ATTACHMENT A

Glossary of Terms

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

ATTACHMENT A

GLOSSARY OF TERMS

ACRE-FOOT. The quantity of water (43,560 cubic feet or 316,700 gallons) that would cover 1 acre to a depth of 1 foot.

AQUIFER. A porous soil or geological formation lying between impermeable strata in which water may move for long distances; yields groundwater to springs and wells.

AREA OF ORIGIN. A commonly used term generally defined as the area in which a water supply originates. The term is based on three statutes in the California State Water Code: the County of Origin and the Watershed Protection Statutes, and the Delta Protection Act.

CANDIDATE SPECIES (ALSO CANDIDATE THREATENED OR ENDANGERED SPECIES). Taxa (species or subspecies) of plants and animals currently being considered for listing by the U.S. Fish and Wildlife Service.

CENTRAL VALLEY PROJECT YIELD. The volume of water available over a period of time from CVP facilities.

CFS. A measure of a moving volume of water; i.e., cubic feet per second. Synonymous with "second-feet."

CLASS II. Contracts for water serviced after delivery of water to firm yield contractors on an "if and when available basis."

CONJUNCTIVE USE. A term used to describe operation of a groundwater basin in coordination with a surface water system.

CONSUMPTIVE USE. Total amount of water taken up by vegetation for transpiration or building of plant tissue, plus the unavoidable evaporation of soil moisture, and intercepted precipitation associated with vegetative growth.

CONVEYANCE CAPACITY. The volume of water that can be transported by a canal, aqueduct, or ditch. Conveyance capacity is generally measured in cubic feet per second (cfs).

CULTURAL RESOURCE. Any building site, district, structure, object, data or other materials significant in history, architecture, archaeology, or culture.

DECISION-1485 (D-1485). The SWRCB decision specifying water quality standards for the Sacramento-San Joaquin Delta and Suisun Marsh.

projections, and per capita historical consumption; and reduced by feasible conservation and conjunctive use yield) that would meet net demands for a water contractor through the contract period.

WATER RIGHT. A grant, permit, decree, appropriation, or claim to the use of water for beneficial purposes. California has a dual system of water rights: riparian and appropriative.

WATER USE. The quantity of water actually being diverted or assumed to be diverted in the future.

WETLANDS. Areas defined by the prevailing vegetation types and soil moisture content and contain vegetation typical of soils that are saturated for a major portion of the year.

YIELD. The volume of water available over a period of time from a storage facility.

the intermittent supply would depend on the type of water year (wet, normal, or dry), and the quantity of water delivered each year to firm yield contractors. The probability of delivering an intermittent supply would be calculated on the basis of past hydrology and the ability to meet firm yield demands based on the 1928-34 dry year period (e.g., 75 years out of 100, 80 years out of 100, 85 years out of 100, etc.).

INTERRUPTIBLE WATER. See Intermittent Water.

PEAK FLOW. The maximum discharge of a stream during a specified period of time.

PERMEABILITY. The property or capacity of a porous rock, sediment, or soil for transmitting a fluid.

RECREATION DAY. A standard unit of use consisting of a visit by one individual to a recreation development or area for recreation purposes during any reasonable portion or all of a 24-hour period.

RETURN FLOW. Water which reaches surface drainage by overland flow or through groundwater discharge as a result of irrigation.

RIPARIAN. Living on or adjacent to a water supply such as riverbank, lake, or pond.

SAFE YIELD. The rate or amount at which an aquifer may be pumped without exceeding recharge and incurring overdraft.

SHORTAGES. Reductions in the amount of water being delivered under contract. The amount of the reduction is based on deficiency criteria established in each contract to moderate the effects of a dry and critically dry period.

SPECIES. The basic category of biological classification intended to designate a single kind of animal or plant.

SURPLUS WATER. Water which historically has been available. Generally, this water has been intermittent or interim water. See previous definitions.

THREATENED SPECIES. A species that is likely to become endangered in the foreseeable future and is included in the federal list of threatened species.

WATER DEMAND. The amount of water required to meet the needs of a contractor on a monthly basis. The demand is based upon the evapotranspirative needs of vegetation, seepage rates on the refuge, and conveyance losses.

WATER NEED. A monthly schedule of additional water deliveries (determined by review of farm delivery requirements, population

ATTACHMENT B

Abbreviations

U.S. DEPARTMENT OF THE INTERIOR
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ATTACHMENT B

ABBREVIATIONS

BVWSD	Buena Vista Water Storage District
BWGID	Biggs-West Gridley Irrigation District
CCID	Central California Irrigation District
CMP	Corrugated Metal Pipe
Contract 2948A	Contract 14-06-200-2498A
COTP	California-Oregon Transmission Project
CVP	Central Valley Project
DFG	California Department of Fish and Game
DMC	Delta-Mendota Canal
DWR	California Department of Water Resources
EQ	Environmental Quality
FKC	Friant-Kern Canal
GCID	Glenn-Colusa Irrigation District
GRCD	Grassland Resource Conservation District
GWD	Grassland Water District
KCWA	Kern County Water Agency
LHWSD	Lost Hills Water Storage District
MID	Merced Irrigation District
NED	National Economic Development
NWR	National Wildlife Refuge
PID	Pixley Irrigation District
PG&E	Pacific Gas & Electric Company
RCP	Reinforced Concrete Pipe
SLCC	San Luis Canal Company

ATTACHMENT C

Persons Contacted

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

ATTACHMENT C

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Mr. Harold Russel	Manager
Mr. Martin N. Milobar	Assistant Engineer Manager

Central California Irrigation District

Mr. Walt Latham	Watermaster
Mr. Michael Porter	Manager

Glenn-Colusa Irrigation District

Mr. Robert D. Clark	Manager
Mr. Louis R. Hoskey	Watermaster
Mr. Ben Tennock	Engineer

Grassland Water District

Mr. Don Marciochi	Manager

Joint Water District Board

Mr. Milt McVicker	Manager

Kern County Water Agency

Mr. Stuart Pyle	Manager

Lost Hills Water District

Mr. Joe Steele	Manager

Lower Tule River Irrigation District

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ATTACHMENT D

Related Legislation and Acts

U.S. DEPARTMENT OF THE INTERIOR
BUREAU OF RECLAMATION
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APPENDIX D

RELATED LEGISLATION AND ACTS

This appendix represents only a partial listing of related legislation and programs. A more complete listing will be included in the Refuge Water Supply Planning Report.

with duck stamp receipts in the fund and assigned to the Secretary of the Interior. These funds are used to acquire migratory bird refuges under provisions of the Migratory Bird Conservation Act and to acquire "Waterfowl Production Areas."

Unless the Wetlands Loan Act debt is forgiven,[1] 75 percent of the revenues from duck stamp sales will be used beginning in 1985 to repay the loan. This repayment could drastically reduce the funds available for Federal habitat acquisition under the MBCF.

Funds created by this act could be used to purchase areas of national significance to waterfowl in California. MBCF funds are now used to purchase conservation easements in the Central Valley that protect in perpetuity the wetlands acquired.

The Migratory Bird Conservation Act of 1929 established the Migratory Bird Conservation Commission. This commission approves areas and prices the Secretary of the Interior recommends for acquisition with MBCF funds. However, this act requires that the Secretary of the Interior consult with the appropriate State governments before recommending an area for purchase. Acquisition authority under this act includes rentals and purchase in fee or partial interests (easements). This act also authorizes the Secretary of the Interior to cooperate with local authorities in wildlife conservation as well as to conduct investigations, publish documents related to North American birds, and maintain and develop refuges.

This act also authorizes investigations that could be used in California to assess the need for more habitat. The extent of this need is a key question that requires additional research. With approval from all the required Federal, State, and county governments, more waterfowl habitat could be acquired in the Central Valley under the authority of this act.

The Wetlands Loan Act of 1976 authorizes the appropriation of funds to accelerate the USFWS's land acquisition program for waterfowl. These funds are allocated to the MBCF and are subject for uses authorized under the Migratory Bird Hunting Stamp Act of 1934. This loan is to be repaid to the Treasury beginning in Fiscal Year 1985 with duck stamp revenues from the MBCF. Legislation is currently before Congress that would forgive this loan and extend funding for another 10 years. This legislation is further discussed below under "Federal Management and Improvement Programs."

These new funds could be used to acquire more waterfowl habitat in the Central Valley, but how these funds will be distributed among the States for the purposes authorized by the Migratory Bird Hunting Stamp Act is unknown.

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[1]The Department has submitted draft legislation to the Congress with the suggestion that it be introduced by a member of Congress. H.R. 30823 and S. 1329 would extend the Wetlands Loan Act for 10 years and forgive the repayment of advances made under it. For more information, see "Federal Management and Improvement Programs" below.

LEGISLATION AND PROGRAMS AFFECTING CENTRAL VALLEY HABITAT

This discussion is organized into two major sections. It begins with the laws that affect Central Valley habitat and then looks at programs that present opportunities for improving that habitat.

LEGISLATION AFFECTING CENTRAL VALLEY HABITAT

The following discussion of laws affecting Central Valley waterfowl habitat is divided into Federal and State legislation.

Federal Legislation

The Federal government's authority to develop habitat is based largely on a body of existing Congressional acts that have been approved and amended over the past 55 years. Special acts of Congress and executive orders are other means of acquiring habitat. The following discussion identifies the scope and limitation of each Federal act for providing new and better Central Valley waterfowl habitat.

Federal acts related to developing more waterfowl habitat can be divided generally into funding, acquisition, and assistance authorities. Some acts address more than one authority. Table E-1 presents a summary of the applicable Federal acts and their authorities.

Most of the Congressional acts applicable to this study have been amended many times to accommodate changing priorities in the direction and funding of habitat acquisition. These modifications have changed the original emphasis of some acts. Because of these changes in emphasis, the following act summaries are not arranged in chronological order but begin with those that are most general in authority and set policy and funding structure that other acts depend on.

The Fish and Wildlife Act of 1956 established a comprehensive national fish and wildlife policy and the present USFWS. It directs the Secretary of the Interior to provide continuing research, to provide extension and information services, and to take any necessary steps to develop, manage, protect, and conserve fish and wildlife resources. These steps may include acquiring refuge lands and developing existing facilities.

The general authority established in this act could be used to develop the research necessary in the Central Valley to determine the need for additional habitat. It could also provide the authority to acquire more habitat with the use of Land and Water Conservation Funds or from special appropriations.

Coordination Act, and the Endangered Species Act of 1973. Three primary sources of funds for acquiring refuge lands are the MBCF, the Wetlands Loan Act, and the Land and Water Conservation Fund Act.

If the need for more waterfowl habitat can be demonstrated clearly, a special act of Congress establishing additional refuges in the Central Valley may be the most likely avenue for obtaining more habitat. This avenue may be necessary, because all funding sources under existing authorities are now being applied to various programs.

The Refuge Recreation Act of 1962 authorizes the Secretary of the Interior to administer refuges, hatcheries, and other conservation areas for recreational use when such uses do not interfere with the area's primary purpose. It also authorizes the acceptance of donations of funds and real and personal property for purposes of the act. As amended by the Endangered Species Act of 1973, it authorizes the acquisition of lands and interests suitable for either (1) fish and wildlife-oriented recreation, (2) protection of natural resources, (3) conservation of endangered or threatened species, or (4) carrying out two or more of the above. Such lands must be adjacent to or within the conservation area. Acquisition cannot be carried out with MBCF funds; however, funds for acquisition are available from the Land and Water Conservation Fund.

Central Valley National Wildlife Refuges could be expanded under this authority depending on the availability of Land and Water Conservation Funds.

The Land and Water Conservation Fund Act of 1965 created a special fund from various types of revenues such as surplus property sales, motorboat fuel tax, and Treasury appropriations. This act authorizes appropriations from the fund for matching grants to States for outdoor recreation projects and for financing various Federal programs, including the national wildlife refuge system. Acquisition of habitats funded through this act for the refuge system may be authorized by the Endangered Species Act, the Refuge Recreation Act, the Fish and Wildlife Act--except migratory waterfowl areas authorized by the Migratory Bird Conservation Act--and special acts of Congress.

This act will generate funds only through 1989 unless it is reauthorized. Legislation[2] is currently in Congress that will authorize the appropriation of $75 million per year for 10 years from the Land and Water Conservation Fund (LWCF) for habitat acquisition under the Migratory Bird Conservation Act. This transfer of LWCF funds was not previously authorized for this purpose.

If the use of LWCF funds for the Migratory Bird Conservation Act is approved, the authority of this act to acquire more waterfowl habitat will be greatly enhanced. If, however, the transfer of funding is not approved, the most likely way to apply these funds to acquire waterfowl habitat would be through a special act of Congress.

[2]H.R. 30823 and S. 1329.

Funds authorized for acquisition by this act are not being used now for obtaining new habitat in California; they are being funneled primarily into management projects. Although there is some Federal control over the way States use these funds, the amount of habitat acquired under the authority of this act is largely the State's prerogative.

The Lea Act of 1948 authorizes the acquisition and development of up to 20,000 acres of land in California for the management and control of migratory waterfowl and other wildlife. These activities are carried out with funds appropriated from time to time by Congress. However, funding is contingent upon the State's acquiring equivalent acreage.

Approximately 5,400 acres of waterfowl habitat have been acquired in California under authority of the Lea Act. This authority, however, has not been used recently. Until there is additional need to control waterfowl depredation problems in California and the State agrees to have equivalent acreages, this authority will not be available for acquiring additional habitat.

The National Wildlife Refuge System Administration Act of 1966 expresses Congressional policy and provides guidelines and directives for the administration of all areas of the national wildlife refuge system, including areas for the conservation of fish and wildlife that are threatened with extinction. This act consolidates and expands authorities relating to management of the refuge system and provides sanctions and enforcement provisions to protect its resources. This act also provides the authority to exchange lands, negotiate concession contracts, and other similar activities.

A 1968 amendment provides that proceeds from disposal of lands in the system acquired with Duck Stamp funds or by donation are to be paid into the MBCF and that the Migratory Bird Conservation Commission must be consulted before any land from the refuge system is disposed of. It was amended in 1974 by PL 93-509 to require payment of the fair-market value of rights-of-way or other granted interests, with the proceeds being deposited in the MBCF and made available for land acquisition. It was amended by PL 94-215 to allow the disposal of interests in lands in the system by exchange. Finally, it was amended by PL 94-223 to establish administration and management of the system by the USFWS and to limit disposition of certain refuges except by an act of Congress.

Because this act addresses mainly the policy and administration of the national wildlife refuge system, it does not provide authority to acquire more waterfowl habitat in the Central Valley. It could be used as a funding source for the MBCF, but the amount of money generated from sale of rights-of-way or other interests is insignificant compared with other MBCF sources.

In addition to specific acts of Congress, refuges can be established by means of National Wildlife Refuges Acts in many ways, including withdrawal from public land, transfer from other agencies, cooperative agreement with other agencies, donation, and purchase. The purchases may be made under such authorities as the Fish and Wildlife Act of 1956, the Migratory Bird Conservation Act, the Fish and Wildlife

annual payment may be made to participating owners, and the costs of conservation measures may be shared. State and county governments must agree to this program before it can be implemented locally.

In California, there is more demand for water bank agreements than can be met with current funds. Further development of waterfowl habitat in California is not possible under this act until additional funds are appropriated.

The Watershed Protection and Flood Prevention Act of 1954 declares a policy of assisting State and local organizations in preventing erosion, flood water, and sediment damages to watersheds and to further "the conservation, development, utilization and disposal of water, and the conservation and utilization of land."

This act authorizes the Secretary of Agriculture to assist local organizations in preparing and carrying out certain improvement works. It also requires that the Secretary of the Interior be notified of approval of assistance so that he "may make surveys and investigations" and recommend measures for "conservation and development of wildlife resources." However, inclusion of such measures in the project are discretionary for the local organization and the Secretary of Agriculture. The Secretary of the Interior must bear the cost of such conservation surveys and reports.

This act does not authorize Federal habitat acquisition but could provide Federal technical assistance to organizations interested in improving waterfowl habitat as part of their watershed protection plan.

