

ELKHORN SLOUGH:

ESTUARINE SANCTUARY SUMMARY REPORT

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HISTORY

Elkhorn Slough stretches 7½ miles, predominantly through rural Moss Landing in Monterey County. Unlike the usual dying condition of other estuaries, Elkhorn Slough is a viable and increasing system due to natural conditions as well as human-influenced changes (see table 1). The once-fresh water system now reaches salinity levels equal to or greater than the ocean during high tide, and is diluted considerably by fresh water run-off during periods of low tides. Thus, the Elkhorn Slough maintains all the features of a salt water estuary.

"...estuary means that part of a river or stream or other body of water having unimpaired connection with the open sea where the sea water is measurably diluted with fresh water derived from land drainage."

-Coastal Zone Management Act Sec 312, 921.2 (b) (CZMA)

Elkhorn Slough is one of the most diverse and least disturbed estuaries on the west coast, partly due to the fact that the slough opens up to a deep submarine canyon attracting many forms of oceanic life.¹ The slough system maintains a self-cleaning flushing action from the twice-daily tides and the filtering action of the marshland vegetation which replenishes nutrients and moves fish and invertebrates.² Another important aspect of the estuarine environment is the highly efficient energy conversion of sunlight to abundant nutrients used by a large number of life forms.³

The Elkhorn Slough was once inhabited by the Costanoan Indians. There are 14 recorded (10 unrecorded) archeological sites surrounding the slough; all being kitchen middens which contain revealing characteristics of the Indians' lifestyle and offer hints of the slough's general conditions and life forms of the past.⁴

The slough and surrounding marshlands are being used in various ways. About one half of the marshlands are being reclaimed by dairy farmers for grazelands. Nature Conservancy, a private conservation-oriented establishment, has purchased a total of 343 acres of prime

marshlands and vital upper slough areas for natural recamation. The PG&E facilities located at Moss Landing, use the salt water from the slough for the cooling down process and the resulting thermal waters are relocated to another area within the slough. The San Diego Salt Company owns 800 acres of salt ponds in Elkhorn Slough, only 300 of which are being used for raising brine shrimp and oysters. Non-human uses of the slough include hatcheries for various species of fish and habitats for a large variety of salt marsh fauna.⁵

TABLE 1: CHANGES IN THE ELKHORN SLOUGH⁶

NATURAL	HUMAN-INFLUENCED
<ul style="list-style-type: none"> -rerouting of Salinas River <ul style="list-style-type: none"> a) natural wave refraction pattern b) April 18, 1906 Earthquake -littoral drift 	<ul style="list-style-type: none"> -rerouting of Salinas River <ul style="list-style-type: none"> a) local residents built channel as flood control b) dredging for Moss Landing Harbor -pumping Monterey Bay <ul style="list-style-type: none"> • decreases water table - human constructed dikes <ul style="list-style-type: none"> a) for oyster industry b) to expand grazing land for cattle

NOTE: ELKHORN SLOUGH WAS ONCE A FRESH WATER BODY BECAUSE IT WAS FLUSHED BY THE ^{Periodic} FLOODING OF THE SALINAS RIVER. BECAUSE OF VARIABLE AND FILTERED FACTORS, THE SLOUGH IS NOW A SALT WATER ESTUARY WITH SALT GRASSES MAKING UP 90% OF THE WETLAND VEGETATION.

LEGISLATION

Because of the unique characteristics of the Elkhorn Slough a wave of attention has flooded the area with concerned citizens and interest groups to preserve it. The slough is believed to be a resource-rich environment for scientific studies and educative purposes. Stemming from the Federal Coastal Zone Management Act of 1972 (CZMA), revised in 1976, and Proposition 20, now the CA. Coastal Act of 1976 (CCA), federal money was made available on a matching grant basis for acquisition, development and operation of valuable areas classified as Estuarine Sanctuaries.⁷ CZMA defines Estuarine Sanctuaries as...

"...a research area which may include any part or all of an estuary, adjoining transitional areas, and adjacent uplands, constituting to the extent feasible a natural unit, set aside to provide scientists and students the opportunity to examine over a period of time the ecological relationships within the area."

-Sec 304 e

Acquisition:

Under section 312-921.4a (CZMA), one area ranging from Mexico to Cape Mendicino (i.e. the "Californian" classification) will be selected for an Estuarine Sanctuary title.

