2.0 PROBLEMS, NEEDS AND OPPORTUNITIES

This chapter presents the results of the first step of the planning process: the specification of water and related land resources problems and opportunities in the study area. The chapter concludes with the establishment of planning objectives and planning constraints, which are the basis for the formulation of alternative plans.

2.1 National Objectives

The national or Federal objective of water and related land resources planning is to contribute to national economic development consistent with protecting the nation's environment, pursuant to national environmental statutes, applicable executive orders, and other Federal planning requirements. Contributions to National Economic Development (NED) are increases in the net value of the national output of goods and services expressed in monetary units. Contributions to NED are the direct net benefits that accrue in the planning area and the rest of the nation.

The Corps has added a second national objective for Ecosystem Restoration in response to legislation and administration policy. This objective is to contribute to the nation's ecosystems through ecosystem restoration, with contributions measured by changes in the amounts and values of habitat.

As stated in Engineering Regulation ER-1105-2-100:

> "Ecosystem restoration is one of the primary missions of the Corp of Engineers Civil Works program. The Corps objective in ecosystem restoration planning is to contribute to National Ecosystem Restoration (NER). Contributions to National Ecosystem Restoration (NER outputs) are increases in the net quantity and/or quality of desired ecosystem resources. Measurement of NER is based on changes in ecological resource quality as a function of improvement in habitat quality and/or quantity and expressed quantitatively in physical units or indexes (but not monetary units). These net changes are measured in the planning area and in the rest of the Nation. Single purpose ecosystem restoration plans shall be formulated and evaluated in terms of their net contributions to increases in ecosystem value (NER outputs), expressed in non-monetary units..."

2.2 Public Concerns

The Bolinas Lagoon Ecosystem Restoration Study has been guided by the advice and interest of the public through public meetings and workshops, as well as by the Bolinas Lagoon Technical Advisory Committee (BLTAC) which meets quarterly and in special sessions in a public forum, and advises MCOSD on how to manage Bolinas Lagoon. Through these meetings, a number of concerns have been identified. A discussion of public involvement is included in Chapter 8, Public Involvement and Agency Coordination. The public concerns that are related to the establishment of planning objectives and planning constraints, as stated in the EIS/EIR, are:

• That non-invasive sediment input reduction (e.g., restoration in the watershed) be considered as an alternative to dredging the lagoon.

• That at least one of the alternatives include incremental dredging.

• That aesthetics are an important concern to members of the public.

• That rock revetment on the ocean side of the Stinson Beach sand spit may have caused or exacerbated erosion of the sand from the spit, which then moves into the lagoon.

• That the Corps is overly focused on erosion in the upper watershed, instead of in the bottoms of the canyons, on the east side of the lagoon.

• That the study area should include the Bolinas groin.

• That the Corps should open Seadrift Lagoon to full tidal influence, restore Pine Gulch Creek Delta, open up the channel between Kent Island and the town of Bolinas, and remove excess fill from Dipsea Road.

• That residuals of copper sulfate might enter Bolinas Lagoon from Seadrift Lagoon or that there might be future failures of the leach fields along Dipsea Road.

• That the project should be designed to encourage natural processes to scour sediment from the lagoon.

• That adaptive management be used to guide implementation and scope of restoration activities.

2.3 Problems and Opportunities

The evaluation of public concerns reflects a range of needs, which are perceived by the public. This section describes these needs in the context of problems and opportunities that can be addressed through water and related land resource management. The problems and opportunities are based upon the without project conditions that are described in Chapter 3, Study Area Description.

2.3.1 Problem Identification

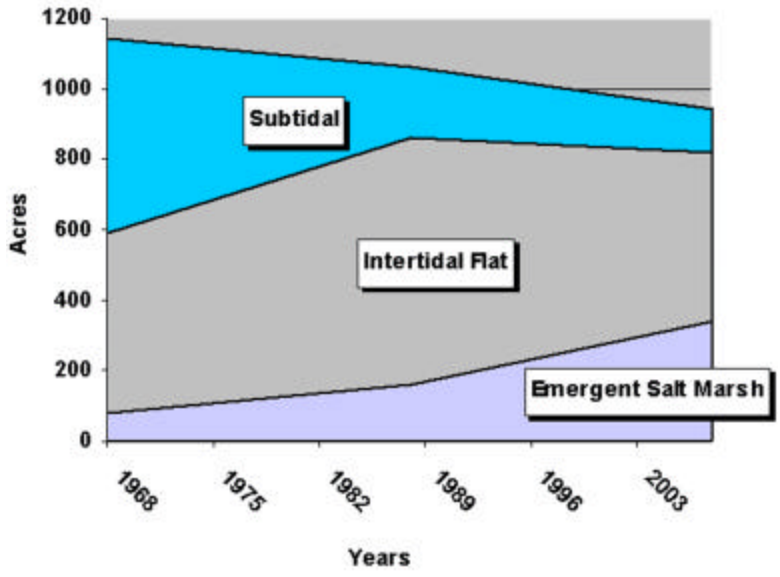
Lagoons normally have a geologically short life span, accreting more sediment over time than is carried out. Thus, the normal life cycle of a lagoon is to change from an estuary into, first, intertidal wetland habitat, then, as sediment continues to accrete, into upland habitat. Because of its location along the San Andreas Fault line, however, Bolinas Lagoon has had an extended life span. Due to a balance between sedimentation, sea level rise, and tectonic subsidence, the estuarine habitat has been maintained for some 7,000 years (BLMPU 1996). Available information indicates that the "Great San Francisco Earthquake" of 1906 caused about one foot of subsidence in most of the

lagoon. It is because of this relationship that Bolinas Lagoon is not, in fact, a lagoon at all. It is an estuary, an estuary that survived several thousand years of human intervention; until Europeans arrived and changed that balance.

