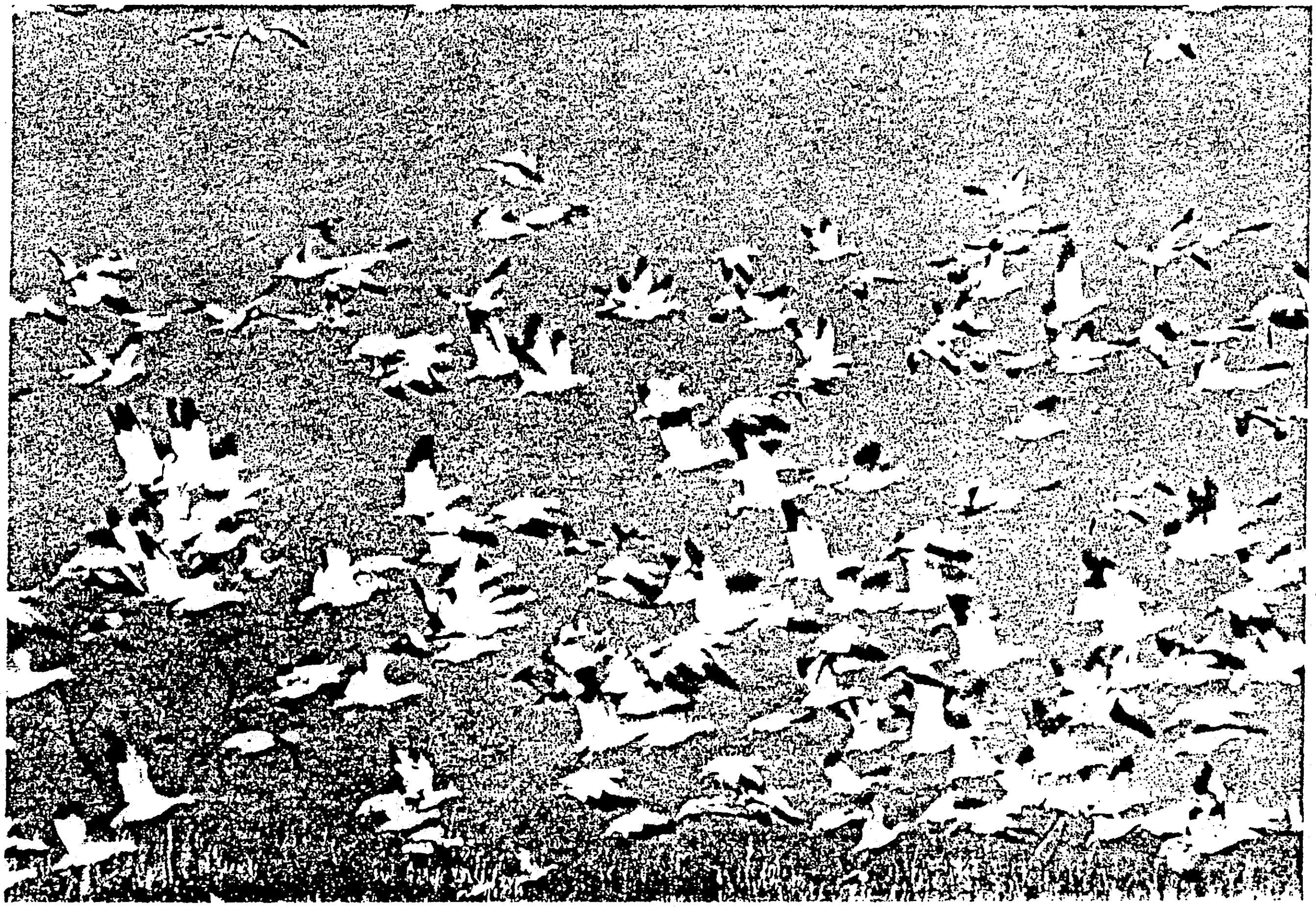
CHAPTER II

Need for Action



U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
MID-PACIFIC REGION

CHAPTER II

NEED FOR ACTION

A. INTRODUCTION

Waterfowl migration remains one of the marvels of nature. Twice each year, for millennia, millions of ducks and geese have flown from one end of the North American continent to the other following the same routes each year. The Central Valley lies at the southerly end of the Pacific Flyway migratory route, and in presettlement times, the valley's vast marshes and dense stands of tules and riparian vegetation provided ideal wintering habitat and attracted large numbers of waterfowl.

Today, most of the wetlands are gone due to land conversion to other uses. The birds, however, continue to fly their ancient routes and crowd into the remaining habitat to rest, feed, and nest. Since the turn of the century, the numbers of ducks and geese wintering in California has plummeted and the loss of wetlands has been a significant factor in the decline. As waterfowl habitat has been modified, Federal and State fish and wildlife agencies, private organizations, and hunting clubs have developed several managed areas for waterfowl and other wildlife by establishing National Wildlife Refuges, State Wildlife Management Areas, conservation areas, and hunting clubs. Despite extensive research conducted by Federal, State, and private entities, existing data are insufficient to completely quantify the relationship between waterfowl and habitat. The following key information relative to waterfowl is known:

1. Waterfowl populations in the Central Valley are below historical levels for most species.

2. Winter habitat can influence the distribution and abundance of wintering waterfowl.

3. Existing habitat can be enhanced.

4. The condition of waterfowl returning from wintering grounds can influence reproductive capability.

At the present time an opportunity exists to preserve and enhance wildlife in the Central Valley. As part of the preparation of the Water Contracting EISs currently underway, Reclamation is assessing the impacts of entering into long-term contracts for the remaining uncommitted yield of the Central Valley Project (CVP). Reclamation is evaluating the effects of allocating different amounts of water to meet the needs of wildlife refuges and wetlands. Following completion of the Refuge Water Supply Study and the Water Contracting EISs, Congress will have the opportunity to develop necessary legislation and/or provide opportunities for refuge water supplies.

This chapter addresses the existing conditions in the Central Valley--water shortages, diminishing habitat, and related problems--that are known to threaten the maintenance of the Pacific Flyway migratory route, as shown on Figure II-1. These needs reflect the data gathered as part of this study and represent a consensus among the biologists contacted within various agencies and organizations involved in waterfowl management.

B. IMPORTANCE OF THE CENTRAL VALLEY TO THE PACIFIC FLYWAY

Waterfowl migration to the Central Valley begins in August with the arrival of the first birds from the north. The number of wintering waterfowl rapidly increases over the late summer and fall and by late December as many as 10 to 12 million waterfowl have migrated to or through the valley for their winter sojourn. These birds include from 5 to 6 million ducks and geese who winter in the Central Valley. In addition, the Central Valley provides migration habitat for 1.3 million more ducks and geese which winter in Mexico.

