NATIONAL WETLANDS INVENTORY

MAP REPORT

SIERRA NEVADA

PHOTO INTERPRETATION

including:

Fresno NE & SE.

Mariposa NE, NW, SE, SW

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I. INTRODUCTION

The United States Fish and Wildlife Service's National Wetlands Inventory (NWI) is producing maps showing the location and classification of wetlands and deepwater habitats of the United States. Classification of Wetlands and Deepwater Habitats of the United States by Cowardin et al. (1979) is the document used by the NWI to define and classify wetlands. Photo interpretation conventions, hydric soils lists and wetland plant lists are also used to implement the Cowardin classification system.

The purpose of this map report is to: (1) provide information on the production of NWI maps, including narrative on imagery and interpretation; (2) provide a descriptive crosswalk from NWI wetland codes on the map to common terminology and to representative plant species found on specific wetland sites; and (3) describe local geography, climate, and wetland communities.

II. FIELD RECONNAISSANCE

Field reconnaissance is a necessary procedure in order to accurately interpret aerial photography. Photographic signatures are correlated to the wetland habitat in the field. Collateral information including vegetative communities, soil types and topographic setting are further evaluated to aid in the photointerpretation process. This information is evaluated for seasonality and conditions existing at the time of photography and at ground truthing.

Project Area

The project area covers the central and southern portions of the Sierra Nevada Range and encompasses six (6) 1:100,000 scale maps. Fresno NE and Fresno SE are in Tulare, Inyo and Fresno counties and include Sequoia and Kings Canyon National Park and portions of Sequoia and Inyo National Forests. Mariposa NW, Mariposa NE, Mariposa SW and Mariposa SE are in Mariposa, Madera, Fresno, Mono and Inyo counties and include Yosemite National Park and portions of Inyo and Sierra National Forests. A small portion (approximately 15%) of the project area contains Owens Valley.

Field Personnel

Dennis Peters	-	U.S. Fish and Wildlife Service (October 5-7, 1992)
Howard Browers	-	U.S. Fish and Wildlife Service
Elaine Blok	-	U.S. Fish and Wildlife Service (October 8-12, 1992)
David Geddis	-	Geonex, Inc.
Renata Goodridge	-	Geonex, Inc.
Barbara Johnson	-	Geonex, Inc.
Mark Butler	-	National Park Service, Yosemite National Park (October 5-6, 1992)
Jan Van Wagtendonk	-	National Park Service, Yosemite National Park (October 5, 1992)
Harold Werner	-	National Park Service, Sequoia and Kings Canyon National Park (October 8-9, 1992)
Mike Neuman	-	National Park Service, Sequoia and Kings Canyon National Park (October 9, 1992)
Diane Ingram	-	National Park Service, Sequoia and Kings Canyon National Park (October 9, 1992)

Field Dates

October 5-12, 1992

Aerial Photography

Primary Source Data (100%)
Type: NHAP Color Infrared
Scale: 1:58,000

1:100,000	Date of Photography	Number of Quads	Percent Coverage
Mariposa SE	08/25/83	7	22.00%
	09/03/83	2	6.25%
	09/04/83	2	6.25%
	08/10/85	10	31.00%
	08/11/85	7	22.00%
	08/30/86	2	6.25%
Mariposa NE	09/15/84	4	12.50%
	09/25/84	11	34.00%
	08/02/85	8	25.00%
	08/11/85	4	12.50%
	09/02/85	3	9.40%
	08/13/86	1	3.25%
	07/25/87	1	3.25%
Mariposa SW	06/28/83	9	28.00%
	09/25/84	2	6.25%
	08/02/85	6	18.75%
	08/11/85	4	12.50%
	08/13/86	8	25.00%
	07/25/87	3	9.49%
Fresno NE	08/25/83	3	9.40%
	09/03/83	9	28.00%
	08/10/85	12	37.50%
	08/11/85	4	12.50%
	09/14/88	4	12.50%
Fresno SE	09/03/83	12	37.50%
	09/04/83	2	6.25%
	08/10/85	12	37.50%
	08/11/85	2	6.25%
	07/25/87	2	6.25%
	09/14/88	2	6.25%
Mariposa NE	08/25/83	4	12.50%
	09/03/83	1	3.20%
	08/10/85	8	25.00%
	08/11/85	3	9.40%
	08/30/86	4	12.50%

