CALFED

TECHNICAL REPORT
AFFECTED ENVIRONMENT

VEGETATION & WILDLIFE

DRAFT

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CALFED
BAY-DELTA
PROGRAM

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LIST OF ACRONYMS

CALFED	CALFED Bay-Delta Program
CDF	California Department of Forestry and Fire Protection
CNPS	California Native Plant Society
Corps	U.S. Army Corps of Engineers
CVHJV	Central Valley Habitat Joint Venture
CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CWA	Clean Water Act
DFG	California Department of Fish and Game
DWR	California Department of Water Resources
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FRAP	Fire and Resource Assessment Program
GIS	geographic information system
NWI	National Wetlands Inventory
NDDB	Natural Diversity Data Base
NPDES	National Pollutant Discharge Elimination System
PEIS	Programmatic Environmental Impact Statement
Reclamation	U.S. Bureau of Reclamation
RWQCB	Regional Water Quality Control Board
SNA	significant natural area
SWRCB	State Water Resources Control Board
SWP	State Water Project
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

VEGETATION & WILDLIFE

INTRODUCTION

This technical report identifies vegetation and wildlife resources that could be affected by implementation of the CALFED Bay-Delta Program (CALFED). Special-status species of plants and wildlife and rare natural communities are emphasized because various federal and state agencies administer regulations and policies designed to preserve and protect these resources. Plant and animal common names are used throughout this document. For a complete list of both scientific and common species names, refer to Table S-2 in the Supplement.

Current resource conditions for most regions discuss the following:

- Natural and agricultural communities and their associated wildlife,
- Special-status plants,
- Special-status wildlife,
- Significant natural areas, and
- Waterfowl and shorebirds.

The greatest level of detail is provided for the Delta and Bay regions because the goals of CALFED are focused on these regions.

SOURCES OF INFORMATION

Historical Perspective

Information on historical (pre-1920s) through 1985 biological resource conditions and trends was obtained from documents describing changes in the condition and extent of major habitats and species in California over the last decades. Parts of this section were adapted from Appendix X of the *Sacramento River Service Area Water Contracting Program Draft Environmental Impact Statement* (Reclamation 1988). Current status and historical trends for several species that illustrate overall trends in the study area were summarized from a variety of published sources.

The approximate extent of common habitat types in the study year immediately prior to the State Water Project (SWP) and Central Valley Project (CVP) was determined by planimetry of polygons within the study area from Wieslander's (1945) map of California vegetation. This map is a highly generalized synthesis of more detailed maps prepared for U.S. Geological Survey (USGS) topographic quadrangles throughout the state. Results of the planimetry were rounded to the nearest 10,000 acres to indicate the approximate nature of these data. Habitat classifications for the 1945 and existing habitat acreages were correlated where possible; however, direct comparison of 1945 and existing acreages for trend analysis is not possible for all habitats. Any comparison is difficult because of the generalized nature of statewide habitat mapping, and differences in historical and modern habitat classifications (the wildlife-habitat relationships habitat classification system did not exist in 1945). Some categories in Wieslander's classifications were combined to match the current classification.

Other important sources of historical biological data include published results of environmental studies and planning efforts in the study area conducted by the California Department of Water Resources (DWR) (1994), the California Department of Fish and Game (DFG), U.S. Fish and Wildlife Service (USFWS) (1992), Cohen

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and Carlton (1995), and Madrone Associates (1980).

Current Resource Conditions

Plant Communities and Associated Wildlife. Descriptions of common natural communities were based on wildlife habitat descriptions published by the California Department of Forestry and Fire Protection (CDF) (Mayer and Laudenslayer 1988), supplemented with information from DFG (Holland 1986) and the California Native Plant Society (CNPS) (Sawyer and Keeler-Wolf 1995).

The distributions and acreages of common natural vegetation in the study area regions were estimated from a geographic information system (GIS) of hardwood and other vegetation types prepared for CDF's Fire and Resource Assessment Program (FRAP), modified and supplemented with data from additional sources. The CDF map incorporates mapping from CALVEG (Matyas and Parker 1980) and more recent hardwood mapping by CDF (Greenwood et al. 1993). Additional sources used to improve mapping detail in agricultural and urban areas include a land use study of the Delta (DWR 1993); various state maps showing city limits in large urban areas; and rectified Landsat Thematic Mapper imagery from August and September 1990, interpreted using GRASS image processing software from the U.S. Army Corps of Engineers (Corps).

Information on wildlife commonly associated with major habitats was obtained from the California Statewide Wildlife-Habitat Relationships System, an electronic database of wildlife-habitat relationships and wildlife species distributions maintained by DFG (Mayer and Laudenslayer 1988), literature listed below, and contacts with knowledgeable individuals.

Riparian and Wetland Habitats. Information on the extent and types of riparian and wetland habitats in the study area was determined from existing published and unpublished data described below, including a land use study of the Delta (DWR 1993), the USFWS National Wetlands Inventory (NWI) maps, DWR data (1987), and Natural Diversity Data Base (NDDB) information (DFG 1997).

References to the Delta and Bay land cover maps and habitat acreages were derived from the USFWS NWI maps, DWR's Land Use Mapping Program data, and the land cover layer of the California Gap Analysis Project (Biogeography Lab, University of California, Santa Barbara).

Land use data were used assuming that average land use patterns would not change between the date of data acquisition and 1995, although land use on individual parcels may change. Whenever possible, the most up-to-date land use data available were used. Although changes in land cover probably have occurred between the date of mapping and 1995, this difference is not expected to substantially affect the impact assessment.

Agricultural Habitats. The extent of agricultural habitats was based on information from county agricultural commission reports in the Agricultural Resources Technical Report. The value of these managed habitats to wildlife was described using existing literature.

Reservoirs. The extent of common habitat types at reservoirs was determined from a map of hardwood (Greenwood et al. 1993) and other vegetation types (CALVEG: Matyas and Parker 1980) prepared by FRAP. Estimates of shoreline extent for various habitat types were based on estimates of the relative abundance of each common habitat type along the shoreline and data on shoreline mileage from Reclamation (1990a). Vegetation was not mapped in detail for the reservoir watersheds.

Special-Status Plant Communities. Descriptions and information on general distributions of rare natural communities were based on unpublished data from DFG (Holland 1986, DFG 1997).

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Significant Natural Areas. Information on significant natural areas (SNAs) was obtained from the Natural Heritage Division of DFG (1997).

Special-Status Species. The summaries of total number of sensitive species in each of the CALFED study area regions presented in this report are based on the Central Valley Project Improvement Act (CVPIA) Programmatic Environmental Impact Statement (PEIS) Draft Technical Appendix (Reclamation 1997). The special-status plant and animal information contained in the CVPIA PEIS is based on printed and electronic (database) versions of the CNPS Inventory of Rare and Endangered Vascular Plants of California (Skinner and Pavlik 1994) and from proposed and final rules on species' listing in the Federal Register. Information on some species was supplemented with data from DFG's NDDB (1997).

Special-status species are plants and animals that are legally protected under state and federal Endangered Species Acts (ESAs) or other regulations, and species that are considered sufficiently rare by the scientific community to qualify for such listing. For the purpose of this programmatic study, special-status plants are species in the following categories:

- Plants listed or proposed for listing as threatened or endangered under the federal ESA (50 Code of Federal Regulations [CFR] 17.12 [listed plants] and various notices in the Federal Register [proposed species]);
- Plants listed or proposed for listing by the State of California as threatened or endangered under the California ESA (14 California Code of Regulations [CCR] 670.5); and
- Plants that are candidates for possible future listing as threatened or endangered under the federal ESA (61 Federal Register 40, February 28, 1996).

Special-status animals are species in the following categories:

- Animals listed or proposed for listing as threatened or endangered under the federal ESA (50 CFR 17.11 [listed animals] and various notices in the Federal Register [proposed species]);
- Animals that are candidates for possible future listing as threatened or endangered under the federal ESA (61 Federal Register 40, February 28, 1996); and
- Animals listed or proposed for listing by the State of California as threatened or endangered under the California ESA (14 CCR 670.5).

ENVIRONMENTAL SETTING

Regulatory Context

The federal ESA and the California ESA protect listed special-status species directly by regulating jeopardy to a population or "take" and indirectly by protecting habitat. Federal ESA compliance is enforced by USFWS, and California ESA compliance is enforced by DFG. DFG also enforces regulations under the Fish and Wildlife Protection and Conservation Act (California Fish and Game Code, Sections 1600-1608, also known as the Streambed Alteration Agreement).

Numerous federal, state, and local laws contain provisions that protect wetlands and terrestrial habitats. The federal Clean Water Act (CWA) is administered by the State Water Resources Control Board (SWRCB) and the Central Valley and San Francisco Bay Regional Water Quality Control Boards (RWQCBs) under an agreement with the U.S. Environmental Protection Agency (EPA). Under Section 303 of the CWA, water quality standards and implementation plans must be developed periodically, including

effluent limitations; receiving-water ambient standards; and total maximum daily load standards for trace metals, sediment, or other pollutants. Section 303 also allows for revisions and intergovernmental cooperation; for adequate implementation, including schedules of compliance; and for revised or new water quality standards.

Section 402 of CWA includes the National Pollutant Discharge Elimination System (NPDES), which implements standards established under other sections of CWA, including Section 303. EPA may issue permits for discharge of waste into navigable waters of the United States. Section 404 requires that permits be obtained from the U.S. Army Corps of Engineers (Corps) prior to dredging and filling. This includes dredging or filling activites that would disturb jurisdictional wetlands.

The 1995 Water Quality Control Plan, implemented by SWRCB, established water quality objectives for the protection of fish and wildlife and for other beneficial uses of water (consumptive and nonconsumptive use) in the San Francisco and Suisun bays and in the Delta.

The Suisun Marsh Preservation Act requires maintenance of specific salinity levels in the marsh. The Suisun Marsh Salinity Control Structure was constructed as a barrier to prevent high-salinity waters from encroaching into the marsh. The structure is primarily for maintenance of freshwater marsh and wetland habitat to benefit waterfowl. The structure maintains fresh water suitable for waterfowl-management needs.

All Regions

HISTORICAL PERSPECTIVE

The study area contains some of the most varied natural habitats and highest biodiversity anywhere in North America (Barbour et al. 1991, 1993). Many of these resources have been severely reduced or degraded by human settlement, population growth, and economic development since the mid-19th century, but they remain a prominent part of California's natural and cultural landscapes. The following historical perspective of the CALFED study area is based on the CVPIA Draft PEIS (Reclamation 1997).

Measurable, documentable changes in the aquatic environment began soon after Spaniards first settled in California during the 1770s. By the 1850s, changes in coastal grasslands became noticeable with the introduction of European grasses and forbs to help feed cattle and sheep, first near the missions and later on more inland ranches. Exotic plant species were introduced almost immediately by the Spanish (Frenkel 1970, Barbour et al. 1993).

Early reports from European explorers described the herds of grazing animals in the Central Valley as rivaling the bison of the central plains or the antelope of South Africa (McCullough 1971); waterfowl were widely distributed and abundant (DFG 1983).

When Shasta Dam was constructed in 1944, many of California's natural habitats had been altered dramatically and irrevocably from their near-pristine conditions of 150 years earlier. Extensive herds of native grazing animals and their associated predators had been eliminated. Approximately 30% of all natural habitats had been converted to urban and agricultural lands (Table 1).

Habitat Type	Delta	Sacramento River West	Sacramento River East	San Joaquin River West	San Joaquin River East	Total
Mixed conifer forest[a]	0	540,000	2,910,000	0	850,000	4,300,000
Juniper[b]	0	0	40,000	10,000	0	50,000
Valley foothill hardwood[c]	0	1,260,000	1,710,000	280,000	1,440,000	4,680,000
Grassland	50,000	500,000	700,000	1,060,000	1,340,000	3,650,000
Chaparral	0	710,000	500,000	140,000	310,000	1,660,000
Desert scrub and alkali desert scrub	0	0	0	10,000	0	10,000
Coastal scrub	0	0	0	60,000	0	60,000
Freshwater emergent wetland[d]	10,000	120,000	30,000	0	0	160,000
Agricultural and urban	670,000	1,620,000	1,340,000	810,000	2,040,000	6,480,000
Total	**730,000**	**4,750,000**	**7,230,000**	**2,370,000**	**5,980,000**	**21,060,000**

NOTES:

See Table 2 for 1993 acreages.

Areas are planimetered from Wieslander (1945) map of California vegetation and rounded to nearest 10,000 acres (apparent inaccuracies are due to rounding error).

Uncertainties of total habitat acreages are estimated to be ±15%. Uncertainties of most individual habitat acreages are variable (estimated at ±10-20%) and are caused by minor errors in planimetry and habitat mapping. Wetland acreages are least accurate because only a few large wetland sites were included in Wieslander's statewide map.

Wildlife habitat relationship types in the Central Valley are not distinguished by Wieslander (1945) and include montane hardwood, valley foothill riparian, montane riparian, inland dunes, and some freshwater emergent wetlands. See Table 2 for riparian habitat acreages.

[a] Mixed conifer forest includes Wieslander's "Pine," "Fir," "Pine-Douglas Fir-Fir," and "Lodgepole Pine-Whitebark Pine" categories.

[b] Juniper includes Wieslander's "Pinyon Pine" and "Juniper" categories.

[c] Valley foothill hardwood includes Wieslander's "Woodland (hardwoods)" and "Woodland-Grass" categories.

[d] Fresh emergent wetland includes Wieslander's "Marsh" and "Lakes" categories for the Delta Region.

Table 1. Habitat Areas in All Regions in 1945

Case studies, as presented in the CVPIA Draft PEIS (Reclamation 1997), are provided for three habitats: riparian, freshwater emergent wetlands, and grasslands. These habitats were selected because they have been affected substantially by development in the study area. Each characterization below provides a description of changes in vegetation and changes in distribution or status of selected species of plants and wildlife associated with that habitat.

RIPARIAN HABITAT AND ASSOCIATED WILDLIFE

The Sacramento and San Joaquin valley floodplains originally supported vast riparian woodlands along their major rivers. Historical maps and accounts indicate the existence of continuous forests up to 5 miles wide along the Sacramento River, plus extensive forests on high terraces even farther from the river. The riparian forests were diverse in composition and structure and often were dominated in size and number by valley oaks (Thompson 1961).