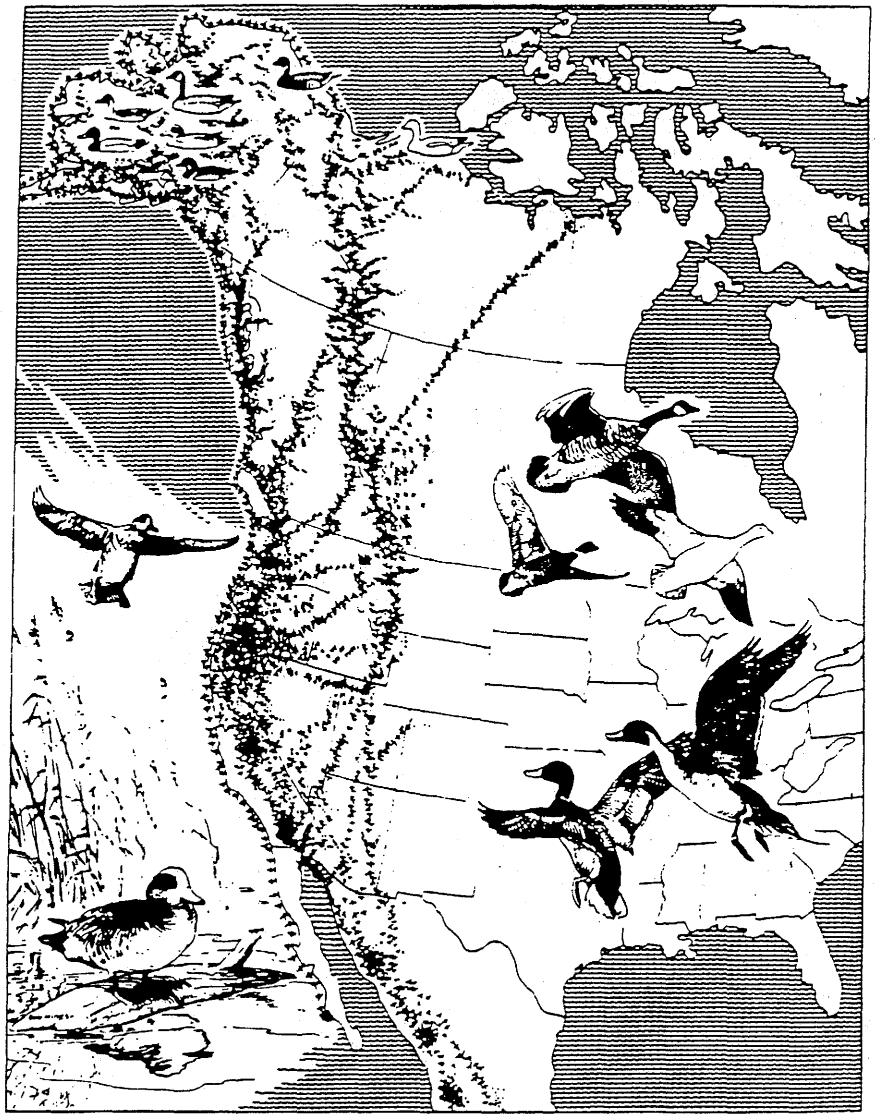
As shown on Figure II-2, the Central Valley is critical to the Pacific Flyway. Central Valley migrants represent about 15 to 20 percent of the total continental wintering waterfowl population and about 60 percent of the Pacific Flyway's waterfowl. Altogether, nearly 10 to 12 million waterfowl, along with millions of other water-related birds, annually winter in or pass through the Central Valley (Gilmer et al., 1982). Many waterfowl migrate through the valley en route to Mexico.

Maintenance of the Pacific Flyway for waterfowl depends largely on maintaining critical wetland wintering habitat in the Central Valley, about one-third of which is comprised of Federal and State wildlife areas. The Service ranks Central Valley wetland habitat as one of the top five habitats in the United States.

C. CENTRAL VALLEY WATERFOWL

The Central Valley of California has traditionally served as a major wintering ground for millions of migratory birds. Fall flights of waterfowl, shorebirds, raptors, and passerines return annually to the wetland, riparian, and grassland habitats of the valley.

Each year in early August the first flight of ducks from the northern breeding grounds begin arriving in the Central Valley. Substantial numbers of some species, including over 90 percent of California's wintering mallard duck population, are bred in California. Populations increase through fall and by late December peak between 5 and 6 million waterfowl, as shown in Figure II-3.



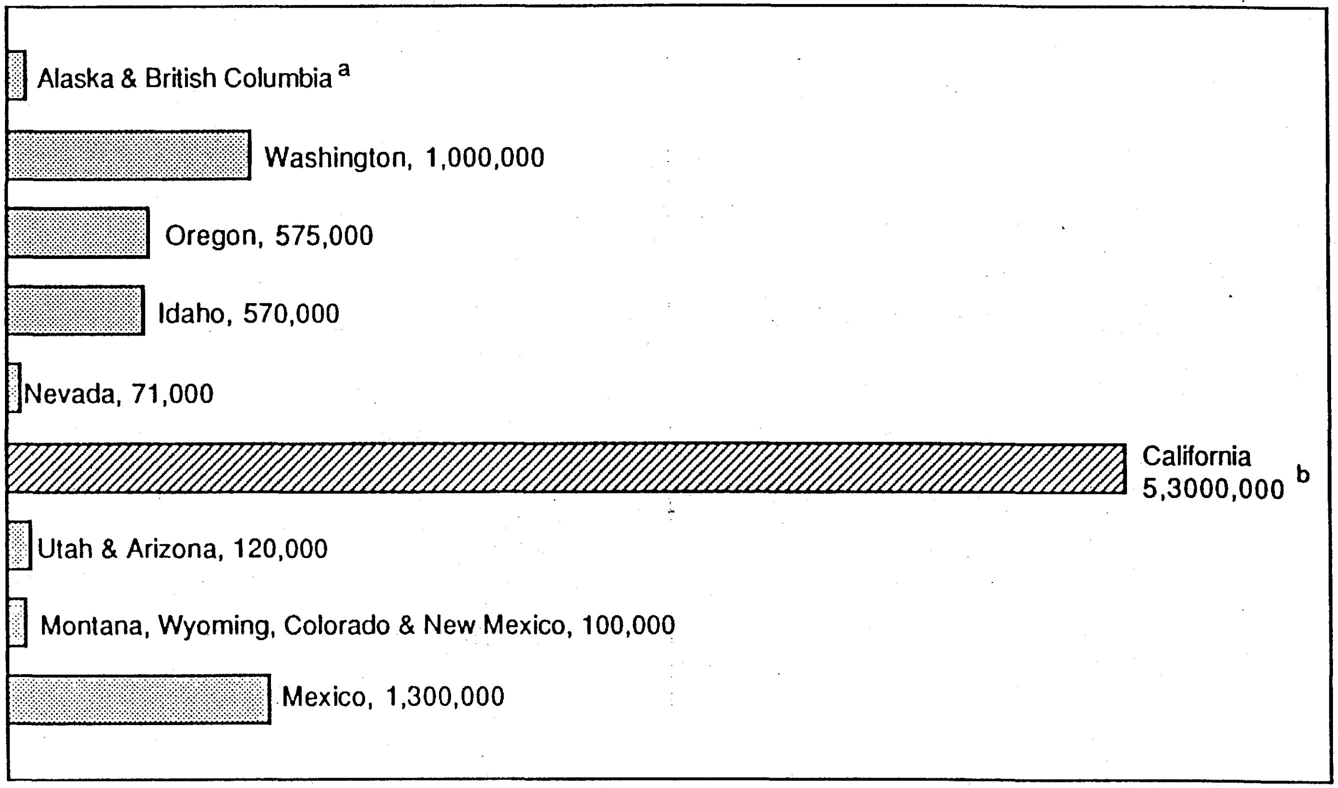
Courtesy of Fish & Wildlife Service

PACIFIC FLYWAY

The migration of waterfowl remains one of the marvels of Nature. Twice each year millions of ducks and geese fly from one end of the North American continent to the other, following the same routes each year. These migration routes are known as flyways, which are defined as definite geographic regions with breeding grounds in the north, wintering grounds in the south, and a system of migration routes between the two. There are four such flyways on the North American continent, each with its own population of ducks, geese, and other migratory birds.

The Pacific Flyway is the westernmost flyway and encompasses territory in three countries: northern and western Canada, Alaska and all states west of the Rocky Mountains in the United States, and western Mexico. Management of the flyway is governed by international treaties among the United States, Canada, Mexico, and Japan.

