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An evaluation of selected California Coastal Commission wetland projects

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AN EVALUATION OF SELECTED CALIFORNIA COASTAL COMMISSION WETLAND PROJECTS

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ABSTRACT

AN EVALUATION OF
SELECTED CALIFORNIA COASTAL COMMISSION WETLAND PROJECTS

by Teri Uyeda Zenk

In recent years, there has been significant debate over the success rates of wetland mitigation and restoration projects. The resulting issue is whether or not human-made wetlands can effectively replace natural wetlands. The question of how wetland projects should be evaluated for success is critical, yet generally unresolved.

This study examines twelve wetland projects, and offers evaluation methods for determining project success from compliance and biological standpoints. Research areas include: 1) the evaluation of project success based upon project compliance, 2) the evaluation of biological success based upon field methodologies, and 3) the evaluation of wetland projects for overall success, based upon the success criteria as stated in Executive Order W-59-93.

The results, based upon the twelve project sites, show higher than expected rates of success for both project compliance and general elements of biological functioning for coastal wetlands located within the Monterey Bay region of California.

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER ONE

INTRODUCTION

Wetland ecosystems, which cover an estimated six percent of the Earth's land surface, represent one of the most productive and critically endangered resources. With six of the world's ten largest cities (New York, London, Shanghai, Buenos Aires, Osaka, and Los Angeles) situated along the coasts (Holmberg 1988), and 110 million people or 50 percent of the U.S. population living in or near the coastal zone, which comprises only 20 percent of the total land area (Tippie 1991), it is no surprise that coastal wetland habitats are threatened by human activity. In the United States alone, of the original 215 million wetland acres, only 99 million acres exist today (Holmberg 1988), with an annual loss of 400 thousand acres (Tippie 1991). Although there is still an estimated 67,100 hectares or 166,000 acres of wetlands within the coastal states of California, Oregon, and Washington (Josselyn 1990), California's existing wetlands represent less than 15 percent of those that existed before settlement by Europeans (Larson 1981). Within Monterey Bay, 75 percent of the original wetlands have already been lost (United States Department of Commerce 1992).

While existing wetlands are limited, they gain importance when you consider that wetlands are unique habitats and develop only when specific characteristics of geology,

hydrology, chemistry, and microclimate conditions are present. Three recognized and atypical attributes of wetlands are its hydrology, hydrophytic vegetation, and hydric soils. Wetland hydrology is evident by periodic soil saturation or inundation during the growing season of the prevalent vegetation. Hydrophytic vegetation, for the prevalent plant species, matures and reproduces in soils where portions of the root zone becomes anaerobic during the growing season. Hydric soils are soils that become saturated, flooded, or ponded long enough during the growing season to develop anaerobic conditions, approximately fifteen consecutive days.

The need to protect wetlands is obvious when their functions and values are considered. The functions vary, depending upon the type of wetland and region. Some wetlands provide functions having only local or regional values, while other wetlands may have functions with national or even global value. Finally, a single wetland will not possess all of the functions, nor any of them equally. However, when viewed collectively, the range of wetland functions is impressive: maintenance of biological diversity, water quality improvement, storm damage protection, floodflow alteration, shoreline stabilization, sediment/toxicant retention and removal, groundwater recharge and discharge, nutrient cycling, climate moderation, recreation, and visual values (Larson 1981, Holmberg 1988, Oliver 1990, Ogawa 1990, Adamus et al. 1987, S.F. Estuary Project 1991, Tippie 1991, Niering 1994).

Coastal wetlands located in Monterey Bay provide many of the previously mentioned functions. In particular, the wetlands provide critical habitat for a number of

plants, fish, shellfish, and other wildlife. Protection from storm and wave damage, the recharge of aquifers, and improved water quality are also important functions found in the wetlands of the Monterey Bay region (US Department of Commerce 1992).

Regulatory Issues

The issues surrounding wetland management and protection are both controversial and dynamic. Although it is generally agreed that wetlands provide numerous benefits and deserve to be protected, it is also recognized that wetlands are under great pressure to be converted to other uses. The nation's demand for growth and resources and the increase in population and waste have resulted in an overwhelming concentration of all of these elements within the coastal zone. According to Tippie (1991), 28 percent of the abandoned hazardous waste sites, including 35 percent of the EPA's Superfund National Priorities List, are located in coastal areas and 50 percent of the pollution loading to coastal waters is believed to be from such nonpoint sources as agriculture runoff and urban areas.

Due to the historic loss and threat of continued degradation of coastal areas, the policy response has been to regulate activities negatively impacting these natural resources. Historically, legislative enforcement of wetland protection began in 1899 with the Rivers and Harbors Appropriations Act. The policy of permitting the discharge of pollutants into navigable waters was updated in 1972 with the Federal Water Pollution Control Act (FWPCA), otherwise known as the Clean Water Act. Section 404 of the

Clean Water Act is of special importance as it mandates the restoration and maintenance of the chemical, physical, and biological integrity of the nation's waters (Cuipek 1986).

In 1974, the U.S. Army Corps of Engineers (Corps) redefined "navigable waters" to include wetlands adjacent to waters used for interstate commerce and defined wetlands as "areas that are periodically inundated and normally characterized by the prevalence of vegetation that requires saturated soil conditions for growth and reproduction" (Parish and Morgan 1982, 48). The definition of a wetland remained ambiguous and was revised in 1977 and again in 1987, which further broadened the jurisdiction of the Corps. Although the definition of a wetland remains in flux politically, the National Academy of Sciences has adopted the following definition of a wetland, based on the findings of the Committee on Wetlands Characterization (National Research Council U.S. 1995, 59):

> *A wetland is an ecosystem that depends on constant or recurrent, shallow inundation or saturation at or near the surface of the substrate. The minimum essential characteristics of a wetland are recurrent, sustained inundation or saturation at or near the surface and the presence of physical, chemical, and biological features reflective of recurrent, sustained inundation or saturation. Common diagnostic features of wetlands are hydric soils and hydrophytic vegetation. These features will be present except where specific physicochemical, biotic, or anthropogenic factors have removed them or prevented their development.*

Aside from defining wetlands, legislation has focused on permitting procedures which allow for both the "reasonable" use of wetlands and their continued protection. This has led to the creation of mitigation measures, which were designed to reduce significant impacts to nonsignificant levels. The term mitigation, as defined by the 1958

amendments to the Fish and Wildlife Coordination Act (FWCA,) is the "actual restoration, creation, or enhancement of wetlands to compensate for permitted wetland losses" (Lewis 1992, 418). This definition was eventually expanded to five, prioritized approaches: 1) avoidance, 2) minimization, 3) rectification, 4) reduction, and 5) compensation (Savage 1986).

In recent years, wetland mitigation has shifted from the avoidance and lessening of damages, to the replacement of wetland habitat through permit negotiations, otherwise known as compensatory mitigation. The result has often meant "trading away natural wetlands in exchange for restoring, replacing, or creating wetlands elsewhere" (Race 1985, 71), in order to maintain the federal and state goal of "no net loss" of wetlands. Although human-made wetlands are unpredictable and at best experimental (Kentula et al. 1992), the use of compensatory mitigation has continued and is expected to increase in the future. The resulting issue is whether or not human-made wetlands can effectively replace natural wetlands.

Recent critiques and reports, evaluating the success of wetland mitigation projects, show a growing need for more scientific information and show a trend of wetland loss due to low success rates for mitigated sites (Race 1985, San Francisco Bay Conservation and Development Committee 1988, Turner 1988, Redmond 1992, Roberts 1993, Josselyn et al. 1993, Helmlich 1995, Tolman 1995). Common errors in wetland mitigation projects include a lack of basic scientific baseline information, lack of design expertise, lack of project supervision, improper site conditions, invasion by exotic species, failure to protect

project site from animals and/or human intervention, and failure of the project to be carried out as planned (Kusler 1990, Josselyn 1986, Reimold 1986). A report by Quammen (1986) summarized five studies on the success of mitigation. Quammen found an overall low functional effectiveness for the mitigated sites and a lack of stated objectives in the permit conditions and restoration plans, which resulted in unsuccessful projects. Josselyn (1990) also reviewed nine wetland restoration and enhancement project reports which were completed by consultants, researchers, and agencies. Josselyn found that five of the nine reports were "office evaluations" meaning that permit conditions were the only success criteria used to measure success. General considerations applicable to all of the sites included the concern for replacement acreage ratios, timing of mitigation project construction, construction oversight and inspection, revegetation methods and species, the lack of buffers, and the need for monitoring programs (Josselyn 1990). Although the examples cited here are by no means a comprehensive listing of wetland mitigation reviews, it does support the trend, especially for those projects along the Pacific Coast of the United States, that we are experiencing a loss of wetland habitat and/or biological functioning due to low success rates for mitigated wetland projects.

At a local level, due to the ever increasing demand for development along the Pacific Coast, the problems encountered with restored and mitigated wetlands, and the recognition of wetlands as unique habitats, residents of California expressed a concern regarding the protection of this threatened natural resource (CCC 1981). California's desire for strong environmental protection is evident in the establishment of the California

Environmental Quality Act (CEQA) in 1970, a year after the National Environmental Protection Act (NEPA). Then in 1972, a comprehensive coastal zone management program began with the passage of the Coastal Zone Conservation Act, which led to the establishment of the California Coastal Commission (CCC). The California Coastal Commission has been recognized as "the flagship of the national coastal zone management program" as it is funded, professionally staffed, and comprehensive with regard to wetland planning, management, and regulatory needs (Fischer 1985). However, the CCC may not be as effective as hoped regarding the protection of coastal wetlands if the national trend of wetland loss applies to California's coastal wetlands as well.

The Coastal Act of 1976 resulted in two phases of CCC organization: from 1977 to 1981, the establishment of local coastal programs (LCPs), and from 1981 to the present, the implementation of LCPs in issuing coastal permits with the CCC as the secondary review agency (Fischer 1985). This approach aimed to form partnerships and policies to create a more unified coastal management plan.

Because of the growing debate regarding the effectiveness of mitigated human-made wetlands, this paper will provide additional information on mitigation effectiveness, especially for coastal wetlands located in California. In addition, this evaluation of selected CCC projects will be useful to the CCC by providing baseline data and present status reports for the selected project sites.

Purpose

The purpose of this project was to provide both the California Coastal Commission (CCC) and wetland professionals with an evaluation of selected CCC wetland mitigation and restoration project sites. Specific research goals include: 1) the evaluation of biological success based upon field methodologies, 2) the evaluation of project success based upon project compliance, and 3) the evaluation of wetland projects for overall success, based upon the success criteria as stated in the *California Wetlands Conservation Policy* (Executive Order W-59-93) "to ensure no overall net loss and long-term net gain in the quantity, quality, and permanence of wetland acreage and values in California" (CCC 1995, 3).

Human-made wetland systems often do not provide all of the functions of natural wetlands. A major issue is how to evaluate wetlands for functions that are or are not successfully provided. Most studies suggest using performance criteria, standard evaluation formats, and long-term monitoring methods. Realistically, many projects lack the necessary performance criteria and monitoring which would allow an evaluation, yet they still need to be evaluated for success. This paper examines twelve wetland projects, completed within the CCC's jurisdiction, and offers evaluation methods to determine project success even when performance criteria and monitoring were not required. The specific objectives of this project are as follows:

- Evaluate wetland projects for biological success, based upon field observations and the use of previously developed evaluation methodologies;

- Evaluate project success for compliance, based upon measurable field observations;

- Evaluate wetland projects for overall success, based upon the success criteria as stated in the *California Wetlands Conservation Policy* (Executive Order W-59-93) "to ensure no overall net loss and long-term net gain in the quantity, quality, and permanence of wetland acreage and values in California" (CCC 1995, 3).

Regarding the first objective, biological success has been determined using field observations and methodologies used by other researchers. Typical elements examined included the substrate, vegetation, and fauna parameters. Permit files, consultant's reports, aerial photographs, color photographs, and site visits were also used when available to complete the site evaluations.

The second objective of establishing project compliance success was based upon the stated goals and objectives found within the permit files, and were limited to those criteria which were measurable during field visits. The method used compared the actual work completed against the stated requirements.

The third and last objective was to evaluate the overall success of the project sites using the Executive Order W-59-93 as stated in the *California Wetlands Conservation Policy* "to ensure no overall net loss and long-term net gain in the quantity, quality, and permanence of wetland acreage and values in California" (CCC 1995, 3), as the measure of success. Although the CCC's *Procedural Guidance Document for Evaluating Wetland Mitigation Projects in California's Coastal Zone* (1995) attempts to provide a framework for mitigation planning and project performance, it acknowledges that "comprehensive

technical standards for evaluating the success of wetland mitigation projects are lacking" (CCC 1995, 1). Executive Order W-59-93, which served as a success criteria, was qualitative in nature, yet effetively summarized the CCC's goals for mitigated and restored wetland projects in California.

By satisfying the three research objectives for each site, observations were made and recommendations for improving wetland mitigation and restoration projects were given, as well as areas of further research.

CHAPTER TWO

STUDY AREA

The sites chosen for this study were all located within Monterey Bay, which is approximately 50 miles south of San Francisco, along the central coast of California. Monterey Bay, recognized as California's second largest bay, is one of the few large bays found along the Pacific Coast of the United States.

The importance of Monterey's wetlands is clearly understood when the surrounding land uses are considered. The majority of land is undeveloped forest and range land, although large areas are used for agriculture. Commercial agriculture is the most common activity, and includes irrigated and non-irrigated fields, as well as dairies and feedlots (US Department of Commerce 1992). Another area of significant land use is the coastal development that has occurred and is expected to increase in this region. Development, both commercial and residential, is increasing steadily with large amounts of growth in Monterey, Santa Cruz, Watsonville, and Salinas. In addition to the direct changes, there are also increases in the amount of discharge, non-point source surface runoff, and the additional demands placed on local sewage treatment plants. The scenic beauty of the area is also important because much of Monterey Bay has been a tourist attraction since the late 1800s, with an annual number of more than 18 million tourists (US Department of Commerce 1992). Monterey Bay is also home to the Monterey Bay

National Marine Sanctuary, which serves to protect the unique submarine canyon and the adjacent waters of the Bay. The Bay and the surrounding areas support great biodiversity due to the relatively pristine lands and the upwelling of nutrient rich waters found in the Bay. A biological assessment of wildlife species confirmed the presence of 16 endangered species and three threatened species within the Monterey Bay region (US Department of Commerce 1992, 31). The species listing is as follows:

Endangered:		
	California Brown Pelican	*Pelicanus occidentalis calif.*
	Short-tailed albatross	*Diomedea albatrus*
	American peregrine falcon	*Falco peregrinus anatum*
	California least tern	*Sterna antillarum browni*
	Gray whale	*Eschrichtius robustus*
	Fin whale	*Baleenoptera physalus*
	Right whale	*Eubalaena glacialis*
	Blue whale	*Balaenoptera musculus*
	Humpback whale	*Megatera novaeangliae*
	Sperm whale	*Physeter catodon*
	Green sea turtle	*Chelonia mydas*
	Pacific Ridley sea turtle	*Leidochelys olivacea*
	Southern sea otter	*Enhydra lutris nereis*
	Santa Cruz long-toed salamander	*Ambystoma macro. croceum*
	San Francisco garter snake	*Thamnophis sirt. tetrataenia*
	Smith's blue butterfly	*Euphilotes enoptes smithi*
	Sei whale	*Balaenoptera borealis*
Threatened:		
	Loggerhead sea turtle	*Caretta caretta*
	Guadalupe fur seal	*Arctocephalus townsendi*
	Steller sea lion	*Eumatopias jubatus*

In addition to the ecological significance of Monterey Bay, the majority of coastal wetland mitigation and restoration projects are located within both Monterey and Santa Cruz Counties, primarily due to the jurisdiction of the California Coastal Commission.

Site Selection

Twelve project sites (See Table 1) were selected from the CCC's project database. All twelve sites were located within the Monterey Bay area, specifically within Santa Cruz and Monterey counties (See Figure 1). The criteria for site selection were: 1) access to permit information and historical records, 2) recognition of the project as an approved CCC project, 3) completion of the project, and 4) project classification as either a wetland mitigation or restoration project. Using definitions set by the CCC, compensation is recognized as "mitigation undertaken to replace lost or adversely impacted habitat with habitat having similar functions of equal or greater ecological value" and can include creation, restoration, or enhancement (CCC 1995, 5). Non-mitigated activities or voluntary restoration work can also be undertaken, and can also include creation, restoration, or enhancement activities which "may be completed solely for the purpose of increasing the quality and/or quantity of wetlands in California" (CCC 1995, 2). For this study, in-kind projects or projects that duplicate the lost habitat or functions would have been preferred over out-of-kind projects, and same-site projects would have been preferred over off-site projects. Ideally, all twelve projects would have been in-kind, same-site, compensatory mitigation projects with both impact and mitigation site assessments, and a minimum of three years of prepared monitoring reports for the mitigation site. However, since this would have severely limited the number of test sites, the ideals were relaxed and expanded. Many of the sites involved were small projects, usually mitigating and/or restoring less than two acres of wetland habitat. Historically,

since avoidance was the common form of mitigation used by the CCC and mitigation projects were rare, projects less than two acres in size were common.

Examples of such small project sites are the Neary Lagoon Wastewater Plant project, Moss Landing Wildlife Area levee and pond project, and Marina Vernal Pond sites #3 and #2. Other projects may not have encompassed much acreage, but consisted of an entire wetland ecosystem such as Crespi Pond and Moran Lake. Laguna Grande, Roberts Lake, and the Spanish Bay sites are representative of larger projects.

Several sites are part of the same permit application, but are listed separately. This separation may be due to a difference in location or habitat, and as a result the sites are listed and analyzed as separate projects.

