



BOLINAS LAGOON ECOSYSTEM  
RESTORATION PROJECT



RECOMMENDATIONS FOR  
RESTORATION AND MANAGEMENT

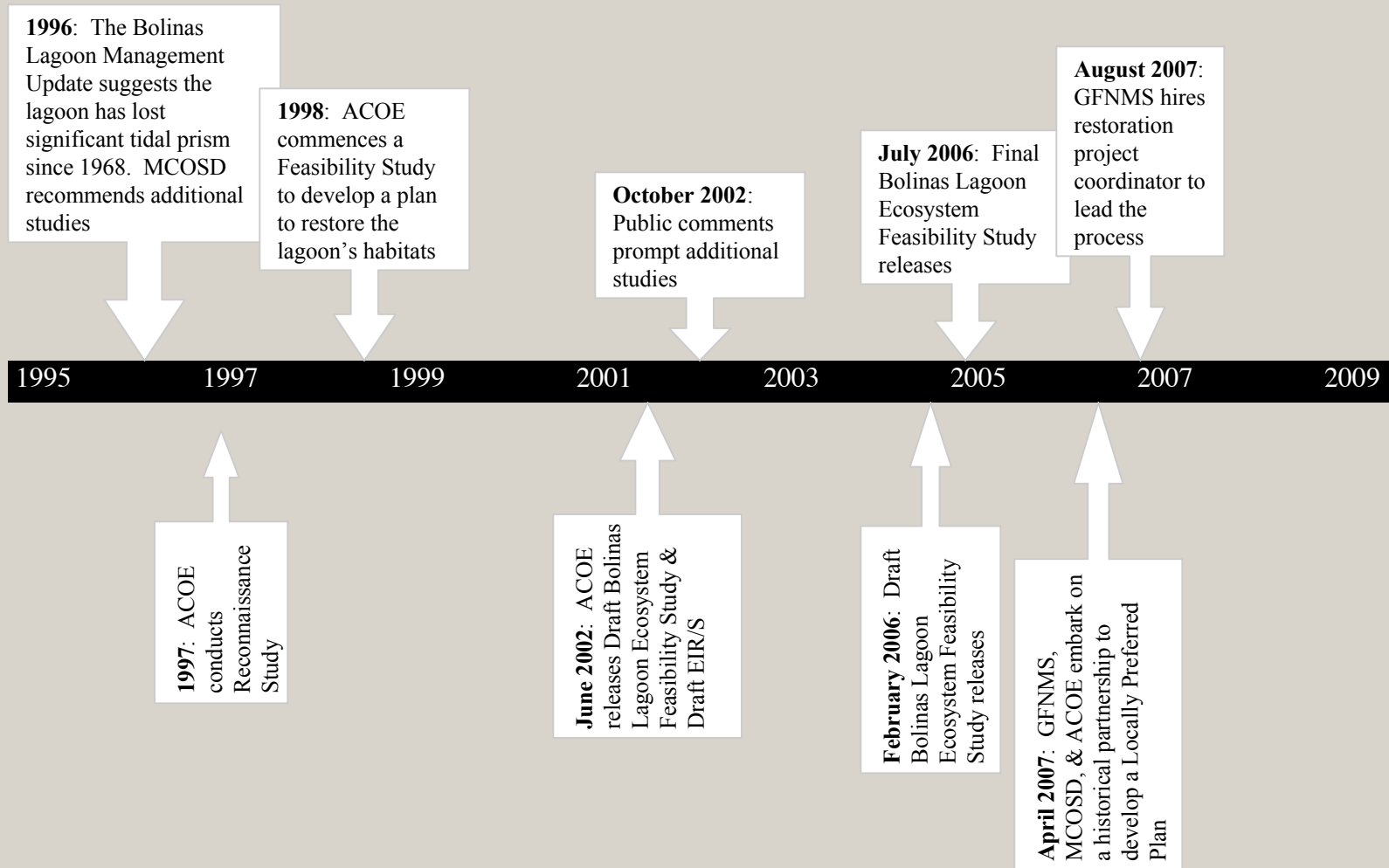
JULY 2008



Photo: Robert Campbell



# Bolinas Lagoon Timeline





*National Marine Sanctuaries • America's Ocean Treasures*



## Working Group Members

- Bruce Bowser, Chair  
Sanctuary Advisory Council Member, GFNMS
- Gordon Bennett  
Sierra Club Representative
- Ralph Camiccia  
Geologist, Bolinas Resident
- Josh Collins, Ph.D.  
Landscape Ecologist, San Francisco Estuary Institute
- Rudi Ferris  
Recreational/Subsistence Fisher, Bolinas Rod & Boat
- Ted Grosholz, Ph.D.  
Estuarine Ecologist, University of California, Davis
- Gwen Heistand  
Biologist, Audubon Canyon Ranch
- Dick Kamieniecki  
Seadrift Representative
- Brannon Ketcham  
Hydrologist, Point Reyes National Seashore
- Bucky Mace  
Bolinas Lagoon Foundation
- Tom Moore  
Fisheries Biologist, California Dept of Fish & Game
- Chuck Morton  
Caltrans Representative
- Nick Nidzieko  
Environmental Fluid Mechanics Lab, Stanford Univ.
- Gary Page  
Co-Director Wetlands Ecology Division, PRBO  
Conservation Science



## Staff

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Ecology Consultant, Marin County Open Space District

Bill Brostoff, PhD

Coastal & Wetlands Ecologist, U.S. Army Corps of  
Engineers



## Working Group and Public Meetings



Public Meeting	September 19, 2007
Working Group Meeting #1	September 20, 2007
Working Group Meeting #2	November 2, 2007
Working Group Meeting #3	December 7, 2007
Working Group Meeting #4	January 3, 2008
Working Group Meeting #5	January 30, 2008
Working Group Meeting #6	February 12, 2008
Evening Lecture	March 13, 2008
Working Group Meeting #7	April 15, 2008
Public Workshop	June 11, 2008
Working Group Meeting #8	June 25, 2008



# Intellectual Framework

## Principles

- Supports an adaptive management strategy that encourages collaboration
- Recognizes that the public, regional community of coastal engineers, scientists and natural resource managers are primary identifiers of environmental issues
- Assumes that the conditions of Bolinas Lagoon are mainly governed by the dynamic interplay between water and sediment supplies
- Focused on environmental issues and concerns about the lagoon, where humans have caused the greatest impact