Estimates of the presettlement extent of riparian vegetation along the Sacramento River range from 800,000 (Roberts et al. 1977, Katibah 1984) to 1,000,000 acres (Thompson 1961; USFWS 1984, 1987), not including the extensive forests along some tributaries. Katibah (1984) estimated that another 50,000 acres of riparian habitat occurred in the San Joaquin Valley.

At least three-quarters of the Central Valley's original riparian forest was lost before the federal and state water projects were constructed (see Figure 1). On the Sacramento River, riparian forests were extensively cleared within a few decades of the discovery of gold. Trees were cut to fuel boats; build and heat towns; and make way for levees, farms, and harbors. Massive erosion from hydraulic mines in the Sierra Nevada filled the rivers and Delta with sediment.

When the rivers were dredged to permit navigation, the spoils were deposited as levees in the riparian zone. During the first half of this century, more forests were lost to large-scale placer mining using dredges (Katibah 1984, Thompson 1961).

Levee building was nearly continuous in the Sacramento and San Joaquin valleys, except during the Great Depression of the 1930s. By 1939, the amount of woody riparian habitat in these valleys had been reduced to approximately 65,400 acres (Frayer et al. 1989), nearly a 90% reduction. By 1944, the Sacramento Valley Flood Control Project was nearly complete, with 980 miles of levees, 438 miles of channels and canals, and 95 miles of bypasses (Kahrl 1979).

In the mid-1980s, the area of mature riparian forest in the entire Sacramento and San Joaquin valleys was estimated to total about 34,600 acres (Frayer et al. 1989). Along the Sacramento River, an estimated 2% of the estimated historical riparian forest remained (McGill 1979, McCarten and Patterson 1987). Today, the cumulative loss of historical Central Valley riparian habitat associated with the Sacramento and San Joaquin rivers and tributaries may exceed 90%.

Factors contributing to this loss include continued conversion of nonirrigated land to irrigated agricultural land, levee construction and maintenance, bank erosion, bank protection, groundwater extraction, and flow regulation. Dams have flooded riparian vegetation in their impoundments and degraded it downstream by altering flows and geomorphic processes. Flood control has interfered with natural processes that affect forest regeneration.

EMERGENT WETLANDS AND ASSOCIATED WILDLIFE

In normal rainfall years, vast portions of the Central Valley flooded as winter and spring runoff collected in the low areas. Extensive wetlands formed behind natural river levees, especially in the Butte Creek sink, Colusa Basin, and the Delta. The Sacramento and San Joaquin rivers merged in an inland Delta containing

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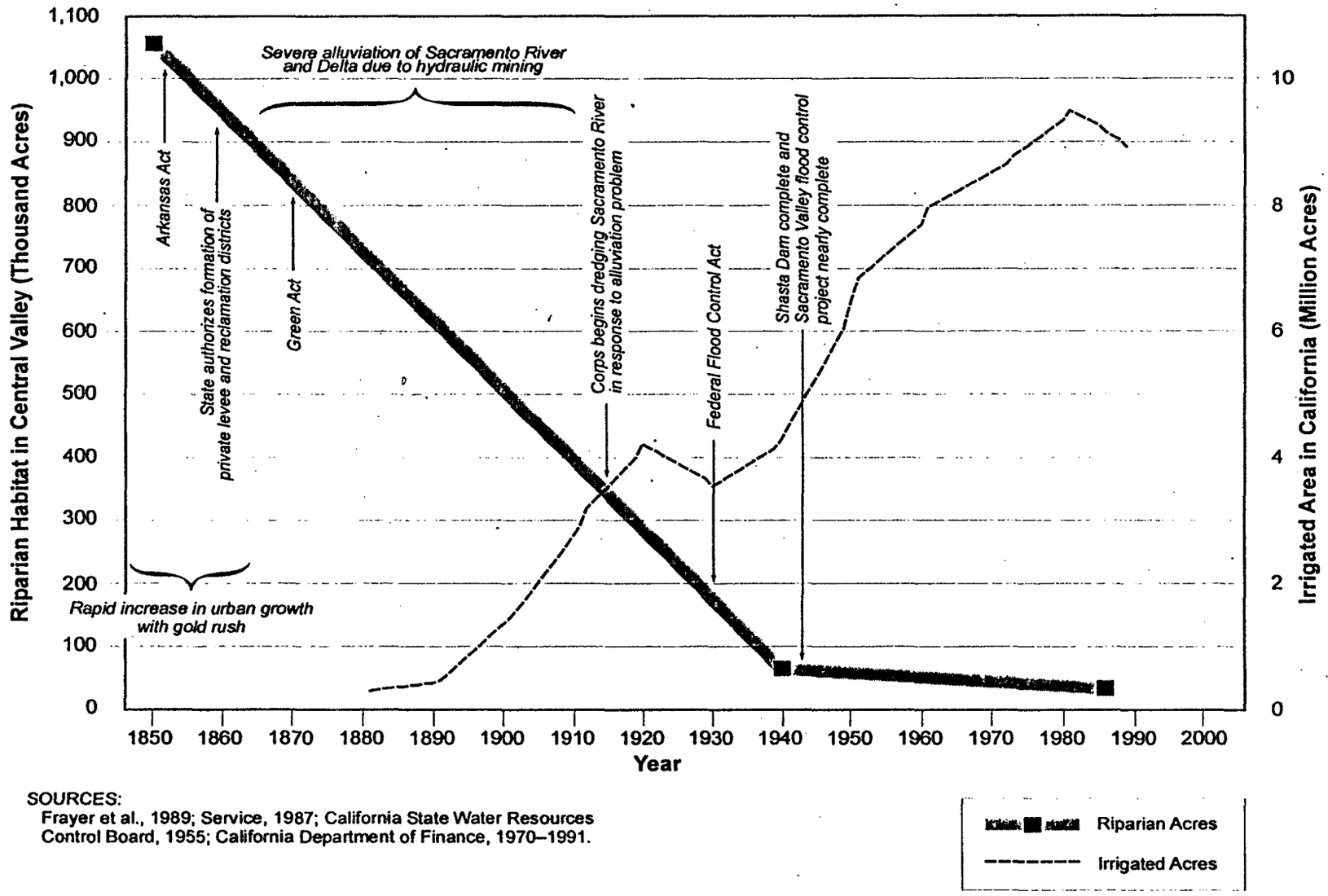

SOURCES:
Frayer et al., 1989; Service, 1987; California State Water Resources Control Board, 1955; California Department of Finance, 1970–1991.

Figure 1. Riparian Habitat Trends in the Central Valley

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more than 60 islands and more than 700 miles of waterways. Most of the Delta islands were marshy and some had a shrub overstory (DFG and USFWS 1980).

Seasonal wetlands, such as vernal pools, alkali meadows, and valley sink scrub, were widespread in the Sacramento Valley. Montane meadows were common in canyon bottoms along rivers and creeks.

Estimates of the original extent of California's wetland and open-water habitats range from 2 to 5 million acres (Dennis and Marcus 1984, DFG 1983, and Frayer et al. 1989). The Central Valley contained an estimated 4 million acres of permanent, seasonal, and tidal wetlands (Frayer et al. 1989, Dennis and Marcus 1984). Marsh occupied approximately 500,000 acres, 60% in the Delta (Kahrl 1979, DFG 1983). These estimates do not include areas of vernal pool, alkali meadow, alkali sink scrub, and montane meadow habitat.

By 1939, Central Valley wetlands had declined from about 4 million to approximately 483,000 acres (Frayer et al. 1989), an 88% loss (Figure 2). Statewide, the highest rate of wetland loss occurred between 1906 and 1922 (Dennis and Marcus 1984). The many reasons for these declines parallel those described earlier for riparian habitats. The largest declines occurred early in this century, when reclamation and flood control combined to accelerate conversion of wetlands to irrigated agricultural land.

The area of freshwater emergent wetlands in the Central Valley declined from about 483,000 acres in 1939 to about 243,000 acres in 1985 (Frayer et al. 1989). In the San Joaquin Valley, an estimated 92% of the historical permanent and seasonal wetlands have been drained and reclaimed for agriculture; only 85,000 to 91,000 acres of managed wetlands remain. The cumulative loss in the Central Valley now exceeds 90%. In addition, Holland (1978) estimated that 70 to 95% of historical vernal pool wetlands have been lost. Some of the loss can be attributed to agricultural and urban conversions.

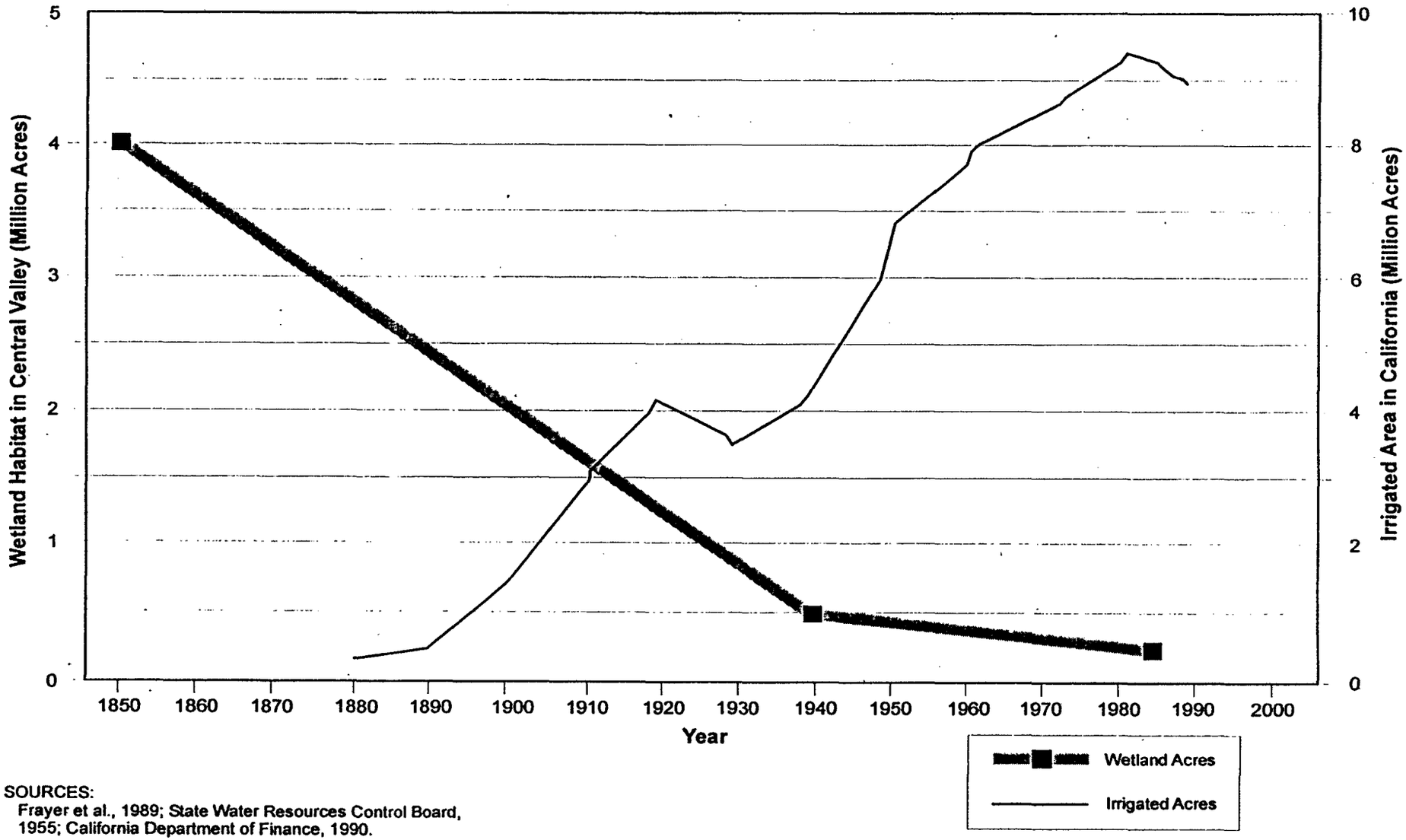
Historically, 4 million acres of seasonal and permanent wetlands in the Central Valley provided habitat for numerous species of wildlife, including many millions of wintering waterfowl. By 1920, approximately 70% of the wetlands had been reclaimed, and the wintering waterfowl population had been cut in half. Within the next 20 years, 88% of the wetlands were drained, and the wildlife species were substantially reduced.

The loss of many wildlife species was slowed, however, by the establishment of wildlife refuges and private hunting areas and, in some cases, by the development of suitable agricultural uses that provided habitat value for many of those species.

GRASSLANDS AND ASSOCIATED WILDLIFE

Grasslands once covered more than 14 million acres in California (Barbour et al. 1991). They were dominated by a wide variety of native species, including many perennial bunchgrasses, such as needlegrass, wild rye, melic grass, alkali sacaton, and deer grass. Native wildflowers and other herbs also were abundant. Some ecologists believe that nearly all of the state's original grasslands were dominated by perennial needlegrasses; others argue that annual grasses and wildflowers were dominant in many areas (Barry 1972, Bartolome and Gemmil 1981, and Wester 1981). In either case, grasslands were composed entirely of indigenous species until the late 1700s.

Changes in the composition of California's grasslands began in the 1770s, when Spanish settlers introduced a wide variety of annual grasses and forbs from the Mediterranean region. Throughout the 1800s and up to the present, hundreds of non-native plants arrived in the state from around the world. Many were aggressive enough to out-compete the native



SOURCES:
Frayer et al., 1989; State Water Resources Control Board, 1955; California Department of Finance, 1990.

Figure 2. Freshwater Emergent Wetland Trends in the Central Valley

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species and settle permanently into the California landscape. Grasslands were particularly hard hit by the introduction of non-natives, especially during times of heavy grazing and drought. By 1945, most of California's grasslands were no longer dominated by native plants.

Jensen (1947) estimated that grasslands of all types occupied about 10.4 million acres throughout the state in 1945, a decline of 26% from presettlement times. Most of this decline resulted from the expansion of croplands. Wieslander's (1945) map of California vegetation shows about 5.8 million acres of grassland in the Central Valley (Table 1), indicating that the Central Valley included approximately 55% of California's grassland habitat.