FIGURE II-1



Source: Sacramento Waterfowl Habitat Management Committee, undated

[a] Survey data incomplete
[b] The Sacramento Valley accounts for 56% of this total, or about 2,870,000 birds

FIGURE II–2

WINTERING WATERFOWL POPULATIONS FOR STATES AND COUNTRIES OF THE PACIFIC FLYWAY, 28-YEAR AVERAGE, 1954 TO 1981

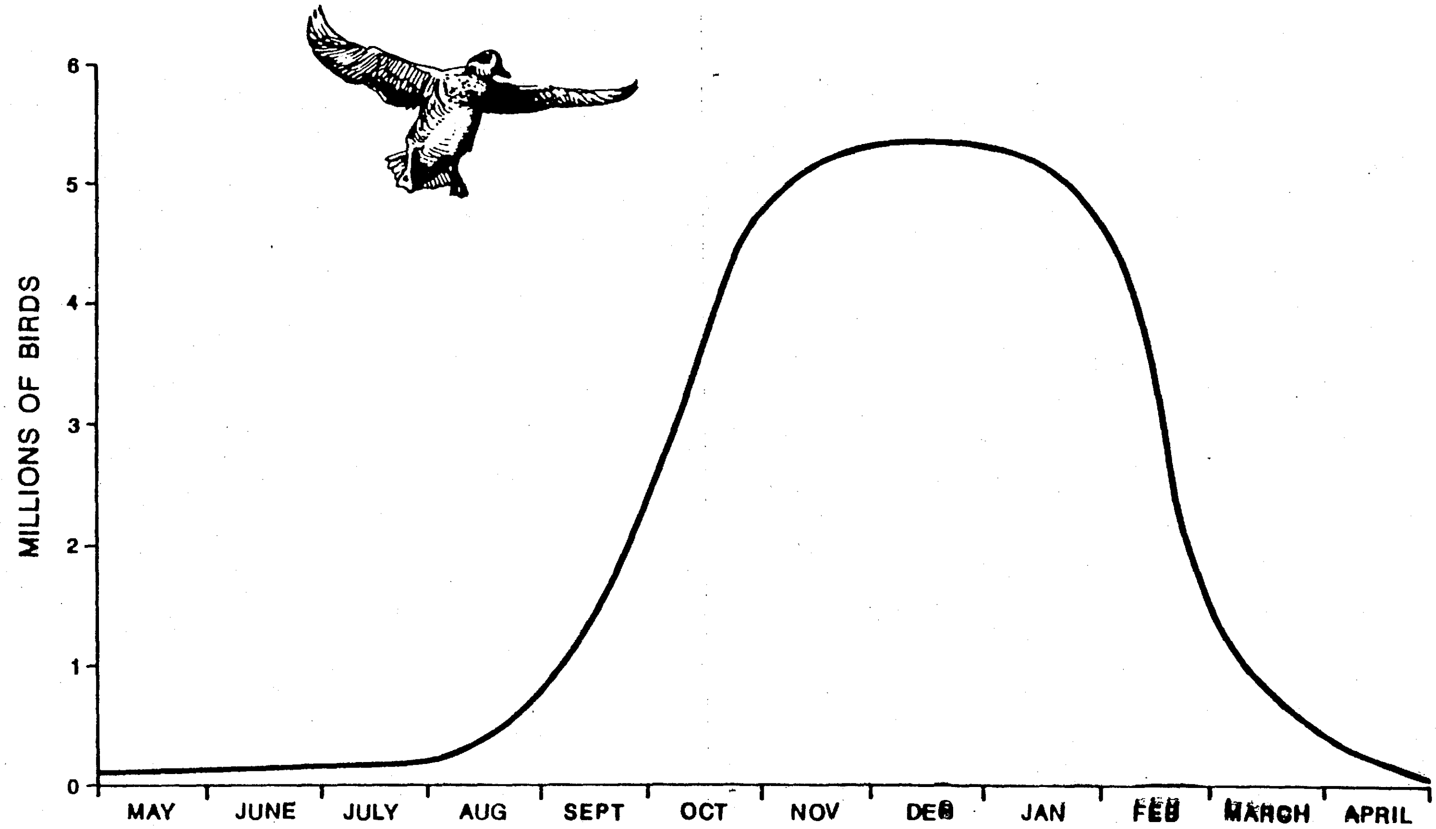


FIGURE II-3

APPROXIMATE PERIOD OF WATERFOWL USE
IN THE CENTRAL VALLEY

Waterfowl most common in the Central Valley are listed on Table II-1. Based on midwinter surveys (Pacific Flyway Study Committee, 1972-1981), a large percentage of the Pacific Flyway waterfowl population winters here. Major species include tundra swan (69 percent), Greater white-fronted geese (90 percent), cackling Canada geese (84 percent), pintails (76 percent), mallards (25 percent), northern shovelers (77 percent), greenwinged teal (47 percent), American widgeon (62 percent), gadwalls (50 percent), wood ducks (93 percent), and canvasbacks (44 percent). The entire continental population of tule white-fronted geese, endangered Aleutian Canada geese, and all but a fraction of Ross' geese winter in the Central Valley.

In recent years Pacific Flyway waterfowl numbers have declined. About 3.6 million ducks were counted in the Pacific Flyway in 1987 (Pacific Flyway Midwinter Waterfowl Survey--1987), which is the lowest population index since coverage was comparable in 1955. The latest index is 12 percent below 1986 and 9 percent fewer than the previous record low index of 1985. The 1987 index is 40 percent below the 10-year average (1977 - 1987) and 43 percent below the 32-year average. In number of ducks, the loss has been greatest in California.

Some of the waterfowl species that rely upon wetlands in the Valley include the Aleutian Canada goose, tule white-fronted goose, white-fronted goose, and Ross' goose. The Aleutian Canada goose is listed as a Federal endangered species because of its restricted breeding range and low numbers. Currently, nesting occurs only on a limited number of the Aleutian Islands of Alaska. The Aleutian Canada goose's breeding range was more extensive until trappers introduced artic foxes to the nesting islands. Extensive recovery efforts are under way to increase population levels by removing foxes from former nesting islands, protecting known staging and migration areas, and implementing hunting closures. Parts of the Colusa, Butte, and San Joaquin basins are closed to hunting of all Canada geese at varying times to protect the Aleutian Canada goose. If breeding populations are successfully established on several more of the Aleutian Islands and a sustaining population is achieved, this subspecies may be transferred to the threatened category and eventually taken off the endangered list.

The tule white-fronted goose is known with certainty to winter only in the Central Valley of California. The three small areas where the goose is known to winter are the Butte Creek Basin near Marysville, the Sacramento National Wildlife Refuge Complex near Willows, and the Suisun Marsh near Fairfield.

White-fronted and Ross' geese arrive in California in Mid-October. By November, they have moved to the Sacramento Valley relying on the existing refuges for loafing areas. The bulk of

TABLE II-1

MAJOR CENTRAL VALLEY WATERFOWL SPECIES

Coot

American (Fulica americana)

Ducks

Bufflehead (Bucephala albeola)
Canvasback (Aythya valisineria)
Gadwall (Anas strepera)
Goldeneye, Common (Bucephala clangula)
Mallard (Anas platyrhynchos)
Merganser
  Common (Mergus merganser)
  Hooded (Lophodytes cucullatus)
  Red-breasted (Mergus serrator)
Pintail, Northern (Anas acuta)
Redhead (Aythya americana)
Ring-necked Duck (Aythya collaris)
Ruddy Duck (Oxyura jamaicensis)
Scaup
  Greater (Aythya marila)
  Lesser (Aythya affinis)
Shoveler, Northern (Anas clypeata)
Teal
  Cinnamon (Anas cyanoptera)
  Green-winged (Anas crecca)
Wigeon, American (Anas americana)
Wood Duck (Aix sponsa)

Geese

Canada (Branta canadensis)[a]
Greater white-fronted (Anser albifrons)
Ross' (Chen rossii)
Snow, Lesser (Chen caerulescens)

Tundra Swan (Cygnus columbianus)

(a) The Aleutian Canada goose is classified as an endangered species. Almost the entire population of this species is believed to winter in the Central Valley. The cackling Canada goose is another unique subspecies whose populations have declined to relatively low levels and are now possibly threatened.

the Ross' geese move in December to the San Joaquin Valley, centering on Merced National Wildlife Refuge. In March, the geese head back to the Sacramento Valley en route to arctic breeding grounds in Canada.

In addition to waterfowl, millions of other water-related birds annually winter in or pass through the Central Valley. These birds originate in breeding habitats primarily in Alaska and the provinces and territories of western Canada.

