

State of California
DEPARTMENT OF FISH AND GAME

THE NATURAL RESOURCES OF
BOLINAS LAGOON
THEIR STATUS AND FUTURE

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Bolinas Lagoon is a relatively undeveloped estuarine area in Marin County. It consists of about 1,400 acres of salt water, tidal mudflats, marshlands, and sandbars. The lagoon once served as a harbor for shallow-draft vessels, but boating is now confined to skiffs and other small craft.

The change in navigability is the result of sedimentation and alteration of tidal circulation. Sediments of land origin are apparently the chief cause of a gradual filling of the lagoon and an evolution from marine to terrestrial environment. There have been appreciable accretions of new land within the lagoon within the last century.

Much of the lands in, and adjacent to, the lagoon's watershed are in public ownership or reserved for wildlife use. In addition, the County of Marin, with the assistance of State and Federal funds and land grants from the Nature Conservancy and the Audubon Canyon Ranch, has acquired title to much of the lands on the east and west shores of the lagoon as well as Kent Island near the town of Bolinas. These lands will eventually become part of a shoreline park and have been dedicated to recreation and wildlife preservation purposes.

There are two small towns at the vertices of the west and east sides of the lagoon and ocean front. Stinson Beach, on the east, is a beach-oriented community confronted with problems of congestion, heavy recreation use, and lack of easily-developed land. Bolinas, on the opposite side, enjoys a greater opportunity for expansion, but it has a very small beach front.

because of geographical seclusion, local desires, and the lack of modern highways. Although it is close to the Bay Area, the connecting roads are narrow and winding and not conducive to commuter use. An improved highway system is under consideration, but it is the subject of considerable controversy.

There is an important State Clam Reserve within the lagoon, and most of the remaining tidelands have been leased to the Audubon Canyon Ranch as a wildlife preservation area. The lands under the lease (now of uncertain status) are an important feeding site for herons and egrets and essential to the protection of the heron rookery at the Ranch.

Bolinas Lagoon could be classified as a wintertime estuary and a summertime lagoon, because of the varying input of fresh water. On either basis it supports a productive shellfish resource and is a valuable resting, feeding, and wintering area for shorebirds and migratory waterfowl; a nursery and nutrient source for inshore fisheries; and a food source for the egrets and herons which annually nest at the Audubon facility. The rookery is the largest along the central California coast.

The entire area - uplands, grasslands, lagoon, tributary gulches, and ocean tide pools - has a varied and rich array of plant and animal communities. As such, it serves as an admirable outdoor laboratory for students of all educational levels. The College of Marin maintains a marine station at Bolinas. In addition to its normal program, the station's staff conducts students and teachers (about 4,000 in 1969) on ecological study tours of the lagoon and nearby Duxbury Reef. In 1970, the Audubon Canyon Ranch was host to over 30,000 visitors. With

school children and a three-year program to train volunteer teachers in the fields of conservation and ecology. In addition, countless persons visit the general area for individual study, birdwatching, hiking and casual wildlife observation, nature photography, beachcombing, tide-pool exploration, or mere enjoyment of its open space.

Hunting for deer and upland game is generally confined to the larger private ranches, and waterfowl shooting is now prohibited because the lagoon has been declared a county park.

Each year a few silver salmon and steelhead trout visit Pine Gulch Creek Delta during the spawning season. There is a seasonal striped bass fishery at the mouth of the lagoon. The bass sometimes venture into the lagoon when in pursuit of schools of topsmelt. Otherwise, bottomfish and perch comprise the chief catch of the lagoon fishermen. Bayside fishing attractions include surf fishing from the beach, rock-fish angling, and salmon trolling. From a fishery standpoint, the chief value of the lagoon probably lies in its role of providing a home and food for numerous species of juvenile inshore fishes that remain in the lagoon until they attain sea-going size.

In former years, the lagoon was a popular clamming area. Its numerous mollusks include gaper, Washington, littleneck, and bent-nose clams, but a recent quarantine prohibits the taking of all shellfish. Oyster-growing too was once a productive activity in the lagoon, but public health considerations forced its discontinuance many years ago.

All areas of the lagoon are of ecological significance, but pollution, sedimentation, poor water circulation, and other factors have had

use by humans. These effects include the abandonment of oyster farming, unexplained disappearance of edible crabs, the quarantine currently on the taking of shellfish and water contact sports, the die-off of eel grass (a staple food of the black brant) for unknown reasons, and the possible loss of some generations of clams. With the anticipated abatement of pollution by 1972, there is good cause to believe that these resources can be reestablished by natural or artificial methods.

The pollution and contamination problem is primarily associated with the discharge of untreated sewage into the mouth of the lagoon near the town of Bolinas. Stinson Beach and Bolinas have now entered into a joint agreement to construct a sewage disposal system with an eventual ocean outfall northwest of Duxbury Reef. The location and timing of outfall construction is still being considered, and problems related to marine ecology and beneficial uses of the Duxbury Reef-Agate Beach area can be anticipated.

There have been several proposals for stabilization of the lagoon's outlet to Bolinas Bay, development of a harbor refuge in the southern end of the lagoon, engineering solutions of the sediment problems, and other developments. The proposals have encountered serious considerations involving funding, potential beach erosion, and concern for the welfare of the lagoon's fish and wildlife resources.