Table 1.--Project Sites

	Name of Site	Permit I.D. Number	Project Type
1	Neary Lagoon Plant	3-86-114	Mitigation
2	Moran Lake Restoration Park	P-77-733	Voluntary Restoration
3	Moss Landing Wildlife Area-Levee Project	3-88-096	Voluntary Restoration
4	Moss Landing Wildlife Area-Treatment Pond	3-88-096	Mitigation
5	Marina North/South Pond #3	3-MAR-92-04	Mitigation
6	Marina West Pond #3	3-MAR-92-04	Mitigation
7	Locke Paddon Park Pond #2	3-MAR-87-004	Voluntary Restoration
8	Laguna Grande	3-86-129	Voluntary Restoration
9	Roberts Lake	3-876-129	Voluntary Restoration
10	Crespi Pond	3-89-200	Voluntary Restoration
11	Spanish Bay-North Riparian	3-84-226	Mitigation
12	Spanish Bay-South Riparian	3-84-226	Mitigation

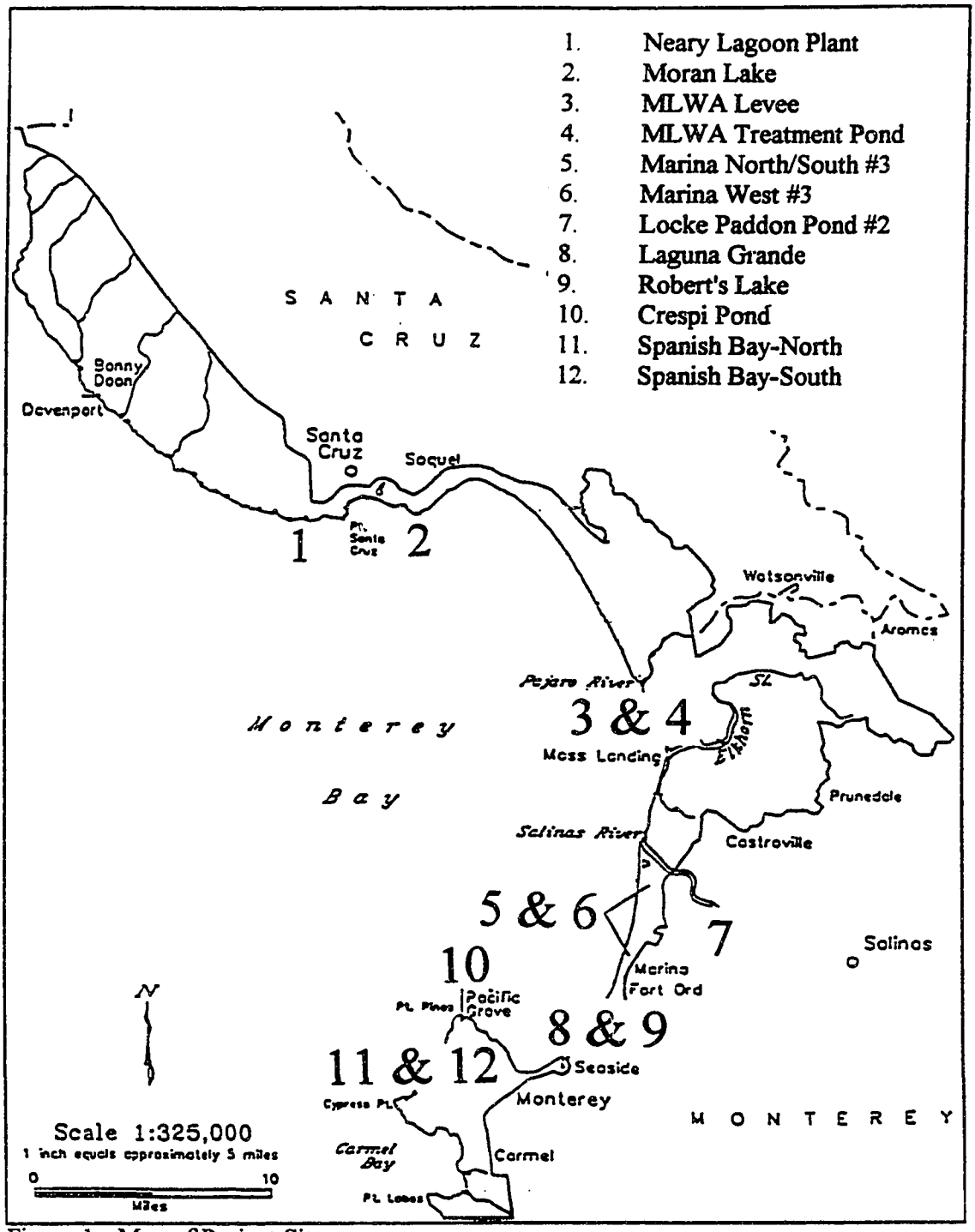

Figure 1.--Map of Project Sites

CCC ReCAP Pilot Project 1994, modified p. 69

CHAPTER THREE

METHODS

This study evaluated twelve CCC wetland sites for both biological functioning and project compliance. Project compliance was determined by examining the objectives in the permit files, and comparing them against field observations to verify completion of the work as stated. The objectives were then evaluated and a percent value representing compliance success was established.

Biological functioning was determined using field evaluations and several methodologies established by other researchers (See Table 2). While the methods used were acceptable approaches, they were qualitative in nature and were excellent tools for non-technical people. The reason for selecting these methods was to provide an evaluation of a project site at a specific point in time and in its present condition, for project compliance and biological functioning.

Site parameters evaluated for biological functioning included observed, measured, and additional information. Observed variables included variables that were based on visual observation alone such as location of the site, site access, human disturbance, wetland classification, and surrounding land use. The result was a detailed site drawing, which included a visual estimation of the surrounding land use, landmarks, and disturbance features. Variables measured included the substrate type, vegetation data, and fauna data.

The third category, additional information, included aerial photographs, color site photographs, and descriptive notes taken by the researcher.

Project Methodologies

Variable	Function	Method	Model Used
OBSERVED:			
1 Location	To identify site from permit file	Create a site map w/directional arrow & landmarks	Kentula et al. 1992
2 Site Access	To determine location	Contact private owner if necessary	N/A
3 Human Disturbance	To determine any human disturbance	Observe site for signs of disturbance	N/A
4 Wetland Type	To classify type of wetland	Observation & guidance book	Cowardin et al. 1979
MEASURED:			
5 SUBSTRATE			
Soil Texture	To classify the soil type & condition	Use of the "Feel Method"	E.I.P. Associates 1990
6 VEGETATION			
Percent Cover	To determine amount of vegetation	Visual estimation	Brower & Zar 1984
Plant Survivorship	To determine health of vegetation	Visual estimation & field inspection	Erwin 1990
Quadrant Sampling	To determine the % cover, rare species.	Field work & evaluation	Dyste 1995
-percent cover	and the amount of native and		Brower & Zar 1984
-presence of rare species*	invasive species present		Faber 1982
-natives vs. invasives			Faber 1982
7 FAUNA*			
Wildlife & Habitat Indicators	To determine fauna type & density	Visual estimation	Cooperrider et al. 1986
Domestic Animals	To determine presence of domestics	Visual estimation	N/A
ADDITIONAL:			
8 Photographic Record	To record changes/observations	Photograph wetland & surrounding areas	Homer & Raedeke 1989
9 Descriptive Narrative	To provide additional information	Make written site/project notes	N/A
10 Aerial Photographs	To show change in general area	Attain historical & current aerial photographs	N/A

* Consultant's reports used when available

Instrumentation and Data Collection

The evaluation of project compliance was based on the objectives stated in the project files, and was limited to criteria that could be measured using field observations. Final project compliance evaluations were summarized by counting the number of possible project objectives for that site, the number of objectives that were fully met, the number of objectives that were partially met, the number of objectives not met, and calculating a total value for the project site's percent compliance.

Biological data was collected and subdivided into the three categories of observed, measured, and additional information. Observed variables included the location of the site based on information contained in the permit file, site access, human disturbance, and wetland classification (Cowardin et al. 1979). The end result was a detailed site map (Kentula et al. 1992) which included a visual estimation of surrounding land use (Anderson et al. 1976), landmarks, and disturbances. Measured variables included the substrate type, vegetation data, and fauna data. The soil texture was determined based upon the "feel method" used by E.I.P. Associates (1990) in their monitoring reports of Laguna Grande and Roberts Lake. For vegetation studies, a visual estimation of percent cover (Brower and Zar 1984), survivorship (Erwin 1990), as well as quadrant sampling (Brower and Zar 1984, Dyste 1995) was completed. The quadrant sampling revealed the percent cover for the quadrant (See Appendix A), as well as the presence of rare species (Faber 1982), and the presence of native and invasive species (Faber 1982). Fauna data was limited to direct observations of the wildlife and included consultant's reports when

available, the use of wildlife habitat indicators (Cooperrider et al. 1986), and the presence of domestic animals. Additional information included aerial photographs supplied by the CCC, and color site photographs (Horner and Raedeke 1989) and descriptive notes taken by the researcher. See Appendix B for examples of site evaluation forms.

Analysis

Field observations for project compliance, taken at the project sites, were compared to project requirements and each parameter was evaluated as being "fully met," "partially met," or "not met." A percent value was then calculated for each site by adding the numbers of fully met objectives and partially met objectives, dividing by the number of total possible project objectives, and multiplying by 100 to give a percent. The method for computing the percent value is as follows:

$$\frac{\text{\# fully met objectives + \# partially met objectives}}{\text{\# total possible objectives}} \times 100 = \%$$

> Example: If a site has a total of seven possible objectives, and three objectives are fully met, three objectives are partially met, and one is not met at all, the percent value for that site would be 86%.
>
> (To calculate 86%: total possible points = 7, sum of fully and partially met objectives = 6. Six divided by seven is 0.857, multiplied by 100 to give the percent value of 85.71. This is rounded up to 86%.)

The determination of a successful project, based on its biological functioning, was harder to define. Literature references stating specific biological success criteria for western coastal wetlands could not be found, unless it was part of an extensive monitoring

program, and is further evidence that standardized field evaluation methods are needed. The one biological standard that was found was not applicable to this study as Marble's criteria (1992) were established for a southern/eastern hardwood wetland, greater than two acres in size.

Since standardized success criteria were not available, the vegetation and fauna information was collected and evaluated, but no efforts were made to create standardized success cutoffs or categories. The vegetation data included the percent cover, and the presence of exotic and rare species. Fauna data was limited to wildlife observations, presence of domestic animals, and the presence of human disturbance. Consultants' reports were also used, when available, to supplement the wildlife species and environmental data.

Overall project success, based on both project compliance and biological performance, was then assessed and compared to the general goal of "no overall net loss and a long-term net gain in the quality, quantity, and permanence of wetland acreage and values" (CCC 1995, 3) to indicate the general health and success of the sites.

During the course of this study, it was observed that a successful wetland project was one that: 1) met all of the required project conditions, and 2) functioned or had the same values as the natural wetland. Ideally, if a wetland project had the correct objectives, and the project criteria were fully met, then the wetland site should function as a self-sustaining natural wetland. However, if the project did not possess correct or comprehensive project objectives to ensure the desired functions, then it was possible for a

site to successfully meet the compliance criteria, but fail to become a functioning wetland, which would mean failure to meet its biological success criteria. This problem was revealed when the relationship between project compliance and biological functioning was examined and two deviations were observed. Individual project objectives were organinzed into a matrix table in which actual project objectives were categorized as being either "fully present," "partially present," or "not present." Project objectives that were not required for that site were left blank. The matrix table was also used to identify common project errors.

Problems

Foreseeable problems with this study included the methods used, as well as the project compliance criteria. For methods, the number of quadrant samples taken at each site was estimated to be ten, although replicate samples were taken until there were no significant changes in the variance between the quadrant samples. There were several limitations in data collection. Estimates of wildlife habitat were qualitative since capture/release studies were not part of this study. The methods used were fairly simple and did not require complex instrumentation or lab testing. Although most were semi-quantitative, the majority of the methods were taken from the literature, and could easily be applied to field evaluations. In addition, this project provided an assessment of the adequacy of the methods chosen.

Regarding project compliance criteria, it was observed that in several instances the project objectives were flawed, which resulted in poor biological functioning and prevented the site from becoming a fully functioning wetland. Although the establishment of correct project objectives was beyond the scope of this study, the project objectives used were those stated within the project files, and were limited to measurable field observations. Thus permit compliance was evaluated separately from biological functioning, and the projects were evaluated "as designed."

CHAPTER FOUR

STUDY SITE CHARACTERISTICS

All project site summaries include: 1) a site history, 2) an aerial photograph, 3) field photo(s) taken by the researcher, 4) measurable project objectives, 5) site observations taken by the researcher except when cited, and 6) necessary corrections. Site summaries for the twelve wetland projects follow.

Site 1. Neary Lagoon

Site History

Neary Lagoon, located within the city of Santa Cruz, was a highly degraded and developed urban lagoon (See Figure 2). Project background information for Neary Lagoon is given in Table 3. The most significant landmark of Neary Lagoon has been the establishment of a wastewater treatment plant, originally built in 1928.

Table 3.--Background Information on Neary Lagoon

Permit No.	**Access Ease**	**Ownership**	**Project Type**	**Dates of Field Visits**	**Cost (Estimate)**
3-86-114	Not Difficult	Public Park	Mitigation	12/17/95 12/19/95	N/A

In 1986, the wastewater treatment plant was expanded to include the construction of a dewatering building and other facilities, which encroached into the 100 foot wetland buffer. To compensate for the loss of 0.02 acres of wetland habitat and 0.18 acres of riparian habitat, the city of Santa Cruz was required to mitigate (See Table 4). Mitigation objectives included: 1) revegetating 0.20 acres of open land, 2) restoring riparian habitat on the opposite side of the lagoon, and 3) enhancing an adjacent area of riparian habitat (Harvey and Stanley Associates 1986).

Table 4.--Neary Lagoon Mitigation Site Acres Destroyed/Created

	Wetland Habitat (acres)	**Riparian Habitat** (acres)
Lost due to construction	0.02	0.18
Revegetated/Restored	0	0.30
Total Acres	**0**	**0.12**
Net Gain/Loss	Loss of 0.02 acres	Gain of 0.12 acres

Figure 2.--Neary Lagoon Aerial Photograph

Figure 3.--Neary Lagoon Mitigation Site

Project Objectives

Expansion of the existing wastewater treatment plant at Neary Lagoon was approved, based upon the following goals and objectives:

Goals

- Revegetate area
- Restore and enhance riparian habitat
- Maintain mitigation ratio of 1:1
- In-kind, same location mitigation project

Measureable Field Objectives

- Revegetate 0.20 acres of open area with native riparian vegetation
- Restore and enhance the riparian habitat on the opposite side of lagoon, near tank structures

- Enhance an adjacent area of riparian habitat to make a continual band of vegetation along the shore
- Remove any exotic species found within project areas and along trails
- Provide fencing around mitigation area
- Build 330 feet of new trails, to include 75 feet of floating boardwalk
- Encourage and enhance passive recreational use of area
- Construct noise barrier by raising the levee, and screen plant facilities from view
- On site contamination of surface water runoff

Site Observations

Neary Lagoon, as an urban lagoon, was surrounded by multi-family housing units (Neary Lagoon Cooperative Housing) and railroad facilities. The site was easily accessed as street parking was available on California Street near the park entrance. Passive recreational use of Neary Lagoon was encouraged and picnic tables, a basketball court, observation decks, and designated trails were present at the site.

The mitigation site (See Figure 3) was located to the left of the pedestrian path, before crossing the neck of the lagoon. The site was covered with dense vegetation which served as both wildlife habitat and as a screen from the railroad tracks which run adjacent to Neary Lagoon. Although fenced, the site could be accessed through a large hole in the fence near the railroad tracks. It was obvious that the site was used as a campsite by people in the area. During the field evaluation, four separate areas were observed in which the vegetation had been cleared or flattened, and items such as clothing, blankets, cookware, and garbage had been left behind. Also, six distinct paths through the revegetated area were observed. The use of the site by humans was considered to be the primary problem for both this mitigation site and Neary Lagoon in general.

The surviving plants looked healthy and seemed to be thriving as the vegetation can be described as a dense thicket of trees and underbrush. Along the water's edge, cattail and tule were abundant. Further inland, various trees and shrubs had been planted and include red alders, sycamore, cottonwood, oak, willow, and elderberry.

The restoration/enhancement site was easily accessed by following the pedestrian path toward the water treatment facilities, along the floating walkway. Vegetation planted included ceanothus, bush poppy, coffeeberry, toyon, sycamore, and manzanita. At the edge of the water, cattail and tule were found, as well as wild berry vines.

In summary, the vegetation at both sites looked healthy and seemed to be thriving except where it had been altered by humans. Several non-native pampas grass tufts were observed within the fenced mitigation site, as well as along the pedestrian trail. Wildlife observations were limited to sightings of mallard ducks by the researcher.

Necessary Corrections

Based on field observations, the following are suggested corrections for Neary Lagoon:

- Field evaluations should be taken once a year to observe any corrections which may become necessary such as regrowth of invasive species, repair of floating walkways, etc.
- Remove non-native species along the path and throughout Neary Lagoon on a regular basis to reduce new growth
- Repair the hole in the fence to keep humans out of the mitigation area. This criteria is considered to be fully met since the fence was originally established at the mitigation site

Site 2. Moran Lake

Site History

Moran Lake, located in the city of Santa Cruz, was a degraded five acre coastal lagoon. Project background information for Moran Lake is given in Table 5. Although recognized as being an "important recreational/open space area in urban Santa Cruz" (Josselyn et al. 1993, B-28), Moran Lake has been greatly altered. Three alterations which have had the most impact on water quality and wildlife habitat were: 1) the fill of three acres of open water habitat, 2) the installation of the replacement bridge and culvert at East Cliff Drive, and 3) residential development surrounding Moran Lake.

Table 5.--Background Information on Moran Lake

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
P-77-733	Not Difficult	Public Park	Voluntary Restoration	12/17/95 12/19/95	$426,718

The initial Moran Lake staff report (Singer and Aston 1976) reported two main problems with regard to water quality. In the summer, Moran Lake experienced one-way tidal inflow followed by stagnation and evaporation. During the winter, Moran Lake receives run-off from the 620 acre watershed, which contains heavy metals, oil, grease, and dissolved solids and nutrients (Josselyn et al. 1993, B-28). In 1975, Moran Lake and surrounding areas were acquired by Santa Cruz County as park land (See Figure 4). The acquisition led to funding for the restoration and enhancement of Moran Lake in 1976,

with additional financial assistance from the Land and Water Conservation Fund. The restoration plan was to enhance the degraded lagoon by: 1) removing polluted sediment, 2) restoring tidal action, 3) creating a salt marsh, 4) revegetating barren land, and 5) providing public access and recreational facilities (See Figure 5).

Figure 4.--Moran Lake Aerial Photograph

Figure 5.--Moran Lake Overview

Prior to 1961, Moran Lake was a tidal lagoon and received daily tidal flushing and salt water inflow. The habitat was that of a thriving salt marsh. In 1963, three acres of open water were filled with the dredge material from the construction of the Santa Cruz Yacht Harbor. In 1970, the East Cliff Drive bridge was constructed over the lagoon's mouth. A culvert was installed under the bridge, however it was too small and the elevation was above the high mean tide. As a result, the culvert became blocked by sand and regular tidal flushing and exchange stopped, which altered Moran Lake's water quality and salinity levels and eliminated the salt marsh vegetation.

Project Objectives

The enhancement plan for Moran Lake was initiated in 1980 and completed in 1983. The goals and objectives are as follows:

Goals

- Restore vegetation at Moran Lake by improving water quality
- Enhancement of wildlife habitat and scenic values
- In-kind, same location, voluntary restoration

Measurable Field Objectives

- Dredge top layer of sediment (2,000 yd^3)
- Excavate lagoon to five feet in depth, which increases lagoon area by 0.4 acres
- Recontour lagoon and build a 0.125 acre island
- Install box culvert (65'x12') with 80' concrete apron
- Install flashboard tide gate
- Provide public access, trails, parking, and restrooms
- Revegetate barren areas with native salt marsh vegetation

Site Observations

Moran Lake was a relatively small kidney shaped lagoon, surrounded by single-family housing. A parking lot was easily accessible off East Cliff Drive. Besides ample parking, Moran Lake park has restroom facilities, picnic areas, and a trail surrounding the lagoon.

Approximately one month after the completion of the restoration project, a storm eradicated much of the planted vegetation on the south shore (culvert end). Josselyn et al. (1993, B-29) noted that in addition to the storm event, erosion and poor water quality account for the lack of vegetation at Moran Lake. During a site visit by the researcher, it was also noted that the replacement culvert was at the wrong elevation and was blocked by sand, thus eliminating any chance of tidal flushing.

There was a complete lack of marsh vegetation, or any vegetation for that matter, at the water's edge of Moran Lake. The only species found were groves of eucalyptus, a stand of Monterey Cypress, grasses, and ice plant. A large, bare mudflat area was observed at the culvert side of the lagoon, which was the site of the restoration work. Wildlife was absent as well, although gulls and a mallard were observed. In addition, the homes surrounding Moran Lake were encroaching into the lake area. In three cases, there were 15 feet or less between the homeowner's fence and the lagoon's high water mark. The park was observed to be used extensively by people and domestic animals, primarily dogs, for passive recreation. In summary, Moran Lake remains a highly degraded non-tidal lagoon. The lack of salt marsh vegetation and wildlife was an obvious

sign that Moran Lake was not a functioning wetland.

Necessary Corrections

The restoration of Moran Lake has not been successful in establishing salt marsh vegetation and improving wildlife habitat. A 1992 proposal by BioSystems, Swanson, and Rodrigues highlights the importance of tidal flushing and its influence over all aspects of successful restoration work at Moran Lake. Based on this report and field observations, the recommendations are as follows:

- Replace existing culvert with one at the proper elevation
- Maintain culvert entrance openings
- Remove ice plants and replant with native species
- Replant banks with emergent vegetation along shoreline
- Control in-flow water and water quality into Moran Lake by the addition of a sedimentation catch basin

Site 3. Moss Landing Wildlife Area Levee Project

Site History

The Moss Landing Wildlife Area (MLWA) was located off Highway 1, adjacent to Elkhorn Slough in Monterey county. Project background information is given in Table 6. Originally acquired from Monterey Bay Salt Company in 1984, the Moss Landing Wildlife Area (See Figure 6), which encompasses 655 acres, has remained degraded salt evaporation ponds. Under the supervision of the California Department of Fish and Game, the area was considered to be critical salt marsh habitat for both resident and migratory shorebirds and waterfowl. Of special interest was the presence of three species of endangered birds: the California least tern, the California brown pelican, and the California clapper rail. The management goals for the site focused on passive recreation and included the viewing and study of wildlife, fishing, and waterfowl hunting.

