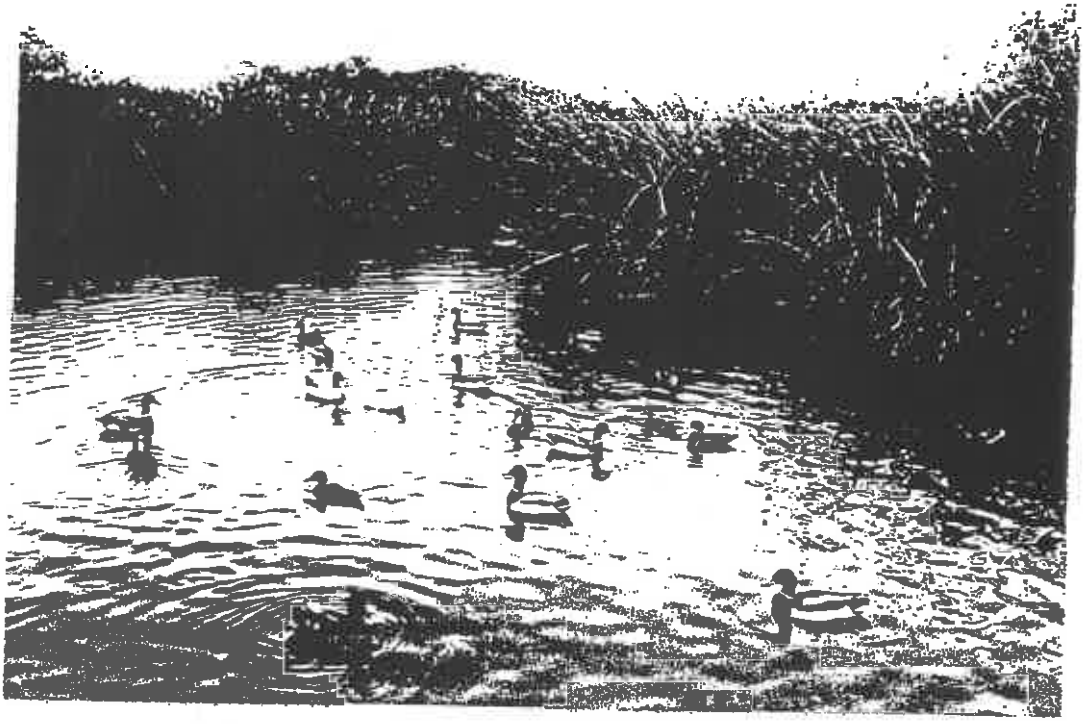
Neary Lagoon Management Plan



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PREPARED FOR:

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City of Santa Cruz
Santa Cruz, California

NEARY LAGOON
MANAGEMENT PLAN
CITY OF SANTA CRUZ

November 1992

Neary Lagoon Management Plan

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INTRODUCTION

CHAPTER 1
INTRODUCTION

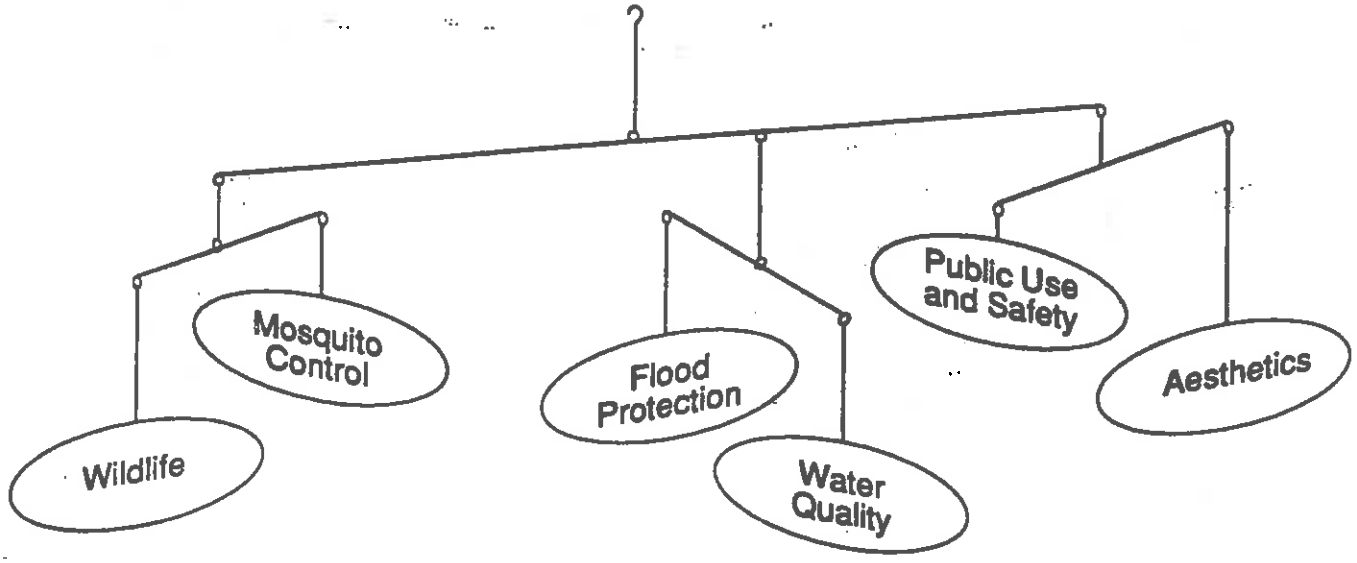
Need and Purpose

Virtually isolated within the expanding urban matrix of Santa Cruz, Neary Lagoon is an important natural area. It provides valuable habitat for wildlife and a unique resource for the community despite the impacts associated with efforts made in the last century to drain and fill it and the more recent impacts of encroaching development, introductions of exotic plants and animals, urban runoff, and increased public use. Today, impacts and pressures continue to threaten the lagoon's character, quality, and integrity. Without informed and comprehensive management of the lagoon and its environs, the value of the area for wildlife and people could diminish or be lost entirely.

The Neary Lagoon Management Plan has been prepared as a comprehensive guide and directive for managing the lagoon area to ensure its long-term viability as an ecosystem and its value as a unique resource for the community. Goals, objectives, and actions described in the plan are designed with the purpose of preserving and enhancing the lagoon's environmental integrity and quality while satisfying other purposes for public use and safety. This management plan is intended to guide all aspects of operations, maintenance, protection, improvements, and monitoring consistent with these purposes. To obtain full approval by the California Coastal Commission (CCC), the management plan also is intended to satisfy the CCC's requirements that it integrate and be consistent with all previous, partially approved elements of the plan and that it satisfy other CCC conditions and concerns.

The plan provides direction for creating a balance between the lagoon's various purposes for wildlife values, public use and safety, flood protection, water quality, mosquito control, and aesthetics. Achieving this balance of purposes will require a detailed level of ongoing management that is comprehensive and adaptive to changes. Without such management, the lagoon could eventually have adverse effects on wildlife, people, or both, and valuable resources may be diminished or lost as a result.

Balance of Purpose



INTRODUCTION

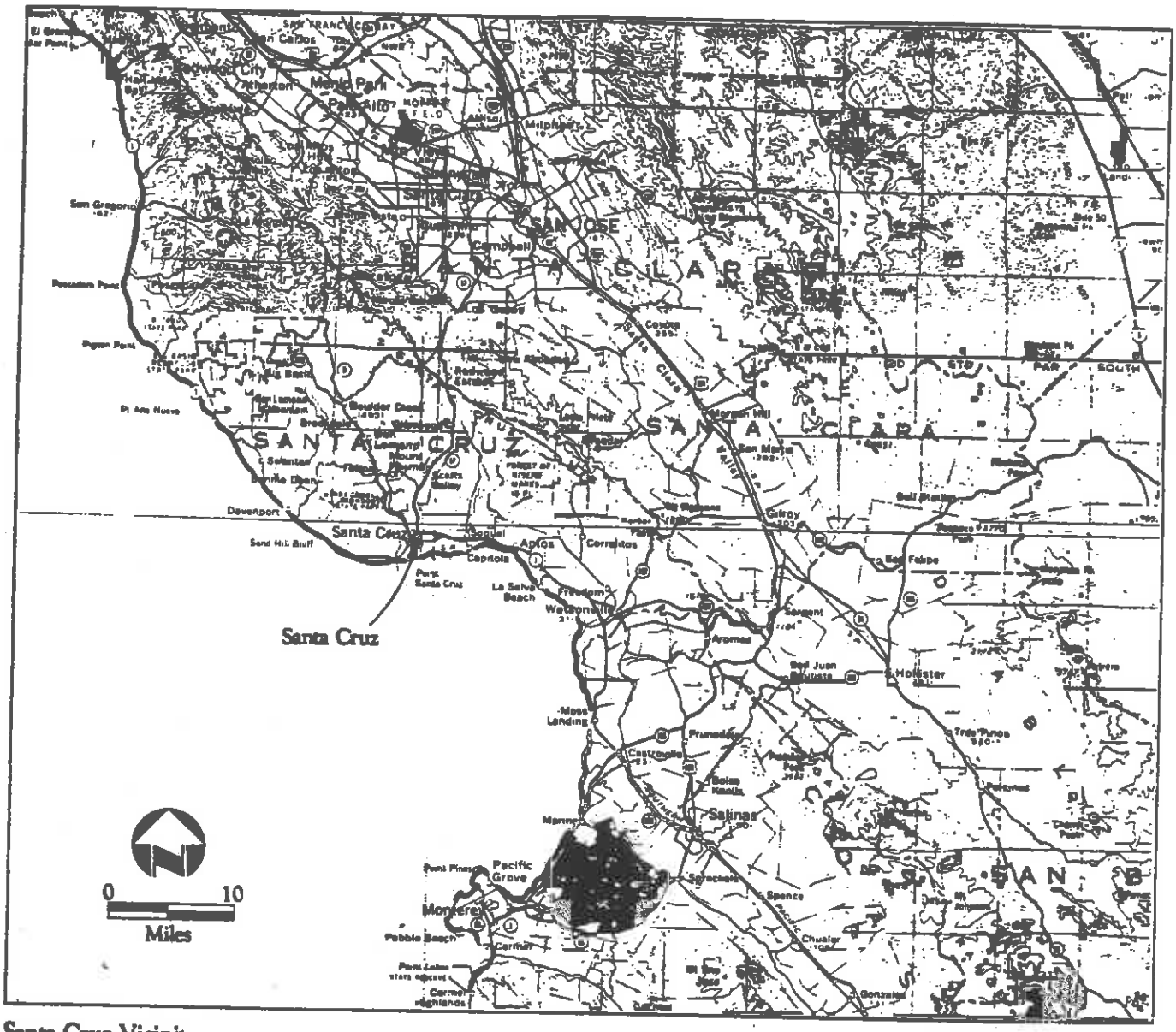
The objectives of this management plan are the following:

- **Fulfill** CCC conditions and requirements for preparing a management plan for Neary Lagoon as specified in the 1975 coastal permit (P-1523) for constructing recreation improvements; the August 1978 Neary Lagoon Park and Wildlife Refuge Management Plan Outline prepared by Harvey & Stanley Associates; and the CCC directive contained in the 1989 coastal permit (3-89-54) and subsequent work program.
- **Fulfill** general plan local coastal program (LCP) policies directing preparation of management plans.
- **Fulfill** requirements of Section 24.14.080.4c of the City of Santa Cruz LCP for an approved management plan for Neary Lagoon to enable approval of projects in and adjacent to the lagoon that are found to be consistent with that plan.
- **Serve** as the basis for future funding and budgeting requests for implementing elements of the management plan.
- **Demonstrate** that a viable ecosystem will be maintained at Neary Lagoon with the addition of wastewater treatment plant facilities adjacent to the lagoon management area.

Environmental Setting

Neary Lagoon is located in Santa Cruz County on California's north-central coast (Figure 1-1). The lagoon is less than 1 mile southwest of downtown Santa Cruz and within 0.25 mile north of the Municipal Pier at Cowell Beach (Figure 1-2).

The lagoon is within a few minutes' walk of numerous residences and important commercial, hotel, and visitor facilities, including the Santa Cruz Boardwalk amusement park, beaches, and the Pacific Garden Mall. A new factory outlet center

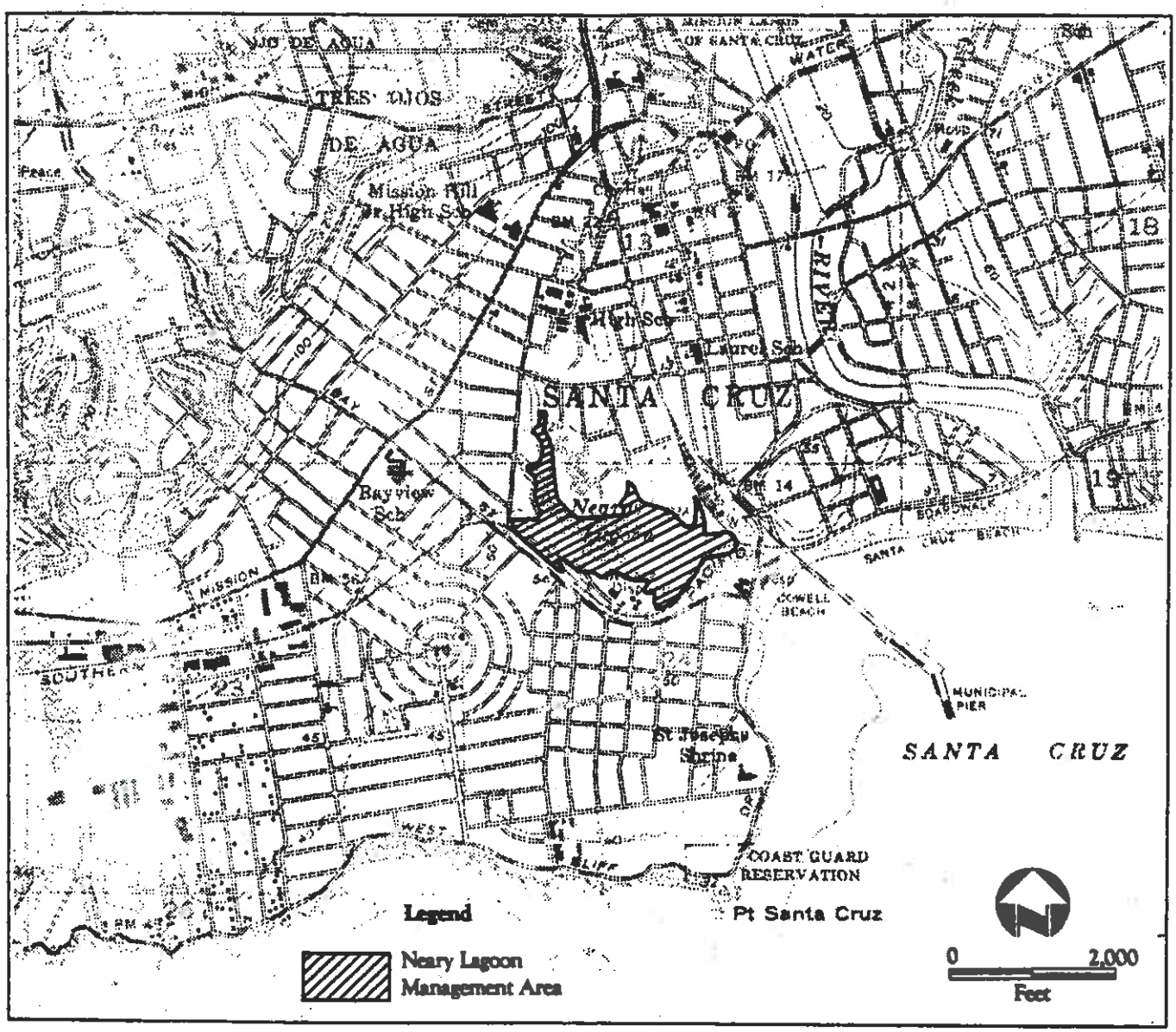


Santa Cruz Vicinity

Figure 1-1

retail development at the former site of the Ice Plant is planned to be constructed near the intersection of Chestnut and Laurel Streets north of Neary Lagoon. The Roaring Camp Railroad operates a tourist train that passes the lagoon enroute from the town of Felton to the beach at Santa Cruz.

The lagoon and its environs, described as the Neary Lagoon management area (Figures 1-3 and 1-4), comprise about 44 acres, most of which are wetland, riparian, and woodland habitats. Neary Lagoon is a well-known birdwatching area and has been featured in national birding magazines. Vegetation at the lagoon is

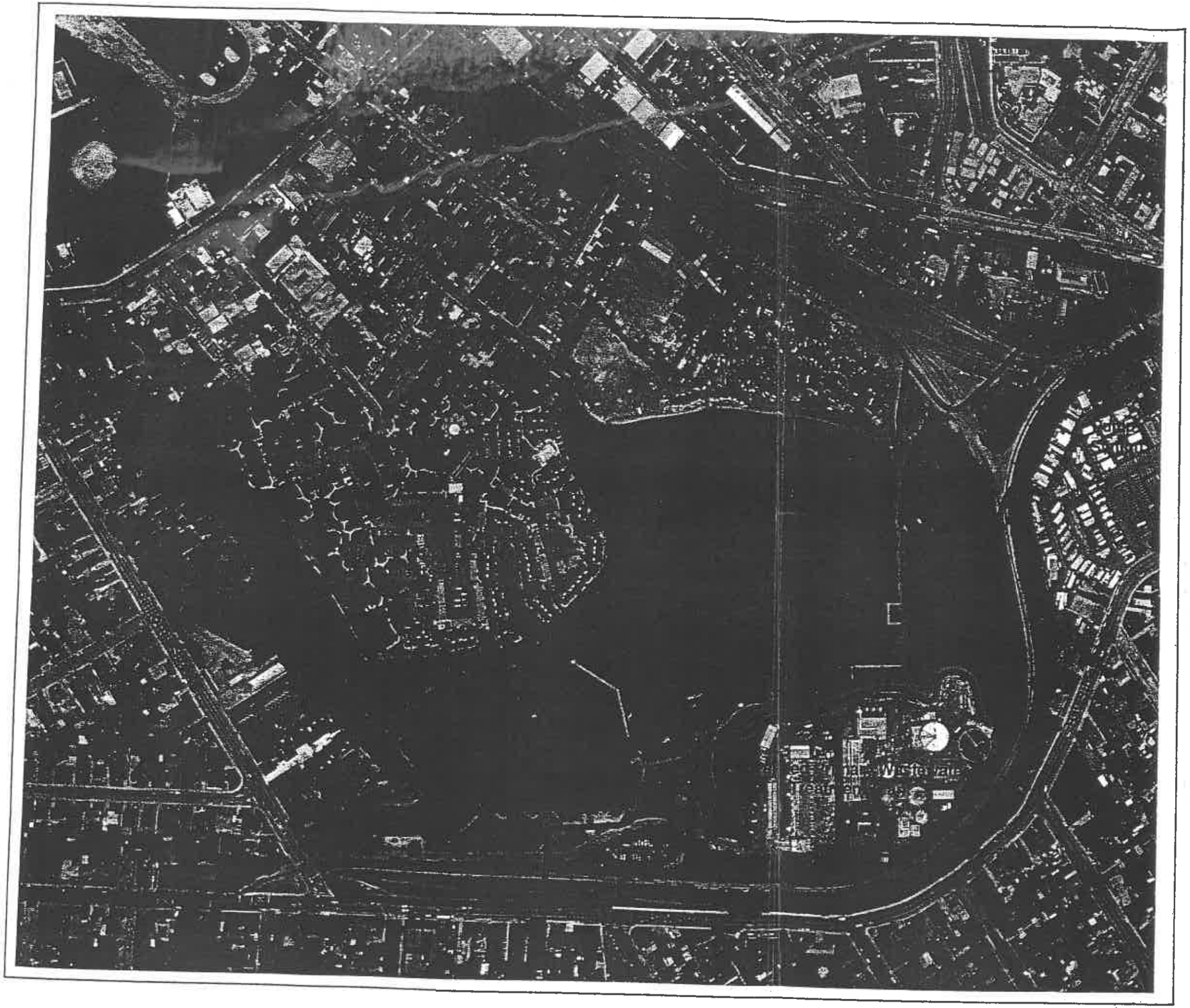


Neary Lagoon Vicinity

Figure 1-2

dominated by riparian and freshwater marsh communities, which occupy approximately 75% of the management area. Other vegetation and land cover types in the management area are mixed oak woodland; ruderal; non-native grassland; parkland and maintained landscape; cleared, graded, or developed land; and open water.

Developed parkland at Neary Lagoon, some of which lies outside the management area boundary, includes a large grassy area with an amphitheater, a children's playground, three full tennis courts and one half court, a picnic area with tables and barbecue facilities, a restroom, and a 24-car parking lot.

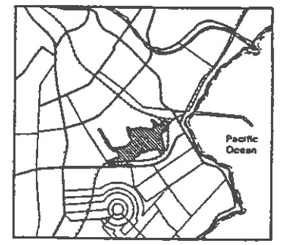


Neary Lagoon Management Area Aerial Photograph

0 100 200 300 400

SCALE IN FEET

Location Map



Source: Jones & Stokes Associates 1991
Date of photograph: July 25, 1991

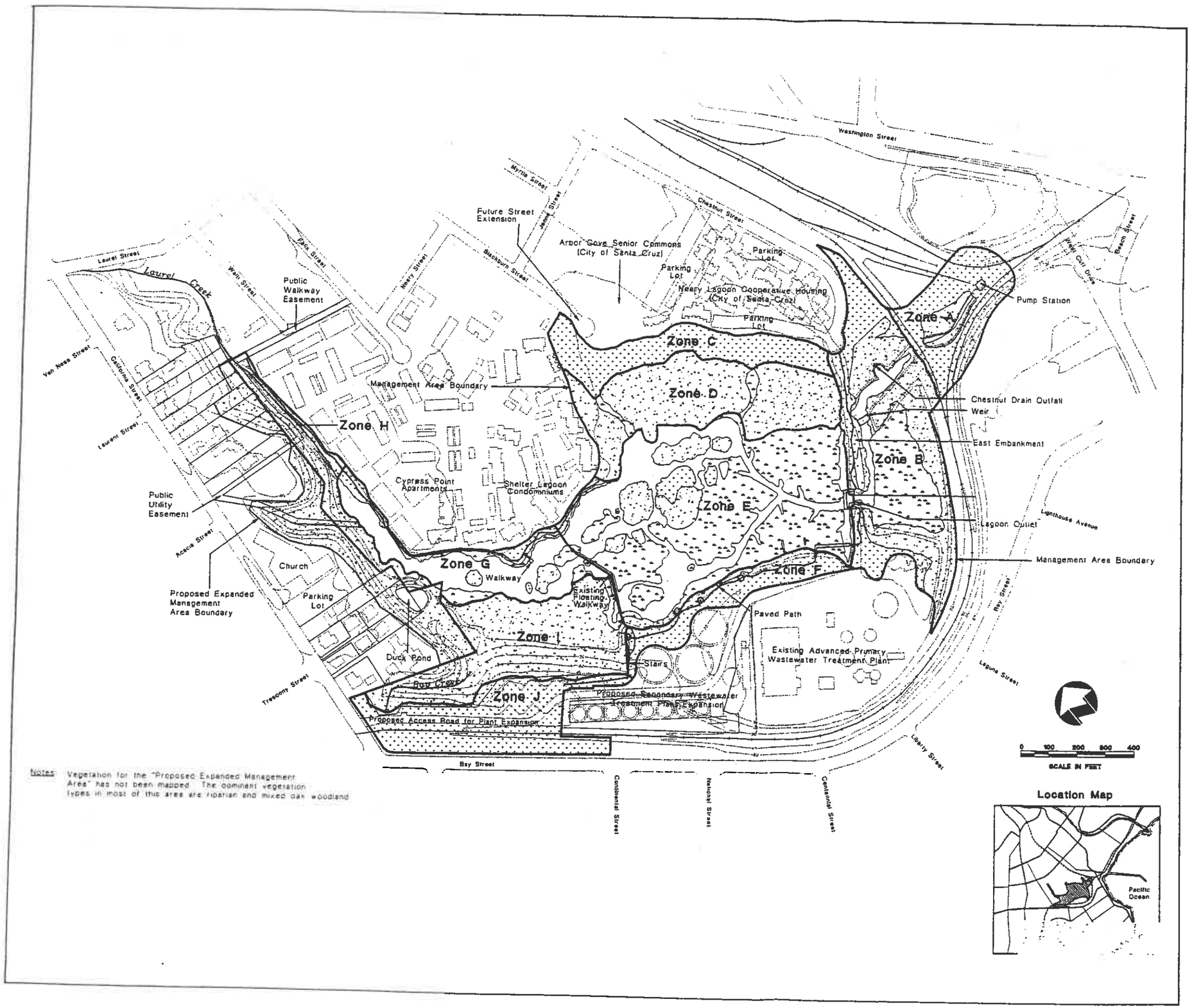
NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 1-3

Neary Lagoon Management Area with Management Zones



Notes: Vegetation for the "Proposed Expanded Management Area" has not been mapped. The dominant vegetation types in most of this area are riparian and mixed oak woodland.

Legend

- Riparian and Mixed Oak Woodland
- Freshwater Marsh
- Other Areas (maintained, recreation, grassland, ruderal)
- Open Water

Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 1-4

Soquel loam (170) generally overlays the alluvial deposits. The liquefaction potential for this soil is moderately high when the water table is close to the surface or soils are saturated. Soquel soils consist of very deep, moderately well-drained material on alluvial fans, plains, and narrow valley bottom. Soquel soils were formed in alluvial deposits derived from sedimentary rock. (U.S. Soil Conservation Service 1980.)

Watsonville loam (176, 178, 179) generally overlays the lowest emergent coastal terrace deposits, and has low liquefaction potential. Watsonville soils consist of very deep, poorly drained soils on old coastal terraces. These soils were formed in alluvium. (U.S. Soil Conservation Service 1980.)

The soil type of the lagoon itself has not been identified by the SCS, so its soil characteristics cannot be accurately described. Soils formed on basin deposits are highly expansive, however, with high liquefaction potential and low strength.

Soil Characteristics

The SCS soil characteristics described here apply only to soils in their natural location and condition. Relocating soils for fill or other purposes, such as habitat enhancement, may alter their characteristics.

The three principal soils identified in the management area exhibit only slight to moderate potential for erosion hazards. On steep slopes, especially the steep escarpment of the bluff, these soils may have a significantly higher potential for erosion. All three soil types tend to have low strength. Shrink-swell potential varies with soil depth but is generally low to moderate near the surface for all three types. The greatest difference among the soils is their potential for corroding concrete. The corrosion potential is high for Watsonville loam, moderate for Soquel loam, and low for Elkhorn sandy.

Shrinking and swelling and normal settlement of soils in the management area may require that special foundations be used for construction. Watsonville loam along the southwestern portion of the management area may limit revegetation possibilities. A dense clay subsoil may be present in that region that could limit the effective root zone to 24 inches. The roots of many native species, however, may penetrate deeper by following cracks in the clay. These soils are best suited for shallowly rooted grasses and shrubs; however, trees could be planted if the subsoil were broken up sufficiently.

Recreation facilities, paved surfaces, structures, and shallow excavations are most appropriate for areas on top of the bluffs away from the slope edge and perhaps on the northeastern side of the lagoon away from the water. Paths near the bluff edge, on the steep escarpment slopes, or in the marsh area should not be paved with asphalt or concrete, but instead should be constructed as raised wooden boardwalks or paved with permeable surfaces, such as decomposed granite, preferably over a gravel base.

Hydrology

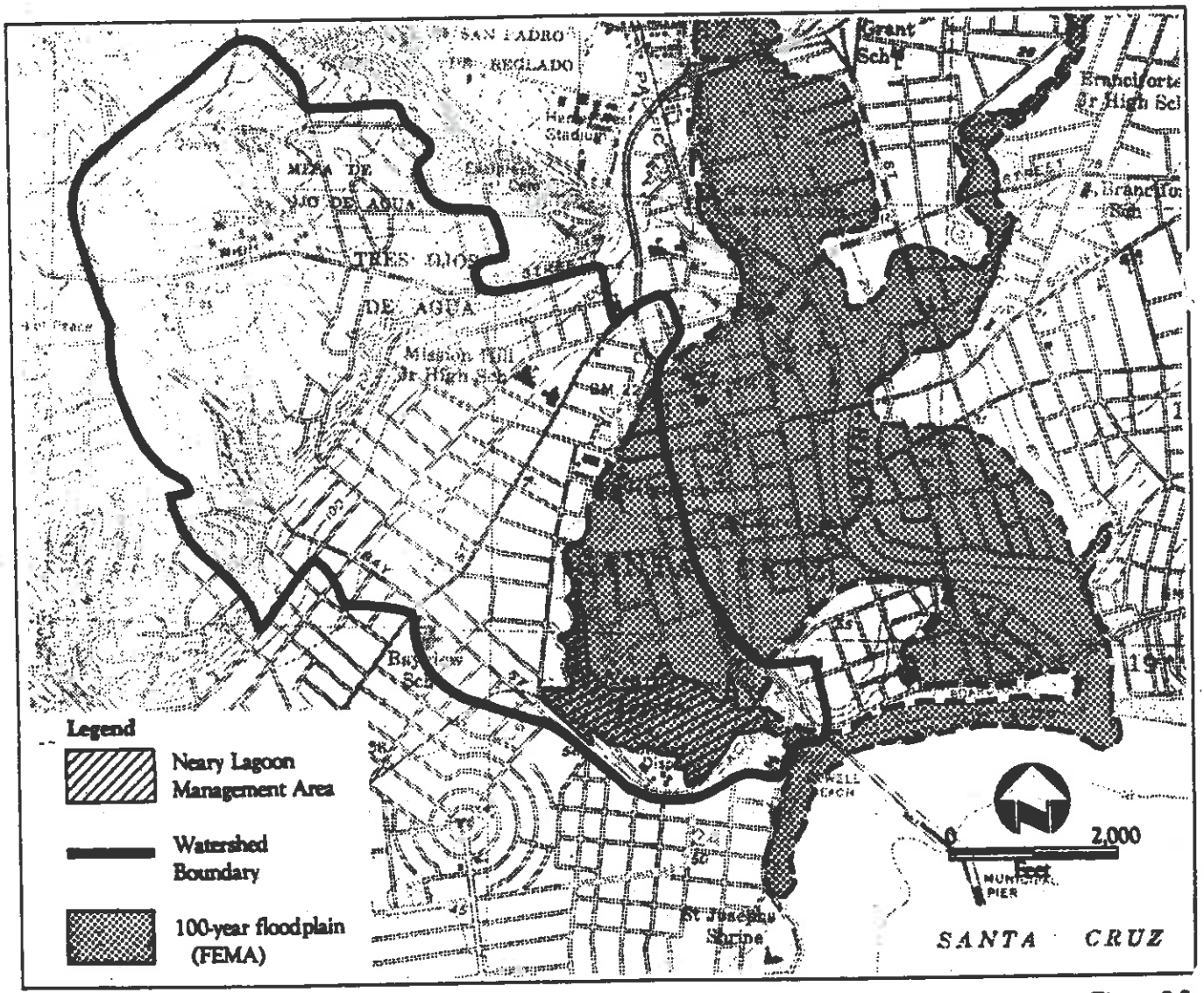
Watershed and Flood Potential

The watershed for Neary Lagoon comprises about 850 acres (Figure 2-3) and drains generally to the southwest at slopes averaging around 3-5%. The watershed ranges in elevation from sea level where drainage from the watershed discharges at Cowell Beach to almost 400 feet above msl on the southern edge of the University of California, Santa Cruz campus. (Camp, Dresser, McKee 1988.)

The watershed consists primarily of residential land uses with about 640 acres (75%) single-family residential; 130 acres (15%) multifamily residential; and

80 acres (10%) open space, including parks, playfields, vacant lots, and part of the University of California, Santa Cruz campus. A small amount of commercial land is also included in the watershed.

Most of the management area for Neary Lagoon is located within the Federal Emergency Management Agency's designated 100-year flood zone (Figure 2-3). The Federal Emergency Management Agency has developed flood inundation maps depicting the expected depth of flooding in the Santa Cruz area during a 100-year flood event for the San Lorenzo River. The depth of water in the Neary Lagoon area for a 100-year flood is estimated to be about 14 feet (Federal Emergency Management Agency 1986). The Corps is considering building levee improvements along the river that would remove Neary Lagoon from the river's 100-year floodplain. Until this is done, however, most of



Watershed and 100-Year Floodplain for Neary Lagoon

Figure 2-3

Source: Linsley, Kraeger Assoc., 1987/FEMA Flood Insurance Rate Map, 1985.

the management area for Neary Lagoon will remain in the San Lorenzo River's 100-year floodplain.

Flooding in low-lying areas of coastal Santa Cruz is often associated with winter storms in combination with high tides, large waves, and storm swells. Past flooding in Santa Cruz has been caused mostly by storms occurring in December, January, and February. The greatest peak floodflows have occurred when a short-duration, intense storm follows a longer period of heavy rainfall. Past flooding around Neary Lagoon has occurred mostly during winter when these conditions have occurred.

Inflow Drainage System

The inflow drainage system for Neary Lagoon consists of storm drains, open channels, and minor unoff from adjacent properties. The lagoon serves as ponding area that detains runoff before it drains into the ocean through the lagoon's outlet system at Cowell Beach. Sediments and other materials carried in runoff from the watershed are deposited in the lagoon. The lagoon is flushed occasionally by large floodflows.

The major points of stormwater inflow to the lagoon (Figure 2-4) are a 54-inch pipe at Bay and California Streets, open channel flow from Laurel Creek, a 30-inch pipe at Acacia Street, a 36-inch by 58-inch oval pipe at Felix Street, and a 24-inch pipe at Myrtle Street (Camp, Dresser, McKee 1988).

The Myrtle/Jenne Street outflow was part of the existing Chestnut Street storm drain system. In conjunction with the CHC housing development, the City installed a new 66-inch storm drain line to carry runoff from development on Chestnut Street south to Laurel Street to discharge into the outlet channel downstream of the weir at Neary Lagoon. Flows in the ditch will not be reduced as required by the DFG stream alteration permit (III-664-90) for the project. The existing Myrtle/Jenne Street outflow will continue to receive runoff from the drainage basin above Laurel Street. The City is required to monitor dry weather flows in the replacement 24-inch storm drain after project completion. Monitoring will continue for a period sufficient to establish base dry weather flow rates from the Chestnut Street drainage basin into Neary Lagoon.

Chestnut Street storm drain outfall located downstream of the weir.

The City's storm drain policy requires sizing of all new storm drain culverts and sewers to accommodate a 10-year flood event. Some structures pertaining to the larger conveyance channels, such as creek drainages and the lagoon, may be designed to handle a 100-year flood event. (Sharp pers. comm.)

Lagoon Capacity

Water Level Fluctuations

The surface area of the lagoon fluctuates as water levels vary in response to rainfall, inflow runoff, and City maintenance of the outfall at Cowell Beach. At a surface elevation of 5.5-6.5 feet above msl, the surface area of the lagoon is about 16 acres with approximately equal areas of open water and emergent marsh (e.g., tules and cattails). Emergent marsh is more prevalent in the eastern and central portions of the lagoon. Overall, the lagoon is shallow, with few areas more than 4 feet deep when the surface elevation is at 6 feet above msl.

Background

This section describes the lagoon's historic land uses and ownership and the development of the management plan. Table 1-1 provides a chronology of the important events discussed below.

Historic Land Use and Ownership

The Santa Cruz area was home to a Native American linguistic group called the Costanoan (also known as the Ohlone), who lived along the coast from San Francisco Bay to Monterey Bay. In 1769, Portola's expedition explored the Santa Cruz area in search of a suitable site for a mission, and in 1791 the Santa Cruz Mission was established. Secularization of the missions in 1833 freed the mission's former landholdings, and large tracts of land were granted to individuals. These large "ranchos" were primarily used for raising cattle. After 1848, when California became part of the United States, these tracts were divided into smaller parcels. With the discovery of gold in California, businesses and industries began to flourish in the Santa Cruz area, and these small parcels were purchased by newcomers. (Bean and Rawls 1988.)

One of the newcomers who arrived in California in 1849 was Sedgewick J. Lynch, who eventually settled in Santa Cruz and purchased the lagoon and adjacent farmland. In 1868, Lynch sold the farmland and lagoon to Thomas J. Weeks, who owned it for 8 years. In 1876, two brothers, James and Martin Neary, purchased the lagoon and farmland from Weeks. The Nearys, who came to Santa Cruz from Ireland in 1862, used the land near the lagoon for a small dairy and for farming various crops. (City of Santa Cruz Department of Parks and Recreation 1987.)

Although the Nearys maintained barns and carriage sheds at the lagoon, they resided for many years in an adobe in town that was part of the mission guard headquarters and is now the oldest building in Santa Cruz. This residence later became the Santa Cruz Mission State Historical Monument (Hoover, Rensch, and Rensch 1966). The Neary family owned the lagoon property until the City of Santa Cruz acquired it in 1967 (Santa Cruz Historical Society 1974).

It was during the early years of the Nearys' ownership of the lagoon that it began to be called Neary's Lagoon. In recent years the lagoon has come to be known simply as Neary Lagoon. During the 1850s, the lagoon covered about 75 acres, extending north to about where Laurel Street is today and east to what is now Pacific Avenue (City of Santa Cruz Department of Parks and Recreation 1987). Compared to its present size of about 14 acres, the lagoon was quite extensive.

The lagoon began its long decline in the 1870s with the construction of a railroad grade along its eastern edge. During this time the lagoon was partially filled and isolated from tidal influence. An 1877 map of Santa Cruz (Figure 1-5) indicates the newly constructed railroad grade east of the lagoon, marshy land surrounding it, and an outlet from the lagoon to the bay.

In the 1880s, the lagoon's waters became contaminated by the city's sewer lines, runoff from adjacent pastures, and poor drainage and circulation. The lagoon was considered by many to be a public health threat and was partially blamed for local outbreaks of cholera. For these reasons, attempts were made in the 1890s to drain the lagoon permanently by constructing a flume to carry the water to the sea. Further attempts to drain and fill the lagoon followed. An aerial photograph of the lagoon, taken from a captive air balloon in 1906 (Figure 1-6), shows that the lagoon still contained large areas of standing water, though this may have been seasonal runoff (as indicated by standing water at the edges of adjacent cultivated fields).

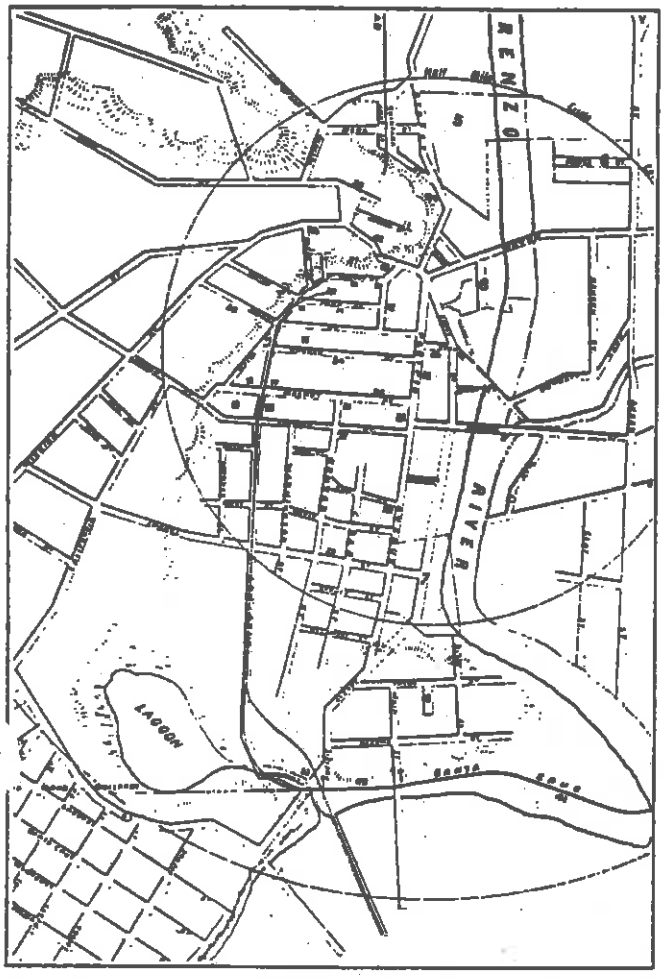
Table 1-1. Chronology of Important Events in Neary Lagoon's Development and Management

Date	Event
1868	Thomas J. Weeks purchases lagoon from Sedgewick J. Lynch
1876	James and Martin Neary purchase lagoon from Thomas J. Weeks
1870s	Railroad grade constructed, filling a portion of the lagoon and isolating it from the bay
1880s	City sewer and surrounding pastures contaminate lagoon; cholera outbreaks result
1893	Flume constructed to help drain lagoon
1928	Wastewater treatment plant built on city-owned land bordering lagoon
1930s	Lagoon primarily a marsh with little open water
1938	Robert Burton, local naturalist, suggests that lagoon be made a public park and bird refuge
1967	City acquires lagoon from Neary family
1972	City approves construction of apartments and condominiums on lagoon's north side on condition that developers dredge the lagoon and help restore it as a natural area
1973	City adopts general plan parks element designating Neary Lagoon Park and Wildlife Refuge as a communitywide facility
mid-1970s	Lagoon dredged; islands created
1975	CCC approves coastal permit to construct park and wildlife refuge improvements at Neary Lagoon with the condition that a management plan be prepared
1975-1986	Neary Lagoon Park and Wildlife Refuge improvements occur
May 1977	Neary Lagoon Park and Wildlife Refuge dedicated
August 1977	Master plan prepared for Neary Lagoon Park and Wildlife Refuge by Harry Tsugawa, landscape architect
August 1978	*Outline of Neary Lagoon Park and Refuge Management Plan prepared by Harvey and Stanley Associates
1986	Harvey and Stanley Associates conduct biological studies at Neary Lagoon
February 1986	Mechanical removal of 10,000 cubic yards of marsh vegetation from Neary Lagoon for hydrology, water quality, and wildlife habitat improvement
June 1986	*Drainage, Grading, and Wildlife Management Plan for the Neary Lagoon Area, Phase I, prepared by Linsley, Kraeger Associates

Table 1-1. Continued

Date	Event
August 1986	*Wastewater Treatment Plant Expansion: Mitigation of Project Impacts to Neary Lagoon prepared by Harvey and Stanley Associates
January 1987	*Drainage, Grading, and Wildlife Management Plan for the Neary Lagoon Area, Phase II, prepared by Linsley, Kraeger Associates
July 1987	City coastal permit approved for wastewater treatment plant expansion to advanced primary
August 1987	*Neary Lagoon Enhancement Plan prepared by Harvey and Stanley Associates
February 1988	*Evaluation of Mosquito Problem prepared by California Department of Health Services
September 1988	*Implementation Addendum to the Neary Lagoon Enhancement Plan prepared by the City of Santa Cruz Planning and Community Development Department
December 1988	*Neary Lagoon Drainage Improvements Hydrologic and Hydraulic Study prepared by Camp, Dresser, McKee
May 1989	CCC approves the eight documents mentioned above, deeming that they comprise the management plan, subject to specified changes
January 1990	*Neary Lagoon Management Plan, Phase I, prepared by Jones & Stokes Associates, document approved by CCC as part of management plan
June 1990	CCC requests that City integrate all documents into one document
October 1990	*Neary Lagoon Management Plan, Phase IIa, prepared by Jones & Stokes Associates
October 1990	Neary Lagoon Drainage and Enhancement Plan, prepared by the Habitat Restoration Group for restoring the delta ditch area as mitigation for CHC housing projects
May 1991	City contracts with Jones & Stokes Associates to integrate documents and prepare final management plan
August 1991	Public workshop held to receive input on management plan
January 1992	Pump station begins operation
February 1992	Draft management plan completed for agency and public review
July 1992	Final management plan approved by Santa Cruz City Council
August 1992	Final management plan approved by California Coastal Commission

* Documents approved by the CCC as part of the Neary Lagoon Management Plan.



City of Santa Cruz, 1887 Figure 1-5

Source: Santa Cruz County, California State Library.

This historic map of central Santa Cruz indicates the lagoon and marshy land surrounding it, the newly constructed railroad grade east of the lagoon, and an outlet from the lagoon to the bay.

In 1928, a wastewater treatment plant was built on city-owned land bordering the lagoon. By the 1930s, the lagoon had become primarily a shallow freshwater marsh or bog with few areas of open water. (City of Santa Cruz Department of Parks and Recreation 1987.)

In 1967, the City of Santa Cruz (City) purchased the lagoon from the Neary family. A few years later, in 1972, the City granted approval to the Thrust IV development firm of Sunnyvale, California, to construct the Shelter Lagoon condominium and Cypress Point apartment developments on the north side of the lagoon. Approval was granted with the conditions that Thrust IV would restore the lagoon through dredging, aid in developing surrounding land as a park, and dedicate a 10-foot-wide easement for public access and city maintenance along the property adjacent to the lagoon.

The lagoon was dredged in the mid-1970s, and recreation facilities were developed gradually between 1975 and 1986 by the City with Land and Water Conservation Fund support. An aerial photograph, taken in about 1973 looking east across the lagoon (Figure 1-7), shows some of the filling occurring as part of the Shelter Lagoon condominium development. The photograph also shows the recently completed Cypress Point apartments, the central and eastern portions of the lagoon still intact before dredging, and grading in progress for construction of tennis courts on the bluff to the southwest.

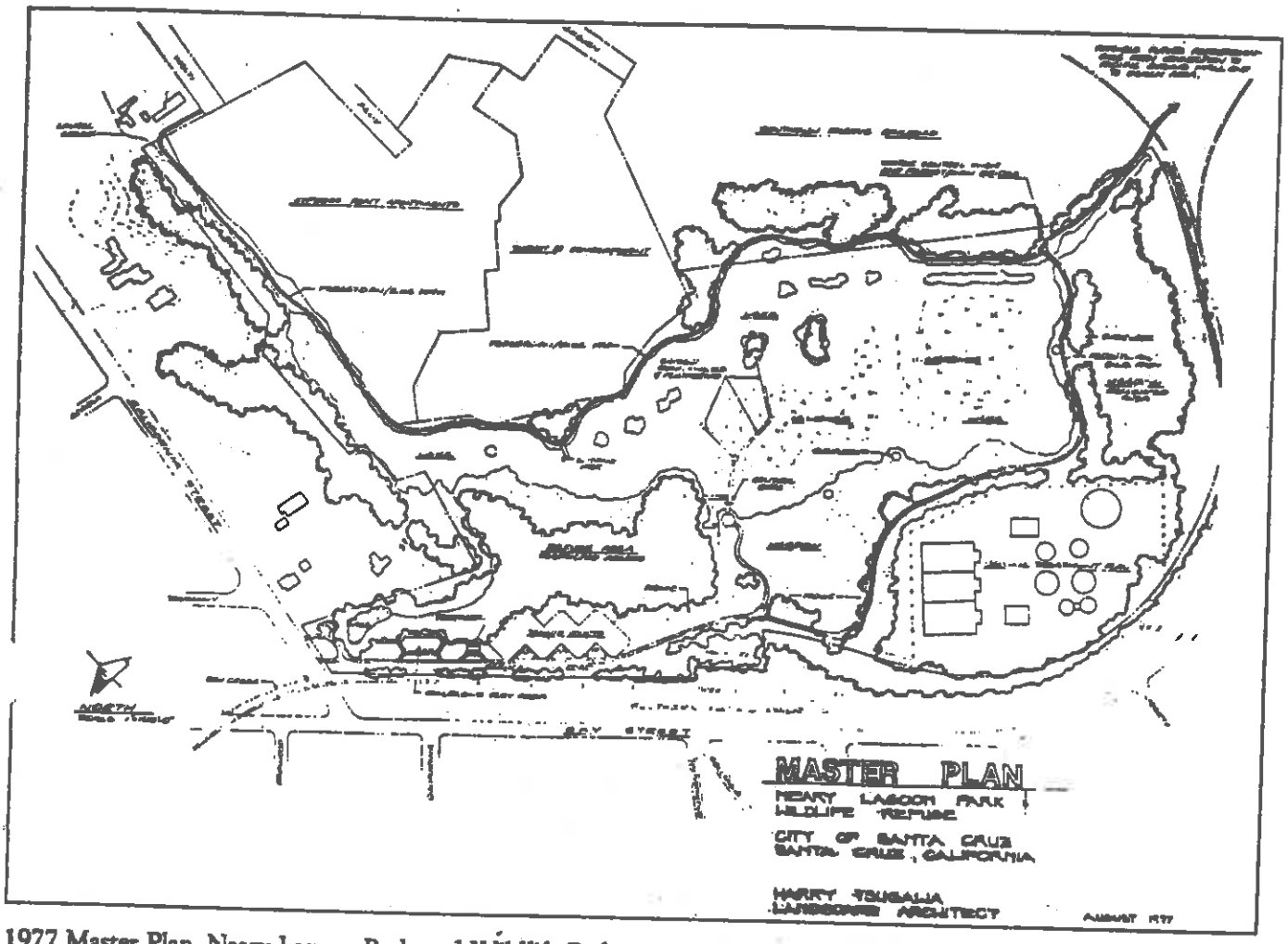
Management Plan Development

In 1975, the City applied to the CCC for a coastal permit to construct recreation improvements including some wetland alterations. As a condition of approval, the CCC required that a management plan be completed and approved for the lagoon and its facilities. In 1977, a master plan for the Neary Lagoon Park and Wildlife Refuge was prepared for the City to guide planning and design for the lagoon (Figure 1-8). Since then, the City has received three grants to construct park improvements according to the master plan. Since the mid-1980s, various documents have been prepared that describe the site's natural resources and management (Table 1-1). In May 1989, the CCC approved eight of these documents to collectively comprise the management plan, subject to the condition that specified additions and changes be made and approved. In January 1990, a ninth document was approved by the CCC as part of the conditionally approved plan.

Aerial View of Neary Lagoon, 1906 Figure 1-6
Source: Santa Cruz County, California State Library from Library of Congress.

Aerial View of Neary Lagoon, 1973 Figure 1-7
Source: Covello and Covello Photography, Santa Cruz.

Figure 1-6 is an aerial photograph of Neary Lagoon taken in 1906 from a captive air balloon. This view shows large areas of standing water in and around the lagoon. Figure 1-7 is an aerial photograph taken in 1973 looking southeast. This view shows some of the filling that occurred during construction of the Shelter Lagoon condominium development.



1977 Master Plan, Neary Lagoon Park and Wildlife Refuge

Source: City of Santa Cruz.

Figure 1-8

In June 1990, the CCC requested that steps be taken by the City to comply with previous commitments to fulfill the conditions for the plan's approval. One of the conditions was that all nine documents be integrated into a cohesive, final management plan. In November 1990, the CCC approved a tenth document as part of the management plan.

Because of issues associated with proposed expansion of the adjacent wastewater treatment plant, the City determined that the public works department would coordinate preparation of the final management plan with assistance from the City's parks and recreation and planning departments. To facilitate preparation of the Neary Lagoon Management Plan, the City organized the Neary Lagoon Management Task Force. The task force was organized as a liaison between City staff and governing bodies and to provide review, guidance, and assistance to City staff and the environmental consultant throughout the plan development process. The task force consists of six members, two each from the public works, parks and recreation, and planning commissions.

Neary Lagoon Management Plan Development Process

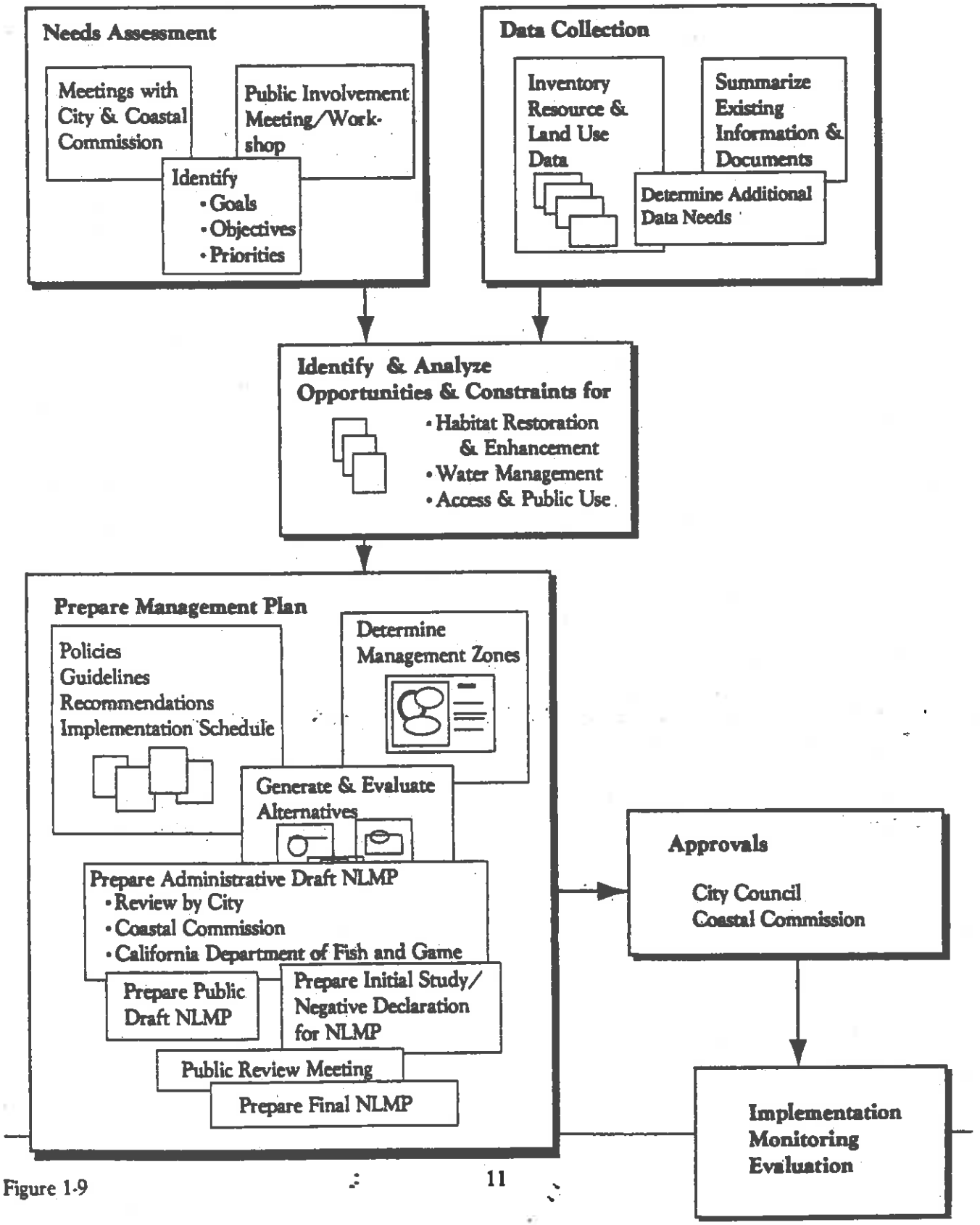


Figure 1-9

INTRODUCTION

In May 1991, the City contracted with the environmental planning firm of Jones & Stokes Associates to prepare the final management plan. Final approval by the CCC depends on completion of this final management plan. Jones & Stokes Associates developed the approach for preparing the management plan and conducted most activities to accomplish the plan, including coordinating with City staff and other agencies, organizing and conducting public involvement activities, inventorying resource and land use information, analyzing project opportunities and constraints, developing management plan elements, preparing maps and graphics, directing a water quality analysis, and preparing management plan and water quality reports. Figure 1-9 illustrates generally the process for developing the management plan.

Project Scope and Approach

This management plan concentrates on lands within the management area boundary and discusses adjacent and watershed lands briefly. Resource and land use information was summarized primarily from existing information and from interviews with knowledgeable individuals. When necessary, information was verified in the field by resource specialists. Resource and land use information was mapped using a computer-aided design (CAD) system, and management zones were identified. Opportunities and constraints were analyzed, and the management plan concept and elements were described graphically and in text.

A water quality analysis was conducted and data were analyzed to identify the level and extent of potential water quality problems, and to provide base information from which to identify future water quality data needs. The water quality study is included with this document as Appendix A, and its conclusions have been integrated into the management plan.

Coordination with City staff, the task force, the CCC and other agencies, and the public was an essential part of the project. Management objectives and guidelines were developed through a process of City, agency, and public review. Cost estimates and implementation policies and guidelines for plan elements were developed also.

Public Workshop

On August 20, 1991, a public workshop was held in Santa Cruz to identify public concerns, provide information, and receive public input on the Neary Lagoon Management Plan. The workshop was sponsored by the City and conducted by Jones & Stokes Associates. The workshop was announced publicly with advertisements in the local newspaper, posters placed at the lagoon, and direct mailings to over 1,000 property owners and residents near the lagoon. About 70 people attended the workshop, including representatives from the task force, the City's public works department, the California Department of Fish and Game (DFG), and the CCC.

The workshop provided an overview of the background, purpose, and content of the management plan and presented information on opportunities and constraints affecting lagoon management decisions. A survey requesting participants to identify ideas and priorities was distributed, and small groups of workshop participants discussed their ideas for lagoon management and marked their suggestions on aerial photographs and maps of the lagoon. Workshop attendees favored maintaining high-quality wildlife habitat; improving water quality, flood protection, and public safety; and controlling mosquitos. Attendees were divided on the level and type of public access that should be provided.

A summary of the workshop (Appendix B) was prepared and distributed to attendees and other interested persons.

ANNOUNCING

THE NEARY LAGOON
Management Plan Public Workshop

Date: Tuesday, August 20, 1991

Time: 7-9 p.m.

Location: Louden Nelson Community Center
301 Center St. at Laurel St.

