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FISH AND WILDLIFE RESTORATION OF THE LAGUNA DE SANTA ROSA
SONOMA COUNTY, CALIFORNIA

Laguna Technical Advisory Committee

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INTRODUCTION

The Laguna Technical Advisory Committee was formed in August 1988 by Congressman Doug Bosco to explore the feasibility of creating a National Wildlife Refuge in the Laguna de Santa Rosa. The members of the committee were chosen because of their familiarity with the Laguna and their long involvement with its preservation and use as an important wildlife, agricultural, and flood control area. In preparing its report, the committee interviewed many individuals and representatives of organizations connected with the Laguna. Organizations and agencies contacted included the Farm Bureau of Sonoma County, the Audubon Society, the Sierra Club, the North Coast Builders Exchange, the Northwest Cultural Resources Information Center, the City of Santa Rosa, the City of Sebastopol, and the League of Women Voters.

There exists an immediate and compelling rationale for using Federal funds to acquire lands within the Laguna de Santa Rosa as a National Wildlife Refuge. Despite the loss of hundreds of acres of Laguna wetlands, significant areas of wetland habitat remain. They are, however, under increasing threat. While State and local preservation efforts are underway, only the Federal government possesses the resources capable of providing the type of sustained, extensive land acquisition program necessary to halt the degradation of this valuable wetland area. In as much as wetland preservation, and an increase in wetland acreage, has been recognized as a national goal, the Laguna de Santa Rosa should be considered a high national priority for protection.

X The Laguna's capacity to support and enhance specific fish and wildlife populations also warrants Federal involvement. With the passage of Public Law 100-653, the Congress and the President have initiated a major Federal commitment to restoring the salmon and steelhead resources of the Russian River basin. At one time, the Laguna was an important nursery for these fisheries. Properly managed, it could be once again. Restoration of the Laguna habitat would thus greatly enhance the future effectiveness of any Federally sponsored Russian River fishery restoration program. As an important wintering and nesting area for migratory waterfowl, the Laguna can also play an important role as a key waterfowl habitat along the Federally-managed Pacific Flyway. Not only will wetlands be protected, but under a resource management plan the acreage of wetlands will be substantially increased. Finally, the Laguna is the type location for the California freshwater shrimp, a Federally designated endangered species. The long term survival of this species may rely, to a large extent, on the preservation and restoration of its habitat in the Laguna de Santa Rosa.

BACKGROUND

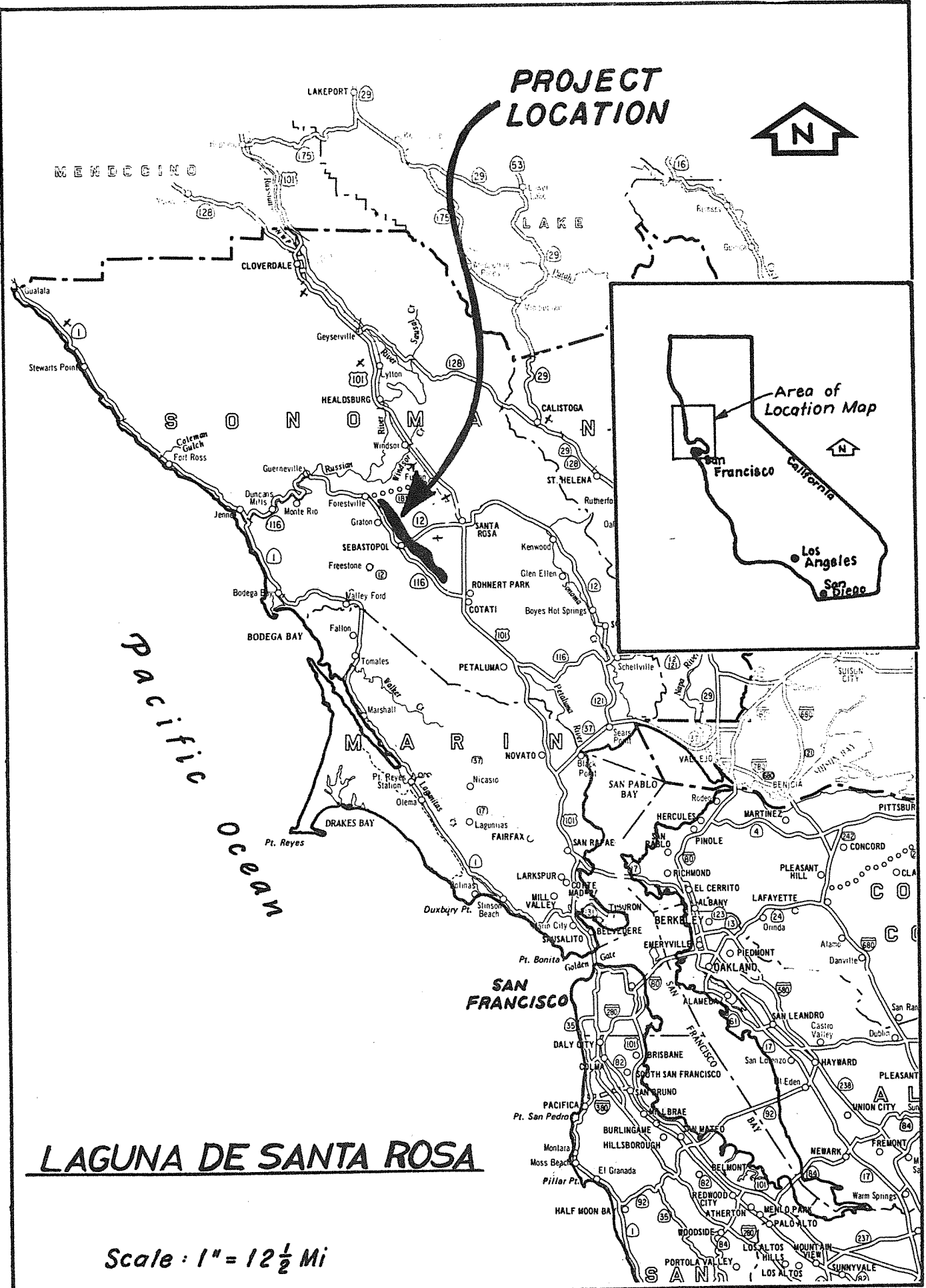
The Laguna de Santa Rosa is a complex system of wetland and upland habitats, including: open water, emergent marsh, riparian forest, vernal pools, oak savanna, oak woodland, and grassland. It is located in south central Sonoma County, 50 miles north of San Francisco, in the Russian River watershed. The Laguna may once have been an extension of San Francisco Bay at a time when the Russian River drained into the Bay.

CULTURAL RESOURCES

For thousands of years the Laguna de Santa Rosa was home to a substantial population of native Americans -- the Pomo. The Laguna provided a favorable climate for the Pomo and an abundance of food in the wildlife, fish, acorns, grass seeds, berries, and bulbs. The wetlands also provided materials needed for everyday uses from baskets to boats. In the Laguna de Santa Rosa, 76 archaeological sites have been identified below the 90-foot contour level. Currently the 100-year flood level is considered to be the 75-foot contour; prior to the construction of the two flood control dams in the Russian River watershed the 100-year flood was estimated to be about the 80-foot level. All the archaeological sites are specifically related to the Laguna as a food production area. With further exploration archaeologists expect to find many more sites. Archaeologists consider the Laguna to be an exceptional and unique data base for the study of historic coastal California.

Archaeological study can influence biotic resource management. Pollen analysis and midden excavation can identify the historic plant and animal communities. This picture of historic Laguna habitat can provide important baseline data for biologists and resource managers involved with habitat restoration.