Table 6.--Background Information on Moss Landing Wildlife Area Levee Project

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-88-096	Not Difficult	Public	Voluntary Restoration	10/1/95 10/7/95	$750,000

The evaporation ponds were separated from Elkhorn Slough by a levee approximately one mile long and three-quarters of a mile wide. Constant tidal movement had caused breaching (See Figure 7) in three spots along the main levee and had destroyed the inner levee system that use to support seventeen individual salt ponds, which were

now exposed tidal mudflats. The continued expansion of the mudflats would have destroyed the existing saltpond ecosystem, which relies upon the varied levels of salinity contained in the various saltponds. A uniform salinity, brought about by the mudflats, would have decreased the habitat value and in turn decreased the wildlife species found in the area.

Restoration of the main levee was estimated to cost 1.1 million dollars, and was not feasible. As an alternative, a new levee 4700 feet long was constructed to protect two-thirds of the original salt ponds, and allow one-third of the salt ponds to be converted to tidal mudflats. The construction of the new levee was considered to be both a restoration project as well as a mitigation project since the new levee covered approximately 5.2 acres of existing tidal marsh land. Thus 5.2 acres of new habitat was to be restored, at the site of the treatment pond (See Table 7).

Table 7.--Moss Landing Wildlife Area Acres Destroyed/Created

	Wetland Habitat (acres)	**Pond Habitat** (acres)
Lost due to construction	5.2	0
Revegetated/Restored	0	5.2
Net Gain/Loss	Loss of 5.2 acres	Gain of 5.2 acres

Figure 6.--Moss Landing Wildlife Area Aerial Photograph

Figure 7.--Breached Levee at Moss Landing Wildlife Area

Project Objectives

The construction of the new MLWA levee was proposed in three phases. Phase One called for the construction of the replacement levee. Phase Two required installation of the rock rip-rap, and of the water control structures. The final phase, Phase Three, called for the development of the inner ponds with individual water control structures. The MLWA levee project was approved as a voluntary restoration project based on the following conditions:

Goals

- Construct new levee within MLWA to replace existing levee
- Habitat restoration and site improvements
- In-kind, same location, voluntary restoration

Measurable Field Objectives

- Construct 4700 foot long, 50 foot wide, 6 feet high levee, which destroyed 5.2 acres of degraded wetlands
- Dredge 30,000 yd^3 of degraded wetland (outboard side) to construct new levee
- Compact levee and add one foot thickness of rock rip-rap for protection
- Add two 24" diameter aluminum water control structures
- Add recreational trails
- Add observation platforms and a wooden walkway along the levee
- Wildlife enhancement of the individual ponds with an emphasis on salinity and water levels

Site Observations

The Moss Landing Wildlife Area was accessed from Highway 1 by a side road that meanders between lettuce crops and cattle. Once the access road was found, the site was easily accessed. A dirt lot was available for parking and there was a pedestrian trail which began at the parking area and connected to the trails and the levee system.

The replacement levee appeared to be constructed, and the dimensions fit those described in the permit files. It was apparent that the replacement levee had been compacted, two water control structures had been added, and recreational trails were present although they may have been part of the pre-existing trail system. What was not observed was the proposed wooden walkway along the levee, observation platforms, and the one foot thick rock rip-rap along the levee. Rock rip-rap was observed but instead of being a foot thick, it was scattered at best. It was obvious that water from the slough

flows over the top of the levee on a regular basis, and runs into the evaporation pond areas, causing erosion. Furrows up to two and half inches deep were observed on both the outward and inward sides of the replacement levee. Above the water control structures, aluminum platforms were present, but the researcher believes these were designed to assist in the control of the water levels and were not observation decks. Although the wooden walkway was not constructed along the levee, the replacement levee was wide enough for two people to walk abreast on, and numerous hikers and bird watchers were observed using the levee as a trail.

Saltmarsh vegetation included that of pickleweed (*Salicornia),* saltwort *(Frankenia),* and flowering plants which were observed along the banks of the replacement levee.

Wildlife observations at the MLWA levee were the most numerous of the twelve project sites. Herons, pelicans, ibis, sanderlings, and Forster's terns were a few of the birds observed, although domestic cat and dog tracks, as well as mice tracks, were observed on top of the levee and in the mudflats.

In summary, the MLWA levee project was considered to be successful for both permit compliance and biological functioning, as the new levee protects the salt evaporation ponds from the effects of tidal scouring and provides wildlife habitat for water associated birds and other species.

Necessary Corrections

Based on both field observations and permit compliance standards, the MLWA levee project was considered to be a successful project site. However, some corrections are necessary and they are as follows:

- Monitor the salt ponds for a minimum of three years for water quality, salinity, and wildlife usage/presence in the individual evaporation ponds which are now protected by the new levee
- Plant additional native species along the banks of the existing levee to reduce erosion
- Additional rip-rap is needed along the reconstructed levee. Devise a method to protect the new levee from tidal scouring without the need for additional rip-rap on a regular basis

Site 4. Moss Landing Wildlife Area Treatment Pond

Site History

The Moss Landing Wildlife Area (MLWA) treatment pond was the mitigation project site for the MLWA levee project (See Table 8). The aerial photograph (See Figure 6) is the same as that for the MLWA levee project.

Table 8.--Background Information on MLWA Treatment Pond

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-88-096	Not Difficult	Public	Mitigation	10/1/95 10/7/95	N/A

The construction of the replacement levee resulted in the destruction of 5.2 acres of tidal marsh, and thus 5.2 acres of new habitat was to be restored in the south-west corner of the wildlife area, which was a non-tidal water treatment pond with a sealed bottom liner (See Figure 8).

Figure 8.--MLWA Treatment Pond Mitigation Site

Project Objectives

The MLWA levee project was approved based on the following mitigation objectives:

Goals

- Mitigate for the loss of wetland habitat (mitigation ratio of 1:1)
- In-kind, same location mitigation project

Measurable Field Objectives

- Create 5.2 acres of tidal wetland habitat

- Restore the treatment pond to a tidal wetland by excavating 5,000 yd^3 of the existing levee
- Habitat restoration and site improvements

Site Observations

The mitigation site, otherwise known as the treatment pond, had not been successfully converted into a functioning tidal wetland as it was devoid of all vegetation, the water was orange-red-brown in color, there was little if any tidal exchange, and neither wildlife nor habtat indicators were observed at the site. It should be noted however that subsequent evaluations of the mitigation site by the Department of Fish and Game on December 15, 1995 resulted in the observation of almost two hundred individual birds, including "greater yellowlegs, black-bellied plover, red and red-necked phalaropes, dunlins, western and least sandpipers, willets, black-necked stilts, avocets, and Bonapart's gulls" (Elliott 1995, 1).

Original objectives for the mitigation site included the excavation of 5,000 yd^3 from the existing levee to allow the tidal inflow deemed necessary for a functioning wetland. However, at the time of the field evaluations, the treatment pond was still separated from Elkhorn Slough by the existing levee. It appeared that none of the required mitigation work had been completed at the proposed mitigation site.

In summary, the MLWA mitigation project which involved converting a treatment pond into a saltwater marsh, was unsuccessful as there was no tidal exchange, and no signs of vegetation or wildlife indicators.

Necessary Corrections

By both field observations and permit compliance standards, the MLWA treatment pond project was not successful due to the failure of the mitigation site to function as a tidal wetland. Corrections are as follows:

- Removal of 5,000 yd^3 from the existing levee
- Plant native species in the treatment pond area to reduce erosion and attract wildlife
- Monitor the site for three years after the creation of a tidal marsh with emphasis on water quality, salinity levels, and wildlife usage/presence

Site 5. Marina Landing Pond #3 North/South Site

Site History

Marina Landing, located within the City of Marina in Monterey County, was known for its extensive network of inland ponds. Designated as "sensitive habitat" areas by the City of Marina's Local Coastal Plan, enhancement plans have been established to protect these unique areas. Marina Vernal Pond #3, now known as Marina Landing Pond, was originally the site of three individual ponds: one pond north of Beach Road, one pond south of Beach Road, and one pond west of Beach and Reservation Roads (See Figure 9). Project background information is given in Table 9.

Table 9.--Background Information on Marina Landing Pond #3

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-MAR-92-04	Not Difficult	Public	Mitigation	10/1/95 10/7/95	N/A

In 1992, the City of Marina approved the construction of a commercial shopping center, which would include a K-mart store and other retailers on 19.6 acres. With the construction of the Marina Landing Shopping Center, a total of 0.49 acres of wetland habitat and 0.75 acres of upland habitat was lost. To mitigate for the construction, 1.84 acres of wetland and 0.60 acres of upland area was to be created, which would result in a total gain of 1.35 acres of wetland habitat and net loss of 0.15 acres of upland area (See Table 10). Specifically, the mitigation plan combined the north and south ponds into one

larger pond (See Figure 10), and enhanced the area for wildlife by providing a vegetative screen and establishing native vegetation at the site.

Table 10.--Marina Pond #3 Acres Destroyed/Created

	Wetland Habitat (acres)	**Upland Habitat** (acres)
Pre-existing	**1.39**	**0.76**
Lost due to construction	0.49	0.75
Created	1.84	0.60
Total Acres	**2.74**	**0.61**
Net Gain/Loss	Gain of 1.35 acres	Loss of 0.15 acres

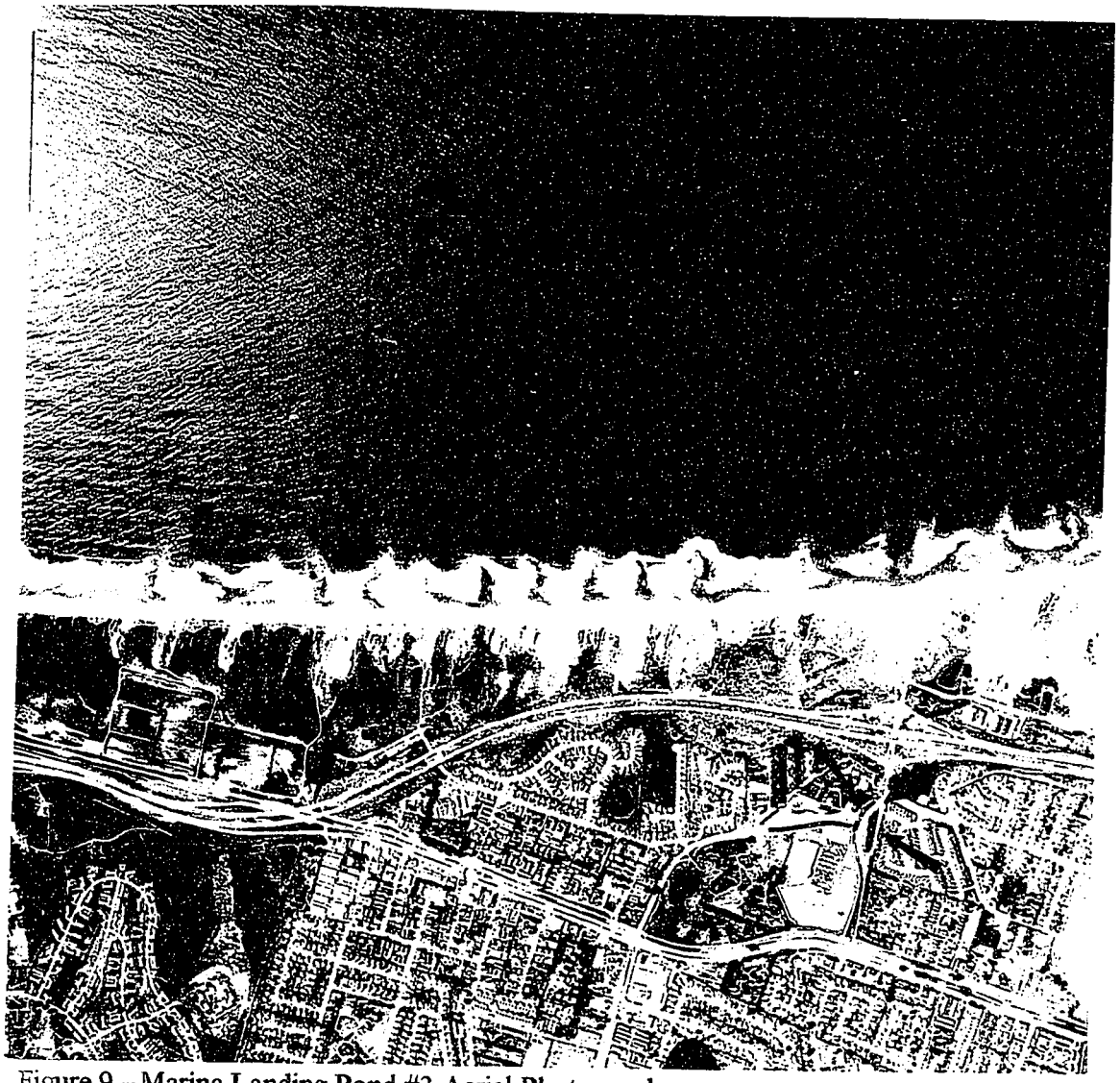

Figure 9.--Marina Landing Pond #3 Aerial Photograph

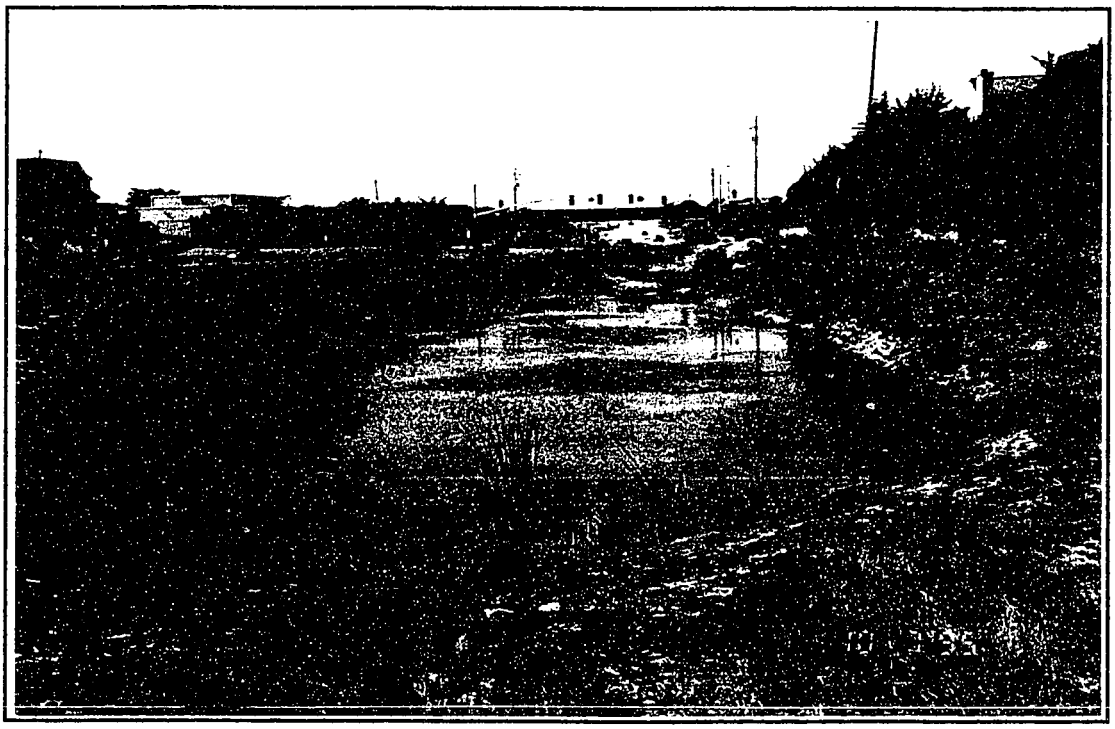

Figure 10.--Marina Landing Pond #3 North/South Site Overview

Project Objectives

Construction of the Marina Landing Shopping Center was allowed in the sensitive habitat area based upon the following goals and objectives:

Goals

- Mitigate for the loss of wetland and upland habitat due to combining existing ponds
- In-kind, same location mitigation with a mitigation ratio of 1:1
- Enhance the combined pond's wildlife habitat and native vegetation

Measurable Field Objectives

- Combine north and south ponds into one larger pond
- No surface water runoff will be allowed to flow into the pond from the shopping center
- Re-grade pond bottom to 1 to 2 feet in depth with seasonal mudflat exposure

- Provide well water to pond during summer months as necessary
- Establish brackish water vegetation (cattails, bulrush)
- Establish riparian habitat (willow)
- Establish herbaceous/grassland vegetation
- Establish upland shrub vegetation (bush lupine, coyote bush)
- Construct two observation platforms
- Install a "snag" or tree limb for wildlife use
- Limit human disturbance by fencing pond and upland areas

Site Observations

Marina Landing Vernal Pond #3 North/South site was easily accessed off Beach Road, in the City of Marina. Parking was not allowed along the shoulder of Beach Road, however parking was available in the shopping center parking lot across the street. Since the project's objective was to limit human disturbance, there were no sidewalks constructed on the pond side of Beach Road, and the entire pond and upland area was enclosed by a wire fence with two observation decks constructed at opposite ends of the pond.

The north and south ponds have been successfully combined to form a single large pond. As previously mentioned, human disturbance was minimized with the elimination of uncontrolled access, although two domestic cats were observed within the fenced area. Upon closer inspection, the brackish water vegetation of bulrush and cattails was thriving along the south bank, but all other vegetation appeared to have achieved limited success. The buffer of riparian vegetation (willow) appeared to be dead, as well as much of the herbaceous vegetation. Grasses were abundant, but it was not known whether the grasses were invasive weeds or planted species. Due to the lack of sufficient ground cover, soil

erosion was observed on the bank between Beach Road and the pond area. A large tree snag had been provided, as proposed, and was being used by gulls. Also observed were six mallards and as previously mentioned, two domestic cats. To the north of the Marina Pond #3 North/South site lie single family homes, with a vegetated slope between the homes and the pond. Garbage was observed at the site, which appeared to have been dumped from a backyard into the upland area of the pond. The culvert, which connected the north/south pond to the overflow pond (west pond site), appeared to be functioning and was not blocked by debris. There was evidence of work still in progress as water hoses and wooden stakes were observed within the fenced area.

Although yearly monitoring reports are due to the City of Marina and the California Department of Fish and Game for a duration of five years, the first report had not been written since the work was not yet completed. According to Mr. Lee, a planner with the City of Marina, the first monitoring report is expected in late 1996.

Necessary Corrections

Site corrections are given below although several corrections may be unnecessary as the finished work may resolve these issues.

- Remove garbage on upland areas and enforce the no dumping policy
- Establish riparian vegetation/buffer by planting established willow trees or a thicket of younger trees
- Establish herbaceous and shrub vegetation to reduce erosion and enhance wildlife habitat
- Enforce the monitoring of the project site, with an emphasis on water quality testing. The five years of monitoring should be extended by an additional year since the initial report has not yet been completed.

Site 6. Marina Landing Pond #3 West Site

Site History

The west pond of Marina Landing was one of the original three vernal ponds which comprised the Marina Landing Pond #3 site. The project background information (See Table 9) as well as the aerial photograph (See Figure 9) is the same for Marina Landing Pond #3 North/South pond. Although the north and south ponds were combined to form one larger pond, the west pond was left unaltered (See Figure 11) by the construction of the Marina Landing Shopping Center. The west pond was considered to be the overflow basin for the north/south combined pond, and remained connected to the north/south pond via a culvert that runs under Beach Road.