# Intellectual Framework

## Principles

- Focused on alternative remedies that are consistent with natural processes, that can be naturally supported and sustained with minimum intervention and cost.
- Does not expect to exactly recover previous conditions in Bolinas Lagoon, or to prevent existing conditions from changing naturally.
- Recognizes that people have had, and will continue to have, ongoing effects on the conditions of Bolinas Lagoon.





# Intellectual Framework

## Principles

- Open to new ideas
- Do no harm to Bolinas Lagoon.
- Interested in achieving long-term solutions and must consider how the effects of its recommended actions might vary over a 50-year period.



# Analytical Procedures

## Analytical Procedures

- Identify environmental issues and concerns of the lagoon.
- Recommend actions based on answers to the following questions:
  - 1) What natural processes govern the environmental conditions that have been identified as an issue or concern?
  - 2) How have people affected the environmental conditions that have been identified as an issue or concern?
  - 3) Can the issue or concern be remedied by management actions that are likely to be sustained by natural processes?



# Analytical Procedures

## Analytical Procedures

- 4) Is the issue or concern a consequence of natural processes or the actions of people that cannot be sustainably altered or managed?
- 5) Is the existing information about the natural and unnatural causes of the issue or concern insufficient to determine whether or not it can be remedied by a management action?
- Revise recommended actions based on public review



# Vision & Problem Statements

## Vision Statement

- Bolinas Lagoon thrives naturally as an ecologically healthy tidal estuary.

## Need for Action

- The ecological and physical functions of Bolinas Lagoon are influenced by ongoing interactions among sea level dynamics, earthquakes and sedimentation. Since the early 19th century, human land uses have altered the shoreline and watershed, changing the proportion of human-caused sediment reaching the lagoon, threatening water quality and altering the rate at which natural processes shape the lagoon. The result is a human-induced acceleration and alteration in the natural processes, resulting in a loss of tidal prism, and changes in composition of plants, animals and habitats.



