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# WILDER RANCH WETLAND RESTORATION PLAN

PREPARED FOR THE DEPARTMENT
OF PARKS AND RECREATION

MOSS LANDING
MARINE LABORATORIES

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**Wilder Ranch Wetland Restoration Plan**

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## 1. INTRODUCTION

Wilder Ranch State Park covers almost 5000 acres of coastal habitat and recreational area with about 900 acres in agriculture, some cattle grazing, and a unique Cultural Preserve (Figures 1 and 2). The ranch was purchased by the state in 1974 and was entered into the park system in 1976. Wilder Creek wetlands and coastal strand form the park's single Natural Preserve.

The approximately 110 acre restoration project area is located in the southeastern corner of the Park boundary (Figures 1 and 2). It includes Wilder beach, saltmarsh, adjacent grassland, the riparian zones along Wilder and Willow Creeks, and three agricultural fields: the fallow south field, west field, and east field (Figures 3 and 4).

Wilder beach encompasses about 19 acres of dunes and beach vegetation grading into the existing saltmarsh. The saltmarsh is bounded by Hillside Creek to the south, Wilder Creek to the northeast and the fallow south field to the west. The saltmarsh rises about 10 to 13 feet above sea level and includes approximately 15 acres. The grassland lies due north of the saltmarsh. It comprises the largest habitat type of the project area, 22 acres, and rises from about 10 to 70 feet above sea level. The riparian zones form long narrow corridors about 200 feet wide along Wilder and Willow Creeks from the railroad to Wilder beach for a total of more than 20 acres. The 13 acre fallow south field lies directly west of the saltmarsh, also bounded by Hillside and Wilder Creeks and at about 13 feet elevation. Northwest of the fallow field, the kidney shaped west field ascends to about 20 feet above sea level. Wilder and Hillside Creeks bound this parcel to the east and west, respectively, and the railroad tracks to the north. This active agricultural field is less than 10 acres and represents the smallest unit in the project area. The east field lies directly east of the west field encompassing approximately 11 acres and at 16 to 20 foot elevation.

Wilder Creek is a potential restoration model for a number of similar wetland systems along the coast of central California. These include the coastal wetlands within the park at Four Mile Beach and Three Mile Beach as well as Red, White and Blue Beach and other wetlands to the north and south (Figure 2).

This report describes the physical and biological environment in the Wilder Creek Marsh and adjacent upland habitats as a background for a Wetland Restoration Plan (Figures 3, 4, & 5). Although several restoration alternatives are presented, the preferred alternative is to restore the entire system to a natural state in several stages. The first stage, to eliminate exotic weeds and stimulate colonization of native wetland species, has been initiated by marine lab and park staff. The restoration process contains a major public education and volunteer effort which includes close cooperation with a unique program of sustainable agriculture.

## 2. ENVIRONMENTAL PLANS, POLICIES AND PERMITS

### 2.1 RELATION TO COASTAL PLANS

#### 2.1.1 Protection and Restoration

The management of coastal resources such as wetlands and sand dunes are addressed in local plans and coastal regulations resulting

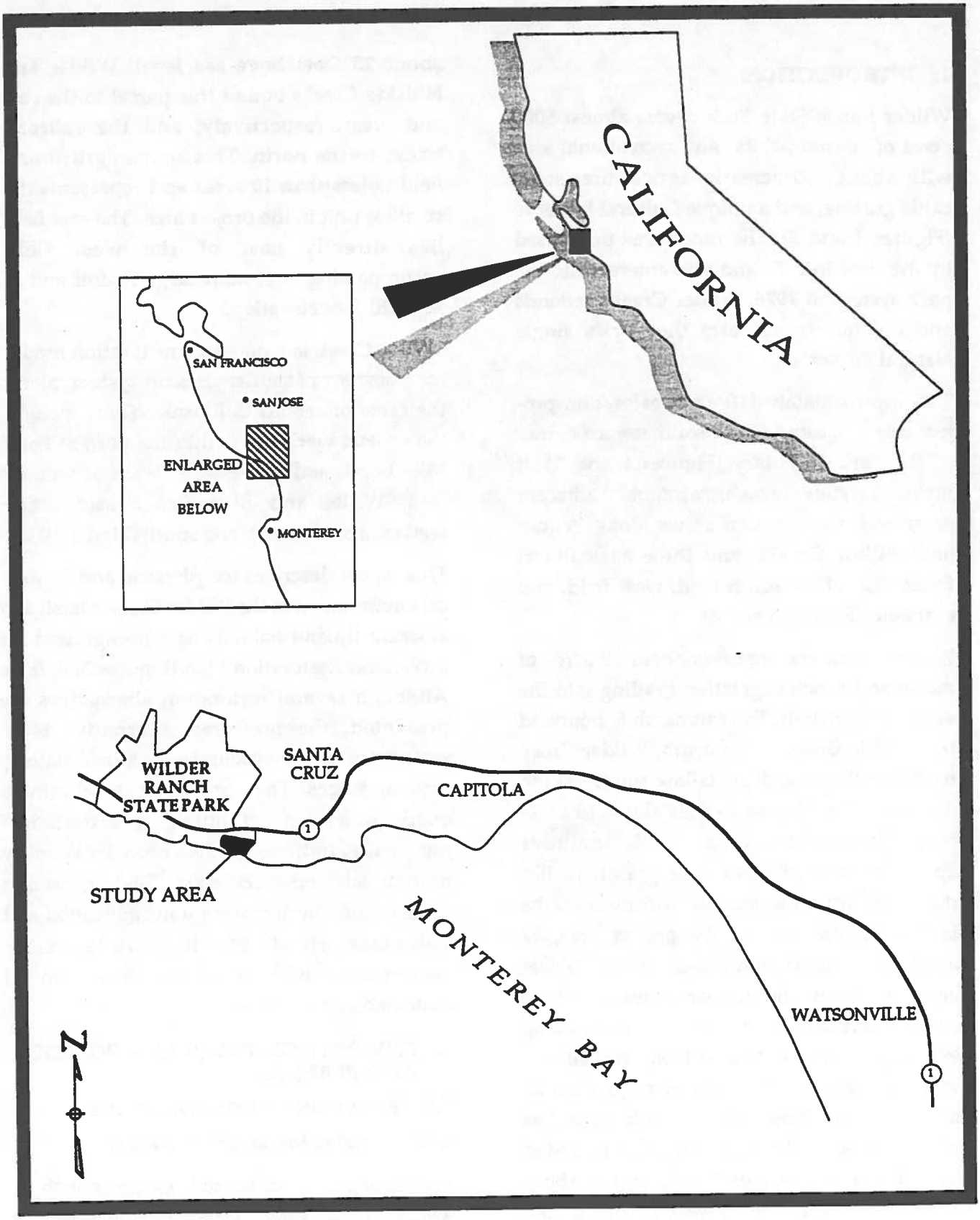



FIGURE 1. Regional location map of the study area.

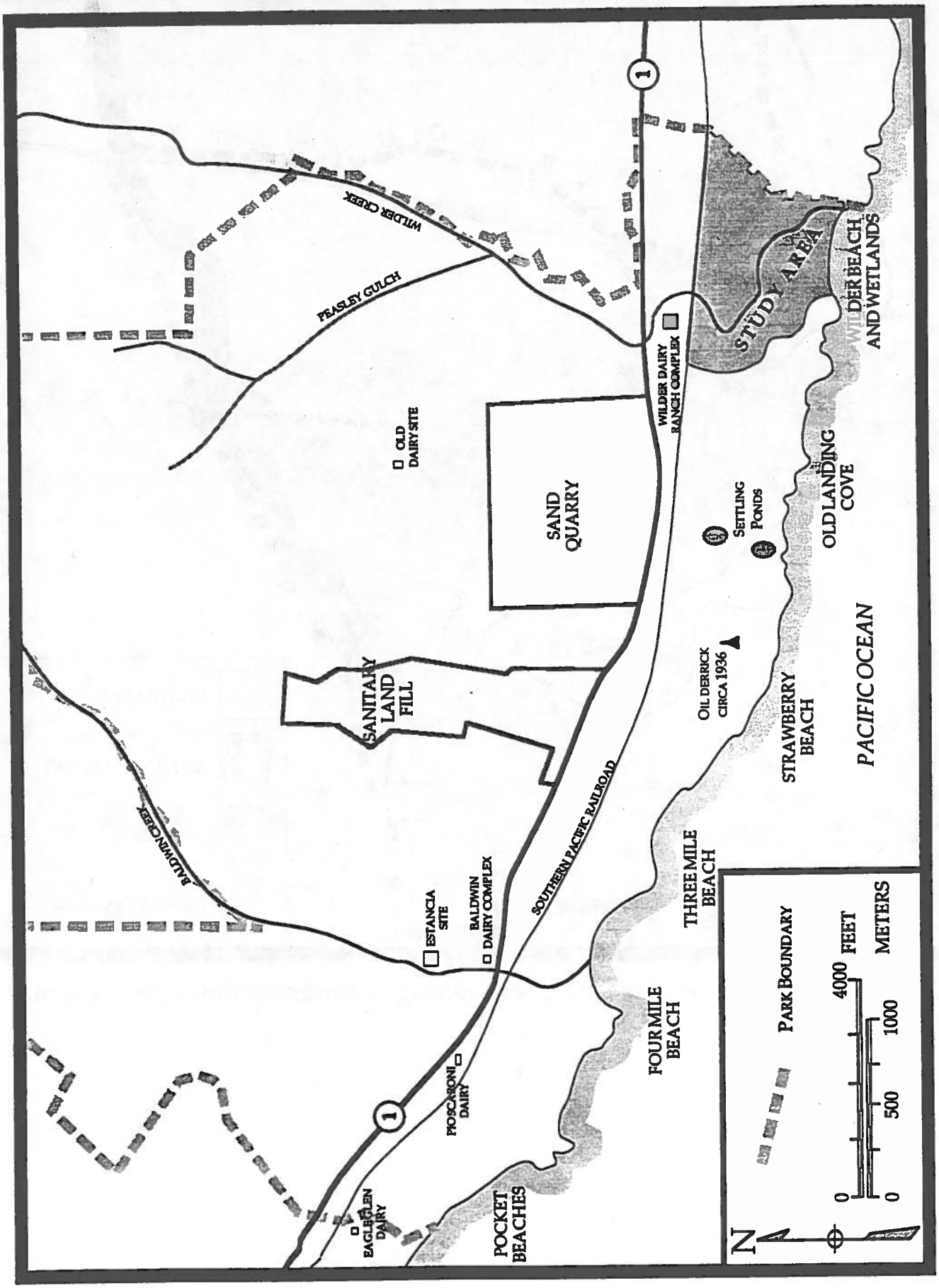



FIGURE 2. Wilder Ranch State Park and vicinity

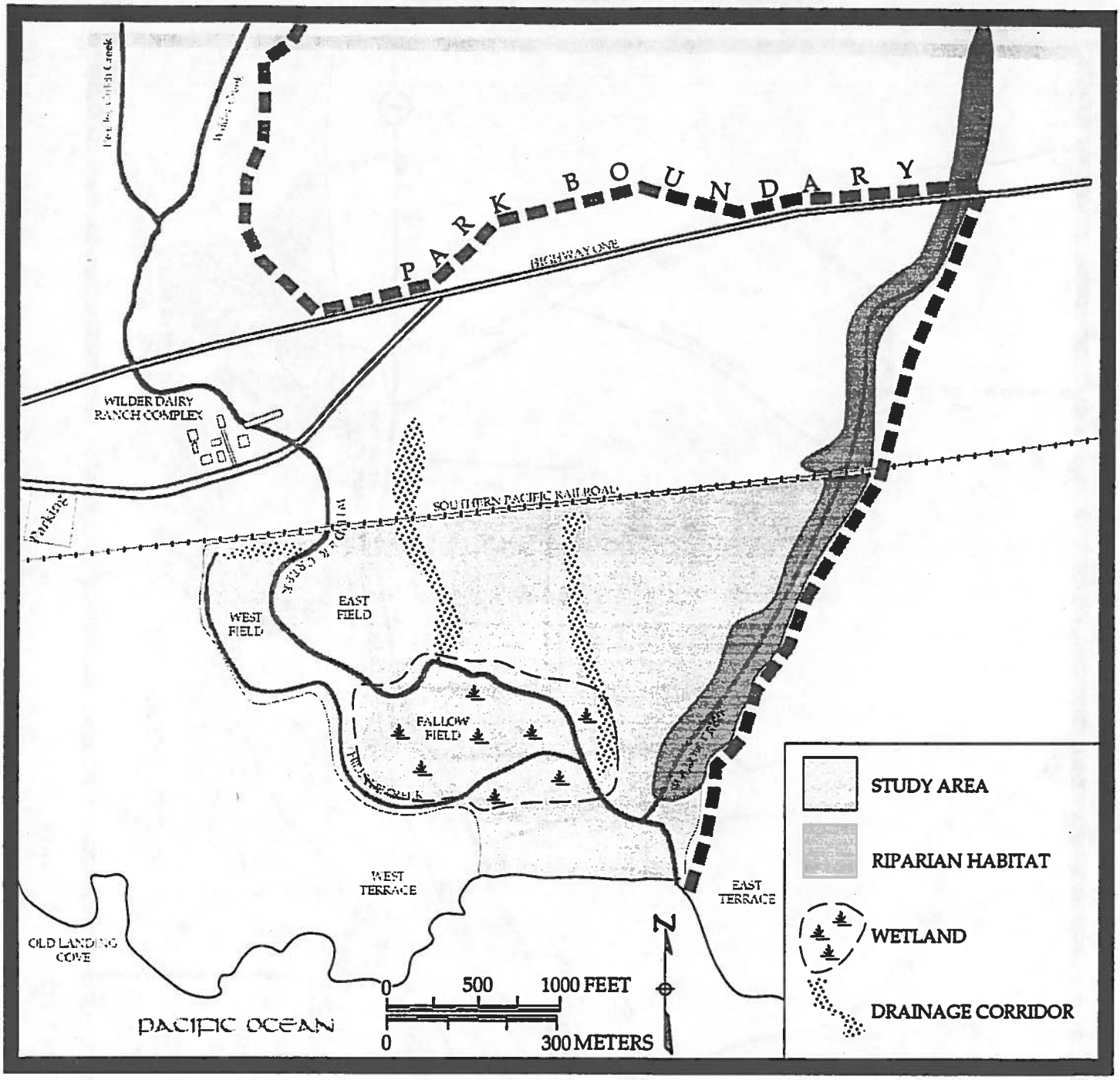



FIGURE 3: Watershed of Wilder Park Area showing two primary drainage creeks and three drainage corridors.


FIGURE 4: Oblique aerial photograph of Wilder Study Area. Wilder Beach, Pacific Ocean on far right, Santa Cruz Mountain foothills sloping to Highway One on the left. Approximate scale 1"= 1500ft.

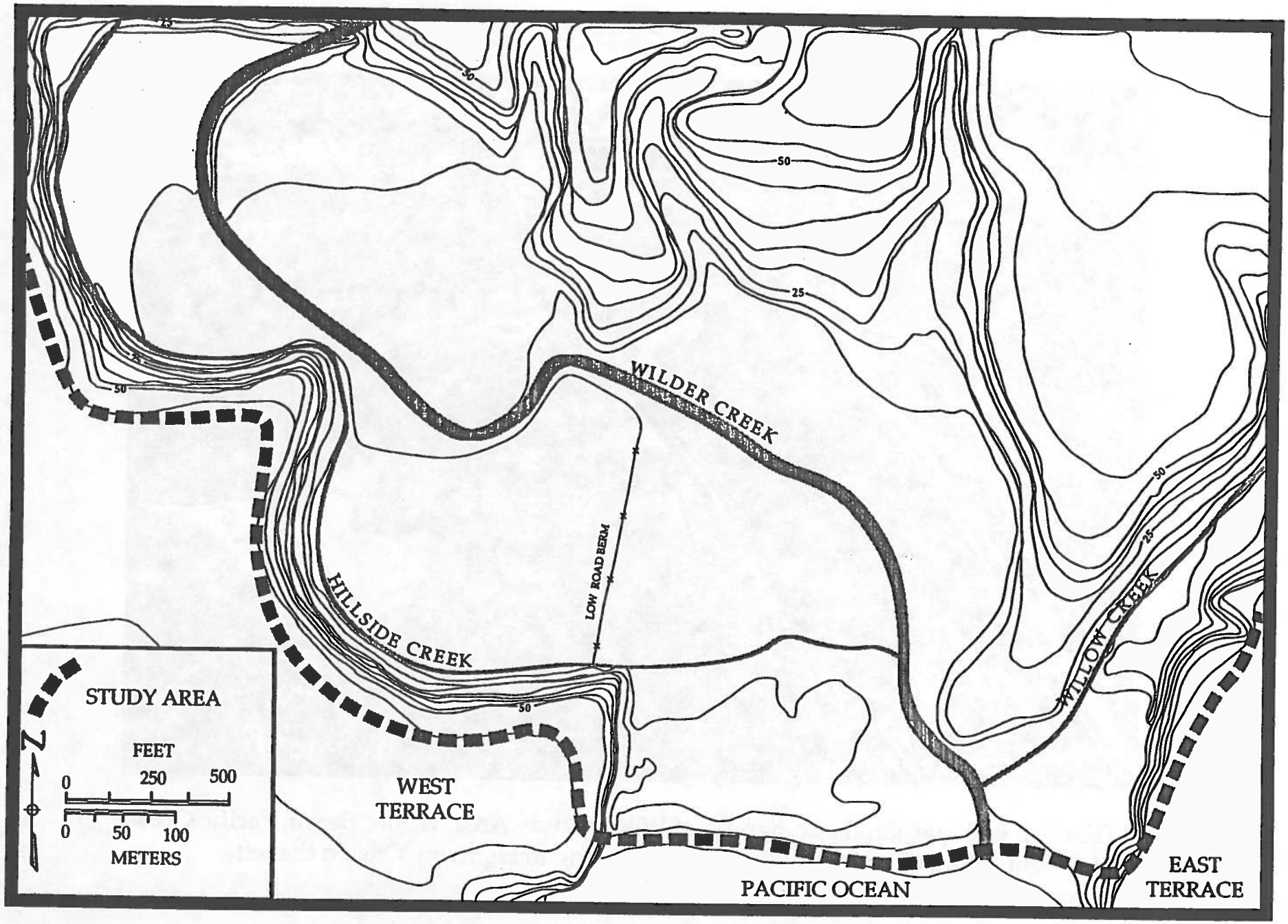



FIGURE 5: Topography of Wilder Study Area. Creeks are represented by shaded lines, contour elevations shown in five foot intervals.

from the Coastal Act of 1972. The Wilder Ranch Wetland Restoration Plan is cited as a State Public Works Plan under permitting jurisdiction of the California Coastal Commission. Coastal planning gives coastal wetland and sand dune preservation, protection, and enhancement the highest priority. The County of Santa Cruz Local Coastal Program Land Use Plan (1988) states: "Environmentally sensitive habitat areas shall be protected against any significant disruption of habitat values... Special protection shall be given to areas and species of special biological ...significance." Wilder Wetland and Beach are included in the land use plan definitions of such habitat. The plan defines sensitive habitat: "e. The habitat of rare, endangered and threatened species as designated by the State Fish and Game Commission or the U.S. Department of Interior Fish and Wildlife Service... and California Native Plant Society.... g. shorebird roosting, resting and nesting areas. h. Dune plant habitats. i. All lakes, wetlands, estuaries, lagoons, streams and rivers. j. Riparian corridors." The land use plan encourages restoration and enhancement of sensitive habitats such as those at Wilder Beach and Wetland and states: "Marine resources shall be maintained, enhanced, and where feasible restored."

### 2.1.2 Watershed and Water Quality

There are provisions in the land use plan for specific protection and restoration of watersheds such as Wilder Creek, including the following policies: "The biological productivity and quality of coastal waters, streams, estuaries ...shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment, controlling runoff, preventing depletion of groundwater supplies and substantial interference with surface water flow, encouraging waste water reclamation, maintaining natural vegetation buffer areas that protect riparian habitats, and minimizing alteration of natural streams." The plan goes further and specifically identifies Wilder Creek above Highway One as "a least disturbed watershed" that shall be maintained. The amount of stream flow is also discussed in the plan and it directs: "Develop more detailed information on stream flow characteristics, water use and habitat needs. Use this information to formulate a more detailed strategy for maintenance and enhancement of stream flows on critical water supply streams."

The Resource Section of the Santa Cruz County Planning Department has produced a "Stream Care Guide" (no date) which sets the immediate county goals of stream care as "minimize erosion or contamination from property adjacent to streams, preserve the stream and the riparian zone bordering it in as natural a state as possible, and repair disturbed sites by stabilizing the stream bank and restoring vegetation.".

### 2.1.3 Agriculture

The local coastal land use plan provides for the preservation of agricultural lands, and discusses minimizing any use conflicts with agriculture. The plan states: "The maximum amount of prime agricultural land shall be maintained in agricultural production to assure protection of the area's agricultural economy. ... All other lands suitable for agriculture shall not be converted to non-agricultural uses unless (1) continued or renewed agricultural use is not

feasible, or such conversion would preserve prime agricultural land ...".

The plan identifies sensitive habitat areas such as Wilder Beach and Wetland that may be in conflict with agriculture and defines buffers between these land uses, "Wetlands, Estuaries and Lagoons... Require minimum setback for agriculture (nature buffer strip of 100 feet).". In addition, the plan directs that sensitive habitat has priority over the use of chemicals, "Prohibit the use of insecticides, herbicides, or any toxic chemical substance in sensitive habitats... when the habitat itself is threatened...". Habitats are also protected from any erosion as a result of agricultural practices: "Identify existing erosion problems... and prepare and implement an erosion control plan...".

The land use plan includes specific policy and programs directed at agriculture in State Parks as follows: Retain the maximum amount of prime agricultural land in agricultural production within each state park unit. Require a site-specific justification for removing agricultural lands from production or for not offering lands capable of farm production for lease. ... Request State parks and recreation department ... develop and apply a program of integrated pest management and experimental agriculture techniques on lands used for agriculture in State Parks as a means of enhancing the compatibility of agriculture with recreation in the state parks."

### 2.1.4 Public Access

Wilder Beach and Wetland is <u>not</u> listed as a site of "primary public access" by the local coastal program land use plan. The LCP is in the process of revision and other primary access sites may be added: Wilder Beach and Wetland should not be included in these new sites. The current local coastal land use plan specifically identifies Wilder Beach as a sensitive shorebird nesting habitat and sets policy which restricts public access: "Discourage all activities within 100 feet of nesting sites during nesting season. Prohibit dogs from beaches having nesting sites. ... Maintain low intensity use, such as nature observation and educational instruction.". The plan recognizes that sensitive habitat such as Wilder Beach and Wetland needs protection from public access impacts:" Wetlands, Estuaries, and Lagoons ... Restrict general public access. Require minimum setback of 100 feet ... "Buffers are measured from the high water mark".

Trail access to Wilder Beach and Wetland is recommended to be on the bluff since there is potential impact on fragile wetland habitat below.

## 2.2 RELATION TO GENERAL PLAN

The Wilder Ranch State Park General Plan (1980) sets the policies and direction of the park's operation. The general plan is consistent with coastal regulations and policy, state regulations and policy, and federal regulations.

### 2.2.1 Habitat

The general plan recognizes Wilder Beach and Wetland as critical, sensitive habitat which needs protection and enhancement; and designates Wilder Beach and Wetland as a "Natural Preserve" in order to provide another layer of protection (Figure 4). The plan states: "The primary objective in the management of the Natural Preserve shall be to protect and perpetuate its natural resource values. General beach recreation activities such as sunbathing, picnicking, surfing, and the like, shall be prohibited in the preserve in order to protect

fragile coastal strand vegetation and other habitat values. Visitor use of the preserve shall be restricted to authorized conducted tours. Appropriate measures, such as complete closure, shall be taken if impacts due to visitor use become apparent. That portion of the preserve used by snowy plovers for nesting shall be closed to the general public during the breeding season... it may be more practical to close the entire preserve during this period.".

### 2.2.2 Restoration

The general plan is supportive of restoration efforts in the Wilder Beach and Wetland preserve, and policy requires that this study and report be completed. The general plan policies include: "Wherever possible the department shall restore altered wildlife habitats as nearly as possible to conditions they would be in today had natural ecological processes not been disturbed." and "A feasibility study shall be made to determine the potential for returning all or a portion of the 10 acre cultivated field adjacent to .. natural wetlands habitat. ... the department shall endeavor to rehabilitate the [Wilder Beach and Wetland] area to its original wetlands state and maintain it as a part of the... Natural Preserve...". The plan also supports the removal of exotic species in restoration efforts, "Aggressive exotic plants... shall be removed...". The plan specifically addresses riparian corridor restoration of Wilder Creek as follows: "The existing zone of riparian or natural growth along Wilder Creek below the Wilder Ranch complex shall be widened to at least 15 meters (50 feet) on each side of the creek by realignment of the existing agricultural access road. This will require the loss of some agricultural production but will increase important wildlife values.". In the proposed facilities section the plan indicates improvements to the natural preserve may include change in water flow and drainage, re-establishment of native plant material, and buffers to agriculture as needed.

### 2.2.3 Agriculture

The majority of the agricultural policies are given in the Agriculture section (Section 3.2.1). Other pertinent policies from the general plan are as follows:

Destructive or unnatural erosion shall be controlled and prevented by means that are in harmony with the purpose of the park.

Pesticide use shall be directed by the policies in the department's pesticide manual. In general these policies require that chemical pesticides not be used until other possible methods are explored and found to be inadequate for control of the pests involved. These policies emphasize the use of biological control or integrated pest management approaches.

In determining the acceptability of any pesticide on agricultural lands within or adjacent to the park, the department shall give primary consideration to the health and safety of park visitors. Of secondary concern shall be the protection of important natural ecosystems. Agricultural productivity must be subordinate to these two concerns.

Pesticides that are determined not to be potentially hazardous to park visitors but which would significantly degrade important natural ecosystems within the park shall be prohibited.

Increased cost shall not necessarily be a factor in determining the feasibility of the alternatives. On State owned lands it may be possible to adjust the fee schedule on agricultural leases

to compensate leases for impact on operating expense and production.

It is the policy of the department to perpetuate the visual qualities of the agricultural scene by maintaining and interpreting row crop agriculture on lands designated for such use. Reductions of acreage in row crop agriculture may be made to protect ...natural resources.... No additional lands shall be used for agricultural purposes without specific approval of the department.

Reductions in agricultural lands will only be considered for the purpose of mitigating conflicts in the implementation of... objectives for resource protection. ... Such reduction will occur... within the natural preserve [Wilder Beach and Wetland] and other riparian areas for the purpose of habitat enhancement.

The operations element of the general plan identifies water quality as an issue that needs to be addressed: Several lands... pose potential hazards to the quality of natural ecosystems within the park. The potential exists for degradation of the lower creek reaches, estuaries, and shoreline through the use of pesticides associated with row crop farming past and present.... Many pesticides commonly used... are known to be extremely toxic to fish. Whether pesticide residues are reaching the creeks or associated wetlands in deleterious amounts is not known.

The public access policies of the LCP are also discussed in Public Access (Section 4.2.6).

## 3. ENVIRONMENTAL SETTING

### 3.1 HISTORICAL CONDITIONS

#### 3.1.1 Natural History

The general terrain of Wilder State Park includes several marine terraces which are cut by three major drainages. One of these is Wilder Creek. Wilder Creek Marsh is a broad flood plain eroded into the lowest marine terrace (Figures 2-5). The low marsh is surrounded by steep cliffs formed of Santa Cruz mudstone. The cliff tops are 60 to 70 feet above sea level. Ongoing natural processes include downcutting in the stream valley and sedimentation in the marsh. Although there are no major faults in the area, Led Engelsman has observed evidence of minor faulting on the ranch including crack features at Old Landing Cove, Wilder Beach and near Highway One.

The marsh system includes the creek, alluvium or marsh flat, and the beach barrier. The creek erodes through the beach most years and has flowed all year long in several past years. Generally, the creek mouth is closed as the beach barrier expands during the spring. Offshore sand is transported shoreward building the summer beach.

Surface marsh sediments were cored in June 1991 from five locations to examine the recent development of the marsh habitats and communities (Figures 6 and 7). Intact cores were only taken from the existing salt marsh behind the sand dunes (Figure 6). Trenches were also excavated three feet into the fallow field and east field revealing a fairly homogeneous agricultural deposit with no distinct wetland strata. These fields have been extensively and frequently plowed and used for agriculture in past decades, usually for crucifer crops. Therefore, any surface wetland deposits are likely to be destroyed. No deeper coring or trenching was done because our major interest was to document recent marsh development as

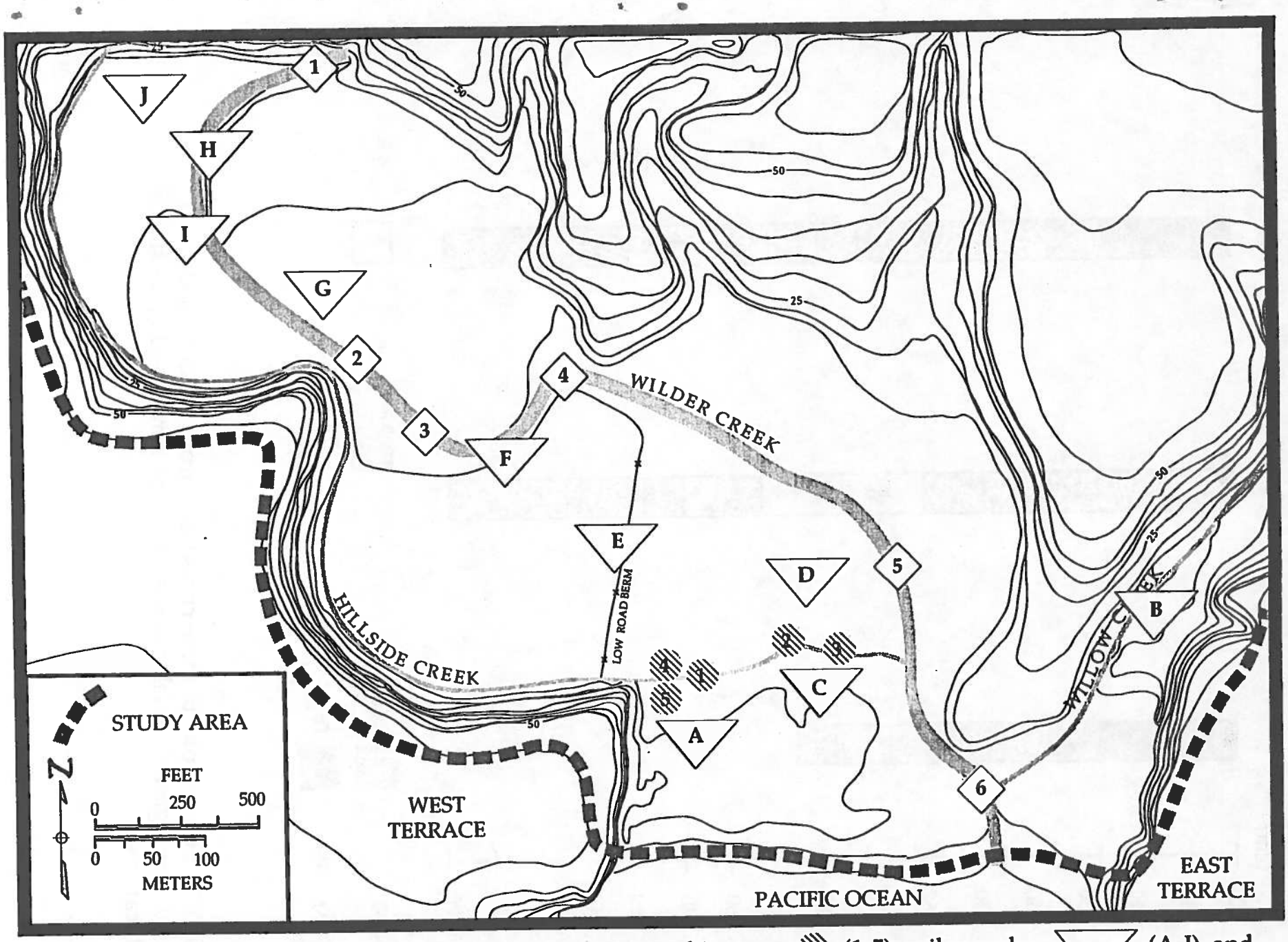



FIGURE 6: Wilder Study Area: Sample stations for stratigraphic cores (1-5), soil samples (A-J), and hydrological measurements (1-6).

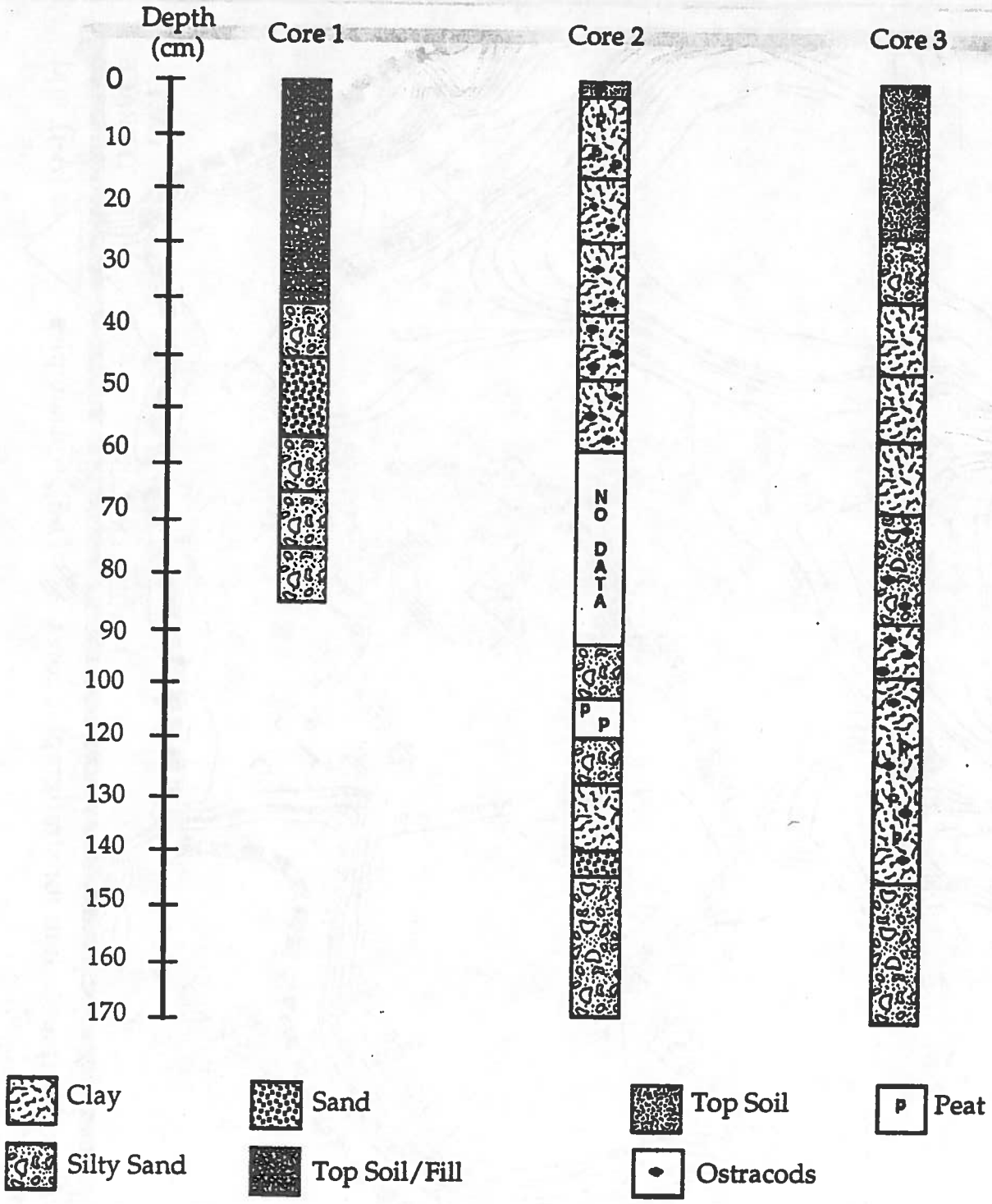



FIGURE 7: Stratigraphy of three cores taken from Wilder Creek wetland. Youngest material is at the top of the core. See Figure six for core locations.

a model for restoration. Cores were also made deep enough to invade a distinct sand strata without marsh vegetation.

Cores were taken by hand auger capable of extracting cores in one meter sections as deep as several meters depending on soil compaction. The deepest cores were nearly two meters long and ended in a hard packed sand which prevented further coring. Core diameter was 3 cm. Each core was divided into 5 cm sections and stored in plastic bags for later laboratory examination. Sediment was separated into coarse and fine fractions with a 63 micron screen. Sediments less than 63 microns are silts and clays. The coarse fraction was examined for plant roots, larger fossils, and general mineralogy. The fine fraction was examined for microfossils, foraminiferans (protozoans) and ostracods (crustaceans).

Cores from sites 4 and 5 contained a thin cover of marsh plants rooted into a highly modified deposit of top soil or fill from the fallow field and underlying sand, probably from the dune. The surface of these cores was similar to core #1 (Figure 7). All three of these sites were undoubtedly influenced by past agricultural activities in the wetland. The fallow field was probably expanded during relatively dry years in the past and some fill material may have been dumped on the bordering road.

Core sites 2 and 3 (Figure 7) were in the most central area of the existing salt marsh. These cores show peat layers interspersed with fine sediments for at least 1 1/2 meters. Both cores ended in a sandy sediment with no wetland indicators present. The peat deposits were too close to the surface or too sparse for radio carbon dating and no large shells were located for this dating either. In the Elkhorn Slough, radio carbon dating of a wide variety of marine, brackish, and freshwater deposits indicate a recent sedimentation rate of 1 mm per year or about one meter per 1000 years (Schwartz et al. 1986, Hornberger 1991). The rate of sedimentation appears to be twice as high in the Pescadero Marsh, where peats were dated to be around 1000 years old from a depth of 2 meters giving a sedimentation rate of 2 mm/year (Williams 1990). The 1.5 meter section of Wilder Creek marsh is probably not older than 1500 years (based on Elkhorn Slough), and is more likely less than 1000 years old, perhaps 700-800 years of age (based on nearby Pescadero Marsh).

Ostracod (small marine crustaceans) fragments were found here and there in the top one meter or so of each core. These animals live in brackish water marsh habitats. The history of human observations of the marsh indicate frequent invasion of the marsh by salt water entering the system through the mouth even during our study: sea water was known to top the dunes with waves breaking at the edge of the east field in the past (see section on Hydrology).

The earliest map of the Wilder Wetland and surrounding area was made by the U.S. Coast and Geodetic Survey in 1853 (Figure 8). It shows the location of Wilder Creek and the cover of lower marsh as well as the riparian corridors. The general landscape patterns were similar to conditions today, except for the construction of the railway and the conversion of land to agriculture and grazing.