Collateral Data for Field Work and Photointerpretation

United States Geological Survey 7.5 Topographic Quadrangles
United States Geological Survey 1:250,000 Topographic Maps
Hydric Soils List of the State of California
Wetland Plant List of the State of California
Soil Conservation Service Soil Surveys (Tulare, Madera, Eastern Fresno and Mariposa counties and Benton-Owens Valley area draft)

III. PHYSICAL DESCRIPTION OF PROJECT AREA

According to Bailey (1980), the Sierran Forest Province covers approximately ninety percent (90%) of the project area and the Intermountain Sagebrush Province covers the remaining ten percent (10%). The latter province is restricted to the eastern edge of the project area.

Geography

Most of the area is steeply sloping to precipitous mountains crossed by many valleys having steep gradients. Much of the area is glaciated. The long west slope of the Sierra Nevada rises gradually from 2,000 feet (600 m.) to higher than 14,000 feet (4,300 m.). The east slope drops abruptly to the floor of the Great Basin. The Great Basin, which is part of the Intermountain Sagebrush Province, consists of numerous separate interior basins. The lower parts of many of the basins have a heavy accumulation of alkaline and saline salts. Streams are rare and few are permanent.

Climate

In the Sierran Forest Province the base of the west slope receives only about 10 to 15 inches (250 to 380 m.) of rainfall and has a long, unbroken, dry summer. At higher elevations, precipitation increases to as much as 70 inches (1,800 mm.), temperatures decrease, the dry summer season shortens, and a larger portion of precipitation falls as snow. Prevailing west winds influence climatic conditions for the whole region. East slopes are much drier than west slopes. Winter precipitation makes up 80 to 85 percent of the total; at high elevations, most of this falls as snow. The greatest total precipitation reported has been on slopes between 3,000 and 7,000 feet (900 and 2,100 m.), which support the mixed conifer forests of the montane zone. The subalpine zone coincides with the altitude of greatest snowfall, where precipitation is 40 to 50 inches (1,000 to 1,270 mm.) a year. Temperatures average 35° to 52°F (2° to 11°C) but decreases as elevation increases.

In the Intermountain Sagebrush Province summers are hot, but winters are only moderately cold. The average annual temperature is 40°to 55°F (4° to 13°C). Spring comes early except at the higher elevations. Total annual precipitation averages only 5 to 20 inches (125 to 500 mm.); almost no rain falls during the summer months except in the mountains.

Vegetation

In the Sierran Forest Province vegetation zones are exceptionally well marked. The lower slopes and foothills, from about 1,500 to 4,000 feet (457 to 1,219 m.), are covered by coniferous and shrub association. On higher slopes, digger pine and blue oak dominate and form typical open or woodland stands. Most of the low hills are covered by close-growing, evergreen scrub, or chaparral, in which buckbrush and manzanita predominate. Several oaks are common associates.

The Montane Zone, which is roughly located between 4,000 and 8,000 feet, is dominated by western yellow pine (Jeffrey), Douglas-fir, sugar pine, white fir and incense cedar. Several other conifers are present, including the giant sequoia.

In the Subalpine Zone, located roughly between 6,500 and 9,500 feet, mountain hemlock, California red fir, lodgepole pine, western white pine and whitebark pine are common. Conditions are severe and timberline varies from approximately 7,000 feet in the north to 10,000 feet in the south.

In the Intermountain Sagebrush Province sagebrush dominates the vegetation of the lower elevations of the province. Other important plants in this sagebrush belt are shadscale, fourwing saltbush, rubber rabbitbrush, spiny hopsage, and horsebrush. All these shrubs tolerate alkali, but in varying degrees; this tolerance is essential to their survival on the poorly drained soils that are widespread in the region. In areas where salt concentration is very high , even these shrubs are unable to grow; in their place communities dominated by greasewood or saltgrass appear.