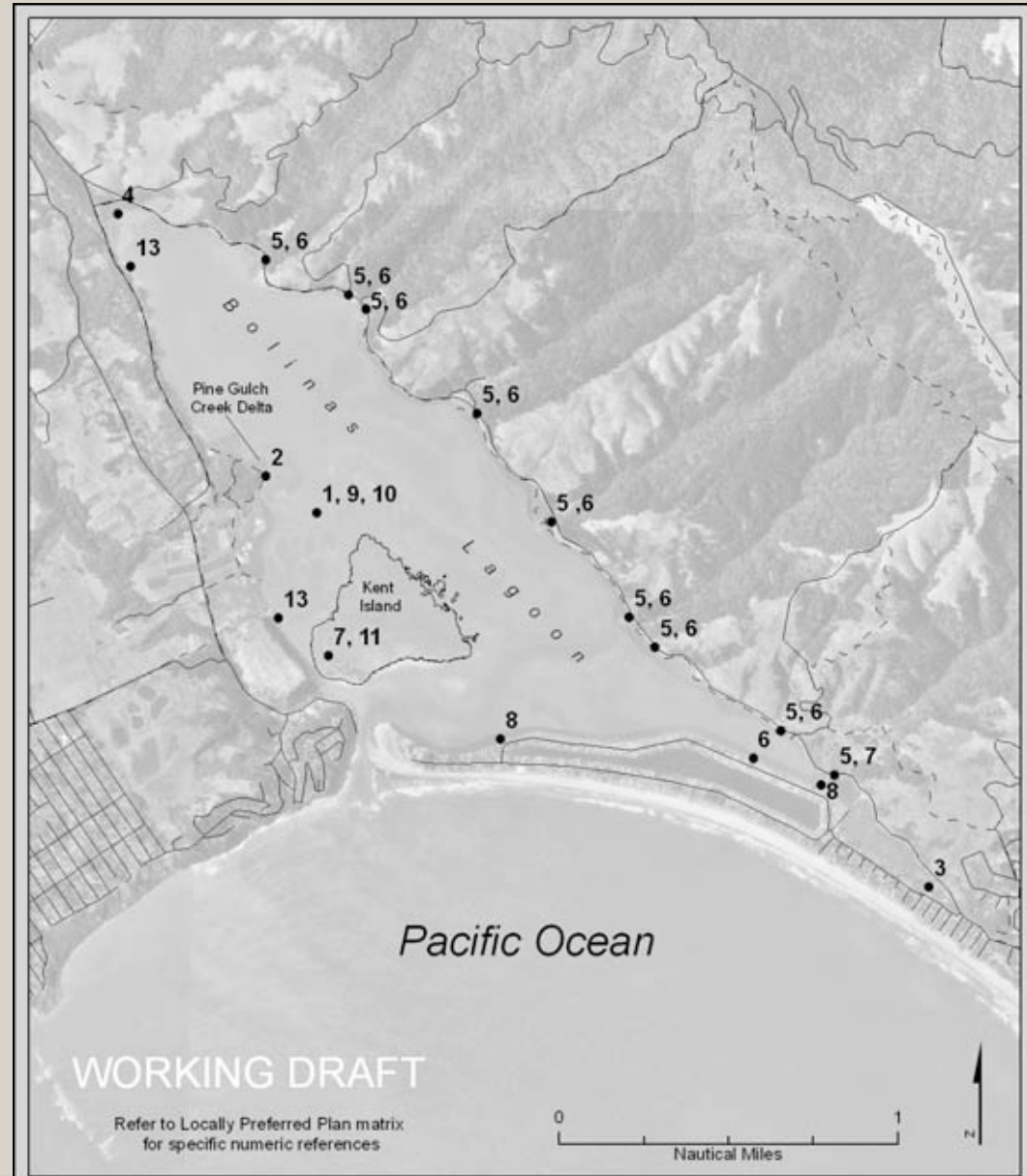
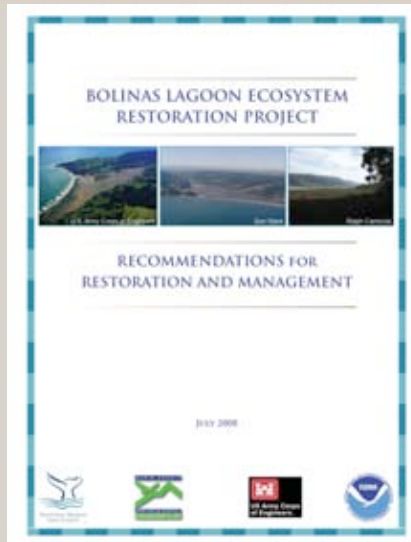
## Project Goal & Objectives

### Project Goal

- The Bolinas Lagoon Restoration Project aims to ameliorate adverse human impacts to the lagoon, thereby promoting the natural, dynamic, geological evolutionary processes of this internationally-recognized estuarine environment.