The Soil Conservation and Domestic Allotment Act of 1935 provides programs for the prevention of soil erosion such as farm pond construction and establishes the Soil Conservation Service of the Department of Agriculture. As amended, it authorizes the Secretary of the Interior to review applications to the Department of Agriculture for assistance in draining farm wetlands in Minnesota, South Dakota, and North Dakota. Drainage assistance is prohibited if the Secretary finds that a wetland is important to wildlife preservation, if the Secretary or a State agency offers to lease or purchase such wetlands for waterfowl purposes within 1 year, or if a deal is closed within 5 years.

Although this act does not give the Secretary of the Interior any authority to review Department of Agriculture wetland drainage programs in California, it could be used to encourage waterfowl habitat improvements in the Central Valley if these improvements were part of a program to prevent soil erosion.

State Legislation and Policies

The following discussion of State laws and policies begins with the most general laws and policies that lay the groundwork for wildlife preservation and ends with those that more specifically aid in acquiring waterfowl habitat. The laws and policies discussed are:

The Endangered Species Act of 1973 provides for the conservation of threatened and endangered species of fish, wildlife, and plants. It authorizes an expanded program of habitat acquisition using LWCF resources.

This acquisition authority could be used to acquire habitat for the Aleutian Canada goose[3] within the Central Valley but has not been used for that purpose. The State must be consulted before land can be acquired under the authorization of this act.

The purpose of the Small Reclamation Projects Act of 1956 is to encourage State and local participation in the development of reclamation projects and to provide Federal assistance. It states that the cost of means and measures to prevent loss of and damage to fish and wildlife resources shall be considered a project cost.

Projects under this authority are subject to the review requirements of the Fish and Wildlife Coordination Act, which authorizes habitat acquisition as a potential mitigation source. The acquisition of more habitat than is actually lost from project impacts is, however, unlikely.

The Federal Water Project Reclamation Act of 1965 declares the intent of Congress that recreation and fish and wildlife enhancement shall be fully considered purposes of Federal water-development projects, provided that non-Federal public bodies agree to three conditions. These bodies must (1) bear not more than one-half the separable costs of the project allocated to recreation and exactly three-quarters of such costs allocated to fish and wildlife enhancement, (2) administer project lands and water areas devoted to those purposes, and (3) bear all costs of operation, maintenance, and replacement. Where Federal lands or authorized Federal programs for fish and wildlife conservation are involved, the cost-sharing requirements are exempted.

This act provides for the expenditure of Federal water projects funds for land acquisition needed to establish refuges for migratory waterfowl when recommended by the Secretary of the Interior. It also authorizes the Secretary to provide facilities for outdoor recreation and fish and wildlife at all reservoirs under the Secretary's control, except those within national wildlife refuges.

The provisions of this act do not apply to projects constructed under authority of the Small Reclamation Projects Act or the Watershed Protection and Flood Prevention Act. Waterfowl refuges and habitat have never been purchased in California under the enhancement authority of this act, but they could be if Federal water agencies were directed to do so.

The Water Bank Act of 1970 authorizes the Secretary of Agriculture, in coordination with the Secretary of the Interior, to enter into 10-year contracts with landowners to preserve wetlands and retire adjoining agricultural lands. An

[3]The Aleutian Canada goose is the only waterfowl species in the Central Valley currently listed as endangered.

General Environmental and Land Use Laws. The following legislation, together with the Public Trust Doctrine, provides general support for Central Valley fish and wildlife resources, including waterfowl and their habitat.

The purpose of the California Environmental Quality Act (CEQA)[5] is to provide timely information to the public and decision makers concerning the potential environmental impacts of proposed land and water use projects. This act is, in effect, the State's charter for environmental protection.

The effectiveness of CEQA in protecting wetlands varies according to how local communities enforce it and according to the nature of the proposed action. For example, no CEQA process is required when most private wetlands in the Central Valley are converted to agriculture. This act, nevertheless, has substantially benefited waterfowl and their management as well as most other State wildlife resources in two ways. (1) CEQA has made decision makers on land and water use more sensitive to environmental conditions, and (2) it has quickened the reform of planning and decision-making practices. In effect, it has helped to ensure that decision makers and the public take into account the value of fish and wildlife resources.

In 1984, the Legislature passed two amendments to the California Endangered Species Act: AB 3270 and AB 3309. AB 3270 requires that the State Fish and Game Commission establish a procedure for receiving and considering petitions to add or delete a species from the State lists of endangered, threatened, and rare plants and animals. This bill formalizes the petitioning process. It is expected to improve public awareness in this area and to provide consistent procedures throughout the State's endangered species program.

AB 3309 amended the California Endangered Species Act to require that certain State agencies adopt alternatives to a proposed project if the Department of Fish and Game determines that the project would jeopardize the existence of or adversely modify the habitat of an endangered or threatened species. This bill is designed to provide greater protection for endangered and threatened species by requiring more careful and deliberate consideration of the special needs of these species in the environmental review process. The text of the Endangered Species Act is included in Appendix F.

The Subdivision Map Act[6] requires that potential impacts to fish and wildlife habitat be identified before a parcel map can be approved. This legislation was strengthened by the State Attorney General's opinion on May 17, 1985. The opinion stated that if significant adverse environmental effects identified with respect to a tentative map of the subdivision related to the design or proposed improvements of the subdivision, then a local agency may not approve the tentative map.

[5]Public Resources Code Section 2100 et seq.

[6]Government Code Section 66410 et seq.

Public Trust Doctrine

General Environmental and Land Use Laws

California Environmental Quality Act
California Endangered Species Act
Subdivision Map Act
California Land Conservation Act of 1965

Water Use and Water Development Laws

Water Code, Section 1243
Davis-Dolwig Act

Wildlife Habitat Conservation Laws

California Species Preservation Act
Conservation of Wildlife Resources Policy
Native Species Conservation and Enhancement Act
Fish and Wildlife Protection Conservation Policy

Wetland Management Laws

California Coastal Act
McAteer-Petris Act
Suisun Marsh Preservation Act
Keene-Nejedly California Wetlands Preservation Act
Senate Concurrent Resolution 28
California Park and Recreational Facilities Act
Fish and Wildlife Habitat Enhancement Act

Public Trust Doctrine. The Public Trust Doctrine has its roots in English Common Law. In England, the waterways were held in trust by the king for the public. Similarly, the California Constitution[4] provides that navigable waters are held in trust by the State for the people of California. This doctrine establishes generally that the State is legally and morally responsible for protecting, among other things, wetlands.

The State Lands Commission is given the authority by Public Resources Codes Section 6307 to settle land disputes between private and public entities. Both the California Supreme Court and the U.S. Supreme Court have used this doctrine to uphold the importance of preserving wetlands. A recent decision on Mono Lake by the California Supreme Court further strengthened and clarified the importance of the Public Trust Doctrine.

[4]Article X, Section 1 (1879); Article X, Section 3 (1879); Article X, Section 4 (1879); Article I, Section 25 (1910).

The Native Species Conservation and Enhancement Act of 1974[10] declares that it is State policy to maintain habitat needed for the continued existence of wildlife, regardless of the level of economic value of that wildlife. It creates the Native Species Conservation and Enhancement Account to receive donations for the conservation and enhancement of nongame wildlife species and native plant species. No such account, however, was set up for game species such as waterfowl, although an account for game species may be possible.

The Fish and Wildlife Protection and Conservation Policy[11] is a general mandate to protect and conserve fish and wildlife resources. It states:

> The protection and conservation of the fish and wildlife resources of this state are hereby declared to be of utmost public interest. Fish and wildlife are the property of the people and provide a major contribution to the economy of the State as well as providing a significant part of the people's food supply and therefore their conservation is a proper responsibility of the state. . . .

This policy lends general support to any legislation that could call for habitat acquisition for the conservation of fish and wildlife resources.

Wetlands Management Laws. Several acts directly protect California wetlands: the California Coastal Act of 1976, the McAteer-Petris Act of 1969,[12] and the Suisun Marsh Preservation Act. However, they only protect small geographic areas. Nearest to the interests of this report are the declarations of the Suisun Marsh Preservation Act, namely, that the marsh be preserved and protected, that it include nearly 10 percent of the State's remaining natural wetlands, and that it provide habitat for wintering waterfowl and other fish and wildlife.

The Keene-Nejedly California Wetlands Preservation Act of 1976[13] calls for recognition of general marsh resource values. It states that there is a need for an "affirmative and sustained public policy and program directed at their [wetlands] preservation, restoration, and enhancement, in order that such wetlands shall continue in perpetuity." This act was designed to lay the foundation for a statewide wetlands plan and for the purchase of 10 wetlands; however, no funds were allocated. Senate Concurrent Resolution 28 (1978) was intended to regain the momentum this act failed to establish.

Senate Concurrent Resolution No. 28 (SCR 28), Relative to Wetlands, (1979), requested the Department of Fish and Game to prepare a plan that would identify means to protect existing wetlands, to restore former wetlands, and to create new wetlands. Among other items, SCR 28 directed the Department of Fish and Game to identify potential wetland habitat and the means to acquire it with the goal of increasing California's wetlands by 50 percent. The plan was submitted in

[10]Fish and Game Code, Sections 1750-1763.
[11]Fish and Game Code, Section 1600.
[12]San Francisco Bay Conservation and Development Commission Enabling Act.
[13]Public Resources Code, Sections 5810-5818.

The California Land Conservation Act of 1965 (Williamson Act) gives tax breaks to landowners who run commercial operations if they sign a 10-year renewable contract to maintain "agricultural preserves." These areas include open-space lands and wildlife habitat such as waterfowl hunting areas, salt ponds, and submerged areas.

This act encourages land use that favors wildlife, including waterfowl; however, because most wetlands are already taxed at a low rate, the effectiveness of this act is limited.

Water Use and Water Development Laws. The following legislation works primarily to enhance habitat through water resources development.

The Water Code, Section 1243, states that enhancement and protection of fish and wildlife is a beneficial use of water, and that the State Water Resources Control Board is to implement this policy. This policy supplies the foundation for the Davis-Dolwig Act of 1961.

The Davis-Dolwig Act of 1961[7] declares that recreation and fish and wildlife should be given equal consideration with other project purposes in the acquisition of lands for State water projects. This act authorizes the use of State General Funds to fish and wildlife resources as part of projects constructed by California alone or by California in cooperation with the U.S. Government. It supports the acquisition of waterfowl habitat by requiring that planning for fish and wildlife preservation and enhancement be done during the design phase of a project.

Wildlife Habitat Conservation Laws. The following legislation provides support for the conservation of wildlife and their habitat.

The California Species Preservation Act of 1970[8] established the Department of Fish and Game's role in listing rare and endangered species. It states that it is the intent of the Legislature to "preserve, protect, and enhance the birds, mammals, fish, amphibia, and reptiles of the State."

This act has required a report, published under the title At the Crossroads, to the Legislature every 2 years since 1972. To date, however, this act has not been used as a vehicle for habitat acquisition, though habitat loss is identified as a key factor in the decline of wildlife.

The Conservation of Wildlife Resources Policy[9] stems from the Public Trust Doctrine that wildlife are the property of all the people of the State. This policy can be used to preserve wildlife habitat, but it does not outline a specific process for doing so.

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[7]Water Code, Sections 11900-11925.
8Fish and Game Code, Sections 900-903, 3511, and 4700, Chapter 1030; AB 2395.
[9]Fish and Game Code, Sections 1800-1801.

November 1983. This plan, entitled A Plan for Protecting, Enhancing, and Increasing California's Wetlands for Waterfowl, is further discussed below under State acquisition programs. SCR 28 and the Department of Fish and Game's plan carry no legal authority; they must be implemented by the Legislature to take effect.

The California Park and Recreational Facilities Act of 1984 (AB 2099), a bond issue, was passed in June 1984. It added a chapter to the Public Resources Code for financing a program of acquiring, developing, or restoring real property for State and local park, beach, recreational, or historical resources preservation. The total bond is for $370 million, of which $5 million is earmarked for acquiring, developing, rehabilitating, or restoring real property for wildlife-oriented public use projects. It may be possible to acquire waterfowl habitat with these funds. A copy of this act is contained in Appendix G.

Along with AB 2099, the Fish and Wildlife Habitat Enhancement Act of 1984 (SB 512) was passed in June 1984. It added sections to the Fish and Game Code that authorize the issuance of bonds totaling $85 million. The funds obtained from the sale of these bonds will be appropriated by the Wildlife Conservation Board and the State Coastal Conservancy to "correct the most severe deficiencies in fish and wildlife habitat currently found in California through a program of acquisition, enhancement, and development of habitat areas that are most in need of proper conservation and management."

Of the $85 million, $30 million is earmarked to acquire and enhance habitat for "wildfowl and other wildlife benefited by a marsh or aquatic environment." In addition, $5 million is earmarked to acquire and enhance lands "for habitat for rare, endangered, and fully protected species."

This total of $35 million is being administered by the Wildlife Conservation Board and holds the greatest potential for acquiring waterfowl habitat. The remaining $50 million will go to restore waterways for the management of fisheries, to manage other wildlife habitat, to acquire coastal zones, to enhance and develop habitat, and to fund local agencies.

As of September 1985, the Wildlife Conservation Board had spent $2.5 million to acquire or develop waterfowl habitat. A copy of the Fish and Wildlife Habitat Enhancement Act is contained in Appendix H.

In addition to the laws and policies discussed above, the California Waterfowl Association has introduced State legislation (SB 493) that would essentially create the State equivalent of the Department of Agriculture's Water Bank Program. One major difference is that the proposed State program would, in addition to requiring an initial 10-year sign-up period, require a 10-year notice before cancellation by the landowner. This legislation, supported by the Department of Fish and Game, is before the Legislature and, if enacted, could become a powerful additional tool to help preserve and enhance Central Valley waterfowl habitat.

Table E-2. Programs and their areas of interest affecting central valley waterfowl habitat

	Interests[a]
FEDERAL PROGRAMS	
Bureau of Reclamation	
Central Valley Project	D
Mid-Valley Canal Project/San Joaquin Conveyance Project	D
San Luis Drain Project	D
West Sacramento Canal Unit	D
Corps of Engineers	
Cache Creek Basin	D
Merced Stream Group	D
Morrison Creek Stream Group	D
Sacramento Riverbank Protection Projects	D
Sacramento-San Joaquin Delta	D
San Francisco-Stockton Ship Channel	D
Department of Agriculture	
Resource Conservation and Development Programs	I
Small Watershed Programs (PL-566)	D,I
Water Bank Program	A,I,T
Department of the Interior	
Preserve Our Wetlands and Duck Resources (POWDR)	I,[b]P,S
Fish and Wildlife Service	
Conservation Easement Program	A
Migratory Bird Wetland Preservation Program	I,P
National Wildlife Refuge Program	C,E,I,M
Use of Agricultural Tile Drain Water for Marsh Management	R
Research Programs	R
Wastewater Availability Study for Wetlands	R
STATE OF CALIFORNIA PROGRAMS	
Bay Conservation and Development Commission	I,M
California Coastal Commission	I,M
Department of Fish and Game	
1981 Duck Club Survey	R
Duck Stamp Program	I,S
Ecological Reserve Program	A,E,I,M
Sacramento-San Joaquin Delta Study[c]	C,R
Region IV Research Programs	R
Senate Concurrent Resolution No. 28	A,P
Waterfowl Group Research Programs	E,R,T
Wildlife Management Area Program	C,E,I,M
Department of Water Resources	
Suisun Marsh Preservation Plan	D,I
Grasslands Water District	
Water Appropriation Program	C,D,L,M
Humboldt State University	
Wildlife Department	R
Resource Conservation Districts	
Suisun and Grasslands Districts Wetland Programs	D,M
Tulare Lake Drainage District	
Drain Water Impoundments	D,I
University of California	
Natural Land and Water Reserves System	A,E,M
Pertinent Studies/Research	R
Wildlife Extension Service	E,I,T
Wildlife Conservation Board	
Acquisition Programs	A,I

PROGRAMS AFFECTING CENTRAL VALLEY HABITAT

A number of Federal, State, and private programs affect Central Valley waterfowl habitat. Most of these programs have several areas of interest; for example, a program may involve habitat acquisition, management, and research. Table E-2 lists the major programs, together with their areas of interest, that affect Central Valley habitat. Appendix I contains a list of contacts for these programs. Appendix J lists the publications related to the programs.

