power plants, housing tracts, etc., will be assessed as to their type and probability:

a. Probability: High (10-15), Moderate (5-10), Low (0-5)
b. Type: Heavy impact (10-15), Moderate Impact (5-10), Low Impact (0-5)

6. Preservation Likelihood Without Federal Intervention

a. Good (Will survive at least 25 years) (0-5) points
b. Fair (50/50 chance of long-term survival) (5-10) points
c. Poor (Lost within 0-10 years) (10-15) points

II. New Wetland Development

Nearly all naturally occurring marshes (those requiring no O/M) have been reclaimed. Future waterfowl management programs may depend upon establishment of new wetlands, once those existing have been preserved. Evaluate identified areas as to their desirability and potential biological value (taking into account potential habitat quality, distribution, location, etc.). No numerical ranking is intended:

a. Desirability: High, Moderate, Low
b. Potential Biological Value: High, Moderate, Low
c. Feasibility: High, Moderate, Low

I. EXISTING WETLANDS

A. Biological Value

Basin:	Butte Sink	Upper Butte Basin	Vina Plains	Sutter Bypass	Outside Bypass	Willow Creek	Lurline Creek	Yolo Bypass	Outside Bypass	Natomas	Lincoln Wheatland Nicolaus	District 10	Suisun Marsh	Stone Lakes	Delta	Farmington-Escalon	Grasslands Water Dist.	West Grasslands Outside District	East Grasslands Flyn	Crane	Modesto Properties	Faith-Mapes Ranches	Mendota Area	Tulare Lake Bed	Kern-Wasco NWR Area	Greenfield Area
	BUTTE			SUTTER		COLUSA		YOLO		AMERICAN			DELTA				SAN JOAQUIN						TULARE			
1. Habitat Quality:																										
Natural Marsh vs. Ag. flood	10	0	10	0	0	10	10	0	0	0	0	0	10	10	0	0	10	10	10	10	10	10	10	0	10	10
Food 3X	15	10	7	12	10	10	10	12	10	10	5	8	15	15	15	10	12	12	12	14	10	12	10	6	10	5
Rest	15	5	10	5	3	3	3	7	3	3	2	7	10	5	15	3	10	10	15	14	15	15	14	15	12	10
Disease Potential	15	13	15	5	7	5	5	5	5	5	10	12	12	12	0	12	11	11	3	4	12	15	14	0	10	12
2. Size of Habitat	12	12	15	8	5	9	7	10	6	3	5	10	15	6	15	5	15	12	8	8	8	8	4	15	11	4
3. Location:																										
Benefits Refuge	15	12	9	15	15	15	15	5	5	5	5	12	15	5	8	5	15	15	15	12	12	5	15	10	12	5
Bird Distribution 2x	10	12	12	12	12	10	10	13	13	13	13	10	10	10	15	12	10	9	14	14	14	14	3	14	14	15
Ag. Food sources	15	15	9	15	15	15	15	13	13	15	10	15	10	12	15	13	10	10	10	10	10	8	8	12	12	10
4. Species of Concern:																										
Swans	10	10	1	8	7	5	5	12	12	8	5	3	1	3	15	1	2	1	2	2	2	1	1	0	0	0
Ross/Snow	15	9	1	9	9	7	7	12	12	9	7	1	3	3	9	1	3	3	12	12	10	2	1	1	1	1
Cackler/Lesser/Great Basin	13	8	14	7	7	7	7	10	10	5	5	3	3	3	5	3	2	2	14	14	12	12	8	1	1	1
White-fronted	13	7	2	8	7	7	7	10	10	6	5	3	10	2	15	2	2	2	12	12	12	12	13	1	1	1
Geese (Ave) 1.5x	14	8	6	8	7	7	7	11	11	6	4	5	5	5	9	2	2	2	8	8	8	8	8	2	2	2
Dabblers 3x	15	10	1	10	8	10	10	12	10	8	6	9	10	2	15	5	14	10	2	3	3	3	7	1	1	1
Divers	12	5	1	8	2	5	5	8	5	1	1	1	15	2	5	1	4	3	8	8	7	3	1	1	1	1
Total population level	15	8	1	8	4	7	5	8	5	3	3	10	10	1	12	3	11	3	8	8	6	3	1	7	5	2
5. Endangered Species																										
Aleutian Goose	15	10	0	0	0	0	0	2	1	0	0	0	5	0	3	0	12	1	0	0	0	0	0	0	0	0
TOTAL	96	76	60	74	69	69	61	85	65	54	50	66	99	89	122	80	121	115	116	117	81	130	63	127	147	115