Soils

In the Sierran Forest Province, Ultisols are extensive on mountain slopes where air is humid; dry Alfisols predominate at lower elevations. Entisols occupy the narrow floodplains and alluvial fans of the valleys. The Intermountain Sagebrush Province consists of mostly Aridisols, Entisols and Mollisols. (United States Soil Conservation Service, 1975).

IV. DESCRIPTION OF WETLAND HABITATS

Riverine

Most of the perennial rivers in the study area have a high gradient and high water velocity and are therefore classified as upper perennial, permanently flooded with an unconsolidated bottom or rock bottom substrate (R3UBH, R3RBH). A rock bottom substrate was found in most rivers, including the Kern, Toulumne, Kaweah and Merced Rivers. The rock bottom subclass is used where the bedrock is visible within the river channel or is the dominant surrounding topography.

The Fresno and Owens Rivers have a low gradient and a well developed floodplain and are therefore classified as lower perennial, permanently flooded with an unconsolidated bottom (R2UBH). As an upper perennial river travels through a large flat meadow it may take on the characteristics of a lower perennial. In this scenario, the river is classified R2UBH within the meadow boundary.

Riverine bars are classified as rocky shore (R3RSC, R3RSA) or unconsolidated shore (R3USC, R3USA, R2USC or R2USA). Streams which do not flow year round are classified as riverine, intermittent, streambed and can be seasonally flooded (R4SBC), temporarily flooded (R4SBA), or intermittently flooded (R4SBJ). As a general rule, the topographic map is used as the basis for differentiating perennial and intermittent streams, particularly for streams which are hidden by tree canopy or shadows. Streams indicated as perennial on topographic maps that contain no water on aerial photography are classified as R3RBG or R4SBC. R3RBG is generally used in the upper elevations and on the eastern slopes. R4SBC is used in the lower elevations and valley floors.

It was not uncommon on the eastern slopes of the Sierra Nevada Range for drainages that are perennial in the higher elevations to change to intermittent in the foothills then disappear completely in the valley due to a higher evaporation rate.

The Fresno River just below Hensley Reservoir was full of *Ludwigia repens* at the time of field reconnaissance. It is classified R2ABH.

Lacustrine

Bodies of open water larger than twenty (20) acres are included in the lacustrine system.

Alpine lakes smaller than twenty (20) acres with a bedrock shoreline and a deep water signature (dark blue, almost black in color) are classified L1UBH.

Shallow flats associated with natural lakes are classified L2USC or L2USA.

Alpine lakes that are vegetated around the edges are classified PUBH or PUBF.

Reservoirs in the study area are classified L1UBHh. Any shallow flats located adjacent to the reservoirs are classified L2USCh or L2USAh.

Collateral data on lake elevation was received from the United States Army Corp of Engineers for Lake Kaweah, Lake Success and Hensley Lake. The break between L1UBHh and L2USCh is located at the 560 foot contour for Lake Kaweah and the 580 foot contour for Lake Success. The L1UBHh and L2USCh break is located at the 450 foot contour for Hensley Lake. Collateral data on lake elevation was received from the California Bureau of Reclamation for Lake Millerton. The break between L1UBHh and L2USCh is located at the 160 foot contour for this reservoir.

Unvegetated salt flats or dry lake beds larger than twenty (20) acres are included in the lacustrine system. These have a well defined border and a bright white (L2USA) or a grey/light blue (L2USC) signature. An example of this is Owens Lake, located in Fresno NE and Fresno SE maps.

Portions of Lake Crowley are classified L2ABHh. It is generally located around the edges of the lake and has a smooth, bright red signature.

Palustrine

This system includes unconsolidated bottom, unconsolidated shore, aquatic bed, emergent, scrub-shrub and forested. Naturally occurring unvegetated bodies of water smaller than twenty (20) acres are classified PUBH. These are often found at higher elevations. If the water appears shallow (light blue signature) or if the body of water is designated as intermittent on the topographic map it is classified PUBF. Dry lake beds less than twenty (20) acres having a well defined border are classified PUSC (grey/light blue signature) or PUSA,J (bright white signature) according to photo signature and location. PUSJ's are found only in the Intermountain Sagebrush Province.

