

Bolinas Lagoon Ecosystem Restoration Feasibility Project

Presentation to the Gulf of the
Farallones Sanctuary Advisory Council

William Carmen
Marin County Open Space District

July 13, 2007





Bolinas, CA 94924, USA

Kent Island

Bolinas

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Pointer 37° 55'07.89"N 122° 41'43.22"W elev 29 ft Streaming ||||| 100% Eye alt 14696 ft

Project Background

- The 1996 Bolinas Lagoon Management Update identified a problem with sediment accumulation and loss of tidal prism.
- A 1997 Reconnaissance Study by the ACOE concluded that corrective action was a matter of National interest
- In 1998 the County, ACOE and State Coastal Conservancy commenced a Feasibility Study to develop a plan to restore the lagoon's habitats
- In 2002, the ACOE released a Draft Feasibility Study and DEIR/S that called for dredging 1.4 MCY of sediment from the lagoon.

Project Background

- Public comments challenged the conclusions of the DEIR/S and cited the need for a clear, scientifically sound description of how the lagoon would evolve if no action was taken (the “No action” alternative).
- In 2004, MCOSD hired a consulting team to conduct a rigorous scientific review of the prior study’s assumptions and to provide a 50-year projection of the lagoon’s hydrological and ecological evolution.
- There have been various public comment opportunities: meetings, comment periods, workshops, etc. The end result is that there is a broad spectrum of opinions about what should be done.
- In 2007, MCOSD and ACOE recommended that GFNMS become an active partner to plan for the restoration of the lagoon and help guide the public to resolution.
- A project coordinator position has been created for GFNMS, funded through ACOE, working in collaboration with MCOSD.

Why Should We Care?

Human-induced changes have altered the lagoon's ecosystem.

- The lagoon is a valuable ecological resource that supports harbor seal haul-out and pupping sites, habitat for myriad shorebirds and waterfowl, fish and invertebrates, and endangered plants and animals.
- The lagoon is one of only 3 RAMSAR sites (Wetlands of International Importance) on the west coast.
- The lagoon provides fishing, boating, bird watching and other recreational opportunities.
- Human changes in the watershed have increased sediment delivery from the watershed and affected tidal prism, habitats, and physical processes that shape the lagoon.
- GFNMS is the primary resource protection agency with jurisdiction throughout the lagoon.

General Findings

- Bolinas lagoon is a complex, dynamic ecosystem governed by interactions between climate, geologic processes, and land use.
- Large earthquakes deepen the lagoon and counteract sediment accumulation.
- After a large earthquake, sediments—primarily from the ocean—rapidly accumulate.
- As the lagoon becomes shallower, sediment accumulation slows as the lagoon tends to evolve towards a shallow equilibrium state.
- These changes result in continuous habitat shifts that affect plant and animal communities.
- The lagoon mouth is not expected to close over the next 50-years.
- Human changes in the watershed have increased sediment delivery from the watershed and affected tidal prism, habitats, and physical processes that shape the lagoon.

- A** littoral transport
- B** cliff erosion
- C** hillslope processes: sediment production
- D** channel floodplain interaction: sediment transport & storage
- E** fluvial sediment delivery: delta & alluvial fans
- F** wind wave & tidal re-distribution via current circulation
- G** tidal inlet dynamics
- H** flood tide shoal formation