In 1969, the State transferred title to the lagoon's tidelands from the Bolinas Harbor District to the County of Marin. The Legislature has required the County to submit a plan of development in 1972. The plan must take many potential uses into consideration. These include the development of boating facilities and fish and wildlife preservation.

ment or a harbor or refuge within the lagoon as a life-saving and emergency facility, but the Department also believes that any associated dredging, filling, or structural work should be undertaken only after careful evaluation of the impact upon the lagoon's ecological welfare. Stabilization of the outlet in connection with such developments may possibly have a beneficial effect upon sediment removal and tidal circulation. At the same time, promiscuous dredging and development for recreational or commercial boats could result in irretrievable losses of valuable fish and wildlife resources. The Department believes that boating facilities should not exceed the minimal needs of a harbor of refuge and should be confined to the provision of a launching and retrieval area for trailered boats to be operated in conjunction with an upland dry storage area for stay-over craft.

If the various planning bodies decide that a large harbor or boat basin is necessary in the Bolinas Bay area, the Department recommends that they consider alternatives to Bolinas Lagoon because:

1. No all-weather harbor can be created in the lagoon without permanent removal of the sandbar at the mouth and/or the construction of a jetty system, the effects of which, on the adjoining ocean front, Duxbury Reef, and adjacent bluffs are unknown.
2. Substantial boating facilities and construction within the lagoon will produce deterioration - probably irreversable - of the ecological and physical equilibrium of the lagoon.
3. Physical facilities within the lagoon could be either destroyed or severely damaged by seismic activity and fault movement - a

in planning and engineering studies.

The Department is in agreement with several authorities cited in this report who believe that the best solution to a slowing in the rate of sedimentation lies in sound soil conservation practices in the watershed, protective zoning, and eradication of erosion hazards.

Despite pollution, sedimentation, and other problems, the lagoon is still one of the finest, least disturbed, and richest tideland areas of the California coast. Hopefully, the means will be found to perpetuate the lagoon's natural attractions and minimize the effects of future development upon the area's aesthetic attractiveness and rich fish and wildlife resources.

Because of the high value of the varied fish and wildlife resources of Bolinas Lagoon, the potential enhancement of these already rich resources through abatement of pollution, the fact that the lagoon is one of the State's few relatively undisturbed estuarine areas still in public ownership, and the growing concern in the planning of future tide-land developments, the Department of Fish and Game recommends that:

1. State, County, and local authorities consider a joint plan of watershed protection and management to reduce the input of stream-borne sediments into the lagoon. The plan should incorporate recommendations advanced by investigators cited in this report. Their recommendations relate to logging, zoning provisions, reduction of erosion hazards, and control of future land-clearing operations.
2. Although installation of tide gates and/or "corrective dredging" may promote the temporary removal of sediments or improvements in tidal circulation in critical areas of the lagoon, such work should not be undertaken until its long-term effects can be fully evaluated.
3. Any engineering plan to utilize dredging, tide gates, or other physical means to promote the removal of sediments from the upper basin of the lagoon not be considered, if they cannot improve upon the existing natural "tidehead" created by the Salicornia (pickleweed) marsh north of Kent Island, or, if they will impair the ecology of the same marshlands.

dredging spoils unless it can be clearly demonstrated that such disposal will benefit, and not detract from, the lagoon's fish and wildlife resources.

5. Particular efforts be made to preserve the small, but ecologically important, marsh areas of Pine Gulch Creek Delta and the southeastern end of the lagoon.
6. Any planned shoreline development or highway construction program in the northern half of the lagoon not be implemented if it will interfere with the success of the rookery at the Audubon facility, the seclusion of feeding birds on the mudflats, and their flights between feeding and nesting areas or along the periphery of the lagoon.
7. A site within Bolinas Lagoon be provided for the safe launching of hand-carried skiffs and other light craft to be used by clam diggers and others desiring to reach mollusk grounds in the lagoon's interior.
8. Any development for stabilization of the lagoon's outlet and/or development of a small craft harbor of refuge be confined to areas of least ecological importance - primarily in the main channels between Kent Island and Seadrift Peninsula in the western half of the lower end of the lagoon.
9. If, in the opinion of responsible State and County agencies, there is a need for boating facilities at Bolinas Lagoon beyond the requirements of a harbor of refuge, the facilities be limited to a launching and recovery area for trailered

service facility. A recent concept which would provide for installation of a launching ramp outside of the lagoon proper, but within the protection of channel-mouth jetties, appears to offer one means of minimizing damage to the lagoon's resources. Another, but less suitable, alternative would involve a ramp location in the western channel north of Bolinas and on or adjacent to County property.

10. Locations other than the interior of Bolinas Lagoon be considered, if it is determined that there is a need for extensive development of small-craft marinas, berthing spaces, and supplemental facilities in the Bolinas Bay area.
11. Sidecasting of slide materials, grading residues, and other highway maintenance spoils into the edge of the lagoon be discontinued.
12. Public parking be available at selected viewpoints around the lagoon to enable optimum opportunities for the public to observe its wildlife.
13. Future uses of Bolinas Lagoon not related to the above recommendations be guided by criteria that require the use to be dependent upon, but not antagonistic to, the lagoon's inherent resources and environmental attributes. Such uses should be of a nature that they could not occur at any location other than the lagoon.

It is noted that the Department of Fish and Game has not, in this report, included any recommendations related to municipal water pollution and its effect upon fish and wildlife or other beneficial uses of

the State Water Resources Control Board and the Regional Boards have the responsibility for coordination of recommendations of this nature. The Department has, consequently, already made recommendations necessary for the protection of the lagoon's shellfish and their use for human consumption. We have also made recommendations relative to the protection of fish and wildlife resources of neighboring waters of Bolinas Bay. These have been reflected in the Board's waste discharge requirements discussed in this report.