Development:

Section 312-921.3a (CZMA) states:

"The purpose of the estuarine sanctuaries^{Program} is to create natural field laboratories in which to gather data and and make studies of the natural and human processes occurring within the coastal zone...for research and education purposes especially to provide some information essential to coastal zone management decision-making."

It is stressed in many areas of CZMA that the estuarine sanctuaries be studied, assessed and used as a vehicle of education to raise the public awareness of the value and importance of these life-sustaining areas.

Management:

Section 312-921.3D

"Management of estuarine sanctuaries shall be the responsibility of the applicant state or its agent...in conformance with these guidelines:

- "a. Define the intended research purposes of the estuarine sanctuary.
- b. Define permitted, compatible, restricted and prohibited uses of the sanctuary.
- c. Include a provision for monitoring the uses of the sanctuary...
- d. Ensure ready access to land use of the sanctuary by scientists...
- e. Ensure public availability and reasonable distribution of research results...
- f. Provide a basis for annual review of status of sanctuary...
- g. Specify how the integrity of the system which the sanctuary represents will be maintained.
- h. Provide adequate authority and intent to enforce management policy and use restrictions."

The Elkhorn Slough is part of a dynamic system in Monterey County. The area is being shared by diverse interest groups ranging from big business (Kaiser, PG&E) to private land holders (dairy and strawberry farmers). Because of the risk of damaging this environmentally sensitive area* a number of proposals have been issued to determine the fate of the slough.

*"Environmentally sensitive area means any area in which plant or animal life or their habitats are either rare or especially valuable because of their special nature or role in an ecosystem and which could be easily disturbed or degraded by human activities and developments." -CCA Sec. 30107.5

FOOTNOTES

1. Elkhorn Slough Proposal from Nature Conservancy (undated)
2. Planning and Analysis of Coastal Estuaries, Gamman Senior Thesis (undated)
3. Nature Conservancy proposal, Ibid
4. Personal interview with Robert Edwards - Cabrillo College
19 April 1977
5. Personal interview with Les Strnad - Coastal Commission
14 April 1977
6. Monterey Bay Area: Natural History and Cultural Imprints,
Burotn Gordon, 1974 pp139 - 164
7. Coastal Zone Management: The Process of Program Development,
Coastal Zone Management Institute, Sec. 312, Subpart A 921.1 p B-32

PROPOSALS

Elkhorn Slough consists of approximately 2500 acres of submerged marine areas, tidal flats and salt marsh which empty directly into the Monterey Submarine Canyon. Inland, about 226 square miles of primary watershed feed the slough system, and create very important estuarine wildlife habitats. Human impacts are rapidly degrading the quality of these habitats. Many current proposals for the area include maximum impact uses such as highway and harbor expansion, and industrial and residential development. Other viable proposals advocate preservation of the slough system before it is degraded beyond repair.

Central California Regional Coastal Zone Commission

The Central California Regional Coastal Zone Commission is recommending that the Elkhorn Slough be designated an estuarine sanctuary under the provisions set forth in the Coastal Zone Management Act of 1972. The Coastal Commission feels that such a unique fragile environment should be fully researched in hopes to attain a better understanding of natural processes and their interrelations so that the findings could be used to devise effective planning methodologies for estuarine areas. For use as a model, it is felt that Elkhorn Slough is the best representative system of those proposed. Seven college level institutions, as well as local high schools, are currently using the

area as a living outdoor laboratory for scientific research and environmental education. Its proximity to the Monterey Submarine Canyon and the valuable nutrients it provides makes the slough very productive in terms of marine life. Protection of the area is needed if the degree of species diversity is to be maintained. Important spawning grounds for geographically unique species could be destructively altered if further development is allowed around the slough. Moss Landing Marine Laboratory, Hopkins Marine Station, U.C. Santa Cruz, Naval Post-Graduate School, Cabrillo, Hartnell, and Monterey Peninsula Community Colleges have begun to collect some baseline data at Elkhorn Slough, but much more needs to be done if a clear understanding of estuarine areas is to be gained. If the slough is designated as an estuarine sanctuary, some minimal impact uses will still be allowed, such as fishing, duck hunting, birdwatching, etc.. The purpose of the estuarine sanctuary in this case is to prevent further environmental degradation.

The Coastal Commission proposes that all the lands within the conservation zone (10 feet above mean high tide) be acquired for direct management as an estuarine sanctuary. For areas in the remaining primary watershed, minimal impact zoning and/or the purchase of development rights would occur to further protect the slough system.

