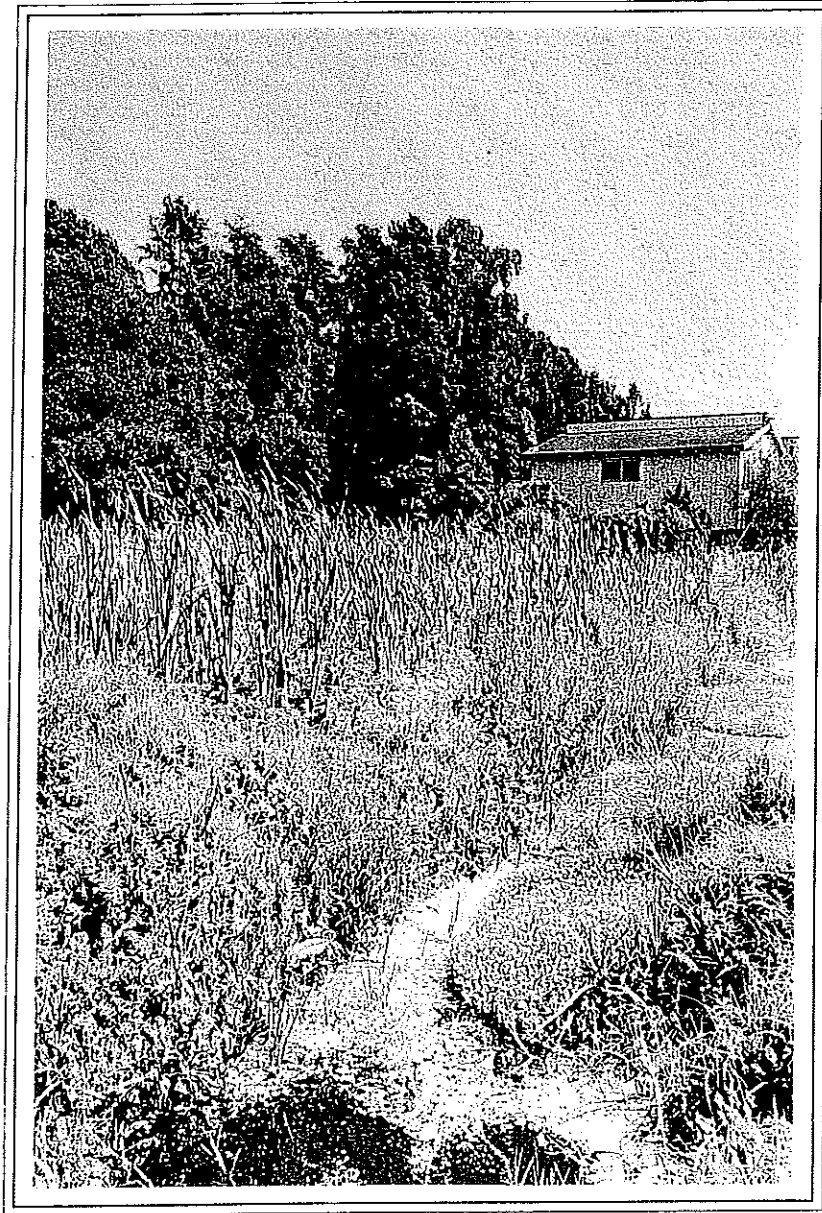


Jessie Street Marsh Management Plan Santa Cruz, California



R R M D E S I G N G R O U P
Habitat Restoration Group

P.O. Box 4006 • Felton, California 95018 • 831.335.6800

Jessie Street Marsh Management Plan

Santa Cruz, California

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CHAPTER 1 EXECUTIVE SUMMARY

INTRODUCTION

In the fall of 1997, the City of Santa Cruz began preparation of a management plan for Jessie Street Marsh. The City retained consultants in the fields of biology, hydrology, and land use planning to develop a long-term plan that would preserve and enhance the natural resources of the marsh, improve water quality, manage flood waters consistent with the protection of natural resources, and provide for public access and education in appropriate areas of the marsh. Data was collected on the marsh system and, with input from the public and City staff, a plan was developed that identifies specific management and enhancement actions to be implemented for the marsh. The plan addresses actions on publicly-owned lands within the marsh area and provides recommendations for voluntary actions on privately-owned lands adjacent to the marsh.

EXISTING PHYSICAL AND BIOLOGICAL RESOURCES

Jessie Street Marsh is located in the lower Ocean Street section of the City of Santa Cruz (Figure 1-1). The marsh is bound by the San Lorenzo River and levee system to the west and south, Broadway to the north, and the Branciforte Bluff to the east. Historically, the marsh was part of a large tidal estuary that was open to the San Lorenzo River and encompassed much of Lower Ocean Street and downtown Santa Cruz. Periodic sediment deposition and scour by the river, as well as tidal flows, formed a salt-brackish water marsh within the estuary. After the devastating flood of 1955, the San Lorenzo River levee system was constructed to prevent winter river flows from flooding the low areas of the City. The levee system blocked all river flood and tidal flows from entering the marsh and significantly limited water circulation. The marsh continues to receive freshwater from a natural spring, groundwater, and urban run-off;

however, sedimentation within the marsh plain, area development, and the spread of non-native plant species have significantly reduced the extent and diversity of the marsh ecosystem. A cattail-dominated freshwater marsh located between Barson Street and Lemos Avenue replaced a more ecologically valuable salt marsh that existed in the late 1970s. The marsh area downstream of Lemos Avenue, historically a wide salt-brackish marsh plain, has mostly been filled and reduced to a small, narrow drainage ditch (Figure 1-2).

Currently stormwater run-off from the surrounding residential areas is directed into the marsh through a series of storm drains and drainage ditches. The stormwater from Jessie Street Marsh is directed into the San Lorenzo River by gravity or by a pump at Bixby Street when the San Lorenzo River is high. The drainage ditches and pumping system are ineffective in draining urban run-off such that street flooding in the Jessie Street area is a severe problem during most rain events.

The current ecological condition of Jessie Street Marsh is substantially degraded as land use activities over the past 40+ years have altered tidal influences, freshwater flows, and most of the historical habitat of the marsh plain. While the marsh is degraded and has far less ecological value than historically, an opportunity exists to enhance, manage, and restore what are now relatively rare estuary habitats in the Santa Cruz area.

MARSH MANAGEMENT PLAN

The management plan proposes to create a combination of salt and freshwater habitat within Jessie Street Marsh. The project area would be modified to allow for increased tidal exchange with the San Lorenzo River and the creation of a salt/brackish marsh between the river and Lemos Avenue. A new slide gate at the San Lorenzo River would be installed to allow tidal exchange between the marsh and the river during non-storm periods. There would also be some

exchange of freshwater with the river when the summer lagoon is in place. A portion of the area downstream of Lemos Avenue would be re-graded to create low marsh plain habitat. Spring freshwater would continue to enter the upper marsh area at Barson Street. Combined with some winter stormwater, the upper marsh will be retained as a freshwater cattail marsh. The area will be enhanced by creating more open water areas and buffers to adjacent land uses.

This plan provides an opportunity to maximize the biodiversity of the marsh areas and significantly enhance wildlife resource values. Both salt/brackish marsh species (e.g., shorebirds) would be expected to utilize open mudflats of the lower marsh, while freshwater marsh species (e.g., waterfowl) would utilize the upper marsh area. The diversity of habitat types will provide several opportunities for natural history interpretation and passive recreation; thereby, meeting the project goals. Constraints to this option include the cost of installing a new slide gate at East Cliff Drive, temporary disruption to traffic patterns during replacement of the slide gate (East Cliff Drive), and impacts to existing wetland habitats during project grading.

The plan also includes measures to provide safe pedestrian use of the upland areas, passive enjoyment of the restored marsh, and increased public safety. Pedestrian access to Ocean View Park will be improved by constructing a raised boardwalk and stairway system connecting Lemos Avenue area and the park. The improved pathways, implementation of formal hours of public access, and periodic patrols by park rangers will improve public safety of the area.

The native marsh and upland vegetative communities will be enhanced by removing invasive, non-native plants, and revegetating degraded areas. Areas between the marsh and adjacent residential areas will also be planted with vegetation to screen and buffer the two land uses.

COORDINATION WITH STORM DRAIN IMPROVEMENT PROJECT

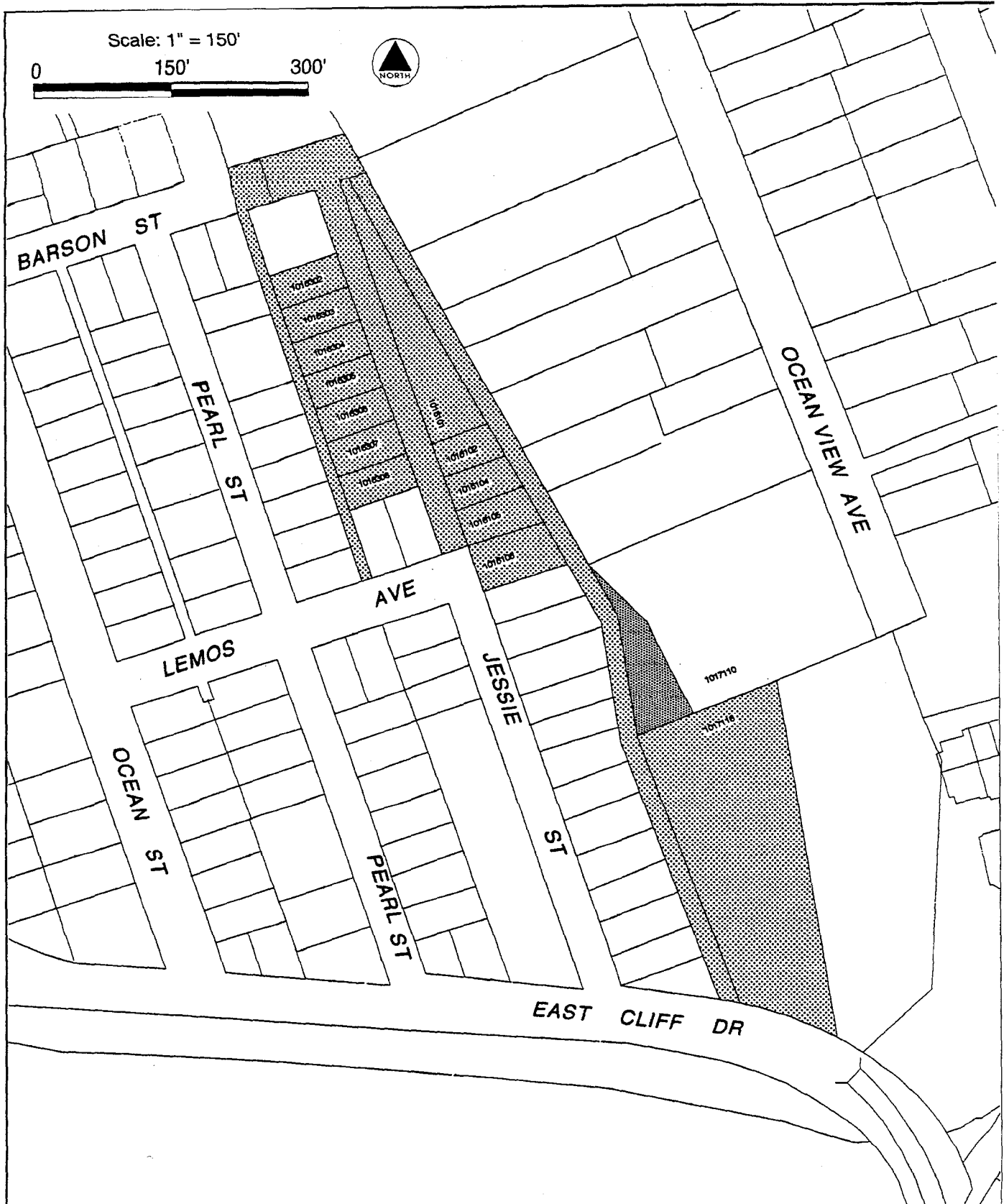
The Jessie Street Marsh Management Plan incorporates plans by the City of Santa Cruz Department of Public Works to improve the street storm drain system for the Ocean Avenue, Barson Street, and Jessie Street Marsh area. The current storm drain system drains approximately 50.4 acres from Ocean View Avenue/Broadway to the east and north and lower Ocean Street to the west. All of this storm water drains to the head of Jessie Street Marsh at the east end of Barson Street. The run-off flows into and through Jessie Street Marsh to a gravity drain/flap gate and to the Bixby Street pump system at the San Lorenzo River. The current drainage to Jessie Street Marsh is much more concentrated than existed prior to construction of the San Lorenzo River levee system when run-off was dispersed over a larger area. As mentioned above, street flooding in the Lower Ocean Street/Jessie Street Marsh system is a chronic problem during moderate rainstorms. Although some improvements were made this winter by dredging the inlet to Jessie Street Marsh, using the present Jessie Street Marsh ditches to convey stormwater run-off will not resolve the flooding problems.

Three major storm drain improvement options were considered by the Jessie Street Marsh Management Plan project team and City of Santa Cruz Public Works Department in relation to the potential impacts or benefits to the Jessie Street Marsh. The preferred project involves routing approximately 35.7 acres of the 50.4 acre Jessie Street Marsh drainage area to a new storm drain constructed under Ocean Street. Flows from the 35.7-acre area would bypass Jessie Street Marsh and flow into the San Lorenzo River at the Bixby Street pump station. Under normal operations, the new storm drain would reduce the stormwater run-off area to Jessie Street Marsh to 14.7 acres including the bluff bounding the east side and the north end of Jessie Street. An operational provision to temporarily block a storm drain junction box at Ocean and Barson Streets would

be included in the plan. This would allow for the diversion of an additional 13.3 acres to the marsh during drought periods. Spring flow from the Branciforte Bluff to the marsh, an important freshwater supply in late summer and fall months, would not be affected by this storm drain option. Improved circulation of backwater from the San Lorenzo River Lagoon would occur through replacement of the flap gate at the Jessie Street Marsh outlet with a slide gate. The slide gate would allow for greater water exchange between the river's freshwater lagoon (in the summer months) and greater salt-water exchange with the river during the winter and spring months (when the river is open to the ocean). This plan would alleviate the need for storm water-related maintenance access and actions in Jessie Street Marsh; all actions would be for ecological and/or recreational needs, as specified in the Jessie Street Marsh Management Plan.



Figure 1-1
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Jessie Street Marsh Management Plan
Study Area

Figure 1-2
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CHAPTER 2 INTRODUCTION

PURPOSE OF MANAGEMENT PLAN

The purpose of the Jessie Street Marsh Management Plan is to identify actions and measures to preserve and enhance the natural resources of the marsh, improve water quality, manage flood waters consistent with the protection of natural resources, and provide for public access and education in appropriate areas of the marsh. The plan indicates specific management and enhancement actions to be implemented on publicly-owned lands within the marsh area and offers recommendations for voluntary actions on privately-owned lands adjacent to the marsh (Figure 2-1).

The plan recommends specific actions to enhance wetland resources on City-owned lands. As these resources are identified in the City of Santa Cruz General Plan and Local Coastal Program, the plan was developed by the City of Santa Cruz Parks and Recreation and Public Works Departments with the assistance of a City-selected consultant team.

GOALS AND OBJECTIVES

The goals of the Jessie Street Marsh Management Plan are derived from the City of Santa Cruz General Plan and Local Coastal Program and input from City staff, the public and the project consultants.

Goals of the Management Plan

- Preserve, enhance, and restore the natural resource values of the marsh and adjacent upland areas to maximize biological resource values.
- Reduce the impacts of human activities (including water quality, sedimentation, and erosion) on the marsh resources.

- Provide passive recreational uses of the marsh and adjacent habitat where compatible with natural resource management and adjacent land uses.
- Increase surface water exchange between the marsh and the San Lorenzo River.
- Develop Best Management Practices (BMP's) for the marsh and immediate vicinity.
- Provide natural resource interpretation for the residents of, and visitors to, the Jessie Street Marsh area.

Objectives of the Management Plan

The objectives of the Jessie Street Marsh Management Plan are the derived measurable results of implementing the goals. The following objectives have been developed for the plan:

Biological Objectives

- Evaluate the benefits, costs, and feasibility of increasing salt/brackish and/or freshwater marsh habitats.
- Examine the benefits, costs, and feasibility of maximizing water exchange with the San Lorenzo River.
- Manage habitat in the marsh in a manner conducive to maintaining or enhancing wildlife values.
- Where possible, create buffers between existing urban land uses and the marsh habitats.
- Revegetate barren and degraded areas with native plant species to enhance botanical and wildlife resources.
- Control and/or eradicate invasive, non-native plant species from sensitive marsh areas.
- Minimize opportunities for invasive, non-native plant species to establish in and around sensitive marsh areas.
- Evaluate methods to control deter pets, feral animals, and other non-native animals (from entering the marsh habitats).
- Maintain the local gene pool of native vegetation by planting primarily locally native species and managing the marsh area to

support their establishment and survival. Wherever possible, use locally obtained seeds and plant propagules.

Hydrology and Water Quality Objectives

- Improve urban stormwater facilities to protect/enhance the water quality of the marsh.
- Minimize sedimentation and soil erosion through the use of vegetation and other surface erosion control measures.
- Manage water exchange between the marsh and the San Lorenzo River in a manner conducive to both natural resource management and flood control.
- Develop a monitoring program to evaluate the success of this program.
- Evaluate the need to control water levels, and salinity, in the marsh.

Public Access and Education

- Encourage citizen involvement and participation in the planning and implementation phases of the marsh management plan.
- Enhance public access to the marsh and provide a pedestrian linkage with Ocean View Park.
- Evaluate opportunities for passive enjoyment and environmental education within the marsh.
- Minimize public safety hazards and encourage safe public access to the marsh consistent with maintaining natural resource values.
- Provide interpretive information to marsh visitors to enhance their understanding of marsh ecosystems.
- Provide fencing, gates, signs, or other measures to limit and control public access in and adjacent to sensitive habitat areas.

RELATIONSHIP WITH CITY GENERAL PLAN AND LOCAL COASTAL PROGRAM

The City of Santa Cruz's General Plan and Local Coastal Program (LCP) guide development within the coastal zone of the City. As Jessie Street Marsh lies within the coastal zone, several

policies within the LCP relate to management of the marsh's resources. A summary of these policies in relation to resources at Jessie Street Marsh is presented below; please refer to the City's General Plan and LCP for exact wording.

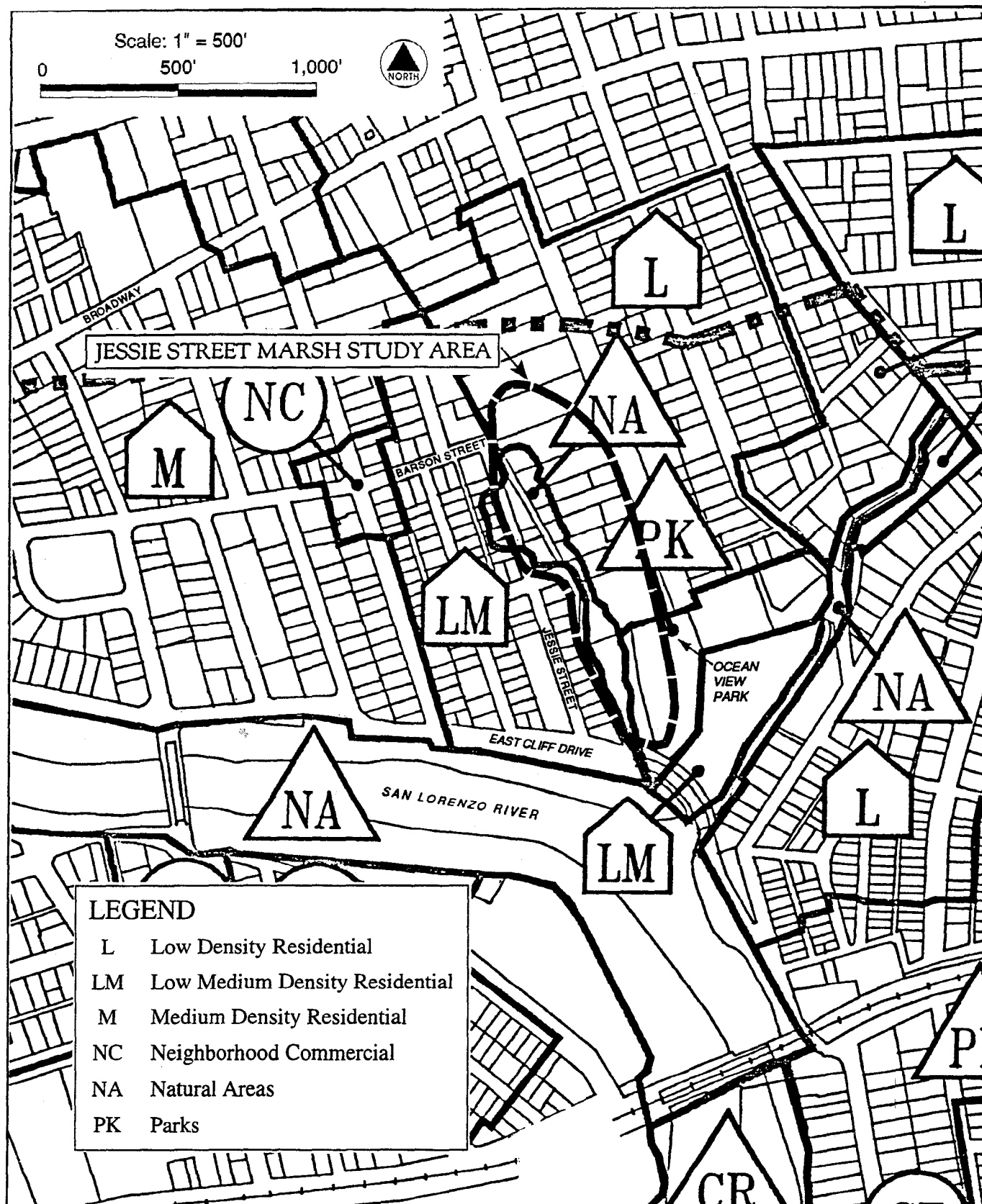
- Preserve and enhance the character and quality of riparian and wetland habitats (Policy 4.2).
- Develop, adopt, and implement management plan for City-owned wetland and riparian areas, including Jessie Street Marsh (Policy 4.2.1).
- Prohibit uses (e.g., construction, grading or removal of vegetation) within riparian and wetland resources and buffer areas and allow permitted uses (e.g., habitat preservation and restoration) consistent with adopted management plans (Policy 4.2.2.3).
- Minimize increased run-off into riparian and wetland areas unless biological evaluation recommends increased inflows (Policy 4.2.3).
- Preserve riparian and wetland vegetation by minimizing removal and allowing only for uses dependent on the resources, passive recreation, and maintenance uses according to adopted management plans (Policy 4.2.4).
- Protect and minimize the impact of development on bird, fish, and wildlife habitat in and adjacent to waterways (Policy 4.2.5).
- River or stream alteration must be consistent with the natural characteristics of the stream and limited to those necessary for flood control and habitat improvement projects (Policy 4.2.6).
- Preserve the character and quality of grassland habitat by minimizing disturbance and removal of native grasslands and design landscaping to provide a natural buffer (Policy 4.3).
- Preserve the character and quality of brush and eucalyptus habitats where they are an integral part of the community or habitat (Policy 4.4).
- Protect monarch butterfly overwintering sites and ensure adequate buffering of these sites from development (Policy 4.5.3).

- Encourage the restoration of native vegetation and other revegetation efforts in areas where plants or habitats are degraded (Policy 4.6).
- Minimize the impact of grading and filling on plant and animal life (Policy 4.7).

Other planning documents also affect land use decisions and development within sensitive environmental areas of the Jessie Street Marsh (i.e., the San Lorenzo River Enhancement Plan and the city's stormwater plan).

EXISTING POLICIES AND REGULATIONS

Land use activities within the Jessie Street Marsh are subject to regulations by several agencies. The City of Santa Cruz is the primary land use authority which regulates development-related activities within the marsh and surrounding areas; however, other agencies may be involved depending upon the location, activity, and resources involved. Other agencies may include: California Coastal Commission (CCC) (permit within tidal and wetland areas); California Department of Fish and Game (CDFG) (streambed alteration agreements, permits relating to State-listed plants and animals); U.S. Fish and Wildlife Service (USFWS) (relating to Federally-listed plants and animals); Regional Water Quality Control Board (RWQCB) (discharges into water bodies); NOAA Monterey Bay Sanctuary (discharges into Monterey Bay); and U.S. Army Corps of Engineers (COE) (fill within jurisdictional wetlands or other Waters of the U.S.).



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Jessie Street Marsh Management Plan
Land Use Designations

Figure 2-1
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CHAPTER 3 HISTORICAL PERSPECTIVE

INTRODUCTION

Jessie Street Marsh has experienced dramatic hydrologic and biological changes since the introduction of European-style land uses in the middle 1800's. These changes were aimed at draining land for agriculture and town development, which counteracted the natural hydrologic forces that originally formed the marsh habitats.

PRE 1850's

Historically, Jessie Street Marsh was part of a large tidal estuary that was open to the San Lorenzo River and encompassed much of what is now Lower Ocean Street and downtown Santa Cruz. Periodic sediment deposition and scour by the river, as well as tidal flows, formed a salt-brackish water marsh within the estuary. Freshwater flows into the marsh were tied to the seasonal occurrence of rainfall combined with perennial spring flow from the Branciforte Bluff area. The marsh probably also received some inundation by freshwater during the summer from a river lagoon.

Although little information is available regarding early biotic conditions specific to the Jessie Street Marsh area, there are many accounts and archeological reports that describe conditions of Santa Cruz in general. From these descriptions and knowledge of local indigenous peoples, it is possible to build a picture of early historical faunal and human conditions in the vicinity of the marsh. Current scientific knowledge suggests that the first native peoples migrated into the Santa Cruz region between 8,000 and 12,000 years ago. Jessie Street Marsh is within the area historically occupied by people known as the Ohlone (Gordon 1987; Margolin 1978). Spanish explorers as early as the late 1500's wrote accounts of the indigenous people, their daily practices as well as the predominant flora and fauna. Wetlands stretched over lowland areas

near the bay with wooded streambanks and redwood dominated hillsides. Until the time of early Anglo occupation, accounts of tule elk, wolves, pronghorn antelope, bald eagles, and California condors were common.

The Ohlone subsisted on carefully maintained edible plants. The Ohlone people practiced land management and harvesting techniques that resulted in the proliferation of edible plant species and botanical products. Their diet was commonly supplemented with game (e.g., antelope, deer, elk) and a wide variety of sea and land birds. It is expected that the Ohlone people utilized the San Lorenzo River estuary for food gathering and hunting.

Substantial biotic changes began to take place within the San Lorenzo River estuary with the settlement of Spanish missionaries and large ranching families in the late 1700's. Land was cleared in 1791 for the Santa Cruz Mission and ranchos were established for agriculture and cattle ranching. Soon thereafter, large native animals (e.g., grizzly bear, tule elk and antelope) were hunted for food and sport and, over time, were extirpated from the lower San Lorenzo River ecosystem.

1850 - 1955

The alteration of wetlands and riparian areas was underway in the Santa Cruz region in the late 1800's and early to mid 1900's. This occurred as agricultural land uses dominated the river flood plains and estuaries. Following 1848, when California became part of the United States and the subsequent discovery of gold in the state, the Santa Cruz area began to grow with businesses, farms, and dairies. The town of Santa Cruz had begun to spread out over the floodplain of the San Lorenzo River as depicted in Figure 3-1. In 1853, the Jessie Street Marsh area was still in its natural state, yet agriculture was evident along the coastal terrace (known as Ocean View Avenue (Figure 3-1). Residential housing extended across both sides of the river,

reaching levels similar to current conditions by the 1950's.

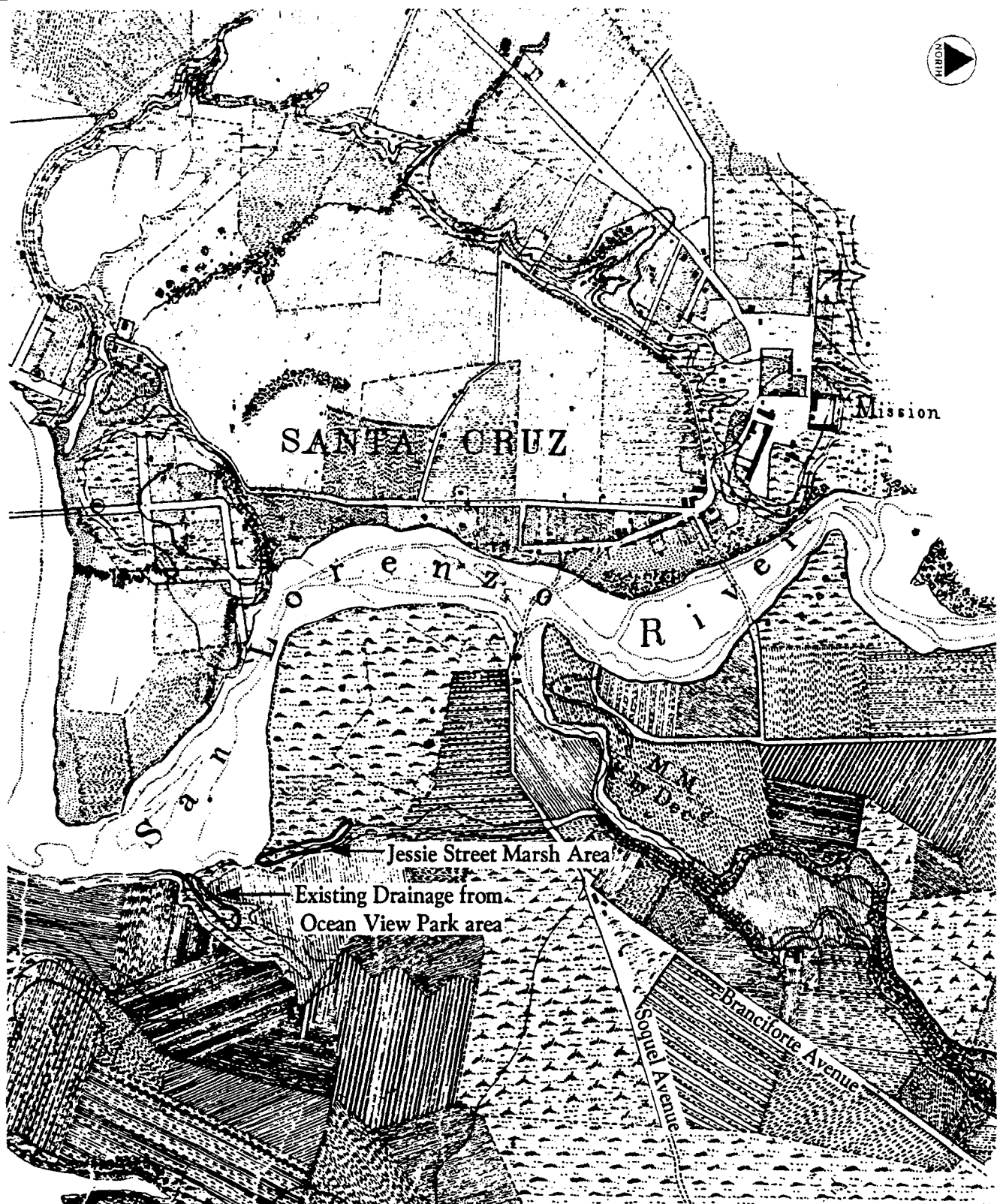
Periodic floods continued to inundate the central portion of the City and the surrounding floodplain areas, culminating in a particularly large flood in 1955. This flood inundated all of downtown Santa Cruz and outlying floodplains with several feet of floodwaters.

1955 - PRESENT

After the flood of 1955, the San Lorenzo River levee system was constructed to prevent winter river flows from flooding the low areas of the City. The levee system blocked all river flood and most tidal flows from entering Jessie Street Marsh and significantly limited water circulation. The marsh continues to receive freshwater from a natural spring, groundwater, and urban run off; however, sedimentation within the marsh plain, area development, and the spread of non-native plant species have significantly reduced the extent and diversity of the marsh ecosystem.

A cattail-dominated freshwater marsh, located between Barson Street and Lemos Avenue, replaced a more ecologically valuable salt marsh that is believed to have existed in the late 1970's (Figure 3-2). The marsh area downstream of Lemos Avenue, historically a wide salt-brackish marsh plain, has mostly been filled with sediment and other fill and is now a small, narrow ditch with remnant salt-brackish water marsh species (Figure 3-3).

Currently stormwater run-off from the surrounding residential areas is directed into the marsh through a series of storm drains and drainage ditches (Figure 3-4). The drainage ditches and pumping system are ineffective in draining urban run-off such that street flooding in the Jessie Street area is a severe problem during most rain events.



Source: Santa Cruz County Place Names

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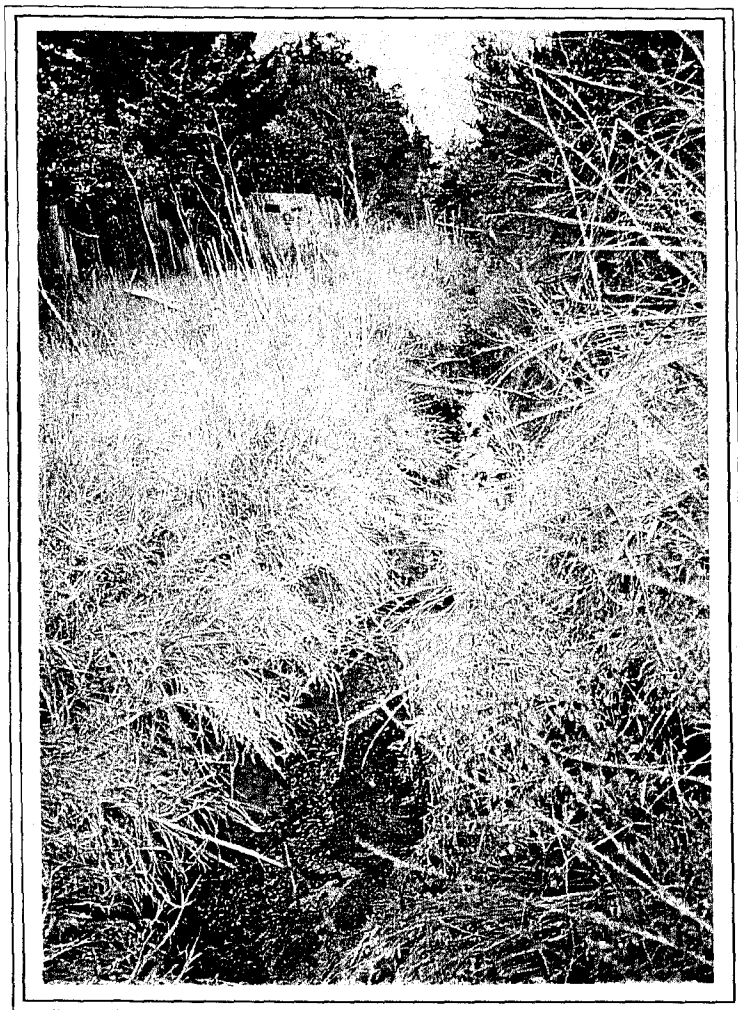
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Jessie Street Marsh Management Plan
Santa Cruz in 1853

Figure 3-1
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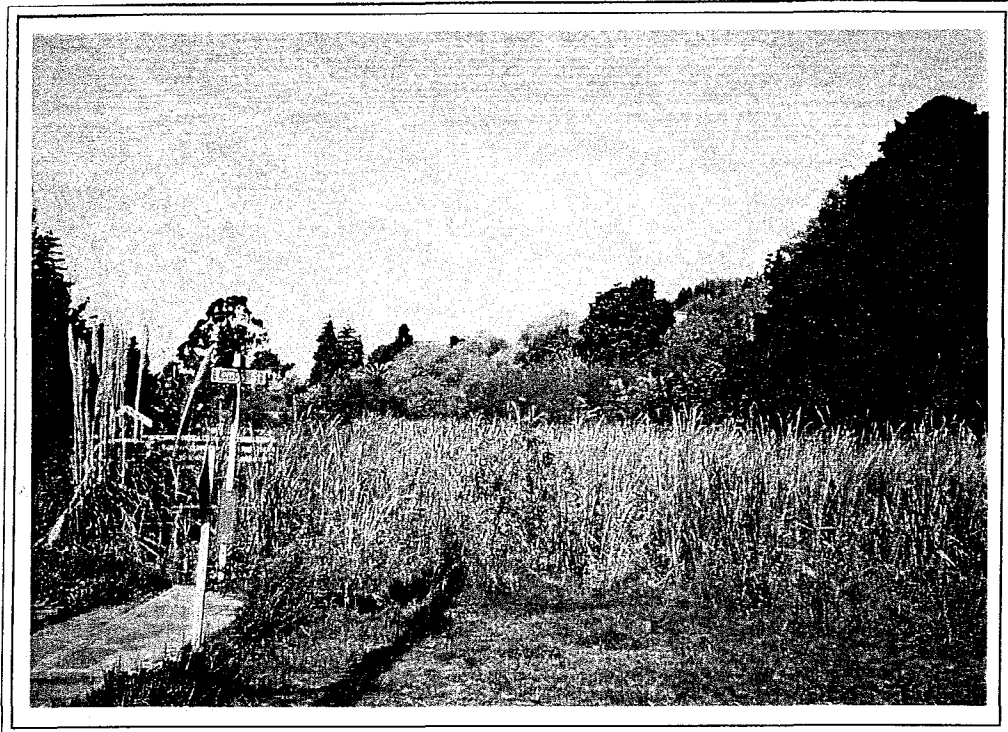
Figure 3-2. View of upper portion of Jessie Street Marsh (between Barson Street and Lemos Avenue) in 1977. Note the drainage ditches along both sides of the marsh plain.



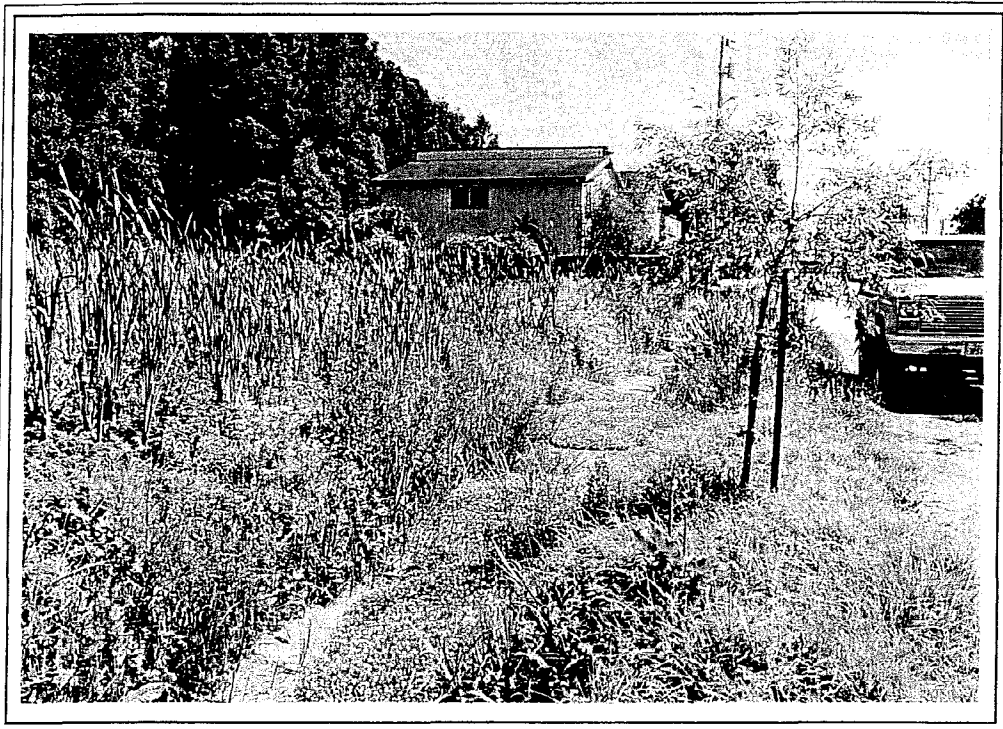
View of lower portion of Jessie Street Marsh (Between Lemos Avenue and East Cliff Drive) in 1997. Note the drainage ditch and remnant brackish marsh vegetation.



Existing path near eucalyptus grove.



View of upper marsh from Lemos Avenue. Note cattails in foreground and riparian and oak woodland along hillside.



View of upper marsh drainage ditch near Lemos Avenue.

CHAPTER 4 GEOLOGY AND HYDROLOGY RESOURCES

INTRODUCTION

The hydrology and geomorphology of Jessie Street Marsh and modifications by human activities are essential factors in the current condition of the marsh and the opportunities to enhance its biological resources. Hydrology is the study of the distribution of water on the earth's surface and subsurface and is a key factor in the quality, type, and character of plant communities and wildlife habitat. Geomorphology is the study of the earth's landscape and the on-going processes of erosion, sedimentation, and soil development that form the surface of the earth. Biological processes (e.g., vegetative growth and water consumption) by plants have important influences on hydrology, soil development, and geomorphic evolution of marsh systems. Land use changes (e.g., urbanization and construction and operation of flood and drainage control facilities) are great influences on hydrology and geomorphic processes. This chapter addresses the physical processes of Jessie Street Marsh and their influence in marsh ecosystem health and management.

SETTING

Jessie Street Marsh consists of about 3.0 acres of salt, brackish, and freshwater marsh situated at the southeastern edge of the San Lorenzo River Floodplain within the City of Santa Cruz. The marsh is situated within a narrow corridor between a dense residential neighborhood to the west and a steep bluff to the east. The marsh consists of a marsh plain with predominately cattail, willow, scrub, and grasses, and a drainage ditch channel that flows from Barson Street southward to East Cliff Drive. The marsh drains into the San Lorenzo River through a pipe buried beneath East Cliff Drive and the flood control levee along the San Lorenzo River. The Branciforte Bluff bounds the marsh to the east, and residential developments bound to the west

and north. Elevations within the marsh range from 1.0 feet above sea level in the lowest points in the channel, between 3.0 to approximately 6.0 feet above sea level (MSL) on the marsh plain. The Branciforte Bluff rises to the east of Jessie Street Marsh to elevations over 60.0 feet above MSL. The residential neighborhood of Lower Ocean Street has elevations ranging between 4.5 feet to over 10.0 feet above MSL.

Watershed Area

The Jessie Street Marsh Watershed (Figure 4-1) encompasses approximately 54.0 acres and includes much of the densely developed urban lands of lower Ocean Avenue/Barson Street area to the northwest, and Jessie Street and Lemos Avenue to the west. Ocean View Avenue drains northward toward Broadway before flowing westward down Broadway to Ocean Street then southward to Barson Street and north Jessie Street then into the Jessie Street Marsh. The Ocean View Avenue/Broadway area comprises approximately 13.0 acres and has mostly dense urban cover. Approximately 14.7 acres of watershed area includes: run-off flowing down North Jessie Street (which drains the north end of the Branciforte Bluff, including the Roosevelt Terrace development and the rural residential area east of the north Jessie Street), and the rural residential properties on the Branciforte Bluff from Ocean View Avenue to Jessie Street Marsh.