The City of Santa Cruz will conduct a public workshop to obtain input for a management plan for the Neary Lagoon Park and Wildlife Refuge. You are cordially invited to participate in this workshop to help guide the park's future development, management, and use by wildlife and the public.

The City has hired the environmental planning firm of Jones & Stokes Associates to assist in conducting the workshop and developing the management plan.

If you are unable to attend the workshop, you may send your written comments to:

City of Santa Cruz
Public Works Department
809 Center Street, Room 201
Santa Cruz, CA 95060

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Applicable Regulatory Statutes and Land Use Requirements

This section describes regulatory and land use considerations that may affect decisions regarding the management of Neary Lagoon.

Section 404 (of the Clean Water Act) Requirements

Section 404 of the Clean Water Act requires that a permit be obtained from the U.S. Army Corps of Engineers (Corps) before fill material may be placed in jurisdictional waters of the United States (including wetlands). The Corps has established a nationwide permit program to authorize certain wetland fills in advance and without project-specific permits. Nationwide permit 26 applies to wetlands designated as isolated water bodies and to fills occupying less than 10 acres of wetland. Under permit 26, fills of less than 1 acre do not require notification of the Corps; fills of 1-10 acres require notification but may not require individual permits. (330 CFR 330.2-330.12.)

The Corps has designated portions of the Neary Lagoon management area as jurisdictional waters of the United States (including wetlands) under Section 404 of the Clean Water Act (see Chapter 2, Figure 2-5). The Corps does not consider the lagoon to be part of a surface tributary system and has designated it as an isolated water body. Fill material placed in Neary Lagoon or adjacent jurisdictional waters that occupied less than 10 acres would be covered by nationwide permit 26. A fill of less than 1 acre would not require notification of the Corps; however, because only the Corps can verify jurisdictional wetland boundaries, notification of the Corps is advisable for fills of any size.

If the Corps determines that management-related activities in Neary Lagoon will require a Section 404 permit, compliance with Section 106 of the National Historic Preservation Act of 1966 may also be necessary. Section 106 requires that federal agencies consider the effects of their actions on properties that may be eligible for listing or already listed in the National Register of Historic Places (NRHP). Implementing the Neary Lagoon Management Plan could be considered a federal undertaking if a Section 404 permit were necessary. To determine if an undertaking could affect NRHP-eligible properties, cultural resource sites (including archeological, historical, and architectural properties) would need to be inventoried and evaluated for listing in the NRHP. If NRHP-eligible properties are present, the Corps district engineer must be notified and a project-specific permit may be required.

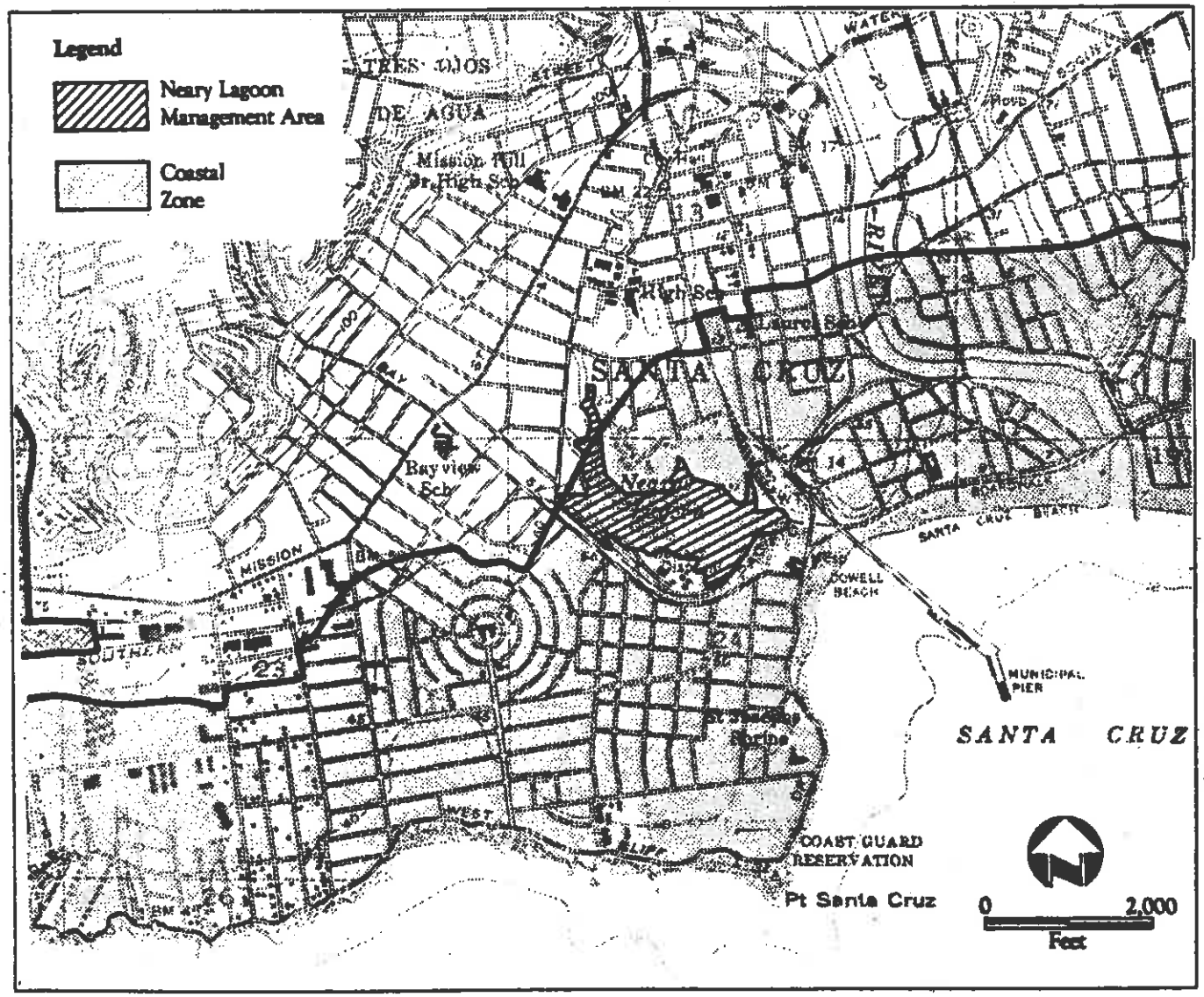
Proposed regulation changes to Section 404 involving nationwide permits and wetlands delineation methods were published in the Federal Register in April and August 1991. Several bills have been introduced in Congress to modify Section 404 during reauthorization of the Clean Water Act. Any of these changes could affect Neary Lagoon management decisions, and the Corps should be consulted before walkways are constructed or fill is placed in the lagoon.

California Department of Fish and Game Requirements

DFG requires that a streambed alteration agreement be obtained for all projects that would alter the bed or bank of any water body or that would use material from the bed or bank of any water body (Fish and Game Code, Sections 1601-1606). Dredging or filling at Neary Lagoon would require securing a streambed alteration agreement between the City and DFG (DeWald pers. comm.).

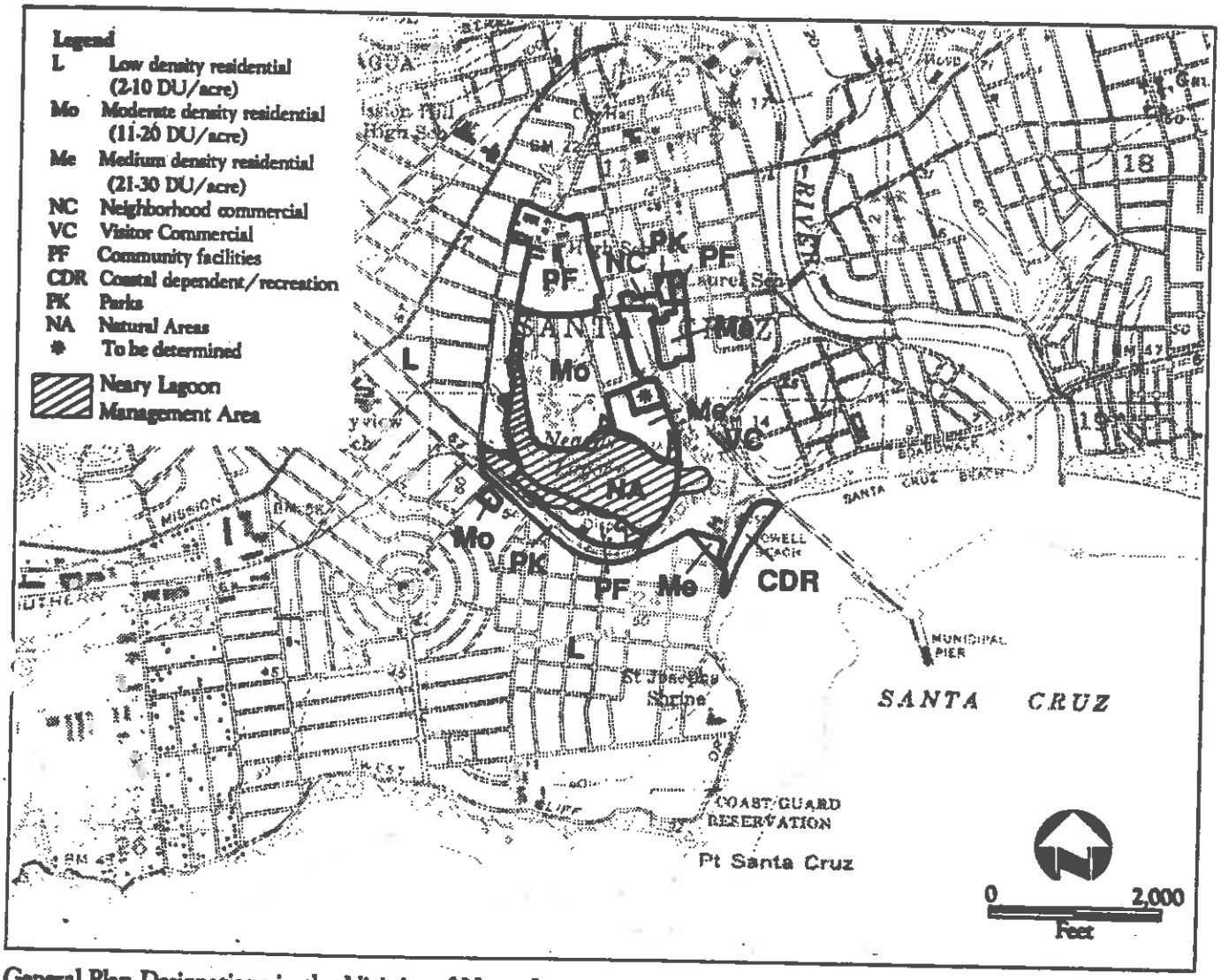
California Coastal Act and California Coastal Commission Requirements

The California Coastal Act of 1976 (Coastal Act) created the CCC and required local governments to prepare an LCP for approval by the CCC. An approved LCP is intended to guide development and activities in the local coastal zone and empowers local governments to review projects proposed within the agency's boundaries within that zone. The coastal zone is defined as a strip of land of varying width along the entire length of the California coast. In the City of Santa Cruz urbanized area, the local coastal zone extends inland approximately 1,000 yards (Figure 1-10). Neary Lagoon is within the Coastal Zone and therefore is subject to regulation under the Coastal Act. LCP requirements for Santa Cruz are described below under "City Regulations and Local Coastal Program Requirements".



Coastal Zone for City of Santa Cruz in Vicinity of Neary Lagoon — Figure 1-10

Source: City of Santa Cruz 1985.



General Plan Designations in the Vicinity of Neary Lagoon

Source: Draft General Plan 2005, Land Use Map, City of Santa Cruz, California.

Figure 1-11

The LCP identifies Neary Lagoon as one of seven local areas containing unique features and contains the following specific directives (City of Santa Cruz Department of Planning and Community Development 1985):

- prepare a management plan for Neary Lagoon;
- provide at least a 100-foot buffer between the lagoon and adjacent land uses, such as parking, housing, and the wastewater treatment plant;
- reserve adequate site area for wastewater treatment plant expansion, including replacement wetlands and wetlands buffer area; and
- in expanding the wastewater treatment plant, provide for the preservation of the lagoon as a unique natural habitat.

Additionally, if the CCC does not have coastal development permit authority through original jurisdiction or on appeal of a local government permit, it still has jurisdiction, through the federal consistency provisions, over any project permitted by the Corps under nationwide permit 26. Thus, a consistency certification would need to be submitted to the CCC by any applicant for a project authorized under Corps nationwide permit 26, unless the CCC (not the local government) already has authority through review of a coastal development permit. The policies in Chapter 3 of the Coastal Act provide a standard of review for a consistency certification. The LCP would be used as guidance, once it has been incorporated into the California Coastal Management Program. (Hyman pers. comm.)

City Regulations and Local Coastal Program Requirements

The City regulates land use activities in the Neary Lagoon area through a variety of mechanisms. These include general plan policies and land use designations that specify appropriate land uses and guide land use activities throughout the City; LCP requirements incorporated into the general plan that establish specific designations for areas within the coastal zone, including Neary Lagoon; and regulations that implement the City's general plan and LCP, including conservation regulations, the coastal zone overlay district, zoning ordinance provisions, and other regulations (e.g., The City Heritage Tree Ordinance).

Proposed land uses designated in the City's draft general plan for the Neary Lagoon area (Figure 1-11) in combination with LCP requirements, are identified to guide future development in an orderly manner that minimizes land use conflicts and protects the area's important resources. Most of the area around Neary Lagoon is designated for single-family and multifamily residential uses with some community facilities and visitor commercial uses nearby. Most of the land adjacent to the management area is currently developed or in the process of being developed in accordance with the LCP and general plan designations.

Most of the Neary Lagoon management area is designated by the City as a natural area or park. The City of Santa Cruz draft general plan specifically describes Neary Lagoon as a unique area to be protected and enhanced. The lagoon is located in the Coastal Zone Overlay District and is subject to coastal zone regulations, some of which are listed below. The City implements coastal zone regulations within the city limits and has incorporated LCP policies into its general plan, zoning ordinance, and land use maps. Chapter 24.14 of the LCP, "Environmental Resource Management", contains the following provisions:

- preserve riparian areas by controlling development near the edge of water bodies and
- maintain and improve existing water quality by regulating the quantity and quality of runoff entering local watercourses.

LCPs contain planning policies and land-use designations that apply within each local government's coastal zone. The City implements coastal regulations in the area of the coastal zone within the Santa Cruz city limits. The City has incorporated LCP policies into its general plan, zoning ordinance, and land use maps. The CCC certified the City's LCP in 1985, transferring coastal permit authority from the CCC to the City. (City of Santa Cruz Department of Public Works 1990.) Coastal permits are required for almost all proposed actions in the coastal zone. Locally issued coastal permits can be appealed to the CCC if they involve major public works or are within 100 feet of wetlands.

The LCP's conservation regulations (Section 24.14 of the City's municipal code) allow the construction of structures and the grading or removal of vegetation in any designated riparian area or within 100 feet of a wetland, marsh, or seasonally flooded grassland for the following purposes only, provided that a restoration/management plan is approved by the City for the project (City of Santa Cruz Department of Planning and Community Development 1985):

- to maintain or replace public works facilities;
- to maintain or restore previously dredged channels, pursuant to an approved management plan;
- to construct pervious, nonmotor vehicle trails;
- to perform incidental public service projects (e.g., burying cables or pipes, inspecting piers, maintaining intake and outfall lines);
- to construct small-scale facilities for nature study or other resource-dependent activities;
- to construct, grade, or remove vegetation as necessary for maintenance of existing improvements;
- to establish landscaping to provide a natural buffer, including necessary grading;
- to provide for passive recreation;
- to preserve and restore habitat; or
- to provide for other uses similar to the foregoing found by the zoning administrator or board to be consistent with these regulations.

The City's Heritage Tree Ordinance (Ordinance 76-43, Chapter 9.56 of the City's Municipal Code) prohibits the cutting of any tree with a trunk diameter greater than 16 inches at 2 feet above the ground without a permit from the director of the Department of Parks and Recreation (City of Santa Cruz Department of Public Works 1990).

CHAPTER 2

NATURAL AND CULTURAL FACTORS INVENTORY

CHAPTER 2

NATURAL AND CULTURAL FACTORS INVENTO.

The natural and cultural factors that comprise and affect Neary Lagoon and its environs are numerous and their interrelationships are complex. Surrounding urban development has largely isolated the lagoon as a small ecosystem that must be carefully managed if it is to remain healthy, provide amenities for the community, and not adversely affect its surroundings. This chapter describes the important natural and cultural factors comprising and affecting the lagoon and its environs. The following inventory of these factors provides a context and basis for deriving the management actions described in Chapter 3. Natural factors described are climate and microclimate; landform, geology, and soils; hydrology; water quality; vegetation; wildlife and fisheries; and mosquitos. Cultural factors include cultural resources, public use, aesthetics, and infrastructure.

Climate and Microclimate

The climate of the Santa Cruz area is influenced by regional climatic patterns and topography, and moderated by the community's proximity to the Pacific Ocean and Monterey Bay. The Santa Cruz Mountains to the east separate the community from inland valley weather patterns, allowing coastal weather to predominate year round.

The climate around Santa Cruz consists of cool, dry summers with frequent fog and cool, wet winters. During summer, coastal fog commonly extends inland as far as the crest of the Santa Cruz Mountains and is responsible for high humidity. Variations in seasonal and daily temperatures are generally small throughout the year. The city's rainfall averages about 28 inches per year, with the rainy season extending from October through May. Historically, the heaviest rainfall has occurred from December through March. Table 2-1 gives the average temperature and precipitation by month for Santa Cruz.

Neary Lagoon is close to the shore and is separated from the ocean by a low coastal ridge or bluff. Its microclimate is strongly influenced by these factors. The prevailing wind direction at Neary Lagoon is from the northwest, owing primarily to marine breezes. These breezes, which are strongest in spring and summer, blow sand inland and create steep summer beach profiles that often block drainage outflows along the coast. The bluff and dense riparian vegetation growing on its inland escarpment generally protect the lagoon from the prevailing winds. Wrapping around the southern and western edge of the lagoon, the bluff also protects the lagoon from severe winter storms that blo generally from the southwest.

Summer fog occurs frequently at the lagoon, most often during mornings and generally burning off by midmorning to late morning, but occasionally persisting into the afternoon. Tall, dense vegetation, such as that found in riparian forests and mixed oak woodlands, tends to create its own summer precipitation from fog condensation on leaves and branches.

Because the lagoon tends to collect cool air from surrounding areas, it can remain quite cool, especially along the southern edge. In winter, because of the low sun angles throughout the day, the shady southern edge along the base of the bluff can remain quite cool for much of the day. Areas along the bluff top and areas exposed to more sunlight on the northern side of the lagoon are usually warmer.

Table 2-1. Average Temperature and Precipitation by Month

Month	Temperature	Precipitation
January	49.9	5.77
February	51.7	5.20
March	53.7	4.14
April	56.4	1.86
May	58.5	0.97
June	61.8	0.22
July	63.1	0.02
August	63.4	0.03
September	62.8	0.47
October	59.6	1.43
November	54.9	2.74
December	51.1	5.40
Yearly	57.2 (average)	28.25

Source: Thomas 1961.

Landform, Geology, and Soils

Landform

Neary Lagoon was originally an oxbow of the San Lorenzo River that was gradually isolated from the main stream, leaving no connection between the lagoon and the river (Camp, Dresser, McKee 1988). The Neary Lagoon management area consists largely of a flat, marshy area surrounded by a coastal bluff with steep escarpment slopes wrapping around its southern and western edges and a flatter area extending northward from the lagoon. Most of the management area is less than 10 feet above mean sea level (msl), although elevations in the management area range from about sea level at the bottom of the lagoon to just over 50 feet above msl along the bluff top. The lagoon water surface elevation fluctuates between about 5 and 7 feet above msl. Along the southern boundary of the management area, fill was brought in to raise the level of the railway. Slopes along the escarpment are generally steep, exceeding 30% on the west side. The bluff top containing recreation facilities on the south side is level from the escarpment edge to Bay Street with the exception of the cut for the railroad grade.

The relatively level and uniform topography of the lower portion of the management area permits revegetation and pathway construction with little erosion resulting from ground disturbances. The lower portion of the management area is easily accessible to construction equipment, such as boats and harvesters, that may be needed to clear vegetation and sediments in the lagoon. In addition, the nearly level terrain of the marsh area allows easy access for people with special mobility needs (e.g., elderly and handicapped persons and young children). The steep slopes of the surrounding bluffs are prone to erosion, slumping, and liquefaction, especially where vegetation has been removed, and would be unsuitable for construction activities. Tops of bluffs around the lagoon would be suitable for small-scale structures, but, near the bluff edge, structures would need to be well anchored.

Geology

The Neary Lagoon management area is located in a seismically active region, about 12 miles southwest of the San Andreas fault zone (Community Planning Consultants 1988). This major seismic zone is the junction of the North American and Pacific tectonic plates. Several other significant faults also affect the region: the San Gregorio, Monterey Bay complex, Zayante, Butano, and Ben Lomond faults. Table 2-2 lists these faults and identifies the maximum credible earthquake and recurrence interval predicted for each.

Neary Lagoon is located in Seismic Risk Zone 4 (U.S. Department of Housing and Urban Development 1979), indicating that it could experience major damage corresponding to Modified Mercalli scale

Table 2-2. Earthquake Faults near Neary Lagoon

Fault	Maximum Credible Earthquake	Recurrence Interval, years
San Andreas	8.5	100-1,000
San Gregorio	7.9	10-100
Zayante	7.4	200-2,000
Corralitos complex	6.9	200-2,000
Monterey Bay complex	6.5+	~1,000
Butano	6.4	200-2,000
Ben Lomond	5.5	Unknown

Source: Hall et al. 1974.

intensity of VII or greater. Modified Mercalli scale ratings are subjective measures of the force of an earthquake at specific locations as determined by its effects on persons, structures, and earth materials. Seismic risk zones are delineated based on the known distribution of damaging earthquakes and their associated intensities, evidence of strain release, and considerations of major geologic structures and provinces believed to be associated with earthquake activity (Algermissen 1983).

The City's LCP identifies the entire Neary Lagoon management area as having a high potential for liquefaction (City of Santa Cruz Public Works Department, n.d.). The National Center for Earthquake Research of the U.S. Geological Survey, however, identifies some portions of the Neary Lagoon management area as having low or moderate liquefaction potential (Dupre 1975). More recent information suggests that liquefaction zones in the Santa Cruz area are more extensive than previously thought (Hyman pers. comm.). The high groundwater table (3.0-5.5 feet below the original ground surface east of the lagoon) in the lower elevation portions of the management area probably reduces the shear strength and surface crust stability of soils in that area, especially following periods of heavy or extended rainfall (Community Planning Consultants 1988). Consequently, seismic occurrences during periods of high groundwater or saturated soils in the area could produce more severe impacts on structures, roads, and utilities than during drier periods.

The Neary Lagoon area could experience severe ground shaking and secondary effects, such as liquefaction and differential settling, during an earthquake. The Loma Prieta earthquake, which occurred in October 1989 and measured 7.1 on the Richter scale at its epicenter about 10 miles from Neary Lagoon, caused minor damage to some of the lagoon's recreation facilities and surrounding structures, such as portions of the tennis courts, the sewage pipes linking the Santa Cruz Community Housing Corporation (CHC) housing developments to the wastewater treatment plant, and rock walls (Stevens pers. comm.). Aside from an examination of the dam and outlet structure, no detailed inspection of the lagoon proper was made for signs of liquefaction or other ground failures (Stevens pers. comm.). The Loma Prieta earthquake occurred toward the end of the dry season during a period of several years of drought in the area. Had the quake occurred during a period of wetter conditions, damage in the area may have been more severe.

Ground shaking and liquefaction could cause slumping of channel banks and damage recreation facilities. Dredging may be necessary after a major seismic event to restore the hydraulic functions of the waterways to maintain movement of floodflows and circulation for desired water quality. To avoid damage from earthquakes, permanent structures should be sited in areas with low liquefaction potential. Paved surfaces, such as parking areas, paved paths, and tennis courts, may crack or buckle if constructed on material subject to liquefaction.

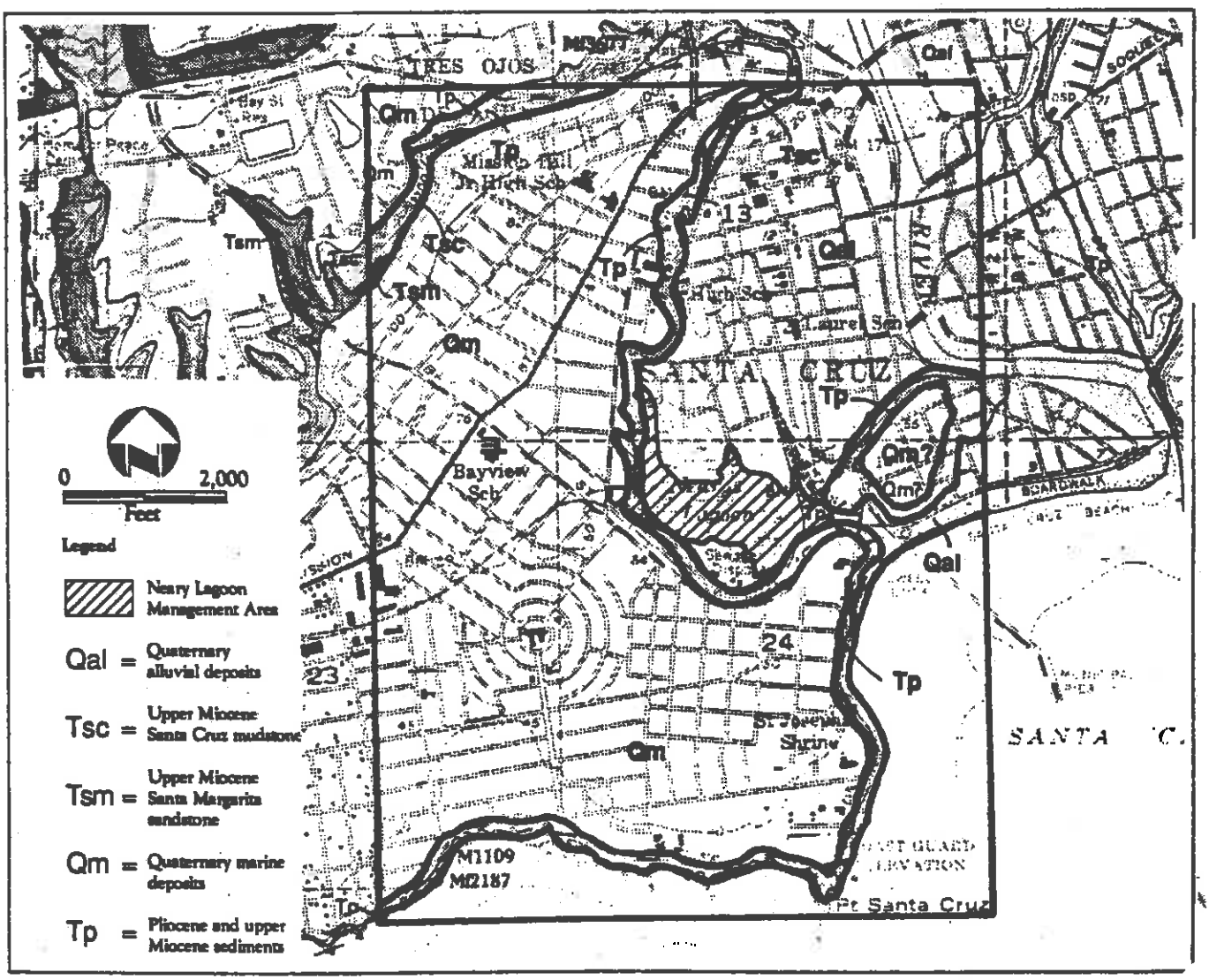
Geologic units in the vicinity of Neary Lagoon consist mostly of the upper Miocene to Pliocene (2-12 million years before present) Purisima Formation (Tp), Quaternary (3 million years ago to present) marine terrace deposits (Qm), and Quaternary alluvium deposits (Qal) (Figure 2-1). Upper Miocene Santa Cruz mudstone (Tsc) and upper Miocene Santa Margarita sandstone (Tsm) also occur in the area (Figure 2-1). (Clark 1981.)

The Purisima Formation (Tp) consists of thick interbeds of tufaceous siltstone, diatomaceous siltstone, and andesitic sandstone (Clark 1981). This formation, typically several hundred feet thick, is exposed along the steep and eroded coastal bluffs south of Neary Lagoon and along the western edge of the management area. The Purisima Formation (Tp) is overlain by Quaternary alluvium deposits (Qal) and marine terrace deposits

(Qm) to the east of the management area and by marine terrace deposits (Qm) to the west of the management area (Figure 2-1).

Quaternary marine terrace deposits (Qm) typically consist of unconsolidated fine sand and gravel (Clark 1981). The terraces were cut by wave erosion as sea levels rose and were exposed by a combination of regional tectonic uplift and falling sea levels. Marine terrace deposits are generally exposed along the southern and western boundaries of the management area. The thickness of these deposits typically ranges from 5 to 20 feet (Clark 1981).

Quaternary alluvium deposits (Qal), located along the eastern boundary of the management area, typically consist of unconsolidated gravel, sand, and silt derived from stream drainage areas. The thickness of



Geological Units in the Vicinity of Neary Lagoon

Figure 2-1

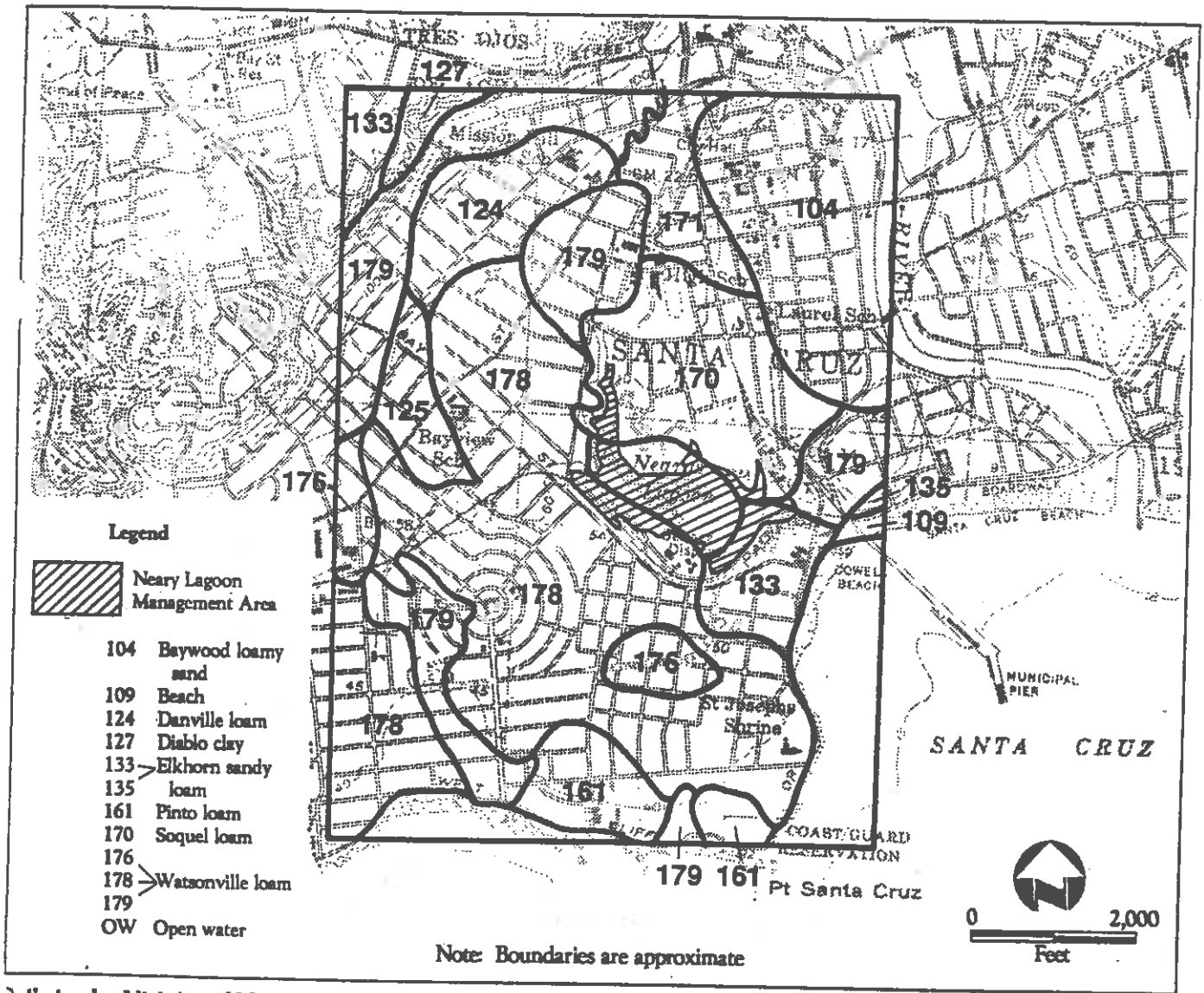
these deposits ranges widely, reaching a maximum thickness of approximately 100 feet near the coast (Clark 1981).

Soils

Soil Types

Three primary soil types identified by the U.S. Soil Conservation Service (SCS) exist in the Neary Lagoon management area: Elkhorn sandy loam, Soquel loam, and Watsonville loam. General locations of these soil types in the lagoon area are depicted in Figure 2-2, and the characteristics of these soils are identified in Table 2-3 and discussed below.

Elkhorn sandy loam (133, 135) consists of very deep, well-drained soils on alluvial fans and marine terraces. Elkhorn soils formed in old alluvium and marine deposits. (U.S. Soil Conservation Service 1980.)

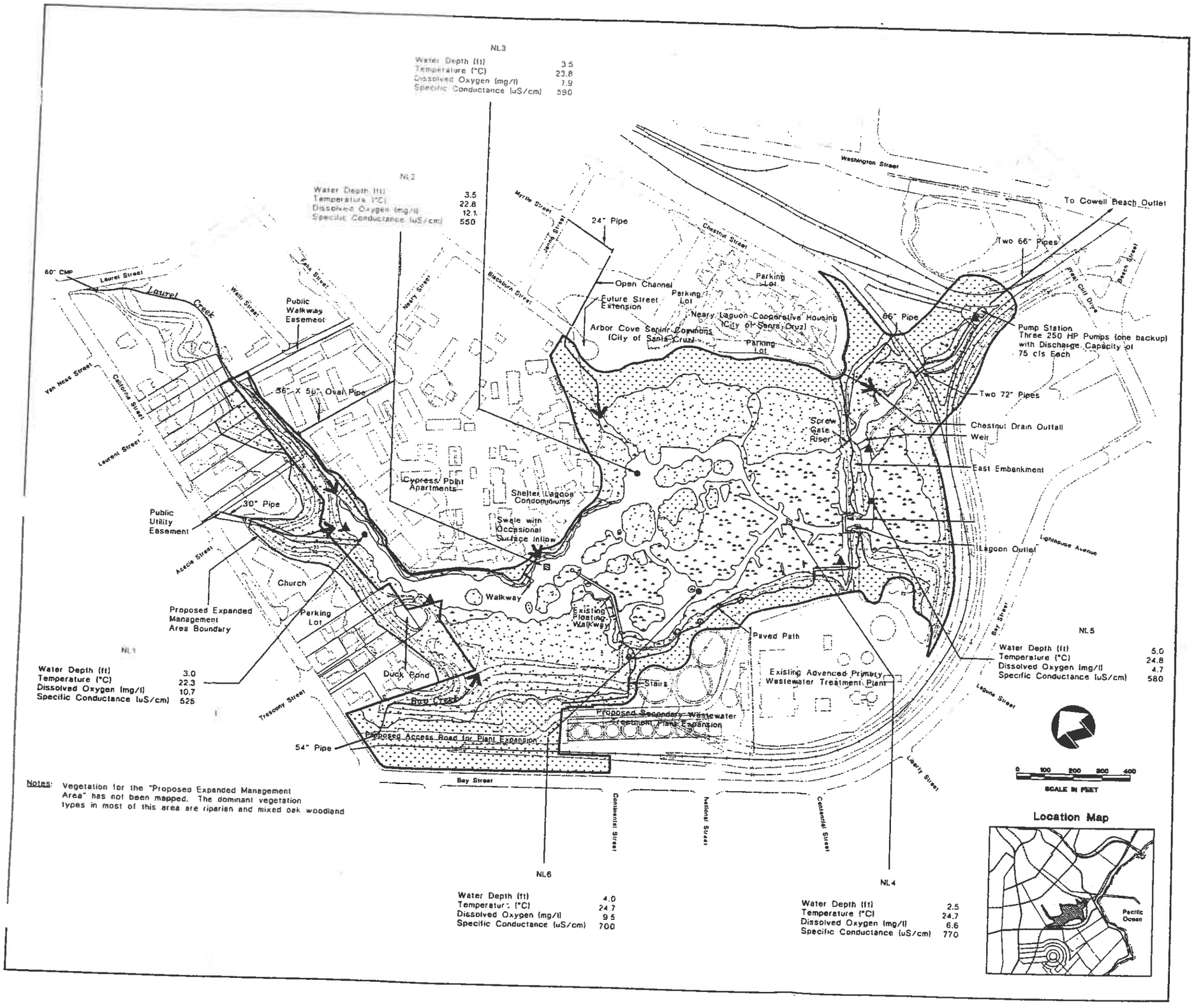


Soils in the Vicinity of Neary Lagoon

Source: U.S. Soil Conservation Service, 1980.

Figure 2-2

Hydrology and Water Quality of Neary Lagoon



Notes: Vegetation for the "Proposed Expanded Management Area" has not been mapped. The dominant vegetation types in most of this area are riparian and mixed oak woodland

Legend

- Riparian and Mixed Oak Woodland
- Freshwater Marsh
- Other Areas (maintained, recreation, grassland, ruderal)
- Open Water
- Water Sample
- Water and Sediment Sample
- Proposed Staff Gage Locations
- Stormwater Inflow Point

Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 2-4

Summer water levels in the lagoon have ranged from less than 5 feet above msl to over 8 feet above msl. When the gravity outlet at Cowell Beach is free of sand, the lagoon weir keeps water levels at 5.5 feet above msl or less, depending on lagoon inflows. The outlet at Cowell Beach has in the past frequently become clogged by shifting beach sand, which restricted outflow and caused the water level in the lagoon to rise. Lagoon water levels have risen above the 5.5-foot weir height and increased to 8 feet or more above msl during low-flow summer periods until City workers cleared the outfall structure with mechanical equipment and water from a high-pressure fire hose. Once cleared, the lagoon water level typically dropped back down to 5.5 feet above msl or less. Summer inflows to Neary Lagoon appear to be primarily from domestic activities in the watershed, such as watering of lawns and washing cars, and from natural seeps and springs. In winter, the lagoon water level has been maintained more regularly at the 5.5-foot weir height between storm events because the City clears the outfall more frequently to maximize the lagoon stormflow holding capacity during the rainy months. When the beach outlet is clear of sand, the gravity drainage system is capable of carrying small storm flows to the ocean without significantly increasing lagoon water levels.

Intense storms have caused lagoon water levels to rise above the 5.5-foot weir height, causing flooding problems in areas adjacent to the lagoon. Flooding from stormwater runoff has resulted in standing water as high as 3 feet at the end of Felix and Blackburn Streets for as long as 4-6 hours during intermediate and extreme storms. The lagoon water surface elevation has a significant impact on the capacity of the culverts draining into the lagoon. Lagoon water levels more than approximately 8 feet above msl cause water to back up in these culverts, which reduces pipe capacities and causes localized ponding.

Effects of Vegetation on Lagoon Water Levels and Floodflows

A fixed concrete weir maintains the lagoon's water surface at 5.5 feet. Most marsh vegetation root mass occurs at or below this base elevation (Linsley Kraeger Associates 1987). The ability of the lagoon to store floodflows has not been significantly diminished by the presence of tules and other aquatic growth. Similarly, removal of marsh vegetation to create more open water may be helpful but would not be essential to the passage of high floodflows (Linsley, Kraeger Associates 1987). Circulation during lower level floodflows (e.g., 5-year or smaller events) could be improved by clearing marsh vegetation (the small increase in lagoon storage capacity resulting from vegetation removal would be more significant in relation to lower level floodflows than high floodflows).

Lagoon Outflow System

Current Conditions

The lagoon outflow system operating in October 1991 had not adequately discharged 100-year peak flows, but the existing drainage system has accommodated up to the 5-year storm event (Camp, Dresser, McKee 1988). Recent development in the watershed, which includes the CHC housing project and the expansion of the wastewater treatment plant to the advanced primary level, has increased the need for additional outfall capacity because of increased runoff from paved areas.

To identify the improvements needed, a hydrologic analysis of the lagoon was performed by Camp, Dresser, McKee (1988) and an outfall improvement plan was formulated. The hydrologic analysis used the Corps' HEC-1 model to simulate the flows resulting from 10-, 50-, and 100-year storms. The routing model simulated the drainage system, lagoon capacity, and existing outfall and considered high tidal

conditions and sand blockage of the beach outlet. The analysis assumed that no water would flow into the lagoon from the San Lorenzo River and that proposed Corps levee improvements would remove the lagoon from the river's 100-year floodplain (Camp, Dresser, McKee 1988). The inflow watershed runoff analysis was based on existing and future anticipated land uses in the watershed, as outlined in the City of Santa Cruz 1980-1990 Land Use Plan, which designated the area of the proposed CHC housing for medium-density residential land uses. (City of Santa Cruz Planning and Community Development Department 1990.)

The hydrologic analysis indicated that Neary Lagoon and the associated outlet drainage system currently provide approximately 2- to 5-year flood protection with a 7-foot tide elevation at the beach outlet and a maximum lagoon water surface elevation of 9.5 feet above msl. Some residences in the Cypress Point and Shelter Lagoon developments adjacent to the lagoon would be flooded when lagoon water levels rise to more than 10 feet above msl. Portions of streets adjacent to the lagoon (e.g., Felix and Blackburn Streets) are less than 9.5 feet above msl and would experience flooding during the 100-year storm. The City considers minor flooding of streets in the Felix and Blackburn area to be acceptable, however, because adjacent structures have finished floor elevations of 10 feet or more above msl and therefore would be safe from flooding as long as water surface elevations are maintained at or below 9.5 feet above msl. (Camp, Dresser, McKee 1988.)

Outflow System Improvements

The City is upgrading the Neary Lagoon outflow system using the primary criterion of maintaining maximum lagoon levels at or below 9.5 feet for the 100-year storm with a 7-foot tide elevation at the beach outlet. Improvements anticipated to be operational by early 1992 include adding a pump system and a second 66-inch pipe from the pumps to the beach outlet (Figure 2-4). The new system will allow a total discharge of about 150 cubic feet per second (cfs). The existing gravity outflow system will be retained to supplement the new pump system.

The pump system under construction consists of three pumps, each with a pumping capacity of 75 cfs. Two of these pumps, with a combined capacity of 150 cfs, would be used to move floodflows out of Neary Lagoon. The third pump would provide a backup. These pumps could be operated either automatically or manually and will be equipped with a standby generator to ensure operation during power outages.

During the winter rainy season, the pump system will begin operating when the outlet becomes blocked by sand and water levels rise to 6.5 feet above msl. At 6.5 feet above msl, the first pump will start automatically and will continue to operate until water levels drop to 6.0 feet. If water levels continue to rise, the second pump will start at 7.0 feet, and the third pump will start at 7.5 feet. The automatic pump controls proposed by the City are shown in Table 2-4.

The system has been designed so that pump discharges from the 66-inch line would have sufficient force to remove sand deposits blocking the outfall, allowing gravity flow to reduce lagoon water levels to the 5.5-foot weir height, and eliminating the need for the City to clear sand from the beach outlet. The discharge system would include an alarm at the beach outlet to warn of pump activation. The pumps also could be operated manually by the City to control water levels during other times of the year (Sharp pers. comm.).

Table 2-4. Proposed Automatic Pump Controls for Flood Protection

Lagoon Elevation (in feet msl)	Pump Feature	Control Function: Water Level Rising	Control Function: Water Level Falling
9.75	Float switch		
9.5		Third pump start (if required for severe flood event)	
7.5		Third pump start (if first or second pump fails to operate)	
7.0		Second pump start	Third pump stop
6.5		First pump start	Second pump stop
6.0			First pump stop
4.0	Float switch		
-5.5	Bottom of wetwell		

Source: Jones & Stokes Associates 1991.

Water Quality

A water quality study was conducted at Neary Lagoon on August 8, 1991. Figure 2-4 identifies sampling locations and some of the study results. Appendix A describes the methods used and the complete results of the study. This section summarizes the findings of the water quality study. Water quality management and monitoring objectives and actions are described in Chapter 3, "Management Elements".

Neary Lagoon is a water body high in nutrients (eutrophic), a condition that favors algal growth. Eutrophic conditions tend to reduce aquatic species diversity. Algal growth caused by excess nutrients depletes dissolved oxygen through the respiration and decay of dead algal cells. Dead algae remain suspended in the water, increasing turbidity, or settle to the bottom, increasing bottom sediments. Sediment

accumulation in eutrophic systems can decrease water quality by increasing the demand for oxygen in lower depths, resulting in a depletion of dissolved oxygen at the bottom of the lagoon. Depletion of dissolved oxygen lowers water quality and reduces habitat value for many fish species and other aquatic organisms.

Nitrogen and phosphorus are the main elements controlling the growth of algae in impoundments such as Neary Lagoon. Because greater amounts of nitrogen are needed for algal growth, nitrogen to phosphorus (N/P) ratios can indicate the relative supply of each nutrient available and, therefore, which nutrient is most likely limiting algal growth. For ratios greater than 10:1, phosphorus tends to be limiting, and for ratios below 5:1, nitrogen tends to be limiting (U.S. Environmental Protection Agency 1985).

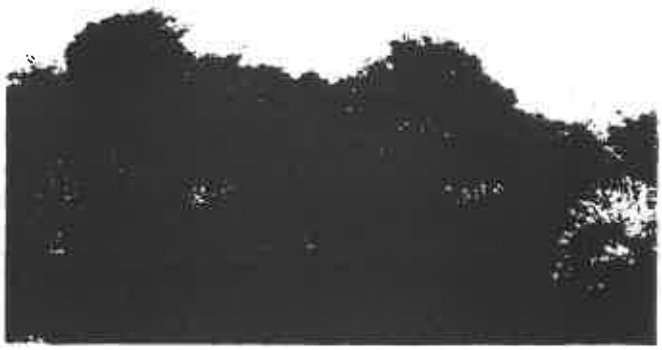
Neary Lagoon has relatively low nitrogen levels and high phosphorus levels (as orthophosphate). The N/P ratio calculated from data collected in the water quality study was approximately 0.25, which indicates that Neary Lagoon is nitrogen limited.

High orthophosphate levels are probably caused by the inflow of urban runoff, which is typically high in soluble phosphorus. If the lagoon were to receive additional nitrogen from lawn fertilizers, animal wastes, and other types of nonpoint source pollution, algal growth could be stimulated above current levels.

Turbidity in Neary Lagoon is a function of its shallow depths, large accumulation of sediment, and wind mixing. An additional source of turbidity is the activity of bottom-feeding fish in the lagoon, although the actual proportion of this contribution is unknown. Few data are available on fish populations in Neary Lagoon. In a study conducted in 1986, Sacramento suckers and largemouth bass were the dominant species (Harvey and Stanley Associates 1987). Three koi carp were also observed. During the water quality analysis performed for this report, at least four European carp were observed. As bottom feeders, carp are probably the most significant cause of fish-induced turbidity. Sacramento suckers are not usually major contributors to turbidity in natural water bodies. Because of the large population and size of the individuals, however, Sacramento suckers are probably a contributor to fish-induced turbidity in Neary Lagoon.

Except for high levels of orthophosphates, Neary Lagoon water quality is fair to good, as indicated by measurements of electrical conductivity, dissolved oxygen, hardness, and suspended solids. Concentrations of metals in water samples were below U.S. Environmental Protection Agency (EPA) criteria for the protection of freshwater aquatic life.

Sediment metal concentrations were below hazardous levels, but chromium, lead, and zinc concentrations were elevated compared to values expected in natural settings (Table 3 in Appendix A). Elevated concentrations of these metals, especially lead and zinc, are probably caused by historic discharges of urban runoff to Neary Lagoon and reduced flushing flows because of the drought. Levels of organochlorine pesticides detected appeared to be low and are common for historic areas associated with development or agricultural activity.



Important sensitive habitats at Neary Lagoon include open water (foreground), freshwater marsh (along the water's edge), and riparian forest (background).

Vegetation

Vegetative Communities and Other Cover Types

Since the area was settled, the lagoon has been removed from periodic tidal influence, and the lagoon banks and bed have been recontoured, allowing riparian and freshwater marsh vegetative communities to become dominant at Neary Lagoon (Figure 2-5). These two communities cover about 60% of the management area. The other 40% supports mixed oak woodland; non-native grassland; parkland and managed landscape; open water; and cleared, graded, and developed sites. Vegetation in the management area is typical of that found in similar wetland areas along the north-central coast of California.

Vegetative communities described in this management plan were identified and mapped in studies at Neary Lagoon during 1986 (Harvey and Stanley Associates 1987). Jones & Stokes Associates biologists conducted a reconnaissance survey of the Neary Lagoon management area on August 8, 1991, to qualitatively assess the general accuracy of the available vegetation information. Representatives of DFG and CCC were present during part of the survey and their management recommendations were solicited. Data from the Harvey and Stanley Associates studies (1987) are used in this report with minor modifications.

For the purpose of management planning, Neary Lagoon has been divided into eight vegetation and land cover categories. Five categories of natural vegetative community cover have been designated: riparian forest, freshwater marsh, mixed oak woodland, ruderal, and non-native grassland. Parkland and managed landscape are artificial vegetative types. Open water is an unvegetated habitat. Cleared, graded, and developed sites are considered a nonhabitat cover category. These cover types are described on the next page.

Riparian forest habitats at Neary Lagoon are woody communities along streams and the edges of the lagoon that are dominated by arroyo willow, yellow willow, red willow, black cottonwood, red alder, California box-elder, and western sycamore. This cover type occupies about 16 acres of the management area. Riparian forest is supported by a perennially high water table and, in some areas, occasional or periodic flooding. Riparian forest occurs on the northern, southwestern, and eastern banks of Neary Lagoon, on islands in the lagoon, and along Laurel Creek. The habitat value of the riparian forest on the southwestern side of the lagoon has been degraded by the presence of exotic trees, including blue gum and green wattle (acacia), and vines, such as Himalaya berry, English ivy, and periwinkle.

Freshwater marsh comprises about 9 acres of the management area. This community of emergent vegetation is supported by shallow, permanent, standing or slow-moving water. Dominant species at Neary Lagoon are tule, cattail, and yellow iris. These occur as either single-species stands or mixed stands. Neary Lagoon supports extensive areas of freshwater marsh.

Harvey and Stanley Associates (1987) sampled five stands of cattails, tules, and iris in July 1986 to determine the volume of standing vegetation in the flood storage area. Results of this study indicate that live vegetation accounts for 0.3-5.2% of total surface area and dead material can account for up to 2.2% of the total surface area. These studies were conducted to provide information for determining flow and flood storage capacity of the lagoon (see discussion under "Hydrology").

Mixed oak woodland comprises about 1 acre of the management area and is dominated by coast live oak. Mixed oak woodland is an upland community occurring on slopes above Laurel Creek.

Ruderal plants are weedy species tolerant of ground disturbances such as grading and filling. Ruderal vegetation covers about 2 acres of the management area. Examples of ruderal species are yellow star-thistle, bristly ox-tongue, wild radish, cheeseweed, fennel, salsify, wild oats, and ripgut brome. Ruderal vegetation dominates sites of recent or repeated disturbance. Ruderal vegetation is common on the east embankment at the southeastern side of the lagoon.

Non-native grassland occupies a 3-acre strip approximately 100 feet wide between the CHC housing development and the willow riparian forest on the northeastern side of the lagoon. (An approximate acre portion of this area was planted as native grassland in fall 1991.) The non-native grassland community supports annual and perennial grass species, most of which are European exotics, as the dominant cover with forbs as a subdominant component. Common species in the grassland include tall fescue, wild oats, wild radish, red-stem filaree, soft chess, ripgut brome, and curly dock.

Non-native grassland at Neary Lagoon.

Parkland and maintained landscape, which cover about 5 acres in the management area, occur in the uplands on the south side of the lagoon and as a narrow strip along the north side associated with the Cypress Point and Shelter Lagoon developments. These areas consist mostly of managed lawn and horticultural plantings associated with recreational facilities. Horticultural plantings include blue gum, red gum, green wattle, and star acacia.

The management area contains about 6 acres of open water habitat in portions of the lagoon recently cleared of marsh vegetation or with water too deep to support marsh plants, and in the channel from the lagoon outlet to the pump system. Much of the open water habitat is shallow water that is slowly converting to freshwater marsh through invasion by tules, cattails, and yellow iris.

Cleared, graded, and developed sites occupy about 2 acres of the management area and consist generally of sites cleared and graded to bare surface and sites with pavement and building construction devoid of vegetation. These areas are not now considered to be habitat for wildlife. Cleared and graded sites that are not slated for paving or buildings may be reinvaded by ruderal plants. Under the management plan, these areas would be restored to native vegetation or other uses.

Sensitive Habitats

Habitats of greatest sensitivity at Neary Lagoon are those of limited regional distribution that support the highest abundance and diversity of native plants and wildlife. These habitats at Neary Lagoon are the riparian forest, freshwater marsh, mixed oak woodland, and open water. These communities form a natural habitat island within a sea of urban development. Of these habitats, the riparian forest supports the greatest diversity of native wildlife, but the combination of habitats and their interconnections enhance the

Open water and marsh areas at Neary Lagoon.

attractiveness of the lagoon for many species. The transitional areas between habitat types, ecotones, are as important as the defined biological communities because wildlife often are dependent on more than one community and frequently move between communities. The ecotones between open water and marsh, marsh and riparian forest, and riparian forest and mixed oak woodland are well developed at Neary Lagoon. The several sensitive habitats and their ecotones make Neary Lagoon a rich wildlife habitat enclave.

Adverse human influences on wildlife in sensitive habitats at Neary Lagoon have included disturbance from people walking into the habitat, noise from surrounding areas, night lighting directed at the lagoon, and dumping of trash or pollutants. The relatively small size of the management area and the dense urban development surrounding it increase the need for buffers to protect wildlife species and their habitats. Buffers are zones between sensitive habitats and disturbance sources that dampen or prevent contact between these areas and ameliorate the adverse effects on wildlife species and their habitats. Types of buffers include barriers to human encroachment, such as fences, wet or flooded areas, or dense vegetation; barriers to outside influences (e.g., noise and lighting), such as screening vegetation or solid (e.g., wood or masonry) fences; and wide zones of intervening natural vegetation, the habitat quality of which is sacrificed to protect interior habitats.

The plant and wildlife species that have established naturally and persisted at Neary Lagoon without artificial assistance have succeeded because of their adaptations to local conditions. Individuals and populations of plants may differ in genetic composition from individuals and populations of the same species growing elsewhere in the region. Protection of these often subtle genetic differences is important to preserve genetic variation of species and genetically based local adaptations. Introduction of individuals of species already present at the lagoon and of new species for habitat enhancement or restoration should be done using local genetic stock, such as individuals or propagules (e.g., cuttings and seeds) taken from habitats at Neary Lagoon or from nearby locations of the same habitat types in coastal Santa Cruz County.

The isolation of Neary Lagoon in an urban matrix has likely precluded many native plant and wildlife species from reaching and colonizing it. Introductions of native plants and animals from the same habitat types in coastal Santa Cruz County would increase the species diversity of Neary Lagoon.

Wildlife and Fisheries

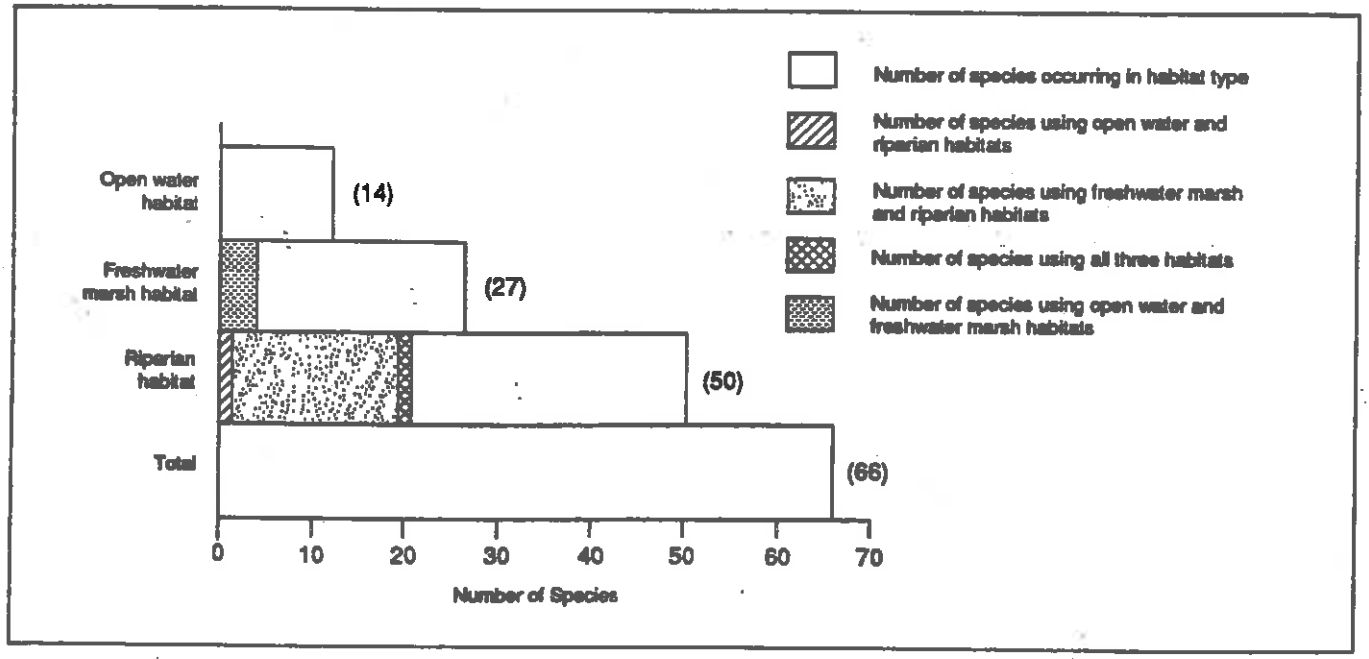
To provide baseline information for management planning, biological surveys were conducted at Neary Lagoon from January through October 1986 by Harvey and Stanley Associates (1987). The surveys identified the refuge's vegetative communities; bird and fish species that make use of the refuge; and the value of riparian forest, freshwater marsh, and open water habitats to the refuge's avifauna. Survey methods used and results of investigations are detailed in the Neary Lagoon Enhancement Plan (Harvey and Stanley Associates 1987). Survey results and information presented in the enhancement plan were the primary sources for information discussed in this section.