PROJECT LOCATION



LAGUNA DE SANTA ROSA

Scale: 1" = 12 1/2 Mi

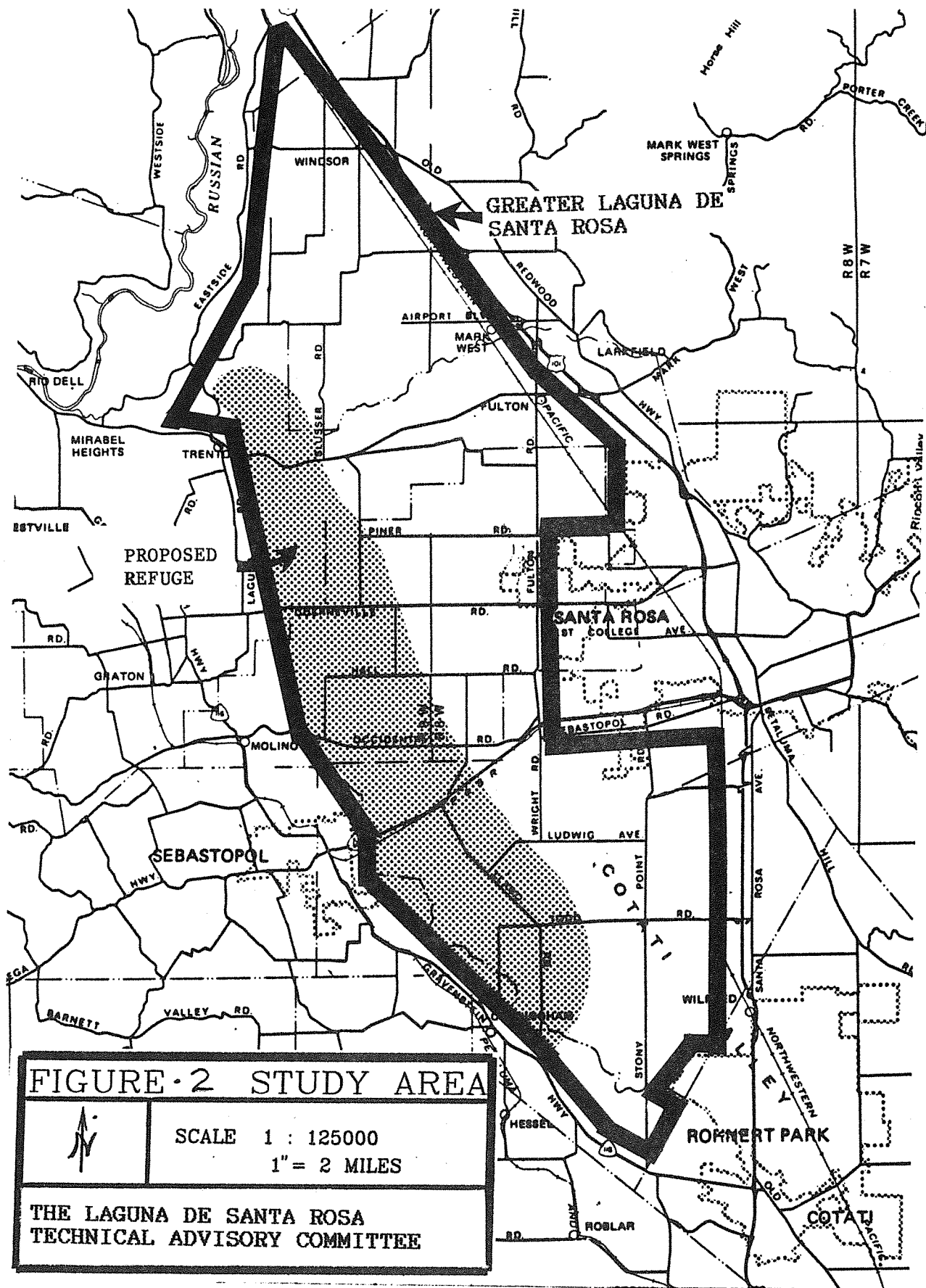


FIGURE - 2 STUDY AREA



SCALE 1 : 125000
1" = 2 MILES

THE LAGUNA DE SANTA ROSA
TECHNICAL ADVISORY COMMITTEE

BIOTIC RESOURCES

Early reports indicate the Laguna was a vast expanse of marsh land with a substantial area of open water that formed a chain of lakes. The wetlands of the Laguna extended much further to the south than is apparent today and included much of what is now the City of Rohnert Park. The abundance and diversity of wildlife and habitat was diminished suddenly in the 1830's by the grazing of thousands of cattle on the Spanish ranchos.

An important feature of the Laguna wetlands was the great diversity of habitat types. The Laguna de Santa Rosa still supports a great diversity of plants and animals, including 5 State listed rare, threatened, or endangered plant species; these 5 plants and 5 others are also Federal Candidate species. The Laguna provides habitat to support four State and/or Federal listed endangered animal species (see Appendix A). Surveys indicate that 286 species of plants, 230 birds, 25 mammals, 19 fishes, 7 amphibians, and 9 species of reptile have been found in the Laguna. A complete species list, taken from the Laguna de Santa Rosa Environmental Analysis and Management Plan prepared by students of Sonoma State University, has been attached as Appendix B.

The Laguna de Santa Rosa is one of the most significant coastal freshwater wetlands in California. Wintering waterfowl once numbered in the hundreds of thousands, with significant local production of mallard and cinnamon teal. During flood cycles, when vast lakes are formed in the Laguna, from 3,000 to 5,000 waterfowl now use the area regularly, and represent the majority of species in the Pacific Flyway. Restoration and development of new wetland acreage in the Laguna has the potential to provide habitat for substantially greater numbers of waterfowl.

The California yellow-billed cuckoo is a State listed endangered bird associated with mature riparian forest habitat. It inhabited the Laguna de Santa Rosa in the past, but was last observed in the 1950's before channelization of the Laguna destroyed its habitat. Re-establishment of the yellow-billed cuckoo is dependent upon the restoration of large expanses of riparian forest.

The bald eagle and American peregrine falcon, Federal and State listed endangered species, occur in the Laguna. Other birds of special concern which inhabit the Laguna include the marsh harrier and burrowing owl. The migratory mourning dove nests in the oak savanna of the Laguna.

The waters of the Laguna de Santa Rosa support a diverse population of fishes. Most of the fish in the Laguna now are introduced warm water species such as largemouth bass, catfish, and carp. These fish are able to use the warm, eutrophic waters of the Laguna. Anadromous steelhead trout and a few coho salmon migrate through the waters of the Laguna to and from their spawning and nursery habitat in Mark West Creek and Santa Rosa Creek. In its pristine condition, the Laguna, and many of its tributaries, likely provided good habitat for both steelhead and coho salmon in large, well shaded pools of clear, cold water. With proper management, this type of

habitat can be restored in portions of the Laguna; salmon and steelhead could then be reestablished.

The California freshwater shrimp, a State and Federal listed endangered invertebrate species, is currently found in Blucher Creek, a tributary to the Laguna, and in several other nearby streams. The freshwater shrimp was found in Santa Rosa Creek until at least 1960, and probably until 1964 when the stream was channelized. The Laguna de Santa Rosa is actually the type location for the freshwater shrimp which was first described in 1895. The last sighting in the Laguna was prior to 1950, but no thorough surveys have been done recently.

The plant communities of the Laguna are a complex system of wetland and upland types, including: emergent marsh, riparian forest, vernal pool, oak savanna, oak woodland, and grassland. The most conspicuous plant is the valley oak which dominates the upland community of the Laguna and the entire Santa Rosa Plain. The valley oak is being rapidly lost as trees are cleared for development and older trees die. Root rot, caused by excessive summer irrigation, appears to be a major cause of tree death. Because of the impact of grazing and cultivation and the competition from introduced grasses, reproduction of the valley oaks is almost non-existent.

The bottomlands of the Laguna are predominantly forested riparian wetlands comprised mainly of tree willow and Oregon ash. Only remnants now remain of the once extensive riparian forest.

