

Key Findings of the Laguna Salada Restoration Report

- Laguna Salada presents a unique opportunity to restore a natural coastal lagoon system of regional significance, with one of the few remaining beaches along the Pacific coastline; and Sharp Park is one of the few sites where resilient, sustainable coastal management practices can be implemented
- The primary obstacles to restoring endangered wildlife are impacts from golf course operations and pumping the lagoon (mowing the marsh, eliminating riparian vegetation and other suitable habitat, nitrogen loading the lagoon from fertilizers; and pumping the lagoon to artificially low levels, fostering spread of cattails and increasing flooding and salinity intrusion risk as sea level rises)
- The Park Department approach to increase engineering solutions and management is likely to be infeasible in the long-term and very costly in the short-term
- Only through reviving the natural physical and ecological processes at Laguna Salada can a sustainable and resilient habitat for the endangered species be maintained in the face of future climate change
- Restoration combined with set back levees and pump stations can provide improved flood and erosion protection for the surrounding areas
- The plan described here will be far less costly and is environmentally superior to other plans; this includes the option of maintaining the status quo, which would require tens-of-millions of dollars in capital outlays, and also result in the complete erosion of Sharp Park Beach if the sea wall continues to be enlarged
- Critical habitat for the endangered species is presently concentrated along the western edge of Laguna Salada, where it is especially vulnerable; freshwater perennial and seasonal wetlands are needed at higher elevations farther inland than they currently are, as these habitats will avoid storm overwash and naturally migrate landward with sea level rise
- A phased restoration and inland migration of snake and frog habitat will have to be developed
- A restored landscape can provide recreational benefits that everyone can enjoy, compatible with endangered species restoration and flood control and protection for surrounding properties

Findings That Contradict Prior Studies and Common Misconceptions

- **Laguna Salada was historically not a saline tidal lagoon.** The name “Laguna Salada” (salty lagoon) leads to an incorrect interpretation of its historical ecology. The term “salada” was applied to all lagoons that were frequently too saline for agriculture or human use. Evidence from historical ecology, comparison with reference sites and analysis of physical processes confirms Laguna Salada was a fresh-brackish non-tidal coastal lagoon with intermittent overwash – not a saline tidal lagoon.
- **The seawall and golf course did not “create” freshwater habitat for the frog and snake.** The seawall and golf course did not create endangered species habitat at Laguna Salada; in fact suitable habitat is degraded by present land use and restored physical processes will greatly enhance habitat.
- **Restoration, not the seawall or coastal armoring, is the best flood protection available at Sharp Park.** The levee and pump infrastructure are not needed to protect existing developments from flooding. This incorrect assumption was the primary reason that removal of the seawall was not considered to be a feasible component in the SF Parks analysis. The seawall actually prevents natural drainage of the lagoon during rainfall runoff and causes the need for pumping. If natural lagoon processes were restored, lower, narrower and cheaper setback levees could be reconstructed farther inland away from direct wave attack, in sheltered areas, and require less maintenance.

- **The seawall is not required to protect Laguna Salada or frog and snake habitat from sea level rise.** If natural lagoon processes are restored, the barrier beach will naturally migrate landward and upward in response to sea level rise. Over time, the lagoon and endangered species habitat will also migrate inland and upslope. The seawall protects existing frog and snake habitat in a non-natural location at Horse Stable Pond, but this protection is tenuous and difficult to maintain. Restored natural lagoon processes will create more freshwater wetland habitat in the floodplain east of Laguna Salada and along the restored Sanchez Creek riparian corridor – where it likely existed historically and will be more sustainable in the future.
- **Sedimentation is not the primary cause of reduced lagoon extent.** Artificial management of the lagoon through pumping and artificial drainage has allowed cattails to encroach on open water, reducing the lagoon area. Damaging and expensive dredging is not needed.
- **The proposed SFRPD plan is not the most feasible and ecologically superior alternative.** The restoration proposed here provides greater ecological benefits and is much less costly and more reliable.
- **Full restoration is the cheapest rather than the most expensive alternative.** The SFRPD did not evaluate and compare the costs associated with the restoration alternative proposed in this report, which could be implemented at a lower cost using construction and phasing methods consistent with other large-scale restoration efforts along the west coast. The costs to construct and maintain the type of coastal structures proposed in prior studies are underestimated and should be re-evaluated.