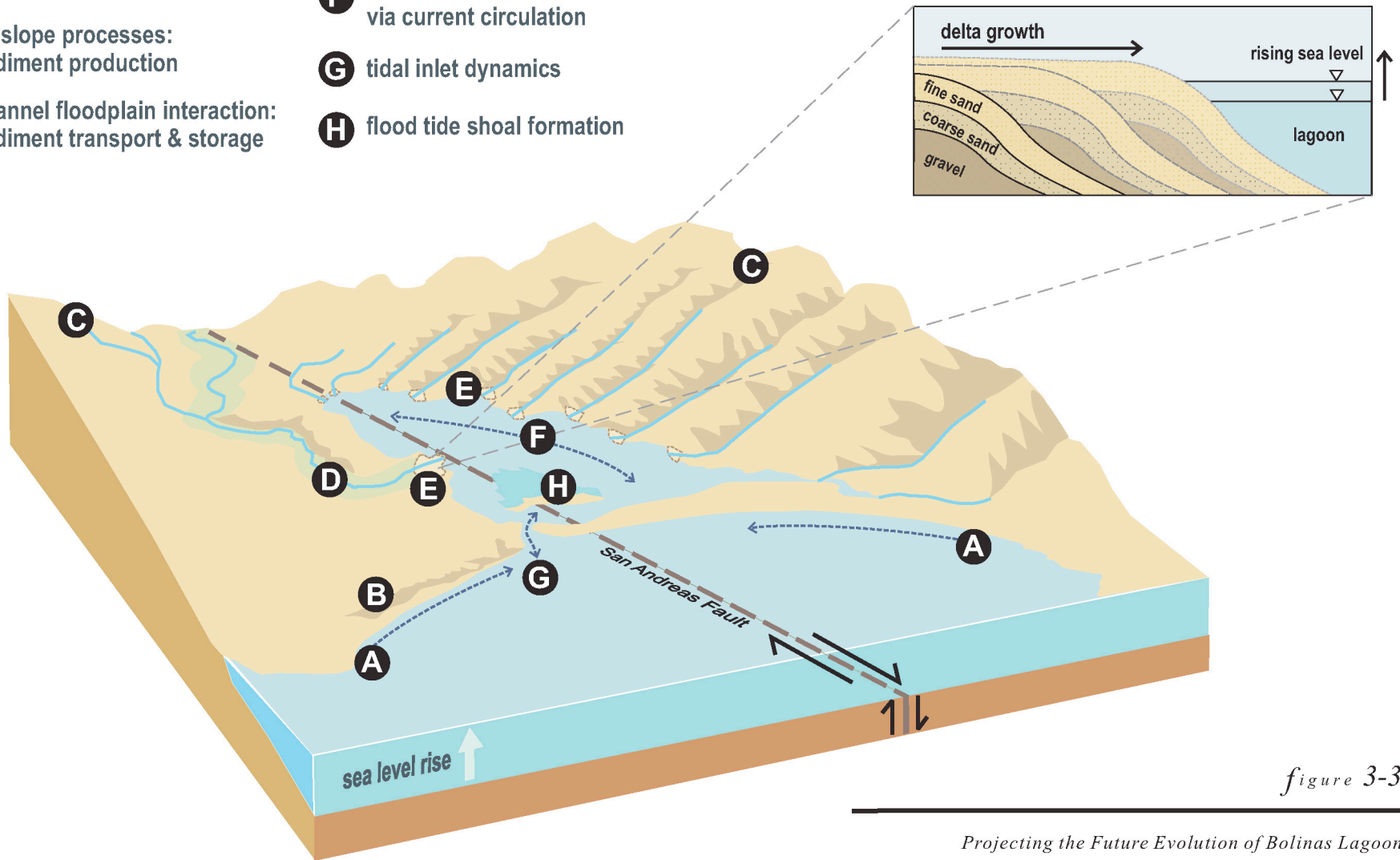