Wildlife

Neary Lagoon is a small but important urban wildlife area that provides a variety of habitats for birds and other wildlife. Since the early part of this century, a total of 199 bird species have been observed at the lagoon. Several rare birds have been sighted at the lagoon. Twenty-one species of birds are known to have nested there since the early 1970s (Harvey and Stanley Associates 1987).

Harvey and Stanley Associates (1987) reported that 66 bird species were observed during the 1986 surveys (Appendix C): 50 in riparian forest, 27 in freshwater marsh, and 14 in open water habitats (Figure 2-6).

Riparian forest supports the greatest number of species because this habitat provides understory, midstory, and overstory layers of vegetation and supports a greater diversity of vegetation than marsh or open water habitats.



Number of Bird Species Observed in Major Habitats at Neary Lagoon
Source: Harvey and Stanley 1987.

Figure 2-6

Freshwater marshes, which are dominated by closed stands of bulrush, cattail, and yellow iris, provide little diversity in vegetation or structure. Consequently, this habitat supports a less diverse community of wildlife than that associated with riparian forests.

Open water is used by aquatic birds and birds that feed in water, such as herons, egrets, and waterfowl. The value of the refuge to waterfowl is thought, in part, to be limited by water quality and the pattern of seasonal fluctuations in the lagoon's water levels. Waterfowl use of the eastern portion of the lagoon is low compared to use of other areas of the lagoon. Low levels of dissolved oxygen, caused by dense stands of emergent vegetation and poor water circulation in this portion of the lagoon, may have been the cause. Because water levels in the lagoon typically rise after waterfowl have constructed nests, flooding may reduce the nesting success of resident waterfowl. (Harvey and Stanley Associates 1987.)

Thirty-two bird species are year-long residents at the refuge and 34 seasonally breed or overwinter, or use the lagoon as a stopover on a migration route. The more common resident species include the pied-billed grebe, black-crowned night heron, mallard, wood duck, American coot, mourning dove, Anna's hummingbird, chestnut-backed chickadee, bushtit, marsh wren, song sparrow, and house finch. The greatest variety of birds is present at the lagoon during spring when migrating birds pass through the refuge and seasonal residents arrive to establish breeding territories. Allen's hummingbirds, western flycatchers, violet-green swallows, cliff swallows, Swainson's thrush, warbling vireos, Wilson's warblers, black-headed grosbeaks, and purple finches are among the species that use the lagoon during this period. Some species, such as the cinnamon teal, northern flicker, orange-crowned warbler, white-crowned sparrow, and tricolored blackbird winter at the refuge.

The large number of bird species that use such a small area can be attributed to the following characteristics of the lagoon:

- Because the lagoon provides a patchwork of habitats dispersed throughout the refuge, the border areas where different habitat types meet (ecotones) are large. The border area between two habitats usually supports a greater diversity of vegetation and habitat structure than either of the adjacent habitats; consequently, the wildlife community associated with ecotones usually will also be more diverse. Although the lagoon provides habitat for many species, the size of each species' population is still limited by the small size of the refuge.
- The lagoon's habitats are isolated from other tracts of similar habitats; migrating birds use the refuge as a suitable resting area in an otherwise unsuitable landscape.
- The lagoon is situated along a narrow migration corridor. The Coast Ranges and the Pacific Ocean act as migration barriers that concentrate large numbers of migrating birds along the coast. As a consequence, the lagoon provides a suitable resting area for some migrants, particularly during periods of inclement weather.

No surveys were conducted for amphibians, reptiles, or mammals; however, a compilation of recorded sightings identified three species of amphibians and five species of reptiles as having been observed in the lagoon management area (Table 2-5).

The refuge may support several species of small native mammals, such as vagrant and ornate shrews *(Sorex vagrans, S. ornatus)*, several species of bats, western harvest mice *(Reithrodontomys megalotis)*, deer mice *(Peromyscus maniculatus)*, and California voles *(Microtus californicus)*. Few, if any, large mammals would inhabit the refuge because of its small size, isolation from other undeveloped lands, and level of human disturbance at the site and on adjacent lands. Virginia oppossums *(Didelphis virginiana)*, raccoons *(Procyon lotor)*, and striped skunks *(Mephitis mephitis)* make use of urban lands in the Santa Cruz area and are adapted to high levels of human disturbance; however, if these species are present at the lagoon, populations are probably small because of large home range requirements in relation to refuge size (Zeiner 1990).

The refuge also supports non-native populations of Norway rats, domestic ducks and geese, and, until recently, a pair of mute swans.

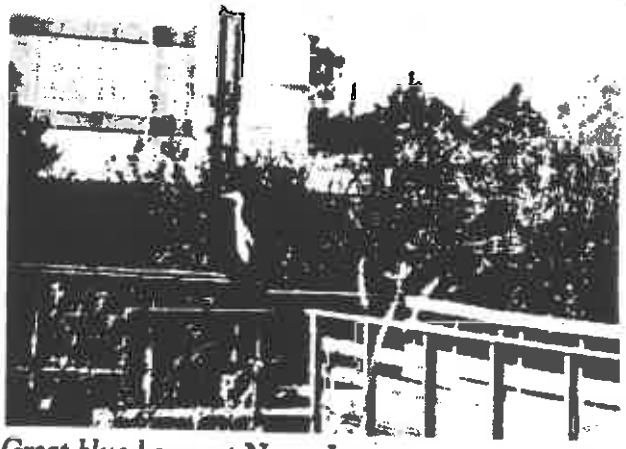
Special-Status Species

Twenty-three special-status species have been observed at the lagoon in recent years, none of which are federally listed as endangered or threatened. The willow flycatcher is state-listed as endangered and the bank swallow is state-listed as threatened. The western pond turtle, caspian tern, saltmarsh yellowthroat (a subspecies of the common yellowthroat), and tricolored blackbird are Category 2, candidate species for federal listing (Table 2-6). Special-status species are described in further detail below.

Western Pond Turtle. The western pond turtle is classified into two distinct subspecies, both of which are designated by DFG as species of special concern. The western pond turtle is also a candidate for federal listing (Table 2-6). The range of the northwestern subspecies, Clemmys marmorata pallida, includes Neary Lagoon. Although western pond turtles have been observed at the lagoon (Harvey and Stanley 1987), the status of the population is unknown.

Waterbirds. Eight special-status waterbirds have been observed at the lagoon. The need to protect nesting colonies or rookeries is the basis of concern for five of these species (Table 2-6). None of these species are known to nest at the lagoon (Harvey and Stanley 1987); however, suitable nesting and foraging habitat for the great blue heron, great egret, and black-crowned night heron occurs at the lagoon. Although the American white pelican, double-crested cormorant, California gull, and Caspian tern may occasionally occur, preferred habitat for these species does not occur at the lagoon.

Wood ducks nest at the lagoon and are a species of local interest. The availability of natural nesting cavities for this species is limited by the scarcity of nesting trees of suitable size. Most, if not all, wood duck nesting occurs in artificial nesting boxes that have been constructed and maintained by individuals at the duck pond at the western side of the management area (Figure 2-5) (Harvey and Stanley 1987).



Great blue heron at Neary Lagoon.

Table 2-5. Fish, Amphibians, and Reptiles Known to Occur at Neary Lagoon

Common Name	Scientific Name
Fish	
Rainbow trout	*Oncorhynchus mykiss*
Carp	*Cyprinus carpio*
Sacramento sucker	*Catostomus occidentalis*
Mosquitofish	*Gambusia affinis*
Bluegill	*Lepomis macrochurus*
Largemouth bass	*Micropterus salmoides*
Prickly sculpin	*Cottus asper*
Amphibians	
California slender salamander	*Batrachoseps attenuatus*
Pacific treefrog	*Hyla regilla*
Bullfrog	*Rana catesbeiana*
Reptiles	
Western pond turtle	*Clemmys marmorata*[a]
Southern alligator lizard	*Gerrhonotus multicarinatus*
Gopher snake	*Pituophis melanoleucus*
Western terrestrial garter snake	*Thamnophis elegans*
Western aquatic garter snake	*Thamnophis couchi*

[a] The western pond turtle has been reclassified into two distinct subspecies. The range of the northwestern subspecies, *C. marmorata pallida*, includes Neary Lagoon.

Source: Harvey and Stanley Associates 1987.

Table 2-6. Special-Status Species Observed at Neary Lagoon

Common Name	Scientific Name	Status[a]	Condition
Western pond turtle	*Clemmys marmorata pallida*	CSC, 2	
American white pelican	*Pelecanus erythrorhynchos*	CSC	Nesting colony
Double-crested cormorant	*Phalacrocorax auritus*	CSC	Rookery
Great blue heron	*Ardea herodias*	O	Rookery
Great egret	*Casmerodius albus*	O	Rookery
Black-crowned night-heron	*Nycticorax nycticorax*	O	Rookery
Wood duck	*Aix sponsa*	L	
Osprey	*Pandion haliaetus*	CSC	Nesting
Northern harrier	*Circus cyaneus*	CSC	Nesting
Sharp-shinned hawk	*Accipiter striatus*	CSC	Nesting
Cooper's hawk	*Accipiter cooperii*	CSC	Nesting
California gull	*Larus californicus*	CSC	Nesting colony
Caspian tern	*Sterna caspia*	CSC, 2	Nesting colony
Long-eared owl	*Asio otus*	CSC	
Short-eared owl	*Asio flammeus*	CSC	Nesting
Black swift	*Cypseloides niger*	CSC	Nesting
Willow flycatcher	*Empidonax traillii*	SE, FSS	Nesting
Bank swallow	*Riparia riparia*	ST	Nesting
Virginia's warbler	*Vermivora virginiae*	CSC	Nesting
Yellow warbler	*Dendroica petechia*	CSC	Nesting
Saltmarsh yellowthroat[b]	*Geothlypis trichas inuosa*	2	
Yellow-breasted chat	*Icteria virens*	CSC	Nesting
Tricolored blackbird	*Agelaius tricolor*	2	Nesting colony

[a] Status applies only for the condition listed.

[b] Presence of subspecies not confirmed.

CSC = DFG species of special concern.
2 = category 2 candidate for federal listing.
SE = state endangered.
ST = state threatened.
FSS = federal sensitive species.
O = considered special-status by DFG.
L = considered special-status because of local interest in the species.

Sources: Harvey and Stanley Associates 1987, California Department of Fish and Game 1990.

Raptors. Six species of special-status raptors have been observed at the lagoon, none of which are known to nest (Harvey and Stanley 1987). The need to protect nesting territories and ensure breeding success is the basis of concern for five of these species (Table 2-6).

Preferred nesting and foraging habitat does not occur at the lagoon for ospreys, northern harriers, and short-eared owls; however, young dispersing from nesting territories, wintering birds, or migrants may occasionally occur at the lagoon. Preferred nesting and foraging habitat for Cooper's hawks, sharp-shinned hawks, and long-eared owls is extremely limited and subject to human disturbance associated with urban environments. These species probably only occur at the lagoon as dispersing young, migrants, or wintering birds.

Passerine Birds. Two species of passerine birds have been observed at Neary Lagoon that are listed by the state as threatened or endangered. Additionally, five species of passerine birds known to occur at the lagoon are designated by the state as special-status species (Table 2-6), which are described below.

The willow flycatcher is a state-listed endangered species (Table 2-6) that is not known to breed at or in the vicinity of the lagoon (Harvey and Stanley 1987). Riparian willow shrub habitat associated with meadows is this species' preferred habitat, but willow habitats present at the lagoon would be unsuitable or marginal. Although Neary Lagoon is not within this species' range (Zeiner et al. 1990), vagrants may occasionally occur.

The bank swallow is state-listed as threatened because of loss of suitable nesting cliffs and banks throughout its range (Table 2-6). Suitable nesting habitat is not present at the lagoon; however, the lagoon provides suitable foraging habitat for spring and fall migrants.

Suitable habitat for Virginia's warbler does not occur at the lagoon. Limited yellow-breasted chat habitat occurs at the lagoon, but nesting has not been documented. Although Neary Lagoon is not within the range of these species (Zeiner et al. 1990), infrequent migrants or vagrants may occur.

Black swifts require sea cliffs located above the surf or cliffs with waterfalls for nesting. Nesting habitat for this species does not occur at the lagoon; however, because black swifts nest in Santa Cruz County, this species may occasionally forage at the lagoon.

The tricolored blackbird is a candidate for federal listing and has been proposed for state listing as endangered. Severe population declines have been documented for this species. Loss of wetland habitat is considered the primary cause of these declines (Beedy et al. 1991). Tricolored blackbirds winter in emergent marsh habitats, which occur at the lagoon (Harvey and Stanley 1987). This species attempted to nest at the lagoon in 1973, but the colony was quickly abandoned. Aggressive behavior by red-winged blackbirds toward the colony is thought to have been the cause of its failure (Beedy et al. 1991).

The saltmarsh yellowthroat, a subspecies of the common yellowthroat, is a candidate for federal listing. Common yellowthroats nest at the lagoon; however, the subspecific status of the lagoon's population has not been determined (Harvey and Stanley 1987).

Fisheries

Three native fish species occur in the lagoon (Table 2-5). Sacramento suckers are abundant in the lagoon and spawn in Laurel Creek when sufficient flow is available in high runoff years. Prickly sculpin are found in Laurel Creek and the lagoon proper, although the lagoon probably provides only marginal habitat because of low dissolved oxygen levels near the lagoon's bottom. Rainbow trout were found in the lagoon; because the lagoon is not a typical trout habitat, these are probably escapees from a stocked pond west of the management area.

Largemouth bass, bluegill, carp, and mosquitofish are non-native species that have been introduced into the lagoon (Table 2-5). Largemouth bass and bluegill successfully reproduce in the lagoon, constructing nests in the sandy-bottomed, shallow areas near the inflow of Laurel Creek. Only a few large carp were recorded during surveys. On a reconnaissance survey on August 8, 1991, Jones & Stokes Associates biologists observed at least four carp in the lagoon. Mosquitofish were introduced to the lagoon to control mosquito production; however, they were uncommon during surveys conducted by Harvey and Stanley Associates (1987). Low carp and mosquitofish numbers may be attributed to predation by largemouth bass and bluegill.

Mosquitos

Mosquitos have four distinct life cycle stages: egg, larva, pupa, and adult. The first three stages generally occur in shallow water with an abundance of vegetation and floatage, and where protection from wave action is available. Some waterfowl that use Neary Lagoon feed on mosquito larvae, and adult mosquitos are eaten by flycatchers, vireos, warblers, and other birds.

Based on larvae sampling, the principal mosquito production area is along the edges of the lagoon, where the water is shallow and aquatic plants and vegetation mats provide protection from predatory mosquitofish that have been introduced into the lagoon. The shallow water, dense vegetation, and muddy bottom also provide ideal habitat for aquatic midge production. (Doty pers. comm.)

The California Department of Health Services (DHS) conducted an evaluation of Neary Lagoon as a possible mosquito source during the spring, summer, and fall of 1987. Sampling was conducted for mosquito adults, larvae, and pupae; six adult species were identified. Mosquito populations were low but constant from April through September, with a peak in July. DHS concluded that while mosquitos at this density do not pose a public health risk, they may be a nuisance to nearby residents. In addition, four species of aquatic midges were identified. Midges are frequently confused with mosquitos, and, although they do not suck blood, they are often present in large numbers, contributing to the nuisance factor. (Doty pers. comm.)

Neither the City nor Santa Cruz County currently has a mosquito control program (Rau pers. comm.).

Cultural Resources

Cultural resources refer to artifacts and sites from either the historic or prehistoric periods. The historic period, described in the "Background" section of Chapter 1, essentially began with the Spanish explorations into California. The earliest historic records of the Santa Cruz area are from Portola's expedition, which passed through in 1769 in search of a suitable site to establish a mission. Following is a description of the prehistoric period and cultural resource sites.

Prehistoric Period

The Santa Cruz area was occupied during precontact times by Native Americans called the Costanoan (also known as the Ohlone). Their name is derived from the Spanish term costanos, meaning coastal people. This term is used to describe several Indian groups with linguistic affinity that lived in the area between San Francisco Bay and Monterey Bay (Levy 1978).

Like the sociopolitical organization of many native Californian groups, Costanoan organization was based on the tribelet, a small, loose-knit group of individuals who held specific lands and spoke related, but distinct, languages. Tribelets usually had one or more permanent villages and several temporary camps located near seasonally available resources (Levy 1978).

The Costanoan diet centered around acorns. This staple was supplemented by hunting, fishing, and procuring inland and shoreline resources.

The entry of Spanish into Costanoan territory in the late 1700s was disastrous for the native population. The use of the Indians as laborers for the missions, the introduction of diseases, and the intentional eradication of the native Californian way of life resulted in the nearly complete destruction of the Costanoan people. By 1935, no speakers of the language could be located. Today, only a few hundred descendants of the Costanoan group still reside in their former territory.

Cultural Resource Sites

Cultural resource specialists performed a records search and limited field reconnaissance for this document. No attempt was made to survey for previously unrecorded sites. The purpose of the field reconnaissance was to relocate previously recorded sites and to assess the overall sensitivity of the management plan area for cultural resources. This section summarizes the results of these investigations.

Several cultural resource sites have been recorded near Neary Lagoon, although only a small portion of the southwestern edge of the lagoon has been surveyed systematically for cultural resources (Jones & Stokes Associates 1991a). One previously recorded site is within the management plan area, and another may be within the area.

Site CA-SCR-273/H is located within the management plan area. The site consists of prehistoric and historic materials located in an area bordering the north side of Neary Lagoon. Prehistoric cultural materials consisted of a few pieces of chert debitage, shell, and bone found in five concentrations within a larger area. A single piece of ceramic, found in one of these concentrations, comprised the historic component. The scarcity of material and the site's location within a low area and potential flood zone may indicate that CA-SCR-273/H consists of fill material.

Portions of the area where CA-SCR-273/H is plotted were inspected on foot. Much of the plotted site area has been developed and landscaped. Access to a small portion of the site is possible via a path between a residential development and the edge of the lagoon. In this area, the ground visibility was very poor because of

landscaping around the buildings. A single piece of aqua-colored bottle glass was observed in this location.

Site CA-SCR-87/H may extend into the management plan area. The site, located on a bluff overlooking Neary Lagoon, has been visited and recorded by archeologists at least three times, and some subsurface testing (augering) was conducted in 1985 (Bourdeau 1985). No field reconnaissance on CA-SCR-87/H was performed for this document because the land on which the site is located is privately owned and fenced.

Both prehistoric and historic artifacts have been found at CA-SCR-87/H. Prehistoric artifacts included midden soils, a mano, chert debitage, bone, charcoal, and shell. An obsidian core was found away from the midden deposit, near an adjacent building. The prehistoric materials may have been disturbed by construction of the building or by nearby construction activities and the placement of fill on the site.

Historic artifacts included Chinese porcelain fragments and other ceramics, a square-cut nail, and a mother-of-pearl hand-cut button, suggesting occupation in the period between the late 19th century and the middle of the 20th century. A shed is located on the lot, and a driveway, which probably once led to a dwelling, is noted on the site record map.

Although CA-SCR-87/H site maps indicate that both the prehistoric and historic artifacts are located only on the bluff overlooking Neary Lagoon and are separated from the lagoon by an embankment, cultural materials from this site may extend into the management plan area. The site is not mapped or recorded to current professional standards, making it difficult to determine whether the site is within the management plan area.

Two prehistoric sites, CA-SCR-80 and CA-SCR-293, are located just outside the management plan area, on the western bluff overlooking the lagoon. Undoubtedly, this part of the lagoon would have been a very desirable area to occupy during prehistoric times because of its elevation and its proximity to fresh water and resources. The surfaces of both sites have been disturbed by road and railroad construction, and currently neither site can contribute much information concerning prehistoric lifeways around the lagoon. Recommendations have been made to test excavate CA-SCR-293 and the area between CA-SCR-293 and CA-SCR-80 as part of the Santa Cruz Wastewater Treatment Plant Modification Program (Jones & Stokes Associates 1991a). Data from test excavations could provide valuable insights into life around the lagoon during the prehistoric period.

Public Use

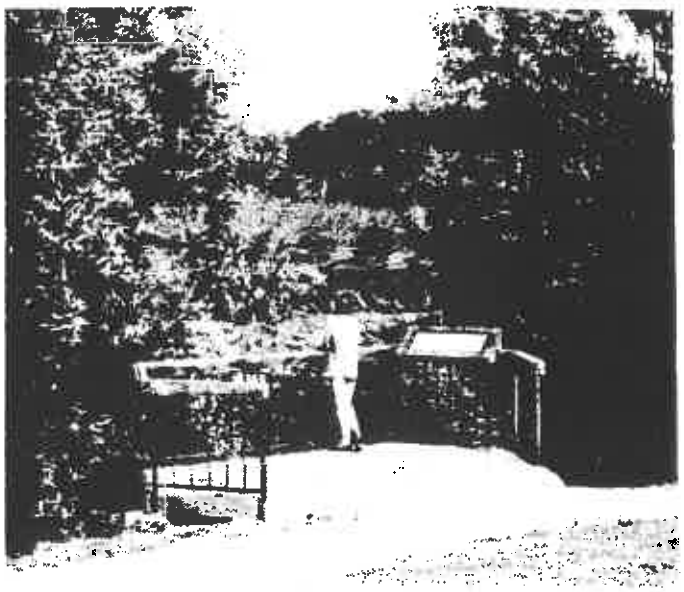
Neary Lagoon serves as an important resource both for the community of Santa Cruz and for visitors to the area. It has long been recognized as an important area for birdwatching and attracts birders from outside the area. Located within a few minutes' walk of both the central downtown area of Santa Cruz and the beach area with its amusement park and municipal pier, the lagoon is easily accessible to a broad spectrum of residents and visitors. The railroad adjacent to the management area carries tourists between the area of the amusement park and beach and the Henry Cowell Redwoods State Park in the Santa Cruz Mountains several miles away. An important commercial shopping facility called the Ice House is currently under construction less than 200 yards north of the lagoon. The lagoon has been used mostly by residents in the

immediate neighborhood of the lagoon and by area school groups. With new commercial facilities developing nearby, use could increase depending on access provisions.

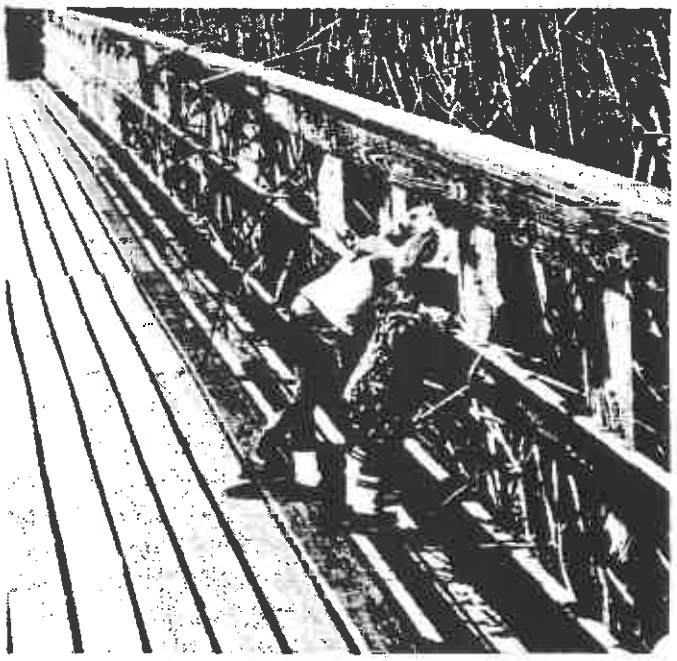
Most use of the lagoon occurs on the south side, where recreation facilities are located. Facilities presently consist of three full tennis courts, a half tennis court, a tot lot play area for small children, a small restroom, picnic tables and barbecue facilities, an amphitheater, an open lawn area, observation areas with some interpretive signs, a trail linking the observation areas, and a floating boardwalk leading to an observation platform in the lagoon. A 24-car parking lot is located east of the tennis courts. Additionally, the City maintains a 10-foot-wide public easement containing a turf pathway along the north side of the lagoon, between the lagoon edge and the Cypress Point and Shelter Lagoon developments. Although the trail is marked with signposts, no signs indicate entry to the trail from public areas and no parking or staging areas exist. The trail apparently is used mostly by residents of the developments. A small observation platform extends into the lagoon from the north side path.

Most recreation facilities are located on a generally level area on the southern bluff top between the railroad tracks and the edge of the steep escarpment and riparian forest. The lawn area, amphitheater, and observation areas are located off the bluff top and are closely associated with the lagoon. The amphitheater and most of the open lawn area would be replaced by planned expansion of the secondary wastewater treatment facilities if approved for construction. Other changes to the design of the recreation area will also occur if the expansion occurs.

Public use of recreation facilities at Neary Lagoon has been estimated by the City Department of Parks and Recreation and appears in Table 2-7. Overall use is lowest during January and highest during July and August. Use is high, however, aesthetic role in the



Observation area with an interpretive sign on the south side of the lagoon.



Central floating walkway leading to an observation platform at the lagoon.

Recreation facilities presently include an amphitheatre and open lawn area on the lagoon's south side.

Trail along the north side of the lagoon.

from March through October. The tennis courts and play areas are used mostly between April and October. The floating boardwalk is used mostly during April and May, and October through December.

The management area also receives use from transients and others who often camp illegally in remote areas. Dense vegetation areas, such as the riparian forests, located in the eastern portion of the management area have been used most frequently. These areas are easily accessible to the railroad tracks and beach area. Area residents have lodged numerous complaints with the police and parks and recreation departments regarding illegal campers, gatherings, inebriated people, violent crimes, trash, and other concerns (Dunbaugh pers. comm.). During 1990, the fire department responded to more fire calls for this area than for any other area of the city. The fire department attributes this high number to transients frequenting the wooded areas of the lagoon (Ekers pers. comm.).

Fire incidents at Neary Lagoon reported to the Santa Cruz Fire Department totaled 16 in 1989 and 17 in 1990. As of April 1991, three fires had been reported. Brush and refuse fires are the most frequent types of fires reported. (Ekers pers. comm.) Most of these fires were located in the riparian area southeast of the lagoon, where transients frequently build fires for warmth and cooking (Lopes pers. comm.).

Fires occurring at Neary Lagoon usually are small enough to control using the 300 gallons of water carried by each fire truck. If more water is required, fire trucks draw their water from hydrants, which are located at the end of most streets in Santa Cruz. Fire truck hoses are approximately 1,600 feet long, an adequate length to convey water from hydrants to the riparian area. (Lopes pers. comm.)

Formal use of the lagoon for environmental education activities is not well documented. The Santa Cruz County Office of Education has published educational materials for use during programs conducted at the lagoon. School classes visit the lagoon to learn about the cultures of local Native Americans who lived in the area. Activities have included basket making and food grinding and preparation (Goldfrank pers. comm.). Because the lagoon is located close to Bay View Elementary School, many teachers from the school walk with students to the lagoon for educational fieldtrips (Helman pers. comm.). Other schools in the area also use the lagoon consistently (Iglesius pers. comm.). The Santa Cruz Bird Club conducts regular outings to the lagoon in the spring and fall.

Table 2-7. Estimated Number of Park Users at Neary Lagoon

Month	Tennis Courts Users[a]	Play Area Users	Floating Walkway Users	Total Users[b]
January	800	100	80	980
February	825	100	80	1,005
March	2,000	250	100	2,350
April	2,200	450	180	2,830
May	2,500	450	260	3,210
June	3,000	450	100	3,550
July	3,000	600	100	3,700
August	3,000	600	100	3,700
September	2,500	500	100	3,100
October	2,500	450	260	3,210
November	750	250	340	1,340
December	750	100	260	1,110
Total	23,825	4,300	1,960	30,085

[a] Estimated from signup sheets.

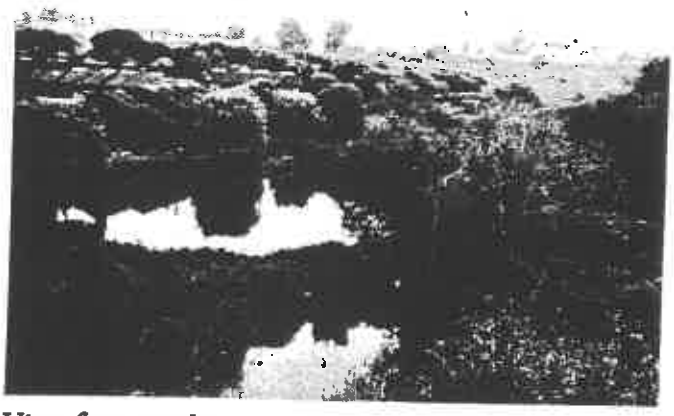
[b] Includes special functions and daily observations.

Source: Lindquist pers. comm.

Aesthetics

As a vestige enclave natural area within the surrounding urban matrix of housing, commercial, and industrial land uses, Neary Lagoon plays a unique aesthetic role in the area. Its visual character is strongly natural, despite the many views of surrounding development from within the lagoon.

The most important elements comprising the lagoon's visual character are the lagoon itself (i.e., the open water area of the lagoon) and the surrounding riparian and oak woodland forests. The densely vegetated escarpment slope, particularly the portion along the west side, is a particularly important visual feature because of the combination of abrupt relief and heavy vegetation. The mosaic of different types of vegetation provides a high amount of visual variety. The vegetation in and around the lagoon varies considerably in height, color, and texture. Open, level



View from residences on the west bluff overlooking the lagoon.

expanses of fine-textured marsh vegetation include shades of brown, yellow, and green; tall, mounding riparian vegetation, mostly medium-textured willows, is generally gray-green; and the taller, coarse-textured vegetation of the mixed oak forest is a typically dark green and shady.

Visual resources of the management area, including areas of high visual quality, visual edges formed by the escarpment and tall vegetation, views of various levels of quality, and both positive and negative visual features are shown generally in Figure 2-7.

The industrial character of the wastewater treatment plant contrasts strongly with the natural character of the lagoon environment. Surrounding housing also contrasts but blends better because of the lower heights of buildings, screening and partial screening provided by vegetation, and use of wood materials and darker, earth-tone colors. The newly constructed CHC housing project is more highly contrasting than other existing housing because of the lighter colors used, greater building masses, and lack of vegetation around structures. Several houses and a large church are located on top of the western bluff. These elements tend not to be highly noticeable or imposing viewed from the lagoon trails and observation areas because they are partially screened by trees and other vegetation on the escarpment.

Few views of the lagoon from outside the management area are available other than those from residences adjacent to the management area. Sporadic views are available to people traveling along Bay Street. Some overlook views of the lagoon are available from the western bluff top on private properties along Bay Street. Most views from the southern edge include the wastewater treatment plant in the foreground. Some views overlooking the lagoon are available from the extreme eastern end of the recreation area and from the stairs on the south side, but no formal overlooks exist from high vantage points along the bluff. Observation decks built along the south edge of the lagoon and the central floating walkway and observation deck generally provide good low-level views of the lagoon area. Marsh vegetation has, however, grown up in front of several of these observation decks and partially blocked expansive views. Views into the management area generally are limited to those from residences immediately around the boundary. Views of the lagoon are important to nearby residents, as evidenced by the trimming and control of marsh vegetation along the north shoreline at the apartment and condominium developments. For people using the lagoon-edge trails, fast-growing and dense emergent marsh vegetation along the shoreline is a detriment to desired viewing opportunities. Opportunities to view wildlife close up are a unique and important elemnt to the lagoon's aesthetic character. Large fish and numerous birds, especially waterfowl, are seen easily by visitors and are an important aesthetic attraction.

The recreation area and current park entrance are not seen easily from Bay or California Streets. The eroded, grassy area between Bay Street and the railroad tracks is not a particularly attractive area in its current state of maintenance.

Odors and noise are other elements that affect people's aesthetic impressions of the management area. Except for temporary noises associated with construction of the City housing development and improvements to the wastewater treatment plant, the lagoon is, for the most part, a quiet area. Most of the sounds heard in the lower area of the lagoon are bird noises, vegetation rustling in the wind, and occasional voices. Some noise and occasional odors associated with the operation of the treatment plant are apparent in areas of the lagoon. These noises and odors detract from people's overall aesthetic impression of the lagoon. Trash accumulates around the Laurel Creek inflow to the lagoon and is often found in the more remote areas of the management area frequented by transients. Accumulated trash and illegal camping and gathering areas are negative aesthetic elements in the management area. Decomposing vegetation and algae blooms in the lagoon, often associated with poor water quality, also are viewed by many as negative aesthetic elements.

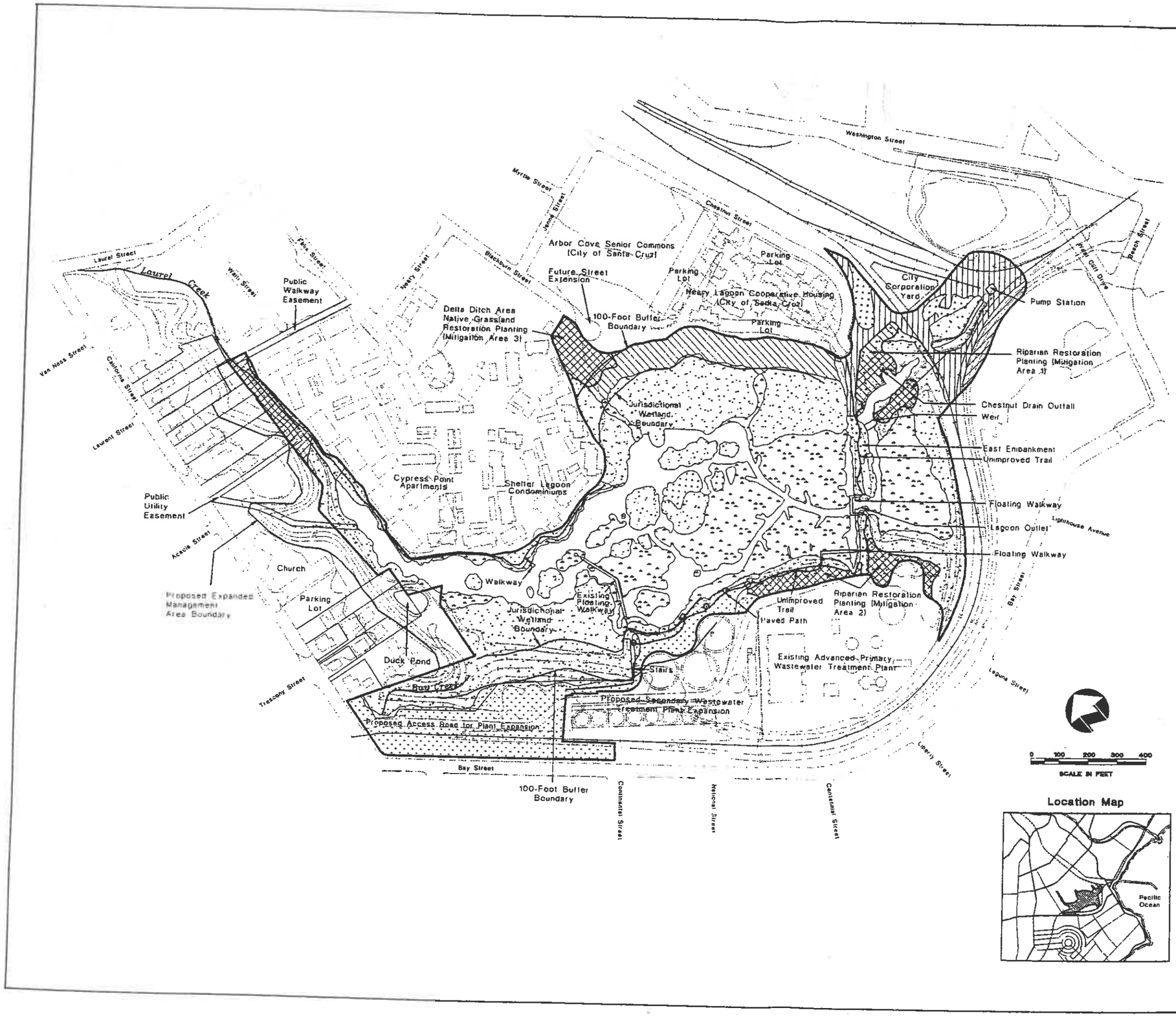
Infrastructure

Water mains and sewer lines terminate at the end of streets bordering the Neary Lagoon management area, including Chestnut and Blackburn Streets (City of Santa Cruz Public Works Department n.d.). Chestnut Street and its existing water, sewer, and electrical lines were extended to service the housing cooperative development. Blackburn Street and its existing water, sewer, and electrical lines will be extended to service the Arbor Commons Senior Housing development. These utility lines could provide water, sewage, and electrical service for any new entrance or restroom facilities if they were to be built at the end of Chestnut Street. Drainage improvements also were made in conjunction with these developments and are described in the "Hydrology" section above.

Sewer lines extend from the end of Chestnut Street to the wastewater treatment facility at the southern boundary of the management area. These lines are buried beneath the east embankment of the lagoon, and a maintenance easement accessible by vehicles extends along the embankment. Vehicle access for maintenance is from Chestnut Street or through the wastewater treatment plant.

The restroom at the main park entrance on California and Bay Streets is served by city water, sewer, and electrical lines. No lighting currently exists in the open lawn and amphitheater area near the main park entrance.

Vegetation and Land Cover



Source: Harvey and Stanley 1987 with modifications by Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 2-5

CHAPTER 3

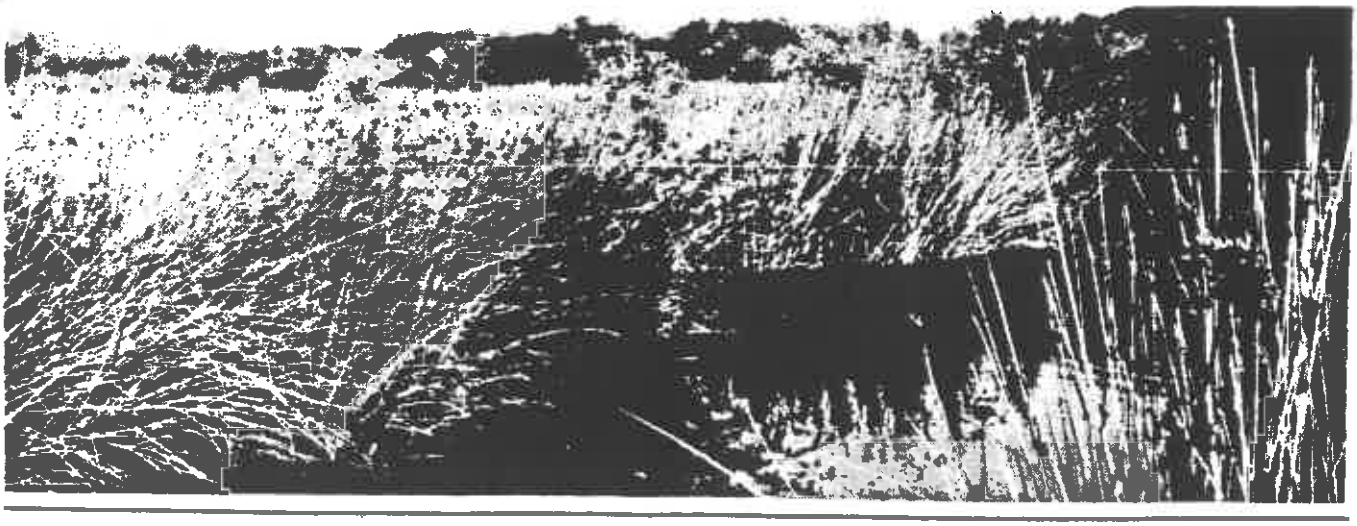
MANAGEMENT ELEMENTS

This chapter describes the management elements comprising the plan. For each management element, a goal and objectives, and actions designed to accomplish the objectives, are described. To avoid possible redundancy, the rationale for management objectives and actions is described at the beginning of each management element section rather than immediately following each action.

Because the various management elements are interrelated, some management actions are repeated under different management elements to accomplish different objectives (e.g., providing fencing appears as action V-3.1 for vegetation management and action PU-2.3 for public use and safety). Where actions overlap, references to similar actions in other elements are generally provided. The management area has been organized into 10 management zones to help identify the locations of actions in the lagoon area (Figure 1-4). Figure 3-1, "Public Use Improvements Plan", and Figure 3-2, "Vegetation Management Plan", depict graphically many of the management actions and areas in which management actions will occur. Figure 3-3, "Central Lagoon Area Enlargement", provides more detail at a smaller scale for management actions in the central portion of the lagoon.

Management elements appear in this chapter and in Table 4-1 (Chapter 4) in the following order (an abbreviation code follows the element title in parentheses):

- Hydrology Management (H),
- Water Quality Management (WQ),
- Vegetation Management and Habitat Restoration (V),
- Wildlife and Fishery Management (WF),
- Mosquito Control (M),
- Cultural Resource Protection (CR),
- Public Use and Safety (PU),
- Aesthetic Management (A),
- Infrastructure Management (I), and
- Mitigation Commitments and Land Use Requirements (ML).



Hydrology Management

Managing hydrology at Neary Lagoon is intended to protect surrounding areas from flooding, enhance the lagoon's water quality, maintain and improve vegetation and wildlife habitats, improve mosquito control, and maintain and improve the lagoon's aesthetics.

Water Level Management

Managing lagoon water levels is important for flood protection, water quality management, habitat improvement for wildlife and desirable vegetation, and mosquito control. Because sand buildup frequently blocks the outlet structure at Cowell Beach during summers, water levels have tended to rise through spring and summer until City maintenance crews clear the outlet structure. New pump and outlet facilities have recently been constructed that will be used to manage water levels for flood protection, primarily during the winter rainy season. These improvements also could be used to manage water levels during other times of the year to accomplish other purposes. Additionally, various other methods and combinations of methods could be employed to manage water levels at the lagoon.

Lagoon Outflow System

Weirs and Outflow Channels. Retrofitting an adjustable weir structure at the existing concrete weir would help to control water levels in the lagoon. The adjustable weir could be used alone or in combination with the new pump system to provide incremental control of lagoon water levels.

The lagoon outlet at the east embankment has a reduced capacity compared to the rest of the downstream channel and is heavily overgrown with vegetation. The outlet probably acts as a weir itself. The lagoon outlet should be kept clear of vegetation and other obstructions to improve the effectiveness of the concrete weir and pump system.

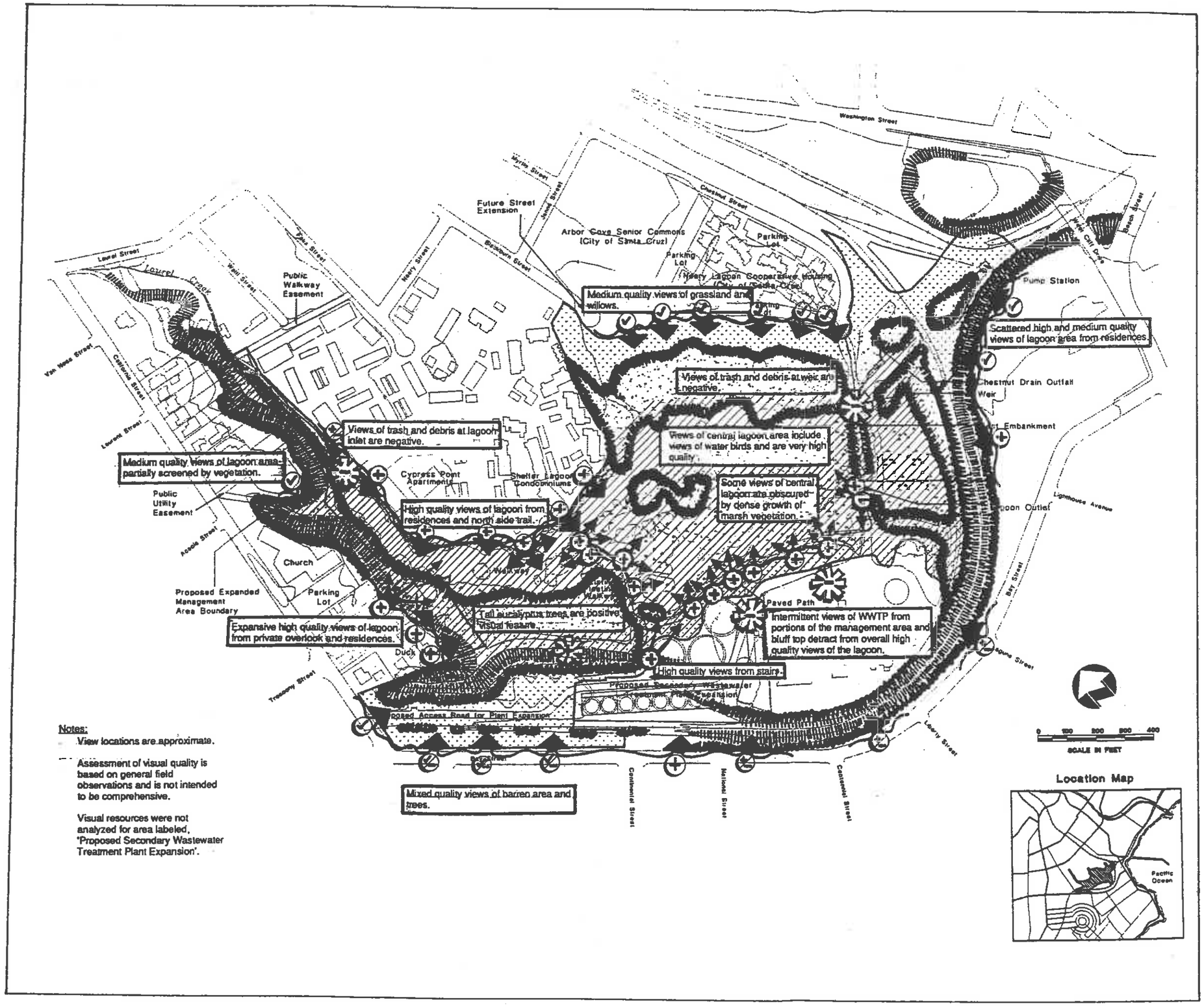
Modifying or clearing out the existing screw gate structure at the east embankment, widening the outlet channel and weir structure, and keeping the lagoon outlet and outlet channel free of marsh vegetation would increase the efficiency of water conveyance through the lagoon, particularly at low and intermediate floodflows.

The floating walkway at the lagoon outlet at the east embankment may not be able to withstand the high flow velocities possible at the outlet channel. High floodflow velocities could cause the structure to break loose and be carried downstream. If the structure were to lodge across the channel downstream, it could trap debris and form a dam, rendering the pump system less effective and causing flood levels to occur in the lagoon. Even if the structure were to remain attached, it could trap debris, slowing outflows and potentially causing upstream flooding. This structure should either be removed during the wet season each year or be removed permanently and replaced with a permanent structure with a soffit (underside) elevation above the maximum anticipated 100-year flood level of 9.5 feet. Permanent replacement is the preferred action.

Outflow System

To provide 100-year flood protection during the winter rainy season, the new pump system has been designed to start automatically when water levels reach 6.5 feet in the outlet channel and lagoon and continue to operate until water levels are lowered to 6.0 feet. The new outlet structure at Cowell Beach is designed to be largely self-clearing of sand and should require less maintenance by City work crews during the winter storm season. However, to ensure proper operation of the outlet structure with no adverse impacts on the

Visual Resources



Notes:

- View locations are approximate.
- Assessment of visual quality is based on general field observations and is not intended to be comprehensive.
- Visual resources were not analyzed for area labeled, 'Proposed Secondary Wastewater Treatment Plant Expansion'.

Legend

- Riparian and Mixed Oak Woodland
- Freshwater Marsh
- Other Areas (maintained, recreation, grassland, ruderal)
- Open Water
- Area of High Visual Quality
- Bluff Edge
- Tall Vegetation Edge
- ⊕ High Quality Views
- ✓ Medium Quality Views
- ⊖ Low Quality Views
- ⊕/⊖ Mixed Quality Views
- Positive Visual Feature
- Negative Visual Feature

Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

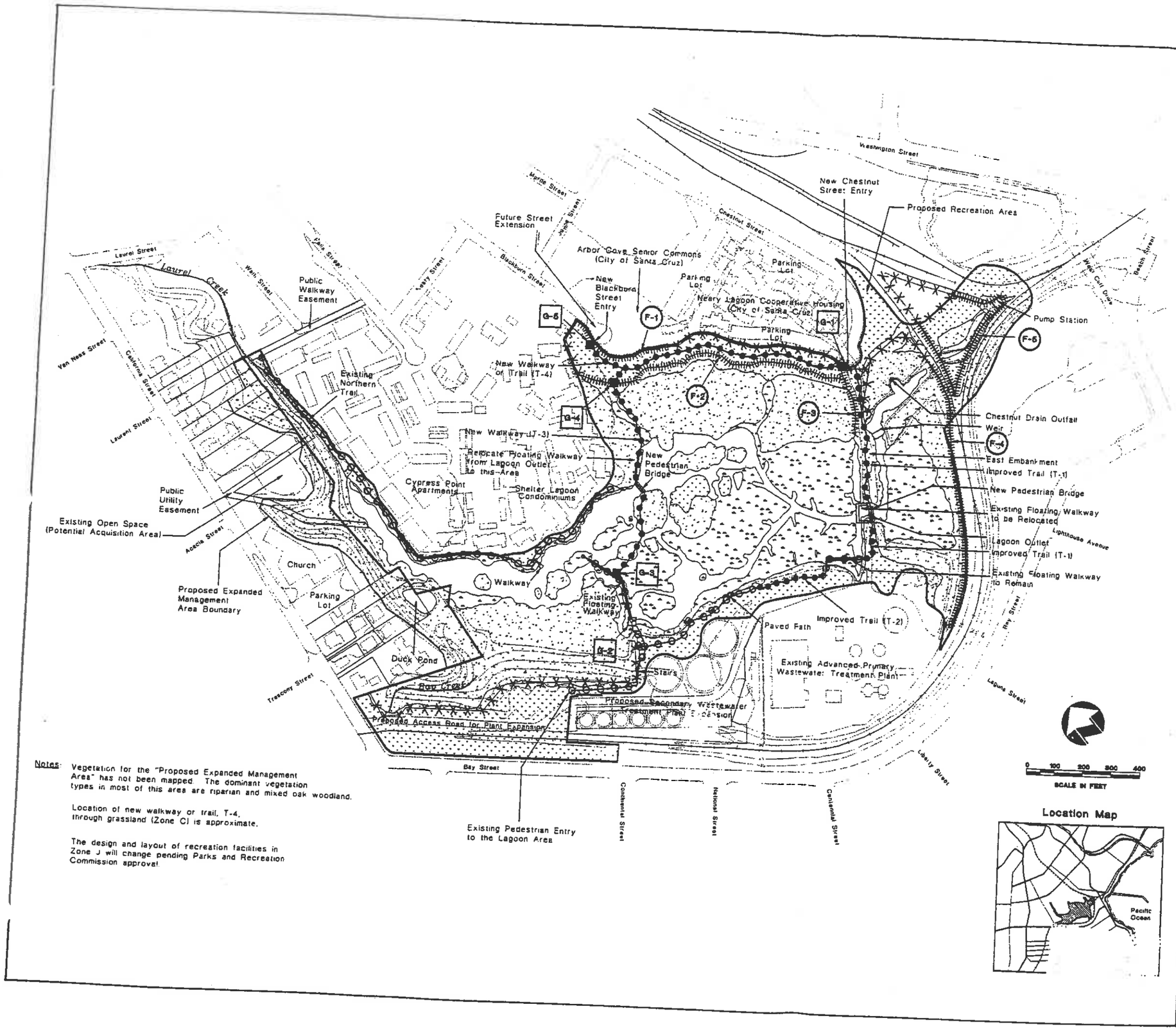
Prepared by: Jones & Stokes Associates

Figure 2-7

CHAPTER 3

MANAGEMENT ELEMENTS

Public Use Improvements Plan



Notes:

Vegetation for the "Proposed Expanded Management Area" has not been mapped. The dominant vegetation types in most of this area are riparian and mixed oak woodland.

Location of new walkway or trail, T-4, through grassland (Zone C) is approximate.

The design and layout of recreation facilities in Zone J will change pending Parks and Recreation Commission approval.

Location Map

Legend

- Riparian and Mixed Oak Woodland
- Freshwater Marsh
- Other Areas (maintained, recreation, grassland, ruderal)
- Open Water
- F-# Indicates Fence Segment Number
- G-# Indicates Gate Number
- New Gate
- Existing Gate
- Existing Fence
- New Fence
- Existing Trail
- New or Improved Trail or Walkway

Source: Jones & Stokes Associates 1991

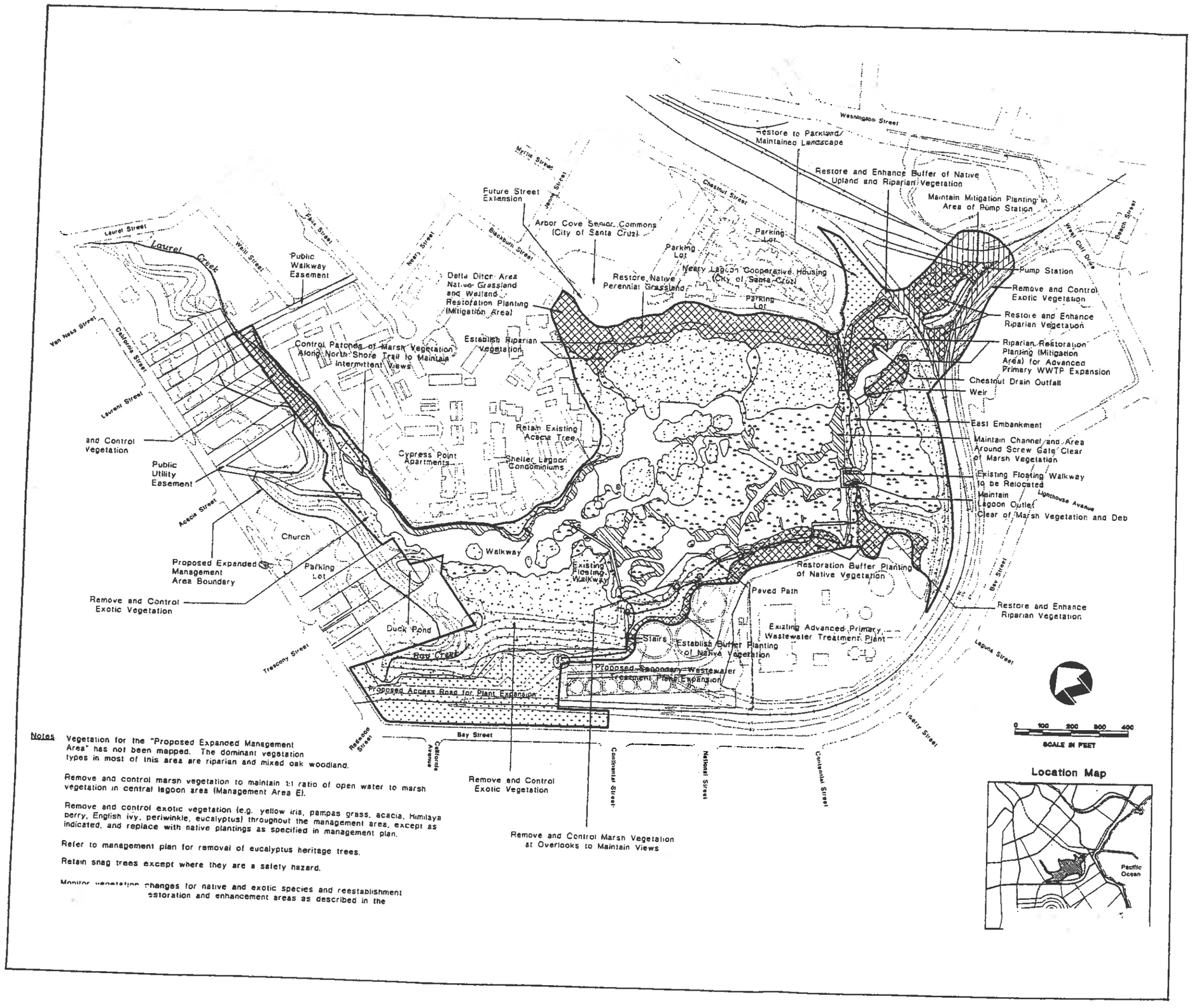
NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 3-1

Vegetation Management Plan



Notes

Vegetation for the "Proposed Expanded Management Area" has not been mapped. The dominant vegetation types in most of this area are riparian and mixed oak woodland.