Under the mitigation proposal, the west pond remained at its present location and required minimal work. There was no mention of controlling the surface water runoff from the shopping center, no grading, and well water would not be provided to maintain water levels. The area, being a seasonal wetland, was not a managed site and did not require observation platforms, fencing, or wildlife habitat enhancement. The only requirements stated were that the pond was to be left at its present location and that a willow buffer was to be established along the northern edge of Beach Road.

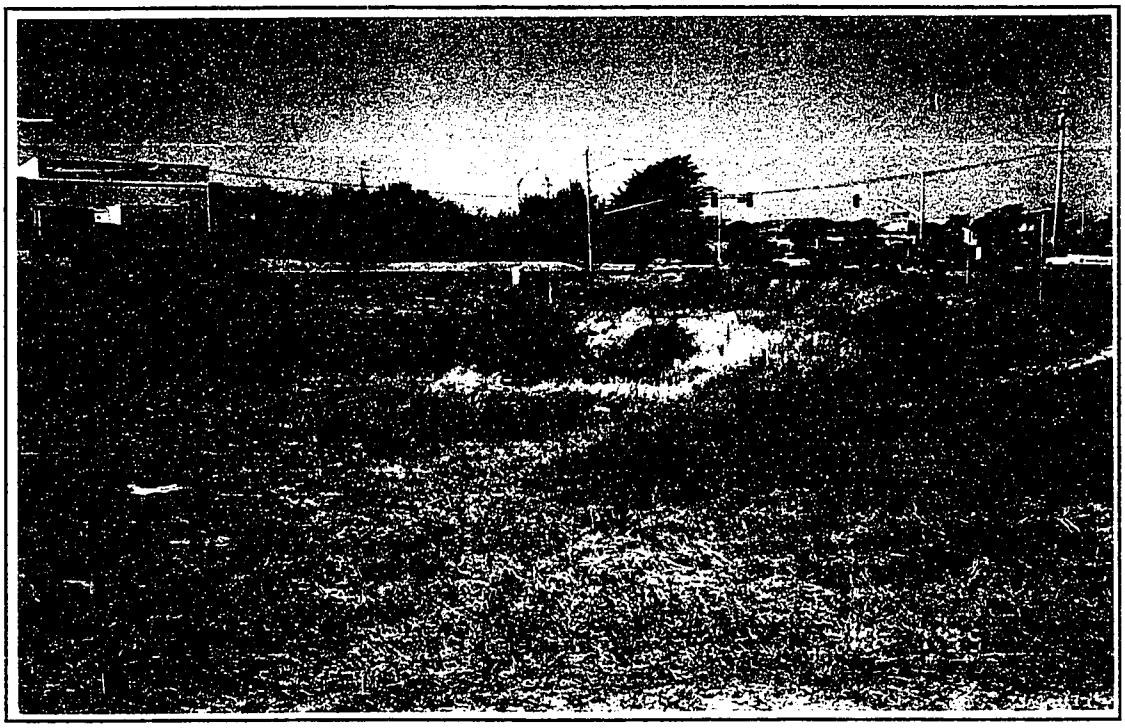

Figure 11.--Marina Landing Pond #3 West Pond Overview

Project Objectives

The West Pond of the Marina Landing Pond #3 site contained only two objectives. They are as follows:

Goals

- Mitigate for the development of Marina Landing Shopping Center by protecting the existing west pond site
- In-kind, same location, mitigation project

Measurable Field Objectives

- Maintain the location of the Marina Pond #3 West Pond
- Establish a willow buffer along Beach Road

Site Observations

The west pond was easily accessed off Beach Road. Although Beach Road had a wide shoulder with a bus stop area, the site could also be accessed using an asphalt driveway which led to a paved parking area. The asphalt lot, which could hold between eight to ten cars, fed into a private sand/dirt road ending at a private residence. The asphalt area in question effectively divided the lot and decreased the amount of available wetland habitat. In addition, all reviewed project file documents failed to mention the asphalt parking lot, the sand/dirt road, or the private residence.

The site, being a seasonal wetland, was dry at the time of the field visits and appeared to be an abandoned lot with little wildlife value. The culvert, under Beach Road, was present and clear of debris. Vegetation at the site was composed of grasses, mustard plants, and large clumps of ice plant, especially along the roadside. Great patches of barren sandy soil were also observed. Seven willow trees were planted along the north side of the site, to provide a buffer between the wetland site and any human disturbances. The willows appeared to be surviving, although they were far too small to serve as a buffer. Both Beach and Reservation Roads were busy intersections, and a bus stop was located less than ten feet from the wetland site. The site was surrounded to the north by Beach Road, to the south by the private residence, to the east by the asphalt driveway and then Reservation Road, and finally to the west where there was a Denny's restaurant and a Motel 6.

Necessary Corrections

Based on field observations, the following are suggested corrections for Marina Pond #3 West Pond:

- Establish a riparian buffer with adult willow trees planted along Beach Road, and plant a vegetative buffer between Denny's/Motel 6 and the west pond
- Remove asphalt driveway and parking lot from site
- Remove non-native plants (ice plant) and replant with native species
- Relocate the bus stop from its present location, to a distance of at least 200 feet from the wetland site to reduce human disturbance of wildlife species
- Enforce project monitoring by the developers of the Marina Landing Shopping Center for a period of five years (same as for Marina Pond #3 North/South Pond site)

Site 7. Locke Paddon Park Pond, Marina Pond #2

Site History

Locke Paddon Park Pond was also known as Marina Freshwater Marsh, Marina Vernal Pond #2, and KIDD Pond (named after the two radio towers which are present at the site). The site, which covers 16 acres, was located at the junction of Reservation Road and Del Monte Boulevard, in the City of Marina (See Figure 12). Project background information is given in Table 11.

Table 11.--Background Information on Marina Vernal Pond #2

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-MAR-87-004	Not Difficult	Public	Voluntary Restoration	10/7/95 11/26/95	N/A

According to Callander and Associates (1986, 4-5), the marsh possesses "unique and valuable characteristics which warrant preservation and enhancement [as it] attracts and nourishes a wealth of wildlife. The concentration and abundance of wildlife in these ponds make them ideal educational laboratories" (See Figure 13). Over 65 species of wildlife alone had been observed at the site by Callander and Associates (1986, 7-10), seven of which were either threatened or endangered. In addition, numerous plant species were also present, three of which were recognized as threatened or endangered. The threatened/endangered species for Marina Pond #2 are listed below (CCC Regular Calendar #3-MAR-87-004 1987, 3):

Plant Species:

Menzies' wallflower	*Erysimum menziesii*
Dune Gilia	*Gilia temuiflora*
Monterey Spine Flower	*Chorizanthe pungens*

Wildlife Species:

Smith's Blue Butterfly	*Euphilots enoptes smithi*
Peregrine falcon	*Falco peregrinus*
Bald Eagle	*Haliaeetus leucocephalus*
Santa Cruz long-toed Salamander	*Ambystoma macro doctylum croceum*
Western pond turtle	*Clemmys marmorata*
California black legless lizard	*Anniella pulchra nigra*
Tricolor blackbird	*Agelaius tricolor*

Prior to restoration, Marina Pond #2 had a sedimentation problem, uncontrolled emergent wetland vegetation, degraded water quality, and a problem with invasive plant species in the upland areas.

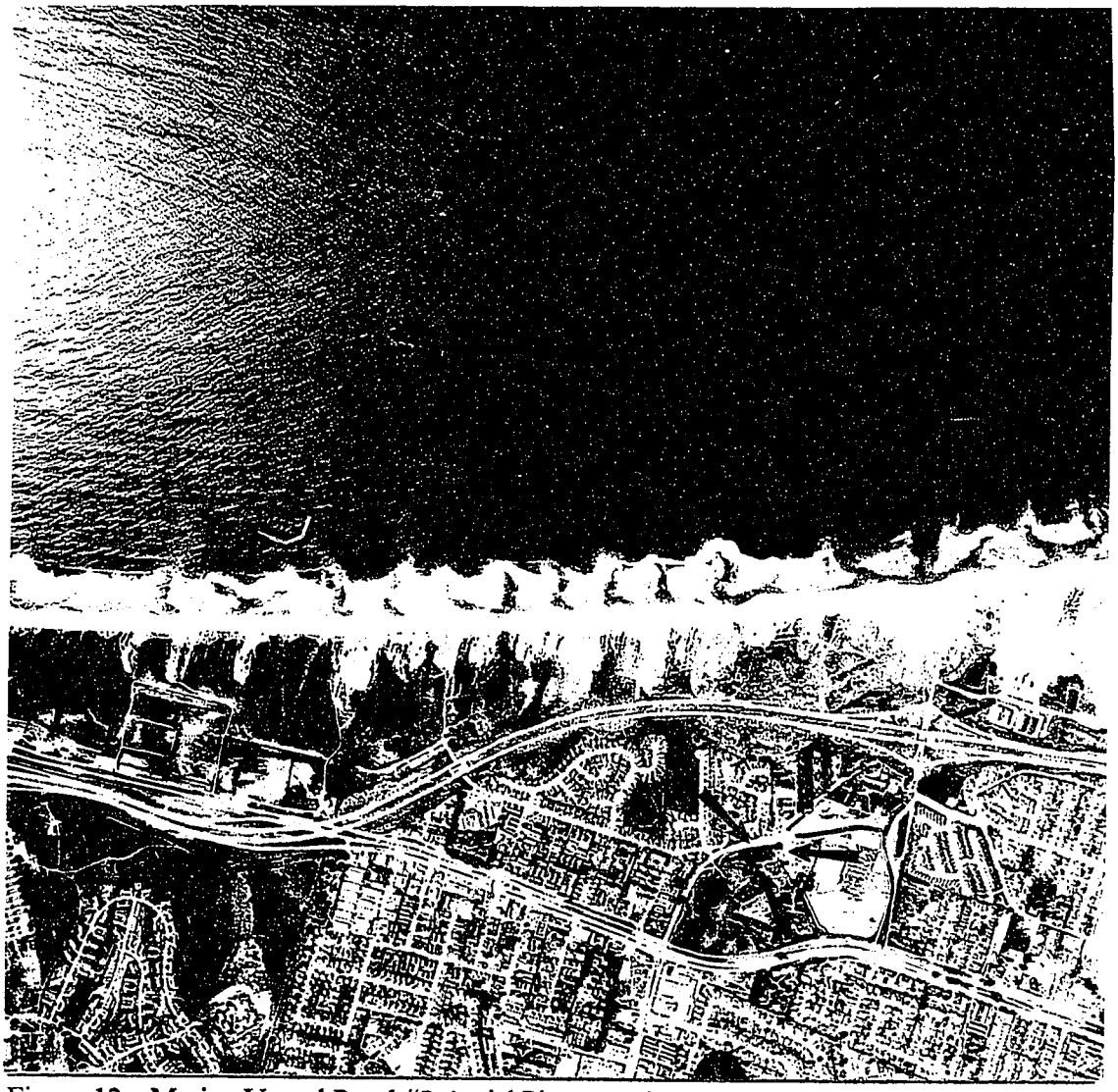

Figure 12.--Marina Vernal Pond #2 Aerial Photograph

Figure 13.--Marina Vernal Pond #2 Overview

Project Objectives

Due to the problems with water quality, sedimentation, and vegetation, the goals and objectives are as follows:

Goals

- Improve habitat for wildlife species, especially rare or endangered species
- Improve water quality and vegetation
- In-kind, same location, voluntary restoration

Measurable Field Objectives

- Remove sediment and overgrowth of emergent vegetation
- Remove introduced species and replant areas with native species
- Improve water quality from street runoff and parking facility

- Improve water circulation within pond
- Install nest boxes and waterfowl platforms
- Establish redwood trees for raptors
- Maintain a buffer of 100 feet of upland area
- Construct public facilities to include restrooms, parking lot, trails, boardwalk, floating bridge, and amphitheater

Site Observations

The site was easily accessed from Reservation Road, and there were ample parking facilities. The installation of public access facilities was completed and included restrooms, the parking area, trails, picnic areas, a boardwalk, a floating bridge, amphitheater, and interpretive signs. The north end of the pond was flanked by a beach area, and people were observed sunbathing along with the ducks and geese. Several pedestrian trials encircled the pond and surrounding areas, and the site was well used by local residents. Although heavily used by people, there were secluded wildlife areas. The floating walkway was an attractive addition, which allowed visitors to see the water covered areas of the park.

Since the area was heavily used by people, there were signs of misuse as observed by the researcher. The interpretative signs had been vandalized and were no longer readable, graffiti was observed on the asphalt trails in three locations, as well as two tree carvings near the amphitheater. A metal shopping cart was also left behind in the marsh, as well as various bits of paper garbage and aluminum soda cans. A camp site had been established within the park, and two people were observed using the duck nesting platforms as end posts for a clothes line and park benches as tents. The redwood trees,

although present, were not 100 feet in height, which was the minimum height required for raptors to perch in the trees.

In addition to observations made by the researcher, the following observations were taken from a project report by Josselyn et al. in 1993. According to Josselyn et al. (1993, B-26), the existing water channels were not dredged and therefore additional open water habitats and improved water circulation was not attained. The tule vegetation was also reported to have reinvaded much of the open water areas. It was also reported by Josselyn et al. (1993, B-27) that the pump used to maintain the water level was inadequate to match the evaporation rates during the summer.

One of the more striking observations found by the researcher was the invasion of ice plant, which dominated the results of the quadrant sampling, and could be found throughout the park. It was also noted that the upland areas were either sparsely vegetated or had been invaded by weedy grasses and ice plant.

Necessary Corrections

In summary, Locke Paddon Park Pond was a thriving wetland which served both wildlife and humans. Although the pond appeared healthy, there were some suggested corrections:

- Remove invasive species (ice plant) throughout the park
- Revegetate upland areas with native species
- Regulate the people and their activities within the park, namely the vandalism and camping
- Upgrade the existing pump to accommodate the summer usage of water

Site 8. Laguna Grande

Site History

In 1986, the City of Seaside applied for a permit which would allow the restoration of two areas known as Laguna Grande and Robert's Lake. Both sites, Laguna Grande and Robert's Lake, were part of the same watershed that was fed by Canyon Del Rey Creek, which flowed directly into Laguna Grande and then into Robert's Lake before reaching Monterey Bay. Originally, Laguna Grande/Robert's Lake was a seasonal estuarian body of water dominated by salt marsh vegetation. Today, the lagoon is a fresh water lake comprised of 34 acres of open water, marsh, and riparian vegetation. The lagoon became two lakes in the 1880's when the Southern Pacific Railroad line was constructed on fill through the lake. Later, development occurred which would reduce the size of the lake, and finally the land was purchased in 1976 by the Monterey Peninsula Regional Park District for use as a park (CCC Consent Calendar #3-86-129 1986, 6-7).

The lagoon provides both riparian and freshwater wildlife habitats. Both the California Coastal Commission and the Department of Fish and Game recognize the significance of riparian and freshwater wetland habitats since these habitats have suffered the greatest amount of destruction. Of added importance was the significant use of the area by waterbirds and migratory species.

Located within the City of Seaside, Laguna Grande was bordered by Canyon Del Rey Boulevard to the east, the Del Monte Grove residential area of Monterey to the west,

Fremont Avenue to the south, and Del Monte Boulevard to the north (See Figure 14). Background information on Laguna Grande and Roberts Lake is provided in Table 12. In 1985, it became evident that restoration was needed to "halt the accelerated sedimentation in the lake due to rapid development in the surrounding watershed" (State Coastal Conservancy 1986, 3). Although sedimentation is a natural process, this process had been accelerated at Laguna Grande by sand blowing into the lake from denuded dunes, direct lake filling, and the transport of sediment from the Canyon Del Rey watershed into Laguna Grande/Roberts Lake. The sedimentation problem resulted in "poor water quality with periodic high coliform counts, algal blooms and fish kills, rapid increase in tule growth, increased rodent and mosquito populations, nuisance odors, and a reduction of flood storage capacity, all of which significantly degraded shoreline and aquatic habitats" (State Coastal Conservancy 1986, 3).

Table 12.--Background Information on Laguna Grande

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-86-129	Not Difficult	Public	Voluntary Restoration	10/8/95 11/26/95	$3,700,000

Figure 14.--Laguna Grande Aerial Photograph

Figure 15.--At Laguna Grande Fishing Pier Looking Towards Roberts Lake

Figure 16.--Canyon del Rey

Project Objectives

The restoration project description for Laguna Grande included dredging, construction of sediment basins, creek channel stabilization, and wildlife and recreational improvements.

Goals

- Removal of sediment and construction of siltation control facilities
- Improve habitat for wildlife species
- In-kind, same location, voluntary restoration

Measurable Field Objectives

- Construct two sediment basins in Canyon Del Rey Creek
- Widen Canyon Del Rey channel to 30' by 4' deep for a distance of 1300'

- Selective removal of excessive tule growth
- Construct three bird nesting islands within the lake
- Install shoreline and bank protection to retard tule growth
- Eradicate non-native vegetation and replace with native vegetation
- Install water aeration facilities to increase water quality and movement
- Construct grease and oil traps for pollutants
- Construct four observation platforms
- Construct pedestrian trails

Site Observations

Laguna Grande appeared to be a functioning wetland, which had incorporated wildlife habitat with passive, human recreational uses. The three sediment traps were identified by the researcher, as well as the primary sedimentation area in Canyon Del Rey. The second sedimentation area was not identified. The three bird nesting islands appeared to be thriving and were fully vegetated. It appeared that dense groves of tule had been removed as channels were observed between stands of tule and along the shoreline. Four observation decks were identified in Laguna Grande as well as two fishing piers and two observation platforms (See Figure 15). In addition, a pedestrian trail encircled the lagoon, and Laguna Grande was equiped with restrooms, benches, and parking facilities.

The honorable mention for this project was that all five year's worth of monitoring reports were located and easily retrieved! Laguna Grande/Roberts Lake was the only site in which the researcher was able to locate the required monitoring reports.

As observed during the site visits by the researcher, the vegetation appeared to be thriving, although the tule will have to be periodically removed if open water habitat is to be retained. Of special interest was the area known as Canyon Del Rey (See Figure 16).

The pedestrian trail ended at the end of the canyon, where the woodland vegetation became very dense and the waterway was reduced to a trickle. At the end near Fremont Avenue, the canyon was enclosed and single family residences could be seen. The canyon walls supported a sagging tarp, which was suppose to catch and hold the sediment so that it did not enter the lagoon's drainage basin. A drainage pipe carried surface water from the top of the slope to a cement box culvert, which drained out to the lagoon. The cement culvert was cracked and surrounded by silt and sand. The majority of the canyon floor was bare sand and silt, covered by sparse grasses, some tule, and pampas grass. The area was heavily littered, showed signs of campfires, and was reportedly a hangout for the local teenagers and homeless people.

Necessary Corrections

Based on the field observations, the necessary corrections are as follows:

- The sediment from Canyon Del Rey needs to be dredged again as the primary sediment basin appears to be full. In addition, improved siltation methods are needed as the use of tarp, pipe, and box culvert are not effective
- The second sediment area also needs to be dredged as it could not be located and is assumed to be full
- Continual removal of invasive vegetation species in Canyon Del Rey and Laguna Grande
- Regular maintenance of the sediment/grease traps

Site 9. Roberts Lake

Site History

Roberts Lake was a continuation of the Laguna Grande restoration project, permit identification number 3-86-129 (See Table 13). Therefore much of the information that was given for Laguna Grande also applies to Roberts Lake.

Table 13.--Background Information on Roberts Lake

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-86-129	Not Difficult	Public	Voluntary Restoration	10/8/95 11/26/95	$3,700,000

Roberts Lake, located to the north of Laguna Grande, was bordered by Del Monte Boulevard to the south, Roberts Avenue to the north and west, and Canyon Del Rey Boulevard to the east (See Figure 17). Unlike Laguna Grande, Roberts Lake had a unique area of coastal dune scrub, which was located between Roberts Avenue and Highway 1 (See Figures 18 and 19). The sedimentation problem that affected Laguna Grande prior to restoration also posed a problem for Roberts Lake. In addition, Roberts Lake has had limited success in establishing vegetation on the three habitat islands as the lake was subject to salt spray and winds that caused wave wash, erosion, and high soil salinity. There was also the problem of controlling nuisance bird species, such as pigeons and gulls, at the site.