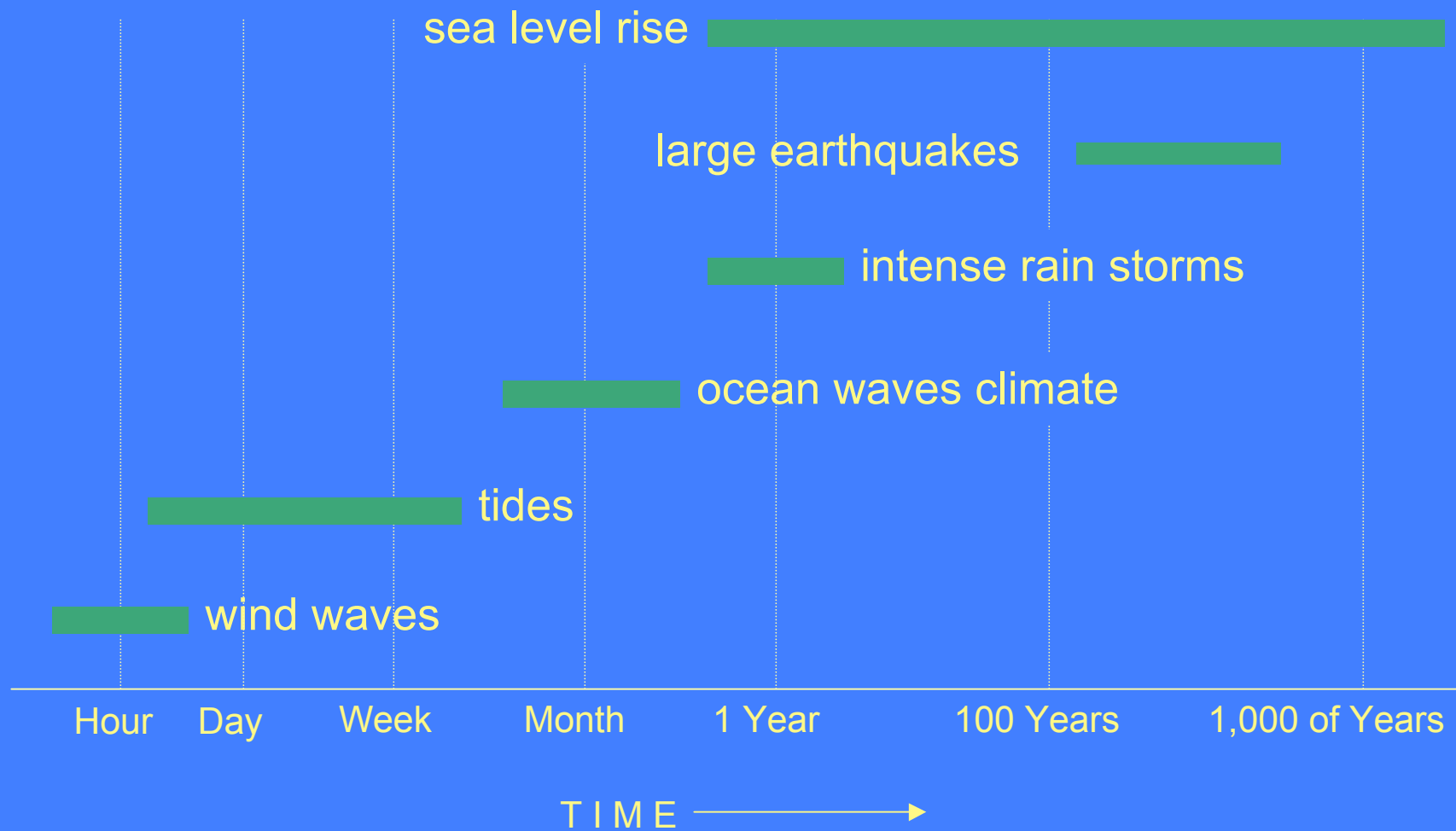