There is little additional information on the natural history of the Wilder Creek Marsh prior to human presence. The earliest information here comes from Indian middens

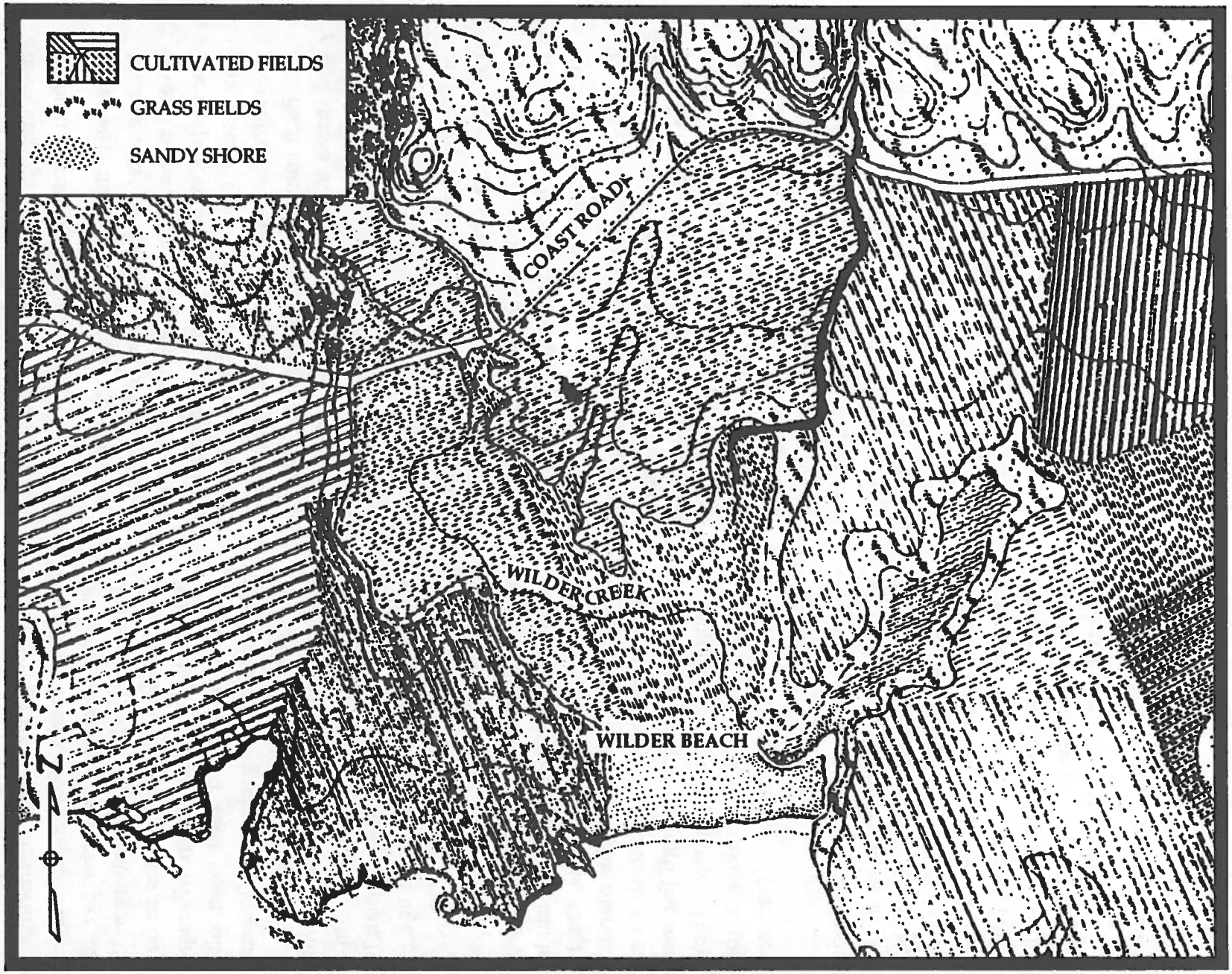



FIGURE 8: 1853 Coast and Geodetic Survey Map showing areas of sand, grass, and cultivation which existed within the present study area. This image was taken from Chart T-444, Map of Santa Cruz Harbor and Vicinity, California, U.S. Coast Survey, 1853. Scale: 1/10,000.

around the marsh and throughout the coastal region (see next section).

### 3.1.2 Human Activities

#### 3.1.2.1 Costanoan Period

The first native Indians migrated into the Monterey Bay area at least 8,000 years ago and there is evidence of Costanoan presence at Wilder Ranch as much as 3,500 years ago. The earliest known midden dates from approximately 1200 A.D. (Harriton, 1976). The Costanoans lived adjacent to and utilized Wilder Beach and wetland. The Wilder Dairy Ranch Complex apparently was a permanent Indian encampment with temporary camps set up on the terraces on either side of the wetland. The temporary camps provided excellent views of the wetland and beach. From Indian middens found around the dairy complex and the terrace west of the wetland, artifacts suggest the wetland and beach were utilized for a number of resources including fish, shellfish, waterfowl and some marine mammals (Dallas, pers. comm.). At the upper reaches of the wetland a Costanoan female's remains were found complete with a periwinkle necklace (Engelsman, pers. comm.). Although there may have been substantial harvesting and exploitation of wetland and beach species, Indians probably had little long term impact on the structure of marine or wetland communities since replacement of these species from large coastal populations is likely (Gordon, 1987, ABA Consultants 1989).

The landscape around the wetland was probably impacted by Costanoans for thousands of years. They intentionally and extensively burned native vegetation to obtain food (Gordon, 1987). The burning also cleared land of heavy brush and trees favoring the development of certain food and facilitating travel. Local evidence of the burning comes from the Portola expedition in 1769 which descended four deep watercourses between Santa Cruz and Año Nuevo (including Wilder and Baldwin Creeks) and reported the presence of trees only in the water coarses and burned grass everywhere else. Grasslands of the Costanoan period were probably a bunchgrass association including perennials such as nodding stipa and needle grass (Harriton, 1976).

European occupation caused a relatively rapid decline of the Costanoan population. A few Costanoans were known to survive near Wilder Ranch as late as the 1890's still practicing some traditional life style. "The following note, written in 1914, refers to a large shell mound about five miles upcoast from Santa Cruz: 'Old timers tell me that the Indians used to come from the hills to this place, gather and cook shellfish, and throw the shells on the heap'." (Gordon, 1987).

#### 3.1.2.2 Spanish and Mexican Period (1791–1849)

The first European contact was a brief visit by explorer Captain Gasper de Portola of Spain in 1769. The Spanish returned in 1791 and established a mission at Santa Cruz. At this time the Wilder Ranch area was first grazed by cattle as an "Estancia" (station) for the Rancho Arroyo de Matadero, located on Baldwin Creek. The rancho appears to have served as the slaughtering grounds for the mission's annual fall kill of cattle. Cattle ranching continued for over 80 years.

The practice of burning was discontinued with Spanish and Mexican settlement to allow more grazing land for cattle. Settlers discouraged Costanoans from setting fires. In addition, the

settlers introduced (intentionally and unintentionally) numerous grasses for their grazing value and wildflowers which soon dominated the landscape around the wetland. Introduced grasses of this period include foxtail and wild oat, and introduced flowers include mustard and wild radish (still common today) (Harriton, 1976).

The Wilder Ranch was part of a 12,000 acre Mexican land grant called Rancho Refugio bordered on the east by Moore Creek, the west by Laguna Creek, the south by the Pacific Ocean, and the north by Rancho Canada del Rincon (Plat of the Rancho Refugio U.S. Surveyor General, 1859). Rancho Refugio was granted to three grand daughters of Joaquin Isidro Castro of the 1776 de Anza expedition: Maria de los Angeles, Canada, and Jacinta. Jacinta, being a nun, relinquished her claim. From 1839 to 1841, Maria and her husband Joseph L. Majors managed the cattle ranch and even fought a battle with the Costanoans for the possession of the ranch in which Maria lost her life. In 1841, the grant went to Canada and subsequently to her husband Antonio Bolcoff (American courts later determined Bolcoff had erased her name from the grant and added his own [Koch, 1973]). Joseph Majors attempted to claim his wife's portion but was rejected (Fulcher, 1970).

The Bolcoff family lived in an adobe located near the more recent Wilder Dairy on the Refugio and continued grazing cattle. There is some question whether the adobe was built in 1841 or previously in 1781. A later adobe was built but did not last. After Bolcoff's death, Majors was granted the western third of the rancho that had belonged to his wife and started a cheese dairy. The remainder passed from Bolcoff's heirs to Moses Meder (older maps identify what we now call Wilder Creek as Meder Creek) and later through several other owners. Other portions of the 8000 acres were sold and developed by surrounding ranchos, including Davis and Cowell who operated liming industries.

#### 3.1.2.3 American Period (1850 to Present)

In 1850 California gained statehood and was further settled by people of European decent. The area around Wilder Creek continued to be pasture for beef cattle until 1871. The area is unique in this respect, because most of the surrounding area was converted to agriculture with the advent of irrigation and drainage in the 1850s (Harriton, 1976). American immigration in the region brought the introduction of now common weeds such as poison hemlock, sweet fennel, and Bermuda grass (Harriton, 1976; Gordon, 1987).

The Wilder Era began in 1871 and continued until the 1960's (Figure 9). Deloss D. Wilder and Levi K. Baldwin purchased the remaining 4030 acres of Rancho Refugio in 1871 and changed the land use surrounding the wetland and beach from grazing cattle to agriculture and dairy farming. Initially they leased land for two dairies and started a dairy of their own. The lease to H.M. Terry established the first dairy on Wilder Creek with Terry running 230 to 300 cows around 1877 (Harrison, 1892). The door of the Bolcoff adobe is stenciled with H.M. Terry Dairy. A second lease went to C.W. Finch who ran 120 cows.

Using money generated by the leases Wilder and Baldwin began their own dairy operation running over 500 head of cows and cattle from 1871 to 1885. In the year 1885 they dis-

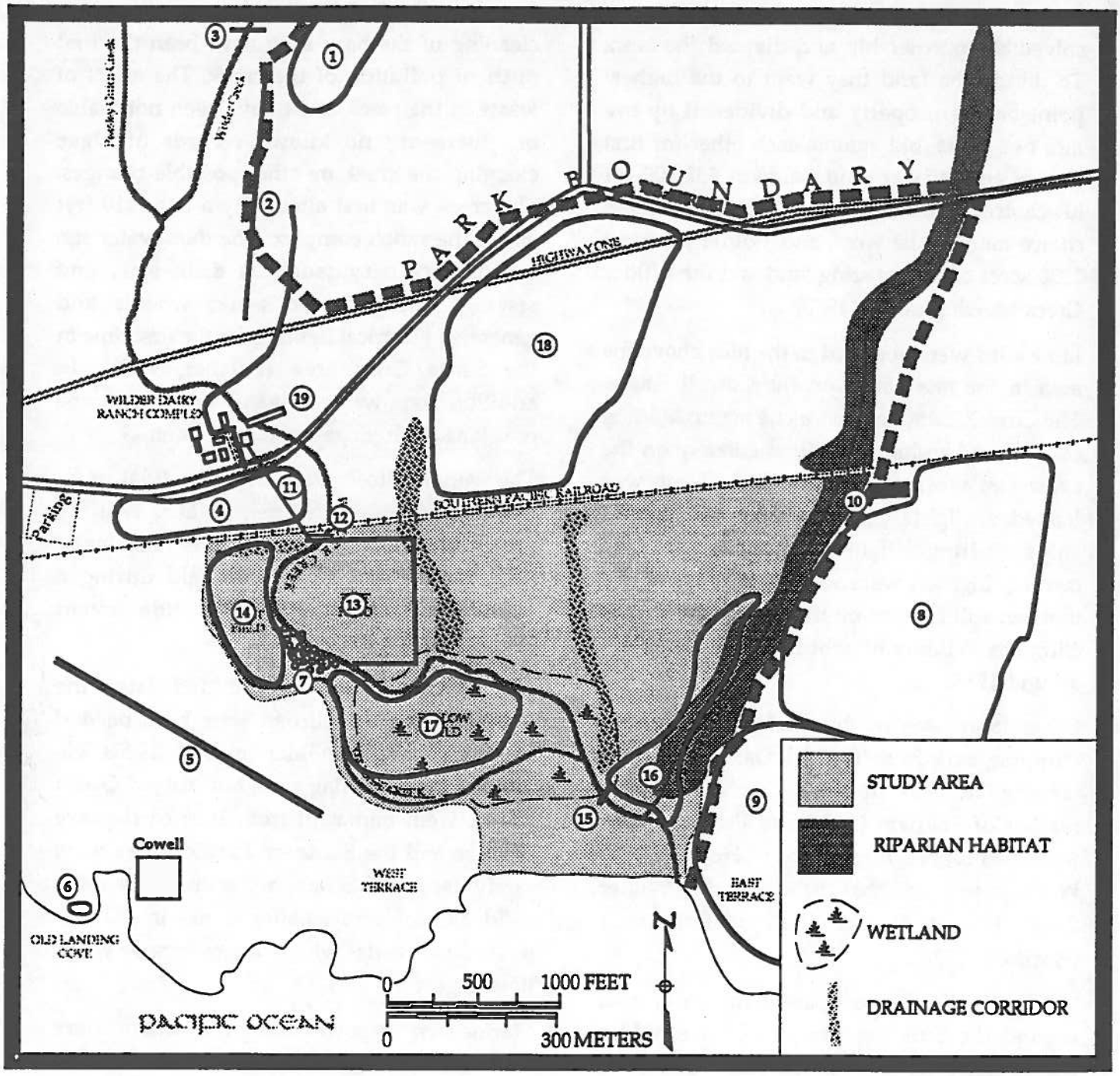



FIGURE 9: Structures and activities from recent history (1890-1940) in Wilder Study Area.

1. Redwoods preserved by Wilders.
2. Irrigation canal.
3. Dam (circa 1890).
4. Field growing corn and pumpkins for cattle and hogs.
5. Airstrip (circa 1925).
6. Former natural bridge site.
7. Willows which extended from creek into the flat.
8. Younger property in artichoke production (by Rinaldi's).
9. Younger property in pasture.
10. Reservoir on Younger property, filled by pumping water from Wilder Creek.
11. Lead pipe for pumping skimmed milk from dairy to hog house for making slop.
12. Hog house.
13. Hog pasture.
14. Day pasture for hogs.
15. Weir on creek.
16. Pasture.
17. East field.
18. Hay field.
19. Cow Barn

solved the partnership and divided the land. To divide the land they went to the highest point on the property and divided it by eye into two parts, bid against each other for first choice, and Wilder paid Baldwin $32,000 for his choice. Baldwin received 1700 acres of less choice land to the west, and Wilder received 2330 acres of rich grazing land and the Wilder Creek Marsh (Fulcher, 1970).

Lime kilns were operated in the hills above the area in the late 1800's on the Cowell Estate. The Cowell Estate owned a one acre inholding called Old Landing Cove immediately on the coast just west of Wilder Beach. Lime was loaded on lighters at the cove and taken to ships waiting offshore (Engelsman, pers. comm.). Lighters were anchored to metal rings that can still be seen on the bench cut into the cliff. The Wilders bought back the inholding around 1965.

Other land uses in the late 1800s included stripping bark from Tanbark Oak used by the tanning industry in Santa Cruz. The upper reaches of Baldwin Creek and Peasely Creek were also logged for redwoods. However, the Wilders requested that the area east of Wilder Creek known as Goat Hill be left uncut (Harriton, 1976).

Wilder continued to operate the dairy and expand the building complex of the Wilder Ranch Dairy (Figure 9). The dairy was quite successful and at one time produced butter at the rate of one ton per day (Fulcher, 1970). Wilder was an innovative dairyman and built a 320 foot milking barn holding 206 cows at one time over Wilder Creek. The barn was designed so that all cow wastes could be emptied directly into the creek and washed down stream to the ocean (Harrison, 1892). The cleaning of the barn may have been the first nutrient pollution of the creek. The effect of waste in the creek must have been noticeable but there are no known records of algae clogging the creek or other possible changes. The creek was first altered by a dam 210 feet above the ranch complex. The dam water ran ranch machinery (such as drill, saw, and sewing) using Pelton water wheels and generated electrical lighting for the first time in the Santa Cruz area (Fulcher, 1970). In addition, dam water irrigated fields via a one mile long ditch (Engelsman, pers. comm.).

The wetland itself was subject to tidal inundation throughout this period. D.R. Wilder's uncle often told the story of waves breaking at the lower edge of the east field during a combined storm and high tide event (Engelsman, pers. comm.).

The Ocean Shore railroad and later the Southern Pacific Railroad were both deeded rights of way by Wilder in early 1900s. He hoped for a local flag stop, but instead Ocean Shores went bankrupt from 1906 earthquake damage and the Southern Pacific tracks were rarely used. The Southern Pacific tracks cross Wilder Creek and smaller creeks in the watershed by trestles which do not impede water flow (Figure 9).

Marine terraces surrounding the wetland were first leased for agriculture in the 1920's after D.D. Wilder's son (D.R. Wilder) graduated from the agricultural program at UC Davis. The first acreage to go into vegetable growing was 250 acres on the terrace just west of Wilder Creek Marsh. Within a few years over 500 acres were mostly in artichokes (Harriton, 1976). This agricultural land use has continued until today (see the section on Agriculture).

During this period, an oil derrick was erected on the terrace west of the wetland but was unsuccessful and abandoned (Land Use map, U.S. Dept. of Agriculture, 1936; Monterey Oil Company, Quitclaim, 1955). There was also a landing strip for small aircraft on the terrace just west of the wetland (Engelsman, pers. comm.).

Led Engelsman came to the ranch as foremen in 1929. His primary responsibilities were as gamekeeper for the uplands and as a horse trainer. He worked with Jim Burns who lived in a cabin on the wetland and was paid a stipend to act as gamekeeper for the wetland and flat around the wetland. The Wilders maintained the wetland as a waterfowl reserve and did not allow hunting on the ranch by outsiders: the Wilders and their close friends hunted the area. There was a weir made of sand and old farm machinery on the lower portion of Wilder Creek forming a lagoon that attracted thousands of ducks and geese during migration and had substantial numbers of nesting waterfowl in the spring. The lagoon was utilized by large numbers of quail as well. The Wilders goal was conservation of waterfowl, and Engelsman's job in those days was to keep out poachers. The weir allowed willows to extend beyond the creek channel near what is now the upper end of the fallow field and into the wetland flat until cut back later by farming. The field above the wetland next to the creek, was kept as a hayfield where Engelsman raised and released game pheasants for hunting by the Wilders (Engelsman, pers. comm.).

The Rinaldis used water pumped from Wilder Creek behind the weir to irrigate their crops on the terrace east of the wetland from the early 1920's to about 1939.

In the 1930's there was hog farming on the upper end of the wetland. The hogs were pastured on the west and east sides of the creek near the willow outgrowth and were fed milk, corn, and pumpkins. The milk was pumped by a lead pipe from the ranch complex to a hog house. Cholera killed many hogs, and the Wilders gave up on hog farming before the end of the decade (Engelsman, pers. comm.; Fulcher, 1970).

In 1937, the Wilder's ceased dairy farming because of new sanitary and inspection laws requiring extensive and costly rebuilding and modification of their operation (Harriton, 1976). The ranch returned the land to cattle grazing. The local slaughterhouse complained that Wilder beef livers were infested with flukes. Cattle were apparently contracting flukes by ingesting eggs deposited on wetland plants in Wilder Creek Marsh. The weir was destroyed and the duck reserve abandoned.

The Wilder Corporation was formed by Wilder's sons, daughters, and sister in law. The corporation continued cattle operations and leases to vegetable growers for artichokes and brussel sprouts. The terraces surrounding the wetland and some acreage in the upper end of the wetland were farmed. During the 1940's and 1950's, dikes were first built along the sides of Wilder Creek to reduce the effects of flooding damages to agricultural fields.

Engelsman began running about 50 head of cattle on the wetland area and beach from 1940 until 1985. He burned the flat area every

five years or so to promote the growth of grass for cattle (Engelsman, pers. comm.).

The Wilders began to sell portions of the ranch in 1954 until it was completely sold to different development and industrial companies by 1968.

The Old Coast Road was replaced by Highway One in 1957. This opened the coastal area to higher traffic from agriculture and tourism. The improved transportation corridor created opportunity for a wider range of development speculation including industry and residential subdivisions.

The 24 acre Wilder Creek Marsh parcel was purchased from the Wilders by Nolte and Peters in 1954. They proposed a residential development that did not go forward. The parcel was eventually acquired by the California Department of Parks and Recreation in 1980. Led Engelsman continued to graze cattle on and oversee the parcel until 1985.

Granite Construction Company was granted a 30 year lease of 300 acres (275 north of the highway) for a hydraulic sand mining operations in 1959. Sand mining began in the late sixties tearing up hillsides and creating three effluent settling ponds. The ponds settle out clay. One is located in a coastal wetland west of the terrace above Wilder Creek Marsh. The clay is used by Santa Cruz landfill. The hillsides are undergoing restoration to prevent erosion, and a restoration plan is being developed for the settling pond by the ocean, which is no longer in use by the mining operation. The sand plant is expected to continue to operate on a smaller scale for another 7 to 10 years. The plant has significantly impacted the wetland used as a settling pond and may contribute to sedimentation of Wilder Creek.

In 1968, Moroto Investment Company (a subsidiary of Sussman Properties Ltd. of Toronto, Canada) purchased the remaining ranch acreage. In conjunction with Hollywood Turf Group and Rossi Ranch (both owned adjacent property), they proposed an ambitious development plan for the nearly 4,000 acres in 1972. The plan included 10,000 residential homes, schools, shopping center, professional services, industrial development, annexation to the City of Santa Cruz, and three square miles of open space. Environmentalists and agricultural preservationists opposed and campaigned against the proposed development: the opposition movement was called Operation Wilder. The development proposal was kept from going forward and the State of California Department of General Services began acquiring the land in 1974.

Wilder Ranch State Park was established in 1980 and stretches from one mile west of the City of Santa Cruz along five miles of scenic coastline including the Wilder Beach and Wetland. The park will contain over 4,500 acres when acquisition is complete. The park provides for the preservation and protection of natural and cultural resources that are significant (see Policies section for more detail). Wilder Creek Marsh is protected as a Natural Preserve, and the Wilder Ranch buildings complex is a Cultural Reserve (see Public Access section for more detail).

The Wilder Beach Wetland Natural Reserve excludes public access and recreation in order to provide protection for snowy plovers. Led Engelsman was forced to remove his cattle from the wetland and beach due to concern

for the snowy plovers. The park was first opened to the public in 1990 and provides hiking trails and historical interpretation at the ranch complex. The other beaches and wetlands of the park are accessible to the public.

## 3.2 PRESENT LAND USE

### 3.2.1 Agriculture

Agriculture plays a significant role in Wilder Ranch State Park and will remain an important and preserved use of the land (Figures 10 and 11). The Wilder Ranch area has been altered for agriculture uses since the early days of the Costanoans as much as 3,500 years or more ago. The Costanoans burned the land to encourage growth of food stuffs such as fresh greens and grass seeds, and to provide open grazing land for wild game (Gordon, 1987). The area was grazed by cattle from 1791; this continues on portions of the land north of Highway One. The land around Wilder Beach and Wetland was used for dairy farming from about 1870 until 1937. With the demise of the dairy, portions of the land were returned to cattle grazing. Vegetable farming on the marine terraces surrounding Wilder Beach and Wetland began in 1922, and was fully underway within a few years. Most of the vegetable farmers leased their land from the Wilder Ranch Corporation (Fulcher, 1970). Currently, vegetable farming is practiced on about 850 acres within the state park, not including the privately owned and farmed east terrace.

#### 3.2.1.1 Recent History (Vegetable Farming 1922 to present)

The marine terraces surrounding the wetland were first leased out for agriculture in the 1920's with the return of D.D. Wilder's son. The first acreage to go into vegetable growing was 250 acres on the terrace just west of Wilder Beach and Wetland. Within a few years over 500 acres were in cultivation, mostly artichokes (Harriton, 1976). Artichoke farming without use of pesticides continued to spread throughout most of the marine terraces area around the wetland until World War II. There were also two acres of daisies in the fields just east of the wetland.

The Rinaldis began farming the east terrace in the early 1920's. They irrigated their fields by pumping water up from Wilder Creek near the weir until about 1939.

The wetland portion of Wilder Beach and Wetland was pasture with a slaughterhouse at the upper end until early 1940, when G. Georgie first attempted to farm it. His cultivation covered all the wetland from Wilder Creek banks to the back of the dunes to the base of the cliffs. His farming of the area was short lived since the high salt content made it difficult to grow anything successfully. Georgie gradually gave up most of the lower wetland, but continued to farm what is now the fallow field until about 1954.

Artichoke farming was displaced farther south to Castroville with the advent of frozen foods in the early 1940s. Most of the vegetable farming around Wilder Beach and Wetland converted to Brussels sprouts at this time. Brussels sprout farming was further encouraged by an increased demand during World War II. Brussels sprouts are generally planted around April and harvested in the late fall or early winter. Many of the original brussel sprout farmers are still farming the land today, and several of their sons are farming with them.

Starting in 1957, J. Colombini began Brussels sprout farming in the wetland field earlier abandoned by Georgie (the current fallow field). He encountered numerous problems trying to farm this area, not the least of which included tidal inundation of at least half the field every other winter (and a couple of summers). As the field is in a small depression, after flooding it would be under two to 3 feet of water, causing loss of half or more of the crop. In addition to tidal inundation, Wilder Creek periodically floods over its banks in winter, removing topsoil and crops, and depositing a variety of debris. In response to creek flooding, Colombini built up the dikes on either side of the creek and cleared the creekbed of vegetation such as cattails with a dragline every five years or so. For three years, about 60 acres of the terraces was in strawberries, although the exact location is unknown.

The Brussels sprouts packers had a great influence on farming practices. As pesticides and other chemicals improved the cosmetics of the vegetables, packers raised cosmetic standards so that all farmers had to conform in order to compete. If the Brussels sprouts are unacceptable to the packer, the grower must sell the produce on the fresh market through a broker and make substantially less profit. Although Brussels sprouts are somewhat salt tolerant, in the tidally inundated fields they turn lighter green towards yellow, decreasing their marketability.

Brussels sprouts were originally harvested by hand in late November and December, when the vegetable is the tastiest and not bitter, and trimmed by hand by the packer. When mechanized harvesters which trim the sprouts came into use in the late 1960's and early 1970's, packers would only accept the mechanically harvested Brussels sprouts. This saved the packer the cost of trimming the sprouts and other costs. The mechanical harvester can not be used in wet weather, so harvesting of Brussels sprouts now occurs in mid-October. Some of the farmers blame the decline in Brussels sprouts popularity on early harvesting, because early-harvested vegetables are more bitter in taste. The decline in demand is threatening to close the only local packer left. If the last packer closes, chances are Brussels sproutsfarming at Wilder Ranch will be replaced by a more profitable crop.

When the State of California acquired Wilder Ranch in 1974, it also acquired the farming leases associated with the property. When incorporated into the State Park General Plan for the area, the agricultural land use was identified as significant and was preserved. However, the Colombini wetland field was identified for wetland restoration, so when the lease expired in the mid 1980's the field was taken out of Brussels sprouts production and allowed to go fallow (Figures 10 & 11). The two fields just east of the fallow field along Wilder Creek will also be removed from agricultural production when their leases expire in 1994. These areas are also slated for habitat restoration.

Beginning in 1990, the park imposed 50 foot setbacks between the farmed fields and public access hiking trails. The setbacks were placed to reduce pesticide hazards to visitors and to reduce pesticide transport into Wilder Beach and Wetland natural preserve. The setback areas are causing quite a few headaches for the farmers, as the setbacks have become infested

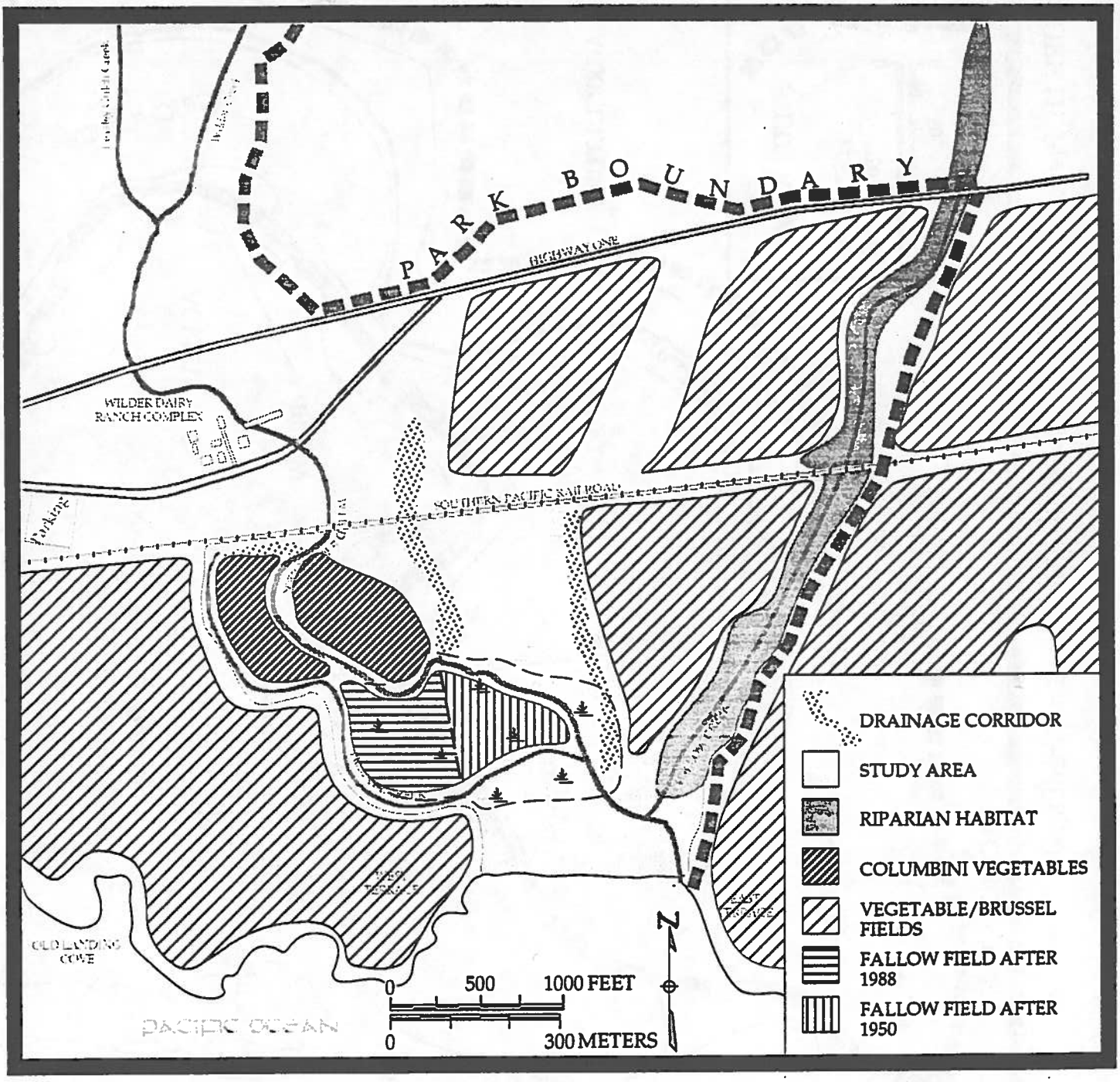



FIGURE 10: Present agricultural use of fields in and around vicinity of Wilder Study Area. Symbols represent different crop types. Fallow fields indicated with dates when they were set aside.

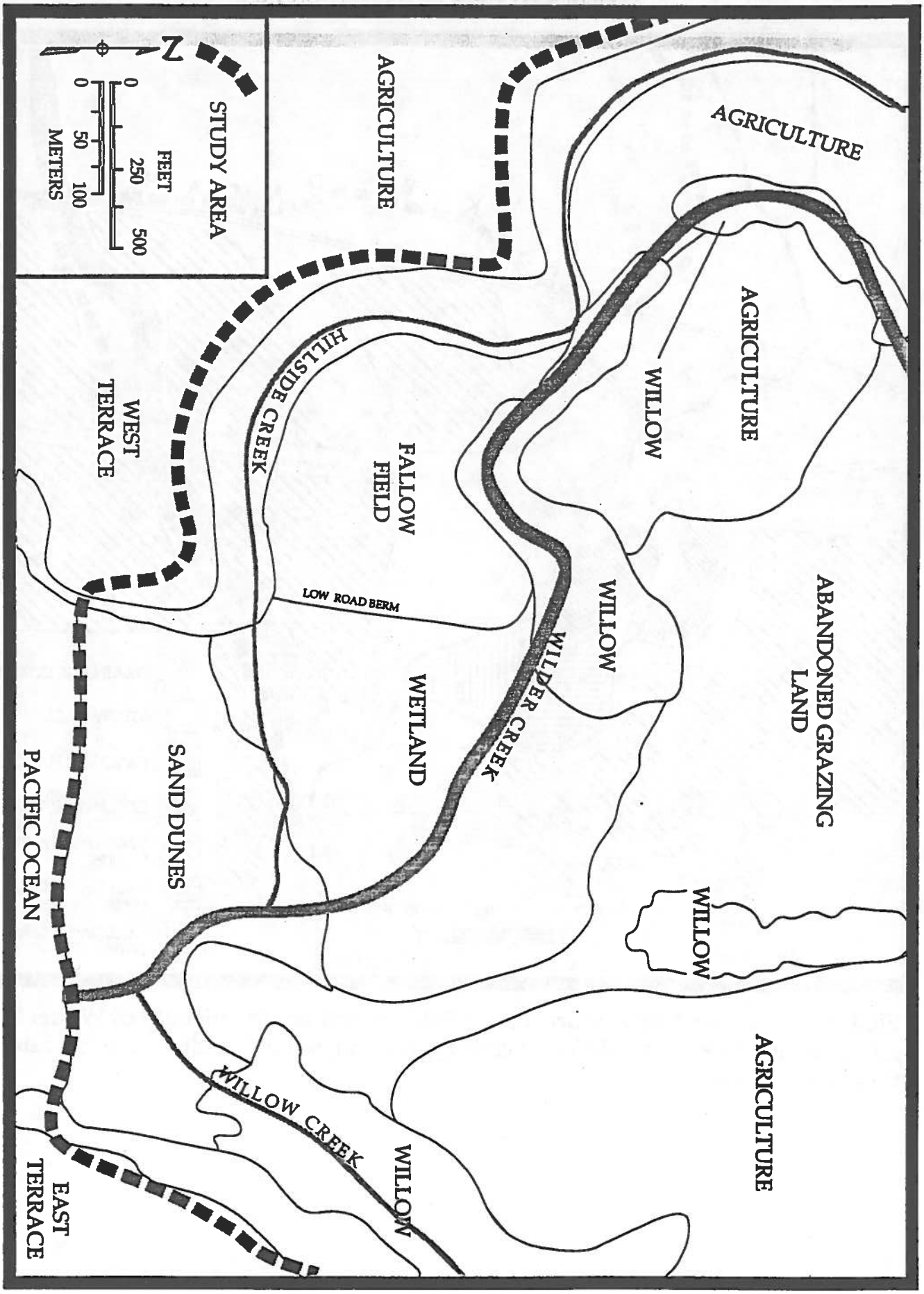



FIGURE 11: Present land status of Wilder Study Area and adjacent lands.

with ground squirrels, harvest mice and moths which feed on the crops (Dellamora, pers. comm.).

Since the county agricultural department stopped trapping squirrels and the Wilder Corporation stopped running the ranch and therefore poisoning the squirrels with thallium, the squirrel population has steadily increased (Engelsman, pers. comm.). Farmers complain of squirrels feeding on crops around the dairy ranch complex (so many that Rinaldi who farms the east terrace now uses poison): numerous squirrels were sighted in the Wilder Beach and Wetland (pers. obs.).

A portion of the terrace immediately around the ranger complex is currently farmed using organic and sustainable methods. State Parks hopes that in the future the remaining agricultural fields will become a showcase for organic farming practices. This may occur as the Brussels sprouts farmers retire, or if the demand for Brussels sprouts continues to decline. On the whole, farmers are well educated about pesticide use management, appreciate the natural values of the wetland, and are cooperative and supportive of the wetland restoration concept.

#### 3.2.1.2 Pesticide and Chemical Use and Effects

The first pesticide use began in the same time period as Brussels sprouts farming, just after World War II. The first pesticides were used as dust over the crops and began with nicotine and then BHT. Dusts tended to get everywhere and caused health problems to the users, so dusting was phased out and discontinued in the mid to late 1960's. Dusting was replaced by spraying of DDT, parathion, then toxaphene, dieldron, aldrin, chlordane and TEP through the mid-1980's.

A study of pesticide use in 1982 (California Department of Food and Agriculture) determined that pesticide use by the farmers did not represent a hazard to public visitors in the park. The study found that the majority of pesticides were applied in May with use continuing into September. Organophosphate insecticides, more acutely toxic but less persistent, were applied at a lower rate from June to September. DDT and its residues, although outlawed for several years, were also found in the soil throughout the park, a pattern seen in numerous other agricultural areas.

In 1984, Integrated Pest Management (IPM) began as part of the State Park program. The purpose of the program is to reduce pesticide contamination of the environment, and to reduce pesticide exposure to the public visiting the park. The use of toxaphene, dieldrin, aldrin, chlordane, and TEP were immediately eliminated by IPM. The problem with the spraying is that the farmers have little control over when the spraying contractor actually sprays. The spraying contractor tries to schedule all the farmers using his services at the same time to keep costs down. The plan has reduced the number of sprays by 10% to 20%, from 8 to 9 sprays per season to 6 to 7 sprays per season (Dellamora, pers. comm.; Bargiacchi, pers. comm.). Colombini, who does his own spraying, has been more effective and estimates a 30% reduction in spraying. In contrast, the Younger property on the terrace east of the wetland, which is not under IPM, is sprayed at least 9 times a year with a wide variety of chemicals, including a persistent, high-impact endosulfan/parathion mixture

near the end of the season in September (Rinaldi, pers. comm.). Dry and hot weather requires an increase in spraying, and cooler weather requires less.

A list of the pesticides in use at Wilder Ranch State Park can be found in the parks inventory. The use of Pounce was eliminated in 1989, Talon is no longer on the market, and Metasystox/Systox are being phased out since the company is not re-registering it. The main pesticide in use by the Brussels sprouts farmers in the early 1990s is Lorsban.

Under the IPM program, farmers are required to monitor and report pest management procedures and pesticide use. The farmers have hired a consultant to do the monitoring and reporting for them. The organic and sustainable farming around the ranger station has been successfully underway for over three years.

#### 3.2.1.3 Agricultural Influences on Wetland and Creek

Little is known about impacts of pesticides on the wetlands. The utilization of IPM practices, with their emphasis on reduced pesticide applications, has probably reduced recent pesticide inputs into the wetlands. However, there are no data to support this contention. Long-term usage of pesticides has undoubtedly altered the species composition of some groups, particularly insects and aquatic crustaceans. However, without comparisons with un-impacted areas, it is impossible to understand what effects the possible decimation of these groups might have on the community structure of the wetlands. Input of persistent pesticides, such as DDT, which is resident in the soils in all formerly cultivated areas, will continue to exert an unmeasured influence on insect populations.

Although most of the persistent chemicals are no longer being used, they have been replaced with shorter-lived but more acutely toxic pesticides. These chemicals are difficult to study because their direct effects, while possibly very significant, are of short duration. Such chemicals are not heavily used in the IPM areas, but are still heavily relied on for the Rinaldi farm on the terrace east of the wetland. We do not know what, if any, of these chemicals are actually entering the wetlands, and what impact they are having, if any. However, it would be prudent to attempt to reduce the possibility of inputs by implementing IPM practices on the east terrace.

#### 3.2.1.4 Related Policies

The Coastal Act of 1976 has provided a number of policies that influence agriculture. Coastal policy states that prime agricultural lands shall be preserved and any conflicts in use be minimized by establishing buffers, limiting conversion to use other than agriculture, developing nonagricultural land first, and maintaining long-term productivity of soils.

The Coastal Act also states that environmentally sensitive natural areas, such as sand dunes and coastal wetlands, shall be preserved. Preservation includes preserving and restoring habitat, setting aside areas adjacent to sensitive habitat as buffer zones, protecting the marine environment, and maintaining the quality of all waters.

Wilder Ranch State Park General Plan policies also concern agriculture. Destructive or unnatural erosion shall be controlled and

prevented by means that are in harmony with the purpose of the park. Pesticide use shall be directed by the policies in the department's pesticide manual. In general these policies require that chemical pesticides not be used until other possible methods are explored and found to be inadequate for control of the pests involved. These policies emphasize the use of biological control or integrated pest management approaches. In determining the acceptability of any pesticide on agricultural lands within or adjacent to the park, the department shall give primary consideration to the health and safety of park visitors. Of secondary concern shall be the protection of important natural ecosystems. Agricultural productivity must be subordinate to these two concerns. Pesticides that are determined not to be potentially hazardous to park visitors but which would significantly degrade important natural ecosystems within the park shall be prohibited. Increased cost shall not necessarily be a factor in determining the feasibility of the alternatives. On State owned lands it may be possible to adjust the fee schedule on agricultural leases to compensate leasees for higher operating expenses.

It is the policy of the department to perpetuate the visual qualities of the agricultural scene by maintaining and interpreting row crop agriculture on lands designated for such use. Reductions of acreage in row crop agriculture may be made to protect... natural resources.... No additional lands shall be used for agricultural purposes without specific approval of the department.

Reductions in agricultural lands will only be considered for the purpose of mitigating conflicts in the implementation of... objectives for resource protection. ... Such reduction will occur... within the natural preserve [Wilder Beach and Wetland] and other riparian areas for the purpose of habitat enhancement.

The operations element of the general plan identifies water quality as an issue that needs to be addressed: Several lands... pose potential hazards to the quality of natural ecosystems within the park. The potential exists for degradation of the lower creek reaches, estuaries, and shoreline through the use of pesticides associated with row crop farming past and present.... Many pesticides commonly used ... are known to be extremely toxic to fish. Whether pesticide residues are reaching the creeks or associated wetlands in deleterious amounts is not known.