State listed rare, threatened, or endangered plant species found in the Laguna de Santa Rosa area include: white sedge, Burke's goldfields, Sebastopol meadowfoam, many flowered navarretia and Hoover's semaphore grass. Other plants in the Laguna appearing on the California Native Plant Society list of rare plants include: Baker's blennosperma, swamp harebell, Gairdner's yampah, and showy Indian clover, thought to be extinct.

Plants of secondary concern to the California Native Plant Society, because they are uncommon or restricted to special habitats, such as vernal pools, include: dwarf downingia, Douglas' pogogyne and Lobb's buttercup.

CURRENT CONDITIONS

Much of the natural wetland habitat of the Laguna has been affected by sedimentation. Both agriculture and urban development have played a major role in increasing sedimentation and in causing a gradual shift in the ecosystems of the Laguna, from wetland toward upland.

Urban development in the Santa Rosa Plain during the past 30 years has forced agriculture from the prime soils of the plain into the marginal lands nearer the Laguna. Riparian forests and oak woodlands have been cleared for agriculture or for the excavation of flood control or drainage channels, wetlands have been drained. Past municipal, industrial, and agricultural waste disposal practices adversely affected Laguna water quality. Spray disposal of treated wastewater has been detrimental to the

survival of the valley oak in the Laguna because excess summer water promotes the growth of oak root fungus.

Much of the water quality degradation which occurred through the mid-1970's has been reversed through a combination of improved wastewater treatment and improved agricultural management practices. The North Coast Regional Water Quality Control Board will be conducting a 2-year Federally funded investigation of non-point source pollution in the Laguna. The Regional Board will be conducting its study in cooperation with local, State, and Federal agencies and the interested public to abate and mitigate any detrimental non-point pollution.

Even though a significant portion of the Laguna habitats have been lost or degraded, much remains. The remnant habitat must be protected against further loss. Much of the habitat that has been lost or altered can be restored, provided restoration is started before additional development results in a permanent commitment of the land and resources to uses not compatible with Laguna protection and restoration.

Other uses which now occur within the Laguna de Santa Rosa include: the City of Santa Rosa water reclamation system, including spray irrigation fields, storage ponds, and a wastewater treatment plant; the Sonoma County Water Agency aqueduct; flood control channels of the Sonoma County Water Agency; agriculture; and lands which have already been developed including portions of the City of Sebastopol, and parcels along Highway 12 and Llano Road. Some of these uses may be compatible with restoration for wildlife, other may not.

Preservation and restoration efforts are already underway. The Department of Fish and Game owns three parcels within the Laguna de Santa Rosa, including the Laguna de Santa Rosa Ecological Reserve, totalling 125 acres, and two conservation easements totalling 50 acres. A 175 acre parcel has recently been approved for acquisition. Three additional parcels, totalling 68 acres, have been proposed for acquisition. Proposition 70, from the June 1988 California election, provides \$4,000,000 for acquisition of land around San Pablo Bay and coastal wetlands including the Laguna de Santa Rosa. It is the intention of the California Department of Fish and Game to emphasize acquisition in the Laguna. Other Proposition 70 funds, designated for local use and for rare and endangered species, may also be used in the Laguna.

The geographic extent of the Laguna is difficult to define as it grades gradually into the Santa Rosa Plain to east. Depending on the definition used, the Laguna encompasses between 7,422 acres and 64,000 acres. The larger figure includes most of the Santa Rosa Plain, at one time an integral part of the fish and wildlife habitat system of the Laguna. This area is now mostly developed, and, except for a few small parcels, beyond preservation or restoration. The smaller figure includes the 100-year flood plain at the 75-foot contour. This area is mostly free from development, other than agriculture, and is generally capable of being protected and restored. The 100-year flood plain line includes most of the riparian forest and emergent marsh, but does not include other significant

habitats, primarily vernal pools and oak woodland. For planning purposes, the Laguna Technical Advisory Committee has considered the Laguna to be the existing wetlands and adjacent, associated upland habitats. This is an area of about 9000 acres (see Figure 2).

FINDINGS

The Laguna de Santa Rosa supports a great diversity of plants and animals, including five endangered plant species.

Two endangered bird species are found in the Laguna and one other endangered bird was formerly found in the Laguna.

The endangered California freshwater shrimp is found in a stream tributary to the Laguna and, in the past, was likely found throughout the Laguna and many of its tributaries.

Two tributaries of the Laguna, Mark West Creek and Santa Rosa Creek, now support important runs of anadromous steelhead trout. Much of the Laguna and many of its other tributaries probably provided spawning and nursery habitat for these fish at one time.

The extensive wildlife populations of the Laguna, the many useful and food producing plants, such as the rushes, sedges, and oaks, and the mild climate made the Laguna de Santa Rosa an attractive home to the Pomo Indians for thousands of years.

The Laguna is now surrounded by urban development including the cities of Santa Rosa, Sebastopol, Rohnert Park, and Cotati, and by suburban development in the adjacent, unincorporated portions of the County.

The urban and suburban areas are developing in a direction which will put the wetlands of the Laguna at an ever greater risk.

Much of the wetland habitat of the Laguna has been drained to facilitate flood control and conversion to agriculture. Drainage included dredging of the low water channel of the Laguna and clearing of much of the riparian forest.

Agricultural practices and the spray disposal of reclaimed wastewater have eliminated much of the upland valley oak woodland and prevented the regeneration of these oaks which were the dominant native vegetation of the Santa Rosa plain.

Portions of the Laguna have been filled for the construction of waste water storage ponds and to "reclaim" the land for development.

OBJECTIVES

It is the objective of the Laguna Technical Advisory Committee to assist in the establishment of a National Wildlife Refuge in the Laguna de Santa Rosa to protect and restore the native fish, wildlife, and plant communities of the Laguna.

RECOMMENDATIONS

- 1) Establish a National Wildlife Refuge in the Laguna de Santa Rosa. The Wildlife Refuge should be cooperatively managed by the U. S. Fish and Wildlife Service and the California Department of Fish and Game.
- 2) Acquire, from willing sellers only, about 6000 acres within the Laguna de Santa Rosa. About 3000 acres within the Wildlife Refuge boundary would likely remain in the ownership of other public agencies or private individuals, giving a total area within the boundary of about 9000 acres. The estimated land acquisition cost of the Refuge is approximately \$14,000,000 (see Appendix C).
- 3) Develop a resource management plan, and encourage development of a coordinated land use plan, to protect, restore, and enhance the Laguna de Santa Rosa.

GOALS

- 1) Protect, restore, enhance and, develop wetland habitat for migratory waterfowl and other native wildlife species within the Laguna.
- 2) Protect, restore, enhance and, develop fish habitat in the waters of the Laguna.
- 3) Protect and restore the native plant communities of the Laguna, including: emergent marsh, riparian forest, vernal pools, oak savanna, oak woodland, and grassland.
- 4) Restore endangered species or other species that have been lost to the Laguna.
- 5) Protect archaeological and historical sites in the Laguna.
- 6) Manage water supplies in the Laguna to best satisfy the needs of the native plant and wildlife communities. Where appropriate, develop enhancement water supplies to restore and create wetlands. Water management plans must emphasize the maintenance of high water quality standards for downstream users.
- 7) Encourage management practices in the Laguna watershed to further the goals of Laguna rehabilitation. A basin management plan should be prepared to address watershed problems related to erosion, sedimentation, non-point source pollution, and habitat loss.
- 8) Provide public use opportunities.
- 9) Develop facilities and programs for education in natural resources and native American history.
- 10) Encourage the maintenance of agriculture in the Laguna and peripheral lands as an important socio-economic and cultural resource compatible

with wildlife management. Impose no new level of regulation on agriculture.