The wetlands provide direct benefits to many species of raptors such as the northern harrier and swainsons, sharp-shinned, and red-tailed hawks. Other species, such as the bald eagle (a Federal endangered species) periodically visits valley refuges to feed and rest. Modoc National Wildlife Refuge often has numerous golden and bald eagles that spend their winters on the refuge feeding on sick and crippled waterfowl. The greater sandhill crane relies on refuges in the valley for feeding and sanctuary. Several refuges (Kern, Pixley, Modoc, Merced, San Luis national wildlife refuges) manage specific areas for this species.

D. RELATIONSHIP OF WATERFOWL TO WINTER HABITAT

The Pacific Flyway is unlike other North American flyways in that most wintering waterfowl are concentrated in the relatively small area of the Central Valley. The significance of wintering habitat has been increasingly recognized by research. Some waterfowl can occupy their wintering habitat for as long as eight months of the year, and many biologists believe that wintering habitat could be the single most important limiting factor for Pacific Flyway waterfowl (USBR, 1986a). To accurately determine the relationship of waterfowl to winter habitat, however, one must understand the factors that most limit waterfowl populations. Unfortunately, the effects of specific habitat components on waterfowl abundance and distribution are not yet well understood. While it is certain that the quantity and quality of wintering habitat can significantly influence the distribution and abundance of waterfowl, the degree which it does so is difficult to demonstrate quantitatively.

An ideal habitat fulfills all of a species' requirements, providing a balance of the food, shelter, water, and sanctuary which it needs to survive. The lack of any essential component can decrease a species' survival or decrease its reproductive success. Conversion of wetlands to other uses, inadequate water supplies, and changing agricultural practices are factors believed to be most limiting to waterfowl habitat. Water quality, disease, and food stress are factors believed to affect habitat quality. Many of these factors are interrelated and changing one factor will affect the others.

It is uncertain which winter habitat variable -- food, cover, sanctuary, or water conditions -- most limits population levels (Figure II-4). Habitat conditions influence the mortality and physical state of waterfowl surviving the winter. The number and condition of the survivors in turn determine their breeding success.

1. Impacts of Agricultural Practices

Various factors such as improved water management techniques and increased knowledge of plant and soil sciences have encouraged the transformation of land from mixed vegetation to monocultures in the production of commercial crops. Crop production has become more efficient thus reducing the amount of crops left in the fields which in the past has provided food for waterfowl.

Laser field leveling is an example of a change in agricultural practices that has affected the quantity and quality of waterfowl habitat. Poorly leveled fields of rice or other crops contain many small levees with vegetation for food and shelter, deep and shallow water, dry spots, and open water areas. These characteristics allow other water plants to grow with the rice and provide habitat diversity. The water plants, waste grain, and weed seeds provide food for waterfowl. In contrast, laser land leveling allows uniform application of water and rapid draining of the field without ponding. The rapid drainage reduces smartweed, millet, sedges, rumex, and similar water plants that are used as waterfowl food. Land leveling also reduces the number of levees which support habitat for food and cover.

E. SIGNIFICANCE OF WETLANDS

Waterfowl wintering in the Central Valley move among the wetlands of the Sacramento and San Joaquin Valleys, the Delta, and the Suisun Marsh in response to weather changes, water conditions, and food availability. Waterfowl distribution and movement patterns are largely predictable and change only during very wet years when the amount of habitat increases significantly because of flooding and ponding on agricultural lands and in flood bypasses.

Wetlands are among the most productive of all biological systems and their value cannot be overestimated. Destruction or lack of wetland habitat results in direct losses of species within the wetland itself and ultimately losses of species that normally forage in wetlands. Wetlands provide necessary habitat for many rare and endangered animal and plant species. More than half of all areas identified as critical habitat under provisions of the Federal Endangered Species Act involve weltand areas. In California, 55 percent of animal species designated as State threatened or endangered depend on wetland habitats for their survival.

Wetlands play an important role in flood control and groundwater recharge, improving water quality, and providing a multitude of recreational opportunities.

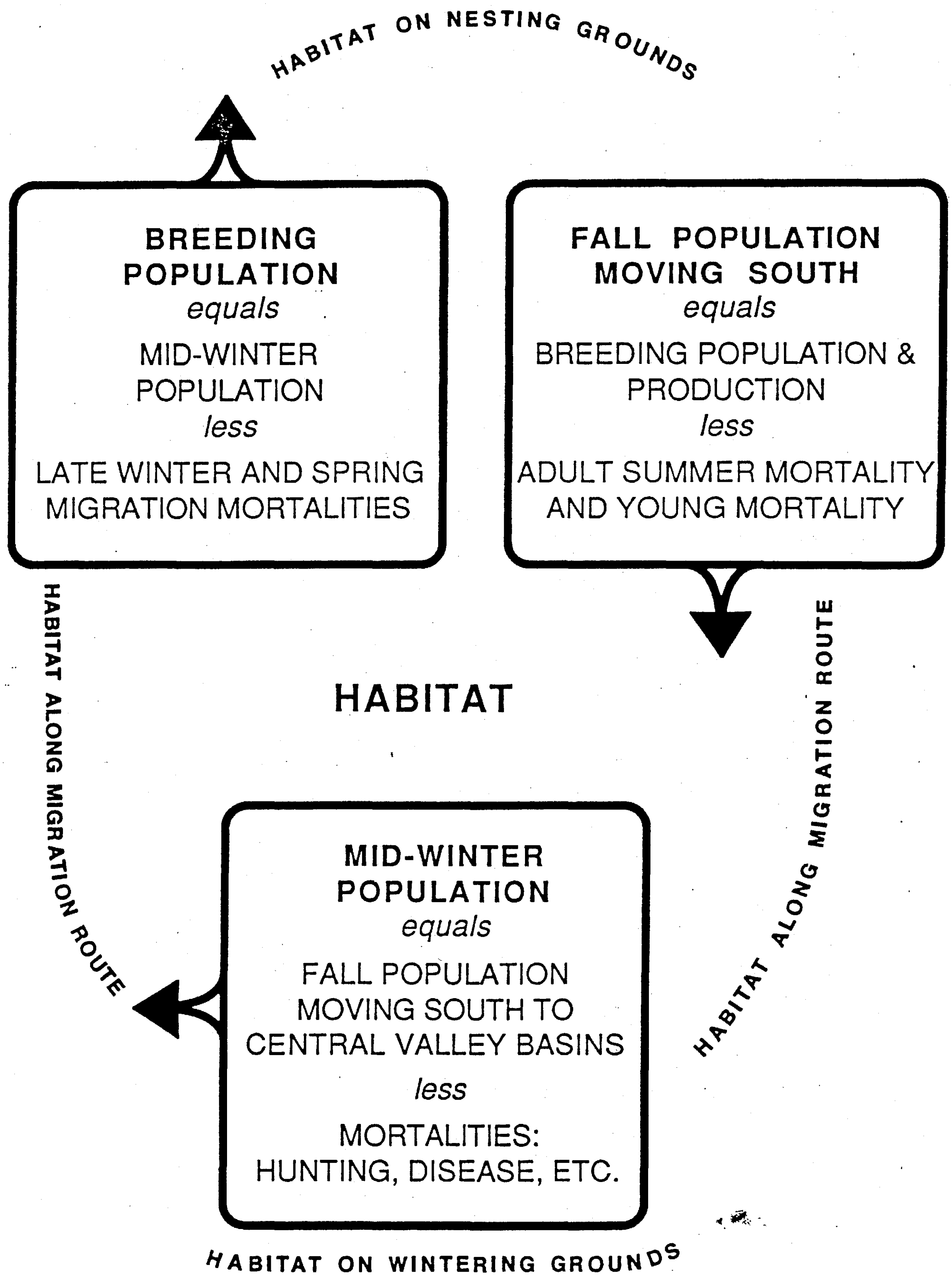


FIGURE II-4

FLOW DIAGRAM SHOWING HOW DIFFERENT LIMITING FACTORS AFFECT PACIFIC FLYWAY WATERFOWL POPULATION

1. Historical Loss of Wetlands

Before the intensive settlement of California in the 1800's, much of the Central Valley was subject to annual or periodic flooding caused by winter, spring, and early summer run-off and by floodwaters from the Sacramento and San Joaquin rivers and their tributaries. Depending on the time of year, flooding frequently turned parts of the valley into an inland sea, as the waters moved slowly toward the Delta.