I. EXISTING WETLANDS

B. Threats to Habitat

Basin:	Butte Sink	Upper Butte Basin	Vina Plains	Sutter Bypass	Outside Bypass	Willow Creek	Lurline Creek	Yolo Bypass	Outside Bypass	Natomas	Lincoln Wheatland Nicolaus	District 10	Suisun Marsh	Stone Lakes	Delta	Farmington-Escalon	Grasslands Water District	West Grasslands Outside District	East Grasslands Flyn	Crane	Modesto Properties	Faith-Mapes Ranches	Mendota Area	Tulare Lake Bed	Kern-Wasco NWR Area	Greenfield Area
	BUTTE			SUTTER		COLUSA		YOLO		AMERICAN			DELTA				SAN JOAQUIN						TULARE			
1. Taxes:																										
Present	5	8	5	5	6	10	10	5	6	10	5	8	2	5	5	5	3	3	5	5	10	8	10	3	10	10
Future	10	10	8	7	8	12	12	8	9	12	7	8	2	7	6	2	10	10	12	12	12	12	4	12	12	12
2. Water Availability (Qual. / Quant.):																										
Present 5X	3	5	2	7	7	3	4	5	5	5	5	3	2	5	2	5	2	2	2	2	2	2	4	2	2	2
Future 5X	7	10	2	10	10	6	8	5	5	5	5	5	12	7	6	5	6	6	8	8	8	4	8	4	8	10
3. Economic Incentive to convert to Agriculture	5	10	5	5	10	10	10	5	10	5	5	5	2	2	8	10	14	15	10	10	10	10	10	5	10	12
4. Operational Expenses:																										
Present	5	5	2	5	5	5	5	5	6	6	6	6	8	2	5	6	3	5	5	5	5	2	5	5	10	10
Future	5	5	2	5	5	5	5	7	7	7	7	7	8	2	7	6	2	10	12	8	8	10	12	15	15	15
5. Industrial/Urban Development potential:																										
Probability	2	5	5	1	10	2	2	1	10	1	10	8	2	10	8	8	8	5	6	6	6	5	5	2	2	5
Type	1	10	8	1	10	2	2	1	10	2	10	8	2	10	4	10	5	5	5	5	5	5	5	5	5	8
6. Survivability	2	5	4	2	8	10	10	8	12	11	11	8	2	5	2	12	13	10	10	10	9	10	4	13	13	15
TOTAL	85	133	59	116	147	101	116	82	116	122	112	102	99	101	89	113	80	121	115	116	81	130	63	127	147	115

APPENDIX D

KEY WETLANDS REQUIRING PROTECTION
CENTRAL VALLEY CALIFORNIA

APPENDIX D - INDEX

PRIORITY (FINAL) RANKING	WETLAND AREA	ACRES	PAGE
1	Butte Sink	10,000	D-3
2	Greenfield Area 1/	800	D-5
3	Kern NWR-Wasco Area 1/	5000	D-7
4	Crane Ranch Area 2/	8000	D-9
5	Outside GWD 3/	17,000	D-11
6	Flynn Ranch-Merced NWR Area 2/	6000	D-13
7	Suisun Marsh 4/	46,000	D-15
8	Modesto Properties 2/	5000	D-17
9	Lurline Creek Area 5/	3500	D-19
10	Mendota WMA Area	700	D-21
11	Willow Creek-Sacto NWR Area 5/	7000	D-23
12	Grasslands Water District 3/	47,000	D-25
13	Stone-Beach Lakes 4/	3000	D-27
14	Faith-Mapes Ranch Area	4800	D-29
15	Vina Plain 4/	10,000	D-31

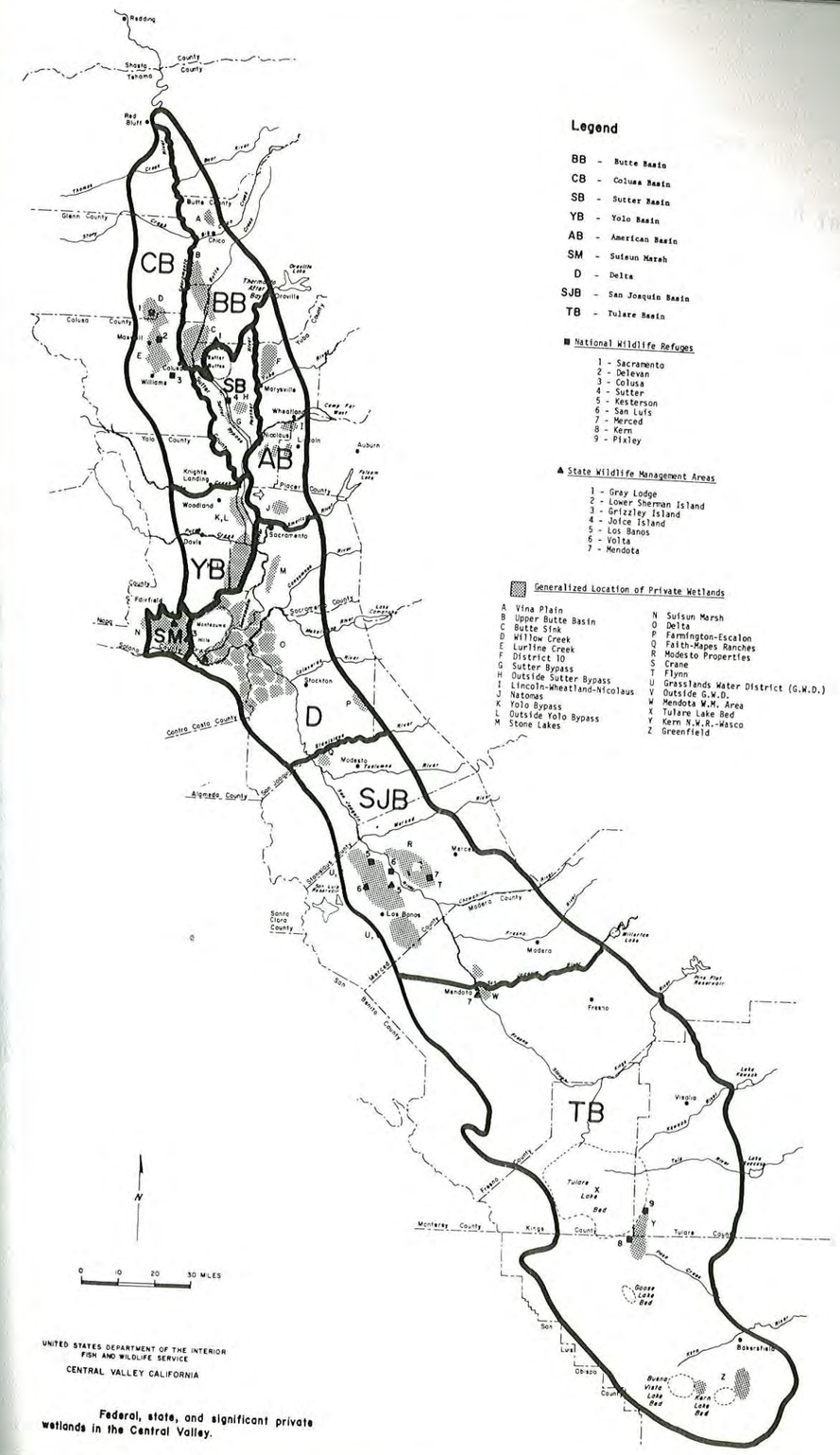
1/ The Greenfield and Kern NWR-Wasco wetlands may constitute one project area.