Key Recommendations of the Laguna Salada Restoration Report

- **Manage lagoon hydrology** to reduce artificial drainage of freshwater inflows allowing higher and natural equilibrium water levels to establish, increasing habitat extent
- **Restore Sanchez Creek riparian corridor** by daylighting culverted sections of creek through the restoration site and establishing natural riparian corridor and freshwater/seasonal wetlands within Laguna Salada and east of Highway 1
- **Enhance lagoon habitat** by constructing wetlands east of the lagoon similar to constructed wetlands at Mori Point, providing breeding habitats for red-legged frogs; add large woody debris to transition zones to provide basking and roosting sites
- **Allow the existing seawall to erode over time** and remove armoring and rip rap in phases to restore the natural barrier beach berm fronting the lagoon
- **Construct new setback levees** along the western and northern edge of the Fairway Park neighborhood (south Laguna Salada) and along Clarendon Rd/Lakeside Ave (north Laguna Salada) to provide flood protection against inundation and help accommodate the increased lagoon extent
- **Remove existing pump infrastructure** including pump house, drainage culverts at Horse Stable Pond and beach outfall with the phased levee removal
- **Construct new stormwater runoff infrastructure** including detention basins along Lakeside Avenue and Fairway Park to collect stormwater runoff from adjacent neighborhoods, and new culverts (Fairway Park) and a new pumping station (Clarendon Road/Lakeside Avenue) to allow drainage of the basins to the lagoon
- **Expand floodplain and upland transitional habitat** by excavating the artificial golf-course fill to expand habitat and provide source material for other restoration elements

- **Increase public access** including possible pedestrian trails, boardwalks, viewing platforms, modular seasonal bridge, clubhouse enhancements, etc.
- **Interim habitat management actions** to protect sensitive species during restoration and allow for transition of habitat, such as allowing higher winter lagoon water levels, establishing willow thicket buffers and marsh ponds east of the lagoon, replacing invasive weeds with native plants, and reducing fertilizer application

Anticipated Results of the Proposed Restoration

- A hydrologic regime change for Laguna Salada from a managed system in which water levels are artificially pumped down to a naturally functioning back-barrier lagoon
- Higher lagoon water levels that will restore wetlands to the east higher above sea level, reducing wetland exposure to saline seawater flooding and overwash
- Significantly expanded acreage and complexity of freshwater wetland and terrestrial habitats, especially at the east end of the lagoon and its floodplain
- Ability of freshwater wetland habitats for special-status wildlife species to expand significantly and shift landward ahead of coastal retreat
- Maintenance of a natural barrier beach and intermittent outlet channel by waves and stormwater runoff, serving as a natural line of coastal flood defense
- Significant increase in lagoon open water habitat, buffering against salinity intrusion and wave overwash
- Increased lagoon depths without dredging, avoiding water quality impacts of mobilizing sulfidic, toxic bottom sediments
- Restored submerged aquatic vegetation providing favorable habitat for frogs and birds
- Improved flood protection through inland perimeter floodwalls instead of along the high energy wave-dominated shoreline, allowing smaller-scale, less expensive flood protection infrastructure and preserving the natural beauty and ecology of the beach
- Reduced nutrient loading of the lagoon and improved natural water quality functions of lagoon wetlands
- Increased ecological resilience to climate change and sea level rise and tolerance of extreme flood events and seasonal flooding
- Compatibility between beach protection, shoreline access and increased public recreational access of Sharp Park

Comparison With S.F. Park Department Plan

- **Pre-existing land use constraints:** the SFRPD plan was biased toward pre-existing land uses; the new plan is not constrained by existing land use, and instead presents a long-term restoration vision for the site
- **Sustainability of restoration plan:** the SFRPD plan is a short-term habitat enhancement plan that places critical habitat in a vulnerable position directly behind a coastal levee, with increasing costs and reduced viability for maintaining suitable habitat over time; the new plan creates a dynamic natural system that will evolve in response to sea level rise
- **Location of endangered species habitat:** the SFRPD plan would squeeze habitat against the levee in Horse Stable Pond and Laguna Salada, in a coastal flood hazard zone vulnerable to salinity seepage with sea level rise, with increasing difficulty protecting it over time; the new plan locates critical habitat to the

east of Laguna Salada where it existed historically and is best able to survive climate change and salinity pulses, and retains habitat connectivity to Mori Point, the sole beneficial element of the SFRPD plan.

- **Scope of restoration:** the SFRPD plan focused on minor habitat enhancements within the constraints of the golf course; the new plan will restore full ecosystem function to benefit the endangered species.
- **Increased open-water habitat:** the SFRPD plan would deal with loss of open water habitat caused by water pumping through disruptive and expensive dredging; the new plan would increase open water depth and extent by simply allowing the lagoon water level to increase.
- **Reliance on pumping:** the SFRPD plan relies on pumping to provide flood protection from rainfall runoff due to impoundment behind the coastal levee; the new plan allows natural breaching and natural drainage of high water from the lagoon through the barrier beach.
- **Loss of beach:** the SFRPD plan would maintain (and likely have to raise) the coastal seawall at Sharp Park beach, which will cause loss of the beach by coastal erosion; the new plan allows natural inland migration of the beach, maintaining its width over time in response to sea level rise (this may be the only section of Pacifica where a beach can be maintained for the next 100 years of projected sea level rise without loss of private property and large infrastructure costs).
- **Cost of full restoration:** the SFRPD preferred plan costs \$12-18 million including seawall construction, the SFRPD “full restoration” alternative was estimated to cost \$9-22 million without the seawall and not accounting for costs for ongoing land management and to adapt to sea level rise; the new plan would cost about \$5 million dollars over 50 years, with much lower initial and total costs and has a longer design life.

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