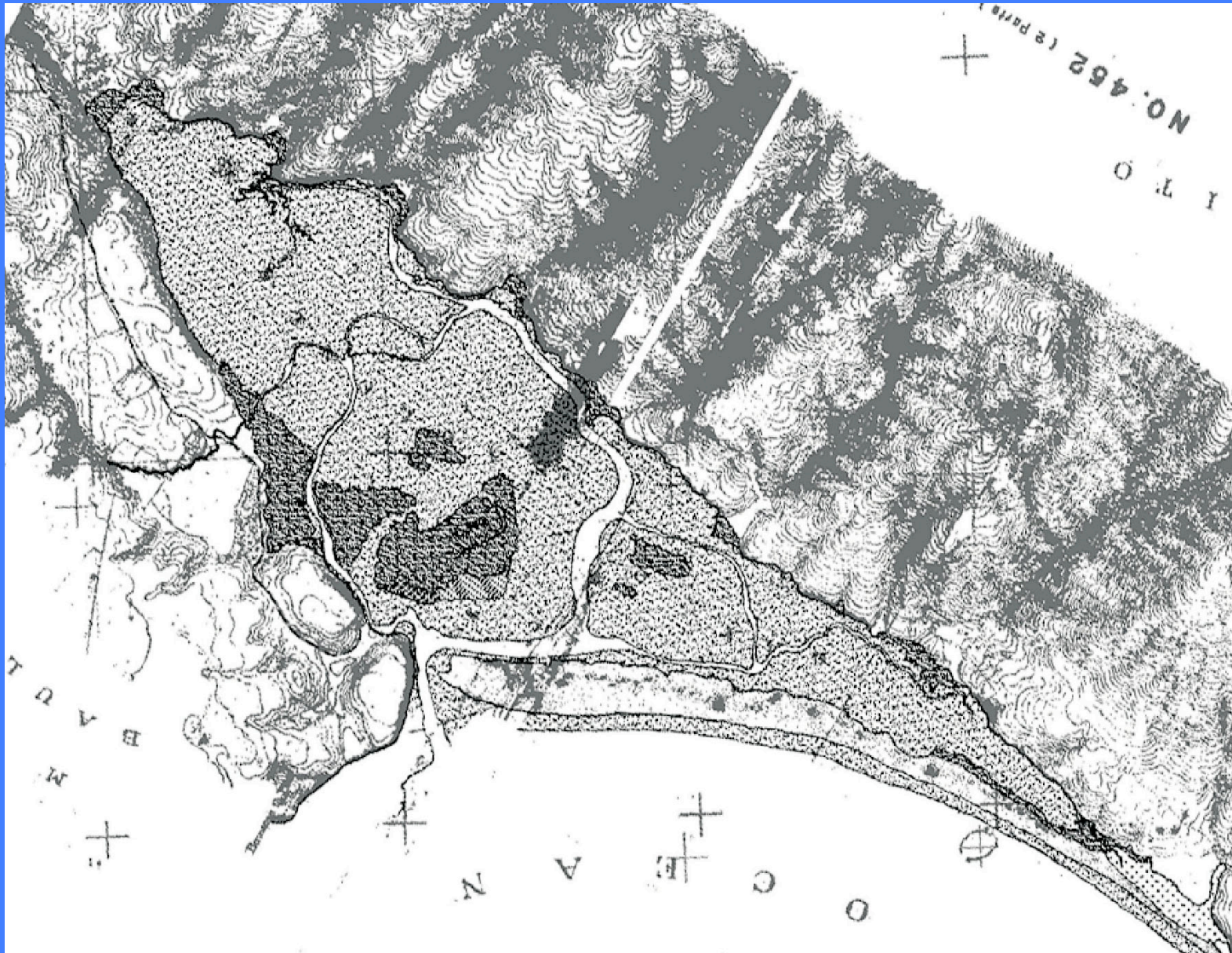
figure 3-3

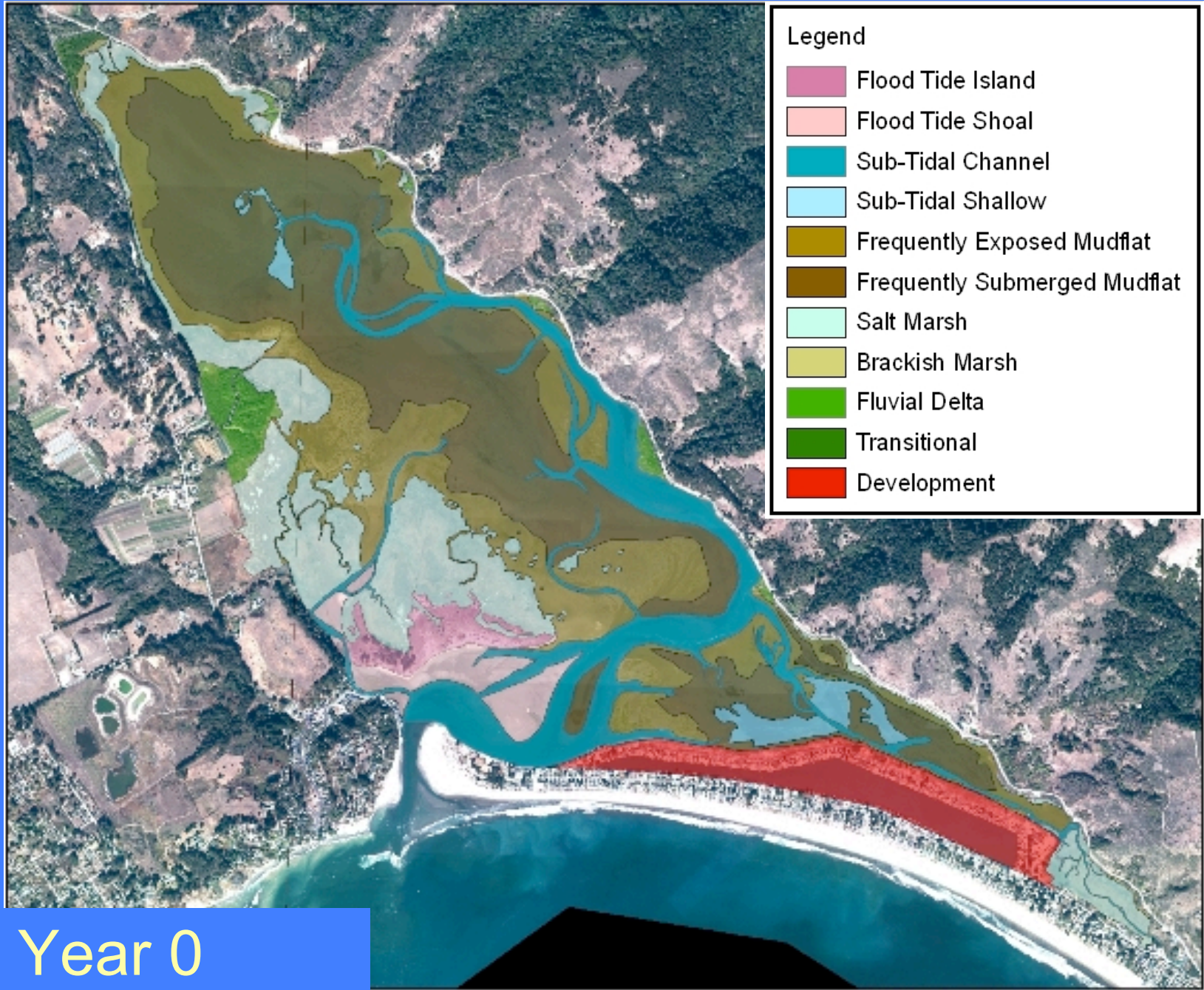
Projecting the Future Evolution of Bolinas Lagoon
Physical Processes Affecting Bolinas Lagoon