2/ All East Grasslands area may be considered together as one project area.

3/ The Grasslands Water District (GWD) and clubs Outside the GWD may constitute one project area.

4/ Work will be deferred on these areas (See text).

5/ The Willow Creek and Lurline Creek wetlands may constitute one project area.



Federal, state, and significant private wetlands in the Central Valley.

AREA: BUTTE SINK

1. Biological Ranking 265 (Number 1)

2. Rank based on threat 102 (Number 12)

3. Overall Rank 469 (Number 1)

4. Habitat Present:

   Seasonal X
   Permanent X
   Uplands X
   Rice/Grain X
   Native X

   Benefits existing Refuge High

   Promotes wider distribution of waterfowl Moderate

   Relationship to agricultural food sources Excellent

5. Disease a problem? No

6. Waterfowl Value

   Swans Moderate

   Geese High

   Ross
   Lesser Snow
   Cackler
   Lesser Canada
   Great Basin Canada
   White-fronted

   Dabblers High

   Pintail
   Mallard
   Wigeon
   Green-winged Teal
   Gadwall
   Shoveler
   Cinnamon Teal

   Divers High

   Canvasback
   Ring-necked
   Ruddy

7. Aleutian Goose present: Yes

8. Threat of Habitat Loss:
   Overall, relatively low. Water contracts appear firm, even though Sink clubs have not made joint application to the State for water. Largest threat appears to be potential flood control projects which would prolong flooding of the Sink, or eliminate it altogether. Taxes could be a future problem.

9. Proposed Action:
   Proceed with ascertainment to acquire conservation and flowage easements on the existing 10,000 acres of natural marsh remaining.

Butte Sink

AREA: GREENFIELD

1. Biological Ranking 116 (Number 13)

2. Rank based on threat 176 (Number 1)

3. Overall Rank 468 (Number 2)

4. Habitat Present:

Seasonal X
Permanent
Uplands X
Rice/Grain
Native X

Benefits existing Refuge Low

Promotes wider distribution of waterfowl High

Relationship to agricultural food sources Moderate

5. Disease a problem? No

6. Waterfowl Value

Swans None

Geese None

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Low

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: No

8. Threat of Habitat Loss:

Extremely high rate of loss in this area; mostly, conversion to agriculture. Water will also be a problem in the near future. High operational costs associated with pumping ground water is a problem. Unless action is taken soon, the area will be lost.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on remaining natural marsh.

Greenfield Area

AREA: Kern NWR - Wasco Area

1. Biological Ranking 157 (Number 11)

2. Rank based on threat 164 (Number 2)

3. Overall Rank 462 (Number 3)

4. Habitat Present:

Seasonal	X	Benefits existing Refuge	High
Permanent		Promotes wider distribution of waterfowl	High
Uplands	X		
Rice/Grain		Relationship to agricultural food sources	High
Native	X		

5. Disease a problem? Moderate-Botulism

6. Waterfowl Value

Swans None

Geese Low

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: No

8. Threat of Habitat Loss:

Very high threat of loss, recent habitat increases notwithstanding. High operating costs associated with pumped water, taxes, and incentives to convert to agriculture will become more serious in the future.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on existing natural marsh.