These seasonal marshes resulted in the growth of dense stands of tules over large areas of the floodplain. Adjacent lands that were not inundated as frequently or were well drained supported stands of riparian woodlands. Areas of shallow or poor soils supported annual and perennial grasses and forbs. It is estimated that seasonal or permanent marshes or wetlands comprised about four million acres of valley lands and provided a haven to waterfowl migrating south for the winter. Wetlands lost since the 1850's are shown in Figure II-5, and a comparison of the current distribution of wetlands to those of the late 1880's on Figure II-6. The discovery of gold in 1849 and the subsequent influx of immigrants into the State brought dramatic changes in the valley's landscape. No habitat was more altered than the wetlands, which were significantly reduced as the Central Valley became more densely populated and flood control and agricultural development became the principal priority of valley residents. Major factors responsible for the loss of wetlands have been, (1) construction of thousands of miles of flood control levees and the subsequent conversion of natural wetlands to agricultural production and urban development; (2) dredging and filling of estuarine habitat for urban, industrial, and port development; (3) construction of flood control and water storage reservoirs; and (4) the channelization of thousands of miles of natural waterways.

Today, many of the remaining wetlands and associated fish and wildlife resources are being degraded by pollutants such as persistent pesticides, heavy metals, and toxic chemicals from urban, industrial, and agricultural sources and petrochemical spills from land based facilities, ships, and pleasure craft. Still other wetlands are degraded because of increasing salinity and the lack of adequate water supplies at appropriate times of the year.

As shown in Figure II-5, the greatest loss of wetlands occurred between 1906 and 1922, when approximately 2.5 million acres of wetlands were lost to levees, bypass channels, dams, towns, and croplands. Reduced habitat and a drought in the breeding grounds during the late 1920's and early 1930's resulted in a large reduction in the number of waterfowl in the Central Valley. Extensive crop damage occurred when the birds turned to grain fields and pastures for food. To alleviate crop damage and increase waterfowl numbers, the Department of Fish and Game established the first Waterfowl Management Area in 1929. The first National Wildlife Refuge was established in 1937.

Today only about 300,000 acres of the original acreage remains. About two-thirds is in private ownership, the remaining third is owned by the Federal and state governments as National Wildlife Refuges and Wildlife Management Areas, respectively.

Collectively, the ten Federal National Wildlife Refuges, four State Wildlife Management Areas, and resource conservation district investigated in this study total 168,477 acres.

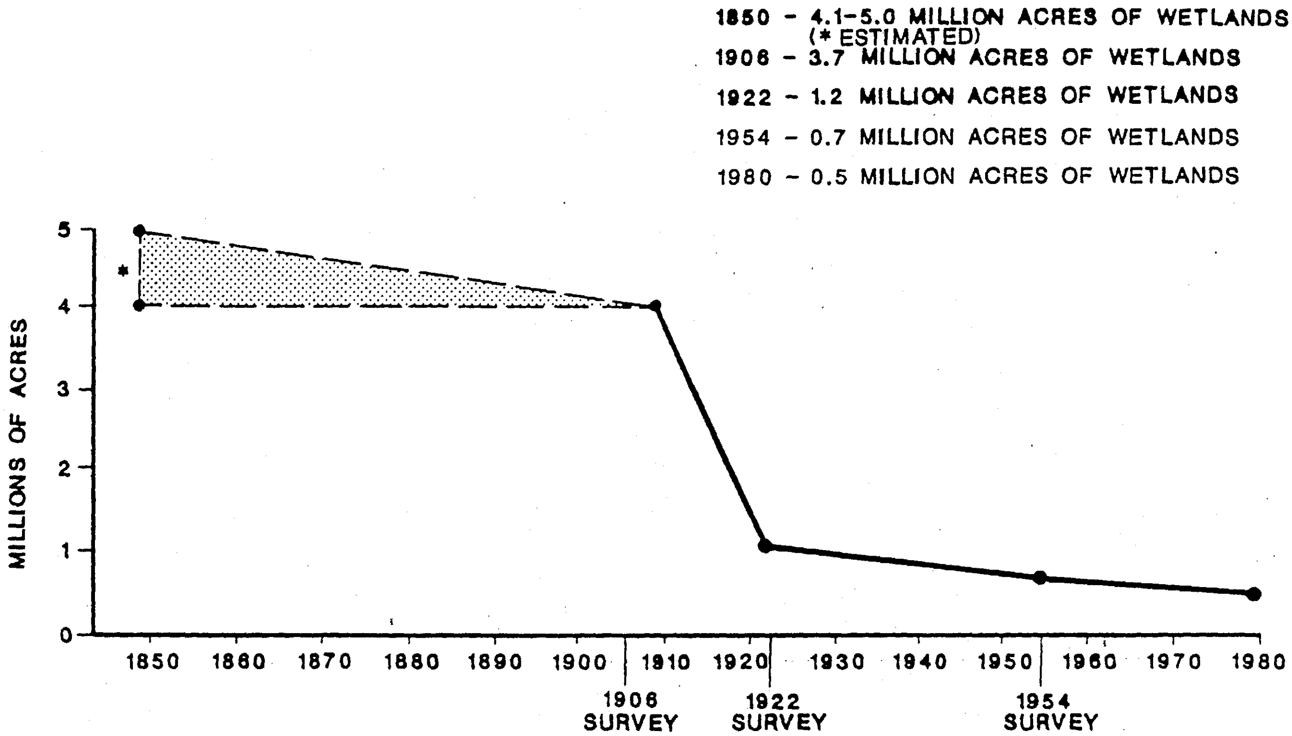
2. Other Habitat

In addition to wetlands, waterfowl habitat includes riparian vegetation. The single most important role for these areas is to provide wintering habitat. Riparian woodlands provide nesting habitat, cover, and food areas for ducks, especially wood ducks. As with wetlands, the historical acreages of riparian woodlands have been reduced to 10 to 15 percent of the original acreages, and only half of the remaining acreages are of good quality. To benefit waterfowl, the riparian vegetation cannot be located far distances away the wetlands.

F. WATER NEEDS

At the present time, approximately one percent of the total applied fresh water in California is used for wildlife areas. The water is used to flood ponds, create marshes, irrigate crops used for waterfowl, and maintain water in ponds and marshes. The majority of the water must be delivered in the fall and winter months to provide initial water and circulation water for wintering habitat. The balance is applied during the growing season to produce waterfowl food plants. If adequate water is not available, feed crops cannot be irrigated and waterfowl are crowded onto smaller areas. Stressful conditions lead to major outbreaks of waterfowl diseases, such as avian botulism and fowl cholera.

Dependable supplies of good quality water are necessary to preserve and increase wetlands and are vital to implementing a managed wetland concept. At the present time, inadequate water supply is a major factor limiting the quantity and quality of Central Valley waterfowl habitat and is a principal problem for the wildlife areas evaluated in this report. None of the refuges evaluated receive, on a yearly basis, the quantity of water required to operate optimally as determined by the Service and DFG; 8 of the 15 wetland areas studied have no existing dependable supply of water. Estimated annual water requirements at full development for these areas are shown in Figure II-7.