Remove and control marsh vegetation to maintain 1:1 ratio of open water to marsh vegetation in central lagoon area (Management Area E).

Remove and control exotic vegetation (e.g. yellow iris, pampas grass, acacia, Himilaya berry, English ivy, periwinkle, eucalyptus) throughout the management area, except as indicated, and replace with native plantings as specified in management plan.

Refer to management plan for removal of eucalyptus heritage trees.

Retain snag trees except where they are a safety hazard.

Monitor vegetation changes for native and exotic species and reestablishment restoration and enhancement areas as described in the

Location Map

Legend

- Riparian
- Freshwater Marsh
- Mixed Oak Woodland
- Ruderal
- Nonnative Grassland
- Parkland/Maintained Landscape
- Cleared, Graded and/or Developed
- Open Water
- Native Vegetation Restoration and Enhancement Area
- Vegetation Control Areas

Source: Jones & Stokes Associates 1991

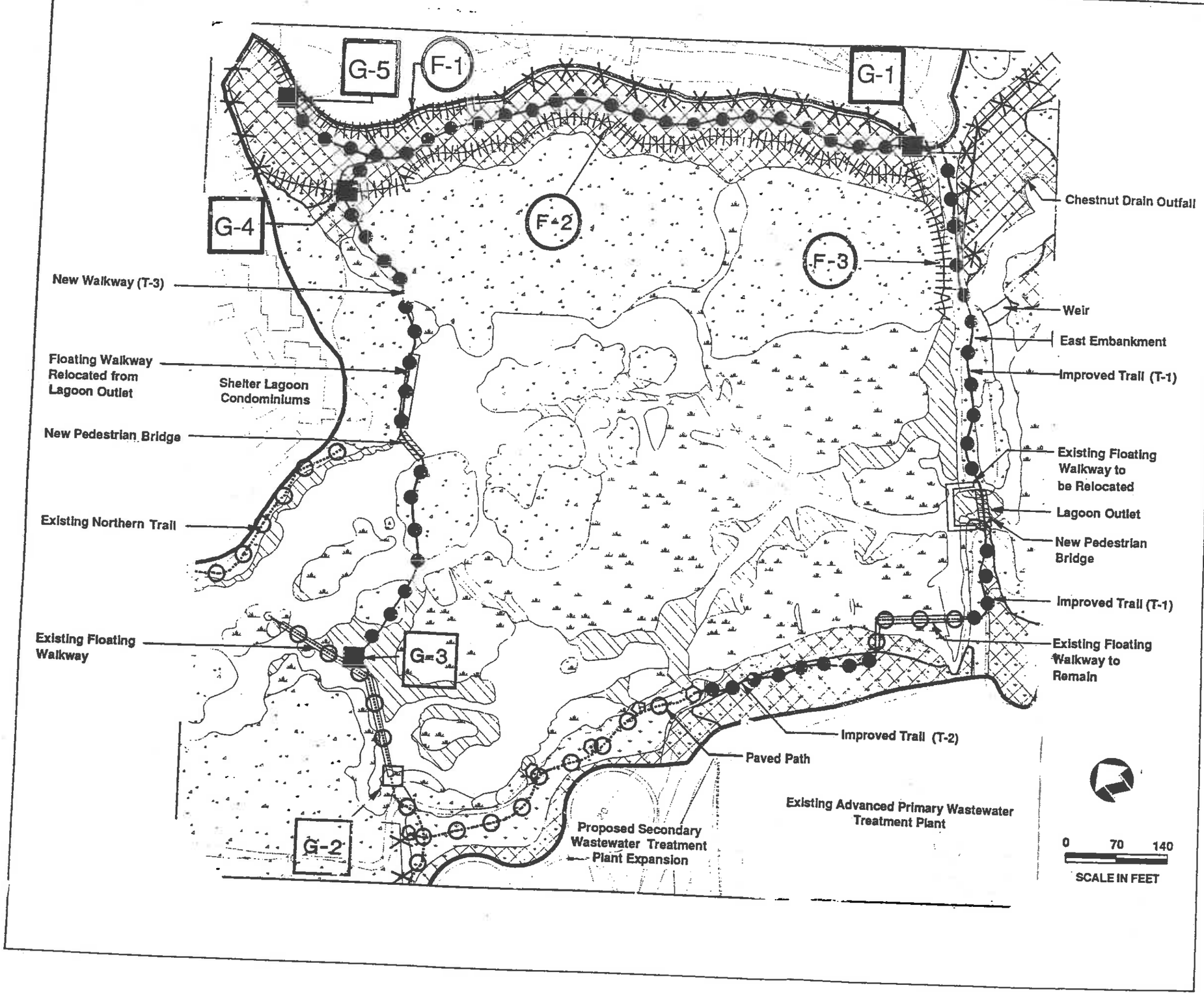
NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 3-2

Central Lagoon Area Enlargement



Legend

- Riparian and Mixed Oak Woodland
- Freshwater Marsh
- Other Areas (maintained, recreation, grassland, ruderal)
- Open Water
- F-# Indicates Fence Segment Number
- G-# Indicates Gate Number
- New Gate
- Existing Gate
- Existing Fence
- New Fence
- Existing Trail
- New or Improved Trail or Walkway
- Vegetation Control Areas
- Native Vegetation Restoration and Enhancement Area

Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 3-3

lagoon or beach, monitoring over several years will be required pursuant to coastal permit 3-90-31. To protect public safety at Cowell Beach during and after discharges from Neary Lagoon, a program should be implemented that includes a warning alarm and signs posted at the beach, notification of the county health services agency and CCC before discharges, monitoring of sand buildup and water quality of ponded water at the beach, and releases performed primarily during times of low use of the beach by the public.

Dry Season Water Levels

During spring, summer, and fall, lagoon water levels could be allowed to rise to approximately 8 feet without causing significant backwater problems to existing storm drain systems at Felix, Walti, and Blackburn Streets (Sharp pers. comm.). However, when lagoon levels reach 8 feet, local residents become concerned about the lagoon encroaching into their yards. To minimize impacts on surrounding residents, the summer lagoon level should not exceed about 7 to 7.5 feet msl (Sharp pers. comm.). Lagoon water levels could be maintained between 5.5 and 7.5 feet msl during the nonrainy season, with an adjustable flashboard system retrofitted to the existing concrete weir. Flashboards could be used to maintain water levels from April through October and could be removed before the rainy season.

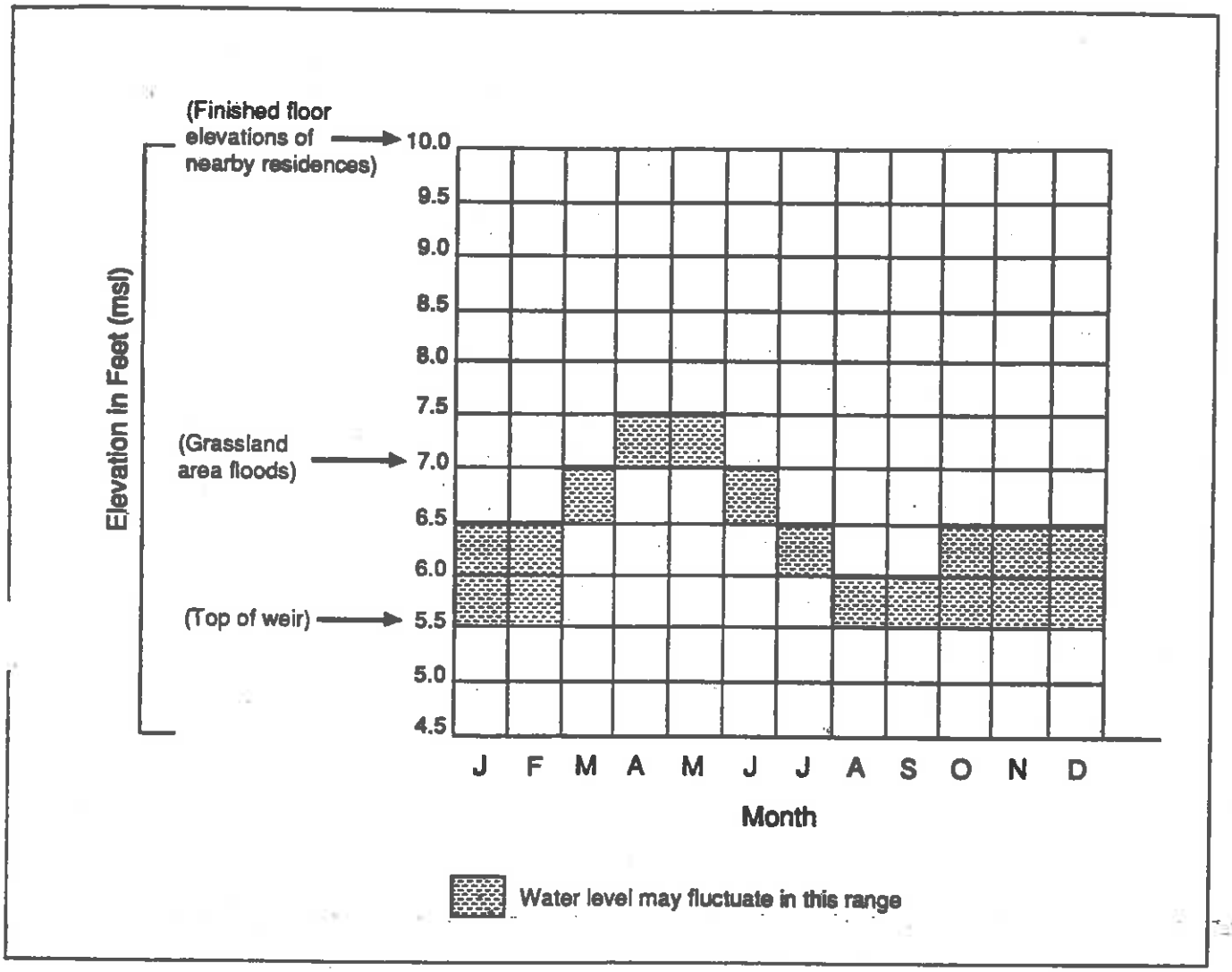
The pump station and outlet system currently under construction will also allow the City to manipulate the rate of flow through the lagoon when water levels are 5.5 feet above msl so that any possible adverse water quality conditions (e.g., dissolved oxygen sags, botulism outbreaks, extreme algae blooms) could be improved rapidly. Although the pump and flashboard systems would allow rapid drawdown of water in the lagoon, water level increases would be determined by inflows to the lagoon, which probably cannot be improved at this time.

The pumps also could be used by the City to control water levels for the purposes of improving waterfowl nesting habitat, controlling tules and cattails, and reducing mosquito populations. Although the City has initially set automatic pump activation at 6.5 feet above msl, the pumps also can be operated manually to respond to a variety of lagoon management needs. This may be done either in addition to or in place of the adjustable flashboard system.

When the outlet structure at Cowell Beach becomes blocked by sand, water levels typically increase at the lagoon from spring through summer and occasionally into fall. Rising water levels can flood water bird nests during critical times of the breeding season and create summer shallow ponding of water in areas, such as the northeast grassland, that can serve as mosquito breeding habitat. The high water levels that flood the northeast grassland and other areas probably also help to maintain and support expansion of riparian vegetation. Gradually decreasing water levels in the lagoon through late spring and summer probably would benefit nesting water birds and reduce mosquito habitat during midsummer and late summer. Holding water levels at around the 7.5-foot level for a brief period during spring after the rainy season probably would help maintain the health and vigor of riparian vegetation and compensate for lower water levels later in summer (see "Vegetation Management and Habitat Restoration" below). Cattails also may benefit from this reversed, more natural water regime. Figure 3-4 indicates goals for managing water levels through the year for supporting flood protection, water bird, and vegetation needs while probably helping to reduce summer mosquito habitat.

Lagoon Capacity Maintenance

Dredging existing lagoon channels upstream of the outlet channel would have little effect on water levels for larger flood events, such as the 50- and 100-year floods. During large floods, the outlet system



Water Level Management Goals by Month for Neary Lagoon

Figure 3-4

Source: Jones & Stokes Associates 1991.

constricts flow and backs water up into the lagoon. Placing additional fill into the lagoon could induce lagoon flooding by reducing the available reservoir storage capacity of the lagoon. Over the long term, sediments entering the lagoon could reduce the lagoon's water storage capacity and may eventually need to be removed.

Dredging existing channels or widening pools within the lagoon could improve water flow through the lagoon during minor storms, potentially reducing flood levels during such storm events. Specific management recommendations for vegetation or sediment removal are discussed under "Improving Water Circulation" in the "Water Quality Management" section below in this chapter (see also the "Vegetation Management and Habitat Restoration" section below in this chapter).

Erosion and Siltation Control

Dredging of existing channels within the lagoon is not necessary for flood control. To maintain the 100-year flood control capacity of the lagoon, however, the tule and cattail root masses in the lagoon should be kept at or below elevation 5.5 feet msl. Although marsh plant root masses typically remain below this elevation in the lagoon, periodic ground surveys of the root masses should be made. Root mass elevation surveys should be performed roughly every 10 years. The aquatic vegetation growing above the root mass itself is not considered a significant flood control hindrance. If a major portion of the lagoon is found to be covered with aquatic vegetation with root masses above 5.5 feet msl, root masses should be removed to elevation 5.5 feet to maintain the flood control integrity of the lagoon.

No formal program for bankline maintenance is required for the lagoon because bank erosion is not considered a significant problem in the lagoon. The existing natural bank vegetation acts as stabilization in most areas. Bank vegetation along the north shoreline at the Cypress Point Apartments, however, should be reestablished where it has been removed periodically. (For further discussion, see "Removal of Shoreline Marsh Vegetation" below in the vegetation management section.)

Control of Encroaching Vegetation

Tule and cattail growth within the lagoon is not a significant hindrance to flood control. Woody vegetation growing along the banks of the lagoon also is not considered a problem to flood control or lagoon hydrology. Woody bank vegetation and emergent marsh vegetation growing within the outlet channel may need to be removed periodically to maintain the effectiveness of the channel and pump system. The extent of outlet channel maintenance should be determined by the Department of Public Works based on annual monitoring and assessment of flowage potential at the lagoon outlet.

Water Level and Flow Monitoring

Lagoon water levels should be managed between 5.5 and 7.5 feet above msl. To monitor lagoon water levels, staff gauges should be placed at key locations in the lagoon. One staff gauge placed immediately upstream of the pump station and one gauge placed upstream of the concrete weir would be required to accurately gauge water levels for weir flashboard placement. A staff gauge placed in the lagoon upstream of and near the lagoon outlet also would allow for monitoring the backwater effects of the outlet channel on the lagoon. A staff gauge also should be placed at the upper end of the lagoon to monitor the relationship between lower and upper lagoon water levels, especially during larger flood events.

Monitoring of inflows and outflows for Neary Lagoon would be valuable for developing lagoon water budgets and pollutant loading estimates, particularly during low-flow periods. Sources of consistent low-flow inflows, such as Laurel Creek and the duck pond outfall, will require more precise measuring techniques than those used for inflows from residential sites, such as Felix and Blackburn, and Myrtle and Chestnut Streets.

An inflow measurement system could be implemented by developing stage versus discharge rating curves at particular inflow points using the rating curves developed. Constructing a low-flow parshall flume gauge also could serve the same purpose. Any opportunities to improve inflows to the lagoon should be identified and evaluated for their feasibility and influence on water quality (see further discussion under "Water Quality Management" below).

Management Actions

Management Goal H: Manage the lagoon hydrology for flood protection; wildlife, vegetation, and water quality enhancement; mosquito control, and aesthetics.

MANAGEMENT ELEMENTS

Objective H-1: Manage lagoon water levels to reduce the flood potential in the surrounding areas.

Action H-1.1: The newly installed pump system will be operated during the winter rainy season to maintain lagoon water levels below 6.5 feet msl. The new pump system is designed to begin operation automatically to lower water levels when the lagoon water level reaches an elevation of 6.5 feet msl and to stop pumping when the water level reaches 6.0 feet msl.

Action H-1.2: The new outlet structure at Cowell Beach will be inspected periodically and kept clear of sand during the flood threat season. The accumulation of sand at the outfall will be monitored daily during winter and when storm activity is predicted or occurs and weekly during summer. Before moving sand deposits on Cowell Beach, the City will coordinate with the CCC. A monitoring log for sand accumulation at the outfall will be maintained by the City. If and when water ponds at Cowell Beach as a result of sand accumulation at the outfall, the City will coordinate with the county health services agency to determine the need for testing the quality of ponded water. A monitoring log for water quality of ponded water at the outlet will be maintained.

Objective H-2: Keep the lagoon outlet clear of obstructions to floodflows.

Action H-2.1: The lagoon outlet area will be inspected annually and, as needed, cleared of vegetation and other obstructions (see also action WQ-2.2).

Action H-2.2: The existing floating walkway at the lagoon outlet will be removed and replaced with a permanent bridge structure designed to be handicapped accessible and with a soffit positioned at least 9.5 feet msl to allow passage of 100-year floodflows. (The floating walkway will be relocated to the north side of the lagoon and installed as part of segment T-3 of the loop trail [Figure 3-1] [see action PU-1.3]).

Action H-2.3: For an area near the east embankment indicated in Figure 3-2, marsh vegetation will be periodically removed to provide a clear channel for more easily conveying low floodflows through the lagoon (see also action V-5.1).

Objective H-3: Manage lagoon water levels to support goals for wildlife, vegetation, water quality, mosquito control, and aesthetics.

Action H-3.1: The new pump system and/or a new adjustable flashboard system retrofitted at the weir will be used to manage water levels in the lagoon. Between about mid-April and mid-September, water levels will be reduced incrementally from a peak of about 7.5 feet msl to the weir height of 5.5 feet msl (Figure 3-4). Precise water levels and timing of releases will be determined by a biologist for the City Parks and Recreation Department based on available water and through monitoring of wildlife and vegetation and assessment of mosquito conditions. Incremental releases generally will be between 3 and 6 inches of drawdown per release.

Objective H-4: Protect public safety as part of water level management.

Action H-4.1: A program to protect public safety will be implemented as part of outflow operations at Cowell Beach. The program will include the following:

Install a permanent alarm system at the outflow at Cowell Beach.

Post signs on the beach near the outflow structure warning of the dangers associated with intermittent outflows.

Limit discharges from the lagoon during the dry season to evening hours only to minimize public exposure to outflow.

The alarm will operate automatically when pumps begin operating.

For dry season releases that may be small, City personnel will ensure that sand does not block the outflow structure and outflows are not otherwise inhibited. The City will also notify the Santa Cruz County Environmental Health Department and CCC before releases occur during the dry season (see action H-1.2 above).

Based on monitoring results, strategies for beach management will be devised to prevent adverse water quality impacts and disruption of recreational use, consistent with the City's beach management plan.

Objective H-5: Monitor lagoon water levels and inflow/outflow conditions at least monthly during the year and during important flood events.

Action H-5.1: Staff gauges will be installed at key locations in the lagoon, indicated on Figure 2-4, to permit regular monitoring of water levels monthly and during important flood events. Key locations will be immediately upstream of the pump station, upstream of the concrete weir, in the lagoon upstream of the lagoon outlet channel (to monitor backwater effects of the outlet channel to the lagoon), and at the upper end of the lagoon to monitor the relationship between lower and upper lagoon water levels, especially during larger flood events.

Action H-5.2: Flow monitoring studies will be conducted at important inflow points to the lagoon at least monthly. Inflow points on Laurel Creek and the duck pond outfall will be used for flow measurements, particularly during low-flow periods. For flow monitoring studies, a staff gauge or parshall flume will be placed at a key point in each of the two channels and a stage versus discharge rating curve will be developed for that key point in the inflow channel.

Action H-5.3: Root masses for emergent marsh vegetation will be monitored once every 10 years as part of marsh vegetation monitoring activities to determine whether root masses may interfere with floodflow conveyance (see action V-5.2).

Water Quality Management

Neary Lagoon water quality may be enhanced by improving watershed management and by increasing freshwater inflows and water circulation within the lagoon. Monitoring water quality is required to determine the efficacy of implemented actions, protect the aquatic ecosystem and wildlife, and determine the need for additional actions.

Improving Watershed Management and Freshwater Inflows

Because Neary Lagoon receives much of its inflow from urban runoff, it accumulates the pollutants commonly found in this runoff, and is susceptible to the adverse effects of those pollutants. The highest

At the lagoon outlet channel, marsh vegetation will be periodically removed and the floating walkway will be replaced by a bridge.

pollutant concentrations are usually found during the first significant storms of the season.

The California Regional Water Quality Control Boards (RWQCBs), under the direction of the California State Water Resources Control Board and EPA, are responsible for regulating stormwater runoff under the Clean Water Act. Stormwater runoff in cities with populations below 100,000 is not governed under the current regulations. The City has no stormwater management program to maintain water quality, although such provisions for new developments may be included in the general plan update (Sharp pers. comm.). Because outflow from Neary Lagoon enters the recently established Monterey Bay National Marine Sanctuary, the City is committed to preserving the water quality of the Neary Lagoon watershed.

Best management practices (BMPs) are designed to prevent or reduce water pollution, and involve educational, regulatory, and public agency actions. BMPs are usually applied as a system of practices and are selected on the basis of site-specific conditions that reflect natural background conditions and political, social, economic, and technical feasibility. Educational BMPs seek to motivate residents of a watershed to reduce the amount of pollutants entering the drainage system from their yards and streets.

Nonpoint-source pollution controls are difficult to implement in older residential and commercial neighborhoods, such as those comprising the Neary Lagoon watershed. Some BMPs are likely to be expensive to implement. Some of the actions recommended below may require additional expenditures by the City to perform maintenance on creeks, flumes, and other water conveyances. Also, landowners and tenants may object to recommended actions around the lagoon perimeter (e.g., prohibiting the application of salts or chemicals for controlling vegetation). The City may need to consider public education programs as part of implementing such actions.

Selection and implementation of BMPs for Neary Lagoon should focus on reducing the loading of metals and sediment. No adverse effects on wildlife from toxic pollutants in Neary Lagoon have been observed; however, implementing a combination of the BMPs listed below, in consultation with RWQCB, the CCC, and Santa Cruz County Environmental Health Department, would help to reduce these and other pollutants. Recommended BMPs are described below in management action WQ-1.1.

Improving Water Circulation

Dense vegetation in the central portion of the lagoon interferes with water circulation, impedes flow to the final outlet channel, and may increase sedimentation upstream. Vegetation growth has isolated an open water area in the western portion of the lagoon, just south of the central boardwalk observation platform, reducing circulation with the main open water channel. Marsh vegetation should be removed and controlled to reconnect the open water areas and permit improved water circulation in the lagoon.

Methods for removing marsh vegetation are described below in "Vegetation Management and Habitat Restoration". Vegetation would typically be removed with vegetation-cutting machinery. Dredging

would not be performed to control vegetation or improve water circulation except as part of future operations required to improve flood capacity in the lagoon. However, if water quality and flood capacity conditions in the lagoon deteriorate in the future, dredging may be considered. If dredging is proposed in the future, the Corps should be notified, regardless of the size of area considered, to determine the need for a Section 404 permit (described in Chapter 1). Because dredged material could contain high levels of pollutants, lagoon sediments must be monitored, a dredging plan must be prepared, and the appropriate regulatory authorities must review the monitoring results and approve the dredging plan before dredging is performed. (For further discussion of dredging, see "Lagoon Capacity Maintenance" and "Erosion and Siltation Control" in the hydrology management section above.)

Monitoring Water Quality

A water quality monitoring program that addresses sediments should be developed for Neary Lagoon and should be reviewed and approved by the CCC, RWQCB, and the Santa Cruz County Environmental Health Department before implementation. The monitoring program described below under "Management Actions" is intended as a cost-effective, baseline approach. Additional monitoring, if recommended by DFG or other agencies, should take precedence.

Inorganic parameters can be analyzed easily by the wastewater treatment plant laboratory; refer to the water quality study (Appendix A) for a list of parameters, detection limits, and other details. Monitoring frequency may be reduced for metals not detected in subsequent samples.

A study to determine the effects of waterfowl populations on water quality in the lagoon may be warranted. Waterfowl populations at the lagoon may need to be controlled if they are determined to be detrimental to the lagoon's water quality.

Although fish at Neary Lagoon may contribute to turbidity and water quality concerns at the lagoon, controlling fish populations for the purpose of water quality improvement is not recommended at this time because of limited data on the effects of fish on water quality. A study of fish populations and their effects on water quality at the lagoon may be helpful in the future. Refer to management actions WQ-3.1 through WQ-3.6 below.

Management Actions

Management Goal WQ: Improve water quality at Neary Lagoon.

Objective WQ-1: Improve the quantity and quality of freshwater inflows to Neary Lagoon through improved watershed management practices and programs.

Action WQ-1.1: A program of BMPs will be implemented for Neary Lagoon that will focus on reducing the loading of metals and sediment entering the lagoon from Laurel Creek and the Felix Street inflow pipe. Although no adverse effects on wildlife from toxic pollutants in Neary Lagoon have been observed, implementing a combination of BMPs from the list below will help to reduce these and other pollutants. Selection of BMPs will be made in consultation with the RWQCB, the CCC, and Santa Cruz County Environmental Health Department. The BMPs that will be evaluated as part of this program are identified below. Evaluation of ongoing BMPs will include a determination of how often the BMP will be performed.

Regularly remove debris, refuse, and other obstructions near the Laurel Creek inflow within the management area.

Regularly inspect and, if necessary, clear and possibly enlarge the outlet from the duck pond to the lagoon, and clean debris from the duck pond to maximize the volume of clean water entering the lagoon from the pond.

Regularly clean out the flume carrying spring water along Walnut and King Streets and adjacent areas. Construct or clean out an area where the flume joins Laurel Creek and the city storm drain system. Clean debris from the Bay Creek channel.

Prohibit further diversions of freshwater from flumes, creeks, and channels draining into the lagoon, and maintain drainage quality by removing debris, accumulated sediment, and other obstructions.

Implement measures that prevent runoff from the wastewater treatment plant from entering the lagoon during construction and ongoing operation and maintenance of the plant.

Identify disturbed, erodible, or bare soil areas in the management area, especially along the shoreline of the Shelter Lagoon and Cypress Point developments, and require revegetation and restoration of these areas to reduce erosion and sedimentation from these areas.

Prohibit and enforce the prohibition of using salt, herbicides, or other chemical compounds not approved for wetland use along the lagoon shores.

Investigate and eliminate cross-connections and illegal connections to the storm drain system in the watershed.

Implement a sediment and erosion control program to control drainage from new developments, construction sites, and major remodeling projects.

Implement storage and spill control programs for hazardous materials and other chemicals used at construction, business, and industrial sites.

Conduct a public information program to inform residents living in the watershed about ways of improving and maintaining improved water quality at Neary Lagoon through methods such as conducting public meetings and distributing information brochures. Meetings and brochures would explain the aquatic ecosystem at the lagoon, the stormwater drainage system, the network of channels and streams draining into the lagoon, the potential sources of pollutants entering these water bodies throughout watershed neighborhoods, the sources of pollutants in urban areas, their potential adverse effects on the lagoon, and other BMPs to reduce pollutant levels.

Label storm drain inlets and provide signs at key locations along drainage channels and creeks warning the public not to dispose of pollutants and refuse and explaining the reasons why.

Initiate or expand a recycling program for oil, pesticides, solvents, and other common hazardous materials.

Provide sediment and refuse traps at stormwater inlets to Neary Lagoon.

Regularly sweep major roadways of the watershed using wet scrubbing techniques.

Objective WQ-2: Improve water circulation within the lagoon.

> **Action WQ-2.1:** Freshwater marsh vegetation will be cleared in the areas east of the central floating boardwalk and in front of the southern observation platforms in management zone E, as shown in Figure 3-2, to create more open water and form an improved channel connecting open water areas in the lagoon. Deepening or widening existing narrow channels or opening more small, dendritic channels through the densest vegetation growth will also help increase DO levels, decrease turbidity, maintain channel capacity, allow winter flows to flush the channels, and reduce vegetation encroachment (see also action V-5.1).
>
> **Action WQ-2.2:** Annual inspections will be performed to determine the need for clearing vegetation and other obstructions from the lagoon outlet at the east embankment, from along the channel leading to the weir, and from the area around the screw-gate and concrete weir to facilitate management of water levels to maximize circulation. Marsh vegetation and other obstructions will be cleared regularly, as determined by the inspections (see also action H-2.1).

Objective WQ-3: Conduct regular, ongoing monitoring of the water quality of the lagoon and water entering the lagoon.

> **Action WQ-3.1:** A water quality monitoring program will be conducted, including sampling and analysis to be performed at least yearly during periods of low flow. The program will consist of the following elements:
>
> > **Sample and analyze** for the nine metals (see Appendix A for list of metals).
> >
> > **Sample and analyze** for other inorganic parameters, such as hardness and nutrients (ammonia and nitrate nitrogen, orthophosphate). Refer to Appendix A for a list of parameters, detection limits, and other details. Inorganic parameters can be analyzed easily by the waste treatment plant laboratory.
> >
> > **Collect** water samples at locations approximately corresponding to NL-1, NL-3, and NL-5 of the water quality study (Figure 2-4).
> >
> > **Collect** a sediment sample at NL-1, at a minimum; additional sediment samples can be collected to provide information on pollutant movement and accumulation through the lagoon system; additional sediment samples from a given region also can be composited into one sample for laboratory analysis. To further characterize sediment quality, include grain size analysis and total organic carbon. Sediment accretion and water depth should be measured at each location during sampling.
>
> **Action WQ-3.2:** In addition to the monitoring that will be performed during low-flow conditions as described in action WQ-3.1 above, DO, EC, and temperature will be analyzed for dry and wet weather conditions, in conjunction with water regime changes recommended in the "Hydrology" section, to monitor the effects of these changes on water quality.
>
> **Action WQ-3.3:** If potentially toxic levels of pollutants are identified through monitoring or are suspected to be present at the lagoon, or if water quality problems (e.g., fish kills) occur, the City will conduct analyses of toxic pollutants to determine their levels and extent.

Action WQ-3.4: If toxic pollutant levels are determined in the lagoon, the City will conduct a monitoring program or seek funds to initiate a monitoring program for the storm drain system to identify pollutant sources, analyze water quality and sediments in creeks and channels, and record observations and data. The program will identify pollutants (especially chromium, lead, and zinc) entering Neary Lagoon and their transport and fate within the aquatic system; appropriate remedial programs will be developed.

Action WQ-3.5: Concentrations of metals and pesticides in sediment, reported in the 1991 water quality study (Appendix A), will be submitted for review to DFG, and possibly the U.S. Fish and Wildlife Service, to determine whether the concentrations are a potential threat to aquatic species and wildlife. Based on these comments, additional analyses, if necessary, would be included in future monitoring efforts.

Vegetation Management and Habitat Restoration

Vegetation management at Neary Lagoon is largely intended to maintain and, as necessary, restore vegetation diversity that is representative of the natural plant communities and species found in the area. Other purposes for managing vegetation at the lagoon include flood protection, water quality improvement, wildlife habitat support, mosquito control, and public use (e.g., aesthetics, environmental education).

General Vegetation Management

General vegetation management involves vegetation removal and control, vegetation protection, and riparian forest acquisition.

Vegetation Removal and Control

Because of their growth habits, some species of vegetation found in the management area can have detrimental effects on water circulation, floodflows, and wildlife habitat values. To maintain the lagoon environment for flood protection, improved water quality, diverse wildlife habitat, native vegetation diversity and health, and aesthetics, some species of vegetation in the management area will need to be removed and controlled. Species of exotic plants that compete with native vegetation exist in the management area. The exotics generally provide a lower value of wildlife habitat and can, in some cases, overtake and eliminate valuable native species of vegetation. Vegetation control for Neary Lagoon focuses largely on removing weedy, exotic species and replacing them with native species that provide higher value habitats for wildlife.

Removal and Control of Yellow Iris. Yellow iris, a non-native plant with few wildlife values, is found in saturated soil and shallow water habitats. This weedy exotic dominates large areas of freshwater marsh and may still be spreading. It probably occupies sites that could otherwise be occupied by cattail or tule. Because of its dense growth in clusters, it provides poor cover for wildlife and does not easily allow penetration by fish that may help control mosquito larvae.

A program will be conducted to remove invasive exotic plant species, such as the yellow iris pictured above, from the management area.

A pilot project should be conducted to test methods of removing yellow iris without spreading propagules (most likely rhizome pieces). The pilot project would involve planting cattail and tule rhizomes after yellow iris is removed to test the efficacy of converting stand dominance from yellow iris to cattails and tules. Most of the iris stands, however, will be converted to open water habitat, serving to partially achieve the goal of a 1:1 ratio of open water to marsh in management zone E (see "Open Water Establishment and Maintenance" section below).

Yellow iris should be removed in a manner that precludes the inadvertent spread of iris rhizomes in the marsh. Yellow iris is best removed by hand tool or possibly mechanical excavation of rhizomes. Initial removal of yellow iris should be as complete as possible. Cattail and tule rhizomes would be planted in areas of yellow iris removal where open water habitat is not desired (Figure 3-2). Yellow iris probably cannot be fully eradicated from the lagoon and long-term control will be necessary. Reinvasion should be monitored and periodic removal conducted as new plants become established.

Removal and Control of Weeds in Riparian Areas. Yellow iris, acacia, eucalyptus, pampas grass, Himalaya berry, English ivy, and periwinkle are weedy exotics that have invaded large areas of riparian forest at Neary Lagoon. A removal program for these species should be implemented using hand tool, mechanical, and herbicide removal methods where appropriate and as consistent with City policies regarding the use of herbicides and other methods. Removal of yellow iris is described above. Pampas grass is best removed by excavation of root system or selective herbicide application. Himalaya berry is best removed by mechanical excavation or selective herbicide application. English ivy is best removed by cutting aerial stems and by selective herbicide application on trailing stems. Periwinkle is best removed by selective herbicide application. No herbicides would be used in locations or under weather conditions that would allow them to reach the aquatic system of the lagoon.

Establishment of replacement native species should follow the removal of exotics (see Table 3-1 for recommended native plants for riparian restoration). Replacement plantings should include California blackberry and California rose in partial shade and in small light gaps, and native riparian trees where removal sites create or occur in large light gaps.

Acacia is best removed by cutting. The acacia tree on an island to the east of and near the central floating walkway in management zone E should not be removed because it provides vertical structure and cover for wildlife and it serves as an aesthetic focal point that provides visual relief and variety in the lagoon's center.

Some of the large eucalyptus trees in the riparian habitat in management zone I would qualify as heritage trees under the City's Heritage Tree Ordinance. These trees may provide benefits including screening and aesthetic values for local residents and visitors and forest structure for wildlife. However, eucalyptus trees are weedy, exotic species that have detrimental effects on native vegetation and are generally of lower value to wildlife than native species of trees, such as coast live oaks and willows. Because of their detrimental effects and generally low value to wildlife, a program should be implemented to remove some of the eucalyptus trees and replace them with native tree species in zone I while leaving others with high aesthetic value. As part of the program, native tree species should be planted both before and immediately following removal of eucalyptus trees. Removal and replanting of trees should be phased to occur gradually over a period of several years. Individual trees to be removed will need to be identified in the field by a team that will include (at a minimum) the City arborist, a DFG representative, and a member of the Parks and Recreation Commission.

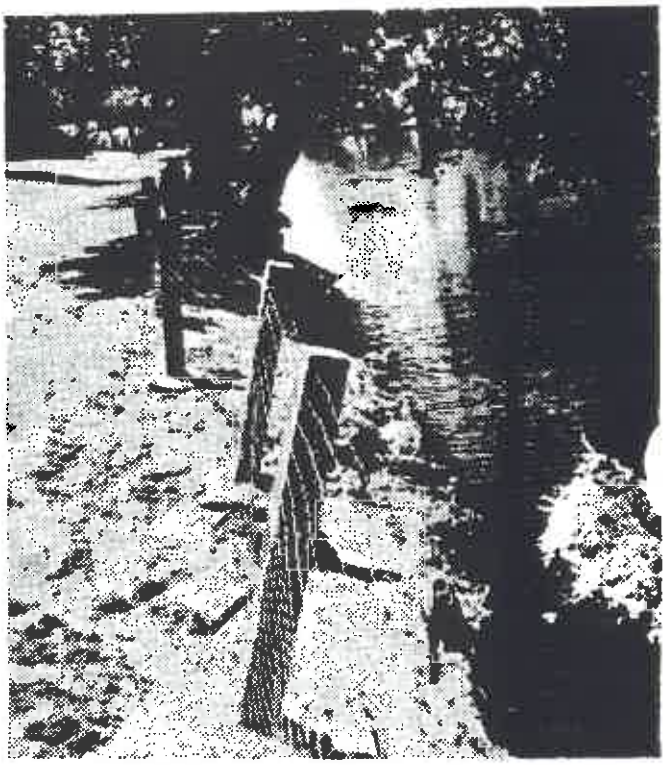
Table 3-1. Recommended Native Plant Species for Riparian Forest Restoration at Neary Lagoon

Common Name	Scientific Name	Form
Plant in Flood Zone		
Yellow willow	*Salix lasiandra*	Tree
Red willow	*Salix laevigata*	Tree
Arroyo willow	*Salix lasiolepis*	Small tree
Black cottonwood	*Populus trichocarpa*	Tree
Fremont cottonwood	*Populus fremontii*	Tree
Red elderberry	*Sambucus callicarpa*	Small tree
California blackberry	*Rubus ursinus*	Bramble
California rose	*Rosa californica*	Shrub
Mule fat	*Baccharis viminea*	Shrub
California mugwort	*Artemisia douglasiana*	Herb
California beeplant	*Scrophularia californica*	Herb
Plant above Flood Zone		
Western sycamore	*Platanus racemosa*	Tree
Coast live oak	*Quercus agrifolia*	Tree
California coffeeberry	*Rhamnus californica*	Small tree
Blue-blossom ceanothus	*Ceanothus thrysiflorus* var. *thrysiflorus*	Shrub
California wax myrtle	*Myrica californica*	Small tree
Coyote brush	*Baccharis pilularis* var. *consanguinea*	Shrub

Once the team agrees on the specific trees to be removed and the phasing plan for their removal and replacement, a permit for removal of selected eucalyptus trees from zone I will be sought from the Parks and Recreation Commission and department director in compliance with the City Heritage Tree Ordinance. The long-term goal should be to remove all eucalyptus trees in riparian areas within the management area and replace them with native riparian trees. All eucalyptus trees that do not qualify as heritage trees (i.e., under 16 inches in diameter) and any new eucalyptus trees that appear in the management area in the future should be removed and replaced with native trees as part of ongoing management to remove and control weeds in riparian areas. Complete eradication of riparian weeds is not likely, and long-term monitoring and control will be necessary.

Removal of Shoreline Marsh Vegetation. To enhance visibility of the lagoon for park visitors, shoreline marsh vegetation should be removed from and kept clear of the areas in front of observation platforms along the south shore and at key areas along the existing north shore trail. Clearing these areas would also serve to partially achieve the goal of a 1:1 ratio of open water to marsh in management zone E (see "Open Water Establishment and Maintenance" below). Patches of shoreline vegetation should be maintained for wildlife cover and foraging.

Residents living adjacent to the north shore of the lagoon and Laurel Creek and maintenance personnel associated with the developments should work with the City to develop a plan to remove vegetation from the north shoreline periodically to maintain views of the lagoon. Much of this vegetation is yellow iris that should be removed for weed control. Residents or maintenance personnel appear to be salting or otherwise chemically treating the banks of Laurel Creek to keep bank vegetation down, apparently to improve views of the lagoon. Although visibility of the lagoon is enhanced, the barren bank is eroding badly and may be reducing water quality. Residents and maintenance personnel should use mechanical means to control shoreline vegetation.



Portions of the lagoon shoreline near Laurel Creek are eroding because of poor vegetation management practices.

Vegetation Protection

Restriction of Access to Riparian Forests. To limit human use impacts on the riparian forest community, access to all large blocks of riparian forest should be restricted. Steep slopes, private property, and fences already restrict visitor access to riparian forests in management zones H and I. Various techniques exist for controlling public access to riparian forests, includin

fences, raised boardwalks, guided access, and permit requirements. Techniques described below are considered the most appropriate for controlling access for each of the riparian forest areas. Access to riparian forest in management zone B should be restricted by constructing a fence (segment F-4 in Figure 3-1) along the west side of the railroad tracks, from the existing restoration area fence at the north end (at the culvert under the railroad tracks) to the existing wastewater treatment plant fence at the south end (Figure 3-1).

To protect important habitat values in the riparian forest in management zone D, access should be restricted by constructing a fence (segment F-2 in Figure 3-1) along the outer edge of the riparian forest adjacent to the grassland, extending from the existing fence at the Shelter Lagoon development on the west to a new fence (segment F-3 in Figure 3-1) that will run south from the terminus of Chestnut Street and along the east edge of the forest to the water edge. Segment F-2 of the new fence will be located in the grassland, approximately 25-40 feet from and parallel to the present edge of the riparian forest in management zone D (Figure 3-5). Access to riparian habitat from the loop trail that may pass through a portion of the west side of management zone D (Figure 3-1) should be discouraged by use of a raised boardwalk. Gates at the trail entry from the grassland to the riparian forest and from the floating walkway entry to the riparian forest should be used to restrict access to the forest. (For further discussion of fences, gates, and other features and methods for protecting vegetation in the management area, see "Public Use and Safety" below.)

Riparian Forest Acquisition

The City plans to consider acquiring management control of lands that include the riparian forest, mixed oak woodland, and duck pond on the west side of the management area. (See "Mitigation Commitments and Land Use Requirements" below.) Acquiring management control of these lands would help link the forested areas in management zones H and I and enable them to be managed in conjunction with important adjacent refuge habitats for exotic weed removal, access control, and riparian enhancement. Access to the lower area along the lagoon edge is already limited, and this area is protected from changes in land use not compatible with maintaining existing riparian habitats as described in this management plan and the "Conservation Regulations" section of Chapter 24.14, "Environmental Resource Management", of the City Municipal Code.

Habitat Restoration and Enhancement

Habitat restoration and enhancement entails establishing and maintaining open water habitat, establishing and enhancing islands, enhancing freshwater marsh habitat, enhancing and restoring riparian areas, and restoring grassland and disturbed areas.

Table 3-2 summarizes acreages of vegetation and land cover types by management zones and the entire management area for both existing and future conditions. Future conditions assume full implementation of management actions as described in this plan. Most notable is that for future conditions, there is a net gain in riparian habitat and a close balance between freshwater marsh and open water areas. Based on removal of 0.2 acre for the loop trail and restoration of 2.3 acres, there will be a net gain of 2.1 acres of riparian vegetation. Freshwater marsh and open water will be about equal at 7.3 acres and 7.1 acres, respectively. Also, there will be a net loss of ruderal and cleared, graded, and developed areas that generally are of low value as habitat for wildlife.

Open Water Establishment and Maintenance

A greater ratio of open water to freshwater marsh habitat could be created in the lagoon by removing tules and cattails in management zone E. The general objective is to achieve a 1:1 ratio of open water

Table 3-2. Vegetation Types and Land Cover by Management Zones for Existing and Future Conditions in the Neary Lagoon Management Area

Management Zone	Vegetation/Land Cover Type	Existing		Future	
		Acres	Percent of Zone	Acres	Percent of Zone
A	Riparian	0.4	14.8	0.4	14.8
	Riparian restoration area	--	--	0.5	18.5
	Pump house mitigation (riparian restoration) area	--	--	0.1	3.7
	Mixed oak woodland	0.4	14.8	0.4	14.8
	Ruderal	0.2	7.4	0.0	0.0
	Cleared, graded, and/or developed	1.6	59.3	1.2	44.5
	Open water	0.1	3.7	0.1	3.7
	Total area	2.7	100.0	2.7	100.0
B	Riparian	3.8	52.0	3.8	52.0
	Riparian restoration area	--	--	0.4	5.5
	Freshwater marsh	1.7	23.3	1.7	23.3
	Ruderal	0.7	9.6	0.4	5.5
	Cleared, graded, and/or developed	0.7	8.2	0.0	0.0
	Parkland/maintained landscape	0.0	0.0	0.6	8.2
	Open water	0.4	5.5	0.4	5.5
	Total area	7.3	100.0	7.3	100.0
C	Riparian restoration area	--	--	0.7	28.0
	Non-native grassland	1.9	76.0	0.0	0.0
	Native grassland and wetland restoration	0.6	24.0	1.8	72.0
	Total area	2.5	100.0	2.5	100.0
D	Riparian	4.7	95.9	4.6	93.9
	Freshwater marsh	0.2	4.1	0.2	4.1
	Parkland/maintained landscape	0.0	0.0	0.1	2.0
	Total area	4.9	100.0	4.9	100.0
E	Riparian	1.3	11.8	1.2	10.9
	Freshwater marsh	6.1	55.5	4.7	42.8
	Ruderal	0.3	2.7	0.3	2.7
	Parkland/maintained landscape	0.1	0.9	0.2	1.8
	Open water	3.2	29.1	4.6	41.8
	Total area	11.0	100.0	11.0	100.0
F	Riparian	0.4	25.0	0.4	25.0
	Riparian restoration area	--	--	0.6	37.5
	Ruderal	0.3	18.7	0.0	0.0
	Parkland/maintained landscape	0.9	56.3	0.6	37.5
	Total area	1.6	100.0	1.6	100.0
G	Riparian	0.2	6.2	0.2	6.2
	Freshwater marsh	0.6	18.8	0.5	15.6
	Parkland/maintained landscape	0.6	18.8	0.6	18.8
	Open water	1.8	56.2	1.9	59.4
	Total area	3.2	100.0	3.2	100.0

Table 3-2. Continued

Management Zone	Vegetation/Land Cover Type	Existing Acres	Existing Percent of Zone	Future Acres	Future Percent of Zone
H	Riparian	0.8	53.3	0.8	96.0
	Freshwater marsh	0.1	6.7	0.1	2.0
	Mixed oak woodland	0.6	40.0	0.6	2.0
	Total area	1.5	100.0	1.5	100.0
I	Riparian	4.7	96.0	4.7	96.0
	Freshwater marsh	0.1	2.0	0.1	2.0
	Open water	0.1	2.0	0.1	2.0
	Total area	4.9	100.0	4.9	100.0
J	Parkland/maintained landscape	3.6	100.0	3.6	100.0
	Total area	3.6	100.0	3.6	100.0
Management area totals					
	Riparian	16.3	37.8	16.1	37.3
	Riparian restoration	--	--	2.3	5.3
	Mixed oak woodland	1.0	2.3	1.0	2.3
	Ruderal	1.5	3.4	0.7	1.6
	Cleared, graded, and/or developed	2.3	5.3	1.2	2.8
	Non-native grassland	1.9	4.4	0.0	0.0
	Native grassland and wetland restoration	0.6	1.4	1.8	4.2
	Parkland/maintained landscape	5.2	12.0	5.7	13.2
	Freshwater marsh	8.8	20.4	7.3	16.9
	Open water	5.6	13.0	7.1	16.4
Total acreage for management area		43.2	100.0	43.2	100.0

Source: Jones & Stokes Associates 1991.

to marsh in management zone E to improve habitat diversity, improve water circulation and conveyance of low floodflows, improve views, and help reduce mosquito breeding habitat. Removal of yellow iris also will contribute to achieving this objective (see "Removal and Control of Yellow Iris" above).

Increasing open water habitat will increase the diversity of habitats available within the marsh; increase the amount of early successional marsh plants, resulting in increased plant diversity and wildlife forage quality; attract more waterfowl and other water birds; enhance water circulation by exposing a greater surface area to wind action; reduce the amount of suitable mosquito breeding habitat; and enhance access of mosquitofish to preferred mosquito breeding sites (by increasing the edge of tule and cattail stands). A drawback to creating open water areas at the expense of marsh habitat is that it necessarily decreases the habitat for species of wildlife that prefer dense stands of emergent vegetation.

Freshwater marsh vegetation should be removed with a machine designed to remove emergent marsh vegetation. Machines used for removing marsh vegetation at the lagoon in the past operate by cutting through vegetation with two rotating blades, which can be set to cut to varying depths, mounted on a barge. In November 1985, a machine such as this was used to

Maintaining a balance between open water and marsh habitats will benefit the lagoon's wildlife, improve water quality and provide other benefits.

create channels 2.5-3 feet deep through the marsh in management zone E (Harvey and Stanley Associates 1987).

Reestablishment of tules and cattails will require that open water areas be maintained through periodic cutting and removal. In the 6 years since channels were cut through the marsh, tules have reestablished at the edges, but the central channel is still clear. Nearly all the early successional marsh vegetation reported to have established on benches at channel edges following cutting in 1986 had been replaced by tules by 1991.

In summer 1991, management zone E supported approximately 4.0 acres of open water and 5.8 acres of freshwater marsh for a ratio of 1:1.45 of open water to marsh. Removal of 0.9 acre of marsh vegetation would result in a 1:1 ratio, with 4.9 acres of each habitat. Marsh vegetation removal sites are presented in Figure 3-2.

Tule and cattail reestablishment in open water should be monitored. Repeat cutting should be conducted when the ratio of open water to marsh drops below 1:1.25 in management zone E. At this ratio, management zone E will have approximately 4.35 acres of open water and 5.45 acres of marsh. The necessary frequency of repeat cutting is likely to be at about 10-year intervals. This estimate is based on the amount of recovery observed from the 1986 channel cutting operation. To further slow reinvasion by emergent marsh vegetation and reduce the required cutting frequency, future cutting should be to a depth of 4 feet. If cutting is not performed to this depth, removal would probably need to be performed more often. Although not proposed at this time, dredging is an alternative method to maintain open water habitat if frequent, repeat cuttings of marsh vegetation become necessary. Dredging is discussed in further detail above under "Water Quality Management" in this chapter.

Island Establishment and Enhancement

Preferred waterfowl nesting and roosting habitat is limited within the lagoon. Establishing new islands and enhancing existing islands could provide additional suitable nesting and roosting habitat in the lagoon. However, waterfowl populations may not increase in response to this action, and it would be expensive and probably require continual maintenance of islands. Additionally, species of wildlife currently using these habitats would be displaced. If dredging is performed as part of marsh vegetation removal and hydrologic improvements, creating some small islands using dredged material may be considered (see discussion of Section 404 in Chapter 1). Because of expense, disruption to wildlife, and questionable return value, island establishment and enhancement should not be performed other than in conjunction with this purpose.

Freshwater Marsh Enhancement

In November 1985, shallow water benches less than 12 inches deep were created from tule and cattail stands adjacent to channels, and upright burhead, pondweed, and water lily were introduced to provide a

preferred source of food for waterfowl. By 1986, smartweed had established on the benches (Harvey and Stanley Associates 1987). By 1991, smartweed had largely disappeared as a result of cattail and tule regeneration. Although creating shallow water benches would increase the diversity of vegetation within the marsh, it would need to be repeated frequently, possibly annually, because of rapid climax marsh vegetation reestablishment on these sites. Because of the expense, the need for frequent repeat clearing, and the limited return value to wildlife, this action should not be performed.

Riparian Forest Enhancement

Existing riparian forest habitat should be enhanced by removing weedy species (see "Removal and Control of Riparian Weeds") and by fencing to control human access (see "Restriction of Access to Riparian orests"). In addition, snag trees should be retained in parian forest areas except where they present a safety hazard to park visitors in areas open to the public. Snag trees provide roosting, nesting, and foraging habitat not provided by living trees for certain species of wildlife.

Riparian Forest Restoration

Riparian forest vegetation should be actively established in cleared and graded areas, in areas of riparian weed removal, and in a portion of the non-native grassland. Restoring riparian vegetation would expand the size of existing riparian habitat patches, help buffer existing riparian areas from impacts of adjacent land uses, create more riparian habitats undisturbed by edge effects, and help support more riparian forest-dependent species.

Riparian forest restoration in some cleared and graded areas has been planned and is being implemented as mitigation for impacts of expanding the wastewater treatment plant to advanced primary treatment. Riparian vegetation should be established in some other areas within the management area to replace loss of riparian habitat value caused by new trail construction. (For further discussion, see "Public Use and Safety".)

Riparian trees and shrubs should be planted where riparian weeds have been cleared (see "Removal and Control of Riparian Weeds"). Table 3-1 is a list of riparian species recommended for planting at Neary Lagoon. Successfully establishing native riparian trees and shrubs probably would require weed control and temporary irrigation for several years following planting. Replacing weedy exotics with riparian forest vegetation would increase the wildlife habitat value of these sites by increasing the structural diversity of the vegetation and increasing plant species diversity. Riparian plantings should be native riparian species collected from nearby natural sources to maintain and support the genetic characteristics and strains of plant species native to riparian forest habitats of the California central coast region. Collection should be conducted in coastal riparian habitats in Santa Cruz County to ensure that local genetic stock is planted.

Riparian forest species should be established in lower areas of the grassland, along the outer edge of the existing riparian forest in management zone C, with the aid of weed control and temporary irrigation (Figure 3-5). The strip of non-native grassland in management zone C is the last remaining unmanaged grassland in the local area. Some of this habitat type would largely be lost from the area if riparian forest and a footpath or boardwalk trail are established. However, the grasslands' small extent and linear configuration adjacent to the new housing development greatly reduces its wildlife value. Replacing non-native grassland with a native riparian forest community would result in greater benefits to wildlife. Some public sentiment against losing grasslands has been expressed; DFG favors retaining some portion of the grassland but also favors riparian enhancement in a portion of this area (Elliot pers. comm.). Some grassland should be retained along the northeast side of the loop trail in management zone C. The protective fence (segment

F-2) will be placed on the grassland side of the existing riparian area between 25 and 40 feet from the present edge of the riparian forest. Riparian plants will be restored in the strip between the fence and the existing riparian forest. The riparian vegetation will be planted to produce a meandering edge with some plants placed on the grassland side of the fence (Figure 3-5). Native blackberries will be planted in patches at the base of the fence on the grassland side to further buffer the riparian area and improve the aesthetics of the fence.

Grassland and Disturbed Area Restoration

The portion of remaining non-native grassland could be restored to native perennial grassland. A restoration plan should be developed to establish native perennial grasses and wildflowers in the grassland. Examples of species to establish are given in Table 3-3. The goal of the restoration will be to have native species as the dominant cover in the grassland. This native grassland will serve as an example and a reminder to refuge visitors of the native coastal prairies of California's past. Once established, the native grassland should be monitored and maintained in its natural state through appropriate grassland management techniques.

Table 3-3. Examples of California Native Species for Native Coastal Prairie Restoration

Common Name	Scientific Name	Habit
California oatgrass	*Danthonia californica*	Grass
Purple needlegrass	*Stipa pulchra*	Grass
Bottlebrush squirreltail	*Sitanion hystrix*	Grass
Douglas' iris	*Iris douglasiana*	Herb
Blue-eyed grass	*Sisyrinchium belluam*	Herb
California poppy	*Eschscholzia californica*	Herb
Baby blue-eyes	*Nemrophila menziesii*	Herb
California buttercup	*Ranunculus californicus*	Herb

Plant Succession Monitoring

Baseline Data Collection

To set target values and monitor vegetation changes over time, baseline data will be collected. Baseline data will be gathered through:

- **delineation** and acreage calculation of open water habitat and subunits of freshwater marsh habitat divided into tule-, cattail-, and yellow iris-dominated stands in the lagoon and
- **field sampling** to estimate the percent cover of riparian weeds in riparian areas.

Vegetation Monitoring

The City plans to monitor the encroachment of cattails and tules into open water habitats. Monitoring results would serve to determine the frequency with which marsh vegetation should be removed to meet the objective of maintaining an approximately 1:1 ratio of open water to freshwater marsh in management zone E. Monitoring should be performed every 5 years following the initial removal described above in the "Open Water Establishment and Maintenance" section. Monitoring should be performed by a City staff person with biological training or a biological consultant contracted to perform this and other tasks.

The City plans to monitor the expansion of yellow iris in the freshwater marsh. Monitoring results would serve to determine the frequency of yellow iris removal. The removal goal should be to keep yellow iris at less than 5% of the total freshwater marsh cover at Neary Lagoon. Yellow iris monitoring should be performed as part of the monitoring described above for tule and cattail encroachment.

The City also plans to monitor the expansion of riparian weeds in the riparian forest. Monitoring results would serve to determine how often yellow iris, acacia, pampas grass, Himalaya berry, English ivy, and periwinkle should be removed. The removal goal should be to keep these species to less than 10% of the cover present in riparian areas before the first removal effort. The weeds in the riparian forest would be monitored in conjunction with the monitoring of marsh vegetation described above.

In addition, the City plans to monitor riparian forest establishment success at restoration and enhancement sites. Planting survival and irrigation systems should be monitored monthly in the first year and quarterly for 4 more years. Irrigation should be discontinued at the end of the third summer after planting. If plant mortality exceeds 5% in any year as determined during monitoring in October and November, replacement plantings should be conducted during the following December through March period. The establishment goal should be to reach 50% areal cover by native riparian shrub and tree species for the restoration and enhancement sites by the end of 5 years and greater than 80% canopy closure by riparian trees within 25 years. Initial planting densities and composition should be designed to meet these goals.