### Objectives

- Objective 1: Restore natural sediment transport and ecological functions of Bolinas Lagoon by ameliorating the negative effects of human induced changes.
- Objective 2: Identify and manage introduced species in the Bolinas Lagoon watershed.
- Objective 3: Protect water quality by minimizing negative human impacts.





# Restoration recommendations in the Locally Preferred Plan

#	Action	Lead or vested agency / organization
<b>Objective 1: Restore natural sediment transport and ecological functions of Bolinas Lagoon by ameliorating the negative effects of human induced changes.</b>		
<b>Recommendations in the Locally Preferred Plan (LPP)</b>		
<b>Watershed</b>		
1-LPP	Conduct a quantitative sediment source analysis of the Bolinas Lagoon watershed and seek remedies for problem areas.	<b>MCOSD</b> ; GGNRA; PRNS; State Parks; Consultant
<b>2-LPP Pine Gulch Creek</b>		
2a-LPP	<b>Floodplain:</b> Reestablish the Pine Gulch Creek floodplain consistent with flood protection.	<b>MCOSD</b> ; Property owners; the Corps; CCC; SLC; Contractor; Caltrans; CDFG; USFWS; GFNMS
2b-LPP	<b>Delta:</b> Remove a portion of the Pine Gulch Creek Delta. Delta removal must be sustainable and completed in conjunction with floodplain restoration activities.	<b>MCOSD</b> ; Property owners; the Corps; CCC; SLC; Contractor; Caltrans; CDFG; USFWS; GFNMS
<b>3-LPP Easkoot Creek</b>		
3a-LPP	<b>Floodplain:</b> Investigate restoring a portion of the GGNRA Stinson Beach parking lot to a seasonal floodplain.	<b>GGNRA</b> ; County of Marin
<b>4-LPP Bolinas "Y"</b>		
4a-LPP	<b>Floodplain:</b> Improve floodplain functions in the area of the Bolinas "Y," consistent with flood protection.	<b>MCOSD</b> ; GGNRA; PRNS; the Corps; USFWS
4b-LPP	<b>Delta:</b> Remove a portion of the unnatural levels of sediment from north Bolinas Lagoon. Sediment removal must be sustainable and completed in conjunction with improving floodplain functions.	<b>MCOSD</b> ; GFNMS; the Corps



# Restoration recommendations in the Locally Preferred Plan

5a-LPP	<b>Floodplain:</b> Improve floodplain functions along the eastern shore of Bolinas Lagoon, consistent with flood protection.	<b>MCOSD;</b> Property owners; the Corps; CCC; SLC; Contractor; Caltrans; GGNRA; PRNS; CDFG; USFWS; GFNMS; ACR; SBCWD
5b-LPP	<b>Delta:</b> Prioritize removal of delta areas along the eastern shore of the lagoon. Delta removal must be sustainable and completed in coordination with improving floodplain functions.	<b>MCOSD;</b> ACR; GGNRA
<b>6-LPP Habitat connectivity and transitional habitat</b>		
6a-LPP	<b>Transitional habitat:</b> Improve transitional habitat along the east shore of Bolinas Lagoon.	<b>MCOSD;</b> ACR; GGNRA
6b-LPP	<b>Transitional habitat:</b> Improve transitional habitat along Dipsea Road	<b>MCOSD;</b> Seadrift Association
<b>Kent Island</b>		
7-LPP	Restore Kent Island as a dynamic flood shoal island.	<b>MCOSD;</b> ACR; MMWD; MCC; WMA; Cal-IPC
<b>Seadrift Lagoon</b>		
8-LPP	Investigate managing tidal exchange of Seadrift Lagoon to promote tidal circulation in Bolinas Lagoon.	<b>MCOSD;</b> Seadrift Association