SOURCE: U.S. FISH AND WILDLIFE SERVICE, PORTLAND, OREGON

FIGURE II-5

HISTORICAL LOSSES OF WETLANDS IN CALIFORNIA

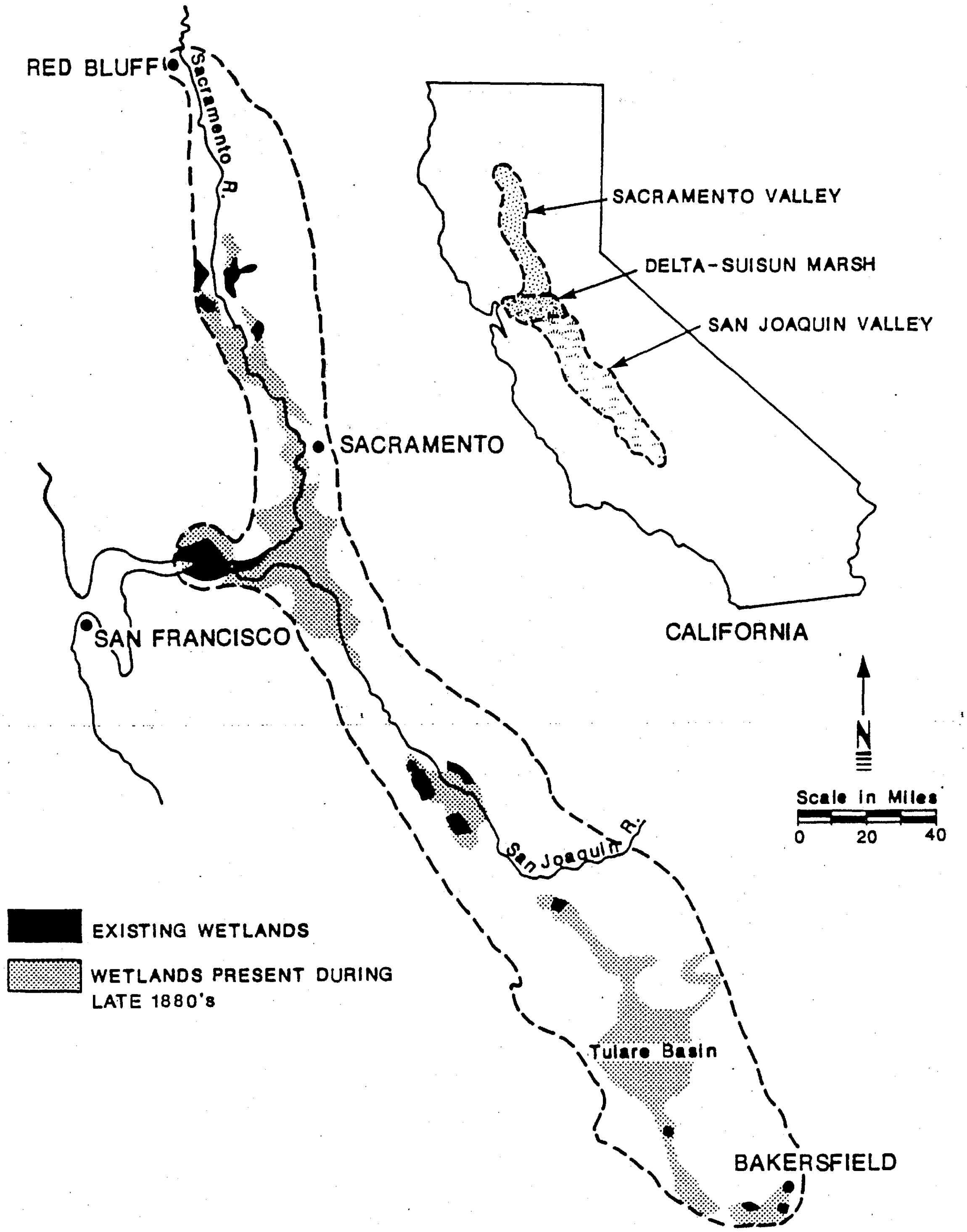


FIGURE II-6

CURRENT DISTRIBUTION OF WETLANDS COMPARED WITH LATE 1880'S

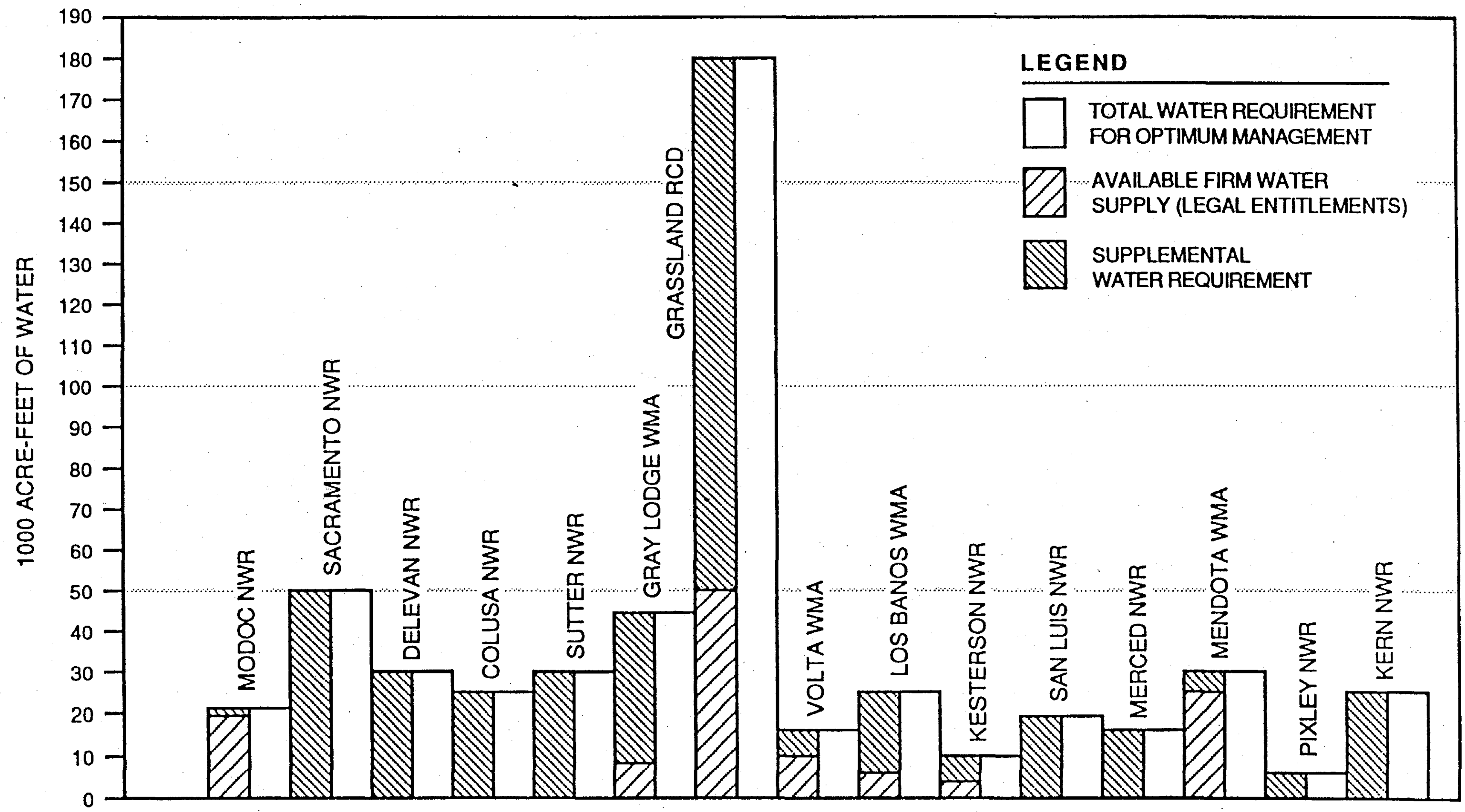


FIGURE II-7

ESTIMATED ANNUAL SUPPLEMENTAL/FIRM WATER REQUIREMENTS AT OPTIMUM MANAGEMENT

TABLE II-2

REFUGE WATER SUPPLY NEEDS

Refuge	Level 1 (ac-ft)	Level 2 (ac-ft)	Level 3 (ac-ft)	Level 4 (ac-ft)
Modoc NWR	18,550	18,550	19,500	20,550
Sacramento NWR	0	46,400	50,000	50,000
Delevan NWR	0	20,950	25,000	30,000
Colusa NWR	0	25,000	25,000	25,000
Sutter NWR	0	23,500	30,000	30,000
Gray Lodge WMA	8,000	35,400	41,000	44,000
Total Sacramento Valley	26,550	169,800	190,500	199,550
Grassland RCD[a]	50,000	125,000	180,000	180,000
Volta WMA	10,000	10,000	13,000	16,000
Los Banos WMA	6,200	16,670	22,500	25,000
Kesterson NWR	3,500	3,500	10,000	10,000
San Luis NWR	0	13,350	19,000	19,000
Merced NWR	0	13,500	16,000	16,000
Mendota WMA	25,463[b]	18,500	24,000	29,650
Pixley NWR	0	1,280	3,000	6,000
Kern NWR	0	9,950	15,050	25,000
Total San Joaquin Valley	95,163	211,750	302,550	326,650
TOTAL	**121,713**	**381,550**	**493,050**	**526,200**