Geologic History

The geology underlying Jessie Street Marsh and its watershed includes recent alluvium of the southern eastern edge of the San Lorenzo River flood plain and recent channel, floodplain, and marsh deposits from the San Lorenzo River. These alluvial deposits occurred prior to urban development (which began in the mid-19th century) and construction of the levee system in 1955.

In the pre-development geomorphic environment, Jessie Street Marsh was part of a large estuary system that extended across the San Lorenzo River floodplain from Neary's Lagoon

to the west and downtown Santa Cruz to the northwest. The bluffs bounding the San Lorenzo River flood plain consist of ocean wave cut terraces of hardened sandstones and mudstones bedrock of marine origin, overlain by a younger layer of recent alluvium (unconsolidated stream deposits of gravels sands and muds). Jessie Street Marsh and the San Lorenzo River floodplain were formed over the past 12,000 years.

Between the end of the last glacial period and a point in time about 6,000 years ago, a 300 foot rise in sea level occurred in response to melting ice caps. This rise drowned the valley between the Branciforte Bluff and the bluff that bounds the westside of downtown Santa Cruz forming an embayment. The area between Beach Hill, a knob of bedrock and Jessie Street Marsh and San Lorenzo Point, would have been an inlet. As the rate in the rise in sea level leveled about 6,000 years ago, sediments from the San Lorenzo River Watershed began to fill the embayment and eventually formed the flood plain and estuary that now underlies much of downtown Santa Cruz and lower Ocean Street. As the flood plain, estuary, and associated marshes formed near present sea level over the past several thousand years, the San Lorenzo River channel migrated across the valley floor (an old abandoned oxbow channel occurs north of Neary Lagoon and lower Laurel Street). From about 6,000 years ago, the Jessie Street Marsh area was subject to the geomorphic processes associated with flooding of the San Lorenzo River including scour and creation of densely vegetated flood plain through fine sediment deposition. Erosion and sediment deposition also occurred as the result of tidal circulation in the estuary. Periodic destruction of flood plain and marsh areas of the estuary occurred by lateral erosion and lateral movement by the San Lorenzo River channel. These processes continued until settlement by Europeans began to alter the landscape in the mid-19th century.

Land Use History

When Friar Francisco Palou came upon an undeveloped Santa Cruz in 1774, 30 years prior to the Lewis and Clark expedition, he recorded the following:

"... (We) came to the San Lorenzo River, which is quite large and has a wide bed, the water reaching to the stirrups. The banks are well covered with cottonwoods, willows, alders, little poplars and other trees and near the ford, close to the hills it has much timber and groves of redwoods.

"This sites is fitted not merely for a town, but for a city. Nothing is lacking to it. It has good land, water, pasture, firewood and timber all at hand and in abundance. It could be established a quarter league from the beach with all of these advantages."

The earliest map of Jessie Street Marsh was drawn in 1853 (Figure 3-1). It shows a small narrow body of water with a channel connecting it to the San Lorenzo River to the south. The channel is shown as being above the mean tide level line shown in the river channel. In the area of lower Ocean Street, Jessie Street Marsh, is shown as marsh vegetation with patches of cultivated lands to the west and north. The pond appears to be a slough that was created by scouring along the bedrock bluff during a large flood on the San Lorenzo River. The depiction suggests that Jessie Street Marsh was a mixed freshwater and saltwater system with a high potential for perennial spring flow from Branciforte Bluff. There appears to be little disturbance or land-clearing reclamation activities. The 1853 map shows Jessie Street Marsh as part of a much larger marsh system that encompassed most of lower Ocean Street from the San Lorenzo River to the Branciforte Bluff.

A later 19th century drawing of Santa Cruz (Figure 4-2) shows greater land development (a house is shown west of the present location of the Bixby and Barson Streets intersection) and

Jessie Street Marsh appears as marsh plain with a darker-shaded swale. There is no pond in this later drawing. The swale also has a different position than the pond shown in the 1853 map. The swale extends from the north bank of the San Lorenzo River at about the point where Bixby Street meets San Lorenzo Boulevard, northeastward across Ocean Street to the point where the present Soquel Avenue climbs the Branciforte Bluff east of Ocean Street. This shows that the northern end of the Jessie Street Marsh Watershed extended to the intersection of Ocean Street and Soquel, just south of Branciforte Creek.

The first half of the 20th century brought the development of small summer beach cottages in lower Ocean Street. This development included filling and reclaiming much of the original marsh and estuary. Jessie Street Marsh was reduced in size and piped under East Cliff Drive. A photograph taken around the 1940s shows most of the lower Ocean Street neighborhood in place, a pipe outlet for Jessie Street Marsh under East Cliff, and a fenced marsh/meadow without lower Jessie Street or the line of houses that were built in the 1970s. The historical maps and photographs indicate that Jessie Street Marsh was connected to the San Lorenzo River through at least an open pipe until 1955 when the levee was built and a flap gate and pump system was installed.

The levees along the San Lorenzo River were constructed shortly after the December 1995 flood. This flood caused heavy damage to Santa Cruz. The levee project included dredging the San Lorenzo River channel and fitting the outlet of Jessie Street Marsh with a flap gate. The flap gate allowed periodic outflow but did not allow flow from the river to Jessie Street Marsh. The channel subsequently filled with sand, which blocked the flap gate. An overflow system was constructed behind the levee system and between the outlet of Jessie Street Marsh and a pump station at Bixby Street to the west. The levee drainage system ended tidal flows and most saltwater circulation into Jessie Street Marsh.

Between 1955 and 1980, more fill and housing developments covered the marsh area. Houses were constructed along lower Jessie Street in former marsh plain. About 6,000 yards of fill was placed in the lower end of the marsh for a housing development in the 1980s. These last two reclamation projects confined the Jessie Street Marsh channel to a small corridor about 30 feet wide. In addition, backyard fences along Jessie Street decreased the width of the marsh by half its former width.

Present Hydrologic Conditions

Historic marsh reclamation and flood and drainage control efforts have dramatically reduced the variety of hydrologic processes that formed the original site. Saltwater only enters the marsh by leaking through the flap gate outlet and this only extends a short distance into the marsh. Most flow entering Jessie Street Marsh comes in as storm run-off from the 54.0 acres of predominately urban watershed land. Winter storm run-off events mostly occur between October and April. The mean annual precipitation falling between these months is about 28.0 inches. Street run-off and storm drains empty into Jessie Street Marsh at Barson Street. Flow continues down the partially excavated/partially filled drainage ditch in Jessie Street Marsh until entering the 12-inch pipe at East Cliff Drive. This pipe was set with a flow line elevation of 1.6 feet above MSL. The 12-inch pipe flows into a concrete junction box just behind the levee. From the junction box, an overflow weir spills into a ditch that flow westward to the Bixby Street pumping station. A 56-inch pipe attached to the south side of the junction box continues under the levee to the levee crown where an inoperable slide gate is fitted. The 56-inch line continues under the levee and daylights at the river and flap gate with a flow line elevation of -2.0 feet MSL.

Another important water source is spring flow generated along the Branciforte Bluff at the contact between the unconsolidated alluvium and the older bedrock that is less permeable. Jessie Street Marsh appears to capture most

spring flow that emits from the Bluff at various locations up to Broadway.

Future Hydrologic Conditions

Due to persistent flooding in the lower Ocean Street area, the storm drain system will be modified by the City Public Works Department in 1998 when a new storm drain is constructed under Bixby, Ocean, and Barson Streets (Figure 1-3). The new storm drain will service 36 acres of the Jessie Street Watershed (Areas A, B, C, D, F, G, and I), bypass the marsh, and direct run-off into the Bixby Street pump station. The remaining watershed (14.7 acres shown as Area E on Figure 4-3), as well as perennial spring flow, will continue to provide run-off directly to Jessie Street Marsh. An operation contingency has been incorporated into the storm drain plan that allows for the diversion of up to 13 additional acres of Area D to supplement drainage area should water supply to the marsh under drought conditions prove inadequate.

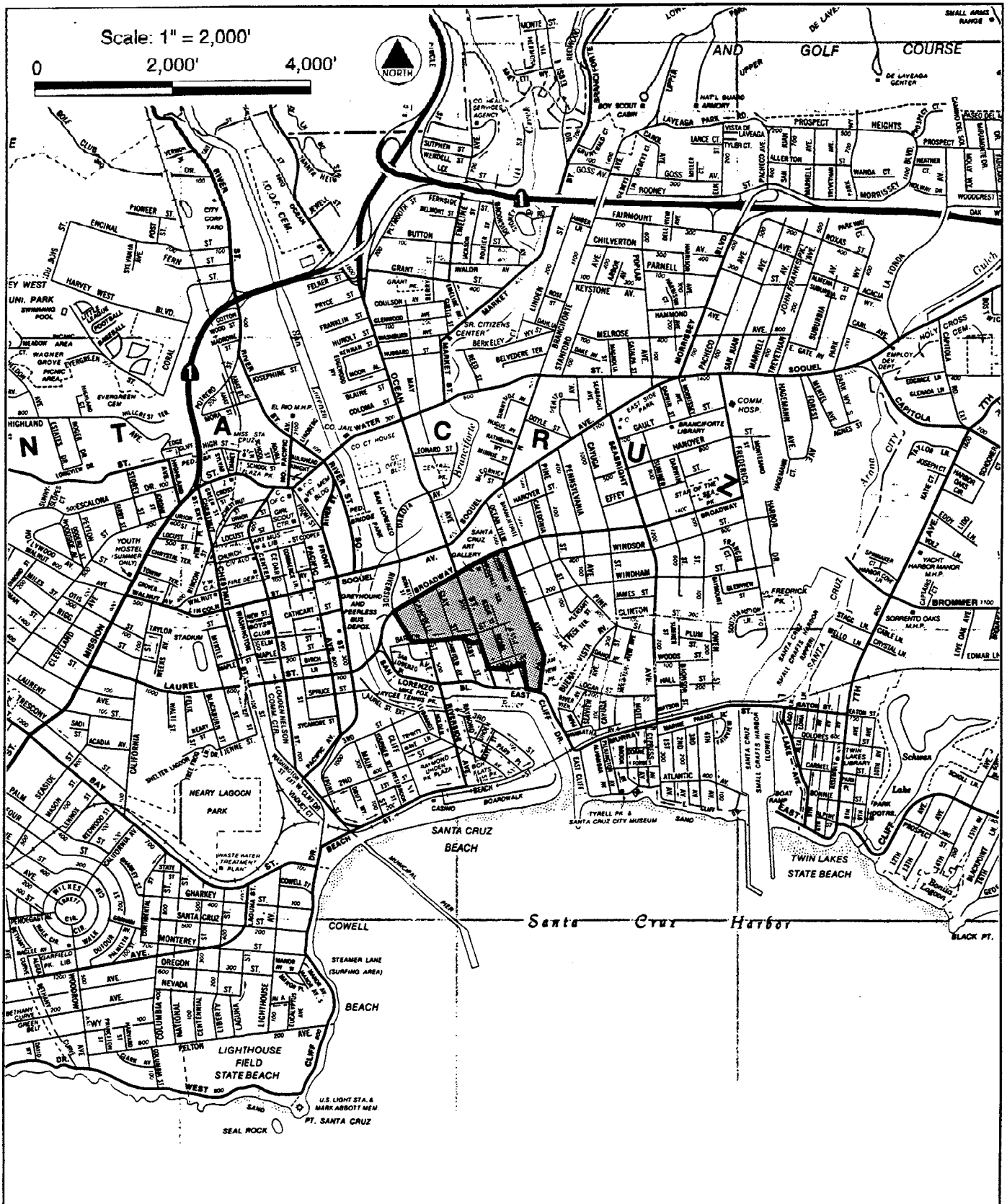
Area D would be diverted by moving a culvert plug inside a junction box under the Ocean and Barson Street intersection (Figure 4-3).

Hydrologic modeling was performed to estimate the run-off from the watershed with the 1998 storm drain project and conditions with and without diversion of the additional 13 acres. The U.S. Army Corps of Engineers HEC-1 rainfall run-off computer simulation model was used to estimate storm run-off during drought conditions when water supply would be critical. Drought conditions were defined as water years (October 1 to September 30) when annual rainfall was less than 22 inches or 75% of normal. In these years, daily rainfall maximums were 1.5 inches or less. In order to measure the effect of the diversion of Area D, the SCS curve number method was used in HEC-1 modeling. Run-off curves are selected by soil and watershed cover characteristics. Rainfall data was taken from the City of Santa Cruz's storm drain design manual and daily rainfall records. The SCS curve numbers were also calibrated to match the calculations used by City Public Works staff to design the storm drain project,

and to "dry", "normal" and "wet" antecedent moisture conditions. The results of the modeling are shown in Figure 4.4.

The "calibrated" and "dry" conditions were closely matched suggesting that the long duration of the storm, 1.6 inches in six hours, was low enough to be absorbed into soils. With normal and wet conditions, the addition of Area D to the post-storm drain project Jessie Street watershed area "E" resulted in over a doubling of run-off volume, which could be significant under drought circumstances (see discussion below in next paragraph). Modeling incorporating Areas, A, B, C, and D into the diversion show significant increases in run-off volume for normal and wet antecedent moisture conditions.

The post-Ocean/Barson storm drain project hydrology will provide less run-off than the pre-project condition. However, improvements of the marsh channel and the connection to the San Lorenzo River lagoon (i.e., removal of flap gate and operation of slide gate) will greatly improve water circulation between the marsh and lagoon and brackish and salt marsh hydrology. The improvements to the Jessie Street Marsh outlet works will allow for greater flexibility in controlling marsh water levels and, thus, avoid prolonged freshwater inundation that leads to freshwater-only marshes. Overall, the post-storm drain project hydrology will favor greater diversity in marsh hydrology and salinity and, therefore, greater diversity in marsh plants and habitats. The project also allows for a great deal of flexibility to adaptively manage the water levels and run-off volumes.



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Jessie Street Marsh Management Plan
Watershed Map

Figure 4-1
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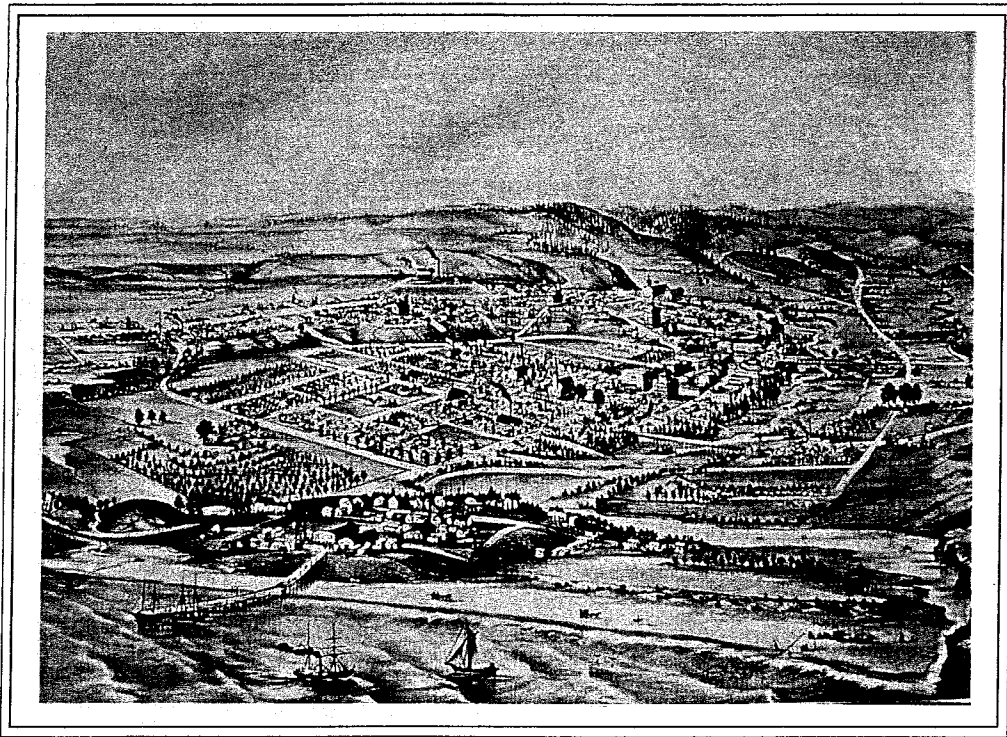
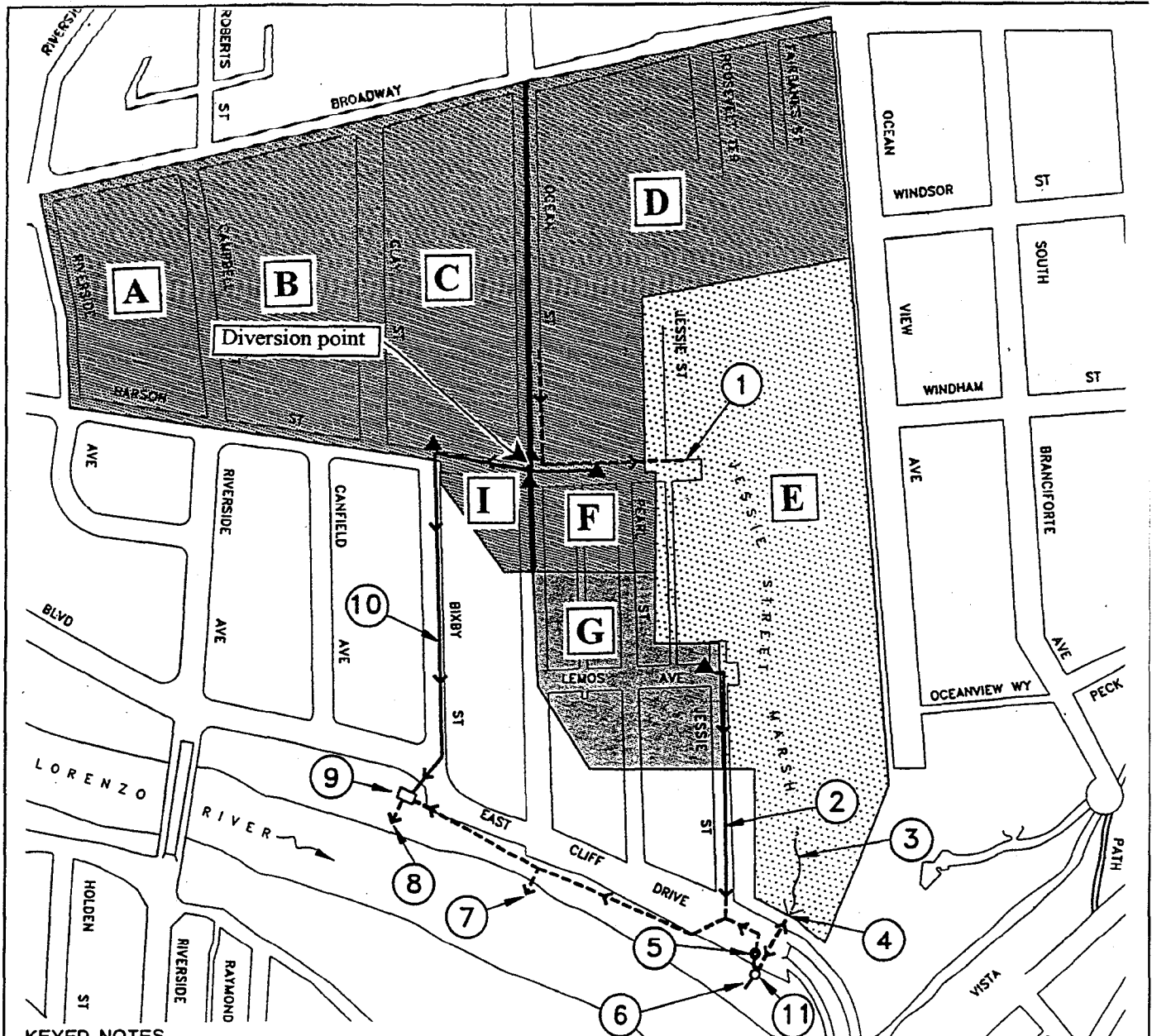


Figure 4-2. The San Lorenzo River and its lagoon in Santa Cruz in the late 19th century.



KEYED NOTES

- ① EXISTING STORM DRAIN OUTLET TO MARSH
- ② PROPOSED STORM DRAIN "PHASE II"
- ③ JESSIE CHANNEL
- ④ MARSH OUTLET
- ⑤ PROPOSED SLIDE GATE
- ⑥ GRAVITY OUTLET NO. 9 (TO RIVER)
- ⑦ GRAVITY OUTLET NO. 10 (TO RIVER)
- ⑧ PUMP STATION OUTLET TO RIVER
- ⑨ BIXBY PUMP STATION
- ⑩ PROPOSED STORM DRAIN "PHASE I"
- ⑪ EXISTING SLIDE GATE

LEGEND

- ▲ COLLECTION POINTS
- PHASE I STORM DRAIN AREA (32.0 AC.)
- PHASE II STORM DRAIN AREA (3.7 AC.)
- DRAINAGE AREA UNAFFECTED (14.7 AC.)
- EXISTING STORM DRAIN
- PROPOSED STORM DRAIN
- DIRECTION OF FLOW



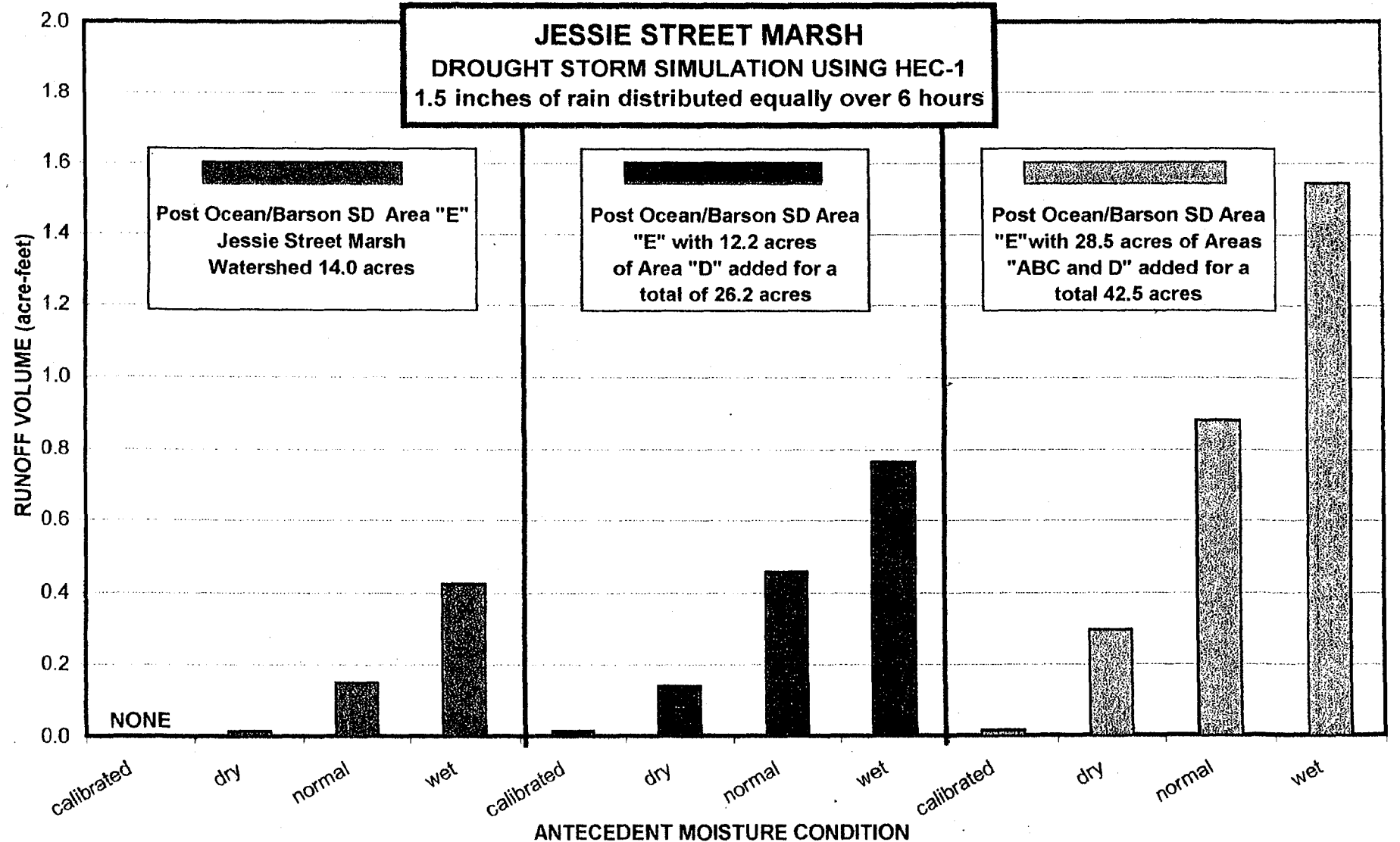
GRAPHIC SCALE



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Jessie Street Marsh Management Plan
Watershed Map Showing Sub-watersheds
used for HEC-1 Modeling

Figure 4-3
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SWANSON HYDROLOGY
Hydrology/Geomorphology/Restoration/Water Resources

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Jessie Street Marsh Management Plan
**HEC-1 modeling results showing runoff volume from
three subwatershed combinations under dry, normal and
wet antecedent moisture conditions**

Figure 4-4
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CHAPTER 5 VEGETATION, WILDLIFE AND AQUATIC RESOURCES

INTRODUCTION

The biotic vegetation resources of the Jessie Street Marsh study area were investigated during August and September 1997 and periodically during the winter/spring of 1998. The study area included Jessie Street Marsh and the adjacent terrace slope below Ocean View Park. Study methods included the review of electronic databases on sensitive resources, literature review, and reconnaissance-level field surveys.

Several unpublished reports on the Jessie Street Marsh area were reviewed, including: Survey of the Biological Productivity of the Jessie Street Marsh (Reilly 1981); Investigating the Potential for Restoration of an Urban Saltmarsh Fragment: Vegetation, Seedbank, Succession and Tidal Influence at Jessie Street Marsh (Davies 1995); Jessie Street Marsh, Environmental Studies Final Project (Ostrowski 1996); letter to Mr. Porter dated December 2, 1985 regarding geologic conditions and aerial photo interpretation of Jessie Street Marsh (Cordex Geologic Consultants 1985); Jessie Street Marsh Biological Survey (Ivan Parker Civil Engineering Company 1980); and Santa Cruz Breeding Birds Atlas (Suddjian *et al.* 1990). The 1997 California Natural Diversity Data Base (NDDB) files for recorded rare species occurrences within the Santa Cruz quadrangle was also assessed (NDDB 1997).

During the 1997 field surveys, the existing plant communities and areas supporting significant concentrations of invasive, non-native plant species were mapped onto an aerial basemap (City of Santa Cruz 1996; scale 1 inch = 100 feet). A botanist and/or wildlife biologist conducted surveys of the study area on August 27, September 4, and September 18, 1997. The plant and animal species observed were recorded in field notebooks.

Existing Plant Communities and Wildlife Habitats

The study area supports four principal habitat types: forest/woodland (i.e., tree-dominated) habitats, scrub and thicket habitats, marsh and wet grassland areas, and upland grassland types. These habitats have several distinct assemblages of plant species or *series*. The locations of the major habitat types are depicted on the Biotic Resources Map (Figure 5-1); the more detailed assemblages of plant species (*series*) are depicted on Figure 5-2 (Plant Habitat Map). The salient features of these habitats are described below.

The upper marsh area (i.e., upstream of Lemos Avenue) is comprised of relatively natural habitats dominated by native plant species. The lower marsh area (i.e., downstream of Lemos Avenue) shows evidence of more intensive human activity (e.g., bare areas, non-native trees and groundcovers, and human debris). Invasive, non-native plant species are prevalent throughout the study area. Man-made drainage ditches occur along the perimeter of the marsh and support a mix of native and non-native hydrophytic (i.e., wet-loving) plant species.

TREE-DOMINATED HABITATS

Groves of coast live oak (*Quercus agrifolia*) trees occur in the northern half of the study area and along the eastern boundary adjacent to Ocean View Park (Figure 5-1). Due to the dominance of the oak tree these areas are classified as a coast live oak series (Figure 5-2).

Riparian trees (e.g., arroyo willow [*Salix lasiolepis*] and box elder [*Acer negundo*]) occur primarily in the northern portion of the study area along the base of the Branciforte Bluff and adjacent to the cattail marsh. The riparian habitats have been degraded due to human activities and invasion by invasive, non-native plant species. Two types of riparian plant communities were observed, according to the dominant tree species present in the overstory.

The study area also supports a large grove of eucalyptus (*Eucalyptus globulus*) near East Cliff Drive (blue gum eucalyptus series), a grove of blackwood acacia (*Acacia melanoxylon*) (blackwood acacia series), and scattered landscape trees.

Coast Live Oak Series

The woodland overstory is dominated by coast live oak; however, there are also several scattered non-native trees of green wattle acacia (*Acacia decurrens*) and blue gum eucalyptus (*Eucalyptus globulus*). The understory is composed primarily of non-native vegetation. The dominant understory species is English ivy (*Hedera helix*); French broom (*Genista monspessulana*) and Himalaya blackberry (*Rubus procerus*) also occur. Native plant species include poison oak (*Toxicodendron diversilobum*) and California blackberry (*Rubus ursinus*). In the southern portion of the study area, the coast live oak trees intermingle with a large grove of blue gum eucalyptus. In the northern portion of the study area, the oak trees grow adjacent to box elder (*Acer negundo*) trees within the riparian corridor (Figure 5-2).

Wildlife Resources of Coast Live Oak Habitat

Oak woodlands are considered critical habitats for the conservation of many bird and mammals species. Important habitat features of oak woodlands include acorn production and the presence of cavity-bearing trees. As a seasonal food, acorns are important for the survival of many species of wildlife in the fall and winter. Animals that are dependent on acorns as a seasonal food source include western gray squirrel, northern flicker, acorn woodpecker, scrub jay, and California quail. Acorns buried by scrub jays, western gray squirrels, and fox squirrels are likely to germinate because they root better and are less likely to be eaten by other species.

Cavity-nesting birds and small mammals depend on the natural cavities associated with mature oak trees. Mature oak trees often have broken limbs that contain some degree of decay and are then excavated by birds and mammals for nest

and roost sites. These cavities receive high levels of use by secondary cavity-nesting birds (e.g., woodpeckers, owls, tree swallow, and violet-green swallow). The insects associated with oaks are prey for several birds (e.g., bushtit, kinglets, and warblers). California towhee and sparrows will forage for insects on the ground beneath the oaks.

Although mature oak woodlands are valuable to wildlife, oak woodland habitats with a matrix of age classes and plant heights allow for a great diversity of wildlife and provide cover required by many species. The understory of the coast live oak woodland at Jessie Street Marsh is dominated by non-native ivy. Although the ivy provides some protective cover for wildlife, the general habitat value for wildlife is not as great as a natural understory layer of poison oak and blackberry. The non-native plum and date palm trees provide some positive value for wildlife. Animals expected to forage on fruit include: scrub jay, Brewer's blackbird, plain titmouse, house finch, rock dove, American robin, varied thrush, northern mocking bird, black-headed grosbeak, western gray squirrel, and raccoon.

Arroyo Willow and Box Elder Series

A small thicket of arroyo willow trees occurs in the northern portion of the study area (Figure 5-2). Along its eastern side, the willow thicket borders the oak woodland and box elder grove. Along its western side, the willow thicket borders the cattail-dominated freshwater marsh. Invasive, non-native species (e.g., English ivy, periwinkle [*Vinca major*] and kikuyu grass [*Pennisetum clandestinum*]) are common in the understory. An area of kikuyu grass, approximately 30 feet wide by 60 feet long, is located along the fence bordering an adjacent residence. Two native plant species, California blackberry and poison oak, were also observed in the understory of the willow thicket.

The box elder series has a tree overstory dominated by box elder, a riparian tree species. In some areas of the woodland, the box elder trees intermingle with coast live oak or arroyo willow trees. Several date

palms (*Phoenix* sp.) and plum trees (*Prunus* sp.) were also observed in the woodland. The understory is dominated by non-native species, including invasive species such as English ivy, German ivy (*Senecio mikanioides*), and periwinkle. The German ivy has grown up the wooded slope; whereas, English ivy dominates the ground surface and has climbed up several box elder trees. A patch of pampas grass (*Cortaderia jubata*) grows west of the box elder trees near Barson Street.

Wildlife Resources of the Arroyo Willow and Box Elder Habitat

The riparian habitat and the nearby open water of the freshwater marsh provide a high value area for wildlife. Mammals, birds, reptiles, and amphibians from adjacent habitats are likely to use the cover of the riparian areas and open water of the marsh while in route to surrounding areas. However, the relatively small size of the habitat and its close proximity to developed urban areas may moderate this areas use by some wildlife species.

The riparian woodland and the adjacent open water areas provide potential breeding areas for aquatic amphibians (e.g., tree frogs). Swallows and bats are expected to forage for insects over the riparian and marsh area, while mammals (e.g., raccoons and opossums) forage adult and larval amphibians. Raccoon, skunks, opossum, long-tailed weasel, and domestic cats and dogs are likely to drink from the marsh and forage on rodents, amphibians, and insects.

Bird species (e.g., warblers and vireos) are expected to utilize the riparian woodland for foraging during their migrations. Resident birds (e.g., thrushes and sparrows) are also expected to forage amid the deciduous trees. The deciduous trees provide an abundance of insects that attract neo-tropical migrants (e.g., warbling vireo). The birds feed on the numerous insects to replenish their migratory fat reserves. Resident bird species (e.g., Swainson's thrush and song sparrow) are more abundant in riparian habitats than in adjacent woodlands.

Species of special concern with potential to forage in the riparian woodland of Jessie Street Marsh include yellow warblers and tri-colored blackbirds. Due to the limited size and high human use of the riparian and marsh areas, nesting habitat is not expected to be suitable for these species.

Blue Gum Eucalyptus and Blackwood Acacia Series

Blue gum eucalyptus groves occur at the southern end of the study area near East Cliff Drive (Figure 5-2). The understory is dominated by low-growing vines of periwinkle, poison oak, and Himalaya blackberry. Periwinkle is considered an invasive, non-native plant species. Additional plant species observed in the understory include the invasive, non-native species of French broom, wild radish, (*Raphanus sativus*), and bull mallow (*Malva nicaeensis*). Other than poison oak, few native plant species were observed under the eucalyptus trees. The understory also includes woody debris (i.e., park peels and downed limbs) from the eucalyptus trees.

A portion of the eucalyptus grove adjacent to East Cliff Drive, including the understory on the slope, had been recently burned as a result of unauthorized camping activities.

Near Lemos Avenue is a large grove of blackwood acacia (*Acacia melanoxylon*) trees. Blackwood acacia is native to Australia and is becoming naturalized along the central coast. Several young coast live oak trees were observed in the understory. The dominant understory species is English ivy; poison oak, and bull mallow. The area is degraded from unauthorized human uses as evidenced by inorganic debris and old campfire rings.

Wildlife Resources of the Bluegum Eucalyptus and Blackwood Acacia Habitat

Overall wildlife use of the eucalyptus and acacia groves is limited in comparison to the adjacent native coast live oak woodland habitat. However, eucalyptus and acacia bark peels can create

microhabitats for some small vertebrate species (e.g., alligator lizards and woodrats). Eucalyptus trees also provide night roosts, foraging perches, and nest sites for some bird species, particularly raptors. However, the eucalyptus and acacia trees provide little foraging value to most birds and mammals compared to native oaks or coastal scrub.

The eucalyptus and acacia trees at Jessie Street Marsh may provide roosting habitat and nectar sources for monarch butterflies in some years. However, significant roosting by monarch butterflies has not been reported in the Jessie Street Marsh area nor were roosts observed during the reconnaissance-level field surveys.

MARSH AND WET GRASSLAND HABITATS

The marsh habitats at Jessie Street Marsh are a remnant of a larger coastal salt marsh that historically occurred in the area. As discussed in Chapter 3, the marsh was historically an estuary of the San Lorenzo River and is believed to have been a salt marsh dominated by pickleweed (*Salicornia virginica*). Following construction of the San Lorenzo River levee system and the installation of a tide gate between the river and the marsh, tidal influences into the marsh were significantly reduced.

Areas previously dominated by pickleweed have slowly converted to a brackish-freshwater system. The lower portions of the marsh (i.e., downstream of Lemos Avenue) have retained a small amount of tidal exchange with the river, such that some brackish-water-tolerant species have persisted. The occurrence of salt tolerant plant species (e.g., pickleweed) have continued to decline, such that in 1997 no mature pickleweed plants were observed. The areas upstream of Lemos Avenue no longer receive tidal inflows and have converted to a freshwater marsh, dominated by cattails (*Typha latifolia*).

Several series, or assemblages of plant species, have been identified in the marsh area; these areas are described below and depicted on Figure 5-2.

Cattail/Bulrush Series

The cattail/bulrush series is a freshwater habitat that occurs as dense thicket upstream of Lemos Avenue. The western boundary of the marsh is linear and coincides with a man-made drainage channel that separates the marsh vegetation from the adjacent grassy area. The dominant plant species are broad-leaved cattail and bulrush (*Scirpus robustus*). Along the edges of portions of the cattails are other hydrophytic plant species (e.g., Pacific silverweed [*Potentilla anserina* ssp. *pacifica*], dense sedge [*Carex densa*], red-rooted cyperus [*Cyperus erythrorhizos*], kikuyu grass, rabbit's foot grass [*Polypogon monspeliensis*], yellow dock [*Rumex crispus*], brass buttons [*Cotula coronopifolia*], water smartweed [*Polygonum punctatum*], and ciliate willow herb [*Epilobium ciliatum* ssp. *ciliatum*]).

Sedge/Rabbitsfoot Grass Series

This plant assemblage occurs near Lemos Avenue along the edge of the man-made drainage channel. A narrow band of freshwater wetland plants grow along the edge of the channel and onto the flat terrace. Plant species include dense sedge and rabbitsfoot grass.

Brass Buttons Series

Patches of brackish water marsh, dominated by the non-native brass buttons, grow along the drainage channel and onto flat low-lying areas south of Lemos Avenue. Associated plant species include: fat hen (*Atriplex patula* var. *patula*), rabbit's foot grass, yellow dock, salt grass (*Distichlis spicata* var. *stolonifera*), and ciliate willow herb.

Saltgrass/Alkali Ryegrass Series

Saltgrass (*Distichlis spicata*) is a common plant throughout the marsh. As a species, the plant is tolerant of a wide range of environmental conditions and can grow in the brackish areas near East Cliff Drive as well as in the freshwater-influenced areas near the cattail marsh. The species can persist in areas that have residual soil salinity, such as the

historic salt marsh soils upstream of Lemos Avenue. The grassy area near Lemos Avenue also includes the native alkali ryegrass (*Leymus triticoides*). Other plant species within the saltgrass-dominated areas occur as scattered individuals and include: fat hen, fleshy jaumea (*Jaumea carnosa*), Pacific grindelia (*Grindelia stricta* var. *platyphylla*), and alkali heath (*Frankenia grandifolia*).

The grassy area north of Lemos Avenue is located within the floodplain of the upper marsh. The area is dominated by saltgrass yet also supports other native and non-native plant species (e.g., Pacific silverweed, rabbit's foot grass, and perennial ryegrass). Scattered patches of the invasive, non-native sea fig (iceplant) (*Carpobrotus edulis*) also occur within this area and intermix with a large patch nearby. Several cultivated plant species typical of residential gardens were also observed in the grassy area (e.g., canna lilies, calla lilies [*Zantedeschia aethiopica*], red-hot poker [*Kniphofia uvaria*], honeysuckle [*Lonicera* sp.], and lily-of-the-Nile [*Agapanthus orientalis*]).

Earlier studies of the marsh documented the occurrence of pickleweed in these saltgrass areas. Four were observed during a 1995 study (Davies 1995); however, no mature individuals were observed during the 1997 field surveys. Seedbank analysis studied conducted by Davies in 1995 found that pickleweed seedlings emerged in half of his sample plots; thus, indicating that a viable seed bank existed on the site. He hypothesized that the seedlings are out-competed by freshwater-adapted plant species and do not reach maturity, which is leading to the extinction of this species from the site.

Sedge/Fat Hen/Brass Buttons Series

The majority of the vegetation within and along the man-made drainage channels is composed of hydrophytic plant species (i.e., dense sedge, fat hen and brass buttons). Other plants, many of which are considered to be invasive, also occur in these areas (i.e., kikuyu grass, waterweed, water hyacinth, poison hemlock, and yellow dock). Other native plants also occur (e.g., water smartweed, red-rooted

cyperus, Pacific silverweed, and mosquito fern [*Azolla filiculoides*]).

Wildlife Resources of the Marsh and Wet Grassland Habitats

The cattails and bull rushes, which occur along the perimeter ditches upstream of Lemos Avenue, provide easy access to the marsh by humans and domestic dogs and cats. The only bird observed in the cattails and rushes was a song sparrow. This habitat is unlikely to support either a diversity or abundance of wildlife, especially birds, due to the high level of domestic cat and human activities in the area. Raccoons and skunks are expected to be attracted to both the available freshwater and foraging habitat of the freshwater marsh and riparian plant communities. Due to the high amount of human activity, presence of domestic dogs and cats, and limited open water areas associated with Jessie Street Marsh, waterfowl that utilize the San Lorenzo River Lagoon are not expected to frequent the open water areas for foraging and bathing. Pacific tree frogs, three-spined stickle backs, dragon fly larva and adults, damselfly larva and adults, and water beetles were observed within the freshwater marsh during the reconnaissance-level surveys.

Wildlife utilization of the brackish water marsh areas downstream of Lemos Avenue is similar to that described for the freshwater marsh. Wildlife use may be moderated by the narrow configuration of and degraded quality of the habitat. In brackish water systems, the surface water is often less saline than deeper water, as the salt water (being heavier/denser than freshwater) sinks. Hence, the surface waters may be fresh enough for some terrestrial wildlife to drink. Coliform bacteria may be present in the water due to the presence of animal and human feces in the area and bacteria entering from the San Lorenzo River Lagoon. The bacteria may pose health hazards to wildlife ingesting water from the lower portions of Jessie Street Marsh.

SCRUB AND THICKET HABITATS

Three types of scrub and thicket habitats occur in the study area. These habitats are characterized by a dense growth of shrubs or vines that are almost impenetrable. Within the Jessie Street Marsh study area these habitats are located in the southern portion of the study area near East Cliff Drive and along the Jessie Street alleyway (Figures 5-1 and 5-2).