# Restoration recommendations in the Locally Preferred Plan

9-LPP	Actively plan and manage for sea level rise at Bolinas Lagoon.	<b>GFNMS; MCOSD;</b> CalTrans; GGNRA; PRNS; ACR
<b><i>Eelgrass</i></b>		
10-LPP	Model suitable habitat for eelgrass and restore in appropriate areas.	<b>GFNMS;</b> NOAA Restoration; CDFG; the Corps
<b>Objective 2: Identify and manage introduced species in the Bolinas Lagoon watershed.</b>		
<b><i>Kent Island</i></b>		
11-LPP	Prioritize, remove and manage all introduced species on Kent Island.	<b>MCOSD;</b> ACR; MMWD; MCC; MCOSD; WMA; Cal-IPC
<b>Objective 3: Protect water quality by minimizing negative human impacts.</b>		
<b><i>Lagoon-wide</i></b>		
12-LPP	Remove treated woody debris from Bolinas Lagoon.	<b>MCOSD;</b> GFNMS
13-LPP	Investigate and if feasible, remove dumps in Bolinas Lagoon.	<b>MCOSD;</b> GFNMS



# Management Recommendations

#	Action	Lead or vested interest
<b>Objective 1: Restore natural sediment transport and ecological functions of Bolinas Lagoon by ameliorating the negative effects of human induced changes.</b>		
<b>Recommendation for Management Actions (MG)</b>		
<b>1-MG Best Management Practices (BMPs)</b>		
1a-MG	Promote BMPs for farming, ranching, and residential areas, including the Bolinas Bluffs.	<b>MCCDA; BCPUD</b>
1b-MG	Work with stream-side property owners to assure protection of summer flow throughout the Bolinas Lagoon watershed (Pine Gulch Creek & Easkoot Creek).	<b>MCOSD; County of Marin; GGNRA; Property owners</b>
1c-MG	Protect floodplain functions of Easkoot Creek through the implementation of an education program.	<b>MCOSD; County of Marin; GGNRA</b>
1d-MG	Ensure BMPs for protecting native and controlling introduced species populations during restoration activities.	<b>GFNMS; MCOSD</b>
<b>Lagoon-wide</b>		
2-MG	Remove trees that fall into the lagoon & identify and remove potential tree hazards.	<b>MCOSD; GFNMS</b>
3-MG	Establish a long-term responsible wildlife viewing program.	<b>MCOSD; GFNMS; PRNS</b>
<b>Bolinas mouth</b>		
4-MG	Develop an emergency response plan in the event of a Bolinas mouth closure.	<b>MCOSD; GFNMS; CCC; NMFS; CDFG; the Corps</b>



# Management Recommendations

<b>Objective 2: Identify and manage introduced species in the Bolinas Lagoon watershed.</b>		
<b><i>Lagoon-wide</i></b>		
5-MG	Immediately remove introduced cordgrass found in Bolinas Lagoon.	<b>GFNMS; MCOSD; ISP</b>
6-MG	Remove introduced plant and invertebrate species found in the Bolinas Lagoon watershed.	<b>MCOSD; MMWD; MCC; WMA; PRNS; GGNRA; Cal-IPC; State Parks</b>
<b>Objective 3: Protect water quality by minimizing negative human impacts.</b>		
<b><i>Lagoon-wide</i></b>		
7-MG	Develop a local oil spill response plan for Bolinas Lagoon.	<b>MCOSD; GFNMS; USCG; CDFG</b>
8-MG	Replace toxic-impregnated materials in Bolinas Lagoon.	<b>GFNMS; MCOSD; CCC</b>
9-MG	Promote environmentally sensitive use of facilities through an education program.	<b>MCOSD; GGNRA; PRNS</b>
<b><i>South Lagoon</i></b>		
10-MG	Identify toxins associated with the abandoned dredge and remove if feasible.	<b>GFNMS</b>



## Considered but not Included

- Seadrift Spit
- Bolinas Bluffs





## Next Steps

- Revise document based on SAC comments
- Motion to approve the final plan
- Forward Bolinas Plan onto MCOSD and the Corps





# Long-Term Vision

Work in collaboration with federal, state and local agencies, and the local community, to restore the natural ecological processes of Bolinas Lagoon



Jamie Hall



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