Nature Conservancy

Nature Conservancy is a group of concerned environmentalists based in San Francisco that would also like to see Elkhorn Slough preserved. In their report, they stress the importance of estuary preservation at great lengths. The most productive and energy efficient ecosystems are estuarine, and Nature Conservancy feels that because of this, estuary systems warrant extensive research in their natural state. The activities they perceive as threatening to the Elkhorn environment are intensive agriculture, industrial, residential, and recreational development. The Department of Fish and Game and the National Oceanic and Atmospheric Association highly recommend public ownership of the slough, as does Nature Conservancy. Nature Conservancy is out to acquire land before it is degraded, and already owns 343 acres in the slough area, which are presently "maintained" by volunteers from the Moss Landing Marine Labs. They have no real management scheme other than land acquisition. The report contains little hard data aside from species inventory, and is most concerned with stating the Nature Conservancy's values and purposes.

Sierra Club

The Sierra Club submitted a report to the Coastal Commission that did not really propose a specific course of action. The Sierra Club was merely letting the commission know that it was concerned about salt water intrusion and intensive groundwater extraction that is occurring in the watershed. Included was

a map that showed Hydrologic units capable of sustaining development. They also quoted section 30250 of the California Coastal Act of 1976 which states, "New development shall be located within existing developed areas able to accommodate it; with adequate public services that will not have adverse effects on coastal resources."

Other possible alternatives for preserving the Elkhorn Slough are by designating it a marine sanctuary, national wildlife refuge, wildlife conservation area, state park, endangered habitat area, private preserve, or university research preserve.

Coastal Zone Management Act of 1972

Section 312 921.4; Biogeographic Classification

a.) It is intended that estuarine sanctuaries not be chosen at random, but should reflect regional differentiation and a variety of ecosystems so as to cover all significant variations.

Classification #6

Californian: South Pacific coast from Mexico to Cape Mendocino; shoreland influenced by coastal mountains; rocky coasts with reduced fresh water run-off; general absence of marshes and swamps; biota temperate.

All three areas proposed are from the same biogeographical classification. The remaining two are Upper Newport Bay and

Bodega-Tomales Bay.

Bodega-Tomales Bay

The Bodega-Tomales Bay area is about 45 miles from San Francisco, right adjacent to the Point Reyes National Seashore.

The area was proposed for estuarine sanctuary designation by the North Central California Regional Coastal Zone Commission.

Their Purpose was stated as;

1. Long term studies for better understanding of estuarine ecosystems.
2. Continuing and broadening baseline data.
3. Investigation into environmental condition change prediction.
4. Monitoring system of human impacts
5. Determining carrying capacities of estuarine ecosystems.

The report was almost entirely based upon the detailed historical background of scientific research done in the area. In 1948, University of the Pacific set up their Pacific Marine Station, and in 1966, U.C. Berkeley built their Horseshoe Cove Marine Station. Other institutions that do research in the area are, Sonoma State, Santa Rosa and Marin Community Colleges, Pt. Reyes Bird Sanctuary, Audobon Canyon Ranch, and the Department of Fish and Game. U.C. Davis, U.C. Santa Cruz, and U.C. San Diego also use the area for summer field study courses. Much baseline data has already been collected by these institutes.

Much surrounding land is managed by federal or state

agencies. Bodega Head is a state park, and the Department of Fish and Game has established an ecological preserve at the upper end of the bay. The possibility of including Bodega-Tomales Bay in the Pt. Reyes National Seashore is also being discussed.

The area proposed for estuarine sanctuary designation totals about 220 square miles. However, the bay is not a true estuary system, and consequently may not meet the federal guidelines for estuarine sanctuaries.

Upper Newport Bay

Upper Newport Bay is located 72 miles northwest of San Diego, and covers about 1000 acres. The bay itself (741 acres) is surrounded by vertical bluffs making access difficult. Most of the land in the area is owned by the Irvine Company. Adjacent urban and commercial areas have direct impacts on the system. The bay/estuarine area, which is now an ecological reserve, is about 1½ miles from U.C. Irvine.

In the 1930s Upper Newport Bay was diked to create salt ponds. Since then more and more residential and commercial uses have occurred around the bay. Ten million people now reside within an 80 mile radius of Newport Bay. In September 1972, the Upper Newport Bay Field Committee was formed to come up with some sort of planning scheme for the area. Since their formation, they have created three proposals concerning the possible futures of the bay.