Coyote Brush Series

The coyote brush series occurs near the southern end of the study area along a portion of the drainage channel near East Cliff Drive. The scrub extends along the slope of fill material just east of the drainage channel. Since the substrate is partially composed of fill that creates drier conditions than the lower-lying marsh areas, upland plant species are present. The scrub habitat is dominated by coyote brush (*Baccharis pilularis*). Several coast live oak saplings are also present amid the shrubs. The scrub understory is dominated by weedy herbs and non-native grasses which include: wild radish, sow thistle (*Sonchus asper*), cut-leaf plantain (*Plantago coronopus*), wild oat (*Avena fatua*), riggut brome (*Bromus diandrus*), bull mallow, and pincushion flower (*Scabiosa atropurpurea*). Adjacent to the drainage channel, kikuyu grass and poison hemlock (*Conium maculatum*) grow under portions of the scrub understory.

Blackberry Series

Dense stands of Himalaya blackberry grow along the rear fences of several residences and adjacent to the Jessie Street alleyway. The vegetation provides virtually impenetrable thickets.

Toyon Series

Shrubs of toyon (*Heteromeles arbutifolia*) also grow on the slope leading to Ocean View Park. Most of the shrubs appear to have been planted as part of the landscaping for the park. These native shrubs provide a dense woody growth. The

understory is comprised of annual grasses (e.g., wild oat).

Wildlife Resources of the Shrub and Thicket Habitats

The blackberry thickets and toyon shrubs provide roosting, cover, and foraging habitat for several wildlife species. The berries from these plants provide food source for several avian species and the shrubs provide cover for small reptiles and mammals.

UPLAND GRASSLAND HABITATS

Upland grassland habitat occurs in three areas of the marsh study area: areas north of Lemos Avenue, the grassy flat at the end of Lemos Avenue, and the grassy knoll near East Cliff Drive. Areas that have been disturbed from previous land use activities are dominated by non-native grasses and weeds. Four series (plant assemblages) have been identified within the Jessie Street Marsh study area.

Bermuda Grass Series

This series is dominated by the non-native Bermuda grass (*Cynodon dactylon*). This common garden/turf grass forms a dense mat of creeping rhizomes. Associated species include: field bindweed (*Convolvulus arvensis*), wild radish, perennial ryegrass (*Lolium perenne*), sow thistle, cut-leaf plantain, and wild oat. The Bermuda grass series occurs in two patches; one is located near the entrance to the marsh near Lemos Avenue and as a grassy patch south of the acacia grove. The grassy area near Lemos Avenue also includes the native alkali ryegrass.

Iceplant Series

A large patch on non-native iceplant (*Carpobrotus edulis*) grows adjacent to the cattail/bulrush-dominated marsh. This patch grows over an old berm and drainageway, forming a dense mat. Iceplant is a fast-growing plant and is spreading into the adjacent saltgrass grassland and arroyo willow thicket.

Kikuyu Grass Series

Kikuyu grass, an invasive, non-native plant species from Africa, is prevalent along portions of the drainage channels and ditches throughout the study area. A large patch occurs at the northern end of the study area by Barson Street and another in the ditch located about 100 feet north of the end of Jessie Street. This grass grows fast and forms dense masses of grassy hummock, out competing and overtopping native plant species.

Wild Oat/Plantain Series

The southernmost grassy knoll near East Cliff Drive occurs is fill material. The substrate is porous and dry compared to the other grasslands in the study area. Common non-native plant species include: wild oat, soft chess (*Bromus hordeaceus*), riggut brome (*Bromus diandrus*), English plantain (*Plantago lanceolata*), cut-leaf plantain, wild radish, field bindweed, Bermuda grass, and pincushion flower.

Wildlife Resources of the Upland Grassland Habitats

The upland grassland habitats within Jessie Street Marsh are limited in size and used primarily by domestic dogs and predatory domestic cats. In the southern portion of the study area, near East Cliff Drive, homeless encampments are located near the shrubs. The human and domestic pet use of such a small area significantly moderates its value to native wildlife; however, large population of pallid-winged grasshoppers, an important foraging sources for some birds, reptiles, amphibians, and smaller mammals, were observed in the area.

Typical reptile species in the ruderal grassland areas are alligator lizard, western fence lizard, garter snake, and gopher snake. Amphibians are not generally abundant in grasslands but may occasionally use mammal burrows for cover while traveling between other habitats. Passerine birds predicted to forage on seeds in this habitat type at Jessie Street Marsh include: song sparrows, house finch, rock dove, and California towhee.

In general, grasslands can provide an important foraging resource for a wide variety of wildlife species. A mosaic of grasses and shrubs, especially when they are surrounded by wooded areas, can increase the wildlife species richness of the grasslands. The grasses and other herbaceous plants produce an abundance of seeds and attract numerous insects, providing food for granivorous and insectivorous wildlife. Sparrows, rabbits, and rodents are commonly found in this habitat. Consequently, grasslands can be valuable foraging sites for raptors (e.g., hawks and owls) and other predators (e.g., fox, skunk, and snakes).

OPEN WATER HABITAT

The open water habitat in the study area is limited to the small drainage ways and some open water amid the cattail-dominated freshwater marsh. Due to this limited resource, fisheries are expected to be minimal (Dr. Jerry Smith pers. com. 1997.). Three-spine stickleback were observed in the drainage ways between Lemos Avenue and Barson Street during the 1997 surveys. Suitable, but limited, habitat for mosquito fish also occurs in this area. Mosquito fish have been observed in the Jessie Street Marsh in previous years (Dr. Jerry Smith pers. com. 1997). Steelhead and coho salmon that are known to utilize the adjacent San Lorenzo River are not expected to enter the marsh, due to the lack of passage and unsuitable habitat conditions. Tidewater goby, a small fish of coastal lagoons (and Federally listed as endangered), are not known in the San Lorenzo River system and are, therefore, not expected to occur within Jessie Street Marsh.

SENSITIVE BIOTIC RESOURCES

Special-Status Plant Species

The search of the CNPS and NDDDB inventories resulted in five special status plant species that have recorded occurrences in the Santa Cruz quadrangle: Santa Cruz tarplant (*Holocarpha macradenia*), Santa Cruz clover (*Trifolium buckwestiorum*), robust spineflower (*Chorizanthe robusta* var. *robusta*), San Francisco popcorn flower (*Plagiobothrys diffusus*), and maple-leaved checkerbloom

(*Sidalcea malachroides*). Robust spineflower and Santa Cruz tarplant are listed as Federally endangered; whereas, San Francisco popcorn flower is listed as State endangered. These species of concern and their status codes are listed in Table 5-1. None of these species were observed within the study area during the September 1997 reconnaissance surveys. Due to the highly disturbed understory and large proportion of invasive, non-native plant species, special status plants are not expected to occur within the study area.

Special Status Wildlife Species

Special-status wildlife species, designated as "species of special concern", are candidates for endangered or threatened status by the CDFG. Species of special concern are "those whose populations in California are so low that extirpation is a real possibility" (Remsen 1978). No sensitive species have been recorded with the NDDDB to occur within the project site. Table 5-2 contains a list of special status wildlife species that are known to occur within Santa Cruz County and are associated with the general habitat types of Jessie Street Marsh. The eucalyptus groves are considered to be locally unique in that they may provide roost sites for wintering monarch butterflies. However, with the exception of Monarch butterflies, the current habitat conditions associated with Jessie Street Marsh are not suitable for sustaining viable populations of any of the potential status species. Unusual sightings of migrant songbirds have been noted from the marsh; however, these are uncommon occurrences.

Due to the combined effects of high predation from domestic cats and raccoons, as well as the shallow/limited size of open water areas, the marsh habitat is not likely to support California red-legged frogs, a species Federally listed as threatened.

Tidewater goby, a small fish of coastal lagoons (and Federally listed as endangered), are not known in the San Lorenzo River system and are, therefore, not expected to occur within the Jessie Street Marsh system.

Sensitive Plant Communities/Habitats

Sensitive habitats are defined by local, State, or Federal agencies as those habitats that support special status species, provide important habitat values for wildlife, represent areas of unusual or regionally restricted habitat types, and/or provide high biological diversity. The following plant communities occurring in the Jessie Street Marsh study area are considered sensitive habitats according to City of Santa Cruz planning policies: coastal salt marsh, coastal brackish marsh, freshwater marsh, and riparian woodland. These sensitive plant communities have been described above and their locations within the Jessie Street Marsh study area are depicted in Figures 5-1 and 5-2.

The City of Santa Cruz General Plan and Local Coastal Program (October 1992) have developed policies to preserve, protect, and enhance such habitats. In general, marshes and riparian plant communities are considered sensitive habitats due to their high wildlife value, limited distribution, and decreasing acreage statewide. These sensitive habitats have been significantly reduced from their historical distributions.

At the State level, riparian plant communities are considered sensitive habitat and have been identified by the California Department of Fish and Game (CDFG) as habitat of special concern (Wetlands Resource Policy, California Department of Fish and Game Commission, 1987). Riparian habitat is valuable because it supports a high density and diversity of wildlife species and because it is a diminishing resource. In the state of California, at least 89.0% of riparian areas existing 130 years ago have been lost (*ibid*).

The study area also supports oak-dominated woodlands and a large eucalyptus grove. While the groves are not considered sensitive habitat, several of the oak and eucalyptus trees would qualify as heritage trees under the City's Heritage Tree Ordinance (i.e., trees greater than 16 inches in diameter).

INVASIVE, NON-NATIVE PLANT SPECIES

Background

In accordance with the policy on invasive, non-native plants adopted by the California Native Plant Society (CNPS) in September 1996, land managers are urged to control/eradicate invasive, non-native plant species (CNPS September 1996). According to the CNPS, an invasive, non-native plant species is one that did not occur naturally in California prior to European settlement and is able to proliferate and aggressively alter or displace indigenous plant communities (*ibid.*). Invasive, non-native plants are detrimental to the environment in many ways and often out compete California native plant species to their exclusion. Invasive, non-native plants can disrupt soil fungi and microorganism's relationships with plants, and they also disrupt nutrient cycles. Certain species (e.g., pampas grass and blue gum eucalyptus) can contribute to the intensity of wild fires.

Both State (Department of Pest Regulation) and Federal governments have enacted legislation declaring the worst aggressive weeds as "noxious weeds" that should be eradicated wherever they are found (Hickman 1993). The California Exotic Pest Plant Council (CalEPPC) has developed a statewide list of invasive, non-native plant species.

Invasive, Non-native Plant Species Occurring in the Jessie Street Marsh Study Area

Riparian habitats and wetlands are often targets for invasion by exotic vegetation, particularly in areas where there has been ground disturbance due to human activities. Some of the more invasive, non-native plant species occurring within the Jessie Street Marsh study area include: German ivy, English ivy, Himalayan blackberry, Bermuda grass, pampas grass, poison hemlock, blue gum eucalyptus, green wattle acacia, French broom, and kikuyu grass. Table 5-3 has a list of the invasive, non-native plant species observed in the Jessie Street Marsh study area. The table also identified whether the species is considered high priority or low priority for removal/control.

Selected problem areas of invasive, non-native plant species are described below. The locations of significant concentrations of invasive species are depicted in Figure 5-3.

German Ivy

German ivy was observed growing in the understory of the box elder riparian woodland and on the adjacent eastern slope.

English Ivy

English ivy has invaded the understory vegetation in the coast live oak woodland, apparently out competing the native plant species. English ivy also occurs along the eastern side of the study area as a dominant species under the blackwood acacia grove.

Pampas Grass

Pampas grass is scattered in several locations, including the northern end of the study area and near the intersection of Jessie Street and Lemos Avenue. Pampas grass is very invasive and produces copious amounts of seeds and, in time, can easily spread throughout the Jessie Street Marsh study area.

French Broom

French broom was observed in two locations within the study area. The broom plants occur within openings in the tree canopy at the toe of the wooded slope.

Kikuyu Grass

Kikuyu grass, an invasive, non-native plant species from Africa, is prevalent along portions of the drainage channels and ditches throughout the study area. A large patch occurs at the northern end of the study area by Barson Street and in the ditch located about 100 feet north of the end of Jessie Street.

Periwinkle

A large patch of periwinkle, over 100 feet long, grows as a herbaceous ground cover under the blue gum eucalyptus grove. Periwinkle also occurs in the understory of the arroyo willow thicket.

Table 5-1. Special Status Plant Species With Potential to Occur in the Jessie Street Marsh Study Area, Santa Cruz, California

Common Name	Scientific Name	Status	Observed in Jessie Street Marsh 1997
Maple-leaved checker bloom	<i>Sidalcea malachroides</i>	CNPS List 1B State none Federal none	no
Robust spineflower	<i>Chorizanthe robusta</i> var. <i>robusta</i>	CNPS List 1B State none Federal FE	no
San Francisco popcorn flower	<i>Plagiobothrys diffusus</i>	CNPS List 1B State SE Federal SC	no
Santa Cruz clover	<i>Trifolium buckwestiorum</i>	CNPS List 1B State none Federal SC	no
Santa Cruz tarplant	<i>Holocarpha macradenia</i>	CNPS List 1B State SE Federal PFT	no

CNPS Status:

List 1B: These plants (predominantly endemic) are rare through their range and are currently vulnerable or have a high potential for vulnerability due to limited or threatened habitat, few individuals per populations, or a limited number of populations. List 1B plants meet the definitions of Section 1901, Chapter 10 of the CDF&G Code. The County of Santa Cruz recognizes CNPS List 1B plants as requiring CEQA review.

List 4: List 4 is a watch list of plants with limited distribution in the State that have low vulnerability and threat at this time. These plants are uncommon, often significant locally, and should be monitored.

State List:

SE = endangered
SR = rare
ST = threatened

Federal List:

FE = endangered
FT = threatened
candidate = sufficient data to support listing
PFT = proposed for threatened status
SC = species of special concern

Table 5-2. Special Status Wildlife Species with the Potential to Occur or Known to Occur in the Jessie Street Marsh Study Area, Santa Cruz, California

Species		Legal Status*	Occurrence in Jessie Street Marsh	Known Occurrence within the Santa Cruz Region
Common Name	Scientific Name	Federal/State	Known or Potential	Nearest Location(s)
Amphibians and Reptiles				
California Red-legged Frog	<i>Rana aurora draytonii</i>	FT/--	Potential: unlikely due to high predation and lack of cover	Natural Bridges
Insects				
Monarch Butterfly	<i>Danaus plexippus</i>	--/SSC	Potential: unlikely due to lack of recorded occurrences	South Branciforte Road, 0.5 mile from the mouth of the San Lorenzo River and at Magic Carpet Motel near the Boardwalk.
Birds (Nest or Night Roost Sites)				
Great Blue Heron Rookery	<i>Arden herodia</i>	--/SSC	Surveyed: No nest sites; potential night roost	Arana Gulch
Green-backed Heron Rookery	<i>Butorides striatus</i>	--/FP	Surveyed: No nest sites; potential night roost	San Lorenzo River, north of the Highway 1 Bridge
Black-crowned Night-heron Rookery	<i>Nycticorax nycticorax</i>	--/FP	Surveyed: No nest sites; potential night roost	Arana Gulch/Santa Cruz Yacht Harbor
Birds (Foraging or Aerial Transients Only)				
American Peregrine Falcon	<i>Falco peregrinus anatum</i>	FE/--	Potential	Eucalyptus grove at the mouth of the San Lorenzo River
Great Blue Heron	<i>Arden herodia</i>	--/FP	Potential	San Lorenzo River
Merlin	<i>Falco columbarius</i>	--/SSC	Potential	NA
Double Crested Cormorant	<i>Phalacrocorax auritus</i>	--/FP	Potential	San Lorenzo River
Savannah Sparrow	<i>Amphispiza belli beldingi</i>	--/SE	Potential	Wilder Creek Beach
Yellow Warbler	<i>Dendroica petechia</i>	--/SSC	Potential	San Lorenzo River
Saltmarsh Common Yellowthroat	<i>Geothlypis trichas sinuosa</i>	--/SSC	Potential	Neary's Lagoon
Tri-colored Blackbird	<i>Agelaius tricolor</i>	C2/SSC	Potential	Antonelli Pond and Neary's Lagoon
Willow Flycatcher	<i>Empidonax traillii</i>	--/SE	Potential	NA
California Gull	<i>Larus californicus</i>	--/SSC	Potential	San Lorenzo River
Long-eared Owl	<i>Asio otus</i>	--/SSC	Potential	Grey Whale Ranch
Sharp Shinned Hawk	<i>Accipiter striatus</i>	--/SSC	Potential	Arana Gulch
Cooper's Hawk	<i>Accipiter cooperii</i>	--/SSC	Potential	NA

Species		Legal Status*	Occurrence in Jessie Street Marsh	Known Occurrence within the Santa Cruz Region
Common Name	Scientific Name	Federal/State	Known or Potential	Nearest Location(s)
Mammals				
San Francisco Dusky-footed Woodrat	<i>Neotoma fuscipes annectens</i>	--/SSC	Potential: animals moving through the area; no nest found	Arana Gulch
Fish				
Tidewater Goby	<i>Eucyclogobius newberryi</i>	FE/--	Potential: unlikely; not found in the watershed due to poor/limited habitat available	Moore Creek and Woods Lagoon (Santa Cruz Yacht Harbor)

*Legal Status

Federal List

- C2 = Category 2 candidate for Federal listing. Category 2 includes species for which the U.S. Fish and Wildlife Service has some biological information indicating that listing may be appropriate but for which further biological research and field study are usually needed to clarify the most appropriate status.
- FE = Listed as endangered under the Federal Endangered Species Act.
- FT = Listed as threatened under the Federal Endangered Species Act.
- PE = Proposed for Federal listing as endangered under the Federal Endangered Species Act.

State List

- FP = Fully protected under the California Fish and Game Code.
- SE = Listed as endangered under the California Endangered Species Act.
- SSC = Species of Special Concern.
- ST = Listed as threatened under the California Endangered Species Act.

Source: 50 CFR 7.11 and 7.12; Natural Diversity Data Base, 1997; and Zeiner *et al.*, 1990; Santa Cruz County Breeding Birds Atlas Project, 1990.

**Table 5-3. Invasive, Non-native Plant Species
Observed in the Jessie Street Marsh Study Area**

Common Name	Scientific Name	Habitat Type	Priority for Removal
Bermuda grass	<i>Cynodon dactylon</i>	Upland Grassland	High
Brass buttons	<i>Cotula coronopifolia</i>	Marsh/Wet Grassland	Low
Blackwood acacia	<i>Acacia melanoxylon</i>	Tree Groves	Low
Blue gum eucalyptus	<i>Eucalyptus globulus</i>	Tree Groves	Low
Bull thistle	<i>Cirsium vulgare</i>	Upland Grassland	Low
English ivy	<i>Hedera helix</i>	Tree Groves	High
Field bindweed	<i>Convolvulus arvensis</i>	Upland Grassland	Low
Iceplant	<i>Carpobrotus edulis</i>	Upland Grassland Marsh/Wet Grassland	Low
French broom	<i>Genista monspessulana</i>	Upland Grassland Tree Groves	High
German ivy	<i>Senecio mikanioides</i>	Tree Groves	High
Green wattle acacia	<i>Acacia decurrens</i>	Tree groves	High
Himalaya blackberry	<i>Rubus discolor</i>	Tree Groves Upland Grassland Scrub and Thickets	Low
Italian thistle	<i>Carduus pycnocephalus</i>	Upland Grassland	Low
Kikuyu grass	<i>Pennisetum clandestinum</i>	Upland Grassland Marsh/Wet Grassland	High
Pampas grass	<i>Cortaderia jubata</i>	Upland Grassland Tree Groves Marsh/Wet Grassland	High
Periwinkle	<i>Vinca major</i>	Tree Groves	Low
Poison hemlock	<i>Conium maculatum</i>	Upland Grassland	High
Water hyacinth	<i>Eichornia crassipes</i>	Open Water	High
Waterweed	<i>Hydrilla verticillata</i>	Open Water	High

CHAPTER 6

PUBLIC ACCESS AND LAND USE

INTRODUCTION

Public access within the marsh is limited to three principal areas: the corner of Jessie and Lemos Avenue, Ocean View Park, and East Cliff Drive (Figure 6-1). Informal access is provided by dirt paths that traverse the marsh area, upland grassy areas, and the eucalyptus grove. A fourth access area, located along the public alley between Lemos Avenue and Barson Street, provides the opportunity for public access to the upper marsh.

Primary use of the marsh area is by area residents, bird watchers, and those going to Ocean View Park, the San Lorenzo River, and adjacent neighborhoods. Use by transients and illegal campers are also readily observed. This area is regularly strewn with trash from illegal unsupervised activities.

EXISTING PUBLIC ACCESS

Junction of Jessie Street and Lemos Avenue

A primary point of public access to Jessie Street Marsh is from the corner of Jessie Street and Lemos Avenue. This is a grassy area between a private residence and the relatively open, wet area of the marsh. Local residents use this access point to traverse the marsh to nearby Ocean View Park. Access requires crossing the main drainage channel which is difficult because there is no formal bridge. This area is often closed as an access due to flooding in the winter.

Ocean View Park Access

The informal path from Ocean View Park down to the marsh is steep and highly eroded. The erosion has loosened rocks and soil and exposed tree roots. Walking up or down the hill without a formalized trail is difficult.

East Cliff Drive Access

The sidewalk on the north side of East Cliff Drive leads to a small opening in the existing guardrail which allows pedestrian access to the marsh (Figure 6-1). The path crosses a flat, grassy area and then travels down a short, steep embankment to meet the grade of the marsh and the path leading to the junction of Jessie Street and Lemos Avenue.

Another path leads from East Cliff Drive to Ocean View Park. This path is located east of the marsh path (Figure 6-1). Portions of the path are steep and eroded in places, which makes walking difficult. Local residents and others use this path to gain access to Ocean View Park.

Jessie Street Public Alley

The City-owned parcels along the Jessie Street alley provide a quiet open space vista into the upper marsh area. There are few fences; however, private residential uses have encroached onto public property in some areas.

SITE ANALYSIS

Jessie Street Marsh Management Plan

City Of Santa Cruz

Main Access September 1998

Bellinger & Foster Landscape Architects
Monterey, CA
(408) 646-1383

Habitat Restoration Group
Felton, CA
(408) 335-6800

Swanson Hydrology & Geomorphology
Santa Cruz, CA
(408) 427-0288

Legend/Notes:



Pedestrian- Vehicular Conflict



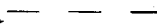
Point of Interest



Property Line



Easement Line



Study Area Boundary

Existing Storm Drain Legend



Storm Drain Outlet to Marsh



Jessie Channel



Marsh Outlet



Gravity Outlet No. 9 (To River)



Slide Gate



Figure 6-1

CHAPTER 7 ALTERNATIVES ANALYSIS

INTRODUCTION

This chapter presents alternative management strategies considered for the Jessie Street Marsh and the rationale for the selected management strategy.

Data Gathering and Public Input

On December 20, 1997, a public meeting was held with neighbors and other interested members of the public to gather information on the marsh and solicit input on potential management plan actions. Over 20 people participated in a marsh walk and a discussion on the opportunities and constraints of the marsh area. A consensus on several management plan actions was achieved at the meeting that included:

- Solve local drainage problems.
- Keep the marsh area natural.
- Restore and enhance natural habitats of the marsh area.
- Provide a safe pedestrian connection between Jessie Street and Ocean View Park.
- Increase fire safety.
- Increase public safety.
- Provide passive access to enhanced or restored marsh areas.
- Provide environmental interpretation of natural features.

In response to this information, a draft Jessie Street Marsh Management Plan was prepared. This plan was presented to the public at a neighborhood public meeting on March 28, 1998.

OPPORTUNITIES AND CONSTRAINTS ANALYSIS

Three management alternatives were evaluated for the Jessie Street Marsh, based on an analysis of historical data, current site conditions, and feasible management actions. The scenarios are

framed according to the hydrologic regime and resulting marsh habitat that could be achieved. Each of these management scenarios involves physically manipulating land and water which includes: regrading land, modifying drainage ditches to naturalistic channels, and changing hydraulic structures (e.g., storm drains) in order to introduce hydrologic conditions that support marsh vegetation and wildlife habitat. These manipulations are also designed in a manner compatible with current land use issues (e.g., flood control, public health and safety, mosquito control, city streets, and auto and pedestrian traffic). While the restoration and management actions look to the past for guidance and examples, the final design recognizes that modern conditions may not allow for the restoration of the pre-European settlement (i.e., pre-1850) conditions.

The three management alternatives are:

- Alternative A — Combination of Salt and Freshwater Marsh Habitat (Preferred Plan).
- Alternative B — Maximize Salt Marsh Habitat.
- Alternative C — Maximize Freshwater Habitat.

Each of the Management Plan alternatives include: 1) improved pedestrian access to Ocean View Park by constructing a raised boardwalk and stairway system; 2) enhanced native marsh and upland vegetative communities by removing invasive, non-native plants and revegetating degraded areas; 3) screening residential areas from marsh habitats to minimize impacts; 4) creating open water and islands to enhance wildlife habitat; 5) improved public safety through better street drainage, new pathways, and consistent park maintenance; 6) implementation of formal hours of public access; and 7) periodic patrols by park rangers.

Alternative A — Combination of Salt and Freshwater Marsh Habitat

Under this alternative, the project area would be modified to create both freshwater and saltwater habitats. Increased tidal exchange with the San Lorenzo River would create a salt/brackish marsh between the river and Lemos Avenue. A new slide gate at the San Lorenzo River would be installed to allow tidal exchange between the marsh and the river during nonstorm periods. There would also be some exchange of freshwater with the river when the summer lagoon is in place. A portion of the area downstream of Lemos Avenue would be regraded to create low marsh plain habitat. Spring freshwater would continue to enter the upper marsh area at Barson Street. Combined with some winter stormwater, the upper marsh will be retained as a freshwater cattail marsh. The area will be enhanced by creating more open water areas and buffers to adjacent land uses.

This alternative is the Preferred Plan because it provides an opportunity to maximize the biodiversity of the marsh areas and significantly enhance wildlife resource values. Salt/brackish marsh species (e.g., shorebirds) would be expected to utilize open mudflats of the lower marsh, while freshwater marsh species (e.g., waterfowl) would utilize the upper marsh area. The diversity of habitat types will provide several opportunities for natural history interpretation and passive recreation; thereby, meeting the project goals. Constraints to this option include the cost to remove fill and other materials to create a marsh plain, temporary disruption to traffic patterns during construction replacement of the slide gate (East Cliff Drive), and impacts to existing wetland habitats during project grading.

Alternative B — Maximize Salt Marsh Habitat

This alternative is similar to Alternative A, except that the marsh would be dredged deeper and only be open to tidal exchange during winter and spring months; not during summer when

freshwater dominates the San Lorenzo River Lagoon. Alternative B would also necessitate the efficient drainage of freshwater in winter months so standing freshwater does not persist in the marsh plain.

Alternative B was not selected because it would be more costly, have less habitat diversity, and have greater potential maintenance costs. In addition, due to residual urban and springfed freshwater sources and the need to divert them, Alternative B has an unacceptably high risk of failure due to either too much freshwater or not enough salt water.

Alternative C — Maximize Freshwater Habitat

This alternative would create freshwater ponds and marsh downstream of Lemos Avenue and enhance the existing freshwater marsh between Barson Street and Lemos Avenue. Grading the marsh plain downstream of Lemos Avenue would be required. This scenario would require construction and modification of the slide gate at the San Lorenzo River to increase freshwater exchange between the river and marsh; while not allowing for significant tidal exchange of salt water. This operation could lead to water stagnation in spring and winter months because the slide gate would be closed to avoid introducing salt water.

Alternative C was not selected due to a lack of biodiversity and potential water stagnation problems.

RELATED PROJECTS

Storm Drain Improvements and Jessie Street Marsh Management Plan

Each of the Jessie Street Marsh management alternatives also incorporates plans by the City of Santa Cruz Department of Public Works to improve the street storm drain system for the Ocean Avenue, Barson Street, and Jessie Street Marsh areas. The current storm drain system

drains approximately 50.4 acres from Ocean View Avenue/ Broadway to the east and north, and lower Ocean Street to the west. All of this storm water drains to the head of Jessie Street Marsh at the east end of Barson Street. The run-off flows into and through Jessie Street Marsh to a gravity drain/flap gate and to the Bixby Street pump system at the San Lorenzo River. The current drainage to Jessie Street Marsh is much more concentrated than existed prior to construction of the San Lorenzo River levee system when run-off was dispersed over a larger area. As mentioned above, street flooding in the Lower Ocean Street/Jessie Street Marsh system is a chronic problem during moderate rainstorms. Although some improvements were made this winter by dredging the inlet to Jessie Street Marsh, using the present Jessie Street Marsh ditches to convey stormwater run-off will not resolve the flooding problems.

Three major storm drain improvement options were considered by the City of Santa Cruz Public Works Department. The Jessie Street Marsh Management Plan project team reviewed these options in relation to the potential impacts or benefits to Jessie Street Marsh.

Storm Drain Option 1 — Construct New Ocean Street Storm Drain

Storm Drain Option 1 involves routing approximately 35.7 acres of the 50.4-acre Jessie Street Marsh drainage area to a new storm drain constructed under Ocean Street. Flows from the 35.7-acre area would bypass Jessie Street Marsh and flow into the San Lorenzo River at the Bixby Street pump station. Under normal operations, the new storm drain would reduce the stormwater run-off area to Jessie Street Marsh to 14.7 acres (including the bluff bounding the east side and the north end of Jessie Street). An operational provision to temporarily block a storm drain junction box at Ocean and Barson Streets would be included in the plan. This would allow for the diversion of an additional 13.3 acres to the marsh during drought periods. Spring flow from the Branciforte Bluff to the marsh, an important

freshwater supply in late summer and fall months, would not be affected by this storm drain option. Improved circulation of backwater from the San Lorenzo River Lagoon would occur through replacement of the flap gate at the Jessie Street Marsh outlet with a slide gate. The slide gate would allow for greater water exchange between the river's freshwater lagoon (in the summer months) and greater saltwater exchange with the river during the winter and spring months (when the river is open to the ocean). This plan would alleviate the need for storm water-related maintenance access and actions in Jessie Street Marsh; all actions would be for ecological and/or recreational needs, as specified in the Jessie Street Marsh Management Plan.

Storm Drain Option 1 is favored by the City Public Works Department because it is a long-term, cost-effective, and low maintenance solution that eliminates the need for managing Jessie Street Marsh for flood control purposes and avoids environmental conflicts. From the perspective of the Jessie Street Management Plan, this option would be necessary to implement marsh Alternative B, the salt marsh alternative because freshwater inflow would have to be minimized. The preferred management Alternative A (combination salt, brackish and fresh) would work well hydrologically with this storm drain plan and would eliminate flood control maintenance activities in the marsh. Similarly, the freshwater only alternative (Alternative C) would work with this storm drain plan because freshwater conditions can be maintained by manipulation of topography and residual freshwater sources would remain in the marsh.

Storm Drain Option 2 — Enlarge the Jessie Street Marsh Drainage Ditch and Install a New Pump Station

Storm Drain Option 2 involves improving the ditch and outlet system of Jessie Street Marsh to service the present 50.4-acre drainage area to 10-year storm engineering standards. This option plan would enlarge the drainage ditch within the

marsh to convey the 70 cubic foot per second (cfs) peak flow associated with a 10-year storm (the standard capacity for curb, gutter, and street storm drain design). The improvements would require that the present ditch be enlarged to approximately 10.0 feet wide by 4.5 feet deep and be accessible to dredging equipment for periodic maintenance and would require a parallel access road or concrete lining for driving equipment in the channel. The outlet system would have to be upgraded to a pump system in order to convey flow over the levee. This would replace the gravity and overflow pipe to the Bixby Street Pump station. The existing 12-inch pipe beneath East Cliff Drive has to be replaced with a 24-inch pipe.

Preliminary cost estimates indicate that this option would be more expensive than Option 1 in terms of up-front capital costs and would involve greater cost in the future due to maintenance requirements. Periodic maintenance is likely as marsh vegetation would readily establish on sediment run-off from the watershed. Although a concrete lined channel is not necessary for the system to work, without it a 12-foot wide maintenance road adjacent to the channel would be needed. Alternatively a more expensive "floatable" dredge could be used, but it would raise costs. The major drawback of this storm drain option would be the periodic maintenance measures in the channel that would not be compatible with marsh ecosystem management and water quality objectives. Although collaboration between ecosystem management and flood control maintenance is a possibility, the disturbance is often impacting to the ecosystem. Furthermore, a uniform drainage ditch would be needed under this option plan rather than a naturally designed, structurally complex, and sculpted channel that would promote biodiversity. The City of Santa Cruz Department of Public Works does not support this option plan because of concerns over the long-term maintenance costs and potential environmental restrictions.

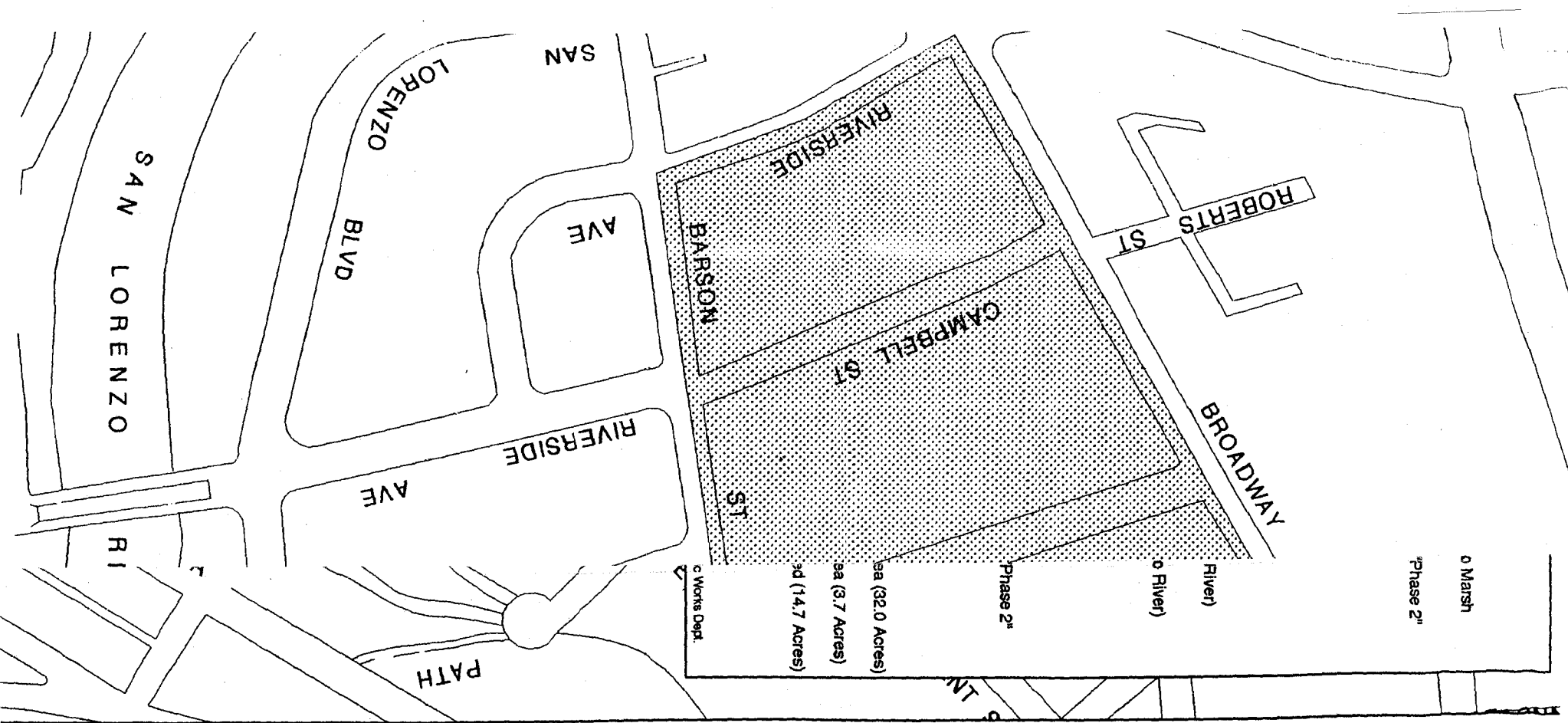
Storm Drain Option 3 — Combine New Storm Drain and Jessie Street Marsh Drainage Ditch Improvements

Storm Drain Option 3 is a combination of Option 1 and Option 2 wherein a new storm drain would be constructed under Ocean Street to drain approximately 20.0 acres of the 50.4-acre drainage area, with Jessie Street Marsh conveying the remainder of the flows. Under this option, the Jessie Street Marsh ditch would be enlarged to carry about 45 cfs in a 7.5 foot wide and 3.5 feet deep channel, which would have to be maintained. A pump station and new pipe under East Cliff Drive would also be required.

This option would be more expensive than Option 1 or Option 2 since it combines construction and maintenance elements. Option 3 was eliminated from consideration when it was realized that operational flexibility could be added to Option 1 by temporarily plugging a culvert under Ocean Street that would divert run-off into the marsh if needed during a drought.

SELECTED MANAGEMENT PLAN ALTERNATIVE

Based upon a variety of input and consultation from the public and city personnel, Alternative A (Combination of Salt/brackish and Freshwater Marsh) achieves the best results by optimizing the restoration of the ecosystem with surrounding urban uses while providing appropriate passive recreational opportunities and improved public safety. In addition, based upon an analysis of the management plan alternatives with a set of Storm Drain Improvement Options, Storm Drain Option 1 was selected as most compatible with the management alternative because it eliminates flood control maintenance in the Jessie Street Marsh while maintaining appropriate hydrologic conditions.



Legend/Notes:

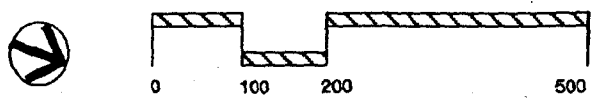


FIGURE 7-1

STORM DRAIN PLAN

Jessie Street Marsh Management Plan

City Of Santa Cruz
September 1998

Bellinger & Foster Landscape Architects
200 Cannery Row
Monterey, CA 93940
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CHAPTER 8 MANAGEMENT PLAN ACTIONS

APPROACH

The management plan for Jessie Street Marsh proposes to modify the marsh features to allow for: 1) increased tidal exchange with the San Lorenzo River; 2) enhancement of the salt/brackish marsh between East Cliff Drive and Lemos Avenue; and 3) enhancement of the freshwater marsh between Lemos Avenue and Barson Street.

Management plan actions include the modifying the operation of the existing slide gate and inlet pipe at the confluence of the marsh and the San Lorenzo River. This structure will allow tidal exchange between the marsh and the river during non-storm periods. The slide gate will be adjusted to allow limited exchange of water between the marsh and river when the river's freshwater lagoon is in place during the summer months. Portions of the marsh area will be excavated to create low plains for the establishment of a salt/brackish water marsh. The upstream marsh area will be enhanced as a freshwater marsh complex. Natural spring flows from the Branciforte Bluff area will continue to enter the upper marsh and a portion of winter stormwater run-off from the watershed will be routed to the marsh.

The marsh management plan is compatible with the City's storm drain improvements (Ocean-Barson Storm Drain Improvement Project). During normal rainfall event years, stormwater run-off from a 14.7-acre watershed will continue to enter the marsh. In drought years, flows will be blocked at one junction box to allow increased flows into the marsh if needed to maintain the marsh habitats.

Both marsh and upland habitats will be enhanced by removing invasive, non-native plants and by revegetating degraded areas. Vegetative screens and other physical features will be established

between residential areas and new or existing marsh habitats. These screens and features will be established to enhance habitat values and increase public safety for area residents and marsh visitors. A pedestrian link from the Jessie Street neighborhood to Ocean View Park will be provided by constructing a trail system. Opportunities for environmental education of the marsh habitats will be provided through interpretive displays and marsh overlooks. The plan includes a program for park maintenance and ranger patrols to provide upkeep and management of the area.

This management approach will maximize the biodiversity of the marsh areas and significantly enhance biotic resources. The diversity of habitat types will provide several opportunities for natural history interpretation and passive recreation; thereby, meeting the project goals and objectives.

SITE DESIGN

The site design is characterized by six key features. These key features are: 1) the modification of the operation of the slide gate and inlet pipe at the San Lorenzo River to allow tidal inundation to Lemos Avenue; 2) creation on low-elevation marsh plain along a new tidal channel; 3) modifying the existing cattail marsh to create islands and open water habitat; 4) creation of vegetative screens near residential areas; 5) enhancement of woodlands surrounding the marsh through revegetation and the removal of invasive non-native plant species; and 6) construction of pedestrian trails and interpretive features.

The actions to accomplish the management plan are described in detail below and their locations depicted on Figure 8-1 (Habitat Management Plan) and Figure 8-2 (Public Access Plan). Detail sheets of management plan actions are depicted on Figures 8-3 through 8-13. A Schematic Grading Plan is depicted in Figure 8-14. The schedule for implementation is described in Chapter 9.

HYDROLOGY ACTIONS

ACTION H-1 — Modify Operation of Existing Slide Gate at East Cliff Drive and San Lorenzo River

City of Santa Cruz Public Works Department staff will modify the outlet works of Jessie Street Marsh as part of the Ocean/Barson storm drain project. This work is scheduled for construction in Fall 1998. The improvements include: removal of the flap gate, repair of the existing slide gate (SG-1), and installation of a new slide gate (SG-2) between the culvert junction box on the land side of the levee and the culvert that flows to the Bixby Street Pump Station. Once completed, operation of the slide gate will allow for exchange of flow between the lagoon and Jessie Street Marsh. See Figure 6-1 for locations of the storm drain features.

Action H-1a — Operate Slide Gates

Operation of the slide gates will be conducted by City of Santa Cruz Public Works Department staff in coordination with the City of Santa Cruz Parks and Recreation Department. In general, the seasonal operation will be as follows:

- SG-1 will be open and SG-2 will be closed between April 1 and December 1.
- SG-1 will be closed when the lagoon water surface elevation exceeds 3.0 feet NGVD during this period.
- From December 2 through March 31, SG-1 will be closed and SG-2 will be open unless drought conditions occur (defined as rainfall less than 75% of normal annual to-date [mean annual precipitation for Santa Cruz is about 29-inches]) (high flows in the San Lorenzo River are unlikely and the lagoon is below 3.0 feet NGVD).

Action H-1b — Monitor Tidal Influence

Drought operations of the slide gate and the storm drain plug at Ocean and Barson Streets will be closely monitored by City personnel. The

operation of SG-1 and SG-2 should be modified as necessary to promote hydrologic conditions favorable to marsh habitat and to avoid property damage due to flooding or inundation.

ACTION H-2 — Create New Tidal Channel between East Cliff Drive and Lemos Avenue

A new tidal channel will be excavated to facilitate tidal exchange between the San Lorenzo River Lagoon and Jessie Street Marsh (Figure 8-1).