Human activities beginning in 1849 initiated a change in the balance, favoring sediment accumulation. Activities such as logging, clearing, and grazing in the watershed, as well as placement of fill material along the edge of the lagoon and the diversion and manipulation of watercourses entering the lagoon have caused a large amount of sediment to enter the lagoon, accelerating the transition from estuarine lagoon to intertidal marsh. Lagoon bathymetries show that between 1968 and 1988, the lagoon lost about 25% of its tidal prism (the amount of water that flows in and out during a normal tidal cycle) and 7% of its estuarine habitats (BLMPU 1996).

Without intervention, Bolinas Lagoon will continue to fill with sediment, resulting in further losses of subtidal estuarine and intertidal habitats. Estimates indicate that "between 1998 and 2008, subtidal habitat area will decrease by 40% (down nearly 80% compared to 1968); intertidal flat area is expected to decrease 30%; emergent salt

Figure 2.1 Bolinas Lagoon Habitat Changes



marsh habitat type area will have increased more than 50% (400% increase compared to 1968); and upland habitat will increase by 11% as estuarine and wetland habitats are converted to uplands" (BLMPU 1996).

Historically, poor watershed management has contributed to higher sediment loads being transported into the lagoon. High sedimentation rates, in combination with the placement of fill material along the edge of the lagoon, have not only caused a direct

loss of tidal prism and intertidal subtidal habitats, but have also accelerated the natural shoaling processes in the lagoon.

A decrease in tidal prism results in a loss of subtidal and intertidal habitats, equating to significant changes in habitat conditions for the species that are dependent on those areas. A decline in subtidal habitat, for example, would result in the loss of estuarine plants (e.g., eelgrass), invertebrates and fish species in the lagoon (BLMPU 1996). Steelhead and Coho salmon are two federally listed threatened species that would be detrimentally affected by a loss of subtidal habitat (and access to the watershed's tributaries). Bird diversity would also be affected.

Bird surveys indicate that since 1972, diving birds (e.g., grebes and diving ducks) have decreased, giving rise to birds dependent on the intertidal zone, such as shorebirds and dabbling ducks. This trend is counter to statewide and regional trends. These trends will only continue as long as sediment continues to fill the lagoon. The next transitional phase to occur would be that of intertidal habitat to upland habitat. According to the *Bolinas Lagoon Management Plan Update of 1996*, "By 2008, the Lagoon will likely be a significantly less valuable migration and over-wintering location on the Pacific Flyway, where estuarine habitats have already suffered huge losses and degradation." Other species, like the harbor seals that use Bolinas Lagoon during their pupping season, would also suffer losses in habitat quality and quantity. Given the diversity of wildlife species using the lagoon and its proximity to relatively undisturbed and protected areas, Bolinas Lagoon is a critical element of a unique ecosystem. Although Bolinas Lagoon currently provides important habitat to a variety of species, the value of its habitats will continue to degrade as intertidal and subtidal habitats continue to decline.

A decline in subtidal habitat would have a concomitant loss in intertidal habitat, and vice versa. Similarly, an increase in intertidal habitat would also signify a gain in subtidal habitat. The two are linked. Therefore, although increases in intertidal volume are used as an indicator for "success" for the purposes of this project, it is assumed that while intertidal habitat is increasing, subtidal habitat is also increasing. An increase in both of these habitats correlates to an improvement in the lagoon as an ecosystem.

2.3.2 Opportunities

Because habitat quality and quantity in Bolinas Lagoon have diminished in the recent past, there are many opportunities for restoration in the lagoon via sediment removal. In addition, although a full feasibility-level evaluation for restoration in the watershed is beyond the scope of this study, potential restoration opportunities in the watershed can be identified.

2.4 Planning Objectives

The national objectives are general statements, not specific enough for direct use in plan formulation. The water and related land resource problems and opportunities identified in this study are stated as specific planning objectives to provide focus for the

formulation of alternatives. The study team identified the objectives through the Reconnaissance Study effort and from public and agency comments during the Feasibility scoping process. These planning objectives reflect the problems and opportunities, and represent desired positive changes with respect to existing conditions and Without Project Conditions. The planning objectives are specified as follows:

- Restore intertidal and subtidal habitat
- Increase tidal prism
- Reduce the chance for inlet closure
- Identify potential restoration projects in the watershed to reduce the amount of sediment coming into the lagoon

2.5 Planning Constraints

Unlike planning objectives that represent desired positive changes, planning constraints represent restrictions that should not be violated. The planning constraints identified in this study are as follows:

- Do no harm to sensitive species, including rare, sensitive, threatened and endangered species (for example, the black rail, salt marsh common yellowthroat, steelhead, Coho salmon and *Cordylanthus meridius*, a herbaceous plant).
- Maintain existing habitat values the lagoon provides to important species.
- Dispose of dredged material properly; ensure the availability of appropriate disposal sites.
- Utilize "dredging windows" to avoid impacts to sensitive species during important life stages (breeding, nesting, spawning, foraging, wintering, migration, etc.).
- Minimize project impacts on extensive residential development in the Seadrift Lagoon community.
- Develop alternatives that are acceptable to the local community.
- Utilize monitoring and adaptive management as the project is implemented.
- Avoid the need for regularly scheduled maintenance dredging, which would not be permitted by the Gulf of the Farallones National Marine Sanctuary (GFNMS). If additional restoration measures were needed in the future to realize project benefits, future work would be considered. However, this

restoration project should be a one-time effort. Project alternatives must be designed to ensure, as much as possible, that the system becomes self-sustaining.