Aquatic bed is evident in only a few places on the aerial photography. It generally appears smooth with a bright red or pink signature and is classified PABF or PABH.

Emergent wetlands are generally found along rivers and streams and in wet meadows, irrigated fields, impoundments, lakes and ponds. Emergent growth ranges from temporarily flooded to permanently flooded. The signature varies with the degree of wetness from white or grey to light and dark red. Semipermanently flooded areas appear dark brown/purple while permanently flooded areas exhibit a very dark tone with apparent water. PEMA, PEMC, PEMF and PEMH are all present within the study area. In addition, many meadows were found to be saturated and are classified PEMB. These PEMB's are generally found in both the montane and subalpine zones and are indicated by a rich red signature on the aerial photography. These are generally found on a slope and may be represented by spring or marsh symbols on topographic maps. Plant species commonly associated with the saturated meadows include Juncus spp., Carex spp. and Epilobeum sp.

In some areas of the Owens River Valley extensive meandering is present creating a variety of wetland types from temporarily, seasonally and semipermanently flooded emergents, small open water oxbow lakes (PUBF) and temporarily and seasonally flooded trees. Lumping of habitat types (such as all PEMF, PEMC, PFOC, etc.) was done when the amount of detail necessary to separate the river channel and other wetland types within the floodplain was not possible due to the limitations caused by the scale of aerial photography.

Temporarily and seasonally flooded scrub-shrub wetlands are generally associated with drainages, river floodplains and wet meadows. The associated Salix spp. are indicated by a bright red signature on the aerial photography. As a general rule, perennial streams were classified as PSSC and intermittent streams were classified as PSSA when the shrubs were in the stream channel. Shrubs at the edges of the channel or between meanders could be temporarily or seasonally flooded depending on signature; seasonally flooded shrubs have a darker, red signature and in some cases visible surface water. Salix spp. are also present in some saturated meadows and are classified PSSB.

Temporarily flooded and seasonally flooded forested wetlands are also generally associated with drainages, river floodplains and wet meadows. In most cases linear forested wetlands are temporarily flooded even if the stream itself is perennial. The common plant species include Alnus rhombofolia, Populus fremonti and Salix spp. Forested saturated meadows are classified PFOB. They are generally found in the mid-elevation zone and higher and are indicated by a bright red understory on the aerial photography. The associated species are Pinus contorta, Populus tremuloides and Salix spp.

In a small portion of the project area, vernal pools are present. They are located in the southwest corner of the Mariposa SW map where the project area moves into the San Joaquin Valley. Most of the vernal pools were vegetated at the time of field review and are classified PEMA or PEMC. The few vernal pools not vegetated are classified PUSA or PUSC. All vernal pools are mapped as vegetated unless field reconnaissance or other collateral data proved otherwise. In all cases, they are indicated by a well defined border and a bright white (PEMA) or grey/light blue (PEMC) signature on the aerial photography. Due to the average size and nature of vernal pools, it was impractical in some areas to delineate and label each vernal pool individually. In these areas the vernal pools are "lumped" together in a single larger polygon which included some of the surrounding upland. These individual polygons are classified with a label that names both the dominant type of vernal pools present and also the surrounding upland; the dominant cover is named first, for example, U/PEMA or PEMC/U, etc.

General Conventions

At the time of field reconnaissance, most of the region was suffering from six year drought conditions. This was taken into consideration when identifying field check sites.

Meadows and lakes indicated on the topographic map but covered by snow on the aerial photography are mapped according to the topo. As a general rule, the meadows are classified PEMB and the lakes are classified L1UBH.

Soil surveys will be followed closely (whenever available) for upland/wetland breaks.

Beaver (b), impounded (h), excavated (x), and artificial substrate (r) modifiers will be used when appropriate.

The Los Angeles and California Aqueducts are classified R2UBKHrx to maintain consistency with external tie maps.

All wetland labels that were determined in the field will have an underlined water regime. Checksites will be indicated by an asterisk.