Today, grasslands occupy about 8.7 million acres statewide (Barbour et al. 1991), a 38% decline from historical times. Much of this decline occurred in the Central Valley. The loss of grasslands dominated by native bunchgrasses has been much greater; only remnants of this type remain (Heady 1977, Barbour et al. 1993). Grassland losses have continued to result from urban expansion and conversion to irrigated croplands. The degradation of grassland quality also has continued, especially on heavily grazed rangelands. In particular, the shift of short-term seasonal grazing by native species to a longer grazing season by livestock resulted in a reduction in native plant species abundance and diversity (Heady 1977, Barbour et al. 1993).

Prior to European settlement, Central Valley grasslands supported vast herds of tule elk and pronghorn antelope similar to the great herds of bison that once occurred in the Midwest (Dassmann 1964). The composition of these grasslands began to change with the introduction of Spanish livestock. Market hunting nearly eliminated the vast herds of the Central Valley's large grazing animals. By 1945, a substantial portion of the Central Valley's grasslands had been converted to agricultural crops.

AGRICULTURAL LANDS AND ASSOCIATED WILDLIFE

Historical records indicate agriculture and irrigation development in the study area began in the mid-1800s. Prior to the extensive levee system and water development facilities in the study area, agriculture in the region consisted primarily of dryland farming or irrigated agriculture from artesian wells, groundwater pumping, and some creek canals. Following the completion of the levees in the Delta area in 1913, a series of human-made waterways and water development facilities were constructed. Water development facilities were constructed to ship water from the Delta to other parts of California for agricultural, urban, and other uses (DWR 1993). Agricultural land use acreage in the Central Valley in 1945 (see Table 1) is estimated at approximately 8 million acres, slightly more than current estimates.

For more details regarding agricultural development in the CALFED study area, see the Agricultural Resources Technical Report.

ALL REGIONS - CURRENT RESOURCE CONDITIONS

An overview of plant communities and special-status species resources in All Regions is provided below. A general discussion is provided for:

- Common natural communities,
- Rare natural communities,
- Significant natural areas, and
- Special-status species.

Detailed descriptions of the common natural communities and their associated wildlife and rare natural communities are included in the Supplement to this technical report.

The Supplement also includes a list of potentially affected special-status species and SNAs for each region.

COMMON NATURAL COMMUNITIES

Plant community resources are mapped and defined as upland, wetland, agriculture, or urban. Plant community acreages in each study region are provided in Table 2. Upland plant communities in the CALFED study area include:

- Mixed conifer forest,
- Montane hardwood,
- Pinyon juniper,
- Valley foothill hardwood,
- Chaparral,
- Sagebrush,
- Alkali desert scrub/desert scrub, and
- Grassland.

Wetland plant communities in the CALFED study area include:

- Riparian (herb, scrub, forest, and woodland subtypes),
- Freshwater and saline emergent wetland,
- Open water, and
- Barren.

Although not a true habitat type, agricultural lands provide some resources to native wildlife. Agriculture types in the CALFED study area include:

- Grains,
- Pasture,
- Rice,
- Orchards and vineyards,
- Vegetables, and
- Cotton.

RARE NATURAL COMMUNITIES

Rare natural communities are recognized by state and federal agencies as important habitats because of their high species diversity and richness, high productivity, unusual nature, limited distribution, and declining status, or some combination of these qualities. The NDDB maintains a list of rare natural communities in California. The CALFED study area encompasses 24 rare natural communities. Table 3 lists the rare natural communities known or with potential to occur in the Delta, Bay, Sacramento River, and San Joaquin River regions of the study area.

SIGNIFICANT NATURAL AREAS

The SNA Program is administered by DFG and designed to encourage recognition of the state's most significant natural areas and to seek perpetuation of these areas (California Fish and Game Code, 1930-1933). SNAs have no legal status. They have been identified in response to a legislative mandate to raise the level of awareness about California's natural diversity and to identify opportunities for cooperative efforts, in order to conserve important biological resources.

DFG has used only the NDDB to identify SNAs. The exact boundaries of SNAs have not been established because thorough field surveys have not been completed. SNAs have been identified on the basis of biological value alone; geological or cultural resource values have not been included in the inventory. To qualify as an SNA, a site must meet one of the following four criteria:

- The species or community (element) is extremely rare.
- An assemblage of three or more rare elements is present.
- The element is the best example (relatively undisturbed condition).
- The element is a center of high diversity.

Habitat	Delta Region	Bay Region[a]	Sacramento River Region	San Joaquin River Region	Total
Mixed conifer forest	0	0	3,690,000	1,652,000	5,342,000
Montane hardwood	0	0	370,000	253,000	623,000
Pinyon-juniper	0	0	2,000	1,375,000	1,377,000
Valley foothill hardwood	0	[b]	2,055,000	1,968,000	4,023,000
Chaparral	0	[b]	968,000	1,140,000	2,108,000
Sagebrush scrub	0	0	50,000	0	50,000
Alkali desert scrub and desert scrub	0	0	0	481,000	481,000
Grassland	0	170,000	1,066,000	2,023,000	3,259,000
Riparian	7,000	2,000	14,000	29,000	52,000
Freshwater and saline emergent wetland	25,000	66,000	157,000	170,000	418,000
Open water	56,000	126,000	122,000	62,000	366,000
Barren	0	13,000	242,000	11,000	266,000
Subtotal (Natural Habitats)	**88,000**	**377,000**	**8,736,000**	**9,164,000**	**18,365,000**
Agriculture					
Grains	97,000	[c]	601,000	782,000	1,480,000
Pasture	95,000	[c]	442,000	1,393,000	1,930,000
Rice	18,000	[c]	398,000	20,000	436,000
Orchards and vineyards	20,000	33,000	322,000	1,332,000	1,707,000
Vegetables	275,000	[c]	221,000	628,000	1,124,000
Cotton	0	[c]	0	1,185,000	1,185,000
Subtotal (Agriculture Habitats)	**505,000**	**45,000[c]**	**1,984,000**	**5,340,000**	**7,862,000**
Urban and other					
Urban	46,000	51,000	252,000	411,000	760,000
Other	61,000	14000[d]	1,057,000	911,000	2,043,000
Subtotal (Urban and Other)	**107,000**	**65,000**	**1,309,000**	**1,322,000**	**2,803,000**
Total (All Habitats)	**700,000**	**487,000**	**12,029,000**	**15,826,000**	**29,030,000**

NOTES:

All acreages are rounded to the nearest 1,000 acres.
Community types that do not occur in the Central Valley or Delta (coastal and desert communities) are not included in this table.
Riparian vegetation acreage for the Sacramento Valley is based on the *Sacramento River Environmental Atlas* (DWR 1978) and excludes an unquantified and possibly substantial amount of vegetation along tributaries to the Sacramento River.
Habitat classification for the Delta Region differs slightly from that used in other regions because of the different data source. Grasslands in the Delta Region are included in "Agriculture." "Freshwater emergent wetland" in the Delta includes all palustrine wetlands. "Saline emergent wetland" in the Delta includes all estuarine wetlands.

[a] Based on California Central Valley Wetlands and Riparian Geographic Information Service (DFG 1997), Version 1.0. (Includes Suisun Marsh and Bay; lower watersheds of Napa, Sonoma, Petaluma drainages; and San Pablo Bay).
[b] Not separately classified, part of the "Other" category.
[c] Not separately classified, part of the total Agricultural Habitats category.
[d] Includes chaparral, valley foothill hardwood, and residential trees.

SOURCES:

Natural Communities: CDF unpublished map (digital format).
Urban Areas: Landsat Thematic Mapper data (classified using GRASS software) and DWR (1993).
Agricultural Habitat: DWR (1993).
Delta: "Wetlands" coverage for Delta from Teale Data Center, Sacramento, CA, compiled from NWI maps.
"Other" Areas: Calculated as the difference between the total area within the region boundaries and the sum of all natural, agricultural, and urban habitats. "Other" includes a variety of industrial, small urban, and other areas, including some natural habitats.

Table 2. Approximate Natural Community and Agricultural Crop Acreages in CALFED Study Area Regions

Rare Natural Community	Delta Region	Bay Region	Sacramento River Region	San Joaquin River Region
Alkali meadow and seep	x		x	x
Bog and fen			x	x
Cismontane alkali marsh	x		x	x
Coastal and valley freshwater marsh	x		x	x
Coastal brackish marsh	x	x	x	
Elderberry savanna			x	x
Fremont cottonwood riparian forest	x		x	x
Great Valley mesquite scrub				x
Great Valley willow scrub	x		x	x
Ione chaparral			x	x
Mixed riparian forest	x		x	x
Monvero residual dunes				x
Northern basalt flow vernal pool			x	x
Northern claypan vernal pools	x	x	x	x
Northern coastal salt marsh	x	x		
Northern hardpan vernal pool			x	x
Serpentine bunchgrass grassland		x	x	
Stabilized interior dunes	x			
Sycamore alluvial woodland				x
Valley needlegrass grassland	x	x	x	x
Valley oak riparian forest	x		x	x
Valley oak woodland			x	x
Valley sacaton grassland				x
Valley sink scrub	x	x		x
Wildflower field	x	_	x	x
Total in each region	**14**	**6**	**19**	**21**

Table 3. Rare Natural Communities Known or with Potential to Occur in the CALFED Study Area

C-009101

C-009101

SNAs are used in this document to geographically portray the location of special-status species and rare natural areas. Their distribution is described separately for each CALFED study area region.

SPECIAL-STATUS SPECIES

Special-status species are plants and animals that are recognized as rare by state and federal agencies and conservation groups. They include federally listed and state-listed threatened or endangered species, and federal or state species of concern.

Complete descriptions, including legal status, distribution, and habitat requirements of special-status species, are provided in the CVPIA Appendix for Vegetation and Wildlife (Reclamation 1997). Table 4 presents numbers of special-status plants and wildlife in the study area.

Listing Status	Plants	Animals
Federally listed as threatened or endangered	28	22
Proposed for federal listing as threatened or endangered	18	0
State-listed as threatened, endangered, or (for plants only) rare	15	9
Federal candidate	5	4
Total	**66**	**35**

NOTES:

Many species have a federal and state status. However, in this table, each species was assigned to the highest-ranked category of legal protection (federally listed = highest, state-listed = lowest) and counted only once.

See the Vegetation and Wildlife Environmental Consequences Technical Report for a complete list and description of individual sensitive species by region.

SOURCE:

Reclamation 1997.

Table 4. Numbers of Special-Status Plant and Wildlife Species that Occur in the CALFED Study Area

The rich biological heritage in California includes more than 750 native vertebrate species, 6,800 plant species, and 25,000 native insect species. More than one-third of the plant and freshwater fishes are endemic to California. Because of this rich biological diversity, the number of species with limited distributions and high sensitivity is large.

Tables 5 and 6 list the numbers of special-status plant and wildlife species, respectively, by listing status and habitat in each region.

Delta Region

HISTORICAL PERSPECTIVE

The habitats of the Delta Region have changed dramatically since prehistoric times (Bingham 1996). Much of the ancient Delta was covered by tidal freshwater and brackish marsh, with riparian forest and scrub at higher elevations.

Following European settlement, sedimentation as the result of hydraulic mining, levee construction, and draining of wetlands behind flood control levees resulted in great losses of natural habitat (Bingham 1996). Wetland and terrestrial habitats in the Delta and Bay regions have undergone extensive changes as a result of marsh reclamation for agriculture, water diversions, flood control efforts, and the effects of sedimentation caused by hydraulic mining.

Before 1850, the Delta consisted of approximately 400,000 acres of tidal marshland surrounded by 200,000 to 300,000 acres of land at slightly higher elevation behind natural alluvial berms that supported shallow backswamps. The extent of tidal marshland was reduced from approximately 400,000 to 18,000 acres by 1985 (based on USFWS NWI data) (see Figure 2). During spring, tides and runoff

Region/Status	Mixed Conifer Forest	Montane Hardwood	Pinyon-Juniper	Valley-Foothill Hardwood	Valley-Foothill Riparian	Inland Dunes	Montane Riparian	Chaparral	Alkali Desert Scrub	Desert Scrub	Sagebrush & Bitter-bush Scrub	Grass-land	Freshwater Emergent Marsh	Saline Emergent Marsh
Delta Region														
Federally listed or proposed						2						9		2
State listed					1							2	2	1
Federal candidate														
Total					**1**	**2**						**11**	**2**	**3**
Bay Region														
Federally listed or proposed		2	3	4				1	5			12		
State listed	1	1		1						1		1		
Federal candidate		1		1								1		
Total	**1**	**4**	**3**	**6**				**1**	**5**	**1**		**14**		
Sacramento River Region														
Federally listed or proposed	1	8		7				6	1			18	1	1
State listed	2	2		2	1			2	1			3	3	1
Federal candidate		1		1				3						
Total	**3**	**11**		**10**	**1**			**11**	**2**			**21**	**4**	**2**
San Joaquin River Region														
Federally listed or proposed		6	1	9				2	4			15		
State listed	4	4		4	2			4				2	2	1
Federal candidate	1	2		3				2				1		
Total	**5**	**12**	**1**	**16**	**2**			**8**	**4**			**18**	**2**	**1**

NOTES:

Coastal and desert habitats that do not occur in the Central Valley are not included in this table.
Potentially affected species are described by region in the Environmental Consequences Technical Report for Vegetation & Wildlife.
A species that is state and federally listed was counted only once as federally listed and not as a state-listed species.

SOURCES:

Reclamation 1997, DFG 1997.

Table 5. Numbers of Special-Status Plants by Status Level and Habitat in CALFED Regions

C-009103
C—009103

Region/Status	Mixed Conifer Forest	Montane Hard-wood	Pinyon-Juniper	Valley-Foothill Hard-wood	Valley-Foothill Riparian	Inland Dunes	Montane Riparian	Chaparral	Alkali Desert Scrub	Desert Scrub	Sagebrush & Bitter-bush Scrub	Grass-land	Freshwater Emergent Marsh	Saline Emergent Marsh	Lacustrine	Riverine	Irrigated Pasture	Row Crops	Grain Crops	Rice
Delta Region																				
Federally listed or proposed						1							8	2	3	3	1		1	
State listed					2		1						1	1		1	2	1	3	
Federal candidate					1								1		1		1		1	
Total					3	1	1						10	3	4	4	4	1	5	
Bay Region																				
Federally listed or proposed	1				2				5			5	4		2	1				
State listed	1				3		1	1				1	1		1			2	1	
Federal candidate						1					1	2	2		1		1		1	
Total	2				5	1	1	1	5		1	8	7		4	1	1	2	2	
Sacramento River Region																				
Federally listed or proposed	1				1							3	8		4	4	1		1	
State listed					1		1					1	2	1	2	1		1	1	
Federal candidate												2	1				1		1	
Total	1				2		1					6	11	1	6	5	2	1	3	
San Joaquin River Region																				
Federally listed or proposed	1				2				6	1		5	6		3	3	1		1	
State listed				1	3		1					1	1		1			2	1	
Federal Candidate												2	1		1		1		1	
Totas	1			1	5		1		6	1		8	8		5	3	2	2	3	

NOTES:
Coastal and desert habitats that do not occur in the Central Valley are not included in this table.
Potentially affected species are described by region in the Environmental Consequences Technical Report for Vegetation & Wildlife
A species that is state and federally listed was counted only once as federally listed and not as a state-listed species.