This discussion categorizes these programs according to their major interest or activity, taking habitat acquisition to be the most important for the purposes of this report. Categories, in order of discussion, include:

Acquisition
Water resource development
Management and improvement
Research
Lobbying

Each of these activities is in turn divided into Federal, State, and, if applicable, private programs.

Habitat Acquisition Programs

The decline in the value of Central Valley lands has created an excellent opportunity to acquire these lands for development back into waterfowl habitat. The following paragraphs describe those Federal, State, and private programs that work primarily to acquire new waterfowl habitat.

Federal Acquisition Programs. Many Federal authorities can be used to acquire more waterfowl habitat in the Central Valley. The majority of these authorities are designed for use by the USFWS in its habitat acquisition programs. The degree to which these authorities can be used for habitat acquisition, however, is determined by the policies of each Federal bureau or department and by the limitations and policies specified in each authority. Authority limitations were pointed out earlier under the discussion of Federal legislation.

USFWS Land Acquisition Policy. The aim of the USFWS land acquisition policy as of August 1982 is to protect lands and waters consistent with legislation, congressional guidelines, and executive orders, for the conservation of fish, wildlife, and plants and their related habitat. This policy includes providing wildlife-oriented public use of these lands and waters as well as educational and recreational uses.

The basic USFWS policy is to acquire interest in land only when other means of achieving program goals and objectives, such as zoning or regulation, are not appropriate, available, or effective. When lands are to be acquired, the minimum

To carry out this policy, a Land Protection Plan is developed whenever a land-based solution to a resource protection problem is identified for action by the USFWS. The plans are prepared with public participation and consider the sociocultural impacts of implementation.

To implement the various authorizing acts and congressional mandates, USFWS acquisition units are divided into two land acquisition authorization categories:

1. Specifically Authorized Areas. In those areas specifically authorized by an act of Congress, acquisition is carried out in accordance with the policies prescribed by Congress in the authorizing legislation.

2. Generally Authorized Areas. Acquisitions in areas under general authorities such as the Migratory Bird Conservation Act, Fish and Wildlife Act of 1956, Endangered Species Act, Migratory Bird Hunting and Conservation Stamp Act, and Refuge Recreation Act of 1962 are carried out on a willing-seller basis. However, the USFWS may acquire land through litigation to manage and develop the unit effectively or to prevent uses that would cause irreparable damage to the resources the unit was established to protect. Requests to the solicitor to initiate condemnation will be made only after receiving previous approval from the director and notifying the landowner.

Two major ongoing Federal programs in the Central Valley deal with acquisition by fee, rental, or easement of waterfowl habitat. They are the USFWS Conservation Easement Program and the Department of Agriculture Water Bank Program. These programs are funded by and administered under authority granted by the Migratory Bird Conservation Act and the Water Bank Act.

USFWS Conservation Easement Program. The purpose of the USFWS Conservation Easement Program is to preserve waterfowl habitat by obtaining perpetual easements in key areas identified in the USFWS's Land Protection Plans. Landowners in this program must maintain existing land use conditions and cannot alter their land in any way that is detrimental to waterfowl. Easement payments are based on assessed value of the land.

The USFWS has targeted three major Central Valley areas for its Conservation Easement Program: the Grasslands Area of the San Joaquin Valley (Kauffeld and Loth, 1985), the Butte Sink (USFWS, 1984), and the Colusa Basin (Strong and Helvie, 1985) of the Sacramento Valley. Since 1979, about 26,000 acres have been placed under conservation easements in the western part of the Grasslands Area. Within Butte Sink, about 2,400 acres are now protected, and about 637 acres of existing wetlands are protected in the Colusa Basin.

In August 1985, the USFWS released a plan to acquire about 36,550 acres of waterfowl habitat in the eastern part of the Grasslands Area of Merced County

(Kauffeld and Loth, 1985). This plan proposes conservation easements on 30,260 acres of grassland and marshland, and fee title acquisitions on 6,290 acres of grassland, marshland, and cropland. Funding for these acquisitions would come

Table E-2. Programs and their areas of interest affecting central valley waterfowl habitat, continued

	Interests[a]
OTHER PROGRAMS	
Audubon Society	
Reserve Programs	A,E,I,L,M
California Waterfowl Association	
California Marsh Program	I,L,M,S
Ducks Unlimited	
Waterfowl Habitat Leasing Program	A
John Schulte	
Private Research Projects	R
Nature Conservancy	
California Critical Areas Program	A,E,I,M
Oregon State University	
Department of Fisheries and Wildlife	R
Sacramento Valley Waterfowl Habitat Management Committee	L
Waterfowl Habitat Owners Alliance	L

Key: A--Acquisition, easement, leasing
C--Consumption of waterfowl
D--Water development
E--Education, information
I--Improvement
L--Lobbyist group on wetland/waterfowl issues
M--Management, maintenance
P--Planning
R--Research
S--Cost sharing for improvement
T--Technical assistance in management

[a]For those programs that have two or more areas of interest, the area of interest under which the program is discussed in the text is indicated with an underscore.
[b]In the text, habitat improvement programs have been combined with habitat management programs in a single discussion.
[c]With the USFWS.

interest necessary to reach management objectives is acquired or retained. If fee title is required, full consideration is given to extended-use reservations, exchanges, or other alternatives that will lessen the impact on the owner and the community. Donations of desired lands or interests are encouraged.

priority, of potential new wetlands for acquisition or development. To take effect, the Legislature must provide funding and implementation. The passage of the Fish and Wildlife Habitat Enhancement Act of 1984 will aid the habitat acquisition portion of this plan.

The Fish and Wildlife Habitat Enhancement Act (see Appendix H) is a major vehicle for acquiring and improving Central Valley waterfowl habitat. This act authorized bonds totaling $85 million, $35 million of which is earmarked for acquiring and improving waterfowl and other wildlife habitat. Under provisions of this act, two significant acquisitions have been approved for funding: (1) about 150 acres adjoining the west side of the Mendota Wildlife Management Area in Fresno County and (2) about 949 acres adjoining the eastern edge of the Mendota Wildlife Management Area. Within the same area, another two acquisitions involving 2,477 acres are also being considered for funding. Because of the relative importance of these acquisitions, they have been described in greater detail in Part IV under "State Resources for Improving Habitat."

The Wildlife Conservation Board, working with the Department of Fish and Game, administers acquisition programs that include acquiring wetlands by purchasing fee titles, by purchasing easements, and by arranging leasing. The goals of these programs are to preserve natural habitat, improve existing lands for wildlife, and develop access to and facilities for hunting and fishing. Funding is obtained from pari-mutuel racing funds, license plate fees, and bond issues, including bonds issued under the Fish and Wildlife Habitat Enhancement Act.

Private Acquisition Programs. Private duck clubs have also acquired, preserved, and managed wetlands for waterfowl in the Central Valley. Of all areas managed for waterfowl, about two-thirds are duck clubs. In 1981, about 137,000 acres of waterfowl habitat were in private ownership (California Department of Fish and Game, 1983).

In addition, local parks and private foundations have acquired habitat for waterfowl. The Nature Conservancy, the Audubon Society, and Ducks Unlimited have purchased land directly, obtained partial interest in land, or leased land to protect wetlands. (See also the discussion of the California Waterfowl Association below under "Private Management and Improvement Programs.")

Nature Conservancy. The Nature Conservancy manages the California Critical Areas Program. The purpose of this program is to identify and protect ecologically endangered lands through acquisition and easements. To date, the Nature Conservancy has acquired wetland, riparian, and upland preserves throughout California that are important to waterfowl and plans to acquire additional areas.

The Nature Conservancy is considering funding a proposal by Farm and Wet Lands Incorporated for the Mokelumne Sink area. The Mokelumne Sink comprises about 11,000 acres of native wetlands, riparian woodlands and forests, and developed farmlands about 20 miles south of Sacramento at the confluence of the Cosumnes and Mokelumne rivers. Although the area already provides habitat of considerable value to waterfowl, particularly during the winter season when some flooding occurs,

under provisions of the Migratory Bird Conservation Act and the Endangered Species Act. The two areas proposed for fee title acquisition would be managed by the USFWS to complement the Merced and San Luis national wildlife refuges. Easement lands, on the other hand, would continue to be managed by the landowner under terms of the easement documents.

Over the years, much of the East Grasslands has been converted to farmland. The most recent conversions occurred during the late 1970s, when nearly 15,500 acres of waterfowl habitat were lost. Unless the area receives protection, such as the kind provided by implementation of the USFWS's plan, additional acres may be converted to farmland.

Landowners have been expressing a high degree of interest in the USFWS's Conservation Easement Program. For example, from the Colusa Basin alone, about 60 landowners with a total of about 6,000 acres have requested a USFWS easement appraisal. Particularly encouraging is the fact that much of the current landowner interest in easements involves converting agricultural land back to marshland.

Additional easements are being pursued aggressively with available funds. However, current funding levels are inadequate to rapidly meet the easement needs projected for the Central Valley (Kauffeld and Loth, 1985; USFWS, 1984; Strong and Helvie, 1985).

Department of Agriculture Water Bank Program. The objectives of the Department of Agriculture Water Bank Program are to provide wetland and upland habitat for nesting waterfowl, to provide food for waterfowl, and to provide technical assistance in preparing and applying a conservation plan for the landowners in important waterfowl areas. The Agricultural Stabilization and Conservation Service administers funds for cost-sharing in the above activities. Under this program, landowners enter 10-year agreements to maintain their property in a condition determined by the Soil Conservation Service.

State Acquisition Programs. The California Department of Fish and Game is charged with carrying out certain legislatively mandated programs, some of which directly affect wetlands. The California Fish and Wildlife Plan (draft) describes wetlands as a habitat of concern and includes strategies for protecting, maintaining, and acquiring waterfowl habitat.

As described above under the discussion of State legislation, the Department of Fish and Game developed a plan for protecting, enhancing, and increasing California's wetlands for wildlife. This plan, required by SCR 28, was submitted in November 1983.

The plan identifies a formidable array of threats to wetlands and waterfowl and presents a program requiring many legislative actions. The proposed plan calls for acquiring conservation easements, finding new sources of water, using wastewater for waterfowl and wetlands improvement, protecting waste grain for waterfowl, and accelerating wetland and waterfowl research. In addition, the plan suggests new sources of funding, sample proposed legislation, and a list, arranged according to

Bureau of Reclamation. The Bureau of Reclamation is responsible for several Central Valley water projects:

San Luis Drain Project
Mid-Valley Canal Project/San Joaquin Conveyance Project
West Sacramento Canal Unit
Central Valley Project

The purpose of the San Luis Drain Project is to provide an agricultural drainage system as a solution to high water-table and salinity problems in the San Joaquin Valley. Associated with the drain are proposed holding reservoirs that could benefit waterfowl. This project is in the feasibility stage.[15]

The Mid-Valley Canal Project/San Joaquin Conveyance Project is intended to provide agricultural water from the proposed Auburn Dam to service areas between Merced and Pixley. The original plan called for some water appropriations to national wildlife refuges as well as wetland management. This project is in the feasibility stage.

The West Sacramento Canal Unit is intended to provide Sacramento River water to western Sacramento Valley areas, mainly in Yolo and Solano counties. The original plan called for the creation of a 5,900-acre refuge at the mouth of Putah Creek in the Yolo Causeway in Yolo County. The feasibility study for this project has been completed, and the project is currently inactive.

In December 1978, the Secretary of the Interior directed the Bureau of Reclamation to prepare legislation regarding the Central Valley Project that would accomplish the following:

1. Authorize the Federal Central Valley Project to meet State water quality standards.

2. Authorize the relocation of the intake to the Contra Costa Canal.

3. Amend the Central Valley Project's authorization by making fish and wildlife protection specific project purposes and by allowing Central Valley Project water to be provided for fish and wildlife as appropriate on a nonreimbursable basis.

4. Authorize a guaranteed water supply for Central Valley refuges.

5. Establish a Coordinated Operating Agreement for the Central Valley Project and California's State Water Project.

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[15]The San Luis Drain terminates in the Kesterson National Wildlife Refuge reservoir, where high selenium concentrations were discovered to be causing serious reproductive problems in waterfowl. The Kesterson problem has cast the future of the San Luis Drain Project into uncertainty.

waterfowl habitat would be significantly improved under the Farm and Wet Lands proposal. The proposal involves both the acquisition of conservation easements and the creation of new waterfowl habitat, including fall-flooded agricultural fields that do not now exist.

Audubon Society. Through its Reserve Programs, the Audubon Society protects the natural diversity and abundance of wildlife and their habitats. The Audubon Society accomplishes its goals through land acquisition, management, lobbying, and litigation. Its preserves in California contain wetland habitat. The society also informs and educates the public about wildlife and environmental issues.

Ducks Unlimited. A private organization established in 1937, Ducks Unlimited has contributed tremendously to improving breeding conditions for waterfowl through its Waterfowl Habitat Leasing Program.

This organization has developed and purchased breeding habitat in Canada and, recently, the United States. California has recently been included in this program, and projects totaling about $0.5 million are scheduled for 1986.

Water Resources Development Programs

The availability of water resources has a profound effect on waterfowl habitat. The following Federal and State programs hold opportunities for enhancing waterfowl habitat through water development projects.

Federal Water Programs. Several Federal agencies are carrying out water development programs in the Central Valley that affect waterfowl habitat: the Bureau of Reclamation, the Army Corps of Engineers, and the Department of Agriculture. Of the various Federal water projects outlined below, only the Cache Creek Basin Project and the Morrison Creek Stream Group Project by the Corps of Engineers appear to have the potential to enhance the Central Valley waterfowl habitat base significantly (rather than merely mitigate for project-caused losses).

Acquisition of Unappropriated Water. During fall, winter, and spring, a significant amount of Sacramento River water remains unappropriated.[14] Various entities have recommended that the USFWS and the California Department of Fish and Game file applications with the State Water Resources Control Board for rights to use portions of this unallocated water to manage public refuges. Such applications have already been initiated by some private entities. For example, near Lambertville, which is adjacent to the Sacramento National Wildlife Refuge, a group of duck-hunting clubs, working through their local irrigation district, recently applied for a firm supply of the surplus water. The application, which was opposed by the Department of Fish and Game because it lacked a fish screen, has not yet been approved. Its approval would establish an important precedent and act as encouragement for future applications.

[14]For additional discussion, refer to the Central Valley Fish and Wildlife Management Study report for Problem B-1.

The Merced Stream Group Project is intended to provide local flood protection by channelizing streams and creating reservoirs. This project has been authorized, and a USFWS easement is proposed as mitigation for project effects. The easement could perpetuate critical wetlands in the area.

The purpose of the Morrison Creek Stream Group Project is to provide local flood protection by channelizing streams and creating a holding basin. One feature of this project would result in a new wildlife refuge for possible management by the USFWS. The size of this refuge could range from about 2,500 to 7,800 acres, depending on which of the developmental alternatives, if any, is adopted. The Morrison Creek Stream Group Project has been authorized for construction; however, the Corps of Engineers is considering substantial project changes, which may delay the start of construction.

The purpose of the Sacramento-San Joaquin Delta Project is to select a plan for rehabilitating Delta levees to reduce the threat of flooding. A number of fish and wildlife enhancement alternatives have been discussed, including flooding some Delta island areas. The feasibility study for this project has been completed, and the project is currently inactive.

The purpose of the Sacramento River Bank Protection projects is to stabilize the riverbanks. These projects are ongoing, and there has been some discussion of establishing riparian wetland refuges along the river as mitigation for project impacts.

The San Francisco-Stockton Ship Channel Project is intended to remove dredge material from the channel. The dredge material from this ongoing project will be placed on adjacent lands to create upland and wetland habitat.

Department of Agriculture. The Department of Agriculture conducts the Small Watershed Programs (PL-566). These programs, which apply to areas less than 250,000 acres, have a number of purposes. They are intended to:

1. Promote soil and water conservation on public and private lands with the goal of controlling erosion, siltation, and flooding.

2. Supply water for growing domestic and industrial needs.

3. Attract new industries.

4. Provide agricultural water management.

5. Improve fish and wildlife resources.

6. Provide recreation.

7. Recharge groundwater reservoirs.

8. Provide water quality management.

Furthermore, the Secretary of the Interior indicated that long-term commitments of interim or intermittent water should not be made until the water needs of the areas of origin and various refuges have been met.