TABLE 1. OBSERVED WETLAND VEGETATION

Emergents

Juncus spp.	rush
Carex spp.	sedge
Epilobium sp.	willow herb
Veratrum californicum	corn lily
Distichlis sp.	saltgrass
Hordeum jubatum	foxtail barley
Rumex spp.	dock
Panicum sp.	panic grass
Phleum pratense	timothy
Cirsium sp.	thistle
Tragapogon dubius	goats beard
Achillea millefolium	common yarrow
Rhynchospora	beakrush
Heracleum sphondylium	cow parsnip
Mentha sp.	mint
Poa pratensis	Kentucky bluegrass
Poa sp.	bluegrass
Holcus lanatus	common velvet grass
Equisetum spp.	horsetail
Plantago sp.	plantain
Umbrellularia californica	California laurel
Iris missouriensis	Rocky mountain iris
Scirpus americanus	Olney's bulrush
Scirpus sp.	bulrush
Solidago sp.	golden-rod
Typha sp.	cattail

Aquatic Bed

Lemna spp.	duckweed
Ludwigia repens	red water primrose or creeping seedbox

Scrub-Shrub

Salix sp.	willow
Cronus stolonifera	red-osier dogwood

Forested

Quercus lobata	valley oak
Populus fremontii	fremont cottonwood
Alnus rhombofolia	white alder
Populus tremuloides	quaking aspen
Pinus contorta	lodgepole pine
Salix sp.	willow
Platanus racemosa	California sycamore

Table 2. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
R3RB (H,G)	Riverine, upper perennial, rock bottom	Rivers, waterfalls	Stones, boulders, bedrock
R3UB (H)	Riverine, upper perennial, unconsolidated bottom	Rivers	Sand, mud, cobble-gravel
R2AB (H)	Riverine, lower perennial, aquatic bed	Rivers	*Ludwigia repens* (red water primrose)
R2UB (H)	Riverine, lower perennial, unconsolidated bottom	Rivers	Sand, mud, cobble-gravel
R3RS (C,A)	Riverine, upper perennial, rocky shore	Rivers	Stones, boulders, bedrock
R3US (C,A)	Riverine, upper perennial, unconsolidated shore	Riverbanks	Sand, mud, cobble-gravel, pioneer plants

Table 2. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
R2US (C,A)	Riverine, lower perennial, unconsolidated shore	Riverbanks	Sand, mud, cobble-gravel, pioneer plants
R4SB (C,A,J)	Riverine, intermittent, streambed	Creeks, streams, canals	Sand, mud, cobble-gravel, bedrock,
L1UB (H)	Lacustrine, limnetic, unconsolidated bottom	Lakes, reservoirs	Sand, mud, cobble-gravel
L2AB (H)	Lacustrine, littoral, aquatic bed	Lakes, reservoirs	Potamogeton spp. (pondweed) Lemna spp. (duckweed) Algae
L2US (C,A,J)	Lacustrine, littoral, unconsolidated shore	Lake shores, reservoir draw-down, alkali flats	Sand, mud, cobble-gravel
PUB (H,F,K)	Palustrine, unconsolidated bottom	Ponds, stock ponds, borrow pits, sewage tanks	Sand, mud, cobble-gravel
PUS (C,A,J)	Palustrine, unconsolidated shore	Pond beds, unvegetated depressions, alkali flats	Sand, mud or gravel

Table 2. NWI WETLAND CLASSIFICATION CODES, COWARDIN DESCRIPTION AND COMMON TERMINOLOGY

NWI CODE WATER REGIME	COWARDIN DESCRIPTION	COMMON DESCRIPTION	VEGETATION
PAB (H,F)	Palustrine, aquatic bed	Ponds, stock ponds	Lemna sp. (duckweed) Algae
PEM (H,F,C,B,A)	Palustrine, persistent emergents	Seeps, springs, vegetated streams and canals, wet meadows, marshes	Juncus spp. (rushes) Carex spp. (sedges) Scirpus spp. (bulrush) Rumex sp. (dock) Epilobeum sp. (willow herb) Poa spp. (bluegrass) Typha spp.
PSS (C,B,A)	Palustrine, scrub-shrub	Seeps, springs, vegetated streams and rivers, wet meadows	Salix spp. (willow)
PFO (F,C,B,A)	Palustrine, forested	Forested streams and rivers, floodplains, wet meadows, seeps and springs	Salix sp. (willow) Quercus sp. (oak) Pinus contorta (lodgepole pine) Populus tremuloides (quaking aspen) Populus fremontii (fremont cottonwood) Alnus rhombofolia (white alder) Platanus racemosa (California sycamore)

V. WATER REGIME DESCRIPTION

(A) Temporarily Flooded - Surface water present for brief periods during growing season, but water table usually lies well below soil surface. Plants that grow both in uplands and wetlands are characteristic of this water regime.