SOURCES
Reclamation 1997, DFG 1997

Table 6. Number of Special-Status Wildlife Species by Status Level and Habitat in CALFED Regions

C-009104
C—009104

from the Sacramento and San Joaquin river watersheds turned the Delta into a large inland lake, which supported dense stands of tules and riparian vegetation.

Large areas of riparian forest along the Sacramento River were cut during the 1800s for fuel. The advent of steamboat transportation along the Sacramento River in the 1840s created a lucrative market for firewood to fuel the steamboat boilers. The easiest place to get this wood was along the river. By the turn of the century, only remnants of this riparian forest remained, primarily on channel islands (Bingham 1996).

Changes in the condition of the Delta and Bay regions have resulted in the decline of many species. The region supported more than 250 species of birds and mammals, and was one of the most important waterfowl wintering areas in the state. Furbearers and other large mammals, including river otter, bobcat, grizzly bear, antelope, tule elk, and deer, were present in the Delta and surrounding uplands. Wildlife populations were not substantially affected by Europeans until the mid- to late 1800s. Trapping had greatly reduced furbearer populations by 1856, and elk and antelope herds were almost eliminated by 1880 as a result of market hunting and habitat destruction in the Delta and Bay regions (Madrone Associates 1980, USFWS 1992).

Reclamation of Delta wetlands for agricultural use was accelerated during and after the gold rush. In 1850, the Federal Swamp and Overflow Act deeded Delta lands to the state, spurring reclamation efforts. The first documented levee was constructed in 1852. Because early levees were no more than low earthen mounds and soil subsidence was common in wetland areas, reclaimed lands flooded frequently.

Extensive hydraulic mining in the Delta watershed during the late 1800s resulted in the deposition of millions of cubic yards of sediment and debris into the Delta channels and San Francisco Bay. Because sedimentation raised channel bottoms by as much as 15 vertical feet, levees were raised to reduce flood risk. Between 1913 and 1924, the Sacramento River was dredged, allowing channels to scour and largely restore streambed elevations after hydraulic mining ceased (Madrone Associates 1980, USFWS 1992).

Approximately 100,000 acres had been reclaimed by 1880. Construction of larger, more substantial levees was initiated during the 1890s, and by 1900 about half of the historic Delta had been reclaimed. By 1930, reclamation of the Delta was largely completed with the creation of about 60 islands covering approximately 450,000 acres (Madrone Associates 1980, USFWS 1992).

SALTWATER INTRUSION

Saltwater intrusion, particularly into the western Delta, was a problem noted before large-scale reclamation of the Delta; however, as water diversions and reclamation efforts proceeded, saltwater intrusion became more frequent and extensive. The greatest intrusion occurred in 1931, when an estimated 74% of the Delta's water supply became unusable because of elevated salinity. The CVP was initiated in 1933 primarily to use water more efficiently and, to a lesser degree, to address problems in the Delta. The SWP, authorized in 1959, was designed to provide a greater degree of flood control and additional water for agricultural and urban use. In the same year, the Delta Protection Act was authorized to provide salinity control in the Delta and provide an adequate supply of water to Delta users (Madrone Associates 1980).

WATERFOWL AND SHOREBIRDS

Early accounts by settlers and explorers suggest that the Central Valley once supported a substantially larger waterfowl population than in recent times. Populations of ducks in the Bay and Delta regions are estimated to have been 40 times more abundant in the mid-19th century than in the 1920s (DWR 1994). Declines in waterfowl populations from pre-1900 levels have been attributed to extensive hunting and

loss of wetlands in both the Central Valley and other breeding grounds. Large-scale reclamation of tidal marshes in the Delta occurred between 1860 and 1910. By 1930, when diking was completed, 450,000 acres of tidal wetlands had been converted to agricultural use (Madrone Associates 1980, DWR 1994). Shifts in agricultural cropping patterns since the 1970s have increased the quality of waterfowl foraging habitat in the Delta. Winter flooding of cornfields and other croplands to leach salts from the soil and control weeds has created favorable waterfowl foraging conditions. As a result, populations of waterfowl in the Delta have increased because of increasing forage availability (Madrone Associates 1980, DWR 1994).

Historical shorebird population levels in the Delta Region and elsewhere in California are not well known. Other than waterfowl, shorebirds are the most abundant group of aquatic bird species that depend on wetlands (Point Reyes Bird Observatory 1992). Consequently, the extensive loss of tidal wetlands in the Delta Region to reclamation for agriculture, and the overall loss of approximately 95% of historic wetlands throughout the Central Valley, suggest that shorebirds may have been more abundant before widespread settlement.

CURRENT RESOURCE CONDITIONS

NATURAL AND AGRICULTURAL COMMUNITIES AND ASSOCIATED WILDLIFE

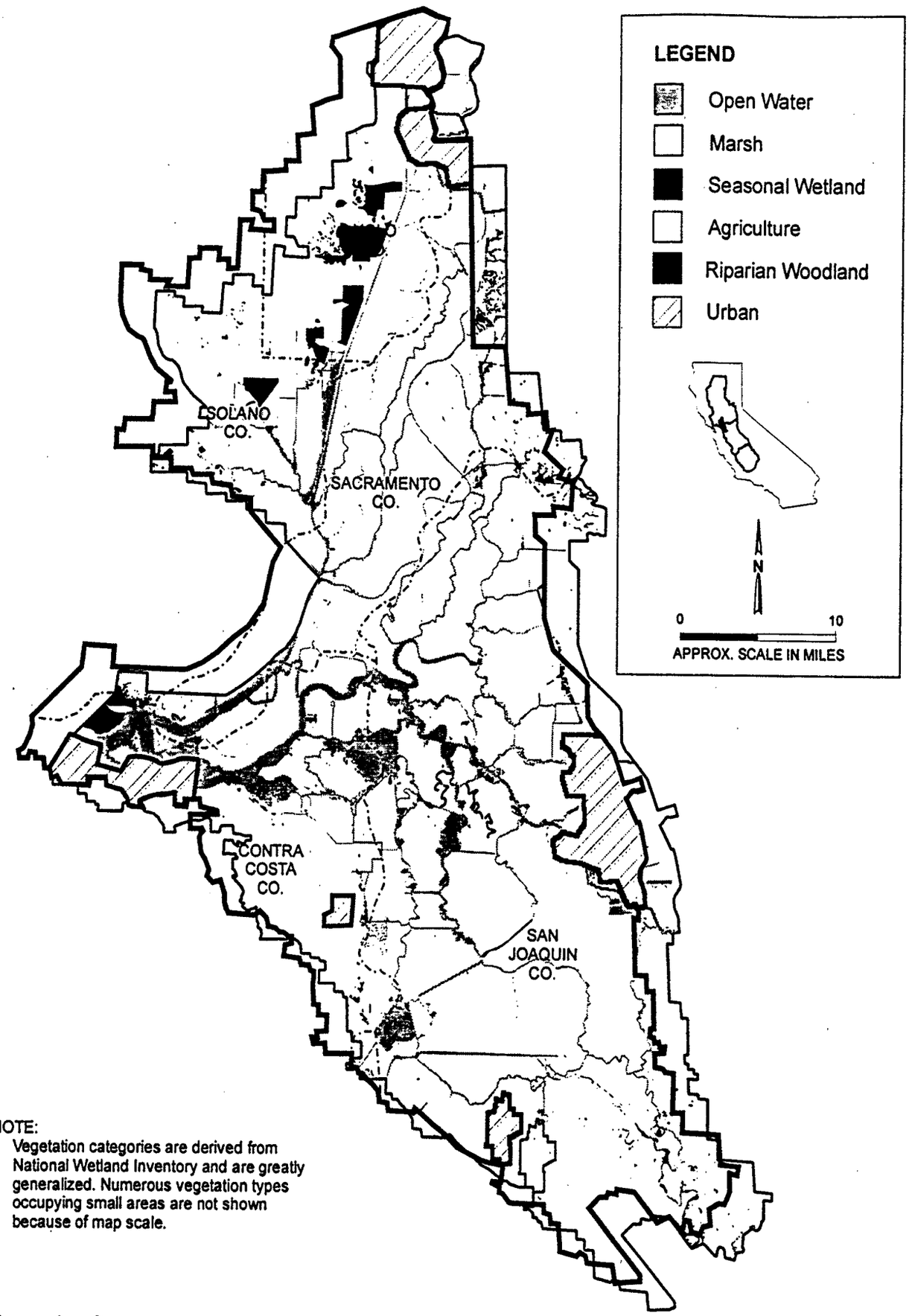
Vegetation types in the Delta Region include both wetland- and riparian-type communities as shown in Figure 3. Table 2 summarizes the area of each of these habitat types to the nearest 1,000 acres.

Wetland- and riparian-type communities occupy 32,000 acres, or 5% of the total land area in the region. Open water occupies another 56,000 acres, or 8%. One upland community, agriculture, also occurs in the Delta Region and occupies approximately 505,000 acres (72%) of a total land area of 700,000 acres of the Delta Region. Figure 3 presents the distribution of habitats in the Delta Region. The natural and agricultural communities found in the Delta are described below.

Open water in the Delta Region includes sloughs and channels in the Delta, flooded islands, ponds, and bays. Deep open-water areas are largely unvegetated; beds of aquatic plants occasionally occur in shallower open-water areas. Typical aquatic plant species include water hyacinth (a non-native noxious weed), water milfoil, and yellow water weed (DWR 1994). Open water provides resting and foraging habitat for water birds, including loons, grebes, pelicans, gulls, cormorants, and diving ducks. These species forage primarily on invertebrates and fish (Madrone Associates 1980).

Nontidal freshwater marsh occurs on the landward side of Delta levees and in Delta island interiors mostly in human-made waterways and ponds in agricultural areas. Dominant nontidal freshwater marsh species include tule, bulrush, cattail, watergrass, and nutgrass. Common floating aquatic species include pretty water smartweed and yellow water weed. Nontidal freshwater marsh is typically associated with agricultural drainage and irrigation ditches, levee blowout ponds, state and federal wildlife refuges, duck clubs managed specifically to create and maintain marsh habitat, and extensive areas of open water. (Madrone Associates 1980).

Seasonal freshwater wetlands include inland freshwater marshes that maintain surface water during only a portion of the year and vernal



NOTE:
Vegetation categories are derived from National Wetland Inventory and are greatly generalized. Numerous vegetation types occupying small areas are not shown because of map scale.

Figure 3. General Vegetation Types of the Delta Region

pools associated with grasslands (see following description for vernal pool discussion). In addition to natural wetlands, seasonal wetland conditions also are created when harvested cornfields are flooded in the Delta during fall and winter to reduce soil salinity and control weeds (DWR 1994). Large seasonal wetlands managed for waterfowl occur in the northwestern part of the Delta, west of the Sacramento Deep Water Ship Channel. Seasonal freshwater wetlands are of great importance to migratory waterfowl and shorebird populations for the forage they provide during fall, winter, and spring when bird populations in the Delta increase dramatically (DWR 1994).

Vernal pools, a type of seasonal wetland in which water is present only during the rainy season (usually spring), occur in grasslands along the fringes of the Delta Region and support a wide diversity of native plants and invertebrates, including several special-status species. In particular, the Jepson Prairie Preserve contains vernal pools that support several special-status species.

Riparian woodland typically occurs along unmaintained, narrow channelbanks in the Delta, creeks, other waterways, and major tributaries (DWR 1994). The major rivers of the Delta consist of the Sacramento, San Joaquin, Mokelumne, Cosumnes, and Calaveras. NWI maps document approximately 7,000 acres of riparian vegetation occurring primarily on the levees of the Delta islands and along the Cosumnes and Mokelumne rivers. The riparian zone along leveed islands is usually very narrow, but more extensive riparian areas occur along the San Joaquin River just below its confluence with the Stanislaus River, and along the Cosumnes River. Extensive and relatively wide corridors of riparian woodland that support a multilayered canopy generally provide greater wildlife habitat values than do smaller, less diverse stands.

Riparian scrub is associated with banks protected from erosion by riprap and levees, channel islands, and natural berms that are not protected by riprap at the margins of some Delta islands, and with unmaintained agricultural ditches in the interior of Delta islands. Riparian scrub habitats typically are disturbed periodically for levee maintenance. In the absence of disturbance or frequent inundation from highest tides, most sites supporting riparian scrub in the Delta eventually would develop into riparian woodland (Madrone Associates 1980). The riparian zone along leveed islands is usually very narrow, but more extensive riparian areas occur along the San Joaquin River just below its confluence with the Stanislaus River and along the Cosumnes River.

Grassland and ruderal habitat are present throughout the Delta Region and are typically small in size, but these habitats can provide relatively high wildlife values because intensive and extensive agriculture has greatly reduced the available natural or naturalized upland habitats. The extent of use by wildlife depends on the type of vegetation present and on the adjacent land use.

Agricultural habitat in the Delta Region encompasses approximately 546,000 acres (see Table 2). Major crops and cover types in agricultural production include small grains (such as wheat and barley), field crops (such as corn, sorghum, and safflower), truck crops (such as tomatoes and sugar beets), forage crops (such as hay and alfalfa), pastures, orchards, and vineyards. Vegetable crops are the most abundant crops in the region. The distribution of seasonal crops in the Delta Region varies annually depending on crop-rotation patterns and market forces. Recent agricultural trends in the Delta include an increase in the extent of vineyards and orchards.

Agricultural lands in the Delta Region provide important forage and resting habitat for wintering and migrant waterfowl and sandhill cranes. Pastureland and open fields in the eastern portion of the Delta are of great importance to wintering sandhill cranes.