The Upper Newport Bay Land Exchange Concept would include

a marina, and increased urban and commercial development. An aquatic complex would be built, and there would also be provisions for several small parks. The public was opposed to this plan. Under the Park Plan, bike paths, elevated walkways, and an interpretive center/museum constructed on the estuary. This idea was the Department of Fish and Games' favorite. The Alternate Plan would have the interpretive center/museum in the upper bay while continuing urban and commercial development in the south bay.

Upper Newport Bay is already an ecological reserve. In addition to being a candidate for estuarine sanctuary nomination, the field committee is also seeking money from the Land and Water Conservation Fund to acquire public ownership of undeveloped uplands. According to the plans submitted, the estuarine area would be managed by the Department of fish and Game in conjunction with Orange County ^{and}/or the city of Newport Beach. The underlying purpose of estuarine sanctuary designation is for a chance at restoring the bay to a more desirable level. This restoration process would include work by Cal Trans to restore the salt ponds. The National Oceanographic and Atmospheric Association stated in its estuarine sanctuary guidelines, "It would appear that if restoration efforts cannot occur without estuarine sanctuary designation, then given the limited resources of this program, such efforts would not be feasible."

Once an area has been selected for estuarine sanctuary nomination, the Coastal Commission's recommendation will be given to the National Oceanographic and atmospheric Association. If

NOAA agrees with it then it will get federal nomination. After this happens, public hearings will be held concerning land acquisition.

ACTORS INVOLVED:

It is imperative to have the estuarine sanctuary proposal for Elkhorn Slough reviewed by interested parties. The Coastal Commission directed by Les Strnad in conjunction with the Monterey County Planning Department directed by Bill Farris will draw up the final proposal for the sanctuary. Other national, state, and local governmental agencies will be involved as part of the technical advisory committee. Special interest groups, educational institutions, and local public will be involved. Some of the key actors are listed below.

GOVERNMENTAL AGENCIES

Ca. Dept. of Fish and Game - Mr. E.C. Fullerton, director
U.S. Environmental Protection Agency - Mr. P. DeFalco, director
State Water Resource Control Board - Mr. B.B. Dendy, director
U.S. Fish and Wildlife Service - Mr. R.K. Martinson, director
U.S.C. Sea Grant Program - Mr. Alan Kreditor
U.C. Sea Grant Program - Mr. Jim Sullivan
U.S. Geological Service - Mr. George Robinson, asst. regional director
States Lands Commission - Mr. William Northrup, executive director
National Oceanic and Atmospheric Administration

Special Interest Groups

Sierra Club - Dave Bockman, Norbret Dahl
Audubon Society
Friends of the Earth
National Parks Service; San Francisco office
Conservation Foundation
various sportsmans clubs

Educational Institutions

Moss Landing Marine Station
University of California, Santa Cruz - Bill Doyle
Hopkins Marine Station
Naval Post-Graduate School
Cabrillo College
Hartnell College
Monterey Peninsula College

Local Public

Monterey County realators

individual property owners

Ruth Andresen, Central Coast Region Commissioner

Farmers and Growers Association

INTERRELATIONSHIPS

The acquisition of the Elkhorn Slough, under section 312 of CZMA, for the purpose of an estuarine sanctuary will mean restricted development* and revised land-use policies of the surrounding area. The prime use of an estuarine sanctuary is for scientific research determining the natural evolution of the estuarine environment, and the effects of human intervention. By definition the Elkhorn Slough as a estuarine sanctuary would be a "sensitive coastal resource area; which means...

"...those identifiable and geographically bounded land and water area within the coastal zone of vital interest and sensitivity. 'Sensitive coastal resource areas' include: a) Special marine and land habitat areas, wetlands, lagoons, and estuaries as mapped and designated in Part 4 of the coastal plan."-(CCA 30116)

Management Program (CZMA Sec, 305):

- (b)(1). "...the Act requires that the management program include:
- an identification of the boundaries of the coastal zone subject to the management program
 - a definition of what shall constitute permissible land and water uses within the coastal zone which have a direct and significant impact on the coastal waters
 - an inventory and designation of areas of particular concern within the coastal zone.

*Development means, on land, in or under water, the placement or erection of any solid material or structure, discharge or disposal of any dredged materials or of any gaseous, liquid, solid or thermal waste, grading, removing, dredging, mining or extraction of any materials; change in the density or intensity of use of land, including, but not limited to subdivision pursuant to the Subdivision Map Act. (CCA 30106)

- 1) Coastal Zone Management: The Process of Program Development,
-Coastal Zone Management Institute, 1974 ppB6-7

Artical 4, section 30230, reinforces the protection sensitive coastal resource areas should receive:

"Special protection shall be given to areas and species of special biological or economic significance. Uses of the marine environment shall be carried out in a manner that will maintain healthy populations of all species of marine organisms adequate for long-term commercial, recreational, scientific and educational purposes." (CCA)

The proposed area designates the mean high water mark as a preservation area and a ten-foot buffer zone extending into the surrounding marshland will assume conservation status. These boundaries were determined by criteria considering the efficiency and feasibility of the area in terms of the cost of acquisition, development and manggement.