Kern NWR - Wasco Area

AREA: EAST GRASSLANDS - CRANE RANCH AREA

1. Biological Ranking 184 (Number 4)

2. Rank based on threat 139 (Number 6)

3. Overall Rank 462 (Number 4)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl High

Relationship to agricultural food sources Moderate

5. Disease a problem? Yes-Cholera

6. Waterfowl Value

Swans Low

Geese High

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

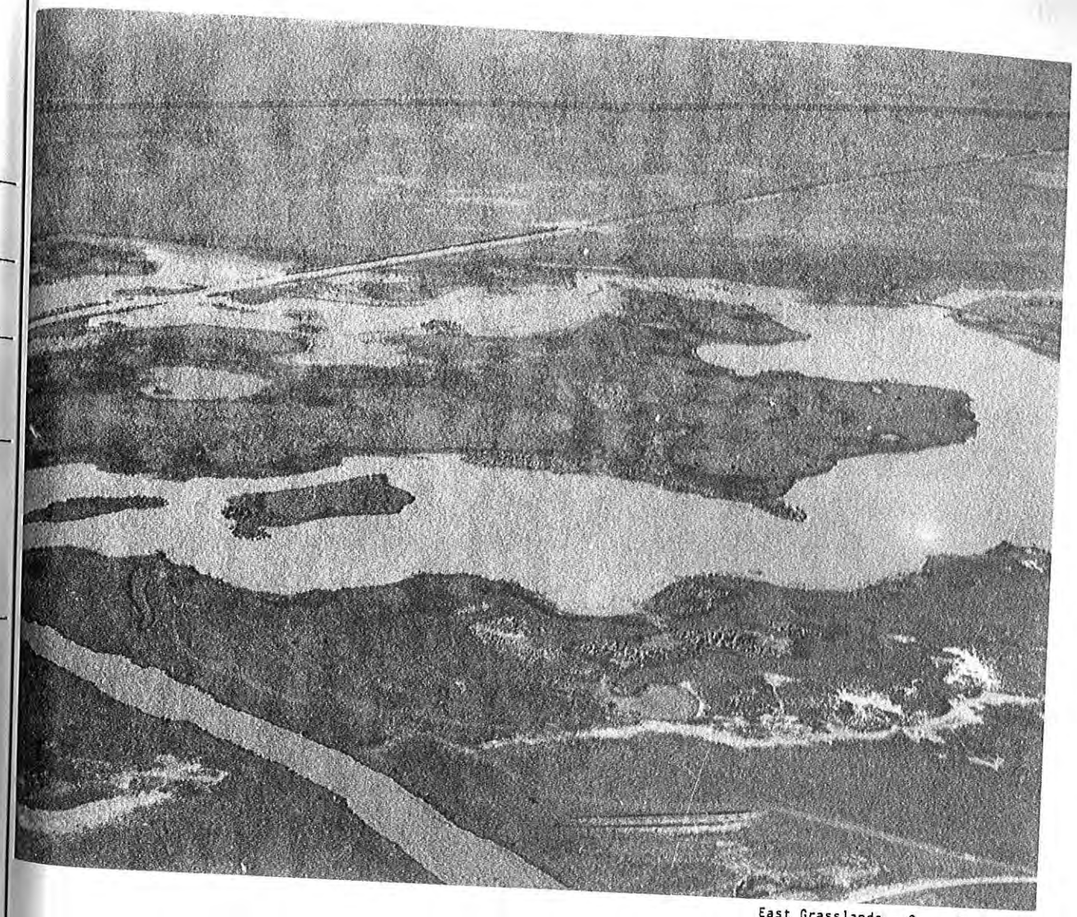
Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: Presumably

8. Threat of Habitat Loss:
Increasing threat of loss with time. Corps of Engineers' project threatens annual floodwater supply to marshes. Project will also increase incentives to convert native marsh and pasture to irrigated pasture. Taxes are high and may force conversion from cattle ranching to row crops.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on natural marsh and native pasture.



East Grasslands - Crane Ranch Area

AREA: WEST GRASSLANDS - OUTSIDE GRASSLANDS WATER DIST

1. Biological Ranking 171 (Number 6)

2. Rank based on threat 145 (Number 4)

3. Overall Rank 461 (Number 5)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl Moderate

Relationship to agricultural food sources Moderate

5. Disease a problem? Moderate-Cholera

6. Waterfowl Value

Swans Low

Geese Low

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: Yes

8. Threat of Habitat Loss:

The threat of loss is very high relative to the adjacent Grasslands Water District. Operating costs are high associated with pumping costs. Conversion to row crops has occurred recently and will continue. This is the single greatest threat.

9. Proposed Action:

Continue ascertainment studies to acquire conservation and flowage easements on natural marsh and native pasture.

West Grasslands - Outside Grasslands Water District

AREA: EAST GRASSLANDS; FLYNN RANCH-MERCED NWR AREA

1. Biological Ranking 182 (Number 5)

2. Rank based on threat 138 (Number 8)

3. Overall Rank 458 (Number 6)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl High

Relationship to agricultural food sources Moderate

5. Disease a problem? Yes-Cholera

6. Waterfowl Value

Swans Low

Geese High

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: Presumably

8. Threat of Habitat Loss:

Very high threat of loss primarily related to high taxes and attendant incentives to convert to row crops. Much native pasture and marsh have been lost to the plow in recent years, and this will continue.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on natural marsh and native pasture.

East Grasslands - Flynn Ranch - Merced NWR Area

AREA: SUISUN MARSH

1. Biological Ranking 206 (Number 2)

2. Rank based on threat 118 (Number 11)

3. Overall Rank 442 (Number 7)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl Moderate

Relationship to agricultural food sources Moderate

5. Disease a problem? No

6. Waterfowl Value

Swans Low

Geese Moderate

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers High

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: Yes

8. Threat of Habitat Loss:

The threat of physical loss of the marsh is very low. The greatest threat is deteriorating water quality resulting from reduced freshwater outflow through the Sacramento-San Joaquin Delta. Operational expenses might prove burdensome in the future.

9. Proposed Action:

No ascertainment studies are proposed at the present time. Until water quality problems are solved, the FWS easement program would not contribute to preserving the habitat.