Water Supply Level 1: Existing firm water supply

Water Supply Level 2: Current average annual water deliveries

Water Supply Level 3: Full use of existing development

Water Supply Level 4: Optimum management

(a) As of 1985, Grassland Resource Conservation District no longer receives agricultural drainage flows due to water quality concerns.

(b) Only 18,500 ac-ft can be delivered to the Mendota WMA without modifications of existing facilities.

San Luis 5650 Kesterson 6500

Also - Freitas has received full level 4 since 1990

Volta gets 3000 AF + replacement

Mendota 9694

As demands for fresh water increase throughout the Central Valley, the historical supplies of surface water, groundwater, and agricultural return flows are diminishing. The increasing cost of irrigation water is causing farmers to use their available supplies more carefully. This water conservation results in reduced availability and quality of agricultural return flows. Where poor quality agricultural return flows are used for wetland water supplies, problems have developed, and in some areas agricultural return flows are no longer considered acceptable as a water supply source. To supplement surface water supplies, groundwater is available for irrigation in certain refuges.

Although groundwater is generally not sufficient to provide the entire amount of refuge water, it could provide a supplemental supply as part of a conjunctive use program. A conjunctive use program is the joint management of surface water and groundwater supplies. These programs are developed by determining the water needs, then estimating the safe yield of the aquifer and the amount of surface supplies available. The purpose of a conjunctive use program is to more effectively utilize the water resources. By using surface water and groundwater conjunctively, groundwater overdraft can be minimized and the total available supply will become more reliable. Implementation of a conjunctive use program will require construction of dual surface water and groundwater supply facilities. In dry years, full needs would be met with groundwater. In wet years, full needs would be met with surface water supplies. The primary disadvantage of dual systems compared to typical firm yield systems is that both the surface water and groundwater supply facilities must be sized to deliver full needs. The Water Contracting EISs will evaluate impacts associated with implementation of a conjunctive use program for the refuges. Preliminary calculations developed for the Water Contracting EISs indicate that the groundwater facilities would be used an average of five out of every ten years.

Four water delivery levels were identified for each refuge as part of this study, as shown on Table II-2. These water delivery levels were used as the basis for evaluation of existing and proposed water supply and conveyance plans, as discussed in Chapter IV of this report. The difference between water supplies for optimum management (Level 4) and the existing average annual water deliveries (Level 2) are related to habitat diversity, duration of late winter flooding, brood water, and pond areas. Table II-3 displays the irrigated wildlife habitat, bird-use days, and public-use days under Levels 2 and 4. Bird-use days are the total of all birds, including wading and shore birds, waterfowl, upland game birds, and threatened and endangered species.

TABLE II-3

SUMMARY OF WILDLIFE RESOURCE IMPACTS
FOR SELECTED WATER SUPPLY LEVELS

Refuge	Water Supply Level 2	Water Supply Level 4
Modoc NWR		
Habitat Acreage	6,181	6,181
Bird Use Days	3,356,000	3,567,500 [a]
Public Use Days	14,300	14,300
Sacramento NWR		
Habitat Acreage	7,147	7,225
Bird Use days	56,024,300	56,850,300
Public Use Days	39,200	39,500
Delevan NWR		
Habitat Acreage	3,980	4,740
Bird Use Days	35,478,100	42,245,100
Public Use Days	7,800	8,800
Colusa NWR		
Habitat Acreage	3,356	3,396
Bird Use Days	28,106,100	31,090,100
Public Use Days	7,200	7,200
Sutter NWR		
Habitat Acreage	1,985	2,435
Bird Use Days	15,817,100	19,410,100
Public Use Days	3,100	3,600
Gray Lodge WMA		
Habitat Acreage	8,400	8,400
Bird Use Days	58,300,000	72,300,000
Public Use Days	165,200	200,500
Grassland RCD		
Habitat Acreage	56,000	56,000
Bird Use Days	127,210,000	159,250,000
Public Use Days	109,000	136,000

TABLE II-3

SUMMARY OF WILDLIFE RESOURCE IMPACTS
FOR SELECTED WATER SUPPLY LEVELS
(Continued)

Refuge	Water Supply Level 2	Water Supply Level 4
Volta WMA		
Habitat Acreage	3,000	3,000
Bird Use Days	25,000,000	28,100,000
Public Use Days	7,000	13,000
Los Banos WMA		
Habitat Acreage	3,208	3,208
Bird Use Days	23,768,000	26,869,000
Public Use Days	34,400	39,200
Kesterson NWR		
Habitat Acreage	497	1,420
Bird Use Days	3,757,900	7,157,400
Public Use Days	2,100	3,500
San Luis NWR		
Habitat Acreage	3,030	3,550
Bird Use Days	13,362,100	19,927,200
Public Use Days	22,400	35,100
Merced NWR		
Habitat Acreage	700	1,200
Bird Use Days	7,522,400	9,808,100
Public Use Days	2,800	10,200
Mendota WMA		
Habitat Acreage	9,440	9,440
Bird Use Days	2,600,000	12,200,000
Public Use Days	14,800	22,500
Pixley NWR		
Habitat Acreage	0	1,600
Bird Use Days	6,000	4,193,400
Public Use Days	300	10,300

TABLE II-3

SUMMARY OF WILDLIFE RESOURCE IMPACTS
FOR SELECTED WATER SUPPLY LEVELS
(Continued)

Refuge	Water Supply Level 2	Water Supply Level 4
Kern NWR		
Habitat Acreage	2,800	7,000
Bird Use Days	7,197,500	72,996,000
Public Use Days	6,700	15,500

(a) Water Supply Level 2: Current average annual water deliveries.
Water Supply Level 4: Optimum management.

NOTES: Although the total habitat acreage is not proposed to change for several refuges, the habitat quality would improve with additional water supplies.

Longer winter flooding periods at areas with high protein food sources, such as invertebrates, could improve conditions for breeding ducks and will increase their survival rate. If water continues to be available in the spring, the condition of brood ponds could be improved and the overall resident waterfowl populations could be increased. Additional water also could increase the amount of vegetation at the pond edges. A pond that has a larger perimeter could provide more feeding areas. In addition, if the area is properly irrigated, more seeds will be produced.

G. CONVEYANCE

In addition to water supply allocations, refuge water deliveries depend on conveyance facilities and delivery agreements with local water or irrigation districts. At the present time, contractual agreements with these districts are the principal means of conveying water to the refuges. Conveyance systems for some refuges are inadequate to deliver the water needed for optimum refuge operation. Some existing refuge delivery systems need to be improved to increase winter deliveries of water. Some of the water districts that could supply water to the refuges discontinue operations in November to allow for maintenance of the canals. Improvements to existing conveyance facilities could reduce winter maintenance requirements. In addition, water supplies are interrupted during the winter to allow operation of flood control facilities or to allow fish migration. Coordination with those activities are also being investigated. The Refuge Water Supply Investigations evaluated numerous alternatives to increase the winter deliveries from existing water supplies.