### 3.2.2 State Park

State park land use patterns are well described in the General Plan for Wilder Ranch State Park (1980). Many features of the General Plan are mentioned throughout this report, but the most important components are the Cultural Preserve designed around the dairy ranch and the Natural Preserve which is the Wilder Creek Beach and Wetland.

## 3.3 PRESENT PHYSICAL CONDITIONS

### 3.3.1 Watershed Habitats

Wilder Creek is the main natural drainage into Wilder Marsh (Figures 3 and 4). The creek watershed extends into the adjacent hills and receives a number of smaller creeks. Wilder Creek runs east of Highway One from the coastal mountain watershed (Figure 3). Most of the watershed is open grassland formerly grazed by cattle, although the upper slopes include forests of coastal live oak and redwoods. Wilder Creek is flanked by willow trees along most of the lower course through

the existing agricultural fields. The willows stop near the creek mouth and lagoon (Figure 4). Their distribution is probably limited by seasonal intrusion of brackish water into the lagoon and river channel. Sea water invades the marsh as river flow decreases through the sandy beach in late winter or spring. Later the river mouth is closed by shoreward movement of sand. During winter storms, waves erode the beach and deposit sand in offshore bars. The seasonal erosion and rebuilding of the sand beach is a primary control of salinity and water quality at the river mouth and lagoon. The lowest portion of the creek is flanked by salt marsh and salt tolerant freshwater reeds, rushes and tules (Figures 4 and 12).

Wilder Creek receives several other smaller drainages within the Wilder Marsh. They include the Hillside Creek and Willow Creeks. The Hillside Creek runs along the northern rim of the marsh obtaining most of its drainage water from the hillside slopes and from the northern agricultural field (Figures 3 and 4). The channel is probably a natural drainage feature, but was ditched along the cliff face many years ago. It continues through the salt marsh as a natural creek channel just behind the sand dunes, emptying into Wilder Creek at the upper lagoon. The Willow Creeks drain the immediate hillsides along the eastern edge of the marsh. They are small creeks even in heavy rains. These drainages are marked by linear groves of willows, which are well developed in the two southern Willow Creeks (Figure 4).

### 3.3.2 Other Habitats

Several other local habitats surround the coastal marsh and are important habitat buffers or unique regional environments (Figure 12). They include upland hillsides and cliffs, sand dunes and beach, and caves and rocky marine shores. The upland hillsides are heavily grazed grasslands with little native vegetation or natural habitat value. The cliff slopes surround most of the northern marsh and are covered with dense vegetation. They are much better natural habitat for upland species using the marsh and adjacent environments. The sand dune and beach are unique natural habitats because human disturbances are minimized by park public access policies. The dune is a special habitat for nesting snowy plovers. Nevertheless, there is considerable illegal and unregulated human traffic on the beach and dunes, contributing to a significant loss of dune vegetation and thus habitat in the last two decades (Figure 13). The sand beach is bordered by rocky walls with deep coves at the northern end of the beach. These contain unique plant communities with conspicuous fern galleries. The rock walls are swept by waves and tides forming a rich zone of intertidal plants and sessile animals. These rocky intertidal communities continue around the marsh cove along the open coast.

### 3.3.3 Hydrology

The major aquifer for the area is the Santa Margarita sandstone (Weber et al. 1990). Scotts Valley uses the same aquifer. Growth in Scotts Valley may put increasing pressure on the water supply. Water levels in park wells around the wetland were near 220 ft. in 1990 with standing levels about 150 ft. The local water table has fallen since the 1970's, when pumping levels were 160 ft. and standing levels were 94-97 ft. Local farmers estimate that aquifer levels are down 20-30 ft. in only the last four years. Well water is now heavy in iron and sulfur (Dellamora, pers. comm.). Water levels shifted after the 1989 earthquake, with

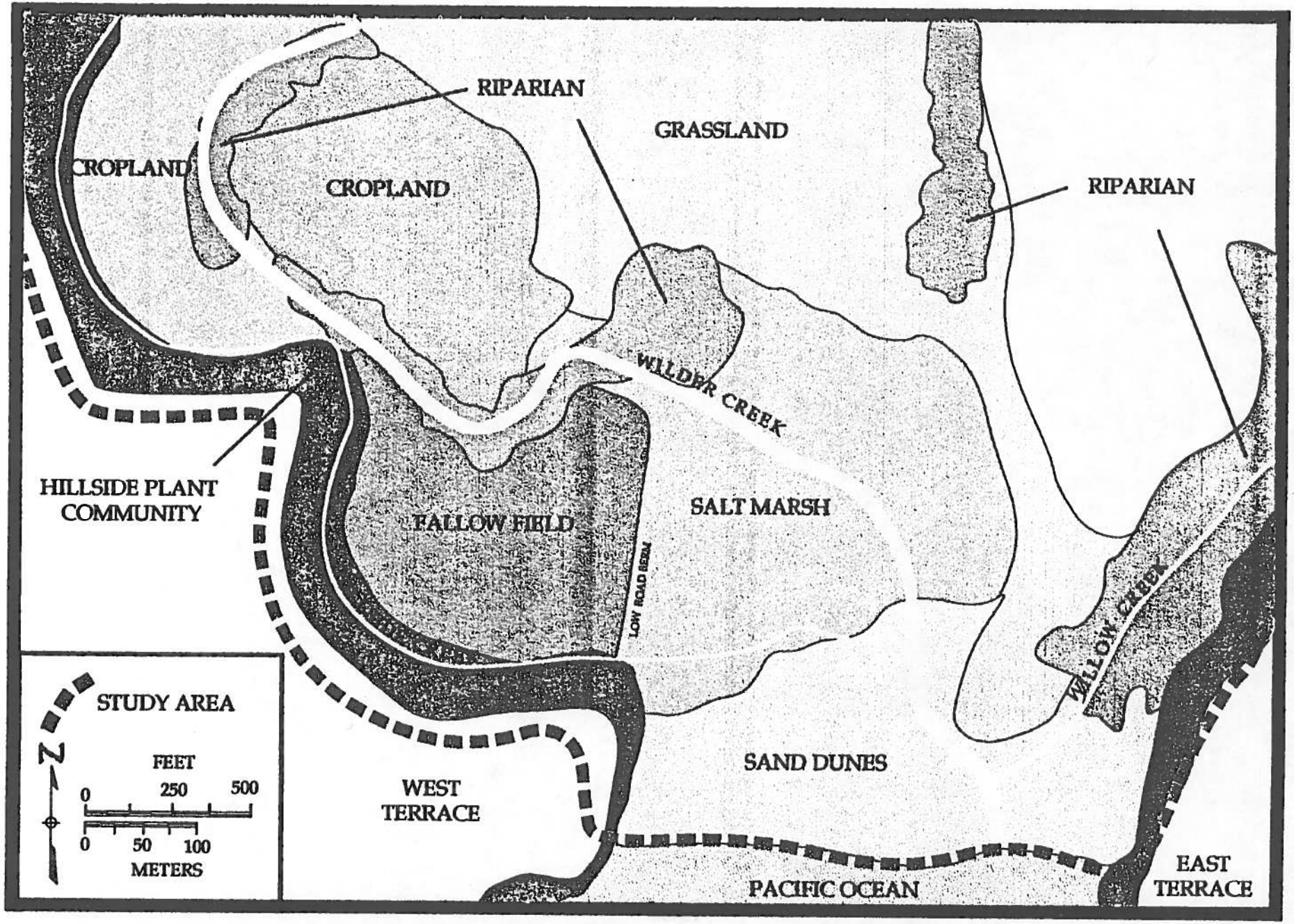
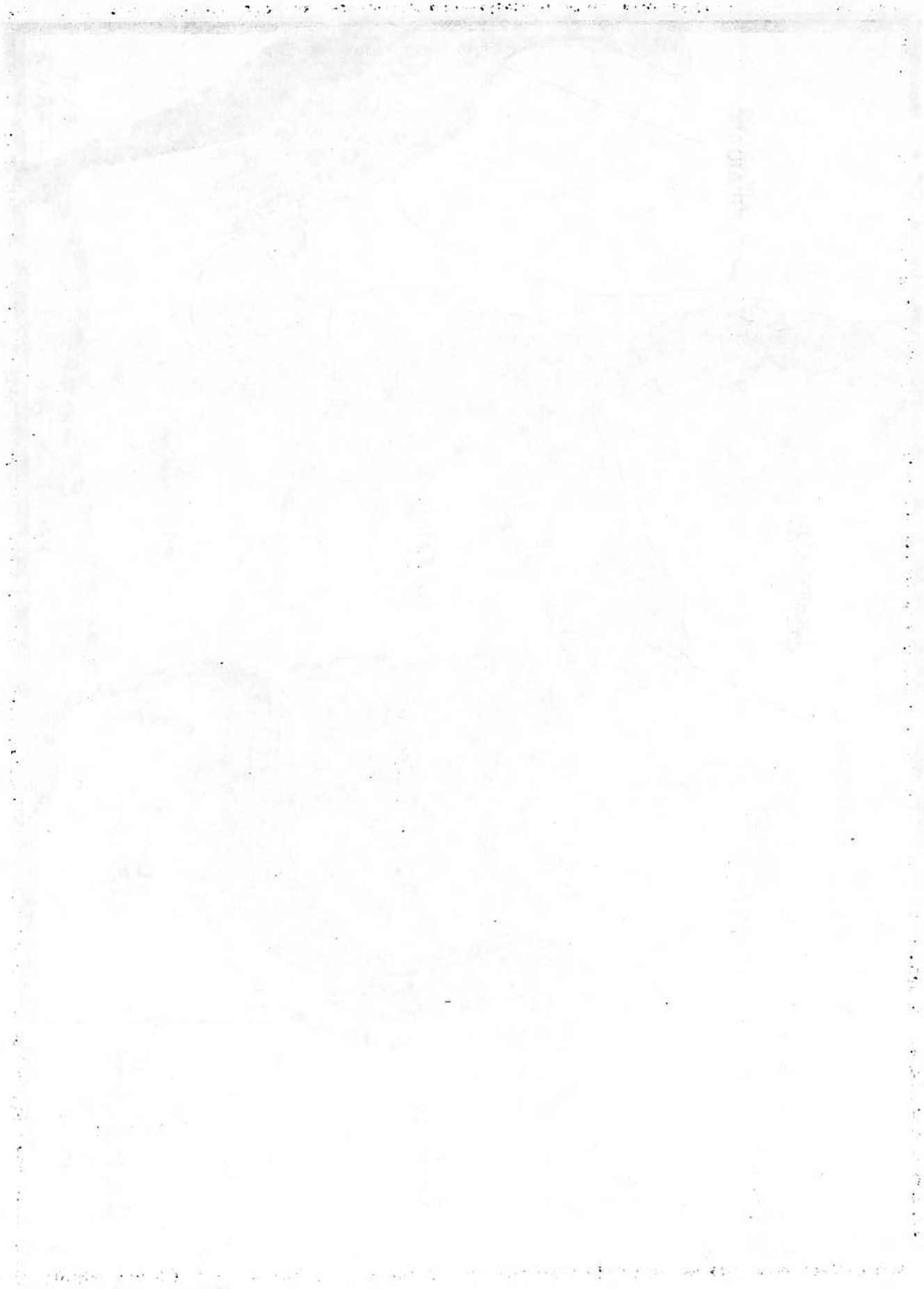
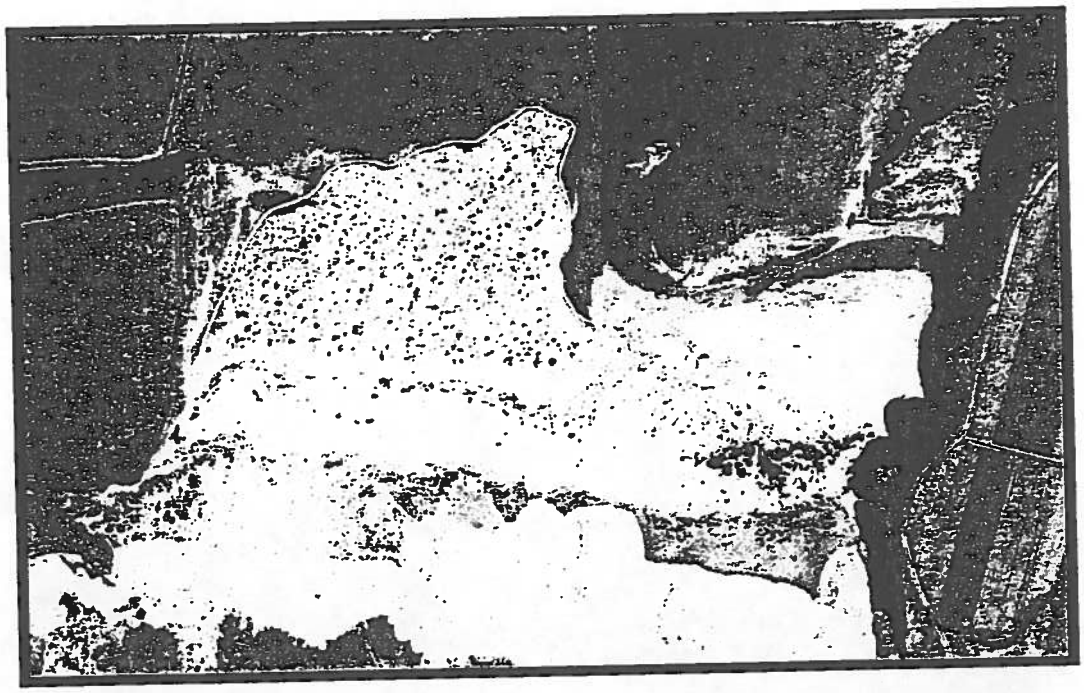
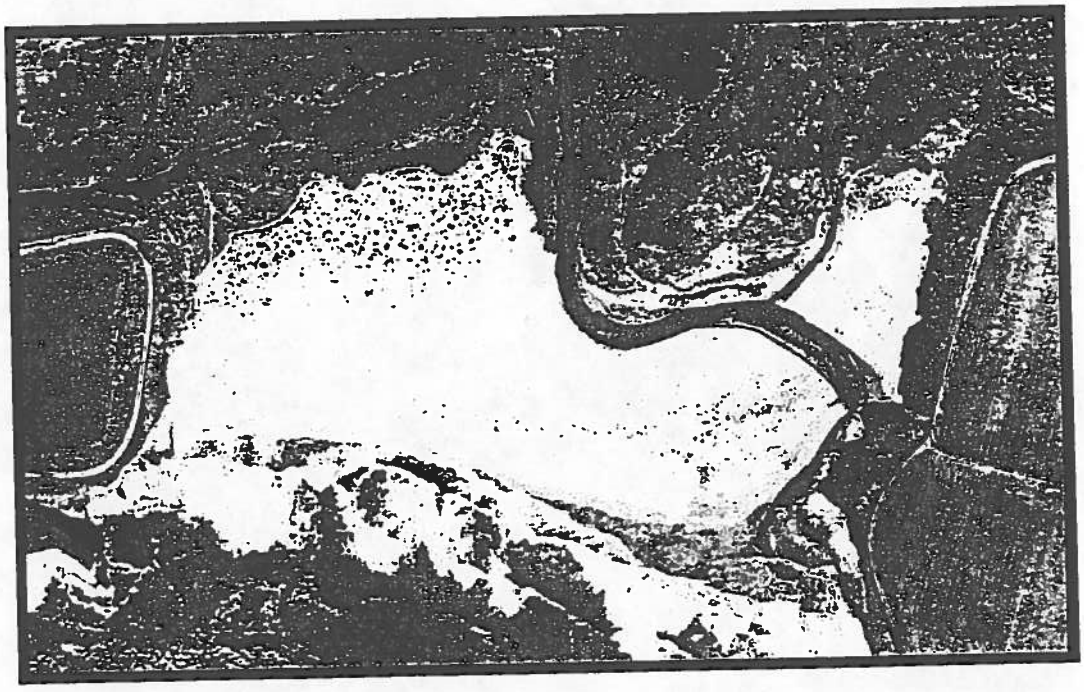



FIGURE 12: Habitat types of Wilder Study Area.



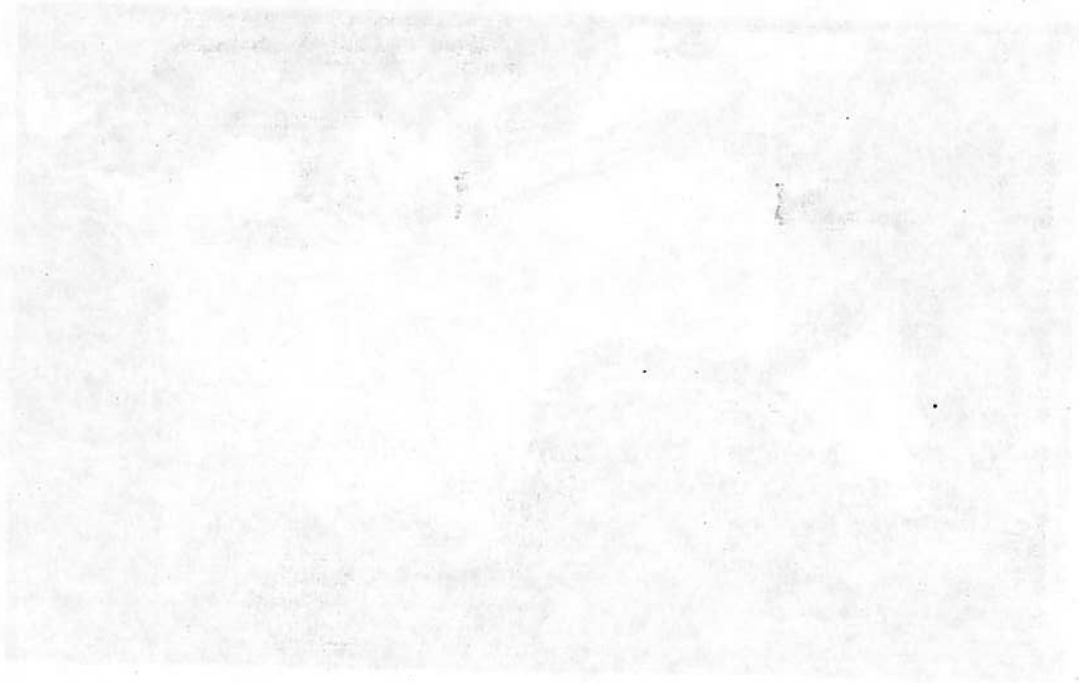


WILDER BEACH-1978; VEGETATED DUNE AREA-428,015 sq.ft.



WILDER BEACH-1993; VEGETATED DUNE AREA-154,656 sq.ft.

FIGURE 13: Dune vegetation changes between 1978 and 1993.



higher wells losing water and lower wells gaining (Rinaldi, pers. comm.).

#### 3.3.3.1 Stream Flow

Most of the water entering the Wilder Creek Marsh comes from Wilder Creek. Since 1990, the creek is often dry in long sections during the summer, and may go underground. The other larger creeks in the park, Baldwin and Majors, usually run throughout the summer. Baldwin Creek is dry in spots and ponded in others. Majors Creek runs year round, though not always full. The Majors Creek canyon has stayed damp throughout the summers of our observations (1990-1992), despite the drought. These creeks also feed coastal wetlands similar to the marsh at Wilder Creek.

Wilder Creek has had relatively poor flow since the rains of 1982-83. The regional drought led to very little flow in the creek until this year, 1992-93, when above-average rain fell. This study began in 1990, the driest year of the drought observed by local farmers. Wilder Creek had its lowest flows in decades from 1990 into 1992 (Dellamora, pers. comm.). As a result, only qualitative observations of creek flow and water quality were made before 1992, when the quantitative sampling was done covering periods of maximum and minimum flow in a wet year (Table 1). Qualitative observations included walks along the entire creek coarse during high and low flows from the mouth to about a mile or more inland from Highway One. Water conditions and the flora and fauna in the lower creek were observed during the four major seasons from 1990 into 1993. Quantitative hydrologic measurements were made in July and November 1992 and in February and April 1993 (final sampling period for the 1992-93 seasonal hydrographic patterns) at six stations along the lower creek (Figure 6).

The stream has been channeled and ditched numerous times in the past. The early ditching produced distinct levees along both sides of the creek in the 1940's and 50's to prevent flood damages to agricultural fields. However, the creek manipulations started even earlier. There was a weir made of sand and old farm machinery on the lower portion of Wilder Creek near the beach when Led Engelsman first worked on the ranch in 1929. The weir created a large lagoon in the lower wetland behind the dunes with water as deep as 3 feet deep in places. The lagoon is visible in aerial photographs taken in 1928. The weir was destroyed in 1937. Its main function was to create a pond for a waterfowl reserve. After the weir was destroyed, the tide deposited seaweed in the fallow field (then under production) and sometimes halfway into the east field. During this same period, the upper creek was dammed at an elevation of over 200 ft. to provide irrigation water to the upper ranch (Figure 14).

For many years the creek bed has been well contained between the low dikes, permitting rapid flow down creek to the lagoon and ocean and minimizing flow outside the creek channel. Farmers dragged debris from the creek channel at least every five years or so to minimize potential blockage of flow. However, in recent years, park personnel asked farmers to allow the creek to become blocked by natural accumulations of water born debris. As a result, the creek flowed over the dikes at several locations during high flows spreading water and smaller plant debris over the abandoned or existing agricultural fields. These

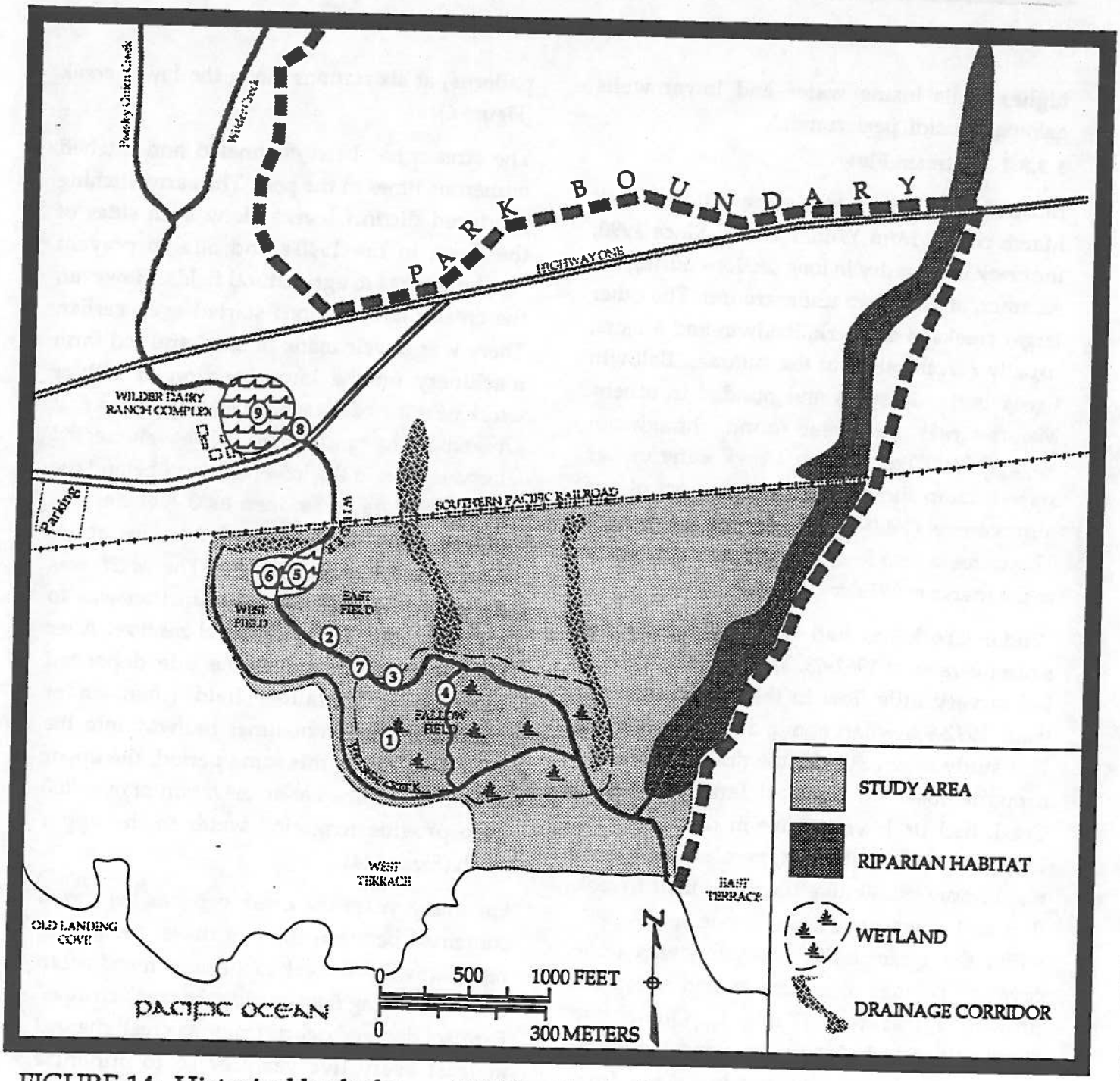



FIGURE 14: Historical hydrology of Wilder Study Area.

1. Location of frequent tidal seaweed deposition.
2. Furthest inland extent of seaweed deposition.
3. Location of high tide waves breaking in 1890.
4. Extent of tidal influence in 1982-83 storms.
5. Area of creek flooding in 1982, 83 & 84.
6. Area flooded by creek during heavy rains.
7. Site where creek jumps dike annually.
8. Site where creek flooded and removed topsoil in 1986.
9. Under 2 feet of flood water in 1955.

events have been important in locating areas to remove dike and encourage stream overflow into potential wetland restoration sites.

Despite the ditched and diked conditions, the creek has spread well beyond the channel in the past either from high flows, debris damming, or high tides and creek flows (Figure 14). Storms also helped to force water into the creek. As recently as the winter of 1982-83, winter storms and high tides topped the beach and flowed into the marsh. Wave movement was strong enough to move a large log from the west end of the beach to the east end (Dellamora, pers. comm.). Heavy rains and high tides of 1955 flooded the dairy complex in two feet of water, closed the bridge, and covered all of Wilder Creek wetland even throughout the entire summer (Colombini, pers. comm.). The creek flowed over the dikes along the east field in 1982, 83 and 84. Silt, rocks, and worms are sometimes dumped 1 inch deep on the fields next to the creek. Logs as large as 1 1/2 feet in diameter have been stranded in the fields. Overflow events were probably even more common in past decades. Aerial photographs taken in 1940 and 1941 show alluvial fans spreading into the fallow field from the creek.

During low water flows, the creek is dammed in the mid-marsh with flash boards (wooden slates placed into a cement frame) to collect irrigation water for farmers. Water is pumped from the creek reservoir with an electric pump and spread over the adjacent fields. During higher creek flows, the boards are removed to encourage drainage along the creek and from the adjacent cultivated land, which is historical wetlands.

The ditched and diked creek is quite effective at draining the lower watershed and preventing flooding of the adjacent fields. This is illustrated by the flow patterns during the above average rains of 1992-93. During and after the heaviest rains, water still flowed primarily within the creek channel. No large areas of the lower salt marsh, the abandoned field, or either of the cultivated fields were flooded, except for a small area near the creek where debris blocked the channel and the water overflowed the dike into the north field. During the 1991-92 winter, which had the second best rain fall during the drought, the heaviest rains and subsequent creek flow flooded into the abandoned field, again at a site where debris collected in the stream. Although the debris was removed by farmers in the past, its accumulation is presently encouraged by the park, and is an important recommendation of the Restoration Plan to increase water flow into areas of historical wetland: the abandoned field, the east cultivated field, and eventually the north cultivated field (Figures 15 and 16).

During winter rains, the creek flows rapidly along all of its coarse through the Wilder Creek Marsh. The creek widens and flows decrease at the lagoon just behind the coastal sand dunes. Generally, the creek mouth is usually located at the extreme eastern end of the sandy beach, however, it periodically runs through the central beach. Aerial photographs show the creek mouth near the central beach in 1986, 1976, and 1953. In 1941 there were two mouths, one at the center beach and the other at the eastern beach location.

As the creek flow decreases, salt water enters the lagoon during high tides and creates a brackish environment with salinities that are

## Table 1: Water quality monitoring data for Wilder Creek.

| DATE | STN | (M) Height off bottom | (celsius) TEMP | (ppm) DISS. O | (0/00) SALINITY | (M) Channel width | (M) Channel depth | * NO3 | ** NO3 | ** NH3-N | ** TOTAL P |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 7/16/92 | WRWQ-1 surface | 0.2 | 17.5 | 8.6 | 0.4 | 4.26 | 0.45 | 4.2 | <0.1 | 0.02 | 0.02 |
| 7/16/92 | WRWQ-2 surface | 0.15 | 17.5 | 6 | 0.4 | 5.18 | 0.76 | 0.7 | <0.1 | 0.03 | 0.03 |
| 7/16/92 | WRWQ-3 surface | | | | | 2.13 | 0.3 | | | | |
| 7/16/92 | WRWQ-4 surface | 0.15 | 17 | 5.1 | 0.7 | 2.13 | 0.3 | <0.5 | 0.1 | 0.02 | 0.03 |
| 7/16/92 | WRWQ-5 surface | 0.5 | 21.8 | 6.4 | 3 | 9.75 | 1.52 | <0.5 | <0.1 | 0.04 | 0.03 |
| 7/16/92 | WRWQ-6 surface | 0.3 | 20.7 | 9 | 4.3 | 25.6 | 0.6 | <0.5 | 0.1 | 0.1 | 0.1 |
| 11/3/92 | WRWQ-1-surface | 0.1 | 15 | 5 | 0.5 | 0.75 | 0.1 | | | | |
| 11/3/92 | WRWQ-2 bottom | 0.3 | 15 | 2.5 | 0.5 | 1 | 1 | | | | |
| | WRWQ-2 surface | 1 | 15 | 4 | 0.5 | | | | | | |
| 11/3/92 | WRWQ-3 surface | 0.2 | 15 | 3 | 0.5 | 2.5 | 0.2 | | | | |
| 11/3/92 | WRWQ-4 bottom | 0.3 | 15 | 3 | 1 | 2 | 0.5 | | | | |
| | WRWQ-4 surface | 0.5 | 15 | 5 | 1 | | | | | | |
| 11/3/92 | WRWQ-5 bottom | 0.3 | 20 | 8 | 20 | 5.5 | 1.5 | | | | |
| | WRWQ-5 surface | 1.5 | 20 | 8 | 18 | | | | | | |
| 11/3/92 | WRWQ-6 bottom | 0.3 | 20 | 7.6 | 20 | 20 | 0.6 | | | | |
| | WRWQ-6 surface | 0.6 | 19.5 | 6.4 | 18 | | | | | | |
| 2/11/93 | WRWQ-1 mid | 0.1 | 14 | 10.4 | 0 | 7 | 0.2 | | | | |
| 2/11/93 | WRWQ-2 mid | 0.15 | 13.5 | 10 | 0 | 3.5 | 0.3 | | | | |
| 2/11/93 | WRWQ-3 mid | 0.2 | 13.5 | 10.6 | 0 | 2.2 | 0.55 | | | | |
| 2/11/93 | WRWQ-4 mid | 0.2 | 14 | 9.4 | 0 | 4 | 0.45 | | | | |
| 2/11/93 | WRWQ-5 bottom | 0.15 | 13 | 8.6 | 10 | 19.5 | 0.85 | | | | |
| | WRWQ-5 surface | 0.7 | 14 | 10.4 | 0 | | | | | | |
| 2/11/93 | WRWQ-6 mid | 0.15 | 14 | 10.9 | 0 | 7 | 0.2 | | | | |

Chemical analyses was done for July sample period only.

* Detection Limit <0.5

** Detection Limit <0.1

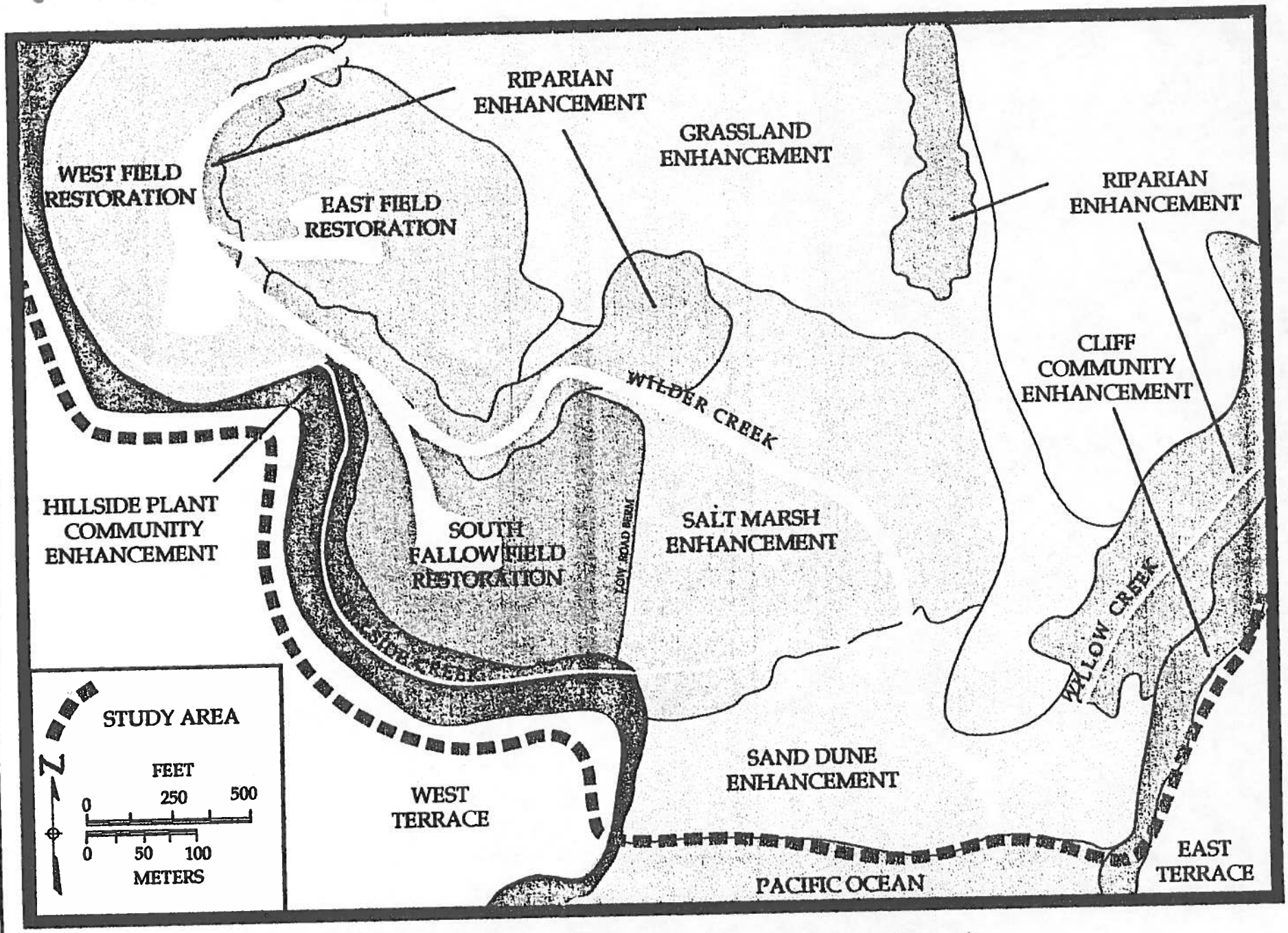
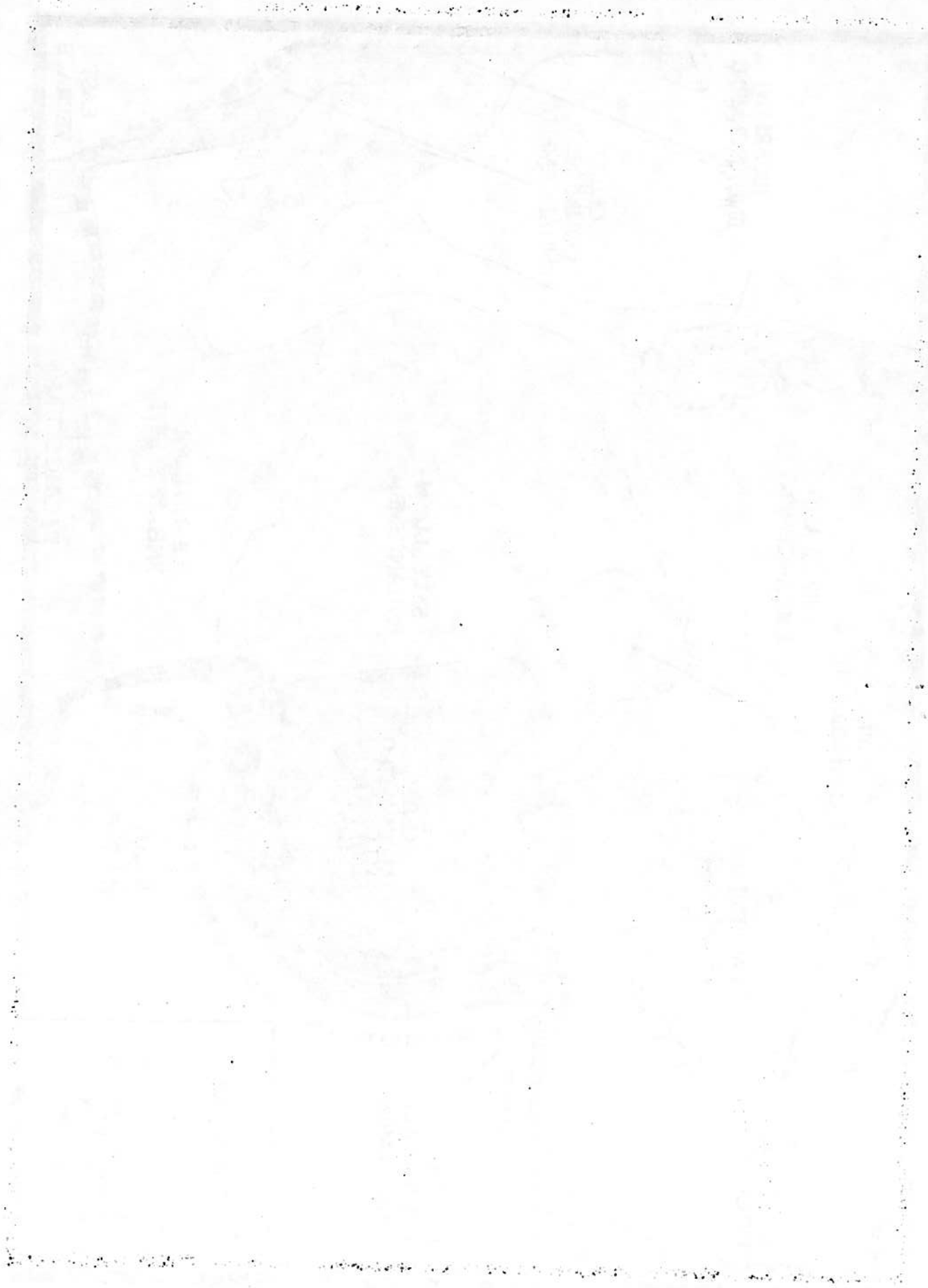



FIGURE 15: Wilder Study Area showing restoration areas and proposed creek channels.