Suisun Marsh

AREA: EAST GRASSLANDS - MODESTO PROPERTIES

1. Biological Ranking 161 (Number 9)

2. Rank based on threat 140 (Number 5)

3. Overall Rank 441 (Number 8)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl High

Relationship to agricultural food sources Moderate

5. Disease a problem? Yes-Cholera

6. Waterfowl Value

Swans Low

Geese Moderate

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

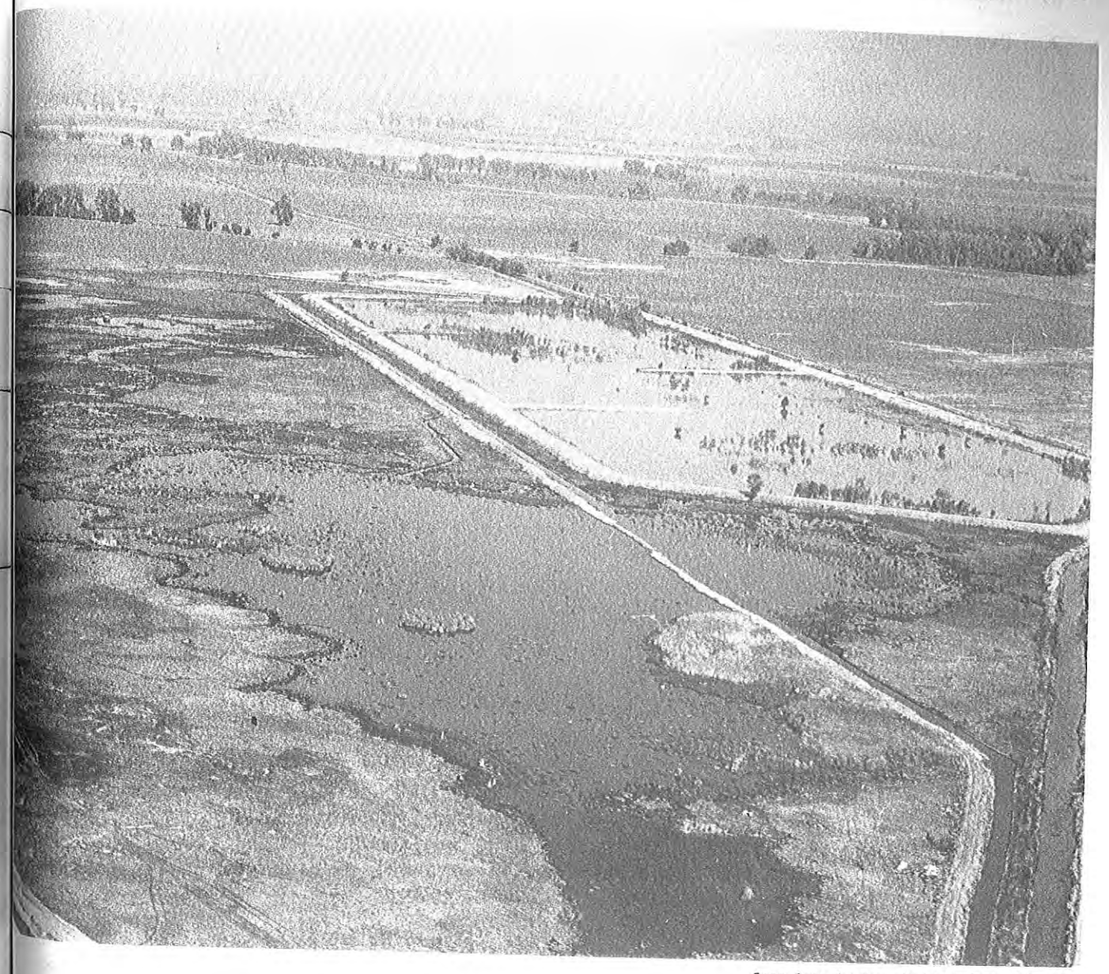
7. Aleutian Goose present: Presumably

8. Threat of Habitat Loss:

High taxes going higher with attendant incentive to convert wetlands to irrigated pasture and row crops the greatest threat in this area. A large part of the area has been converted to irrigated pasture recently.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on natural marsh and native pasture.



East Grasslands - Modesto Properties Area

AREA: LURLINE CREEK AREA

1. Biological Ranking 161 (Number 8)

2. Rank based on threat 139 (Number 7)

3. Overall Rank 439 (Number 9)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	X
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl Moderate

Relationship to agricultural food sources High

5. Disease a problem? Low-Botulism/Cholera

6. Waterfowl Value

Swans Low

Geese Moderate

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: No

8. Threat of Habitat Loss:

High taxes, with attendant incentives to convert native marsh to rice production are the greatest threat in this area. Although flooded rice fields (harvested) constitute important habitat, it does not compare with natural marsh.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on natural marsh.