- 11) Maintain the flood control capacity of the Laguna and, where appropriate and compatible with protection of developed urban areas, allow sections of the Laguna which have been channelized to revert to a natural form.
- 12) Coordinate the land use and water policies and practices of the various public agencies involved in the Laguna.
- 13) Encourage better enforcement of existing Federal, State, and local regulations for environmental protection.
- 14) Encourage citizen participation in Laguna management in a stewardship role.

LAND ACQUISITION

Lands acquired in the Laguna by the California Department of Fish and Game will be on a willing seller basis only. Any lands acquired for the Laguna de Santa Rosa National Wildlife Refuge by the U.S. Fish and Wildlife Service should also be from willing sellers only. Other lands within the boundary of the Wildlife Refuge will remain in the ownership and management of other public agencies or private individuals. Wildlife Refuge management should strive to develop cooperative agreements with adjacent land owners to establish mutually acceptable and beneficial management practices.

WILDLIFE REFUGE MANAGEMENT

Under established procedures, responsibility for field management of a Federally designated National Wildlife Refuge usually rests with the U. S. Fish and Wildlife Service. In most instances, this has worked to the overall benefit of our nation's resources. However, in this particular case, realities dictate the need for a more cooperative Federal-State approach to management.

The major land ownership and headquarters of the U.S. Fish and Wildlife Service is located 80 miles away in the San Francisco Bay area. This geographical factor, along with limited resources, restrict the Service's presence in Sonoma County. At the same time, the California Department of Fish and Game has a Regional headquarters in nearby Napa County and has a major involvement with wildlife management in the north San Francisco Bay area with substantial holdings in the Petaluma Marsh, Napa Marsh, and Suisun Marsh. Within the Laguna de Santa Rosa itself, the Department already owns 125 acres, holds two conservation easements totalling 50 acres, and has recently approved acquisition of another 175 acre parcel. The Department currently has available \$4,000,000 for acquisition of land around San Pablo Bay and coastal wetlands including the Laguna de Santa Rosa. It is the intention of the Department of Fish and Game to emphasize acquisitions in the Laguna.

It is evident that the U. S. Fish and Wildlife Service does not, in and of itself, possess the staffing resources necessary to provide the Laguna with the type of timely, vigorous management it so badly needs and deserves. Only by drawing on the considerable experience and expertise of State and local officials can an effective wildlife refuge be assured. To best accomplish this, a cooperative management agreement should be instituted between the Service and the California Department of Fish and Game that recognizes their respective strengths and limitations in the Laguna area. Specifically, a Memorandum of Understanding could be developed that specifies management responsibilities and practices.

WATER MANAGEMENT

Records of historic water flows for the Laguna de Santa Rosa do not exist, but hydrologic comparison of the Laguna watershed with other nearby watersheds for which records are available indicate that summer flows in the Laguna low flow channel ranged from no flow to nine cubic feet per second depending on the amount of rainfall in the previous winter. Even under conditions of no flow, there would have been large areas of standing water.

Substantial changes have occurred to alter the natural hydrology of the Laguna. Intensive grazing of the watershed has compacted the soils and reduced the amount of vegetation on the land. Urbanization has covered the soil with impervious surfaces. Streams have been channelized to drain the land and carry off flood waters. These actions have resulted in faster run-off of water from winter rains. The groundwater table has dropped in certain areas, reducing the amount of water naturally discharging to the streams. On the other hand, lawn irrigation in urban areas, the disposal of wastewater through spray irrigation, and a reduction in water diversions from Santa Rosa Creek and the Laguna for agricultural purposes has increased the available summer water in some areas.

In 1987, 23,000 acre-feet of water was imported to the Laguna watershed by the Sonoma County Water Agency. Over half of this water was used outdoors and a portion of this water was eventually added to the flow of Santa Rosa Creek and other tributaries to the Laguna. The remainder of imported water was used for domestic purposes, and a portion of it was ultimately added to the Laguna as wastewater.

These changes have altered the location and abundance of water in the Laguna complex. Oak woodlands and vernal pools, for example, which naturally would have been dry in the summer are now being irrigated. Former wetlands associated with the smaller tributaries to the Laguna are now dry in the summer.

To protect and restore the native plant communities and wildlife habitat of the Laguna, water will have to be managed for the benefit of these resources. The question is: when, where, and how much water is needed? For vernal pools and valley oaks, for example, summer water is not desirable; therefore, summer irrigation should be reduced or eliminated in

these areas. Riparian forests and marshes can be enhanced with additional summer water.

The rate at which reclaimed water is applied to the Laguna can probably be increased with application to appropriate habitats while still protecting and restoring those habitats sensitive to summer water. Without a management plan, the amount of reclaimed water that could be beneficially used in the Laguna cannot be determined.

Reclaimed water from the nearby sub-regional wastewater treatment plant provides the greatest opportunity for providing additional water to those areas of the Laguna that need it. Other opportunities also exist. Future water projects to provide for the needs of the rapidly-growing Santa Rosa area may include ground water recharge with water diverted from the Russian River. Mitigation for such a project may include the use of some of the water for wetland enhancement.

Constructed wetlands have received much attention recently because they have the potential to provide "polishing" of effluent while restoring some natural wetland functions and values in areas where they have been depleted. Successful constructed wastewater wetlands have been developed in Martinez and Arcata, California.

Two types of wetlands may be constructed in the Laguna. "Treatment wetlands" are engineered to maximize the biological reactions that reduce levels of regulated pollutants. These wetlands offer wildlife habitat as a secondary, incidental function. "Enhancement wetlands" use treated effluent as the basis for wildlife habitat development with the secondary, incidental function of effluent polishing. Both types of wetlands may be appropriate for the Laguna. The City of Santa Rosa is in the process of developing a demonstration treatment wetland in the Laguna. Any wetlands constructed on lands purchased for the wildlife refuge should be managed as enhancement wetlands, the amount and timing of water application must be controlled by the wildlife management agency.

Treatment wetlands must be located in areas where wetlands do not already exist, so as not to diminish any existing wetland values.

*Release date -
1/17/89*

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Appendix A

Rare, threatened, or endangered plants found in the Laguna de Santa Rosa

Scientific Name	Common Name	DFG	FWS	CNPS
<u>Blennosperma bakeri</u>	Baker's blennosperma		C2	1B
<u>Campanula californica</u>	swamp harebell		C2	1B
<u>Carex albida</u>	white sedge	E	C1	1B
<u>Downingia humulis</u>	dwarf downingia		C3c	4
<u>Lasthenia burkei</u>	Burke's goldfields	E	C2	1B
<u>Limnanthes vinculans</u>	Sebastopol meadowfoam	E	C2	1B
<u>Navarretia plientha</u>	many flowered navarretia	E	C2	1B
<u>Perideridia gairdneri</u> spp. gairdneri	Gairdner's yampah		C2	1B
<u>Pleuropogon hooverianus</u>	Hoover's semaphore grass	R	C2	1B
<u>Pogogyne douglasii</u> spp. parviflora	Douglas' pogogyne		C2	4
<u>Ranunculus lobbii</u>	Lobb's buttercup			4
<u>Trifolium amoenum</u>	showy Indian clover		C2	1A

Endangered animals of the Laguna de Santa Rosa

<u>Coccyzus americanus</u>	California yellow-billed	E		
<u>occidentalis</u>	cuckoo			
<u>Haliaeetus leucocephalus</u>	bald eagle	E	E	
<u>Falco peregrinus anatum</u>	American peregrine falcon	E	E	
<u>Syncaris pacifica</u>	California freshwater shrimp	E	E	

1. DFG = California Department of Fish and Game designation:
 R = Rare
 E = Endangered
2. FWS = U.S. Fish and Wildlife Service designation:
 C1 = Enough data on file to support Federal listing.
 C2 = Threat and/or distribution data insufficient to support Federal listing.
 C3c = Too widespread, or not threatened.
3. CNPS = California Native Plant Society designation:
 1A = Plants presumed extinct in California.
 1B = Plants rare and endangered in California and elsewhere.
 4 = Plants of limited distribution (a watch list).