Time Scale of Forces that Shape the Lagoon

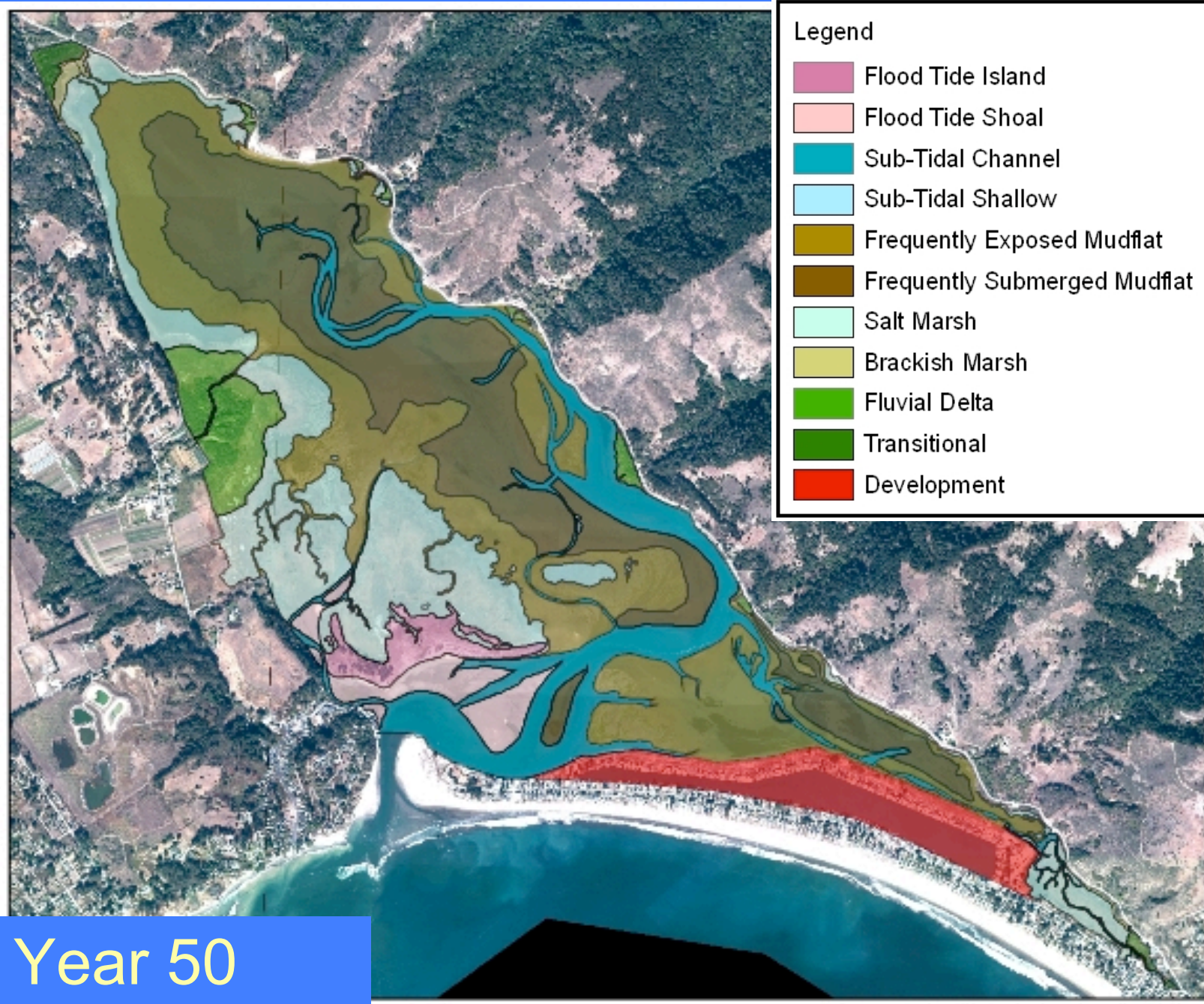


1854 Map





Year 0

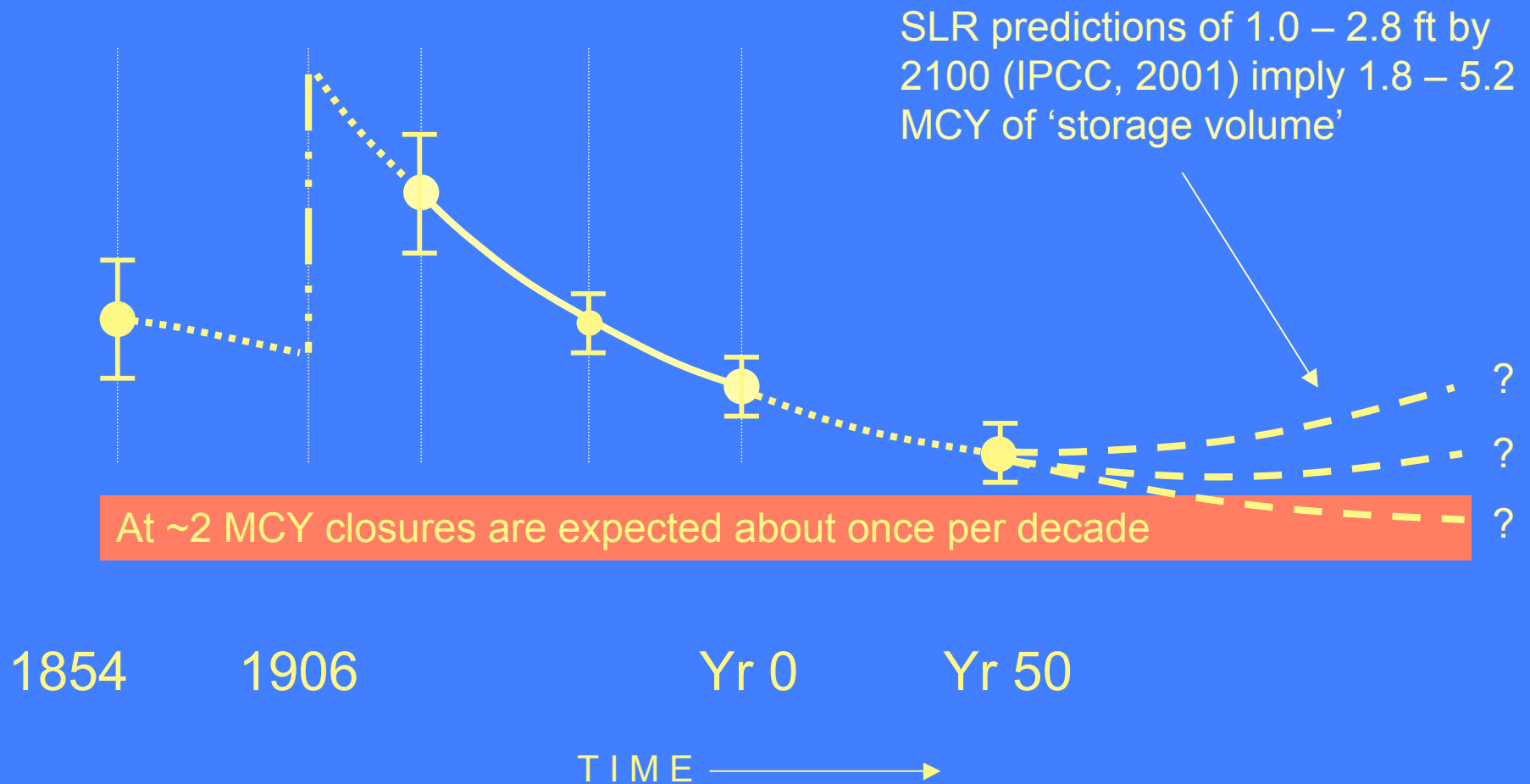


Year 50

Expected 'End State' (No Earthquake)



Longer-Term Trends in Tidal Prism



Ecological Changes

- There were large scale shifts in habitats following the 1906 earthquake— from shallow intertidal habitat to deeper water marine habitat.
- Over the last 100 years the lagoon has been accumulating sediment and tending toward a shallow intertidal state.
- Over the next 50 years, we predict a loss of subtidal shallows, a 26% reduction of frequently submerged mudflat with a corresponding increase in higher mudflat and tidal marsh, and a doubling of Pine Gulch Creek delta.
- These habitat shifts will result in shifts in the abundance of diversity of plants and animals associated with the different habitats.

Anthropogenic Changes

Since the early 19th Century, land use changes have altered the historical shoreline and watershed and have and will continue to result in

- increased sediment delivery
- loss of tidal prism
- changes in habitat types
- change in the physical processes that shape the lagoon.

It is difficult to quantify the proportion of change in the lagoon's evolution caused by humans against the backdrop of large scale natural changes



Restoration Options

Over the last 4-5 years, there have been numerous restoration activities proposed to address human impacts.

- Removal of Invasive Species
- Removal of Telephone Poles and derelict dredge
- Watershed measures to reduce sediment availability
- Activation of the Pine Gulch Creek floodplain to reduce sediment deposition in the Lagoon
- Sediment Removal



GFNMS Short-term Planned Actions

- Complete planning and permitting phase of projects to remove marine debris from Bolinas Lagoon.
 - Remove abandoned telephone poles.
 - Coordinate effort to clean Bolinas Lagoon culverts.
 - Seek funding and create a project plan for removing a derelict dredge from the lagoon.
- Issue permits to remove invasive species from Bolinas Lagoon.

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 (RP 13).