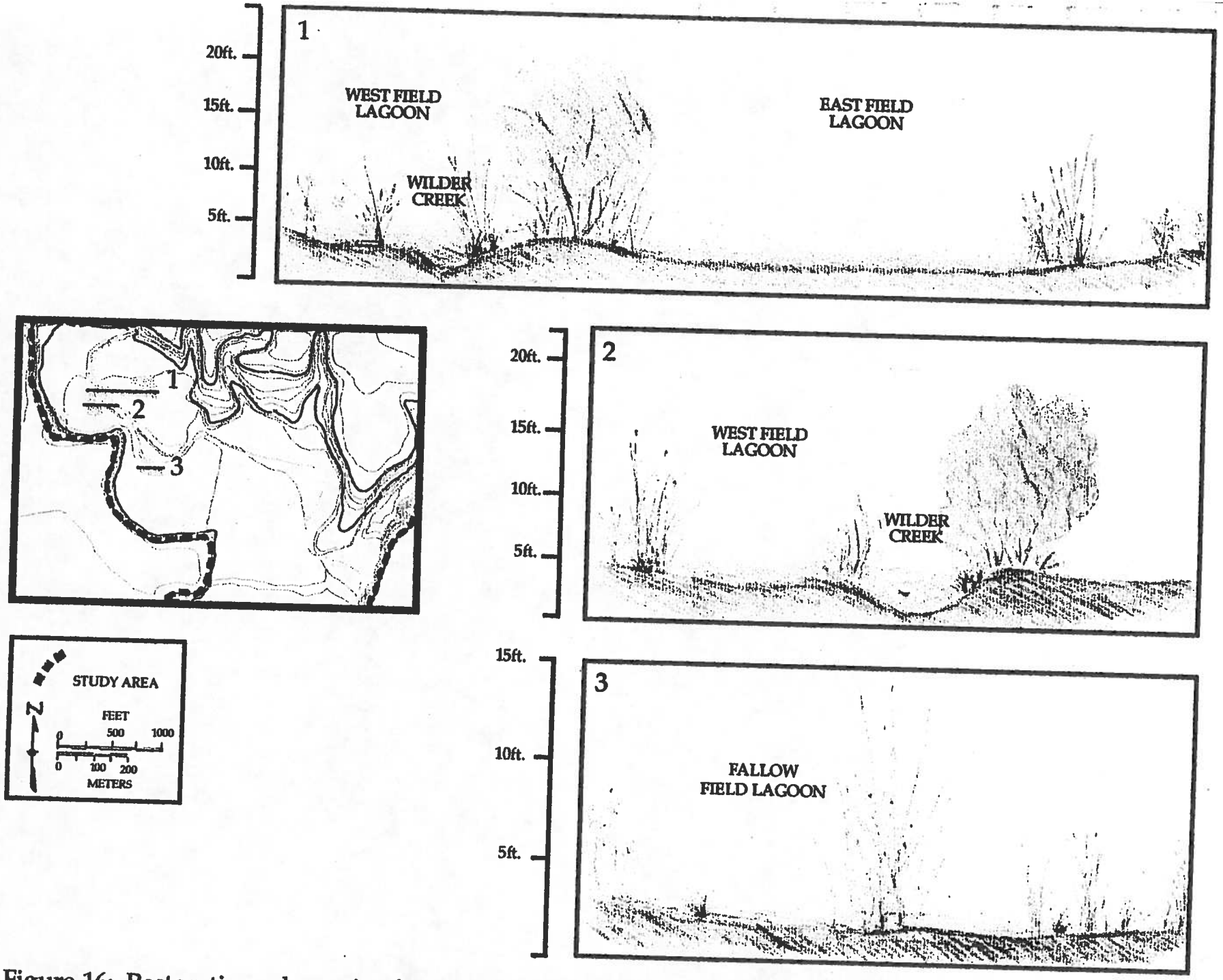
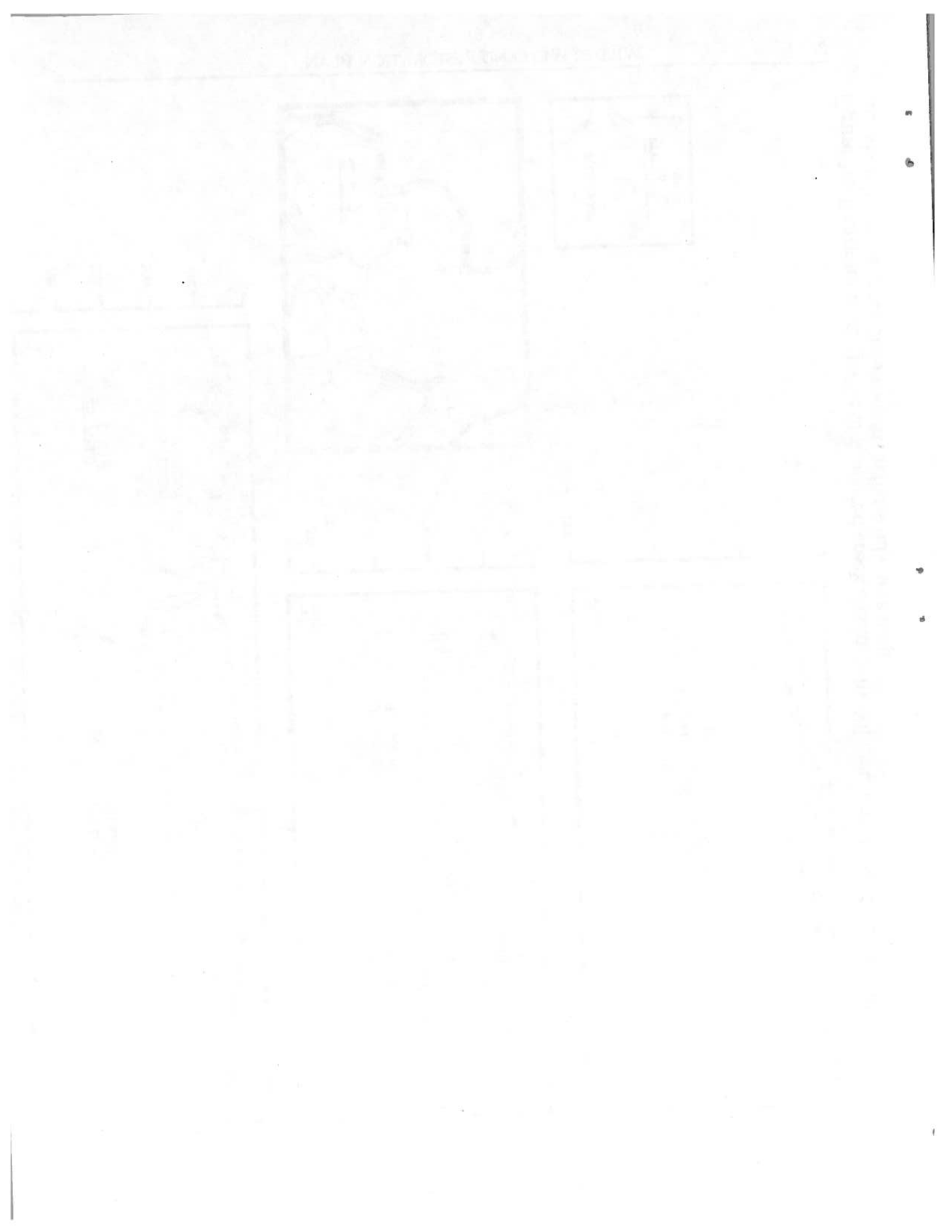



Figure 16: Restoration schematic of proposed creek channels in Wilder Study Area. Cross sections views are taken from the three lines shown on the study area map.



2/3 as salty as sea water (see November salinity at stations 5 and 6 in Figure 6: Table 1). Brackish water is usually restricted to the creek mouth and lagoon, where the dominant vegetation is pickleweed, salt grass and other salt tolerant marsh plants. The water depth of the creek is rarely over one meter during non-rainy seasons, and then only in deeper pools behind the wooden dam (station 2) and near the lagoon (station 5). Most of the wider lagoon at the creek mouth is covered with less than 0.5 meters of water (station 6). During winter rains, the creek depth is over one meter along most of the coarse and is over 2 meters at the deepest pools, where water flow is still high (Table 1).

Since the creek channel was ditched and diked, like so many rivers and creeks for flood control and wetland reclamation (Gordon 1987), the flow of water through the system is not natural. The present system encourages rapid flow from the system and little water reaches the adjacent flat areas, which were former wetlands. Under past natural conditions, the creek wandered from its present confined course into the adjacent wetland flats, especially during periods of heavy rains. In addition, the historical watershed was much more heavily vegetated providing large inputs of woody plant debris to the creek which accumulated here and there causing the creek coarse to change and certainly to flow into the adjacent wetlands at much higher frequencies than it did since the presence of agriculture.

The most serious water quality problems in local and regional rivers, creeks and ponds are low oxygen or anoxia combined with the production of ammonia. These conditions were not observed in Wilder Creek during several years of observations, despite the very low water flows related to the regional drought. Occasional spills of agricultural chemicals cause major fish and other animal kills in nearby systems (e.g., Pescadero wetlands), but have not been observed at Wilder Creek. The most troublesome nutrients are nitrates from agricultural fertilizers, and in the past from cattle feces. However, even at the lowest water levels with high inputs of drainage water from farm fields, nutrient levels were not high. All of the water quality problems are reduced by higher water flows, restoration of the adjacent agricultural fields to wetland, and return of natural drainage patterns in the adjacent marsh flats. Higher rain fall and creek flows are expected if the present drought cycle follows past patterns of about 30 years of wet and dry years. If so, we are near the end of ten years of lowest rain fall expected in the wet/dry cycle. The present drought started as early as 1984 after the heavy rains and coastal storms in the winter of 1982-83.

The main flow into the wetland comes from Wilder Creek, but the other smaller drainages also contribute to the marsh and maintain riparian vegetation along their courses (Figures 3 and 4). The eastern Willow Creek runs after a good rain but then only for a short while (Rinaldi, pers. comm.). The Hillside Creek is natural, not man-made, although channelized (Colombini, pers. comm.). In addition to local runoff, a spring near the upper end of the cliff provides water that may help maintain small ponds in this ditch (Engelsman, pers. comm.).

### 3.3.4 Erosion and Sedimentation

The most significant erosion problems in the ranch are from the coastal cliffs where landslides are common. Cliff erosion has little impact on the Wilder Creek wetlands. There are other erosion problems in the upper park where cattle grazing was more intense: this erosion also has little impact on Wilder Creek, at least the lower section flowing into the coastal marsh. The most important erosion problems around the wetland come from erosion of bare agricultural grounds and roads. This erosion leads to local inputs of sediment to the creek and creek edge and more often to the marsh flats which are presently in farm land use. The local erosion problems can be easily overcome with plant buffers along roads and at field edges (discussed in the Restoration Plan). Sedimentation has undoubtedly increased in the lower marsh because of the reduction of tidal input to the system and the general decrease in wetland area caused by ditching and diking the creek. There is no information on historical increases in sedimentation to the wetland caused by logging and cattle grazing in the upper watershed. On the other hand, vertical cores from the lower marsh showed no obvious recent changes in sedimentation as indicated by lenses of deposition and other depositional features such as grain size or peat development.

## 3.4 PRESENT BIOLOGICAL COMMUNITIES

### 3.4.1 Animals

The restoration of natural ecosystems at Wilder Wetland focuses primarily on plant revegetation, but this process will profoundly impact animal populations which also define the ecosystems and are equally and sometimes more important to restore and conserve. The large number and diversity of animals at Wilder Wetland is remarkable and reassuring. Over three hundred and forty vertebrate species occur throughout the wetland, including about 250 species of birds, 56 mammals, 19 reptiles, 13 amphibians and 3 or 4 freshwater or anadromous fish. Invertebrates have not been well documented. In addition to Wilder's importance to a large number of species, it hosts or plays some role in the support of a group of highly significant animals. Fifty-nine species at Wilder are listed by the federal or state to be endangered, threatened, rare, candidate, or otherwise of special concern. The majority of those animals, two thirds, are birds. Since work on this plan began, one animal at Wilder has been added to the list: the western snowy plover was declared threatened in March 1993.

#### 3.4.1.1 Methods and Materials

The major field work for the biological assessment of Wilder Wetland was conducted during 1991 and 1992. Vertebrate data collection was mostly qualitative- the presence and activity of animals were noted, but not systematically counted. Mammal presence was noted from scat, trails and burrows, and nests as well as direct visual observations. Observations were augmented by live-trapping small mammals. Birds and herptiles (reptiles and amphibians) were visually observed. Fish were not sampled because of the very low water levels in the creek. There was enough water to harbor aquatic invertebrates which were sampled semi-quantitatively by making replicate sweeps along a 1 m swath with a net having a mouth opening of 0.0075 sq. m and mesh size of 0.5 mm. Aquatic subhabitats were defined and sampled according to depth,

distance from bank and amount and kind of vegetation. Intertidal beach invertebrates were sampled qualitatively and also assessed based on extensive previous qualitative and quantitative samples taken from Wilder Ranch beaches and similar beaches along the central California coast.

Past reports and species lists from the area were drawn upon and their results verified and used to guide field observations. Accounts of local and interested observers were sought and incorporated with other observations. Previous residents of the Wilder Ranch, Park staff, and observers from the Santa Cruz Bird Club and Point Reyes Bird Observatory provided historical and current information through interviews and field visits.

#### 3.4.1.2 Mammals

##### 3.4.1.2.1 Terrestrial Mammals

The terrestrial habitats around the wetland are virtually contiguous with the same habitats to the east, interrupted only by Highway One. Although the highway presents a barrier to traveling animals, particularly during daylight, it is traversed. Open grassland, oak woodland, and riparian habitats conduct animals into similar or adjacent areas around the wetland. Consequently, the pool of animal species from the Santa Cruz mountains are potential visitors to Wilder Park, including the wetlands and its surrounding hillsides. Table 2 presents the list of 56 mammal species and their habitat types compiled for the Wilder Park by Schaub (1980). Many of the species listed would not find suitable habitat within the wetland. The wetland area is relatively small and most or all of the large-sized species would be only transient visitors. It is significant that the red fox was not included by Schaub (1980). Since his report, this species has been sighted within the park.

##### 3.4.1.2.2 Large mammals

Most of the large species in Table 2 use the wetlands as rare or occasional visitors without causing problems. Mountain lion were sighted by Mr. Wilder in the 1950's. They were not a threat to cattle in the area probably because of sufficient deer prey in the uplands (Engelsman, personal communication). There is a small deer herd of possibly 6 to 8 individuals living in the area upon which mountain lions could prey. Raccoons, gray foxes, and bobcats also forage occasionally in the wetland system.

A few species pose significant potential problems. Coyotes were abundant and were hunted in the 1920's (Rinaldi, personal communication). They are mobile predators, bold and disruptive and their movements and activities should be monitored. However, they could provide the benefit of controlling other smaller predators especially red foxes. They have been observed around Wilder Ranch (Bloom, personal communication), including the marsh (George, personal communication). Red foxes were illegally introduced into the Hollister area a couple of decades ago. The population has expanded throughout the Monterey Bay area; and in the last decade has caused severe problems as predators on bird and small mammals. Red foxes have apparently decimated the Clapper Rail population in south San Francisco Bay and Elkhorn Slough. They clearly destroy snowy plover nests at an alarming rate. Red foxes were not reported from Wilder Ranch by Rausch (1980), but have since been sighted and constitute a serious potential threat to ground nesting birds (Al Bloom, personal

**Table 2.** Checklist of resident or visitor mammals observed or expected to be found within Wilder State Park (modified from Schaub, 1980).

| | |
|---|---|
| **MARSUPIALS** | |
| Oppossums (Didelphidae) | |
| Opossum | *Didelphis marsupialis* |
| **INSECTIVORES** | |
| Shrews (Soricidae ) | |
| Ornate Shrew | *Sorex ornatus* |
| Trowbridge Shrew | *Sorex trowbridgei* |
| Vagrant Shrew | *Sorex vagrans* |
| Moles (Talpidae) | |
| Shrew Mole | *Neurotrichus gibbsi* |
| Townshend Mole | *Scapanus townsendi* |
| California Mole | *Scapanus latimanus* |
| **BATS** | |
| Evening bats (Vespertilionidae) | |
| Pallid Bat | *Antrozous pallidus* |
| Big Brown Bat | *Eptesicus fuscus* |
| Red Bat | *Lasiurus borealis* |
| Hoary Bat | *Lasiurus cinereus* |
| Western Big-eared Bat | *Plecotus townsendi* |
| Western Pipestrelle | *Pipistrellus hesperus* |
| California Myotis | *Myotis californica* |
| Long-eared Myotis | *Myotis evotis* |
| Little Brown Myotis | *Myotis lucifugus* |
| Fringed Myotis | *Myotis thysanodes* |
| Long-legged Myotis | *Myotis volans* |
| Yuma Myotis | *Myotis yumanensis* |
| Free-tailed Bats (Molossidae) | |
| Brazilian Free-tailed Bat | *Tadarida brasiliensis* |
| **CARNIVORES** | |
| Weasels (Mustelidae ) | |
| Sea Otter | *Enhydra lutris* |
| Longtail Weasel | *Mustela frenata* |
| Striped Skunk | *Mephitis mephitis* |
| Spotted Skunk | *Spilogale putorius* |
| Badger | *Taxidea taxus* |
| Racoons (Procyonidae) | |
| Ringtail | *Bassariscus astutus* |
| Raccoon | *Procyon lotor* |
| Dogs (Canidae) | |
| Coyote | *Canis latrans* |
| Gray Fox | *Urocyon cinereoargenteus* |
| Red Fox | *Vulpes fulva* |

**Table 2. (continued) Checklist of resident or visitor mammals observed or expected to be found within Wilder State Park (modified from Schaub, 1980).**

| | |
|---|---|
| Cats (Felidae) | |
| Mountain Lion | *Felis concolor* |
| Bobcat | *Lynx rufus* |
| **PINNIPEDS** | |
| Seals (Phocidae ) | |
| Harbor Seal | *Phoca vitulina* |
| Sea lions (Otariidae) | |
| California Sea Lion | *Zalophus californianus* |
| **RODENTS** | |
| Squirrels (Sciuridae) | |
| California Ground Squirrel | *Eutamias merriami* |
| Merriam Chipmunk | *Otospermophilus beecheyi* |
| Western Gray Squirrel | *Sciurus griseus* |
| Pocket gophers (Geomyidae) | |
| Pocket Gopher | *Thomomys bottae* |
| Pocket mice (Heteromyidae) | |
| Pacific kangaroo rat | *Dipodomys agilisd* |
| Santa Cruz kangaroo rat | *Dipodomys venustus* |
| California pocket mouse | *Perognathus californicus* |
| Native rats and mice (Cricetidae) | |
| Western Harvest Mouse | *Reithrodontomys megalotis* |
| California Mouse | *Peromyscus californicus* |
| Deer Mouse | *Peromyscus maniculata* |
| Piñon Mouse | *Peromyscus truei* |
| Brush Mouse | *Peromyscus boylii* |
| Dusky-footed Wood Rat | *Neotoma fuscipes* |
| California Vole | *Microtus californicus* |
| Muskrat | *Ondatra zibethica* |
| Old world rats and mice (Muridae) | |
| House Mouse | *Mus musculus* |
| Norway Rat | *Rattus norvegicus* |
| Black Rat | *Rattus rattus* |
| **HARES and RABBITS** | |
| Hares and Rabbits (Leporidae) | |
| Blacktail Jackrabbit | *Lepus californicus* |
| Audubon Cottontail | *Sylvilagus audubonii* |
| Brush Rabbit | *Sylvilagus bachmani* |
| **UNGULATES** | |
| Deer (Cervidae) | |
| Blacktail Deer | *Odocoileus hemionus* |

**Table 3:** List of bird species observed at Wilder State Park south of Highway One. (modified from Suddjian 1990).

Abundance code: **c**=common (>200 birds), usually present in large numbers; **f**=fairly common (20 to 200), usually present in moderate numbers; **u**=uncommon (5 to 20), usually present in small numbers; **r**=rare (1 to 5), of regular occurrence; **o**=occasional (5 or fewer records in last 5 years)

notes: **n**=nested since 1980, **d**=dead on beach, **m**=marine, only on ocean, **?** = probably present but sighting not recorded as confirmed. (number of records in parentheses)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| LOONS (Gaviidae) | | | | | |
| Arctic Loon | c | r | c | c | m |
| Common Loon | f | r | f | f | m |
| Red-throated Loon | f | r | f | f | m |
| Yellow-billed Loon | | | | | r,m |
| GREBES (Podicipedidae) | | | | | |
| Eared Grebe | u | u | u | u | m |
| Horned Grebe | u | u | u | u | m |
| Pied-billed Grebe | r | r | r | r | n |
| Red-necked Grebe | | | | r | m |
| Western Grebe | f | r | f | c | m |
| Clark's Grebe | u | r | u | u | m |
| ALBATROSSES (Diomedeidae) | | | | | |
| Black-footed Albatross | | d | | | (1),m |
| SHEARWATERS (Procellaridae) | | | | | |
| Northern Fulmar | | d | | | m |
| Pink-footed Shearwater | | | o | | m |
| Black-vented Shearwater | | | r | | m |
| Sooty Shearwater | u | u | u | o | m |
| PETRELS (Hydrobatidae) | | | | | |
| Fork-tailed Petrel | | | | | ?,m |
| PELICANS (Pelicanidae) | | | | | |
| American White Pelican | | o | | | (1) |
| Brown Pelican | u | c | c | f | |
| CORMORANTS (Phalacrocoracidae) | | | | | |
| Brandt's Cormorant | c | f | c | c | n? |
| Double-crested Cormorant | u | r | u | u | m |
| Pelagic Cormorant | f | f | f | f | n |
| FRIGATEBIRDS (Fregatidae) | | | | | |
| Magnificent Frigatebird | | o | | | (1),m |
| HERONS (Ardeidae) | | | | | |
| American Bittern | o | | r | r | |
| Black-crowned Night Heron | r | o | r | r | n? |
| Cattle Egret | | | o | r | |
| Great Blue Heron | r | r | r | r | |

Table 3 (continued)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| Great Egret | r | o | r | r | |
| Green-backed Heron | r | r | r | r | |
| Snowy Egret | u | r | u | u | |
| WATERFOWL (Anatidae) | | | | | |
| Tundra Swan | | | o | | (1) |
| Canada Goose | | | r | r | |
| Brant | f | | r | | m |
| Greater White-fronted Goose | | | o | o | (2) |
| Snow Goose | | | o | | (1) |
| Mallard | f | u | f | f | n |
| Gadwall | r | | u | r | |
| Northern Pintail | r | | r | u | |
| Green-winged Teal | r | | r | f | |
| Cinnamon Teal | u | | u | r | |
| American Wigeon | r | | r | f | |
| Northern Shoveler | r | | r | u | |
| Wood Duck | | | r | r | |
| Ring-necked Duck | | | | r | |
| Canvasback | o | | o | r | |
| Lesser Scaup | r | | | r | |
| Common Goldeneye | r | | r | r | |
| Bufflehead | r | | r | r | |
| Harlequin Duck | | | | o | m,(2) |
| Surf Scoter | c | u | c | c | m |
| Black Scoter | o | | o | r | m |
| White-winged Scoter | u | | u | u | m |
| Ruddy Duck | r | | r | u | |
| Red-breasted Merganser | u | | u | u | m |
| VULTURES (Cathartidae) | | | | | |
| Turley Vulture | r | u | r | | |
| HAWKS (Accipitridae) | | | | | |
| Osprey | r | | r | o | |
| Black-shouldered Kite | r | r | u | u | n |
| Sharp-shinned Hawk | u | o | u | u | |
| Cooper's Hawk | u | | u | u | |
| Red-tailed Hawk | u | u | u | u | n |
| Red-shouldered Hawk | r | | u | u | |
| Rough-legged Hawk | | | r | r | |
| Ferruginous Hawk | | | r | r | |
| Golden Eagle | o | | r | r | |
| Bald Eagle | | | | o | (1) |
| Northern Harrier | r | r | u | u | n |
| FALCONS (Falconidae) | | | | | |
| Peregrine Falcon | r | o | r | r | |
| Merlin | r | | r | r | |
| American Kestrel | u | u | u | u | n |

Table 3 (continued)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| QUAIL (Phasianidae) | | | | | |
| California Quail | f | f | f | f | n |
| Ring-necked pheasant | | | | | ? |
| RAILS (Rallidae) | | | | | |
| Virginia Rail | u | r | u | u | n |
| Sora | u | | u | u | |
| Common Gallinule | | | o | o | (3) |
| American Coot | f | r | u | f | n |
| Black Rail | | | | | ? |
| OYSTERCATHERS (Haematopodidae) | | | | | |
| Black Oystercatcher | r | r | u | u | n |
| STILTS (Recurvirostridae) | | | | | |
| American Avocet | | | | | ? |
| PLOVERS (Charadriidae) | | | | | |
| Semipalmated Plover | u | | u | | |
| Killdeer | f | u | f | f | n |
| Western snowy Plover | f | u | f | f | n |
| Lesser Golden Plover | | | r | | |
| Black-bellied Plover | u | r | f | f | |
| SANDPIPERS (Scolopacidae) | | | | | |
| Marbled Godwit | u | r | f | f | |
| Whimbrel | u | o | u | u | |
| Long-billed Curlew | r | o | r | | |
| Greater Yellowlegs | u | | u | u | |
| Lesser Yellowlegs | | | r | | |
| Solitary Sandpiper | | | o | | |
| Willet | f | r | f | f | |
| Wandering Tattler | u | | u | u | |
| Spotted Sandpiper | r | | r | r | |
| Ruddy Turnstone | u | | u | u | |
| Black Turnstone | f | | f | f | |
| Common Snipe | f | | u | f | |
| Short-billed Dowitcher | r | | r | | |
| Long-billed Dowitcher | r | | r | | |
| Surfbird | u | | r | u | |
| Red Knot | | | o | o | (3) |
| Sanderling | c | | c | c | |
| Western Sandpiper | u | | u | | |
| Least Sandpiper | u | | u | r | |
| Baird's Sandpiper | | | r | | |
| Pectoral Sandpiper | | | r | | |
| Buff-breasted Sandpiper | | | o | | (1) |
| Dunlin | r | | u | | |
| Wilson's Phalarope | u | | r | | |
| Northern Phalarope | u | | u | | |
| Red Phalarope | r | | | r | m |

Table 3 (continued)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| GULLS (Laridae) | | | | | |
| Pomarine Jaeger | u | | u | r | m |
| Parasitic Jaeger | r | | u | | m |
| South Polar Skua | | | o | | m,(1) |
| Glaucous Gull | | | | o | (3) |
| Glaucous-winged Gull | u | r | f | c | |
| Western Gull | c | c | c | c | n |
| Herring Gull | r | | u | u | |
| Thayer's Gull | r | | r | r | |
| California Gull | c | u | c | c | |
| Ring-billed Gull | u | | f | f | |
| Mew Gull | u | | u | c | |
| Bonaparte's Gull | c | o | u | c | |
| Heermann's Gull | u | c | c | f | |
| Black-legged Kittiwake | r | | | r | m |
| Forster's Tern | u | u | r | r | |
| Arctic Tern | | | | | ? |
| Common Tern | r | | r | | |
| Artic Tern | | | | | m,? |
| Least Tern | o | | | | (1) |
| Elegant Tern | r | f | f | | |
| Caspian Tern | u | u | r | | |
| AUKS, MURRES (Alcidae) | | | | | |
| Common Murre | f | f | f | f | m |
| Pigeon Guillemot | f | f | r | | n |
| Marbled Murrelet | u | u | u | r | m |
| Ancient Murrelet | o | | o | r | m |
| Xantu's Murrelet | | | | | ? |
| Cassin's Auklet | r | | r | u | m |
| Rhinoceros Auklet | r | | r | u | m |
| Horned Puffin | | | | d | m |
| PIGEONS, DOVES (Columbidae) | | | | | |
| Common Ground Dove | | | | | (1) |
| Band-tailed Pigeon | c | c | f | r | |
| Rock Dove | f | f | f | f | n |
| Mourning Dove | f | f | c | c | n |
| BARN OWLS (Tytonidae) | | | | | |
| Barn Owl | r | ? | r | r | n? |
| OWLS (Strigidae) | | | | | |
| Great Horned Owl | r | r | r | r | n? |
| Burrowing Owl | | | o | o | (4) |
| Short-eared Owl | | | o | r | |
| Long-eared Owl | | | | | (1) |
| NIGHTJARS (Caprimulgidae) | | | | | |
| Common Poorwill | | | | | ? |
| SWIFTS (Apodidae) | | | | | |
| Black Swift | | r | | | n? |

Table 3 (continued)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| Vaux's Swift | u | r | u | | |
| White-throated Swift | o | | | o | (2) |
| HUMMINGBIRDS (Trochilidae) | | | | | |
| Anna's Hummingbird | f | f | f | f | n |
| Rufous Hummingbird | u | r | r | | |
| Allen's Hummingbird | f | u | | | n |
| KINGFISHERS (Alcedinidae) | | | | | |
| Belted Kingfishers | r | r | r | r | |
| WOODPECKERS (Picidae) | | | | | |
| Northern Flicker | f | | f | f | |
| Red-breasted Sapsucker | r | | r | r | |
| Hairy Woodpecker | | | r | r | |
| Downy Woodpecker | u | r | u | u | n |
| Nuttall's Woodpecker | | | | r | |
| FLYCATCHERS (Tyrannidae) | | | | | |
| Tropical Kingbird | | | o | o | (2) |
| Western Kingbird | r | o | r | | |
| Cassin's Kingbird | o | | | | (1) |
| Ash-Throated Flycatcher | r | | r | | |
| Black Phoebe | f | f | f | f | n |
| Say's Phoebe | r | | u | u | |
| Pacific—slope Flycatcher | f | u | f | | n |
| Western Wood-peewee | r | | r | | |
| Willow Flycatcher | o | | r | | |
| Olive-sided Flycatcher | r | | r | | |
| Least? or Hammond's? Flycatcher | | | | (1) | |
| LARKS (Alaudidae) | | | | | |
| Horned Lark | | | | | ? |
| SWALLOWS (Hirundinidae) | | | | | |
| Violet-green Swallow | f | f | r | o | n |
| Tree Swallow | u | u | r | o | n? |
| Rough-winged Swallow | u | u | | | n? |
| Barn Swallow | f | c | f | | n |
| Cliff Swallow | c | c | r | | n |
| Purple Martin | o | | | | (1) |
| Bank Swallow | | | | | ? |
| JAYS, CROWS (Corvidae) | | | | | |
| California Jay | f | f | f | f | n |
| Steller's Jay | r | | r | r | |
| American Crow | o | | o | | (5) |
| Common Raven | r | r | r | r | |
| CHICKADEES (Paridae) | | | | | |
| Chestnut-backed Chickadee | f | f | f | f | n |
| BUSHTITS (Aegithalidae) | | | | | |
| Bushtit | c | c | c | c | n |

Table 3 (continued)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| CREEPERS(Certhidae) | | | | | |
| Brown Creeper | | r | r | | |
| WRENS (Troglodytidae) | | | | | |
| House Wren | | | r | o | |
| Winter Wren | | | r | r | |
| Bewick's Wren | f | f | f | f | n |
| Marsh Wren | u | u | u | u | n |
| OLD WORLD WARBLERS (Muscicapidae) | | | | | |
| Ruby-crowned Kinglet | u | | f | f | |
| Golden-crowned Kinglet | | | r | r | |
| Blue-gray Gnatcatcher | | | r | r | |
| American Robin | f | u | f | c | n |
| Varied Thrush | r | | r | r | |
| Hermit Thrush | u | | f | f | |
| Swainson's Thrush | f | f | r | | n |
| Western Bluebird | r | | r | u | |
| Wrentit | f | f | f | f | n |
| MOCKINGBIRDS (Mimmidae) | | | | | |
| Northern Mockingbird | r | r | r | r | n |
| WAGTAILS, PIPITS (Motacillidae) | | | | | |
| Yellow Wagtail | | | o | | (1) |
| American Pipit | u | | f | c | |
| Water Pipit | | | | | ? |
| WAXWINGS (Bombycillidae) | | | | | |
| Cedar Waxwing | u | | u | f | |
| SHRIKES (Laniidae) | | | | | |
| Loggerhead Shrike | r | | r | u | |
| STARLINGS (Sturnidae) | | | | | |
| European Starling | f | f | c | c | n |
| VIREOS (Vireonidae) | | | | | |
| Hutton's Vireo | r | r | r | r | n |
| Solitary Vireo | o | | o | | (2) |
| Warbling Vireo | u | u | u | | n |
| WARBLERS, etc. (Emberizidae) | | | | | |
| Orange-crowned Warbler | f | r | f | r | n |
| Nashville Warbler | r | | r | | |
| Yellow Warbler | u | r | f | | n |
| Yellow-rumped Warbler | u | | c | c | |
| Black-throated Gray Warbler | r | | r | | |
| Townshend's Warbler | r | | f | f | |
| Tennessee Warbler | | | | | (1) |
| Common Yellowthroat | f | f | f | f | n |
| Wilson's Warbler | f | f | f | o | |
| Hermit Warbler | r | | r | | |
| Palm Warbler | | | r | | |

Table 3 (continued)

| | SEASON | | | | |
|---|---|---|---|---|---|
| | Sp | Sm | F | W | notes |
| MacGillivray's Warbler | r | | r | | |
| American Redstart | | | o | | (1) |
| Western Tanager | r | | r | | |
| Black-headed Grosbeak | u | u | r | | n |
| Lazuli Bunting | r | | r | | |
| Rufous-sided Towhee | u | u | u | u | n |
| California Towhee | f | f | f | f | n |
| Savannah Sparrow | u | u | c | c | n |
| White-throated Sparrow | o | | o | o | (2) |
| White-crowned Sparrow | c | u | c | c | n |
| Golden-crowned Sparrow | c | | c | c | |
| Fox Sparrow | r | | f | f | |
| Lincoln's Sparrow | r | | f | f | |
| Swamp Sparrow | | | o | o | (3) |
| Song Sparrow | c | c | c | c | n |
| Lark Sparrow | o | | o | | (2) |
| Clay-colored Sparrow | | | o | | (1) |
| Chipping Sparrow | o | | r | | |
| Dark-eyed Junco | | | r | u | |
| Bobolink | | | o | | (1) |
| Western Meadowlark | u | | c | c | |
| Yellow-headed Blackbird | o | | | | (1) |
| Red-winged Blackbird | c | c | c | c | n |
| Tricolored Blackbird | | | u | u | |
| Brewer's Blackbird | f | f | c | c | n |
| Brown-headed Cowbird | f | f | r | o | n |
| Northern Oriole | r | r | | | n |
| FINCHES (Fringillidae) | | | | | |
| Purple Finch | u | u | u | u | n |
| House Finch | c | c | c | c | n |
| Pine Siskin | u | r | f | f | n? |
| American Goldfinch | c | c | c | c | n |
| Lesser Goldfinch | u | u | u | u | n |
| Lawrence's Goldfinch | o | | o | | (2) |
| WEAVER FINCHES (Passeridae) | | | | | |
| House Sparrow | u | u | u | u | n |

**Table 4:** Checklist of reptiles of Wilder Ranch State Park. Only a few species were confirmed to be present by direct observations (X). However all are potential residents of the park including the wetland and its immediate surroundings. (modified from Schaub 1980).

Habitat preference: C = coastal scrub/chaparral, G = grassland, F = freshwater marsh, R = riparian woodland, S = stream, D = coastal sand dune.

| | Habitat | Observed |
|---|---|---|
| WATER TURTLES (Testudinidae) | | |
| Southwestern pond turtle (*Clemmys marmotata pallida*) | S, F, | X |
| IGUANAS (Iguanidae) | | |
| Northwestern fence lizard (*Sceloporus occidentalis occidentalis*) | F, G, C | X |
| California horned lizard (*Phrynosoma coronatum frontale*) | C | |
| SKINKS (Scinidae) | | |
| Western skink (*Eumeces skiltonianus skiltonianus*) | C | |
| ALLIGATOR LIZARDS (Anguidae) | | |
| California alligator lizard (*Gerrhonotus multicarinatus multicarinatus*) | C, G, | X |
| San Francisco alligator lizard (*Gerrhonotus coeruleus coeruleus*) | C | |
| LEGLESS LIZARDS (Annielidae) | | |
| Silvery legless lizard (*Aniella pulchra pulchra* ) | R, D | |
| BOAS (Boidae) | | |
| Pacific rubber boa (*Charina botae botae* ) | R, C | |
| COLUBRIDS (Colubridae) | | |
| Pacific ringneck snake (*Diadophis punctatus amabalis*) | G, R | |
| Sharp-tailed snake (*Contia tenuis*) | F, G, R | |
| Western yellow-bellied racer (*Coluber constrictor mormon*) | G, R | X |
| Striped racer (*Maticophis lateralis*) | C, R | |
| Pacific gopher snake (*Pituophis melanoleucus catenifer*) | C, G, R, F | X |
| California kingsnake (*Lampropeltis getulus californiae*) | C, G | |
| Coast mountain kingsnake (*Lampropeltis zonata multifasciata*) | R | |
| Red-sided garter snake (*Thamnophis sirtalis infernalis*) | R | |
| Coast garter snake (*Thamnophis elegans terrestris*) | G, C | X |
| Western aquatic garter snake (*Thamnophis couchi*) | F, R, S | X |
| VIPERS (Viperidae) | | |
| Northern Pacific rattlesnake (*Crotalus viridis oreganus*) | G, C, R | X |

**Table 5:** Checklist of amphibians of Wilder State Park. Few observations were made to confirm the presence of these species (modified from Schaub 1980).