APPENDIX B

FRESH WATER MARSH PLANTS OF THE LAGUNA DE SANTA ROSA

Taken from a list compiled by Nancy Harrison for the California Native Plant Society. This list includes plants that are typical of vernal pools, grassland, and various woodland communities.

Athyrium Filix-femina v. sitchense (Lady Fern)
Aster chilensis (Wild Aster)
Anthemis Cotula (Mayweed)
Alisma triviale (Native Water Plantain)
Alisma lanceolatum (Intro.)
Anagallis arvensis (Scarlet Pimpernel)
Atriplex natula ssp. hastata (Saltbush)
Amaranthus Powellii (Common Redroot)
Aesculus californica (Buckeye)
Azolla filiculoides (Duckweed Fern)
Aira caryophyllea (Hairgrass)
Alopecurus aequalis v. sonomensis (Foxtail) Rare
Alopecurus Howellii (Foxtail)
Brodiaea hyacinthina (White Brodiaea)
Brodiaea peduncularis
Brodiaea terrestris (Dwarf Brodiaea)
Boisduvalia densiflora
Boisduvalia glabella
Boisduvalia stricta
Barbarea orthoceras (Winter Cress)
Baccharis Douglasii
Brassica ssp. (Wild Mustard)
Briza minor (Small Quaking Grass)
Carex stipata (Sedge)
Carex Tracyi
Carex obnupta
Carex densa
Carex barbarae
Carex Cusickii
Carex Hassei
Cammassia Quamash
Crataegus Douglasii (Native Hawthorne)
Cornus californica (Dogwood)
Centaurium floribundum
Cirsium vulgare (Thistle)
Cicuta Douglasii (Water Hemlock)
Chlorogalum pomeridianum (Soap plant)
Cyperus niger (Umbrella Sedge)
Convolvulus arvensis (Bindweed)
Chenopodium spp. (Pigweeds)
Chenopodium ambrosioides (Mexican Tea)
Cotula coronopifolia (Brass Buttons)
Calochortus uniflorus (Star Tulip)
Calandrinia ciliata Menziesii (Red Maids)
Callitriche marginata (Water Starwort)

Deschampsia danthonoides (Hairgrass)
Dipsacus fullonum (Teasel)
Daucus Carota (Wild Carrot)
Danthonia californica
Downingia concolor (vp's)
Equisetum arvense (Horsetail)
Epilobium spp. (Willow Herbs)
Eryngium armatum (Bee-Thistle)
Eryngium aristulatum (Bee-Thistle)
Euphorbia serpyllifolia (Spurge)
Eschscholzia californica (California poppy)
Erodium sp. (Filaree)
Eragrostis hypnoides (Teal Grass)
Fraxinus latifolia (Oregon Ash)
Festuca arundinacea (Fescue - Alta)
Foeniculum sp. (Fennel)
Galium tridium (Cleavers)
Galium spp. (Cleavers)
Geranium dissectum (Wild Geranium)
Glyceria elata
Gnaphalium purpureum (Purple Cudweed)
Gnaphalium chilense (Common Cudweed)
Gnaphalium palustre
Grindelia sp.
Glyceria occidentalis (Manna Grass)
Holcus lanatus (Velvet Grass)
Hypericum anagalloides (Tinker's Penny)
Hypericum perforatum (Klamath Weed)
Hemizonia congesta (Tarweed)
Hemizonia sp.
Hypochoeris glabra
Helenium puberulum (Sneezeweed)
Hordeum hystrix (Wild Barley)
Hordeum brachyantherum (Barley)
Humulus Lupulus (Hops)
Heleocharis rostellata (Walking Sedge)
Holocarpha virgata (Tarweed)
Isoetes Howellii (Quillwort) Rare
Juncus phaeocephalus
Juncus effusus v. pacificus
Juncus dubius
Juncus Bolanderi
Juncus bufonius (Toadrush)
Juncus occidentalis
Juncus oxymiris
Jussiaea repens v. peploides (Aquatic)
Kickxia Elatine (Scroph) (Fluellin)
Luzula Spp. (Woodrush)
Lotus Purshianus (Spanish Clover)
Lotus corniculatus (Birdsfoot Trefoil)
Lemna minor (Duckweed)
Lippia nodiflora (Lippia)
Lythrum Hyssopifolia (Loosestrife)
Lonicera involucrata (Twinberry)
Leontodon nudicaulis (Hawkbit)

Linum angustifolium (Blue Flax)
Lathyrus Sp. (Pea)
Lolium multiflorum (Rye)
Lactuca spp. (Wild Lettuce)
Limnanthes vinculans (Rare Meadow Foam) Rare
Limnanthes Douglasii & ssp. (Meadow Foam)
Lilaea scilloides (Flowering Quillwort)
Myrica californica (Wax Myrtle)
Mentha Pulegium (Pennyroyal)
Mimulus guttatus (Monkeyflower)
Myriophyllum brasiliense (Braz. Milfoil)
Madia sativa (Common Tarweed)
Marrubium vulgare (Horehound)
Medicago hispida (Bur-Clover)
Melilotus albus (White Melilot)
Melilotus indicus (Yellow Melilot)
Matricaria matricarioides (Pineapple Weed)
Marah sp. (Wild Cucumber)
Machaerocarpus californicus (Star Water Plantain)
Myosurus minimus (Mousetail)
Marsilea vestita (Clover Fern)
Nasturtium officinale (Watercress)
Navarretia squarrosa (Skunkweed)
Oenanthe sarmentosa (Water Parsley)
Polygonum hydropiperoides
Plantago major (Common Plantain)
Plantago lanceolata (Buckhorn)
Polyogon monspeliensis (Common Beardgrass)
Phalaris arundinacea (Reed Canary Grass)
Picris echioides (Ox Tongue)
Perideridia Gairdneri (Yampah) Rare
Poa annua (Annual Bluegrass)
Plagiobothrys sp. (Marsh Popcorn Flower)
Pleuropogon californicus (Semaphore Grass)
Pogogyne Douglasii parviflora (Popogyne)
Quercus lobata (Valley Oak)
Rumex crispus (Curley Dock)
Rumex conglomeratus (Dock)
Rumex pulcher (Fiddle Dock)
Rumex Acetosella (Sheep Sorrel)
Rumex salicifolius (complex) (Native Dock)
Rubus procerus (Himalaya Berry)
Rubus vitifolius (Native Blackberry)
Rosa sp. (intro) (Rose)
Rhus diversiloba (Poison Oak)
Ranunculus californicus (Cal. Buttercup)
Ranunculus Lobbii (Aquatic Buttercup)
Ranunculus muricatus (Spiny Buttercup)
Ranunculus sp. (Buttercup)
Ranunculus Bloomeri (Bloomer's Buttercup)
Ribes divaricatum (Gooseberry)
Raphanus sativus (Wild Radish)
Rorippa curvisiliqua (Yellow Cress)
Sisyrinchium bellum (Blue-eyed Grass)
Sisyrinchium californicum (Yellow-eyed Grass)