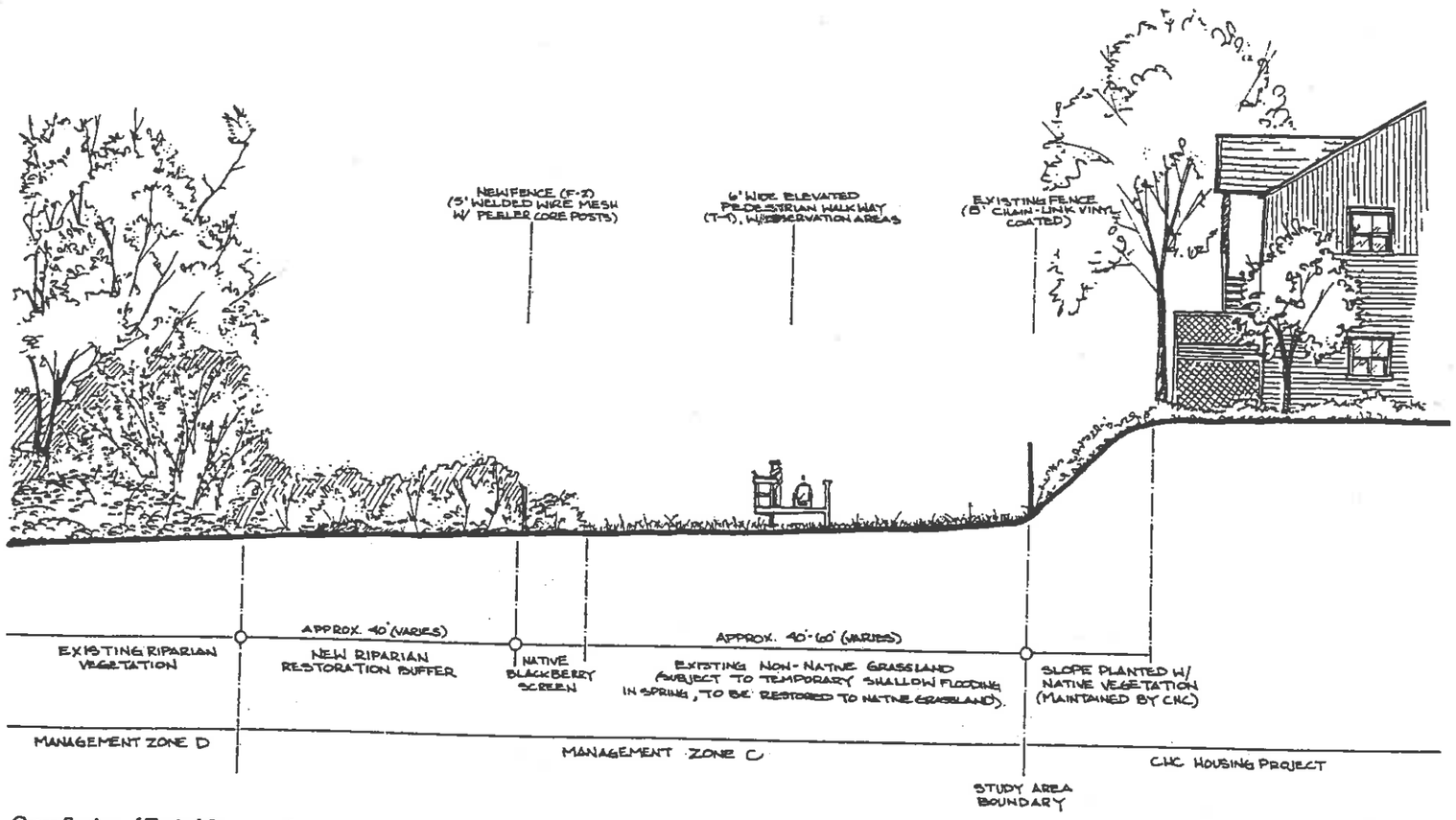
Management Actions

Management Goal V: Improve and maintain native vegetation diversity and health in the management area.

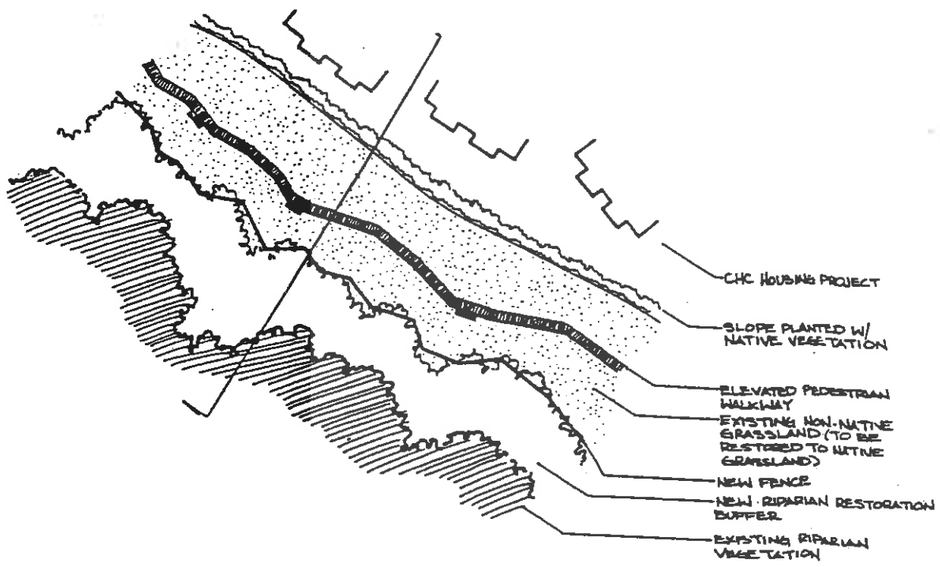
Objective V-1: Remove and control at low levels invasive, exotic species of vegetation that are detrimental to the diversity and health of native vegetation.

> **Action V-1.1:** A program to control yellow iris to less than 5% of marsh vegetation coverage in the lagoon will be conducted using nonchemical methods (e.g., hand tools or mechanical means),

Improvements for Management Zone C



Cross Section of Typical Segment of Management Zone C
Not to Scale



Plan View of Typical Segment of Management Zone C
Not to Scale

Note: All areas within the 100-foot buffer area where fill has been placed as part of the CHC housing development are to be revegetated as soon as possible following fill slope construction (see Appendix F for fill slope revegetation detail and plant list).

Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 3-5

replanting some areas with cattails and tules and monitoring reestablishment rates annually. Initial removal of yellow iris could be performed as part of marsh vegetation removal described in action V-5.1.

Action V-1.2: A program will be conducted to remove and control riparian weeds, including acacia, eucalyptus, pampas grass, Himalaya berry, English ivy, periwinkle, and yellow iris, from riparian areas using the removal techniques described above in the "Removal and Control of Riparian Weeds" section. As part of removal of weedy species, replacement planting will be conducted using locally native riparian species. The removal and control program for eucalyptus trees will include establishment of a qualified expert committee, which will identify individual trees to be removed and a phasing plan for their removal, and will work to obtain the necessary permits in compliance with the City's Heritage Tree Ordinance.

Objective V-2: Control shoreline marsh vegetation in key areas to improve and maintain views for visitors and residents.

Action V-2.1: Using hand or mechanical methods, patches of shoreline marsh vegetation will be removed and controlled at key locations around observation platforms on the south side of the lagoon, at the central floating walkway, and at key locations along the northern trail to improve and maintain views. The first priority will be to remove yellow iris. For key shoreline locations along the northern trail, not more than 50% of the marsh vegetation present in July 1991 will be removed (see actions A-1.1, V-2.2, and V-5.1).

Action V-2.2: The City will actively pursue obtaining a maintenance agreement with the Cypress Point and Shelter Lagoon developments that establishes maintenance responsibility and precise locations and techniques for removing and maintaining shoreline vegetation along the northern trail and at the northern floating observation platform. The maintenance agreement will establish that the City is responsible for providing technical oversight and monitoring and that only nonchemical methods (e.g., hand or mechanical methods) will be employed for removing shoreline vegetation.

Objective V-3: Protect riparian areas by restricting and limiting access to them by the public and domestic animals.

Action V-3.1: The riparian areas in management zones A, B, and D will be fenced permanently in locations specified on the Public Use Improvement Plan (Figure 3-1) using fence segments F-2, F-3, F-4, and F-5 described under "Public Use and Safety" below (see action PU-2.3). Construction of fence F-5 would occur only after management control of the SPTC property in zone A is acquired.

Objective V-4: Protect and manage the western riparian forest and mixed oak woodland area consistent and in conjunction with the purposes of adjacent management areas.

Action V-4.1: A program will be developed to secure improved management control of the riparian forest and mixed oak woodland area adjacent to the western boundary of the management area.

Objective V-5: Create and maintain a balance between open water habitat and freshwater marsh habitat in management zone E.

Action V-5.1: Emergent marsh vegetation will be removed in specified areas (Figure 3-2) to achieve

a 1:1 ratio of open water to freshwater marsh habitat. Removal will be performed using primarily an aquatic vegetation cutting machine described above, and hand or mechanical removal of yellow iris. As part of possible future dredging operations, marsh vegetation will also be removed. The goal for marsh vegetation removal will be to cut marsh vegetation in specified areas to a depth between 2 and 4 feet below the water level when the lagoon's surface elevation is at 5.5 feet msl. Episodic marsh vegetation control is estimated to be required about once every 5 years (see also action WQ-2.1).

Action V-5.2: A program will be implemented to monitor marsh vegetation encroachment into open water at least once every 2 years to determine the frequency of removal necessary for hydrologic, water quality, wildlife, aesthetic, and other purposes and to periodically remove marsh vegetation to maintain a 1:1 ratio of open water to freshwater marsh habitat. Mechanical cutting will be performed when the ratio of open water to freshwater marsh drops below 1:1.25 in management zone E. This is estimated to occur about once every 5 years (see Action V-5.1.) Monitoring of root masses, as discussed in action H-5.3, will need to occur once every 10 years. Monitoring will be performed by a qualified City staff person with biological training or by a qualified biological consultant under contract with the City. Monitoring of yellow iris expansion in the management area will be conducted yearly to determine the extent and rate of expansion.

Objective V-6: Enhance and restore riparian forest areas in the management area.

Action V-6.1: Snag trees will be retained in riparian forest areas except where they present a safety hazard to visitors in areas open to the public. Also, weed species will be removed, and access will be controlled in the riparian areas.

Action V-6.2: A program will be implemented to establish native riparian species as part of replanting efforts in cleared and graded areas indicated on the Vegetation Management Plan (Figure 3-2) and areas of riparian weed removal. Native riparian species will be collected from naturally occurring sources of local genetic stock in riparian habitats in coastal Santa Cruz County (see Table 3-1 for list of native plant species recommended for riparian forest restoration). Weed control and temporary irrigation generally will be used as part of riparian plant establishment.

Action V-6.3: Native riparian species will be established in the grassland in management zone C in low areas adjacent to and within 40 feet of the existing riparian forest edge. A fence will separate the riparian restoration area from the grassland, and native blackberries will be planted in patches along the north side and at the base of the fence (see also action PU-2.3).

Objective V-7: Restore native grassland in the management area.

Action V-7.1: In management zone C, existing non-native grassland will be restored to a predominately native perennial grassland consisting primarily of species identified in Table 3-3. (See action V-8.3).

Objective V-8: Monitor vegetation changes in the management area to determine rates of change; species affected; extent of changes; and timing, extent, and methods of control necessary.

Action V-8.1: A program will be implemented to monitor expansion of weed species in the riparian forest yearly to determine the frequency required

for control and the effectiveness of past removal efforts for the various weed species. Monitoring will be performed yearly in conjunction with other monitoring efforts by a qualified City staff person with biological training or by a qualified biological consultant under contract with the City. Removal of riparian weeds will be based on maintaining weed species at less than 10% of the cover present in riparian areas before the first removal effort.

Action V-8.2: A program will be implemented to monitor riparian forest establishment success in restoration and enhancement areas. Planting survival and irrigation systems will be monitored monthly in the first year and quarterly for 4 more years. Irrigation probably would be discontinued at the end of the third summer after planting. If plant mortality exceeds 5% in any year, as determined during monitoring in October and November, replacement plantings will need to be performed during the following December-March period. The establishment goal is to reach 50% areal cover by native riparian shrub and tree species for the restoration and enhancement sites by the end of 5 years and 80% or greater canopy closure by riparian trees within 25 years.

Action V-8.3: A program will be implemented to monitor native perennial grassland establishment success in management zone C. Planting survival will be monitored quarterly for 5 years. Replacement plantings will be performed annually during this period. The establishment goal is to achieve 80% cover of native perennial grassland species in the grassland portion of management zone C by the end of 5 years after project initiation (see action V-7.1).

Wildlife and Fishery Management

This section describes wildlife and fishery management concerns, the rationale for implementing management actions designed to address those concerns, and the detailed management actions.

Wildlife Management

Predator Control

Important non-native predators that pose a threat to native wildlife in the management area include domestic dogs and cats and Norway rats. Although all three animals are capable of affecting wildlife using the lagoon, the degree of impact has not been determined.

Dogs are prohibited from the management area, but they are often brought to the area by visitors or roam unattended into the area from nearby residential areas. Although they probably cause little, if any, direct mortality to wildlife, they have been observed harassing wildlife near shorelines. Domestic dogs and cats can significantly stress and disturb wildlife, causing the wildlife to be more vulnerable to disease and predation.

Cats, like dogs, probably are introduced to the management area by visitors or enter the lagoon area unattended from adjacent lands. Domestic cats can survive in the wild, and feral cats may exist in the management area. Cats are efficient predators of small mammals and ground-nesting birds, and are a major concern during the bird breeding season in spring and summer. Cats would have the greatest wildlife impact in riparian areas, where they can hunt easily. Their effects within wet areas and dense areas of marsh vegetation probably would not be as great.

Dogs and cats are not permitted at the Cypress Point and Shelter Lagoon developments, and they are restricted at the new CHC cooperative housing project.

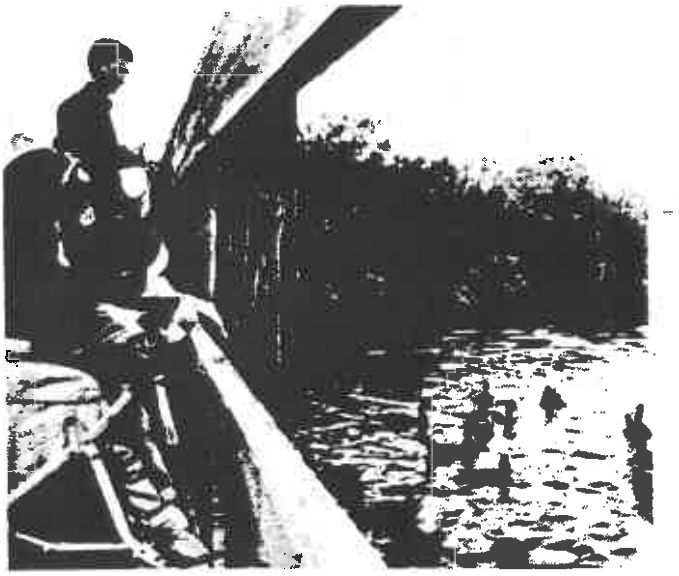
Effective methods of reducing impacts from domestic pets on wildlife in the management area are probably limited to enforcing regulations that restrict access opportunities for domestic pets, continuing to enforce restrictions on keeping pets at multifamily residential developments adjacent to the management area, and constructing barriers that deter pets from entering important wildlife areas. Although fences may prevent access by dogs, they are unlikely to significantly reduce access by cats. Open water channels probably would have little effect on reducing dog access. Additionally, new open water channels created around the marsh perimeter could cause significant impacts by removing important vegetation that serves as wildlife escape cover and increasing maintenance needs for clearing vegetation from the channels.

A self-sustaining Norway rat population has been present at the lagoon since at least the 1940s. Norway rats are omnivorous and can survive on a wide variety of vegetable and animal matter. Rats have been observed feeding on duck eggs at the lagoon and probably are nest predators of other species as well. Food left for water birds by visitors and garbage left both onsite and adjacent to the area probably also provide a food source for rats. Rats are good swimmers and can easily gain access to all islands and areas throughout the management area.

The size of the rat population and the extent of impacts that rats may have on wildlife at the lagoon are unknown. Rats probably live throughout the area surrounding the management area. Because of this, controlling rat populations in the management area would be difficult. As rats were removed from the area, other rats probably would quickly repopulate. Controlling rats probably should be undertaken only if a public health risk is determined to exist because impacts on wildlife from rats are unknown, benefits to wildlife may be small, effectiveness of a control program may be small compared to costs, effectiveness may be short term, and methods employing poisons may affect other wildlife with direct effects on voles and mice and secondary effects related to loss of potential food sources to predatory birds.

Mammal Management

An inventory of the mammals residing at the refuge has not been conducted; however, several small mammals, such as shrews, rodents, and bats, undoubtedly inhabit the area. If larger mammals use the refuge, only a few species (e.g., striped skunk, Virginia opossum, or raccoon) and a few individuals are probably present. Species and populations of mammals inhabiting the refuge are currently unknown. The management actions outlined in this document are expected to help maintain the current diversity and populations of mammals in the management area.



Although feeding birds is a popular activity, it will be discouraged at Neary Lagoon because leftover scraps help sustain the lagoon's rat population.

Water Bird Management

Water birds include grebes, herons, egrets, waterfowl, and other species that forage in open water. Neary Lagoon supports habitats that are important for maintaining local populations of year-long and seasonally resident water birds. The lagoon is also used as a resting area by nonresident water birds during migration. Because water birds are readily visible and recognizable, this group of birds has a greater appeal to a larger group of visitors than smaller, more secretive species of wildlife.

Because some species of wildlife are easily disturbed by the presence of people, public access to wildlife resting and breeding areas will be carefully managed.

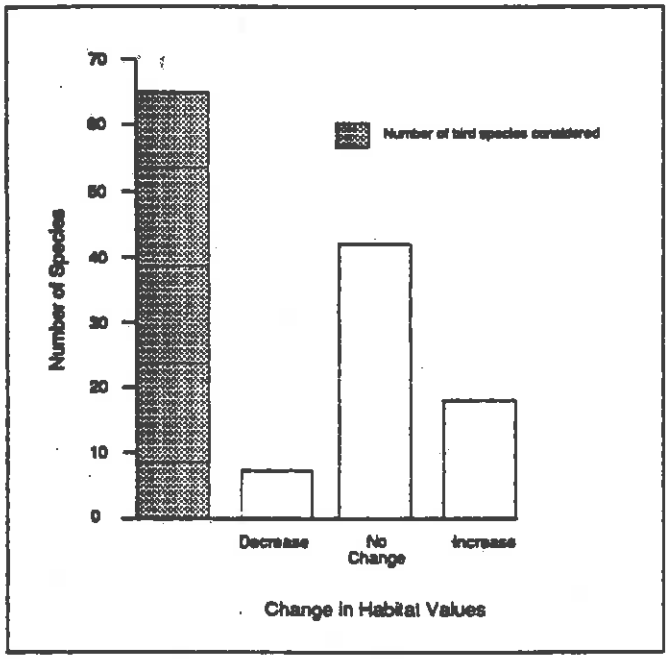
Waterfowl are the most abundant water birds on the refuge. Eight native species of waterfowl (greater white-fronted goose, Canada goose, wood duck, mallard, northern pintail, cinnamon teal, gadwall, and ruddy duck) were observed on surveys. The wood duck, mallard, and ruddy duck also nest at the refuge (Harvey and Stanley Associates 1987).

Although Neary Lagoon supports ducks and geese, the refuge does not provide optimal waterfowl habitat. Factors that may limit waterfowl numbers include encroachment of emergent vegetation into open water areas, a lack of suitable resting and nesting habitat, and low quantities and quality of food plants.

Maintaining open water areas by periodically removing emergent marsh vegetation would benefit waterfowl and other water birds (see "Open Water Establishment and Maintenance" section in the "Vegetation Management" chapter). Removal of emergent plants would result in a loss of habitat for species dependent on marsh vegetation; however, habitat values would be enhanced for a greater number of species than would be adversely affected (Figure 3-6).

Few feasible options are available for improving the availability of resting and nesting areas (see "Island Establishment and Enhancement" section in the "Vegetation Management" chapter). Management actions specifically designed to increase waterfowl food plants would be costly to implement and maintain; however, actions proposed for removing marsh vegetation would provide temporary increases in waterfowl food plants by creating niches for their establishment (see "General Vegetation Management" section in the "Vegetation Management" chapter). Because night lighting of portions of the lagoon reduces the acreage of preferred roosting areas for diurnal species inhabiting the refuge, lighting should not be permitted to shine directly into the lagoon. Existing security lighting located along the northern trail near the lagoon should be redirected or replaced.

Neary Lagoon also supports a population of domestic ducks and geese. Because waterfowl habitats are restricted, domestic ducks compete directly with native waterfowl for available resources. Periodic removal of domestic/hybrid waterfowl from the refuge would improve opportunities for native waterfowl by reducing competition for habitat. Removal could be accomplished by noting roost locations and capturing birds with a net in the early morning hours. Complete



Impact of Controlling Marsh Vegetation on Birds at Neary Lagoon Figure 3-6

removal of all domestic/hybrid waterfowl, although desirable for protecting and enhancing native waterfowl populations, may be economically infeasible. Because domestic/hybrid waterfowl may continue to be reintroduced to the lagoon, the removal program would need to be ongoing.

Terrestrial Bird Management

Five species of birds that require expansive tracts of emergent marsh vegetation could potentially be adversely affected by periodic removal of vegetation to maintain open water areas; however, most species associated with emergent vegetation would benefit from the increase in ecotonal areas that would result from this action. Direct impacts on wildlife would be minimized by avoiding marsh vegetation removal during breeding and other sensitive periods of the year.

The proposed trail through a portion of the lagoon's riparian habitat (segment T-3 in Figure 3-1) would increase human disturbance to wildlife in this area. Potential impacts on wildlife would be most critical during the breeding season. Increased disturbance could prevent establishment of breeding territories or cause reproductive failure for some species using habitat near the trail. To minimize disturbance, the trail is designed as a raised boardwalk with railings to discourage visitors from leaving designated walkways, and lockable gates are positioned so that trails can be closed during sensitive periods of the breeding season. The need for trail closure during the breeding season will be evaluated yearly by a qualified staff or consulting biologist or in consultation with DFG.

Trail segment T-4 (Figure 3-1) will be located in the grassland near riparian habitat. To minimize disturbance of the riparian habitat, a fence (segment F-2 in Figure 3-1) will be constructed to prevent visitors from accessing riparian woodlands and a buffer strip of riparian habitat will be established adjacent to the existing riparian area (Figures 3-2 and 3-5).

The lagoon's wildlife values would be enhanced by fencing portions of the lagoon boundary to control unauthorized access and restoring riparian habitat in management zone C (see "Riparian Forest Restoration" in the vegetation management section above for further discussion).

Special-Status Species

The western pond turtle and special-status water birds would not be adversely affected by the management actions described in this document. Fencing to control access to the lagoon, continued restrictions on boating and fishing, and maintenance of open water areas would likely benefit these species.

Ospreys, northern harriers, short-eared owls, black swifts, willow flycatchers, bank swallows,

Virginia's warblers, and yellow-breasted chats would not be affected by the proposed management actions because either preferred habitat is currently lacking or limited, or the species only occur as vagrants outside their normal ranges.

Sharp-shinned hawks, Cooper's hawks, long-eared owls, yellow warblers, and common yellowthroats make use of the lagoon's riparian habitats. Although the proposed riparian trail (segment T-3 in Figure 3-1) may increase disturbance in localized areas, impacts on these species would be minimal. To minimize disturbance, the trail will be designed to discourage visitors from leaving designated walkways (see action PU-2.2 in "Public Use and Safety" below) and, if monitoring indicates wildlife are adversely affected by trail use during sensitive periods of the breeding season, the trail would be closed (see actions PU-2.1, PU-4.5, and PU-4.7 in "Public Use and Safety" below). Fencing portions of the lagoon boundary to control unauthorized access and restoring riparian habitat in a portion of the grassland area in management zone C (Figures 3-2 and 3-5) would likely benefit these species.

Winter roosting habitat for the tricolored blackbird would be reduced as a result of removing emergent vegetation to maintain open water areas; however, maintenance of winter roosting habitat at Neary Lagoon is not considered critical for this species. This species attempted to colonize the lagoon in 1973, but the colony failed and was abandoned. Tricolored blackbird colonies are highly susceptible to human disturbance (Beedy et al. 1991); therefore, because potential nesting habitat is limited and occurs within an urban environment, control of emergent vegetation is not expected to jeopardize possible future colonization of the lagoon by this species.

Fisheries Management

Three of the seven species of fish known to inhabit the lagoon are considered sport fish by DFG. Sport fishing at the lagoon is prohibited by the City. Fishing could result in more litter (e.g., waste bait containers and other carry-in items) in remote portions of the lagoon, potential wildlife injury or mortality from tangling with waste monofilament line and lures (especially for diving water birds), disturbance to wildlife and vegetation from people trying to gain access to sensitive and restricted portions of the lagoon. Sport fish populations probably are not sufficient to provide a high-quality fishery, and limited lagoon size and access would create congestion problems.

Four non-native fish species have been introduced: carp, largemouth bass, bluegill, and mosquitofish. The presence of non-native species in the lagoon conflicts with the concept of maintaining the refuge as a natural area; however, attempting to eliminate fish from the lagoon would be difficult. Removal of non-native fish probably would require that the lagoon be poisoned. Poisoning is an expensive process, and some fish in the lagoon probably would survive because dispersing the toxicant through heavily vegetated areas would be difficult. Even if poisoning could completely eliminate fish populations, non-native fish species probably would be quickly reintroduced by park visitors.

Management Actions

Management Goal WF: Protect and improve opportunities for maintaining and increasing populations of native wildlife at Neary Lagoon.

Objective WF-1: Minimize impacts of domestic pets on wildlife at the lagoon.

> **Action WF-1.1:** To increase public awareness of the lagoon's regulation prohibiting dogs onsite, notices will be posted at access points explaining the regulation, its rationale, and the City's intent to enforce the regulation.

Action WF-1.2: Cooperation of the organizations, agencies, or departments (e.g., Society for Prevention of Cruelty to Animals) responsible for animal control in the city will be requested to assist in retrieving stray, injured, diseased, or nuisance animals and enforcing domestic animal prohibition regulations. Assistance from the City police department staff will also be requested to enforce the regulation during patrols through the refuge area.

Action WF-1.3: Sensitive habitat areas in the management area will be fenced to deter access to those areas by dogs and cats. (Fences will also help to control visitor access to sensitive areas.) (See actions V-3.1 and PU-2.3.)

Action WF-1.4: Prohibitions and restrictions will be maintained and enforced regarding dogs and cats at multifamily residential developments near the management area.

Action WF-1.5: As a condition of approval for all new future multifamily residential developments proposed within 1,000 feet of the management area, restrictions similar to those described for the CHC developments in action WF-1.4 will be imposed regarding dogs and cats as a condition of project approval by the City.

Objective WF-2: Reduce impacts by Norway rats on lagoon wildlife populations.

Action WF-2.1: Potential sources of food for Norway rats will be reduced at the lagoon by posting signs near entrances, in picnic areas, along trails, and at other key locations explaining the need to reduce rat food sources, encouraging visitors not to feed wildlife, and requesting proper disposal of waste food.

Action WF-2.2: If the County Environmental Health Department determines that a public health risk exists or DFG determines that significant impacts on wildlife from rats are occurring at the lagoon, the City will design a program to control rat populations in consultation with DFG and county health department experts to minimize potential impacts on people and wildlife. The program would consider the possibilities of expanding its rat control program in and around the management area by poisoning Norway rats in areas of the lagoon that are not easily accessible to people and trapping rats in areas accessible to people, including adjacent residential areas. Selection of toxicants and baits would involve consultation with public health officials to determine the safest approach to poisoning, including types of toxicants available, federal and state regulations for use, and other environmental and public safety factors.

Objective WF-3: Maintain the lagoon's current native mammal populations unless adverse impacts on other important wildlife or on people are documented.

Action WF-3.1: If DFG determines that native mammals are threatening the health, safety, or welfare of people or important wildlife at the lagoon, a program to control the populations of offending species will be developed in consultation with DFG and county health department staff.

Objective WF-4: Determine if waterfowl populations are declining, stable, or increasing and provide baseline information to guide management direction.

Action WF-4.1: Waterfowl counts will be conducted annually on two separate days during late December and early January over a 5-year period to determine the size and species composition of wintering populations. Counts will be

conducted by one or more persons qualified to identify bird species. Survey coverage will include all open-water areas of the lagoon and the duck-rearing ponds.

Action WF-4.2: Waterfowl survey data from action WF-4.1 will be analyzed by qualified biologists to determine:

if waterfowl habitat conditions are declining (as evidenced by declining wintering populations),

if habitat conditions are being maintained or are improving (as evidenced by stable or increasing wintering populations), and

if a change in wintering waterfowl populations can be correlated to management actions designed to improve waterfowl habitat conditions.

Action WF-4.3: Surveys will be conducted biweekly from mid-May through mid-July to determine the size and reproductive success of the breeding waterfowl population for 5 years. Counts will be conducted by one or more persons qualified to identify bird species. Survey coverage will include all open-water areas of the lagoon and the duck-rearing ponds. Data collected will include a total count of all waterfowl and counts broken down by species and sex, brood size, and brood age class will be analyzed by qualified biologists to determine:

a rough estimate of waterfowl nesting success (derived from the ratio of adult females with broods to adult females without broods);

reproductive success (derived from the number of broods and number of young per brood surviving to age class III); and

if the breeding population or the reproductive success of the breeding population is declining, stable, or increasing.

Action WF-4.4: Qualified biologists will evaluate data collected for the monitoring program described for actions WF-4.1 and 4.3. Based on data evaluations, the City will determine if additional monitoring is necessary to meet management objectives. If wintering or breeding populations are found to be declining or if breeding success is consistently low, additional investigations will be developed to determine the possible causes.

Objective WF-5: Maintain and improve habitat conditions for waterfowl.

Action WF-5.1: If warranted by results of waterfowl surveys from actions WF-4.1 to 4.4, additional nesting and resting habitats would be either enhanced on one of the lagoon's islands or constructed on additional islands created from lagoon bottom sediments, if available. The design of these habitats would be approved by DFG and regulatory authorities.

Action WF-5.2: Emergent marsh vegetation will be removed and maintained to provide increased acreage of open water habitat for waterfowl and other water birds. Emergent marsh vegetation will be removed during September to minimize disruption to wildlife breeding and rearing and the arrival and presence of migrating and wintering birds at the lagoon (see action V-5.1).

Action WF-5.3: If waterfowl surveys and analyses indicate that waterfowl habitat conditions, such as shortages of desirable food plants, are severely limiting wintering or breeding populations, a study will be performed to determine

ways of providing additional forage habitat, such as shallow water feeding areas, or other enhancement efforts.

Objective WF-6: Reduce competition by domestic and hybrid waterfowl for native waterfowl habitat.

Action WF-6.1: A program will be developed to monitor populations of domestic and hybrid waterfowl as part of the monitoring activities described for actions WF-4.1 through 4.4.

Action WF-6.2: A program to minimize the populations of exotic and hybrid waterfowl at the lagoon will be implemented with the goal of removing as many individuals as possible. When the population reaches 25 individuals, it should be reduced to between zero and 15 individuals.

Objective WF-7: Reduce public use impacts of existing operations and conditions on wildlife and minimize public use impacts of future operations and conditions on wildlife. (See "Public Use and Safety" in this chapter for additional objectives and actions to protect wildlife.)

Action WF-7.1: Fishing will continue to be prohibited at the lagoon and reasons for its prohibition will be provided as part of interpretive displays at the lagoon.

Action WF-7.2: The existing security lighting, which shines directly into the lagoon from the northern trail, will be directed away from the lagoon or replaced with low-height, indirect security lighting (see also action PU-3.1).

Action WF-7.3: To evaluate the need to temporarily close trail segments to minimize impacts on birds, surveys will be conducted by a qualified biologist at least monthly throughout the year, and more frequently just before and during the early part of the general breeding period for birds at the lagoon. If determined necessary to protect or enhance bird populations, segments of trails through sensitive areas will be temporarily closed or restricted to the general public, and a written explanation for the closure will be posted at the points of closure. Limited access may still be permitted for key persons or small groups approved by the qualified biologist and permitted by the City (see also actions PU-4.4 through PU-4.7).

Mosquito Control

Improved mosquito control was a key issue identified in the August 1991 public workshop. The City has received approximately 100 mosquito complaints during the past 2 years (Stevens pers. comm.). In December 1985, the City received a petition asking for improved mosquito control that was signed by 33 people living adjacent to the lagoon (Doty pers. comm.).

Based on a 1987 study of Neary Lagoon as a possible source of mosquitos (see "Mosquitos" in Chapter 2), DHS concluded that mosquitos at Neary Lagoon do not pose a public health risk and that the number of mosquito complaints received may be indicative of nearby residents' intolerance for mosquitos rather than the number of mosquitos present (Doty pers. comm.). Based on these conclusions, the County of Santa Cruz Health Services Agency recommended to the City of Santa Cruz Superintendent of Parks that a mosquito abatement program not be implemented at Neary Lagoon (Evans pers. comm.). No mosquito control program has been enacted in either the City or Santa Cruz County (Rau pers. comm.).

Even though mosquitos do not pose a health risk, the public perception of Neary Lagoon as a mosquito source and the number of mosquito complaints from Santa Cruz residents indicate that the role of the lagoon in mosquito production should be evaluated and control measures considered. Control strategies should focus on reducing the mosquito population below nuisance levels. Some waterfowl feed on mosquito larvae, and adult mosquitos are eaten by flycatchers, vireos, warblers, and other birds. Mosquitos are an important link in the food chain, and their total elimination from Neary Lagoon would be undesirable. (Harvey and Stanley Associates 1987.)

Mosquito Control Techniques

The City has introduced predaceous mosquitofish to the lagoon on several occasions. A study of lagoon biology conducted in 1987 found very low populations of mosquitofish, with individuals seen only in shallow water near the outlet to the lagoon. Largemouth bass and possibly bluegill are predators of mosquitofish, and this has probably been responsible for the small numbers of mosquitofish in the lagoon. (Harvey and Stanley Associates 1987.)

The City has also investigated the use of environmentally safe mosquito larvicides. The granular form of these larvicides, which would be required to penetrate the thick foliage, is expensive; distribution throughout the lagoon would be difficult because of limited access; and the larvicide would have to be reapplied frequently to control the many cycles of mosquitos that develop during the warm months. Considerable staff time would be required to check all suitable mosquito-rearing habitat and apply the larvicide, and several new pieces of equipment would also be required. (Harvey and Stanley Associates 1987.)

Water level management is a fundamental aspect of mosquito control. Sudden changes in water levels disturb the water-plant interface where mosquito larvae are harbored and drown or dehydrate the larvae (Collins and Resh 1989).

Introducing additional mosquitofish may temporarily contribute to mosquito control, but predation would likely reduce mosquitofish populations in a short time. Control of bass and bluegill by fishing or poisoning is not currently recommended because of the possible negative effects on other lagoon wildlife from these activities, the high costs of conducting such control programs, and the likelihood that the programs will be ineffective because of reintroductions of these species.

Management Actions

Management Goal M: Maintain mosquito populations at safe levels at Neary Lagoon.

Objective M-1: In the event that mosquitos reached unsafe levels in the vicinity of the management area, identify the nature and magnitude of the mosquito problem and the lagoon's contribution.

Action M-1.1: If the County Environmental Health Service determines that a public health risk exists due to mosquitos at Neary Lagoon, a program will be conducted by the County Environmental Health Service to determine the nature and extent of the problem. The program would be developed by health service staff and vector control specialists in consultation with the City and might generally consist of the following:

Mosquitos would be trapped in residential areas throughout the city to determine if populations are higher near the lagoon.

Mosquito complaints will be tracked by location to determine if more complaints are received from residents close to the lagoon.

Species of mosquitos trapped within range of the lagoon would be compared with those observed at the lagoon and its associated wetlands to determine what areas of the lagoon may be contributing to the problem.

Based on the two previous actions, health department staff and vector control specialists would determine whether the lagoon is a significant mosquito source and what areas of the lagoon may be most productive.

In consultation with mosquito control specialists, population thresholds would be established that would trigger control efforts.

The occurrence of standing water within and adjacent to the riparian woodland areas at Neary Lagoon would be monitored between April and October. A permanent staff gauge or continuous water level recorder placed at the weir would enable correlation of the occurrence of standing water in various areas with lagoon water levels. This information would be combined with mosquito source data to indicate which areas should be drained and how changes in lagoon water levels affect standing water in these areas.

Objective M-2: Manage vegetation and water levels in the lagoon to reduce mosquito habitat and explore other mechanisms for controlling mosquitos.

Action M-2.1: As part of water level management for the lagoon, water levels will be lowered rapidly at least 6 inches within a 2-day period at least twice during the warm season (Jones & Stokes Associates 1991a). Water level adjustments will be coordinated with other lagoon management objectives and actions.

Action M-2.2: Vegetation will be removed to open additional channels or enlarge existing channels to improve water circulation and increase wave action. Vegetation removal for mosquito control should be coordinated with water quality, wildlife habitat, and other lagoon management goals (see action V-5.1).

Cultural Resource Protection

Before ground-disturbing activities can be conducted in the management area, the City must comply with applicable laws and regulations for avoiding impacts on important cultural resources. The City has regulations to protect cultural resources. Important cultural resources are described in the California Environmental Quality Act as:

- being associated with an event or person of recognized significance in California or American history, or recognized scientific importance in prehistory;
- providing information that is both of demonstrable public interest and useful in addressing scientifically consequential and reasonable or archeological research questions;
- having a special or particular quality, such as oldest, best example, largest, or last surviving example;
- being at least 100 years old and possessing substantial stratigraphic integrity; or

- involving important research questions that historical research has shown can be answered only with archeological methods.

Management Actions

Management Goal CR: Protect important cultural resources at Neary Lagoon.

Objective CR-1: Minimize impacts on cultural resources at Neary Lagoon by identifying and avoiding or, if avoidance is not feasible, mitigating impacts on cultural resources.

Action CR-1.1: A program will be conducted that identifies and avoids or, if avoidance is not feasible, mitigates impacts on cultural resources in the management area. City cultural resource protection regulations will be complied with. The program will include the following elements:

Perform a complete archeological reconnaissance of proposed impact areas before any ground-disturbing activities are conducted.

Perform archival and historical research to reconstruct the prehistoric and early historic boundaries of the lagoon, to determine what activities occurred in the area, to determine whether other historic sites could be present in the area of impact, and to determine whether CA-SCR-273/H is a location of historic and prehistoric activities.

Conduct a mechanical testing program to determine if resources are present in areas where archival and historical research indicate that buried or otherwise obscured cultural resources may exist. This testing program should be supervised by a qualified archeologist and should consist of a subsurface examination of impact areas using an auger or backhoe.

Conduct (if known cultural resources cannot be avoided), a test excavation to determine the importance of the site. If the site is determined to be important and cannot be avoided, conduct a data recovery excavation to extract the information that would be lost through development of the site.

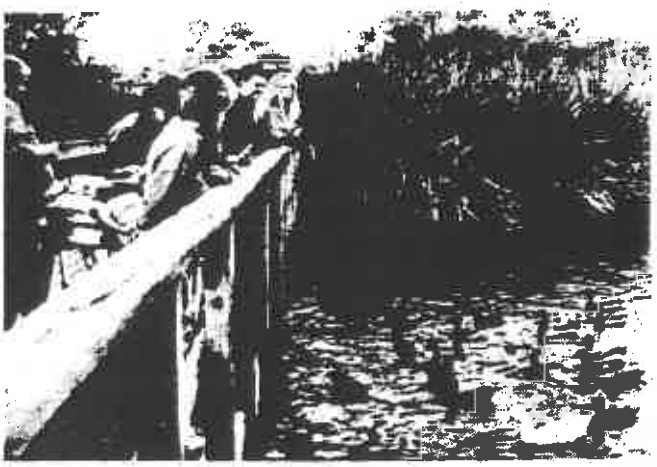
Public Use and Safety

General Use and Activities

Neary Lagoon provides a broad spectrum of opportunities for public use. Surrounded mostly by residences and positioned within a few minutes' walk of important tourist facilities and commercial areas, Neary Lagoon is accessible to neighborhood residents and visitors and has the potential to attract many people with diverse interests. Few, if any, similar publicly owned freshwater marsh areas in the region are located so close to large numbers of potential users. Neary Lagoon provides unique opportunities for people to experience such a natural area in an urban environment.

Recently, the lagoon has been used for bird watching; strolling; feeding ducks; picknicking; environmental education; and other, generally passive, nature-oriented activities. These types of activities generally have occurred in and immediately surrounding the marsh area. Activities more typically found in urban recreation and park areas occur in the more developed

park area (management zones J and F, Figure 1-4), including tennis, children's play, dog walking, picnicking, and organized events and play using the open lawn area and amphitheater. The lagoon may also be used by children living in the CHC housing development for traveling between home and school. In addition, the lagoon has been used for illegal camping and illicit activities, largely because of the minimal restrictions to access, its location near public areas, its mild climate, and the small chance of being observed. This has resulted in public use conflicts and impacts on the lagoon's environment, including its wildlife and vegetation, and the quality of people's recreational experiences.



The central floating boardwalk is a popular place to view wildlife and experience the lagoon at close range.

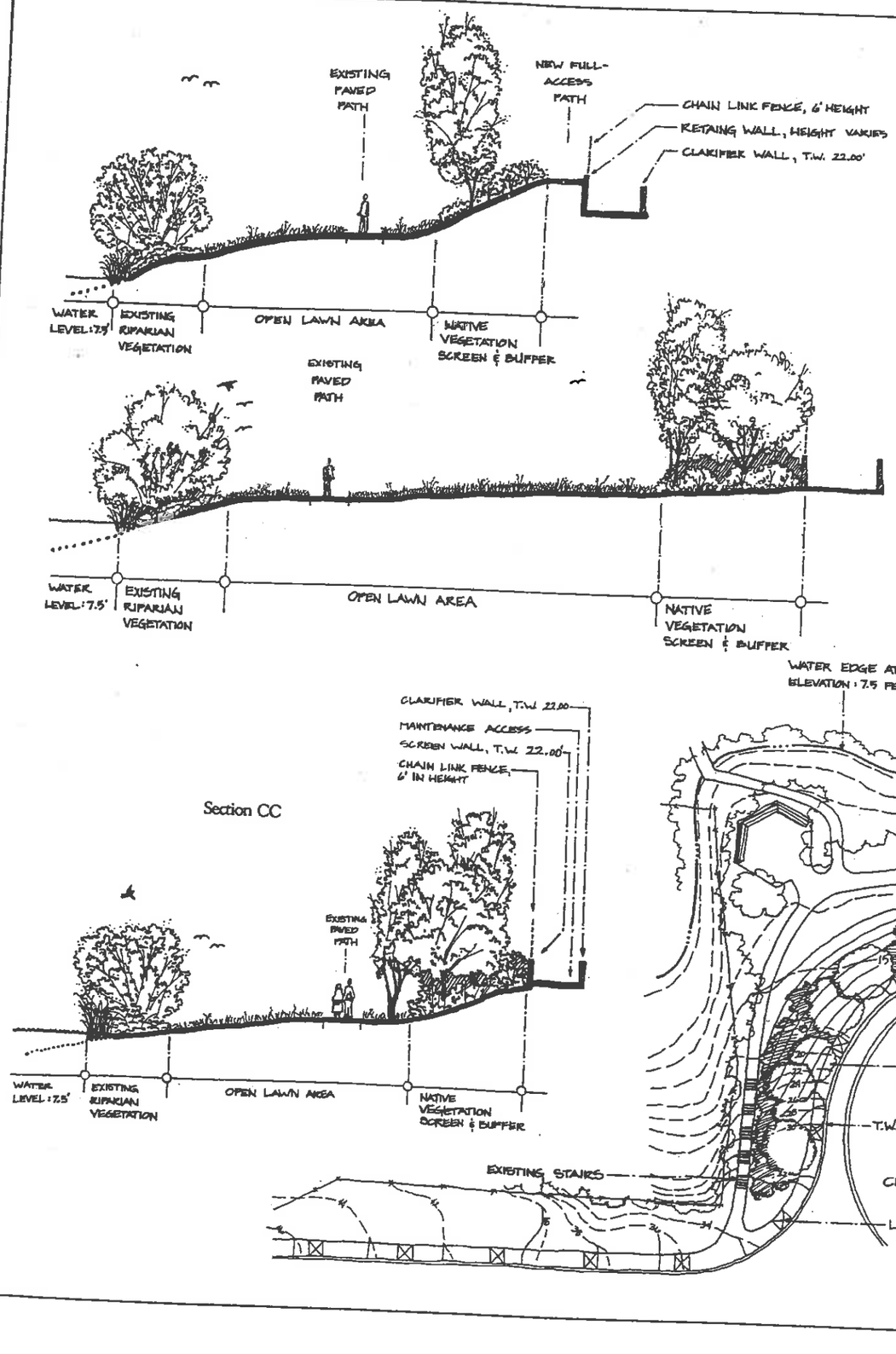
Access Concerns

The principal access to the management area is presently from the recreation area (management zone J) on the south side. The central floating walkway, at the boundary of management zones E and G, is an important feature that allows people to experience the marsh environment and wildlife at close range. Public access to most of the lagoon is limited, though trails and boardwalks connecting the south side with the terminus of Chestnut Street will soon be opened to public use. Because the lagoon is a public facility and unique local natural area, access should be improved to provide the community with more opportunities to experience the area. Access should be carefully designed and controlled, however, to minimize impacts on wildlife and the overall character of the area for visitors. Entries should be pedestrian oriented; accessible to handicapped people, the elderly, and small children; and have informational signs and interpretive exhibits. Full-access entries to the lagoon area should be provided for pedestrians from Chestnut Street, Blackburn Street, and the park area near Bay Street. Figure 3-7 illustrates a conceptual plan for providing a full-access pedestrian path to the lagoon and lawn in management zone F from the park facilities on the lagoon's south side.

Because Neary Lagoon is intended to provide experiences that encourage environmental awareness and sensitivity, access should be designed to encourage pedestrian use. Adequate parking for private vehicles should be provided, but not emphasized, in order to discourage travel to Neary Lagoon by private automobile. The majority of the parking area for cars should continue to be provided on the south side of the management area near recreation facilities in management zone J. Parking should be located at the periphery of the management area to minimize intrusion of cars into the area. Parking on the north side should be limited to on-street parking with a maximum of 10 curbside automobile spaces designated near public entry points. The majority of these spaces should be along Chestnut Street near the Chestnut Street entry. In addition, adequate handicapped and bus parking spaces should be provided.

Restrictions on activities that may affect wildlife, vegetation, or people should be clearly described and explained to encourage compliance. Fences, gates, and signs should be designed to help

Path and Vegetation Screening for South Lagoon Area



Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 3-7

control access to important wildlife areas. Areas important to wildlife, such as riparian forests, have been degraded by camping and illegal gatherings. Numerous public complaints have been received regarding violent crimes, fires, inebriation, and sanitation associated with these important areas.

The pathway along the north side of the lagoon at the Cypress Point and Shelter Lagoon developments is not developed, and few people are aware of it or that it is available for public use. The trail is used mostly by residents of the two developments. No signs indicate entry to the trail from public areas, and no parking or staging areas are provided. Access to this trail could be improved, but increased use could have negative effects on residents by increasing noise and security concerns. The trail is a public right-of-way and should be accessible for public use, however, because Neary Lagoon is a community facility. To improve public access opportunities to the northern trail, signs should be placed at Felix and Walti Streets to indicate pedestrian entries to the northern trail, and the existing public walkway easement running from Felix and Walti Streets to the Laurel Creek arm of the management area (Figure 3-1) should be maintained to allow public access. Signs should be posted requesting that visitors respect the privacy of residents of the Cypress Point and Shelter Lagoon developments. Additionally, the new loop trail should not be connected to the existing northern trail to further ensure residents' privacy and to help protect wildlife. Adding more public access points to the loop trail, particularly to segment T-3, would increase the difficulty and reduce the effectiveness of the City's ability to enforce access restrictions to sensitive wildlife areas.

Activities such as bicycle riding, roller-skating, and skateboarding may disturb wildlife or people who wish to engage in bird watching; nature study; or other passive, nature-oriented activities at the lagoon. Activities that might be disruptive to wildlife, threaten people's safety, or negatively affect people's experience of the lagoon as a natural area should be discouraged or prohibited in the management area.

The trail along the lagoon's north edge provides excellent opportunities for observing wildlife and enjoying views of the lagoon.

The impacts on the lagoon's environment from children living in the CHC development and traveling between home and school should be monitored by officials and residents of the CHC development to ensure appropriate use of the lagoon area by children. The lagoon could also present a hazardous environment to young children. A program should be established that would address concerns of safety and negative impacts on the lagoon as associated with children. The program should be developed by CHC with input from the schools and the parks and recreation department. Patrols by CHC resident parents may be important to

ensure safety of children and their compliance with rules and regulations of the management area. The parks and recreation department will also assist the CHC in providing public education opportunities regarding the lagoon.

Opportunities for Improvement

Loss of recreation facilities, including the amphitheater and most of the open lawn area, because of the likely expansion of the wastewater treatment plant provides an opportunity to more clearly separate the important and sensitive wildlife areas of the lower lagoon from activities that would be incompatible with protecting wildlife values and the lagoon's natural character. Careful management and design of facilities should be employed that consider the importance of separating uses to minimize conflicts.

The lagoon, with its rich history, diverse habitats, and accessible location, provides many opportunities for environmental education and interpretation that should be exploited. Because the lagoon is so important and diverse, and because management issues and activities described in this plan are so varied, it would be beneficial for the City to assign a qualified person to manage the elements described in the management plan. Training in biology and environmental education would be important qualifications for such a position. Monitoring of visitor use and impacts would assist greatly in determining the effectiveness of management actions and programs and guiding future management directions.

Management Actions

Management Goal PU: Provide improved high-quality, and safe public access, recreation, and environmental education opportunities that are consistent with other purposes of the management area.

Objective PU-1: Improve the quality and amount of public access opportunities at the lagoon.

Action PU-1.1: A new pedestrian entry will be developed on the northeast side of the management area at the terminus of Chestnut Street that will serve as the principal entry for the lagoon's natural area and new loop trail. The entry area will be wheelchair accessible and include interpretive features, a sitting area, a small restroom, a water fountain, and emergency and maintenance access capability. (See action PU-5.2 and Appendix D for a detailed description of design elements and criteria.)

Action PU-1.2: A new entry will be developed near the northwest end of the grasslands (zone C), at the terminus of Blackburn Street, that will serve as a secondary entry for pedestrians, accommodate emergency service access needs, and be wheelchair accessible. The entry will include a lockable gated entrance to zone C, informational and interpretive signs, and a bicycle rack for at least five bicycles. The entry will be designed to be compatible with the Delta ditch restoration area and other restoration efforts described in this plan.

Action PU-1.3: An interpretive loop trail will be completed around the central portion of the lagoon by constructing new trail segments and improving existing segments. The new trail segment will connect the central floating walkway with the new Blackburn Street entrance and the new Chestnut Street entrance (Figure 3-1). The new loop trail will not be connected to the existing northern trail at the Shelter Lagoon development. The new trail portions will consist of segments of raised boardwalk, short bridges, decomposed granite surfaced trail, and a small segment of floating walkway. The trail will be fully wheelchair accessible with appropriately designed entrances at Chestnut and Blackburn Streets and a

paved full-access ramp from the top of the stairs to the lawn area at the south side of the lagoon in management zone F (Figure 3-7). The trail will be about 6 feet wide and designed to provide year-round use while discouraging movement off the trail. Lockable gates will permit access control at key locations along the trail. (See Appendix D for a detailed description of design elements and criteria.)

Objective PU-2: Provide mechanisms for controlling public access to important wildlife habitat areas.

Action PU-2.1: Lockable gates will be installed as part of new trail construction at key locations along the loop trail where access to important wildlife habitat areas may need to be restricted during certain periods.

Action PU-2.2: All new trail improvements will be designed to inhibit and discourage human access into important wildlife habitat areas through the use of features such as raised boardwalks, railings, barriers, and signs explaining why access to sensitive areas is prohibited and requesting compliance with access restrictions.

Action PU-2.3: Fences will be constructed in locations indicated in Figure 3-2 to prevent public access to important wildlife habitat areas. Fences will be either 6-foot-high standard chain link with steel posts or 5-foot-high welded wire mesh with treated peeler core posts. Welded wire mesh fencing and peeler core posts will be used along the boundary between the grassland in zone C and the riparian area in zone D (fence segment F-2 and F-3) for aesthetic purposes and to discourage entry into the important riparian forest. Fence F-2 will be located approximately 30-40 feet into the grassland and run approximately parallel to the edge of the existing riparian area to allow room for riparian restoration south of the fence. Also, the north portion of fence F-3 will help restrict access into the zone C grassland. Chain-link fencing will be used along the eastern boundary of the management area at the edge of zone B (fence segment F-4) and at zone A (fence segment F-5) for security and durability and to discourage entry into the riparian areas. Fencing along the northeastern boundary of the management area at zone C (fence segment F-1) will be provided as part of construction for the CHC housing project. All fence segments will be installed in a manner that minimizes damage to existing native vegetation. (see also actions V-3.1 and V-6.3).

Objective PU-3: Reduce public use impacts on wildlife and people from existing and new design elements in the management area.

Action PU-3.1: The existing security lighting, which shines directly into the lagoon from the northern trail, will be permanently redirected to avoid shining directly into the lagoon or replaced with lower intensity, low-height, indirect security lighting to reduce impacts on wildlife (see also action WF-7.2).

Action PU-3.2: New trails will be surfaced with materials, such as decomposed granite and gapped wooden boards, that discourage use by roller skates and skateboards to reduce impacts from fast movement or recreation activities that are not compatible with the lagoon's goals of wildlife protection and passive human use. Surfaces will permit wheelchair use.

Action PU-3.3: New trails will incorporate design features such as decomposed granite surfacing, curved segments, and bollards that discourage fast bicycling while permitting wheelchair use.

Action PU-3.4: A program will be established for children's use of the lagoon. The program will address maintaining children's safety and minimizing their disturbance of wildlife, with special attention given to children's use of the lagoon as a through route between home and schools.

Objective PU-4: Establish, enforce, and explain reasons for restrictions on public access and activities to increase understanding and reduce impacts on wildlife and people.

Action PU-4.1: Riding bicycles will be discouraged in the management area, except on through trails in zones B, F, and J where the feasibility and appropriateness of bicycle riding will be investigated to meet the goal of low-level impacts on wildlife and refuge users. A bicycle path along the railroad tracks will be investigated as an alternative to bicycle riding on through trails in the management area. Informational signs explaining the restrictions, reasons for the restrictions, and bicycle etiquette will be posted at key entry points and other locations in the management area. Bicycle racks will be installed at key locations near entries to the loop trail, with signs explaining bicycle etiquette and restrictions.

Action PU-4.2: Activities prohibited throughout the management area will include roller-skating, skateboarding, littering, damaging vegetation, fishing, walking dogs, harassing wildlife, entering important wildlife areas except by trail or with permission of the City, camping, and other activities prohibited by laws and ordinances. Informational signs explaining reasons for the prohibitions will be posted at key entry points and other locations and as part of interpretive exhibits in the management area.

Action PU-4.3: Activities that will be discouraged with reasons explained on signs and as part of interpretive exhibits in the management area will include feeding wildlife and making loud noises that may disturb wildlife and people in or near the management area.

Action PU-4.4: Public access to fenced areas in zones A and I will be prohibited except by written permission from the City. Permission to enter these zones may be granted if the activity is supervised by qualified personnel, of short duration, infrequent, and determined to be consistent with protecting wildlife values. Permission to enter may be granted for scientific study, nature study or field trips by groups or individuals from nature organizations, and school field trips for environmental education (see also action WF-7.3).

Action PU-4.5: Public access to zones B, C, D, E, G, and H will be restricted to public trails and areas designated in this management plan except by written permission from the City, using the same criteria described in action PU-4.4. No public access restrictions will apply to zones F and J.

Action PU-4.6: Public use of the management area will be restricted to the hours between dawn and dusk except by written permission from the City using the same criteria described in action PU-4.4.

Action PU-4.7: Gates at key locations along the existing trail and the new loop trail (Figure 3-1) will continue to be locked at dusk and unlocked at dawn by the Park and Recreation Department each day of the year, unless the City determines that public access along a trail segment needs to be restricted for wildlife protection (e.g., during important breeding periods) or public safety. The decisions to close trail segments to protect wildlife

will be made only by a qualified biologist or by the City in consultation with DFG (see also action WF-7.3).

Action PU-4.8: All areas of the management area will remain accessible for maintenance and emergency equipment. Gates will be provided and maintained for emergency access at key locations indicated in Figure 3-1 and at other locations determined necessary by the City for emergency service access.

Action PU-4.9: As part of interpretive exhibits and informational signs at the lagoon, reasons for restrictions on public use activities will be explained and illustrated.

Objective PU-5: Improve and develop new recreation facilities in zone J and limit active recreation uses to this zone and to the extreme north end of zone B where it borders Chestnut Street.

Action PU-5.1: A new plan for recreation facilities and access will be developed for zone J and implemented after it is approved by the City. The plan will contain features responsive to access needs and the conditions and requirements of the environmental impact report (EIR) for expanded wastewater treatment facilities (Jones & Stokes Associates 1991b), local neighborhood concerns (including public transportation needs), maintenance needs, public safety and security needs, needs of the physically impaired, and recreation needs. At a minimum, design features will include parking for 24 cars, bicycle racks for at least 10 bikes, landscape improvements, security lighting, informational signs, and interpretive features. Design features may also include an improved children's play area, a sitting area, picnic facilities, and a small open lawn area. The existing restroom, sitting area at California Street, fence along the riparian forest edge, and stairs to the lower lagoon area will remain.