Habitat preference: G—grassland, F = freshwater marsh, R = riparian woodland, S = stream.

| | |
|---|---|
| MOLE SALAMANDERS (Amystomidae) | |
| California tiger salamander (*Ambystoma tigrinum californiense*) | G, S, F, |
| Pacific giant salamander (*Dicamptodon ensatus*) | R, S, |
| NEWTS (Salamandridae) | |
| Coast Range newt (*Taricha torosa torosa*) | R, S, |
| Northern rough-skinned newt (*Taricha granulosa* ) | R, S |
| LUNGLESS SALAMANDERS (Plethodontidae) | |
| Ensatina (*Ensatina eschscholtzi*) | R, S |
| California slender salamander (*Batrachoseps attenuatus*) | R |
| Santa Cruz black salamander (*Aneides flavipunctatus niger*) | S, R, F |
| Arboreal salamander (*Aneides lugubris*) | R, F |
| TOADS (Bufonidae) | |
| California toad (*Bufo borias halophilus*) | G, F, R |
| TREEFROGS (Hyalidae) | |
| Pacific treefrog (*Hyla regilla*) | F, S |
| TRUE FROGS (Ranidae) | |
| California red-legged frog (*Rana aurora draytoni*) | F, S |
| Foothill yellow-legged frog (*Rana boylei*) | F, S |
| Bullfrog (*Rana catesbeiana*) | F, S |

**Table 6:** Invertebrates identified from semiquantitative collections from four different habitats of Wilder Creek. Upper stream was north of Highway One, the other 3 habitats were in the wetland. Number of animals collected represented by: x =1-9, xx = 10-99, xxx = >100.

| INVERTEBRATES | HABITAT TYPE | | | |
|---|---|---|---|---|
| | upper stream | cattails | willow roots | lagoon |
| Flatworm (Planariidae) | xx | - | - | - |
| Worm (Oligochaeta) | x | x | - | - |
| Copepoda | x | x | xx | - |
| Water fleas (Cladocera) | x | - | x | - |
| *Hyallela azteca* (Amphipoda) | xxx | - | x | - |
| Water mite (Hydracarina) | x | - | xx | - |
| Springtail (Poduridae) | - | x | - | xx |
| Mayfly (Baetidae) | xxx | x | - | - |
| Dragonfly (Gomphidae) | x | - | - | - |
| Dragonfly (Libellulidae) | x | - | - | - |
| Damselfly (Coenagrionidae) | xx | x | - | - |
| Water boatman (Corixidae) | x | x | x | xxx |
| Backswimmer (Notonectidae) | xx | x | - | - |
| Giant water bug (Belastomatidae) | x | - | - | - |
| Riffle bug (Vellidae) | x | x | - | - |
| Velvet water bug (Hebridae) | xx | - | - | - |
| Bug (Hemiptera) | x | x | - | - |
| Caddis fly ((Hydroptilidae) | xx | - | - | - |
| Predaceous water beetle (Dytiscidae) | x | x | - | - |
| Minute moss beetle (Hydraenidae) | - | x | - | - |
| Trout stream beetle (Amphizoidae) | x | - | - | - |
| Midge (Chironomidae) | x | x | - | xxx |
| Mosquito (Culicidae) | x | - | - | - |
| Snail (Physidae) | - | xx | x | - |
| Snail (Planorbidae) | x | - | x | - |
| Clam (Pelecypoda) | x | x | - | - |

**Table 7:** Vascular plants found in the Wilder Ranch wetlands and immediate surroundings.

Names: from Hickman (1993), orThomas (1961) where no common name in Hickman.
Origin: N=Native, I=Introduced.
Habitat: where most of the individuals of the species are typically found: **b**=beach and dune, **c**=cliff, **d**=disturbed, mainly field and road edges, **g**=grasslands, **h**=hillslopes, **m**=marsh, **r**=riparian (from Trumbly 1984; Randall Morgan personal communication; field observations).

| Species | Common Name | Family | Org | Hab |
|---|---|---|---|---|
| *Abronia latifolia* | Yellow Sand Verbena | Nyctaginaceae | N | b |
| *Abronia maritima* | Pink Sand Verbena | Nyctaginaceae | N | b |
| *Acaena pinnatifida* | California acaena | Rosaceae | N | g |
| *Acer macrophyllum* | Big-leaved Maple | Aceraceae | N | r |
| *Achillea millefolium* | Common Yarrow | Asteraceae | N | g,d |
| *Aesculus californica* | California Buckeye | Hippocastanaceae | N | h |
| *Alnus rubra* | Red Alder | Betulaceae | N | r |
| *Amaranthus retroflexus* | Green Amaranth | Amaranthaceae | I | d |
| *Ambrosia chamissonis* | Beach-bur | Asteraceae | N | b |
| *Ammophila arenaria* | European Beachgrass | Poaceae | I | b |
| *Amsinckia menziesii intermedia* | Fiddleneck | Boraginaceae | N | b |
| *Anagallis arvensis* | Scarlet Pimpernel | Primulaceae | N | d,h |
| *Armeria maritima* | Sea Pink | Plumbaginaceae | N | b |
| *Artemisia californica* | California Sagebrush | Asteraceae | N | h |
| *Artemisia douglasiana* | Mugwort | Asteraceae | N | h,b,d |
| *Arundo donax* | Giant Reed | Poaceae | I | b |
| *Aster chilensis* | California Aster | Asteraceae | N | h |
| *Aster subulata* | Slim Aster | Asteraceae | N | b,m |
| *Athyrium felix-femina* | Common Lady Fern | Dryopteridaeceae | N | r |
| *Atriplex leucophylla* | Beach Salt Bush | Chenopodiaceae | N | b |
| *Atriplex patula* | Spear Oracle | Chenopodiaceae | N | m |
| *Avena barbata* | Slender Wild Oat | Poaceae | I | h,b,d |
| *Avena fatua* | Wild Oat | Poaceae | I | d,g |
| *Bromus carinatus marinus* | Seaside Brome | Poaceae | N | d,m |
| *Baccharis douglasii* | Marsh Baccharis | Asteraceae | N | m |
| *Baccharis pilularis* | Coyote Brush | Asteraceae | N | all |
| *Brassica oleracea* | Brussels Sprouts | Brassicaceae | I | d |
| *Brassica rapa* | Field Mustard | Brassicaceae | I | d |
| *Briza minor* | Little Quaking Grass | Poaceae | I | g |
| *Brodiaea terrestris* | Dwarf Brodiaea | Liliaceae | N | g |
| *Bromus carinatus* | California Brome | Poaceae | N | d |
| *Bromus catharticus* | Rescue Grass | Poaceae | I | d |
| *Bromus diandrus* | Ripgut Grass | Poaceae | I | d,b |
| *Bromus hordeaceus* | Soft Chess | Poaceae | I | h |
| *Cakile maritima* | Sea Rocket | Brassicaceae | I | b |
| *Calystegia soldanella* | Beach Morning-glory | Convolvulaceae | N | b |
| *Capsella bursa-pastoris* | Shepard's Purse | Brassicaceae | I | d |
| *Carex obnupta* | Slough Sedge | Cyperaceae | N | m,d |
| *Carex spp.* | Sedge | Cyperaceae | N | m,h |
| *Carpobrotus edulis* | Hottentot Fig | Aizoaceae | I | d |

**Table 7:** (continued)

Origin: N=Native, I=Introduced.
Habitat: b=beach and dune, c=cliff, d=disturbed, mainly field and road edges, g=grasslands, h=hillslopes, m=marsh, r=riparian (from Trumbly 1984; Randall Morgan personal communication; field observations).

| Species | Common Name | Family | Org | Hab |
|---|---|---|---|---|
| *Chamissonia cheiranthifolia* | Beach Evening Primrose | Onagraceae | N | b |
| *Chamissonia ovata* | Sun Cup | Onagraceae | N | g |
| *Chamonilla suaveolens* | Pineappleweed | Asteraceae | I | d |
| *Chenopodium album* | Lamb's Quarter | Chenopodiaceae | I | d |
| *Chenopodium californicum* | California Goosefoot | Chenopodiaceae | N | m |
| *Chenopodium macrospermum* | Coast Goosefoot | Chenopodiaceae | I | d,m |
| *Chloragalum pomeridianum* | Soap Root | Liliaceae | N | g |
| *Cicuta douglasii* | Water Hemlock | Apiaceae | N | m |
| *Cirsium arvense* | Canada Thistle | Asteracea | I | g,h |
| *Cirsium vulgare* | Bull Thistle | Asteraceae | I | h,d |
| *Claytonia perfoliata* | Miner's Lettuce | Portulacaceae | N | m |
| *Conium maculatum* | Poison Hemlock | Apiaceae | I | all |
| *Conyza canadensis* | Horseweed | Asteraceae | N | d |
| *Cortaderia jubata* | Jubata Grass | Poaceae | I | d |
| *Cotula coronopifolia* | Brass-buttons | Asteraceae | I | m |
| *Cyperus sp.* | Cyperus | Cyperaceae | N | r |
| *Distichlis spicata* | Saltgrass | Poaceae | N | m |
| *Dryopteris arguta* | Coastal Wood Fern | Polypodiaceae | N | h,d |
| *Dudleya farinosa* | Bluff Lettuce | Crassulaceae | N | c |
| *Epilobium brachycarpum* | Panicled Willow Herb | Onagraceae | N | d |
| *Epilobium ciliatum* | Northern Willow Herb | Onagraceae | N | r |
| *Equisetum telmateia* | Giant Horsetail | Equisetaceae | N | d,m |
| *Erigeron glaucus* | Seaside Daisy | Asteraceae | N | h |
| *Eriogonum latifolium* | Coast Buckwheat | Polygonaceae | N | h |
| *Eriophyllum staechadifolium* | Seaside Woolly Sunflower | Asteraceae | N | c |
| *Erodium botrys* | Long-beaked Filaree | Geraniaceae | I | d,g |
| *Erodium cicutarium* | Red-stemmed Filaree | Geraniaceae | I | d,g |
| *Erodium moschatum* | White-stemmed Filaree | Geraniaceae | I | d,g |
| *Eschscholzia californica* | California Poppy | Papaveraceae | N | d,g |
| *Euphorbia lathyris* | Caper Spurge | Euphorbiaceae | I | d |
| *Euthamia occidentalis* | Western Goldenrod | Asteraceae | N | m |
| *Festuca arundinacea* | Alta or Reed Fescue | Poaceae | I | d |
| *Fragaria chiloensis* | Beach Strawberry | Roseaceae | N | b |
| *Gnaphalium luteo-album* | Weedy Cudweed | Asteraceae | I | d |
| *Gnaphalium stramineum* | Cotton Batting Plant | Asteraceae | N | d,m |
| *Heliotropium curassavicum* | Seaside Heliotrope | Boraginaceae | N | d,m |
| *Hordeum murinum leporinum* | Mediterranean Barley | Poaceae | I | d |
| *Hypochaeris radicata* | Hairy Cat's Ear | Asteraceae | I | d |
| *Jaumea carnosa* | Fleshy Jaumea | Asteraceae | N | m |
| *Juncus bufonis* | Toad Rush | Juncaceae | N | d |
| *Juncus leseurii* | Salt Rush | Juncaceae | N | d,m |

**Table 7:** (continued)

Origin: N=Native, I=Introduced.
Habitat: b=beach and dune, c=cliff, d=disturbed, mainly field and road edges, g=grasslands, h=hillslopes, m=marsh, r=riparian (from Trumbly 1984; Randall Morgan personal communication; field observations).

| Species | Common Name | Family | Org | Hab |
|---|---|---|---|---|
| *Juncus patens* | Rush | Juncaceae | N | g,m |
| *Lathyrus littoralis* | Silky Beach Pea | Fabaceae | N | b |
| *Lavatera cretica* | Cretan Lavatera | Malvaceae | I | d |
| *Lemna sp.* | Duckweed | Lemnaceae | N | r |
| *Lepidium virginicum* | Wild Pepper Grass | Brassicaceae | N | d |
| *Leymus mollis* | American Dune Grass | Poaceae | N | b |
| *Leymus triticoides* | Alkali Rye Grass | Poaceae | N | d,m |
| *Lobularia maritima* | Sweet Alyssum | Brassicaceae | I | d |
| *Lolium multiflorum* | Italian Ryegrass | Poaceae | I | d |
| *Lolium perenne* | Perennial Ryegrass | Poaceae | I | d |
| *Lomatium caruifolium* | Alkali Parsnip | Apiaceae | N | g,h |
| *Lupinus arboreus* | Yellow Bush Lupine | Fabaceae | N | h |
| *Lupinus microcarpus* | Chick Lupine | Fabaceae | N | h |
| *Lupinus nanus* | Sky Lupine | Fabaceae | N | g |
| *Lythrum hyssopifolia* | Hyssop Loosestrife | Lythraceae | I | m |
| *Malva parviflora* | Cheeseweed | Malvaceae | I | d |
| *Marah fabaceus* | California Man-root | Cucurbitaceae | N | h |
| *Medicago polymorpha* | California Bur Clover | Fabaceae | I | d |
| *Melilotus indica* | Sourclover | Fabaceae | I | d |
| *Mimulus guttatus* | Monkey Flower | Scrophulariaceae | N | h |
| *Myosotis latifolia* | Forget-me-not | Boraginaceae | I | d |
| *Nassella pulchra* | Purple Needlegrass | Poaceae | N | g |
| *Oenanthe sarmentosa* | Pacific Oenanthe | Apiaceae | N | m,r |
| *Oxalis pes-caprae* | Bermuda Buttercup | Oxalidaceae | I | d |
| *Parapholis incurva* | Sickle Grass | Poaceae | I | d |
| *Picris echinoides* | Bristly Ox Tongue | Asteraceae | I | m |
| *Plantago coronopus* | Cut-leaved Plantain | Plantaginaceae | I | d |
| *Plantago lanceolata* | English Plantain | Plantaginaceae | I | d,g |
| *Plantago major* | Common Plantain | Plantaginaceae | I | d |
| *Plantago maritima* | Seaside Plantain | Plantaginaceae | N | m |
| *Poa annua* | Annual Bluegrass | Poaceae | I | d |
| *Polygonum arenastrum* | Common Knotweed | Polygonaceae | I | d |
| *Polygonum punctatum* | Water Smartweed | Polygonaceae | N | m,r |
| *Polypodium scouleri* | Leather-leaf Fern | Polypodiaceae | N | c |
| *Polypogon monspeliensis* | Annual Beard Grass | Poaceae | I | d,m |
| *Potamogeton natans* | Floating-leaved Pondweed | Potamogetonaceae | N | m |
| *Potentilla anserina pacifica* | Pacific Silverweed | Rosaceae | N | m,r |
| *Pteridium aguilinum* | Bracken Fern | Dennstaedtiaceae | N | d,g |
| *Quercus agrifolia* | California Live Oak | Fagaceae | N | h |
| *Ranunculus californicus* | California Buttercup | Ranunculaceae | N | h |

**Table 7:** (continued)

Origin: N=Native, I=Introduced.
Habitat: b=beach and dune, c=cliff, d=disturbed, mainly field and road edges, g=grasslands, h=hillslopes, m=marsh, r=riparian (from Trumbly 1984; Randall Morgan personal communication; field observations).

| Species | Common Name | Family | Org | Hab |
|---|---|---|---|---|
| *Ranunculus lobbi* | Lobb's Aquatic Buttercup | Ranunculaceae | N | m |
| *Ranunculus repens* | Creeping Buttercup | Ranunculaceae | I | h |
| *Raphanus sativus* | Radish | Brassicaceae | I | all |
| *Rhamnus californica* | California Coffeeberry | Rhamnaceae | N | c,h |
| *Rhus diversiloba* | Poison Oak | Anacardiaceae | N | h |
| *Rorripa nasturtium-aquaticum* | White Watercress | Brassicaceae | N | m,r |
| *Rosa californica* | California Rose | Rosaceae | N | b |
| *Rubus discolor* | Himalayan Blackberry | Rosaceae | I | h |
| *Rumex acetosella* | Sheep Sorrel | Polygonaceae | I | d |
| *Rumex conglomeratus* | Whorled Dock | Polygonaceae | I | h |
| *Rumex crispus* | Curly Dock | Polygonaceae | I | m |
| *Rumex occidentalis* | Western Dock | Polygonaceae | N | m |
| *Rumex pulcher* | Fiddle Dock | Polygonaceae | I | d |
| *Salicornia virginica* | Pickleweed | Chenopodiaceae | N | m |
| *Salix lasiolepis* | Arroyo Willow | Salicaceae | N | r |
| *Salix lucida lasiandra* | Yellow Willow | Salicaceae | N | r |
| *Sambucus r. racemosa* | Red Elderberry | Caprifoliaceae | N | h,r |
| *Scirpus acutus* | Common Tule | Cyperaceae | N | m |
| *Scirpus americanus* | Three Square | Cyperaceae | N | m |
| *Scirpus californicus* | California Tule | Cyperaceae | N | m |
| *Scirpus robustus* | Prairie Bulrush | Cyperaceae | N | m |
| *Scrophularia californica* | California Figwort | Schrophulariaceae | N | h,r |
| *Senecio mikanoides* | German-Ivy | Asteraceae | I | h |
| *Senecio vulgaris* | Common Groundsel | Asteraceae | I | d |
| *Senicio elegans* | Purple Ragwort | Asteraceae | I | d |
| *Sequoia sempervirens* | Redwood | Taxodiaceae | N | h |
| *Sidalcea malvaeflora* | Checker Mallow | Malvaceae | N | h |
| *Silene gallica* | Common Catchfly | Caryophyllaceae | I | d |
| *Silybum marianum* | Milk Thistle | Asteraceae | I | d,h |
| *Sinapis kaber* | Charlock | Brassicaceae | I | d |
| *Sisyrinchium bellum* | California Blue-eyed Grass | Iridaceae | N | h |
| *Solanum furcatum* | Forked Nightshade | Solanaceae | I | d,h |
| *Solidago californica* | California Goldenrod | Asteraceae | N | m |
| *Sonchus a. asper* | Prickly Sow Thistle | Asteraceae | I | d |
| *Sonchus asper oleraceous* | Common Sow Thistle | Asteraceae | I | d |
| *Spergularia macrotheca* | Large-flrd Sand Spurrey | Caryophyllaceae | N | m |
| *Spergularia marina* | Salt-marsh Sand Spurrey | Caryophyllaceae | N | m |
| *Stachys bullata* | California Hedge Nettle | Lamiaceae | N | h,r |
| *Stellaria media* | Common Chickweed | Caryophyllaceae | I | d |
| *Taraxacum officinale* | Common Dandelion | Asteraceae | I | d |

**Table 7:** (continued)

Origin: N=Native, I=Introduced.
Habitat: b=beach and dune, c=cliff, d=disturbed, mainly field and road edges, g=grasslands, h=hillslopes, m=marsh, r=riparian (from Trumbly 1984; Randall Morgan personal communication; field observations).

| Species | Common Name | Family | Org | Hab |
|---|---|---|---|---|
| *Tetragonia tetragonioides* | New Zealand Spinach | Aizoaceae | I | d |
| *Trifolium albopurpureum* | Common Indian Clover | Fabaceae | N | d,h |
| *Trifolium fucatum* | Sour Clover | Fabaceae | N | c,h |
| *Trifolium repens* | White Clover | Fabaceae | I | d |
| *Triphysaria erianthus roseus* | Popcorn Flower | Schrophulariaceae | N | h |
| *Typha angustifolia* | Narrow-leaved Cattail | Typhaceae | N | m |
| *Typha latifolia* | Broad-leaved Cattail | Typhaceae | N | m |
| *Umbellularia californica* | California Bay | Lauraceae | N | h |
| *Urtica dioica* | Stinging Nettle | Urticaceae | N | h |
| *Veronica americana* | American Brooklime | Schrophulariaceae | N | r |
| *Veronica persica* | Persian Speedwell | Schrophulariaceae | I | d |
| *Vicia sativa* | Spring Vetch | Fabaceae | I | h |
| *Viola pedunculata* | Johnny-jump-up | Violaceae | N | g |
| *Vulpia bromoides* | Six-weeks Fescue | Poaceae | I | d |
| *Vulpia myuros* | Rattail Fescue | Poaceae | I | d |
| *Xanthium spinosum* | Spiny Clotbur | Asteraceae | N | d |

**Table 8:** List of special species and communities at Wilder Ranch State Park (from Anonymous. 1990, 1992, 1993, Holland 1986).

Status codes: **FE** = federal endangered, **FT**= federal threatened, **FPT** = federally proposed threatened, **FSS** = federal sensitive species, **1** = category 1 candidate for federal listing, **2** = category 2 candidate for federal listing, **SE** = state endangered,.**ST** = state threatened, **SCT** = state candidate threatened, **CSC** = California species of special concern, **S** = special species or status, **(n)** = breeding sites or status.

Presence at Wilder Park: **O** = observed at Wilder, **P** = probably occurring at Wilder, **A** = occurring near by and likely at Wilder at some time.

Sources of information concerning species presence: **1** = natural diversity data base search, **2** = on-site observations and checklists from past site studies, **3** = other.

| | Status | Presence | Source |
|---|---|---|---|
| **ANIMALS** | | | |
| **Mammls** | | | |
| Pallid bat (*Antrozous pallidus*) | CSC | P | 2 |
| Steller's sea lion (*Eumatopias juabatus*) | FT | A | 3 |
| Southern sea otter (*Enhydra lutris nereis*) | FT | O | 2 |
| American badger (*Taxoidea taxus*) | CSC | O | 2 |
| **Birds** | | | |
| Common loon (*Gavia immer*) | CSC | O | 2 |
| Clark's grebe (*Aechmophorus clarkii*) | S | O | 2 |
| Western grebe (*Aechmophorus occidentalis*) | S | O | 2 |
| Fork-tailed storm petrel (*Oceanodroma furcata*) | CSC(n) | O | 2 |
| California brown pelican (*Pelicanus occidentalis californicus*) | SE, FE(n) | O | 2 |
| Double-crested cormorant (*Phalcrocorax auritus*) | CSC(n) | O | 2 |
| Great blue heron (*Ardea herodias*) | S(n) | O | 2 |
| Great egret (*Camerodius albus*) | S(n) | O | 2 |
| Snowy egret (*Egretta thula*) | S(n) | O | 2 |
| Black-crowned night heron (*Nycticorax nycticorax*) | S(n) | O | 2 |
| Harlequin duck (*Histrionicus histrionicus*) | CSC(n), 2 | O | 2 |
| Osprey (*Pandion haliaetus*) | CSC(n) | O | 2 |
| Cooper's hawk (*Accipiter cooperi*) | CSC(n) | O | 2 |
| Sharp-shinned hawk (*Accipiter striatus*) | CSC (n) | O | 2 |
| Golden eagle (*Aquila chrysaetos*) | CSC(n) | O | 2 |
| Bald eagle (*Haliaeetus leucocephalus*) | SE, FE | O | 2 |
| Ferruginous hawk (*Buteo regalis*) | CSC, 2 | O | 2 |
| Northern harrier (*Circus cyanus*) | CSC(n) | O | 2 |
| Black-shouldered kite (*Elanus caeruleus*) | S(n) | O | 2 |
| Merlin (*Falco columbarius*) | CSC | O | 2 |
| American peregrine falcon (*Falco peregrinus anatum*) | SE, FE | O | 2 |
| California black rail (*Laterallus jamaicensis coturniculus*) | ST, 2 | P | 2 |
| Western snowy plover (*Charadrius alexandrinus nivosus*) | CSC, FT(n) | O | 2 |
| Long-billed curlew (*Numenius americanus*) | CSC | O | 2 |
| California gull (*Larus californicus*) | CSC(n) | O | 2 |

| Table 8 (continued) | Status | Presence | Source |
|---|---|---|---|
| Elegant tern (*Sterna elegans*) | CSC, 2(n) | O | 2 |
| Forster's tern (*Sterna foresteri*) | S(n) | O | 2 |
| Caspian tern (*Sterna caspia*) | S(n) | O | 2 |
| California least tern (*Sterna antillarum browni*) | SE. FE(n) | O | 2 |
| Marbled murrelet (*Brachyramphus marmoratus*) | SE, FT(n) | O | 2 |
| Rhinocerus auklet (*Cerorhinca monocerata*) | CSC(n) | O | 2 |
| Xantus' murrelet (*Synthliboramphus hypoleucus*) | CSC, 2 | O | 2 |
| Common murre (*Uria aalge*) | S | O | 2 |
| Short-eared owl (*Asio flammeus*) | CSC(n) | O | 2 |
| Long-eared owl (*Asio otus*) | CSC(n) | O | 2 |
| Burrowing owl (*Athene cunicularia*) | CSC | O | 2 |
| Black swift (*Cypseloides niger*) | CSC(n) | O | 2 |
| Vaux's swift (*Chaetura vauxi*) | CSC | O | 2 |
| Willow flycatcher (*Empidonax traillii*) | SE | O | 2 |
| Purple martin (*Progne subis*) | CSC(n) | O | 2 |
| Bank swallow (*Riparia riparia*) | ST(n) | P | 1 |
| Loggerhead shrike (*Lanius ludovicianuis*) | CSC, 2 | O | 2 |
| Tricolored blackbird (*Agelaius tricolor*) | CSC, 2(n) | O | 2 |
| | | | |
| Others | | | |
| Southwestern pond turtle (*Clemmys marmorata pallida*) | CSC, 2 | P | 2 |
| Black legless lizard (*Aniella pulchra nigra*) | CSC, 2 | P | 2 |
| California newt (*Taricha torosa torosa*) | CSC | P | 2 |
| California red-legged frog (*Rana aurora draytoni*) | CSC, 1 | P | 2 |
| Foothill yellow-legged frog (*Rana boylii* ) | CSC, 2 | P | 2 |
| Tidewater goby (*Eucyclogobius newberryi*) | CSC, 1 | A | 1 |
| Coho, or silver salmon (*Onchorhynchus kisutch*) | CSC | P | 3 |
| Steelhead (*Onchorhynchus mykiss*) | CSC, FSS | O | 1 |
| McKenzie cave amphipod (*Stygobromus mackenziei*) | 2 | A | 1 |
| San Francisco tree lupine moth (*Grapholita edwardsiana*) | 2 | P | 1 |
| Dollof cave spider (*Meta dolloff*) | 2 | A | 1 |
| Empire cave pseudoscorpion (*Pseudogarypus imperialis*) | 2 | A | 1 |
| | | | |
| PLANTS | | | |
| Santa Cruz tarplant (*Holocarpha macradenia*) | SE, 1 | A | 1 |
| White-rayed pentachaeta (*Pentachaeta bellidiflora*) | SE, 2 | P | 1 |
| | | | |
| NATURAL COMMUNITIES (element code number) | | | |
| Northern foredune grassland (21211) | S | O | 2 |
| Northern coastal bluff scrub (31100) | S | O | 2 |
| Coastal terrace prarie (41100) | S | P | 2 |
| Valley needlegrass grassland (42110) | S | O | 2 |
| Northern coastal salt marsh (52110) | S | O | 2 |
| Coastal brackish marsh (52200) | S | O | 2 |
| Coastal and valley freshwater marsh (52410) | S | O | 2 |
| Central coast live oak riparian forest (61220) | S | A | 2 |
| Central coast arroyo willow riparian forest (61230) | S | O | 2 |
| Central coast riparian scrub (63200) | S | O | 2 |

communication). The plan for their control currently being developed by Fish and Wildlife Service may useful for Wilder Park management.

Domestic dogs are another potential disruptive agent. Abandoned or stray dogs, wanderers from nearby urbanized areas, and residents of nearby farms may move into the area. Dogs were observed during our field work. They can disrupt or destroy nesting birds, especially waterfowl, harass or kill deer and other mammals, and prey on small ones.

#### 3.4.1.2.3 Small Mammals

Feral and abandoned cats have not been observed during our field work and they do not appear to pose a predation problem to native animal species. Old world hares have not been reported from the park, and the other alien mammal species in the park, old world rats and mice, are not causing problems. Rats and mice are often associated with agriculture, old buildings, barns and feed storage facilities. As these habitats are eliminated through park activities, the pests should also disappear. In addition, Wilder Park appears to have enough native or near-native habitats with sufficient predators to prevent problems from rat and mice overpopulation.

Skunks, raccoons, and weasels could become unduly destructive of other small animals, especially ground nesting birds, if they became too abundant. While these predators are native species, the profound modification of habitat that accompanies a ranching operation, and the constant presence of visitors to the park result in unnatural conditions which often favor disruptive population levels.

Muskrats, a native species, were once limited to certain areas in California, but have been widely distributed by man throughout the state. They are notorious for burrowing through earthen banks and causing extensive damage. Since they eat marsh plants such as tules and cattails, they are valued for controlling vegetation. Their role at Wilder appears minimal, but they could play a minor role in maintaining open water in the marsh. Their burrowing habits may be positive to the wetland by dispersing water into historically flooded areas.

Ground squirrels and gophers are native species which could cause damage through excessive soil disturbance due to over-abundant populations. Both are considered pests in other areas around the Monterey Bay area, particularly on disturbed open grassy hillsides similar to those bordering the wetland. However, neither species is destructively abundant within the Wilder wetland area.

Deer mice and voles may also become very abundant due to natural fluctuations in population size (Barbour et al 1973). We observed no evidence of large populations of these small rodents. Deer mice were moderately abundant and easily observable only on the beach dunes. The dune habitat of sparse vegetative cover is especially vulnerable to human disturbance. Native wood rats have constructed nests within the willow forests. These desirable rodents could be jeopardized by red fox predation.

#### 3.4.1.2.4 Marine Mammals

Most of the rich marine mammal fauna of the California coast remains offshore or is concentrated in certain sites onshore. Sea ot-

ters use the kelp beds offshore from the park for habitat and the prey within for food. No otters use the beach. The 3000 to 4000 elephant seals in the area breed exclusively or almost so, at Año Nuevo. However, the population is still increasing, animals seek alternative landing sites to the crowded beaches at Año Nuevo at least as far south as the Big Sur area. It is conceivable that the Wilder beach could serve as a haul out in the future for the overflow of individuals which do not compete for space at Año Nuevo. Likewise the abundant California sea lions and Steller sea lions also use Año Nuevo beaches, as well as offshore rocks along the coast. There is a permanent haul-out area for California sea lions at Point Santa Cruz, and one was observed at Old Landing Cove (just west of Wilder Beach) (Schaub 1980). Both species could also use the beach, although not as a prime site.

Harbor seals haul out just west of Wilder beach, at Old Landing Cove, where almost 180 animals have been observed (Engelsman personal communication). They could use the beach as a breeding and pupping area in the spring, and molting area in the summer (Schaub 1980). Seals are susceptible to disturbance by human activities. Extraordinary efforts are made along a seal haul-out area on the Monterey Peninsula to protect sensitive seal pairs during pupping and nursing from human disturbance. Wilder Beach is potential habitat for seal haul out activities since it provides the required ready access to deep water and is adjacent to the population at Old Landing Cove. But the site must be protected from human disturbance to be useful habitat.

**3.4.1.3 Birds**

The Santa Cruz Bird Club has censused and kept records of the avifauna of Wilder Ranch and Beach since 1970 and has listed 238 species of birds known to occur in the park west of Highway One, including ocean waters to one half mile offshore. Other sightings, including species found dead on the beach, bring the total to about 250 species (Table 3). Most of those species occur in one of three main habitat types: oceanic, about 40% of the species; marsh, about 20%; and upland, including cliffs, riparian, grassland and scrub, about 40% (Dwyer et al 1979). Those three general habitat types include all of the natural vegetation areas in the study area.

David Suddjian provided the following summary of the significance of Wilder Ranch and Beach as bird habitat, particularly relative to the rest of the county. The area has been thoroughly studied by birders, especially the beach, marsh, and paths leading to them. About 65% of the bird species in Santa Cruz County are found here. At least fifty four species, and possibly 7 or 8 more, nest within the area, a large number considering the relatively small total area. Thirty three of the species are exclusively oceanic, or nearly so. "Overall, the diversity of birds at Wilder is very high, relative to other areas in the county. This is a reflection of the diversity of habitats in the area, and the presence of highly productive habitats, such as undisturbed beach, freshwater and brackish marsh, riparian, grassland, and rocky shore. Wilder Beach, perhaps due to its relatively undisturbed character, is one of the best beaches in the county with regard to species richness and bird abundance. The marsh area is also very productive, particularly when it becomes

flooded with winter rains. The mosaic of extensive grassland, marsh, riparian, ruderal, and beach habitats attracts one of the most diverse assemblages of raptors in the county. Numbers and species diversity of raptors are typically higher at Wilder than elsewhere in the county, except for the Harkins/Hanson/Struve Slough area." (Suddjian, personal communication).

#### 3.4.1.3.1 Beach and Dune

Marine species may occur in the waters off Wilder, or make incidental landfall on the beach. Listed species (Table 8) that may occur there are the marbled murrelet, xantus' murrelet, rhinoceros auklet and fork-tailed storm petrel. Next to Pajaro Dunes, brown pelicans use Wilder Beach more than any other beach in Santa Cruz county.

Shorebirds rely much more on the habitat of the beach, dunes and lagoon which provide feeding, roosting, and bathing resources for migrating and wintering shorebirds, gulls, and terns. The only county record for the buff-breasted sandpiper was made at Wilder Beach in August 1989. Of the more than 50 species of shorebirds (Table 3), 7 are listed species: Long-billed curlew, California gull, elegant tern, Forster's tern, Caspian tern, California least tern and, most importantly, western snowy plover.

Wilder Beach is an important breeding resource to the snowy plovers: it is one of only 5 snowy plover nesting areas in the county. Snowy plovers establish territories and pair bond in March and continue young care until August, the end of the breeding season. The beach is one of 7 regularly used wintering sites for the plovers. (See Special Species 4.4.3)

The adjacent rocky intertidal shore provides foraging habitat for some shorebirds, primarily oystercatchers.

#### 3.4.1.3.2 Marine Cliffs

At least two species nest on the marine cliff faces to the west of the beach. Pelagic cormorants nest regularly in the first cove west of Wilder Beach. Twelve pairs bred there in 1990. Over the last few years this site has contributed 25% to 50% of the Santa Cruz County breeding population. Brandt's cormorants may also nest in the same area. Twelve or more pairs of pigeon guillemots nest on the cliff beyond the west end of the beach. Birds tending nests are subject to disturbance by people. Illegal trespass on the beach disrupts the guillemots. And the presence of park visitors on the cliff overlooking the cormorants could be disruptive, especially if the visitors approach the edge of the cliff.

One to 6 black swifts are present regularly around the beach between May and August. No nests have been observed on park land, but suitable habitat along the cliff is present and they probably do nest in some years. Only 17 to 21 nesting black swift pairs are known in the county.

#### 3.4.1.3.3 Marsh

Grebes, herons, waterfowl, rails, wrens and warblers are the main users of the marsh area. Several hundred ducks may use the winter-flooded marsh, forming one of the largest concentrations of waterfowl along the Santa Cruz county coast. The main species are American widgeon, mallard, and green-winged teal. Of all the waterfowl mallards are the only species to nest in the marsh.

Pied-billed grebes also nest in the marsh. American coots breed in the area. A pair of Virginia rails nested in the marsh in 1987. This species breeds only rarely in the rest of the county. The black-crowned night heron probably nests in the marsh as well. Long-billed marsh wrens and common yellow-throat warblers nest in the marsh, and probably red-winged blackbirds. Swallows commonly feed on insects above marsh vegetation.

#### 3.4.1.3.4 Riparian

Warblers are the most common birds nesting in riparian habitats. Wilson's warbler, orange-crowned warbler, yellow warbler, warbling vireos, and common yellowthroats nest at Wilder. A huge number of species, particularly song birds, especially warblers, vireos, and thrushes, use the tree and shrub vegetation of riparian corridors and perimeters. They use the vegetation for roosting, shelter, and nesting and feed on insects here. Trees along the periphery of the riparian areas are used as perches and nest sites by raptors. A high proportion of the non-sea birds in Table 3 use riparian habitat to some degree.

#### 3.4.1.3.5 Upland

The upland habitats around Wilder wetland includes a high diversity of vegetation types: grass hillsides, oaks, scrub, Himalayan blackberry and poison oak tangles, and roadside with an association of alien weeds. A large proportion of the bird species (Table 3), particularly passerines (song birds), use these habitats. Sparrows use the open grassland especially as it grades into shrubs. Oaks are good perches and roosts for many birds, chickadees and bushtits forage for insects in them and towhees forage on the ground beneath them. Himalayan blackberry and poison oak provides good cover for sparrows and quail.

Rare species of owls use the Wilder uplands. The short-eared owl is very rare throughout Santa Cruz County. In recent winters it has been seen in the grasslands at Wilder as regularly as anywhere else in the county. Relatively rare burrowing owls and long-eared owls have also been seen at Wilder.

Several rare passerine species use the Wilder Ranch uplands. A Cassin's kingbird was sighted in March 1990 and is the only county record. One pair of northern mockingbirds nests around the ranch buildings. This is the farthest north siting for this species in the county. One yellow wagtail was observed in 1983, is the only county record, and one of the few sightings in the state. A northern oriole pair nested around the ranch buildings; it is also the most northerly coastal siting for this species in the county.

#### 3.4.1.3.6 Raptors

Fourteen species of hawks and falcons are reported from Wilder. Four species nest there. A pair of black-shouldered kites nested in the willows in the back marsh, a highly significant event because there are only 2 to 3 nesting pairs in the county away from the Pajaro River Valley. Several kites are always around during non-breeding season. Northern harriers also nest in the marsh. At least one is usually visible flying over the marsh or uplands, or roosting in willows. Their courtship behavior over the marsh provides a dramatic show conveniently viewed from the overlook trail. Peregrine falcons occur at Wilder very regularly, most frequently from September to November and February and March. Few other sites have such predictable falcon sightings.

Only singles have been observed. Merlins are present during fall and winter, usually only a single individual, or at least one at a time. Kestrels and red-shouldered hawks also nest in Wilder. Harriers and especially kestrels may prey on snowy plover nests, contributing to the low nesting success.

#### 3.4.1.3.7 Pests

Most restoration effort is directed at creating and improving favorable habitat and to encourage and monitor its use by desirable species. However undesirable species should also be considered. Pest or potential pest species may need to be controlled.

Three species represent possible pests. Brewer's blackbirds, a native species, often occur in large flocks, especially around agricultural fields. By sheer numbers they could overwhelm other species attempting to roost or nest in trees. An introduced species, European starlings, are also a potential threat because of their swarming tendency becoming overabundant and displacing and driving off native species. Since they nest in cavities, they might displace native cavity nesters such as woodpeckers. A third species, house sparrows, are also non-native and could also become pests due to overabundance. They associate with urbanized habitats. Restoration of agricultural lands to native plant communities and habitats may be most effective at minimizing threats from these pests

#### 3.4.1.3.8 Human Disturbance

Restoration must be accompanied by sound management of restored habitats and adjacent areas. The prime management need is protection from human incursions. At present, birds are subject to human disturbance in all of the habitats considered in this plan because of the open trail systems which provide, and even invite, easy incursions to the beach, marsh, grasslands, and stream-sides. The wetlands are relatively small and have limited access; they are protected from illegal entry from the south by the ocean and to a large extent the cliffs on the west and east. See section 3.4.4 for specific management recommendations.

### 3.4.1.4 Reptiles

Nineteen species of reptiles are likely inhabitants of Wilder Ranch. Eight were observed during surveys (Table 4) and 2 species are listed.

The two species of special concern, turtles and black legless lizards, are also the most directly linked to the restoration. Pond turtles may soon be federally listed as endangered. They were observed in every wetland in the park in the past (Dellamora, personal communication). Legless lizards are found in sandy soil, especially dunes. They have not been observed in Wilder but may occur here.

Among the other five species of lizards, horned lizard are also found in sandy soil including dunes. Although it was not observed on the site, this species is a potential beneficiary of restoration, especially dune protection. California and San Francisco alligator lizards tend to be woodland species and benefit from shade and moist conditions provided by improved riparian habitat. The other two lizard species occupy a wide variety of habitats.

The twelve species of snakes potentially or actually found at Wilder Ranch (Table 4) occupy a wide variety of habitats and take varied prey. The striped racer prefers brushland

drier conditions. Other species prefer streamside habitat as well as upland. The rattlesnake, for example, occupies grass, brushland, forest, rocky outcrops and ledges, all of which are found in and adjacent to the wetland. The aquatic garter snake is found in brackish as well as fresh water. Only the sharp-tailed snake, a slug predator, has a restricted diet (Stebbins 1966). The California kingsnake, larger than its congener mountain king snake, is known for it predation of rattlesnakes.

#### 3.4.1.5 Amphibians

The forested coastal slope north of Highway One is excellent habitat for amphibians, particularly salamanders, because of the moist, shaded conditions. The coastal forest connects with the Wilder Creek and wetland habitats by way of riparian corridors offering excellent amphibian migration routes. Table 5 presents 13 species which probably occur in the park. All may also occur within the wetland and 3 are listed. Only 4 species were observed in the field: tree frog, Pacific giant salamander and 2 listed species, red-legged frog and coast range newt. Of the 2 species of frogs observed, the tree frog was undoubtedly the most numerous and probably the most significant as a prey species. The bullfrog is the largest frog in the west, non-native species, it has spread rapidly, and has been highly successful (Stebbins 1954). The bullfrog is strictly aquatic and requires permanent standing water in contrast to the 2 native species. The yellow-legged tends to prefer riffles, rocks and sunny banks. The red-legged, to be federally listed as an endangered species, prefers ponds and thick willow overgrowth, but may occur in grasslands, especially as it migrates during rain. A restored wetland and marsh should provide habitat favoring the 2 native species. However, some concern must be given to monitoring the bullfrog and controlling its population if it threatens the other 2 species. Nearby farm pond water which warms to temperatures that allow bullfrog reproduction are the most likely production centers of invasion by this species.

#### 3.4.1.6 Fish

Wilder Creek is one of a series of coastal streams draining the seaward slope of the Santa Cruz Mountains. The streams typically originate in coastal redwood forest and empty into the ocean during winter. During seasons of low water flow, the streams form seasonal lagoons at their mouths behind sand spits which act as dams to keep salt water out and impound fresh water. There are three important species of fish in the Wilder Creek restoration area. They are anadromous and dependent on the seasonal lagoon habitat at the creek mouth: steelhead (*Onchorhynchus mykiss*), tidewater goby (*Eucyclogobius newberryi*), and, threespine stickleback (*Gasterosteus aculeatus*). A fourth species, coho or silver salmon (*Onchorhynchus kisutch*), is also anadromous and possibly occurred in Wilder Creek. Three of the species, steelhead, salmon and goby, are or will be listed in some status as special species.

Steelhead are important at Wilder because of their abundance and ecological significance. Steelhead occur in nearby Baldwin Creek. In January of 1992, 50-60 dead fish were found trapped in the lower reaches of that creek. They have been seen only rarely in Wilder Creek since the 1970's: the last large run occurred about 1976. Nest building was ob-

served near the ranch cow barn in 1982 (Dellamora personal communication).

Low and impeded water flows caused by drought and stream obstructions may be the main factors preventing Wilder Creek from supporting anadromous fish runs. The creek might support as many as 100 spawning pairs of steelhead if they had access to upstream spawning habitat (Dave Strieg, personal communication).

Tidewater gobies are restricted to brackish water of lagoons or stream mouths. They were historically present in Wilder Creek but are no longer present They still occur nearby in Baldwin, Laguna and Moore Creeks. Since they are a threatened species and are perhaps the most characteristic of the brackish mouths of small coastal streams, they may deserve the highest priority among the fish species in management considerations. Good management practices for this species are consistent with steelhead requirements.

The stickleback is anadromous, it lives in the brackish habitat and salt water and spawns in freshwater. At Wilder Creek the species can be important prey for birds and fish.

Coho salmon populations south to the San Lorenzo River are to be listed as a threatened species. The San Lorenzo River is the southernmost location where the species occurs (Marston, personal communication) and Wilder Creek is the next stream to the north. The San Lorenzo population may have been introduced. None occur in the Wilder Creek drainage which is probably too steep to support much of a population.

Habitat evaluation for salmon and steelhead was carried out this spring along Wilder Creek watershed by the Department of Fish and Game (Jennifer Nelson, personal communication). She conducted a 2 1/2 mile survey of the main branch of Wilder Creek between the lagoon and the Gray Whale Ranch and found an impassable barrier within the park on the north side of Highway One. Sedimentation was heavy below the barrier as well as above it for about 2000 feet, precluding spawning by steelhead or salmon. One of the Wilder Creek tributaries is relatively clear for about 300 feet before it is broken by a culvert seven feet above the stream bed. Additionally, there is no suitable substrate for insect production necessary for fish food. Sediment and obstructions need to be removed to rehabilitate the stream for anadromous fish spawning.

Other fish in Wilder Creek may include rainbow trout high in the drainage. These are steelhead that remain in the creek for their entire reproductive cycle rather than migrating to marine water. Prickly sculpin (*Cottus asper*) and coastrange sculpin (*Cottus aleuticus*) are species which use stream mouth habitat and could use Wilder Creek, but none have been captured.