The Bureau of Reclamation did prepare a draft environmental statement in 1980, but no legislation along these lines was ever enacted by Congress.

During mid-1985, the Bureau of Reclamation and Department of Water Resources completed a proposed Coordinated Operating Agreement for the Central Valley Project and State Water Project. The agreement would require negotiations for the exchange and sale of Central Valley Project water to the State Water Project. Congress is acting on this agreement now (Summer 1986). To date, draft legislation meeting the other four of the Secretary of the Interior's 1978 directives has not been prepared.

The Bureau of Reclamation's pursuance of reauthorization of the Central Valley Project (1) to make fish and wildlife protection specific project purposes and (2) to guarantee water supplies for refuges could significantly aid efforts to expand Central Valley waterfowl habitat. However, many roadblocks, problems, and questions still exist in developing necessary legislation. Moreover, the need for new legislation, particularly the reauthorization making fish and wildlife protection specific project purposes, has not yet been agreed to by the entities involved.

The reauthorization of the Central Valley Project according to the Secretary's 1978 directives would certainly benefit Central Valley waterfowl. Nevertheless, because the necessary legislation has still not been prepared, and because there is a debate over the need for such legislation, these important issues may not be resolved for some time.

Corps of Engineers. The Corps of Engineers is carrying out a number of water reclamation projects in the Central Valley. These projects involve the following waterways:

Cache Creek Basin
Merced Stream Group
Morrison Creek Stream Group
Sacramento-San Joaquin Delta
Sacramento Riverbank
San Francisco-Stockton Ship Channel

The purpose of the Cache Creek Basin Project is to provide flood control improvements at Clear Lake and sediment control improvements at the Cache Creek settling basin. In conjunction with the proposed settling basin, the Corps of Engineers and the USFWS are planning a new 3,600-acre wildlife refuge. The Cache Creek Basin Project has been authorized, and construction funding could be available as early as Fiscal Year 1986. The USFWS is evaluating whether this refuge, if created, would be added to the national wildlife refuge system, perhaps for management through the Sacramento National Wildlife Refuge.

Federal Management and Improvement Programs. The Department of the Interior, the USFWS, and the Department of Agriculture are conducting Federal programs that affect Central Valley waterfowl habitat.

Department of the Interior. The Department has submitted draft legislation to the Congress with the suggestion that it be inroduced by a member of Congress under the name of the POWDR Program (Preserve Our Wetlands and Duck Resources). This program is intended to serve as a focal point for the Administration, Congress, State and local governments, and the private sector to cooperate in developing a comprehensive program to encourage the conservation of wetland and duck resources. The POWDR Program could enhance funding in a number of ways. The legislation introduced before Congress is intended to:

1. Increase revenues in the Migratory Bird Conservation Fund by increasing the cost of the Federal duck stamp to $15 dollars and requiring users of certain national wildlife refuges to purchase entrance permits.

2. Amend the Land and Water Conservation Fund to authorize grants to states for wetlands conservation. The proposed grants would be in an amount equal to three times the amount of a given state's annual duck stamp revenues dedicated to wetlands conservation.

3. Extend the Wetlands Loan Act for 10 years and forgive repayment of advances made under this act, permitting the USFWS to continue using revenues from sales of duck stamps for acquisition of migratory bird habitat.

4. Prohibit the use of Federal tax dollars for subsidizing the drainage and development of wetlands.

Fish and Wildlife Service. The USFWS is administering two ongoing programs that affect Central Valley habitat: the National Wildlife Refuge Program and the Migratory Bird Wetland Preservation Program.

The purpose of the National Wildlife Refuge Program is to provide food and resting areas for migratory birds during the fall and winter. These goals are obtained partly through working to preserve existing waterfowl habitat and controlling the depredation of local croplands. Protecting threatened and endangered species is also a special concern of this program. Another of its objectives is to provide opportunities to the public for bird watching, studying, and hunting.

The purpose of the Migratory Bird Wetland Preservation Program is threefold:

1. To identify, evaluate, and determine the priorities of wintering waterfowl habitat.

2. To determine which areas require Federal involvement for preservation and, if required, the nature of the involvement.

3. To determine what efforts other than acquisition are required for preserving wetlands.

The Soil Conservation Service participates in these programs by providing technical and financial assistance.

State Water Programs. In addition to the State Water Project, which consists of water storage and conveyance facilities being managed or operated by the State, a Federal and State interagency group and various districts are conducting wetland conservation programs.

Suisun Marsh Protection Plan. An interagency group that includes the Department of Water Resources, the Department of Fish and Game, and the Bureau of Reclamation is carrying out the Suisun Marsh Protection Plan. The purpose of this plan is to restore and protect water quality in the Suisun Marsh to levels that are conducive to waterfowl food-plant production.

Resource Conservation Districts. California has many resource conservation districts; however, only the Suisun and Grasslands districts are primarily oriented toward wetlands and waterfowl. Both have a Wetland Program. The purpose of these ongoing programs is to protect and manage wetlands. The programs are carried out with the involvement of private landowners, water districts, the Soil Conservation Service, and other government agencies.

Grasslands Water District. The Grasslands Water District is managing an ongoing Water Appropriation Program. The purpose of this program is to distribute water among the users within the district. Litigation and legislative decisions have allocated cheap Central Valley Project water to the Grasslands Water District that can only be used on duck clubs maintained in native wetland or pasture habitats.

Tax advantages are also available to duck club owners within the Grasslands Water District. The Carpenter Act of 1973 stabilized tax assessments on duck clubs within the Grasslands Water District. This act provides for the assessment of lands as open space when such lands are subject to a "wildlife habitat contract" that restricts use of the lands to wildlife habitat and native pasture. Such lands must be eligible to receive Federal water and must be 150 acres or larger.

Tulare Lake Drainage District. The Tulare Lake Drainage District is developing drain water impoundments in the Tulare Lake Basin. The purpose of these impoundments is to provide agricultural drain water holding reservoirs and evaporation ponds. The district operates approximately 3,200 acres of evaporation ponds, which receive tile drain water and contain water throughout the year. In addition, the district manages flood-water holding facilities, which receive water intermittently during winter. Both areas are used heavily by waterfowl. Future plans of the district include constructing 5,300 additional acres of evaporation ponds.

Habitat Management and Improvement Programs

In addition to acquisition programs and water development programs that create or contribute to new waterfowl habitat, many programs involve managing or improving existing habitat. As Table E-2 shows, most of the programs have various areas of interest. Although some of the following programs may also be involved in habitat acquisition, their primary interest is in habitat management and improvement.

The University of California also has a Wildlife Extension Service. As part of this service, the university offers training courses in waterfowl and wetland management and advises landowners on how to improve the wildlife value of their property. The Wildlife Extension Service also sponsors research related to waterfowl and their habitat needs.[16]

Bay Conservation and Development Commission. The Bay Conservation and Development Commission was the nation's first coastal management agency. As mentioned above under the discussion of State wetlands management laws, the programs administered by this commission do protect wetlands, but they are limited geographically. Nevertheless, the commission's programs serve as examples of ways to preserve waterfowl habitat.

California Coastal Commission. Like the Bay Conservation and Development Commission, the jurisdiction of the California Coastal Commission lies outside the Central Valley. However, this commission implements the Coastal Act of 1976, which contains some of the best wetland protection policies in existence. Moreover, its Interpretive Guidelines for Wetlands and Other Wet Environmentally Sensitive Habitat Areas has caused these areas to be better managed locally, and its success supports efforts to restore wetlands in the Central Valley.

Private Management and Improvement Programs. The California Waterfowl Association is administering the California Marsh Program, which acts to increase California breeding and wintering habitat by creating new marshes. It accomplishes this goal through agreements with various government agencies. The agencies provide wetland sites, design and engineering work, and operation and maintenance funds; the California Waterfowl Association provides the construction money.

In addition to the Marsh Program, the California Waterfowl Association lobbies to preserve and improve California's marshes by influencing legislation and government agency programs that affect wetlands.

Habitat Research Programs

A number of research projects concerning Central Valley waterfowl and their habitat are being carried out by Federal, State, and private organizations or individuals. Some of these projects are specifically directed toward waterfowl in the Central Valley, while others merely have implications for them. The more important research projects are discussed generally below. Appendix K contains a compilation of particular research project titles and the names of the scientists carrying them out.

Federal Research Programs. The USFWS is the Federal agency most involved in research on waterfowl and their needs. In addition to those research programs listed in Appendix K, the USFWS studied the use of agricultural tile drain water for

[16]These research programs are listed in Appendix K.

Department of Agriculture. The Department of Agriculture is responsible for the Resource Conservation and Development Programs. These are locally initiated, sponsored, and directed programs that usually include several counties. Their purpose is to conserve and develop natural resources within the project area. Fish and wildlife habitat improvement is commonly carried out under this program. The Soil Conservation Service provides technical and financial help to the projects.

State Management and Improvement Programs. The Department of Fish and Game is the principal State organization responsible for maintaining Central Valley habitat. However, the University of California, the Bay Conservation and Development Commission, and the California Coastal Commission also have programs that affect waterfowl habitat.

Department of Fish and Game. The Department of Fish and Game administers the State's Duck Stamp Program, the Wildlife Management Area Program, and the Ecological Reserve Program.

The purpose of the Duck Stamp Program is to provide a source of funds through the sale of State duck stamps to finance the enhancement of waterfowl breeding and wintering habitat in California and Canada. At least 33 percent of the funds go to Canada, with the balance going to administrative costs and California wetland enhancement. The funds are not being used currently for acquiring wetlands because of the high cost of obtaining lands in fee. However, there are no restrictions on the use of these funds for acquiring wetlands.

The purpose of the Wildlife Management Area Program is to provide food, cover, water, and other habitat requirements to resident and migratory wildlife. This goal includes preserving critical habitat types such as wetlands and uplands. By providing food during fall, the Department of Fish and Game hopes to reduce preharvest crop depredations. This program also provides hunting and other recreational opportunities to the public. Moreover, the areas managed by this program are designed to act as flood control basins during wet years.

The Ecological Reserves Program was developed to protect rare and endangered wildlife, aquatic organisms, and specialized habitat types. This program gives the Department of Fish and Game the authority to acquire land and water and set them aside as ecological reserves. The land may be acquired in any number of ways, including purchasing, leasing, or receiving as a gift.

University of California. The University of California administers the Natural Land and Water Reserves System Program. The purpose of this program is to preserve and manage a cross section of the State's diverse natural habitats to meet the university's teaching and research needs in those disciplines that require field work. As yet, no wetland reserve has been acquired under this program, but such an acquisition is a top priority of the Davis campus.

The Department of Fish and Game also worked with the USFWS on studies of the Sacramento-San Joaquin Delta. These studies documented the wildlife resources of the Delta. Based upon the results of the study, the research group recommended ways to conserve, enhance, and restore these resources.[17]

In addition to the above Department of Fish and Game programs, the Wildlife Department at California State University at Humboldt is conducting basic research on wildlife projects of interest to individual department members.[18]

Private Research Programs. Mr. John Schulte, a veterinarian, and Oregon State University are conducting private research programs related to Central Valley waterfowl.

Mr. Schulte's study, limited to the Sacramento Valley, will determine the effects of weather-related stress on mallards using different types of wetlands. His results will attempt to identify those habitat types that are most valuable to the mallard and thus could be useful in determining Central Valley habitat needs.

Oregon State University's Department of Fisheries and Wildlife is studying the Tulare Lake Basin to determine the use of its wetlands by wintering waterfowl and to correlate this use with invertebrate populations and salinity. Oregon State University is also working with the USFWS to assess drainwater evaporation ponds as waterfowl habitat in the San Joaquin Valley.

Recent Waterfowl Research Developments. Two recent developments involving waterfowl research have implications for the alternative plans outlined in Part III.

Relationships Between Habitat and Waterfowl Populations.
the relationships between Central Valley wintering habitat and waterfowl breeding success and survival are not yet well documented. However, it appears probable that strong correlations will be found between each of these population variables and the Central Valley's winter habitat conditions. Recent data for pintails show that their body weights and conditions decline dramatically during dry winters in the Central Valley. During wet winters, however, when wetland habitat is more abundant, the changes are much less significant (Miller, 1985).

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[17]These recommendations were outlined in the Department of Fish and Game report entitled Sacramento/San Joaquin Delta Wildlife Habitat Protection and Restoration Plan.

[18]Dr. R. Botzler: "Avian Cholera and Lead Interaction in Waterfowl Using the Sacramento Valley"; Dr. S. W. Harris: "Food Habits of Waterfowl in the San Joaquin Valley."

marsh management in the San Joaquin Valley and the use of municipal wastewater for developing wetlands. The study of tile drain water involved reviewing the available literature, determining the sufficiency of available data, and recommending specific studies concerning management techniques.

The study of wastewater availability for wetlands was broader in scope: it involved 11 national wildlife refuges, the Butte Sink Area, and the Grasslands Area. Study participants analyzed all existing and available data relating to wastewater supply and use on these 13 Central Valley wetlands.

Several excellent examples showing the utility of municipal wastewater effluent to develop wetland habitat have been completed. For example, near Show Low, Arizona, a 46.9-acre marsh that provides excellent waterfowl habitat was recently created with effluent from a municipal secondary treatment plant. The high value of this newly created habitat was demonstrated by the unusually high density of breeding pairs (4.0 per acre of water surface), the density of nests on islands (121.5 per acre), and the production of ducklings (60.1 per acre of water surface) (Piest and Sowls, 1985).

One of the most recent examples in California of using wastewater to create wetlands is along the San Francisco Bay shoreline near the city of Hayward. Here, the Hayward Marsh Development Plan provides for restoring about 1,800 acres of fresh- and brackish-water marshland, with effluent from secondary treatment plants and seasonal urban storm runoff water as the primary freshwater sources. Although the project has experienced substantial delays because of engineering problems, it is expected to become fully operational soon.

State Research Programs. In 1981, the Department of Fish and Game conducted a duck club survey to identify problems that duck club owners were having with maintaining their wetland habitat. The results of the survey were published and are available through the Wildlife Management Branch of the Department of Fish and Game.

The Department of Fish and Game is carrying out various research programs within its Region IV, which has its headquarters in Fresno and encompasses the surrounding counties. The purpose of these programs is to assess the benefits of current wetland management practices to waterfowl. The study covers the State wildlife management areas within this region. Based upon its assessment, the Department of Fish and Game will identify and implement management practices that will increase the value of wildlife areas to waterfowl.

The Department of Fish and Game's Waterfowl Group conducts surveying, banding, and research assistance programs. The surveying programs document the population trends of waterfowl wintering in California. These surveys reveal the short- and long-term changes in waterfowl distribution. The data are used to develop final annual harvest regulations.

The banding program documents the mortality, movements, distribution, immigration, and emigration of waterfowl in California. The research assistance programs provide financial and logistical support to students and other individuals who are conducting waterfowl research in California.

In addition, parallels to the Central Valley can be drawn from an ecologically similar situation in Mississippi Flyway wintering areas. In the Mississippi Flyway, a strong correlation between wintering-ground conditions and mallard repoductive rates has been known for some time (Heitmeyer and Fredrickson, 1981). Moreover, biologists have just recently reported for this species a probable link between wintering grounds and survival rate (Nichols et al., 1985). The senior author of the report dealing with mallards in the Mississippi Flyway is conducting similar research on Central Valley waterfowl species.

Small, Intensively Managed Wetland Units. The California Waterfowl Association and the Department of Fish and Game have recently begun a research study, with funding from State Duck Stamp revenues, of waterfowl nesting productivity on California's Grizzly Island Wildlife Management Area.

The objective of the study is to test the hypothesis that small but very intensively managed wetland units can substantially increase waterfowl nesting productivity in California. The theory includes three basic principles: (1) use relatively small areas to provide high-quality nesting cover, (2) exclude predators, and (3) provide high-quality brood ponds. The application of this concept elsewhere has increased densities of nesting mallards from about 15 to 500 per square mile. Similar results in the Central Valley might enable managers to increase fall and winter populations of certain species substantially, especially mallards.