Action H-2a — Excavate New Channel

The channel will be excavated to a flow line of -1.5 feet NGVD at the culvert inlet (flow line sits at elevation -1.8 feet NGVD) at East Cliff Drive to elevation 0.0 feet at a point near Lemos Avenue. The channel slope will be 0.0025 or less. The new channel dimensions will be approximately 5.0 feet wide and 1.5 feet deep. Total project grading volume is approximately 2,000 cubic yards; grading for the new tidal channel and marsh plain represent about one-half of that volume.

Action H-2b — Monitoring of New Channel

During the first two years after grading, the new tidal channel will be monitored to assess tidal inflows and stability of the channel. Topographic spot locations will be established to document sedimentation or other processes.

ACTION H-3 — Fill Existing Channel between East Cliff and Lemos Avenue

Action H-3a — Fill Channels during Site Grading

The existing channel will be filled during site grading operations or will become part of the new marsh plain, as part of Action H-2, above.

ACTION H-4 — Create New Salt/Brackish Marsh Plain between East Cliff Drive and Lemos Avenue

Action H-4a — Excavate Marsh Plain

A new marsh plain will be excavated between 0.0 feet and 4.5 feet NGVD along the new channel described in H-2 (Figure 8-1). This marsh plain will function as mudflat (elevations 0.0 to 1.0 feet) adjacent the channel, up to the upper tidal zone (4.5 feet) (Figure 8-3). Approximately 0.13 acre of marsh plain will be created. Salinity will range from salt/brackish to fresh. Total project grading volume is approximately 2,000 cubic yards; grading for the new tidal channel and marsh plain represent approximately one-half of that volume.

Action H-4b — Monitoring of Marsh Plain

During the first two years after grading, the marsh plain will be monitored to assess tidal inflows and stability of the graded plain. Topographic spot locations will be established to document sedimentation or other processes.

ACTION H-5 — Create New Freshwater Channel between Lemos Avenue and Barson Street

Action H-5a — Create New Freshwater Channel

A new channel will be excavated from approximately Lemos Avenue to Barson Street. The new channel will be longer than the existing channel due to increased sinuosity. The flow line elevation will be from 0.0 feet NGVD at Lemos Avenue to 2.5 feet NGVD at a point approximately 100 feet below the dead end of Barson Street. At this point the channel will be the outlet to a sediment retention basin. The channel will have dimensions of 3.0 to 5.0 feet wide and depths at least 2.5 feet below the marsh plain in order to avoid tule/cattail growth. The new channel will be bounded by the existing and new freshwater marsh plain and open water areas.

The channel will receive winter run-off from the post-Ocean/Barson Storm Drain Project, Jessie Street Marsh watershed, and backwater and tidal flow from the San Lorenzo River Lagoon. Total project grading volume is approximately 2,000 cubic yards; grading for the new freshwater channel and open water areas (H-6, below) represent approximately one-half of that volume.

Action H-5b — Monitoring of Freshwater Channel

During the first two years after grading, the channel will be monitored to assess inflows and stability of the new drainageway. Topographic spot locations will be established to document sedimentation or other processes.

ACTION H-6 — Create Open Water Areas between Lemos Avenue and Barson Street

Action H-6a — Create Open Water Areas

Open water areas will be created between Lemos Avenue and Barson Street to complement the new channel and freshwater marsh. The open water areas will be swales that will be deep enough to discourage tule/cattail growth (water depth 4.5+ feet). The open water swales will be connected to the new channel with sills set at 4.5 feet NGVD and become deeper (to 0.0 feet NGVD minimum) away from the main channel. Approximately 0.27 acre of open water area will be created (Figure 8-1).

Action H-6b — Monitoring of Open Water Areas

During the first two years after grading, the open water areas will be monitored to assess sedimentation and stability of the open water areas. Topographic spot locations will be established to document sedimentation or other processes.

ACTION H-7 — Create Sediment Retention Basin near Barson Street

A sediment retention pond will be created downstream of Barson Street in order to control sedimentation in the new channels of Jessie Street Marsh (Figure 8-1).

Action H-7a — Construct Sediment Basin

The basin will be approximately 20 feet wide by 30 feet long. The basin will receive flow from the two channels that originate at the end of Barson Street. Outflow from the basin will be through a 24-inch diameter flash board vertical CMP riser pipe with an inlet elevation set no lower than 0.5 feet below the rim elevation of the pond. The riser pipe will be connected to a horizontal 24-inch CMP that will daylight to the head of the channel described in H-5. The culvert will be buried in compacted fill with a seepage collar. The flow line of the outlet culvert will match the flow line of the channel bed downstream.

Action H-7b — Periodic Maintenance of Basin

The basin will require periodic cleaning by heavy equipment (backhoe and dump truck) which will use the land between the two channels for access. A maintenance access gate will be installed at the end of Barson Street, as depicted in Figure 8-2.

ACTION H-8 — Partially Fill Existing Drainage Swale between Lemos Avenue and Barson Street

Action H-8a — Fill Channels during Site Grading

The existing channel will be filled to elevation 2.5 feet NGVD +/- in order to promote tule/cattail growth. Areas, where the existing channel is within 20 feet of the new channel or the open water swales, will be filled to create a vegetated marsh plain to avoid flow capture. The fill for the marsh plain will be generated from channel excavation. Excavated materials from

the open water areas and new freshwater channel will be used to create new marsh islands. Approximately 0.03 acre of new marsh will be created (Figure 8-1).

HABITAT RESTORATION AND ENHANCEMENT ACTIONS

ACTION R-1 — Create New Salt/Brackish Water Marsh between East Cliff Drive and Lemos Avenue

Salt/brackish water marsh habitat will be created along the edges of a newly created meandering channel and on two low-elevation marsh plains between East Cliff Drive and Lemos Avenue. As discussed under Action H-1 will increase tidal circulation within the marsh to Lemos Avenue and allow for the creation of new marsh areas and the restoration of a portion of the existing degraded marsh. Salt/brackish marsh (e.g., pickleweed and other salt-tolerant wetland plant species) will be created on the newly excavated areas through seeding and planting native marsh species (Figure 8-3).

The marsh habitat will receive tidal flows from the San Lorenzo River during non-storm periods and some freshwater flows during the summer when the river lagoon is in place. Tidal exchange with the river will prevent water stagnation within the lower Jessie Street Marsh; thereby, reducing concerns on water quality and mosquito populations. During winter high tides, it is expected that the lower channel and marsh plain will be inundated. This tidal exchange will benefit the growth and health of the marsh plain vegetation. Regular tidal exchange will preclude the establishment of freshwater marsh plant species and will favor the growth of salt-tolerant species (e.g., pickleweed).

During the summer, when the San Lorenzo River lagoon is in place, the amount of water allowed to enter the marsh will be controlled by full or partial closure of the slide gate. Flows will be allowed in the meandering low-flow channel; however, inundation of the marsh plain with

freshwater will not be allowed. The absence of standing water in the marsh plain will also reduce summer mosquito habitat.

Action R-1a — Site Preparation

Prior to the start of construction, the City shall obtain all applicable permits relating to wetlands and watercourses. Wetland resources to be retained adjacent to construction activities will be clearly marked in the field prior to construction.

Action R-1b — Revegetation

Active revegetation of the newly created marsh areas will be implemented. Previous seed bank analysis studies showed that the existing wetland may not have sufficient viable seed for natural re-establishment of a salt/brackish marsh (Davies 1995). Therefore, following site grading, native wetland plant species will be planted on the low-elevation marsh plains using native plant propagules. As depicted on Figure 8-1, approximately 0.13 acre of salt/brackish water marsh will be established on the site.

The salt/brackish water marsh will be planted with native plant species. A list of native plant species to be utilized in creating this habitat are listed in Table 8-1. Plant materials will be native to the Jessie Street Marsh area and/or marsh ecosystems in the vicinity. Depending upon plant species availability, plant materials will be collected from Jessie Street Marsh and/or nearby salt/brackish marsh areas (e.g., lower Arana Gulch). Collection of propagules will occur approximately one year prior to planting, such that suitable planting materials are available. Planting/seeding will occur in the fall following marsh plain grading.

Action R-1c — Special Status Species Protection

No special status aquatic species are known to inhabit the marsh area (i.e., California red-legged frog, tidewater goby); therefore, impacts to such

resources from construction and implementation of the plan are not expected.

Action R-1d — Removal of Vegetation from Site Grading Operations

Creation of the salt/brackish marsh habitat downstream of Lemos Avenue will require the removal of several blackwood acacia trees. Although these trees are non-native and the area has been significantly degraded by unauthorized human uses, some of the trees are heritage-size (i.e., greater than 20" in diameter). These trees also provide a visual screen for some of residences. Re-plantings of trees and shrubs along the raised berm is proposed to offset this impact; this is described in more detail under Action R-3 (Figure 8-5). Implementation of the management plan will result in a net increase in wetland habitats (and values) on the site. However, approximately some existing wetland area between East Cliff Drive and Lemos Avenue will be impacted during site grading of the tidal channel and marsh plain. This activity will require several permits which include: 1) a permit from the U.S. Army Corps of Engineers, pursuant to Section 404 of the Clean Water Act; 2) a water quality certification from the Regional Water Quality Control Board; and 3) a Streambed Alteration Agreement from California Department of Fish and Game. The City will obtain these permits prior to site construction activities.

Action R-1e — Long-term Management of Salt/Brackish Water Marsh

Long-term management actions within the salt/brackish marsh area will include periodic removal/control of invasive, non-native plant species and supplemental revegetation (as necessary).

Action R-1f — Mosquito Control

The marsh areas currently provide suitable habitat for both saltwater and freshwater mosquitoes. Increased tidal activity between East Cliff

Drive and Lemos Avenue is expected to create conditions unsuitable for mosquitoes. The daily tidal activity will reduce potential breeding habitat for the salt marsh mosquitoes. In an effort to reduce mosquitoes, bat and swallow boxes will be installed in the marsh area concurrent with the revegetation actions.

Action R-1g — Installation of Bat and Swallow Boxes

Nest/roost boxes for bat and/or swallows will be installed around the perimeter of the marsh to encourage use of the marsh area by insect-eating mammals/birds (including mosquitoes). Commercially-available bat and swallow boxes will be purchased and placed in appropriate woodland areas near the marsh. The City will confer with a wildlife biologist on the exact placement of the boxes.

ACTION R-2 — Enhance Existing Eucalyptus Grove near East Cliff Drive

The eucalyptus grove near East Cliff Drive is a prominent natural feature within the study area. Although a non-native tree, the eucalyptus provides vertical structure and cover for wildlife (e.g., roosts for raptors and other birds) and screening and aesthetic value for local residents and travelers along East Cliff Drive. Due to the large amount of bark peels that drop from the trees, the understory vegetation is relatively sparse and provides little natural resource value. The bark peels, leaf litter, and several low-lying branches contribute to a high fuel load in this area and increases the fire danger of the area. One portion of the grove was burned in 1997 by an unauthorized campfire. Future fires are a concern of area residents. Unauthorized trails throughout the grove, coupled with the steep slope, have resulted in bare erosion-prone areas and unsafe site conditions (see Chapter 6).

The management plan proposes to enhance the biotic resource values of the grove, increase public safety, and improve erosion control by thinning the tree grove and revegetating the slope

with native plant species. As depicted on Figure 8-4, each tree clump will be thinned to preserve one-to-two trees per clump (currently the tree clumps range from 4 to 6 trees per clump). The largest tree(s) within each clump will be preserved. The remaining trees and their lower branches (within 20 feet of the ground) will be removed to increase the amount of light reaching the grove floor. The goal of the thinning is to have trees on a minimum 30-foot spacing. The eucalyptus leaves and bark litter, as well as resprouts will be gathered and removed from the grove. The material may be chipped and used as mulch.

Action R-2a — Site Preparation

Prior to the start of construction, the City shall obtain all applicable permits relating to removal of trees (including heritage trees). Vegetation resources to be retained adjacent to tree removal activities will be clearly marked in the field prior to construction.

Action R-2b — Revegetation

Following tree removal operations, the hillside will be revegetated with native shrubs, vines, and herbaceous groundcovers. The vegetation will reduce hillside erosion and the continued removal of downed materials within the grove will decrease fire hazard within the area. Native plants that have naturally established within the grove will be preserved, including young oak seedlings (to the greatest extent feasible). Plant species suitable for revegetation within these areas are depicted on Table 8-2. Propagation materials are available from on-site and nearby areas. Collection of propagules will occur approximately one year prior to planting, such that suitable planting materials are available.

Action R-2c — Special Status Species Protection

No special status aquatic species are known to inhabit the eucalyptus grove (i.e., Monarch butterfly); therefore, impacts to such resources

from implementation of the plan are not expected. Tree removal should occur in August after nesting birds have fledged. A pre-construction raptor survey should be conducted prior to tree removal to determine any nesting activity and to ensure all young have fledged (if nests are observed) prior to tree removal operations.

Action R-2d — Removal of Vegetation

Enhancement of the eucalyptus grove area will require the removal of several eucalyptus trees. Although these trees are non-native and the area has been significantly degraded by unauthorized human uses, some of the trees are heritage-size and provide a visual resource for the area. Revegetation of native shrubs and groundcovers amid the retained eucalyptus trees is proposed to offset this impact.

Action R-2e — Long-term Management of Eucalyptus Area

Within the eucalyptus grove, the City (an/or volunteers) will conduct yearly maintenance to remove eucalyptus re-sprouts, suckers, loose bark, and leaf debris. Removal and control of invasive, non-native plant species will also be conducted when occurrences are noted.

ACTION R-3 — Create New Raised Berm and Vegetative Screening near Residences between East Cliff Drive and Lemos Avenue

The management plan includes the creation of a raised berm between existing and/or new wetlands and the back yards of the homes along Jessie Street. This raised berm will be planted with native trees and shrubs to provide screening of the houses from the marsh and separate pedestrian uses in the marsh area from the neighboring land use. As depicted on Figure 8-1, the plantings will follow the entire length of the backyard fences between East Cliff Drive and Lemos Avenue. Figure 8-5 depicts the size of the berm and the location of the plantings.

Action R-3a — Site Preparation

No permits are necessary for this work. Vegetation resources to be retained adjacent to the berm construction area will be clearly marked in the field prior to construction.

Action R-3b — Revegetation

Following construction of the berm, the area will be revegetated with native trees, shrubs, and herbaceous groundcovers. The vegetation will reduce potential erosion of the berm and provide a visual screen. Plant species suitable for revegetation within these areas are depicted on Table 8-3. Propagation materials are available from occurrences of these species on-site and nearby areas. Collection of propagules will occur approximately one year prior to planting, such that suitable planting materials are available. Planting will occur in the fall following site grading and berm construction.

Action R-3c — Special Status Species Protection

No special status aquatic species are known to inhabit the area of the berm; therefore, impacts to such resources from implementation of the plan are not expected.

Action R-3d — Removal of Vegetation

Creation of the berm will require the removal of Himalaya berry; this invasive, non-native plant species is recommended for removal. Creation of the berm and the establishment of native trees and shrubs will enhance the value of the adjacent marsh habitat.

ACTION R-4 — Retain and Enhance Freshwater Marsh Habitat between Lemos Avenue and Barson Street

The existing freshwater marsh habitat upstream of Lemos Avenue will be enhanced through the creation of a mosaic of open water areas and cattail/bulrush-dominated marsh. The existing

drainage ditches will be removed and the area regraded to create a more naturalistic channel, a large open water area, and a vegetated island. Figure 8-1 depicts the configuration of the freshwater marsh area, including the areas of open water and cattail/bulrush marsh. Approximately 0.27 acre of open water and 0.03 acre of cattail/bulrush marsh will be created and/or preserved. A ratio of 1:1 of open water to marsh (retained and/or new marsh areas) has been selected as the design goal for the upper marsh. This ratio of open water and vegetated area will improve habitat diversity, improve water circulation and the conveyance of winter floodflows, and decrease mosquito breeding habitat. The areas of deeper water will attract waterfowl and other birds to the upper marsh and to the island for possible breeding. A cross-section depicting the freshwater marsh zones is shown as Figure 8-6.

Action R-4a — Site Preparation

Prior to the start of construction, the City shall obtain all applicable permits relating to wetlands and watercourses. All applicable permits include: 1) a permit from the U.S. Army Corps of Engineers, pursuant to Section 404 of the Clean Water Act; 2) a water quality certification from the Regional Water Quality Control Board; and 3) a Streambed Alteration Agreement from California Department of Fish and Game. The City will obtain these permits prior to site construction activities.

Wetland resources to be retained adjacent to construction activities will be clearly marked in the field prior to construction.

Action R-4b — Special Status Species Protection

No special status aquatic species are known to inhabit the marsh area (i.e., California red-legged frog, tidewater goby); therefore, impacts to such resources from construction and implementation of the plan are not expected.

Action R-4c — Removal of Vegetation from Site Grading Operations

Modification of the freshwater marsh habitat between Lemos Avenue and Barson Street will require the removal of some existing wetland vegetation (cattail and bulrush); however, implementation of the management plan will result in a net increase in wetland habitats (and values) on the site.

Action R-4d — Creation of Open Water

The open water areas will be created by cutting and removing the dense cattail/bulrush vegetation and removing marsh sediments to reach an open water depth that will preclude re-establishment of marsh vegetation (i.e., greater than 4.5 feet deep). The existing dense vegetation will be removed with vegetation-cutting machinery (or other suitable equipment) and the cut materials disposed of off-site (i.e., City landfill).

Action R-4e — Creation of Islands within the Freshwater Marsh

An island will be created in the freshwater marsh using dredged materials. The island will facilitate breeding by waterfowl by discouraging predation by domestic dogs and cats and disturbances by humans. The deepwater channel is expected to discourage mammal access to the island.

Action R-4f — Long-term Management of Freshwater Marsh

The deepwater channels and other open water areas within the upper marsh are expected to receive some sediment from the watershed area. The sediment basin to be constructed near Barson Street is expected to entrap most of the urban sediments that will be transported to the marsh; however, some sediment from the Branciforte Bluff area is expected to enter the marsh. Sediment accumulation within the open water areas will encourage the growth/spread of cattail

and bulrush once the water depth is less than 2.5 feet.

The depth of the water within the open water areas will be periodically measured (i.e., every two years) and evaluated as to sedimentation rates. Visual observations of cattail/bulrush establishment with the open waters will also be conducted at two-year intervals. If sediment deposits reach levels where water depths are less than 4.5 feet and/or the amount of marsh vegetation encroaches into the open water by more than 0.1 acre, vegetation/sediment removal actions will be initiated. Maintenance may include removal of sediments from open water areas and/or removal of vegetation and sediments to achieve the specific depths depicted on Figure 8-6 and specified in Action H-6.

Other long-term management actions within the freshwater marsh will be implemented. Invasive, non-native plant species (e.g., waterweed, water hyacinth, kikuyu grass, iceplant, and pampas grass) will be periodically removed from the retained marsh areas and prevented from creating dense concentrations within the newly created marsh. The marsh vegetation may be selectively trimmed around the observation platform to retain views of open water areas.

Action R-4g — Mosquito Control

Mosquitoes are expected to remain a management concern in the upper marsh areas, as these areas will be dominated by freshwater. The freshwater winter mosquito has increased its presence in the region over the last several years. The life cycle begins in November-December and lasts through spring. The species produces one brood per year and are vicious biters. The mosquito population is difficult to manage without draining of wetlands or to have water areas with little or no vegetative breeding habitat (an action contrary to the intent of the management plan). The management proposes the installation of bat boxes around the upper marsh area in an attempt to reduce mosquito populations; however, it is expected that freshwater winter mosquito popula-

tions will continue to occur in the area and may continue to be a concern to area residents. In an effort to reduce mosquitoes, bat and swallow boxes will be installed in the marsh area concurrent with the revegetation actions.

Action R-4h — Installation of Bat and Swallow Boxes

Nest/roost boxes for bat and/or swallows will be installed around the perimeter of the marsh to encourage use of the marsh area by insect-eating mammals/birds (including mosquitoes). Commercially available bat and swallow boxes will be purchased and placed in appropriate woodland areas near the marsh. The City will confer with a wildlife biologist on the exact placement of the boxes.

ACTION R-5 — Create New Freshwater Marsh Habitat

Action R-5a — Revegetation

Several areas of marsh vegetation will be created and/or allowed to naturally re-establish following the re-grading of the marsh area. Where new marsh areas are to be created, salvaged root masses of cattails, bulrushes, and other native wetland species will be re-planted. Dense vegetation will be retained and/or be allowed to re-establish on the island in the hopes that wildlife can utilize these areas without being disturbed by mammals (including humans).

Dredged material from the existing marsh will be removed from the site or used to create the central islands. Areas along the perimeter of the marsh that are disturbed from dredging activities will be actively revegetated (or allowed to naturally re-establish) with native freshwater marsh species (i.e., cattails and bulrush) (approximately 0.03 acre) (Figure 8-6). The large patch of iceplant that is encroaching into the marsh will be removed during site grading. Table 8-4 lists the plant species to be utilized in revegetation of this habitat type. Plant materials will be native to the Jessie Street Marsh area

and/or marsh ecosystems in the vicinity. Depending upon plant species availability, plant materials will be collected from Jessie Street Marsh and/or nearby areas.

ACTION R-6 — Retain and Enhance Existing Riparian Habitat

The riparian habitat will be enhanced through the removal of invasive, non-native plant species. The primary non-native plants with the riparian habitat are English ivy, German ivy, periwinkle, kikuyu grass, and pampas grass. All of these plant species are aggressive and are difficult to eradicate.

Action R-6a — Removal of Invasive, Non-native Vegetation

Existing concentrations of invasive, non-native plant species will be reduced through manual removal (i.e., hand tool or mechanical) and periodic maintenance; however, complete eradication of these plant species from the marsh area is not expected. Plant materials will be removed by hand and disposed of off-site. Native understory species (e.g., California blackberry and poison oak) will be allowed to naturally re-establish in areas where the non-native plants have been removed. Removal of invasive, non-native plant species is an on-going management plan action that will begin concurrent with other plan actions. The locations of invasive, non-native plants to be removed from the riparian habitat are depicted on Figure 8-7. Techniques for the removal of invasive plant species are identified in Appendix C.

Residential properties bordering the riparian areas of the marsh also support occurrences of invasive non-native plants. Area residents will be encouraged to prevent the spread of these species into the neighboring marsh through education and outreach efforts (see Action P-5).

ACTION R-7 — Create New Riparian Habitat between Lemos Avenue and Barson Street

The management plan includes the creation of new riparian habitat in areas currently infested with invasive non-native plant species. As depicted on Figure 8-1, the riparian plantings will occur near the edge of an existing residence near Barson Street (0.1 acre).

Action R-7a — Site Preparation

No permits are necessary for this work. Vegetation resources to be retained adjacent to the riparian revegetation area will be clearly marked in the field prior to planting activities.

Action R-7b — Revegetation

Following removal/control of invasive non-native plant species, the area will be revegetated with native riparian trees. The revegetation will enhance the riparian habitat resources of the upper marsh area. Plant species suitable for revegetation within these areas are depicted on Table 8-5. Propagation materials are available from occurrences of these species on-site and nearby areas. As willow is the primary species to be planted, pole cuttings of this species may be obtained immediately prior to planting.

Action R-7c — Special Status Species Protection

No special status aquatic species are known to inhabit the area of the revegetation; therefore, impacts to such resources from implementation of the plan are not expected.

Action R-7d — Removal of Invasive, Non-native Vegetation

Invasive, non-native plant species (i.e., kikuyu grass and iceplant) will be removed from the area as part of the revegetation; this will enhance the value of the riparian area and the adjacent marsh habitat. Kikuyu grass is prevalent on private

property adjacent to the marsh; removal and/or control of this infestation will be encouraged by the City such that the grass does not invade the riparian revegetation areas.

ACTION R-8 — Retain and Enhance Existing Oak Woodland

The coast live oak-dominated woodlands will be enhanced through the removal of invasive, non-native plant species and revegetation with native understory species. The primary non-native plant species within the oak woodland area is English ivy. There are also scattered occurrences of French broom and Himalaya blackberry. These plants will be removed by hand and disposed of off-site. Open areas greater than 6 feet-square, that are created following removal of the non-native plants, will be revegetated with native oak woodland understory plants. A list of plant species to be used for the revegetation are depicted in Table 8-6

Action R-8a — Removal of Invasive, Non-native Plant Species

The oak woodland areas will require periodic maintenance activities to remove and/or control the spread of invasive non-native plant species. Once a year, City work crews and/or marsh volunteers will conduct a non-native plant eradication/control session. During the work session, non-native plants within the oak woodland understory will be removed (see location of invasive plants to be removed on Figure 5-3). Removal of invasive, non-native plant species will be an on-going management plan action. Techniques for the removal of invasive plant species are identified in Appendix C.

ACTION R-9 — Create New Oak Woodland

New oak woodland will be created along the edge of the graded slope between East Cliff Drive and Lemos Avenue. The planting will replace scrub vegetation removed during site grading for the salt/brackish water marsh plain. Oak woodland

will also be established upstream of Lemos Avenue near the Jessie Street alleyway. This area currently has a large blackberry thicket and coast live oak grove. This vegetation will be retained, plus additional trees and shrubs will be added to nearby areas to enhance the habitat values and to screen neighboring residences from the public access area. Approximately 0.3 acre of new oak woodland will be created.

Action R-9a — Site Preparation

No permits are necessary for this work. Vegetation resources to be retained adjacent to the oak woodland revegetation areas will be clearly marked in the field prior to planting activities.

Action R-9b — Revegetation

Following removal/control of invasive non-native plant species and/or site grading, the area will be revegetated with native oak woodland trees and shrubs. The revegetation will enhance the habitat resources of the marsh and upland area. Plant species suitable for revegetation within these areas are depicted on Table 8-6. Propagation materials are available from occurrences of these species on-site and nearby areas. Oak acorns will be collected from the site and grown into container stock for out-planting.

Action R-9c — Special Status Species Protection

No special status aquatic species are known to inhabit the area of the revegetation; therefore, impacts to such resources from implementation of the plan are not expected.

Action R-9d — Removal of Invasive, Non-native Vegetation

Invasive, non-native plant species (i.e., kikuyu grass) will be removed from the area as part of the revegetation; this will enhance the value of the oak woodland area and the adjacent marsh habitat. Kikuyu grass is prevalent on private

property adjacent to the marsh; removal and/or control of this infestation will be encouraged by the City such that the grass does not invade the revegetation areas.

ACTION R-10 — Retain and Enhance Existing Saltgrass Grassland

The existing saltgrass/alkali rye grass areas will be enhanced through the removal of invasive, non-native plant species and periodic management of the marsh plain. Native wetland plant species (e.g., salt grass and alkali rye grass) will be encouraged to spread throughout the grassland area. The grassland adjacent to the upper marsh is comprised of a mixture of native and non-native plant species. The grasslands will be managed to encourage the growth and reproduction of the native plant species; thereby, adding to the biodiversity of the marsh area. Management actions will include bi-annual control/removal of invasive, non-native plant species from the area (i.e., iceplant) and spring and fall mowing to reduce the amount of non-native grass seeds.

Action R-10a — Long-term Management of Grassland Areas

The grassland areas will be mowed each spring and fall for the first five years of the site management. The mowing is intended to reduce the amount of non-native grass seeds. The need to continue mowing after Year 5 will be assessed by the City and a botanist. The City (an/or volunteers) will implement bi-annual control/removal of invasive, non-native plant species from the area (i.e., iceplant).

ACTION R-11 — Remove/Control Invasive, Non-native Plant Species

The removal and/or control of invasive, non-native plant species from the marsh study area will enhance the biotic resource values of the area. Periodic site maintenance sessions will be conducted to remove and control the spread of these species, as discussed under each habitat type. Primary methods for removal will be hand

labor and hand tools; however, mechanical removal may be suitable for waterweed (an aquatic plant growing within the existing drainage ways). See Appendix C for specific management techniques that will be used.

PUBLIC ACCESS ACTIONS

Public access actions for the marsh are depicted in Figure 8-2. Details depicting specific marsh entrance features, pathways, and overlook are depicted on Figures 8-7 through 8-13.

ACTION P-1 — Construct Bridge and Boardwalk across Marsh Channel near Lemos Avenue and Jessie Street

A primary access area to the marsh is from the intersection of Jessie Street and Lemos Avenue. This access area provides area residents with a pedestrian connection to Ocean View Park, the San Lorenzo River, and adjacent neighborhoods. Access from this location requires a bridge over the marsh channel and a boardwalk adjacent to the marsh plain.

A boardwalk extending from the bridge along the toe of the wooded slope and parallel to the marsh channel will be constructed (see Figure 8-2). The boardwalk will provide pedestrians with safe access across the marsh channel during all times of the year and will be handicap-accessible.

Action P-1a — Site Preparation

Applicable permits for bridge, boardwalk, and path improvement should be obtained as part of this overall restoration plan, as discussed in Action R-4 above.

Action P-1b — Removal of Vegetation and Channel Grading

Construction of the bridge and boardwalk will require site clearing. Existing black acacia trees and Himalaya blackberry shrubs will be removed as part of the marsh and channel grading work (see Action R-4 above) and will open the area for

placement of the bridge and boardwalk. The vegetative screening provided by the black acacia trees will be replaced by the construction of a raised berm and new plantings (as described in Action R-3 above).

Action P-1c — Construction of Bridge and Boardwalk

Bridge footings shall be located to allow a minimum clearance of 10 feet across the marsh channel and a minimum of 3 feet freeboard (i.e., distance from bottom of bridge to water surface elevation). Footings shall be treated with a wood preservative approved for use in marine environments. Boardwalk walking surfaces shall have 0.5% maximum cross slope and 3% maximum longitudinal slope. Railings (42" high) will be constructed along the boardwalk in areas next to open water, the marsh plain, and at the two overlooks. Maximum boardwalk elevation is 5.0 feet, approximately equal to the adjacent residential backyard elevations. A schematic view of the boardwalk is depicted on Figures 8-10 and 8-11.

ACTION P-2 — Construct Footpaths Within Upper and Lower Marsh Areas

Public access in the upper and lower marsh area (i.e., East Cliff Drive to Lemos Avenue) will be facilitated by construction of decomposed granite-surfaced paths (in addition to the raised boardwalk, described above). The path (six-foot wide) will allow pedestrian, as well as periodic park vehicle maintenance, access. The path within the lower marsh will occur east of the marsh plain, as depicted on Figure 8-2. Vegetation adjacent to the path (i.e., within 2 feet) will be comprised of herbaceous plants or low woody shrubs that will allow visibility and promote trail user safety. The pathway will connect the Jessie Street/Lemos Avenue area to East Cliff Drive. A connection to the sidewalk along East Cliff Drive will be located at the end of the guardrail approximately 100 feet east of Jessie Street.

A pedestrian path (decomposed granite-surface) in the upper marsh area (i.e., between Lemos Avenue and Barson Street) will also be constructed. This path will provide public access from the Jessie Street alleyway to the saltgrass grassland and freshwater marsh area (see Figure 8-2).

All of the decomposed granite-surfaced paths will be raised slightly above adjacent natural grades. The paths will include a geo-textile fabric between sub-grade and path base to stabilize the path and reduce plant encroachment onto the path. All paths will have a center crown and not exceed 5% slopes.

Action P-2a — Site Preparation

Strip all vegetation from path base area. Path clearing and grading is expected to be a part of the overall site grading permit and operations.

Action P-2b — Path Layout

Locate the path a minimum of five feet from proposed marsh areas and ten feet from any private backyard. Widen path areas for marsh viewpoints and interpretive sign features, as depicted in Figure 8-2 and detailed design on Figures 8-7 through 8-9.

Action P-2c — Path Maintenance

Inspect path annually for erosion and foot traffic wear. Scarify eroded areas and re-surface with similar granular material incorporating a soil stabilizer additive.

ACTION P-3 — Construct Gates and Split-Rail Fences and Install Boulders

Improving access through Jessie Street Marsh will also require barriers to inhibit inappropriate access. At each path connection to public streets, alleyways, or sidewalks, a combination of boulders and split rail fencing will be used to control pedestrian and/or vehicular access. Where maintenance vehicle access is desired (i.e.,

at the end of Barson Street and at the Jessie Street/Lemos Avenue access area), a 10-foot wide swinging gate will be installed. Where the path abuts open water (such as in the upper marsh), a split rail fence barrier will be installed (see Figure 8-2). A typical detail of a split rail fence is depicted on Figure 8-12.

ACTION P-4 — Construct Trail and Steps to Ocean View Park

Currently, neighborhood residents travel between the marsh and Ocean View Park along a steep slope. The steep slope creates erosion problems and access hazards. The plan identifies the construction of a new path (with steps) to provide a safe and convenient pedestrian access route to Ocean View Park. The location of the path and steps is shown on Figure 8-2. The steps will be constructed with wood headers with decomposed gravel between each step. A railing will be placed along one side of the steps, as shown on Figure 8-13. Fifteen steps are needed to traverse the hillside. Due to the slope of the hillside and the need for stairs, this access to Ocean View Park is not handicap accessible. A detail of the steps is depicted on Figure 8-13.

Action P-4a — Site Preparation

The new trail and steps will be located along the current hillside footpath. The path will traverse the slope and steps will be provided at the steeper locations so as to minimize grading.

Action P-4b — Construction

The steps will be constructed using pressure treated Douglas Fir timbers. The steps will be incised and attached to ground with rebar stakes. The steps will be back filled with decomposed granite. The path will be cut into the hillside with a maximum 2:1 cut slope and 3:1 fill slope. Erosion control water bars will be installed across the trail at maximum 25-foot intervals. The cut and fill slopes will be revegetated with native herbaceous groundcovers, as identified in the Eucalyptus Grove Enhancement and Oak

Woodland planting lists (Tables 8-2 and 8-6, respectively). A metal railing will be installed along one side of the steps (see Figure 8-13).

ACTION P-5 — Install Interpretive and Public Access Signs

Action P-5a — Install Signs

The enhancement of the marsh and public access improvements will increase the community's interest in the marsh's history and environmental values. Interpretive and public access information will be provided by the use of signs. Both public access information and interpretive signs will be installed at the three marsh entrances (i.e., Jessie Street alleyway, Jessie Street/Lemos Avenue intersection, and East Cliff Drive entrance). The Jessie Street/Lemos Avenue area is an excellent marsh entrance. There is sufficient area for a bench, interpretive exhibit, bicycle rack, and trash container. Primary neighborhood concerns are keeping a plant buffer between any trail and private fences for security and graffiti control (see Action R-3). Fencing will restrict open water access and restrict vehicle encroachment into the marsh. Street parking is adequate for the anticipated local use. Additionally, interpretive signs will be placed at the marsh viewpoint (located along the footpath in the lower marsh) and the marsh overlooks (two on the boardwalk and one in the upper marsh). Signs will be in English and Spanish; public access information signs will describe user rules, hours of operation, and related information. The interpretive signs will describe the natural and cultural history of the marsh area and marsh restoration efforts. A detail of the interpretive sign is depicted on Figure 8-12.

Action P-5b — Create a Nature Walk Experience

The interpretive signs will be designed to provide a nature walk experience for marsh visitors.

ACTION P-6 — Install Benches, Bicycle Racks, and Trash Containers

Action P-6a — Install Benches, Bicycle Racks, and Trash Containers

At each marsh entrance area, seating for marsh visitors will be provided. Trash receptacles will also be installed at several locations. Figure 8-2 depicts the locations for these features; details of these areas are depicted on Figures 8-7 through 8-9. Large boulders and wood benches will be used. Bicycle lock posts racks will be provided at the Jessie Street/Lemos Avenue entrance. Park information signs will encourage marsh visitors to leave their bicycles outside the marsh.

ACTION P-7 — Long-term Site Maintenance

Action P-7a — Implement Long-term Site Maintenance

During the first year after site improvement, the City will provide weekly inspection of the footpaths and steps to clean-up debris and monitor inappropriate/illegal uses of the marsh. The hillside area to Ocean View Park will be monitored for any hillside erosion during the plant establishment period (i.e., up to one year after hillside planting). The park improvements (i.e., steps, paths, signs) will be repaired by City staff as needed. Currently, the site is littered with food, bottles, and cans left by people traveling through the marsh. With improved access and visibility, and maintenance by the City, it is anticipated there will be a substantial decrease in litter. However, like most public places, there will be some trash. Placement of trash containers at marsh entrances will intercept some trash and provide easy maintenance. Figures 8-7 through 8-9 depict the location of trash receptacles. Vehicular access for maintenance vehicles is provided at the Jessie Street/Lemos Avenue entrance and at the Barson Street area (sediment removal maintenance access), as depicted on Figure 8-2.

ACTION P-8 — Improve Existing Trail to Ocean View Park

The existing pedestrian path that travels from East Cliff Drive to Ocean View Park will be improved. The trail tread will be smoothed and compacted to improve use of the trail for marsh visitors, including those with strollers. Due to the slope of the trail route, the path is not handicap-accessible.

Action P-8a — Site Preparation

Strip all vegetation from path base area.

Action P-2b — Improve Path Surface

Re-grade path to remove rills and gullies. Slope pathway to improve cross-drainage and reduce future erosion. Apply decomposed granite to path and compact as necessary to create a stable base.

Action P-2c — Path Maintenance

Inspect path annually for erosion and foot traffic wear. Scarify eroded areas and re-surface with similar granular material incorporating a soil stabilizer additive.

**Table 8-1. Plant Species List for Salt/Brackish Water Marsh Revegetation Areas,
Jessie Street Marsh Management Plan**

Common Name	Scientific Name	Percent Composition (%)
Marsh Plain		
Alkali Heath	<i>Frankenia salina</i>	10
Baltic Rush	<i>Juncus balticus</i>	10
Jaumea	<i>Jaumea carnosa</i>	20
Pickleweed	<i>Salicornia virginica</i>	50
Salt Grass	<i>Distichlis spicata</i>	10
Marsh Transition Area		
Alkali Heath	<i>Frankenia salina</i>	30
California Marsh Rosemary	<i>Limonium californicum</i>	20
Fat Hen	<i>Atriplex triangularis</i>	20
Gumplant	<i>Grindelia stricta</i>	20
Salt Grass	<i>Distichlis spicata</i>	10

**Table 8-2. Plant Species List for Eucalyptus Grove Enhancement,
Jessie Street Marsh Management Plan**

Common Name	Scientific Name	Percent Composition (%)
Trees		
Blue Elderberry	<i>Sambucus mexicana</i>	25
Buckeye	<i>Aesculus californica</i>	25
Coast Live Oak	<i>Quercus agrifolia</i>	50
Shrubs		
California Rose	<i>Rosa californica</i>	20
Coffeeberry	<i>Rhamnus californica</i>	20
Hillside Gooseberry	<i>Ribes californicum</i>	20
Mugwort	<i>Artemesia douglasiana</i>	10
Snowberry	<i>Symphoricarpos albus</i>	10
Sticky Monkey Flower	<i>Mimulus aurantiacus</i>	20
Erosion Control Seed Mix		
California Brome	<i>Bromus carinatus</i>	50
Cereal Barley	<i>Hordeum vulgare</i>	25
Western Wild Rye	<i>Elymus glaucus</i>	25

**Table 8-3. Plant Species List for Raised Berm and Vegetative Screening
Between East Cliff Drive and Lemos Avenue,
Jessie Street Marsh Management Plan**

Common Name	Scientific Name	Percent Composition (%)
Trees		
Buckeye	<i>Aesculus californica</i>	50
Coast Live Oak	<i>Quercus agrifolia</i>	50
Shrubs		
California Rose	<i>Rosa californica</i>	10
Coffeeberry	<i>Rhamnus californica</i>	20
Hillside Gooseberry	<i>Ribes californicum</i>	20
Snowberry	<i>Symphoricarpos albus</i>	10
Sticky Monkey Flower	<i>Mimulus aurantiacus</i>	20
Toyon	<i>Heteromeles arbutifolia</i>	20
Erosion Control Seed Mix		
California Brome	<i>Bromus carinatus</i>	50
Cereal Barley	<i>Hordeum vulgare</i>	25
Western Wild Rye	<i>Elymus glaucus</i>	25

**Table 8-4. Plant Species List for Freshwater Marsh Revegetation Areas,
Jessie Street Marsh Management Plan**

Common Name	Scientific Name	Percent Composition (%)
California Bulrush	<i>Scirpus californicus</i>	20
Cattail	<i>Typha latifolia</i>	40
Pacific Silverweed	<i>Potentilla anserina</i> ssp. <i>pacifica</i>	20
Pale Spikerush	<i>Eleocharis macrostachya</i>	20

**Table 8-5. Plant Species List for Riparian Woodland Revegetatoin Areas,
Jessie Street Marsh Management Plan**

Common Name	Scientific Name	Percent Composition (%)
Trees		
Arroyo Willow	<i>Salix lasiolepis</i>	50
Blue Elderberry	<i>Sambucus mexicana</i>	30
Buckeye	<i>Aesculus californica</i>	20

**Table 8-6. Plant Species List for Oak Woodland Revegetation Areas,
Jessie Street Marsh Management Plan**

Common Name	Scientific Name	Percent Composition (%)
Trees		
Blue Elderberry	<i>Sambucus mexicana</i>	25
Buckeye	<i>Aesculus californica</i>	25
Coast Live Oak	<i>Quercus agrifolia</i>	50
Shrubs		
California Rose	<i>Rosa californica</i>	20
Coffeeberry	<i>Rhamnus californica</i>	20
Hillside Gooseberry	<i>Ribes californicum</i>	20
Mugwort	<i>Artemisia douglasiana</i>	10
Snowberry	<i>Symphoricarpos albus</i>	10
Sticky Monkey Flower	<i>Mimulus aurantiacus</i>	20
Erosion Control Seed Mix		
California Brome	<i>Bromus carinatus</i>	50
Cereal Barley	<i>Hordeum vulgare</i>	25
Western Wild Rye	<i>Elymus glaucus</i>	25

CHAPTER 9 IMPLEMENTATION PROGRAM

IMPLEMENTATION PROGRAM

The focus of the implementation and cost estimate section is to identify potential sources of implementation, including both funded and volunteer activities, and preliminary costs of each action. The City of Santa Cruz currently has funds allocated to implement a portion of the management recommendations outlined in this report.

Table 9-1 summarizes the actions to be accomplished within the Jessie Street Marsh area and identifies technical expertise required and preliminary costs. The table lists each management action by topic and number, as described in Chapter 8. Actions suitable for implementation by volunteer groups are also identified. Several of the management plan actions may be implemented by the City, in conjunctions with assistance by local schools, community groups, and neighborhood residents. Community outreach can foster stewardship of the marsh area; thereby, contributing to a successful habitat management and enhancement program.

There are several avenues for implementation of the marsh management recommendations. Activities could include the following.

1. **Fully Funded Programs Administered by the City.** Capital improvements (e.g., initial site grading for the tidal channel, marsh plains, freshwater marsh, and open water habitats) and construction of trail and pathway improvements are examples of actions that could be implemented by the City of Santa Cruz with existing available funds.
2. **Joint City and State/Federal Programs Administered by the City.** There are several funding programs available for restoration of wetland and coastal resources.

Funding may be available from grant programs and/or matching fund programs for implementation of the enhancement and management recommendations.