Figure 17.--Roberts Lake Aerial Photograph

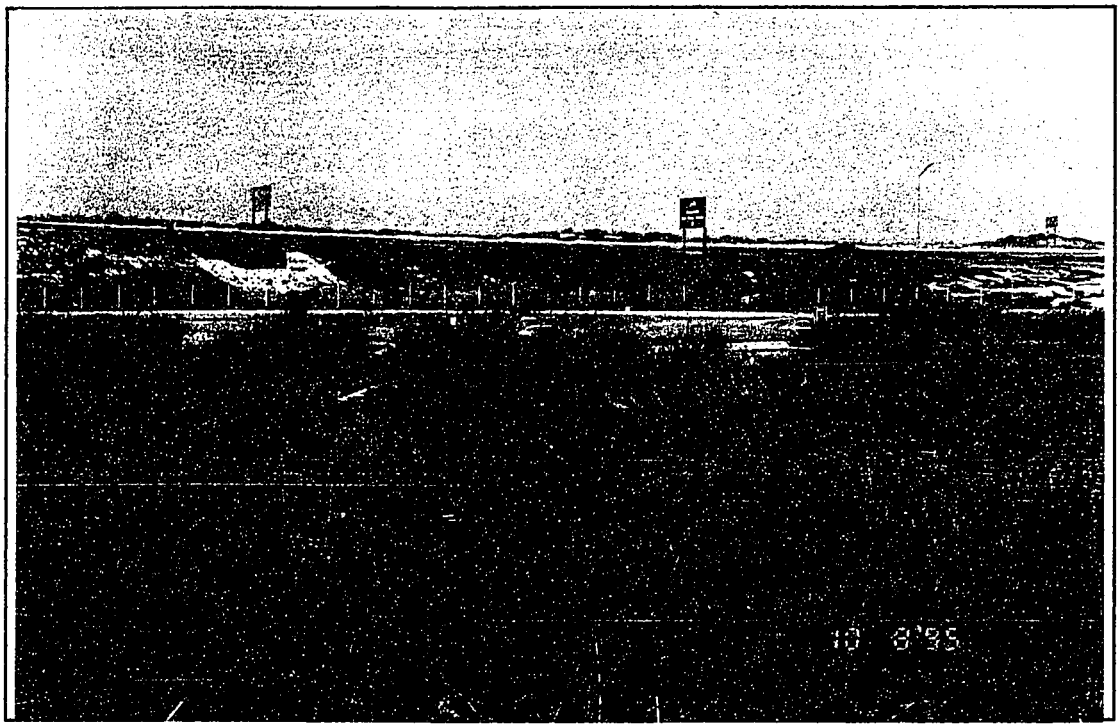

Figure 18.--Roberts Lake Overview


Figure 19.--Roberts Lake Dune Habitat

Project Objectives

The project goals described for Laguna Grande apply to Roberts Lake, although there were some differences as well. The goals and objectives for Roberts Lake are as follows:

Goals

- Removal of sediment and construction of siltation control facilities
- Improve habitat for wildlife species
- In-kind, same location, voluntary restoration

Measurable Field Objectives

- Ensure that the weir between Roberts Lake and Monterey Bay is functional
- Restore dune habitat with native dune vegetation

- Remove excessive tule growth
- Construct three bird nesting islands within the lake
- Install shoreline and bank protection to retard future tule growth
- Eradicate non-native vegetation and replace with native vegetation
- Install water aeration facilities
- Construct grease and oil traps for pollutants
- Construct two observation platforms
- Construct pedestrian trails

Site Observations

Roberts Lake was a small pond surrounded by transportation corridors and commercial buildings. What was surprising was that despite its surroundings, Roberts Lake provided much needed wildlife habitat. A pedestrian path encircled the lake, and two parking areas were also present in addition to picnic tables, garbage cans, and two observation decks. The focus of the lake was the water fountain in the center, which also served to aerate Roberts Lake. In addition, there were three habitat/bird breeding islands which had been seeded with tule and other emergent vegetation. The surrounding edges of Roberts Lake supported tule and cattail, and scattered cypress and willow trees were present as well. The dune habitat appeared to be supporting vegetation, although there were several barren areas. The weir area was the only observed area, besides the habitat islands, to support non-native ice plant and other weedy invasive plant species. The weir was clear of debris and appeared to be functioning.

Again, since only the Laguna Grande/Roberts Lake monitoring reports were located, the information retrieved was invaluable. For example, according to the fifth year monitoring report by EIP (1995, 2-4), the lack of vegetation at the habitat islands was of

great concern. Island 1 was finally successful in maintaining a population of willows, hemlock, nettle, and tule. Island 2 was the most problematic as it not only failed to support vegetation, but was almost entirely underwater. Island 3 was finally able to support vegetation of willows, non-native french broom, and tules. During the field observations, all three islands appeared to be supporting some vegetation, although the majority was tule and cattail. It was difficult to identify the three islands as tule patches had developed near the habitat islands, giving the impression that four to six islands were actually present. Wildlife observed during the field visits included pigeons, gulls, comorants, coots, mallards, hummingbirds, brown pelicans, ground squirrels, a domestic cat, and mice.

People were observed walking, jogging, biking, picnicking, and roller blading around the lake using the pedestrian trail. Three bird watchers and two fishermen were also observed at one of the observation platforms.

Necessary Corrections

The completion of five year's worth of monitoring reports for Roberts Lake was helpful in determining the overall long-term success as well as problem areas. Project corrections are as follows:

- Island 2 should be monitored for continued vegetation survival and to ensure that it is not submerged
- All habitat islands should have the non-native vegetation removed, especially the french broom and pampas grass
- The dune habitat needs to be replanted with additional native dune vegetation

- Nuisance birds (gulls, pigeons) need to be controlled. There are posted signs which warn people not to feed the birds, but with the picnic area nearby, the scavengers will still be attracted
- Willow trees and other riparian vegetation have yet to grow to a size which can buffer the lake from the streets, so additional trees are necessary
- Remove non-native invasives, especially the ice plant surrounding the weir structure
- Regular maintenance and cleaning of the grease/oil/sediment traps

Site 10. Crespi Pond

Site History

Crespi Pond was located in Pacific Grove, Monterey County. The pond was actually located within the Pacific Grove Municipal Golf Course at Oceanview Point, Point Pinos Lighthouse Reservation, at the 16th hole. Project background information is given in Table 14.

Table 14.--Background Information on Crespi Pond

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-89-200	Not Difficult	Federal	Voluntary Restoration	10/1/95 10/8/95	$19,500

Crespi Pond was a small, naturally occurring freshwater wetland, approximately four acres in size with two acres of open water and two acres of emergent vegetation (See Figures 20 and 21). Over time, the pond filled with sediment and the siltation reduced both "the depth and open water areas, which in turn reduced its value for migratory waterfowl and other wildlife" (CCC Consent Calendar #3-89-200 1989, 3).

According to the Coastal Act Section 30231, "biological productivity and quality of coastal wetlands shall be maintained and where feasible, restored" (CCC Consent Calendar #3-89-200 1989, 3). In addition, Pacific Grove's Local Coastal Program Land Use Plan (LUP) calls for the continued protection of Crespi Pond, and Policy 2.2.4.4. prohibits "any significant alteration of the pond except for maintenance dredging and

similar activities essential for restoration of natural habitats" (CCC Consent Calendar #3-89-200 1989, 4). Under these regulations, the restoration of Crespi Pond was approved and the project included the removal of 4710 yd^3 of silt and 2010 yd^2 of tule vegetation, the renovation of the pond for wildlife usage, installation of a new water control structure, and the replacement of the existing drain culvert under Oceanview Boulevard.

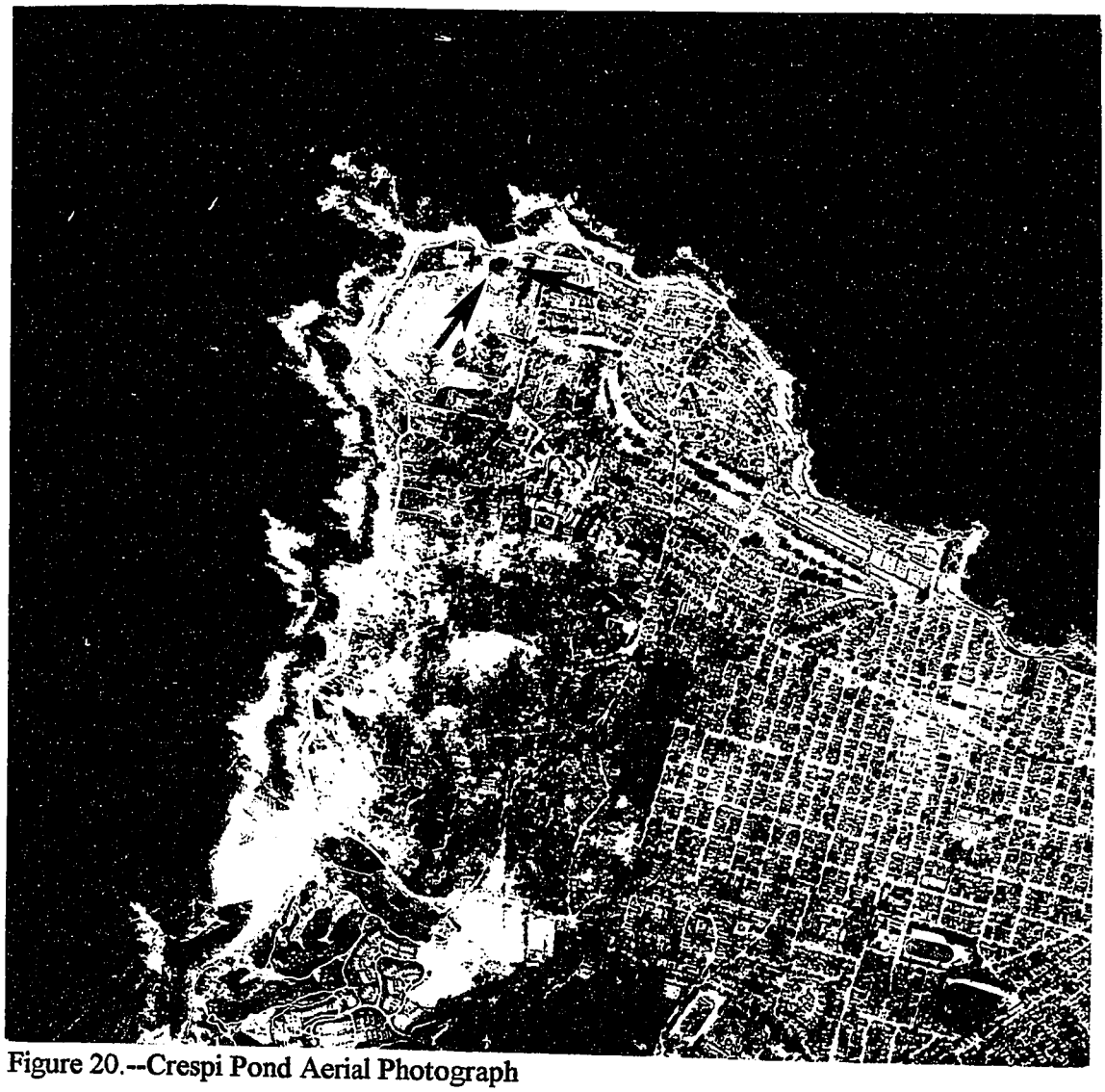

Figure 20.--Crespi Pond Aerial Photograph

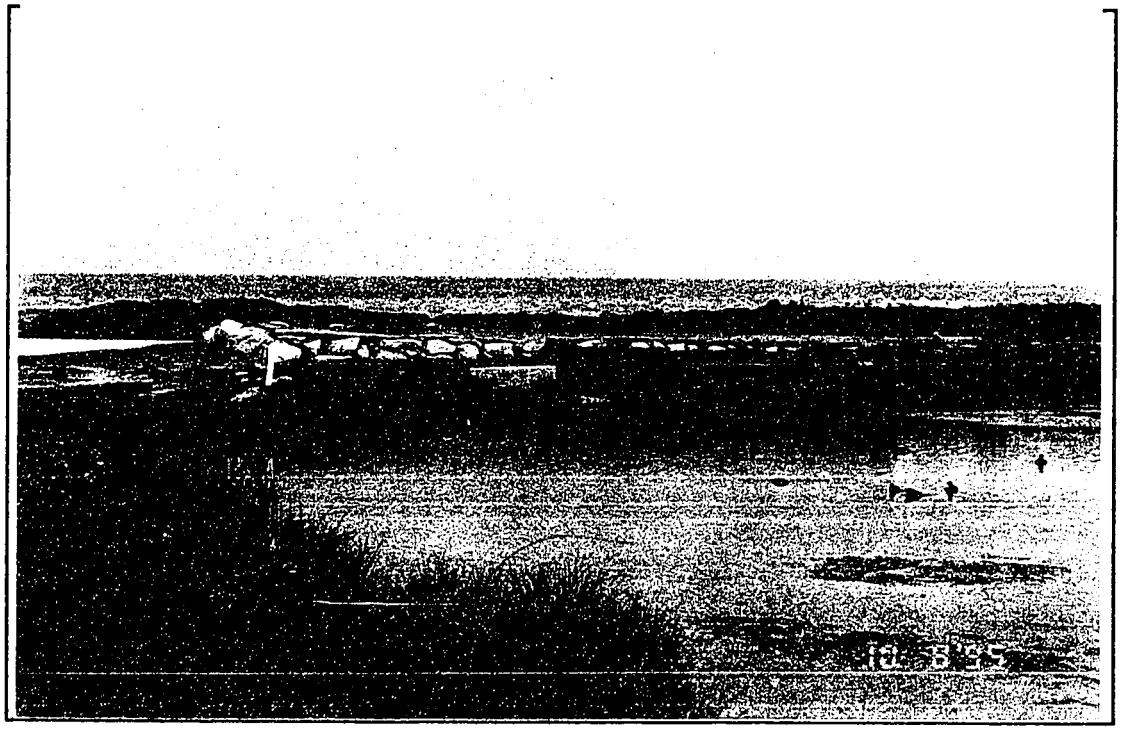

Figure 21.--Crespi Pond Overview

Project Objectives

The project objectives were relatively straightforward and included the following:

Goals

- Maximize the wildlife habitat of Crespi Pond
- In-kind, same location, voluntary restoration

Objectives

- Excavate sediment (4710 yd^3) when the open water area is minimal
- Remove 2010 $feet^2$ of tule vegetation or 1/3 of the tule
- Revegetate pond border with emergent vegetation (tules)
- Use dredged spoils (6720 yd^3) to create a driving range since the spoils are not suitable for beach replenishment
- Install a weir to regulate water levels in the pond

- Replace existing culvert under Oceanview Boulevard and extend approximately 17 feet seaward to discharge onto rocky substrate
- Reshape and recontour pond to maximize wildlife habitat values

Site Observations

Crespi Pond appeared to be a healthy freshwater pond. The vegetation, both emergent and water cover plants, were green and healthy, the water was not stagnant, and there were no overwhelming algae covers. According to the CCC's Consent Calendar #3-89-200 (1989, 3), one third of the existing tules were removed, with some of the excavated tule replanted along the contoured edges of the pond. At the time of the field visits, it appeared that the tules were again spreading and as a result, the pond vegetation was extremely dense, especially at the south end of the pond. The single weir was clear of debris and the culvert extended under Oceanview Boulevard, ending at the rocky substrate which then led to the Monterey Bay. The rocky substrate reduced the risk of sand dune erosion from the discharge, while maintaining the necessary hydrologic characteristics (CCC Consent Calendar #3-89-200 1989, 3). The driving range that was constructed from the dredged material was revegetated and stabilized. It appeared to enhance the site and eliminated the problem of waste sediment, since the dredged materials could not be used for beach replenishment. Wildlife observed at the site by the researcher included ducks, coots, seagulls, butterflies, and deer.

The observed golfers seem to be unfazed by the presence of deer (and visa versa), and ignored the pond area. The pond was located just north of the 16th hole, and just

south of the ladies' 17th hole tee box. A buffer did not exist between the golf course and the pond nor between the pond and Oceanview Boulevard, which is part of the scenic 17-mile drive along the California coastline. Access was not a problem as there was a gravel turn-out just north of Crespi Pond off Oceanview Boulevard. There was also a small parking lot on the same side of Crespi Pond, again off of Oceanview Boulevard, just prior to the 16th hole. An interpretative sign discussed the pond's importance, and was located just north of the ladies 17th hole tee box along Oceanview Boulevard.

Necessary Corrections

Several corrections can be made to improve Crespi Pond. The recommended corrections are as follows:

- Tules will have to be periodically removed to maintain the open water areas
- Siltation will occur again as measures were not taken to reduce the amount of sediment carried into Crespi Pond. Address the need for siltation devices/measures at Crespi Pond
- Plant a vegetative buffer between the golf course greens and Oceanview Boulevard

Site 11. Spanish Bay North Site

Site History

The Spanish Bay Resort, located in Monterey County between 17-Mile Drive and Highway 68, was comprised of 237 acres of forest, dune, and wetland habitat. Originally coastal sand dunes and pine forest, the site housed two sand plants from the 1920's through 1970. The mining operation removed the network of sand dunes, created impervious surfaces which supported little or no vegetation, lowered surface elevation to the granite bedrock, and decreased drainage. As a result, runoff water collected from the higher elevations was stored at the surface, which created riparian and marsh habitats. The northern riparian site and the southern marsh site are two examples of habitat areas which were created due to the sand mining activities. Project background information is given in Table 15 for both sites.

Table 15.--Background Information on Spanish Bay

Permit No.	Access Ease	Ownership	Project Type	Dates of Field Visits	Cost (Estimate)
3-84-226	Not Difficult	Private/ State	Mitigation	10/8/95 11/26/95	N/A

The original project proposed building Spanish Bay Resort, which included a 270 room hotel, 80 residential condominiums, 18-hole golf course, the relocation of Spanish Bay Road, land divisions, a new entrance road for Del Monte Forest, and the reclamation of sand mine areas. The project called for the mitigation of unique and/or wildlife habitats,

and included two wetland areas in Spanish Bay: the northern enhancement area and the southern enhancement area (See Figure 22).

Since the sand mining operation altered the area's drainage patterns and caused the formation of wetland, riparian, and/or drainage related vegetation at the site, the development plans were designed to accommodate and enhance these areas in addition to dune and forest habitats located on the Spanish Bay property.

The northern riparian area (See Figure 23), located between Sunset Drive and the 14th fairway, was left largely unaltered, except where inlet aprons were installed to reduce siltation and erosion, and the addition of a pond, which was necessary to meet the storm drainage requirements of the project. The original vegetation was limited to thickets of arroyo willow, fringed by ice plant and pampas grass. Replacement vegetation emphasized native species and included wax myrtle, coyote bush, mock heather, sea rocket, and yellow bush lupine (LSA 1987, VII-4). In the past, the northern area was an illegal dumping ground for garbage. With the restoration efforts, the garbage was removed, a stormwater detention pond was excavated, and a weir was installed to allow a constant water level to be maintained. In addition to detaining storm water, the pond increased the wildlife habitat diversity. According to LSA (1987, VII-5), "song sparrow, yellowthroat, marsh wren, pied-billed grebe, moorhen, green heron, Virginia and sora rail, raccoon, opossum, tree frog, western toad, and garter snakes" benefited from the presence of the pond.

Figure 22.--Spanish Bay Aerial Photograph

Figure 23.--Spanish Bay Northern Riparian Site

Project Objectives

The building of the Spanish Bay Resort was approved, with mitigation measures.