### 3.4.1.7 Invertebrates

#### 3.4.1.7.1 Terrestrial

No comprehensive survey was done nor is there literature to describe the terrestrial invertebrate fauna of the Wilder wetland area. However, several significant species occur on the site. Monarch butterflies were numerous on a fallow field in the fall of 1990. There is not sufficient protected tree roost habitat nor adjacent nectar source for the wetland area to serve as wintering grounds. Conceivably the area around the farmhouse could serve overwintering needs, but does not appear to be prime habitat. The fall appearance of butterflies may indicate a stopover during south migration. Three other invertebrate species, which are listed, potentially occur on the site and/or live nearby: San Francisco tree lupine moth, Dollof cave spider, Empire cave pseudoscorpion (see comments under Special Species). Another listed species, the globose dune beetle, could take advantage of vegetation in a restored and well developed dune community.

#### 3.4.1.7.2 Beach and Dunes

The invertebrate fauna of beach and dunes is subject to massive physical changes. Wilder Beach is washed by large waves creating a steep face and eroding much of the sand in single storms. Kelp washes on the beach in the winter to depths of at least four feet. In the low intertidal zone, sand crabs aggregate into patches according to size and sex and migrate up and down the beach with the tides. They are an important food source for shorebirds. This high energy beach supports only low densities of other intertidal fauna such as nephtyid and protodrilid polychaetes, phoxocephalid and haustoriid amphipods, and cirolanid isopods.

In the high intertidal zone, the tangle of decomposing kelp wrack provides a rich organic matrix for intense feeding and breeding activity of kelp flies (Coelopidae) and their larval development, for burrowing and feeding by beach hoppers, and for vigorous predation on flies and hoppers by rove beetles (Staphalinidae). The wrack habitat, and its fauna, is very patchy in time and space. It is dependent on storms to dislodge kelp and deposit it on beaches, but the entire zone is also subject to extreme erosion from high tides and waves. Calm winters and warm summers prevent good development of the community. Footfalls destroy it. A variety of shorebirds feed and roost in the wrack zone. Barn swallows skim the sand and feed on shore flies.

Farther up the beach, in the supralittoral zone, above all but the highest waves of the year, are shore isopods (*Alloniscus perconvexus*). These animals burrow under the hardened crust of dried sand. Unlike beach hopper burrows in the moist, denser sand lower on the beach, isopod burrows are brittle and immediately destroyed by human footfalls. Tiger beetles (Cicindelidae) also live in the supralittoral and dune sands. They are active and fast predators. Several beetles are listed species, but are not known to occur on Wilder Beach.

#### 3.4.1.7.3 Aquatic

Aquatic invertebrates were sampled along four habitat types in Wilder Creek (Table 6). The semi-quantitative samples showed that the greatest diversity and abundance of invertebrates, mainly insects, were in the upper part of the stream, in an open, slow

moving section rich in aquatic vegetation. The site was about one half mile north of Highway One. That habitat type was chosen because it appeared to represent the abundance and richness of aquatic invertebrate fauna of a restored and well developed marsh better than any area of the creek in the present wetland.

The lower reaches of the stream, in the wetland restoration area, were vegetatively less diverse than the upper part and the invertebrate fauna reflected this. The invertebrate fauna was also different in willow root and cattail habitats. Cattails formed a marsh-like environment with fairly good physical and vegetation diversity. Willow roots formed a monotonous habitat of very heavy shade, thin sediment cover, often with a heavy layer of willow leaf litter, over gravel/cobble bottom, and shallow water with little cover. The most depauperate habitat was in the lowest reach of the creek, the brackish water section, where bottom sediments were anoxic immediately below their surface and water circulation was minimal resulting in relatively high temperatures and low dissolved oxygen levels. Corixids, water boatmen (insects), were the dominant, and nearly only, invertebrate. Their presence often indicates poor water quality and brackish conditions. Along the lower reaches of other local creeks (Scott, Waddell, Pomponio Creeks) healthy lagoons contain a well developed crustacean fauna. Isopods (*Gnorimoshaeroma oregonensis*), amphipods (*Eogammarus confervicolus*, *Corophium* spp.) and mysids (*Neomysis mercedis*) are the numerical dominants. These peracaridean crustacean communities are key prey for steelhead populations. Young fish feed on these creatures in the lagoon in order to grow large enough to enter marine water.

MacKenzie's cave amphipod is a federal candidate 2 species. It is a member of a recently revised taxon (Holsinger 1974) occurring almost exclusively within the United States. At least 90% of the species were recognized only in the last two decades. These amphipods are known primarily from limestone and lava cave streams and pools in the west, but also may occur in other ground water or in deep lakes.

### 3.4.2 Plants

Most of the plant associations surrounding Wilder Ranch wetland are the result of prolonged and heavy disturbance associated with activities of farming, ranching, road, and railroad building. The most important disruptive activities were grazing, burning, plowing, introduction of alien plants, extensive recontouring of surface soils, and large scale earth moving. The results left a raised railroad bed cutting across the natural drainages with their mostly riparian plant communities; graded and bare soil surfaces of roads; and most of the terrace areas leveled and plowed. The plants, other than crops, occupying these profoundly modified surfaces are almost exclusively weeds - species that thrive under the disturbance of constant soil displacement. Around the ranch house, for instance, the vegetation list contained 79 species only 6 of which were natives, and none of the common alien weeds were included in the list of 79 (Trumbly 1984). The remnant native species occupy small, relatively undisturbed or specialized pockets: cliff faces, hillsides, stream sides and wet areas, and rocky outcrops. Table 7 lists all the species found in

our survey of the wetlands and surrounding upland.

Coast live oak woodland is represented by only a few individuals of a few mostly widespread species. The woody species are coyote brush, coast live oak, poison oak; all of which are common, nearly ubiquitous species. California sage, bay, elderberry, buck-eye, and coffee berry are much less abundant but still widespread upland species. The plants and species of the remnant Northern coastal scrub community are a little more numerous, but still highly localized on a few places of the cliffs (for example, lizard tail). The grassland hillsides are dominated by invasive alien species. Fragments of native assemblages are present in very small patches, growing on the shallow soils of rock outcrops.

The wetland is also extremely modified habitat, mainly agricultural fields with little natural vegetation. Even the natural streamside plant community occupies the highly modified leveed banks along the channelized creek. The recovering fallow field is being recolonized by appropriate native species, but most of the field is covered with alien weeds. The salt marsh is a significant exception. The plant community is composed mainly of appropriate native species, although the entire marsh was probably modified in the past by cattle grazing. Non-natives have also become persistent members of native communities. Bristly ox-tongue, curly dock, ripgut brome, Himalayan blackberry and poison hemlock are common examples.

Weed species completely dominate disturbed or previously disturbed soils. Annual grasses, especially ripgut brome, occupy the most area. They are very dominant along with thistle patches on the grassland. Poison hemlock dominates large areas of the cliff sides, hillsides, roads, wetlands and grasslands. Jubata grass (pampas grass) is a large perennial plant and is difficult to eradicate. Radish and mustard patches occupy significant areas in several plant communities. All the weed species tend to dominate space. Most of the large areas these weeds occupy are not simply roadside or field edges, but are previously disturbed sites that should be recolonized by natives. Instead the weeds prevent or greatly retard natural plant succession.

#### 3.4.2.1 Methods

Color aerial photographs were enlarged to 8 1/2 by 17 inch prints for field maps to guide observations. Plant patterns, displayed by colors and shapes on the prints, were field checked and identified during ground truthing and surveying. Surveys of the wetland area and its surrounding upland were carried out in all seasons by walking over most of the area, guided by land contours and recognizing and following plant patterns. Voucher specimens of plants not identified in the field were returned to the lab to be identified with dissecting microscope. Plant species and associations were recognized with several criteria in mind: whether they were native or alien and if alien pest weeds or not; if they were native plants warranting protection or other special treatment; if they were native plant patches that could act as spreading centers into surrounding enhanced habitat; and if they were native plants that could be good sources of propagation material.

Only two species of plants associated with Wilder Park are listed species, the White-rayed pentachaeta and the Santa Cruz tarplant. Both species occur in this part of the county, but neither has been found within the park.

Hickman's (1993) comprehensive nomenclatural changes were followed for all scientific and common names of plants. Where Hickman does not provide common names, Thomas (1961) is followed. Generally we use only common names in the text, most scientific names are listed in Table 7. For names not listed in the table the scientific name is included in the text the first time the name appears.

#### 3.4.2.2 Communities

The plant associations of the Wilder wetland area and the surrounding habitats correspond to the physiography of the site. The flat marsh area is composed of marsh and fields divided by streamside riparian, fronted by beach and dune to the south, and bounded by cliff slopes to east and west, and by grass hills to north (Figure 17).

Trumbly (1984) identified seven relatively general plant communities in Wilder Ranch State Park, of which 5 or their remnants are contained within the Wilder Wetland area. Holland (1986) recognized many classifications of closely defined plant communities, but they are subdivided much more than is necessary for this presentation. Several plant associations or remnants merit special recognition (see Communities under Special Species). Trumbly's list of community names with Holland's equivalents are shown below:

Communities in the upland include:

Northern coastal scrub = Northern coastal bluff scrub. Grows along cliff faces.

Annual grassland = Coastal terrace prairie, Valley needlegrass grassland, Non-native grassland. These are the grasslands of the hillsides.

Coast live oak woodland was not included by Trumbly. It is represented by live oaks and buckeye trees and their associates on the hillsides.

In addition, an assemblage of weeds occupies roadsides, field edges, fallow fields and other disturbed places, in both upland and lowland areas.

Communities in the lowland:

Coastal strand = Northern foredune grassland. Vegetation on the beach and dune.

Freshwater marsh = Coastal and valley freshwater marsh. Grows in a few places in Wilder Creek and the secondary channel on the west side.

Northern coastal salt marsh and Coastal brackish marsh were not included in Trumbly's list. Coastal salt marsh includes most of the non-cultivated area of the wetland and brackish marsh elements contribute.

Riparian forest = Central coast live oak riparian forest, Central coast arroyo willow riparian forest, Central coast riparian scrub. They grow along the 4 drainages through the lowland area.

##### 3.4.2.2.1 Upland Communities

The upland communities comprise three clearly defined landscapes which correspond with the occupying community types: marine cliffs with coastal scrub, steep slopes

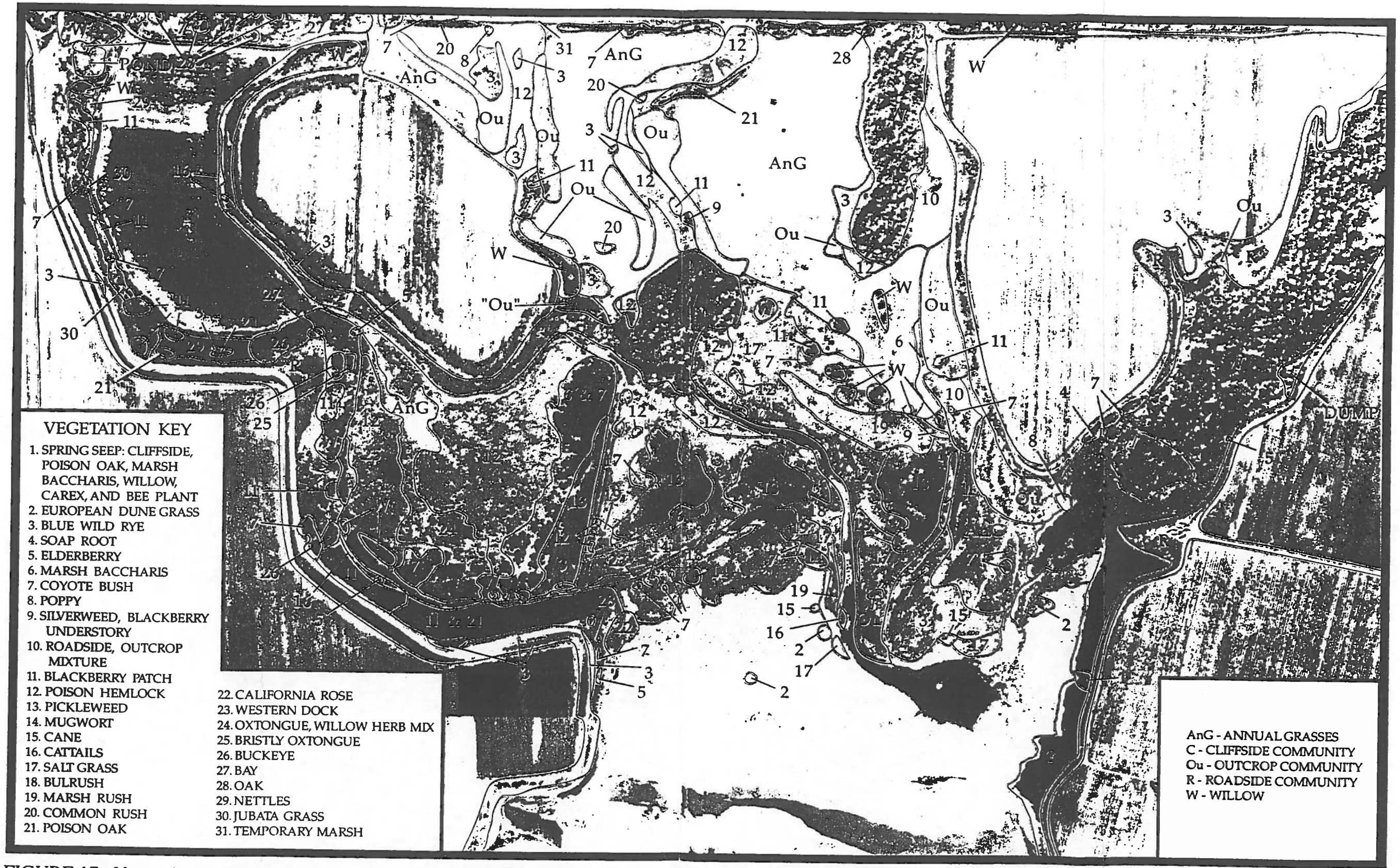



FIGURE 17: Vegetation map of Wilder Study Area.

with elements of oak woodland, and hills with grasslands (Figure 12).

3.4.2.2.1.1. Marine Cliffs

Exposed marine cliffs occur on both ends of Wilder Beach (Figure 12). They contain remnants of Northern coastal bluff scrub, a low scrub of dwarf shrubs (Figure 17), exposed to constant winds with high salt content on rocky and poorly developed soil. However, this community is very peripheral to the study area. It occurs only on the east cliff which faces into the prevailing northwest wind. This is a low growing plant association, buffeted by constant offshore winds hitting the cliff faces nearly at a right angle and therefore with substantial force. sour clover, a relatively rare species in Santa Cruz County, also grows along the cliff community. This community extends inland along the steep hillside to merge with a mixed flora of native and alien species. Lizard-tail is one of the dominants. The sand beach forms the lower boundary and field-side road with its cover of annual weeds defines the upper edge.

The west cliff face is east-facing and protected from the prevailing northwest winds. If there were coastal scrub elements here, they were destroyed and the slope is badly degraded into a poison hemlock thicket. Inland from the thicket the vegetation consists of elements of Coast live oak woodland: poison oak, some oaks, a bay tree, and California sage.

Wildlife value of the coastal scrub community relative to the wetland is inconsequential because the habitat is barely contiguous with wetland and the area is small. Pigeon guillemots and cormorants nest along cliff faces, but on rocky substrate, and the kind of vegetation, if any, is probably of little importance.

3.4.2.2.1.2. Steep Slopes

Steep slopes define much of the perimeter of the wetland (Figure 12). They extend inland from the coast-facing cliffs, run along the wetland edges, meet the railroad, and extend along the railroad embankment. Because this landscape type is limited to the perimeter, it does not encompass much area. Plant communities grade from Northern coastal scrub association of the ocean-exposed cliffs to elements of a Coast live oak woodland (Figure 17). On the west slope dominant species are weedy native and non-native bush and herbaceous species, especially Himalayan blackberry, poison oak, nettles, poison hemlock and the trees- oak, buckeye, bay, and elderberry (Figure 17). Most of the slope area along the east slope is covered with foliage of large willows growing in the riparian immediately below. The railroad embankment supports oaks and associates (Figure 17) along the small west part, opposite the ranch site, and annual grassland with a coyote brush fringe along the rest.

Borders of steep slopes are mostly roadside weed associations, including poison hemlock patches, especially along their upper margins (Figure 17). Lower edges along the west side range from beach and dune, to freshwater marsh in the channel along the fallow field, to roadside weeds along the west field. Along the east side the lower border is mostly willow.

Along the west slope a Coast live oak woodland association inhabits the slope beginning even with the intertidal-dune edge on the sand beach (Figure 17). Some stunted oaks

and a bay tree grow along this intersection with the marine cliff. Mostly the vegetation is continuous, thick brush comprised of pure stands or patches of weedy native species including poison oak, nettles and non-native blackberries (Himalayan blackberry). A dense forest of buckeye and bay trees among oaks and elderberries occurs along the steep slope where it nearly abuts Wilder Creek. Past the forest the dense brush continues in a patchy mosaic including the aliens, poison hemlock and jubata grass. The upper edge of the steep slope is defined by the farm road and roadside weeds. The lower edge is defined by fresh marsh vegetation in the cliff channel.

The east slope grades from the interface with cliff face vegetation to a mix of robust vegetation in patches of native and alien species such as poison oak, blackberry, poison hemlock and radish (Figure 17). A small seep maintains an area with wet soil species notably marsh baccharis and sedges. From the inner edge of the sand beach, the dense forest of willow trees extends inland along the wet drainage. The willows produce limbs and foliage which encroach up the entire slope to shade and crowd all but the roadside weeds.

Oaks, bays and brush species such as coyote brush, poison oak, blackberry, and California sage form a dense foliage along the north edges of both cultivated fields (Figure 17). Along the rest of the railroad, mostly annual grass weeds and poison hemlock and only a thin fringe of shrubby vegetation, mostly coyote brush, borders the grasslands and the east terrace field. The railroad cut created a vertical rock face which is not well vegetated. The narrow area between the cut bank and track bed is weedy, and in some places perennially wet or damp where the soil supports a mix of alien grasses and sedges and rushes.

The west slope blackberry, nettle, and poison oak thickets form valuable wildlife habitat. Thickets provide shelter and protection from weather and predators, food sources, and breeding habitat for small mammals, and especially birds such as wrens and sparrows. The dense tree groves are also valuable for roosts and nests for wildlife such as owls, woodpeckers, and cavity nesting birds. The wind-sculpted tree foliage is esthetically valuable to viewers from the overlooking pathway. The oak woodland habitat along the railroad attracts upland birds such as jays, chickadees, bushtits, and roosting raptors. The willow stand on the east face provides cover and habitat for small mammals such as wood rats and their predators, gray foxes. However, this dense willow canopy probably reduces the diversity of wildlife on the slope.

Only limited restoration effort is necessary in the oak woodland even though most of the community was more or less disturbed in the past. Most important are the upper and lower borders where the roadside weed associations should be controlled and replaced.

In addition to the roadside borders, there are four problem areas of extensive encroachment by invasives. The hillside along the west edge of the north field is the most choked with poison hemlock and pampas grass. The farm roadside above the fallow field is also heavily infested with poison hemlock and radish. The almost pure stand of poison hemlock on the steep face above the beach should be eradicated. The upper

margin along the east boundary is the fourth problem area. Despite the strong shade from willows, weeds have crept into the willows. More critical is the dumping of agricultural and especially household trash down the slope into the willows.

3.4.2.2.1.3. Annual Grassland

Annual grassland occupies the hillsides south of the railroad and above the east field and marsh (Figures 12 and 17). The vegetation is low grasses and herbaceous annual and perennial species. Dominants are undesirable annual invasive species of grass and thistles. Few shrubs and no trees grow here. Most likely the hills were covered with perennial grasses and associates of Coastal terrace prairie and/or Valley needlegrass grassland communities before livestock overgrazing converted the hillside to the present assemblage of exotic pest species.

Along Monterey Bay the coastal prairie community intersects the other California grass type, valley grassland (Heady 1990). Grass species which characterize coastal prairie reach their southernmost limits in the Monterey Bay area (Beetle 1947). However, the characterizing species of both types are widespread: needlegrass of valley (Crampton 1974) and oatgrass of coastal prairie (Hickman 1993). Only needlegrass was observed, but it is likely that oatgrass is also present.

The hillsides are covered mostly with Mediterranean annual grasses - ripgut brome, oats, rattlesnake grass, and foxtail barleys - and patches of taller weeds, mainly thistle with some radish and poison hemlock. Three swales cut through the grassland with other plant assemblages. Where the swale is wet near the marsh, wet species such as silverweed are present. In the higher and drier parts of the swales, poison hemlock is dominates with patches of native alkali rye grass. Willows grow out of the swales in some places and shade out potential grassland community plants.

The most significant native plants of the grasslands occur on the Santa Cruz mud stone outcrops along the hill edges. The thin soil supports components of northern coastal scrub, e.g. buckwheat, and of native grassland, e.g. needlegrass, corethrogyne and soaproot. The outcrop habitat is a refuge for the native perennials from the invasive annual aliens. Even here natives are partially restricted by the foliage of invasives spreading across the outcrop. This native outcrop assemblage is present even in the salt marsh on a small outcrop at the estuary mouth. The native grassland remnants are nuclei from which native vegetation can recolonize the hillsides. The only outcrops barren of the native assemblage have been grown over by adjoining willows - on the north edge of the east field. Soaproot and California poppies are found in distinct patches across wider areas than just the mudstone outcrops, and alkali rye grass, which spreads by rhizome growth, has established several patches up to a few hundred feet wide and may be expanding.

Grassland wildlife should increase with increasing diversity of plant species. Presently rodents such as gophers are primary prey of raptors. The open fields are good habitat for savanna sparrows and horned larks. Garter snakes and gopher snakes are prey on rodents and birds eggs.

3.4.2.2.1.4. Disturbed Areas

The edges of cultivated field are roads for farm vehicles and are continually disturbed. The roadsides are weed reservoirs maintaining populations of weeds that can spread into more native communities. The fallow field was invaded by hemlock when cultivation was terminated. Swales in the grassland, the west cliff side, fresh and salt marsh, and hill slopes were all invaded by hemlock after disturbances.

The main problem weed is poison hemlock, an annual species that has spread throughout the wetland. It occurs along roadsides as well as all upland and wetland habitats. Jubata grass (pampas grass) is another major problem species. Although not so widespread as hemlock, each plant is much more difficult to eradicate. Seed production is prodigious and dispersal is widespread. Annual grasses, especially barley and ripgut brome, and thistles are very invasive, widespread, and difficult to control. Weed species often disperse along roads and foot paths. As noted earlier, the farm buffer zones around cultivated fields are covered with invasive weeds that must be restored with native plant communities.

Only one native species, alkali rye grass, has colonized field roads around the wetland. Patches occur along the road edge farthest from cultivation and closest to remnant native plant populations. Alkali rye grass is a perennial species spreading by rhizomes and thus often found along linear features. It has colonized large areas of the grassland hills and salt marsh.

**3.4.2.2.2 Wetland Communities and Sand Dunes**

3.4.2.2.2.1. Riparian

Central coast arroyo willow riparian forest is comprised of dense arroyo willows on moist ground. Three distinct forests of this plant association grow here (Figure 17). Arroyo willow is the exclusive tree in relatively even aged stands. These large old trees form closed canopies excluding direct sunlight from the forest floor resulting in a paucity of species in the understory. Silverweed, oenanthe, and Himalayan blackberry tangles are the main understory species.

Another riparian forest grows on the banks of Wilder Creek (Figure 17). This stream-side forest may represent another riparian assemblage type, the Central coast riparian scrub. It grows along a much more active waterway than the swale forests and is more species diverse. Most of the trees are arroyo willows, but some yellow willows and a very few elderberry and red alder trees are present. The dense canopy completely shades the creek bottom where almost nothing grows on the gravel or muddy bottom. Some open areas of the stream support cattails, bulrushes, and smartweed. A small colony of creeping buttercup has established itself under the willows north of the salt marsh. This alien species should be eradicated. Willows have also started to grow along the cliff channel west of the fallow field, but they are relatively young and have not formed a forest.

Central coast live oak riparian forest occupies outer floodplanes along perennial streams. It is yet another riparian species association, and may survive here as a vestige along the upper stream east of Highway One. Live oak, mugwort, coyote bush, poison oak, wild rose, and elderberry are major elements of this plant type. They

are present along the upper creek, but only in small areas.

Riparian forests have not been invaded by weed species, except along their edges. Borders with cultivated and fallow fields and roads are subjected to invasion by poison hemlock and annual grasses. These pest species grade into riparian forest understory, but have not displaced native species any further.

The willow thickets in swales provide densely wooded habitat for wood rats. Coots and even ducks use the seasonal standing water under the canopy. The dense forests adjacent to open grassland provide an ecotone, or edge, for foraging animals such as deer. The willow foliage provides roosting, feeding, breeding habitat for many songbirds, notably warblers and willow flycatchers. Along Wilder Creek, the woody and herbaceous vegetation along the bank is valuable habitat for mice, raccoons, deer, and birds.

3.4.2.2.2.2. Freshwater Marsh

The freshwater marsh is comprised of Coastal and valley freshwater marsh types, where there is little or no current. It presently occurs only in two places as patches of cattails and bulrushes, and grades into brackish marsh and Northern coastal salt marsh (Figure 17). Freshwater and brackish water marshes covered most of the lowland before Wilder Creek was altered (Figure 8). Ditching, diking, and channeling the creek drastically changed and reduced the influence of water in the wetlands (see Hydrology section). Much of the freshwater marsh was converted to dry habitat for farming or grazing. Willow groves presently growing in low wet areas occupy what was probably previously freshwater marsh (Figure 8).

Cattails and bulrushes are tall plants emerging above the standing water: they characterize the freshwater marsh. They often grow so densely to exclude all other plants. Emergent species such as smartweed, oenanthe and pennywort grow in adjacent open water. In the Wilder Wetland, the remnant freshwater vegetation occurs in narrow bands next to willows or intermittently flooded areas with silverweed, rushes, ox-tongue, willow herb, and young willows.

Freshwater marsh may have the highest habitat value of any environment in the Monterey Bay area. Enormous wetland areas were destroyed in the past causing major long-term problems with watershed management and health. In addition to keeping the supply of freshwater, these wetlands harbor numerous species of birds, amphibians, reptiles, and some mammals. A number of species of special significance (Table 8) are dependent on freshwater marshes. Herons, rails, waterfowl, and many song birds use the vegetation of permanently standing water and associated habitats. Nesting birds are protected from many predators by water; and gain food, shelter, and reproductive habitat as well.

3.4.2.2.2.3. Salt Marsh

The lower wetland behind the sand dunes is a Northern coastal salt marsh (Figure 17). Large areas are covered with rushes, pickleweed, salt grass, alkali rye grass and some fleshy jaumea. Brackish marsh elements occur along the Wilder Creek channel in the salt marsh: bulrushes and cattails. The gradation from salt marsh to freshwater marsh or

riparian along Wilder Creek and other channels occurs about where willows begin.

The marsh is characterized by flat topography and is subject to flooding from overflow of the creek, from high tides coming into the creek, and from storm waves (see Figure 14). Two main channels conduct water through the marsh. The large channel is Wilder Creek. The small cliff channel conducts slow-moving water from the west side of the fallow field through a marshy channel beyond the beach to its intersection with Wilder Creek (Figure 3). Three other swales empty into the salt marsh from the grass slopes. All 3 should function as water collection sites and extensions of marsh as restoration progresses (Figure 3).

The Wilder Creek channel is lined with cattails and bulrushes along its edges in scattered patches, especially near the mouth. Otherwise, rushes predominate along the channel and over much of the rest of the area. Pickleweed, salt grass, and alkali wild rye grass form most of the other vegetative cover. The small channel is dominated by rushes, but has a population of western dock along the upper portion. Wrack has been carried several hundred feet up the small channel where it was colonized by fat hen.

Salt marsh has encroached along the east and south perimeters of the fallow field. Wrack deposition and flooding facilitated the colonization of pickleweed here (Figure 17). Marsh baccharis, willow herb, silverweed, and prickly ox-tongue (an alien) colonized behind pickleweed. The area has become a rank brushland and may be slowly pushing out the poison hemlock covering most the field. A possible historic watercourse, originating at the flash board dam on Wilder Creek, runs southeast through the fallow field and is demarcated from the dominant poison hemlock cover by annual grasses (Figure 17).

3.4.2.2.2.4. Beach Dune

The plant community on the small dunes occupies poor, well-drained soil, exposed to onshore breezes. It should be a Northern foredune grassland with sparse cover of native bluegrass, dune grass, beach bur, sea rocket and sand verbena. This plant association was once widespread, but is now scarce. Human activities and invasion of aliens species such as ripgut brome grass have greatly disrupted the community. Most of the characteristic species are present at the Wilder beach except the bluegrass.

Sea rocket grows along the front of the dunes. The plants stabilizes sand in mounds around them. Even this stabilization by relatively few and small plants helps to prevent massive blow-outs which are now common in many parts of Monterey Bay because of intense human disturbance. There appears to be a tenuous balance between trampling and the ability of enough plants to survive and stabilize enough sand to prevent a disaster. There are also many beach bur, beach primrose, and some beach saltbush plants.

In back of the dune crest vegetation growth is more robust. Native dune grass, silky beach pea and beach morning glory also grow here as well as on the seaward side of the crest.

The dunes are small and low: they do not develop through mid and back dunes into northern coyote brush scrub as in larger systems. Instead they end in the rushes of the

salt marsh. Notable species at the interface include a patch of low growing wild rose, which is bisected and trampled by an illegal trail, and a couple of patches of mugwort. Ripgut brome has invaded in dense patches.

Four species on Wilder Beach are of special value: Beach Pea, Pink Sand Verbena, Beach Saltbush and Beach Morning-glory. These populations were once the largest or one of the largest colonies in Santa Cruz County. They are all uncommon or rare in the county. A rare white-flowered variant of Pink Sand Verbena also grows here. However, since these observations were made by Randy Morgan in 1987, the abundances of all these species have declined drastically at Wilder Beach, due, at least in part, to trampling by human activities.

The beach and dune may be the most critical habitat of the Wilder Ranch State Park. Restoration and protection recommendations are extended because of the great importance of the area. The sand community is very limited in area and fragile and yet has probably received the harshest treatment of any habitat during the last few years. It needs the most protection because of the large number of listed species which should use it. These animals are especially vulnerable on the open, unprotected sands.

### 3.4.3 Special Species

#### 3.4.3.1 Animals

The Wilder Wetland encompasses a variety of habitats which helps explain the surprisingly high number of special interest species which occurs there, 61 animals and 2 plants (Anon. 1992, 1993) (Table 8). Nine plant communities or remnants of them occur in and adjacent to the wetland and are rare enough to warrant special concern. The preponderance of species on the list are birds, 43, and the remaining 4 mammals, 2 reptiles, 3 amphibians, 3 fish, 4 invertebrates and 2 plants amount to less than half of the bird species. The lagoon, beach, and dune habitats are important to a number of very mobile species, especially marine mammals, birds, and fish. Wilder Wetlands may play a role in the life cycle of at least 56 of these special animal species, from simply providing space to a vital role in the life cycle. Other species pass by through the local marine waters.

The pallid bat and badger hunt ground-dwelling prey, the bat forages for flightless insects and other arthropods and the badger digs burrowing rodents. Both species gain directly from conversion of tilled agricultural land and of roadways to grassland.

The western snowy plover is the most significant special species at Wilder Ranch. It was recently federally classified as threatened. Overall the population decline in recent years has been precipitous. Nests are simply bare sand on open, unprotected beaches exposed to strong weather. The heavy use of Wilder beaches by people, horses, and dogs prevented nesting in the past. However, patrols to protect cattle in the wetland kept most people off the beach prior to 1985 (Engelsman pers. comm.). In 1985, there was heavy equestrian use and no nests; at least two attempts to build nests were made in 1986; and three in 1987; five chicks were fledged in 1988; 18 in 1989; five in 1990; about four in 1991,; and four in 1992 (Page 1988, PRBO unpub data; George, personal communication). Undisturbed beach is essential for nesting success. Wilder beach has been

used at least since the 1920's by plovers and is used for wintering by a flock of 30 to 40 birds. Human disturbance is by far the main problem at Wilder. Feral cats, dogs, and especially red foxes must be monitored and controlled to protect plovers.

Wilder Beach and wetland are significant to a number of other listed species. Flocks of up to several hundred brown pelicans may roost on the beach. Elegant terns in flocks as large as 1700 individuals have been observed on the beach. These large aggregations are immediately disrupted and fly off when intruded by humans. California gulls, Forster's terns, Caspian terns and California least terns are other listed shorebirds which use the beach. Double-crested cormorants and pigeon guillemots nest on the marine cliffs where black swifts may also nest.

Four of the 7 herons at Wilder are on the list: great blue, great egret, snowy, and black-crowned night heron. None have been observed breeding there.

The bank swallow, probably occurs and the purple martin has been observed at Wilder Ranch. They are listed as state threatened and species of special concern, respectively. The bank swallow nests in burrows in the ground and the purple martin is a cavity nester. Tricolored blackbirds (and red-winged blackbirds) nest and feed in freshwater marshes and use the Wilder marsh.

The large number of listed raptors occupy diverse habitats. Only the harrier and kite nest in the marsh area. Burrowing owls have been observed at Wilder. Large species such as golden and bald eagles are occasional visitors. Ospreys, merlins, peregrine falcons, ferruginous hawks, Cooper's hawks and sharp-shinned hawks winter in the area but are rarely present during breeding season. There is only a single record of a short-eared owl and of a long-eared owl from Wilder. The marsh—riparian interfaces are good habitat for nesting willow flycatcher, though they have not been observed in Wilder during breeding season.

Legless lizards need good dune habitat with native perennial vegetation. Two subspecies, occur along the coast and their ranges overlap at central Monterey Bay. The black legless lizard extends north from the Monterey Bay and could occur at Wilder (the silvery legless lizard occurs along the bay and south). Southwestern pond turtles were probably relatively common in the past from local wetlands. They are still present in Wilder.

Of the two frog species the red-legged has been observed and the yellow-legged probably occurs in the wetland. The listed status of the coast range newt applies to populations from San Luis Obispo and south. This species has been observed in Wilder Park on the north side of Highway One. They are relatively common.

Three of the 4 prominent fish species present are or will be listed. Steelhead populations south of Point Sur are proposed to be federally listed as candidate species. Their populations use nearby streams, and some animals may still ascend Wilder Creek. The tidewater goby is a federal candidate 2 and a state species of special concern. Populations occur in nearby Baldwin, Laguna and Moore Creeks, providing potential sources of animals for reintroduction to Wilder Creek. Coho salmon populations south of the San Lorenzo River

are proposed to become a federally listed candidate species. However their use of Wilder Creek is questionable, the habitat of the creek may not be correct for them.

The McKenzie cave amphipod, Dollof cave spider, and Empire cave pseudoscorpion occur in nearby habitats. All three are potential inhabitants of Wilder. The San Francisco tree lupine moth has not been observed on Wilder, but the coastal scrub habitat is an appropriate environment. The value of restoration includes the possibility of establishing, or reestablishing these invertebrates as well as the better known and more easily appreciated vertebrates that have been listed above.

#### 3.4.3.2 Plants

Santa Cruz tarplant and White-rayed pentachaeta are listed plants but have not been found within park boundaries. There is suitable habitat for both.

Many natural plant communities or their remnants grow in the wetlands and immediate surroundings. Some of these communities deserve recognition as special communities (Holland 1986) and merit inclusion in the California Native Plant Society Inventory (Smith and Berg 1988). Ten special communities were identified and included in Table 8: Northern foredune grassland, Northern coastal bluff scrub, Coastal terrace prairie, Valley needlegrass grassland, Northern coastal salt marsh, Coastal brackish marsh, Coastal and valley freshwater marsh, Central coast live oak riparian forest, Central coast arroyo willow riparian forest, and Central coast riparian scrub.

1—The dunes comprise a Northern foredune grassland: sparse grassland of upper strand and foredune dominated by American dune grass. This community remains heavily disrupted by human activities and invasion of alien plants.

2—Marine cliffs on either end of the beach contain remnants of Northern coastal bluff scrub: a low scrub of dwarf shrubs, exposed to constant winds with high salt content, on rocky and poorly developed soil. The elements left have been heavily disturbed by trails and footsteps on the steep faces and shallow soil, and invasive weeds such as annual grasses and poison hemlock.

3—The Coastal terrace prairie type, characterized by California oatgrass, intergrades with the valley needlegrass community in the Monterey Bay area. Remnants probably occur as part of the needlegrass community on the hillside.

4—Valley needlegrass grassland is dominated by perennial needlegrass, but with many other native and alien annuals. This community type is present on small rocky outcrops where invasive alien annual grasses and thistles do not dominate. It is the most interesting and natural vegetation on the grassland slopes and should be preserved, protected, enhanced, and extended.

5—Northern coastal salt marsh vegetation covers the lower reaches of the wetland. Pickleweed, rushes and salt grass dominate with less cover of alkali rye grass, silverweed and fleshy jaumea .

6—Coastal brackish marsh elements grow along Wilder Creek where it runs through the salt marsh. This community greatly

overlaps with the Northern coastal salt marsh. Bulrushes and cattails dominate.

7—Elements of the Coastal and valley freshwater marsh community grow in the cliff channel. The slow-moving water is thick with bulrushes and cattails with pennywort and sedges.

8—Central coast live oak riparian forest occupies outer floodplanes along perennial streams. Live oak, mugwort, coyote bush, poison oak, wild rose, elderberry constitute major elements, and all are present, but do not form an extensive cohesive type. This plant association survives only as a vestige along the upper stream margins.

9—There are three distinct stands of Central coast arroyo willow riparian forest along the Willow Creeks. This is a fairly dense canopy of old willows.

10—Central coast riparian scrub forms a stream-side thicket in fine sand and near-surface ground water along Wilder Creek. It is dominated by arroyo willow with some yellow willow and coyote brush.

### 3.4.4 Management Recommendations

With a few exceptions, the key to the management of the biological communities for the Wilder Wetland Restoration project can be summed up, in one word, protection. Protection from human disturbance will be fundamental to the long-term success of the project. Monitoring pests, such as dogs, cats, red foxes and bullfrogs, is also important in order to protect from potential damage they could cause.

#### 3.4.4.1 Birds

David Sudjjian (Santa Cruz Bird Club) contributed the following recommendations for protection of the avifauna.

-The Wilder Beach is probably the most undisturbed beach in the county, and the avifauna reflects this. Public access to the beach and marsh should be prohibited and the restriction effectively enforced.

- Access to the top of the cliffs should be controlled during pelagic cormorant breeding season, March to July, so that nesting birds are not disturbed by people. The trail should be rerouted away from the cliff edge, or routed so that cormorants cannot see or hear people.

- The cottonwood riparian habitat near the ranch buildings is rare along the coast. The understory vegetation should be enhanced and more cottonwood trees planted where possible.

- Public access to the basin upstream of the marsh should continue to be restricted. If trails are located here they should be routed away from riparian and wetlands vegetation.

- Wilder Ranch is a prime area for raptors and should be managed for their benefit. The grassland area east of the creek and the marsh area should have no trails nor other human activity.

#### 3.4.4.2 Beach and Dunes

- The sand community is very limited in area and fragile and yet has probably received the harshest treatment of any habitat during the last few years. It needs the most protection because of the large number of listed species which try to or should use it, and their vulnerability on the open, unprotected sands. The undisturbed beach would undoubtedly be used by bigger congregations of birds and marine mammals than present. The plant community would

undoubtedly respond quickly to restoration and, arguably, demonstrate the most dramatic positive change of any of the plant communities.

- Dave Dixon at Marina State Beach has initiated a volunteer program to erect fencing around plover nests along Monterey Bay to protect eggs and young from foxes. So far they have not apparently damaged the beach plover population at Wilder Beach (George, personal communication). However, this program may have to be implemented if red foxes (or dogs) become a problem. If the beach develops into the pristine habitat possible if released from human disturbance, many other species could be damaged by fox depredation and a broader fox extermination program could be necessary.

-Marine mammals would undoubtedly benefit from protection to the beach. If fully protected from human influence, Wilder beach can become a rare and highly desirable beach where they can haul out without being harassed by people, their pets, or vehicles. Haul out activities could range from resting and perhaps refuge, to breeding and rearing young. The beach could be used by four species of pinnipeds, a situation unique along the California coast, except for Año Nuevo, and rare anywhere else in the world.

If the dune vegetation were simply protected from trampling it would recover. Human footsteps move the sand, crush plants, and maintain bare sand which is exposed to the strong winds which blow across the beach. Wind blown sand is unstable and difficult for plants to colonize. Few if any beaches along California are not trampled and so good models are not obvious. However, restoration of many local dune is in progress. Projects at Asilomar, Marina, and Moss Landing State Beaches, for example, give good examples and provide well-proven methods.