The initial test in 1985 of the high-density breeding concept at Grizzly Island produced extremely encouraging results, recording nest densities of about 1.0 per acre. The experience will be expanded into the Sacramento Valley during 1986, probably at the State's Gray Lodge Wildlife Management Area.

If the high-density breeding concept gains widespread acceptance and use, future conflicts could arise between managing Central Valley wetlands for production versus wintering habitat. Care will be needed to maintain a balanced program.

Lobbying Organizations

Many of the private organizations discussed above include lobbying as one of their interests, although not a primary one. At least three organizations, however, are primarily interested in lobbying: the Waterfowl Habitat Owners Alliance, the Sacramento Valley Waterfowl Habitat Management Committee, and the California Waterfowl Association.

The Waterfowl Habitat Owners Alliance is a nationwide lobbying group interested in the preservation and management of waterfowl habitat. The Sacramento Valley Waterfowl Habitat Management Committee is interested in providing guidance and recommendations to the USFWS, the Department of Fish and Game, legislators, and other committees concerning the management and needs of Sacramento Valley wetlands. The California Waterfowl Association lobbies to preserve and protect key wetlands by influencing legislation and government agency programs.

2052. The Legislature further finds and declares that it is the policy of the state to conserve, protect, restore, and enhance any endangered species or any threatened species and its habitat and that it is the intent of the Legislature, consistent with conserving the species, to acquire lands for habitat for these species.

2053. The Legislature further finds and declares that it is the policy of the state that state agencies should not approve projects as proposed which would jeopardize the continued existence of any endangered species or threatened species or result in the destruction or adverse modification of habitat essential to the continued existence of those species, if there are reasonable and prudent alternatives available consistent with conserving the species or its habitat which would prevent jeopardy.

Furthermore, it is the policy of this state and the intent of the Legislature that reasonable and prudent alternatives shall be developed by the department, together with the project proponent and the state lead agency, consistent with conserving the species, while at the same time maintaining the project purpose to the greatest extent possible.

2054. The Legislature further finds and declares that, in the event specific economic, social, or other conditions make infeasible such alternatives, individual projects may be approved if appropriate mitigation and enhancement measures are provided.

2055. The Legislature further finds and declares that it is the policy of this state that all state agencies, boards, and commissions shall seek to conserve endangered species and threatened species and shall utilize their authority in furtherance of the purposes of this chapter.

2056. The Legislature further finds and declares that the cooperation of the owners of land which is identified as habitat for endangered species and threatened species is essential for the conservation of those species and that it is the policy of this state to foster and encourage such cooperation in furtherance of the purposes of this chapter.

SECTION 1. Article 1 (commencing with Section 900) of Chapter 3 of Division 2 of the Fish and Game Code is repealed.

SEC. 2. The heading of Article 1.5 (commencing with Section 1000) of Chapter 3 of Division 2 of the Fish and Game Code is amended and renumbered to read:

Article 1. Generally

SEC. 3. Section 1902 of the Fish and Game Code is repealed.

SEC. 4. Section 1903 of the Fish and Game Code is repealed.

SEC. 5. Chapter 1.5 (commencing with Section 2050) of Division 3 of the Fish and Game Code, as added by Chapter 1510 of the Statutes of 1970, is repealed.

SEC. 6. Chapter 1.5 (commencing with Section 2060) is added to Division 3 of the Fish and Game Code, to read:

CHAPTER 1.5. ENDANGERED SPECIES

Article 1. General Provisions

2050. This chapter shall be known and may be cited as the California Endangered Species Act.

2051. The Legislature hereby finds and declares all of the following:

(a) Certain species of fish, wildlife, and plants have been rendered extinct as a consequence of man's activities, untempered by adequate concern and conservation.

(b) Other species of fish. wildlife, and plants are in danger of, or threatened with, extinction because their habitats are threatened with destruction, adverse modification, or severe curtailment, or because of overexploitation, disease, predation, or other factors.

(c) These species of fish, wildlife, and plants are of ecological, educational, historical, recreational, esthetic, economic, and scientific value to the people of this state, and the conservation, protection, and enhancement of these species and their habitat is of statewide concern.

2067. "Threatened species" means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this chapter. Any animal determined by the commission as "rare" on or before January 1, 1985, is a "threatened species."

2068. "Candidate species" means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant that the commission has formally noticed as being under review by the department for addition to either the list of endangered species or the list of threatened species, or a species for which the commission has published a notice of proposed regulation to add the species to either list.

2060. The definitions in this article govern the construction of this chapter.

2061. "Conserve," "conserving," and "conservation" mean to use, and the use of, all methods and procedures which are necessary to bring any endangered species or threatened species to the point at which the measures provided pursuant to this chapter are no longer necessary. These methods and procedures include, but are not limited to, all activities associated with scientific resources management, such as research, census, law enforcement, habitat acquisition, restoration and maintenance, propagation, live trapping, and transplantation, and, in the extraordinary case where population pressures within a given ecosystem cannot be otherwise relieved, may include regulated taking.

2062. "Endangered species" means a native species or subspecies of a bird, mammal, fish, amphibian, reptile, or plant which is in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease. Any species determined by the commission as "endangered" on or before January 1, 1985, is an "endangered species."

2063. "Feasible" means feasible as defined in Section 21061.1 of the Public Resources Code.

2064. "Project" means project as defined in Section 21065 of the Public Resources Code.

2065. "State lead agency" means the state agency, board, or commission which is a lead agency under the California Environmental Quality Act (Division 13 (commencing with Sec. 21000) of the Public Resources Code).

[2073.5 Within 90 days, the department shall evaluate]
the petition, and report one of the following recommendations to the commission:

(a) Based upon the information contained in the petition, there is not sufficient information to indicate that the petitioned action may be warranted, and the petition should be rejected.

(b) Based upon the information contained in the petition, there is sufficient information to indicate that the petitioned action may be warranted, and the petition should be accepted and considered.

2074. The commission shall schedule the petition for consideration at its next available meeting and distribute its pending agenda to interested persons pursuant to Section 2078. The commission shall also make the petition available for review upon request.

2074.2. (a) At the scheduled meeting, the commission shall consider the petition, the department's written report, and comments received, and the commission shall make and enter in its public record one of the following findings:

(1) If the commission finds that the petition does not provide sufficient information to indicate that the petitioned action may be warranted, the commission shall publish a notice of finding that the petition is rejected, including the reasons why the petition is not sufficient.

(2) If the commission finds that the petition provides sufficient information to indicate that the petitioned action may be warranted, the commission shall publish a notice of finding that the petition is accepted for consideration. If the accepted petition recommends the addition of a species to either the list of endangered species or the list of threatened species, the commission shall include in the notice that the petitioned species is a candidate species. The commission shall maintain a list of species which are candidate species.

(b) The commission shall distribute the findings relating to the petition pursuant to Section 2078.

2074.4. If a petition is accepted by the commission for consideration, all reasonable attempts shall be made to notify affected and interested parties and to solicit data and comments on the petitioned action from as many persons as is practicable. In addition to commission efforts to provide notification through distribution of the commission agenda and minutes pursuant to Section 2078, the department shall immediately undertake efforts to notify affected and interested parties. Methods of notification may include, but are not limited to, correspondence, newspaper notices, and press releases, and notification shall include notice to owners of that land which may provide habitat essential to the continued existence of the species, unless the director determines that ownership is so widespread, fragmented, or complex as to make individual notice impractical.

Article 2. Listing of Endangered Species

2070. The commission shall establish a list of endangered species and a list of threatened species. The commission shall add or remove species from either list if it finds, upon the receipt of sufficient scientific information pursuant to this article, that the action is warranted.

2071. The commission shall adopt guidelines by which an interested person may petition the commission to add a species to, or to remove a species from either the list of endangered or the list of threatened species.

2071.5. The department shall recommend, and the commission shall adopt, criteria for determining if a species is endangered or threatened.

2072. The petition shall be written, shall be clearly identified as a petition, and shall clearly indicate the administrative measure recommended.

2072.3. To be accepted, a petition shall, at a minimum, include sufficient scientific information that a petitioned action may be warranted. Petitions shall include information regarding the population trend, range, distribution, abundance, and life history of a species, the factors affecting the ability of the population to survive and reproduce, the degree and immediacy of the threat, the impact of existing management efforts, suggestions for future management, and the availability and sources of information. The petition shall also include information regarding the kind of habitat necessary for species survival, a detailed distribution map, and any other factors that the petitioner deems relevant.

2072.7. The department may, in the absence of a petition from an interested party, recommend to the commission that it add a species to, or remove a species from, either the list of endangered species or the list of threatened species. If it makes a recommendation under this section, the department shall include the information specified in Section 2072.3. A department recommendation under this section shall be considered by the commission as a petition with a departmental recommendation to accept and consider as described in subdivision (b) of Section 2073.5, and is subject to Sections 2074 to 2079, inclusive.

2073. Within 10 days of the receipt of a petition from an interested person under Section 2072.3, the commission shall refer the petition to the department.

2076. Any finding pursuant to this section is subject to judicial review under Section 1094.5 of the Code of Civil Procedure.

2076.5. Notwithstanding Sections 2071 to 2075.5, inclusive, the commission may adopt a regulation which adds a species to the list of endangered species or to the list of threatened species as an emergency regulation pursuant to Article 1.5 (commencing with Section 2401) to Chapter 2 of Division 1 if the commission finds that there is any emergency posing a significant threat to the continued existence of the species. The commission shall notify affected or interested persons of the adoption of such an emergency regulation pursuant to the methods described in Section 2074.4.

2077. (a) The department shall review species listed as an endangered species or as a threatened species every five years to determine if the conditions that led to the original listing are still present. The review shall be conducted based on information which is consistent with the information specified in Section 2072.3 and which is the best scientific information available to the department. The review shall include a review of the identification of the habitat that may be essential to the continued existence of the species and the department's recommendations for management activities and other recommendations for recovery of the species. The department shall notify any person who has notified the commission, in writing with their address, of their interest, and the department may notify any other person.

(b) Review of species that are listed by both the commission and the United States Department of Interior will be conducted in conjunction with the five-year review process of the United States Department of Interior.

(c) Initial review of those species listed by the commission before January 1, 1982, that are not listed by the federal government shall be undertaken and completed by July 1, 1987. Initial review of those species listed by the commission after January 1, 1982, that are not listed by the federal government shall be undertaken and completed within five years of the date the species was originally listed by the commission.

2074.6. The department shall promptly commence a review of the status of the species concerned in the petition. Within 12 months of the date of publication of a notice of acceptance of a petition for consideration by the commission pursuant to paragraph (2) of subdivision (a) of Section 2074.2, the department shall provide a written report to the commission, based upon the best scientific information available to the department, which indicates whether the petitioned action is warranted, which includes a preliminary identification of the habitat that may be essential to the continued existence of the species, and which recommends management activities and other recommendations for recovery of the species.

2074.8. Nothing in this article imposes any duty or obligation for, or otherwise requires, the commission or the department to undertake independent studies or other assessments of any species when reviewing a petition and its attendant documents and comments.

2075. The commission shall schedule the petition for final consideration at its next available meeting after receipt of the departmental report provided pursuant to Section 2074.6 and shall distribute the pending agenda for that meeting pursuant to Section 2078. The commission shall make the department's report, or copies thereof, which was provided, pursuant to Section 2074.6, available for review upon request.

2075.5. At the meeting scheduled pursuant to Section 2075, the commission shall make one of the following findings:

(1) The petitioned action is not warranted, in which case the finding shall be entered in the public records of the commission and the petitioned species shall be removed from the list of candidate species maintained pursuant to Section 2074.2.

(2) The petitioned action is warranted, in which case the commission shall publish a notice of that finding and a notice of proposed rulemaking pursuant to Section 11346.4 of the Government Code to add the species to, or remove the species from, the list of endangered species or the list of threatened species. Further proceedings of the commission on the petitioned action shall be made in accordance with Chapter 3.5 (commencing with Section 11340) of Part 1 of Division 3 of Title 2 of the Government Code.

2084. The commission may authorize, subject to terms and conditions it prescribes, the taking of any candidate species, or the taking of any fish by hook and line for sport that is listed as an endangered, threatened, or candidate species.

2085. The provisions of this article shall apply to any species designated as a candidate species under Section 2074.2 if notice has been given pursuant to Section 2074.4.

(d) Notwithstanding any other provision of this section, the commission or the department may review a species at any time based upon a petition or upon other data available to the department and the commission.

(e) The department shall report in writing to the commission the results of its five-year review for each listed species. The commission shall treat any report of the department under this subdivision which contains a recommendation to add a species to, or remove a species from, the list of endangered species or the list of threatened species as a department recommendation submitted pursuant to Section 2072.7.

2078. To provide all interested persons access to information and notification of pending listing or delisting actions, the commission shall distribute the related agenda of pending actions and those portions of its minutes of actions taken under this article to any individuals who have notified the commission, in writing with their address, of their interest. This notification shall meet the requirements of public notice as required for commission action under Section 2074, 2074.2, 2075, or 2077.

2079. The department shall, by January 30 of each year, beginning January 30, 1986, prepare a report summarizing the status of all state listed endangered, threatened, and candidate species, and shall submit the report to the commission, the Legislature, the Governor, and all individuals who have notified the commission, in writing with their address, of their interest. This report shall include, but not be limited to, a listing of those species designated as endangered, threatened, and candidate species, a discussion of the current status of endangered, threatened, or candidate species, and the time frames for the review of listed species pursuant to this article.

2092. (a) Notwithstanding Section 21081 of the Public Resources Code, if, after consulting with the department pursuant to Section 2090, jeopardy is found, the state lead agency shall require reasonable and prudent alternatives consistent with conserving the species which would prevent jeopardy.

(b) If specific economic, social, or other conditions make infeasible the alternatives prescribed in subdivision (a), except as provided in subdivision (c), the state lead agency may approve a project when jeopardy is found, if both of the following conditions are met:

(1) The state lead agency requires reasonable mitigation and enhancement measures as are necessary and appropriate to minimize the adverse impacts of the project upon the endangered species or threatened species, or habitat essential to the continued existence of the species, including, but not limited to, live propagation, transplantation, and habitat acquisition, restoration, and improvement.

(2) The state lead agency finds all of the following:

(A) The benefits of the project as proposed clearly outweigh the benefits of the project were it to be carried out with the reasonable and prudent alternatives consistent with conserving the species which would prevent jeopardy.

(B) An irreversible or irretrievable commitment made after initiation of consultation required pursuant to Section 2090, of resources to the project, which has the effect of foreclosing the opportunity for formulating and implementing reasonable and prudent alternatives consistent with conserving the species which prevent jeopardy, has not been made.

(c) A state lead agency shall not approve a project which would likely result in the extinction of any endangered species or threatened species. The state lead agency shall base its determination on the best existing scientific information.

2093. In order to encourage resolution of potential conflicts as early as possible, the department shall, through guidelines, provide a mechanism for informal consultation prior to a determination pursuant to Section 21080.1 of the Public Resources Code.

2094. At the request of a project applicant, the applicant shall be afforded the opportunity to participate fully in the consultation under this article.

Article 3. Taking, Importation, or Sale

2080. No person shall import into this state, export out of this state, or take, possess, purchase, or sell within this state, any species, or any part or product thereof, that the commission determines to be an endangered species or a threatened species, or attempt any of those acts, except as otherwise provided in this chapter, the Native Plant Protection Act (Chapter 10 (commencing with Section 1900) of this code), or in the California Desert Native Plants Act (Division 23 (commencing with Section 70500) of the Food and Agricultural Code).

2081. Through permits or memorandums of understanding, the department may authorize individuals, public agencies, universities, zoological gardens, and scientific or educational institutions, to import, export, take, or possess any endangered species, threatened species, or candidate species for scientific, educational, or management purposes.

2082. This chapter does not prohibit the sale of any endangered species or threatened species, or any part or product thereof, when the owner can demonstrate that the species, or part or product thereof, was in the person's possession before the date upon which the commission listed the species as an endangered species or threatened species or as an endangered animal or rare animal prior to January 1, 1985, and shall not prohibit the sale of that part or product by an individual not normally engaged in that sale if it was originally possessed by the seller for the seller's own use and so used by that seller. However, it shall be unlawful to sell any species, or part or product thereof, if that sale would have been unlawful prior to the date upon which the commission added the species to the listing of endangered species or threatened species or to the listing of endangered animals or rare animals prior to January 1, 1985.