C-009108

C-009108

SELECTED FACTORS AFFECTING HABITAT CONDITIONS AND PRODUCTIVITY

Several factors affect the wetland and terrestrial habitat conditions and the productivity in the Delta. These factors include:

- Subsidence of the Delta islands,
- Habitat fragmentation, and
- Introduction and expansion of non-native plant and animal species.

These factors are further defined as follows.

Subsidence of Delta Islands. Historically, Delta islands were at or near sea level. Islands have subsided by as much as 20 feet as a result of decomposition of peat soils, wind erosion, the earlier practice of burning peat soils, water erosion, compaction by heavy equipment, natural gas extraction, and groundwater withdrawal. Unless the water table is elevated above ground level, subsidence will continue until the peat soils have oxidized or blown away. Island levees also are subsiding and eroding, and periodic refurbishment is required to maintain their height and prevent flooding (Madrone Associates 1980).

Loss of productive peat soils could cause changes in Delta cropping patterns. A shift from high-value wildlife crops to lower value crops would reduce the Delta's value to wildlife. If subsidence is severe enough, farming could become economically inviable on some islands (Madrone Associates 1980). Levee repairs necessitated by subsidence result in periodic disturbance of riparian vegetation, degrading the value of levees to wildlife.

Habitat Fragmentation. Habitat losses that have occurred since early settlement of the Delta Region have resulted in the fragmentation of once-contiguous areas of habitat into smaller, isolated patches.

The extensive riparian woodlands once associated with the margins of the Delta along the Sacramento, San Joaquin, Cosumnes, and Mokelumne rivers have largely disappeared (Madrone Associates 1980). Today, most riparian vegetation occurs in relatively degraded and noncontiguous stands along channelbanks. Even with the ongoing destruction or degradation of riparian habitat, these habitats remain among the most productive and diverse in the state.

Introduction of Non-Native Species Populations. A total of 212 species of non-native invertebrates (69%), fish and other vertebrates (15%), vascular plants (12%), and protists (single-celled mobile organisms [4%]) have been introduced into the Bay-Delta estuary. The establishment of invasive non-native plants in native habitats is of concern because these species displace native plants and their function in ecosystems, and typically provide lower wildlife habitat value than native plants. Major concerns in the Delta Region include water hyacinth, a highly invasive aquatic plant that can form thick mats of vegetation in waterways dense enough to impede boat navigation and salmon migration (Cohen and Carlton 1995); and control of the establishment and spread of Himalaya berry, giant reed, and other non-native plants in riparian habitats.

Non-native birds include the ring-necked pheasant, rock dove, European starling, and house sparrow (Cohen and Carlton 1995). Of these species, the European starling probably has the greatest effect on native birds. The European starling is a cavity-nesting species and competes aggressively with native cavity-nesting birds for nest sites (Zeiner et al. 1990).

Non-native mammals include the house mouse, Norway rat, domestic cat, and red fox. In some locations, feral cats may be major predators on small mammals and birds, including listed species associated with salt marshes. The Norway rat is an efficient predator on the eggs of ground-nesting birds, including the federally listed as endangered California clapper rail. The

red fox is also an efficient predator on nests, young birds, and small mammals, including the federally listed as endangered salt marsh harvest mouse and California clapper rail.

SPECIAL-STATUS PLANTS

Generally, the distribution of plant and animal species in the Delta Region is closely linked with the distribution of one or more habitat types on which a species is dependent. The distribution of special-status species described below is reported as the number of occurrences in the Delta Region. In this report, an occurrence indicates only that one or more individuals of a species was recorded as being observed; no inference is made about the status of the species population at the location of the reported occurrence.

Table 5 lists the number of special-status plant species that occur in the Delta Region. The largest number of special-status species occurs in grassland, which includes vernal pools. The second largest number of special-status species occurs in freshwater emergent wetland. At least two plant species that were once present in the Delta Region are presumed to be extinct: Mount Diablo buckwheat and caper-fruited tropidocarpum. Mount Diablo buckwheat occurred on sandy soils in shrublands and grasslands of Alameda, Contra Costa, and Solano counties and was last seen in 1940. Caper-fruited tropidocarpum occurred in Alameda, Contra Costa, Glenn, Monterey, Santa Clara, and San Joaquin counties in grasslands of alkaline hills and was last seen in 1957. The extinction of these two plants was most likely caused by agricultural and urban development of grassland and shrubland habitat.

At least two special-status plant species, Delta button-celery and Mount Diablo manzanita, once occurred in the Delta Region but currently occur only outside the region. Delta button-celery is a species of riparian scrub, and Mount Diablo manzanita occurs in chaparral. The extent of both species has been reduced by urban and agricultural development.

SPECIAL-STATUS WILDLIFE

Table 6 identifies a total of 30 special-status wildlife species that could potentially occur in the Delta Region and their preferred habitats. Most of these species are associated with freshwater emergent wetlands, open water of marshes, and cereal and grain crops. Species such as the American peregrine falcon, bald eagle, Swainson's hawk, California least tern, California black rail, California red-legged frog, California tiger salamander, northwestern pond turtle, giant garter snake, and various fairy shrimp probably were common species in the Delta.

Several wildlife species that historically were present in the Delta Region are now extinct, including the grizzly bear, gray wolf, Antioch dunes katydid, Antioch weevil, Antioch Cophuran robber fly, yellow-banded andrenid bee, and Antioch sphecid wasp (Jones & Stokes Associates 1987). The extinct invertebrates were probably restricted to the sand dune habitat found near Antioch. Grizzly bears and gray wolves occurred in a wide range of habitats throughout California, and their extinction was caused by unregulated hunting and trapping (Storer and Tevis 1955).

Special-status wildlife species that once occurred in the Delta Region, but are now found only outside the Delta Region, include the San Joaquin dune beetle, western least bittern, western yellow-billed cuckoo, and greater western mastiff bat. The reduction of riparian forests and marshland areas are the primary cause for the presumed extirpation of cuckoos and least bitterns from the Delta Region. Greater western mastiff bats may forage in or near the Delta Region, but occurrence data are difficult to gather. The San Joaquin dune beetle occurred on vegetated sand dunes that have been reduced by urban and agricultural development.

Vernal pools and other freshwater seasonal wetlands support several special-status invertebrates. The Delta green ground beetle is known from two occurrences in Solano County;

in the Delta Region, it occurs only at the Jepson Prairie Preserve.

Few occurrences of special-status crustaceans have been documented in vernal pools, in part because routine surveys for these species have been conducted only since 1992. The vernal pool tadpole shrimp (federally listed as endangered) is known from the Jepson Prairie Preserve and near Elk Grove in the northeastern portion of the Delta (DFG 1996) and has potential habitat in other areas with vernal pools. The Conservancy fairy shrimp (federally listed as endangered) occurs at the Jepson Prairie Preserve and elsewhere in Solano County in deep vernal pools (DFG 1996). The vernal pool fairy shrimp (federally listed as threatened) occurs in vernal pools and other seasonal wetlands. It has been found in the Brentwood area (Reclamation 1997).

Although severely declining due to a dramatic shrinkage of suitable habitat, the valley elderberry longhorn beetle (federally listed as threatened) has been found in the Delta Region on McCormac-Williamson and New Hope tracts (DFG 1995).

Grasslands and dryland-farmed fields in the southwestern portion of the Delta support the San Joaquin kit fox (federally listed as endangered, state-listed as threatened). Areas south of Brentwood, east and south of Clifton Court Forebay, and west of Tracy are considered the northernmost portion of the species' range in the Delta Region (DFG 1996).

Several special-status invertebrates occur in the Antioch Dunes area. The Lange's metalmark butterfly (federally listed as endangered) is known to occupy 15 acres of open dune habitat in the Antioch Dunes National Wildlife Refuge and adjacent properties owned by Pacific Gas and Electric Company. Six other insect species endemic to the Antioch Dunes are considered species of concern by USFWS.

The greater sandhill crane (state-listed as threatened) winters in the Central Valley and forages in the Delta in harvested cornfields and pastures, as well as in wetlands and flooded fields. In the Delta, greater sandhill cranes traditionally roost near Thornton—on Black Tract, Canal Tract, and Staten Island— and at scattered locations on other islands (DFG 1995, Miriam Green Associates 1996).

The Aleutian Canada goose (federally listed as threatened) winters in the Central Valley near Colusa and along the San Joaquin River from Modesto to Los Banos. These geese also have been observed in the Delta, but probably only during migration when they forage agricultural fields (DFG 1995).

SIGNIFICANT NATURAL AREAS

A total of 29 SNAs in the Delta Region protect fresh, brackish, and salt marsh; inland dune; and valley sink scrub habitats (Figure 4). A small but biologically important remnant native grassland is present at the Jepson Prairie Preserve in the northwestern part of the Delta. Antioch Dunes, a small area of inland dune habitat near Antioch (in Contra Costa County), provides important habitat for legally protected plant and invertebrate species, including Antioch Dunes evening primrose, Contra Costa wallflower, and Lange's metalmark butterfly.

WATERFOWL AND SHOREBIRDS

Waterfowl and shorebirds forage primarily in natural and artificial wetlands and agricultural lands. The Central Valley portion of California is the most important waterfowl wintering area on the Pacific Flyway, annually supporting approximately 60% of the Flyway's waterfowl population (CVHJV 1990). Approximately 10% of California's wintering waterfowl population (or 6% of the flyway's waterfowl population) occurs in the Delta (CVHJV 1990). Between 1969 and 1990, estimates of the wintering waterfowl population in the Bay-Delta area ranged from a high of 1.3 million in 1977 to a low of 109,000 in 1982. The average wintering population between 1981 and 1990 was estimated to be 390,500 (DWR 1994).

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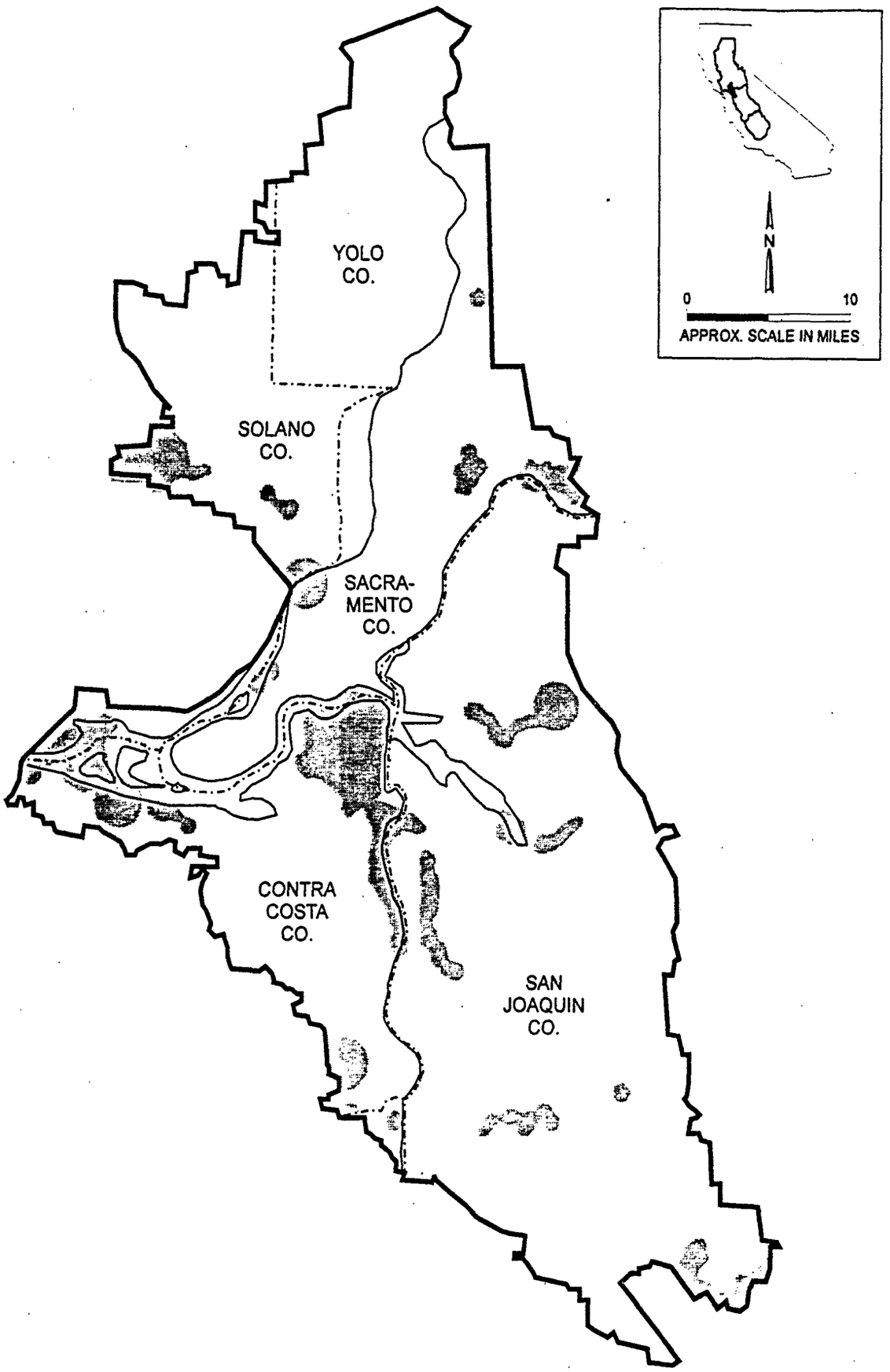

Figure 4. Location of Significant Natural Areas in the Counties of the Delta Region

More than 30 species of shorebirds regularly use the Delta Region (DWR 1994). Six species nest in the Delta Region, and the rest overwinter there or pass through during spring and fall migration. During the 1992-1993 winter, 28,500 shorebirds were counted in the Delta, primarily dunlins and long-billed dowitchers (Shuford et al. 1993). Shorebirds prey extensively on invertebrates.

Important foraging habitats include permanent saline, brackish and freshwater marshes; seasonal wetlands; and agricultural croplands (CVHJV 1990).

Bay Region

The Bay Region includes the entire watershed for the San Francisco Bay. Because the options associated with the CALFED program would occur primarily in the area of Suisun Marsh and Bay and northern San Pablo Bay, the description of affected environment focuses on this area.

