

# **GOLETA SLOUGH AREA SEA LEVEL RISE AND MANAGEMENT PLAN**

## **EXECUTIVE SUMMARY**

### **Part 1 - Introduction**

Goleta Slough is a coastal wetland located along the central coast of California, a region with high biodiversity in which many species reach their northern and southern limits. Like many tidal wetlands along the Pacific Coast, the Slough has been greatly reduced in size and function over the past two centuries through a combination of natural processes and manmade land uses. The *Goleta Slough Area Sea Level Rise and Management Plan* (Plan) comprises an update of previous Slough management plans and includes new detailed information and analysis of future conditions projected to occur as climate changes over the next century.

The *Goleta Slough Area Sea Level Rise and Management Plan* was initiated by the Goleta Slough Management Committee (GSMC). GSMC was formed in 1991 to serve in an advisory capacity to local governments, state and federal agencies to ensure that the Goleta Slough Ecosystem Management Plan Area, comprised of 2,250 acres of habitat and adjoining lands, are addressed in a comprehensive manner, irrespective of jurisdictional boundaries. This plan area is almost entirely within the Coastal Zone and encompasses the entirety of the Slough, open space areas and creeks that feed into it, as well as the Santa Barbara Airport and developed areas within the City of Goleta, Santa Barbara County and UC Santa Barbara (see Figure 2-4). Portions of the Goleta Slough are designated as an Ecological Reserve and a Marine Conservation Area, both managed by the California Department of Fish and Wildlife.

The ecological significance of the Slough and surrounding area is described and recognized in several management plans that have been prepared since the 1980s, including the *Goleta Slough Ecosystem Management Plan* in 1997 and *Goleta Slough Existing Conditions and Monitoring Report* in 2012. This Plan updates those plans and includes a sea level rise vulnerability analysis. The intent is for this informational plan to serve as the foundation for future projects, plans, research and studies in the area. This Plan will be updated periodically as new information comes available such as ecosystem monitoring results, climate change and sea level rise studies, and new policies adopted by jurisdictions in the Ecosystem. It is important to note that sea level rise is an evolving science and local jurisdictions may conduct sea level rise vulnerability and adaptation assessments that differ from the methods used in this Plan.

### **Part 2 – Background**

The background of the Goleta Slough and its environs is described in this section including the importance of the Ecosystem and its resource functions and values. The jurisdictions within the Goleta Slough Ecosystem are described along with major legislation that affects habitats, land uses, development and restoration in the area. The background on the effects of greenhouse gas emissions, climate change and sea level rise is provided. Historic development and changes over the last 150 years are explained and existing uses are described. The roles that GSMC and state and federal agencies play in the area are also explained. Restoration efforts since the inception of GSMC are described and mapped, including the ground breaking tidal restoration demonstration project implemented by the Santa Barbara Airport to restore tidal action to brackish basins in the Slough.

This section describes the physical aspects of the Ecosystem including its geology, hydrology and climate. The 45-square mile watershed and seven creeks that feed the Slough are described, along with annual rainfall patterns. The flood history of the area is discussed, including devastating floods that filled in much of Goleta Slough in 1861-62 and subsequent El Niño storm events that caused significant damage locally.

Sediment supply and removal in the Slough is described along with the Goleta Slough inlet (or mouth) management practices over the last thirty years. The natural functioning of Goleta Slough is explained along with the role of fluvial processes and tidal influences. Since the mid-1990s, the Slough inlet has been opened an average of twice per year to allow tidal circulation and improved water quality in the Slough and to avoid flooding upstream. In 2013, Federal agency concerns about the effects of mechanical opening the inlet on two federally-listed endangered species (Tidewater goby and Southern steelhead) have resulted in opening the Slough inlet infrequently and only under emergency permits. The habitat change and other implications of the infrequent opening of the Slough inlet are described. This provides important background information for the climate change and sea level rise discussion in the next section of the Plan.

### **Part 3 – Looking Ahead (2015 and Beyond)**

Part 3 provides a summary of projections of climate change for Goleta Slough and the impacts it may have on the natural ecosystem and the built environment. It includes an inventory of the infrastructure and habitats that may experience impacts due to rising Slough water levels and, for each vulnerable infrastructure element or habitat, presents a set of adaptation strategies that could be adopted in order to reduce the risk to that infrastructure or habitat.

The final segment of this section describes the inlet analysis conducted to compare the expected outcomes of different lagoon inlet management strategies under existing conditions and with increasing amounts of sea level rise.

The purpose of this section is to help decision-makers, planners and land managers identify and prioritize adaptation strategies, including infrastructure improvements, policy changes and management actions to adapt to sea level rise related impacts. The goals of these adaptation strategies are twofold:

1. To maintain the Goleta Slough Ecosystem in light of sea level rise, and to enhance habitats where possible; and,
2. To minimize the risk of damage to infrastructure within the Goleta Slough area due to flooding under future sea level rise scenarios.

The following are the key findings related to sea level rise at Goleta Slough:

- Recognize that the future management of the Slough inlet will have a very significant impact on water levels and have a large effect on the distribution of habitats and species within the Slough Ecosystem.
- Manage the Goleta Slough inlet to maintain tidal circulation, water quality, and diversity and resilience of species and habitats.
- Establish provisions for the long-term management of the Slough mouth, including ongoing monitoring with adaptive management to achieve well-defined goals and to allow for compliance with future permitting requirements.