Lurline Creek Area

AREA: MENDOTA WMA AREA

1. Biological Ranking 101 (Number 15)

2. Rank based on threat 156 (Number 3)

3. Overall Rank 413 (Number 10)

4. Habitat Present:

Seasonal X
Permanent X
Uplands
Rice/Grain
Native X

Benefits existing Refuge High

Promotes wider distribution of waterfowl Low

Relationship to agricultural food sources Moderate

5. Disease a problem? No

6. Waterfowl Value

Swans Low

Geese Low

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Low

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

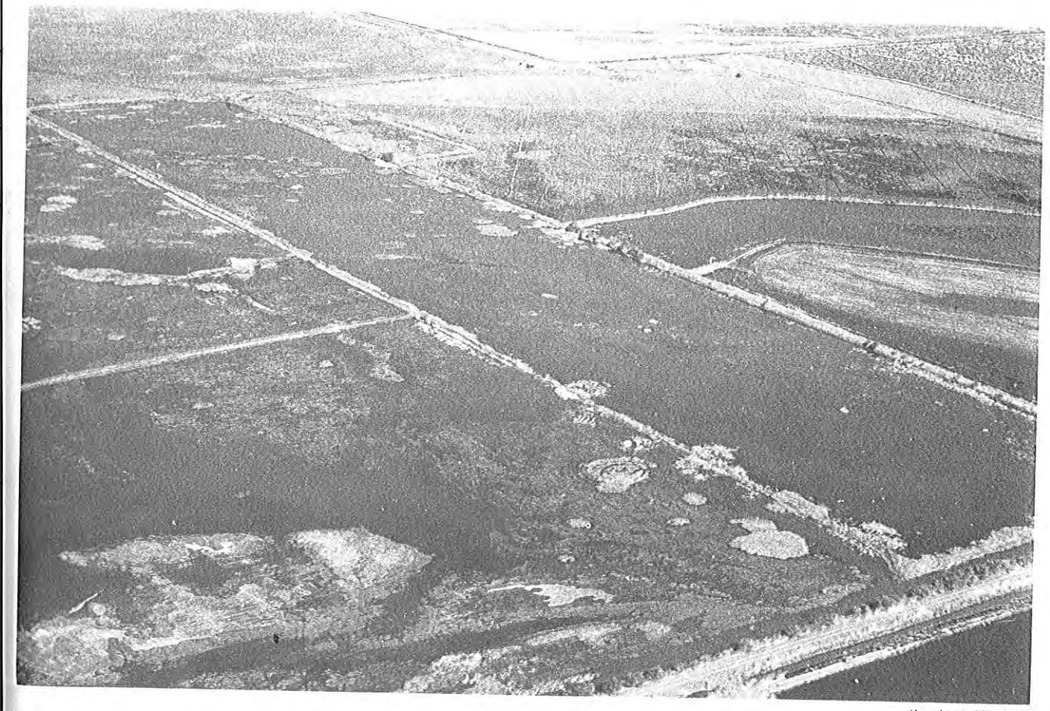
7. Aleutian Goose present: No

8. Threat of Habitat Loss:

High taxes and operational expenses, plus a relatively high incentive to convert to agriculture, combine to make the threat of loss very high.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation and flowage easements on natural marsh.



Mendota WM Area

AREA: WILLOW CREEK

1. Biological Ranking 165 (Number 7)

2. Rank based on threat 121 (Number 10)

3. Overall Rank 407 (Number 11)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	X
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl Moderate

Relationship to agricultural food sources High

5. Disease a problem? Low-Botulism/Cholera

6. Waterfowl Value

Swans Low

Geese Moderate

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Moderate

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: No

8. Threat of Habitat Loss:

High taxes and incentive to convert to rice production are the most serious problems. Several areas of natural marsh have been converted to rice production in recent years while remaining as duck clubs with fall flooding.

9. Proposed Action:

Proceed with ascertainment studies to acquire conservation easements on natural marsh.

Willow Creek Area

AREA: WEST GRASSLANDS - GRASSLANDS WATER DISTRICT

1. Biological Ranking 201 (Number 3)

2. Rank based on threat 96 (Number 14)

3. Overall Rank 393 (Number 12)

4. Habitat Present:

Seasonal	X
Permanent	X
Uplands	X
Rice/Grain	
Native	X

Benefits existing Refuge High

Promotes wider distribution of waterfowl Moderate

Relationship to agricultural food sources Moderate

5. Disease a problem? Moderate-Cholera

6. Waterfowl Value

Swans Low

Geese Low

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers High

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: Yes

8. Threat of Habitat Loss:

The primary threat to this habitat is conversion of native marsh and pasture to row crops such as cotton, melons, and sugar beets. Several clubs within the District have so converted in recent years.

9. Proposed Action:

Continue ascertainment studies to acquire conservation and flowage easements on natural marsh and native pasture.