Suisun Bay supports large areas of tidal flats that provide important foraging habitat for shorebirds. Suisun Marsh supports mostly saline emergent wetland, which provides habitat for salt marsh species that prefer infrequently flooded salt marsh habitat. The non-leveed lowlands in the region support wetlands that change in character from salt marsh around Suisun Marsh to brackish marsh on the major non-leveed channel islands, such as Browns Island. The animal and plant species composition of the tidal wetlands changes as the salinity gradient decreases from west to east. The 112,900-acre Suisun Marsh contains more than 10% of the remaining wetlands in California and is one of the largest contiguous brackish marshes in the United States (DWR 1984). Approximately 89% (53,000 acres) of the wetlands consists of leveed marshlands that support mostly saltgrass, pickleweed, alkali bulrush, and tule (Reclamation 1997). Adjacent to the wetlands is upland habitat including grassland, shrub, riparian, and agricultural communities (DWR 1984).

HISTORICAL PERSPECTIVE

The historical perspective for the Bay Region is the same as that described for the Delta Region.

CURRENT RESOURCE CONDITIONS

NATURAL AND AGRICULTURAL COMMUNITIES AND ASSOCIATED WILDLIFE

Natural communities in the Bay Region include tidal flats, and freshwater and emergent wetlands.

Tidal flats include shoals, sandy mud bars, and portions of streambeds that are exposed at low tide. Tidal flats are largely unvegetated, although some emergent vegetation may be present.

Exposed tidal flats provide resting and foraging habitat for several bird groups. California and ring-billed gulls use tidal flats as resting areas; during spring and fall migration, large numbers of shorebirds congregate to forage on invertebrates in the tidal flat substrate and to forage on the tidal flat substrate. Mammals such as raccoons and skunks also forage on the tidal flat.

Saline emergent wetland is confined to the Suisun Bay/Marsh boundaries. The historic Suisun Marsh system has been modified substantially as a result of agricultural and industrial development (Corps 1994). Historically, saline emergent wetland was subject to tidal influence; however, dikes constructed around most of the marsh eliminated tidal influence. Common plant species associated with saline emergent wetland include cordgrass, pickleweed, and saltgrass

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(DWR 1994, USFWS 1992). Each plant species typically occupies a specific elevational band in relation to the mean tidal water level (DWR 1994).

The Suisun Marsh system supports approximately 200 species of birds, 45 species of mammals, and 36 species of reptiles and amphibians (Corps 1994). Saline emergent wetlands in the Bay Region provide foraging and nesting habitat for wading birds, such as great blue herons and egrets; and foraging habitat for resident and migratory waterfowl, shorebirds, and raptors. Dense emergent vegetation provides nesting and foraging habitat for species such as rails and long-billed marsh wrens (DWR 1994). Mammals associated with saline emergent marsh include the Suisun ornate shrew, mink, beaver, and muskrat (USFWS 1992).

Approximately 52,000 acres of saline and other wetlands are managed by the state or private duck clubs specifically to provide habitat for wintering waterfowl and other wildlife (Corps 1994). In 1995, approximately 65,000 ducks and geese were observed using Suisun Marsh during midwinter waterfowl surveys conducted annually by DFG and USFWS (DFG 1995). Saline wetlands also support small numbers of nesting ducks during the breeding season (Corps 1994).

SPECIAL-STATUS PLANTS

Table 5 lists the legal status and habitat of special-status plants in the Bay Region. Thirty-five special-status plants have known occurrence, six special-status plants have potential to occur, and six species have been extirpated from the Bay Region (Skinner and Pavlik 1994, DFG 1996). The status of federally listed species and species proposed for listing is described below.

The saline emergent marsh habitat of Suisun Marsh supports populations of two plant species that are proposed for federal listing as endangered: Suisun thistle and soft bird's-beak. The latter species also occurs in saline emergent marshes in northern Contra Costa County.

Palmate-bracted bird's-beak (federally listed and state-listed as endangered) occurs in alkaline scrub and grasslands. It is presumed extirpated from the Bay Region but has potential to occur in alkaline habitats of the region. Mason's lilaeopsis (state-listed as rare, no federally listed status) occurs in brackish or freshwater tidal marshes of Suisun Bay/Marsh.

SPECIAL-STATUS WILDLIFE

Table 6 presents a summary of 41 special-status wildlife species and their associated habitats with potential to occur in the Bay Region. The majority of these species are associated with upland grasslands and freshwater emergent wetlands, and are restricted in their range because of the fragmentation and low diversity of habitats. Species such as the bald eagle and peregrine falcon are seasonal visitors to the Bay. Two federally listed and state-listed endangered species occur in saline emergent wetlands of the Bay Region: the salt marsh harvest mouse and the California clapper rail. The salt marsh harvest mouse is known from occurrences in Suisun Marsh, islands in Suisun Bay, and saline emergent marshes south of Suisun Bay. It occurs in higher-elevation marshes throughout the San Francisco Bay estuary. The California clapper rail is known from occurrences in Suisun Marsh and islands in Suisun Bay. It occurs in the lower tidal marshes of the San Francisco Bay estuary

The salt marsh yellowthroat and salt marsh song sparrow subspecies use the tall emergent vegetation that grows in the more brackish areas. California brown pelican, snowy plover, and California least tern also occur in this region.

SIGNIFICANT NATURAL AREAS

A total of 32 SNAs in the Bay Region protect brackish marsh, salt marsh, open water, vernal pools, and native grassland habitat. Some of the larger SNAs include Dozier Vernal Pools,

Peytonia Slough, Pelican Point Marsh, Napa Slough, and Chain Island.

WATERFOWL AND SHOREBIRDS

The Bay Region is an important waterfowl area that may contain more than 1 million birds during migration, with more than 70% of the waterfowl (or 86% of the Pacific Flyway's total waterfowl population) on the Pacific Flyway moving through this area (USFWS 1989). Mid-winter waterfowl surveys in 1991 estimated nearly 268,700 waterfowl in the Bay Region, including approximately 265,000 ducks, primarily scaups, scooters, canvasbacks, ruddy ducks, and pintails.

The Bay Region is a particularly important area for shorebirds, supporting more shorebirds than all other California coastal wetlands combined (Page et al. 1992). An estimated 300,000 to 400,000 shorebirds in fall and 600,000 to 1 million shorebirds in spring can be found in this region (Page et al. 1992).

Sacramento River Region

HISTORICAL PERSPECTIVE

The historical perspective for the Sacramento River Region is the same as that described for All Regions.

CURRENT RESOURCE CONDITIONS

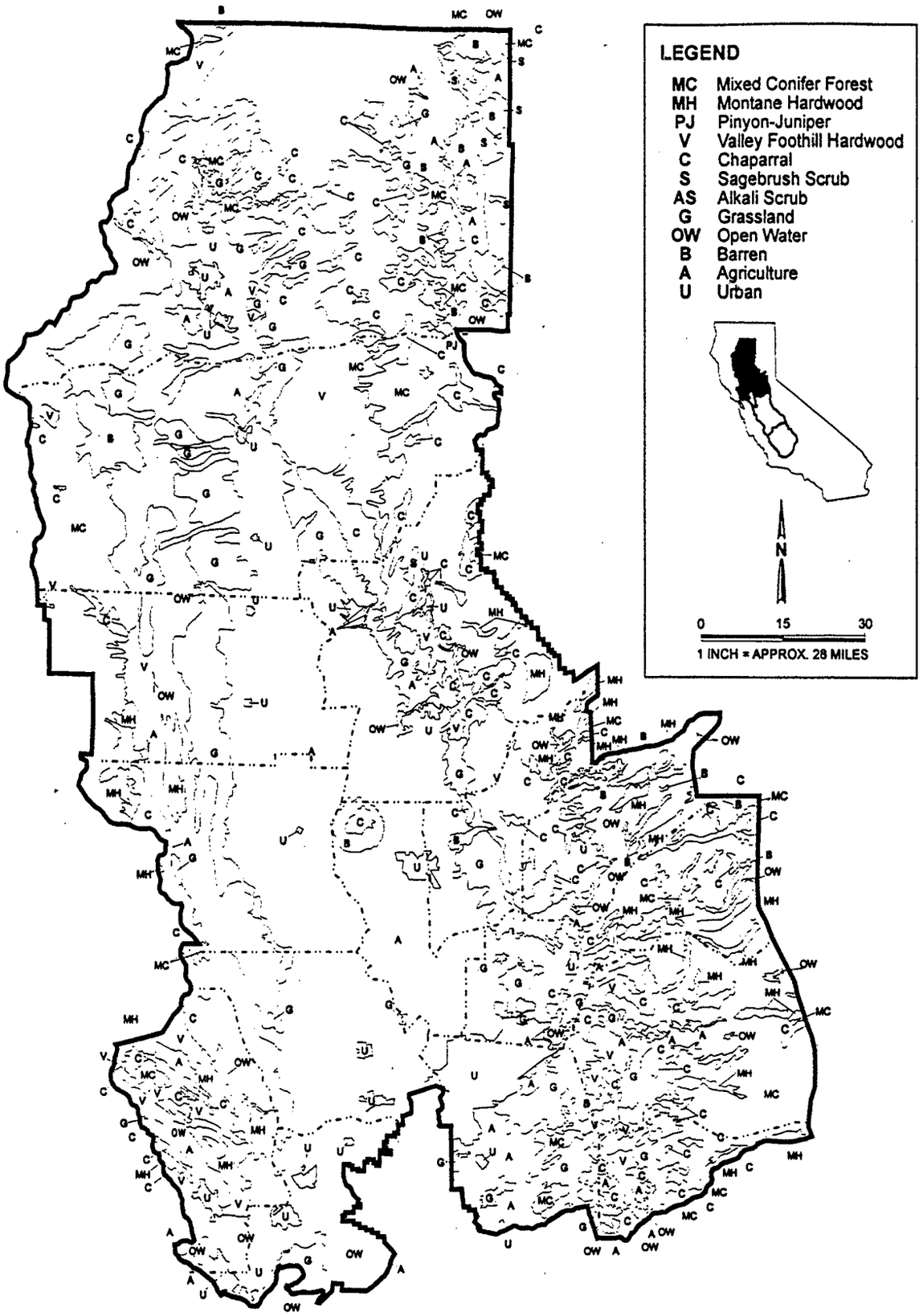
Natural and Agricultural Communities and Associated Wildlife

The 10 natural terrestrial community types in the Sacramento River Region occupy nearly 8.7 million acres, or 72%, of a total land area of 12 million acres. They include mixed conifer forest, montane hardwood, valley foothill hardwood, montane riparian, valley foothill riparian, chaparral, sagebrush scrub, grassland, and freshwater and saline emergent wetlands (marsh). Table 2 summarizes the area of each of these habitat types to the nearest 1,000 acres. Figure 5 presents the distribution of habitats in the Sacramento River Region.

Upland Communities. Mixed conifer forest is the most abundant natural community in this region (3,690,000 acres). Grassland, mostly the non-native type, is the most common natural community on the valley floor and adjacent foothills, occupying 1,066,000 acres. Approximately 242,000 acres are naturally unvegetated (barren) land in the northeastern portion of Shasta County that consist of lava beds and similar substrates unsuitable for vegetation.

The lowland areas of the Sacramento River Region are dominated by agricultural land, occupying approximately 1,984,000 acres. Agricultural crops in the Sacramento River Region include grains, pasture, rice, orchards and vineyards, and vegetables. Grains and pasture are the most abundant crops in the region—at 601,000 and 442,000 acres, respectively.

Riparian and Wetland Communities. The major rivers of the Sacramento River Region are the Sacramento, Pit, Fall, McCloud, Yuba, Feather, Bear, and American; Cache Creek is a major stream. Estimates of riparian vegetation acreage in the Sacramento River Region vary widely because each mapping effort has covered different geographic areas and used different vegetation classifications or mapping criteria (Reclamation 1997). Warner and Hendrix (1985) estimated that approximately 175,000 acres of riparian vegetation exist in the northern portion of the Central Valley (possibly including portions of the Delta). Frayer et al. (1989) estimated that 34,600 acres of "palustrine forested and scrub/shrub" (riparian wetlands) occur in the Central Valley; presumably, most of this habitat type is in the Sacramento River



NOTE:
Vegetation categories are derived from CALVEG data (Matyas and Parker, 1980) modified by the DFF and are greatly generalized. Numerous vegetation types occupying small areas are not shown because of map scale.

Figure 5. General Vegetation Types of the Sacramento River Region

Region. The *Sacramento River Environmental Atlas* (DWR 1978) documented 13,107 acres of "young trees, sub-climax, and climax native vegetation" on high and low terraces along the Sacramento River from Colusa to Keswick Dam (excluding vegetation along tributary rivers and streams). The lower 60 miles of the Sacramento River are leveed and support relatively little riparian vegetation.

Approximately 157,000 acres of wetlands occur in the Sacramento River Region (Table 2), comprising 1.3% of the region. Open water accounts for 122,000 acres, or 1% of the region.

Rivers and Reservoirs. The rivers and 12 reservoirs in the Sacramento River Region are identified in Figure 6. Wildlife species that frequent these reservoirs are described below. Whiskeytown Lake supports primarily diving ducks and western and Clark's grebes (Laymon pers. comm.). Between 1970 and 1990, this reservoir supported one nesting pair of bald eagles (Jurek 1990).
Shasta Lake has generally low waterbird use because of its steep-sided slopes and the minimal amount of shallow water, which limits the available foraging habitat for most waterbirds (Laymon pers. comm.); however, Shasta Lake does have one of the highest concentrations of nesting bald eagles and ospreys in California (Laymon pers. comm.). Between 1970 and 1990, 13 nesting bald eagles were observed (Jurek 1990). The reservoir also supports up to 20 nesting ospreys (Laymon pers. comm.).