(B) Saturated - The substrate is saturated to the surface for extended periods during the growing season, but surface water is seldom present.

(C) Seasonally Flooded - Surface water is present for extended periods especially early in the growing season, but is absent by the end of the growing season in most years. The water table after flooding ceases is extremely variable, extending from saturated to a water table well below ground surface.

(F) Semipermanently Flooded - Surface water persists throughout the growing season in most years. When surface water is absent, the water table is usually at or very near the land's surface.

(G) Intermittently Exposed - Surface water is present throughout the year except in years of extreme drought.

(H) Permanently Flooded - Water covers the land surface throughout the year in all years.

(K) Artificially Flooded - Substrate manipulated by man using natural or synthetic materials. Water level is not constant. Depending on needs, the water is pumped in or out of the reservoir.

VI. IMAGERY

Resolution and clarity on the NHAP photography was good. The color tones on the photography are balanced and allow the differentiation of different vegetation types. However, bleaching was a problem on some of the photography, particularly the Mariposa NW imagery. Snow cover was also a problem with some imagery covering the alpine and subalpine zones. In both cases, overlap was used from the neighboring imagery, if possible, to ensure accuracy. In addition, some of the imagery reflects conditions of a very wet year (1983); this was taken into consideration during delineation of the photography.

VII. MAP PREPARATION

The classification and delineation of wetlands is in accordance with Cowardin et al (1979). National Wetlands Inventory photographic and cartographic conventions can provide more information about the mapping process. Delineations are produced through stereoscopic interpretation of 1:58,000 scale color infrared photography. The dates of photography ranged from 1983 through 1986. The months the mission was flown were June through September.

Field checks were conducted in each of the six 1:100,000 maps in the study area prior to the delineation of wetlands. The check sites were selected to clarify wetland/upland breaks and coinciding signatures to the various vegetative covers.

USGS topographic maps, SCS soil surveys, USGS water resource data book for 1990 water year, vegetation, climate, and ecoregional information are all used as collateral data for wetland delineation.

The user of the map is cautioned that, due to the limitation of mapping primarily through aerial photointerpretation, a small percentage of wetlands may be unidentified. Since the photography depicts only one specific moment in time there may be discrepancies between the maps and current field conditions. Changes in landscape which occurred after the date of photograph would result in such discrepancies.

Aerial photointerpretation and drafting were completed by Geonex, Inc., St. Petersburg, Florida with quality assurance conducted by the United States Fish and Wildlife Service.

VIII. MAP ACQUISITION

To discuss any questions concerning these maps, please contact:

Regional Wetlands Coordinator
U.S. Fish and Wildlife Service - Region 1
Eastside Federal Complex
911 NE 11th Avenue
Portland, OR 97232-4181
(503) 231-6154

To order maps call 1-800-USA-MAPS.

Maps are identified by the name of the corresponding USGS 1:24,000 scale topographic quadrangle name. Topographic map indices are available from the USGS.

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BJ/drs.nwi

X. LITERATURE CITED

Bailey, R.G., 1978. Description of The Ecoregions of The United States. United States Department of Agriculture, Forest Service.

Cowardin, L.M., V. Carter, F.C. Golet, and E.T. LaRue, 1979. Classification of Wetlands and Deepwater Habitats of The United States. United States Department of Interior, Fish and Wildlife Service, FWS/PBS - 79/81.