Because of the characteristics of the slough and the surrounding water shed that feeds into it, the area is sensitive to most development occurring within the water shed boundaries. Although not directly within the estuarine sanctuary boundaries, the farmlands and businesses have a significant effect on the quality of the slough and marshlands. Covering all bases, CZMA states:

In the event of significant impacts caused by activities outside the boundaries determined by the Coastal Commission "the state should work out cooperative agreements between or among the jurisdiction involved (e.g. coastal zone authority and water quality authority)"

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1. Coastal Zone Management: The Process of Program Development,
-Coastal Zone Management Institute, 1974 p 16

There are several potential points of conflict between the implementation of an estuarine sanctuary and several of the important actors. Many of the present and proposed usages of the Elkhorn Slough area would be detrimental to an estuarine sanctuary.

Residential use at present is severely detrimental to the slough because of the lack of a thorough management policy. Further intensification of this use would only compound these difficulties. Some difficulties with residential usage of this area may be listed as problems due to grading, individual septic tanks, increasing lack of fresh water as a result of the overdraft of ground water supplies causing salt water intrusion into the aquifer (~~for per annum~~¹), increase in impermeable surfaces, noise and human disturbances ruining habitat, and visual impact on the area.

Agricultural use poses several conflicts with the need for a pristine environment to study the slough. Fertilizer and pesticide run off and run off from grazing have important effects on the natural distribution of the biota in the slough. Erosion and siltation are real problems from both grazing and agribusiness. The present overdraft of the groundwater supplies, increased noise, and human disturbances and visual impact are not consistent with an estuarine sanctuary. A further major conflict would be the ruination of habitat due to the clearing of the land.

The marine terminal and the expansion of Pacific Gas and Electric Company could have detrimental effects on the slough by the quality of the air, industrial runoff, effluents, and seismic hazards it would impinge on the area. The visual impact offshore as well as onshore is not consistent with an estuarine sanctuary. Futuristically looking at the expansion and that consent on this facility could become a precedent for further expansion, several conflicts arise. One can see a long term increase in the oil spill potential as larger vessels are needed to supply the demands of the central coast.. Also with the increasing acceptance of the use and transportation of liquid nitrogen gas (LNG) further facilities and/ hazards could be placed on the area.

Many of the same problems can be reiterated for Kaiser Industries expansion projects such as effluent, noise, air, increase in impermeable surface, seismic, visual impact, and industrial run off impacts. Due to the settling ponds, ground water dispersion of wastes may have detrimental effects on the slough. Also its proximity to Moro Coho Slough, part of the Elkhorn Slough complex, creates several negative impacts .

Increased recreational usage could have destructive effects on the slough unless strictly controlled. Some of the areas of conflict would be recreational facilities such as comfort stations, parking, boating, and noise, human disturbances such as trampling and scavaging of habitats and increased fire hazard.

Highway 1 expansion would cause several difficulties in maintaining an estuarine sanctuary. Air and noise impacts would greatly increase. Population intensification of the area (i.e. buffer zone and watershed lands) along with its support facilities would certainly occur. It would also increase the access to the Elkhorn Slough area which at present has no managing body to deal with the issues involved. It could also potentially open the slough to increased boating by raising the height of the bridge.

Moss landing harbor expansion would have direct negative effects on an estuarine sanctuary as it would destroy biota habitat, cause further fouling of the waters along with several potential indirect effects on the natural system by changing the boundaries of the harbor.

The fishing industry as stated in the preliminary report on an Elkhorn Slough estuarine sanctuary is contingent on the quality of the water. Increased fishing could impinge on the estuarine ecology.

Conservation groups and sportsmans clubs would like to see the slough in its 'natural' state. Many of the governmental agencies would also uphold this proposition but realise without adequate control over the Preservation and Conservation (P&C) area there is little chance in maintaing this goal.

The demands on the Elkhorn Slough complex are great. As has often been stated 'if you can do it in Elkhorn Slough, you can do it almost anywhere' - a statement of the complexity of the conflicts for present and potential usage of the slough.