Lake Red Bluff supports small numbers of waterbirds. The American coot is the dominant waterbird at this reservoir. Mallards, buffleheads, and common goldeneyes also are found on the lake. Keswick Reservoir supports small numbers of waterbirds. Mallards, buffleheads, and common goldeneyes (around 100 each of each species) also are found on the reservoir (Laymon pers. comm.).
Lake Oroville supports a large number of waterbirds during the year. Several hundred waterfowl, mostly dabbling ducks, winter there regularly. More than 15,000 gulls use the open water as a night roost, and several hundred eared grebes winter on the lake. About six Canada geese nest in the area. The lake receives minimal use by shorebirds (Snowden pers. comm.).
Between 1970 and 1990, two bald eagles nested on or near the lake (Jurek 1990), and several ospreys also bred at the reservoir (Snowden pers. comm.) An estimated 33 bald eagles presently winter in the area (Snowden pers. comm.). Thermalito Afterbay is used by a large number of waterbirds during winter (Snowden pers. comm.). Forty to fifty thousand wintering waterfowl (primarily northern pintail, American wigeon, and ruddy duck) use the lake regularly, along with more than 10,000 American coots. Approximately 2,000 tundra swans also roost at the lake. Several hundred gulls and Clark's, western, and eared grebes feed and roost at the lake. Three to four bald eagles are known to use the lake daily (Snowden pers. comm.).
Thermalito Forebay also supports large numbers of waterbirds, but the species composition differs from that of Thermalito Afterbay. The forebay supports up to 10,000 dabbling ducks during winter, in addition to several thousand ruddy ducks. Approximately 15,000 snow and Ross' geese occur there during winter. The forebay also is used by several thousand Canada geese as a night roost. Ospreys also forage occasionally at the forebay (Snowden pers. comm.). Englebright Lake receives low use by waterbirds (Laymon pers. comm.). Several hundred diving ducks (such as ring-necked duck, ruddy duck, and redhead) use the lake irregularly (Whitmore pers. comm.). Shorebirds are uncommon to rare at Englebright Lake (Laymon pers. comm.), and wintering bald eagles occasionally forage there (Whitmore pers. comm.).

New Bullards Bar Reservoir receives little waterfowl use (Whitmore and Laymon pers. comms.). Diving ducks, such as the common merganser and ruddy duck, occur in low numbers during winter. Between 1970 and 1990, one bald eagle's nest was observed at the lake (Jurek 1990). One pair of ospreys is known to nest at this reservoir (Whitmore and Laymon pers. comms.).

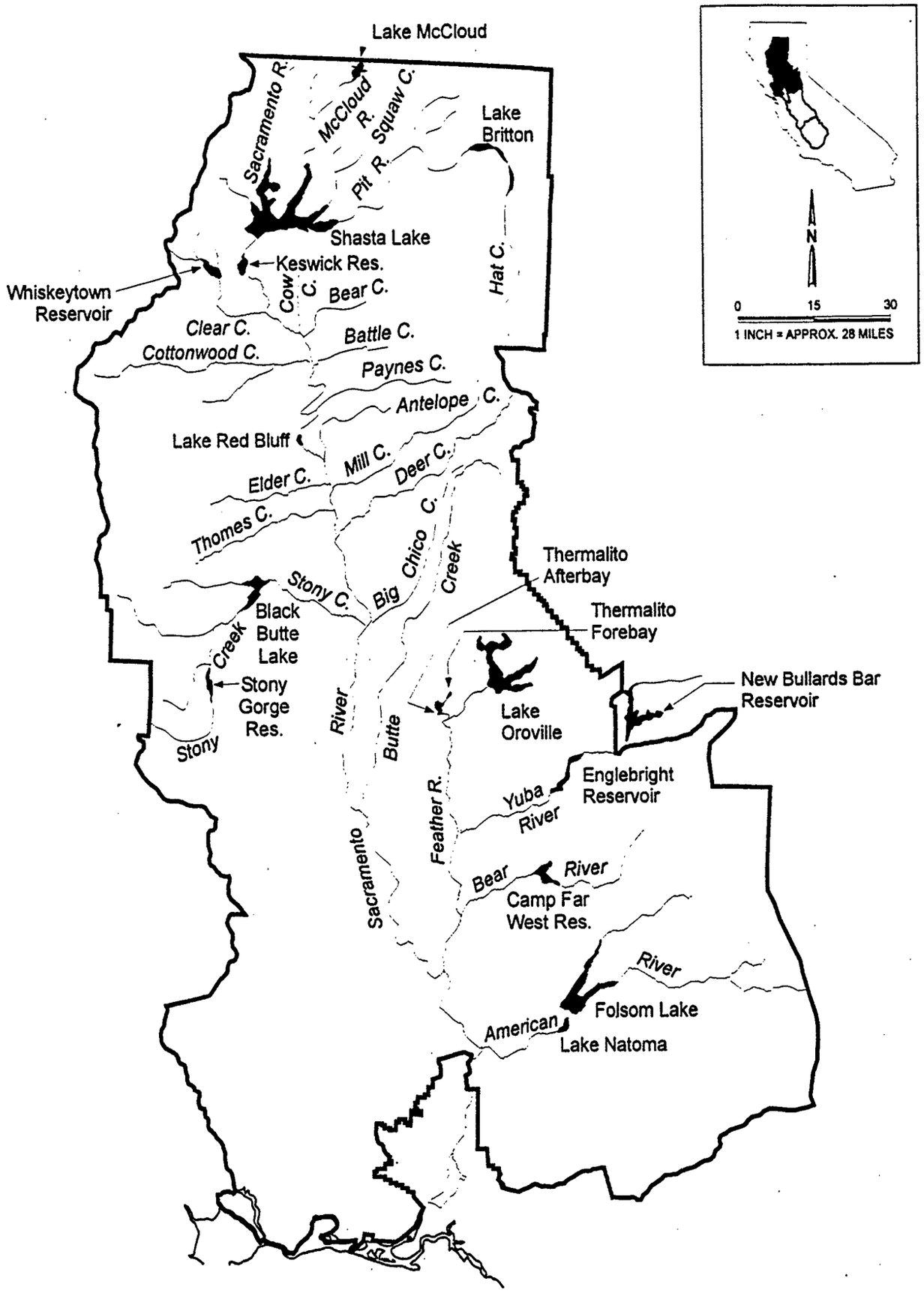


Figure 6. Rivers and Reservoirs of the Sacramento River Region

Hundreds of diving ducks (mostly ring-necked, ruddy, and redhead ducks) and fewer numbers of dabbling ducks winter at Camp Far West Reservoir. Two to five bald eagles winter at Camp Far West Reservoir (Whitmore pers. comm.).

Approximately 40 great blue herons occur at Folsom Lake during winter, but other wading birds and shorebirds are less common. Dabbling ducks (such as mallards [400 to 500] and American wigeons [100 to 500]) and geese (1,400 to 2,400 Canada geese) are regular winter residents at Folsom Lake. Diving waterbirds are less common than dabbling ducks. The lake supports about 700 western grebes and 50 pied-billed grebes during winter. More than 2,000 gulls use Folsom Lake as a night roost during winter.

Dabbling ducks (such as mallards and American wigeons) and Canada geese are regular winter residents at Lake Natoma. Diving waterbirds are less common than dabbling ducks. The lake supports small numbers of western and pied-billed grebes during winter.

CURRENT RESOURCE CONDITIONS - SPECIAL-STATUS PLANTS

Table 5 lists 65 special-status plants that occur in the Sacramento River Region. The largest number of special-status species in this region occurs in grassland, which includes vernal pools. The next largest number of special-status species occurs in chaparral and montane hardwood.

SPECIAL-STATUS WILDLIFE

Table 6 identifies a total of 39 special-status wildlife species that could occur in the Sacramento River Region and their preferred habitats. The majority of these species are associated with grasslands, freshwater emergent wetlands, lakes, and rivers on the valley floor. Many of these species have been listed by federal and state wildlife agencies because of habitat loss associated with agricultural development and water projects. Grain crops also provide important habitat for species such as the Aleutian Canada goose, Swainson's hawk, ferruginous hawk, greater sandhill crane, and loggerhead shrike.

SIGNIFICANT NATURAL AREAS

The Sacramento River Region has 188 designated SNAs (Figure 7). Many of these are along the Sacramento River and contain habitats such as Fremont cottonwood riparian, valley oak riparian, mixed riparian, and Great Valley willow scrub. These habitats support riparian-dependent, special-status wildlife species, such as the western yellow-billed cuckoo, bank swallow, and valley elderberry longhorn beetle.

SNAs also are designated along other significant waterways, such as creeks, lakes, or reservoirs, that support special-status wildlife or plant species—for example, the Shasta salamander, Shasta sideband snail, bald eagle, bank swallow, Shasta crayfish, and rough sculpin in the northern region.

Designated vernal pool and grassland habitats throughout the Sacramento Valley may support valley needlegrass grassland, California tiger salamanders, and burrowing owls. Northern claypan vernal pools support many endemic vernal pool plant species.

Finally, marsh habitats in the southern portion of the region contain northern coastal salt marsh that supports several special-status species, including California clapper rail, California black rail, Suisun Marsh aster, Suisun thistle, and Suisun song sparrow.

WATERFOWL AND SHOREBIRDS

DFG conducts annual statewide surveys of waterfowl numbers throughout winter. This document presents January 1991 midwinter survey results to indicate waterfowl use and

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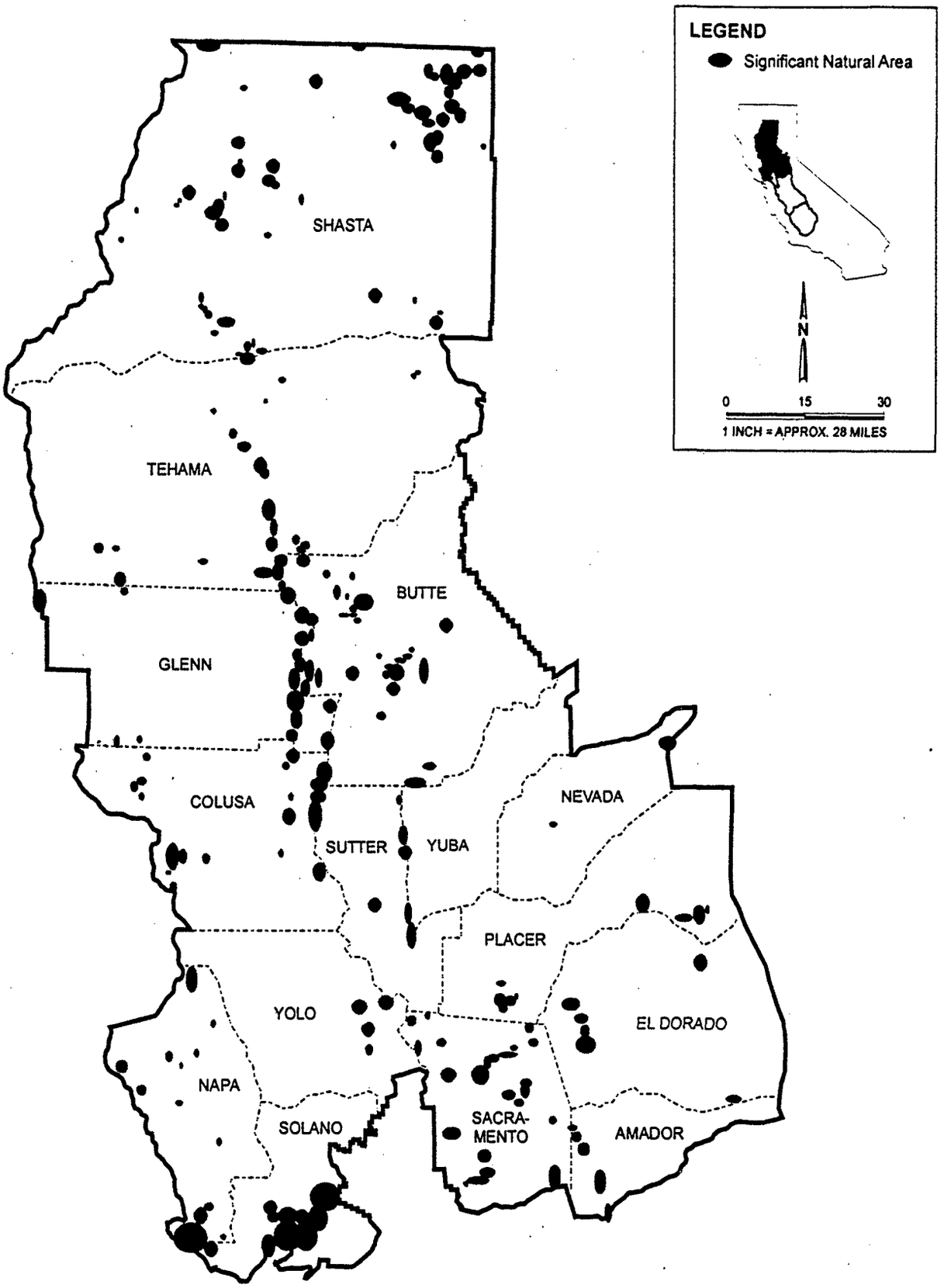

Figure 7. Location of Significant Natural Areas in the Counties of the Sacramento River Region

species composition in an area.

Private duck clubs and state and federal refuges in the Sacramento Valley provide essential habitat for wintering waterfowl and shorebirds. Approximately 55% of the Pacific Flyway waterfowl population winters in the Sacramento Valley (or 92% that winter in the Central Valley) (CVHJV 1990). Midwinter waterfowl surveys in 1991 estimated 2,127,800 waterfowl in the valley, including approximately 1,432,000 ducks and 572,800 geese. Approximately 76% of the ducks were northern pintails, mallards, and American wigeons. Snow and Ross' geese comprised 82% of the geese present. Additionally, more than 25,000 swans and 25,000 American coots were in the valley.

Sacramento Valley wetlands also provide important habitat for shorebirds, with more than 140,000 shorebirds counted in the valley during winter 1992-1993 (Shuford et al. 1993). The valley is particularly important to shorebirds in spring, when 30,000 to 300,000 shorebirds use wetlands in the valley as staging areas during migration to northern breeding grounds (Page et al. 1992).

San Joaquin River Region

HISTORICAL PERSPECTIVE

Estimates of riparian and wetland vegetation acreage in the San Joaquin River Basin vary widely because each mapping effort covered different geographic areas and used different vegetation classifications or mapping criteria. An estimated 30,800 acres of riparian vegetation existed in the San Joaquin River Region in 1977 (Reclamation 1990). CDF data indicate the presence of approximately 15,000 acres of riparian vegetation in the San Joaquin River Region (estimate based on unpublished file data). Warner and Hendrix (1985) estimated that 64,000 acres of riparian vegetation occurred in the southern part of the Central Valley, presumably at least half in the San Joaquin River Region. Frayer et al. (1989) estimated that 34,600 acres of "palustrine forested and scrub/shrub" (riparian wetlands) occur in the Central Valley; presumably, a third of this or less would have been in the San Joaquin River Region.