The goals and objectives are listed below:

Goals

- Protect existing northern riparian site
- Enhance existing wildlife habitat
- In-kind, same location mitigation project

Measurable Field Objectives

- Maintain northern riparian habitat before, during, and after construction of the resort
- Construct a stormwater pond adjacent to the riparian site

- Regulate water depth of 3 feet for cattail and tule growth along the margin of the pond
- Maintain an open body of water
- Install a weir to maintain water depth, regulate rate of overflow, and maintain outflow
- Remove invasive vegetation and replace with native vegetation
- Plant border of willow for wildlife usage and to serve as a vegetative buffer

Site Observations

The north riparian area of Spanish Bay Resort was a densely vegetated area dominated by willow and scrub vegetation. By all appearances, the site appeared to be thriving, although the vegetation was so dense that it was difficult to count individual plants/species. The area was sandwiched between Sunset Drive and the Spanish Bay golf course, with a stormwater pond ending at the pedestrian bridge. The site was not easily accessed by golfers from the golf course as it lies within a deep gully.

The site was moderately easily accessed from the road and shoulder parking was available on both sides of Sunset Drive. During the field visits, the pond held water as well as tules. The installed weir was functioning, and was not blocked by debris or sediment. Although garbage and invasive species had been removed, pampas grass was present along the roadside and within the site. Litter, from Sunset Drive, was present as well as a rubber tire. Wildlife observed by the researcher was limited to mallards, song birds, and gulls. The vegetative buffer of willow, which was suppose to block the northern riparian area from Sunset Drive, was not present at the time of the field evaluation.

It should be noted that monitoring for both Spanish Bay north and south sites was required for five years and successfully completed, although the monitoring reports were not located nor reviewed by the researcher.

Necessary Corrections

The recommendations for the Spanish Bay northern riparian site are minor and include the following:

- Removal of non-native vegetation at the site
- Maintain tule growth along the edge of the pond, while maintaining open water habitat
- Keep weir clear of debris, especially after heavy rains
- Establish the vegetative buffer of willows so that the riparian habitat is screened from Sunset Drive

Site 12. Spanish Bay South Site

Site History

The southern riparian site at Spanish Bay had been greatly altered, compared to the northern riparian site. Since the construction of the Spanish Bay Resort and Golf Course, the southern area had been dredged, expanded, and new habitat areas had been established where they did not previously exist.

The southern site was located off Spanish Bay Road, at the edge of the Spanish Bay property. The 7th and 9th fairways were located within and adjacent to the site (See Figure 24). Prior to construction, the site was characterized by LSA in 1987 as having three different conditions: 1) defined channels, 2) broad wetland areas, and 3) hummocky low-dune terrain. The defined channels supported riparian vegetation of cattails, rushes, sedges, silverweed, willow, wax myrtle, yellow bush, lupine, blackberry, french broom, acacia, and invasive ice plant. The wetland area supported sedges, rushes, silverweed, ice plant, willow, blackberry, pampas grass, acacia, and french broom. The wetland area was terraced and provided habitats with different moisture requirements. Heavy weed cover was observed in this area after it had been mined and filled. The dune hummock area supported "almost pure ice plant mixed with stands of yellow bush lupine, sagewort, purple beach pea," (LSA 1987, VII-6) and other native vegetation.

Figure 24.--Spanish Bay Southern Riparian Site

Required mitigation included the expansion of the riparian habitat from 3.0 to 4.1 acres (See Table 16), removal of non-native species, and revegetating with native plants.

Table 16.--Spanish Bay Southern Riparian Site Acres Destroyed/Created

	Wetland Habitat (acres)
Pre-existing	3.0
Lost due to construction	0
Created	1.1
Total Acres	**4.1**
Net Gain/Loss	Gain of 1.1 acres

Project Objectives

The goals and objectives for the southern riparian site at Spanish Bay were very similar to those for the north site. Two main differences between the sites were that the northern site needed very little work while the southern site was almost completely reconstructed, and the southern site called for an expansion of 1.1 acres of riparian habitat acreage.

Goals

- Enhance habitat for wildlife usage
- Create 1.1 acres of riparian habitat
- In-kind, same location mitigation project

Measurable Field Objectives

- Maintain southern habitat before, during, and after construction of the resort
- Remove invasive vegetation and replace with native vegetation
- Expand riparian habitat by 1.1 acres to a total of 4.1 acres
- Build a weir at the outlet of the southern enhancement area to control water levels within the habitat area

Site Observations

The southern riparian site was set within the 7th, 8th, and 9th golf fairways. The golf course's manicured lawns were a sharp contrast to the riparian vegetation of cattails, rushes, sedges, and the low lying sand dunes which surrounded the site to the west. The only exotic species observed by the researcher were ice plant and pampas grass on the dune habitat bordering the riparian site. According to LSA (1987, VII-7), the "revegetation was accomplished by hand seeding with riparian and wetland species prior to the winter of 1985. Vegetation became established without irrigation and the ultimate

expected plant cover will develop over time from the initial plantings." Based on field observations taken by the researcher, the site appeared to be healthy and thriving.

Access to the site was easily obtained by parking at the public parking lot off Spanish Bay Road and then crossing the street. The only observed hazard was the occassional flying golfball as holes 7, 8, and 9 were within the boundaries of the site. It also appeared that golfers would not stray into the southern riparian site, even after a lost ball, as the site was heavily vegetated and saturated with water at various depths due to the drainage from the golf course. The installed weir could not be observed due to the dense vegetation.

Wildlife observed during this study included deer, songbirds, lizards, and a snake. Numerous songbirds were heard, but could not be identified.

Necessary Corrections

The recommendations for the Spanish Bay southern riparian site are minor and are similar to the recommendations made for the northern riparian site of Spanish Bay.

- Removal of non-native vegetation at the site
- Keep weir clear of debris, especially after heavy rains
- Establish a vegetative buffer along the roadside to block the riparian habitat from Spanish Bay Road

CHAPTER FIVE

COMPLIANCE RESULTS

Project compliance for the twelve coastal wetland sites was evaluated using the measurable objectives stated in the permit files. Final project compliance was determined by comparing the project objectives against the current conditions found at the sites. For each site, a total percent of achieved compliance was developed by assessing the objectives that were fully met, partially met, or not met at all. The percent value was determined by counting the number of fully and partially met criteria, dividing by the number of possible objectives, and multiplying by one hundred to obtain a percent total.

Site 1. Neary Lagoon

Table 17.--Permit Compliance for Neary Lagoon

	Criteria	Criteria Met
1	Revegetate 0.20 acres w/native species	Fully
2	Restore riparian area on opposite side	Partial
3	Enhance riparian area on opposite side	Fully
4	Remove exotic plant species	Partial
5	Fence mitigation site area	Fully
6	Build 330' trails, including floating path	Fully
7	Encourage passive recreation use	Fully
8	Construct noise barrier & vegetation screen	Partial
9	Contain on site surface water runoff	Fully

Table 18.--Compliance Summary for Neary Lagoon

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
9	6	3	0

PERCENT TOTAL	100%

Site 2. Moran Lake

Table 19.--Permit Compliance for Moran Lake

	Criteria	Criteria Met
1	Dredge sediment (approx. 2,000 yd^3)	Fully
2	Excavate lagoon to 5 feet in depth	Partial
3	Recontour lagoon & build 0.125 acre island	None
4	Install functional box culvert w/apron	Partial
5	Install flashboard tide gate	Fully
6	Provide public access, passive recreation	Fully
7	Revegetate barren areas w/native salt marsh vegetation for wildlife habitat	Partial

Table 20.--Compliance Summary for Moran Lake

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
7	3	3	1

PERCENT TOTAL	86%

Site 3. Moss Landing Wildlife Area Levee Project

Table 21.--Permit Compliance for Moss Landing Wildlife Area Levee Project

	Criteria	Criteria Met
1	Construct 4700' levee (50'x6')	Fully
2	Dredge 30,000 yd^3 of wetland for levee	Fully
3	Compact levee, add 1 foot of rock rip-rap	Partial
4	Add two water control structures	Fully
5	Add recreational trails	Fully
6	Add observation decks & wooden walkway	None
7	Enhance individual ponds for wildlife	Partial

Table 22.--Compliance Summary for Moss Landing Wildlife Area Levee Project

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
7	4	2	1

PERCENT TOTAL	86%

Site 4. Moss Landing Wildlife Area Treatment Pond

Table 23.--Permit Compliance for Moss Landing Wildlife Area Treatment Pond

	Criteria	Criteria Met
1	Create 5.2 acres of tidal wetland	None
2	Excavate 5,000 yd^3 of existing levee	None
3	Increase wildlife habitat and improve site	None

Table 24.--Compliance Summary for Moss Landing Wildlife Area Treatment Pond

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
3	0	0	3

PERCENT TOTAL	0%

Site 5. Marina North/South Pond #3

Table 25.--Permit Compliance for Marina North/South Pond #3

	Criteria	Criteria Met
1	Combine north & south ponds	Fully
2	Limit surface water into pond	Fully
3	Regrade pond for seasonal mudflat exposure	Fully
4	Maintain water levels with well water if nec.	Fully
5	Establish brackish vegetation	Fully
6	Establish riparian vegetation/buffer	None
7	Establish herbaceous/grassland vegetation	Partial
8	Establish upland scrub vegetation	Partial
9	Construct two observation platforms	Fully
10	Install a snag	Fully
11	Install a fence around pond & upland areas	Partial

Table 26.--Compliance Summary for Marina North/South Pond #3

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
11	7	3	1

PERCENT TOTAL	91%

Site 6. Marina West Pond #3

Table 27.--Permit Compliance for Marina West Pond #3

	Criteria	Criteria Met
1	West pond to remain as a non-managed, over flow pond for north/south pond	Fully
2	Establish willow buffer	Partially

Table 28.--Compliance Summary for Marina West Pond #3

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
2	1	1	0

PERCENT TOTAL	100%

Site 7. Locke Paddon Park Pond #2

Table 29.--Permit Compliance for Locke Paddon Park Pond #2

	Criteria	Criteria Met
1	Remove sediment & overgrown vegetation	Fully
2	Remove introduced species, replace with native species	Partial
3	Improve water quality	Partial
4	Improve water circulation	Partial
5	Install nest boxes & platforms	Fully
6	Establish redwood trees for raptors	Partial
7	Maintain 100' buffer	Fully
8	Construct public facilities	Fully

Table 30.--Compliance Summary for Locke Paddon Park Pond #2

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
8	4	4	0

PERCENT TOTAL	100%

Site 8. Laguna Grande

Table 31.--Permit Compliance for Laguna Grande

	Criteria	Criteria Met
1	Construct two sediment basins	Fully
2	Widen canyon channel	Fully
3	Remove excessive tule	Fully
4	Construct three nesting islands	Fully
5	Install shoreline/bank protection	Partial
6	Eradicate non-natives, replant with native species	Partial
7	Construct grease and oil traps	Fully
8	Install water aeration facilities	Fully
9	Construct four observation platforms	Fully
10	Construct trails	Fully

Table 32.--Compliance Summary for Laguna Grande

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
10	7	3	0

PERCENT TOTAL	100%

Site 9. Roberts Lake

Table 33.--Permit Compliance for Roberts Lake

	Criteria	Criteria Met
1	Ensure weir is functional	Fully
2	Restore dune habitat w/native vegetation	Partial
3	Remove excessive tule	Partial
4	Construct three nesting islands	Fully
5	Install shoreline/bank protection	Fully
6	Eradicate non-natives, replant w/natives	Partial
7	Install water aeration facilities	Fully
8	Construct grease and oil traps	Fully
9	Construct two observation platforms	Fully
10	Construct trails	Fully

Table 34.--Compliance Summary for Roberts Lake

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
10	8	2	0

PERCENT TOTAL	100%

Site 10. Crespi Pond

Table 35.--Permit Compliance for Crespi Pond

	Criteria	Criteria Met
1	Excavate sediment (4710 yd^3)	Fully
2	Remove 2010 $feet^2$ of tule vegetation or 1/3	Fully
3	Revegetate pond edges	Fully
4	Use dredged material for driving range	Fully
5	Install a weir	Fully
6	Replace culvert, extend to rocky shore	Fully
7	Reshape & recontour pond	Partial

Table 36.--Compliance Summary for Crespi Pond

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
7	6	1	0

PERCENT TOTAL	100%

Site 11. Spanish Bay North Riparian

Table 37.--Permit Compliance for Spanish Bay North Riparian Site

	Criteria	Criteria Met
1	Protect riparian habitat	Fully
2	Construct stormwater pond	Fully
3	Regulate pond depth of 3 feet deep with tule	Fully
4	Maintain open body of water	Partial
5	Install a weir	Fully
6	Remove invasive plant species and revegetate with native species	Partial
7	Establish a buffer of willow	Partial

Table 38.--Compliance Summary for Spanish Bay North Riparian Site

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
7	4	3	0

PERCENT TOTAL	100%

Site 12. Spanish Bay South Riparian

Table 39.--Permit Compliance for Spanish Bay South Riparian Site

	Criteria	Criteria Met
1	Protect riparian habitat	Fully
2	Expand riparian habitat by 1.1 acres	Fully
3	Remove invasive plants and replant with native vegetation	Partial
4	Install a weir	Fully

Table 40.--Compliance Summary for Spanish Bay South Riparian Site

POSSIBLE OBJECTIVES	OBJECTIVES FULLY MET	OBJECTIVES PARTIALLY MET	OBJECTIVES NOT MET
4	3	1	0

PERCENT TOTAL	100%

According to the data (See Tables 41 and Figure 25), project compliance was high, with an overall average of 93 percent for all twelve sites. Of the twelve projects, eight achieved 100 percent compliance when fully and partially met objectives were considered. Although none of the projects fully met all of their objectives, only one site failed to meet any objectives, Moss Landing Wildlife Area Treatment Pond. Based on these initial results, it would seem that the CCC has been successful in obtaining project compliance for both mitigated and restored coastal wetlands.

The high percent of project compliance may be due to a number of reasons. The majority of the projects were considered to be small, coastal pond wetlands. Perhaps this wetland type was more easily restored or enhanced. Also, since these projects were generally less than five acres in size, they may have been less expensive and were perceived as being "achievable." It may also be that it was less intimidating to restore a three acre pond rather than a three hundred acre wetland. As a result, more time and money could have been spent on the project rather than other incurred complications and costs. In addition, it seemed that many of the developers, project coordinators, CCC and other agency personnel spent a great deal of time and money to ensure that the projects were completed as specified, or as close to specifications as possible. Finally, many of the projects evaluated, especially the larger projects, had a history of plan revisions which indicated that if a problem was found, it was corrected. The adaptive management led to greater chances of project compliance and success.

It should again be noted that the project objectives used in this study were limited to measurable objectives which could be verified during field visits. For several projects, water quality was measured, but evaluating this data was beyond the scope of this study.

Table 41.--Project Compliance Summary

	Site Name	Number of Objectives Possible	Total Objectives Fully Met	Total Objectives Partially Met	Total Objectives Not Met	Percent of Objectivs Met (Success)
1	Neary Lagoon	9	6	3	0	100%
2	Moran Lake	7	3	3	1	86%
3	Moss Landing Wildlife Area-Levee	7	4	2	1	86%
4	Moss Landing Wildlife Area-Pond	3	0	0	3	0%
5	Marina North/South Pond #3	11	7	3	1	91%
6	Marina West Pond #3	2	1	1	0	100%
7	Locke Paddon Park Pond #2	8	4	4	0	100%
8	Laguna Grande	10	7	3	0	100%
9	Roberts Lake	10	8	2	0	100%
10	Crespi Pond	7	6	1	0	100%
11	Spanish Bay-North Riparian	7	4	3	0	100%
12	Spanish Bay-South Riparian	4	3	1	0	100%
	Total For All Sites	85	53	26	6	93%

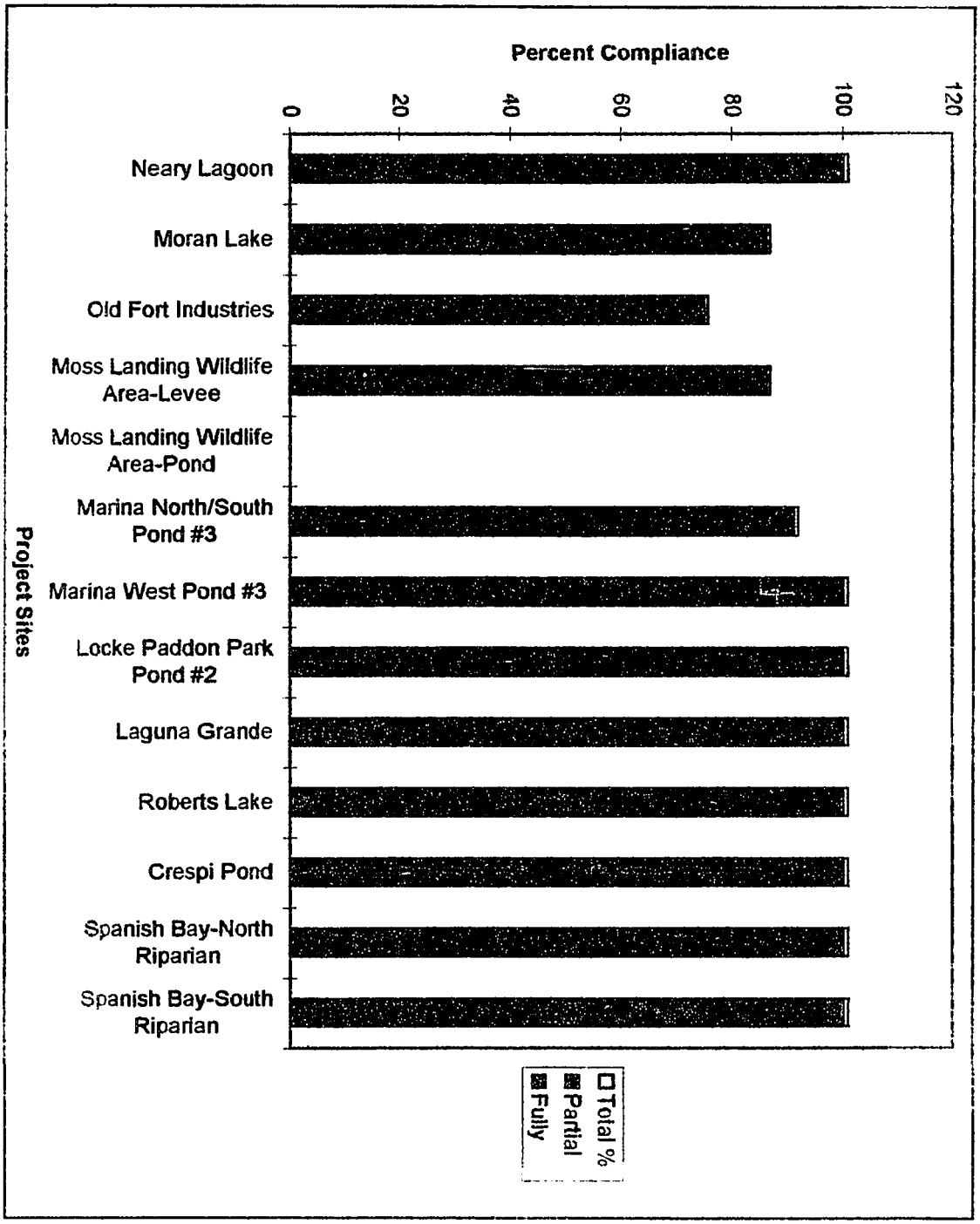

Figure 25.--Project Compliance Summary

CHAPTER SIX

BIOLOGICAL RESULTS

Biological results were determined using field evaluations and methodologies established by other researchers (See Table 2). The methods used gave an overview of the project's health and focused on the presence of wildlife and vegetation. All field observations were taken by the researcher, unless otherwise noted.