Action PU-5.2: A plan for recreation facilities may be developed and implemented after receiving approval by the City for the area bordering Chestnut Street at the extreme north end of management zone B. Recreation facilities may include a multi-use court, a sitting area, and a water fountain. If recreation facilities are developed, a buffer planting area consisting of indigenous plants will be established between the play facilities and the existing riparian restoration area to the east. The buffer will be a minimum of 15 feet wide and run continuously the length of the play area. Any security or other lights will be of low intensity and directed away from nearby residences and the buffer and restoration areas to minimize impacts on wildlife habitat and nearby residents. Parking for these facilities would be along Chestnut Street (see Appendix D).

Objective PU-6: Maintain and, where necessary, provide access and facilities to ensure public safety and security for the management area.

Action PU-6.1: Design new facilities to provide access to fire and police services by providing emergency access gates at key locations and ensuring access to fire hydrants (see also actions I-1.2 and I-1.3).

Objective PU-7: Continue to manage and provide opportunities for public use in the management area that minimize impacts on adjacent properties and residents.

Action PU-7.1: The City will retain jurisdiction over the existing 10-foot-wide public easement along the north shore adjacent to the lagoon and the Cypress Point and Shelter Lagoon developments and enter into a revised contractual

agreement with the developments' management that establishes responsibilities, guidelines, and requirements for maintaining the easement and trail.

Action PU-7.2: As part of a revised maintenance agreement (see action PU-7.1), the City will assist with designing and installing additional signs along the existing northern trail requesting quiet and respect for residents' privacy at the Cypress Point and Shelter Lagoon developments.

Action PU-7.3: Pedestrian access will be improved and maintained along the existing 20-foot-wide public walkway easement running between Felix Street, the terminus of Walti Street, and the Laurel Creek arm of the management area. Signs will be placed at each of the entrances to the public walkway easement to identify it as access to the management area.

Objective PU-8: Improve opportunities for environmental education and research in the management area.

Action PU-8.1: New observation areas and interpretive exhibits will be developed and installed as part of the new loop trail, and new interpretive exhibits will be developed and installed at each of the primary pedestrian entrances to the trail system (Figure 3-1). A map showing the location of all entrances to and important features of the management area will be constructed as a permanent informational feature near each of the primary pedestrian entrances to the trail system.

Action PU-8.2: A study of opportunities for environmental education programs and possibilities for interpretive exhibits will be prepared for Neary Lagoon in consultation with representatives from the local school district, community groups, and other local groups and individuals.

Action PU-8.3: Based on the findings of the study described in action PU-8.2, a comprehensive interpretive program will be developed for Neary Lagoon that will consist of interpretive themes, environmental education study programs, written materials, interpretive exhibits, and other elements. Interpretive themes will address a variety of cultural resource and natural history information and will interpret the positive and negative aspects of the lagoon's conditions, including native and exotic species, the lagoon's history and changes, archeological resources, the role of water management in maintaining the present-day lagoon system, waste water treatment facilities, water quality conditions and improvement opportunities, and impacts and benefits of human use of the lagoon.

Action PU-8.4: A list of potential projects and studies (e.g., mammal monitoring, simple water quality testing, vegetation removal and revegetation projects, bird house construction and maintenance, yellow iris removal, public use surveys and monitoring, marsh vegetation encroachment) that could be performed by groups, students, and individuals at the lagoon will be generated and maintained by the City department of parks and recreation and made available to area schools and other institutions and individuals to facilitate research and environmental education uses and to increase public awareness of and interest in the lagoon.

Action PU-8.5: A program will be developed, in consultation with community groups and others, to train and coordinate volunteer docents willing to lead environmental education tours and give talks at the lagoon.

Objective PU-9: Enforce management area regulations and assure conduct and compliance with management plan elements.

Action PU-9.1: A refuge manager will be employed by the City department of parks and recreation to manage and oversee the management area to ensure that the management plan is implemented and the area protected for wildlife and public use consistent with this plan. The employee will have sufficient biological training to conduct or oversee biological monitoring and studies required in this plan and coordinate and conduct environmental education activities. The employee will also receive training in regulatory requirements related to the management area and have the primary responsibility for evaluating proposed activities for their consistency with the management plan and preparing reports on these activities for review by approving bodies. The refuge manager will oversee activities and studies; prepare reports for the Parks and Recreation Commission, City staff, and CCC on the management of Neary Lagoon; coordinate and serve as a liaison with other City departments, agencies, organizations, and the public; and also may perform other duties for the City.

Action PU-9.2: All City officials and representatives, lessees, contractors, and others performing work in the management area will be required to coordinate their activities with the refuge manager, obtain all necessary approvals, and perform only work that is consistent with the management plan. The only exceptions will be for emergency services responding to immediate emergency needs in the management area. Emergency personnel will be required to coordinate with the refuge manager as soon as possible before, during, or following their actions that may disrupt the lagoon ecosystem.

Objective PU-10: Determine the effects of public use on the environmental conditions of the management area to guide management direction and activities.

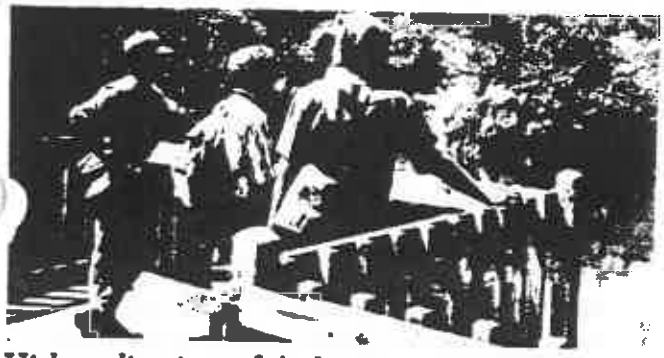
Action PU-10.1: A study of visitor use will be developed for the lagoon using information from wildlife, water quality, and other environmental resource studies to correlate trends in wildlife activity and vegetation growth with patterns of human use in the management area. A visitor monitoring program will be performed, overseen, or assisted by the City over a 5-year period, to correspond with wildlife and vegetation monitoring studies, that will record once monthly the total number of people observed in various parts of the management area and the activities they are engaged in. Part of visitor monitoring will entail evaluating information provided by the CHC on use of the management area by children living in the CHC housing development and traveling between home and school. Officials and residents of the CHC development will regularly monitor use of the management area by children living in the development and provide that information to the City. Additionally, a questionnaire/interview survey of park users will be conducted once each year and analyzed to determine use and activity trends. Annually and at the end of the 5-year period, visitor monitoring studies will be compiled and analyzed with other monitoring information required to determine future management directions and needs.

Aesthetic Management

The visual character of Neary Lagoon is primarily natural despite views of surrounding development from within the management area. The visual resources of the management area are illustrated generally in Figure 2-7. Much of the management area's appeal is in its varied vegetation patterns, textures, and shades. People are attracted to views of open water and associated vegetation. Views of the lagoon's wildlife, usually near the water, are particularly important to visitors. Preserving and enhancing views of these

elements without compromising other purposes of the management area should be given high priority for visual management of the lagoon.

Views from observation platforms and the floating walkways should be maintained. Marsh vegetation, which currently blocks desirable views from some of these areas, should be controlled to provide some enframed and partial views of the lagoon. Vegetation has been removed from the lagoon bank along a portion of the northern trail, to maintain views for residents. Much of the embankment here is denuded and eroding. The marsh vegetation along the northern trail should be managed to permit some framed views while maintaining patches of vegetation to control erosion and provide visual variety.



High-quality views of the lagoon are available from observation platforms.

Viewing wildlife is an important part of the visitor's experience at Neary Lagoon.

The lagoon is partially ringed by a high, steep, and heavily vegetated escarpment that serves as a strong visual enclosure and provides visual variety for the lagoon. Riparian forests and mixed oak woodlands contribute to the variety and sense of enclosure. Visual management of the lagoon should carefully consider the importance of maintaining the natural vegetation on this slope.

Opportunities should be investigated for creating overlooks from higher areas along the slope and the bluff top in areas where public use is not restricted. The opportunity to enter the edge of the tree canopy and view the lagoon should be explored for the area adjacent to the tennis courts and picnic area where zones F and J meet, at points along the west bluff edge, and along the south bluff top between the railroad track and Bay Street.

Recreation, interpretive, and other facilities in the management area should be designed to blend with the natural aesthetic character of the lagoon environment. Landscape design criteria should emphasize use of native plants to blend with the natural character of the lagoon and attract wildlife to the area. The barren area along Bay Street should be aesthetically improved through the use of plantings and other appropriate design elements.

Elements that do not blend well with the lagoon's aesthetic character are the wastewater treatment plant and multifamily residences that abut the management area on the north and northeast. Though the multifamily residences are imposing, they are largely screened from view from most of the management area. Visual management of the area should avoid directing views toward the treatment plant and multifamily housing, and views of these elements should be screened where possible.

Odor and noise control should be considered part of managing the lagoon's aesthetic character. The

lagoon should be managed to minimize trash and trampled vegetation that are negative elements of the lagoon's visual character.

Management Actions

Management Goal A: Maintain important views and visual features of the management area and enhance viewing opportunities.

Objective A-1: Control marsh vegetation to provide views in key areas as part of vegetation management actions.

> **Action A-1.1:** Emergent marsh vegetation will be removed or controlled as part of vegetation management actions for areas near observation platforms along the south shore, along portions of the central floating walkway and the northern trail, and at key locations for the new loop trail (Figure 3-1). Patches of marsh vegetation along the northern trail will be retained to frame views and visual variety along the shoreline and protection for water birds.

Objective A-2: Improve denuded and eroded areas where vegetation is degraded.

> **Action A-2.1:** Denuded and eroded areas along the northern trail and in other portions of the management area will be revegetated and maintained as needed.

Objective A-3: Maintain native vegetation in and around the management area and protect the visual character of the escarpment partially encircling the management area.

> **Action A-3.1:** Native vegetation on all portions of the escarpment in the management area will be preserved and enhanced.

> **Action A-3.2:** A program will be developed for securing improved management control of the escarpment along the western edge of the management area as described in action ML-2.1. If improved management control is secured, the area will be managed to preserve its visual character by protecting patterns of native and existing important vegetation and prohibiting public access and construction of trails and structures.

> **Action A-3.3:** Vegetation in and around the management area that serves important visual functions will be preserved as part of vegetation management actions.

Objective A-4: Explore opportunities for creating overlooks of the lagoon in areas that are not highly sensitive for wildlife.

> **Action A-4.1:** The feasibility for developing a lagoon overlook in the vicinity of the existing picnic area near the juncture of zones F and J will be investigated. If determined to be feasible, the overlook could include riparian habitat and canopy interpretation features.

> **Action A-4.2:** Opportunities to provide bluff-top overlooks along the strip of land between Bay Street and the south bluff edge and along the west bluff edge will be investigated. The investigation will consider possibilities for interpreting the wastewater treatment plant as part of the overlook.

Objective A-5: Design new recreation, interpretive, and other facilities to blend with the natural aesthetic character of the lagoon environment.

> **Action A-5.1:** New recreation, interpretive, and other facilities will be designed to blend with the natural aesthetic character of the lagoon environment. Designs for landscape improvements will

emphasize use of native plants to blend with the natural character of the lagoon and attract wildlife.

Action A-5.2: The strip of land in the management area along Bay Street will be aesthetically improved through the use of native plantings and other appropriate design elements.

Objective A-6: For siting of new facilities and interpretive exhibits on trails, avoid low-quality views and screen views of incompatible features where possible.

Action A-6.1: Site planning of new facilities and interpretive features will consider avoiding views of features that are not compatible with the lagoon's character, such as the CHC housing project and the wastewater treatment plant.

Action A-6.2: Views of incompatible features will be screened from important viewing locations by planting native screening vegetation, including fast-growing trees such as cottonwoods.

Objective A-7: Reduce impacts of noise in the management area.

Action A-7.1: Noise will be minimized for construction and other activities that may occur in the management area through use of temporary sound walls and other techniques for noise attenuation.

Infrastructure Management

Infrastructure, such as roads and sewer, power, and water lines that are present in the management area, will be considered in all management decisions. Important considerations include maintaining access for inspection and maintenance, avoiding damage to utilities through management actions such as trail construction, and public safety. Emergency access needs and infrastructure such as fire hydrants will be provided and maintained in and around the management area (see also "Public Use and Safety" above).

Management Actions

Management Goal I: Maintain access and avoid damage to all infrastructure in the management area and protect public safety.

Objective I-1: Preserve access to the park and adjacent utilities.

Action I-1.1: The entry road to Neary Lagoon will continue to be maintained as access to the wastewater treatment plant facility.

Action I-1.2: Vehicular access for maintenance and emergency purposes will continue to be maintained to the south end of the eastern embankment through the wastewater treatment plant (see also action PU-6.1).

Action I-1.3: Vehicular access will continue to be maintained to the north end of the east embankment from Chestnut Street for maintenance and emergency purposes (see also action PU-6.1).

Action I-1.4: Access from the CHC development to drainage culverts will be maintained.

Objective I-2: Avoid damage to infrastructure from other management actions and protect public safety.

Action I-2.1: Design and construction of facility improvements and other actions in the management area will consider location, access, potential impacts on, and public safety concerns for infrastructure, including location of and access to fire hydrants.

Mitigation Commitments and Land Use Requirements

This section describes mitigation commitments and land use management controls that may affect how lands are managed in or near the management area. Lands that may be appropriate to include in the management area and the mechanisms for their inclusion are also identified. Private property included in and adjacent to the management area (e.g., areas within the 100-foot buffer) will be subject to the policies and actions identified in this management plan.

Applicable regulatory statutes and land use requirements have already been summarized in Chapter 1 for:

- Section 404 (of the Clean Water Act),
- DFG streambed alteration agreement,
- Coastal Act and CCC,
- LCP, and
- City general plan, zoning, and other requirements.

The Corps may require notification and review under Section 404 for activities such as placement of fill material, dredging, walkway construction, and extensive vegetation removal. These activities may also require a streambed alteration agreement from DFG. Construction and management activities at Neary Lagoon described in this management plan have been developed to be consistent with the LCP. The LCP requires the preservation of riparian areas by controlling development near the edge of water bodies and the maintenance and improvement of water quality by controlling runoff entering water bodies (Section 24.14.010).

Activities described in this plan are also designed to be consistent with the City's general plan designation of Neary Lagoon as a park and natural area.

The City Heritage Tree Ordinance prohibits cutting certain important trees without a permit (see Chapter 1), and the grading ordinance prohibits grading from December to March.

Mitigation Commitments

Mitigation for loss of or damage to plant or wildlife habitat has been a requirement of some projects in and near the Neary Lagoon management area. Mitigation consists generally of protective measures to prevent habitat damage, restoration of damaged habitat, or creation of new habitat to compensate for damaged habitat. Mitigation commitments are described below for specific projects and areas in the Neary Lagoon management area. Restoration areas required for mitigation within the Neary Lagoon management area are depicted in Figure 3-2.

Shelter Lagoon and Cypress Point Developments. Shelter Lagoon condominiums and Cypress Point apartments are located on a broad peninsula of land that consists of mostly fill material bordering the north side of the lagoon (Figure 1-3). Because these housing developments were approved before the existence of the CCC, all conditions of approval were determined by the City alone. As a condition of approving this development in 1971, the City required the Shelter Lagoon Association to develop Neary Lagoon as a lake and to grant the City a 10-foot-wide easement, measured from the water's edge when the water level is at an elevation of 6 feet msl. The purpose of the easement is to provide a pedestrian pathway for the general public and for maintenance of the lagoon, including access by motorized maintenance equipment and vehicles. A 20-foot-wide utility easement and walkway that is not

currently maintained for public access extends from Felix Street past the end of Walti Street to the City property and management area boundary near Laurel Creek.

Currently, the 10-foot-wide easement along the lagoon's north edge contains a turf trail identified with marked posts and signs as a public walkway. Access to the trail from public streets and through the developments is not identified, and no public parking or other amenities are provided. To improve community access to the lagoon, consistent with the Coastal Act and the approval agreement for the developments, public access entries should be identified and the walkway maintained for public access.

Portions of Shelter Lagoon and Cypress Point are located within the 100-foot wetland buffer specified in the LCP (see Figure 2-5 and discussion in Chapter 2). Construction of additional structures would be restricted within this buffer, although small-scale facilities for nature study may be allowed. The section, "City Regulations and Local Coastal Program Requirements", in Chapter 1 describes more fully the types of activities permitted within the 100-foot buffer.

Santa Cruz Community Housing Corporation Projects. CHC is developing two separate housing projects on City-owned land adjacent to the northeastern edge of the management area (Figure 1-3). The 95-unit, 4.86-acre Neary Lagoon cooperative housing project will provide affordable housing for low- and moderate-income residents and is expected to be completed in early 1992. The 35-unit, 1.5-acre Arbor Cove Senior Commons development will provide housing for elderly residents and is planned for completion in 1992 or 1993. (Van Allen pers. comm.)

For the Neary Lagoon cooperative housing project, 204 parking spaces are provided onsite, and additional parking is available on Chestnut Street. For the Arbor Cove Senior Commons development, 21 parking spaces will be located onsite. (Community Planning Consultants 1988.)

Mitigation commitments for the CHC projects, including EIR mitigation requirements and additional conditions approved by the City and the CCC for protecting habitat and buffer areas, are described below.

Dogs and cats are restricted in both of the cooperative housing developments (Vogel pers. comm.).

The EIR for the CHC housing developments (Community Planning Consultants 1988) specifies that hay bales be used during construction to prevent fill material from eroding into the lagoon, the slope adjacent to the grassland be seeded with native grasses to stabilize the soil, and jute netting be used to prevent erosion of slopes until landscaping is completed. (Community Planning Consultants 1988.)

A 100-foot buffer area has been established between the wetland boundary and the housing projects as part of the management area and will be maintained by the City according to this management plan.

The EIR for the CHC housing project specifies that vegetation within the 100-foot buffer will not be thinned to provide views of the lagoon and that the buffer area, including native plantings, will be maintained for erosion prevention and aesthetics. As part of ongoing commitments and activities, the buffer area will be maintained by regular inspections to ensure that the area is not damaged by public contact or affected by invasive plants. Inspections will be made at least annually and a report prepared for consideration by the director of parks and recreation. The report should evaluate the use of the area and the impact of that use and should provide recommendations for both short- and long-term measures to enhance and improve the habitat and to accommodate public access. The report will be submitted to the Parks and Recreation Commission for information. (Jones & Stokes Associates 1990.)

The EIR also requires construction of a fence along the edge of the 100-foot buffer to restrict access by humans and domestic animals. The fence will be maintained in good condition for aesthetics and access restriction. As of January 1992, a fence separating the cooperative housing project from the grassland was partially completed. The fence extends below the ground's surface in order to discourage large animals from gaining access by burrowing. The fill slope between the housing projects and the grassland area serves as a screening berm to help protect the grassland and other habitat areas from impacts associated with the housing development. Plant species to be established on the berm are native to California and arranged to create a gradual transition from screening trees near the top of the berm to lower growing plants near the grassland edge. The plants selected for use on the berm were approved by both DFG and CCC (the planting list is included as Table 1 in Jones & Stokes Associates 1990).

The EIR for the CHC project species that grease and oil traps be part of outlet drainage structures and that these and other drainage features be maintained in good operating condition. Most drainage from the project was directed into the Chestnut Street outfall to avoid additional urban runoff entering the lagoon. Drainage from the original Chestnut Street storm drain will continue to discharge into the lagoon and consist primarily of low-flow drainage. Flows would run full in this line before water overflows into the new Chestnut Street storm drain and enters the channel downstream of the weir.

Restoration of the Delta Ditch Area. As part of the CHC housing projects, the delta ditch drainage area located in the northern portion of the grassland (management zone C) was affected. As mitigation for drainage improvements, the delta ditch area was required to be restored to native grassland and wetland habitat (Figure 3-2). Restoration of the site was initiated in fall 1991. Formerly, this area consisted of degraded grassland and a ditch that carried stormwater from Jenne and Blackburn Streets to the lagoon. (The Habitat Restoration Group 1990.)

The wetland existing in the delta ditch area was in part due to water backing up in the lagoon and combining with runoff carried by the ditch. This resulted in water fanning out and creating wetland conditions in the surrounding area. By relocating the ditch and installing a pump to facilitate storm outflow from the lagoon, the area could become drier. (The Habitat Restoration Group 1990.)

The delta ditch area was contoured so that water drains from the property lines to the center of the restoration/enhancement area and into the ditch, which conveys water to the lagoon. The CHC is responsible for controlling erosion from the adjacent slopes to prevent siltation of the delta ditch area. (The Habitat Restoration Group 1990.)

Restoration of the area included removing Himalaya blackberry, an undesirable exotic species, and reseeding with native grasses and wildflowers. The ditch was lined with excelsior fabric for initial erosion control and to prevent the seed from washing away. Wetland plants are expected to recolonize on their own. (The Habitat Restoration Group 1990.)

The City is required to hire a biologist to monitor the area for 2 years after construction is completed, assess the status of the wetland in the vicinity of the ditch, and make recommendations for any necessary restoration or enhancement. Weed control monitoring will be conducted every 3 months for the first year, then once every 6 months during the second year until the 2-year maintenance and monitoring period ends in December 1993. (The Habitat Restoration Group 1990.)

Chestnut Street Drain Outfall. The Chestnut Street drain outfall is located along the outflow channel from Neary Lagoon between the weir and the railroad grade in management zone B (Figure 3-1). The outfall receives drainage from the Chestnut Street drainage improvement, which includes drainage from the CHC housing developments. The outfall receives only stormwater from development south of Laurel Street, with dry weather flows entering the lagoon from the 24-inch pipe and open channel running from Jenne, Myrtle, and Blackburn Streets to the delta ditch area (Figure 2-4). Construction of the outfall required grading and removal of native vegetation and preparation of an erosion control plan.

As part of project approval for the Chestnut Street drainage improvement, the City was required to monitor dry weather flow rates in the 24-inch storm drain until a base flow rate could be established, and to replace riparian vegetation in the vicinity of the outfall that was removed to construct the outfall. Monitoring of vegetation reestablishment in the delta ditch area is described above. Weed control in vegetation reestablishment areas will be limited to nonindigenous species. Volunteer native plant species will be protected.

Nearby Commercial Development

Construction of phase I of the Ice House, a proposed retail center north of the lagoon near the corner of Chestnut and Laurel Streets, has been approved by the City and is currently under construction. Phase I includes 61,400 square feet of retail shops and associated parking. Phase II, which has not been approved by the City, would consist of an additional 63,000 square feet of retail space with 285 parking spaces. (Barbaro pers. comm.) Runoff from phase II would drain into the Chestnut Street outfall and is not expected to affect the lagoon. Grease traps should be employed at the phase II site to minimize pollutant content of waters entering the outlet channel at the Chestnut Street outfall.

As a result of the Ice House development and improved public use and access facilities at the lagoon, visitation to the lagoon could increase. Though increased competition for available street parking in the area could result, very little of this would be from visitors driving to and parking near the north pedestrian entrances to the lagoon. Most of the use of these entrances is expected to be from pedestrians.

Pump Station and City Corporation Storage Yard

Located within the wye formed by the Southern Pacific Transportation Company (SPTC) railroad tracks is a portion of the outflow channel from Neary Lagoon, a City corporation storage yard, and an area of ruderal and riparian vegetation, some of which is in a deteriorated state. Land in the wye is owned by SPTC and leased by the City (Stevens pers. comm.). The land use designation for land in the wye is residential, but is intended to be changed to visitor commercial (Figure 1-10). At present, the corporation yard location is temporary. If the yard were to remain in its present position for a longer period, access would need to be improved and drainage improvements would need to be made to ensure that no hazardous materials would drain into the outlet channel.

A pump station consisting of three 250-horsepower pumps is being constructed in the east corner of the wye to improve flood control and water level management for the lagoon and surrounding area. A detailed description of the pump station, its planned operation, and the beach outfall monitoring and operation appears under "Hydrology" in Chapter 2.

Disturbed soils and vegetation exist in the pump station construction area. Because the pump station is located within 100 feet of a wetland, LCP conservation regulations require mitigation. Following completion of construction, riparian vegetation will be planted in the area of the pump station as mitigation (Figure 3-2). To ensure that the restoration area blends

with its surroundings, the landscape plan for mitigation includes native plants such as California live oaks *(Quercus agrifolia)*, arroyo willow *(Salix lasiolepis)*, and dwarf coyote bush *(Baccharis pilularis)*. Weed control will be performed regularly by the City parks and recreation department to remove invasive, nonindigenous plants (e.g., pampas grass, firethorn, yellow iris, acacia, and genista) These weeds will be removed also from private property areas within the 100-foot buffer area near the pump station in compliance with condition 3 of coastal permit A-3-STC-90-19.

The area of deteriorated ruderal and riparian vegetation will be restored and enhanced as a riparian area, which will help replace the value of riparian vegetation affected by trail construction in management areas D and E (see "Public Use and Safety" and "Vegetation Management" sections above). In addition, this area will be fenced to restrict access by the public and domestic pets, thus helping to minimize impacts on the area.

As part of conditions for approval of the pump station, a trash rack has been installed at the pump inlet and will be maintained to keep the inlet clear and operating. The City's public works department is to prepare a management program for operating the inlet trash rack and channel at the pump station and will prepare a monitoring report 1 year after construction in compliance with condition 14.g of coastal permit 89-313. The City is also committed to keeping the beach outlet safe for recreational users under coastal permit 3-90-31 and in conformance with Coastal Act Section 30231 (see action H-4.1).

Wastewater Treatment Plant. The City Wastewater Treatment Plant (WWTP) is located on 5.2 acres adjacent to the southern edge of the management area. Ground surface elevation at the plant site ranges from 8.5 to 10.0 feet above msl. An earthen berm rises to 20 feet above msl and separates the wastewater treatment plant from the management area, providing

The duck pond located in the foreground of this view provides important resting and breeding habitat for water birds and should be included in the management area.

partial visual screening of the plant from the lagoon. The plant is currently accessed from California Avenue and along the access road paralleling the railroad tracks that pass through the recreation area south of the lagoon.

Upgrade to Advanced Primary Treatment Level. An upgrade of the WWTP to an advanced primary treatment level was completed in late 1991. To compensate for riparian vegetation removed during this upgrade, a mitigation area has been established near the Chestnut Street drain outfall (Figure 3-2). The mitigation area consists of two areas, one on each side of the lagoon's outlet channel. The goal of the revegetation of the mitigation area is to enhance adjacent riparian areas and create a continuous band of riparian vegetation along the eastern shoreline of the lagoon. This vegetation will buffer the open water habitat in the channel

just below the weir at the lower end of the lagoon, increasing the habitat value of the open water area for water birds. The area is protected by a fence to restrict access to people and domestic pets. Monitoring of this mitigation area is performed informally during regular maintenance tasks by the City department of parks and recreation. The department of public works waters the plantings by hand as needed, and will continue to do so until the plants are well established. (Stevens pers. comm.)

In addition, riparian vegetation is being restored along the north side of the expansion area for the advanced primary wastewater treatment plant. This area contains some nonindigenous plants along the berm area, which help visually screen the plant from the lagoon area, and is irrigated with a permanent in-ground system. The plants will continue to be monitored and maintained over a 3-year establishment period.

Other mitigation measures for these facilities include a sound wall to mitigate noise impacts of the WWTP, plantings to visually screen the sound wall, provision of visitor access along the lagoon shoreline adjacent to the WWTP, and onsite containment of all surface runoff and possible spillage from the WWTP.

Upgrade to Secondary Treatment Level. The City is currently in the process of obtaining approvals and permits to upgrade the plant to a secondary level of treatment. If approved, the upgrade is expected to be completed by January 1996. Plans call for expanding treatment plant facilities west into the open lawn and recreation area. A total of 2.8 acres of the open lawn and recreation area would be required for the project, resulting in loss of the following:

- three full tennis courts and one half court,
- a picnic area with eight tables,
- an amphitheater, and
- a 24-car parking lot.

These facilities were built with funds from the federal Land and Water Conservation Fund (LWCF). Property developed with LWCF assistance may not be converted to any use other than public outdoor recreation without first replacing the property to be converted with other recreational properties of at least equal value and usefulness. The area proposed for expansion is not included in the management area and no wastewater facilities will be constructed in the management area.

Mitigation for the loss of these facilities includes:

- acquisition of approximately 1.6 acres of SPTC land along Bay Street to use for parking and recreation use, and planting of vegetation to screen and buffer the WWTP;
- construction of new tennis courts either on the land acquired along Bay Street or at another location,
- improvements to public recreation areas remaining after construction of secondary WWTP facilities, and
- acquisition of the 3.2-acre Jessie Street marsh area (located approximately 1 mile east of Neary Lagoon, near the San Lorenzo River) for park development. (City of Santa Cruz Public Works Department 1991a.)

Additional mitigation measures for the WWTP include establishing screening vegetation between the WWTP and the lagoon and along the south bank of the SPTC railroad cut and performing regular facilities maintenance to minimize odor and noise (City of Santa Cruz Public Works Department 1991a). Screening vegetation between the WWTP secondary expansion facilities and the lagoon is shown in Figure 3-7. Odor will also be minimized through enclosing odor sources and adding air scrubbers. Noise will also be minimized through enclosure of facilities, construction of a sound wall along the access road, and establishment of screening vegetation. Impacts on lagoon wildlife from lighting will be minimized through minimal use of security lighting along the access road and WWTP pathways, placement of security light fixtures at a low height facing away from and screened from the lagoon, turning lights on individually only as needed, and lighting the facilities at night only during an emergency. (City of Santa Cruz 1991b.)

The final design of the recreation area has not yet been determined. A final concept plan for the recreation area that includes access, circulation, parking, play facilities, security lighting, signs, and plantings will be prepared as a condition of final approval of the EIR for adding secondary treatment facilities to the wastewater treatment plant. Part of the final concept plan will include a full-access paved pedestrian path that will be constructed from the top of the existing stairs down to the lawn area at the lagoon in management zone F to serve the access needs of all pedestrians. The recreation area and facilities will be managed as part of the Neary Lagoon management area. Any new security or other lighting will be located and oriented to not shine directly into the lagoon and to minimize impacts on wildlife habitat in the management area.

Land Use Management

Private land borders the Neary Lagoon management area on the northwest side between the Laurel Creek arm of the management area and California Street (Figure 3-1). These adjacent private land parcels contain important riparian and mixed oak woodland vegetation, most of the duck pond, and a steep escarpment with slopes exceeding 30%.

Most of these parcels are developed on the upper, more level area fronting California Street. Development consists mostly of detached single-family residences. A church with a large parking lot is also located on top of the escarpment. One parcel north of the church is undeveloped, and the City is considering acquiring it for recreation or open space uses. The steeply sloping portions of these parcels generally are undeveloped, although some development extends into this area, such as overhanging decks, a shed, and maintained landscaping.

Adjacent Land Management. Most of the land area containing riparian and mixed oak woodland vegetation, the duck pond, or steep slopes is generally considered undevelopable under the City's conservation regulations. These adjacent lands are important to the lagoon's wildlife, vegetation, water quality and hydrology, and aesthetic character, and activities occurring on these lands can have direct effects on the lagoon's environment. Examples of incompatible activities or development are:

- clearing vegetation or building small structures that could cause erosion and siltation in the creek and lagoon;
- having lighting shining on the lagoon or other sensitive wildlife areas within the management area;
- allowing unattended or unrestrained domestic pets to enter the management area;

- building private trails to the lagoon, which might cause erosion or encourage incompatible human intrusion into sensitive habitat areas;
- planting or maintaining exotic vegetation that could ivade the lagoon area; and
- controlling vegetation or pests with chemicals that could affect the lagoon environment.

Managing these adjacent lands consistent with the management area goals and objectives would better ensure the long-term preservation of the lagoon's character and quality. Management of these adjacent lands would improve control of human and domestic animal access, erosion, and exotic plant species and provide other habitat protection and enhancement opportunities. Consistent with management of the adjacent riparian area in management zone I, public access to this area ould be restricted. Lands that should be evaluated for inclusion in the management area are indicated as the proposed expanded management area (Figure 3-1).

Two types of private land are included within the proposed expanded management area. The first type is integral to the habitat and aesthetic character of the lagoon and contains riparian areas that should be managed as part of overall lagoon management. The second type is upland slopes that provide some habitat value near the lagoon and function as a physical and visual buffer between the lagoon and surrounding developed areas. Each of these areas needs some form of integration into the management area to ensure compatible land uses and management.

Various means available for extending appropriate land management to private lands are described below and include regulatory authorities that the City has and will assume in implementing the management plan and additional possible measures to explore to establish more direct City control for the management area.

Regulatory Controls. The City is currently using its general plan, the LCP, and its zoning ordinance to regulate how private land is used. These applicable regulatory controls are more fully described in Chapter 1 and include conservation regulations such as weed abatement, slope setbacks, wetland setbacks, and zoning overlays. The City does, however, have the ability to further regulate private land use consistent with legitimate public objectives while keeping with reasonable private use of the land in question. More restrictive setbacks and use prohibitions on the escarpment or riparian and mixed oak woodland portions of the private property may be adopted by the City; however, these restrictions could be considered inverse condemnation (commonly referred to as a "taking") if they are found to deprive the property owner of all reasonable use of the property.

One regulatory tool that may be used is overlay zoning. An overlay is a special zoning designation on the zoning map that modifies the basic underlying zoning designation to specifically address an issue that may affect a group of properties with different zoning designations. These modifications may include special restrictions on development and land use to eliminate building potential on portions of a parcel, would not allow the City to prohibit access, fence the area, or enter the site to control exotic vegetation. Existing overlay zoning at Neary Lagoon includes coastal zone, shoreline protection zone, and floodplain designations.

The City also has authority to require local property owners to abate nuisance weeds under Chapter 6.24 of the municipal code and/or to perform the work and bill the property owners. The City can use this authority in the proposed expanded management area and other areas of private property in the management area.

Fee Title Ownership. The most comprehensive form of land use control is land ownership, which is available through fee title purchase, dedication (exaction),

donation, or exchange. Another form of fee title ownership is acquisition with the reservation of certain property rights by the seller. These reservations or exclusions may involve rights of access across the property or the right of the seller to live on the property for the remainder of his or her lifetime (known as a life-use reservation or life estate). Such reserved rights encumber property somewhat but can reduce the purchase price. Depending on the management objectives and the extent of the reservations or exclusions, a conservation management agency may be able to reach a mutually beneficial purchase agreement and thereby acquire fee title to important property.

By any of these methods, City ownership would ensure that the land is managed consistently and protected. The cost for the extensive land use control provided by fee title ownership can be as high as the prevailing fair market value of the property. The market value of the property would be influenced by the development potential of the land. Factors such as access, slope, utility availability, and zoning restrictions influence the development potential.

Conservation Easements. Conservation easements could provide the City with specific legal rights to parts of these properties while maintaining private ownership and reducing the owners' overall property tax liability. Conservation easements must be used for the preservation and protection of land in its natural condition (Cal. Cit. Code, Section 815 et seq.), are made in perpetuity, and must be granted voluntarily (easements are generally not a condition of a land use entitlement). The City could purchase the easement at a value commensurate with that of the property rights deeded as part of the easement, but at a far less cost than the fee title acquisition cost. Such an easement could prohibit disturbance of natural vegetation, allow for fencing or other access restrictions, and provide for City access to the property for vegetation management or erosion control activities. Conservation easements would need to be negotiated with property owners on a case-by-case basis.

Transfer of Development Rights or Credits. A more complex option would be to develop a transfer of development rights (TDR) or transfer of development credits (TDC) program. These programs are based on the "package of property rights" concept, in which the right to develop property can be sold independently from the land itself. These programs generally assign development credits to real property and then provide for their sale and transfer to another parcel. The "sending" property is then preserved in its undeveloped state and its owner has been compensated for the lost development rights by receiving proceeds from the sale of the development rights to a "receiving" property. The owner of the "receiving" site can use the transferred credits to develop the property more intensively than would otherwise be permitted. TDR programs usually involve local government involvement in assigning the development credits to the sending areas and designating receiving areas that are appropriate for more intensive development. The focus of the programs is usually the preservation of unique attributes of the sending area, such as historic, natural, or scenic values. The objectives of such a program may include a reduction in the density of permitted development, preservation of a scenic view by reducing permitted building height, or preservation of wildlife habitat.

Management Actions

Management Goal ML: Maintain mitigation commitments and manage land uses to preserve and protect the lagoon's character and resources.

Objective ML-1: Maintain mitigation commitments and manage mitigation areas consistent with requirements and conditions adopted by the City and other regulatory authorities for lands in and around the management area.

Action ML-1.1: The existing 10-foot-wide public easement containing the turf trail along the north edge of the lagoon at the Cypress Point and Shelter Lagoon developments will continue to be maintained for public and City maintenance access.

Action ML-1.2: The existing 20-foot-wide public walkway easement running between Felix Street, the terminus of Walti Street, and the Laurel Creek arm of the management area will be improved and maintained for public pedestrian access and provided with signs on Felix and Walti Streets to identify the entries to the management area.

Action ML-1.3: LCP requirements that restrict the types of structures allowable within the 100-foot buffer around the lagoon and wetland areas will continue to be enforced.

Action ML-1.4: City and CCC requirements and conditions of approval for the CHC housing projects that were designed to protect the character and environmental quality of the management area will continue to be enforced, including:

> **enforcing** restrictions on dogs and cats at the CHC housing developments,
>
> **controlling** drainage and erosion of fill material into the lagoon and maintaining native vegetation planted on the slope between the CHC housing project and the grassland,
>
> **enforcing** prohibition of removing riparian vegetation in or around the management areas for any purpose,
>
> **completing and maintaining** the fence separating the CHC housing project from the 100-foot buffer area to restrict access by humans and domestic pets, and
>
> **inspecting** buffer areas at least annually and submitting a report to the director of parks and recreation.

Action ML-1.5: The delta ditch restoration efforts will continue, including monitoring by a City-approved biologist for 2 years following completion of construction of the housing project. The biologist will:

> **assess** the status of the wetland in the vicinity of the ditch, and recommend necessary restoration or enhancement and
>
> **conduct** weed control monitoring every 3 months for the first year, then once every 6 months during the second year until the 2-year maintenance and monitoring period ends in December 1993.

Action ML-1.6: The mitigation area for the pump station will continue to be maintained to ensure establishment and survival of revegetation plantings.

Action ML-1.7: The mitigation and planting areas for the advanced primary treatment expansion will continue to be maintained to ensure establishment and survival of revegetation plantings.

Action ML-1.8: All final approved requirements of the EIR for the secondary wastewater treatment plant expansion facility will be adhered to for the management area, including:

> **acquiring** approximately 1.6 acres of SPTC land along Bay Street for parking and recreation use,
>
> **constructing** new tennis courts either on SPTC land or at another location,

minimizing lighting and screening security lighting from shining into the lagoon area,

acquiring the Jessie Street marsh area, and

establishing screening vegetation along the south bank of SPTC's railroad cut and performing regular facilities maintenance to minimize odor and noise.

Objective ML-2: Improve existing management control for portions of lands adjacent to the management area that contain important features (e.g., riparian and mixed oak woodland vegetation, the duck pond, overlook or recreation opportunities, or steep escarpment slopes) to maintain the lagoon's visual character and environmental quality.

Action ML-2.1: A program will be implemented to improve existing management control of portions of adjacent lands west of the lagoon that are important for maintaining the lagoon's visual character and environmental quality. The program will include the following:

Identify the important portions of private lands adjacent to Neary Lagoon and detail the special management needs required to implement the management plan.

Explore options for acquiring fee title ownership of the most sensitive private lands adjacent to the lagoon (e.g., the riparian and duck pond areas at the bottom of the escarpment adjacent to the lagoon).

Objective ML-3: Pursue management control of the land enclosed by the SPTC tracks (management zone A) on the east side of the management area to restore native vegetation and protect the environmental quality of the area.

Action ML-3.1: A program to acquire management control of SPTC property in management zone A will be developed.

Action ML-3.2: Immediately following acquisition of management control of SPTC land in zone A, the land will be protected with fencing, revegetated using native plant species listed in Table 3-1, and managed consistent with other goals for the lagoon.

CHAPTER 4

MANAGEMENT IMPLEMENTATION PLAN

CHAPTER 4

MANAGEMENT IMPLEMENTATION PLAN

This chapter of the management plan summarizes the management actions described in Chapter 3, "Management Elements", and describes the City's commitments to implementing the actions. For each management action, the implementation plan (Table 4-1) identifies its priority level, the agency responsible for accomplishing the action, agencies that would assist with its accomplishment, and a range of estimated hours or costs for performing the action.

Priority levels for the management actions are defined as follows:

1 = high priority; implement immediately, within 1 year, or if urgency warrants for health or safety purposes.

2 = medium priority; implement within 3 years.

3 = low priority; implement within 5 years or as funding and staff time permits.

The agency responsible for accomplishing the action will take the lead in initiating the action and will either perform the action, or oversee its performance by other departments, organizations, individuals, or agencies. Assisting agencies would be relied on either for direct assistance or technical advice in accomplishing the action or for accomplishing a portion of the action.

Agencies responsible for implementing actions of the management plan are either the City Department of Parks and Recreation (P&R), the City Department of Public Works (DPW), or the City Department of Planning and Community Development (PCD) (Table 4-1). Also, these agencies appear most often in the implementation plan as assisting agencies. Other agencies listed in Table 4-1 as assisting agencies include the Santa Cruz County Environmental Health Service (EHS), the regional water quality control board (RWQCB), the California Department of Fish and Game (DFG), the U.S. Fish and Wildlife Service (USFWS), and CHC.

The estimated hours or costs for performing the management action is a general estimate based on the best available information. Generally, a range of estimated costs or hours is given for each action. For most actions, direct costs of materials are estimated in dollar amounts and labor is estimated in total person hours (PH) required to accomplish the action. All dollar costs are estimated in 1992 dollars.

For activities that require ongoing labor, such as monitoring or regular maintenance, labor is estimated in person hours per year (PH/yr). For items likely to be contracted out (e.g., storm drain system monitoring), a total dollar amount is estimated. For items generally estimated based on an installed price (e.g., fencing), costs of materials and labor are combined for the estimate. For some items (e.g., periodic clearing of beach sand blockage), ongoing maintenance (OM) will be required and will vary from year to year or by event. For these types of actions, undetermined hours (UH) or undetermined costs (UC) are associated and will need to be estimated yearly by the City. For actions that overlap or are duplicated under different management elements (e.g., action H-2.4 and action V-5.1 for marsh vegetation control), no cost (NC) is indicated for one, or a portion of one, of the actions. Symbols appearing in the "Hours or Costs" column are defined at the end of the table.

Most of the funding for actions described in the management plan and summarized in Table 4-1 will be from sewer assessment district funds from expansion of WWTP facilities.

To assist with implementing the plan, the City Department of Parks and Recreation staff will prepare

an annual report describing the status of management actions accomplished during the preceding year and identifying upcoming priorities and funding, equipment, and personnel needs. For capital improvement projects, additional ongoing maintenance and operation needs will be detailed in a maintenance impact report prepared by the parks and recreation department. The report will be reviewed by appropriate City staff and commissions, and may be used for projecting annual budget needs and scheduling and prioritizing management operations, maintenance, and improvements. The actions listed in Table 4-1 are described in more complete detail in Chapter 3.

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
HYDROLOGY MANAGEMENT			
Goal H: Manage lagoon hydrology for flood protection, and enhancement of wildlife, vegetation, water quality, mosquito control, and aesthetics.			
Objective H-1: Manage lagoon water levels to reduce flood potential in surrounding areas.			
Action H-1.1: Operate pump system during winter rainy season to maintain lagoon water levels below 6.5 feet msl.	1	DPW	UH, OM
Action H-1.2: Maintain Cowell Beach outlet structure clear of blockage during flood season by periodically inspecting and clearing as required.	1	DPW	UH, OM
Objective H-2: Maintain lagoon outlet clear of floodflow obstructions.			
Action H-2.1: Annually inspect and clear vegetation and other obstructions from lagoon outlet, culverts, and outlet channel.	1	DPW/P&R	25-35 PH/yr (see actions WQ-2.2 and V-5.1)
Action H-2.2: Remove existing floating walkway at lagoon outlet, relocate and reuse as part of loop trail, and replace with permanent bridge structure.	2	P&R	$20,000-25,000
Action H-2.3: Remove marsh vegetation (approximately 1 acre) from area near east embankment to provide clear channel for conveying low flood-flows through lagoon.	1	P&R	NC (see action V-5.1)
Objective H-3: Manage lagoon water levels to support goals for wildlife, vegetation, water quality, mosquito control, and aesthetic needs.			
Action H-3.1: Use pump system and/or adjustable flashboard system at weir to manage water levels in lagoon between mid-April and mid-October.	1	DPW/P&R	50-80 PH/yr
Objective H-4: Protect public safety as part of water level management.			
Action H-4.1: Implement a program to protect public safety during out-flow releases at Cowell Beach (i.e., install and operate alarm system; post warning signs; clear obstructions from outlet; notify county environmental health service and CCC before summer releases and discharge during times of low beach use).	1	DPW/P&R, EHS, DPG	UC/+40-80 PH/yr
Objective H-5: Monitor lagoon water levels and inflow/outflow conditions at least monthly and during important flood events.			
Action H-5.1: Install staff gauges at specified locations in lagoon and monitor water levels at least monthly and during important flood events.	2	P&R	$800-1,000 +50-80 PH/yr[c]
Action H-5.2: Conduct flow monitoring studies at important lagoon inflow points.	2	P&R	$800-1,000 +50-80 PH/yr[c]
Action H-5.3: Monitor marsh vegetation root masses once every 10 years as part of marsh vegetation monitoring (see action V-5.2).	3	P&R	20 PH/10 yrs[c]
WATER QUALITY MANAGEMENT			
Goal WQ: Improve water quality at Neary Lagoon.			
Objective WQ-1: Improve quantity and quality of freshwater inflows to lagoon through improved watershed management.			
Action WQ-1.1: Initiate a program to select and implement BMPs.	2	DPW/RWQCB, EHS, PCD	UC/UH

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Objective WQ-2: Improve water circulation within the lagoon.			
Action WQ-2.1: Clear freshwater marsh vegetation near central floating boardwalk and south side observation platforms in management zone E.	1	P&R	NC (see action V-5.1)
Action WQ-2.2: Perform annual inspections and as needed clear vegetation and obstructions from lagoon outlet, channel leading to weir, and area around screw-gate and concrete weir.	1	DPW	NC (see actions H-2.1 and V-5.1) +4-8 PH/yr
Objective WQ-3: Conduct regular, ongoing monitoring of water quality for the lagoon and principal inflows to the lagoon.			
Action WQ-3.1: Conduct a program of water quality monitoring, at least yearly during periods of low flow, that includes sampling and analysis of lagoon water and sediments for metals and other inorganic parameters.	1	P&R/DPW, EHS, RWQCB	$2,500-5,000/yr*
Action WQ-3.2: Conduct a monitoring program during dry and wet weather conditions that monitors the effects of inflow volume on water quality.	1	P&R/DPW, EHS, RWQCB	30-40 PH/yr*
Action WQ-3.3: If toxic pollutant levels are determined or suspected in the lagoon, conduct analyses to determine their levels and extent.	1	P&R/EHS, RWQCB	UC/UH*
Action WQ-3.4: If toxic pollutant levels are determined in the lagoon, conduct or seek funds to initiate a program to monitor the storm drain system to identify pollutant sources, analyze water quality and sediments in creeks and channels to identify pollutants (e.g., chromium, lead, and zinc) and their transport and fate within the aquatic system, and develop appropriate remedial programs.	3	P&R/EHS, RWQCB	$20,000-50,000/yr +UC/UH*
Action WQ-3.5: Submit to DFG and possibly the USFWS concentrations of metals and pesticides in sediment reported in the 1991 water quality study to determine the level of potential threat to aquatic species and wildlife.	1	P&R/EHS, RWQCB, DFG, USFWS	UC/UH*
VEGETATION MANAGEMENT			
Goal V: Improve and maintain native vegetation diversity and health in the management area.			
Objective V-1: Remove and control invasive, exotic species of vegetation detrimental to native vegetation diversity and health.			
Action V-1.1: Control yellow iris to less than 5% of marsh vegetation coverage in the lagoon by using nonchemical removal methods, replanting some control areas with cattails and tules, and monitoring reestablishment rates annually (see action V-5.1).	1	P&R	250-500 PH/5-year period +25-40 PH/yr* (see action V-5.1)
Action V-1.2: Conduct an ongoing program of weed control in riparian areas by removing weeds, including acacia, eucalyptus, pampas grass, Himalaya berry, English Ivy, periwinkle, and yellow iris.	3	P&R	80-100 PH/yr*
Objective V-2: Control shoreline marsh vegetation in key areas to improve and maintain views for visitors and residents.			
Action V-2.1: Remove and control patches of shoreline marsh vegetation at key locations around observation platforms on the south side of the lagoon, at the central floating walkway, and at key locations along the north side trail to improve and maintain views for visitors and local residents.	1	P&R	NC (see actions A-1.1, V-2.2, and V-5.1) +40-50 PH/yr*

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Action V-2.2: Secure a new maintenance agreement between the city and the Cypress Point and Shelter Lagoon developments to establish maintenance responsibility for maintaining shoreline vegetation along the north side of the lagoon.	2	P&R	UC/UH*
Objective V-3: Protect riparian areas by restricting and limiting access by the public and domestic pets.			
Action V-3.1: Permanently fence riparian areas in management zones A, B, C, and D using fences F-2, F-3, F-4, and F-5. Construct fence F-5 only after acquiring management control of the SPTC property in zone A.	2	P&R	NC, +OM (see action PU-2.3 for all fence costs)
Objective V-4: Protect and manage the west side riparian forest and mixed oak woodland area consistent and in conjunction with adjacent management area purposes.			
Action V-4.1: Secure improved management control of the riparian forest and mixed oak woodland area adjacent to the west boundary of the management area.	3	PCD/P&R	UC/UH
Objective V-5: Create and maintain a balance between open water habitat and freshwater marsh habitat in management zone E.			
Action V-5.1: Remove emergent marsh vegetation in specified areas to achieve a 1:1 ratio of open water to freshwater marsh habitat.	1	P&R	$40,000-50,000/5-year period
Action V-5.2: Monitor marsh vegetation encroachment into open water areas at least once every 2 years to determine frequency of removal necessary for hydrologic, water quality, wildlife, aesthetic, and other purposes and periodically remove marsh vegetation in specified areas to maintain a 1:1 ratio of open water to freshwater marsh habitat (see action V-5.1).	2	P&R	8-12 PH/yr* + NC (see action V-5.1)
Objective V-6: Enhance and restore riparian forest areas in the management area.			
Action V-6.1: Retain snag trees in riparian forest areas except where they present a safety hazard to visitors, and remove weed species and control public access.	3	P&R	UC/UH*
Action V-6.2: Establish locally native riparian species as part of replanting efforts in cleared and graded areas and areas of riparian weed removal.	3	P&R	UC/UH*
Action V-6.3: Establish locally native riparian species in the grassland in zone C in low areas adjacent to and within 40 feet of the existing riparian forest edge.	2	P&R	$6,000-8,000 +OM*
Objective V-7: Restore native grassland in the management area.			
Action V-7.1: Establish a predominately native perennial grassland in management zone C (see action V-8.3).	3	P&R	$8,000-10,000 +OM*
Objective V-8: Monitor vegetation changes in the management area to determine rates of change; species affected; extent of changes; and timing, extent, and methods of control necessary.			
Action V-8.1: Monitor expansion of weed species in the riparian forest yearly to determine the frequency required for control and the effectiveness of past removal efforts for the various weed species.	3	P&R	10-15 PH/yr*
Action V-8.2: Monitor riparian forest establishment success in restoration and enhancement areas.	2	P&R	10-15 PH/yr*
Action V-8.3: Monitor native perennial grassland establishment success in management zone C (see action V-7.1).	3	P&R	10-15 PH/yr*

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
WILDLIFE MANAGEMENT			
Goal WF: Protect and improve opportunities for maintaining and increasing populations of native wildlife at Neary Lagoon.			
Objective WF-1: Minimize impacts of domestic pets on wildlife at the lagoon.			
Action WF 1.1: Post notices at park access points explaining the City's dog prohibition regulation, its rationale, and the City's intent to enforce the regulation.	2	P&R	NC (see action PU-4.9)
Action WF-1.2: Notify and secure cooperation of the responsible entities for City animal control for assistance in retrieving animals and enforcing regulations.	1	P&R/animal control, City police	UC/UH*
Action WF-1.3: Fence sensitive wildlife areas to deter access by dogs and cats.	1	P&R	NC (see actions V-3.1 and PU-2.3)
Action WF-1.4: Enforce the policies of adjacent multifamily residential developments regarding dogs and cats.	1	CHC/P&R	UC/UH*
Action WF-1.5: Require pet restrictions similar to those of WF-1.4 for all future multifamily residential developments proposed within 1,000 feet of the management area.	1	PCD	NC
Objective WF-2: Reduce impacts from Norway rats on lagoon wildlife populations.			
Action WF-2.1: Discourage visitors from feeding ducks and encourage them to properly dispose of waste food in picnic areas to eliminate potential rat food sources.	1	P&R	NC* (see action PU-4.9)
Action WF-2.2: If the Santa Cruz County Environmental Health Service identifies a public health risk, or significant impacts on wildlife from rats are determined to exist, design a rat control program.	3	P&R/EHS, DFG	UC/UH*
Objective WF-3: Maintain the lagoon's current native mammal populations unless adverse impacts on other important wildlife or on people are documented.			
Action WF-3.1: If DFG determines that native mammals are threatening the health, safety, or welfare of people or important wildlife at the lagoon, develop a program to control populations of offending species, in consultation with DFG and Santa Cruz County Environmental Health Service.	3	P&R/EHS, DFG	UC/UH*
Objective WF-4: Determine if waterfowl populations are declining, stable, or increasing and provide baseline information for use in guiding management direction.			
Action WF-4.1: Conduct two waterfowl counts annually during late December and early January to determine the size and species composition of wintering populations for a 5-year period. Survey coverage will include all open water areas of the lagoon and the duck rearing ponds.	2	P&R/DFG	10-15 PH/yr*
Action WF-4.2: Analyze waterfowl survey data to determine if waterfowl habitat conditions are declining, if habitat conditions are being maintained or are improving, and if a change in wintering waterfowl numbers can be correlated to management actions designed to improve waterfowl habitat conditions.	3	P&R/DFG	5-10 PH/yr*

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Action WF-4.3: Conduct biweekly surveys from mid-May through mid-July to determine the size and reproductive success of the breeding waterfowl population for a 5-year period. Survey coverage will include all open water areas of the lagoon and the duck rearing ponds. Data collected will be analyzed for reproductive success.	2	P&R/DFG	20-30 PH/yr*
Action WF-4.4: Evaluate collected data and determine if additional monitoring is necessary to meet management objectives. If wintering or breeding populations are found to be declining, or if breeding success is consistently low, develop additional investigations to determine possible causes.	3	P&R/DFG	UC/UH*
Objective WF-5: Maintain and improve habitat conditions for waterfowl.			
Action WF-5.1: If warranted by results of waterfowl surveys, enhance additional nesting and resting habitats on one of the lagoon's islands or construct additional islands from lagoon bottom sediments if available and approved by DFG and regulatory authorities.	3	P&R/DFG	UC/UH
Action WF-5.2: Remove and maintain emergent marsh vegetation to provide increased acreage of open water habitat for waterfowl and other water birds.	1	P&R	NC (see action V-5.1)
Action WF-5.3: If waterfowl surveys and analyses indicate that waterfowl habitat conditions are severely limiting wintering or breeding populations, study potential methods of providing additional forage habitat.	3	P&R/DFG	UC/UH*
Objective WF-6: Reduce competition from domestic and hybrid waterfowl for native waterfowl habitat.			
Action WF-6.1: Monitor populations of domestic and hybrid waterfowl as part of other waterfowl monitoring efforts.	3	P&R/DFG	NC* (see actions WF-4.1 through WF-4.4)
Action WF-6.2: Minimize populations of domestic and hybrid waterfowl and maintain their populations between zero and 25 individuals.	2	P&R/DFG	40-50 PH/yr*
Objective WF-7: Reduce public use impacts on wildlife for existing operations and conditions and minimize public use impacts on wildlife for future operations and conditions.			
Action WF-7.1: Continue to maintain and enforce the prohibition against fishing and provide explanations as part of interpretive information.	1	P&R	NC (see action PU-4.9)
Action WF-7.2: Direct the existing security lighting along the north side trail away from the lagoon, or replace with low-height, indirect security lighting.	2	P&R	UC/UH (see action PU-3.1)
Action WF-7.3: Conduct monthly bird surveys to determine protection needs, especially during the breeding season.	2	P&R/DFG	30-40 PH/yr*
MOSQUITO MANAGEMENT			
Goal M: Maintain mosquito populations at safe levels at Neary Lagoon.			
Objective M-1: If mosquitos reach unsafe levels, identify the nature and magnitude of the mosquito problem.			
Action M-1.1: If the Santa Cruz County Environmental Health Service determines that mosquitos pose a public health risk around Neary Lagoon, develop and conduct a program to determine the nature and extent of the problem.	1	EHS	UC/UH*