3. **Volunteer Programs.** Certain projects are suitable for implementation by volunteers. Projects could include removal of invasive, non-native plant species (where there is no use of herbicides or heavy equipment), monitoring of pond features (i.e., water depth recordings, vegetation, and wildlife observations), and educational activities. Volunteer groups could include: local school group/classes, school science clubs, environmental groups, and neighborhood residents. Examples include:

- **Bird monitoring:** Monitor bird uses at the marsh habitats a minimum of four times a year, during each major season. At each monitoring station, identify and count all birds seen or heard. Use data to compare seasonal and yearly use.
- **Vegetation monitoring:** Conduct vegetation monitoring along established transects each spring, recording plant species along transect line. Monitor trends in vegetation compositions and vegetative cover.
- **Water quality monitoring:** Conduct seasonal measurements of water levels, pH, temperature, and salinity within various portions of the marsh (i.e., salt/brackish marsh, freshwater marsh). Periodically collect samples for laboratory analysis of nitrates and other pollutants.
- **Revegetation:** Collect local native plant species propagules (e.g., seed). Coordinate nursery propagation.
- **Invasive, non-native plant species removal/control:** Assess on a yearly

basis the extent of invasive, non-native plant species within the various habitats. Compare with previous year's mapping to document progress of eradication efforts. Implement eradication of selected species.

4. **Programs Administered by City of Santa Cruz Parks and Recreation Department.** Site maintenance will be the responsibility of City staff. Their duties will include: periodic patrols by the City Park Ranger, periodic maintenance and trash pick-up, seasonal mowing of grasslands, maintenance of trail systems, maintenance of interpretive signs, and park signs.

STEPS NECESSARY TO IMPLEMENT JESSIE STREET MARSH MANAGEMENT PLAN

The Jessie Street Marsh Management Plan has provided a detailed conceptual plan for implementation. In order to bid, permit, and construct the project, several documents will be required. These are described below.

Engineering Plans and Specifications

A set of engineered construction plans and specifications will be developed for permitting, bidding, and constructing the project. The plans will require preparation of a detailed grading plan, typical drawings, and detail drawings of hydraulic control structures. Specifications, special instructions (e.g., water control, access, phasing, etc.), and a bid package will also have to be prepared.

In order to develop the grading plan, the existing topographic map surveyed by Swanson Hydrology in 1998 will be supplemented with some additional survey points to provide adequate detail in some key areas of the final conceptual plan. The plan map, grading plan, and typical and detail drawings would be generated in AutoCad or similar drafting program.

The grading areas will be staked in the field prior to construction. Construction will be supervised by a qualified hydrologist/civil engineer and some fit-in-the-field work (channel work) will be determined by an experienced project construction supervisor.

Engineering plans and specifications would be developed in three phases of completion for review: 50%, 90 %, and 100%. Plans and specification preparation costs (including a pre-bid meeting with prospective contractors) are typically 10 to 15 % of total project costs. Assuming a \$300,000 total project budget, plans and specifications will cost approximately \$27,000.

Construction supervision will be necessary to ensure that work is performed according to the plans. This task cost is approximately \$400 per day during construction. For channel and marsh plain grading work (excluding revegetation and public access features), it is assumed that this may require 7 to 10 working days.

COST ESTIMATES

Table 9-1 presents the preliminary costs for each management plan action. The estimate incorporates costs to prepare detailed grading and construction plans for the new tidal channels, other marsh features, and public access features (e.g., raised boardwalk and stairs). Regulatory permit costs (i.e., California Department of Fish and Game, U.S. Army Corps of Engineers, and Regional Water Quality Control Board) are not included in the estimate.

IMPLEMENTATION SCHEDULE

Table 9-2 presents a generalized implementation schedule for the project, as identified by management actions listed in Chapter 8. Some actions (e.g., the removal of invasive, non-native plant species from the preserved riparian and oak woodland habitats) can occur prior to or concurrent with other site grading and earthwork.

REGULATORY PERMITS AND APPROVALS

Wetland and riparian habitats within the Jessie Street Marsh project area are regulated by several agencies. The management plan provides measures to preserve existing wetland and riparian resources to the greatest extent feasible. However, a goal of the plan is to modify the marsh areas to provide long-term habitat restoration and enhancement. Approximately 0.3 acre of wetland areas will be removed during plan implementation. Additionally, construction of the pedestrian walkway near Lemos Avenue will temporarily impact existing wetland habitat. Due to these activities, the project is expected to be subject to regulation by the following agencies:

- U.S. Army Corps of Engineers (COE) – Nationwide Permit 27, *Wetland and Riparian Restoration and Creation Activities* (non-tidal areas), Nationwide Permit 19, *Minor Dredging*;
- California Department of Fish and Game (CDF&G) - 1601 Streambed Alteration Agreement;
- Regional Water Quality Control Board (RWQCB) - Water Quality Certification (or waiver);
- City of Santa Cruz - City Permits and Environmental Review; and
- Coastal Development Permit, California Coastal Commission.

Areas Potentially Under the Jurisdiction of Section 404 of the Clean Water Act

The marsh restoration work will involve dredging of existing wetland areas and countouring of new tidal channels and marsh plains. These activities will require temporary dewatering of the Jessie Street Marsh channel during construction as well as fill and excavation of wetlands. The marsh areas are considered Waters of the United States, as per Section 404 of the Clean Water Act.

Activities within this area are subject to a permit administered by the COE. Pursuant to the COE's permits, the City will also need to obtain a water quality certification (or waiver) from the Regional Water Quality Control Board.

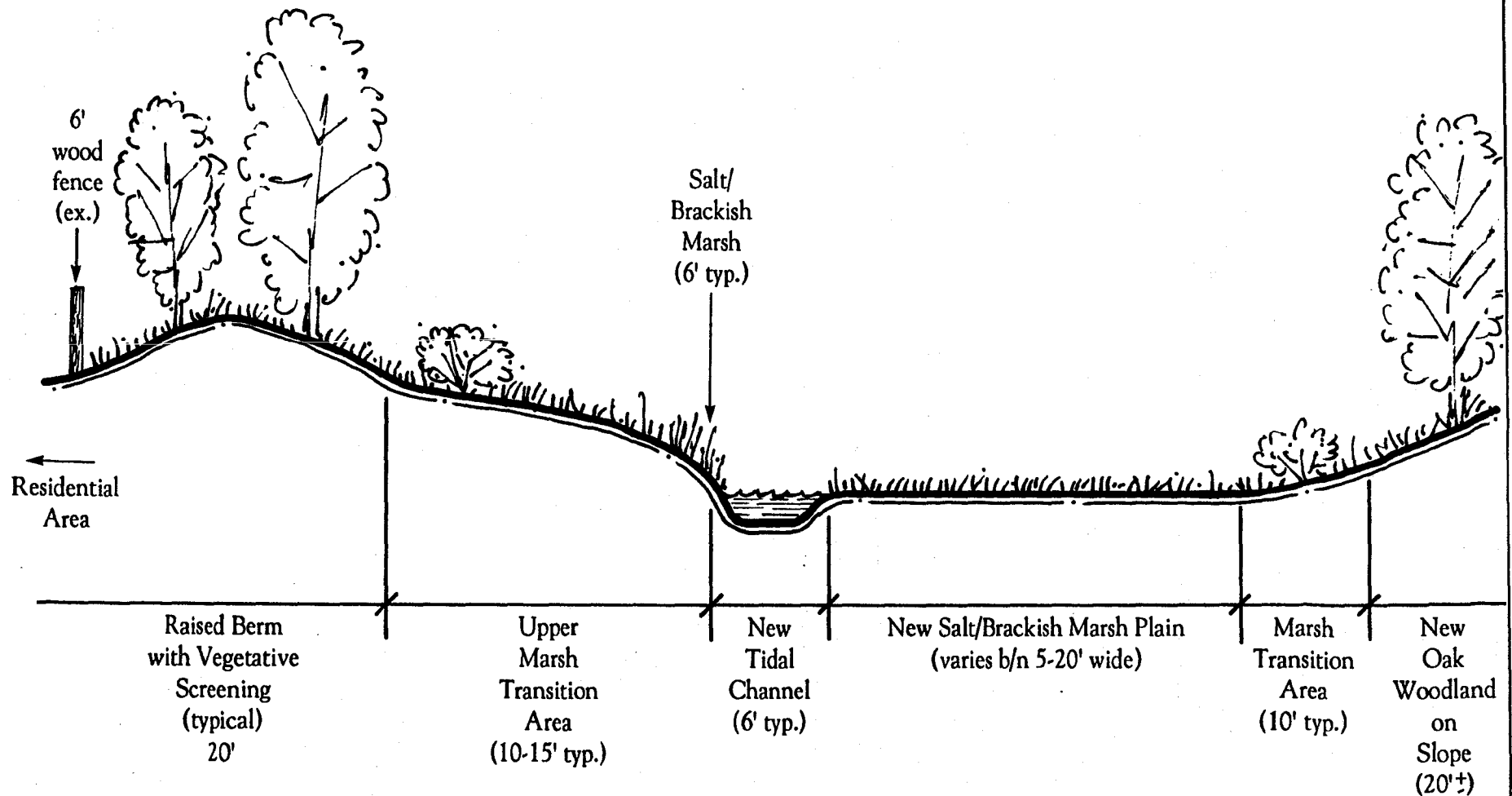
Areas Regulated Under Section 1601/1603 of California Fish and Game Code

Activities affecting the creekbed and creek banks are regulated CDFG under Section 1601/1603 of the Fish and Game Code. Both the proposed removal of marsh vegetation for the restoration work and realigning of the tidal channel will require a Streambed Alteration Agreement with CDFG.

City of Santa Cruz Permits and Other Approvals

The management plan and environmental review document are subject to approval by the City of Santa Cruz. Additionally, the plan is subject to review and approval by the State of California Coastal Commission, pursuant to the City of Santa Cruz's Local Coastal Program. Once the management plan is approved by these entities, specific City permits will also be required. These include a tree removal permit (e.g., removal of selected trees during site grading, improvements, and habitat enhancement actions) and a grading permit. Additional permits or approvals may be necessary, as required by the City of Santa Cruz.

1" = 10'
View Looking Upstream

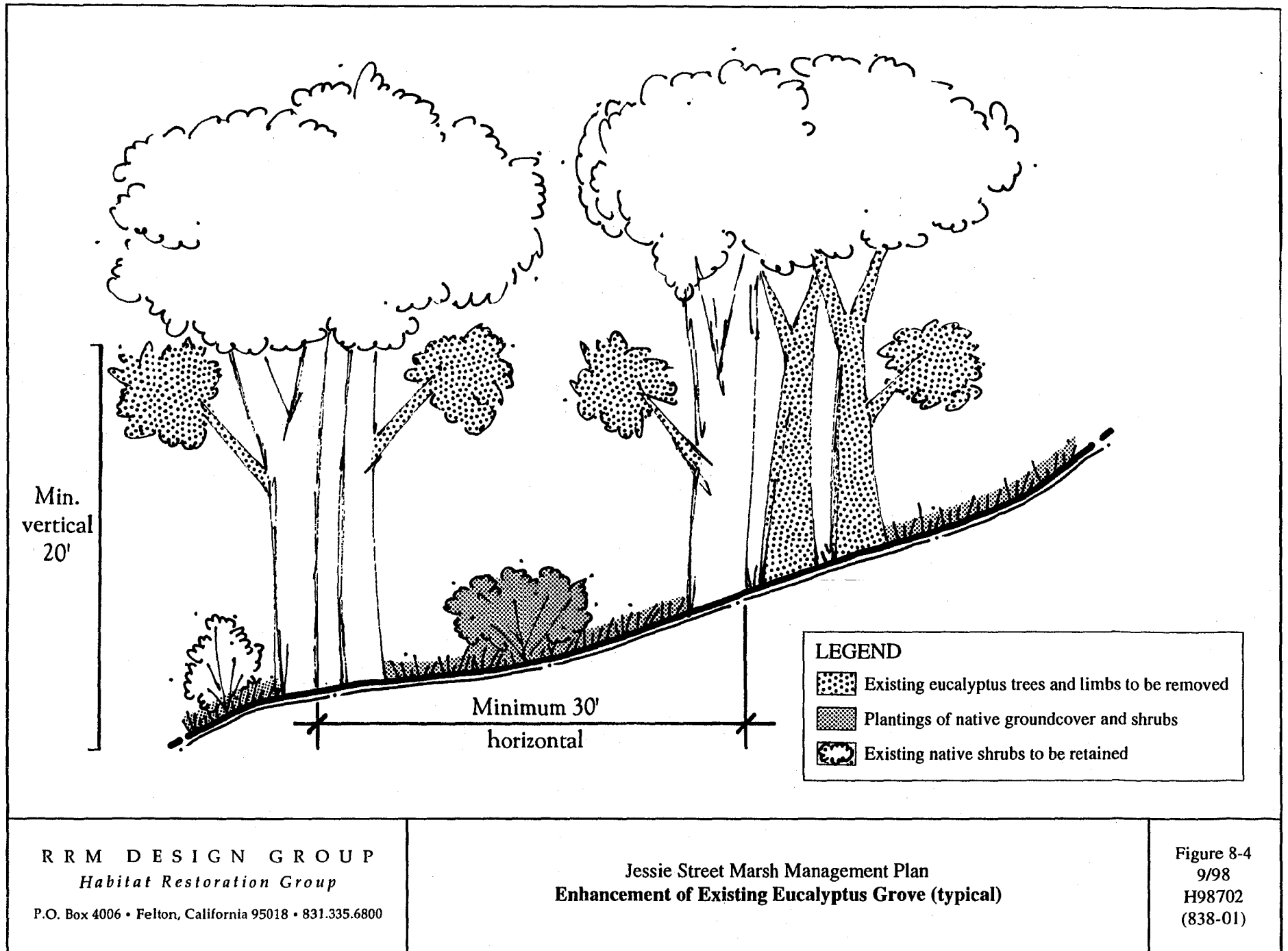


RRM DESIGN GROUP
Habitat Restoration Group

P.O. Box 4006 • Felton, California 95018 • 831.335.6800

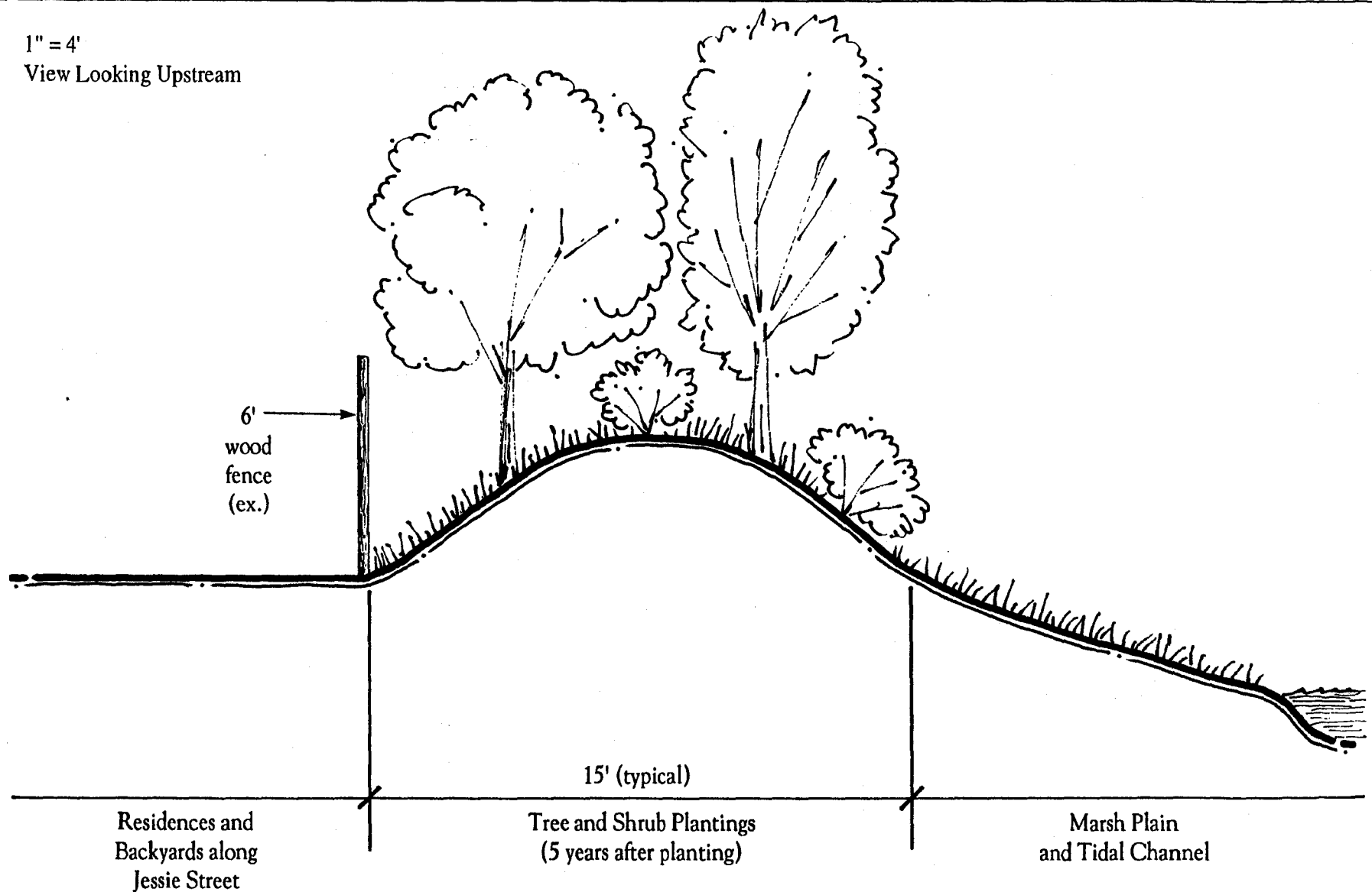
Jessie Street Marsh Management Plan
Cross-section Depicting New Tidal Channel and Marsh Plain Habitat
between East Cliff Drive and Lemos Avenue

Figure 8-3
9/98
H98702
(838-01)



1" = 4'

View Looking Upstream



RRM DESIGN GROUP
Habitat Restoration Group

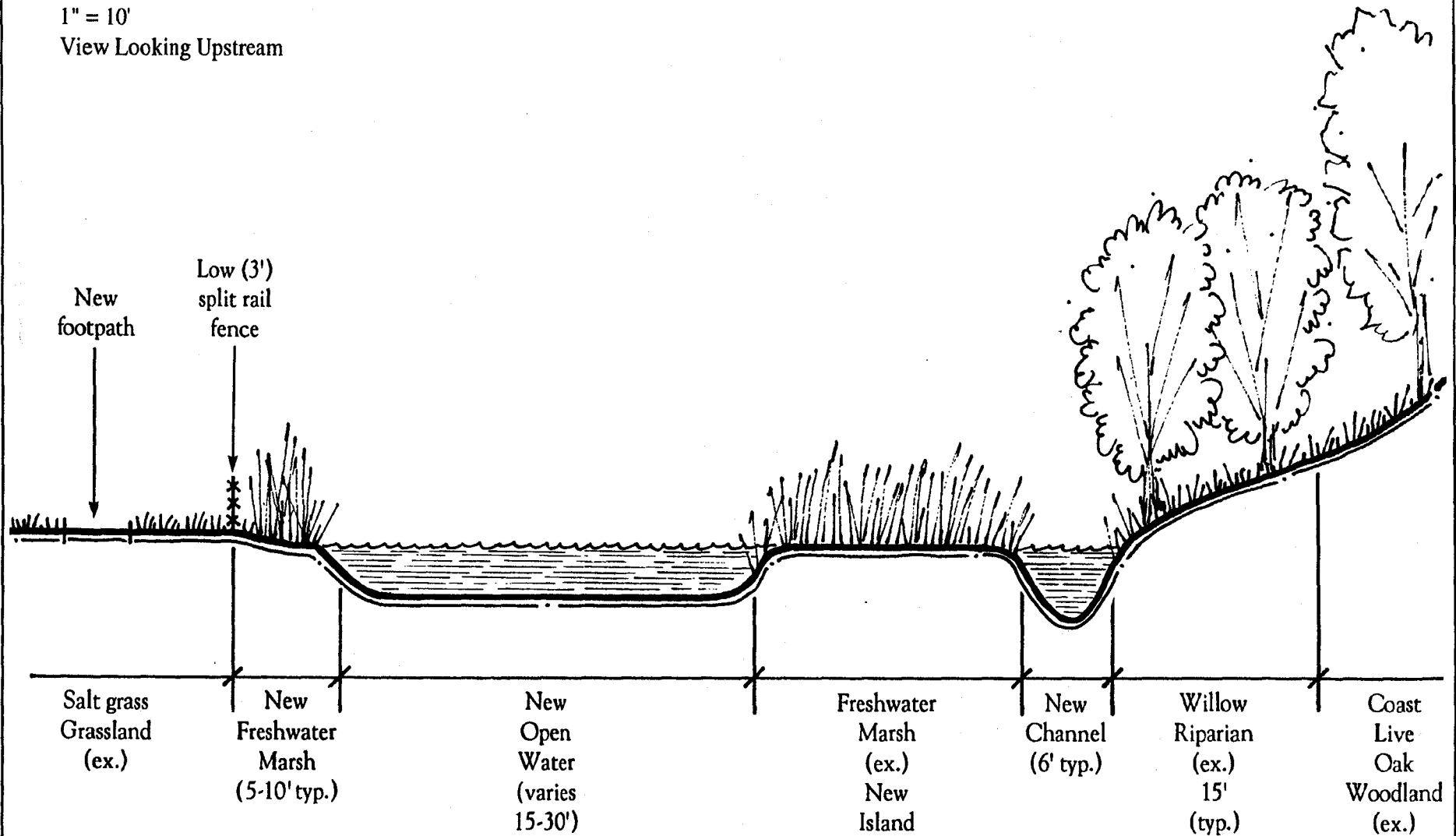
P.O. Box 4006 • Felton, California 95018 • 831.335.6800

Jessie Street Marsh Management Plan
Cross-section Depicting New Raised Berm and
Vegetative Screening Near Residences

Figure 8-5
9/98
H98702
(838-01)

1" = 10'

View Looking Upstream

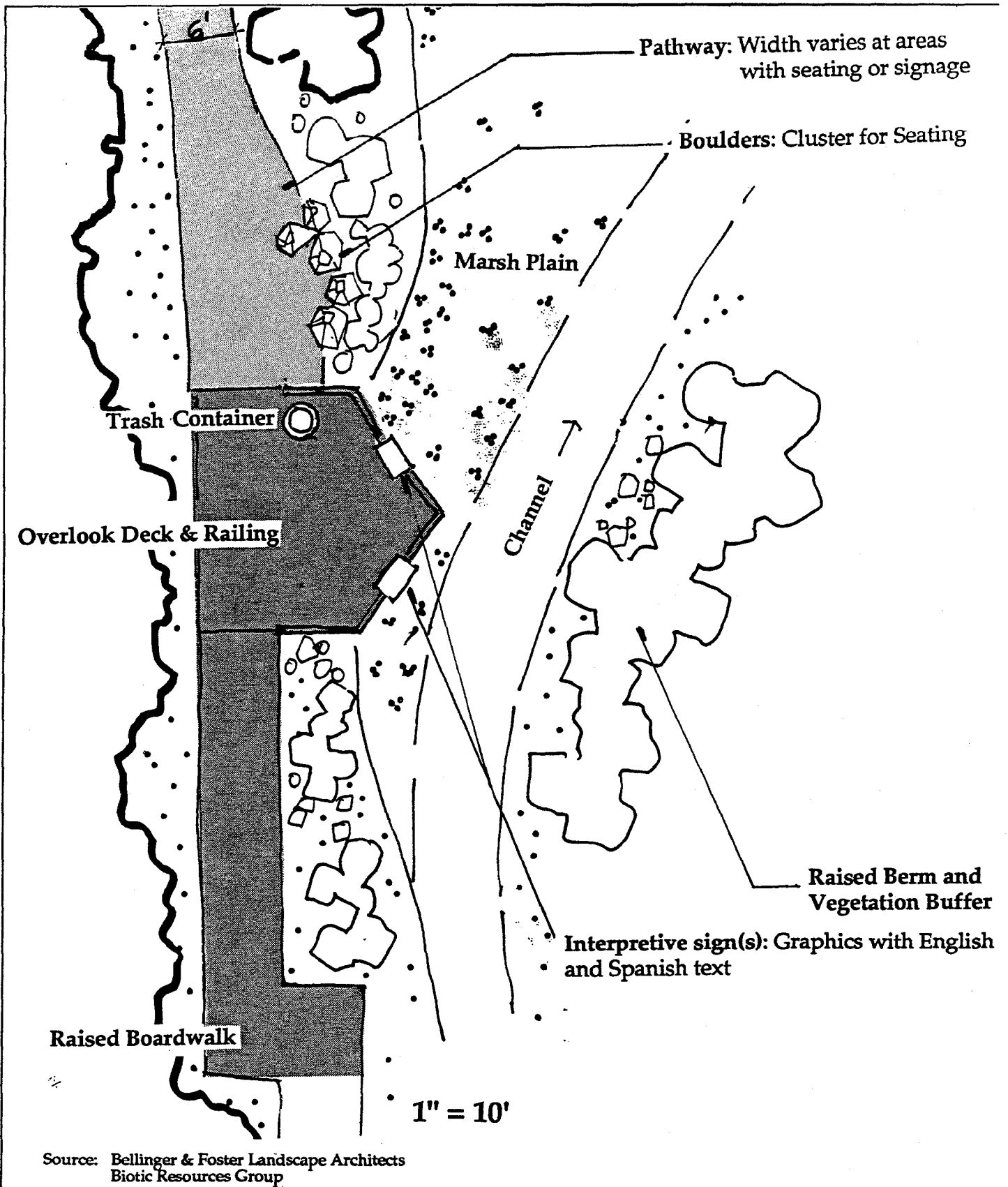


RRM DESIGN GROUP
Habitat Restoration Group

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Jessie Street Marsh Management Plan
Cross-section Depicting New and Enhanced Freshwater Marsh Habitat
between Lemos Avenue and Barson Street

Figure 8-6
9/98
H98702
(838-01)

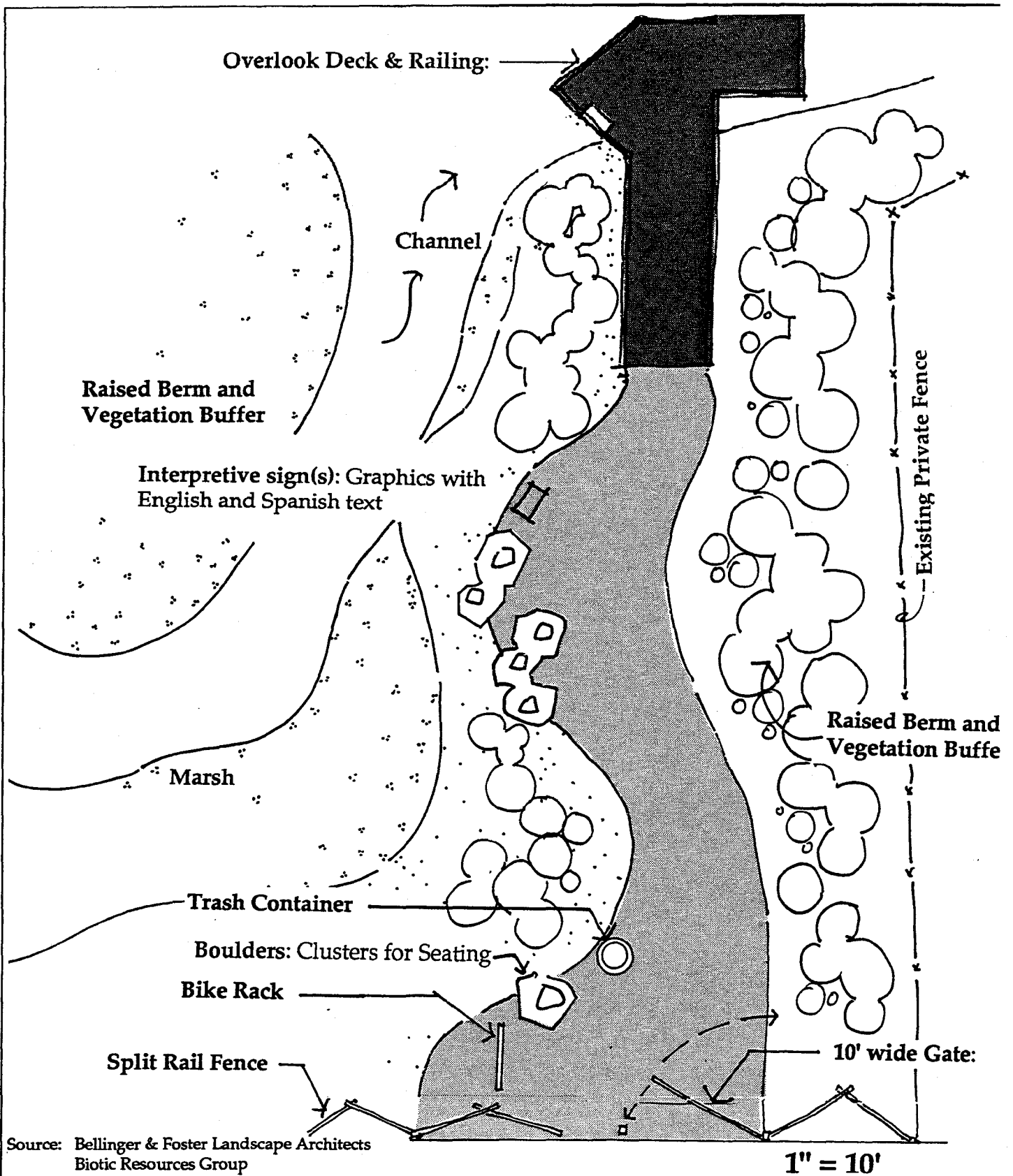


RRM DESIGN GROUP
Habitat Restoration Group

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Jessie Street Marsh Management Plan
Lower Marsh Overlook-Plan View

Figure 8-7
9/98
H98702
(838-01)

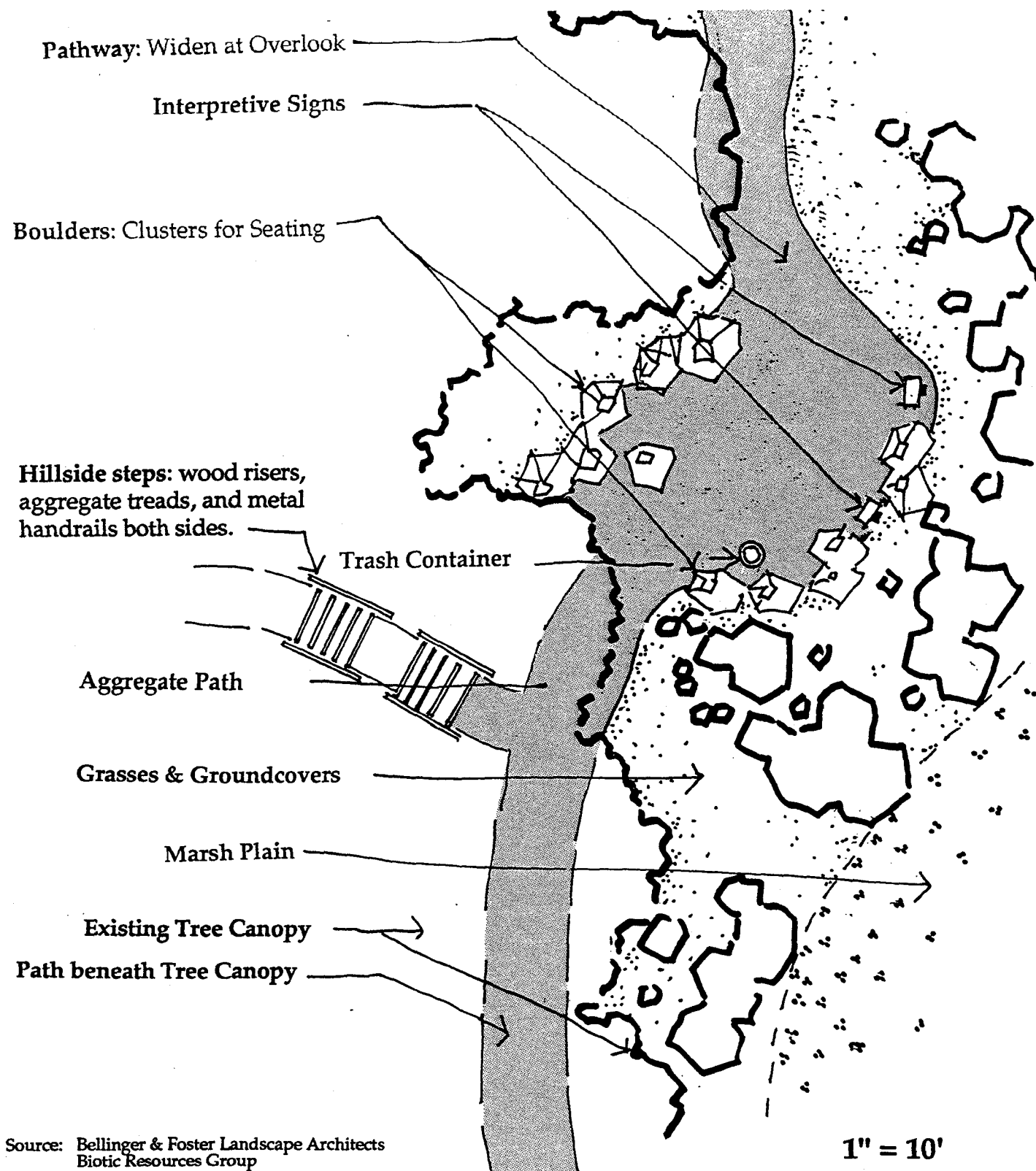


RRM DESIGN GROUP
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Jessie Street Marsh Management Plan
Upper Marsh Overlook-Plan View

Figure 8-8
9/98
H98702
(838-01)



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Habitat Restoration Group

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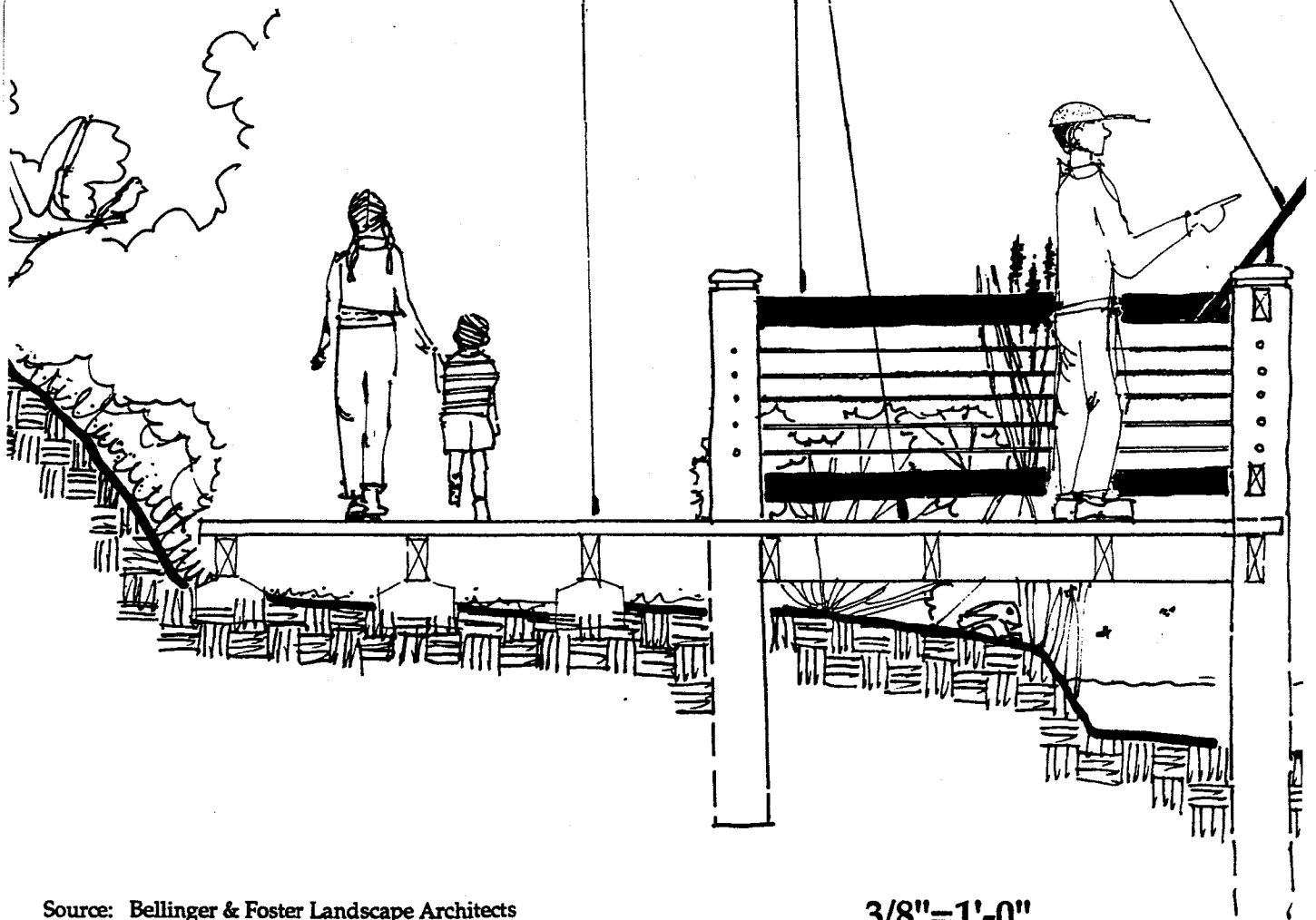
Jessie Street Marsh Management Plan
Marsh Viewpoint-Plan View

Figure 8-9
9/98
H98702
(838-01)

Interpretive sign(s): Graphics with English and Spanish text

Overlook Deck & Railing: Wood post piers, deck, top and bottom rail, cable intermediate rails. Extend hand rail along raised board walk where grade change greater than 18".