West Grasslands - Grasslands Water District

AREA: STONE-BEACH LAKES

1. Biological Ranking 115 (Number 14)

2. Rank based on threat 121 (Number 9)

3. Overall Rank 357 (Number 13)

4. Habitat Present:

Seasonal
Permanent X
Uplands X
Rice/Grain
Native X

Benefits existing Refuge Low

Promotes wider distribution of waterfowl Moderate

Relationship to agricultural food sources High

5. Disease a problem? No

6. Waterfowl Value

Swans Low

Geese Low

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Low

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

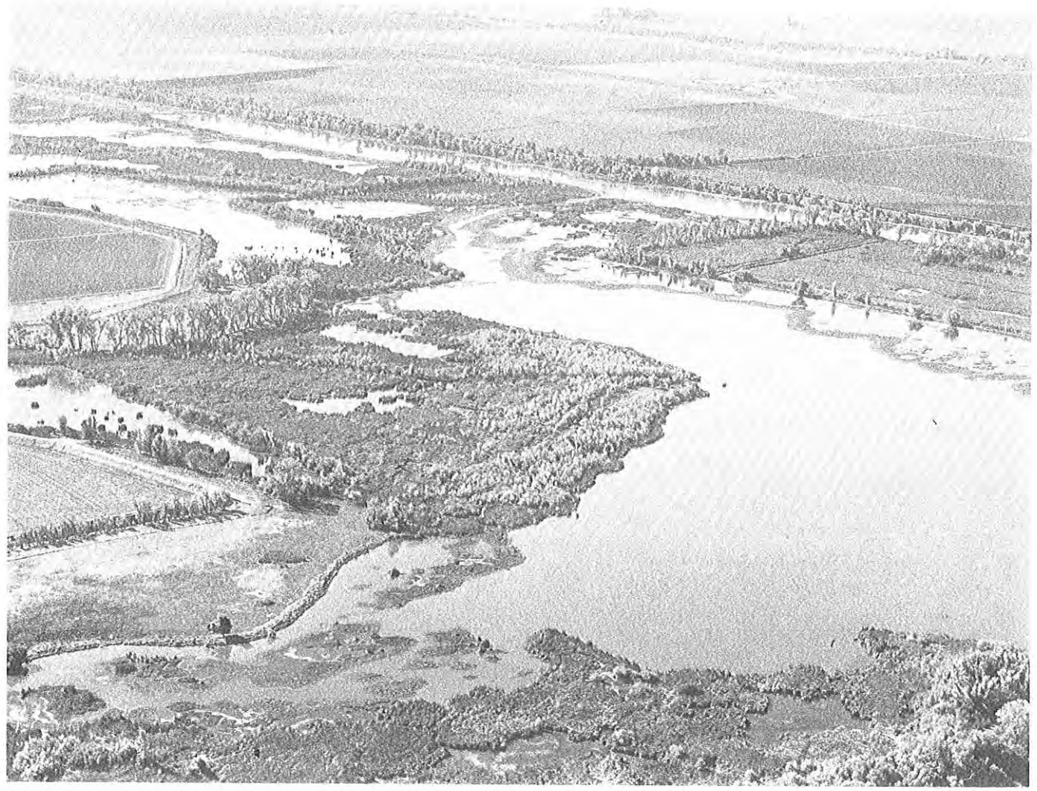
Canvasback
Ring-necked
Ruddy

7. Aleutian Goose present: No

8. Threat of Habitat Loss:
Greatest threat continues from industrial/urban encroachment. There is probably enough public interest in the lakes now to save them from real estate development. But until formal action is taken to preserve the lakes, the threat is still present since they are in close proximity to Sacramento.

9. Proposed Action:

Defer ascertainment studies until it is clear local interests and/or mitigation/enhancement for Corps of Engineers' flood control project will not preserve the habitat. Easement program may not be needed. Urban encroachment is the key problem. Easements on the lakes proper would not preserve them.



Stone-Beach Lakes Area

AREA: FAITH-MAPES RANCHES AREA

1. Biological Ranking 159 (Number 10)
2. Rank based on threat 97 (Number 13)
3. Overall Rank 353 (Number 14)
4. Habitat Present:

   Seasonal X
   Permanent X
   Uplands X
   Rice/Grain
   Native X

   Benefits existing Refuge Low

   Promotes wider distribution of waterfowl High

   Relationship to agricultural food sources Moderate

5. Disease a problem? No
6. Waterfowl Value

   Swans Low

   Geese Moderate

   Ross
   Lesser Snow
   Cackler
   Lesser Canada
   Great Basin Canada
   White-fronted

   Dabblers Low

   Pintail
   Mallard
   Wigeon
   Green-winged Teal
   Gadwall
   Shoveler
   Cinnamon Teal