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Objective M-2: Conduct management actions for the lagoon to help reduce mosquito habitat.			
Action M-2.1: As part of water level management for the lagoon, rapidly lower water levels at least twice during the warm season.	1	DPW/P&R, EHS, DFG	6 PH/yr[c] (see also actions H-4.1 and H-5.1)
Action M-2.2: Remove vegetation to open additional channels or enlarge existing channels to improve water circulation and wave action. Coordinate vegetation removal with water quality, wildlife habitat, and other lagoon management goals.	1	P&R/DPW, EHS, DFG	NC (see action V-5.1)
CULTURAL RESOURCE MANAGEMENT			
Goal CR: Protect important cultural resources at Neary Lagoon.			
Objective CR-1: Minimize impacts on cultural resources at Neary Lagoon by identifying and avoiding or, if avoidance is not feasible, mitigating impacts on cultural resources.			
Action CR-1.1: Identify and avoid, or at least mitigate impacts on, cultural resources by performing a complete archeological reconnaissance of proposed impact areas before any ground-disturbing activities are conducted and implementing additional work as necessary.	1	PCD/DPW, P&R	UC/UH
PUBLIC USE AND SAFETY MANAGEMENT			
Goal PU: Provide improved, high-quality, and safe public access, recreation, and environmental education opportunities consistent with other purposes of the management area.			
Objective PU-1: Improve the quality and amount of public access opportunities at the lagoon.			
Action PU-1.1: Develop a new pedestrian entry at the terminus of Chestnut Street to serve as the principal entry for the lagoon's natural area and new loop trail.	2	P&R	$125,000-150,000
Action PU-1.2: Develop a new pedestrian entry at the terminus of Blackburn Street.	2	P&R	$10,000-15,000
Action PU-1.3: Complete an interpretive loop trail around the central portion of the lagoon connecting the central floating walkway with the new Blackburn Street entrance and the new Chestnut Street entrance.	2	P&R	$250,000-350,000 + OM (see action H-2.2)
Objective PU-2: Provide mechanisms for controlling public access to important wildlife habitat areas.			
Action PU-2.1: Install lockable gates as part of new trail construction features at key locations along the loop trail.	2	P&R	$4,000-6,000
Action PU-2.2: Design all new trail improvements to prevent or discourage human access into important wildlife areas through the use of features such as raised boardwalks, railings, barriers, and signs.	2	P&R	NC (see action PU-1.3)
Action PU-2.3: Construct fences in locations specified in Figure 3-2 to deter public access to important habitat areas.	2	P&R/DPW	$45,000-60,000 + OM (for fences F-2, F-3, F-4, and F-5 (see actions V-3.1 and ML-3.2)

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Objective PU-3: Reduce public use impacts on wildlife and people from existing and new design elements in the management area.			
Action PU-3.1: Permanently redirect the existing security lighting shining directly into the lagoon from the north side trail (see also action WF-7.2).	2	P&R	UC/UH
Action PU-3.2: Surface new trails with materials that discourage use by roller skates and skateboards to reduce impacts from fast movement or recreation activities that are not compatible with the lagoon's purposes for wildlife protection and passive human use.	2	P&R	NC (see action PU-1.3)
Action PU-3.3: Incorporate design features in new trails that discourage fast bicycle riding while permitting wheelchair use.	2	P&R	NC (see action PU-1.3)
Action PU-3.4: Establish a program for children's use of the lagoon that addresses children's safety and disturbance of wildlife, especially for children using the lagoon to travel between home and school.	2	P&R/CHC, city schools	40-100 PH[c]
Objective PU-4: Establish, enforce, and explain reasons for restrictions on public access and activities to reduce impacts on wildlife and people to low levels.			
Action PU-4.1: Discourage bicycle riding in all zones of the management area except management zones B, F, and J and investigate the feasibility and appropriateness of bicycle riding. Post informational signs that explain reasons for the restriction and that walking bicycles is allowed at key entry and other locations in the management area.	2	P&R	NC (see action PU-4.9)
Action PU-4.2: Prohibit activities such as roller-skating, skateboarding, littering, damaging vegetation, fishing, walking dogs, harassing wildlife, entering important wildlife areas (except by trail or with permission by the city), camping, and other activities controlled by laws and ordinances. Informational signs, including reasons for the prohibitions, will be posted at key entries and other locations and as part of interpretive exhibits in the management area.	1	P&R	NC (see action PU-4.9)
Action PU-4.3: Discourage activities that may disturb wildlife and people in or near the management area by posting signs explaining reasons for discouraging the activity as part of interpretive exhibits in the management area.	1	P&R	NC (see action PU-4.9)
Action PU-4.4: Prohibit public access to fenced areas in management zones A and I, except by written permission from the City.	1	P&R	UC/UH
Action PU-4.5: Restrict public access in zones B, C, D, E, G, and H to designated public trails and areas except by written permission from the City. No public access restrictions will apply to zones F and J.	1	P&R	UC/UH
Action PU-4.6: Restrict public use of the management area to the hours between dawn and dusk except by written permission from the city.	1	P&R	NC (see action PU-4.7)
Action PU-4.7: Continue to lock gates at key locations along the existing and new loop trail between dusk and dawn each day of the year and when determined by the city that public access along a trail segment may need to be restricted for purposes of wildlife protection (e.g., during important breeding periods), or public safety. (The park ranger service will continue to provide this service.)	1	P&R/DFG	1,200-1,500 PU/yr (see action WF-7.3)
Action PU-4.8: Maintain access to all portions of the management area for maintenance and emergencies. Gates will be maintained for emergency access at key locations.	1	P&R/DPW	NC (see action PU-6.1)
Action PU-4.9: Explain and graphically illustrate reasons for restrictions on public use activities as part of interpretive exhibits and informational signs at the lagoon.	3	P&R	$6,000-15,000

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Objective PU-5: Improve and develop a new plan for recreation facilities in management zone J and limit active recreation uses to this zone of the management area.			
Action PU-5.1: Develop a new plan for recreation facilities and access for management zone J that responds to WWTP expansion plans and implement the plan subsequent to its approval by the City, as described in the "Public Use" section.	1	P&R/DPW	UC/UH
Action PU-5.2: If a plan for recreation facilities is developed and implemented in the extreme north portion of management zone B, establish a buffer of indigenous plants between recreation facilities and the existing riparian restoration area.	3	P&R/CHC	UC/UH
Objective PU-6: Maintain and, where necessary provide, access and facilities to assure public safety and security for the management area.			
Action PU-6.1: Design new facilities to provide access needs for fire and police by providing emergency access gates at key locations and ensuring access to fire hydrants.	1	P&R/DPW, City fire and police	NC (see action PU-4.8)
Objective PU-7: Continue to manage and provide opportunities for public use in the management area that minimize impacts on adjacent properties and residents.			
Action PU-7.1: Retain the existing 10-foot-wide public easement along the north shore adjacent to the lagoon and the Cypress Point and Shelter Lagoon developments and enter into a revised contractual agreement with the developments' management that establishes responsibilities, guidelines, and requirements for maintaining the easement and trail.	1	P&R	UC/UH
Action PU-7.2: Assist the Cypress Point and Shelter Lagoon developments with designing and installing additional signs along the existing northside trail requesting quiet and respect for residents' privacy as part of a revised maintenance agreement.	3	P&R/PCD	30-40 PH
Action PU-7.3: Improve and maintain pedestrian access to the Laurel Creek arm of the management area from Felix and Walti Streets along the existing public walkway easement, and post signs that identify the entries.	3	P&R/PCD	UC/UH
Objective PU-8: Improve opportunities for environmental education and research in the management area.			
Action PU-8.1: Develop and install new observation areas and interpretive exhibits for the new loop trail and entrances to the trail.	2	P&R	$35,000-60,000 +OM
Action PU-8.2: Prepare a study of opportunities for environmental education programs and possibilities for interpretive exhibits for Neary Lagoon in consultation with representatives from the local school district, community groups, and other local groups and individuals.	2	P&R/Santa Cruz City Museum, City and county schools, community groups	200-400 PH*
Action PU-8.3: Develop a comprehensive interpretive program for Neary Lagoon based on study findings and consisting of interpretive themes, environmental education study programs, written materials, interpretive exhibits, and other elements.	3	P&R/Santa Cruz City Museum, City and county schools, community groups	300-500 PH*
Action PU-8.4: Generate and maintain a list of potential projects and studies that could be performed by groups, students, and individuals at the lagoon to help facilitate research and environmental education uses and to increase public awareness and interest at the lagoon.	3	P&R/Santa Cruz City Museum, City and county schools, community groups	UC/UH*

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Action PU-8.5: Develop a program to train and maintain a list of volunteer docents willing to lead environmental education tours and give talks at the lagoon.	3	P&R/Santa Cruz City Museum, City and county schools, community groups	UC/UH*
Objective PU-9: Enforce management area regulations and ensure conduct and compliance with management plan elements.			
Action PU-9.1: Designate a full-time City employee with training in biology and environmental interpretation to manage and oversee the management area.	1	P&R	2,080 PH/yr (or $50,000/ yr) (this figure includes person-hours from other actions marked with an asterisk in this column)*
Action PU-9.2: Require all city officials, representatives, lessees, contractors, and others performing work in the management area to coordinate with the refuge manager and obtain necessary approvals.	1	P&R	UC/UH*
Objective PU-10: Determine the effects of public use on the environmental conditions of the management area to guide management direction and activities.			
Action PU-10.1: Develop a 5-year study of visitor use that will examine trends in wildlife activity and vegetation growth relative to human use in the management area. Conduct a yearly survey of park users to determine use and activity trends and analyze information to determine future management directions and needs. Monitor CHC resident children's use of the lagoon.	3	P&R/CHC	40-100 PH/yr*
AESTHETIC MANAGEMENT			
Goal A: Maintain important views and visual features of the management area and provide enhanced viewing opportunities.			
Objective A-1: Control marsh vegetation to provide views in key areas as part of vegetation management actions.			
Action A-1.1: Remove and control patches of emergent marsh vegetation as part of vegetation management actions for specified areas. Retain patches of vegetation along the northside trail to provide enframed views and visual variety along the shoreline, as well as protection for water birds.	1	P&R	NC* (see actions V-2.1 and V-2.2)
Objective A-2: Improve denuded and eroded areas where vegetation is degraded.			
Action A-2.1: Revegetate eroded areas along the northside trail and other portions of the management area.	3	P&R	UC/UH*
Objective A-3: Maintain important native vegetation in and around the management area and protect the visual character of the escarpment partially encircling the management area.			
Action A-3.1: Preserve and enhance native vegetation on all portions of the escarpment within the management area as described in management actions for vegetation.	3	P&R/PCD	UC/UH

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Action A-3.2: Develop a program for securing improved management control of the escarpment along the west edge of the management area. If management control is secured, manage the area to preserve its visual character through protecting patterns of native and existing important vegetation and prohibiting public access and construction of trails and structures.	3	PCD/P&R	UC/UH* (see action ML-2.1)
Action A-3.3: Preserve vegetation in and around the management area that serves important visual functions as part of vegetation management actions.	1	P&R	UC/UH*
Objective A-4: Explore opportunities for creating overlooks of the lagoon from areas that are not highly sensitive for wildlife.			
Action A-4.1: Investigate the feasibility of developing an overlook near the picnic area near the juncture of management zones F and J. If determined to be feasible, the overlook will be designed to include interpretive features that may include riparian and canopy interpretation.	2	P&R	UC/UH*
Action A-4.2: Investigate opportunities to provide bluff-top overlooks along the south and west bluff edges. The investigation will consider possibilities for interpreting the wastewater treatment plant as part of the overlook.	3	P&R/PCD	UC*
Objective A-5: Design new recreation, interpretive, and other facilities to blend with the natural aesthetic character of the lagoon environment.			
Action A-5.1: Design new recreation, interpretive, and other facilities to blend with the natural aesthetic character of the lagoon environment. Emphasize use of native plants to fit with the natural character of the lagoon and attract wildlife.	1	P&R/DPW	NC
Action A-5.2: Improve area along Bay Street within the management area by use of native plantings and other appropriate design elements.	3	P&R	$20,000-30,000 +OM
Objective A-6: For siting of new facilities and interpretive exhibits on trails, avoid low-quality views and screen incompatible features where possible.			
Action A-6.1: Avoid views of features that are not compatible with the lagoon's character for new facilities and interpretive features.	1	P&R	NC
Action A-6.2: Screen views of incompatible features from important viewing locations by planting locally native screening vegetation that may include fast-growing trees such as cottonwoods.	3	P&R	UC
Objective A-7: Reduce noise impacts in the management area.			
Action A-7.1: Use noise walls and other techniques for noise attenuation during construction and other activities that may occur in the management area.	1	DPW/P&R	UC
INFRASTRUCTURE MANAGEMENT			
Goal I: Maintain access and avoid damage to infrastructure in the management area.			
Objective I-1: Preserve access to the park and adjacent utilities.			
Action I-1.1: Continue to maintain the main entry road to Neary Lagoon as part of the wastewater treatment plant facilities.	1	DPW	UC
Action I-1.2: Continue to provide access for maintenance and emergency vehicles to the east embankment through the wastewater treatment plant (see also Action PU-6.1).	1	DPW	NC

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Action I-1.3: Continue to provide access along the eastern embankment from Chestnut Street for emergency and maintenance access (see also Action PU-6.1).	1	DPW/P&R	NC
Action I-1.4: Continue to provide maintenance access from the CHC development to drainage culverts.	1	DPW	UC
Objective I-2: Avoid damage to infrastructure from other management actions and protect public safety.			
Action I-2.1: For design and construction of facility improvements and other actions in the management area, consider location, access, potential impacts, and safety concerns for infrastructure, including access to fire hydrants.	1	P&R/DPW, PCD	NC UC/UH
MITIGATION COMMITMENTS AND LAND USE REQUIREMENTS			
Goal ML: Maintain mitigation commitments and manage land uses to preserve and protect the lagoon's character and resources.			
Objective ML-1: Maintain mitigation commitments and manage mitigation areas consistent with requirements and conditions adopted by the City and other regulatory authorities for lands in and around the management area.			
Action ML-1.1: Continue to maintain the existing 10-foot-wide public easement containing the turf trail along the north edge of the lagoon at the Cypress Point and Shelter Lagoon developments for public and city maintenance access.	1	P&R	UC/UH +OM
Action ML-1.2: Improve and maintain for public pedestrian access the existing 20-foot-wide public walkway easement running between Felix Street, the terminus of Walti Street, and the Laurel Creek arm of the management area, and place signs at Felix and Walti Streets to identify the entries to the management area.	3	P&R	$6,000-8,000 +OM
Action ML-1.3: Continue to adhere to and enforce LCP requirements that restrict the types of structures allowable within the 100-foot buffer around the lagoon and wetland areas.	1	PCD	NC
Action ML-1.4: Continue to adhere to and enforce City and CCC requirements and conditions of approval for the CHC housing projects designed to protect the character and environmental quality of the management area.	1	PCD	20-40 PH/yr*
Action ML-1.5: Continue restoration efforts for the delta ditch area, including monitoring wetland status and weeds by a City-approved biologist for 2 years following completion of the housing project.	1	P&R	25-30 PH/yr*
Action ML-1.6: Continue to maintain the mitigation area for the pump station to ensure establishment and survival of revegetation plantings.	1	P&R/DPW	60-80 PH/yr*
Action ML-1.7: Continue to maintain the mitigation and planting areas for the advanced primary treatment expansion to ensure establishment and survival of revegetation plantings.	1	P&R	UC/UH
Action ML-1.8: Adhere to all final approved requirements for the management area of the EIR for the secondary wastewater treatment plant expansion facility.	1	DPW/P&R, PCD	UC/UH

Goals, Objectives, and Actions	Priority Level[a]	Responsible Agency/ Assisting Agencies	Hours or Costs[b]
Objective ML-2: Improve existing management control for portions of lands adjacent to the management area that contain important features (e.g., riparian and mixed oak woodland vegetation, the duck pond, overlook or recreation opportunities, or steep escarpment slopes) for maintaining the lagoon's visual character and environmental quality.			
Action ML-2.1: Initiate a program to improve existing management control of portions of adjacent lands west of the lagoon that are important for maintaining the lagoon's visual character and environmental quality.	3	PCD/P&R, DPW	UC/UH (see action A-3.2)
Objective ML-3: Pursue management control of the land enclosed by the SPTC tracks (management zone A) on the east side of the management area to restore native vegetation and protect the environmental quality of the area.			
Action ML-3.1: Initiate a program to acquire management control of SPTC property in management zone A.	1	PCD/P&R, DPW	UC/UH
Action ML-3.2: Immediately following acquisition of management control of SPTC land in zone A, protect the area with fencing, revegetate it using native plant species listed in Table 3-1, and manage it consistent with other goals for the lagoon.	2	P&R	NC (See action PU-2.3 and V-6.2)

Notes: OM = ongoing maintenance or operating costs associated.
NC = no costs incurred as part of other activities.
PH = person hours.
UC = undetermined costs.
UH = undetermined hours.
* = hours or costs performed entirely or partially as part of regular duties of the refuge manager and included within the 2,080 PH/yr total indicated for Action PU-9.1.

The following abbreviations are used to identify the responsible and assisting agencies:

DPW = City Department of Public Works.
P&R = City Department of Parks and Recreation.
PCD = City Department of Planning and Community Development.
EHS = Santa Cruz County Environmental Health Service.
RWQCB = regional water quality control board.
DFG = California Department of Fish and Game.
USFWS = U.S. Fish and Wildlife Service.
CHC = Community Housing Corporation.

[a] Priority levels:

1 = high priority; implement immediately, within 1 year, or if urgency warrants for health or safety purposes.
2 = medium priority; implement within 3 years.
3 = low priority; implement within 5 years or as funding and staff time permits.

[b] Costs are estimated in 1991 dollars.

CHAPTER 5

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NEARY LAGOON
MANAGEMENT PLAN
CITY OF SANTA CRUZ

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Iglesius, Don. Instruction Office, Santa Cruz City Schools, Santa Cruz, CA. October 8, 1991 - telephone conversation.

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Rau, Lowell. Senior environmental specialist. County of Santa Cruz Environmental Health Service, Santa Cruz, CA. October 23, 1991 - telephone conversation.

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Stevens, Judy. Assistant engineer. City of Santa Cruz Public Works Department, Santa Cruz, CA. September 11, 1991 - telephone conversation and letter to Joe Donaldson of Jones & Stokes Associates describing mosquito complaints.

Van Allen, Bruce. Project manager. Santa Cruz Community Housing Corporation, Santa Cruz, CA. October 24, 1990 - letter to Peter Katzleberger, Planning Director, City of Santa Cruz and Les Stunad, Chief of Permits, California Coastal Commission.

Vasseur, Bonnie. Administrative assistant. Santa Cruz Fire Department, Santa Cruz, CA. September 13, 1991, and October 29, 1991 - facsimile lists of reported fires at Neary Lagoon.

Vogel, Elizabeth. Executive director. Santa Cruz Community Housing Cooperative, Santa Cruz, CA. October 25, 1991 - telephone conversation.

Wolfman, Steve. Associate civil engineer. City of Santa Cruz, Public Works Department, Santa Cruz, CA. April through October 1991 - telephone conversations and meetings.

Zasseur, Bonnie. Santa Cruz Fire Department, Santa Cruz, CA. September 13-19, 1991 - facsimile list of fire reports at Neary Lagoon.

CHAPTER 6

REPORT PREPARATION AND REVIEW

CHAPTER 6

REPORT PREPARATION AND REVIEW

This management plan was prepared by Jones & Stokes Associates under contract to the City of Santa Cruz Department of Public Works. The primary persons at Jones & Stokes Associates responsible for preparing this document are listed below. Also listed below are persons who provided substantial input to or review of the document; these include members of the City staff, City council, various state and local agencies, and general public.

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APPENDIX A

NEARY LAGOON WATER QUALITY STUDY

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Marilyn Frame	Planning Commission
Robert Jorgensen	Planning Commission
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Appendix A

City of Santa Cruz
Neary Lagoon Water Quality Study

Prepared for:

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November 6, 1991

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Table of Contents

List of Tables and Figures

BACKGROUND

The physical and environmental characteristics of Neary Lagoon have been described in other reports (e.g., Neary Lagoon Management Plan); only details relevant to the water quality study have been included in this report.

Since its acquisition by the City of Santa Cruz (City) as a park site in the 1950s, Neary Lagoon has been developed and maintained as a wildlife refuge and for public use (Harvey and Stanley Associates 1987). The City adopted a parks element to the general plan in 1973 and, in 1978, received a permit from the California Coastal Commission to develop the park on the condition that a management plan be prepared for Neary Lagoon. Several documents have been prepared for Neary Lagoon that together comprise the "management plan". This water quality study was conducted in conjunction with the management plan to satisfy requirements for the plan's approval by the California Coastal Commission.

Urban Runoff Retention

An important function of the lagoon, in addition to the uses discussed above, is the retention of stormwater runoff and flood control. As the watershed around Neary Lagoon developed, it has received increased amounts of urban runoff since at least the 1970s, and possibly before that time. The lagoon currently receives a significant portion of its water from wet and dry weather flows generated in the 850-acre urban watershed.

The historic use of Neary Lagoon to retain urban runoff is of concern because pollutants such as nutrients, heavy metals, pesticides, and other synthetic organic compounds are commonly present in urban runoff (Central Valley Regional Water Quality Control Board 1987).

Historic Water Quality Data

Historic water quality data for Neary Lagoon are scarce; limited data are available on fecal coliform bacteria, temperature, dissolved oxygen (DO), and turbidity. A limited water quality study was conducted in September 1986 that included temperature, DO, water and sediment depths, and visibility measurements using a secchi disk (Harvey and Stanley Associates 1987). Specific conductance (EC), a measure of salts and dissolved solids, was not analyzed.

The Harvey and Stanley Associates study reported water depths ranging from less than 1 foot to 4 feet at an approximate water surface elevation of 6-6.5 feet mean sea level

(MSL); soft sediment thicknesses ranged from zero to 3 feet. The depth values showed no apparent trend and were randomly distributed throughout the lagoon. High turbidity levels were present in most areas of the lagoon, with the lowest levels found in the northern arm of the lagoon near the tributaries. Water temperatures taken in June ranged from 16 to 21°C (62-70°F).

DO levels reportedly varied according to phytoplankton growth and abundance, temperature, and wind. DO depletion in lagoon bottom areas was rapid because of decomposition of organic detritus. DO levels in the northern lagoon area near the tributaries ranged from 6 to 8 milligrams per liter (mg/l) and were maintained through the day by cold, clear inflows. DO levels declined steadily toward the eastern end of the lagoon outlet, with readings from zero to 2 mg/l measured in the narrow channels northwest of the east embankment that separates the lagoon from the final outlet channel and weir (Harvey and Stanley Associates 1987).

The report also suggested that limited data on storm drains upstream of the lagoon (data source unknown) indicated that urban runoff may be causing water quality problems in the lagoon itself (Harvey and Stanley Associates 1987).

PURPOSE

This study was based on the needs and concerns identified above and California Coastal Commission requirements and guidance. The purpose of the study was to document existing water quality conditions at Neary Lagoon by conducting a reconnaissance-level study at a cost-effective level of effort. Data generated by this study will serve as a baseline from which results of future monitoring efforts will be evaluated.

WATER QUALITY SAMPLING PLAN

Criteria for Sampling Plan

The sampling plan was developed based on the following criteria:

- maximize areal representation of sample collection.
- analyze pollutants likely to be present from historic urban runoff discharge and focus on persistent and bioaccumulative compounds, and
- include sediment in sample collection.

Sample Locations and Collection Methods

Jones & Stokes Associates subcontracted with Kinnetic Laboratories/ToxScan of Santa Cruz to perform the field sample collection and laboratory analyses. Figure 1 shows the locations of water and sediment samples collected in Neary Lagoon. Samples were collected on August 8, 1991.

Water samples were collected using a vacuum induction pump system consisting of a clean polyethlyene plastic tube attached to a vacuum source at an approximate depth of 1 foot. Water samples were collected in a polyethlyene vacuum chamber and transferred to appropriate plastic containers for laboratory analysis. Metals samples were preserved with nitric acid. Temperature, pH, EC, and water depth were analyzed in the field at each location. DO samples were collected and fixed in the field and then analyzed at the laboratory.

Sediment samples were collected using a modified drop core or "impact core" sampler. The core sampler was manually driven into the sediment deep enough to obtain representative sediment samples. Collecting the sediment samples was difficult at all locations because of the accumulation of detritus. Core samples were measured for adequate volume and extruded into glass sample jars for laboratory analysis.

All samples were collected and analyzed using accepted standard methods and protocols. All sample containers for both water and sediment metals analysis were rinsed according to U.S. Environmental Protection Agency (EPA) protocols.

Parameter List

Water samples were analyzed for the following parameters:

- hardness,
- nitrate (as nitrogen),
- ammonia (as nitrogen),
- orthophosphate,
- total suspended solids,
- arsenic,
- cadmium,
- chromium,
- copper,
- lead,
- mercury,
- nickel,
- silver, and
- zinc.

Sediment samples were analyzed for metals only; samples collected at locations NL 1 (lagoon inlet) and NL 5 (lagoon outlet) also were analyzed for organochlorine pesticides and polychlorinated biphenyls (PCBs) by EPA Method 8080. A list of the individual parameters included in the pesticide and PCB analysis is presented in Appendix 1 of this report.

RESULTS AND DISCUSSION

Temperature and Dissolved Oxygen

The results of the Neary Lagoon water quality study are presented in Tables 1 and 2. Water depths in Neary Lagoon ranged from 2.5 to 5 feet at a water surface elevation of 6 feet mean sea level (MSL), with NL 5 having the maximum depth of 5 feet (Figure 2). Water temperatures were relatively warm, indicative of high air temperatures encountered that day, and increased between NL 1 and NL 4. Temperatures at NL 5 and NL 6 were uniform at 24.7-24.8°C (Figure 3). DO levels decreased at NL 5 after a slight increase at NL 2 (Table 1, Figure 3). DO increased to 9.5 mg/l at NL 6. This increase could be related to the presence of algae in this area. These findings are generally consistent with the Harvey and Stanley Associates study, which reported increasing temperatures and decreasing levels of DO from the inlet to the shallower outlet areas.

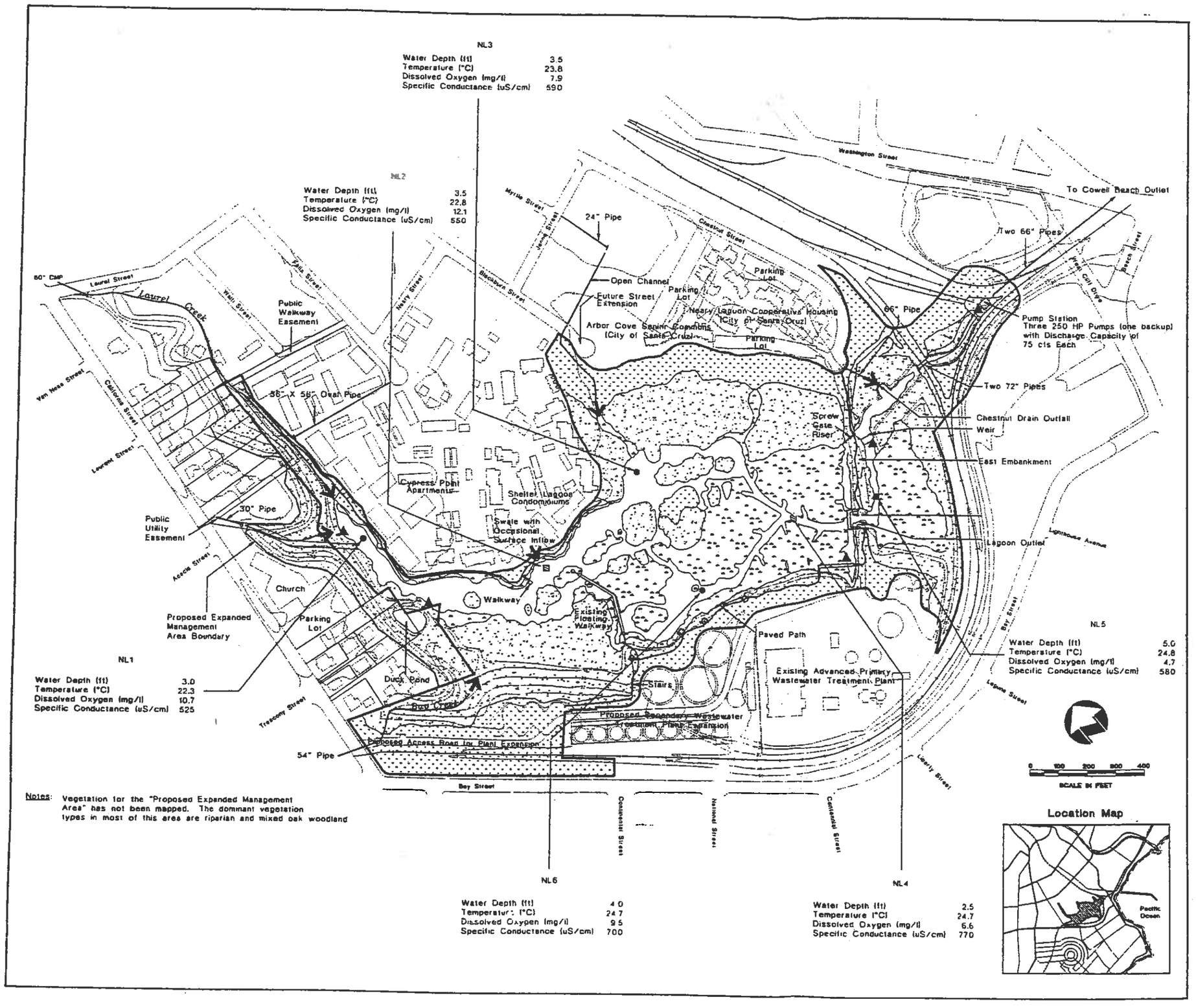
Specific Conductance, Hardness, Suspended Solids, and Nutrients

EC and hardness increased throughout the system, although the increase in hardness was small (Figure 4). EC values ranged from 525 to 770 microsiemens per centimeter (μS/cm), with the two highest values found at NL 4 and NL 6. The high value of 770 μS/cm at NL 4 indicates a shallow, poorly circulated zone. Suspended solids values ranged from 6 to 36 mg/l and generally decreased through the system after a sharp decrease at NL 2 and NL 3 (Figure 5). Slight increases in DO and suspended solids at NL 2 could be attributable to combined freshwater inflows at that point and algal growth.

Nitrates were not detected at three locations (Table 1); concentrations ranged from 0.13 to 0.18 mg/l at the other locations. Nitrate values were low relative to orthophosphate levels. The highest nitrate value was found at NL 5 (Figure 6). Orthophosphate levels, which estimate the amount of bioavailable phosphorus, were high and ranged from 0.8 to 1.8 mg/l. A large increase in orthophosphates to the maximum value of 1.8 mg/l occurred at NL 6 (Figure 7). The large increases in nitrates and orthophosphates found at NL 5 and 6 could be associated with runoff in the lower reaches of the system, which could be a source of these nutrients.

Ammonia levels (total ammonia as N) ranged from 0.08 to 0.16 mg/l, averaging 0.1 mg/l, with the highest value found at NL 2 (Figure 6). The increase in ammonia at NL

Hydrology and Water Quality of Neary Lagoon



Notes: Vegetation for the "Proposed Expanded Management Area" has not been mapped. The dominant vegetation types in most of this area are riparian and mixed oak woodland

Legend

- Riparian and Mixed Oak Woodland
- Freshwater Marsh
- Other Areas (maintained, recreation, grassland, ruderal)
- Open Water
- Water Sample
- Water and Sediment Sample
- Proposed Staff Gage Locations
- Stormwater Inflow Point

Source: Jones & Stokes Associates 1991

NEARY LAGOON MANAGEMENT PLAN

CITY OF SANTA CRUZ

Prepared by: Jones & Stokes Associates

Figure 1

Table 1. Neary Lagoon
Water Quality Data (August 8, 1991)

Sample Location	Parameters																		
	Depth (ft)	Temperature (°C)	pH	DO (mg/l)	Specific Conductance (µS/cm)	Total Suspended Solids (mg/l)	Hardness (mg/l)	Nitrate (as N)(mg/l)	Ammonia (as N)(mg/l)	Orthophosphate (mg/l)	Arsenic (µg/l)	Cadmium (µg/l)	Chromium (µg/l)	Copper (µg/l)	Lead (µg/l)	Mercury (µg/l)	Nickel (µg/l)	Silver (µg/l)	Zinc (µg/l)
Detection limit						1	1	0.1	0.05	0.1	1.0	0.2	1.0	1.0	1.0	0.02	2.0	0.2	1.0
NL 1	3	22.3	7.8	10.7	525	24	240	0.13	0.09	0.82	21	ND	1.8	2.7	2	0.02	ND	ND	12
NL 2	3.5	22.8	7.9	12.1	550	36	250		0.16	0.87	25		1.8	1.6	1.7	0.02			7
NL 3	3.5	23.8	7.6	7.9	590	8	260		0.08	0.99	22		2.4	1.3					25
NL 4	2.5	24.7	7.3	6.6	770	16	270		0.08	1.01	19		1.7						6
NL 5	5	24.8	7.5	4.7	580	6	290	0.18	0.09	0.92	18		1.5						5
NL 6	4	24.7	7.7	9.5	700	13	280	0.16	0.12	1.8	20		1.7						6
Minimum	2.5	22.3	7.3	4.7	525	6	240	0.13	0.08	0.82	18	0	1.5	1.3	1.7	0.02	0	0	5
Maximum	5	24.8	7.9	12.1	770	36	290	0.18	0.16	1.8	25	0	2.4	2.7	2	0.02	0	0	25
Average	3.6	23.85	7.63	8.6	619.2	17.2	265	0.16	0.10	1.07	20.8	0	1.8	1.9	1.9	0.02	0	0	10.2

ND = not detected at any location.
Blank cells indicate not detected at that location.

Table 2. Neary Lagoon
Sediment Metals Data (Wet Weight)

Sample Location	Arsenic (µg/g)	Cadmium (µg/g)	Chromium (µg/g)	Copper (µg/g)	Lead (µg/g)	Mercury (µg/g)	Nickel (µg/g)	Silver (µg/g)	Zinc (µg/g)
Detection limit	0.1	0.1	0.1	0.1	0.1	0.02	0.1	0.1	1.0
NL 1	12	0.7	19	22	95	0.15	11	0.43	150
NL 3	12	0.7	150	20	48	0.16	10	0.53	86
NL 5	8	0.3	31	7.9	11	0.04	9.4	0.33	49
NL 6	12	0.6	18	11	27	0.08	8.3	0.26	57
Maximum	8	0.3	18	7.9	11	0.04	8.3	0.26	49
Minimum	12	0.7	150	22	95	0.16	11	0.53	150
Average	11	0.58	54.5	15.2	45.3	0.11	9.7	0.39	85.5

Figure 2
Neary Lagoon Water Quality Study

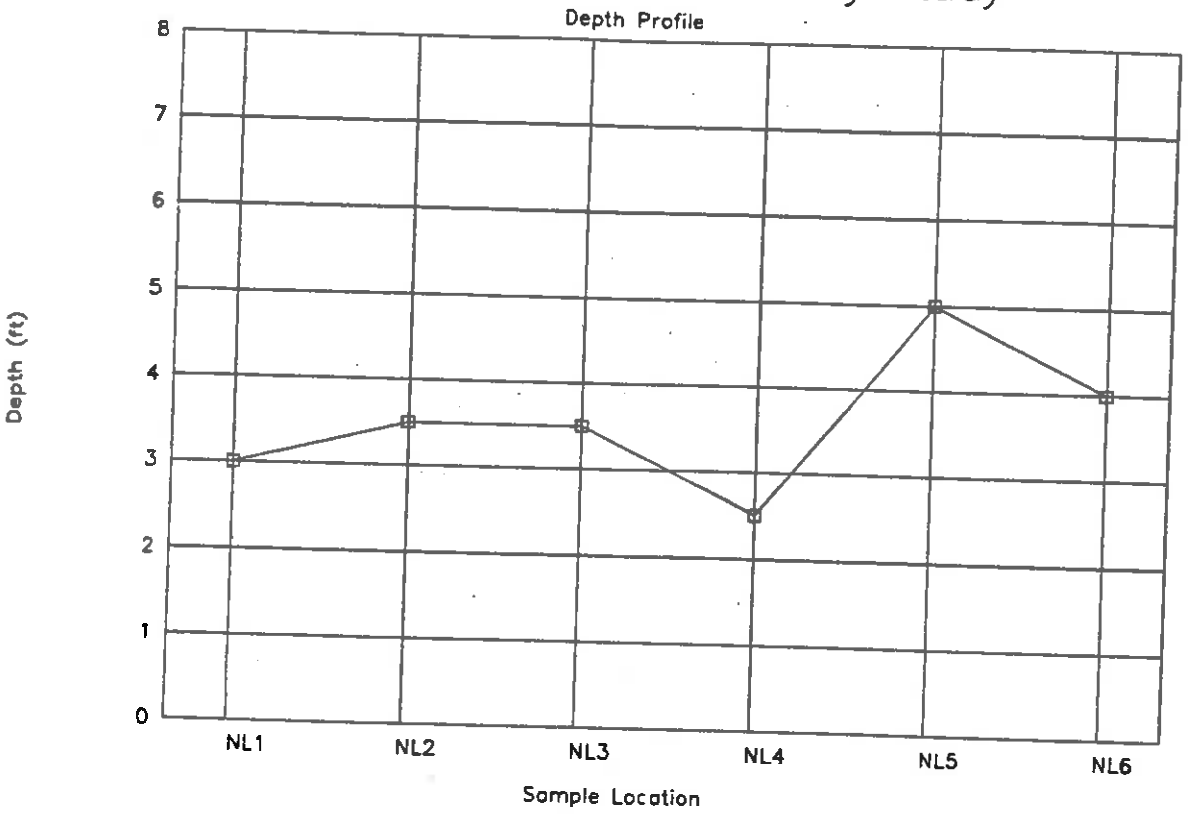


Figure 3
Neary Lagoon Water Quality Study

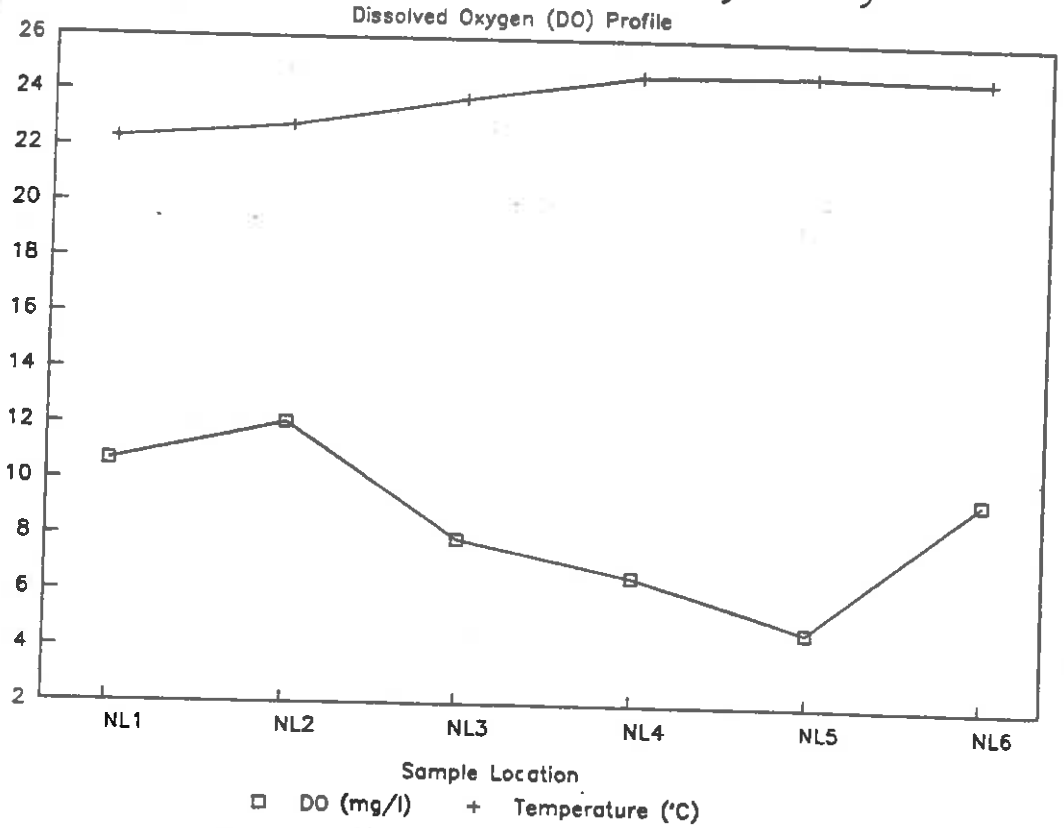


Figure 4

Neary Lagoon Water Quality Study

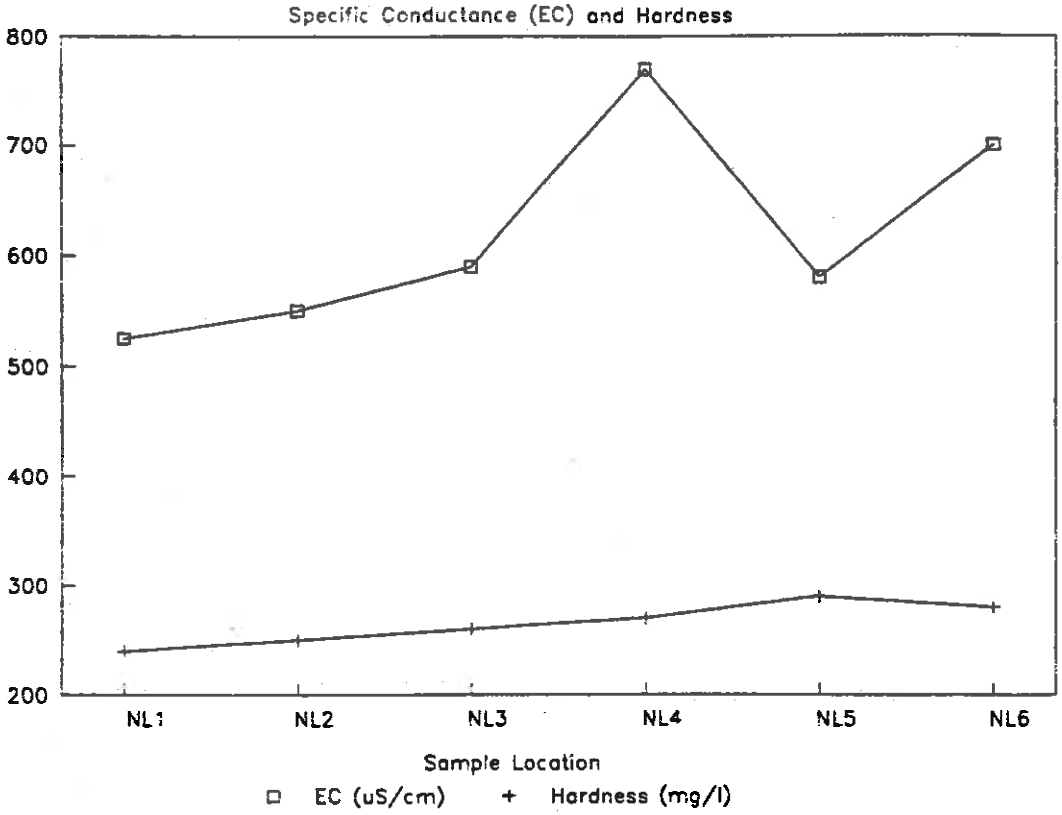


Figure 5

Neary Lagoon Water Quality Study

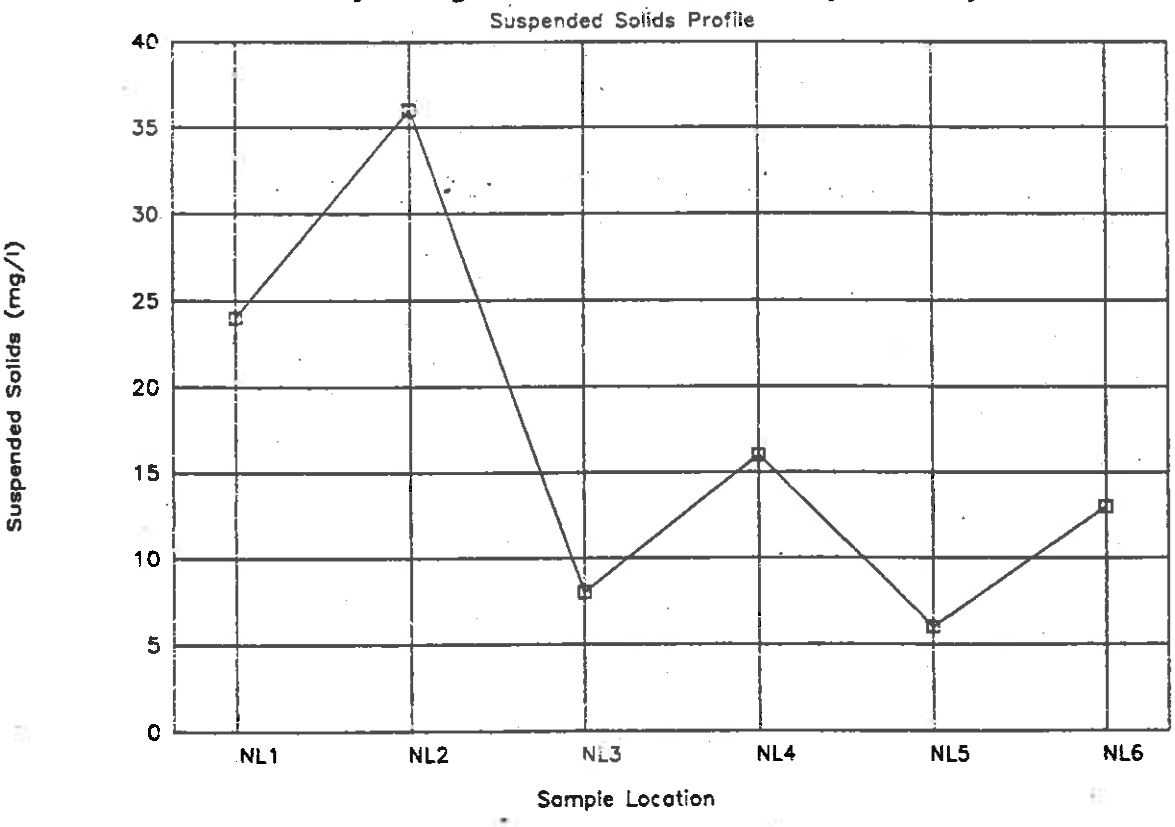


Figure 6

Neary Lagoon Water Quality Study

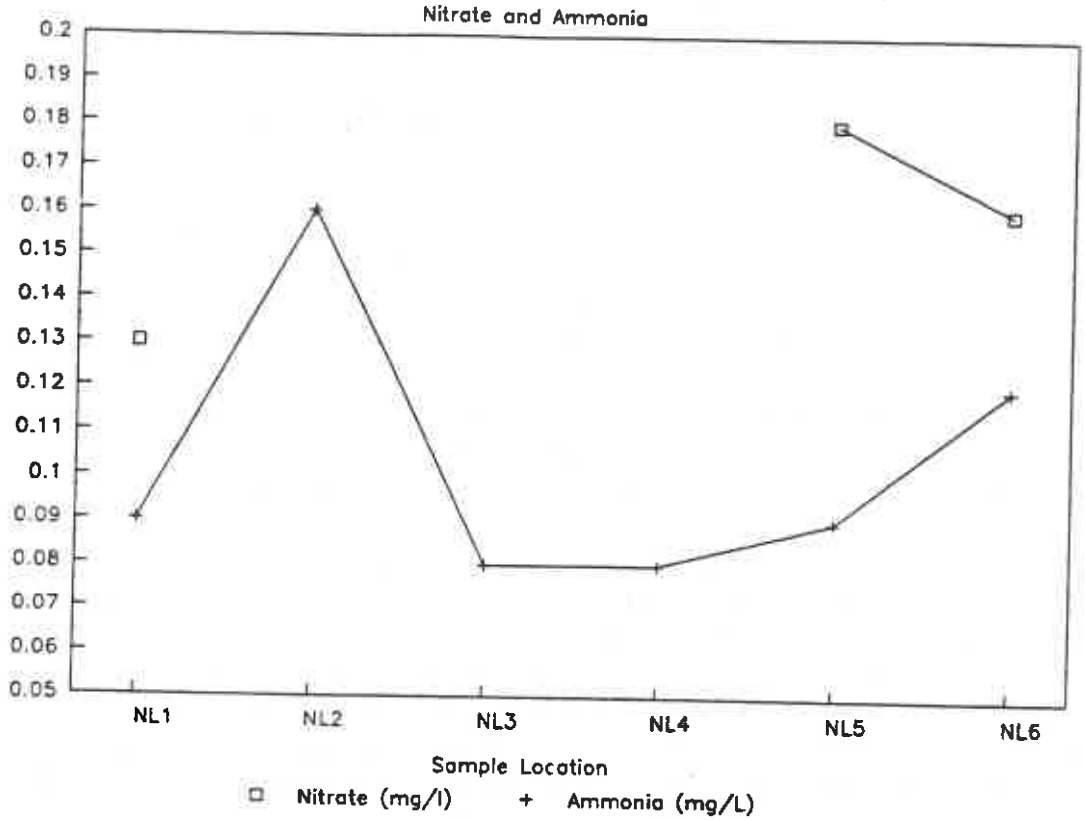
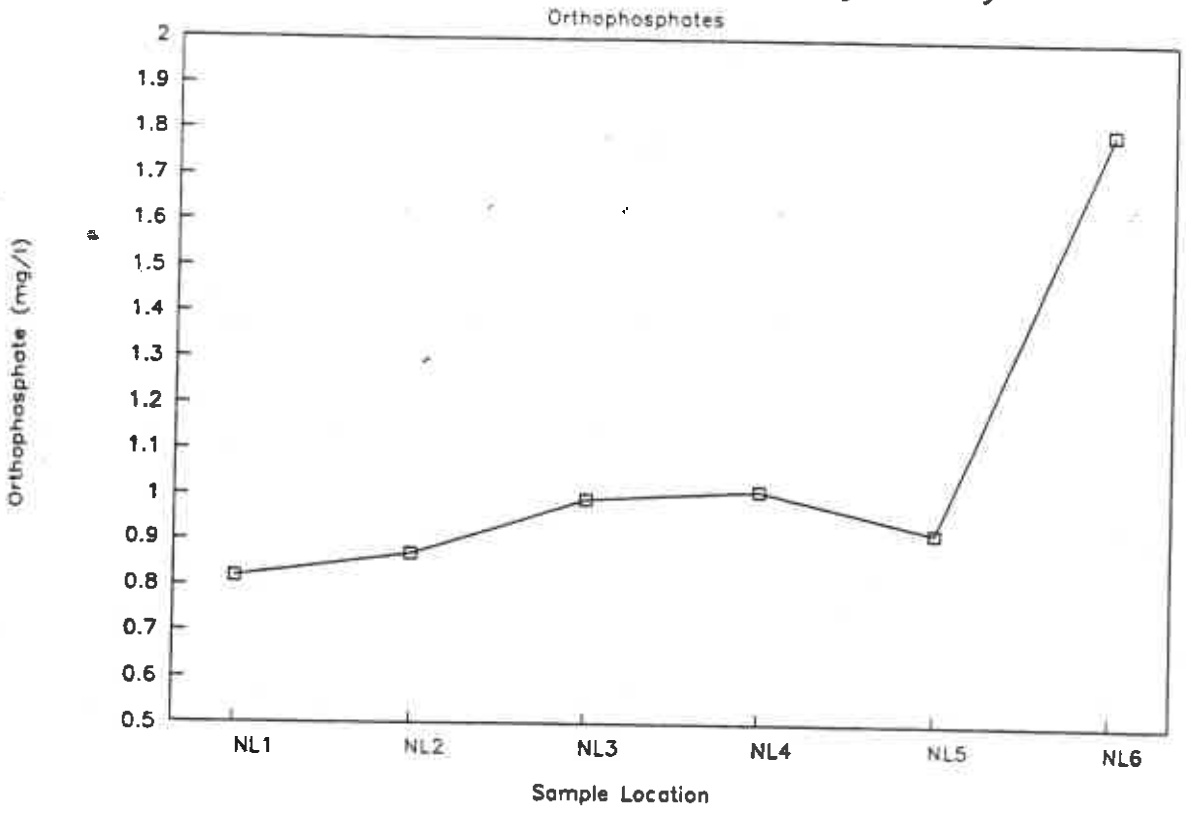


Figure 7

Neary Lagoon Water Quality Study



2 could be associated with fecal material in the duck pond discharge. Ammonia can be very toxic at low concentrations; its toxicity to freshwater aquatic life depends on pH and temperature. The EPA freshwater criterion for ammonia is 0.81 mg/l, which is based on the protection of salmonid fish, the most sensitive species considered by the criteria (U.S. Environmental Protection Agency 1986). This criterion reflects a 4-day average at a temperature of 25°C and pH of 7.75. The maximum ammonia concentration of 0.16 mg/l at NL 2 is below the EPA criterion.

Nitrogen and phosphorus are the main elements controlling the growth of algae in impoundments such as Neary Lagoon. Because greater amounts of nitrogen are needed for algal growth, nitrogen to phosphorus (N:P) ratios can indicate the relative supply of each nutrient available and therefore which nutrient is most likely limiting algal growth. Where the ratio is greater than 10, phosphorus tends to be limiting, and for ratios below 5, nitrogen tends to be limiting (U.S. Environmental Protection Agency 1985).

Neary Lagoon is a highly eutrophic impoundment, as indicated by the high phosphorus and low nitrogen levels and a large accumulation of sediment. High orthophosphate levels probably are attributable to urban runoff, which is typically high in soluble phosphorus. The average nitrogen concentration (as the sum of ammonia and nitrate) was 0.26 mg/l (Table 1). The average phosphorus concentration was 1.1 mg/l, giving a ratio of about 0.25, which indicates that Neary Lagoon is probably very nitrogen limited. Although organic nitrogen was not included in the analysis, it is highly unlikely that N:P ratios would increase significantly above nitrogen-limiting levels. Low N:P ratios (<7) can also tend to favor production of blue-green algae, which fix their own nitrogen (Melack and Lesack 1982). Blue-green algae are undesirable because they can form mats on the water surface and cause noxious odors.

Heavy Metals

Surface Water

Nine heavy metals were analyzed in all surface water samples (Table 1). Cadmium, nickel, and silver were not detected in any samples. Mercury was detected at NL 1 and 2 at 0.02 µg/l. Arsenic, chromium, and zinc were detected at all locations (Figures 8 and 9). Lead and copper were detected at the first two and three sample locations, respectively (Figure 9).

Except for a large increase in zinc and chromium at NL 3, most metals concentrations decreased between NL 1 and NL 5. The cause of the increase of the two metals at NL 3 is unknown. Metals are commonly associated with particulates because of adsorption, absorption, or precipitation reactions. The decrease of most metals in the upstream portion of the system is consistent with the removal of suspended solids discussed above.

Figure 8

Neary Lagoon Water Quality Study

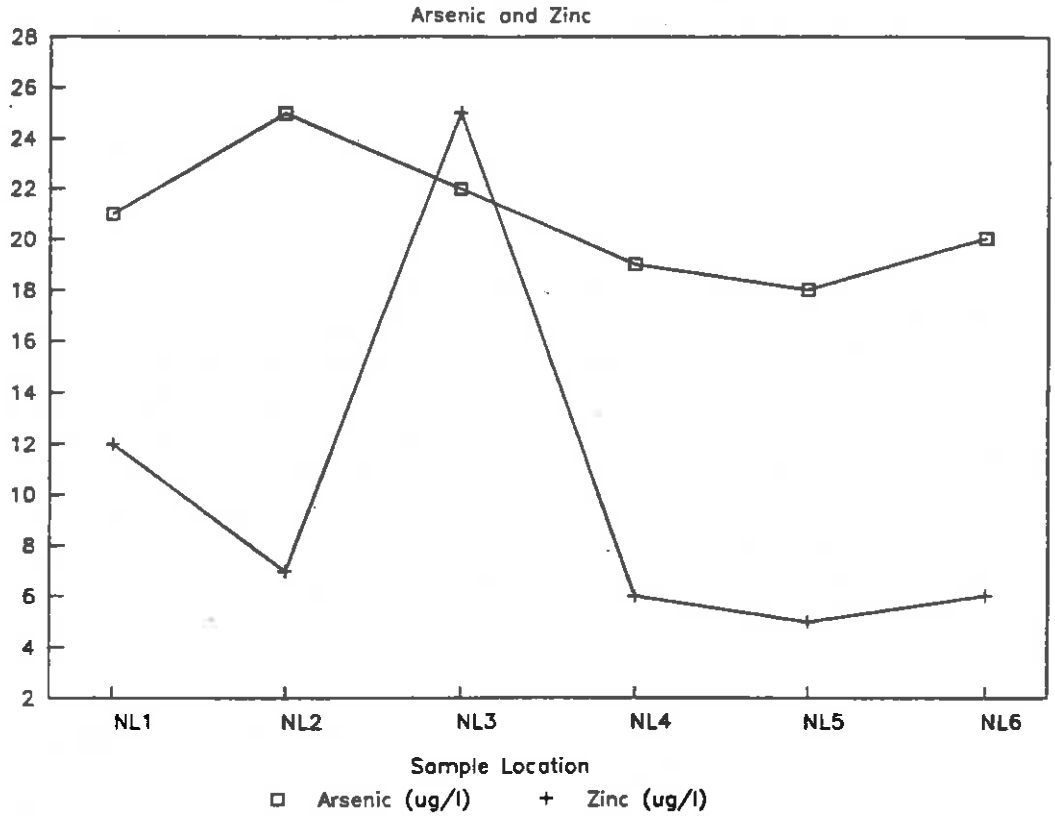
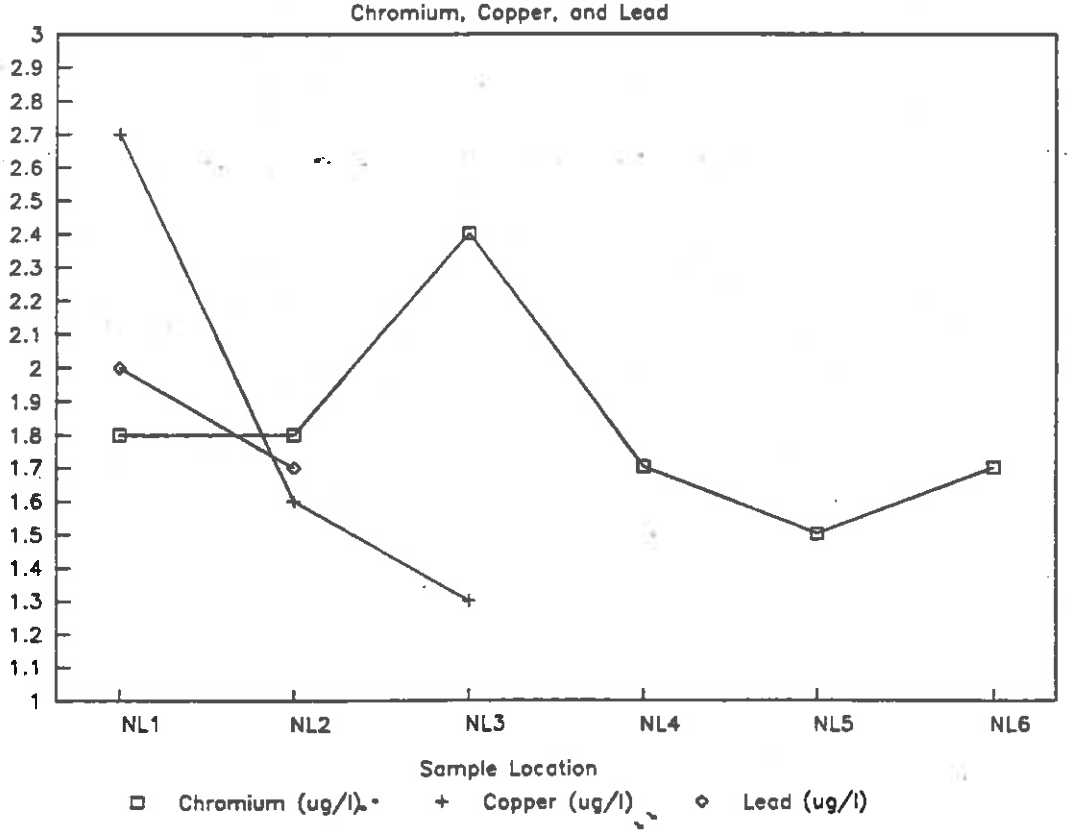


Figure 9

Neary Lagoon Water Quality Study



All metals concentrations reported in Table 1 were below EPA freshwater aquatic life criteria, which are a function of water hardness. The criteria values increase, or are less stringent, as water hardness increases. The reported values in Table 1 were all below EPA criteria adjusted for a hardness of 50 mg/l. Because all hardness values in Neary Lagoon exceeded 200 mg/l, a listing of individual criteria was not included in this report.