Raised Boardwalk



Source: Bellinger & Foster Landscape Architects
Biotic Resources Group

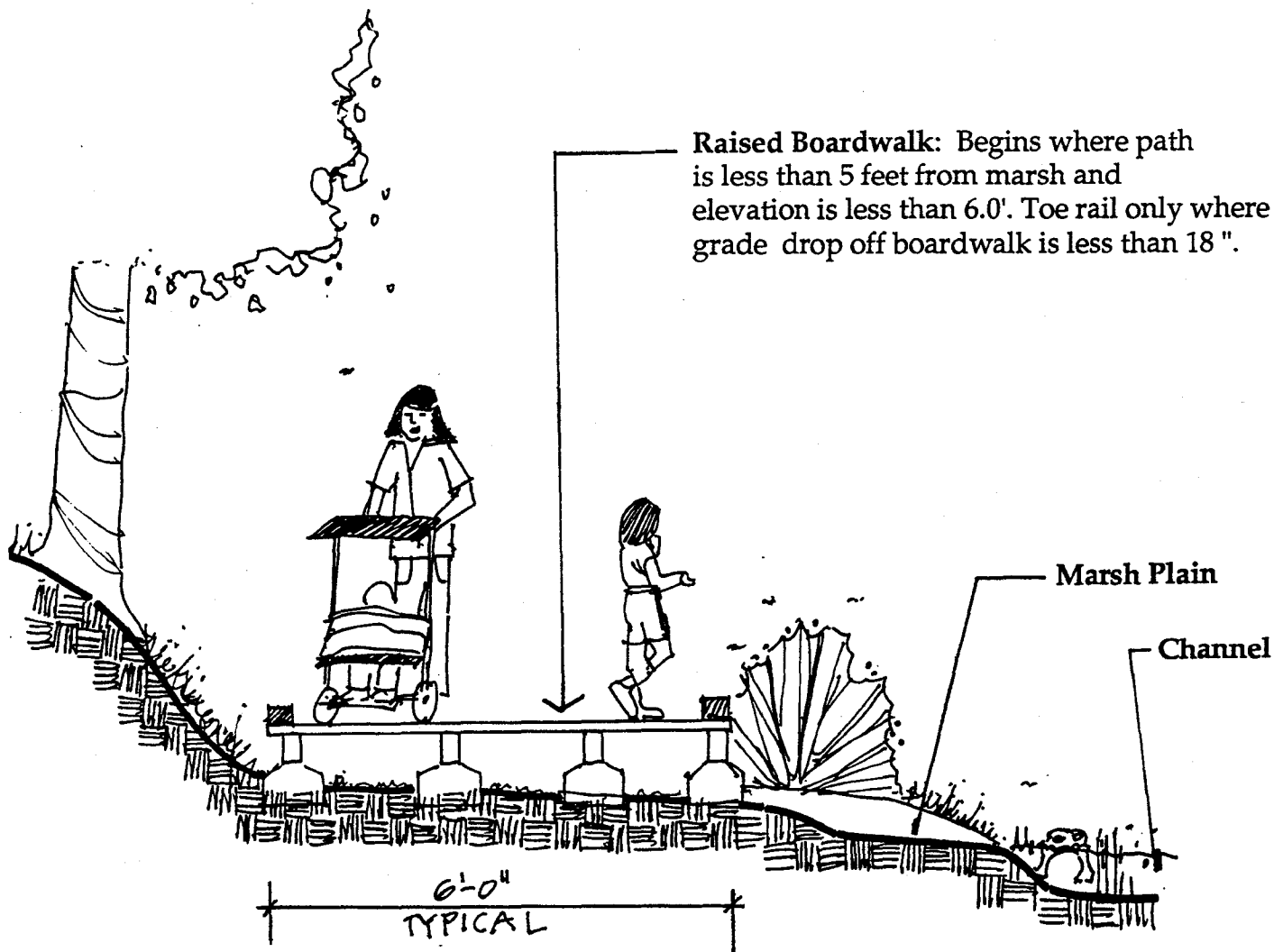
3/8"=1'-0"

RRM DESIGN GROUP
Habitat Restoration Group

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Jessie Street Marsh Management Plan
Boardwalk Overlook-Crosssection at Channel

Figure 8-10
9/98
H98702
(838-01)



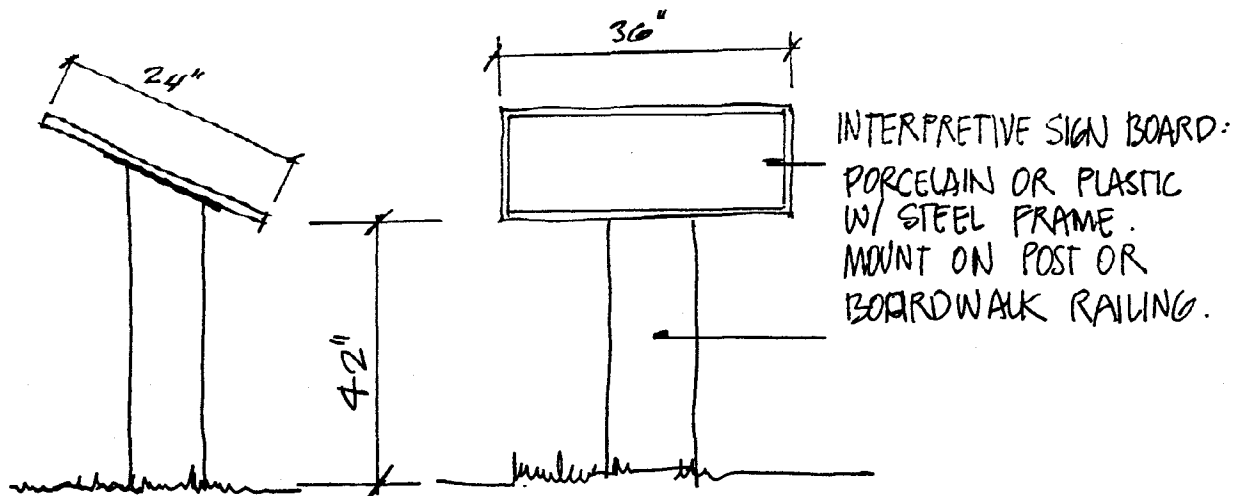
Source: Bellinger & Foster Landscape Architects
Biotic Resources Group

1/2" = 1'-0"

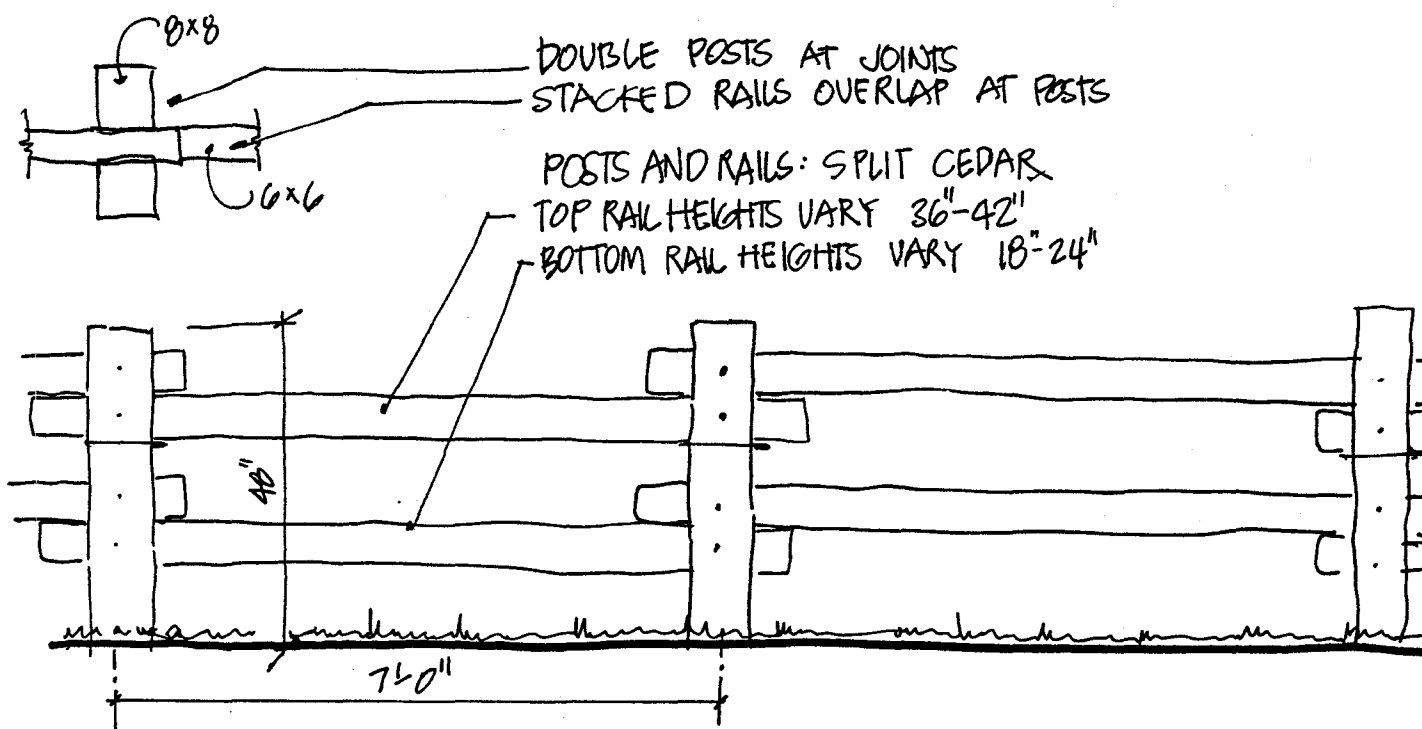
RRM DESIGN GROUP
Habitat Restoration Group
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Jessie Street Marsh Management Plan
Boardwalk-Typical Section

Figure 8-11
9/98
H98702
(838-01)



INTERPRETIVE SIGNS



SPLIT RAIL FENCE

Source: Bellinger & Foster Landscape Architects
Biotic Resources Group

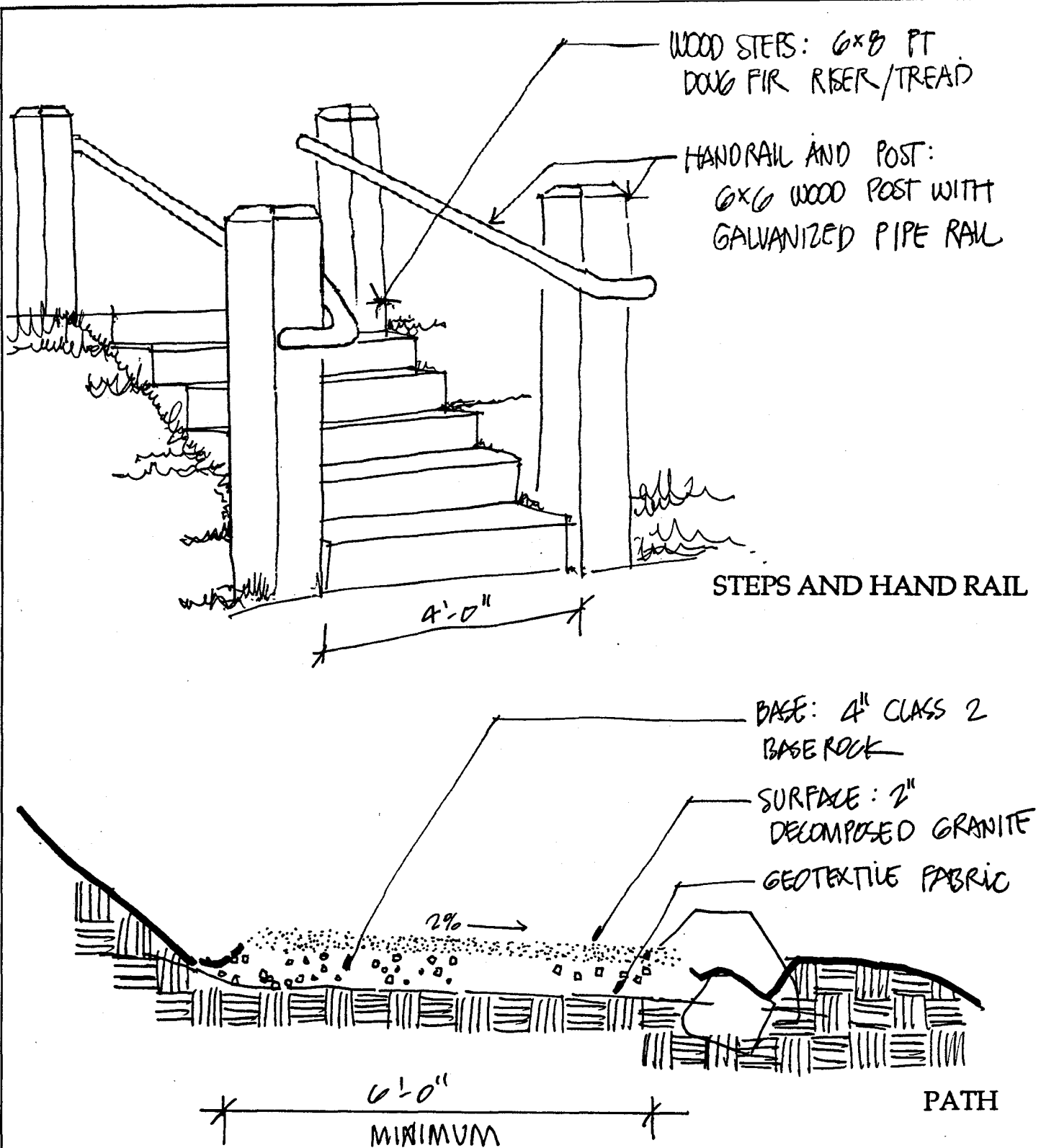
1/2" = 1'-0"

RRM DESIGN GROUP
Habitat Restoration Group

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Jessie Street Marsh Management Plan
Typical Details-Fence/Interpretive Sign

Figure 8-12
9/98
H98702
(838-01)



Source: Bellinger & Foster Landscape Architects
Biotic Resources Group

1/2" = 1'-0"

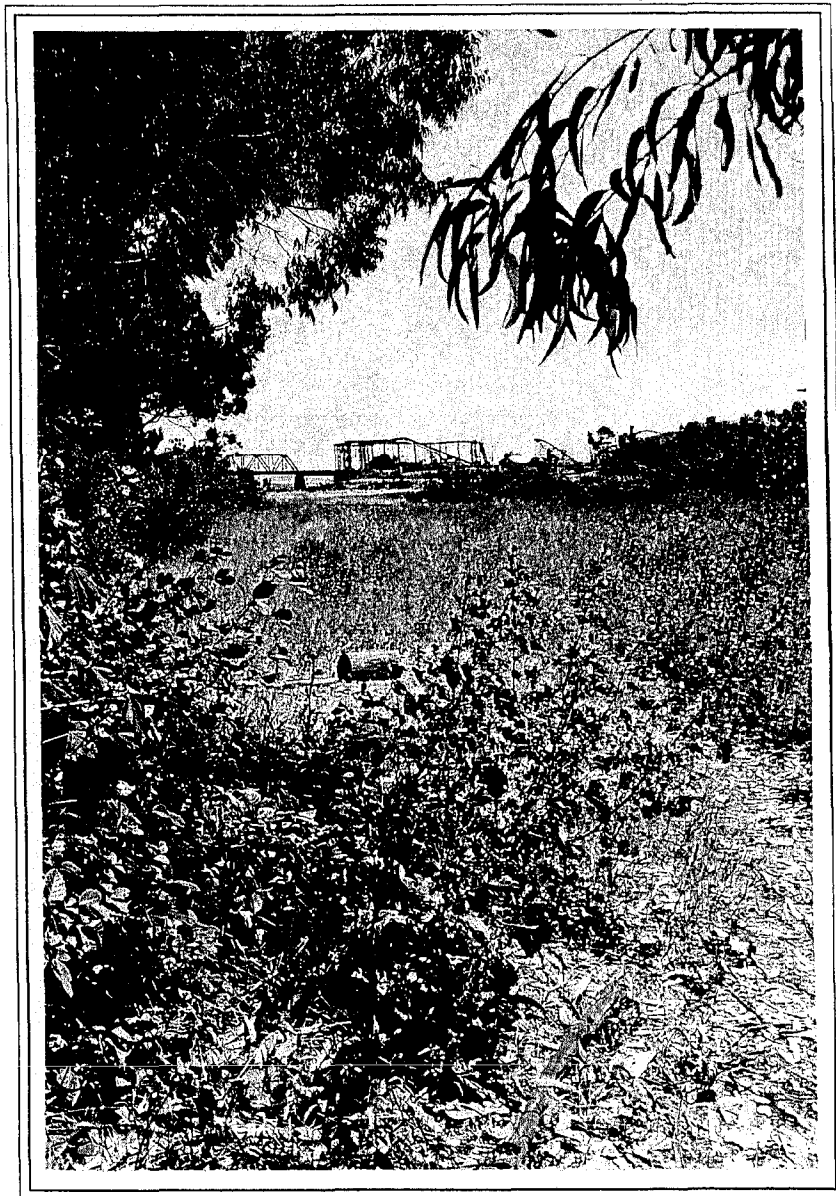
RRM DESIGN GROUP
Habitat Restoration Group
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Jessie Street Marsh Management Plan
Typical Details-Footpath/Hillside Steps

Figure 8-13
9/98
H98702
(838-01)



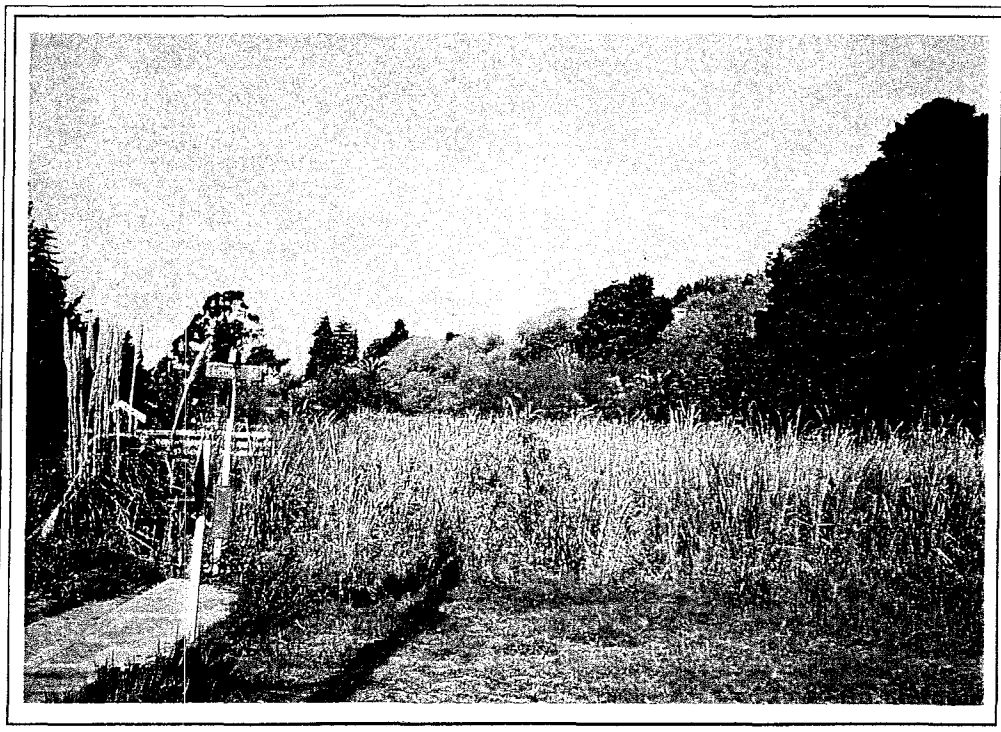
View of houses along Jessie Street. Raised berm and vegetative screening will be constructed between marsh and fences. (Action R-3)



Location of new footpath between East Cliff Drive and the upper marsh. (Action P-2)

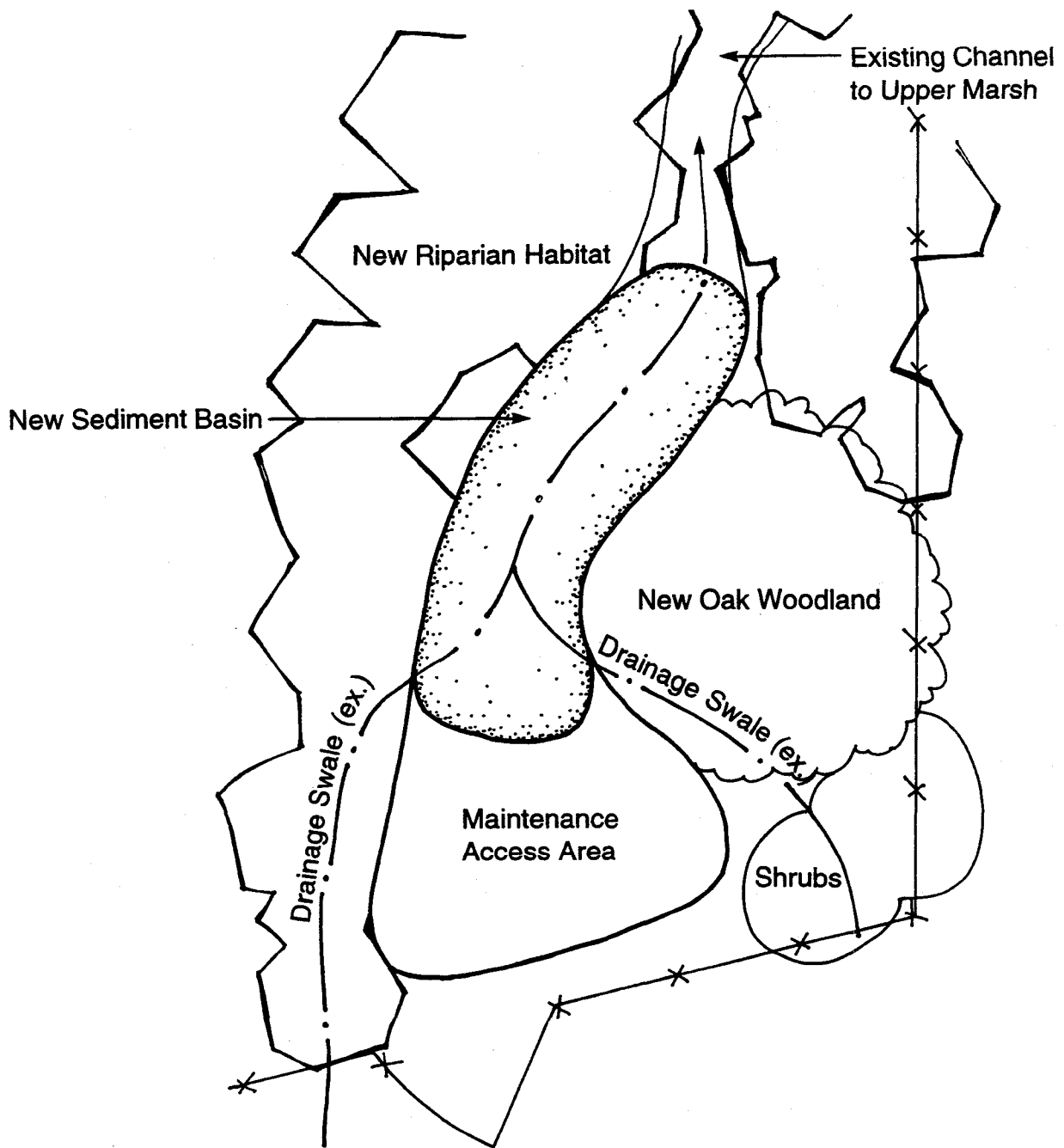


View of upper marsh from end of Barson Street. New sediment basin to be installed to filter storm water entering the marsh. (Action H-7)



View of freshwater marsh to be enhanced by adding areas of open water and islands. (Action R-4 and R-5). Location of interpretive sign and new footpath to Ocean View Park. (Action P-2 and P-5)

Scale: 1" = 12.5'
0 12.5' 25'



RRM DESIGN GROUP,
Habitat Restoration Group

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Jessie Street Marsh Management Plan
Conceptual Design of Sediment Basin

Figure 8-16
9/98
H98702
(838-01)

Table 9-1. Implementation Actions and Cost Estimates for Jessie Street Marsh Management Plan

Management Action	Implementation Mechanism	Responsible Party	Technical Expertise	Capital Costs	Maintenance and Monitoring Costs
HYDROLOGY ACTIONS					
H-1 Operate Slide Gates and Monitor Hydrologic Conditions	City of Santa Cruz	City of Santa Cruz	Marsh Hydrologist, Drainage Engineer, Park Supervisor	none	20 person hours/year
H-2 Create New Tidal Channel	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	\$30,000	(2 yrs) \$1,000/yr
H-3 Fill Existing Channel	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	see H-2	none
H-4 Create New Marsh Plain	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	see H-2	(2 yrs) \$1,000/yr
H-5 Create New Freshwater Channel	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	see H-2	(2 yrs) \$1,000/yr
H-6 Create Open Water Areas	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	see H-2	(2 yrs) \$1,000/yr
H-7 Create Sediment Retention Basin	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	see H-2	(2 yrs) \$1,000/yr
H-8 Partially Fill Channel	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer	see H-2	(2 yrs) \$1,000/yr
Subtotal				\$30,000	(2 yrs) \$6,000/yr

Table 9-1. Implementation Actions and Cost Estimates for Jessie Street Marsh Management Plan (Cont'd.)

Management Action	Implementation Mechanism	Responsible Party	Technical Expertise	Capital Costs	Maintenance and Monitoring Costs
HABITAT RESTORATION AND ENHANCEMENT ACTIONS					
R-1 Create New Salt/Brackish Water Marsh	City of Santa Cruz	City of Santa Cruz	Hydrologist, Biologist, Civil Engineer	4,500	(5 yrs) \$1,000/yr
R-2 Enhance Eucalyptus Grove	City of Santa Cruz, Volunteers	City of Santa Cruz	Biologist	9,100	(5 yrs) \$1,000/yr
R-3 Create New Raised Berm and Vegetative Screening	City of Santa Cruz, Volunteers	City of Santa Cruz	Landscape Architect, civil Engineer	2,600	(5 yrs) \$1,000/yr
R-4 Enhance Freshwater Marsh Habitat	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer, Biologist	see H-1, above	(5 yrs) \$2,500/yr
R-5 Create New Freshwater Marsh	City of Santa Cruz	City of Santa Cruz	Hydrologist, Civil Engineer, Biologist	7,100	(5 yrs) \$1,000/yr
R-6 Enhance Riparian Habitat	City of Santa Cruz, Volunteers	City of Santa Cruz	Biologist	---	(5 yrs) \$2,500/yr
R-7 Create New Riparian Habitat	City of Santa Cruz, Volunteers	City of Santa Cruz	Biologist	4,000	(5 yrs) \$1,000/yr
R-8 Enhance Oak Woodland	City of Santa Cruz, Volunteers	City of Santa Cruz	Biologist	----	(5 yrs) \$2,500/yr
R-9 Create New Oak Woodland	City of Santa Cruz, Volunteers	City of Santa Cruz	Landscape Architect, Biologist	5,200	(5 yrs) \$1,000/yr
R-10 Enhance Saltgrass Grassland	City of Santa Cruz, Volunteers	City of Santa Cruz	Biologist	---	(5 yrs) \$1,000/yr
R-11 Remove/Control Invasive, Non-native Plant Species	City of Santa Cruz, Volunteers	City of Santa Cruz	Biologist	---	see above
Subtotal				\$32,500	(5yrs) \$14,500/yr

Table 9-1. Implementation Actions and Cost Estimates for Jessie Street Marsh Management Plan (Cont'd.)

Management Action	Implementation Mechanism	Responsible Party	Technical Expertise	Capital Costs	Maintenance and Monitoring Costs
PUBLIC ACCESS ACTIONS					
P-1 Construct New Bridge and Boardwalk	City of Santa Cruz	City of Santa Cruz	Landscape Architect	\$82,500	20 person hours/year
P-2 Construct New Footpath	City of Santa Cruz	City of Santa Cruz	Landscape Architect	15,280	20 person hours/year
P-3 Construct Gates and Split-rail Fences and Install Boulders	City of Santa Cruz	City of Santa Cruz	Landscape Architect	10,700	20 person hours/year
P-4 Construct Trail and Steps to Ocean View Park	City of Santa Cruz	City of Santa Cruz	Landscape Architect	9,760	20 person hours/year
P-5 Install Interpretive and Public Access Signs	City of Santa Cruz	City of Santa Cruz	Landscape Architect	6,000	20 person hours/year
P-6 Install Benches, Bicycle Racks, and Trash Containers	City of Santa Cruz	City of Santa Cruz	Landscape Architect	4,000	40 person hours/year
Subtotal				\$128,240	140 person hours/year
Plans and Specifications (15% of project cost)				\$29,000	none
Subtotal				\$219,740	140 person hours/year
Contingency (20%)				\$44,000	
TOTAL CAPITAL COSTS				\$263,740	

+ permit fees

Table 9-2. Generalized Schedule of Management Plan Actions, Jessie Street Marsh Management Plan

Management Plan Actions	1999				2000				2001			
	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall
HYDROLOGY ACTIONS												
H-1 Operate Slide Gates and Monitor Hydrologic Conditions				■				■				■
H-2 Create New Tidal Channel				■								
H-3 Fill Existing Channel				■								
H-4 Create New Marsh Plain				■								
H-5 Create New Freshwater Channel				■								
H-6 Create Open Water Areas				■								
H-7 Create Sediment Retention Basin				■								
H-8 Partially Fill Channel				■								
HABITAT RESTORATION ACTIONS												
R-1 Create New Salt/Brackish Water Marsh					■	■						
R-2 Enhance Eucalyptus Grove				■	■	■						
R-3 Create New Raised Berm and Vegetative Screening				■	■	■						
R-4 Enhance Freshwater Marsh Habitat					■	■	■					
R-5 Create New Freshwater Marsh				■	■	■	■					
R-6 Enhance Riparian Habitat						■	■		■	■		
R-7 Create New Riparian Habitat				■	■	■						
R-8 Enhance Oak Woodland	■	■				■	■		■	■		
R-9 Create New Oak Woodland								■	■	■		
R-10 Enhance Saltgrass Grassland		■		■		■		■		■		■
R-11 Remove/Control Invasive, Non-native Plant Species	■	■			■	■			■	■		

Table 9-2. Generalized Schedule of Management Plan Actions, Jessie Street Marsh Management Plan (Cont'd.)

Management Plan Actions	1999				2000				2001			
	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall	Win	Spr	Sum	Fall
PUBLIC ACCESS ACTIONS												
P-1 Construct New Bridge and Boardwalk						=====						
P-2 Construct New Footpath						=====						
P-3 Construct Gate and Split-rail Fences and Install Boulders						=====						
P-4 Construct Trail and Steps to Ocean View Park						=====						
P-5 Install Interpretive and Public Access Signs						=====						
P-6 Install Benches, Bicycle Racks and Trash Containers						=====						

Appendix A
Vascular Plant Species Jessie Street Marsh Observed in the Study Area
(Species observed on September 18, 1997)

Ferns and Fern Allies

AZOLLACEAE

Azolla filiculoides (mosquito fern)

Conifers

CUPRESSACEAE

Cupressus macrocarpa (Monterey cypress)

PINACEAE

Pinus radiata (Monterey pine)

TAXODIACEAE

Sequoia sempervirens (coast redwood)

Flowering Plants-Dicots

ACERACEAE

Acer negundo var. *californicum* (box elder)

AIZOACEAE

*Carpobrotus edulis** (sea fig)

ANACARDIACEAE

Toxicodendron diversilobum (poison oak)

APIACEAE

*Anthriscus caucalis** (bur-chervil)

*Conium maculatum** (poison hemlock)

*Foeniculum vulgare** (fennel)

*Torilis arvensis** (field hedge-parsley)

APOCYNACEAE

*Vinca major** (greater periwinkle)

ARALIACEAE

*Hedera helix** (English ivy)

ASTERACEAE

Baccharis pilularis (coyote brush)

*Carduus pycnocephalus** (Italian thistle)

*Cirsium vulgare** (bull thistle)

Conyza canadensis (horseweed)

*Cotula coronopifolia** (brass-buttons)

Grindelia stricta var. *platyphylla* (Pacific grindelia)

*Hypochaeris glabra** (smooth cat's-ear)

*Hypochaeris radicata** (rough cat's-ear)

Jaumea carnosa (jaumea)

*Lactuca serriola** (prickly lettuce)

*Senecio mikanioides** (German ivy)

*Sonchus asper** (prickly sow thistle)

*Sonchus oleraceus** (common sow thistle)

*Taraxacum officinale** (dandelion)

BRASSICACEAE

*Brassica rapa** (field mustard)

*Raphanus sativus** (radish)

CAPRIFOLIACEAE

Lonicera hispidula var. *vacillans* (hispid honeysuckle)

CHENOPODIACEAE

Atriplex patula var. *patula* (fat hen)

CONVOLVULACEAE

*Convolvulus arvensis** (bindweed)

CRASSULACEAE

Sedum sp. (stonecrop)

FABACEAE

*Acacia decurrens** (green wattle)

*Acacia melanoxylon** (blackwood acacia)

*Genista monspessulana** (French broom)

*Lotus corniculatus** (birdfoot trefoil)

*Medicago arabica** (burclover)

*Trifolium dubium** (shamrock)

FAGACEAE

Quercus agrifolia (coast live oak)

FRANKENIACEAE

Frankenia salina (alkali heath)

GERANIACEAE

*Erodium cicutarium** (red-stemmed filaree)

Appendix B
Wildlife Species Observed or Predicted to Occur
in the Jessie Street Marsh Study Area

Appendix B

Wildlife Species Observed or Predicted to Occur in the Jessie Street Marsh Study Area

KEY:

- O** - Wildlife species or their signs observed in the study area.
- P** - Wildlife species expected to occur in the study area.
- a** - Bird species known or expected to occur in the study area primarily as aerial transients.

CLASS: AMPHIBIA

ORDER: CAUDATA (Salamanders)

FAMILY: PLETHODONITDAE (Lungless Salamanders)

- | | |
|--|---|
| Ensatina (<i>Ensatina eschscholtzi</i>) | P |
| California Slender Salamander (<i>Batrachoseps attenuatus</i>) | P |
| Black Salamander (<i>Aneides flavipunctatus</i>) | P |
| Arboreal Salamander (<i>Aneides lugubris</i>) | P |

ORDER: SALIENTIA (Frogs and Toads)

FAMILY: BUFONIDAE (True Toads)

- | | |
|-------------------------------------|---|
| Western Toad (<i>Bufo boreas</i>) | P |
|-------------------------------------|---|

FAMILY: HYLIDAE (Treefrogs and Relatives)

- | | |
|--|---|
| Pacific Treefrog (<i>Hyla regilla</i>) | P |
|--|---|

FAMILY: RANIDAE (True Frogs)

- | | |
|--|---|
| California Red-legged Frog (<i>Rana aurora draytoni</i>) | P |
|--|---|

CLASS: REPTILIA

ORDER: SQUAMATA (Lizards and Snakes)

SUBORDER: SAURIA (Lizards)

FAMILY: IGUANIDAE (Iguanids)

- | | |
|---|---|
| Western Fence Lizard (<i>Sceloporus occidentalis</i>) | P |
|---|---|

FAMILY: SCINCIDAE (Skinks)

- | | |
|---|---|
| Western Skink (<i>Eumeces skiltonianus</i>) | P |
|---|---|

FAMILY: ANGUIDAE (Alligator Lizards and Relatives)

- | | |
|---|---|
| Southern Alligator Lizard (<i>Gerrhonotus multicarinatus</i>) | P |
|---|---|

- | | |
|--|---|
| Northern Alligator Lizard (<i>Gerrhonotus coeruleus</i>) | P |
|--|---|

FAMILY: ANNIELLIDAE (California Legless Lizards)

- | | |
|---|---|
| California Legless Lizard (<i>Anniella pulchra</i>) | P |
|---|---|

SUBORDER: SERPENTES (Snakes)

FAMILY: BOIDAE (Boas)

- | | |
|--------------------------------------|---|
| Rubber Boa (<i>Charina bottae</i>) | P |
|--------------------------------------|---|

FAMILY: COLUBRIDAE (Colubrids)

- | | |
|---|---|
| Ringneck Snake (<i>Diadophis punctatus</i>) | P |
|---|---|

- | | |
|---|---|
| Sharp-tailed Snake (<i>Contia tenuis</i>) | P |
|---|---|

- | | |
|--------------------------------------|---|
| Racer (<i>Coluber constrictor</i>) | P |
|--------------------------------------|---|

- | | |
|---|---|
| California Whipsnake (<i>Masticophis lateralis</i>) | P |
|---|---|

Gopher Snake (<i>Pituophis melanoleucus</i>)	P
Common Kingsnake (<i>Lampropeltis getulus</i>)	P
California Mountain Kingsnake (<i>Lampropeltis zonata</i>)	P
Common Garter Snake (<i>Thamnophis sirtalis</i>)	P
Western Terrestrial Garter Snake (<i>Thamnophis elegans</i>)	P
Western Aquatic Garter Snake (<i>Thamnophis couchi</i>)	P

CLASS: OSTERCHTHYES

ORDER:

SUBORDER:

FAMILY:

Stickleback (<i>Gasterosteus aculeatus</i>)	?
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FAMILY:

Mosquitofish (<i>Gambusia affinis</i>)	?
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CLASS: AVES

ORDER: GAVIIFORMES (Loons)

FAMILY: GAVIIDAE (Loons)

Red-throated Loon (<i>Gavia stellata</i>)	a
Pacific Loon (<i>Gavia arctica</i>)	a
Common Loon (<i>Gavia immer</i>)	a

ORDER: PODICIPEDIFORMES (Grebes)

FAMILY: PODICIPEDIDAE (Grebes)

Pied-billed Grebe (<i>Podilymbus podiceps</i>)	a
Horned Grebe (<i>Podiceps auritus</i>)	a
Red-necked Grebe (<i>Podiceps grisegena</i>)	a
Eared Grebe (<i>Podiceps nigricollis</i>)	a
Western Grebe (<i>Aechmophorus occidentalis</i>)	a
Clark's Grebe (<i>Aechmophorus clarkii</i>)	a

ORDER: PELECANIFORMES (Tropicbirds, Pelicans, and Relatives)

FAMILY: PELECANIDAE (Pelicans)

Brown Pelican (<i>Pelecanus occidentalis</i>)	a
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FAMILY: PHALACROCORACIDAE (Cormorants)

Double-crested Cormorant (<i>Phalacrocorax auritus</i>)	a
Brandt's Cormorant (<i>Phalacrocorax penicillatus</i>)	a
Pelagic Cormorant (<i>Phalacrocorax pelagicus</i>)	a

ORDER: CICONIIFORMES (Hérons, Storks, Ibises, and Relatives)

FAMILY: ARDEIDAE (Hérons and Bitterns)

American Bittern (<i>Botaurus lentiginosus</i>)	P
Great Blue Heron (<i>Ardea herodias</i>)	P
Great Egret (<i>Casmerodius albus</i>)	P
Snowy Egret (<i>Egretta thula</i>)	P
Little Blue Heron (<i>Egretta caerulea</i>)	P
Cattle Egret (<i>Bubulcus ibis</i>)	P
Green-backed Heron (<i>Butorides striatus</i>)	P

RRM Design Group/Habitat Restoration Group

ORDER: GALLIFORMES (Megapodes, Currassows, Pheasants, and Relatives)

FAMILY: PHASIANIDAE (Quails, Pheasants, and Relatives)

California Quail (*Callipepla californica*) P

ORDER: GRUIFORMES (Cranes, Rails, and Relatives)

FAMILY: RALLIDAE (Rails, Gallinules, and Coots)

American Coot (*Fulica americana*) a

ORDER: CHARADRIIFORMES (Shorebirds, Gulls, and Relatives)

FAMILY: CHARADRIIDAE (Plovers and Relatives)

Lesser Golden Plover (*Pluvialis dominica*) a

Snowy Plover (*Charadrius alexandrinus*) a

Semipalmated Plover (*Charadrius semipalmatus*) a

Killdeer (*Charadrius vociferus*) a

FAMILY: RECURVIROSTRIDAE (Avocets and Stilts)

Black-necked Stilt (*Himantopus mexicanus*) a

American Avocet (*Recurvirostra americana*) a

FAMILY: SCOLOPACIDAE (Sandpipers and Relatives)

Greater Yellowlegs (*Tringa melanoleuca*) a

Lesser Yellowlegs (*Tringa flavipes*) a

Solitary Sandpiper (*Tringa solitaria*) a

Willet (*Catoptrophorus semipalmatus*) a

Wandering Tattler (*Heteroscelus incanus*) a

Spotted Sandpiper (*Actitis macularia*) a

Whimbrel (*Numenius phaeopus*) a

Long-billed Curlew (*Numenius americanus*) a

Marbled Godwit (*Limosa fedoa*) a

Ruddy Turnstone (*Arenaria interpres*) a

Black Turnstone (*Arenaria melanocephala*) a

Surfbird (*Aphriza virgata*) a

Red Knot (*Calidris canutus*) a

Sanderling (*Calidris alba*) a

Semipalmated Sandpiper (*Calidris pusilla*) a

Western Sandpiper (*Calidris mauri*) a

Least Sandpiper (*Calidris minutilla*) a

Baird's Sandpiper (*Calidris bairdii*) a

Pectoral Sandpiper (*Calidris melanotos*) a

Rock Sandpiper (*Calidris ptilocnemis*) a

Dunlin (*Calidris alpina*) a

Stilt Sandpiper (*Calidris himantopus*) a

Ruff (*Philomachus pugnax*) a

Short-billed Dowitcher (*Limnodromus griseus*) a

Long-billed Dowitcher (*Limnodromus scolopaceus*) a

Common Snipe (*Gallinago gallinago*) a

Wilson's Phalarope (*Phalaropus tricolor*) a

Red-necked Phalarope (*Phalaropus lobatus*) a

Red Phalarope (*Phalaropus fulicaria*) a

FAMILY: LARIDAE (Gulls and Terns)

Laughing Gull (*Larus atricilla*) a

Little Gull (*Larus minutus*) a

Bonaparte's Gull (*Larus philadelphia*) a

Heermann's Gull (*Larus heermanni*) a

Mew Gull (<i>Larus canus</i>)	a
Ring-billed Gull (<i>Larus delawarensis</i>)	a
California Gull (<i>Larus californicus</i>)	a
Herring Gull (<i>Larus argentatus</i>)	a
Thayer's Gull (<i>Larus thayeri</i>)	a
Western Gull (<i>Larus occidentalis</i>)	a
Glaucous-winged Gull (<i>Larus glaucescens</i>)	a
Glaucous Gull (<i>Larus hyperboreus</i>)	a
Sabine's Gull (<i>Xema sabini</i>)	a
Caspian Tern (<i>Sterna caspia</i>)	a
Royal Tern (<i>Sterna maxima</i>)	a
Elegant Tern (<i>Sterna elegans</i>)	a
Common Tern (<i>Sterna hirundo</i>)	a
Arctic Tern (<i>Sterna paradisaea</i>)	a
Forster's Tern (<i>Sterna forsteri</i>)	a
California Least Tern (<i>Sterna antillarum browni</i>)	a
Black Tern (<i>Chlidonias niger</i>)	a
FAMILY: ALCIDAE (Auks, Murres, and Puffins)	
Common Murre (<i>Uria aalge</i>)	a
Pigeon Guillemot (<i>Cephus columba</i>)	a
Marbled Murrelet (<i>Brachyramphus marmoratus</i>)	a
 ORDER: COLUMBIFORMES (Pigeons and Doves)	
FAMILY: COLUMBIDAE (Pigeons and Doves)	
Rock Dove (<i>Columba livia</i>)	O
Band-tailed Pigeon (<i>Columba fasciata</i>)	O
Mourning Dove (<i>Zenaida macroura</i>)	O
 ORDER: STRIGIFORMES (Owls)	
FAMILY: TYTONIDAE (Barn Owls)	
Barn Owl (<i>Tyto alba</i>)	P
FAMILY: STRIGIDAE (Typical Owls)	
Western Screech-Owl (<i>Otus kennicotti</i>)	P
Great Horned Owl (<i>Bubo virginianus</i>)	P
Long-eared Owl (<i>Asio otus</i>)	P
Northern Saw-whet Owl (<i>Aegolius acadicus</i>)	P
 ORDER: APODIFORMES (Swifts and Hummingbirds)	
FAMILY: TROCHILIDAE (Hummingbirds)	
Black-chinned Hummingbird (<i>Archilochus alexandri</i>)	P
Anna's Hummingbird (<i>Calypte anna</i>)	O
Costa's Hummingbird (<i>Calypte costae</i>)	P
Rufous Hummingbird (<i>Selasphorus rufus</i>)	a
Allen's Hummingbird (<i>Selasphorus sasin</i>)	P
 ORDER: CORACIIFORMES (Kingfishers and Relatives)	
FAMILY: ALCEDINIDAE (Kingfishers)	
Belted Kingfisher (<i>Ceryle alcyon</i>)	P

ORDER: PICIFORMES (Woodpeckers and Relatives)

FAMILY: PICIDAE (Woodpeckers and Wrynecks)

Acorn Woodpecker (<i>Melanerpes formicivorus</i>)	P
Yellow-bellied Sapsucker (<i>Sphyrapicus varius</i>)	P
Downy Woodpecker (<i>Picoides pubescens</i>)	P
Hairy Woodpecker (<i>Picoides villosus</i>)	P
Northern Flicker (<i>Colaptes auratus</i>)	a

ORDER: PASSERIFORMES (Perching Birds)

FAMILY: TYRANNIDAE (Tyrant Flycatchers)

Olive-sided Flycatcher (<i>Contopus borealis</i>)	P
Western Wood-Pewee (<i>Contopus sordidulus</i>)	P
Willow Flycatcher (<i>Empidonax traillii</i>)	P
Dusky Flycatcher (<i>Empidonax oberholseri</i>)	P
Gray Flycatcher (<i>Empidonax wrightii</i>)	P
Pacific-slope Flycatcher (<i>Empidonax difficilis</i>)	P
Black Phoebe (<i>Sayornis nigricans</i>)	P
Say's Phoebe, (<i>Sayornis saya</i>)	P
Ash-throated Flycatcher (<i>Myiarchus cinerascens</i>)	P
Western Kingbird (<i>Tyrannus verticalis</i>)	a

FAMILY: HIRUNDINIDAE (Swallows)

Tree Swallow (<i>Tachycineta bicolor</i>)	P
Violet-green Swallow (<i>Tachycineta thalassina</i>)	P
Northern Rough-winged Swallow (<i>Stelgidopteryx serripennis</i>)	P
Cliff Swallow (<i>Hirundo pyrrhonota</i>)	P
Barn Swallow (<i>Hirundo rustica</i>)	O

FAMILY: CORVIDAE (Jays, Magpies, and Crows)

Steller's Jay (<i>Cyanocitta stelleri</i>)	P
Scrub Jay (<i>Aphelocoma coerulescens</i>)	O
American Crow (<i>Corvus brachyrhynchos</i>)	a
Common Raven (<i>Corvus corax</i>)	a

FAMILY: PARIDAE (Titmice)

Chestnut-backed Chickadee (<i>Parus rufescens</i>)	P
Plain Titmouse (<i>Parus inornatus</i>)	P

FAMILY: AEGITHALIDAE (Bushtit)

Bushtit (<i>Psaltiriparus minimus</i>)	P
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FAMILY: SITTIDAE (Nuthatches)

Pygmy Nuthatch (<i>Sitta pygmaea</i>)	P
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FAMILY: CETHIIDAE (Creepers)

Brown Creeper (<i>Certhia americana</i>)	P
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FAMILY: TROGLODYTIDAE (Wrens)