2083. This chapter does not apply to the taking of fish otherwise authorized pursuant to Part 3 (commencing with Section 7600) of Division 6 or to the possession of individual animals which were lawfully possessed before the commission listed the species as an endangered species or as a threatened species or as an endangered animal or rare animal prior to January 1, 1985.

Article 5. Funding

2098. The department shall pay the costs of administration of this chapter from the Endangered and Rare Fish, Wildlife, and Plant Species Conservation and Enhancement Account in the Fish and Game Preservation Fund.

SEC. 3. Section 21104.2 is added to the Public Resources Code, to read:

21104.2. The state lead agency shall consult with, and obtain written findings from, the Department of Fish and Game in preparing an environmental impact report on a project, as to the impact of the project on the continued existence of any endangered species or threatened species pursuant to Article 4 (commencing with Section 2090) of Chapter 1.5 of Division 3 of the Fish and Game Code.

SEC. 4. No appropriation is made and no reimbursement is required by this act pursuant to Section 6 of Article XIII B of the California Constitution or Section 2231 or 2234 of the Revenue and Taxation Code because the only costs which may be incurred by a local agency or school district will be incurred because this act creates a new crime or infraction, changes the definition of a crime or infraction, changes the penalty for a crime or infraction, or eliminates a crime or infraction.

SEC. 5. It is the intent of the Legislature, if this bill and AB 3270 are both chaptered and become effective January 1, 1985, and this bill is chaptered after AB 3270, that the provisions of Chapter 1.5 (commencing with Section 2050), as added to Division 3 of the Fish and Game Code by this bill and Chapter 1.5 (commencing with Section 2060), as added to Division 3 of the Fish and Game Code by AB 3270, form a single, unified California Endangered Species Act (Chapter 1.5 (commencing with Section 2050), Division 3, Fish and Game Code).

Therefore, if both this bill and AB 3270 are chaptered and this bill is chaptered last, this bill does not prevail over AB 3270 and the provisions of both bills shall become operative in a single, unified Chapter 1.5 (commencing with Section 2050) of Division 3 of the Fish and Game Code.

2095. If a project may affect species that are listed as threatened or endangered under both this chapter and the federal Endangered Species Act (16 U.S.C. Sec. 1531 et seq.), and if the project is subject to state lead agency actions pursuant to the provisions of the California Environmental Quality Act (Division 13 (commencing with Section 21000) of the Public Resources Code) and actions of a federal agency action pursuant to the federal Endangered Species Act (16 U.S.C. Sec. 1531 et seq.), the department shall participate to the greatest extent practicable in the federal consultation.

The Legislature encourages cooperative and simultaneous consultation by every state lead agency in order to develop a coordinated federal Biological Opinion that reflects consistent and compatible findings between state and federal agencies. Whenever possible, the department, consistent with this act, shall adopt a federal Biological Opinion as the written findings required pursuant to Section 2090.

Whenever the department has reason to believe that a project may affect species that are listed as threatened and endangered under both this chapter and the federal Endangered Species Act (16 U.S.C. Sec. 1531 et seq.), and if the project is subject to state lead agency actions pursuant to the provisions of the California Environmental Quality Act (Division 13 (commencing with Section 21000 of the Public Resources Code) and actions of a federal agency action pursuant to the federal Endangered Species Act (16 U.S.C. Sec. 1531, et seq.), the department shall request the United States Department of the Interior, Fish and Wildlife Service or the National Marine Fisheries Service, whichever is appropriate, to initiate consultation pursuant to the federal Endangered Species Act (16 U.S.C. Sec. 1531 et seq.).

2096. The provisions of this article do not apply to any species designated as a candidate species under Section 2074.2. However, upon a request from a lead agency or a project proponent, the department shall grant an informal consultation on any proposed project which may affect a candidate species. It is the intent of the Legislature to facilitate the resolution of potential conflicts between candidate species and proposed projects on the basis of information available at the time, and not to require the alteration of project processing schedules pending final determination of the status of any candidate species.

2097. This article shall remain in effect only until July 1, 1987, and as of that date is repealed, unless a later enacted statute, which is chaptered before July 1, 1987, deletes or extends that date.

Article 2. Habitat Enhancement Program

2620. All money deposited in the Fish and Wildlife Habitat Enhancement Fund shall be available for appropriation by the Legislature for the following purposes:

(a) Forty million dollars ($40,000,000) for expenditure by the Wildlife Conservation Board pursuant to the Wildlife Conservation Law of 1947 for the acquisition, enhancement, or development, or any combination thereof, of lands located outside the coastal zone for the preservation of resources and the management of wildlife and fisheries, in accordance with the following schedule:

(1) Thirty million dollars ($30,000,000) for the acquisition, enhancement, or development, or any combination thereof, of lands for habitat for wildfowl and other wildlife benefitted by a marsh or aquatic environment.

(2) Ten million dollars ($10,000,000) for the restoration of waterways for the management of fisheries and the enhancement or development, or both, of habitat for other wildlife.

(b) Five million dollars ($5,000,000) for expenditure by the Wildlife Conservation Board pursuant to the Wildlife Conservation Law of 1947 for the acquisition, enhancement, or development, or any combination thereof, of lands for habitat for rare, endangered, and fully protected species.

(c) Thirty million dollars ($30,000,000) for expenditure by the State Coastal Conservancy for the acquisition, enhancement, or development, or any combination thereof, of marshlands and associated and adjacent lands and the development of associated facilities and for grants to local public agencies for those purposes, in accordance with the following schedule:

(1) Twenty million dollars ($20,000,000) for grants by the conservancy to local public agencies in the coastal zone and in the San Francisco Bay region for the acquisition, enhancement, or development, or any combination thereof of marshlands and adjacent lands

for habitat for wildlife benefitted by a marsh or aquatic environment and the improvement of drainage into wetlands to control or retard erosion and sedimentation, and biologically and hydrologically associated upland habitat areas. Of the amount made available pursuant to this paragraph, not less than five million dollars ($5,000,000) shall be available for grants for projects in the San Francisco Bay region.

(2) Ten million dollars ($10,000,000) for expenditure by the conservancy for the purposes authorized in this subdivision.

(d) Ten million dollars ($10,000,000) for expenditure by the Wildlife Conservation Board pursuant to the Wildlife Conservation Law of 1947 for the acquisition, enhancement, or development, or any combination thereof, inside the coastal zone of marshlands and adjacent lands for habitat for wildlife benefitted by a marsh or aquatic environment.

2621. An annual amount, not to exceed one hundred thousand dollars ($100,000), may be appropriated from the funds available pursuant to subdivisions (a) and (d) of Section 2620 in the 1984–85 through 1989–90 fiscal years, in a particular amount to be determined in each annual appropriation, to the Wildlife Conservation Board for expenditure for costs incurred by the board in administering this chapter, as provided in this section. The board shall augment, as needed, any amount appropriated pursuant to this section with an appropriation from any other funds available to it. This chapter is not intended, nor shall it be construed, to authorize the Wildlife Conservation Board or the department to establish any additional personnel positions.

2622. An annual amount, not to exceed two hundred fifty thousand dollars ($250,000), may be appropriated from the funds available pursuant to subdivision (c) of Section 2620 in the 1984–85 through 1989–90 fiscal years, in a particular amount to be determined in each annual appropriation, to the State Coastal Conservancy for expenditure for costs incurred by the conservancy in administering this chapter.

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CHAPTER _____

An act to add Chapter 7 (commencing with Section 2600) to Division 3 of the Fish and Game Code, relating to financing of a fish and wildlife habitat enhancement program by providing the funds necessary therefor through the issuance and sale of bonds of the state, by providing for the handling and disposition of the funds, and by providing for the submission of the measure to a vote of the people, and declaring the urgency thereof, to take effect immediately.

LEGISLATIVE COUNSEL'S DIGEST

SB 512, Hart. Fish and wildlife habitat enhancement: bond issue.

Existing law states that it is the policy of the state to encourage the conservation and maintenance of wildlife resources under the jurisdiction and influence of the state. The policy also includes specified objectives.

This bill would enact the Fish and Wildlife Habitat Enhancement Act of 1984, which, if adopted, would authorize the issuance, pursuant to the State General Obligation Bond Law, of bonds in the amount of $85,000,000. The funds generated from the bond sale would be available for appropriation to the Wildlife Conservation Board and the State Coastal Conservancy for specified purposes according to specified schedules. The bill would provide for submission of the bond act to the voters at the June 5, 1984, Direct Primary Election.

The bill would take effect immediately as an urgency statute.

The people of the State of California do enact as follows:

SECTION 1. Chapter 7 (commencing with Section 2600) is added to Division 3 of the Fish and Game Code, to read:

CHAPTER 7. FISH AND WILDLIFE HABITAT ENHANCEMENT ACT OF 1984

Article 1. General Provisions

2600. This chapter shall be known and may be cited as the Fish and Wildlife Habitat Enhancement Act of 1984.

2601. (a) The fundamental requirement for healthy, vigorous populations of fish and wildlife is habitat. Without adequate habitat, efforts to conserve and manage fish and wildlife resources will have limited success.

(b) Assuring adequate habitat, with the resulting increase in the abundance of fish and wildlife, confers substantial benefits on the people of California through the opportunities afforded for the use, enjoyment, and appreciation of fish and wildlife resources, the perpetuation of species of fish and wildlife for their intrinsic and ecological values, and the enhancement of economic activities based on these resources.

(c) Accordingly, the purpose of this chapter is to provide the financial means to correct the most severe deficiencies in fish and wildlife habitat currently found in California through a program of acquisition, enhancement, and development of habitat areas that are most in need of proper conservation and management.

2602. As used in this chapter, the following terms have the following meanings:

(a) "Acquisition" means the acquisition of any interest in real property.

(b) "Coastal zone" means the coastal zone as defined and mapped pursuant to Section 30103 of the Public Resources Code.

(c) "Local public agency" means a city, county, city and county, regional park or open-space district, recreation and park district, resource conservation district, association of governments, or joint powers agency whose jurisdiction is wholly or partially within the coastal zone or in the San Francisco Bay region.

FISH AND WILDLIFE HABITAT ENHANCEMENT ACT OF 1984
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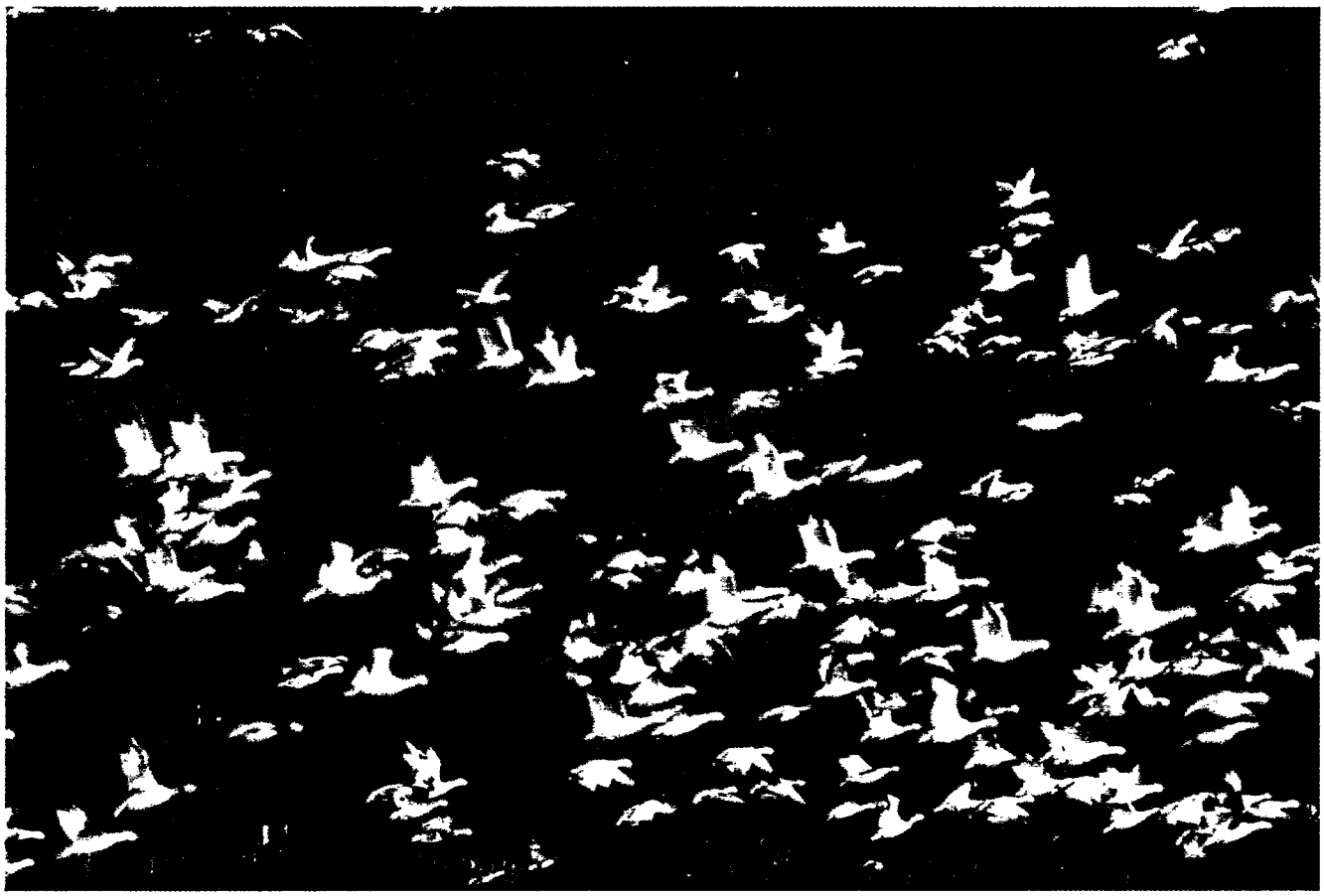
ATTACHMENT E

Central Valley Waterfowl Biology



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CENTRAL VALLEY WATERFOWL BIOLOGY

This discussion of Central Valley waterfowl biology is organized into two parts. The first part identifies the major waterfowl species found in the valley, including several that are considered unique because of their declining populations. The second part discusses the factors known to be limiting Central Valley waterfowl populations.

MAJOR CENTRAL VALLEY WATERFOWL SPECIES

Table C-1 lists the waterfowl most common in the California Central Valley. The most important[1] species are gadwalls, mallards, pintails, shovelers, green-winged teal, American wigeon, several species of Canada geese, Pacific greater white-fronted geese, Ross' geese, lesser snow geese, and tundra swans. Ring-necked ducks and wood ducks are also present in significant numbers. Buffleheads, common goldeneyes, mergansers, lesser scaup, redheads, and cinnamon teal are also present and recorded in population surveys in the Central Valley. However, valley population levels of these species are relatively low, making up only small fractions of the Continental Flyway and Pacific Flyway populations. No trends in numbers have been determined.

Most wintering waterfowl flocks in the Central Valley are not confined to any specific area throughout the fall and winter. They move among the wetlands of the Sacramento and San Joaquin valleys, the Delta, and the Suisun Marsh in response to weather changes, water conditions, food availability, and season. Although some distinct patterns have been recorded, these movements are largely unpredictable. Distribution and movement often change significantly during very wet years when the amount of habitat increases significantly because of flooding and ponding on agricultural lands and in flood bypasses.

Population data for Central Valley waterfowl are compiled from mid-September prehunting season surveys, biweekly surveys during the hunting season, and a January midwinter survey. Data are compiled separately for some organized duck clubs and agricultural areas. Counts are made of waterfowl on each Federal national wildlife refuge and State wildlife management area. Counts are also made of concentrations on several reservoirs in the Sierra Nevada foothills and the Coast Ranges.

[1] Importance measured in terms of numbers, impact on the environment, contribution to annual hunting harvests, and interest to nonconsumptive users such as bird watchers.