Site 1. Neary Lagoon

Table 42.--Soil and Vegetation

SOIL	
Type	Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	88%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 43.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation, camping, trespassing
FAUNA	
Observed Wildlife	mallard
Habitat Indicators	Yes
Presence of Domestic Animals	No

Site 2. Moran Lake

Table 44.--Soil and Vegetation

SOIL	
Type	60% Silt-Clay, 40% Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	71%
Presence of Rare Species	No
Invasive Species Dominant	Yes

Table 45.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation, housing encroachment
FAUNA	
Observed Wildlife	mallards, gulls
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

Site 3. Moss Landing Wildlife Area Levee Project

Table 46.--Soil and Vegetation

SOIL	
Type	Sand-Silt
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	38%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 47.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation, fishing
FAUNA	
Observed Wildlife	herons, pelicans, ibis, sanderlings, terns, mice
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

Site 4. Moss Landing Wildlife Area Treatment Pond

Table 48.--Soil and Vegetation

SOIL	
Type	Sand-Silt
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	0%
Presence of Rare Species	No
Invasive Species Dominant	N/A

Table 49.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Fishing, passive recreation
FAUNA	
Observed Wildlife	None
Habitat Indicators	No
Presence of Domestic Animals	No

Site 5. Marina North/South Pond #3

Table 50.--Soil and Vegetation

SOIL	
Type	Sand-Silt
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	81%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 51.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation, garbage
FAUNA	
Observed Wildlife	mallard
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

Site 6. Marina West Pond #3

Table 52.--Soil and Vegetation

SOIL	
Type	Sand-Silt
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	96%
Presence of Rare Species	No
Invasive Species Dominant	Yes

Table 53.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Bus stop, residence, asphalt lot, garbage
FAUNA	
Observed Wildlife	None
Habitat Indicators	Yes
Presence of Domestic Animals	No

Site 7. Locke Paddon Park Pond #2

Table 54.--Soil and Vegetation

SOIL	
Type	Silt-Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	91%
Presence of Rare Species	No
Invasive Species Dominant	Yes

Table 55.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation, camping, vandalism
FAUNA	
Observed Wildlife	blackbird*, butterfly, ducks, coots, geese, songbirds, ground squirrels
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

* Wildlife information taken from:
CCC Regular Calendar for Marina Vernal Pond #2 #3-MAR-87-004 1987, 3

Site 8. Laguna Grande

Table 56.--Soil and Vegetation

SOIL	
Type	Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	82%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 57.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation, camping, garbage, bonfires
FAUNA	
Observed Wildlife	ducks, coots, gulls, songbirds, pelicans
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

Site 9. Roberts Lake

Table 58.--Soil and Vegetation

SOIL	
Type	Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	74%
Presence of Rare Species	No
Invasive Species Dominant	Yes

Table 59.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation
FAUNA	
Observed Wildlife	ducks, gulls, pigeons, cormorants, hummingbird, pelican, squirrel, mice
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

Site 10. Crespi Pond

Table 60.--Soil and Vegetation

SOIL	
Type	Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	72%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 61.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation
FAUNA	
Observed Wildlife	deer, ducks, coots, gulls, butterflies
Habitat Indicators	Yes
Presence of Domestic Animals	No

Site 11. Spanish Bay North Riparian

Table 62.--Soil and Vegetation

SOIL	
Type	Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	77%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 63.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation
FAUNA	
Observed Wildlife	songbirds, wren, grebe*, heron, rails, raccoon*, possum*, frog, toads, garter snake, ducks, gulls
Habitat Indicators	Yes
Presence of Domestic Animals	Yes

* Wildlife information taken from:
LSA 1987, VII-5

Site 12. Spanish Bay South Riparian

Table 64.--Soil and Vegetation

SOIL	
Type	Sand
VEGETATION	
Number of Quadrants Taken	10
Mean Percent Cover	100%
Presence of Rare Species	No
Invasive Species Dominant	No

Table 65.--Human Disturbance and Fauna

HUMAN DISTURBANCE	
Type	Passive recreation
FAUNA	
Observed Wildlife	deer, songbirds, lizards, snake
Habitat Indicators	Yes
Presence of Domestic Animals	No

Soil and Vegetation

The emphasis of the biological data was on vegetation and wildlife since these categories were easily observed and provided an indication as to the general health of the wetland site. The use of soil texture was not useful as all of the project sites were composed of sand since they were all coastal wetlands. The average percent of vegetation cover for twelve sites (See Table 66 and Figure 26) was 73 percent, with individual sites ranging from 100 percent cover to 0 percent cover. Although the presence of vegetation is usually perceived as a sign of successful restoration, this may not necessarily be the case. The emphasis should be on the presence of native or desired vegetation, as well as the ratio of open water habitat to vegetated habitat as open water habitats are necessary for many wetland species. Although no general ratios of percent vegetative cover to percent open water were found to be applicable to California coastal wetlands, the ratio should be determined on a case-by-case basis. It should also be noted that the vegetative cover almost always included invasive non-native vegetation species. Although invasives should be removed and replaced with native species, they did serve as ground cover which reduced soil erosion. More importantly, invasive species were observed at many of the project sites and therefore should be included in the vegetative data. Although most sites reported the presence of invasive vegetation, only four sites had invasive species as the dominant vegetation. No rare species were obvious at any of the twelve sites, although this assessment was not completed by a botanist.

Disturbances and Wildlife Observations

All twelve sites had some form of disturbance (See Table 67). For this study, human disturbance included passive recreational activities such as walking, hiking, jogging, biking, rollerblading, skateboarding, picnicking, fishing, painting, and bird watching since these human activities have the potential to impact wildlife species and habitats. An exception would have been the use of a vegetative screen with a wide buffer between the human activity and wildlife area, but this scenario was not observed at any of the evaluated sites. While the effects of disturbance on wildlife are beyond the scope of this study, it was assumed by the researcher that most disturbance activities would have a negative effect on wildlife. Yet, improving wildlife habitat and increasing passive recreation facilities were often listed simultaneously as project objectives.

Besides human disturbances, domestic animals can be a serious threat to wildlife. The issue of domestic animals was relevant to this study as most of the sites were located near or within walking distance to private homes. Of the twelve project sites, seven had domestic animal sightings and this was probably an underestimation of the actual number of sites which were routinely visited by domestic animals. The presence of human disturbance and domestic animals in relation to wildlife observations is summarized in Table 68. The sites that had numerous wildlife observations, Moss Landing Wildlife Area Levee, Locke Paddon Park, Laguna Grande, Roberts Lake, Crespi Pond, and the Spanish Bay North Riparian site, were also subject to human disturbances and domestic animal sightings, with the exception of Crespi Pond. The determining factor may not be the

presence of human disturbances or domestic animals, but the frequency and/or duration of either. For example, the Moss Landing Wildlife Area Levee, Locke Paddon Park, Laguna Grande, and Spanish Bay North Riparian sites were either fairly deserted or had relatively isolated areas within the site. Roberts Lake and Crespi Pond were situated in open areas where there was limited brush and cover and although there was a moderately high observance of wildlife, the wildlife species were common birds generally accustomed to humans.

Only two sites, Moss Landing Wildlife Area Treatment Pond and Marina West Pond #3 were devoid of any observed wildlife. At Moss Landing Wildlife Area Treatment Pond, a combination of the lack of vegetation and stagnant water contributed to the absence of wildlife. For Marina West Pond #3, the lack of wildlife could be attributed to the seasonal wetland (it was dry at the time of the field visit), and human interference in the form of busy roads and a bus stop less than ten feet from the site. For the remaining sites, the diversity varied dramatically but wildlife was present.

As is typical of many mitigation and restoration projets, many of the CCC project objectives included the enhancement of habitat for wildlife, yet did not list specific quantifiable requirements. The enhancement of wildlife habitat was often achieved by planting native vegetation or ensuring the presence of vegetative cover, but specific species requirements were not addressed. More research is needed with regard to wildlife habitat enhancement and how wildlife needs can be successfully integrated with recreational uses.

Table 66.--Mean Percent Cover

	Site Name	Total Number of Quadrants	Mean Percent Cover
1	Neary Lagoon	10	88%
2	Moran Lake	10	71%
3	Moss Landing Wildlife Area-Levee	10	38%
4	Moss Landing Wildlife Area-Pond	10	0%
5	Marina North/South Pond #3	10	81%
6	Marina West Pond #3	10	96%
7	Locke Paddon Pond #2	10	91%
8	Laguna Grande	10	82%
9	Roberts Lake	10	74%
10	Crespi Pond	10	72%
11	Spanish Bay-North Riparian	10	77%
12	Spanish Bay-South Riparian	10	100%

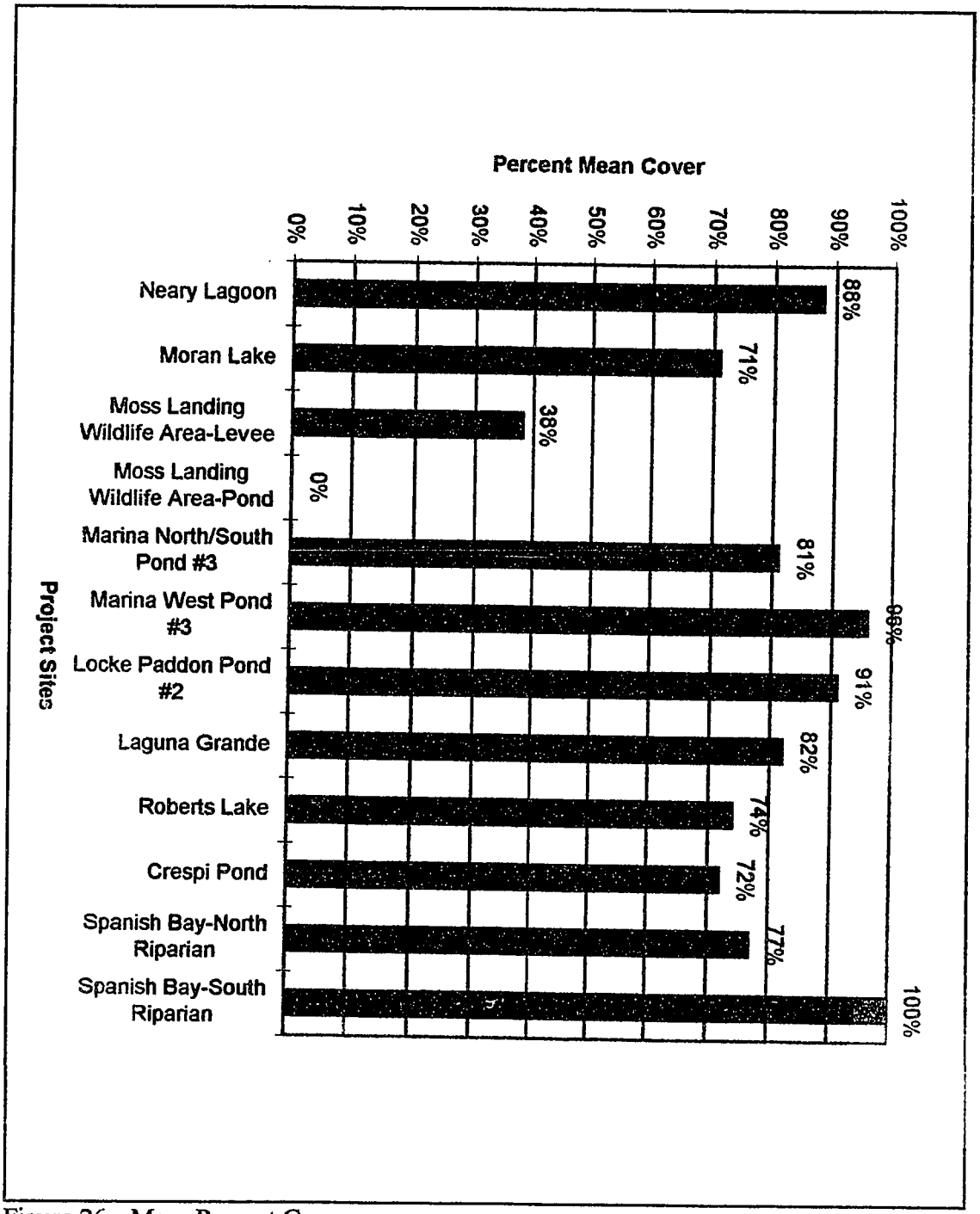

Figure 26.--Mean Percent Cover

Table 67.--Presence of Disturbance in Relation to Wildlife Observations

	Site Name	Human Disturbance-Passive Recreation	Human Disturbance-Other Activities	Presence of Domestic Animals	Wildlife Observations By Species
1	Neary Lagoon	Yes	Yes	No	1
2	Moran Lake	Yes	Yes	Yes	2
3	Moss Landing Wildlife Area-Levee	Yes	No	Yes	6
4	Moss Landing Wildlife Area-Pond	Yes	No	No	0
5	Marina North/South Pond #3	Yes	Yes	Yes	1
6	Marina West Pond #3	No	Yes	No	0
7	Locke Paddon Park Pond #2	Yes	Yes	Yes	7
8	Laguna Grande	Yes	Yes	Yes	5
9	Roberts Lake	Yes	No	Yes	8
10	Crespi Pond	Yes	No	No	5
11	Spanish Bay-North Riparian	Yes	No	Yes	12
12	Spanish Bay-South Riparian	Yes	No	No	4

CHAPTER SEVEN

DISCUSSION

The results of the study were based on field observations taken in October, November, and December of 1995. The main objective of the study was to assess the success of coastal wetland mitigation and restoration projects, within the Monterey Bay region of Northern California, with regard to project compliance and biological functioning.

An approach to site evaluation, using the field methods previously mentioned, was also addressed as well as problems encountered during the study.

Success

Since standardized quantitative success criteria were not available, the twelve sites were assessed based on project compliance and wetland functioning using the presence of vegetation and wildlife as indicators. This simplified comparison demonstrated a relationship between project compliance and biological functioning to overall success (See Table 68).

Table 68.--Relationship of Biological Functioning and Compliance

	Site Name	Vegetation Present According to Specifications	Wildlife Present	Functioning Wetland (Both Vegetation & Wildlife Present)	Percent Project Compliance	Relationship Between Biological Function & Compliance
1	Neary Lagoon	Yes	Yes	Yes	100%	Yes
2	Moran Lake	No	Yes	No	86%	No
3	Moss Landing Wildlife Area-Levee	Yes	Yes	Yes	86%	Yes
4	Moss Landing Wildlife Area-Pond	No	No	No	0%	Yes
5	Marina North/South Pond #3	Yes	Yes	Yes	91%	Yes
6	Marina West Pond #3	Yes	No	No	100%	No
7	Locke Paddon Park Pond #2	Yes	Yes	Yes	100%	Yes
8	Laguna Grande	Yes	Yes	Yes	100%	Yes
9	Roberts Lake	Yes	Yes	Yes	100%	Yes
10	Crespi Pond	Yes	Yes	Yes	100%	Yes
11	Spanish Bay-North Riparian	Yes	Yes	Yes	100%	Yes
12	Spanish Bay-South Riparian	Yes	Yes	Yes	100%	Yes

Two projects did not show a relationship between biological functioning and project compliance. Moran Lake had an 86 percent compliance, but was not considered to be a functioning wetland. Marina West Pond #3 had a 100 percent compliance rate, but had not achieved biologic success as a functioning wetland. It may be that these two projects did not possess correct or comprehensive project objectives, and therefore the project sites could not achieve biologic success regardless of the amount of compliance. In essence, the project objectives failed to match the project's overall goals.

An examination of actual project objectives proved to be interesting but not surprising (See Table 69). Project objectives can be divided into six general categories: site issues, vegetation issues, wildlife issues, water issues, construction, and disturbances. The actual project objectives were listed against the project sites, and fulfilled objectives were categorized as being "full," "partial," or "not" which were abbreviations for fully achieved, partially achieved, and not achieved. For several of the sites, Table 69 did not match the number of permit compliances listed in Chapter Five. This was due to the replication of project objectives. For example, Neary Lagoon listed the restoration and enhancement of riparian areas, while Table 69 combined them into a single category. Only one site, Roberts Lake, included all six categories. Marina West Pond #2, which was one of the unsuccessful projects, had only two objectives and only two of the six objective categories. Moran Lake, as the other unsuccessful site, actually seemed to possess both correct and comprehensive project objectives with a total of six objectives covering four of the objective categories. After examining permit compliance, biological indicators, and

the relationship between both, Moran Lake was the only unsuccessful site which could not be explained using the collected data. The incorrect elevation of the culvert, replacement bridge, and resulting hydrologic problems were directly responsible for the sedimentation problems, poor water quality, and limited wildlife and vegetation. It would seem that the Moran Lake project was incorrectly designed as the project objectives failed to match the overall goals and thus resulted in an unsuccessful project.

An additional note is that evaluating a project in its present condition, without reviewing historical records, can be misleading. For example, the original objectives may have been changed over time to reflect new solutions and while the project may not match its original objectives, it may achieve success based upon its revised goals and objectives.

Table 69.--Actual Project Objectives

Objectives	Neary Lagoon	Moran Lake	Old Fort Industries	MLWA Levee	MLWA Treatment Pond	Marina North/South Pond #3	Marina West Pond #3	Locke Paddon Pond #2	Laguna Grande	Roberts Lake	Crespi Pond	Spanish Bay North	Spanish Bay South
Site Issues													
Create habitat					Not						Full		
Restore/enhance	Partial									Partial			
Protect existing site			Full				Full					Full	Full
Vegetation Issues													
Remove exotics	Partial							Partial	Full	Partial		Partial	Partial
Revegetate habitat w/native spp.	Full	Partial				Partial	Partial	Partial	Partial	Partial	Full	Partial	Partial
Noise barrier/vegetative screen	Partial												
Buffer								Full				Partial	
Wildlife Issues													
Create wildlife ponds			Not	Partial		Full						Full	
Improve wildlife habitat					Not			Full	Full	Full			
Water Issues													
Improve water quality/circulation								Partial	Full	Full			
Dredge sediment		Full		Full				Full			Full		
Install culvert/tide gate		Full		Full						Full	Full	Full	Full
Bank protection									Full	Full			
Construct sediment basins									Full				

Table 69 (continuation).--Actual Project Objectives

Objectives	Neary Lagoon	Moran Lake	Old Fort Industries	MLWA Levee	MLWA Treatment Pond	Marina North/South Pond #3	Marina West Pond #3	Locke Paddon Pond #2	Laguna Grande	Roberts Lake	Crespi Pond	Spanish Bay North	Spanish Bay South
Construction													
Fence	Full												
Excavate		Partial			Not								
Recountour		Not									Full		
Construct observation platforms				Not		Full			Full	Full			
Slope all grades			Partial			Full							
Contain run-off	Full					Full			Full	Full			
Construct levee				Full									
Compact levee, rip-rap				Partial									
Disturbances													
Passive recreation	Full	Full		Full				Full	Full	Full			

Common Project Errors

Since each project was developed, constructed, and evaluated on an individual basis, common errors were restricted to general observations. For the twelve projects, the five most common errors are listed in Table 70.

Table 70.--Common Project Errors for the Twelve Wetland Sites

PROBLEM AREAS	NUMBER OF SITES AFFECTED
Human intrusion/disturbance	12
Presence of exotic species	9
Lacked performance standards	8
Lacked vegetative buffer	7
Presence of domestic animals	7

The problems observed in this study were common to other studies as well. Reports by Josselyn (1990), Erwin (1990), and Shaich and Franklin (1995) list their findings of common project errors as being: 1) the need for both project and habitat goals, 2) the need for an evaluation of existing site conditions, 3) consideration of hydrologic conditions, 4) inadequate replacement acreage ratios, 5) timing of mitigation projects, 6) revegetation issues, 7) the need for buffers, 8) the determination of project compliance, and 9) enforcement monitoring programs.

Evaluation of Field Methods

A crucial element that most studies evaluated by Erwin (1990, 12) failed to acknowledge was the need for "rapidly accessible, easily understandable, and cost effective data" to support an environmental agency review. Keeping these needs in mind, several of the methods used in this study were informative and applicable to coastal wetland evaluations.