Sonchus asper (Sow Thistle)
Sagittaria sp. (Arrowhead)
Salix spp. (Willows)
Scirpus acutus (Common Tule)
Scirpus microcarnus (Bulrush)
Scirpus cernuus (Small Bulrush)
Scirpus koilolepis (Small Bulrush)
Scirpus fluviatilis (River Bulrush) Rare
Sparganium eurycarpum (Bur-reed)
Sparganium multipedunculatum (Bur-Reed) Rare
Sium suave (Water Parsnip)
Solidago occidentalis (Western Goldenrod)
Silene gallica (Windmill Pink)
Stachys rigida quercetorum (Hedge Nettle)
Stachys Chamissonis (Coast Nettle)
Stachys ajugoides (Hairy Nettle)
Sidalcea malvaeflora (Common Checker)
Sidalcea diploscypha (Checker)
Solanum nodiflorum (Nightshade)
Sagina occidentalis (Pearlwort)
Spergularia rubra (Pink Spurrey)
Soliva sessilis (Comp)
Sherardia arvensis (Field Madder)
Symphoricarpos rivularis (Snowberry)
Trifolium Wormskioldii (Cow Clover)
Trifolium repens (White Clover)
Trifolium appendiculatum (Clover)
Trifolium gracilentum
Trifolium subterraneum (Underground Clover)
Trifolium barbigerum
Trifolium depauperatum (Small Clover)
Trifolium variegatum (White-Tip Clover)
Typha latifolia (Cattail)
Tragopogon porrifolius (Oyster Plant)
Taraxacum vulgare (Dandelion)
Tillaea aquatica (Pigmy Weed)
Urtica holosericea (Stinging Nettle)
Veronica americana (Am. Brooklime)
Veronica Anagallis-aquatica (Eur. Brooklime)
Veronica perigrina (Speedwell)
Vicia dasycarpa (Purple Vetch)
Vicia sativa (Spring Vetch)
Vicia angustifolia (Vetch)
Wyethia glabra (Mule's Ears)
Wyethia angustifolia (Narrow-leaved Mule's Ears)
Xanthium strumarium v. canadense (Common Cocklebur)

VERNAL POOL FLORA OF THE LAGUNA DE SANTA ROSA

Taken from a list compiled by Nancy Harrison for the California Native Plant Society - Milo Baker Chapter.

- Isoetes Howellii (Quillwort)
- Myosurus minimus (Mousetail)
- Ranunculus pusillus
- Ranunculus californicus
- Ranunculus muricatus (intro)
- Ranunculus Bloomeri
- Ranunculus Lobbii
- Sidalcea diploscypha
- Limnanthes Douglasii Douglasii
- Limnanthes Douglasii nivea
- * Limnanthes vinculans
- Portulacaceae Montia hallii
- Navarretia Bakeri
- Navarretia tagetina
- Navarretia cotulaefolia
- Navarretia intertexta
- Navarretia viscidula
- Navarretia squarrosa
- Plagiobothrys stipitatus
- Plagiobothrys bracteatus
- Plagiobothrys Greenei
- Nemophila Menziesii atomaria
- Gratiola ebracteata
- Veronica peregrina
- Mimulus tricolor
- Orthocarpus pusillus
- Orthocarpus attenuatus
- Orthocarpus faucibarbus
- Orthocarpus densiflorus
- Orthocarpus castillejoides
- Mentha Pulegium (intro.)
- * Pogogyne Douglasii parviflora
- Tillaea aquatica
- Cicendia quadrangularis
- Centaurium (floribundum)
- Trifolium appendiculatum
- Trifolium tridentatum
- Trifolium microdon
- Lotus Purshianus
- Lythrum Hyssopifolia
- Boisduvalia densiflora
- Boisduvalia glabella
- Boisduvalia stricta
- Clarkia purpurea quadrivulnera
- Oenothera ovata
- Callitriche (marginata)
- Eryngium aristulatum
- * Perideridia Gairdneri Gairdneri
- Downingia concolor
- * Blennosperma Bakeri

Evax sparsiflora
 * Lasthenia Burkei
Lasthenia chrysostoma
Lasthenia glaberrima
Layia chrysanthemoides
Psilocarphus tenellus
Gnaphalium palustre
Gnaphalium chilense
Madia sativa
Holocarpha virgata
Wyethia angustifolia
Solidago occidentalis
Aster chilensis

MONOCOTS

Alisma triviale
Machaerocarpus californicus
Lilaea scilloides
Juncus bufonius (cos.)
Juncus phaeocephalus
Pleuropogon californicus
Danthonia californica
Deschampsia danthonoides
Phalaris naradoxa
Calochortus uniflorus
Calochortus luteus (high ground)
Chlorogalum pomeridianum
Brodiaea hyacinthina
Brodiaea terrestris
Brodiaea congesta (high ground)

* Indicates rare and endangered.

ALGAE IN THE LAGUNA DE SANTA ROSA

Algae observed in water samples taken during the course of this study and identified with the aid of Dr. Chris Kjeldson of the Biology Department of Sonoma State College and of Gary Chere, a student of the same department.

Filamentous

Tribonema
Oedogonium
Vaucheria

Unicellular Flagellates

Trachalomones
Euglena
Phacus

Diatoms

Nitzschia
 (Other diatoms
 not named at
 this time)

LIST OF BIRDS OBSERVED NEAR THE LAGUNA DE SANTA ROSA

A species list based on 20 years of observation by the late Gordon L. Bolander, a resident of the area.

SPECIES	STATUS
Common Loon	<u>Gavia immer</u> W, Rare
Horned Grebe	<u>Podiceps auritus</u> W, Rare
Red-throated Loon	<u>Gavia stellata</u> W, A
Eared Grebe	<u>Podiceps caspicus</u> W
Western Grebe	<u>Aechmophorus occidentalis</u> W
Pied-billed Grebe	<u>Podilymbus podiceps</u> R, B
White Pelican	<u>Pelecanus erythrorhynchos</u> Rare
Double-crested Cormorant	<u>Phalacrocorax auritus</u> W
Great Blue Heron	<u>Ardea herodias</u> R, B
Green Heron	<u>Butorides virescens</u> S
Cattle Egret	<u>Bubulus ibis</u> W, Rare
Great Egret	<u>Ardea occidentalis</u> R
Snowy Egret	<u>Leucophoyx thula</u> R
Black-crowned Night Heron	<u>Nycticorax nycticorax</u> R, B
American Bittern	<u>Botaurus lentiginosus</u> R, B
Whistling Swan	<u>Olor columbianus</u> W, M
* Trumpeter Swan	<u>Olor buccinator</u> W
Canada Goose	<u>Branta canadensis</u> W, M
Black Brant	<u>Branta nigricans</u> Rare
White-fronted Goose	<u>Anser albifrons</u> W
Snow Goose	<u>Chen hyperborea</u> M
Ross Goose	<u>Chen rossii</u> W, A
Mallard	<u>Anas platyrhynchos</u> R, B
Gadwall	<u>Anas strepera</u> W
Pintail	<u>Anas acuta</u> W
Green-winged Teal	<u>Anas carolinensis</u> W
Blue-winged Teal	<u>Anas discars</u> S, B
Cinnamon Teal	<u>Anas cyanoptera</u> S, B
American Wigeon	<u>Mareca americana</u> W
Northern Shoveler	<u>Spatula clypeata</u> W
Wood Duck	<u>Aix sponsa</u> R, B
Redhead	<u>Aythya americana</u> W
Ring-necked duck	<u>Aythya collaris</u> W
Canvasback	<u>Aythya valisineria</u> W
Greater Scaup	<u>Aythya marila</u> W
Lesser Scaup	<u>Aythya affinis</u> W
Common Goldeneye	<u>Bucephala clangula</u> W
Bufflehead	<u>Bucephala albeola</u> W
White-winged Scoter	<u>Melanitta deglandi</u> W, Rare
Surf Scoter	<u>Melanitta perspicillata</u> W, A
Ruddy Duck	<u>Oxyura jamaicensis</u> W
Hooded Merganser	<u>Lophodytes cucullatus</u> W
Common Merganser	<u>Mergus merganser</u> M
Turkey Vulture	<u>Cathartes aura</u> R
White-tailed Kite	<u>Elanus leucurus</u> R, B
Goshawk	<u>Accipiter gentilis</u> V, Rare
Sharp-shinned Hawk	<u>Accipiter striatus</u> W