Table C-2. Estimated Central Valley waterfowl populations and USFWS population objectives

	Estimated population[a]	USFWS population objective	Percentage of objective
Swans			
Tundra	46,207	38,000	122
Geese			
Aleutian Canada[b]	2,357	1,200	196
Cackling Canada	70,979	275,000-325,000[c]	23
Great Basin Canada	12,982	20,000	65
Greater white-fronted	97,557	300,000-350,000[c]	30
Arctic snow	439,753[d]	300,000	66
Wrangel Island snow	18,840	95,000[e]	20
Ross'	--[f]	80,000	--
Ducks			
Canvasback	25,309	20,000	127
Mallard	404,097	500,000	81
Northern shoveler	405,928	500,000	81
Northern pintail	2,120,719	2,750,000	77
Green-winged teal	233,132	200,000	117
American wigeon	484,633	600,000	81

[a]Five-year average (1979-1983).
[b]Endangered.
[c]Fall count.
[d]The 439,753 is a total midwinter white goose average and includes Wrangel Island birds as well as Ross' geese. The population objective for all white geese was estimated at 670,000 birds.
[e]Breeding pairs.
[f]Because Ross' geese are indistinguishable from other white geese during aerial surveys, their current population is unknown. The Ross' goose population in California is thought to be from 80,000 to 100,000 birds.

Unique Central Valley Waterfowl

Three subspecies of geese that winter in the Central Valley--the Aleutian Canada, tule greater white-fronted, and cackling Canada--are unique because of their present population status.

The Federal Government has designated the Aleutian Canada goose as an endangered species because of its restricted breeding range and low numbers. Currently nesting only on a few of the Aleutian Islands--including Buldir, Amukta, Aaitak, and Aggatu--the Aleutian Canada goose's breeding range was more extensive until Russian and, later, American trappers introduced arctic 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 have been closed to hunting of all Canada geese at varying times to protect the Aleutians. If and when breeding populations are reestablished on several more islands in the Aleutian chain and a sustaining population is achieved, this subspecies will be transferred to the threatened category and eventually taken off the list.

The existence of the tule greater white-fronted goose, a subspecies of the greater white-fronted goose, has been a subject of controversy for many years. Breeding grounds have recently been located in the Cook Inlet of Alaska, and all major wintering areas have now been identified. Research is under way to better delineate the number of birds in the breeding and wintering populations. Winter population numbers are currently estimated at about 2,000 (USFWS, 1978). The entire Pacific Flyway population of tule greater white-fronted geese is believed to winter in the Central Valley.

The cackling Canada goose is another unique subspecies whose populations have been substantially reduced. A continued reduction could place it on the list of threatened or endangered species.

Current and Desired Waterfowl Populations

The Pacific Flyway Technical Committees[2] have drafted management plans for all Pacific Flyway geese and swans. These plans include population objectives. The USFWS has also developed population objectives for important species of waterfowl in the Central Valley based on these flyway goals and on historic population levels as measured by midwinter aerial surveys. Table C-2 shows both the population objectives and current status for Central Valley waterfowl that are easily surveyed from the air. These species are also those of primary interest for hunting.

[2]These committees are composed of Federal, State, and university representatives from California, Oregon, Washington, Idaho, Nevada, New Mexico, Wyoming, Utah, and Montana.

determining the need for waterfowl habitat in California, it would be beneficial to understand how annual population indexes compare with actual population size.

Data Needs. To obtain more accurate information regarding waterfowl populations, improved survey methods are needed to produce more accurate population indexes. Methods are also needed to translate these indexes into absolute numbers.

FACTORS LIMITING CENTRAL VALLEY WATERFOWL POPULATIONS

The following discussion of limiting factors takes as its starting point responses to a questionnaire sent to individuals, mostly wildlife biologists, in various Federal, State, and private organizations. The questionnaire requested those surveyed to identify the factors that limit California Central Valley waterfowl populations. Sixteen respondents identified a number of limiting factors. Table C-3 summarizes these factors.

Table C-3. Factors questionnaire respondents identified as limiting Central Valley waterfowl

	Agricultural Practices	Contaminants	Cost of Management	Disease	Food	Habitat Distribution	Habitat Mismanagement	Habitat Quality	Habitat Quantity	Hunting	Marsh Habitat	Predation	Riparian Habitat	Sanctuary	Water	Water Development
U.S. Fish and Wildlife Service																
David Gilmer		●		●	●	●		●						●		
Michael Miller					●						●			●		
Patrick O'Halloran						●	●		●						●	
Harry Ohlendorf		●						●	●							
Felix Smith																●
Paul Springer	●											●	●			
Douglas Weinrich					●				●							
Gary Zahm	●	●		●	●		●			●					●	●
U.S. Dept. of Agriculture																
Wendell Miller							●		●							
Randall Gray									●		●					
Daniel Patterson							●		●							
Calif. Waterfowl Assoc.																
Daniel Chapin			●			●	●								●	
John Schulte	●			●	●							●			●	
Calif. Dept. of Fish and Game																
Robert LeDonne	●															
Calif. Dept. of Water Resources																
George Reiner	●				●											
U.C. Davis																
Dennis Raveling		●		●	●			●		●	●	●	●		●	

The current status of Central Valley waterfowl populations was determined by averaging midwinter (or fall) counts between 1979 and 1983. All waterfowl species are below population objectives except canvasback ducks, green-winged teal, Aleutian Canada geese, and tundra swans. As a group, Central Valley geese are furthest below population objectives, reflecting what appears to have been a steady decline over the last 25 years. Cackling Canada geese in particular have recently undergone a dramatic population decline that triggered emergency hunting closures during the 1983-84 hunting season. These closures will probably continue until the population recovers.

During the past several years, population levels of pintails wintering in the Central Valley have been moderately to severly depressed. Reduced recruitment caused by a prolonged drought over much of the pintail's major breeding range in Canada has caused this reduction in winter populations. When this drought ends--there are signs of an easing now--and the condition of the breeding habitat improves, both pintail recruitment and winter population levels should rise. With larger wintering populations, the major limiting effects, if any, of the existing Central Valley habitat base should be easier to detect and quantify, particularly if a population increase of pintails should happen to coincide with another drought in the valley like the one in 1976-77.

Data Problems. Although midwinter or fall aerial surveys are the best waterfowl population indexes available, some problems are inherent in these counts. The accuracy of surveys is always debatable. Population levels are occasionally generated from several surveys flown at different times. This method produces errors in population indexes if any waterfowl move between survey areas. Also, visual counts are subject to large error due partly to observer bias, flock size, and bird size. Some species of waterfowl are less conspicuous than others and are probably underestimated, especially in mixed flocks, or else not counted at all. For example, counting green-winged teal among larger ducks usually produces an underestimate of teal numbers.

The distribution of waterfowl during winter surveys provides another problem in determining waterfowl population levels in the Central Valley. All waterfowl are highly mobile, and some move great distances in response to temperature, water conditions, and population size (Nichols et al., 1983). Severe northern weather can push birds into California that would otherwise winter at higher latitudes, thus inflating Central Valley counts. This movement is probably more of a problem with ducks, since geese are highly traditional in their winter habitat use, and most cackling, greater white-fronted, and snow geese winter in California regardless of climatic conditions.

Habitat type can also influence the accuracy of waterfowl surveys. Wood ducks prefer riparian habitat and are not amenable to aerial counts; consequently, their population status is unknown.

Because of the many potential errors in waterfowl population indexes, annual surveys are probably best used for tracking long-term population trends rather than for determining absolute annual numbers. However, for management purposes and for

Factors that Control the Number and Condition of Waterfowl

Waterfowl populations are regulated through mortality and natality. These factors act in density-dependent ways to limit populations to levels that can be supported by their habitat. As populations increase beyond the carrying capacity of the habitat, mortality increases or natality decreases, holding populations in check.

Hunting, disease, food stress, predation, and contamination are the major mortality factors acting on waterfowl populations in the Central Valley. In addition to affecting waterfowl mortality, the availability of food in California may also influence the reproductive success of both resident and migratory fractions of California waterfowl populations. The following sections discuss how habitat quantity and quality affect mortality and reproductive success.

Hunting. Hunting is the largest single mortality factor affecting most waterfowl populations. It accounts for approximately 50 percent of all annual waterfowl losses (Bellrose, 1976). In California, the estimated annual retrieved duck and goose harvests from 1961 to 1981 averaged 1,679,633 and 187,477, respectively. Table C-4 shows the species composition of the harvest.

Hunting mortality is regulated with the objective of removing only the harvestable excess in any population. The excess is estimated by annual surveys that determine breeding bird numbers, habitat conditions, and reproductive success of each species. Bag limits, season duration, and methods of hunting are then adjusted to control the allowable kill.

Each species' reproductive capacity and vulnerability to hunting and nonhunting mortality determines the impact hunting will have. Species with large clutches, early sexual maturity, and the ability to renest or produce multiple clutches can theoretically withstand more hunting. Dabbling ducks generally have these traits, and hence their bag limits are relatively high. Swans, geese, and diving ducks have relatively small clutches, deferred sexual maturity, and usually an inability to renest. These characteristics account for the reduced bag limits on geese and some species of diving ducks and for the total protection of swans in California.

Although all species of waterfowl can withstand some degree of hunting mortality, inadequate information for predicting the allowable kill can lead to over harvest. The Aleutian Canada goose in California and races of Canada geese in the Midwest are examples of populations that were at one time limited by hunting. Reductions in harvest of these species produced subsequent increases in population levels.

Disease. Disease directly or indirectly accounts for the largest proportion of nonhunting mortality of waterfowl (Bellrose, 1976). In California, several diseases affect waterfowl populations. Major epizootics[3] of botulism and fowl cholera have killed thousands of water birds in California in a short period.

[3]Epizootic: A disease that affects many animals of one kind at the same time.

In strict theoretical terms, a limiting factor is one that independently prevents a population from increasing. However, because most of the factors identified by the 16 questionnaire respondents are not independent but are interrelated to some degree, this theoretical definition is too strict for the purposes of this discussion. For example, food, water, and disease were all suggested as limiting factors. However, food availability is to a degree related to water. Flooded rice fields, for example, appear to be used more than dry fields by some duck species. Diseases such as botulism are also related to the quantity, quality, and distribution of water. Thus, understanding what factors limit waterfowl populations requires an appreciation of the interaction of many variables.

Annual Fluctuation in Population Levels. Another important element in evaluating limiting factors is the large annual fluctuation in population levels of most waterfowl species. Breeding-ground conditions that affect the quantity and quality of habitat outside of California change dramatically each year, affecting reproduction. Consequently, the number of waterfowl returning each year to winter in California is extremely variable.

In years of poor breeding-ground conditions, the quantity and quality of nesting habitat may be the most important factor limiting waterfowl populations. However, in years of good breeding-ground conditions, the most important factor may be the number and condition of waterfowl returning to the breeding grounds. Conditions in California would play a major role in the latter situation. The limiting factors identified by the 16 respondents should therefore be considered potential, not necessarily acting in all years or on all species.

Grouping Waterfowl by Habitat Needs. Grouping waterfowl by similar habitat needs is also helpful in evaluating potential limiting factors. Because many species of waterfowl share similar habitat needs, limiting factors affecting one species probably act on other ecologically similar species. The following list categorizes waterfowl commonly found in California into groups of species that have similar habitat requirements. In addition to those shown, wood ducks and tundra swans have unique habitat needs.

Dabbling ducks	Diving ducks	Geese
American wigeon	Bufflehead	Canada
Cinnamon teal	Canvasback	Pacific greater white-fronted
Gadwall	Goldeneye	Ross'
Green-winged teal	Merganser	Snow
Mallard	Redhead	Tule greater white-fronted
Northern pintail	Ring-necked duck	
Northern shoveler	Ruddy duck	
	Scaup	

Type C botulism is toxic to all species of waterfowl. However, species that concentrate in large numbers in the Central Valley during late summer or fall, when ambient temperatures are high, are particularly vulnerable to the disease. Botulism hits hardest the early arriving dabbling ducks such as pintail and locally abundant resident breeders such as mallard, gadwall, and cinnamon teal. Geese generally arrive after ambient temperatures have decreased and are not exposed to botulism. Diving ducks and wood ducks are also less affected by botulism because of the diving ducks' preference for deep water and the wood ducks' preference for riparian vegetation.

Fowl Cholera. Fowl cholera is another disease that can cause a massive loss of waterfowl. Over 70,000 waterfowl died of fowl cholera in California during the winter of 1965-66. Poultry and waterfowl can carry this disease in an intermediate, nonvirulent stage. In infectious stages, cholera spreads rapidly through dense flocks of wintering birds.

Similar to botulism, cholera in a virulent stage is infectious to all species of waterfowl. Swans, geese, dabbling ducks, and diving ducks have died in California from cholera. Snow and Ross' geese in the Sacramento Valley and swans in the Delta seem to be affected the most.

The impacts of avian diseases are amplified by the concentration of birds in the affected area. Waterfowl are gregarious during winter and often congregate in flocks of several hundred thousand. Although this natural gregariousness is partly responsible for the bird's vulnerability to disease, the limited amount of habitat available to waterfowl may also contribute to this vulnerability by causing the birds to concentrate in unnaturally high numbers.

Food. Many of the questionnaire respondents cited food as a potential limiting factor of Central Valley waterfowl populations. All waterfowl require food to fulfill individual nutritional needs and to meet energy demands for migration and reproduction. Each waterfowl species has evolved unique feeding strategies to fulfill its nutritional requirements. Geese and swans are mainly adapted to vegetarian diets, whereas diving ducks primarily consume animal matter. Dabbling ducks generally eat a wide variety of animal and plant material, although a species such as the wigeon is largely vegetarian. Agriculture, water, and human disturbance affect the abundance and availability of natural and agricultural foods to waterfowl.

The stress of inadequate food during winter can affect waterfowl in many ways. The birds can starve to death, but this rarely happens in California. Much more likely is their loss to predation or disease as a result of their weakened condition. However, the precise role of food stress in causing losses from predation and disease is unknown.

Effects of Food Quality. Food quality can also affect waterfowl populations. Abundant and readily available foods are not always nutritionally balanced. For example, rice provides an adequate energy source but is low in protein. As a

Table C-4. Relative importance of various ducks and geese in the California waterfowl harvest

Species	Percentage of harvest
Ducks[a]	
Pintail	36.1
Green-winged teal	15.9
Mallard	15.9
American wigeon	11.3
Northern shoveler	8.5
Blue-winged teal/cinnamon teal	2.8
Gadwall	2.6
Scaup	1.5
Ruddy	1.1
Canvasback	1.1
Wood	1.0
Ring-necked	0.6
Bufflehead	0.6
Redhead	0.4
Goldeneye	0.2
Merganser	0.1
Scoter	0.1
Others	Trace
Geese[b]	
Canada	75
Snow	14
Greater white-fronted	8
Others	3

[a]Average harvest of each duck species during the 1966-75 hunting season. Duck data from Carney et al., 1978.

[b]Harvest of each goose species during the 1980 hunting season.

Botulism. Botulism is probably the most devastating waterfowl disease in California. Massive outbreaks in 1968 and 1969 killed an estimated 250,000 waterfowl. Botulism is caused by a bacterium-produced toxin. Warm anaerobic conditions and a protein source are necessary for an outbreak to occur. Pre-irrigation of agricultural fields, receding water levels that expose mud flats, and changes in water quality all kill organisms that provide the protein medium necessary to trigger an outbreak. Decaying waterfowl from an epizootic then produce toxic maggots that are eaten by other waterfowl, thus creating a deadly cycle.

Effects of Human Disturbance on Food Availability. Human disturbance can reduce the availability of food to waterfowl. Hunting in particular can prevent waterfowl from using preferred feeding areas during the day. The demand for hunting areas is great enough that few sanctuaries exist where waterfowl can feed undisturbed. Waterfowl have adapted to disturbance to some degree by feeding at night and resting during the day in public wetlands or other water impoundments such as the San Luis Reservoir.

Predation. Predators affect waterfowl populations by killing the birds or eating their eggs. The ability of predators to catch healthy adult birds, however, is thought to be low and of little consequence to wintering waterfowl populations. Predators are generally more successful at catching sick or weakened adults, incubating females, and broods.