Weed control of the fore and mid dune vegetation requires only killing three patches of alien perennial grasses: European dune grass near the creek mouth and at the mouth of the far east swale should be poisoned. A small cane patch near the creek mouth may be dug out. Ripgut brome grass at the back of the dune might be mowed, but may be satisfactorily controlled by crowding of native species allowed to grow undisturbed. It is a significant advantage that no iceplant has invaded here and therefore its eradication is not necessary.

- People control should center around research on snowy plovers. As long as that project justifies intrusion of people to the beach, then authorized workers will have access. The number of authorized people should be kept to a minimum. And they should be well coordinated so as to make the minimal impact. Endangered species should be the priority concern on the beach and dunes. Therefore restoration, maintenance and monitoring plant communities should be coordinated with and subject to needs of endangered species workers.

Finally, protecting dune vegetation from trampling will stabilize the sands and allow the flora to begin the long process to return to pristine conditions. The recovery will enhance or produce habitats attractive to many species of birds, mammals, reptiles and insects. For these reasons public access to the beach should be prohibited and the restriction effectively enforced.

#### 3.4.4.3 Cliffs

- Access to the top of the cliffs should be controlled during pelagic cormorant breeding season, March to July, so that nesting birds are not disturbed by people. The trail should be rerouted away from the cliff edge, or routed so that cormorants cannot see or hear people.

- Observation blinds with interpretative aids could be installed along the top of the north cliff area. The amphitheater-like view provides excellent opportunities for public education. For example blinds would provide visitors with a formal viewing area to observe the wetlands and beach and dune area. Wildlife using the habitat below would be protected from visual impact of people along the cliff top. Visitors would actually have better ability to observe the fauna below them than if they were actually in the habitat, and the disturbance to the wildlife would be nil.

#### 3.4.4.4 Wetland

- Public access to the basin upstream of the marsh should continue to be restricted. If trails are located here they should be routed away from riparian and wetlands vegetation.

- Purple martins, a special interest species, bufflehead ducks and other cavity nesters may be induced to nest at Wilder if nesting boxes are installed.

#### 3.4.4.5 Upland

- Upland habitats used by burrowing owls for their burrows and nests should monitored and carefully protected from threats, particularly the potential of human trespass.

- Wilder Ranch is a prime area for raptors and should be managed for their benefit. The grassland area east of the creek and marsh should be free of trails and human activity should be restricted.

#### 3.4.4.6 Pests

- Visitor feeding of skunks and raccoons should be discouraged through signage, and educational materials and programs

- A program to protect snowy plover eggs and young from red-fox predation may be required should this species invade the area. Dave Dixon at Marina State Beach has initiated a volunteer program to erect fencing around plover nests. Based on the results of that project, a similar program could be implemented. Additionally, should fox depredation become a serious problem, an extermination program may be necessary.

- Dog activity, such as fox damage, should be monitored and measures for their control be effected promptly if necessary. County animal control officers or park personnel should be involved in eliminating dog problems.

- The non-native bullfrog is the largest frog in the west. It has spread rapidly and is highly successful (Stebbins 1954). The bullfrog should be monitored and controlled if it threatens to displace the two special concern species, the red-legged and yellow-legged frogs. The red-legged frog will soon be federally listed as an endangered species. Nearby farm pond water which warms to temperatures that allow bullfrog reproduction are the most likely production centers of invasion by this species.

### 3.5 WETLAND DELINEATION

Wetland habitats were delineated by mapping the present edge of wetland vegetation,

by surveying the parcel for wetland soil types, and by investigating the history of inundation by both fresh and salt water. The methods used for the wetland deliniation give results consistant with the Army Corps of Engineer guidelines for wetland deliniations.

The history of inundation is discussed in the section on Hydrology. This history suggests that the entire marsh system was covered by water for at least several weeks during heavy rains in the past. Water apparently covered the fallow field, the west field, and the east field. These sites were farmed intensively for many decades and thus show little vegetation or soil patterns that are characteristic of wetlands. We present two wetland delineation lines: one based on the likely water elevations in the past which cannot be verified by present soil and plant patterns and a second line which delineates the wetland area by wetland soils and vegetation (Figure 18).

We also took ten soil samples throughout the wetland system during March 1992 (Figure 6). The most important indicator of wetland or hydric soils are the chromas with a number of 2 or less. All samples except the sand dune have chromas (the last number) of 2 or less (Table 9). None of the soil sampling results are surprising, since the wetland history of the parcel is well known.

Table 9: Munsell color classifications from soil samples taken throughout the Wilder Creek wetland system (see Figure 6 for site locations). Rating and color refer to the code used in Munsell Color Guide (Munsell 1988): Rating indicates the hue of the color and its chart number in the color guide, color indicates the value (vertical value) over the chroma (horizontal value) within the rating.

| SAMPLE | HABITAT | RATING | COLOR |
|---|---|---|---|
| A | Sand Dune | 5 Y | 6/3 |
| B | Lagoon | 5 Y | 4/2 |
| C | Marsh | 10 Y | 2/1 |
| D | Marsh | 10 | 3/2 |
| E | Fallow Field | 10 | 3/2 |
| F | East Field | 2.5 | 3/2 |
| G | East Field | 5 Y | 2.5/2 |
| H | North Field | 2.5 | 3/2 |
| I | North Field | 5 | 2.5/1 |
| J | North Field | 5 | 2.5/1 |

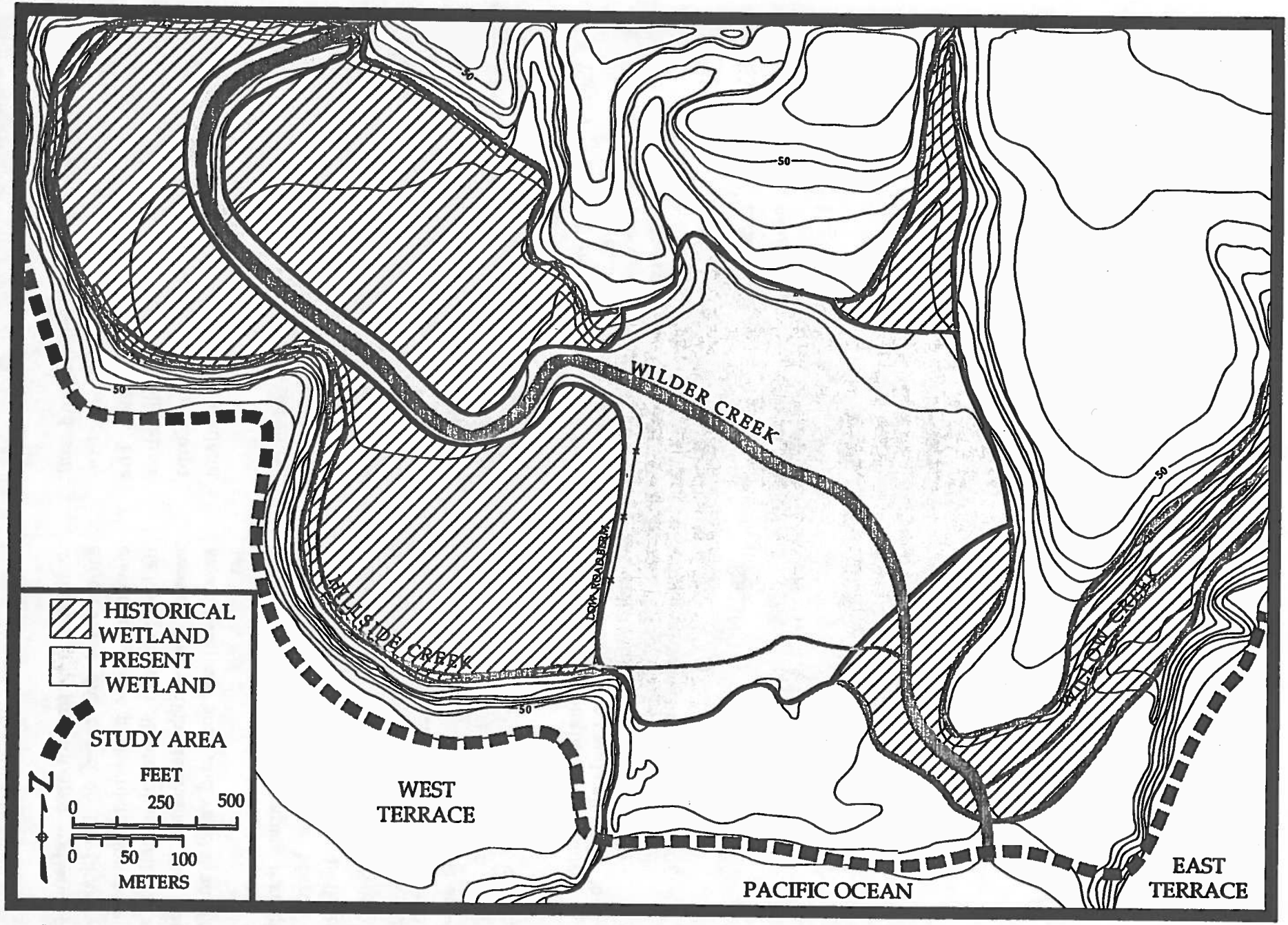



FIGURE 18: Wetland delineation of Wilder Study Area based on present vegetation, soil, and standing water; and likely historical wetland area.

# 4. RESTORATION PLAN

## 4.1 RESTORATION ALTERNATIVES

There are four primary restoration alternatives. The first is to continue present land use policies including agriculture on the east and north fields with no enhancement or restoration of the existing system. The second alternative is to cease commercial agriculture on all the historical wetland sites, the fallow south field and the east and west fields, but with no plan to enhance or restore the wetlands or surrounding uplands. The third alternative is to cease commercial agriculture on all the historical wetland sites and allow the natural erosion of the levee to permit natural inundation to the fields. The fourth and preferred alternative is to remove land from agriculture in stages and to restore the wetlands and surrounding upland habitats.

### 4.1.1 Alternative 1: Continue Present Land Use

Cultivation of the historical wetland areas would continue and there would be no enhancement of the existing Wilder Creek, no enhancement of the fallow south field, and no restoration of upland habitats surrounding the wetland. This alternative was eliminated by early discussions with park staff, other resource agencies, and many wetland scientists and naturalists. The existing and potential habitat values of the entire wetland system are too important to ignore as this alternative does.

### 4.1.2 Alternative 2: Remove Agriculture without Restoration

This alternative recognizes the need to recover historical wetland areas by removing commercial agriculture from the east and west fields. Wetland and surrounding upland habitats would recover without restoration and enhancement activities. This recovery process is likely to take many years and may never result in wetland values as high as those reached in a program of restoration and enhancement. This alternative was eliminated because the wetland system has been designated a Natural Preserve and is a potentially important habitat to a large number of special status species (see Section 3.4).

### 4.1.3 Alternative 3: Natural Levee Erosion

This alternative is the same as alternative #2 except that the natural erosion of the levee will be enhanced permitting seasonal and storm flooding of low-lying habitats. The creek levees will be broken in locations where water will flow into adjacent fields forming natural wet areas. The broken sites are the same as the sites excavated in alliterative #4, where there is excavation of shallow channels and ponds on the field to insure development of even more wetland.

### 4.1.4 Alternative 4: Staged Restoration

This is the preferred alternative and the only one which is considered further in the report. Commercial agriculture will be removed from existing fields and restored with native vegetation in three stages. The first stage is in progress. The south field is fallow, is being colonized by native plants, and is being enhanced by removal the of exotic weeds and the addition of other natives. The second stage is the cessation of agriculture on the east field and the restoration of wetland vegetation here. This stage

also includes restoration and enhancement of upland habitats around the entire wetland. The final stage is the cessation of agriculture on the west field and restoration of wetland here.

## 4.2 STAGED RESTORATION ALTERNATIVE

### 4.2.1 Restoration Goals, Constraints, and General Approach

The main restoration goal is to return as much as possible the original natural habitat values to Wilder Wetland. The best model for restoration is the historical wetland. Since knowledge of most historical systems is usually limited, this historical model is expanded by examining the least disturbed natural systems within the same type of watershed or geographic region. These include coastal wetlands along northern creeks at Pescadero Creek, Waddell Creek, and Scotts Creek as well as wetlands at Red White and Blue Beach and Four Mile Beach, and at the mouths of the Pajaro and Salinas Rivers. All of these systems have been modified by human activities, but natural components of the wetlands persist today. The lower portion of the Wilder Wetland and the adjacent riparian habitats provide excellent models for restoration of the more highly modified part of the system.

Enhancement and restoration are part of a continuum in recovering natural habitat values. Many modified habitats have some component of the native flora and fauna which can be enhanced to improve the natural habitat value of the site. Others have little or no surviving components of the natural system and require almost complete restoration. In this plan, enhancement refers to the restoration of habitats which still retain significant existing values as natural habitats: sites with significant cover of native plants and use by native animals. Restoration refers to a more elaborate landform modification and revegetation effort on sites with little natural, or original, habitat value (Figure 15).

The natural habitat values of the site are largely determined by the historical conditions, which are partially reflected in the more natural sections of the existing Wilder marsh and riparian corridors (Figures 4 and 17) and by other relatively natural coastal wetlands from the region. The historical wetland included a wider and slower flowing Wilder Creek flanked by large ponded areas maintained by creek overflow (Figures 8 and 14). The entire marsh flat was periodically covered with freshwater during winter and early spring in average rain years and into the summer in years of heavy or late rains. At least half of the system was periodically influenced by salt water entering the creek mouth or breaching the beach barrier during storm surf. These events covered the seaward marsh with brackish water for several weeks or more and created a large brackish lagoon behind the dunes and beach.

There are no major physical or other constraints to the restoration of Wilder Wetland within the main marsh. However, there are constraints in the surrounding watershed. Perhaps the most important are the extreme changes in forest and brush vegetation in the upper watershed of Wilder Creek. These vegetation changes probably increase in soil erosion causing higher sedimentation into the marsh and a decrease in the retention of water in the watershed causing water to flow through the wetland more rapidly. Seasonal drainage of a naturally vegetated watershed

would be slower, keeping the wetland areas damp for a longer period each year and thus improving habitat for wetland plants and animals. The extensive use of adjacent terraces by commercial agriculture is another significant constraint to wetland restoration. The natural wetland would be surrounded by extensive coastal scrub, grassland, and woodland habitat as well as smaller freshwater wetlands making a rich habitat mosaic around the wetland. This mosaic would harbor a much higher number of species using the wetland for part of their life history. There are also a number of direct impacts to the wetland and surrounding drainages from agricultural land use. These include soil erosion from bare crop rows and roads and dumping of garbage. The ecological impacts of agricultural chemicals in natural drainages are unknown, but the inputs are clearly significant (see Section 3.2.1 Agriculture).

#### 4.2.2 Site Design and General Approach

Wilder Wetland was an extensive, flat freshwater marsh with seasonal and episodic inputs of brackish water and much larger and frequent inputs of freshwater. The vegetation graded from brackish tolerant species such as pickleweed into riparian species such as willows, similar to the general vegetation pattern today (Figures 4, 17). This is the primary historical model for restoration of Wilder Wetland and for assessing habitat values.

##### 4.2.2.1 Hydrology

There will be minimum disturbance to Wilder Creek, but the primary hydrologic manipulation of the system will be here. The manipulations include removal of the irrigation dam, allowing natural accumulation of debris along the channel, removal of sections of the creek levee or dike, and excavation of a shallow channel and pond system in the fallow south field and the east field. The existing topography around the creek in the west field will produce similar habitats without excavation (Figure 16).

The irrigation dam will be removed from the mid section of the creek and the water course will no longer be used to impound water after the rain for irrigation.

Periodic removal of trees and other natural plant debris from the creek channel will discontinue. The park is already discouraging this practice. Debris will produce natural dams along the creek channel, especially at sites where the bordering levees or dikes are removed (see below). The debris dams will encourage the gradual infilling of the creek channel, which was ditched many decades ago to encourage rapid water drainage from the site. Water will flow out of the creek channel and into the adjacent wetland flats (former agricultural fields: fallow ((south), east, west)) and remain in the wetland longer. This new hydrologic setting will encourage the colonization and spread of wetland plants and habitats for wetland animals.

The existing levee or dike flanking the creek will be removed along sections twenty to 50 feet long at the locations shown in Figure 16. This will permit water to flow out of the creek and into the adjacent flat areas which were former wetland. As noted above, these sites are likely areas for the accumulation of debris as water rises in the creeks and the flow turns to exit through dike breaches. Like the debris dams, the breaches will encourage flow of water into the adjacent flats

retaining a much greater volume of water for longer periods in the developing wetland habitats.

A channel and pond system will be excavated in the fallow field and in the east field (Figure 16). The channels will be an average of 20 feet wide, but should have a somewhat irregular width and course as in a natural system. The channel depth should be approximately one foot below the background elevation at the dike break. Creek water will rise to this level and spill into the channels. The size and shape of the terminal ponds does not require precise control of excavation and should also be done to make more irregular borders. The center of the pond should be one foot below the elevation of the channel. There should be a gradual slope of the pond sides from the surrounding, existing elevations to the pond bottom. Again, there is no need for precise control of the pond topography. The system will function to transport water from the creek into the pond. If water flow is high, water will overflow from the pond into the surrounding wetland flat. At low or no flow, the pond will hold water for a longer period than the channel or adjacent, higher flats.

The purpose of the channel and pond system is to encourage water to flow out of the creek and into the wetland flats. The topography will also provide important habitat heterogeneity for the development of different zones of wetland plants. The excavated areas will harbor plants and animals that require the wettest soils. The low sites will be refuges for wetland organisms during dryer years and sources for expansion during wetter years. If the present drought continues, and it may despite the extremely wet 1992-93 season, the channel and pond systems will be important in developing and harboring wetland species that can colonize the surrounding wetland flats during more normal rain fall.

The construction model for the channel and pond systems is shown in Figure 16. The channel should be about 20 feet wide and about 1 foot deep. The pond should be as much as twice as wide and 2 feet deep at its deepest center. These are very shallow features requiring no precise grading to obtain the approximate depths. The main idea is to let water flow from the creek, through a channel into a central portion of the field, to be trapped in a slightly deeper terminal pond. The width, shape, and location of the channels and ponds should be staked by park staff prior to excavation. More detailed engineering drawings are unnecessary, unless required by regulatory agencies. The areas can easily be excavated in one day with supervision by park or marine lab staff. There is no need for precise control of channel and pond elevations as well. The pond should simply be deeper to retain water when creek flow into the channel decreases or stops.

Another option is to simply cut the creek levees where the channels are shown and let the creek naturally erode a channel into the adjacent fields (this was already part of alternative #3 discussed earlier). This natural erosion option could be substituted for the channel and pond excavation if desirable without modifying any of the other plans in this preferred restoration alternative.

#### 4.2.2.2 Revegetation

The revegetation of the wetland and upland involve the greatest investment of time and money into the restoration project. This pro-

cess has already begun on the fallow field where native species are colonizing the site and exotic colonists are being controlled by mowing. Marine lab and park staff have cooperated in mowing poison hemlock and thistle patches in potential sites for wetland vegetation. Upland buffers along some of the agricultural roads have also been established by the park and, although they have been colonized largely by exotic weeds, the buffers can be restored to rich native borders. The general approach to upland and wetland revegetation is outlined in the next two sections. It is important to emphasize that this plan does not lay out a detailed landscaping design. This is unnecessary. The plan describes the desired habitat and plant patterns and the general approach to realize the restoration and enhancement plans.

Park staff will oversee the restoration. Detailed drawings of plant locations and so on are unnecessary. Volunteers will include competent botanists and biologists as well as unspecialized workers. This pool of expertise allows seed collections from otherwise unnoticed plant populations, and will lend added competence to transplantation techniques, arrangement of restored plant patterns, and more watchful monitoring of week to week success of the restoration. Both State Parks and the marine labs have had excellent success with restoration and enhancement of native habitats using supervised volunteers (see Section on Implementation 4.2.7.2).

#### 4.2.2.2.1 Upland

The successful restoration of Wilder Wetland must include restoration and enhancement of adjacent upland habitats. The staged restoration involves wetland restoration, wetland enhancement, upland habitat restoration, and upland habitat enhancement (Figure 15). Because the wetland is well defined by and immediately adjacent to the upland, and because both systems are strongly integrated (e.g., wetland birds use the upland and upland species such as hawks use the wetland), the upland habitat around Wilder Wetland is a fundamental component of the restoration process.

Perhaps the greatest change to the coastal prairie and grassland habitat came with the arrival of the Spaniards. They brought with them cattle and cattle grazing, and the introduction of Mediterranean annual grasses. These quick growing annuals readily adapted to the California climate, changing the plant species composition of the site and region. Generally, the combination of human activities such as the introduction of annual weeds and open range grazing have altered the pre-historic plant communities. This alteration makes identification of the historical coastal prairie habitat and species difficult to assess.

Alien annual grasses are here to stay (Bartolome 1981, Heady 1990, Blumler 1992). Initial control of the overwhelming dominance of alien annual grasses may be necessary through combinations of burning, disking, herbicides, or other powerful human efforts (John Anderson personal communication). Thereafter controlling and preventing re-invasion of alien annual grasses may be successful through proper management of the restoration species. That is, the desired plants will occupy space and prevent invasives from dominating. It may be necessary to control occasional outbreaks of invasives. However, since most invasives are annuals,

outbreaks could be ephemeral and control actions may not be needed. Until the invasives start significantly degrading or killing desirable species, natural processes should follow their course.

#### 4.2.2.2.2 Wetland

Wetland weeds are primarily invasive alien grasses and a few species of broad-leaved plants. They will be controlled according to the time of year to enhance the effectiveness of mowing, burning and herbicide application.

State Parks policy is to restore with appropriate native plants and population make-up. On-site sources for seeds and propagated material will satisfy the Parks concern that plants be of the correct genetic make-up. Other near-by sources of plant material also represent the gene pool at the site and have been assessed to be acceptable by grasslands biologists John Anderson and John Menke (personal communication). Elkhorn Farms has made numerous seed accessions (collections), particularly of upland species of native grasses and associates from Santa Cruz county areas adjacent to the park. The Farms have good quantities of native grassland seed such as purple needlegrass and California poppy. Seeds and bulbs of other upland species such as blue-eyed grass, golden brodiaea, Ithuriel's spear (triteleia), corethrogyne and buckwheat, and from wetland plants such as California brome and marsh baccharis will be collected from on-site sources and either seeded directly, or multiplied by growing in a nursery setting. The multiplied seed will then be grown to seedlings to be plug-planted on site, or directly broadcast, whichever is more appropriate.

Propagation of on-site plants will also be done by taking cuttings of appropriate materials such as arroyo willow and coast elderberry, large woody species, rooting them in the nursery and outplanting when they are of sufficient size. Other more herbaceous wetland species and associates will naturally colonize. Alkali wild rye will be propagated directly through transplants from thick stands to adjacent restoration ground. Volunteer groups will be especially effective in taking plugs or clumps from natural stands and planting in fields. This species may also be propagated from rhizome divisions rooted in sand and out planted as larger plants. Rootstocks of marsh baccharis may also be transplanted from dense thickets to adjacent restoration sites on the fallow field.

Irrigation is readily available through pumping from the impoundment of the stream between the fallow field and east field, and later from the reservoir in the west field. Irrigation will allow planting to begin early, simulating germinating rain and supplementing natural rainfall. The latter use is valuable if the California drought continues. Simulated germinating rain will allow a more thorough control of weeds by providing two pulses of germination one in fall and a lesser and hopefully final one with winter rains.

Restoration of the marsh and lagoon should provide grow-out resources for young anadromous fishes, parr and smolt, before they leave freshwater to mature in the ocean. Healthy marsh vegetation with insect and vertebrate fauna should grade into a brackish water lagoon. The lagoon

should have moving or replenished freshwater from constant stream flow, oxygenated bottom sediments, and a healthy invertebrate fauna, mainly crustaceans (Jennifer Nelson). The plant growth need not be robust, but the brackish-water crustacean fauna should be well developed. Isopods, amphipods, and mysids are important food items for the fish. While the anadromous fish fauna may not be well restored up stream of the wetland, nonetheless a restored lower grow-out area will also provide resources for other fauna.

### 4.2.3 Wilder Creek Site Preparation

Dike removal can be carried out with hand tools or with a small or large cat. Channel and pond excavation can be done with a small or large cat. The entire construction phase can be completed within one to 2 days. Work should be done during the late summer or fall or at any time when the ground is dry in the first 3-4 feet. The excavated dike material can be placed behind the dike adjacent to the breached areas or dumped at the base of the upland slope in the east field. This is the dump site for material excavated from the channels and ponds as well. The excavated material can be used in other parts of the park if desirable. If soil is dumped at the upland slope site in the east field, it should be roughly graded to conform with the natural slope. The material can be seeded with native grasses and covered with native grass hay to prevent erosion. No wetland habitat or native plants or animals use the slope dump site, which is presently the edge of row crops in the east field.

### 4.2.4 Revegetation Plan

The wetland areas have been covered with commercial agricultural crops and can be periodically covered with water under more natural hydrographic conditions. Farming eliminated the native species and there are few exotic plant species because of farming operations. Once water levels are returned to wetlands, most of the exotic weeds will not thrive if there are periods of partial or complete submergence. As a result, the restoration of wetland habitats is much easier than the restoration of the native grasslands.

#### 4.2.4.1 Fallow South Field- Wetland

Restoration has already begun on the fallow south field (Figure 15). It was removed from agricultural production in the early 1980's (lease ended in 1988). The southwest edge of the field was rapidly invaded by pickleweed in the lowest part of the field, after high water deposited plant debris on the site and helped keep it moist into the summer. Behind the pickleweed, a wide zone of marsh baccharis and coyote brush has colonized the field. And behind this a dense growth of exotic poison hemlock and some thistles now dominate the remaining field.

Hemlock covers the largest area of the fallow field and must be removed to permit restoration of native species. Hemlock was mowed during the summer of 1992. The hemlock area should be mowed each year in late spring or early summer when the flowers are fully developed but before final seed set. The actual time will be determined by monitoring by park staff. Hemlock is the only important exotic species in the fallow south field.

The fallow field should be a mosaic of wetland and wetland plant associates. These in-

clude the present native colonists of pickleweed, marsh baccharis, and coyote brush. Natives from the surrounding habitats, the lower marsh and the riparian corridor, are also appropriate for the fallow field. Alkali rye grass is present along the riparian corridor and can be transplanted to the fallow field by taking plugs from existing patches. The patches should be mown two months prior to removing plugs to facilitate coring and stimulate new grass growth. Other species such as marsh baccharis and California brome will be established by sowing their seeds over the field. Marsh baccharis may also be propagated by cuttings and transplanting plugs. Some of these species and a number of other local plants can be propagated in a park greenhouse nursery as part of a restoration education and volunteer program (see Section 4.2.7.1 Greenhouse and 4.2.7.2 Volunteer Program). In general, the seeding and transplanting should be done in the large open area where hemlock is removed.

#### 4.2.4.2 East Field- Wetland

The east field is covered with commercial row crops (Figures 10 and 15). Once agriculture ceases here, there will be an excellent opportunity to establish native plants rapidly and with minimum expense. There is no dense cover of the usual invasive species which make restoration much more difficult. The restoration has two major phases: establish wetland species of native grasses and establish more riparian and marsh species in the channel and pond system when it is constructed. The first phase must proceed as rapidly as possible after the field is abandoned to avoid the exotic weed problems. The channel and pond construction can be done at any appropriate time after the cessation of agriculture. The field will thus be restored with a mixture of wetland grasses over most of the area and a dense riparian and marsh flora along the wetter channel and pond settings. If the entire field receives and retains more water, either because of more rain or greater spread and retention of water following creek alterations, the channel and pond flora can spread into the surrounding grasses. There will be a natural expansion and contraction of the wetland plants depending on seasonal and annual patterns of water input and retention. The proposed restoration will insure that a dynamic mixture of native wetland species dominates the site.

Agricultural leases on the east field expire in December 1994. At this time, the field should be drill planted with a fallow crop, commercial, non-reproducing barley. The fallow cover crop will protect the soil and hold back the usual weed crop induced by germinating rains. Irrigation may or may not be needed for the fallow crop. Local wetland grass species, meadow barley and California brome, can be drill seeded into the field. Other local seeds can be collected and drilled with these grasses. Candidate species include marsh baccharis, goldenrod, and rushes. Plugs of alkali rye grass can also be planted in several discrete patches acting as spreading centers for future colonization by creeping rhizomes. Coyote brush and other wetland tolerant species such as blackberry, poison oak, elderberry, coffeeberry and lupines may be planted along the field edges where they will interface with the marsh community.

The channel and pond system can be constructed at any time during the restoration process (Figure 16). The only significant construction constraint is the level of water on the field. Ground water should be at least 3-4 feet below the surface to permit easy and effective access and operation of tractor and other excavation equipment. Once the system is excavated, root material of native rushes, sedges, bulrushes, spike rushes, cattails, various so-called pond weeds, including pond weed (Potamogeton), smartweed, pennywort, water hemlock, and other emergent and edge herbaceous wetland species may be simply transplanted into the channel and pond edges from nearby sources. Silverweed, monkey flower, and willows can also be planted here. These species will rapidly expand into wet areas and into standing water. They will also spread into the adjacent flats where wetland grasses, e.g. California canary, manna, hair, and knot grasses, may be sown.

#### 4.2.4.3 West Field–Wetland

##### 4.2.4.3.1 Sustainable Agriculture

Route One Farms currently practices sustainable and organic agriculture in accordance with the Organic Food Act of 1990 on the west field (see Section 3.2.1 Agriculture). This operation can be integrated into the wetland and upland restoration with positive benefits to the future of agriculture and habitat restoration in other areas of the park. The restoration education and volunteer program can have an important sustainable agriculture component. The Route One Farms group already brings school children and other visitors to the park to learn about alternative methods of commercial agriculture using their operation as a teaching example. They have also interested native grass growers to using the park, and can experiment with native grasses in buffers and between rows of commercial crops. The native grasses potentially reduce weed species and thus the need for herbicides; they require low nutrients and have deep root systems that are not likely to compete with an annual crop species; they may increase soil microorganisms improving the growing quality of the soil; they may harbor important natural predators for pests; and they do all this and more with very little water requirements. Since the native bunch grasses are extremely hardy, tractors can be run over them with little or no damage to service the row crops. Native grass seeds can be harvested for commercial sale as well. This is only one example of exciting and educational cooperation between farmers and restoration gardeners.

The educational potential of an active sustainable agricultural operation in the wetland is considered more in the section on Volunteer Program (Section 4.2.7.2). One of the most important aspects of the restoration is developing a restoration education program with docent and volunteer groups interfacing with Route One Farms. State Parks should be a leader in this educational process. We must conserve the natural gardens that we have and restore those that are damaged.

##### 4.2.4.3.2 Future Restoration

The west field is clearly part of the larger Wilder Wetlands. It should be restored to a natural state (Figures 15 and 16). Channel and pond excavation plans will need to incorporate the historic creek route into their design. Decisions must be made on esthetic

as well as practical grounds between using and modifying present water routes and restoring historic channels. The low topography between Wilder Creek and the hillslopes due to the past channel (Figure 16) lend themselves to a ready recolonization by marsh communities. The west field is generally wetter than either the east and most of the fallow south field. Dike removal along the creek is adequate to bring water into the low areas. Eventually the cliffside creek will become more and more filled with living plants and plant debris causing water flow here to move into the west field as well. Additionally, the original emergent and wetland vegetation associated with the main creek channel, along the base of the slopes, will be propagated and recolonize naturally.

The revegetation plan for the west field is the same as that described for the east field with one major addition (Figures 15, 17). Since the east field will be restored first, the restoration of the west field can be modified by the experience gained from the east field and also the fallow south field restoration work. We recommend that the west field be left in the present sustainable agriculture for three to five years and that park staff reevaluate the restoration status at that time. This evaluation concerns changes in the plan based on experience gained from the east and fallow south fields and also by the results of the public education program. For example, if the volunteer and docent groups have developed an exciting program on the farm land, it may be a very good idea to continue this program and therefore the sustainable agriculture on the west field for another five years. It is important to leave this option open because of the tremendous educational potential of the park for both restoration and sustainable agriculture. On the other hand, based on the experiences from the east field and fallow south field, the west field can be restored with minimum costs, field work, and risk of problems.

If a new agricultural lease is developed for the west field it should contain several special requirements. The actual ending of the last year of the lease must be planned with park staff and farmers to cease farming at the optimal time for restoration to begin. This is likely to be after a summer crop in the early fall to be prepared for the first fall rains. The timing can be done to accommodate both the farming and the restoration. If the last year is planned in this manner, the restoration will have a maximum chance for a rapid start with minimum impacts from exotic species. The farmers also need to work with park staff in preparing the field for the last commercial crop so that they also prepare the field for the first crop of native plants. This is not difficult. It only requires a coordinated effort and communication.

#### 4.2.4.4 Existing Marsh and Riparian Wetlands and Lagoon

The existing lower marsh which is dominated by salt tolerant species such as pickleweed and the riparian corridors which are dominated by willows require little enhancement work (Figure 15). If both habitats were simply left alone, they would recover to a nearly completely natural flora, but limited and well directed enhancement work would be very positive by hastening recovery.

The existing marsh wetland can be enhanced primarily through weed control. Initially hemlock and thistle can be mowed in early to mid summer, before they have set seed. A

second mowing may be necessary in late summer or early fall to prevent seed sets from later sprouting plants. Mowing the wetland areas will be by hand operated weed cutter or tractor in open sites. There is one large patch of hemlock in the marsh which needs to be mowed this year at the same time that the hemlock in the fallow south field is mowed. Alkali rye grass can be plugged into the marsh hemlock areas as described for the fallow south field. Although the area will probably quickly become overgrown with the surrounding marsh species, some seeding or plugging of native grasses will insure minimal colonization by exotic weeds.

The biggest problem in the willow habitats is illegal dumping of garbage. For the most part, this garbage can be cleaned up by park or volunteer groups. The largest dump is along the southern willow creek next to the Rinaldi fields. This must be cleaned from the south side of the drainage, which is not part of the State Park. More importantly, steps should be taken to prevent future dumping.

Restoration of the wetlands, including marsh and lagoon, should provide grow-out resources for young anadromous fishes, parr and smolt, before they leave freshwater to mature in the ocean. Healthy marsh vegetation with its attendant insect and vertebrate fauna should grade into a brackish water lagoon. Proper conditions in the lagoon include moving or at least replenished freshwater from constant stream flow, oxygenated bottom sediments, and a healthy invertebrate fauna, mainly crustaceans (Jennifer Nelson). Here the vegetation growth need not be robust, but rather the brackish-water crustacean fauna should be well developed. Isopods amphipods, and mysids are important food items (see Invertebrates below). A restored lagoon could be inoculated with these species from populations from adjacent or at least nearby systems, Moore Creek, for example. Depth of the lower lagoon should be consistent with its other characteristics, and some excavation could be required to remove excess sediment.

#### 4.2.4.5 Hillside Plant Community

This community is vegetated by a mosaic of dense brush patches, pure stands of native species for the most part, and one primary tree stand. It is already a good natural habitat. Disturbance of the slopes has been minimal, probably due to their steepness and therefore unsuitability for farming or grazing. However, there are patches of hemlock which should be eliminated either by selective mowing, which must be timed before seed set, or by poisoning with herbicide (Figure 15). Mowing must be done with weed eater type machines because of the slope and to minimize disturbance to surrounding native vegetation. And along the west field perimeter there are two patches of jubata grass (pampas grass) which must be exterminated, probably by persistent application of herbicide. At the same time the other clumps of this grass, mostly occurring between the field and the parking lot, should also be eliminated.

#### 4.2.4.6 Grasslands

The grasslands (Figure 15) still have native species present but these are mixed into a sea of exotic species, so the grassland restoration

effort is significantly different and more elaborate than the wetland plans.

The site is a low grassland dominated by non-native annual grasses. Heady, et al (1990) defines two major types of grassland in California: valley grassland (Stipa) and coastal prairie (Festuca-Danthonia) grassland. The latter reaches its southern limit in the Monterey Bay area and the two types intersect at Monterey Bay. Therefore, it is not unusual to find both coastal prairie species, California oatgrass and valley grassland species such as purple needlegrass sharing the same ecotype as found on Wilder Ranch. In fact, the combination of the deep rooting bunchgrass is believed to improve the habitat of the coastal prairie by increasing the soil moisture holding capacity, reducing competition for water (the annual grasses have shallow roots and quickly absorb surface water), and reducing the annual litter build-up associated with annual weed die-off (David Amme and John Menke, personal communication 1992).

The restoration goal for the hillside site is to restore a mixture of coastal prairie and valley grassland species (Figures 15 and 17).

#### 4.2.4.6.1 Hillside Site Preparation

Eradication of the annual weeds must be done before planting. Various methods can be used to prepare the site including prescribed burning, mowing, and grazing. However, the most effective method appears to be prescribed burning. Burning in the late fall or early winter (if possible), after the first germinating rain will clear the site of litter and recycle nutrients and minerals back to the soil making them available for young native plants and seedlings. Burning opens up space for sunlight to reach the root crowns of the plants thus warming the roots and promoting growth (David Amme and Paul Kephart, personal communication, 1992). The Hopland Field Station, Sierra Field Station, and Jepson Prairie projects are each studying different methods and schedules for prescribed burning, mowing and grazing. Information from these studies is just surfacing, but will be available for comparison and reference in the near future. The initial findings from the Sierra Field Station show that a late fall burn, just after the first germinating rains, when the annual weeds just begin to turn green has increased the native perennial grass populations significantly over alternative regimes (Menke 1992, Fossum 1990, Langstroth 1991).

Thus, the burn should be scheduled after the first germinating rains of the season, if possible. If burning is prohibited, or is delayed, the site should be mown with a mulching mower. Mowing may be delayed until later in the season or in late spring before the annual weed seeds have set. Unfortunately, mowing the site may not prepare the site as well as a prescribed burn and may require more intensive weed management. Also, mowing is sometimes more expensive than prescribe burning. If mowing is substituted for burning, burning may be rescheduled for the following season.

#### 4.2.4.6.2 Planting

In general, each plant species should be hand broadcast or planted in a micro-climate and site location similar to the site from which it was collected or is known to live in similar habitats. Some key grassland species are considered below.

California oatgrass is a major component of coastal prairie and is difficult to germinate

from seed (Kephart, Grey pers. comm. 1992). It can be obtained, however, in limited quantities as plugs from native grass growers, or patches may be located on other, comparable sites of Wilder Park. The best time to transplant oatgrass is during the winter months. If the transplanting must be scheduled later in the year supplemental irrigation must be provided until the colonies are well established or the rainy season returns. Seeds collected during May from the site or as nearby as possible should be hand broadcast over and around the newly transplanted colonies. The seed should be lightly raked into the soil and transplanted colonies.

The area should be thoroughly watered after transplanting the colonies and hand broadcasting the seed. Water to a depth of twelve inches, or deep enough to moisten the entire root system. If the soil settles and exposes the root crown, add site soil, tamp and lightly water.

Alkali rye grass is a deep rooting native bunchgrass which improves soil structure and soil moisture holding capacity thereby improving habitat for other coastal prairie plants. It may be propagated on the grassland site at the same time as in the wetland area. It is not critical that this species be propagated, but rather the patches now present may be encouraged to spread by controlling weeds around their periphery.

Purple needlegrass is typical of the valley grassland type, but also occurs in coastal prairie including grasslands here in Santa Cruz county. It occurs on the site, and is clearly a surviving component of the natural grassland. Preservation and encouragement of existing populations is important in habitat enhancement. This species will be enhanced by the site preparation which retards the non-native annuals. Seeds of it can be collected and directly sown or grown to plugs to be outplanted. The plan prepared for the University of California at Santa Cruz Great Meadow enhancement project (Janecki and Associates and ABA Consultants 1992) describes the details of properly planting needlegrass plugs.

Blue-eyed grass, golden brodiaea, and Ithuriel's spear (triteleia) will successfully germinate from un-treated seed broadcast on the site. However, to give the bulb populations a head start over the annual weeds, a portion of the collected seeds may be propagated and grown in six inch plug containers. The remaining seeds may be hand broadcast over the plugged area and lightly raked into the soil.

Seeds of herbaceous species such as California poppy, California acaena, and corethrogyne also may be grown in plugs, or hand scattered over the newly planted areas of the grassland and lightly raked into the soil. The long term management plan for the site is intended to encourage a naturalizing of native species.