CURRENT RESOURCE CONDITIONS

NATURAL AND AGRICULTURAL COMMUNITIES AND ASSOCIATED WILDLIFE

The natural terrestrial community types in the San Joaquin River Region occupy approximately 4.6 million acres of a total land area of 8.3 million acres. The natural communities include mixed conifer forest, montane hardwood, valley foothill hardwood, montane riparian, valley foothill riparian, chaparral, grassland, and freshwater and saline emergent wetlands. Table 2 summarizes the area of each of these habitat types to the nearest 1,000 acres. Figure 8 presents the distribution of habitats in the San Joaquin River Region.

Upland Communities. Grassland, dominated by non-natives, is the most abundant natural community in this region, with 1.1 million acres mostly on the edges of the valley floor. Valley foothill woodland is the next most common natural community, occupying 1.4 million acres of the foothill areas of the region.

The lowland areas of the San Joaquin River Region are dominated by approximately 3.1 million acres of agricultural land. Crops include pastures, orchards/vineyards, vegetables, cotton, grains, and rice. Pastures and orchards/ vineyards are the most abundant croplands in the region, at 868,000 and 843,000 acres, respectively.

Riparian and Wetland Communities. Approximately 138,000 acres of freshwater emergent wetlands occur in the San Joaquin

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River Region (Table 2), mostly in western Merced County. CVHJV (1990) identified approximately 120,320 acres of wetlands in this region.

Rivers and Reservoirs. The major rivers of the region include the Mokelumne, Cosumnes, San Joaquin, Stanislaus, Merced, Fresno, Tuolumne, and Chowchilla.

SPECIAL-STATUS PLANTS

Sixty-nine special-status plant species occur in the San Joaquin River Region. The largest number of special-status species (18) occurs in grassland. The second-largest number of special-status species (16) occurs in valley foothill woodland.

SPECIAL-STATUS WILDLIFE

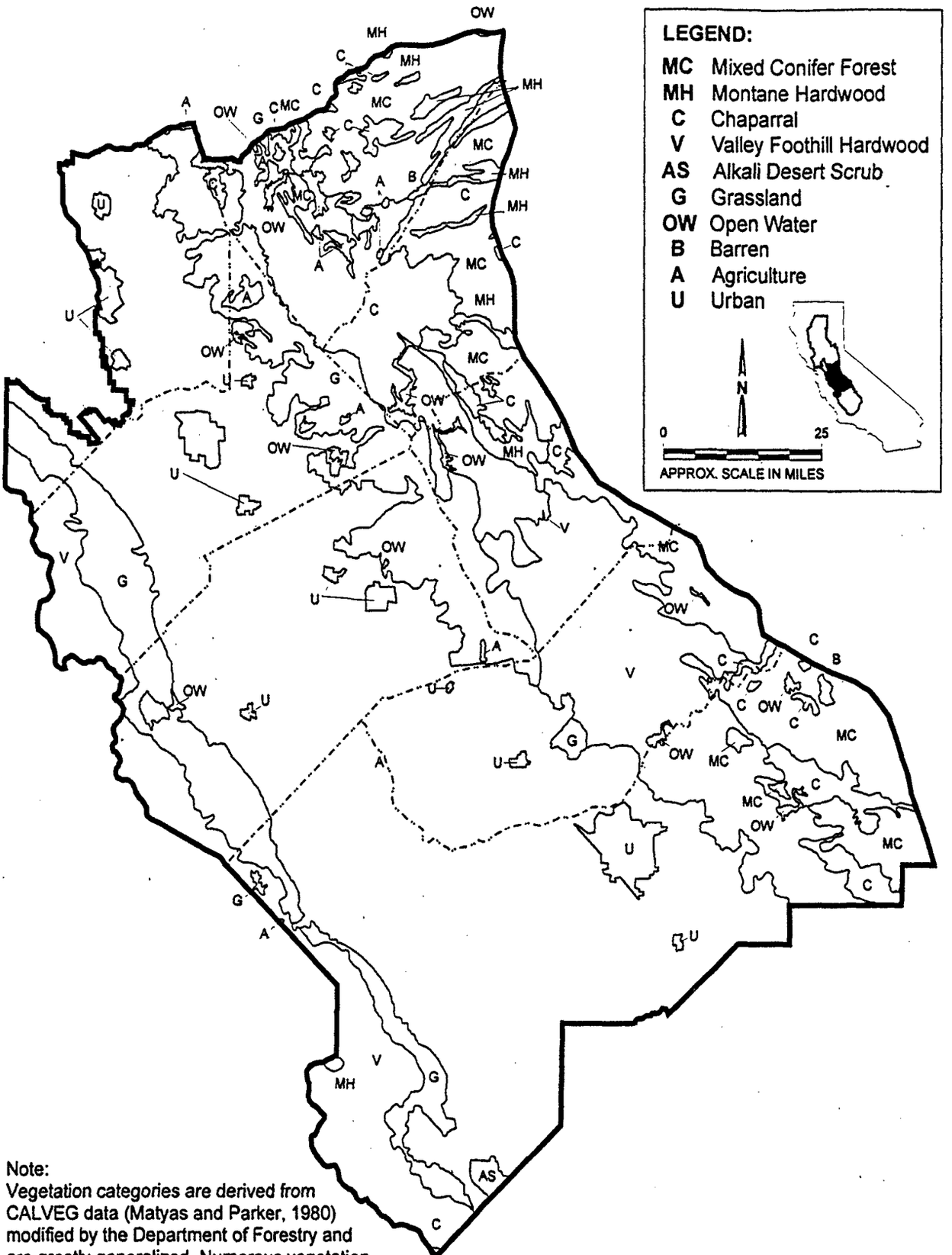
Forty-six special-status wildlife species could occur in the San Joaquin River Region. Most of these species are associated with grasslands, freshwater emergent wetlands, lakes, and rivers that occur on the valley floor. Many of the species have been listed by federal and state wildlife agencies because of habitat loss associated with agricultural development and water projects. Grain crops do, however, provide important habitat for species such as Aleutian Canada goose, Swainson's hawk, ferruginous hawk, greater sandhill crane, and loggerhead shrike.

SIGNIFICANT NATURAL AREAS

The 77 SNAs in the San Joaquin Valley are scattered throughout the region but are concentrated in the grasslands of the valley in freshwater marsh, valley sink scrub, and grassland vernal pool habitats (Figure 9). These areas are important to waterfowl and shorebirds that winter and nest in the San Joaquin Valley, as well as for several special-status species, including the giant garter snake, Swainson's hawk, tricolored blackbird, and Delta button celery. In the southwestern portion of the valley, several SNAs support special-status species (for example, the giant kangaroo rat, blunt-nosed leopard lizard, Swainson's hawk, and San Joaquin antelope squirrel) and habitats (for example, valley needlegrass grassland and northern vernal pool).
Along the eastern side of the valley, SNAs encompass native grasslands and vernal pool habitats, as well as alkali sink scrub, cismontane woodland, chaparral habitats, and grassland habitats. These habitats support special-status species such as Chinese camp brodiaea, tree anemone, and tricolored blackbird.

WATERFOWL AND SHOREBIRDS

The San Joaquin Basin is bounded on the north by the Delta and on the south by the San Joaquin River. Historically, the basin was a large floodplain of the San Joaquin River that supported vast expanses of permanent and seasonal marshes, lakes, and riparian areas. Almost 70% of the basin has been converted to irrigated agriculture, with wetland acreage reduced to 120,300 acres. Nevertheless, the basin contains the largest contiguous block of wetland habitat in the Central Valley (CVHJV 1990). In combination with the adjacent uplands, this wetland complex is referred to as "the Grasslands" and consists of 160,000 acres of private and public lands (Marciochi pers. comm.). Approximately 75,000 acres west of the San Joaquin River (West Grasslands) fall within the Grasslands Resource Conservation District, with water delivery to private wetland management primarily through the Grasslands Water District (CVHJV 1990). Approximately 53,300 acres of the Grasslands are permanently protected in state or federal wildlife refuges or in federal conservation easements (CVHJV 1990).



Note:
Vegetation categories are derived from CALVEG data (Matyas and Parker, 1980) modified by the Department of Forestry and are greatly generalized. Numerous vegetation types occupying small areas are not shown because of map scale.

Figure 8. General Vegetation Types of the San Joaquin River Region

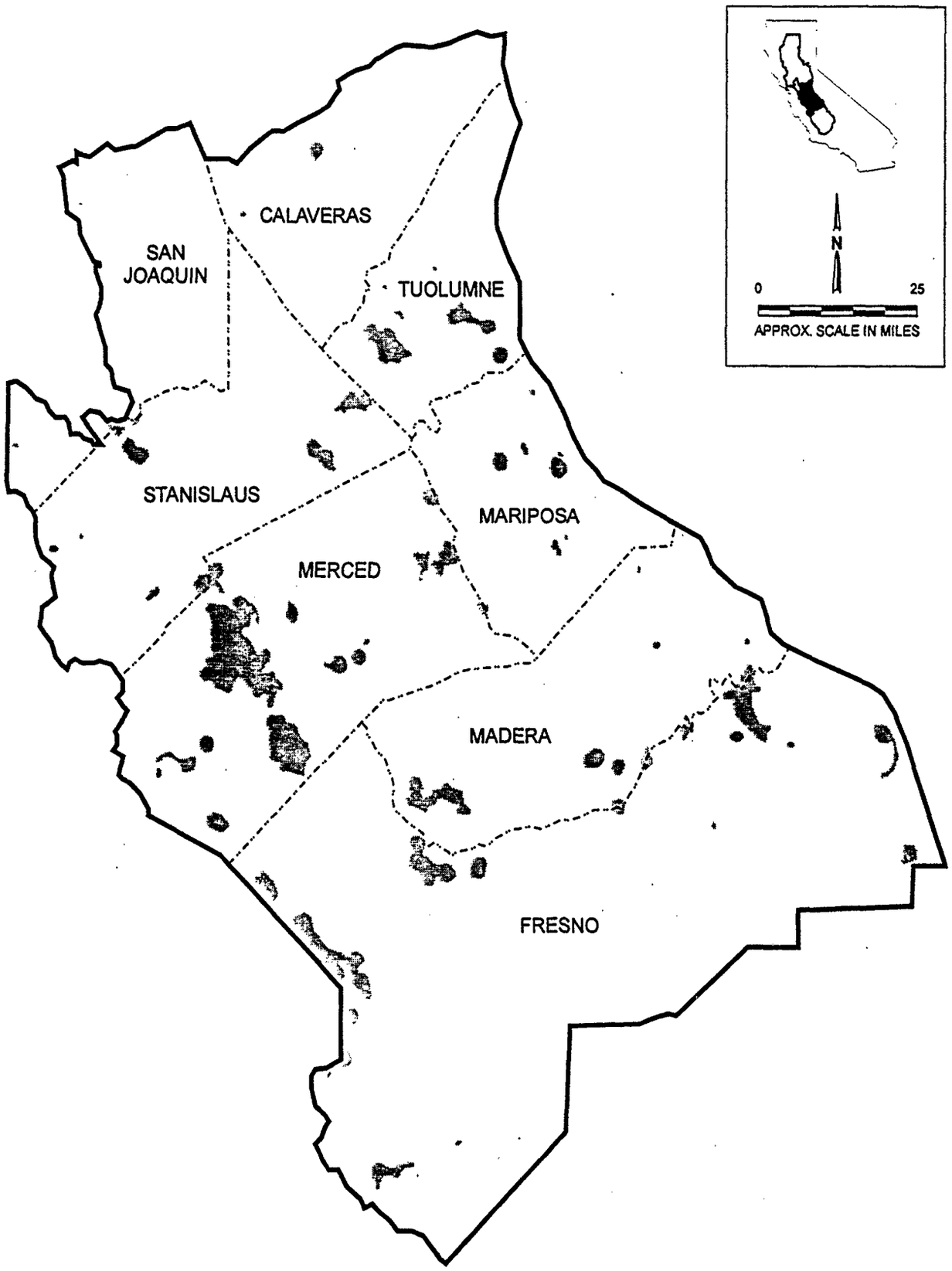


Figure 9. Location of Significant Natural Areas in the Counties of the San Joaquin River Region

The San Joaquin River Region supports approximately 25% of the Central Valley waterfowl and shorebird populations, and up to 30% of the wintering duck population (CVHJV 1990, Shuford et al. 1993). Winter shorebird numbers in 1992-1993 were estimated at 66,700 birds (Shuford et al. 1993). Between 100,000 and 1 million birds were estimated during annual spring staging during 1988-1992 (Page et al. 1992).

In the San Joaquin Valley, more than 37,700 acres are managed by the state and federal governments, including Kesterson, San Luis, and Merced National Wildlife Refuges North Grasslands, Los Banos, and Volta Wilderness Management Areas; and San Joaquin Basin Action Plan lands.

SWP and CVP Service Areas Outside the Central Valley

HISTORICAL PERSPECTIVE

For information regarding historical conditons of service areas outside the Central Valley, refer to the historical perspective for All Regions.

CURRENT RESOURCE CONDITIONS

The SWP and CVP Service Areas Outside the Central Valley include the Central Coast, South Coast, and San Francisco service areas. It is not known how CALFED alternatives would affect these service areas; therefore, descriptions of resources in these service areas are general.

NATURAL COMMUNITIES

The natural communities occurring in the SWP and CVP Service Areas Outside the Central Valley vary by region. The Central Coast service area is dominated by mixed conifer and mature hardwood forest; valley hardwood and valley foothill riparian forests and woodlands; chaparral, coastal sage scrub, and desert alkali; scrub habitats; coastal beaches and cliffs; grassland; freshwater emergent wetland; and open water on reservoirs, lakes, and rivers. Dominant natural communities in the South Coast service area include grassland, chaparral, sage scrub, and riparian habitats.
Natural communities in the San Francisco service area are dominated by chaparral, with pockets of mixed conifer forest, montane hardwood, valley foothill riparian, coastal scrub, inland dunes, coastal beaches and cliffs, grassland, and freshwater and emergent wetlands.

RARE NATURAL COMMUNITIES

Most of the natural communities listed in Table 2 occur in the SWP and CVP Service Areas Outside the Central Valley (Central Coast and San Francisco service areas), with the addition of the following 13 communities: central foredunes, central maritime scrub, Monterey cypress forest, Monterey pygmy cypress forest, central dune scrub, maritime coast range ponderosa forest, Monterey pine forest, northern Bishop pine forest, northern claypan vernal pool, northern foredune grassland, northern interior cypress forest, northern maritime chaparral, and northern vernal pool.

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