The impact of predators in California is probably greatest on the nests of resident breeding waterfowl. Skunks, opossums, rats, and raccoons are the most common Central Valley predators, with gulls, snakes, foxes, and coyotes occasionally destroying nests. Predation was responsible for the majority of nest failures in a study of nesting success in the Grasslands Area (Anderson, 1956). In that 2-year study, predators destroyed 62 and 82 percent of the duck nests in the study area.

Introduced predators appear to be a major cause of low nesting success. Predators new to the valley include the Norway rat, which arrived with the early sailing ships. House cats and dogs probably came with Spanish mission settlements. The valley red fox became established in Glenn County sometime in the 1870s or 1880s, apparently introduced from the eastern United States as a settler's pet. Only during the last 25 to 30 years have these foxes extended their range throughout most of the upper valley. In extending their range, they displaced the native gray fox, which is known to be less predaceous than the red fox. The opossum became established in California around 1912. Its range into the upper Sacramento Valley, however, did not occur until the late 1940s and 1950s (Sacramento Valley Waterfowl Habitat Management Committee, undated).

The high nest predation rates in California have been blamed on the destruction of quality nesting habitat by agriculture. Clean farming techniques and grazing are responsible for removing much of the native cover nesting waterfowl prefer. Many times, the only remaining nesting cover is along dikes, ditches, and fence rows. Because these areas often serve as predator trails, the likelihood of a predator encountering a nest, and thus predator efficiency, is increased.

Predation is probably heaviest on dabbling ducks because of their upland nesting habits. Mallard, gadwall, cinnamon teal, and pintail are the most common dabbling ducks nesting in the Central Valley. The significance of nest predation on population levels of these resident breeders, however, is unknown. Dabbling ducks have the ability to renest if their first nest is destroyed; this ability compensates to some degree for high predation losses.

result, a strict diet of rice would cause malnutrition if supplemental protein and other essential elements were not available. Foods high in protein are especially important during molt and egg formation. Some agricultural crops such as grains and cereals provide an ample source of energy to waterfowl, but invertebrates and native vegetation are probably the source of protein and other essential nutrients. The relationship between the availability of essential nutrients and the needs of waterfowl in the Central Valley is only now beginning to be understood.

Effects of Food on Reproductive Success. Food can dramatically affect reproductive success. Ducks and geese generally arrive at their northern breeding grounds with nearly all of the body reserves necessary to lay and incubate a clutch of eggs (Raveling, 1979; Krapu, 1981). Inadequate reserves result in smaller clutches or delayed breeding while reserves are built up. In either case, reduced production can occur. However, it is not known just how important body reserves acquired on the wintering ground are to reproductive success in northern nesting areas. Migrant waterfowl may be able to acquire all the body reserves they need to reproduce successfully from staging areas between California and their respective breeding areas, although this acquisition seems unlikely.

Adaptation of Feeding Habits to Agriculture. Some species of waterfowl have been able to take advantage of food resources created by the conversion of native habitat to agriculture. Geese commonly feed on the shoots of germinating grain and cereal crops as well as on the seeds. Tundra swans often feed on waste corn in both dry and flooded fields and have been known to take advantage of unharvested potatoes. Of the dabbling ducks, mallard and pintail commonly feed in harvested grain fields.

Other species of waterfowl have not adapted their feeding habits to agricultural practices. The smaller dabbling ducks such as green-winged teal, cinnamon teal, northern shoveler, and gadwall use shallow-water marshes and mud flats for the most part. Diving ducks feed mainly on invertebrate food sources that are primarily produced in deepwater marshes. Thus, food is probably more limiting for these species in the Central Valley than for waterfowl that have adapted to agricultural foods.

Effects of Water on Food Availability. Water probably affects the abundance of food available to waterfowl more than any other factor. California experiences tremendous variation in annual precipitation, often leading to drought or flood conditions. In years of abundant rainfall, rivers and streams overflow into bypasses and basins, and surface water accumulates in agricultural fields, greatly increasing the acreage of flooded habitat in the Central Valley. The bypass areas alone contribute over 150 square miles of water during floods. The importance of these temporary wetlands is shown by their ability to attract hundreds of thousands of waterfowl from neighboring areas. Part of the attraction of these areas is undoubtedly the abundant food resources such as grain and invertebrates that become available when they are inundated. However, in most years (three out of four), only a limited amount of occasional water is available, and then usually only for relatively short periods. Thus, the dependable habitat base is the managed wetlands that have dependable water supplies.

Lead poisoning from ingesting lead shot kills an estimated 2 to 3 percent of the continental fall and winter waterfowl populations annually (Bellrose, 1976). Research suggests, however, that many factors contribute to the severity of the problem. The sex, age, size, and diet of a bird influence the effects lead has on it. Lead poisoning affects females more than males, adults more than immatures, and smaller birds more than larger birds (Jordan and Bellrose, 1951; Jordan, 1968). A diet of hard grains such as corn also increases the toxicity of lead, mainly because of increased mechanical breakdown of lead in the gizzard.

The availability of lead shot is another factor that influences the severity of the problem. In ponds with hard bottoms, lead pellets accumulate at the soil surface, making them readily accessible to foraging waterfowl. In ponds with soft bottoms and in those that are plowed annually, lead pellets are often dispersed, thereby decreasing their accessibility.

Although contaminant problems are known to exist in California, the species of waterfowl that are most affected and the magnitude of the problem are unknown.

Data Needs

Some of the research necessary to determine what habitat components are limiting each species in the Central Valley is under way, but a broader effort and much more information are needed. The importance of California to wintering waterfowl, however, cannot be overstated. More waterfowl winter in California than in all other Pacific Flyway states combined, and the Central Valley receives the majority of California's waterfowl use. All the cackling and Aleutian Canada geese and nearly all of the Pacific Flyway's greater white-fronted geese depend on wintering areas in the Central Valley.

The relative importance of winter habitat in California versus breeding-ground conditions in Canada and Alaska is not clear. Traditionally, biologists thought that breeding habitat was limiting waterfowl populations, but a recent study in the Mississippi Flyway suggests that improved conditions at the wintering ground can increase the numbers of young mallards in fall populations. In that study, the authors used precipitation as an index of winter wetland quality. The study showed increased numbers with above-normal rainfall (Heitmeyer and Fredrickson, 1981). The authors suggested improved body condition of breeding waterfowl during wet years as the mechanism for increased population.

Annual variation in habitat conditions in California probably affects Pacific Flyway waterfowl populations in a similar way. California has lost most of its wetlands and experiences tremendous annual variations in precipitation. Federal agricultural subsidies such as Payment-in-Kind programs greatly affect the amount of land in grain production. The combination of these factors can produce huge annual variations in habitat and food supply. These conditions probably affect the acquisition of body reserves by waterfowl in winter and thus influence their reproductive success during the following nesting season. The reduced body weight of pintails in California during dry winters supports this hypothesis (Michael Miller, undated).

Predation on nesting females also contributes to resident waterfowl mortality. The disproportionate loss of females to predators is thought to be one of the major causes of the unbalanced sex ratios common in continental waterfowl populations. The magnitude of the problem in California, however, is unknown.

Contamination. Contaminants that affect waterfowl populations come in many forms. Pesticide use for agriculture, accidental and intentional chemical dumping, and industrial and municipal waste have all contributed to an overall reduction in environmental quality. Lead poisoning from ingested lead shot is also responsible for a percentage of waterfowl mortality, although mass die-offs are unusual.

The impacts of contaminants on waterfowl are many and complex. The most toxic pesticides can kill waterfowl rapidly through dermal and respiratory contact as well as through contamination of the food they eat. Repeated exposure to less than lethal doses of pesticides can ultimately cause death if the chemicals are persistent and accumulate in the body.

Contaminants have been shown to affect reproduction in many species of wildlife. Exposure to relatively low levels of some pesticides can change nesting behavior. Organochlorines are probably the most well known for their effects on avian reproduction. Exposure to DDT can cause egg shells to thin, causing decreased egg hatchability. DDT was implicated in the decline of brown pelicans and other birds in California. Other organochlorines have similar reproductive effects. Recent studies in California have shown that, while in the state, waterfowl are accumulating contaminants that could be affecting reproduction. This accumulation is occurring even though many of these chemicals have been banned (Harry Ohlendorf, undated).

Some contaminants such as mercury and selenium can cause teratogenesis.[4] As discussed in Part II, an unusually high incidence of embryo deformity was recently observed at the Kesterson National Wildlife Refuge in the eggs of a number of nesting waterfowl, including two species of ducks. High selenium concentrations were found in the reservoir cells and are suspected of causing the problem.

Contaminants that are not directly toxic to waterfowl can still have adverse effects. For example, organic herbicides are generally considered nontoxic to waterfowl, but they have devastating effects on their habitat. Along with the elimination of cover, herbicides can destroy the vegetative food base of some species. Invertebrate populations that depend on vegetation and serve as food sources to other species of waterfowl can also be eliminated through habitat destruction. Moreover, some contaminants are water soluble and thus readily transported through water channels. As a result, these water-soluble contaminants can affect vegetation and food chains in areas remote from the original areas of application.

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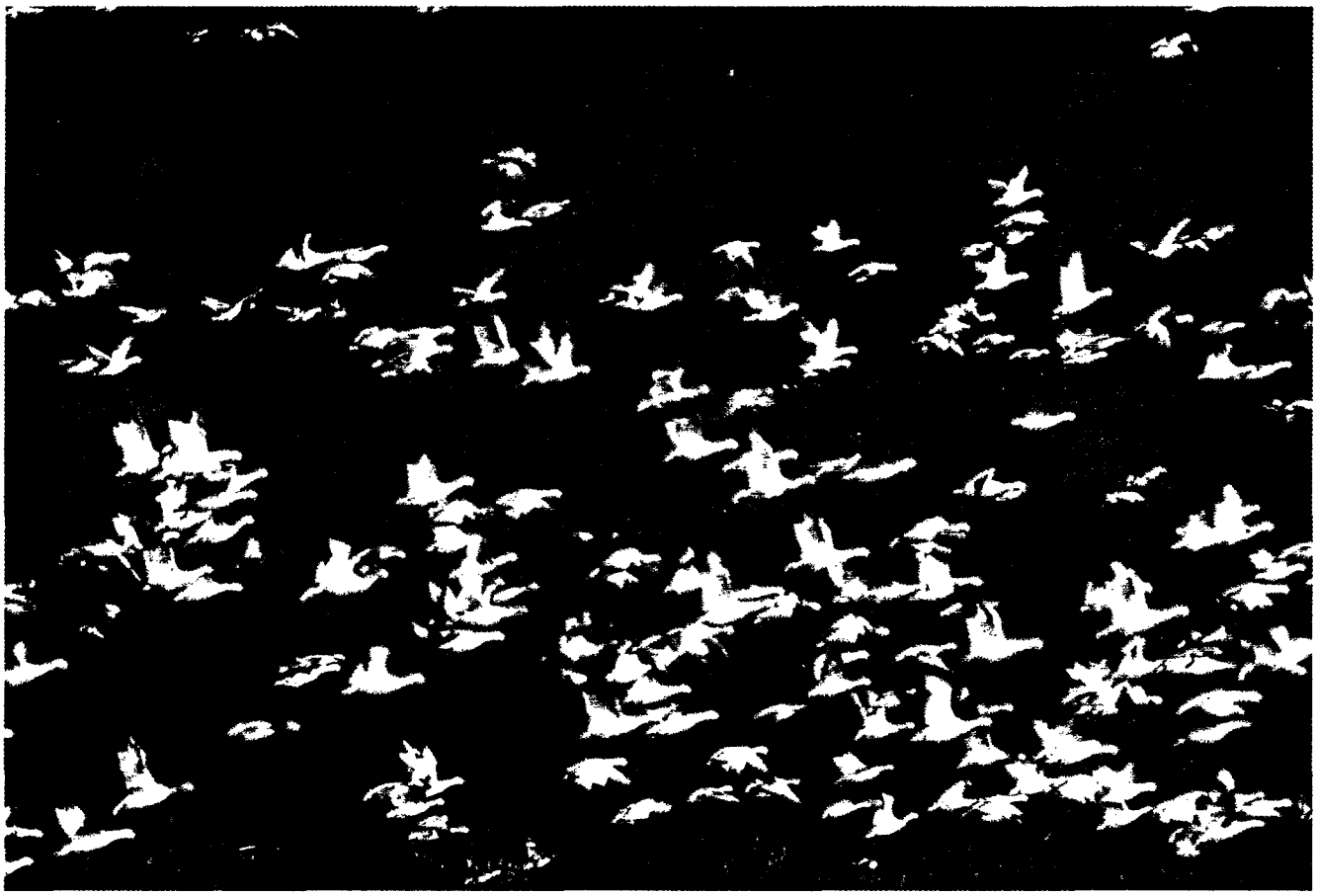
[4]Teratogenesis: The production of malformed fetuses.

Events occurring on wintering and breeding grounds are probably not independent. Wintering conditions seem to affect survival and reproduction on the breeding grounds, and habitat conditions in nesting areas can influence mortality of young returning to wintering areas. Although the relationships between survival, reproduction, and habitat conditions are beginning to be understood for some species, particularly mallards, species-specific research is still needed in the Pacific Flyway before the effects of limiting factors in California can be better understood.

ATTACHMENT F

Unit Costs Used in Cost Estimates in this Report



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

TABLE F-1

UNIT COSTS FOR MATERIALS AND CONSTRUCTION (1987 COSTS)

Items	Unit	Unit Cost/# of Units
o Clearing and Grubbing	acre	$5,000.00
o Pipe Trench Excavation	cu yd	$10.00
o Handling: Stringing and Laying		
12" Pipe	lin ft	$1.45
18" Pipe	lin ft	$1.60
24" Pipe	lin ft	$1.85
30" Pipe	lin ft	$1.90
36" Pipe	lin ft	$2.40
48" Pipe	lin ft	$3.75
60" Pipe	lin ft	$6.20
66" Pipe	lin ft	$6.85
o Pipe Trench Backfill	cu yd	$13.00
o Rip Rap	sq yd	$31.00
o Trench Excavation Cross Section		
12" Pipe	sq ft/ft of trench	10.50
18" Pipe	sq ft/ft of trench	14.00
24" Pipe	sq ft/ft of trench	18.00
30" Pipe	sq ft/ft of trench	22.50
36" Pipe	sq ft/ft of trench	27.50
o Ditch Excavation	cu yd	$5.50
o Ditch Rehabilitation	lin ft	$1.50
o Gunite	sq ft	$1.20
o Reinforced Concrete	cu yd	$600.00
o Trench Backfill Cross Section		
12" Pipe	sq ft	$9.7
18" Pipe	sq ft	$12.2
24" Pipe	sq ft	$14.9
30" Pipe	sq ft	$17.6
36" Pipe	sq ft	$20.4

TABLE F-2

ASSUMPTIONS USED IN DEVELOPMENT OF ANNUAL OPERATION AND MAINTENANCE COSTS

Items	Basis of Cost
Pumping	10.0 of Equipment Cost
Pipeline	0.5 of Construction Cost
Concrete Structure	0.2 of Construction Cost
Wells	3.4 of Construction Cost
Ditch Enlargements	0.5 $(Q_2/Q_1 - 1)$* of Construction Cost
Culverts	0.5 of Construction Cost
Control Gates	0.5 of Construction Cost
Lined Canals	1.0 of Construction Cost
Unlined Canals	2.0 of Construction Cost
Irrigation Distribution Works	3.0 of Construction Cost

*Assumes cost is proportional to the hydraulic radius and that the cost of the existing ditch is already included in another item. Q_1 = existing capacity, Q_2 = enlarged capacity.

COST OF POWER

The energy costs for agricultural power were taken from 1987 Schedule PA-1 of Pacific Gas and Electric Company. This schedule is applicable to reclamation service and to general agricultural service on the farm. A total energy charge of $0.07635 per kilowatt-hour was used for cost estimates.

CONVEYANCE LOSS FACTORS

Items	Percent Loss
Unlined Canals	20
Lined Canals	10
Pipelines	2

USEFUL LIFE OF FACILITIES

Items	Lifetime (Years)
Pumps	30
Wells	30
Well Equipment	15
Unlined Canals	7
Lined Canals	30
Pipelines	30

APPENDIX F

UNIT COSTS USED IN COST ESTIMATES IN THIS REPORT