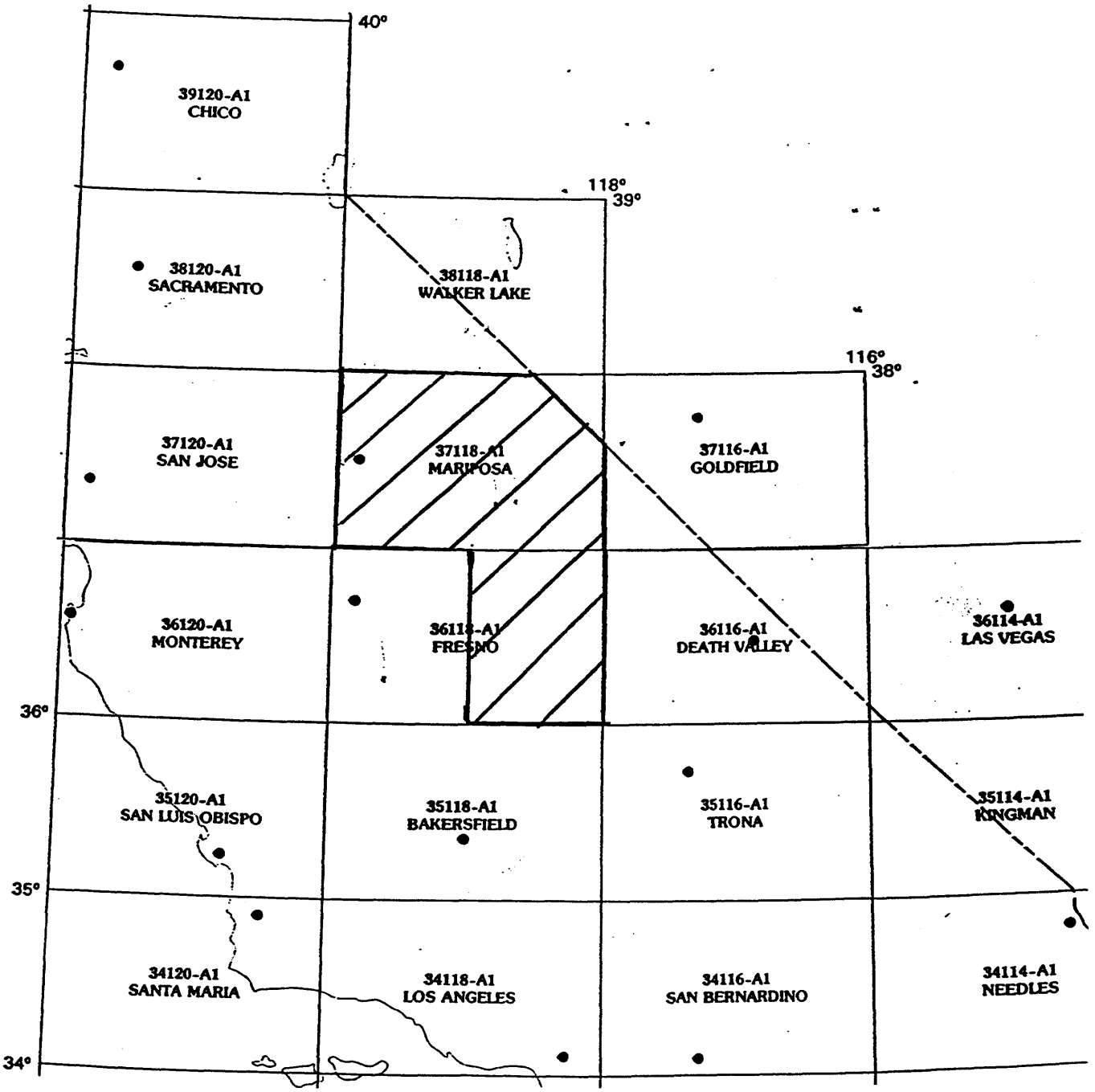
Status of Fishes in 137 Lakes in Sequoia and Kings Canyon National Parks, National Park Service, October 1977.

Mason, Herbert L., 1969. A Flora of the Marshes of California. University of California Press.

Whitney, Stephen. A Sierra Club Naturalist's Guide, Sierra Club Books, San Francisco 1979.

"Status of Fish Populations in 102 Planted Lakes", Yosemite National Park, October 1977.

APPENDIX A
LOCATOR MAP

SIERRA NEVADA PROJECT AREA

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