H. POWER NEEDS

All Central Valley refuges have electrical pumping power requirements. Private utilities supply the electrical power to each refuge. The type of pumping facilities at each refuge depends on whether it pumps groundwater or surface water. Some refuges pump both groundwater and surface water.

For those refuges that pump large amounts of water, the cost of power has become a major budget item. The cost has become a constraint on the full use of available water at many San Joaquin Valley refuges and Gray Lodge WMA. Under current rate structures, pumping additional groundwater is not considered practical by managing agencies because of the formidable costs.

In several areas, lowered groundwater levels have raised pumping costs. In many cases the cost of electrical power has increased to the point where pumping has been reduced to meet budget constraints.

The CVP could provide inexpensive power to the refuges, but whether the authorization exists to provide project power for fish and wildlife use is being examined. The electric power that the CVP powerplants generate is dedicated first to meeting the power requirements of the CVP facilities, or project-use power requirements. After project-use requirements are met, remaining power is used to provide commercial power to preferential customers.

Power generation rates at CVP powerplants are directly related to demands for CVP water. Recognizing that these water demands would be seasonal, CVP powerplants were designed to provide peaking power during summer months. Because peaking power alone cannot satisfy the power requirements of the CVP power customers and because peaking power is more efficiently used when integrated with a baseload power, the Reclamation entered into Contract 14-06-200-2498A (Contract 2498A) with the Pacific Gas & Electric Company (PG&E). The Western Area Power Administration, U.S. Department of Energy, (Western) administers this contract which provides for integrated operations of CVP powerplants and the PG&E system as well as certain transmission services.

The Reclamation instructions limit the allocation of project-use power to facilities that are directly involved in the conveyance or delivery of water. Contract 2948A defines many of the conditions for delivery of power for both project-use and preference customers. The contract specifies that transmission services will be limited to project-use and preference customers loads within the wheeling boundary. All of the refuges considered in this report, except Modoc NWR, are within the wheeling boundaries.

Transmission of power to preference customers is restricted to entities that have monthly maximum demands of 500 kilowatts or more for three consecutive months. For project-use customers, wheeling is restricted to facilities with a maximum demand of 100 kilowatts or more for three consecutive months. In addition, PG&E is not required to deliver power at a voltage of less than 2 kilovolts. PG&E has interpreted these restrictions to mean that the 500 kilowatts and 100 kilowatts loads have to be situated at the same meter. Therefore, a project-use or preference customer could qualify for wheeling by purchasing or constructing distribution lines that interconnect enough portions of their loads to have a power load requirement that would exceed the preference customer limit.

Contract 2948A requires project-use pumping plants to be operated to the maximum extent practical outside of the PG&E peak-load period. When plants are operated on-peak, CVP powerplants must supply the project-use power directly. Therefore, if the refuges were to receive project-use power, the on-peak power use would be minimized.

A facility must be an authorized function of the CVP to receive project-use power. The authority to deliver power to the refuges is currently being examined and will be detailed in the Refuge Water Supply Planning Report.

If it is determined that the refuges do not qualify for CVP project-use power, the refuges could apply for a CVP preference power allocation. There are many more requests for preference power than supply. The existing CVP power supply has been allocated and committed to CVP preference power customers through contracts. Some of the contracts expire in 1994. A marketing plan is being developed for future contracts that will be signed in 1994. The potential is not high for refuges to become CVP preference customers until after 1994. Based on the response to the request made by the Service in 1981 for a CVP preference power allocation, it is not certain that the refuges will receive CVP power in 1994. In 1981, the Service applied to receive CVP power for the national wildlife refuges in the Central Valley as well as for the Coleman National Fish Hatchery. Only the request for the fish hatchery was granted. DFG also applied to receive CVP power for the Gray Lodge Wildlife Management Area. This request also was not granted.

Another potential source of power for the refuges is the Pacific Northwest. This power would be transmitted to California over the transfer capability of the California-Oregon Transmission Project (COTP) which is in the advance planning stage. Under provisions of Title III of the Energy and Water Development Appropriation Act for fiscal year 1985 (P.L. 98-360) and the February 7, 1986 memorandum of the decision of the Secretary of Energy, Western will have access to 6.25 percent of the COTP transfer capability, approximately 100 megawatts. This transfer capability is reserved for use by Western for the Department of Energy Laboratories and Federal wildlife refuges. If construction of the COTP is implemented as currently planned, northwest power supplies could be available to the refuges by the early 1990's. To utilize or receive the benefit of the impact of such power, the Federal wildlife refuges will need to make utility agreements with Western and perhaps other utilities, such as PG&E.

I. RESOURCES CAPABILITY

Current annual average water deliveries to the 15 wildlife areas under study total 381,550 acre-feet, as summarized Table II-2. For optimal management, however, these areas can use up to 526,200 acre-feet annually, as determined by the Service and DFG.

During normal or above average rainfall years, surface water sources present the most dependable source of water to the wildlife areas. This supply, along with a developed groundwater pumping program at those refuges where it is feasible or practical will permit the areas to be managed as desired. The extent to which each area will reach its goal of optimum management of wetland habitat will depend on the allocation of water to each area from the CVP Water Contracting EISs.

The primary source of surface water which could be made available for wildlife area use is from the CVP through conveyance systems such as the Tehama-Colusa Canal, Delta-Mendota Canal, and the California Aqueduct. To a lesser extent, opportunities to obtain water from the State Water Project and local water districts also exist. Direct diversions from the Sacramento, Feather, and San Joaquin Rivers also may occur.

Groundwater is a potential source of water at most wildlife areas; however, with the exception of Gray Lodge Wildlife Management Area and Merced National Wildlife Refuge, none of the areas rely on groundwater as a principal source because of the current availability of less expensive surface water.

In the San Joaquin Valley, groundwater overdraft occurs in the San Joaquin River and Tulare Lake basins. Groundwater quality may make the water unusable. However, the groundwater situation varies from site to site, and groundwater cannot be overlooked as a potential supply. In many cases, groundwater could serve as a supplemental supply to other water supply alternatives.

One disadvantage to relying solely on groundwater is the rate of pump delivery. A limited groundwater pumping rate constrains effective wildlife management because rapid filling of marsh areas in the fall is often necessary. Therefore, numerous pumps are needed to provide the peak flow.

Historically, agricultural return water has been a source of water supply to several wildlife areas. Because of recent water quality concerns, particularly in the San Joaquin Valley, future use of this water remains questionable.

J. CAPACITY AVAILABLE IN EXISTING FACILITIES AND TIMING OF DELIVERIES

In addition to local conveyance capacity problems, the regional conveyance system to export water from the Delta to the San Joaquin Valley also has capacity limitations. Existing available capacity in the Delta-Mendota Canal above existing deliveries is approximately 250,000 acre-feet. The requests for additional water supplies to be exported from the Delta were collected by Reclamation for the Water Contracting EISs, and exceed 3,000,000 acre-feet. If water was to be provided to some or all of these requestors, this water would need to be conveyed through the Delta-Mendota Canal or parallel conveyance system. Regional conveyance options for export water from the Delta will be discussed in the Delta Export Water Contracting EIS and the San Joaquin Conveyance Study. The options include: 1) limiting Delta exports to 250,000 acre-feet, 2) using the California Aqueduct as allowed under the provisions of the Coordinated Operation Agreement, 3) expansion of the Delta-Mendota Canal and Tracy Pumping Plant, or 4) construction of a parallel conveyance facility. Similar capacity limitations occur on the Friant-Kern Canal.

Several public interest groups in California are concerned about increased transfer of water from the Delta. The Sierra Club, Planning and Conservation League, Environmental Defense Fund, and the Audobon Society have expressed the preference to preserve river flows in the Delta for environmental protection and enhancement rather than exporting water out of the area, and may oppose any project or plan that could reduce Delta flows from current levels during certain portions of the year.