Cooper's Hawk	<u>Accipiter cooperii</u>	W
Red-tailed Hawk	<u>Buteo jamaicensis</u>	R
Red-shouldered Hawk	<u>Buteo lineatus</u>	R
Rough-legged Hawk	<u>Buteo lagopus</u>	M
Ferruginous Hawk	<u>Buteo regalis</u>	M, Rare
Golden Eagle	<u>Aquila chrysaetos</u>	Rare
* Bald Eagle	<u>Haliaeetus leucocephalus</u>	W, Rare
Marsh Hawk	<u>Circus cyaneus</u>	W
Osprey	<u>Pandion haliaetus</u>	M
* Prairie Falcon	<u>Falco mexicanus</u>	Rare
* Peregrine Falcon	<u>Falco peregrinus</u>	Rare
Merlin		W, M
American Kestrel	<u>Falco sparverius</u>	R
California Quail	<u>Lophortyx californicus</u>	R
Ring-necked Pheasant	<u>Phasianus colchicus</u>	R
* Virginia Rail	<u>Rallus limicola</u>	
* Sora	<u>Porzana carolina</u>	Rare
Common Gallinule	<u>Gallinula chloropus</u>	W
American Coot	<u>Fulica americana</u>	
Semipalmated Plover	<u>Charadrius semipalmatus</u>	M, Rare
Killdeer	<u>Charadrius vociferus</u>	R, B
Black-bellied Plover	<u>Squatarola squatarola</u>	M
Common Snipe	<u>Capella gallinago</u>	W
Long-billed Curlew	<u>Numenius americanus</u>	M
Whimbrel	<u>Numenius phaeopus</u>	M
Spotted Sandpiper	<u>Actitis macularia</u>	W, M
Solitary Sandpiper	<u>Tringa solitaria</u>	W, M, Rare
Greater Yellowlegs	<u>Totanus melanoleucus</u>	M
Lesser Yellowlegs	<u>Totanus flavines</u>	M, Rare
Pectoral Sandpiper	<u>Erolia melanotos</u>	M, Rare
Least Sandpiper	<u>Erolia minutilla</u>	M
Dunlin	<u>Erolia alpina</u>	M
Short-billed Dowitcher	<u>Limnodromus griseus</u>	M
Long-billed Dowitcher	<u>Limnodromus scolopaceus</u>	M
Western Sandpiper	<u>Ereunetes mauri</u>	M
Sanderling	<u>Crocethea alba</u>	M, A
American Avocet	<u>Recurvirostra americana</u>	M, Rare
Black-necked Stilt	<u>Himantopus mexicanus</u>	M, Rare
Red Phalarope	<u>Phalaropus fulicarius</u>	Rare
Wilson's Phalarope	<u>Steganopus tricolor</u>	M, Rare
Northern Phalarope	<u>Lobipes lobatus</u>	M
Glaucous-winged Gull	<u>Larus glaucescens</u>	W
Western Gull	<u>Larus occidentalis</u>	Rare
Herring Gull	<u>Larus argentatus</u>	W
California Gull	<u>Larus californicus</u>	W
Ring-billed Gull	<u>Larus delawarensis</u>	W
Mew Gull	<u>Larus canus</u>	W
Bonaparte's Gull	<u>Larus philadelphia</u>	M
Forster's Tern	<u>Sterna forsteri</u>	M
Caspian Tern	<u>Hydroprogne caspia</u>	M
Black Tern	<u>Chidonias niger</u>	A
Band-tailed Pigeon	<u>Columba fasciata</u>	M
Rock Dove	<u>Columba livia</u>	R
Mourning Dove	<u>Zenaidura macroura</u>	R

Roadrunner	<u>Geococcyx californianus</u>	A
Barn Owl	<u>Tyto alba</u>	R
Screech Owl	<u>Otus asia</u>	R
Great Horned Owl	<u>Bubo virginianus</u>	R
Pygmy Owl	<u>Glaucidium gnoma</u>	A
Burrowing Owl	<u>Speotyto cunicularia</u>	Rare
Spotted Owl	<u>Strix occidentalis</u>	V, A
Long-eared Owl	<u>Asio otus</u>	M, Rare
Short-eared Owl	<u>Asio flammeus</u>	W
Saw-whet Owl	<u>Aegolius acadicus</u>	W
Common Nighthawk	<u>Chordeiles minor</u>	A
Vaux's Swift	<u>Chaetura vauxi</u>	M
White-throated Swift	<u>Aeronaytes saxatalis</u>	M
Anna's Hummingbird	<u>Calypte anna</u>	R
Rufous Hummingbird	<u>Selasphorus rufus</u>	M
Allen's Hummingbird	<u>Selasphorus sasin</u>	S
Calliope Hummingbird	<u>Stellula calliope</u>	M, R
Belted Kingfisher	<u>Megaceryle alcyon</u>	R
Common Flicker	<u>Colaptes cafer</u>	R
Pileated Woodpecker	<u>Dryocopus pileatus</u>	V, Rare
Acorn Woodpecker	<u>Melanerpes formicivorus</u>	R
Lewis Woodpecker	<u>Asyndesmus lewis</u>	M
Yellow-bellied Sapsucker	<u>Sphyrapicus varius</u>	R
Hairy Woodpecker	<u>Dendrocopos villosus</u>	V
Downy Woodpecker	<u>Dendrocopos pubescens</u>	R
Nuttall's Woodpecker	<u>Dendrocopos nuttallii</u>	R
Western Kingbird	<u>Tyrannus verticalis</u>	M
Ash-throated Flycatcher	<u>Myiarchus cinerascens</u>	S
Black-Phoebe	<u>Sayornis nigricans</u>	R
Say's Phoebe	<u>Sayornis saya</u>	W
Willow Flycatcher		M
Western Flycatcher	<u>Empidonax difficilis</u>	S
Olive-sided Flycatcher	<u>Nuttallornis borealis</u>	S
Western Wood Pewee	<u>Contopus sordidulus</u>	S
Horned Lark	<u>Eremophila alpestris</u>	V, Rare
Violet-green Swallow	<u>Tachycineta thalassina</u>	M, B
Tree Swallow	<u>Iridoprocne bicolor</u>	S, W
Rough-winged Swallow	<u>Stelgidopteryx ruficollis</u>	S
Barn Swallow	<u>Hirundo rustica</u>	S
Cliff Swallow	<u>Petrochelidon pyrrhonota</u>	S
Purple Martin	<u>Progne subis</u>	M
Steller's Jay	<u>Cyanocitta stelleri</u>	W
Scrub Jay	<u>Aphelocoma coerulescens</u>	R
Yellow-billed Magpie	<u>Pica nuttalli</u>	A
Common Raven	<u>Corvus corax</u>	V
Common Crow	<u>Corvus brachyrhynchos</u>	R
Chestnut-backed Chickadee	<u>Parus rufescens</u>	R
Plain Titmouse	<u>Parus inornatus</u>	R
Bushtit	<u>Psaltriparus minimus</u>	R
White-breasted Nuthatch	<u>Sitta carolinensis</u>	R
Red-breasted Nuthatch	<u>Sitta canadensis</u>	W
Pygmy Nuthatch	<u>Sitta pygmaea</u>	V, Rare
Brown Creeper	<u>Certhia familiaris</u>	R
Wrentit	<u>Chamaea fasciata</u>	R
House Wren	<u>Troglodytes aedon</u>	M