#### 4.2.4.6.3 Grassland Maintenance

Edwards (1992) presents a broad view of the conditions under which grasslands presumably evolved and the strong significance, even necessity, of grazing for grasses. Absence of grazing or under-grazing can result in build-up of litter around individual plants that may eventually kill them (King 1991, Thompsen 1991), and the problems of overgrazing are obvious. Proper grazing, well controlled timing, duration, and interval, can be helpful to grass plants (Fossum 1990, Langstroth 1991) and Savory (1988) provides guidelines.

The stimulus and pruning effects of grazing may be gained by mowing, but removing the litter could be difficult. Innovative approaches to applying grazing as a management tool would be appropriate in this relatively small controlled project since there is no economic incentive to commercial operations. Various species of exotic animals should be considered. Owners of pets or novelty animals could be attracted to cooperate because of the favorable publicity or educational value. Potential grazers include sheep, horses, cattle, bison, goats, and pigs. Portable electric fencing is inexpensive, easily employed and moved and very effective in controlling even large animals. The Holistic Resource Management movement may be the single best group to help provide direction and individuals who would be willing to cooperate in studies and provide grazing animals.

Mowing may mimic grazing and burning to some extent by knocking down high growth. It could also help reduce litter if the extra effort of collecting the residue is made. Obtaining or contracting for mowing equipment is easily done through local farmers or the park.

#### 4.2.4.7 Sand Dunes

The sand dune restoration site is very limited in area (Figures 13 and 15). In fact one reason that it has been intensively damaged is that traffic is constricted to the narrow band of sand beach and dune. The other reason for damage is that dune communities are inherently fragile because of the loose substrate. Sand gives way under trampling, plants are displaced and die, and no longer stabilize sand.

Methods have been well developed for restoration of sand dunes and many successful projects have become carried out along the central coast during the last few years. Plant propagation and planting techniques are now well known. All projects have three main aspects: protection, weed control, revegetation.

Protection of Wilder Beach and Dunes has been discussed in various sections of this report. There are many aspects of the beach which need to be safeguarded: special animal species, e.g. Snowy Plovers, roosting habitat for seabirds, marine mammal haul out, habitat for other vertebrates, as well as esthetic values and revegetation. Wherever there is foot traffic dune habitat will suffer. Restoration, including revegetation, of the dunes cannot succeed without stringent if not total control of foot traffic across the dunes. See the section on Public Access.

Weed control is often a major concern, particularly where invasive alien species have become the major vegetation cover, ice plant is a widespread example. At Wilder invasives have not covered substantial areas. However, that is not due to their absence, and they should be eliminated without further opportunity to become a major problem. European dune grass occurs in two patches, easily controlled now because the patches are discrete and relatively small. Poisoning methods are being investigated along Monterey Bay and may provide the best, most expedient solution. Two other pest species pose a smaller problem. Control of the few giant cane plants growing in a clump may be best by pulling them out. Ripgut along the back dune may be poisoned, or simply left to become out-competed by healthy natives. Monitoring

and experimenting with different control measures will ensure success.

Revegetation is the most obvious, but arguably least compelling of the three restoration aspects. If left alone, particularly after the first two aspects have been applied, natural plant recolonization will probably restore the dune system to a healthy community. However, no one knows exactly what the past community was; and the dune communities and habitats along much of the coast are now highly modified and very fragmented. For example, sand-dune bluegrass is suspected of being widespread in the past and is virtually gone from all dune communities in the state. The composition and distribution of dune species will never be known. The main influence of revegetation will be to hasten the recovery of plant cover and to influence the pattern of species and their abundance.

The first and foremost implementation of Wilder Beach restoration should be to protect it from disturbance from illegal access. All trails leading to the beach should be destroyed by straw plugging them to encourage plant growth, erecting barrier fencing across them, and placing signs in front of them. Educational signs, such as the snowy plover display, are essential to back up the trail signs as is a volunteer program. Volunteers will function as educators by simply explaining their work and reinforcing the messages presented on the signs. Their presence will discourage the few people inclined to trespass, and they can facilitate any enforcement needed to respond to violators (see section on Public Access).

All activity on and near the beach should be performed only after careful coordination with all concerns, particularly snowy plover nesting, so that animals are not disturbed. Most weed control can be delayed for months and still be effective. The best time to plant is the wet season, winter, whereas, plover nesting season occurs between March and August.

Propagating and planting dune plants is very straightforward. Tom Moss at Asilomar has provided an excellent example of greenhouse grow-out facilities and a volunteer planting program. Seeds and cuttings may be collected directly from the site, or from appropriate nearby populations and grown out in a local greenhouse. Planting propagules is no more difficult than scooping a hole in the sand. Six years ago Randall Morgan noted that four species, beach pea, pink sand verbena, beach saltbush and beach morning-glory, grew on Wilder Beach better that anywhere else in Santa Cruz County. Today at Wilder Beach, these populations are trampled and struggling but are good species to be propagated by seed. Native beach dune grass may be readily propagated by rhizomes. Sand-dune bluegrass (*Poa douglasii*), probably historically present, is a good candidate to reintroduce to the back dunes area. Nearby populations must be located and can be vegetatively propagated. Seeds of the rest of the species may be collected and broadcast, or grown in the greenhouse and replanted. However some species, so-called early colonists such as beach bur and sea rocket, may respond so readily when released of trampling pressure that they need not be propagated. In general decisions about choice of species, method of propagation, and amount of effort to expend should depend on the overall restoration project. Wetlands restoration has priority and

the dunes may recover adequately simply from being rested.

#### 4.2.4.8 Farm Buffers

The farm buffers are somewhat ambiguous, but usually include the dirt road and edge of the agricultural fields (Figure 15). These buffers have been established along the northern terrace, but not along the eastern terrace (Figure 15). The established buffers are dominated by invasive weeds such as thistle, hemlock, mustard and radish. These must be removed and the site revegetated with native species. The farm buffers are an important component of the entire restoration project. They can be extended throughout the park and can be the buffer model used by the County for other agricultural lands. Route One Farms may be instrumental in developing a more functional natural buffer area and bringing this process into a broader educational arena.

Upland buffer restoration follows a standard formula. It will be burned in fall to reduce the large buildup of thatch from thistle, annual grasses and radish. After rains have begun herbicide will be applied to create a chem-fallow, that is a short thatch of standing dead and dry plants which will prevent erosion and allow moisture retention by the soil. The success of the chem-fallow treatment in limited areas can be assessed and perhaps applied to larger grassland areas to be converted from invasive annuals to perennial native species. Needlegrass sites, outcrop communities, should be avoided. Following the germinating rains of the next season, seeds will be drill planted along the buffer. The seeds include the above discussed grassland species: needlegrass, some bulb species seeds, melic grass, Cailfornia poppy, corethrogyne, buckwheat, and other species, such as native dandelions and annual lupines, which may be collected from fields north of Highway One. Collecting these seeds is labor intensive and may not be feasible for application of them over large-scale planting of grasslands. However, introducing populations of these species in smaller and peripheral buffer areas allows a practical way to establish populations which may spread, and which may provide a ready seed source for further propagating in the future. It may be necessary to apply a second treatment of herbicide or to treat certain weed patches again. Irrigation may be useful in the late summer or fall. Management of the farm buffers may require periodic mowing (or grazing). In addition, some buffers on lower ground with richer soil will be better restored to a primarily shrub flora. Coyote brush would be an excellent "default" species, one that is easily established, requires no maintenance, and will lead to further colonization be other native species. However, other appropriate bushes could be planted: California sage, coffeeberry, black sage, elderberry, depending upon shade, moisture, exposure.

### 4.2.5 Agriculture: Recommendations for Restoration

- Maintain farming buffers.
- Discourage squirrels, mice and other crop destructive animals from using the buffer areas.
- Continue to phase out farming in areas below the terrace and adjacent to the wetland to the north.

- Gradually phase all park farms into sustainable agriculture if possible.
- Continue to monitor pesticide use.
- Continue to keep cattle-grazers out of wetlands.
- Utilize policy concerning adjacent parkland use of pesticides to include IPM in Rinaldi's farming of the terrace east of the wetland.

### 4.2.6 Public Access

Wilder Ranch State Park gives priority to California's recreational demands. At the same time, it provides for the preservation of natural and cultural resources that are of special significance and the protection of all resources. These uses can conflict and must be balanced. Present public access to Wilder Beach and Wetland Natural Preserve has significant impacts to threatened species and sensitive habitat.

The State Park provides environmental interpretation and a trail system for the marsh. Interpretation of the natural preserve is provided mainly by the interpretive shelter at the parking area and is planned in a future nature interpretive center. There is a bluff trail along the west terrace overlooking the natural preserve but the only signage are reminders to remain on the trail and out of the cultivated fields, and recently a sign display describing the snowy plover. The Wilder Ranch complex provides a wide range of historic and other interpretative programs and acts as a focal point for visitors. The ranch complex is located on Wilder Creek and is within easy walking distance of Wilder Beach and Wetland Natural Preserve.

Impacts from public users of Wilder Beach and Wetland, whether they are authorized or not, are important to the success of the restoration project. Wetlands and sand dunes are relatively fragile habitats, even when well established they are easily disturbed. Significant disruption and impacts can result from only a few individuals. The snowy plover nesting area is highly susceptible to significant damage by individuals simply walking through the area.

#### 4.2.6.1 Policy

Many areas in the park, including other beaches and surrounding wetlands, are designated primarily for recreation and public access: Wilder Beach and Wetland is an exception and is designated a Natural Preserve. General beach recreation such as picnicking, sunbathing, surfing and the like are prohibited. Public access is severely restricted in the area to protect fragile coastal strand vegetation, sensitive coastal wetland habitat, and nesting grounds of the threatened snowy plover.

Policy for the Natural Preserve allows appropriate actions, such as complete closure, to be taken if there are adverse impacts due to visitor use. The operations element in the general plan states: "The department's field staff is indeed responsible for the protection of all of its state parks resources. Of special note at Wilder Ranch State Park are natural and cultural resources. These sensitive features are... the natural preserve at Wilder Beach and Wetland... Visitor movement and activities... will be controlled to protect these sensitive areas from indiscriminate use.". The policy of restricting public access in order to protect threatened or endangered species and

sensitive habitats is consistent with the local coastal plan.

#### 4.2.6.2 Observations

##### 4.2.6.2.1 Users

Although there are policies and regulations protecting the wetland and beach and prohibiting public use, the preserve is significantly impacted by unauthorized public users (Figure 19). They enter the area by a number of different routes. Occasional visitors to the Wilder Ranch complex drift into the preserve while hiking, and are generally unaware that the area is closed to such use. Wilder Beach is most frequently trespassed by surfers who park along Highway 1 and hike through Rinaldi's brussel sprout field on the east terrace. They reach the beach at the back dunes within the snowy plover habitat. Others arrive by mountain biking from Long Marine Lab along the coastal terrace adjacent to the shore and then hike down the cliff at the east end of the beach. The unauthorized trails are so frequently used that they appear clearly in aerial photographs of the area and vegetation does not grow in the paths even during the rainy season. They are becoming permanent erosional features.

Uncontrolled public access to the natural preserve is causing severe disruption and destruction of Wilder Beach and Wetland (Table 10). Wetlands and coastal dune strand are being trampled, littered, and used as a public toilet. We observed permanent trails cutting into the wetland and dunes, wetland birds flying out of the marsh when users approach, destruction of snowy plover nests, and general disturbance of habitats. The situation is critical and needs to be remedied for restoration efforts and protection of the area to be successful. Despite the unauthorized use of the preserve, impacts are still much lower than they are on other beaches and wetlands within the park. The utilization of Wilder Beach by bird species is significantly higher when compared to the public access beaches in the park. Some level of protection of the natural reserve has been achieved.

##### 4.2.6.2.2 Visitor Control

Protecting an area such as the natural reserve is not an easy task. However, there are several management and interpretive tools which can make the task of visitor control easier. Fencing would be a valuable tool. Currently the area is partially fenced, but most fences are non-functional and require repair, especially on the Rinaldi's agricultural land along the east terrace (a major illegal access region). In addition, there is no fencing restricting users from leaving the pull out areas adjacent to Highway one. The pull out areas used for parking provide space for as many as eight cars at a time.

There are a few signs prohibiting entry into the area and a few signs identifying the area as a natural preserve with threatened species that are punched through by gun shot. There is inadequate signage to direct visitors to trails and out of restricted areas such as at the Wilder Ranch complex.

The area is not well patrolled and some park volunteers patrolling the natural preserve are unaware of the nesting area and the breeding season. We never encountered state park staff while in the preserve. Once a snowy plover researcher called to us from the bluff encouraging us to stay out of the

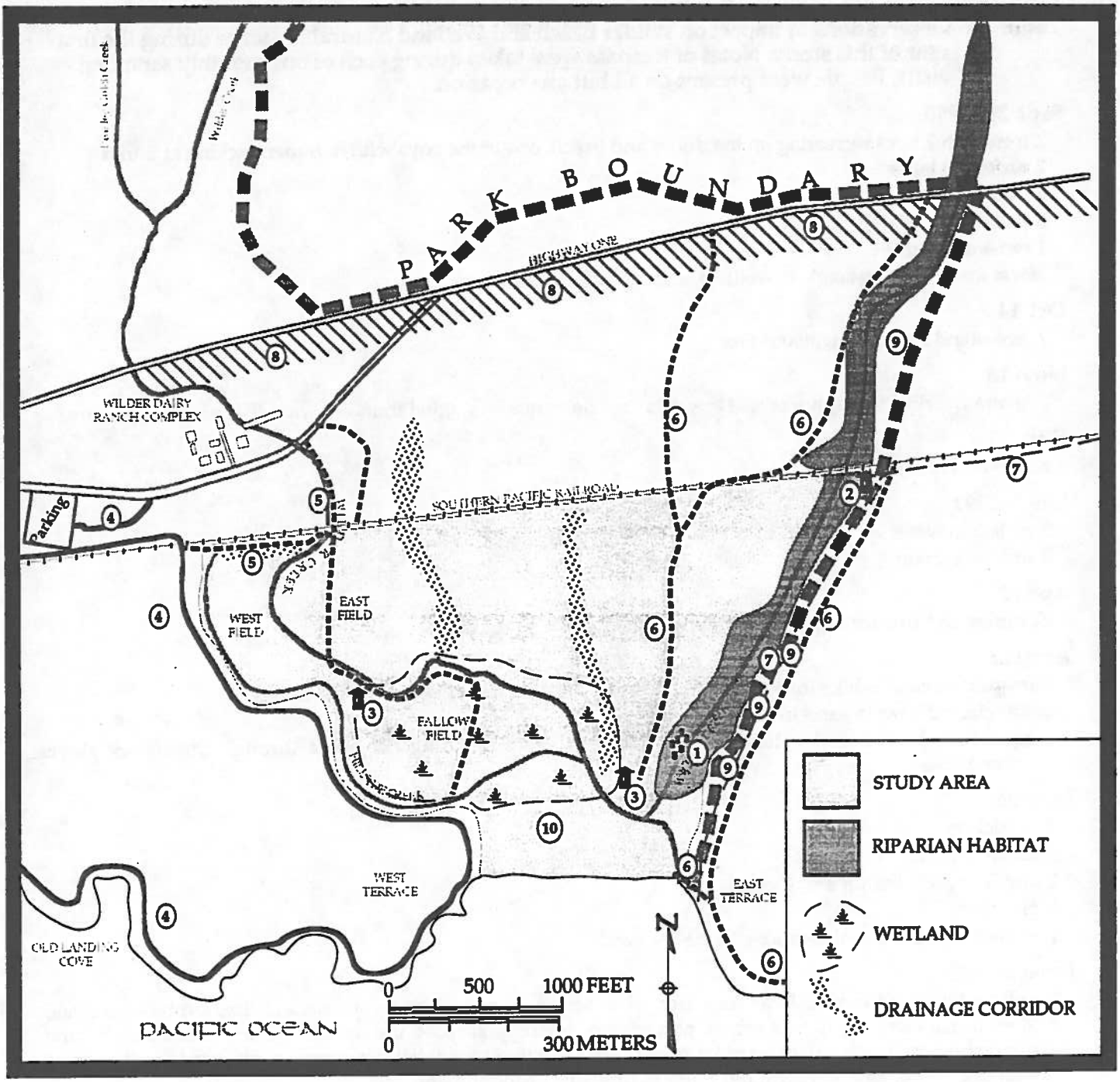



FIGURE 19: Current trespassing and land abuse patterns in and around study area.

1. Party area–beer cans, fires, trash.
2. Used as toilet by surfers and field hands.
3. Used as toilet.
4. Official park hiking trail.
5. Unofficial path used by hikers to enter wetland.
6. Path used by surfers, mountain bikers and hikers to access beach.
7. Broken fencing and signage.
8. Zone of pullouts, broken fencing and lack of signage.
9. Garbage dump.
10. Vegetation and snowy plover nest destruction area.

**Table 10:** Observations of impact on Wilder Beach and Wetland Natural Preserve during the first year of this study. Notes of trespass were taken during each of our monthly sampling visits. People were present on all but one occasion.

Sept 29, 1990
- 2 men with 2 boys recreating on the dunes and beach, one of the boys with hammer hacking at things
- 2 surfers on bikes
- 2 surfers on foot
- 3 fishermen fishing
- 1 romantic couple
- Horse manure along creek, in wetland, and on back dunes

Oct 14
- 2 men standing in the wetland area

Nov. 18
- 7 hikers walking through wetland towards the shore, not on guided tour, unaware that area is a preserve

Dec. 20
- no one observed

Jan 4, 1991
- 3 surfers in water
- 2 surfers on bikes

April 2
- 22 surfers and 1 surfer's large dog running up and down on the beach

April 25
- numerous mountain bike tracks up and down east flat, in wetland and along the dunes
- devils circle drawn in sand in the back dune
- 1 equestrian park patrol volunteer (unaware that she was riding her horse through the snowy plover nesting area)

May 26
- 5 picnickers
- 2 sunbathers
- 2 strollers each with a small child
- 3 bicyclists
- Human Feces in several locations in the wetland

June 11
- 2 backpackers who moved large logs around to set up an overnight camp, made a fire, left beer cans and other trash, camping near a snowy plover nest, possibly keeping the parents off the nest all night, and stepped on the nest as they were leaving, destroying two somewhat developed eggs (heads well formed, with egg teeth), and leaving a third egg to probable abandonment.
- 3 surfers

July 10
- 3 surfers—one arrived by mountain bike
- 1 motorcycle parked on east flat next to the wetland
- 1 fisherman on the beach

nesting area. Farmers complained about the lack of patrolling to discourage unauthorized users. Farmers do patrol the access route as best as possible but without the support of the park. Rinaldis (who farm the east terrace) claim to stop users a few times daily on weekdays and numerous times on weekends. Even so, we observed large numbers of users at the preserve on weekdays and weekends. Farmers also indicated there were almost no users when Engelsman grazed cattle on the Wilder Beach and Wetland because he constantly patrolled the area.

Interpretation and education about the Wilder Beach and Wetland and its natural preserve status is minimal and not visible enough to be effective. This is partly because the visitor entry and parking lot are newly built and the interpretive program is not in full force. The general plan does not call for extensive interpretation of the natural preserve.

#### 4.2.6.2.3 Recommendations

The park can promote responsible and conscientious use of the park and natural preserve by educating people about the importance of wildlife habitat and the critical importance of the Wilder Beach and Wetland Natural Preserve to the snowy plover population, and by inspiring visitors to appreciate these resources. The wetland enhancement and restoration can provide a regular volunteer and docent program which can play a key role in the education and general policing effort. Since Wilder beach and wetland is heavily impacted by unauthorized users, it is strongly recommended that interpretive efforts be increased and focused on the natural preserve and the vital role it plays in regional ecology. The general plan mandates for protecting sensitive resources should be vigorously pursued. Effective compliance with existing policy and regulations on limited public access will be critical for successful restoration.

The following immediate actions are recommended:

4.2.6.2.3.1. The pull outs along Highway One bordering Rinaldi's agricultural land should be eliminated. These pull outs provide the majority of parking for unauthorized users traveling through Rinaldi's to the wetland and beach. Caltrans and the Highway Patrol should be contacted in a joint effort with the park to reduce parking here. Perhaps a park volunteer can be present during peak usage to educate visitors and stop parking and access.

4.2.6.2.3.2. Fencing should be installed along Highway One to discourage users from crossing into Rinaldi's field. Fencing should be repaired and upgraded along the cliff tops of the terraces surrounding the natural preserve. All fencing should be constantly monitored and repaired on at least a weekly basis. All fences should display information, warnings, and directions (see below).

4.2.6.2.3.3. Further deterrents to crossing into the area should be in place. For example, the restoration effort includes planting blackberries and poison oak as barriers under and beside fences and in current entry paths. This vegetation discourages users without visual impacts. However, such planting will need time to become established and the other methods listed here must be in place for re-vegetation efforts to be successful. Straw-plugging trails will serve as visual

barriers as well as hastening recovery of their compacted and eroded soils.

4.2.6.2.3.4. Current unauthorized pathways and trails need to be restored to natural vegetation, paths should be tilled, planted and camouflaged to remove the appearance of being a trail or path. This is a wonderful volunteer program, providing the human power to educate would-be violators in the process.

4.2.6.2.3.5. Signs to inform users are inadequate and should be a high priority to improve compliance with regulations. Signs need to explain the need for protecting the area, give detailed information on the decline of snowy plovers and wetland habitat, provide the users alternative places to go and give responsible visitors a place to report unauthorized use by others. Signs are needed along Highway One pull outs as well as the Long Marine Lab access route and the border of the terraces above the area. Interpretive signs should be in place along the west bluff trail, at the interpretive shelter, and at the Wilder Ranch complex to inform and educate park visitors. Flyers announcing the need to save the snowy plover could be posted in bathrooms, at headquarters, and in surfing shops. All signs should be friendly and informative with less emphasis on the negative presentation and reflect a pro-active park policy.

4.2.6.2.3.6. Patrol of the area needs to be increased. Those patrolling the area should inform the unauthorized users of the reasons that the area is restricted, recommend other access areas the user can use legally. The patrols should occur from the terrace cliff edge to reduce any impacts on the sensitive habitats, restoration efforts, and snowy plover nesting sites. Patrollers should only enter the area to remove unauthorized users and it would be best to contact users entering or leaving the area. Patrols should be increased to several times daily during the snowy plover breeding and nesting period. Equestrian patrols are in direct conflict with the protection goals of the Natural Preserve and should be prohibited.

4.2.6.2.3.7. There should be a place at the park where responsible visitors can report unauthorized users in the natural area. Other sites have found that visitors can be very helpful in discouraging improper use by others. Entry signs should indicate a place where such reports can be made at the park.

4.2.6.2.3.8. All volunteer and staff training at the park should include an element about the natural preserve and its fragile nature. Interpretive programs from historical presentations to guided nature tours should include the natural preserve in their presentation. For example, a historical perspective could include the fact that the Wilder family also kept the Wilder Beach and Wetland as a wildlife preserve.

4.2.6.2.3.9. There needs to be a brochure about the natural preserve including its goals and the reasons why it needs our protection. The brochure should be given to visitors at the entrance kiosk and be available at the Wilder Ranch complex. The trail brochure of the park should clearly indicate the natural preserve as a restricted area and give reasons for hikers to remain outside of it.

4.2.6.2.3.10. A series of news articles could be done to show the detrimental effects of

unauthorized users to the natural preserve and the need for these users to change to other locations.

4.2.6.2.3.11. The Surfriders Association have been contacted and are supportive of the project. A recent article (June, 1993) in their monthly newsletter, "The Ocean's Roar", highlighted the problem of the degradation of Wilder Beach. As one of the major users of the beach, it identified the surfers' role in the destruction of snowy plover nests and general habitat disturbance. The article announced the new trespass violation fee and cautioned surfers to find good waves elsewhere. The continued involvement of the surfing community will be critical in protecting the natural preserve and should be fostered. Surfriders could be enlisted to patrol the access points, especially on weekends. This patrol could be very helpful initially to reduce the current use of the area. Surfriders could distribute flyers about the need to remain out of Wilder Beach to protect snowy plovers. Surfriders may also be interested in volunteering to help repair fences and other damage caused by past surfer use of the area.

4.2.6.2.3.12. Department of Parks and Recreation (DPR) should work in cooperation with neighboring farmers such as the Rinaldis and with Long Marine Laboratory to eliminate illegal access routes. Interpretive signage should be in place to explain the reasons for protecting the area and restricting access. Neighbors could assist with patrol of the illegal access routes if given a phone number to call to report misuse. These neighbors should share in the upkeep and installation of appropriate fencing. If a neighbor is unwilling to help with fencing, DPR should do all the fencing in order to protect its natural preserve. Park staff should discuss cooperation with neighbors to protect the preserve and draft a letter of agreement when necessary.

4.2.6.2.3.13. The reduction of unauthorized users of the natural preserve should be given high priority by state park staff. The changes outlined above are needed for successful restoration of native habitats and natural preserve values. The recommended site changes, signage, and brochure are an essential part of the restoration project.

### 4.2.7 Implementation

#### 4.2.7.1 Greenhouse

In conjunction with a restoration education and volunteer program, a small greenhouse could be constructed at a convenient park site for growing native plants for the restoration. This includes plants started by seed, cuttings, and root material. There are excellent models of inexpensive and active native plant greenhouses at the Elkhorn Slough National Estuarine Research Reserve and at the Moss Landing Marine Laboratories. A simple greenhouse can house most the plant material for the restoration and equally important will become a nucleus for volunteer activities and other public education functions.

#### 4.2.7.2 Volunteer Program

The opportunities for public education with the restoration are considerable and important. The restoration volunteer program is important for at least four primary reasons. First, the restoration depends on a continuous source of enthusiastic and committed labor. The proposed restoration and enhancement work is labor intensive and is inexpensive with volunteer labor. Second,

the volunteer group will be the best possible police force to reduce the illegal and destructive public access problems. Third, experienced volunteer labor can also be used to carry out the restoration monitoring. Finally, the activities of a volunteer and docent group will quickly spread the restoration goals, results, and actions into a broader public awareness. This public education will be a major contribution of the park. It can produce an entire generation of future park users eager to learn and participate in restoration of natural areas. The integration of habitat restoration and sustainable agriculture broadens the educational potential of the program considerably, and again is a major contribution of State Parks to public education. Wilder Ranch has the opportunity and resources to become the major public setting to learn about sustainable agriculture and habitat restoration. No other public park or lands has this unique mixture of natural habitats and farm lands with the opportunity for pubic access and participation.

It is not necessary to outline a restoration education program in detail in this plan. The main objectives of the program are to train and involve volunteers in the restoration, to train docents to carry on the training and involvement, to spread the program to school children, and to educate young and old about both the restoration of native habitats and the values of sustainable agriculture. This program can be funded as part of the restoration and thereby greatly reduce the overall restoration costs.

#### 4.2.7.3 Monitoring and Performance

Detailed monitoring and performance goals are not established because they are inappropriate for this project. Restrictive requirements may be imposed on developers or other entities when they may be only secondarily interested in carrying out directives for mitigation measures. However, this project is under the auspices of a motivated conservation agency. The project and the public are better served by maintaining an experimental setting and a flexible and opportunistic approach.

One of the major objectives of a restoration education and volunteer program is to monitor the success of the restoration. A monitoring task force can be composed of well trained and often highly experienced naturalists. In Elkhorn Slough, water quality and restoration monitoring programs are done by volunteers. This work can be extremely expensive if it is required by government agencies and done either by park staff or consultants. Volunteers are essential for inexpensive and effective monitoring. The monitoring program should include bird counts and observations of habitat use especially nesting; photographs of the major habitats for documenting general plant patterns combined with qualitative observations of experienced volunteers; qualitative observations of other wildlife; general water quality observations (salinity can be easily measured and anoxic conditions noted); and selected data on survival of native plants in the green house and transplanted to the wild.

A detailed monitoring program should be outlined by the restoration manager and volunteer coordinator and should use the considerable experience of the local pool of naturalists. For example, the wetland area is already surveyed by a number of bird natu-

ralists. The snowy plover population is surveyed by the Point Reyes Bird Observatory and the Santa Cruz Bird Club makes regular visits to Wilder Ranch and Wetland. It will be easy to coordinate these activities into a thorough survey of the restoration. Marine lab staff and restoration plant propagators such as Elkhorn Ranch can provide important information on plant and other wildlife patterns during their visits to the site. The coordinated efforts of staff at Route One Farms, other key volunteers, and park staff will all be useful. They must simply make observations in a standard and useful manner. The restoration manager and volunteer coordinator will stimulate the proper activity, help make observations standard, and collect and organize the results. Early in the process a group of the best volunteers will quickly emerge and the monitoring work will focus on them. This work does not need to be frequent, although some observers are likely to be present on site often. These types of data and observations are quite adequate for restoration monitoring, and can become an outstanding example for other programs to follow. Moss Landing Marine Lab is also committed to help develop an effective and exemplary monitoring program for the site and contribute to its success.

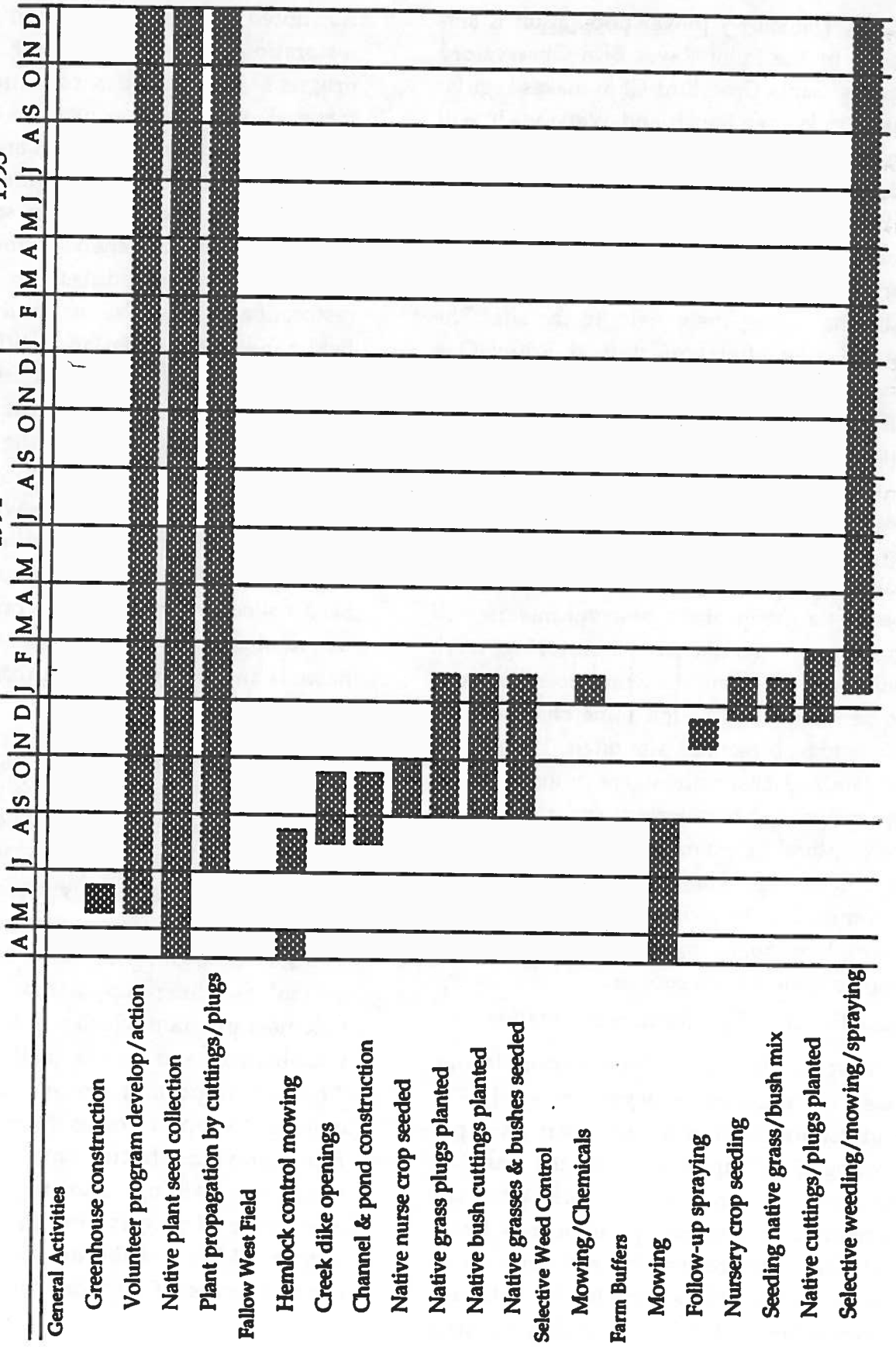
#### 4.2.7.4 Schedule for Implementation

The schedule for implementation is outlined in Figure 20. It begins in April 1993, and continues for two and a half years permitting the completion of all the basic enhancement and restoration work. What will remain is monitoring, periodic weed control, and other restoration maintenance activities which will be done by the volunteer program under the direction of park staff. As noted in the restoration plan, the restoration of the fallow south field is in progress. This includes collection of seed material, identification of grass plug areas for transplantation to the site, and primarily control of hemlock and some thistle by mowing. The implementation schedule includes a number of general restoration activities as well as schedules for each major restoration habitat: fallow south field, east field, sand dunes, grassland, cliff slope, and farm buffers. The general activities include the construction of a greenhouse in the park and the development of the volunteer working program. In addition, collection and storage of native seeds will be done throughout the entire restoration period as well as propagation from cuttings and plugs. Seed collection and cutting work is important to almost all of the different restoration habitats and is a continuous process.

#### 4.2.7.5 Funding

State Parks has developed a budget of $88,000 with $15,000 available for park personnel, a critical involvement, and $73,000 available for restoration contract work. The $73,000 is broken down in Table 11 which also lists the key contributions from volunteer and other sources of matching support. The most important matching support comes from the volunteer program which will be developed, established, and made self sustaining. Another important source of potential matching support comes from Route One Farms providing tractor time, growing help, volunteer training, and regular on site monitoring of progress and problems. Moss Landing Marine Labs are pursuing additional sources of support for the project.

Figure 20: Wilder Ranch Wetland Restoration Implementation Schedule



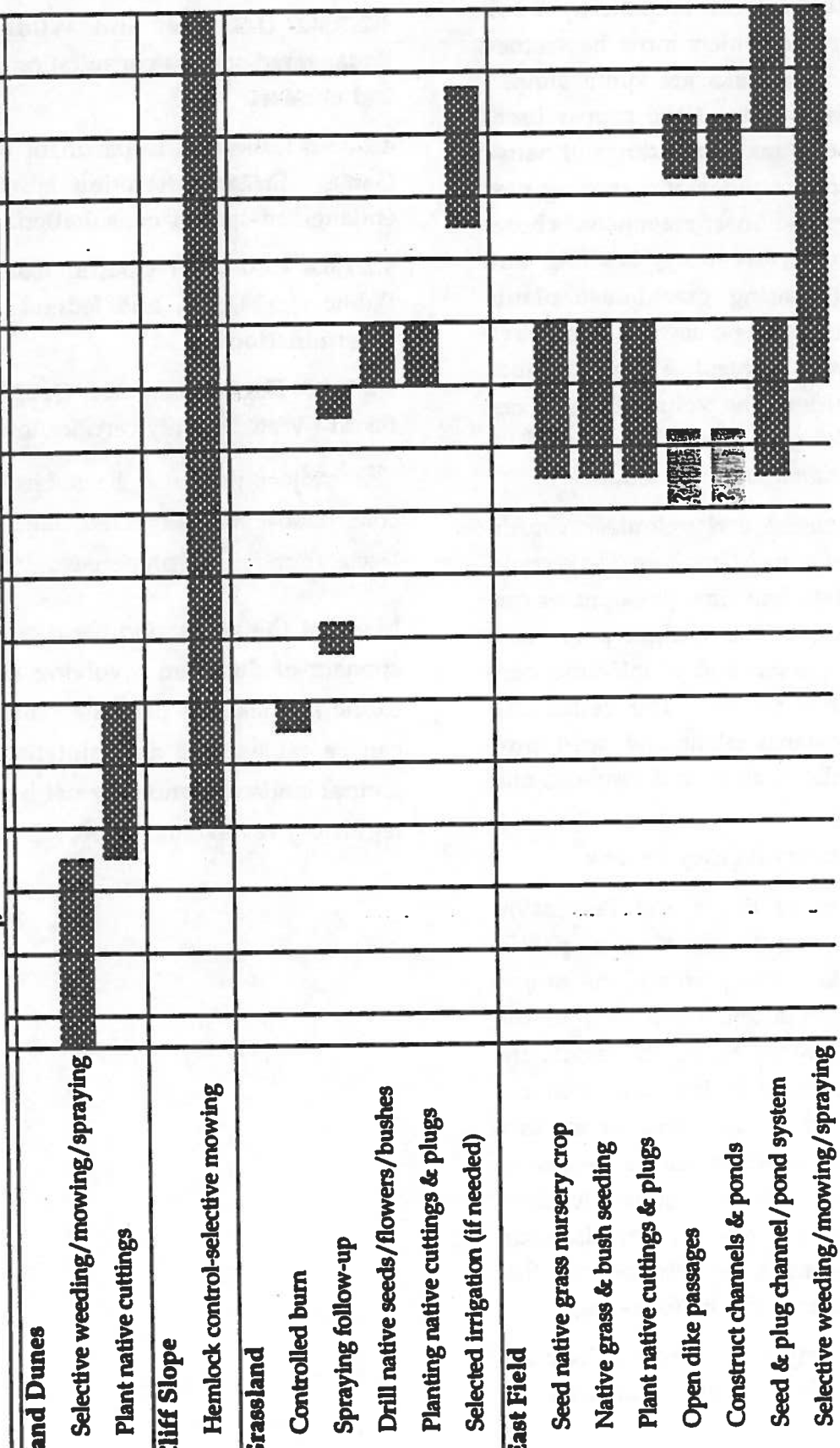



**Figure 20: Wilder Ranch Wetland Restoration Implementation Schedule (continued)**

The bulk of the work can be done by a volunteer work force which must be trained and directed. The tasks are quite simple- collecting native seeds at the proper times and storing seeds; making cuttings of native plants at the correct times and starting new plants in the greenhouse; greenhouse chores such as watering, weeding, labeling and recording; outplanting greenhouse plants and transplanting plugs; sowing seeds; irrigation; and weed control. These are labor intensive activities. The volunteers can easily accomplish this work but the entire effort must be coordinated and directed.

Project management and volunteer coordination tasks are a full time job. They could be done with two half-time positions or one full-time position. The budget permits a half-time park person and a half-time contract for another person. The remaining budget goes towards plant and seed purchases, seed drilling, signs and displays, and soil excavation.

#### 4.2.7.6 Regulatory Agency Review

The Department of Parks and Recreation will use this plan to develop a specific restoration project. The plan and the project design will be submitted for review to the responsible regulatory agencies. Despite the statements elsewhere in this plan that detailed designs and specifications for the proposed restoration activities are not necessary, significant detail may be required to meet the regulatory agency application requirements. Agencies and the permits that may be required include the following:

4.2.7.6.1 U.S. Army Corps of Engineers - Clean Water Act Section 404 compliance.

4.2.7.6.2 U.S. Fish and Wildlife Service Endangered species consultation and biological opinion.

4.2.7.6.3 California Department of Fish and Game - Stream alteration agreement and endangered species consultation.

4.2.7.6.4 California Coastal Commission - Public works plan and federal consistency determination.

4.2.7.6.5 Regional Water Quality Control Board - Water quality certification or waiver.

The project will also be subject to CEQA compliance. It is expected that a Negative Declaration will be prepared.

Much of the vegetation management comsponent of this plan involving removal of exotic species and planting native species can be categorized as maintenance of the natural landscape and may not be subject to regulatory review and approval.

## 5. CONCLUSION

The Wilder Ranch Wetland Restoration Plan identifies the significant natural resource values that currently exist within and adjacent to Wilder Ranch Natural Preserve and identifies the tremendous potential for restoring and enhancing these values. Also included are several recommended strategies for implementation and management. The Department of Parks and Recreation will use this plan to develop a specific restoration project that identifies a detailed project design and methods of implementation. The recommendations for management and implementation contained in this plan represent the views of the Moss Landing Marine Laboratories' staff. The final project design may include modifications of this plan based on additional information that may become available, regulatory agency requirements, funding limitations, and operational concerns.

**Table 11:** Budget for the two primary years of the restoration project.

| Task | 6/93-6/94 Year 1 | 6/94-6/95 Year 2 |
|---|---|---|
| Restoration Management | 15,000 | 15,000 |
| Restoration Volunteer Coordination | 15,000 | 15,000 |
| Greenhouse | 5,000 | |
| Channel & Pond Excavation | 4,000 | 4,000 |
| Seed Development & Drilling | | 15,000 |

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