The "feel method" used by E.I.P. Associates (1990) was an excellent and quick method for determining the general surface soil properties. However, since all of the evaluated sites were coastal wetlands with similar sandy soils, the application was limited. The vegetation information, which included quadrant sampling (Brower and Zar 1984, Dyste 1995), was useful and relatively simple. Originally, the quadrant vegetation was to be counted individually, but this proved to be too time consuming and inapplicable for ground cover, so a percent cover was used instead. The identification of native and invasive species (Faber 1982) would have been challenging for a non-botanist, but fortunately the sites had similar vegetation so identification was limited to a few common species. Wildlife and domestic animal sightings were primarily based upon direct observations, although consultant's reports were incorporated when available as well as the use of habitat indicators (Cooperrider et al. 1986). Habitat indicators were generally useful although according to Cooperrider et al. (1986), almost any natural feature could be considered to be an indicator.

Three concepts looked applicable but did not, for various reasons, provide useful information for the study conducted. The first was the classification of the wetlands. Wetland classification (Cowardin et al. 1979) was not a necessary element for this study as all of the sites were non-tidal coastal ponds or lagoons. If the study had incorporated more variety, the classification method would have been beneficial. The homogeneity of the sites also affected the soil texture as previously mentioned, although the "feel method" (E.I.P. Associates 1990) was simple and could be informative. The last method was the determination of plant survivorship (Erwin 1990). The survivorship concept was only applicable to mature trees or forests where the vegetation tends to linger before it dies, as opposed to shrubs, sapplings, and grasses. At the sites evaluated, the vegetation could easily and without a doubt be categorized as either "dead" or "alive."

The suggested "tools" of drawing a site map, taking descriptive notes and color site photographs were invaluable to this study. The only additional recommendation would be to bring two cameras to the sites; one for color site photos and the second for color slides (Dyste 1995). Color slides were useful for presentations and were easier to store, therefore they were preferred over photos for the historical documentation of the site.

In summary, the methods chosen were simple, applicable, and did provide basic site information. The three methods that were not useful to this study would have yielded relevant site information, had the project sites been appropriate. Regarding the validity of the methods and tools used, they were valid as long as the researcher was attempting to

determine the overall health of the site. Hence, the methods and tools mentioned would be used as indicators of areas that need additional research. The methods would be also be applicable if the researcher wished to complete a follow-up site visit after an in-depth evaluation study had already been completed. If a project needed specific quantitative data, as often monitoring reports do, then these methods would not be appropriate.

Problems Encountered

Problems encountered by the researcher during the course of the study were predictable and were categorized as being either project issues, method issues, or researcher error.

The initial and most common project problem was in locating the project site. Often, the project files listed an address or street location, but location maps and site photos were often obscure. Several sites had maps, but they were either so poorly hand-drawn or incorrect that they misled the researcher. Other project issues involved the use of incorrect project objectives, as previously discussed. An observation was made in which the project objectives were incorrect, and although compliance was high, the project(s) failed biologically as the objectives failed to match the overall project goals.

Method errors included the use of methods and tools which were not suitable for this study due to the homogeneity of the study sites. The unsuitable methods included the determination of soil texture using the "feel method" (E.I.P. Associates 1990), the classification of the wetlands (Cowardin et al. 1979), and vegetation survivorship (Erwin

1990).

Regarding researcher error, wildlife observations were limited due to the lack of sufficient observation time points. To fully study and observe wildlife, a different approach should have been taken. For example, each site should have been observed for several hours, during several consecutive days by a biologist able to identify the local species, and at least once during each of the four seasons with capture/release traps set for the more reclusive species. Another option that was not pursued was the observation of nocturnal species of wildlife. This approach was attempted once, briefly, but was not incorporated into the study as it proved to be too difficult and dangerous.

Research Objectives

Based on the methods used and data collected, the original three research objectives will be addressed in summary form.

Objective 1: Biological Success

- Evaluate wetland projects for biological success, based upon field observations and the use of previously developed evaluation methodologies.

Twelve wetland sites were evaluated for biological functioning using both vegetation and wildlife indicators. Vegetation data included quadrant sampling, with an average percent cover of 73 percent for the twelve project sites surveyed. Individual sites ranged from 100 percent cover to zero percent cover. Although nine sites reported the presence of exotic vegetation, only four sites listed exotic species as the dominant

vegetation. No rare species were observed at any of the twelve sites.

Wildlife observations resulted in two sites being devoid of any observed wildlife. While the other ten sites had wildlife observations, all sites had some form of disturbance, whether it was human disturbance or the presence of domestic animals. It was also noted that while many of the project objectives included the enhancement of wildlife habitat, they also simultaneously listed passive recreation without considering the effects of each.

Objective 2: Project Compliance

- Evaluate project success for compliance, based upon measurable field observations.

Project compliance was determined using the objectives as stated within the project files and was limited to observable criteria which could be evaluated using field surveys. Individual site evaluations were given as a percent total, which incorporated fully and partially met objectives.

An average of 93 percent was calculated for all twelve project sites. Individual percent values ranged from 100 percent to zero percent. In summary, eight projects attained 100 percent compliance, one project had a 91 percent compliance, two projects had an 86 percent compliance, and one had zero percent compliance.

Objective 3: Biological Success

- Evaluate wetland projects for overall success, based upon the success criteria as stated in the *California Wetlands Conservation Policy* (Executive Order W-59-93) "to ensure no overall net loss and long-term net gain in the quantity, quality, and permanence of wetland acreage and values in California" (CCC 1995, 3).

Since a standardized quantitative success criteria was not available, the twelve sites were assessed based on project compliance and wetland functioning using the presence of vegetation and wildlife as indicators. This simplified comparison demonstrated a relationship between project compliance and biological functioning to overall success.

Two projects failed to show a relationship between biological functioning and project compliance. This finding prompted the researcher to examine the relationship between objectives, compliance, and biological success. It is likely that the two deviant projects did not possess correct or comprehensive project objectives, and therefore while the project sites could successfully meet the compliance criteria, they failed to achieve biological success. Consequently, two of the twelve sites failed to meet the biological success criteria of "no overall net loss and a long-term net gain in the quality, quantity, and permanence of wetland acreage and values" (CCC 1995, 3) even though their compliance values were 86 percent and above.

While the evaluated projects showed a high degree of construction compliance and some degree of biological success, it is important to note that the results can not be overgeneralized. It appears that this area of California has had higher than expected success rates with coastal wetland lagoons and ponds, under ten acres in size, with regard

to project compliance. With respect to biological functioning, the findings suggest some level of ecological restoration, but much more specific data is needed to evaluate biological functioning and the degree to which these sites resemble the natural habitat.

CHAPTER EIGHT

RECOMMENDATIONS

Based on the evaluation of twelve coastal wetland projects, three recommendations for improving wetland mitigation and restoration projects in the future are given:

- Establish valid project objectives for the site as project objectives will serve as the foundation for the project and influence the overall success rate of the project.
- Establish a selection of quantitative success criteria for various wetland types, to be used to evaluate project compliance and biological success.
- Require monitoring and annual reports for all wetland projects, regardless of mitigation or voluntary restoration status, so that additional and much needed scientific data can be collected.

Recommendation 1: Project Objectives

- Establish valid project objectives for the site as project objectives will serve as the foundation for the project and influence the overall success rate of the project.

The observation that project objectives served as the foundation and influenced the outcome of project success can not be overemphasized. Based on the data collected and field observations, incorrect objectives often lead to project failure. During the study, it was observed that of the two necessary elements, correct project objectives and project compliance, the significant element was determined to be correct project objectives.

Recommendation 2: Standardized Success Criteria

- Establish a selection of quantitative success criteria for various wetland types, to be used to evaluate project compliance and biological success.

During the course of the study, it became clear that general success guidelines and characterizations did not exist for the vast majority of wetland habitats, and that they are needed. Although most researchers would agree that "comprehensive technical standards for evaluating the success of wetland mitigation projects are lacking" (CCC 1995, 1) the current guidelines of 1) completing an ecological assessment, 2) setting goals, objectives, and performance standards, 3) assigning mitigation attributes, 4) monitoring, and 5) completing performance evaluations (CCC 1995, 8) were not reasonable nor applicable when the project being evaluated did not have the necessary elements implemented at the planning stage. While this five-step approach is sound, it can only be applied to projects which have been designed in this manner. Marble's criteria (1992) were identified as biological success standards, however they were established for southern/eastern hardwood wetlands and watersheds, and were not applicable to the sites being evaluated.

Recommendation 3: Monitoring

- Require monitoring and annual reports for all wetland projects, regardless of mitigation or voluntary restoration status, so that additional and much needed scientific data can be collected.

Project monitoring is a vital step in wetland management, yet it is often overlooked or not completed. The data collected from monitoring reports can be used to establish

general wetland protocols for mitigation and/or restoration efforts, offer problem solving techniques, and enforce project compliance. Monitoring should be somewhat standardized in content and could include such aspects as the duration of the monitoring, source of funding, reporter writers, report receivers, the number of field evaluations per year and deadline dates, methods of evaluation, performance standards, and any site specific requirements. Any and all amendment plans should also be included, along with the reported problems, possible solutions, final decision, and outcome.

Future Research

Although there are numerous areas of possible research, two suggestions are offered:

- *Test the validity of this study by applying the methods used to different sites or test the same project sites using different methods*

An interesting comparison would be to research different methods not used in this study and apply them to the same twelve project sites to see if the project site evaluations match with regard to permit compliance and biological functioning.

A more direct correlation could be made if the same methods were used on different sites, but similar wetland types. Are the methods reproducible? Should they be used in the field at all?

- *Pursue the relationship of disturbance and its effects on wildlife*

It was reported in the study that all twelve sites had some form of disturbance whether it was in the form of passive recreation, human intrusion, or the presence of

domestic animals. A simple relationship between disturbance and the effects on wildlife suggested that much more data is needed to understand this interaction. It was also observed that both passive recreational uses and enhancement of the habitat for wildlife were often listed simultaneously as project objectives without regard to the impacts. It is critical to determine to what extent the effects on wildlife are and how can both objectives regarding passive recreation and wildlife needs be successfully integrated.

While recent critiques and reports evaluating the success of wetland mitigation and restoration projects have indicated a trend of wetland loss due to low success rates, the twelve evaluated project sites seem to exhibit a higher than expected rate of success for project compliance and some degree of biological functioning. It appears that this area of California has had higher than expected success rates with coastal wetland lagoons and ponds, under ten acres in size, with regard to project compliance. With respect to biological functioning, the findings suggest some level of ecological restoration, but much more specific data is needed to evaluate biological functioning and the degree to which these sites resemble the natural habitat.

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APPENDIX A

PERCENT COVER OF QUADRANTS

Site Name	Quadrant I.D.	Percent Open Land	Percent Vegetation	Mean % Cover
Neary Lagoon	1	0%	100%	
Neary Lagoon	2	0%	100%	
Neary Lagoon	3	20%	80%	
Neary Lagoon	4	25%	75%	
Neary Lagoon	5	60%	40%	
Neary Lagoon	6	0%	100%	
Neary Lagoon	7	0%	100%	
Neary Lagoon	8	0%	100%	
Neary Lagoon	9	20%	80%	
Neary Lagoon	10	0%	100%	88%
Moran Lake	1	0%	100%	
Moran Lake	2	10%	90%	
Moran Lake	3	80%	20%	
Moran Lake	4	90%	10%	
Moran Lake	5	0%	100%	
Moran Lake	6	80%	20%	
Moran Lake	7	25%	75%	
Moran Lake	8	0%	100%	
Moran Lake	9	10%	90%	
Moran Lake	10	0%	100%	71%

Site Name	Quadrant I.D.	Percent Open Land	Percent Vegetation	Mean % Cover
MLWA-Levee	1	75%	25%	
MLWA-Levee	2	60%	40%	
MLWA-Levee	3	90%	10%	
MLWA-Levee	4	40%	60%	
MLWA-Levee	5	30%	70%	
MLWA-Levee	6	70%	30%	
MLWA-Levee	7	55%	45%	
MLWA-Levee	8	75%	25%	
MLWA-Levee	9	70%	30%	
MLWA-Levee	10	55%	45%	38%
MLWA-Pond	1		0%	
MLWA-Pond	2		0%	
MLWA-Pond	3		0%	
MLWA-Pond	4		0%	
MLWA-Pond	5		0%	
MLWA-Pond	6		0%	
MLWA-Pond	7		0%	
MLWA-Pond	8		0%	
MLWA-Pond	9		0%	
MLWA-Pond	10		0%	0%

Site Name	Quadrant I.D.	Percent Open Land	Percent Vegetation	Mean % Cover
Marina #3 No./So.	1	10%	90%	
Marina #3 No./So.	2	0%	100%	
Marina #3 No./So.	3	25%	75%	
Marina #3 No./So.	4	10%	90%	
Marina #3 No./So.	5	20%	80%	
Marina #3 No./So.	6	10%	90%	
Marina #3 No./So.	7	0%	100%	
Marina #3 No./So.	8	80%	20%	
Marina #3 No./So.	9	15%	85%	
Marina #3 No./So.	10	20%	80%	81%
Marina #3 West	1	0%	100%	
Marina #3 West	2	5%	95%	
Marina #3 West	3	0%	100%	
Marina #3 West	4	0%	100%	
Marina #3 West	5	5%	95%	
Marina #3 West	6	10%	90%	
Marina #3 West	7	0%	100%	
Marina #3 West	8	0%	100%	
Marina #3 West	9	0%	100%	
Marina #3 West	10	20%	80%	96%

Site Name	Quadrant I.D.	Percent Open Land	Percent Vegetation	Mean % Cover
Marina #2	1	10%	90%	
Marina #2	2	10%	90%	
Marina #2	3	20%	80%	
Marina #2	4	10%	90%	
Marina #2	5	0%	100%	
Marina #2	6	20%	80%	
Marina #2	7	0%	100%	
Marina #2	8	0%	100%	
Marina #2	9	0%	100%	
Marina #2	10	25%	75%	91%
Laguna Grande	1	0%	100%	
Laguna Grande	2	25%	75%	
Laguna Grande	3	20%	80%	
Laguna Grande	4	0%	100%	
Laguna Grande	5	50%	50%	
Laguna Grande	6	25%	75%	
Laguna Grande	7	0%	100%	
Laguna Grande	8	10%	90%	
Laguna Grande	9	50%	50%	
Laguna Grande	10	0%	100%	82%

Site Name	Quadrant I.D.	Percent Open Land	Percent Vegetation	Mean % Cover
Roberts Lake	1	20%	80%	
Roberts Lake	2	20%	80%	
Roberts Lake	3	60%	40%	
Roberts Lake	4	0%	100%	
Roberts Lake	5	25%	75%	
Roberts Lake	6	0%	100%	
Roberts Lake	7	90%	10%	
Roberts Lake	8	20%	80%	
Roberts Lake	9	0%	100%	
Roberts Lake	10	25%	75%	74%
Crespi Pond	1	20%	80%	
Crespi Pond	2	50%	50%	
Crespi Pond	3	75%	25%	
Crespi Pond	4	30%	70%	
Crespi Pond	5	20%	80%	
Crespi Pond	6	0%	100%	
Crespi Pond	7	30%	70%	
Crespi Pond	8	0%	100%	
Crespi Pond	9	10%	90%	
Crespi Pond	10	50%	50%	72%

Site Name	Quadrant I.D.	Percent Open Land	Percent Vegetation	Mean % Cover
Spanish Bay North	1	0%	100%	
Spanish Bay North	2	20%	80%	
Spanish Bay North	3	10%	90%	
Spanish Bay North	4	0%	100%	
Spanish Bay North	5	75%	25%	
Spanish Bay North	6	25%	75%	
Spanish Bay North	7	10%	90%	
Spanish Bay North	8	60%	40%	
Spanish Bay North	9	25%	75%	
Spanish Bay North	10	10%	90%	77%
Spanish Bay South	1	0%	100%	
Spanish Bay South	2	0%	100%	
Spanish Bay South	3	0%	100%	
Spanish Bay South	4	0%	100%	
Spanish Bay South	5	0%	100%	
Spanish Bay South	6	0%	100%	
Spanish Bay South	7	0%	100%	
Spanish Bay South	8	0%	100%	
Spanish Bay South	9	0%	100%	
Spanish Bay South	10	0%	100%	100%

APPENDIX B

EXAMPLES OF PROJECT EVALUATION FORMS

FORM I: Field Evaluation Form
(Pages 45-47 have been modified by the author from Kentula 1992, 38-39.)

Date: _____

Site Name: _____

State: _____ County: _____ Type: _____

A. Describe ease of access to and within the site (roads, parking, problems, etc.)

B. Provide exact directions to site. Attach a marked copy of a map.

C. Document check of ownership of site. Owner contacted? YES NO
Was trespass permission granted? YES NO

D. Sketch the wetland below. Include information on the factors influencing hydrology (water control structures, ditching) and surrounding land use. Indicate north direction.

FORM I (cont): Field Evaluation Form

I. Indicate % open water, % vegetation, % non-vegetated areas within the wetland (A-C=100%).

A. _____ % open water
   1. _____ % unvegetated
   2. _____ % with submerged aquatic vegetation

B. _____ % vegetated*
   1. _____ % trees
   2. _____ % shrubs (15 feet or less)
   3. _____ % herbs

C. _____ % unvegetated

II. Indicate % relative cover of surrounding areas within 100 meters of the wetland boundaries (A-E should equal 100):

A. _____ % trees
B. _____ % shrubs
C. _____ % natural herbaceous vegetation
D. _____ % water body-specify type: _____
E. _____ % human landuse
   1. _____ % crops
   2. _____ % fallow
   3. _____ % grazing
   4. _____ % industrial-specify type: _____
   5. _____ % commercial
   6. _____ % transportation corridor
   7. _____ % housing-single family dwellings
   8. _____ % housing-multiple family dwellings

   Note: 1-8 should total the percentage value for E

III. Soil texture/type is _____

IV. Indicate % of wetland which is distrubed and describe the distrubance (ditches, water control structures, dumping, fill, hazardous waste, etc.)
_____%

V. Vegetation class interspersion is: High [ ] Low [ ]
VI. Habitat islands are present: Yes [ ] No [ ]
VII. Wetland edge is irregular: Yes [ ] No [ ]

FORM I (cont): Field Evaluation Form

VIII. Vegetation-Species List

Plant Species	Frequency	Type
_____	_____	N/I/U
_____	_____	N/I/U
_____	_____	N/I/U
_____	_____	N/I/U
_____	_____	N/I/U

Note: N=Native Species, I=Invasive Species, U=Unknown

IX. Vegetation Survivorship _____ % vegetated*

A. _____ % trees

Survivorship: [ ] L [ ] S [ ] TDB [ ] BS [ ] NF [ ] AD [ ] D

B. _____ % shrubs (15 feet or less)

Survivorship: [ ] L [ ] S [ ] TDB [ ] BS [ ] NF [ ] AD [ ] D

C. _____ % herbs

Survivorship: [ ] L [ ] S [ ] TDB [ ] BS [ ] NF [ ] AD [ ] D

Legend: L=Live, S=Stressed, TDB=Tip Die Back, BS=Basal Sprouts, NF=Not Found, AD=Apparently Dead, D=Dead

X. Wildlife/Wildlife Habitat Observations:

Vegetation Field Survey

	Trees	Survivorship	Shrubs (< 15 feet)	Survivorship	Herbs	Survivorship	Common Vegetation Found	Native Vegetation	Invasive Vegetation
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
(11)									
(12)									
(13)									

NOTE: All data should be a numerical count for each category, with a survivorship estimate given as well as native spp. vs. invasive spp. counts for that quadrant.

NOTE: Explain how quadrants were selected and why only 10 quadrants were selected.

SURVIVORSHIP LEGEND:

L =	Live
S =	Stressed
TDB =	Tip Die Back
BS =	Basal Sprouts
NF =	Not Found
AD=	Apparently Dead
D =	Dead

Site: _____

Date: _____

Permit Compliance Form

SITE: _____ DATE: _____	Met Specifications?
1 _____	
2 _____	
3 _____	
4 _____	
5 _____	
6 _____	
7 _____	
8 _____	
9 _____	
10 _____	
11 _____	
12 _____	
13 _____	
14 _____	
15 _____	

NOTE: Legend is as follows for meeting objectives:

F = Fully met
P = Partially met
Z = Did not meet at all (zilch)
N/A = Not applicable

'# points for each requirement _____ x 100 =
'# total possible points