Sediment

Sediment at all locations was several feet thick (based on observation; no measurement was taken) and was overlain by a thick layer of detritus. Sediment samples were collected at NL 1, 3, 5, and 6 and were analyzed for heavy metals. The results of the sediment analyses are presented in Table 2. Concentrations of metals are given in $\mu g/g$ (equal to parts per million) wet weight. Metals were detected at all locations; lead, chromium, and zinc had the highest average concentrations, 45.3, 54.5, and 85.5 $\mu g/g$, respectively. In general, sediment metals concentrations decreased between NL 1 and NL 5, with exception of a large increase in chromium at NL 3 (Figure 10). The increase in chromium at NL 3 appears to be related to the increase in chromium in the water sample at NL 3; however, no concurrent increase in sediment zinc was indicated in the NL 3 water sample.

Sediment metals concentrations shown in Table 2 were all below total threshold limit concentrations established to designate a material as hazardous waste set by the California Department of Health Services Code of Regulations, Title 26, Division 22. Other than the hazardous threshold limits, no regulatory criteria have been established for metals in sediment, with the exception of dredged material. In light of this fact, background or baseline concentrations of metals in soils and sediment are used in this report to compare with sediment metals concentrations in Neary Lagoon. The maximum concentration from Table 2 for each metal was used for comparison with baseline values. This comparison is presented in Table 3. Because background data in Table 3 are given in dry weight units, sediment metals data were converted from wet weight to dry weight using a conservative average solids content of 60% (Brown pers. comm.). To convert the figures from wet weight to dry weight, the solids content (as a decimal) should be divided into the wet weight concentration (Table 3). Comparison of dry weight concentrations with range data for soil and bottom sediment in Table 3 indicates that chromium, lead, and zinc levels are elevated above the expected ranges for these metals. In particular, lead and zinc exceeded the high range values for bottom sediment by 112 and 173 $\mu g/g$, respectively.

Elevated sediment concentrations of the metals discussed above, especially lead and zinc, are believed to be associated with the historic discharge of urban runoff to Neary Lagoon.

Figure 10

Neary Lagoon Water Quality Study

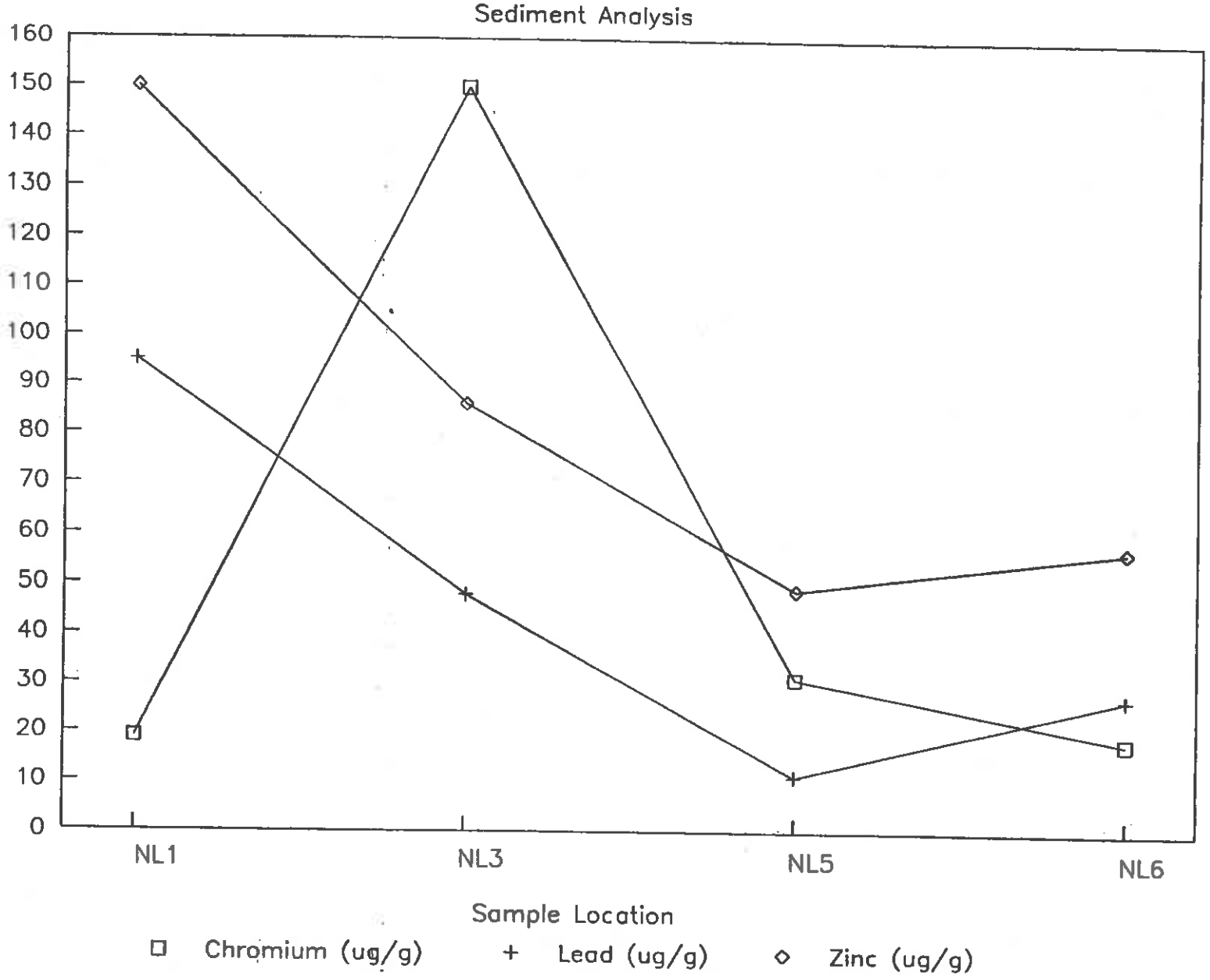


Table 3. Baseline Concentrations of Metals in Soils and Bottom Sediment for the Western United States Compared to Neary Lagoon Sediment Metals Concentrations

Metal	Neary Lagoon Concentration[a]		Baseline Concentration			
			Soil[b]		Bottom Sediment[b]	
	Wet Weight	Dry Weight	Geometric Mean	Range	Median	Range
Arsenic	12	20	5.5	1.2-22	6.3	0.6-16
Cadmium	0.7	1.2	--	--	<2	<2
Chromium	150	250	41	8.5-200	49	21-170
Copper	22	37	21	4.9-90	36	19-67
Lead	95	158	17	5.2-55	5	<4-46
Mercury	0.16	0.27	0.046	0.0085-0.25	0.04	<0.02-0.22
Nickel	11	18	15	3.4-66	29	12-93
Silver	0.53	0.9	--	--	--	--
Zinc	150	250	55	17-180	53	23-77

Note: -- = no data.

[a] Neary Lagoon values from Table 2 are maximum wet weight concentrations adjusted to dry weight (μg/g) assuming a 60% solids content of samples.

[b] Values in μg/g dry weight.

Source: Shacklette and Boerngen 1984.

Organochlorine Pesticides and PCBs

Sediment samples from NL1 and NL 5 also were analyzed for organochlorine pesticides and PCBs. The results of this analysis are included in the complete laboratory report presented in Appendix 1 of this report.

No pesticides or PCBs were detected at NL 5, and no PCBs were detected at either location. Three organochlorine pesticides were detected at NL 1: chlordane, DDD and DDE, and methoxychlor. Concentrations of these compounds were between 0.01 and 0.02 $\mu g/g$.

The levels of the three organochlorine pesticides detected are common in sediments of areas previously used for agricultural purposes. Chlordane also is used commonly in residential areas for control of ants and other insects around foundations and basements. DDD and DDE are breakdown byproducts of DDT, which was widely used in the 1940s and 1950s. Methoxychlor is a general-purpose agricultural insecticide introduced to replace DDT. It was introduced because it is relatively nontoxic to mammals compared to DDT, has a low persistence, and does not readily bioaccumulate (Doull, Klaassen, and Amdur 1980).

Pesticides are of concern primarily because of their potential adverse effects on wildlife: acute toxicity causing direct mortality of organisms; chronic effects that limit organism survival by lowering resistance to disease, decreasing food uptake, or affecting nervous system activity; and disruption of aquatic habitat food chains (U.S. Geological Survey 1991).

CONCLUSIONS AND RECOMMENDATIONS

Except for high levels of orthophosphates, Neary Lagoon water quality is fair to good, as indicated by EC, DO, hardness, and suspended solids. Metals concentrations in water samples were below EPA freshwater criteria for the protection of aquatic life.

Sediment metals concentrations were below hazardous levels, but chromium, lead, and zinc concentrations were elevated compared to baseline values expected in natural settings. Levels of organochlorine pesticides detected appeared to be low and are common for historic areas associated with development or agriculture activity.

The reported concentrations of metals and pesticides in Neary Lagoon sediment should be reviewed by California Department of Fish and Game and possibly U.S. Fish and Wildlife Service staff to determine whether they are considered a potential threat to aquatic species and wildlife. Comments also should be elicited as to the levels considered potentially harmful. Based on these comments, additional analyses, if necessary, should be included in future monitoring efforts.

Future Monitoring Recommendations

The monitoring program described below is intended as a cost-effective, baseline approach. Additional monitoring, if recommended by the California Department of Fish and Game or others, should take precedence. The following actions are recommended for future water quality monitoring at Neary Lagoon:

- Water quality sampling and analysis for the nine metals should be conducted annually, at a minimum, during low-flow conditions. Other inorganic parameters, such as hardness and nutrients (nitrate and phosphate), also should be included. (Note: Inorganic parameters can be analyzed easily by the treatment plant laboratory.) Refer to Appendix 1 for a list of parameters, detection limits, and other details. The monitoring of metals not detected in subsequent samples may be reduced in frequency.

- Water samples should be collected at locations roughly corresponding to NL 1, NL 3, and NL 5 of the water quality study.

- A sediment sample should be collected at NL 1, at a minimum. Additional sediment samples can be collected to provide information on pollutant movement and accumulation through the lagoon system; those samples from a given region also can be composited into one sample for laboratory analysis. To further characterize sediment quality, grain size analysis and total organic carbon should be included. Sediment accretion and water depth should be measured at each location during sampling events.

- DO, EC, and temperature should be analyzed during dry and wet weather conditions, in conjunction with water regime changes recommended in the "Hydrology" section of Chapter 2, to monitor the effects of these changes on water quality. (Again, treatment plant or park staff can perform these analyses easily).

- Toxic pollutants should be analyzed if they are known or suspected to be present or if water quality problems occur (e.g., fish kills).

The proposed monitoring program should be reviewed and approved by the California Coastal Commission, Central Valley Regional Water Quality Control Board, and county health department before it is implemented.

CITATIONS

Printed References

Central Valley Regional Water Quality Control Board. 1987. Urban runoff discharges from Sacramento, California, 1984-85. Standards, Policies, and Special Studies Section. Sacramento, CA.

Doull, J., C. Klaassen, and M. O. Amdur (eds.). 1980. Cosarett and Doull's toxicology: the basic science of poisons. 2nd edition. Macmillan Publishing Co., Inc. New York, NY.

Harvey and Stanley Associates. 1987. Neary Lagoon enhancement plan. Alviso, CA. Prepared for Linsey, Kraeger Associates, Ltd., and City of Santa Cruz, Santa Cruz, CA.

Melack, J. and L. Lesack. 1982. Progress report (November 1982) Long Valley Research Program. University of California, Department of Biological Sciences and Marine Science Institute. Santa Barbara, CA.

U.S. Environmental Protection Agency. 1985. Water quality assessment: a screening procedure for toxic and conventional pollutants in surface and ground water. Environmental Research Laboratory, Office of Research and Development. Athens, GA.

_____. 1986. Quality criteria for water 1986. (EPA 440/5-86-001.) Office of Water Regulation and Standards. Washington, DC.

U.S. Geological Survey. 1991. Reconnaissance investigation of water quality, bottom sediment, and biota associated with irrigation drainage in the Klamath Basin, California and Oregon, 1988-89. (Water Resource Investigations Report 90-4203.) Sacramento, CA.

Personal Communications

Brown, Kent. Laboratory supervisor. Kinnetic Laboratories/ToxScan, Inc., Santa Cruz, CA. October 21, 1991 - telephone conversation.

APPENDIX 1

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetics Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

August 29, 1991

Attn: Kent Brown

MATERIAL:	Water samples received August 9, 1991
ANALYSIS COMPLETED:	August 20, 1991
IDENTIFICATION:	Neary Lagoon
TOXSCAN NUMBER:	T-7927
REPORT:	Quantitative chemical analysis is as follows, expressed as milligrams per liter, (parts per million) as received:

Sample Identification	Hardness as $CaCO_3$
NL-1	240
NL-2	250
NL-3	260
NL-4	270
NL-5	290
NL-6	280

Detection Limit = 1 ppm

Philip D. Carpenter
Laboratory Director

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetics Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

August 29, 1991

Attn: Kent Brown

MATERIAL:	Water samples received August 9, 1991
ANALYSIS COMPLETED:	August 20, 1991
IDENTIFICATION:	Neary Lagoon
TOXSCAN NUMBER:	T-7927
REPORT:	Quantitative chemical analysis for Total Suspended Solids is as follows, expressed as milligrams per liter, (parts per million) as received:

Sample Identification	Total Suspended Solids
NL-1	24
NL-2	36
NL-3	8
NL-4	16
NL-5	6
NL-6	13

Detection Limit = 1 ppm

Philip D. Carpenter
Laboratory Director

ANALYTICAL CHEMISTS
and
BACTERIOLOGISTS
Approved by State of California

SOIL CONTROL LAB

42 HANGAR WAY
WATSONVILLE

A Division of Control Laboratories Inc.

Tel: 408 724-5422
FAX: 408 724-3188

In any reference, please quote Certified Analysis Number appearing hereon.

91376-6-3344

ToxScan Inc.
42 Hangar Way
Watsonville CA 95076

21 AUG 91

CERTIFIED ANALYTICAL REPORT

MATERIAL: Water samples received 9 August 1991
IDENTIFICATION: T-7927 - Kinnetic Laboratories/Neary Lagoon
REPORT: Quantitative chemical analysis is as follows expressed as milligrams per liter (parts per million):

Sample Identification	Orthophosphate	Nitrate Nitrogen
NL-1	0.82	0.13
NL-2	0.87	< 0.1
NL-3	0.99	< 0.1
NL-4	1.01	< 0.1
NL-5	0.92	0.18
NL-6	1.80	0.16
Detection Limit	0.1	0.1

The undersigned certifies that the above is a true and accurate report of the findings of this Laboratory.

A-21

Analyst

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetics Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

August 29, 1991

Attn: Kent Brown

MATERIAL:	Water samples received August 9, 1991
ANALYSIS COMPLETED:	August 20, 1991
IDENTIFICATION:	Neary Lagoon
TOXSCAN NUMBER:	T-7927
REPORT:	Quantitative chemical analysis is as follows, expressed as milligrams per liter, (parts per million) as received:

Sample Identification	Ammonia as N
NL-1	0.09
NL-2	0.16
NL-3	0.08
NL-4	0.08
NL-5	0.09
NL-6	0.12

Detection Limit = 0.05 ppm

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42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetics Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

August 29, 1991

Attn: Kent Brown

MATERIAL: Water samples received August 9, 1991
ANALYSIS COMPLETED: August 20, 1991
IDENTIFICATION: Neary Lagoon
TOXSCAN NUMBER: T-7927
REPORT: Quantitative chemical analysis is as follows, expressed as micrograms per liter, (parts per billion) as received:

Analyte	NL-1	NL-2	NL-3	Detection Limit
Arsenic	21	25	22	1.0
Cadmium	ND	ND	ND	0.2
Chromium, Total	1.8	1.8	2.4	1.0
Copper	2.7	1.6	1.3	1.0
Lead	2.0	1.7	ND	1.0
Mercury	0.02	0.02	ND	0.02
Nickel	ND	ND	ND	2.0
Silver	ND	ND	ND	0.2
Zinc	12	7	25	1.0

ND = None Detected

Philip D. Carpenter
Laboratory Director

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetics Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

August 29, 1991

Attn: Kent Brown

MATERIAL:	Water samples received August 9, 1991
ANALYSIS COMPLETED:	August 20, 1991
IDENTIFICATION:	Neary Lagoon
TOXSCAN NUMBER:	T-7927
REPORT:	Quantitative chemical analysis is as follows, expressed as micrograms per liter, (parts per billion) as received:

Analyte	NL-4	NL-5	NL-6	Detection Limit
Arsenic	19	18	20	1.0
Cadmium	ND	ND	ND	0.2
Chromium, Total	1.7	1.5	1.7	1.0
Copper	ND	ND	ND	1.0
Lead	ND	ND	ND	1.0
Mercury	ND	ND	ND	0.02
Nickel	ND	ND	ND	2.0
Silver	ND	ND	ND	0.2
Zinc	6	5	6	1.0

ND = None Detected

Philip D. Carpenter
Laboratory Director

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

QA\QC FOR PROJECT # 7926 and 7927

Environmental Resource Associates "WasteWatR"
Quality Control Standard Lot No. 9938

	Certified Value	Value Found	% Recovery
	ug/l	ug/l	
Arsenic	93	97	105
Cadmium	113	115	102
Chromium	141	132	94
Copper	115	116	101
Lead	170	163	96
Mercury	1.94	1.65	85
Nickel	175	159	91
Silver	92	76	83
Zinc	234	245	105

Philip D. Carpenter
Laboratory Director

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42 Hangar Way
Watsonville, CA 95076
(408) 724-4522
FAX (408) 724-3188

QA\QC FOR PROJECT #7926 and 7927

CONCENRATIONS OF THE FOLLOWING ARE IN UG/L

ELEMENT	SAMPLE	SPIKE and SAMPLE	AMOUNT OF SPIKE	THEORETICAL SPIKE+SAMPLE	RECOVERY %
ARSENIC NL-3	22.1	32.1	10.0	32.1	100
CADMIUM NL-3	ND	474	500	500	95
CHROMIUM NL-3	2.4	434	500	502	86
COPPER NL-3	1.3	488	500	501	97
LEAD NL-3	ND	480	500	500	96
MERCURY NL-3	ND	2.82	2.50	2.50	113
NICKEL NL-3	ND	451	500	500	90
SILVER NL-3	ND	9.4	10.0	10.0	94
ZINC NL-3	25.0	540	500	525	103

Philip D. Carpenter
Laboratory Director

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetic Laboratory
307 Washington
Santa Cruz, CA 95060

August 26, 1991

Att. Kent Brown

MATERIAL: Sediment
IDENTIFICATION: Neary Lagoon
TOXSCAN NUMBER: 7927
REPORT Quantitative chemical analysis is as follows, expressed as micrograms per gram, parts per million, as recieved:

Element	Sample I.D. NL 3	NL 6	NL 1	NL 5	Detection Limit
Arsenic	12	12	12	8.0	0.1
Cadmium	0.7	0.6	0.7	0.3	0.1
Chromium	150	18	19	31	0.1
Copper	20	11	22	7.9	0.1
Lead	48	27	95	11	0.1
Mercury	0.16	0.08	0.15	0.04	0.02
Nickel	10	8.3	11	9.4	0.1
Silver	0.53	0.26	0.43	0.33	0.1
Zinc	86	57	150	49	1.0

Philip D. Cargenta
Laboratory Director

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

QA\QC FOR PROJECT # 7927
SEDIMENTS

ELEMENT	% RECOVERY OF SPIKE	AMOUNT OF SPIKE ug/ml	REP 1	REP 2	% ERROR
ARSENIC	95	0.28	13.0	11.5	3.1
CADMIUM	100	0.03	0.80	0.70	3.3
CHROMIUM	125	2.85	19	18	1.4
COPPER	100	2.85	22.0	21.0	1.2
LEAD	86	2.85	95.0	90.0	1.4
MERCURY	76	0.05	0.15	0.15	0.0
NICKEL	84	1.43	11.0	10.0	2.4
SILVER	107	0.28	0.45	0.43	1.1
ZINC	87	2.85	146	139	1.2

QA\QC FOR PROJECT 7927
SEDIMENTS

ELEMENT	VALUE FOUND ug/g	CERTIFIED VALUE ug/g	+/-	PERCENT RECOVERY %
ARSENIC	13.46	11.6	1.3	116
CADMIUM	0.27	0.36	0.07	75
CHROMIUM	57.0	76.0	3.0	75
COPPER	17.3	18.0	3.0	96
LEAD	27.4	28.2	1.8	97
MERCURY	0.076	0.063	0.01	121
NICKEL	23.4	32.0	3.0	73
ZINC	126	138	6	91

RM = National Institute of Standards and Technology
Estuarine Sediment, 1646.

Philip D. Crapuzzo
Laboratory Director

ToxScan Inc.

42 Hangar Way
Watsonville, CA 95076

(408) 724-4522

FAX (408) 724-3188

Kinnetics Laboratories, Inc.
307 Washington Street
Santa Cruz, CA 95060

Attention: Kent Brown

August 30, 1991

MATERIAL: Sediment samples received August 9, 1991
ANALYSIS COMPLETED: August 20, 1991
EXTRACTION DATE: August 13, 1991
IDENTIFICATION: Neary Lagoon
TOXSCAN NUMBER: T-7927
REPORT: Quantitative chemical analysis by EPA Method 8080 is as follows, expressed as micrograms per gram, (parts per million) as received:

Analyte	NL-1	NL-5	Detection Limit
Aldrin	ND	ND	0.008
alpha-BHC	ND	ND	0.008
beta-BHC	ND	ND	0.008
delta-BHC	ND	ND	0.008
gamma-BHC (lindane)	ND	ND	0.008
alpha-Chlordane	ND	ND	0.008
gamma-Chlordane	0.02	ND	0.008
2,4'-DDD	ND	ND	0.003
4,4'-DDD	0.01	ND	0.003
2,4'-DDE	ND	ND	0.003
4,4'-DDE	0.01	ND	0.003
2,4'-DDT	ND	ND	0.003
4,4'-DDT	ND	ND	0.003
Dieldrin	ND	ND	0.016
Endosulfan I	ND	ND	0.008
Endosulfan II	ND	ND	0.016
Endosulfan sulfate	ND	ND	0.016
Endrin	ND	ND	0.016
Endrin aldehyde	ND	ND	0.016
Heptachlor	ND	ND	0.008
Heptachlor epoxide	ND	ND	0.008
Methoxychlor	0.01	ND	0.08
Toxaphene	ND	ND	0.160
PCBs	ND	ND	0.160

ND = None detected

Philip D. Cassente
Laboratory Director

APPENDIX B

PUBLIC WORKSHOP SUMMARY

NEARY LAGOON MANAGEMENT PLAN
CITY OF SANTA CRUZ

Neary Lagoon Management Plan
Public Workshop
Summary

Prepared for:

City of Santa Cruz
Public Works Department/Planning Department
809 Center Street
Santa Cruz, CA 95060
Contact: Steve Wolfman
408/429-3016

Prepared by:

Jones & Stokes Associates, Inc.
2600 V Street, Suite 100
Sacramento, CA 95818-1914
Contact: Joseph Donaldson
916/737-3000

September 9, 1991

This document should be cited as:

Jones & Stokes Associates, Inc. 1991. Neary Lagoon management plan public workshop summary. Sacramento, CA. September 9, 1991. (JSA 9198.) Prepared for City of Santa Cruz Public Works Department/Planning Department, Santa Cruz, CA.

Table of Contents

NEARY LAGOON MANAGEMENT PLAN PUBLIC WORKSHOP SUMMARY

Introduction

A public workshop was held from 7 to 9 p.m. on August 20, 1991, at the Louden Nelson Community Center in Santa Cruz to generate and receive input for the Neary Lagoon Management Plan. Public notification of the workshop was accomplished by mailing 1,032 postcards announcing the workshop to residences within about 1,000 feet of the lagoon, posting flyers at the lagoon, and placing advertisements in the Santa Cruz Sentinel newspaper on August 16, 17, and 18.

An estimated 70 people attended the workshop, 58 of whom signed a mailing list to be notified of future task force meetings. The workshop was also attended by Susan Cooper, Mike DiDonato, Robert Semas, and Russel Weisz of the Neary Lagoon Management Plan Task Force; Steve Wolfman of the City of Santa Cruz Public Works Department; Harry Tsugawa, consulting landscape architect for the city; Jeannine Dewald of the California Department of Fish and Game; and Rick Hyman of the California Coastal Commission.

The workshop provided an overview of the background, purpose, and content of the management plan, and presented information on opportunities and constraints affecting lagoon management decisions. A slide show about Neary Lagoon oriented attendees, and generated questions and discussion about the lagoon.

A key element of the workshop was the input received during small group discussions. Attendees formed groups of five to seven people who worked together for approximately 30 minutes to generate, discuss, and illustrate lagoon design and management options. Groups recorded their ideas on large aerial photographs of the lagoon, maps of the lagoon illustrating vegetation types and water area, and large sheets of paper. On completion of the small-group discussions, photographs, maps, and lists of comments were posted, stimulating more discussion and comments from the entire group.

A summary of potential lagoon management goals, objectives, and actions and a survey requesting participants to identify ideas and priorities were distributed. The summary provided a matrix comparing the effects and compatibility of specific management actions with overall management goals. The survey was designed to gather qualitative information on public values and perceived problems of lagoon management.

Throughout the workshop, participants asked numerous questions and enthusiastically discussed potential management options. The comments recorded during the small-group discussions generally reflected group goals and priorities; comments received in surveys and letters expressed individual interests and concerns.

Summary of Comments from Workshop Groups

Comments that each workshop group recorded on aerial photographs, maps, and paper are organized below according to the goals identified on the summary of potential goals handout distributed at the workshop.

Maintain High-Quality Wildlife Habitat and High Wildlife Diversity

Preserving wildlife and wildlife habitat was generally listed as the highest priority goal by group participants. Specific comments included:

- keep lagoon as wildlife area,
- selectively remove or reduce tules and yellow iris,
- control weeds,
- improve wildlife cover at lagoon edges,
- limit bird feeding; post signs prohibiting feeding,
- establish nesting areas,
- improve predator control,
- restore native plant and animal species,
- remove non-native water birds,
- maintain 1:1 ratio of water and vegetation,
- limit expansion of sewage plant into refuge, and
- prevent lighting from disturbing wildlife.

Control Mosquitos at Acceptable Levels

Mosquito control was frequently mentioned as important. Some participants expressed a desire for "natural" mosquito control and mosquito control without insecticides.

Provide a High Level of Public Safety

Although not generally stated as a primary concern, public safety improvements were recommended, including the following:

- prevent camping,
- control transients, and
- reduce fire danger.

Protect Against Flooding

Two workshop groups listed flooding as a concern, and one group suggested dredging as a possible management action to reduce the potential for flooding.

Improve Water Quality

Water quality improvement was a frequently cited goal for lagoon management. Participants made the following specific comments:

- prevent toxic spills from sewage treatment plant,
- control urban runoff,
- control amount of water flowing in and out of lagoon,
- increase water clarity,
- periodically lower water level to flush brackish water out of lower lagoon areas,
- dredge 4 feet deep to remove siltation,
- correct erosion problems,
- divert more water into lagoon, and
- have fire department discharge water used in training exercises into lagoon.

Human Use Opportunities

Recorded comments both supported and opposed increased human use. The following comments were made in support of ongoing and improved human use:

- provide guided access to wildlife areas, including docents;
- screen sewage treatment plant before construction using trees and noise wall;
- retain or enlarge grassy area;
- fence tot lot for security;
- maintain Bay Street access to tennis and basketball courts and playground;
- develop wildlife education programs; and
- provide full-time employee to monitor use and provide information.

The following comments favored a decrease in human use:

- limit public access;
- provide only limited access to certain areas for educational purposes;
- do not provide new entry to lagoon;
- do not provide access through riparian area;
- do not provide connecting access to Shelter Lagoon/Cypress Point;
- eliminate eastern access at outflow;
- fence areas recommended by California Coastal Commission;
- do not build new trails, particularly through northeast riparian area;
- do not build interconnecting trails;
- do not increase use in Shelter Lagoon/Cypress Point area;
- do not build boardwalks in marshy areas;
- do not expand recreational facilities; and
- allow only day use at new tennis and basketball courts.

Workshop attendees commented on funding and implementing the management plan as follows:

- provide funding and implementation for the plan,
- obtain funding from sewer funds,
- develop timeline for implementation,
- obtain guaranteed annual funding as mitigation for secondary treatment plant,
- coordinate management plan with management of surrounding private land, and
- provide for annual maintenance to meet objectives.

Summary of Comments from Surveys and Letters

The survey was not designed to be a scientific study but rather to obtain qualitative information about lagoon management priorities. Of the 50 surveys distributed at the workshop, 31 were returned: 22 from residents of Shelter Lagoon, one from a resident of Cypress Point, and eight from residents of other areas (four from within 1/4 mile of the lagoon, two from farther away than 1/4 mile, and two from communities other than Santa Cruz). In addition, 11 letters were received.

Shelter Lagoon/Cypress Point residents reported visiting Neary Lagoon more frequently than residents of other areas. Shelter Lagoon/Cypress Point residents also reported more frequent disturbances from the water treatment plant, objected more frequently to any increase in the number of trails at the lagoon, and were generally more concerned about water quality than residents of other areas.

Residents of Shelter Lagoon/Cypress Point were generally more concerned about mosquitos than nonresidents. Residents, however, were evenly divided on the question of removing largemouth bass and bluegills, while nonresidents favored their removal.

Water quality was a primary concern of all respondents and was frequently cited as an important lagoon management consideration. Respondents largely supported management of the lagoon to favor wildlife, although respondents also slightly favored retaining exotic ducks. Several respondents indicated that their opinion on removing exotic ducks would depend on the impacts of ducks on other species in the lagoon. Respondents generally supported allowing bird feeding at the lagoon. The widespread support of management favoring wildlife, in combination with support of retaining exotic ducks and continuing bird feeding, may indicate that respondents view all waterfowl as wildlife.

Respondents were divided on the existence of rat problems. Shelter Lagoon/Cypress Point residents appeared to be less concerned than nonresidents. More than half the respondents felt that dogs and cats were a problem or potential problem, with residents less concerned than nonresidents.

Respondents were also divided on their perceptions of public safety problems, with nonresidents slightly more concerned than residents.

Respondents frequently mentioned wildlife, nature, beauty, serenity, and the opportunity to have a nature area close to an urban area as their favorite aspects of Neary Lagoon. Often-mentioned negative aspects of the lagoon were encroachment of tules and other vegetation, presence of the sewage treatment plant, poor water quality, siltation of the lagoon, mosquitos, the proximity of housing, the presence of transients, and the potential flood danger posed by the lagoon.

Management activities recommended for the lagoon included a city commitment to funding and implementing the management plan, vegetation control, improving water quality, protecting wildlife, controlling flooding, removing transients, dredging the lagoon, extending trails along the lagoon perimeter, and providing personnel for law enforcement and environmental education.

As of August 29, 11 letters had also been received. Seven of these letters were from residents of Shelter Lagoon, with three arriving before the August 20 workshop. The three letters expressed concerns about public access to the northeast section of the lagoon. Of the four letters received from Shelter Lagoon residents after the workshop, one letter expressed concern about the presence of carp and their potential negative effects on bird populations and water quality, and stated that the City of Santa Cruz had not responded to the writer's concerns. One letter expressed general support for keeping Neary Lagoon as a park and wildlife preserve. One letter expressed concern about the reduction in numbers and diversity of wild birds, and vegetation encroachment on the lagoon. The fourth resident letter itemized concerns about diminishing wildlife, poor water quality and siltation, encroaching vegetation, flood hazard, predation by dogs and cats, lagoon maintenance and monitoring, increased population and construction in the lagoon area, and the importance of preserving open space and wildlife habitat in an urban area.

Two letters from nonresident owners of homes in Shelter Lagoon expressed concern about the lack of maintenance of Neary Lagoon, poor water quality, and encroaching vegetation. The writers advocated maintaining existing fences and objected to constructing more trails. A letter from the landscape maintenance contractor for Shelter Lagoon expressed concern about siltation and vegetation encroachment, and stated that vandalism and litter at Shelter Lagoon had decreased since the path at the end of the lawn was blocked off. The fourth letter, from a resident of Clear View Court near Neary Lagoon, objected to disturbances caused by transients and suggested that Neary Lagoon be closed from sunset to sunrise and patrolled regularly by police.

Summary of Workshop Results

The combination of small group discussions and survey questions provided a comprehensive approach to obtaining original ideas and responses to specific issues. The workshop was well received by the participants and stimulated enthusiastic discussions on potential management options.

Based on recorded comments from the small group discussions and on survey responses, preserving the natural environment at Neary Lagoon is the highest priority. Specific concerns receiving widespread support included improving water quality, reducing vegetation encroachment on open water, controlling mosquitos, and providing adequate funding and implementation for the management plan.

Small-group participants' and survey respondents' concerns varied regarding problems caused by rats, domestic animals, flooding, and transients. These issues do not appear to be of primary importance.

Participant and respondent views were clearly divided on providing lagoon access, with residents of Shelter Lagoon/Cypress Point strongly opposed to increasing access to the northeastern portion of the lagoon. The location and degree of access appropriate for the lagoon clearly emerged at the workshop as a primary concern for managing the lagoon.

Agenda
for
The Neary Lagoon Management Plan Public Workshop

Tuesday, August 20, 1991

7:00 – 9:00 p.m.

Louden Nelson Community Center
301 Center Street (at Laurel Street)

7:00 p.m.	Begin Workshop
	Introduction
	Welcome
	Introductions:
	Joe Donaldson, Mary Menconi – Jones & Stokes Associates
	Steve Wolfman – Public Works Department, Santa Cruz
	Task Force members
	Purpose of workshop
	Workshop organization / objectives / format
7:15 p.m.	Management Plan Overview
	Background / purpose / content
	Issues / opportunities / constraints presentation
7:30 p.m.	Survey Distribution and Discussion
7:45 p.m.	Small Group Discussions
	Concerns and issues identification
	Opportunities and constraints identification
	Organize and record ideas, information
8:15 p.m.	Break / Refreshments / Individual Review of Group Work
8:30 p.m.	Small Group Presentations
8:45 p.m.	Discussion / Summary / Followthrough
9:00 p.m.	End of Workshop

Appendix A. Neary Lagoon Management Plan Survey

Survey for Neary Lagoon Management Plan Public Workshop
August 20, 1991

This informal survey has been prepared to get workshop participants' ideas about managing Neary Lagoon. The information you provide will help us identify and assess public concerns and priorities.

1. Area of residence:

___ Shelter Lagoon
___ Cypress Point
___ within 1/4 mile of Neary Lagoon
___ greater than 1/4 mile from Neary Lagoon in Santa Cruz
___ community other than Santa Cruz: _____

2. How did you hear about the workshop?

___ direct-mailed postcard from city
___ newspaper
___ poster at Neary Lagoon
___ friend
___ other

3. About how often do you visit Neary Lagoon?

___ at least once a week
___ about once a week
___ several times a month
___ several times a year
___ once a year or less often

4. What types of activities do you engage in at Neary Lagoon?

	frequently	occasionally	seldom
picnic	___	___	___
relax/walk/enjoy nature	___	___	___
birdwatch	___	___	___
feed birds	___	___	___
people watch	___	___	___
play tennis	___	___	___
take children to play area	___	___	___
other: _____	___	___	___
other: _____	___	___	___

5. List briefly the things you like most about Neary Lagoon (i.e., its primary attractions and unique qualities):

_____
_____
_____

6. List briefly the things you dislike about Neary Lagoon (i.e., things you feel detract from the lagoon experience):

_____
_____
_____

7. Indicate how you feel the lagoon should best be managed, whether mostly for wildlife (e.g., habitat protection and enhancement) or mostly for people (e.g., environmental education, recreation, views) by circling one number on the scale below.

Wildlife 1 2 3 4 5 People

8. List in order of priority (listing the most important first) what you feel should be the main activities occurring at the lagoon. (Use activities listed in question 4 for ideas.)

1. _____
2. _____
3. _____
4. _____
5. _____

The following are some specific questions regarding potential management actions being considered for the lagoon.

9. Regarding trails at the lagoon, do you feel there should be:

___ more?
___ fewer?
___ the same as currently exist?

10. Do you feel that the introduced large-mouth bass and bluegills that are believed to be predators of mosquito fish (fish that eat mosquito larvae) be eradicated from the lagoon?

___ yes
___ no
___ depends on: _____

11. Do you feel that the introduced exotic ducks should be removed from the lagoon?

___ yes
___ no
___ depends on: _____

12. Do you feel that mosquitoes are a problem at Neary Lagoon?
    ___ yes
    ___ no

13. Do you feel that Norway rats are a problem at the lagoon and should be controlled?
    ___ yes
    ___ no
    ___ depends on:_____

14. Do you feel that dogs and/or cats are a problem or a potential problem at the lagoon and that stricter enforcement of animal control is needed?

    dogs: ___ yes ___ no
    cats: ___ yes ___ no

15. Do you feel that water quality is a problem at the lagoon?
    ___ yes
    ___ no

16. Do you feel that safety and security are a problem at the lagoon?
    ___ yes
    ___ no

17. Do you feel that feeding birds should be permitted at the lagoon?
    ___ yes
    ___ no

18. Please list, and indicate your priorities for, any management activities you feel should occur at the lagoon:

    _____
    _____
    _____

19. Please provide any additional comments or concerns you have about Neary Lagoon or the management plan.

    _____
    _____
    _____
    _____
    _____
    _____

Thank you!

APPENDIX C

BIRDS OBSERVED AT NEARY LAGOON

Appendix C. Birds Observed at Neary Lagoon, January-October 1986

Common Name	Scientific Name
Pied-billed grebe	*Podilymbus podiceps*
Double-crested cormorant	*Phalacrocorax auritus*
Great blue heron	*Ardea herodias*
Snowy egret	*Egretta thula*
Green-backed heron	*Butorides striatus*
Black-crowned night-heron	*Nycticorax nycticorax*
Greater white-fronted goose	*Anser albifrons*
Canada goose	*Branta canadensis*
Wood duck	*Aix sponsa*
Mallard	*Anas platyrhynchos*
Northern pintail	*Anas acuta*
Cinnamon teal	*Anas cyanoptera*
Gadwall	*Anas strepera*
Ruddy duck	*Oxyura jamaicensis*
Sharp-shinned hawk	*Accipiter striatus*
California quail	*Callipepla californica*
Virginia rail	*Rallus limicola*
Sora	*Porzana carolina*
Common moorhen	*Gallinula chloropus*
American coot	*Fulica americana*
Mourning dove	*Zenaida macroura*
Anna's hummingbird	*Calypte anna*
Allen's hummingbird	*Selasphorus sasin*
Belted kingfisher	*Ceryle alcyon*
Downy woodpecker	*Picoides pubescens*
Northern flicker	*Colaptes auratus*
Pacific-slope flycatcher	*Empidonax difficilis*
Black phoebe	*Sayornis nigricans*
Tree swallow	*Tachycineta bicolor*
Violet-green swallow	*Tachycineta thalassina*
Cliff swallow	*Hirundo pyrrhonota*
Barn swallow	*Hirundo rustica*
Steller's jay	*Cyanocitta stelleri*
Scrub jay	*Aphelocoma coerulescens*
Chestnut-backed chickadee	*Parus rufescens*
Bushtit	*Psaltriparus minimus*
White-breasted nuthatch	*Sitta carolinensis*
Bewick's wren	*Thryomanes bewickii*
Marsh wren	*Cistothorus palustris*
Ruby-crowned kinglet	*Regulus calendula*
Swainson's thrush	*Catharus ustulatus*
Hermit thrush	*Catharus guttatus*

Appendix C. Continued

Common Name	Scientific Name
American robin	*Turdus migratorius*
Wrentit	*Chamaea fasciata*
Cedar waxwing	*Bombycilla cedrorum*
European starling	*Sturnus vulgaris*
Warbling vireo	*Vireo gilvus*
Orange-crowned warbler	*Vermivora celata*
Yellow warbler	*Dendroica petechia*
Yellow-rumped warbler	*Dendroica coronata*
Common yellowthroat	*Geothlypis trichas*
Wilson's warbler	*Wilsonia pusilla*
Black-headed grosbeak	*Pheucticus melanocephalus*
Rufous-sided towhee	*Pipilo erythrophthalmus*
California towhee	*Pipilo crissalis*
Song sparrow	*Melospiza melodia*
Golden-crowned sparrow	*Zonotrichia atricapilla*
White-crowned sparrow	*Zonotrichia leucophrys*
Red-winged blackbird	*Agelaius phoeniceus*
Tricolored blackbird	*Agelaius tricolor*
Brewer's blackbird	*Euphagus cyanocephalus*
Brown-headed cowbird	*Molothrus ater*
Purple finch	*Carpodacus purpureus*
House finch	*Carpodacus mexicanus*
Lesser goldfinch	*Carduelis psaltria*
American goldfinch	*Carduelis tristis*

Source: Harvey and Stanley Associates 1987.

APPENDIX D

DESIGN ELEMENTS AND CRITERIA

Appendix D. Design Elements and Criteria

Chestnut Street Entry (See Actions PU-1.1 and PU-5.2)

The new Chestnut Street entry will be a pedestrian entry located on the northeast side of the management area at the terminus of Chestnut Street. It will serve as the principal entry for the lagoon's natural area and new loop trail. The new Chestnut Street entry will include an open-walled, roofed shelter providing protection from rain and containing informational signage and interpretive exhibits; sitting facilities; an informal open gathering area to accommodate a small group of about 20 people; restroom facilities with separate accommodations for men and women; a small equipment and maintenance storage facility; water fountain; landscape improvements using locally native plants; low level security lighting screened from riparian areas; a bicycle lock rack for at least 10 bicycles; a lockable gated entrance to the grasslands (zone C); two curbside parking spaces on the street marked for handicapped use; one curb-side space on the street marked as a bus drop-off and waiting area; and up to 10 additional curb-side spaces indicated near the entry area. Additionally, a hard-surface, multi-use play court may be constructed near the entry that would be buffered from the existing riparian area by a minimum 15-foot-wide planting screen using locally-native plant species. All facilities will be handicapped-accessible. Design of the entry will permit only public pedestrian access, and maintenance and emergency vehicle access.

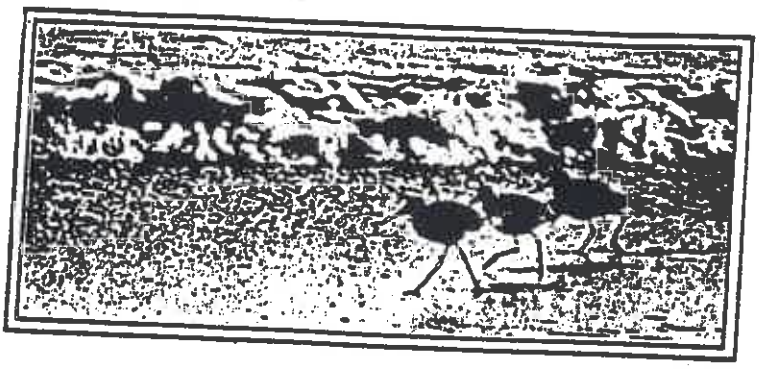
Loop Trail (See Action PU-1.3)

A handicapped-accessible, interpretive loop trail will be completed around the central portion of the lagoon connecting the existing central floating walkway with the new Blackburn Street entrance, the new Chestnut Street entrance, and the existing entrance from Bay and California Streets (Figure 3-1). The new loop trail will be improved to a decomposed granite surface about 6 feet wide running along the eastern embankment and connecting with the paved trail terminus in zone F. A new bridge will be constructed across the lagoon outlet to replace the present floating walkway. The existing floating walkway at the southeast corner of zone E will remain. The portion of the trail from the central floating walkway running northeast through the marsh and the riparian area will be mostly a raised wooden boardwalk with a bridge over the main open water channel and a short section of floating walkway (relocated from the lagoon outlet) near the western end of zone D. The raised wooden boardwalk through the west end of the riparian area (zone E) will be located out of view and a minimum distance of 75 feet from existing Shelter Lagoon residences, have railings, and a walkway surface elevation of minimum 9.0 feet msl to inhibit people from leaving the walkway and entering the riparian forest. The portion of the trail

through zone C will consist mostly of a raised board walk. The trail through zone C will be designed to meander through the area to provide large areas for riparian and grassland restoration (Figure 3-5). It will also be designed to permit year-round use, and discourage exit off the trail by use of railings and barriers. Portions of the trail segment through zone C may be constructed of decomposed granite with railings on a raised grade if year-round use can be maintained and disturbance of the grassland is minimized. Lockable gates will be installed at fenced crossings into zone C from Chestnut Street and Blackburn Street, the transition between zones C and D, and near the transition between the existing central floating walkway and the new raised boardwalk. The existing lockable gate leading onto the central floating walkway from zone F will remain. A paved pedestrian path will be constructed from the top of the stairs to the lower lagoon area in zone F to provide full access to the loop trail for pedestrians (Figure 3-7).

APPENDIX E

BUDGET REQUIREMENTS



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APPENDIX E

Budget Requirement

Table 4-1 "Implementation Plan" contained in Chapter 4 outlines 116 tasks within 10 areas of lagoon management. The attached Future Neary Lagoon Plan Budget Table (Table) lists 19 "projects" that will entail directly implementing 35 of the 116 tasks. This table will serve as a guide for budget and project scheduling during the next 5 years. To further understand the implications of performing all 116 tasks, the tasks can be divided into the following categories:

1. Twelve (12) tasks will be performed as part of another task.
2. Thirty-five (35) tasks will be funded and performed as shown on the attached Table.
3. Twenty-four (24) tasks are currently being performed by existing City staff.
4. Thirty-two (32) tasks will be performed at minimal cost, by either existing City staff or new staff (.e., Lagoon Manager), that are contained in the Table.
5. Nine (9) tasks only need to be performed, if a particular condition that does not exist now, occurs in the future.
6. Fourteen (14) tasks are not considered critical during the first five (5) years, and will be prioritized by the Lagoon Manager.

As shown above, a majority of tasks and all essential tasks will be implemented during the next five (5) years.

The City, the Parks and Recreation Department and the Lagoon Manager must be given flexibility in implementing the Neary Lagoon Management Plan. This is why Chapter 4 specifies three (3) levels of implementing task: 1) during first year; 2) within three (3) years; and 3) within five (5) year or as funding and staffing permits. The Table is more specific and clear on the cost and schedule of the key projects to be performed during the next five (5) years. The NLMP commits the City to implement the plan according to Chapter 4. This Appendix (including the Table) provides one schedule of how implementation can be accomplished. Changes to that schedule may occur as allowed by the criteria set forth in Chapter 4.

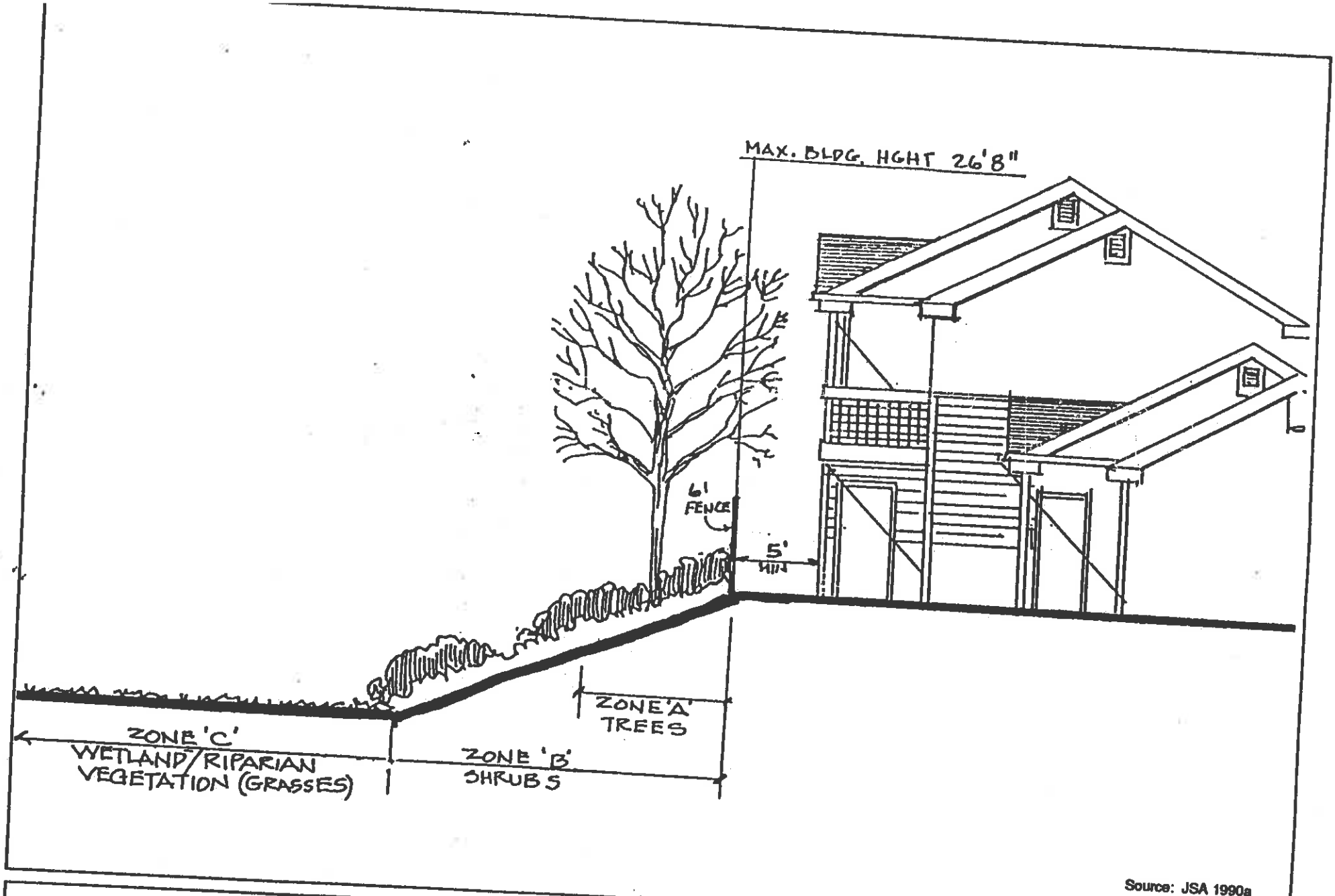
FUTURE NEARY LAGOON MANAGEMENT PLAN BUDGET TABLE

	FY 1992-93	FY 1993-94	FY 1994-95	FY 1995-96	FY 1996-97
Remove Marsh Vegetation (H2.3, WQ1.1, V1.1, 2.1, 5.1, WF5.2, M2.2, A1.1)	$45,000.00	$ -0-	$ -=0-	$ -0-	$ -0-
New NL P&R Staff Position (PU9.1)	$38,000.00	$55,000.00	$55,000.00	$60,000.00	60,000.00
H_2O Quality Testing(WQ3.1)	$ 4,000.00	$ 5,000.00	$ 5,000.00	$ 5,000.00	5,000.00
Install Staff Gauges(H5.1)	-0-	$ 1,000.00	-0-	-0-	-0-
Perform Flow Monitoriing (H5.2)	-0-	$ 1,000.00	-0-	-0-	-0-
Plant Riparian Habitat in Grassland (V6.3)	-0-	$ 8,000.00	-0-	-0-	-0-
New Fencing (V3.1, WF1.3, PU2.3, 4.4, 4.5, ML3.2)	-0-	$50,000.00	-0-	-0-	10,000.00
Design Loop-Trail & Entrance Facilities	-0-	$60,000.00	-0-	-0-	-0-
Construct Loop-Trail & Entrance Facilities ($600,000)					
Signage (PU4.1, 4.2, 4.3, 4.9)	-0-	-0-	$ -0-	$15,000.00	-0-
Chestnut Entrance (WF1.1, PU1.1)	-0-	-0-	150,000.00	-0-	-0-
Blackburn Entrance (WF1.1, PU1.2)	-0-	-0-	20,000.00	-0-	-0-
Loop-Trail (PU1.3, 2.2, 3.2, 3.3, 43)	-0-	-0-	350,000.00	-0-	-0-
Trail Look-outs (PU8.1)	-0-	-0-	50,000.00	-0-	-0-
Bridge (H2.2)	-0-	-0-	25,000.00	-0-	-0-
Gates (PU2.1)	-0-	-0-	5,000.00	-0-	-0-
Purchase Utility Vehicle				$ 15,000.00	-0-
Addition Maintenance Worker I				$ 50,000.00	$ 50,000.00
Part-time Maintenance Aide	$ 8,000.00	$ 8,000.00	$ 8,000.00	$ 10,000.00	$ 10,000.00
Additional Ranger Hours (PU4.6, 4.7)	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00	$ 10,000.00
TOTAL	$105,000.00	$198,000.00	$678,000.00	$165,000.00	$145,000.00

C:\1\950-20\Projects.CIP\NLHPTask.Tbl

APPENDIX F

FILL SLOPE REVEGETATION



Source: JSA 1990a

Figure 5. Detail of Figure 4

TABLE I

PLANTING LIST

NEARY LAGOON
BUFFER SCREEN

Species	Common Name	Native to Monterey Bay Region	Prefers or Requires Well-Drained Soil
Trees			
Alnus rhombifolia	white alder	yes	no
Lyonothamnus floribundis	Catalina ironwood	no	yes
Pinus contorta	beach pipe	no	yes
P. muricata	bishop pine	yes	yes
P. radiata	Monterey pine	yes	yes
Shrubs			
Arctostaphylos edmundsii	Little Sur manzanita	yes	no
A. hookeri	Monterey manzanita	yes	yes
Baccharis pilularis	Coyote bush	yes	no
Ceonothus griseus	Carmel creeper	yes	yes
C. maritimus	ceanothus	no	yes
Garrya elliptica	coast silktassel	yes	yes
Heteromeles arbutifolia	toyon	yes	yes
Mahonia pinnata	California holly-grape	yes	no
Myrica californica	California wax-myrtle	yes	no
Prunus ilicifolia	holly-leaf cherry	yes	yes
Rhamnus crocea ilicifolia	holly-leaf redberry	yes	yes
Rhus integrifolia	lemonade berry	no	yes

Notes: These plants were selected for their buffering ability, and possess characteristics such as dense foliage, stiff branches, and moderate spininess. All should tolerate the Santa Cruz climate. With the exception of the holly-grape, which prefers light shade, all prefer a sunny southern exposure. All of these plants are evergreen except the alder, which will screen poorly in winter. Soil preference/requirements are based on Schmidt[1] and Williamson[2].

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1 Schmidt, M. C. 1980. Growing California Native Plants. University of California Press, Berkeley.

2 Williamson, J. F. (ed.) 1986. New western garden book. Lane Publishing Company, Menlo Park, CA.

Source: JSA 1990a