Winter Wren	<u>Troglodytes troglodytes</u>	W
Bewick's Wren	<u>Thryomanes bewickii</u>	R
Long-billed Marsh Wren	<u>Cistothorus platensis</u>	R
Mockingbird	<u>Mimus polyglottos</u>	R
California Thrasher	<u>Toxostoma redivivum</u>	R
American Robin	<u>Turdus migratorius</u>	R
Varied Thrush	<u>Ixoreus naevius</u>	W
Hermit Thrush	<u>Hylocichla guttata</u>	W
Swainson's Thrush	<u>Hylocichla ustulata</u>	S
Western Bluebird	<u>Sialia mexicana</u>	R
Blue-gray Gnatcatcher	<u>Polioptila caerulea</u>	M
Golden-crowned Kinglet	<u>Regulus satrapa</u>	W
Ruby-crowned Kinglet	<u>Regulus calendula</u>	W
Water Pipit	<u>Anthus spinoletta</u>	W
Cedar Waxwing	<u>Bombycilla cedrorum</u>	W
Northern Shrike	<u>Lanius excubitor</u>	W, Rare
Loggerhead Shrike	<u>Lanius ludouicianus</u>	R
Starling	<u>Sturnus vulgaris</u>	R
Hutton's Vireo	<u>Vireo huttoni</u>	R
Solitary Vireo	<u>Vireo solitarius</u>	M
Warbling Vireo	<u>Vireo gilvus</u>	S
Black and White Warbler	<u>Mniotilta varia</u>	Rare, M
Tennessee Warbler	<u>Vermivora peregrina</u>	Rare, M
Orange-crowned Warbler	<u>Vermivora celata</u>	S
Nashville Warbler	<u>Vermivora ruficapilla</u>	M
Yellow Warbler	<u>Denfroica petechia</u>	S
Yellow-rumped Warbler		W
Northern Parula Warbler	<u>Parula americana</u>	M, Rare
Black-throated gray Warbler	<u>Dendroica nigrescens</u>	M
Townsend's Warbler	<u>Dendroica Townsendi</u>	W
Hermit Warbler	<u>Dendroica occidentalis</u>	M
Chestnut-sided Warbler	<u>Dendroica pensylvanica</u>	M, Rare
Blackpoll Warbler	<u>Dendroica striata</u>	M, Rare
McGillivray's Warbler	<u>Oporornis tolmiei</u>	M
Common Yellowthroat	<u>Geothlypis trichas</u>	S
Yellow-breasted Chat	<u>Icteria virens</u>	S
Wilson's Warbler	<u>Wilsonia pusilla</u>	S, M
American Redstart	<u>Setophaga ruticilla</u>	M, Rare
House Sparrow	<u>Passer domesticus</u>	R
Western Meadowlark	<u>Sturnella neglecta</u>	R
Yellow-headed Blackbird	<u>Xanthocephalus xanthocephalus</u>	M, Rare
Red-winged Blackbird	<u>Agelaius phoeniceus</u>	R
Tri-colored Blackbird	<u>Agelaius tricolor</u>	V
Northern Oriole		S
Brewer's Blackbird	<u>Euphagus cyanocephalus</u>	R
Brown-headed cowbird	<u>Molothus ater</u>	R
Western Tanager	<u>Piranga ludoviciana</u>	S
Summer Tanager	<u>Piranga rubra</u>	M
Black-headed Grosbeak	<u>Pheucticus melanocephalus</u>	S
Blue Grosbeak	<u>Guiraca caerulea</u>	V, Rare
Lazuli Bunting	<u>Passerina amoena</u>	M
Painted Bunting	<u>Passerina ciris</u>	A
Evening Grosbeak	<u>Hesperiphona vespertina</u>	W
Purple Finch	<u>Carpodacus nurnureus</u>	R
House Finch	<u>Carpodacus mexicanus</u>	R

Pine Siskin	<u>Spinus pinus</u>	R
American Goldfinch	<u>Spinus Tristis</u>	R
Lesser Goldfinch	<u>Spinus psaltria</u>	R
Lawrence's Goldfinch	<u>Spinus lawrencei</u>	S
Red Crossbill	<u>Loxia curvirostra</u>	
Green-tailed Towhee	<u>Chlorura chlorura</u>	A
Rufous-sided Towhee	<u>Pipilo erythrophthalmus</u>	R
Brown Towhee	<u>Pipilo fuscus</u>	R
Savannah Sparrow	<u>Passerculus sandwichensis</u>	W
Lark Sparrow	<u>Chondestes grammacus</u>	M
Dark-eyed Junco		W
Chipping Sparrow	<u>Snizella passerina</u>	S
White-crowned Sparrow	<u>Zonotrichia leucophrys</u>	
Golden-crowned Sparrow	<u>Zonotrichia atricapilla</u>	W
White-throated Sparrow	<u>Zonotrichia albicollis</u>	
Fox Sparrow	<u>Passerella iliaca</u>	W
Lincoln's Sparrow	<u>Melospiza lincolnii</u>	
Swamp Sparrow	<u>Melospiza georgiana</u>	W, Rare
Song Sparrow	<u>Melospiza melodia</u>	R
Stilt Sandpiper	<u>Micropalama himantopus</u>	A
Yellow Billed Cuckoo	<u>Coccyzus americanus</u>	

-
- R - Resident year round
 - S - Summer resident
 - W - Winter resident
 - B - Breeding
 - M - Migrant
 - V - Vagrant
 - A - Accidental
 - * - Endangered Species

LIST OF MAMMALS OBSERVED ALONG THE LAGUNA

Black-tailed Deer
Raccoon
Striped Skunk
Spotted Skunk
Gray Fox
Mink
Weasel *
River Otter
Jack Rabbit
Brush Rabbit
Pocket Gopher
Mole
Wood Rat
White-footed Mouse
Meadow Mouse
Brown Bat
Hoary Bat
Red Bat
Muskrat
Gray Squirrel
Bobcat *

From a list by Gordon Bolander

* Indicates added to list during the study.

LIST OF FISHES OF THE LAGUNA DE SANTA ROSA

Pacific lamprey	<u>Lampetra tridentata</u>
Threespine stickleback	<u>Gasterosteus aculeatus</u>
* White catfish	<u>Ictalurus catus</u>
* Brown bullhead	<u>Ictalurus nebulosus</u>
* Mosquitofish	<u>Gambusia affinis</u>
Prickly sculpin	<u>Cottus asper</u>
Rainbow trout/steelhead	<u>Salmo gairdneri</u>
Silver salmon (accidental)	<u>Onocorhynchus kisutch</u>
Tule perch	<u>Hysterothorax traski</u>
* Largemouth black bass	<u>Micropterus salmoides</u>
* Bluegill	<u>Lepomis macrochirus</u>
* Redear sunfish	<u>Lepomis microlophus</u>
* Green sunfish	<u>Lepomis cyanellus</u>
* White crappie	<u>Pomoxis annularis</u>
Western sucker	<u>Catostomus occidentalis</u>
* Common carp	<u>Cyprinus carpio</u>
Sacramento blackfish	<u>Orthodon microlepidotus</u>
Sacramento roach	<u>Hesperoleucis symmetricus</u>
Sacramento squawfish	<u>Ptychocheilus grandis</u>

* = introduced species

REPTILES AND AMPHIBIANS OBSERVED IN THE AREA

Pacific Mud Turtle
Bull Frog
Pacific tree frog
Western toad
Yellow-legged frog
Slender salamander
Arboreal salamander
Ensatina (Yellow-eyed salamander)
Yellow-bellied racer
Gopher snake
Garter snake
King snake
Fence lizard
Skink
Southern alligator lizard
Northern alligator lizard

Appendix C

Laguna de Santa Rosa National Wildlife Refuge
Preliminary Estimates - 11/17/88

Refuge boundaries contain approx.	8850± acres
minus existing publicly owned lands	(2075±)
minus 10% likely to stay private	(885±)

Rough estimate of acquisition acreage	5890± acres
times estimated average price per acre	X \$3000

Rough estimate of purchase price, land only	\$17,670,000
minus CA Dept. of Fish & Game's Prop. 70 funds	(\$4,000,000)

Rough estimate of Federal share of purchase price, land only
\$13,670,000

Acquisition would be from willing sellers only and would include gifts, bargain sales, and market sales of fee, conservation easement, and remainder interests.