Bewick's Wren (<i>Thryomanes bewickii</i>)	P
House Wren (<i>Troglodytes aedon</i>)	P
Winter Wren (<i>Troglodytes troglodytes</i>)	a
Marsh Wren (<i>Cistothorus palustris</i>)	P

FAMILY: MUSCICAPIDAE (Old World Warblers, Gnatcatchers,

Kinglets, Thrushes, Bluebirds, and Wrentit)	
Golden-crowned Kinglet (<i>Regulus satrapa</i>)	P
Ruby-crowned Kinglet (<i>Regulus calendula</i>)	P
Blue-gray Gnatcatcher (<i>Polioptila caerulea</i>)	P
Townsend's Solitaire (<i>Myadestes townsendi</i>)	P
Swainson's Thrush (<i>Catharus ustulatus</i>)	P

Hermit Thrush (<i>Catharus guttatus</i>)	P
American Robin (<i>Turdus migratorius</i>)	P
Varied Thrush (<i>Ixoreus naevius</i>)	P
Wrentit (<i>Chamaea fasciata</i>)	P
FAMILY: MIMIDAE (Mockingbirds and Thrashers)	
Northern Mockingbird (<i>Mimus polyglottos</i>)	P
FAMILY: STURNIDAE (Starlings)	
European Starling (<i>Sturnus vulgaris</i>)	P
FAMILY: VIREONIDAE (Typical Vireos)	
Solitary Vireo (<i>Vireo solitarius</i>)	P
Hutton's Vireo (<i>Vireo huttoni</i>)	P
Warbling Vireo (<i>Vireo gilvus</i>)	P
Red-eyed Vireo (<i>Vireo olivaceus</i>)	P
FAMILY: EMBERIZIDAE (Wood Warblers, Sparrows, Blackbirds, and Relatives)	
Orange-crowned Warbler (<i>Vermivora celata</i>)	a
Virginia's Warbler (<i>Vermivora virginiae</i>)	a
Northern Parula (<i>Parula americana</i>)	a
Yellow Warbler (<i>Dendroica petechia</i>)	a
Chestnut-sided Warbler (<i>Dendroica pensylvanica</i>)	a
Magnolia Warbler (<i>Dendroica magnolia</i>)	a
Black-throated Blue Warbler (<i>Dendroica caerulescens</i>)	a
Yellow-rumped Warbler (<i>Dendroica coronata</i>)	a
Black-throated Gray Warbler (<i>Dendroica nigrescens</i>)	a
Townsend's Warbler (<i>Dendroica townsendi</i>)	a
Hermit Warbler (<i>Dendroica occidentalis</i>)	a
Black-throated Green Warbler (<i>Dendroica virens</i>)	a
Blackburnian Warbler (<i>Dendroica fusca</i>)	a
Prairie Warbler (<i>Dendroica discolor</i>)	a
Palm Warbler (<i>Dendroica palmarum</i>)	a
Black-and-white Warbler (<i>Mniotilta varia</i>)	a
Northern Waterthrush (<i>Seiurus noveboracensis</i>)	a
MacGillivray's Warbler (<i>Oporornis tolmiei</i>)	a
Common Yellowthroat (<i>Geothlypis trichas</i>)	P
Hooded Warbler (<i>Wilsonia citrina</i>)	a
Wilson's Warbler (<i>Wilsonia pusilla</i>)	a
Canada Warbler (<i>Wilsonia canadensis</i>)	a
Yellow-breasted Chat (<i>Icteria virens</i>)	a
Western Tanager (<i>Piranga ludoviciana</i>)	a
Rose-breasted Grosbeak (<i>Pheucticus ludovicianus</i>)	a
Black-headed Grosbeak (<i>Pheucticus melanocephalus</i>)	P
Blue Grosbeak (<i>Guiraca caerulea</i>)	a
Lazuli Bunting (<i>Passerina amoena</i>)	a
Indigo Bunting (<i>Passerina cyanea</i>)	a
Rufous-sided Towhee (<i>Pipilo erythrophthalmus</i>)	P
California Towhee (<i>Pipilo crissalis</i>)	O
American Tree Sparrow (<i>Spizella arborea</i>)	P
Chipping Sparrow (<i>Spizella passerina</i>)	a
Clay-colored Sparrow (<i>Spizella pallida</i>)	a
Brewer's Sparrow (<i>Spizella breweri</i>)	a
Black-chinned Sparrow (<i>Spizella atrogularis</i>)	a
Vesper Sparrow (<i>Pooecetes gramineus</i>)	a

Lark Sparrow (<i>Chondestes grammacus</i>)	a
Savannah Sparrow (<i>Passerculus sandwichensis</i>)	a
Grasshopper Sparrow (<i>Ammodramus savannarum</i>)	a
Sharp-tailed Sparrow (<i>Ammodramus caudacuta</i>)	a
Fox Sparrow (<i>Passerella iliaca</i>)	a
Song Sparrow (<i>Melospiza melodia</i>)	O
Golden-crowned Sparrow (<i>Zonotrichia atricapilla</i>)	P
White-crowned Sparrow (<i>Zonotrichia leucophrys</i>)	P
Dark-eyed Junco (<i>Junco hyemalis</i>)	P
Red-winged Blackbird (<i>Agelaius phoeniceus</i>)	P
Tricolored Blackbird (<i>Agelaius tricolor</i>)	P
Brewer's Blackbird (<i>Euphagus cyanocephalus</i>)	P
Brown-headed Cowbird (<i>Molothrus ater</i>)	P
Hooded Oriole (<i>Icterus cucullatus</i>)	P
Northern Oriole (<i>Icterus galbula</i>)	P
FAMILY: FRINGILLIDAE (Finches)	
Purple Finch (<i>Carpodacus purpureus</i>)	P
House Finch (<i>Carpodacus mexicanus</i>)	P
Lesser Goldfinch (<i>Carduelis psaltria</i>)	P
American Goldfinch (<i>Carduelis tristis</i>)	P
Evening Grosbeak (<i>Coccothraustes vespertinus</i>)	P
FAMILY: PASSERIDAE (Weaver Finches)	
House Sparrow (<i>Passer domesticus</i>)	P

CLASS: MAMMALIA

ORDER: MARSUPIALIA (Opossums and Relatives)

FAMILY: DIDELPHIDAE (Opossums)

Virginia Opossum (<i>Didelphis virginiana</i>)	P
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ORDER: INSECTIVORA (Shrews and Moles)

FAMILY: SORICIDAE (Shrews)

Ornate Shrew (<i>Sorex ornatus</i>)	P
Trowbridge's Shrew (<i>Sorex trowbridgii</i>)	P

FAMILY: TALPIDAE (Moles)

Broad-footed Mole (<i>Scapanus latimanus</i>)	P
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ORDER: CHIROPTERA (Bats)

FAMILY: VESPERTILIONIDAE (Vespertilionid Bats)

Little Brown Myotis (<i>Myotis lucifugus</i>)	P
Yuma Myotis (<i>Myotis yumanensis</i>)	P
Long-eared Myotis (<i>Myotis evotis</i>)	P
Fringed Myotis (<i>Myotis thysanodes</i>)	P
Long-legged Myotis (<i>Myotis volans</i>)	P
California Myotis (<i>Myotis californicus</i>)	P
Small-footed Myotis (<i>Myotis leibii</i>)	P
Western Pipistrelle (<i>Pipistrellus hesperus</i>)	P
Big Brown Bat (<i>Eptesicus fuscus</i>)	P
Silver-haired Bat (<i>Lasionycteris noctivagans</i>)	P
Red Bat (<i>Lasiurus borealis</i>)	P
Hoary Bat (<i>Lasiurus cinereus</i>)	P

Townsend's Big-eared Bat (<i>Plecotus townsendii</i>)	P
Pallid Bat (<i>Antrozous pallidus</i>)	P
FAMILY: MOLOSSIDAE (Free-tailed Bat)	
Western Mastiff Bat (<i>Eumops perotis</i>)	P
ORDER: RODENTIA (Squirrels, Rats, Mice, and Relatives)	
FAMILY: SCIURIDAE (Squirrels, Chipmunks, and Marmots)	
Western Gray Squirrel (<i>Sciurus griseus</i>)	P
Fox Squirrel (<i>Sciurus niger</i>)	O
FAMILY: GEOMYIDAE (Pocket Gophers)	
Botta's Pocket Gopher (<i>Thomomys bottae</i>)	O
FAMILY: CRICETIDAE (Deer Mice, Voles, and Relatives)	
Western Harvest Mouse (<i>Reithrodontomys megalotis</i>)	P
California Mouse (<i>Peromyscus californicus</i>)	P
Deer Mouse (<i>Peromyscus maniculatus</i>)	P
FAMILY: ARVICOLIDAE (Voles and Allies)	
California Vole (<i>Microtus californicus</i>)	P
FAMILY: MURIDAE (Old World Rats and Mice)	
Black Rat (<i>Rattus rattus</i>)	P
Norway Rat (<i>Rattus norvegicus</i>)	P
House Mouse (<i>Mus musculus</i>)	P
ORDER: CARNIVORA (Carnivores)	
FAMILY: PROCYONIDAE (Raccoons and Relatives)	
Raccoon (<i>Procyon lotor</i>)	O
FAMILY: MUSTELIDAE (Weasels, Badgers, and Relatives)	
Long-tailed Weasel (<i>Mustela frenata</i>)	P
Striped Skunk (<i>Mephitis mephitis</i>)	P
FAMILY: FELIDAE (Cats)	
Mountain Lion (<i>Felis concolor</i>)	
Bobcat (<i>Lynx rufus</i>)	
ORDER: ARTIODACTYLA	
FAMILY: SUIDAE (Pigs)	
Wild Pig (<i>Sus scrofa</i>)	
FAMILY: CERVIDAE (Deer, Elk, and Relatives)	
Black-tailed Deer (<i>Odocoileus hemionus</i>)	
CLASS: INSECTA	
ORDER: ODONATA (Dragonflies and Damselflies)	
SUBORDER: ANISOPTERA (Dragonflies)	
FAMILY: PHYLUM = ARTHROPODA	
Common Bluedarner (<i>Aeshna multicolor</i>)	O
Dusty Skimmer (<i>Sympetrum illotum</i>)	O
Big Red Slammer (<i>Libellula saturata</i>)	P
ORDER: ORTHOPTERA	
FAMILY: ACRIDIDAE	
SUBFAMILY: OEDOPODINAE	
Pallid-winged Grasshopper (<i>Trimerotropis palidipennis</i>)	O

Appendix C
Control of Invasive, Non-native Plant Species

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

BERMUDA GRASS (*Cynodon dactylon*)

Aliases: Wiregrass, Devilgrass, Dogtooth Grass, Scutchgrass, Vinegrass, Couchgrass

Escaped from: Warmer regions of Europe

Identifying Characteristics: Member of the Grass Family (*Poaceae*)

Growth Habit: Prostrate perennial grass forming dense sod. Both rhizomes and stolons are many jointed. Bermuda grass may be confused with native salt grass. Salt grass rhizomes are yellower, and leaves are in 2 rows as they go up the stem.

Leaves: Leaves on rhizomes and stolons are short, broad, and scale-like. Leaves on erect stems range from 1-4" long; smooth on lower surface and rough above. At junction of leaf blade and leaf sheath, there is a distinct ring of white hairs.

Flowers: Erect stems (culms) bear clusters of minute flowers. The 3-5 flower-bearing stalks originate from one point at top of stem. Individual spikelets are in 2 rows on 1 side of the stalk. There is 1 flower per spikelet.

Blooming period: June thru August

Life History: Reproduces vegetatively by rhizomes or stolons, producing new plants at stem joints. Also reproduces by seeds. Seeds are often carried in hay, packing, and livestock bedding, and are easily dispersed by wind and irrigation water.

Invasiveness: Bermuda grass is very invasive in warm regions. It escapes from playgrounds and lawns where it has been planted. Not a problem in cold-winter climates. Bermuda grass is a troublesome weed that can displace native flora. Invades annual crops, orchards, vineyards, roadsides, and landscaped areas. Few other species form as dense a sod as Bermuda grass, and few native plants can seed into this sod.



Control Measures: 1) Apply 5% glyphosate before summer dormancy. Good results can be expected if sprayed during flowering. Best results are during periods of lush growth. Do not disc or till. Replant or reseed large areas with appropriate native plants. or 2) Uproot small patches including all underground parts.

Disposal: Leave in place if sprayed. Remove or expose roots to sun if uprooted.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

COCKLEBUR (*Xanthium strumarium*)

Aliases: Clotbur, Buttonbur, Ditchbur, Sea Burdock, Hedgehog Burweed, Sheep Bur

Escaped from: Europe

Identifying Characteristics: Member of the Sunflower Family (*Asteraceae*)

Growth Habit: Fast growing annual herb with widely branching, stout stems. Mature plant is upright or bushy, from 2-5' in height, with red spots on its stems.

Leaves: The first true leaves are opposite on the stem. Later leaves alternate on the stems. Leaves are dull green on the upper surface; paler green on the under surface. They are long stalked and triangular, with margins that are lobed and coarsely toothed.

Flowers: Male and female flowers are small and greenish. Male flowers in clusters at top of plant; female flowers are burs in leaf axils along the stem. Burs are football-shaped and covered with hooked stiff spines.

Blooming period: June thru October

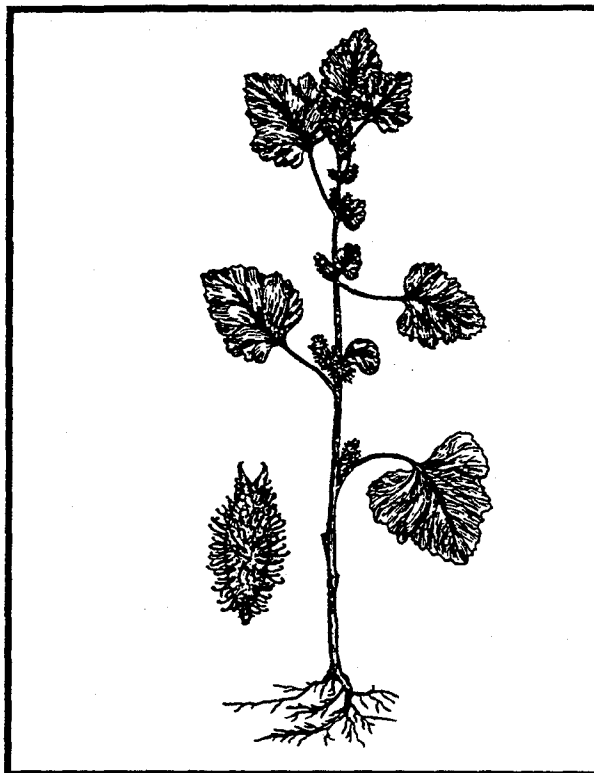
Life History: Reproduces by seeds in the spiny bur fruits. Spines are easily caught in fur and feathers of passing animals, which in turn disperse the seeds.

Invasiveness: Very invasive; infests pastures, irrigation ditches, and cultivated areas, especially where water has stood or accumulated in winter or early spring. Shades out smaller native plants.

Warning: Plants and seeds contain the poison xanthostrumarin.

Control Measures: 1) Pull or uproot when plants are young and soil is moist; or 2) Hoe 2" below ground level, before seed set; or 3) Repeated mowing.

Disposal: Bag and remove plant parts that have formed burs.



Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

HIMALAYA-BERRY (*Rubus discolor*)

Aliases: Himalaya Blackberry, formerly known as *Rubus procerus*.

Escaped from: Western Europe

Identifying Characteristics: Member of the Rose Family (*Rosaceae*)

Growth Habit: Sprawling, evergreen perennial shrub, forming large mounds or thickets. Canes are decumbent or trailing; have well-spaced, straight or slightly curved prickles.

Leaves: Most leaves on Himalaya-berry have 5 leaflets, whereas most leaves of the smaller California blackberry have 3 leaflets. Leaflets of Himalaya-berry are roundish to oblong with toothed edges.

Flowers: White-pink, showy flowers are formed on large terminal clusters. Each flower is $\pm 1"$ across with 5 petals and numerous stamens.

Blooming period: Spring

Life History: Reproduces vegetatively from roots forming at cane tips that produce new plants. Also reproduces by seed contained in edible berries that are red to shining black, $\pm 1"$ long. Seed is dispersed by wildlife.

Invasiveness: Himalaya-berry is very invasive. It has escaped from cultivation, and become a widespread weed pest, especially in areas that are initially disturbed, then neglected by humans. It displaces many native plant species.



Control Measures: 1) Mow or cut; spray new sprouts 3 weeks later with 5% glyphosate. or 2) Spray entire plant with 5% glyphosate during active growth stage; repeat spraying as necessary. or 3) Repeated digging out of all plant parts.

Disposal: Cut stems may be left on site or removed. Remove roots, or expose to sun.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

POISON HEMLOCK (*Conium maculatum*)

Aliases: Poison Parsley, Deadly Hemlock, Snakeweed

Escaped from: Eurasia and North Africa

Identifying Characteristics: Member of the Carrot Family (*Apiaceae*)

Growth Habit: Tall biennial with long white taproot. Stems are erect and branching. Stems are hollow and marked with purple dots. Mature plants are 3-10' tall.

Leaves: Leaves are arranged alternately along the stem and are pinnately compound with finely cut leaflets. The lower leaves have short stalks that are flattened at the base and partially envelop the stem.

Flowers: Numerous, small white flowers borne in large umbrella-shaped clusters.

Blooming period: April thru August

Life History: Poison hemlock reproduces by seed and is water dispersed.

Invasiveness: Poison hemlock is a very invasive weed, especially in disturbed areas such as pastures, creeks, roadsides, meadows and waste places. Poison hemlock makes revegetation site maintenance difficult due to its rapid growth and size. Dense stands can shade out smaller native plants.

Warning: All plant parts contain poisonous alkaloids. Usually avoided by livestock. Wear gloves when handling.



Control Measures: 1) Pull or uproot when soil is moist; or 2) Hoe 2" below ground level, before flowering; or 3) Repeated mowing.

Disposal: Remove from site if mature or nearly mature seed is present.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

BRISTLY OX-TONGUE (*Picris echioides*)

Aliases: Bugloss, Bugloss-Picris

Escaped from: Mediterranean region and Southwestern Asia

Identifying Characteristics: Member of the Sunflower Family (*Asteraceae*)

Growth Habit: Annual, biennial, or short-lived perennial. Mature plant is coarsely branched and 2-3' tall. Stems are angled and covered with barbed hairs that make the plant painful to the touch.

Leaves: Basal and lower leaves are 2-6" long, and ± 1 " wide, oblong in shape with shallowly scalloped margins. Upper leaves are smaller and clasp the stem. All leaves are rough to the touch due to barbed bristles that arise from blister-like swellings.

Flowers: Yellow dandelion-like flowers, $\pm \frac{1}{2}$ " across. Flowers are borne in clusters, or singly, above 4-5 modified leaves (bracts).

Blooming period: April thru December

Life History: Reproduction is by one-seeded fruits (achenes). The achenes bear feathery bristles that facilitate wind dispersal.

Invasiveness: Bristly ox-tongue is a common invasive weed of disturbed habitats such as ditches, fallow fields, and roadsides. It also infests cultivated croplands, orchards, and vineyards. Bristly ox-tongue can overwhelm groundcovers in revegetation sites.



Control Measures: 1) Pull or uproot when soil is moist; or 2) Hoe 2" below ground level, before flowering; or 3) Repeated mowing.

Disposal: Remove flower parts from site.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

PAMPAS GRASS (*Cortaderia jubata*)

Aliases: Jubata Grass, Andean Grass

Escaped from: Andes Mountains of northern Argentina, Ecuador, Peru, and Bolivia

Identifying Characteristics: Member of the Grass Family (*Poaceae*)

Growth Habit: Non-native, perennial grass, forming large tussocks up to 8' tall. Fast grower.

Leaves: Numerous long, dark green blades arise at the base of the plant and have a drooping habit. Leaves are 1-2 cm wide with razor-like margins. This contrasts with another commonly planted pampas grass, *C. selloana*, which has narrower, blue-green leaves.

Flowers: Small flowers are borne in pinkish or purplish plume-like clusters (panicles) and later turn creamy white. Flower stems rise up to 3 times higher than the clump of foliage. All of the plants are female and seeds are formed asexually. Flower color contrasts that of *C. selloana*, which is white and glistening at maturity.

Blooming period: March thru September

Life History: Reproduction is mainly by seed and optimal germination occurs with high soil moisture and temperatures around 10°C. Seedlings can germinate and become established in a variety of soil types. There are populations of pampas grass that consist entirely of female plants that can form seed without pollination (apomixis); therefore millions of seeds can be produced per plant. The seeds are primarily dispersed by the wind.

Invasiveness: Pampas grass is a very invasive non-native plant, capable of taking over both disturbed and natural areas, especially in the coastal fog belt where freezing temperatures do not occur. Huge seed loads contribute to the plant's invasiveness. Pampas grass is highly competitive with native plants and is a substantial threat to native habitats, especially coastal sand dunes and inland sand hills that contain a number of rare and threatened plant species.



Control Measures: 1) Well-established plants should be removed first because they have the highest reproductive potential due to their prolific seed heads. If adequate manpower is available and the plants are not too large, pampas grass can be manually removed with a pick and shovel. It is important that all of the crown be removed so that crown sprouting is prevented. or 2) Established plants can be controlled chemically. The herbicide glyphosate has proved successful for large plants and seedlings.

Disposal: Regardless of the size of the plant removed, the plant remains should be cleared from the area, since pampas grass can send roots back into the ground and continue to grow.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

FRENCH BROOM (*Genista monspessulana*)

Aliases: Formerly known as *Cytisus monspessulanus*); often mistaken for its cousin, Scotch Broom

Escaped from: Canary Islands, Mediterranean, and the Azores

Identifying Characteristics: Member of the Pea Family (*Fabaceae*)

Growth Habit: Perennial shrub, 3-9' tall with villous branchlets. Some reach 15'.

Leaves: Three-parted (trifoliate) with petioles about $\frac{1}{4}$ " long. Leaflets are obovate, entire, and $\pm \frac{1}{2}$ " long; the undersides are covered with soft hairs.

Flowers: Light yellow flowers on short lateral branches, each flower stalk bearing 3-9 flowers. This contrasts with Scotch broom (*G. scoparius*), with single flowers borne in the axil (upper angle formed by a leaf or branch with the stem).

Blooming period: March thru May

Life History: Both French and Scotch broom reproduce primarily by seed, although vegetative reproduction and stump sprouting occur. Seeds are long-lived, and may remain viable for 80 years. The hard seed coats are distributed by birds and other animals, passing vehicles, and survive transport in river gravels. Seeds are borne in pods that often open explosively.

Invasiveness: Brooms are very aggressive, spread rapidly, and are becoming a common problem in pastures, forests, and disturbed areas such as roadsides and recently cleared land. The Calif. Dept. of Food and Agriculture has declared French and Scotch broom as Class C pest species. French broom is the most widespread and damaging of the weedy brooms; in some places it forms impenetrable thickets that displace native vegetation and lower the habitat value for wildlife. They render rangeland worthless, and increase the cost of maintenance of roads, ditches, and canals.



Control Measures: 1) Manual control methods: Remove plants before they set seed. Seedlings should be destroyed whenever they are found. A hand-tool, the Weed Wrench, was developed for controlling this species. Avoid disturbing soil, since bare soil fosters broom germination. Removal should be done during the rainy season, when soil is moist prior to seed set. or 2) Broadcast herbicide application is effective in dense thickets. Herbicides commonly used for broom are 2,4-D and 2,4,5-T; alone or with additives. Broom has been determined susceptible to picloram. Herbicides may be applied with spot chemical methods; stem injection; and cut stump treatment. or 3) Control with prescribed burning and/or prescribed grazing (goats and sheep) methods.

Disposal: Uprooted plants not supporting flowers or seed pods can be scattered thinly as a mulch. However, care should be taken to prevent vegetative reproduction from stems. All foliage with flowers and seeds should be removed from the site.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

PERIWINKLE (*Vinca major*)

Aliases: Myrtle, Vinca

Escaped from: Mediterranean region, Europe

Identifying Characteristics: Member of Dogbane Family (*Apocynaceae*)

Growth Habit: Non-native, perennial herb with erect flowering stems and trailing non-flowering stems. Stems have a milky-latex. Plants can form extensive, low-growing patches.

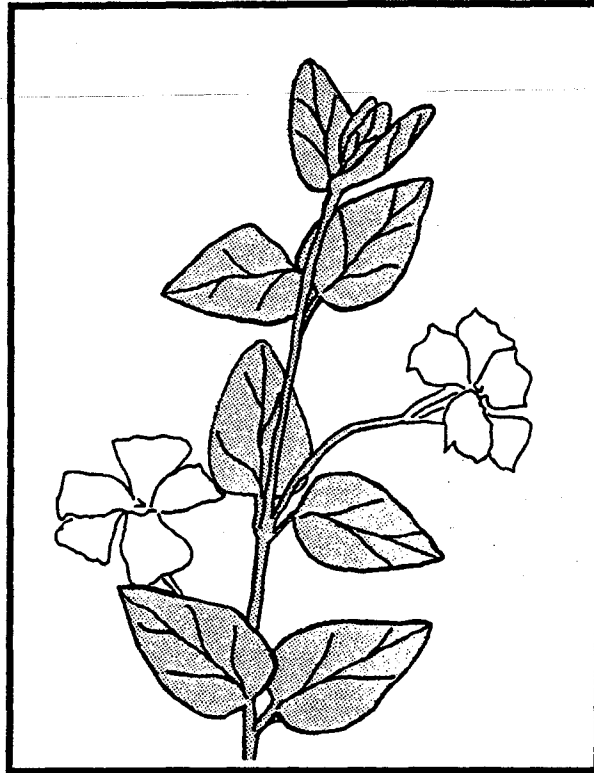
Leaves: Dark green and oval, 1-2" long. Leaves arranged alternately along the stem.

Flowers: Periwinkle blue flowers are solitary in the leaf axils. The corolla is divided into 5 lobes about 1/4" long.

Blooming period: March thru July

Life History: Periwinkle spreads vegetatively by arching stolons that root at the tips. Frequently found as a garden escapee in moist or wooded areas. Not known to reproduce from seed as seeds rarely mature.

Invasiveness: Periwinkle is very invasive forming dense patches to the exclusion of other vegetation. Although susceptible to dry weather and frost, it quickly resprouts, especially in moist, shady areas. Its rapid spread can out-compete native flora, disrupting natural plant communities such as riparian areas.



Control Measures: 1) Mow, then spray cut surfaces immediately with 5% glyphosate. Do not disc or till. Reseed large areas with appropriate native plants. *or* 2) Spray entire plant with 5% glyphosate using extra surfactant.

Disposal: Leave in place.

Jessie Street Marsh Management Plan

Invasive Non-native Plant Species Control

BULL THISTLE (*Cirsium vulgare*)

Aliases: Spear Thistle, Common Thistle, Plume Thistle

Escaped from: Europe and Asia

Identifying Characteristics: Member of the Sunflower Family (*Asteraceae*)

Growth Habit: Biennial herb 3-4' tall, with stout branching stems. During the first year, the plant can have a rosette-like appearance.

Leaves: Leaves arranged alternately along stem, and are lance-shaped. Leaves are coarsely toothed or deeply lobed almost to mid-rib. Teeth or lobes bear long needle-pointed tips. Lower leaves are from 6"-1' long, and 2½"-4" wide. Upper leaves are not stalked, but attach at the base of the blade.

Flowers: Flower heads are 1½"-2" high, in clusters of 4 or 5 at tips of flowering stalks. Flowers are deep purple to rose in color.

Blooming period: June thru October

Life History: Reproduction is by one-seeded fruits (achenes). The achenes bear feathery bristles that facilitate wind dispersal.

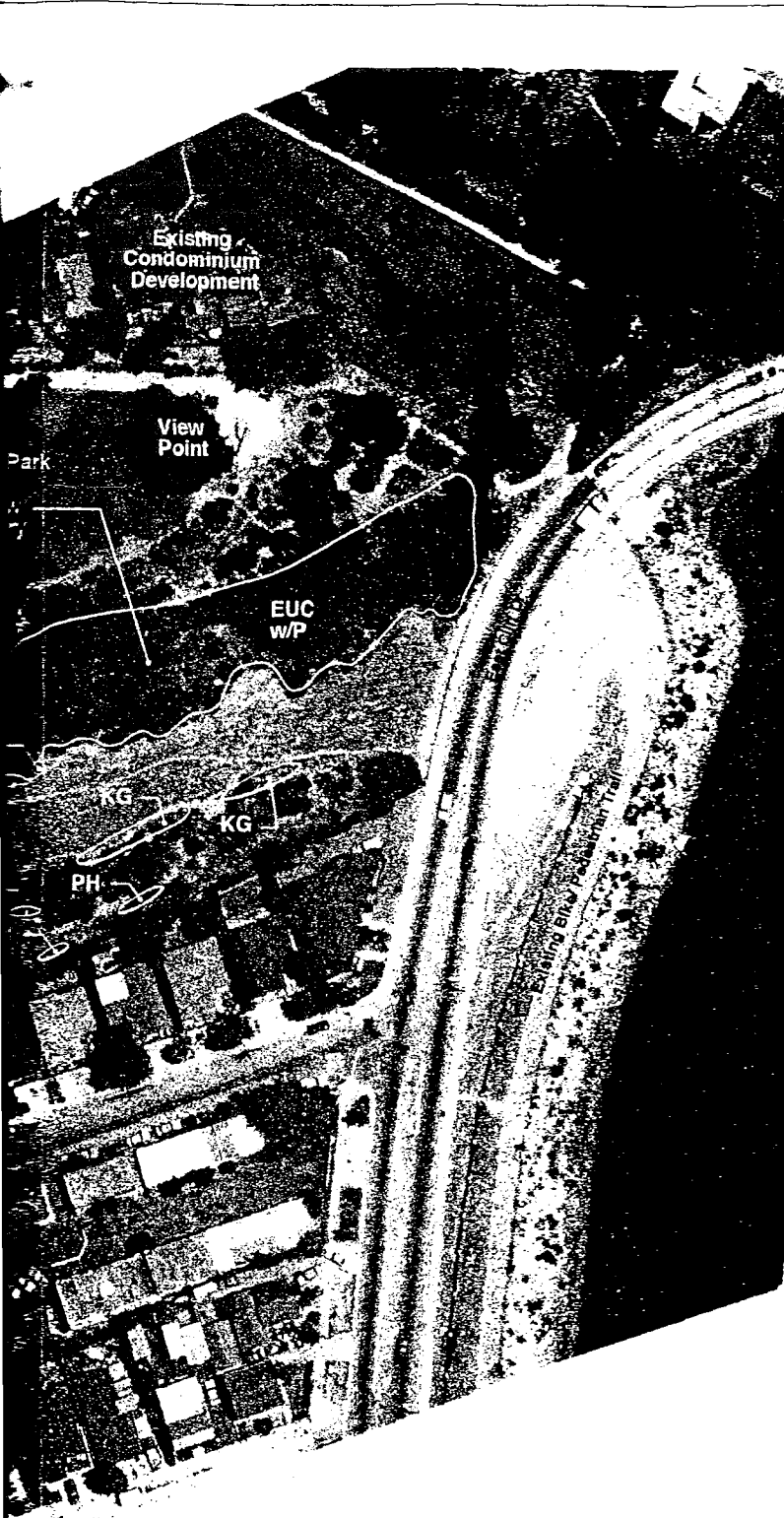
Invasiveness: Bull thistle is an aggressive weed that has become common in disturbed habitats and waste places. Bull thistle makes revegetation site maintenance difficult, due to its size, spines, and rapid spread. Troublesome weed in pastures; not good fodder for livestock.



Control Measures: 1) Uproot or pull while plant is a rosette. *or* 2) Hoe 2" below ground level before the plant flowers. *or* 3) Repeated mowing.

Disposal: Remove flowering plants from site. Immature flowers ripen and set seed after plant is cut.

THE UNIVERSITY OF CHICAGO



INVASIVE PLANT SPECIES MAP

Jessie Street Marsh Management Plan

City Of Santa Cruz

September 1998

Bellinger & Foster Landscape Architects
Monterey, CA
(408) 646-1383

Habitat Restoration Group
Felton, CA
(408) 335-6800

Swanson Hydrology & Geomorphology
Santa Cruz, CA
(408) 427-0288

Legend/Notes:

Invasive, Non- Native Plant Species Legend

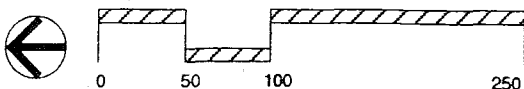
BA	Black Acacia
GA	Green Wattle Acacia
EUC	Blue Gum Eucalyptus

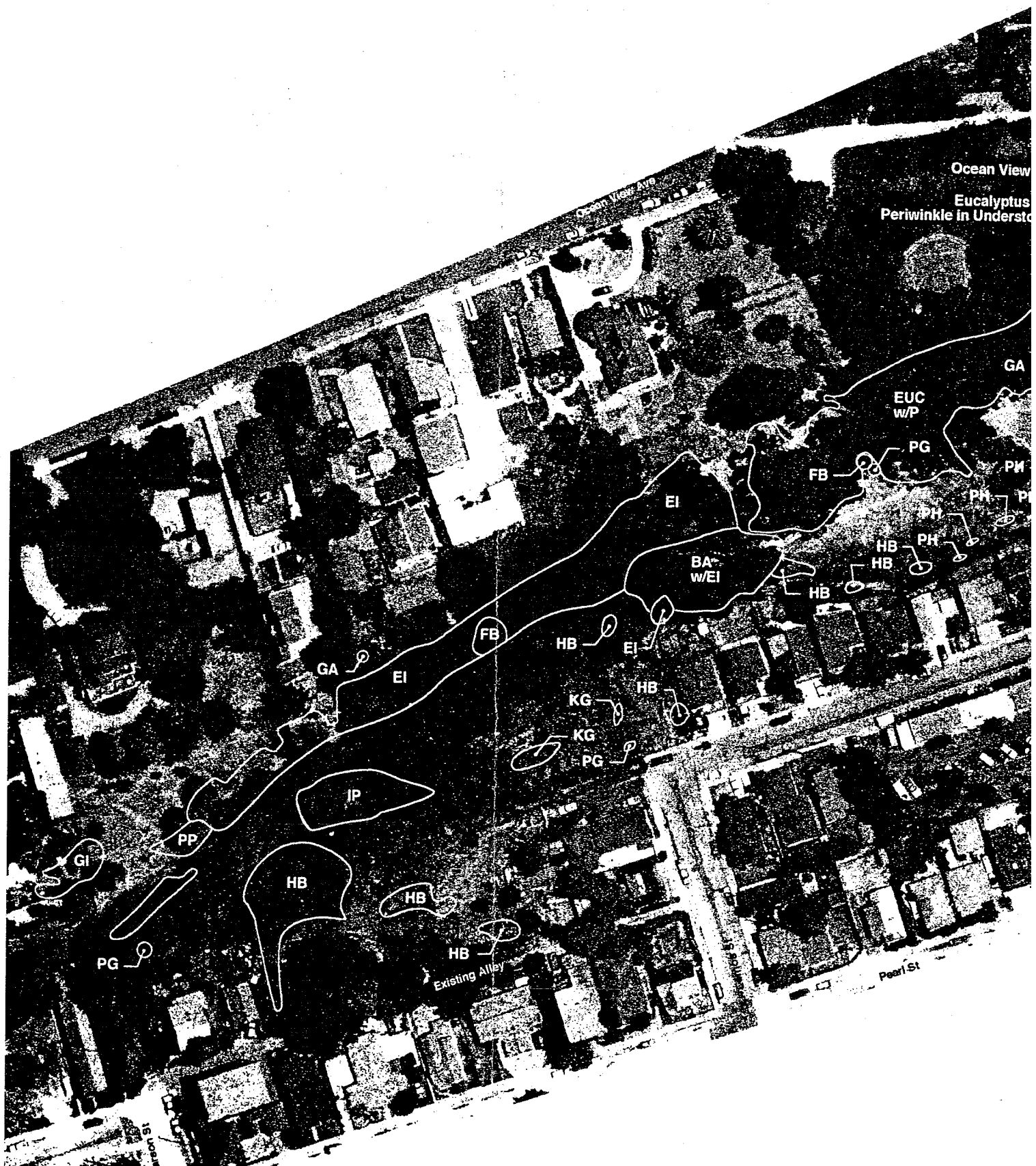
Shrubs and Vines

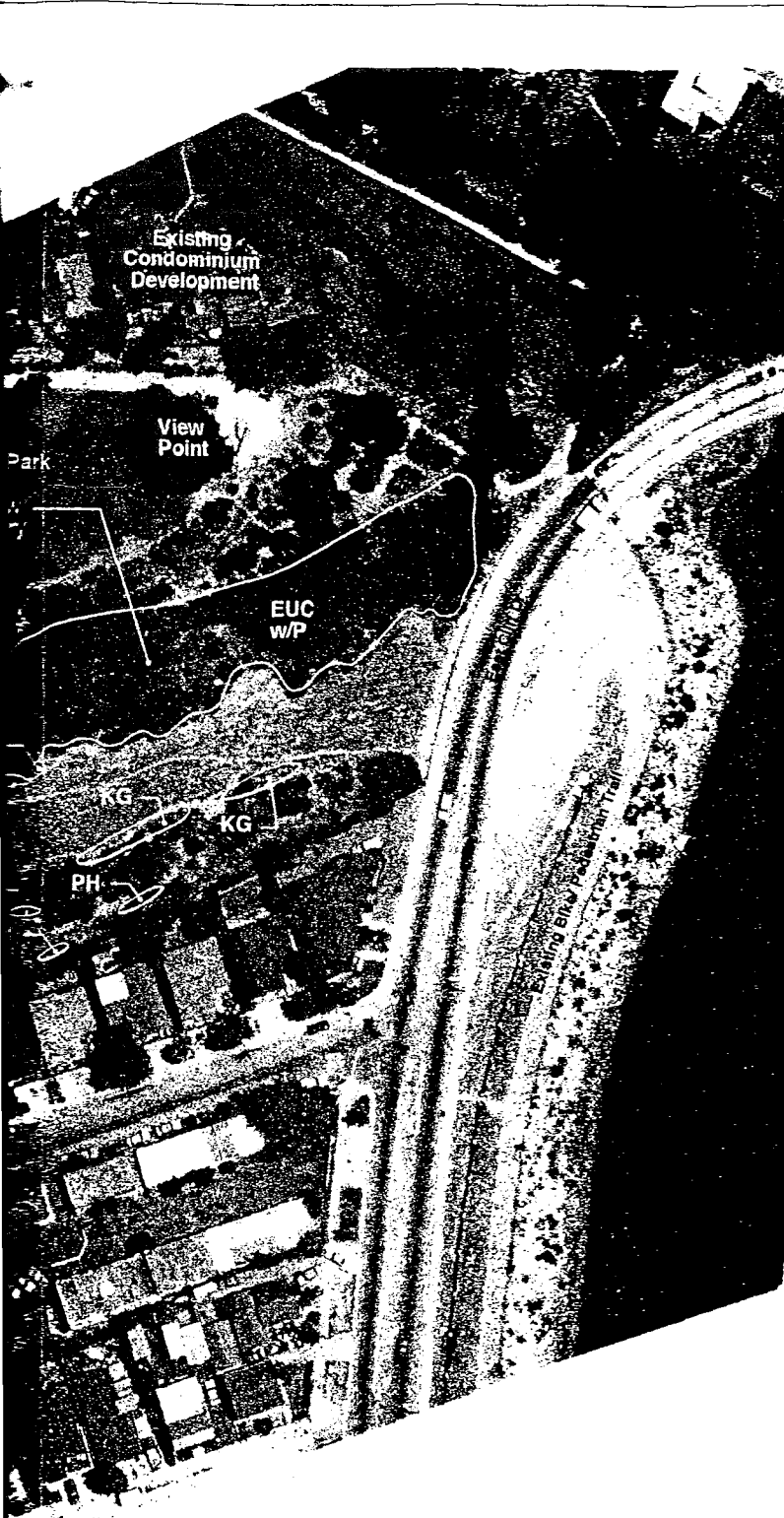
HB	Himalaya Blackberry
FB	French Broom
PG	Pampas Grass

Herbaceous Plants

KG	Kikuyu Grass
P	Periwinkle
PH	Poison Hemlock
EI	English Ivy
IP	Iceplant (Sea Fig)
GI	German Ivy







INVASIVE PLANT SPECIES MAP

Jessie Street Marsh Management Plan

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Legend/Notes:

Invasive, Non- Native Plant Species Legend

BA	Black Acacia
GA	Green Wattle Acacia
EUC	Blue Gum Eucalyptus

Shrubs and Vines

HB	Himalaya Blackberry
FB	French Broom
PG	Pampas Grass

Herbaceous Plants

KG	Kikuyu Grass
P	Periwinkle
PH	Poison Hemlock
EI	English Ivy
IP	Iceplant (Sea Fig)
GI	German Ivy





PLANT HABITAT MAP

Jessie Street Marsh Management Plan

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September 1998

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Legend/Notes:

Tree Habitats

CLO	Coast Live Oak Series
BE	Box Elder Series
AW	Arroyo Willow Series
EUC	Blue Gum Eucalyptus Series
BA	Black Acacia Series
LT	Landscape Trees

Scrub and Thicket Habitats

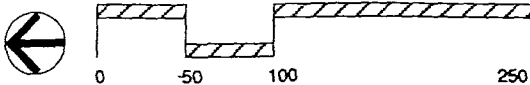
CBS	Coyote Brush Series
BT	Blackberry Series
TS	Toyon Series