   Divers Low

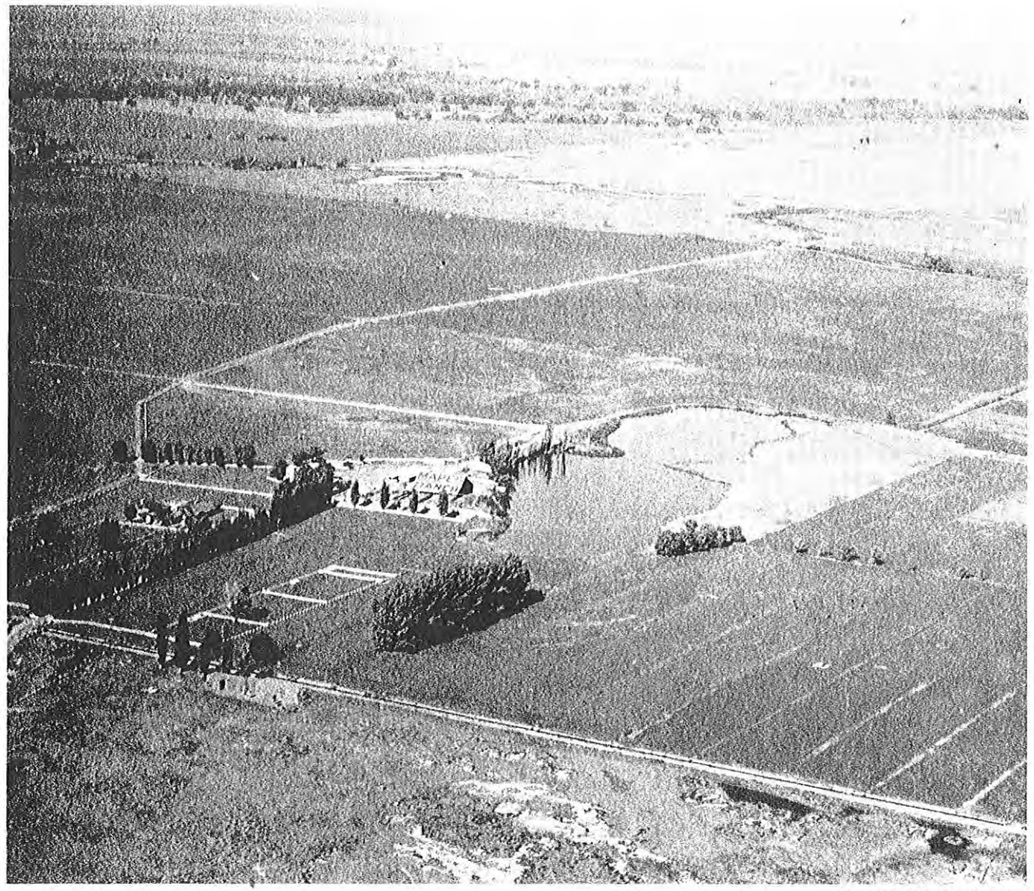
   Canvasback
   Ring-necked
   Ruddy

7. Aleutian Goose present: Yes
8. Threat of Habitat Loss:

   High taxes and incentive to convert native pasture and marsh to irrigated pasture and row crops are the most serious problems. However, overall, the areas appear to be secure and will remain a cattle ranching operation.

9. Proposed Action:

   Proceed with ascertainment studies to acquire conservation and flowage easements on natural marsh and native pasture.



Mapes-Faith Ranch Area

AREA: VINA PLAIN

1. Biological Ranking 126 (Number 12)

2. Rank based on threat 71 (Number 15)

3. Overall Rank 268 (Number 15)

4. Habitat Present:

Seasonal X
Permanent
Uplands X
Rice/Grain
Native X

Benefits existing Refuge Moderate

Promotes wider distribution of waterfowl High

Relationship to agricultural food sources Moderate

5. Disease a problem? No

6. Waterfowl Value

Swans Low

Geese Moderate

Ross
Lesser Snow
Cackler
Lesser Canada
Great Basin Canada
White-fronted

Dabblers Low

Pintail
Mallard
Wigeon
Green-winged Teal
Gadwall
Shoveler
Cinnamon Teal

Divers Low

Canvasback
Ring-necked
Ruddy

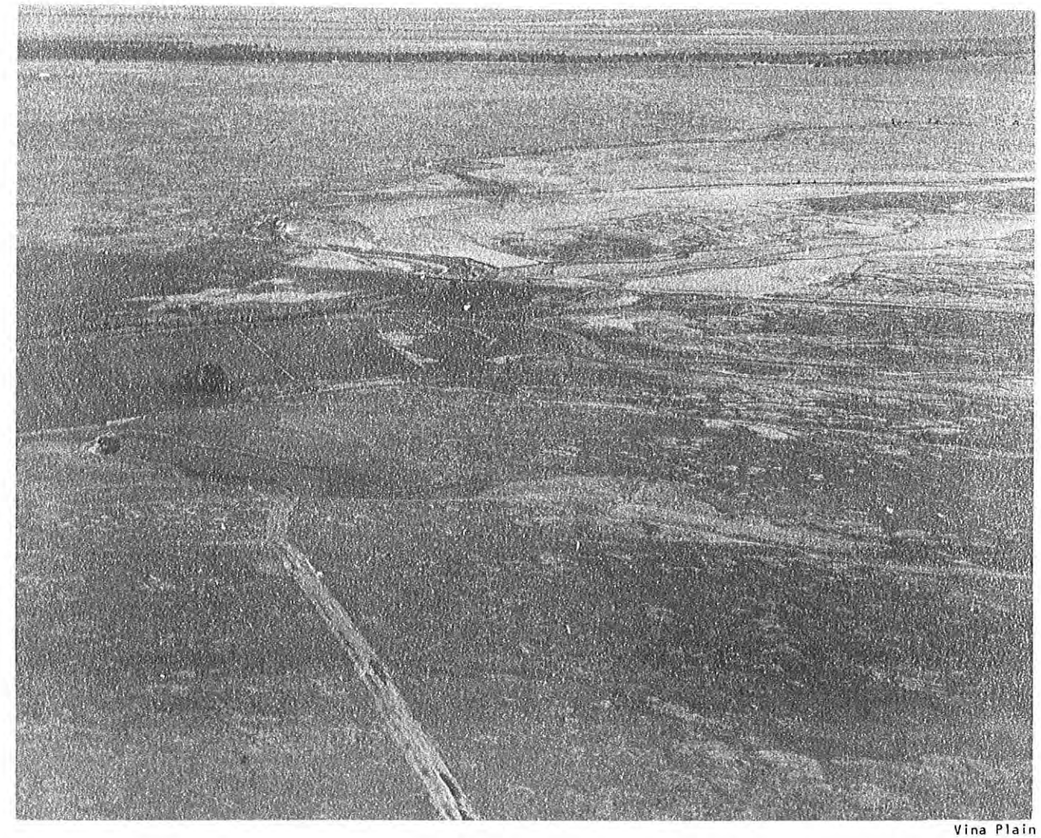
7. Aleutian Goose present: No

8. Threat of Habitat Loss:

Threat of loss appears to be quite low. Water supply is dependent solely on rainwater. While conversion of the native hill and swale topography to row crops has occurred, the rate is low.

9. Proposed Action:

Defer ascertainment studies until a clear threat to the area becomes evident. The easement program may not be needed. Also, Vina Plain is watered only by precipitation and is not really a wetland per se. Wetland areas will get the highest priority over the native pasture of Vina Plain.



Vina Plain

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