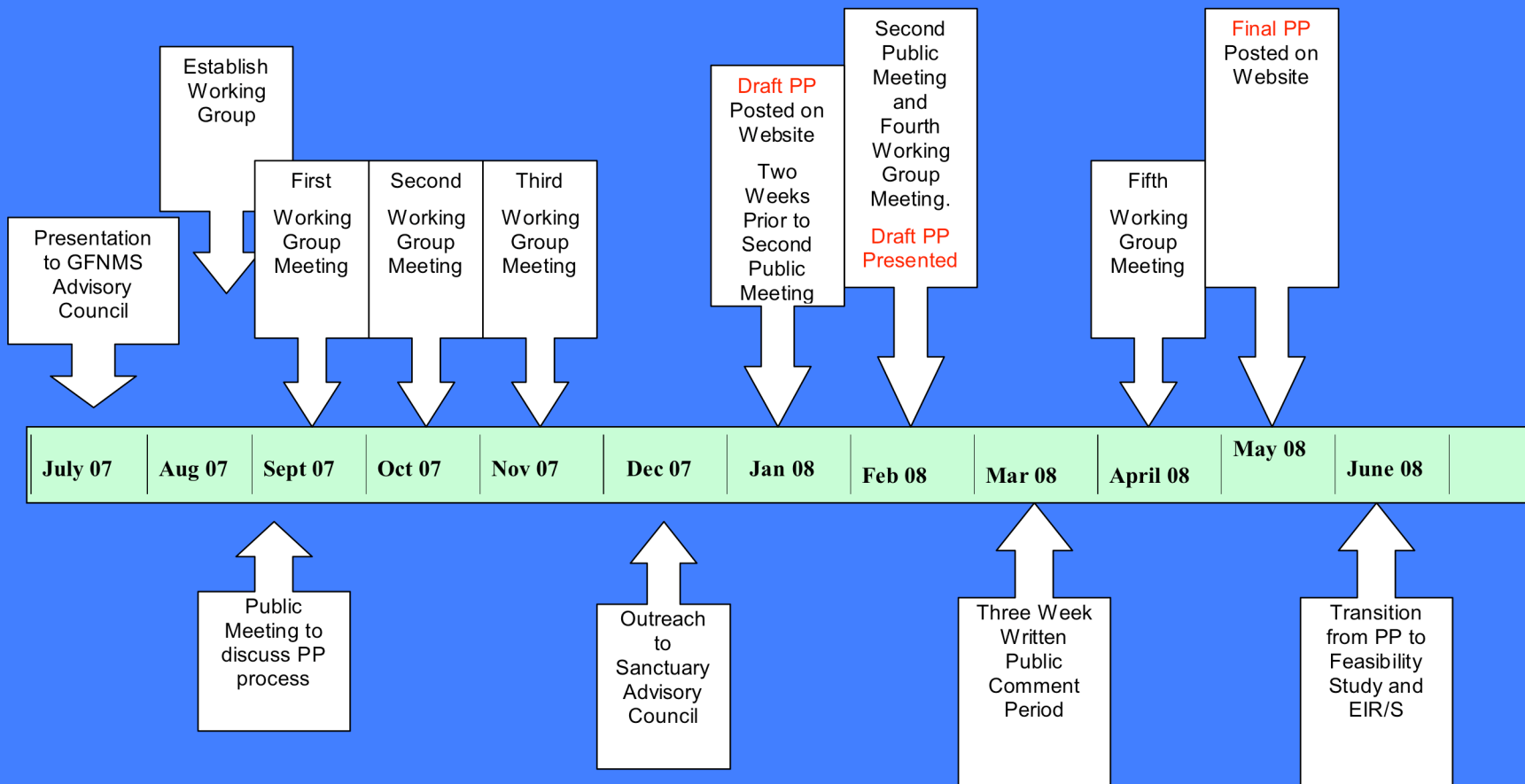
- Collaborate in the development and implementation of a comprehensive plan to examine actions that would reduce, and possibly reverse, sediment accumulation and habitat shifts caused by human impacts.
- Adopt a model of adaptive management, with long-term monitoring.

Proposed Process

- A Working Group is established to identify restoration components of a Preferred Plan (PP) that addresses human impacts to the lagoon.
- Components of the PP will determine whether an EIR/S is required and the project partners—MCOSD, GFNMS, ACOE, SCC— will revise the EIR/S, if necessary.
- The PP would be evaluated as part of other plans included in the revised Bolinas Lagoon Ecosystem Restoration Feasibility Study and EIR/S.

Proposed Process Timeline

BOLINAS LAGOON ECOSYSTEM RESTORATION PROJECT SCHEDULE FOR COMPLETION OF ADVISORY PP



Next Steps

Request to establish the Bolinas Lagoon Restoration Working Group of the SAC to develop a Preferred Plan (PP).