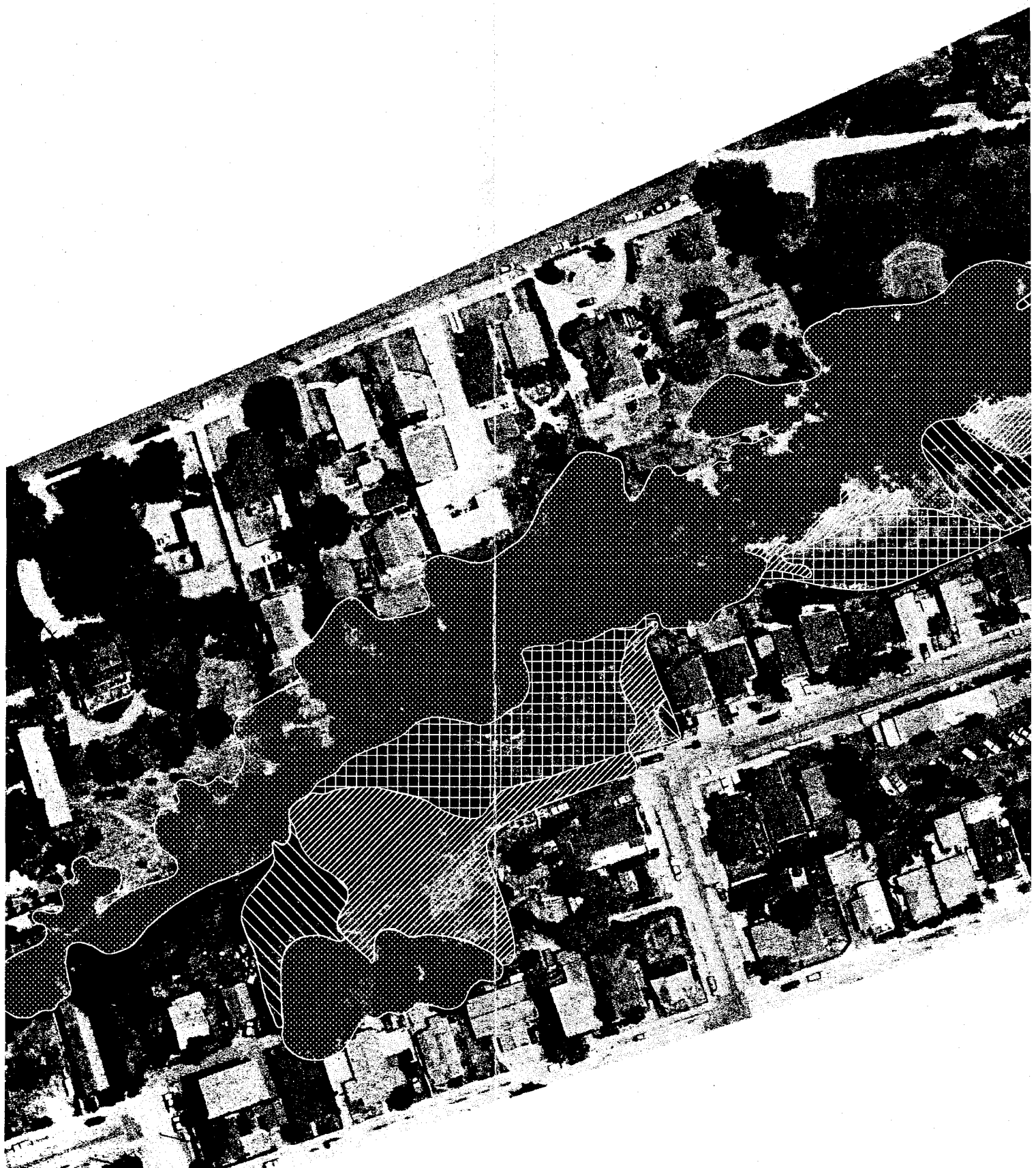
Marsh and Wet Grassland Habitats

CT	Cattail -Bulrush Series
BB	Brass Buttons Series
SG	Salt Grass- Alkali Rye Grass Series
SRG	Sedge- Rabbitsfoot Grass Series
SFH	Sedge- Fat Hen- Brass Buttons

Upland Grassland Habitats

BG	Bermuda Grass Series
IP	Iceplant Series
KG	Kikuyu Grass Series
WOS	Wild Oat- Plantain Series







BIOTIC RESOURCES MAP

Jessie Street Marsh Management Plan

City Of Santa Cruz
September 1998

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Legend/Notes:



Tree Habitats



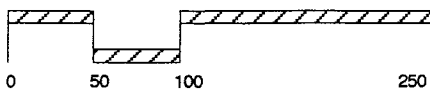
Scrub and Thicket Habitats

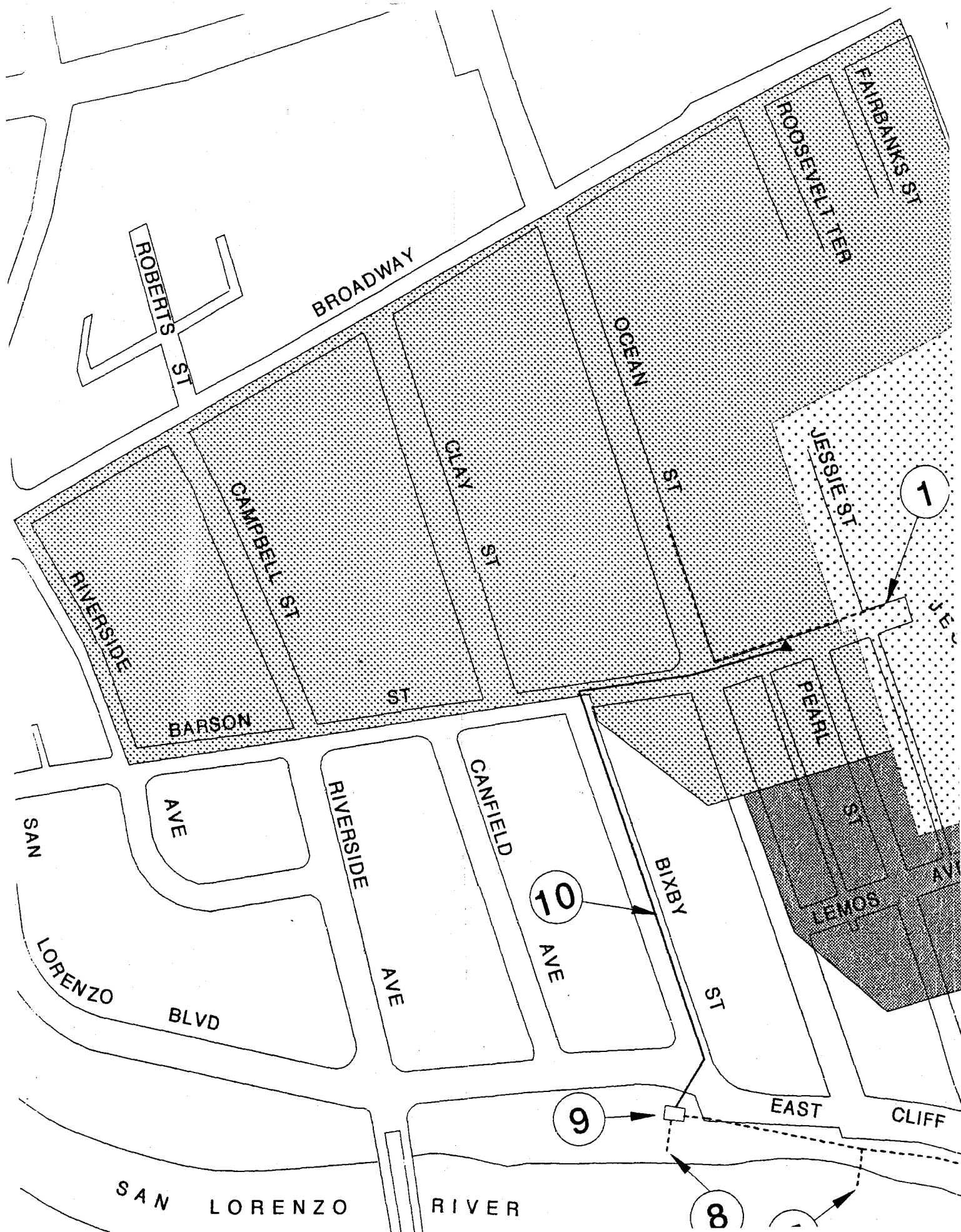


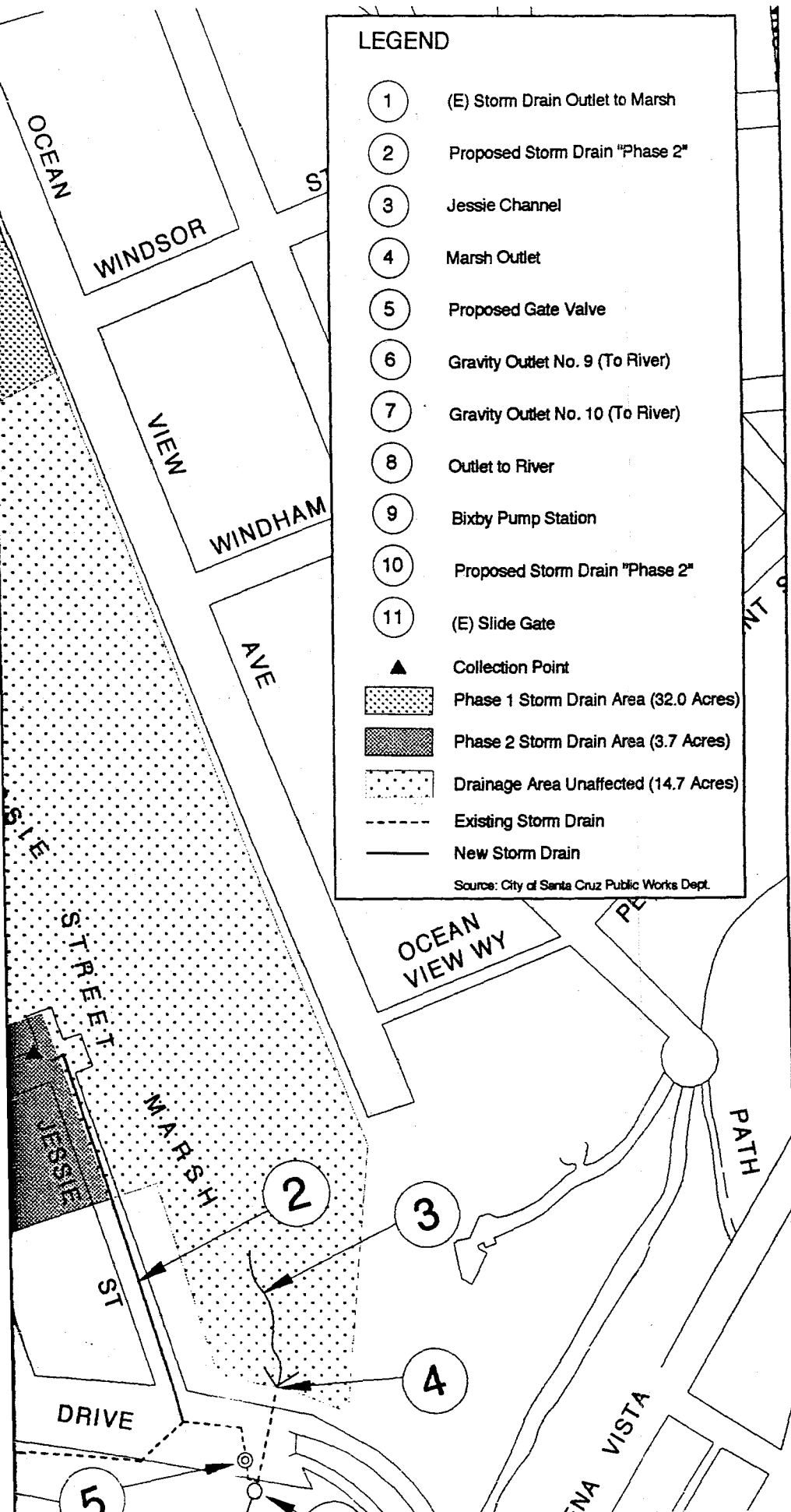
Marsh and Wet Grassland Habitats



Upland Grassland Habitats







LEGEND

- 1 (E) Storm Drain Outlet to Marsh
- 2 Proposed Storm Drain "Phase 2"
- 3 Jessie Channel
- 4 Marsh Outlet
- 5 Proposed Gate Valve
- 6 Gravity Outlet No. 9 (To River)
- 7 Gravity Outlet No. 10 (To River)
- 8 Outlet to River
- 9 Bixby Pump Station
- 10 Proposed Storm Drain "Phase 2"
- 11 (E) Slide Gate
- ▲ Collection Point
-  Phase 1 Storm Drain Area (32.0 Acres)
-  Phase 2 Storm Drain Area (3.7 Acres)
-  Drainage Area Unaffected (14.7 Acres)
- - - Existing Storm Drain
- New Storm Drain

Source: City of Santa Cruz Public Works Dept.

STORM DRAIN PLAN Jessie Street Marsh Management Plan City of Santa Cruz September 1998


 Bellinger & Foster Landscape Architects
 200 Cannery Row
 Monterey, CA 93940
 (408) 646-1383 • Fax (408) 373-9653





Graded Area,
Scenic View
Point, Path
Eroded

Existing
Condominium
Development

View
Point

Marsh Path Ends @ Sidewalk
Existing Culvert Location-
Lots of Debris & Overgrown Plants

Graded Fill Area

SITE ANALYSIS

Jessie Street Marsh Management Plan

City Of Santa Cruz

September 1998

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(408) 427-0288

Legend/Notes:



Pedestrian- Vehicular Conflict



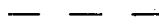
Point of Interest



Property Line



Easement Line



Study Area Boundary

Existing Storm Drain Legend

①

Storm Drain Outlet to Marsh

②

Jessie Channel

③

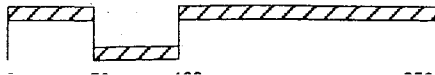
Marsh Outlet

④

Gravity Outlet No. 9 (To River)

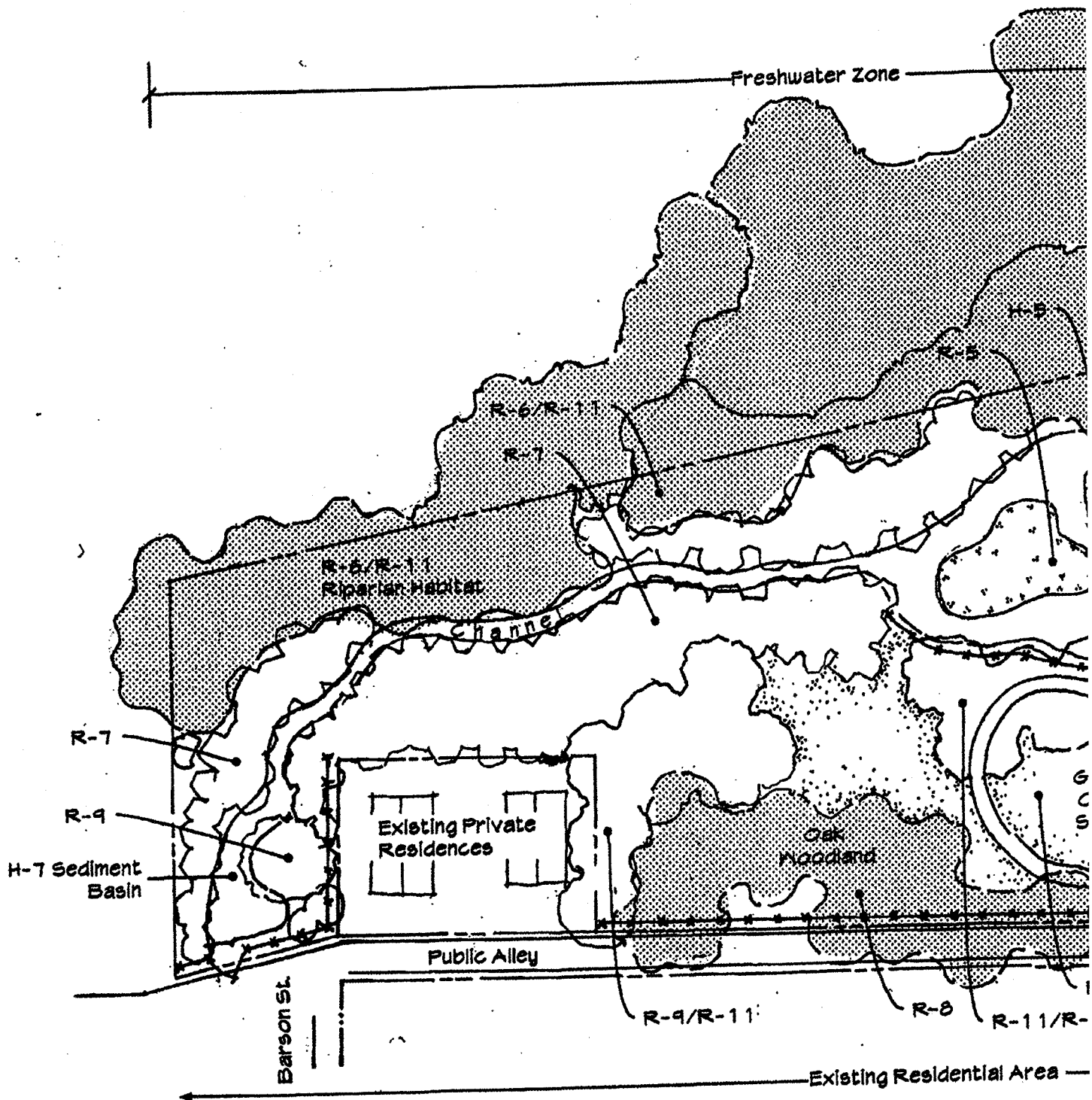
⑤

Slide Gate



HYDROLOGY ACTIONS

- H-1 Modify Operation of Existing Slide Gate at East Cliff Drive and San Lorenzo River
- H-2 Create New Tidal Channel Between East Cliff Drive and Lemos Avenue
- H-3 Fill Existing Drainage Channel Between East Cliff Drive and Lemos Avenue
- H-4 Create New Salt/Brackish Water Marsh Plain Between East Cliff Drive and Lemos Avenue
- H-5 Create New Freshwater Channel Between Lemos Street and Barson Street
- H-6 Create Open Water Areas Between Lemos Avenue and Barson Street
- H-7 Create Sediment Retention Basin Near Barson Street
- H-8 Partially Fill Existing Drainage Swale Between Lemos Avenue and Barson Street

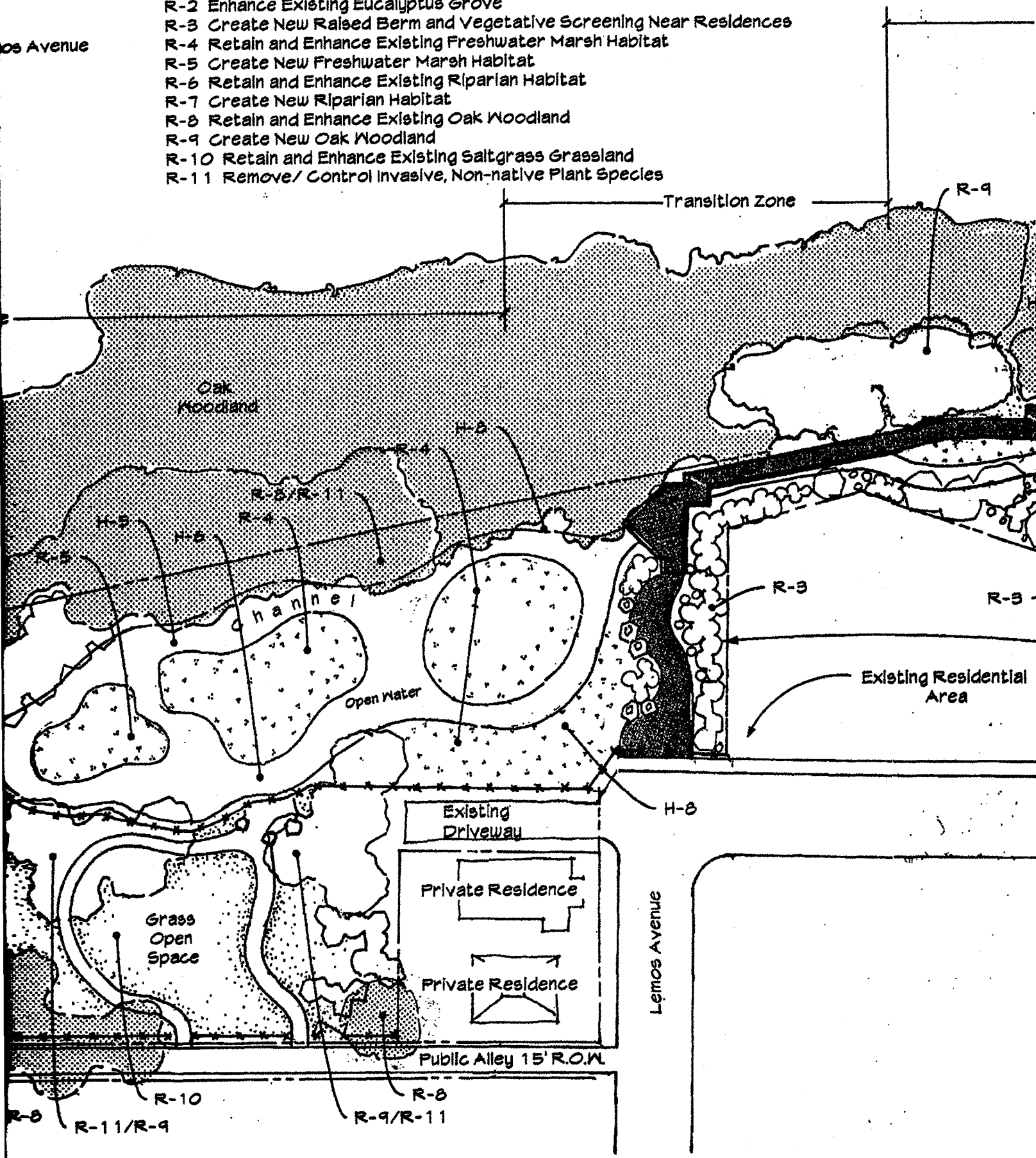


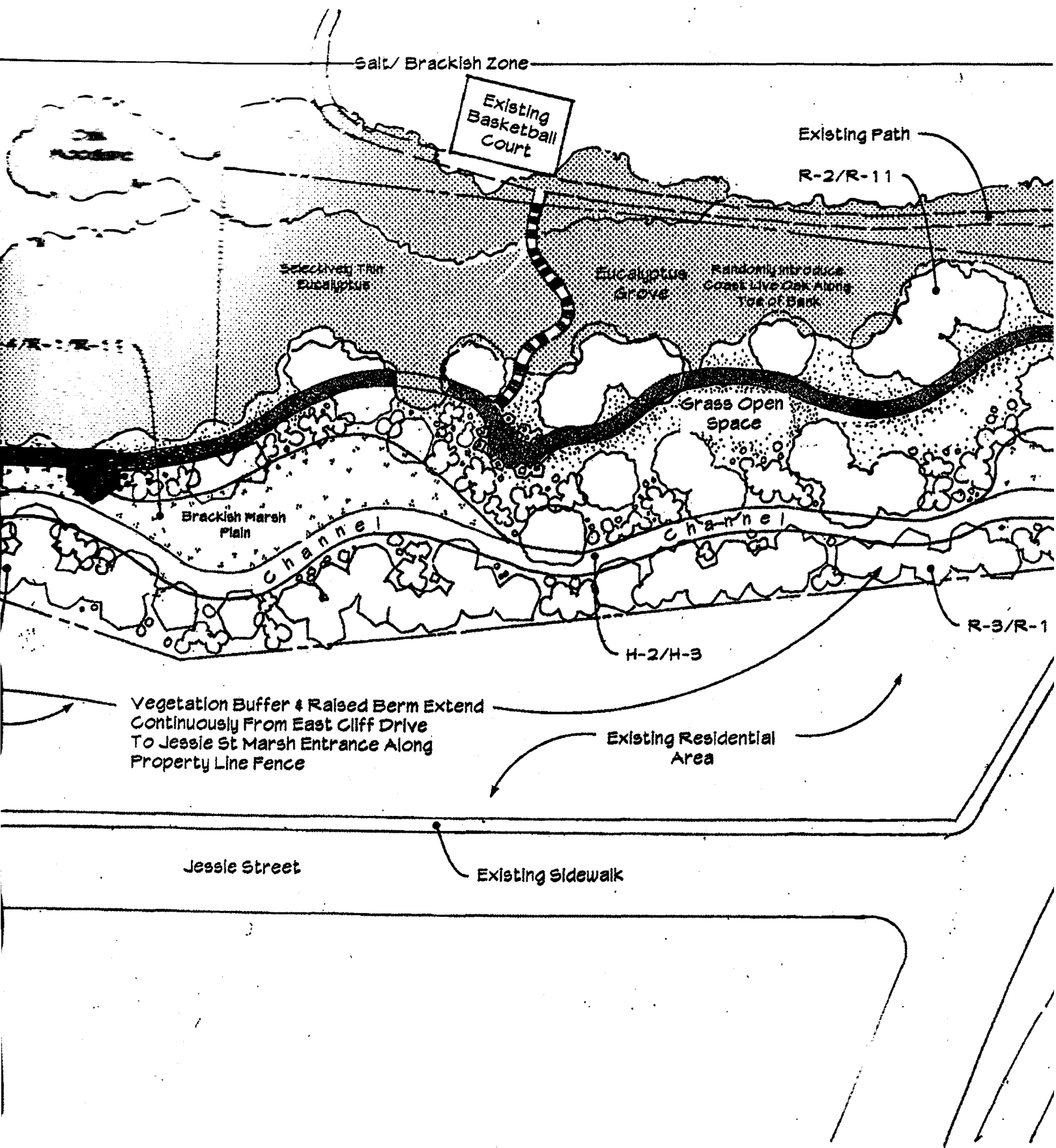
HABITAT RESTORATION & ENHANCEMENT ACTIONS

- R-1 Create New Salt/Brackish Water Marsh Habitat Between East Cliff Drive and Lemos Avenue
- R-2 Enhance Existing Eucalyptus Grove
- R-3 Create New Raised Berm and Vegetative Screening Near Residences
- R-4 Retain and Enhance Existing Freshwater Marsh Habitat
- R-5 Create New Freshwater Marsh Habitat
- R-6 Retain and Enhance Existing Riparian Habitat
- R-7 Create New Riparian Habitat
- R-8 Retain and Enhance Existing Oak Woodland
- R-9 Create New Oak Woodland
- R-10 Retain and Enhance Existing Saltgrass Grassland
- R-11 Remove/ Control Invasive, Non-native Plant Species

er

os Avenue





HABITAT MANAGEMENT PLAN

Jessie Street Marsh Management Plan

City Of Santa Cruz
September 1998

RRM Design Group
Habitat Restoration Group
Felton, CA
(831) 335-6800

Bellinger & Foster Landscape Architects
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Swanson Hydrology & Geomorphology
Santa Cruz, CA
(831) 427-0288

Biotic Resources Group
Santa Cruz, CA
(831) 476-4803

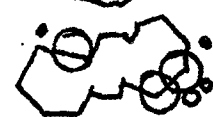
Legend:



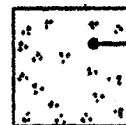
Existing Tree Canopy



Proposed Trees:
Coast Live Oak



Proposed Riparian Shrubs:
See Plant List



Proposed Brackish Marsh Plain (R-1) or
Freshwater Marsh (R-4) as Noted



Proposed Grassland



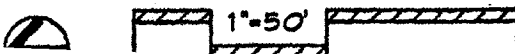
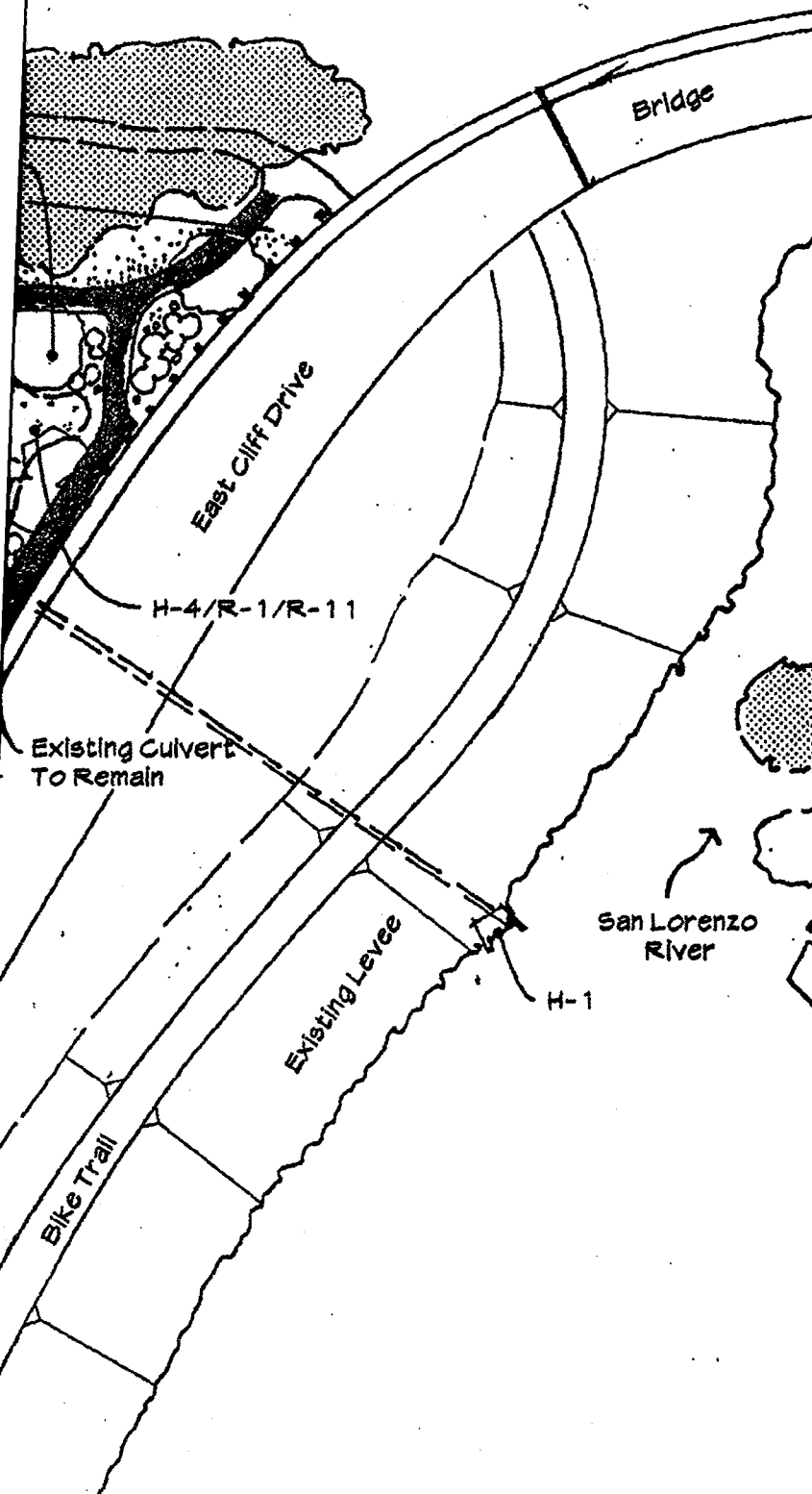
Path &
Boardwalk:
See Public Access Plan



Split Rail Fence:
See Public Access Plan



Boulders

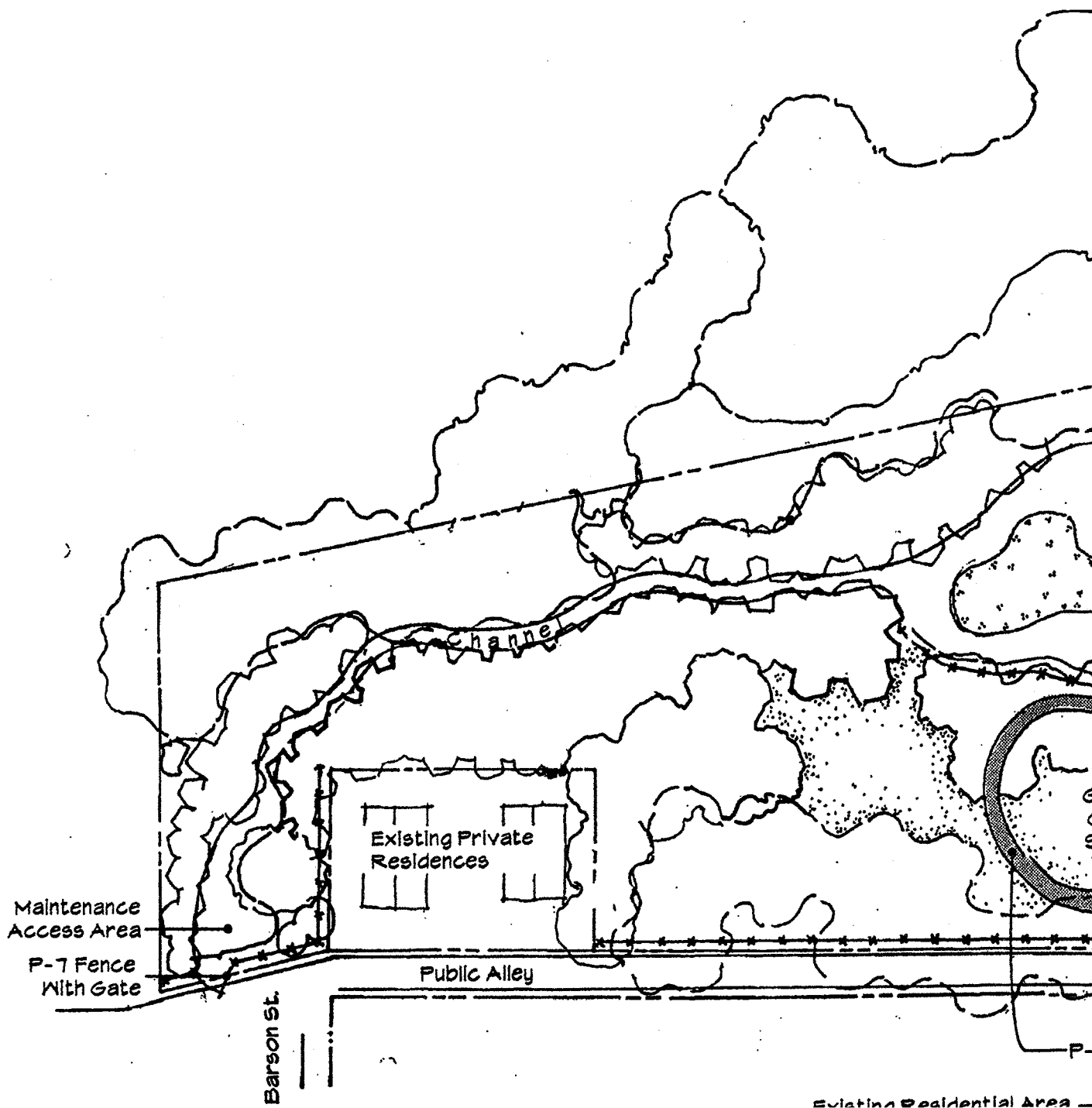


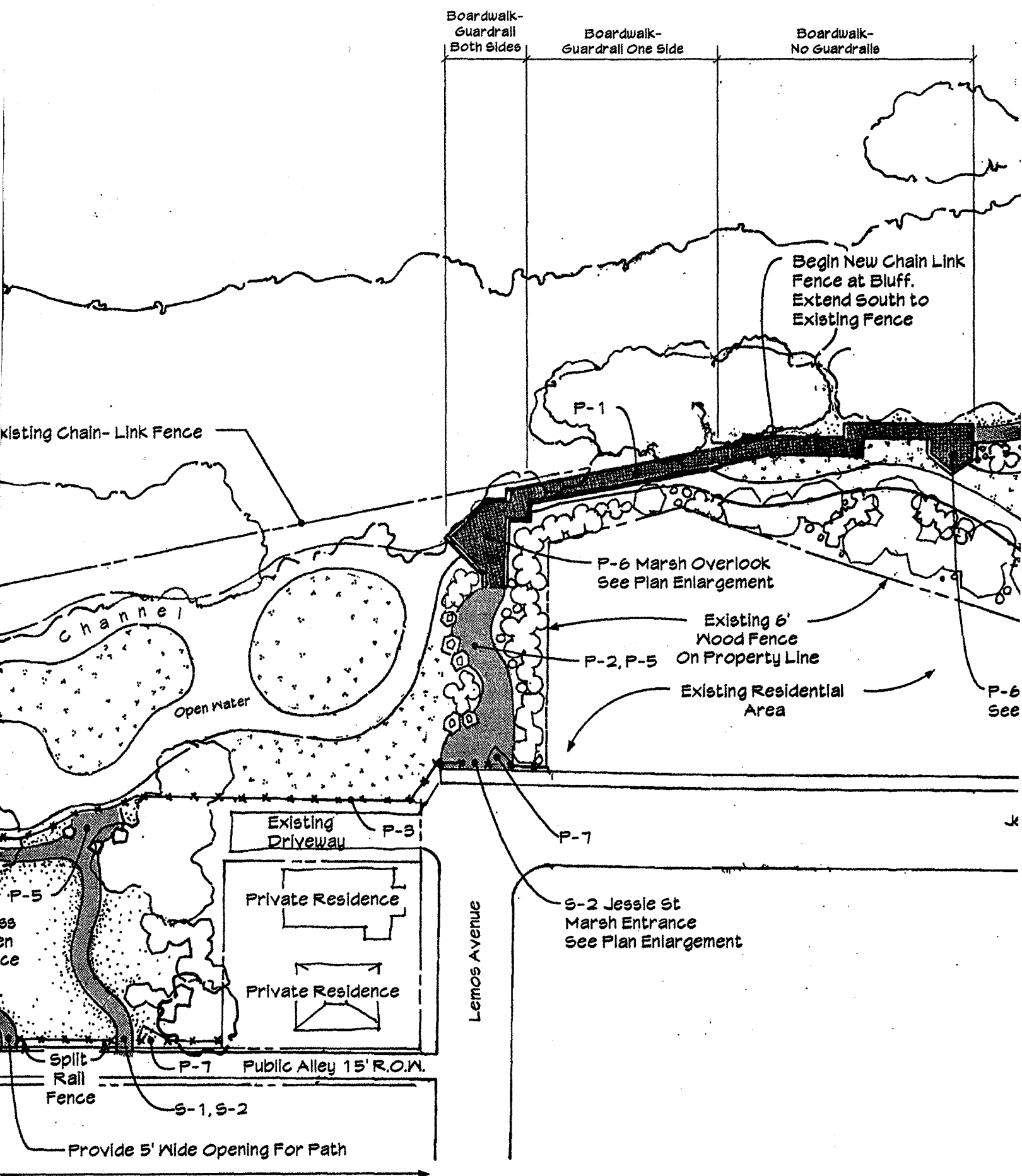
PUBLIC ACCESS ENHANCEMENT ACTIONS

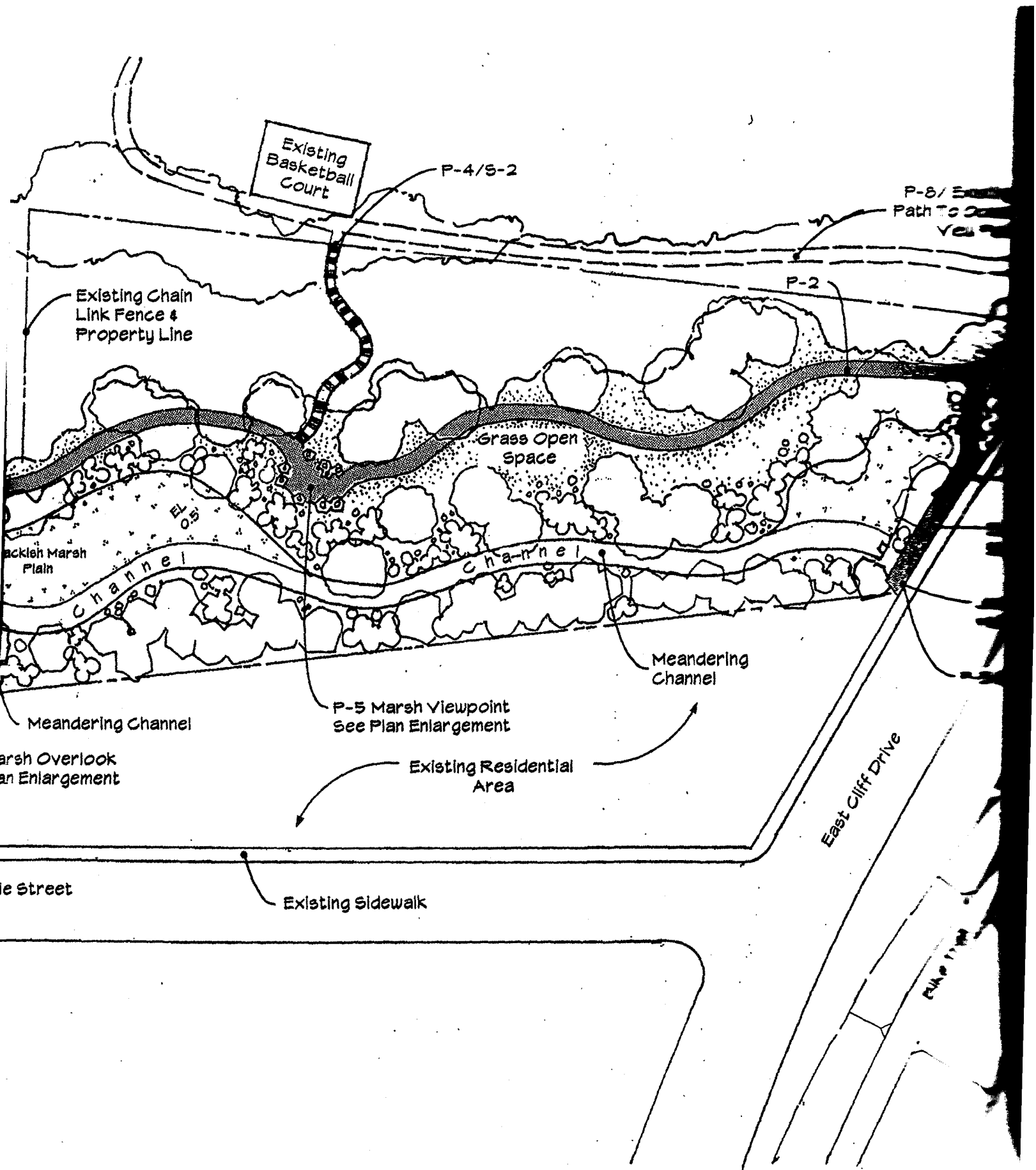
- P-1 Construct Raised Boardwalk
- P-2 Construct New Footpath-6' Wide
- P-3 Install New Perimeter Split-Rail Fencing
- P-4 Construct New 4' Wide Stairway & Path to Ocean View Park
- P-5 Path Viewpoint. Widen Path, Provide Boulders For Seating, & Interpretative Signage
- P-6 Construct Wood Deck Overlook-See Plan Enlargement
- P-7 Maintenance/Emergency Vehicle Access. Install 10' Wide Gate
- P-8 Repair Existing Path

PUBLIC ACCESS SIGNAGE

- S-1 "No Access To Ocean View Park"
- S-2 "Jessie Street Marsh Entrance"







PUBLIC ACCESS PLAN

Jessie Street Marsh Management Plan

City Of Santa Cruz
September 1998

RRM Design Group

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Swanson Hydrology & Geomorphology
Santa Cruz, CA
(831) 427-0288

Biotic Resources Group
Santa Cruz, CA
(831) 476-4803

Legend:

--- Project Boundary

* * * * * Split Rail Fence

▨ Path-Handicap Accessible

▤ Wood Boardwalk-
Handicap Accessible
Boardwalk Railing

Existing Tree Canopy

Proposed Vegetation:
See Habitat Management Plan



Boulders