- View sediment as a resource that can be used within the Slough to increase the resiliency of the habitats as sea level rises.
- Deposition of sediment from the watershed onto tidal marshlands and flats within the Slough should be encouraged to maximize marsh accretion relative to sea level rise.
- Improve ecological linkages, increase resiliency and reduce habitat fragmentation by restoring tidal action to diked areas and provide more adjacent upland habitat for transgression.
- Identify and pursue priority projects to protect, enhance and/or expand key habitat areas, taking advantage of existing open space areas that are already near the typical elevation range for these habitats.
- Identify and pursue priority projects to protect the most vulnerable infrastructure so as to increase the threshold water surface elevation at which flood damage becomes likely.
- Require the consideration of future sea level rise and Slough inlet management practices when determining flood risk and identifying flood hazard areas.
- Minimize the construction of new vulnerable infrastructure within flood hazard areas.

#### Part 4 - Goals, Policies and Actions

When the first *Goleta Slough Ecosystem Management Plan* was developed in the mid-1990s, the goals, policies and actions were derived from those of the local jurisdictions in the area. The goals were in four broad categories: Administrative Framework; Protection and Maintenance of Existing Resources, Functions and Values; Education, Research and Public Access; and Restoration and Enhancement of Historic Resources, Functions and Values. The status of implementation of each goal, policy and action of the 1997 Plan is provided in Table 4-1. Many actions are ongoing, e.g., collaborating with agencies on projects and plan updates, and these actions have generally been carried forward into the updated Plan. Some actions have not yet been completed and these are mostly retained, although with some edits to reflect current and expected future conditions.

The major change to this updated Plan is the addition of the sea level rise vulnerability analysis. Rather than having a separate sea level rise goal with corresponding policies and actions, the issues relating to climate change and sea level rise have been incorporated throughout the policies and actions. GSMC participants agreed that integrating the issues and possible adaptations relating to sea level rise into all relevant policies and actions would increase the likelihood that a comprehensive approach to this important issue would be achieved. The updated goals, policies and actions are included in Section 4.4.

The updated goals of this Plan are:

**ADMINISTRATIVE FRAMEWORK (Goal A)** – Provide an administrative framework for the adoption, implementation and periodic updates of the GSEMP through cooperative interaction between landowners, public interest groups, responsible agencies and jurisdictions. Consider the evolution of habitats, adaptive management and other changes that are likely to occur over time, including those related to climate change. Compatibility with surrounding land uses must also be considered in the review of plans and projects.

**PROTECTION AND MAINTENANCE OF EXISTING RESOURCES, FUNCTIONS AND VALUES (Goal P)** – Protect and maintain the natural diversity and resilience of species, habitat types

and Ecosystem functions through protection of physical processes that naturally maintain these resources. More deliberate adaptation actions may be necessary as sea level rise accelerates and other climate change impacts become more apparent. These adaptation strategies, when implemented, should, to the maximum extent feasible, avoid further alteration of habitats or physical processes.

**RESTORATION AND ENHANCEMENT OF HISTORIC RESOURCES, FUNCTIONS AND VALUES**

**(Goal R)** – To the maximum extent possible, enhance and restore the Slough’s natural diversity of resources, habitats, physical processes and functions that have been lost or degraded and that are needed to maintain the resilience of the Slough in the light of climate change.

**EDUCATION AND RESEARCH (Goal E)** – Increase the understanding and awareness of the Goleta Slough Ecosystem and its historic and future functions and values, through providing inventories of resources and supporting research and monitoring to inform decision makers and the public.

Section 4.5 of this Plan summarizes all the actions by specific subject area, e.g.,

- Administration and Management
- Goleta Slough Inlet Management and Tidal Circulation
- Monitoring and Research
- Protection, Enhancement and Restoration of Habitats
- Sedimentation and Beach Nourishment
- Support of Specific Species
- Watershed/Areawide Issues

This grouping should be helpful in implementing the Plan. For example, if funds are needed for restoration, the actions that relate specifically to restoration are grouped and can be reviewed together, and an appropriate project and funding source can be identified. Monitoring actions are particularly important so that the short- and long-term effectiveness of actions can be ascertained.

The Goleta Slough Management Committee also reviewed the summarized actions and initially divided them into ‘A’ (most important), ‘B’ (also important), ‘C’ (need to do eventually) and ‘D’ (ongoing) priorities. As GSMC intends to begin implementation of the Plan immediately, they also reviewed all ‘A’ and ‘B’ priorities and further refined them into A1, A2, A3 and A4 “sub-priorities” based on this hierarchy:

- A1 – Administration and Management
- A2 – Goleta Slough inlet and Inlet Management
- A3 – Monitoring and Research
- A4 – Protection, Enhancement and Restoration

The ‘B’ priorities follow the same “sub-priority” hierarchy.

Section 4.6 of the Plan discusses monitoring protocols as the amount and quality of baseline monitoring data is limited and should be improved. Existing monitoring protocols are discussed, including the maintenance and monitoring requirements of many projects and plans recently

approved or proposed throughout the Ecosystem. Considerations for future monitoring are discussed in Section 4.6.2.

The final section (4.7) discusses future updates to the Plan. The *Goleta Slough Area SLR and Management Plan* is one of the first comprehensive plans in the area that incorporates climate change and sea level rise. As Local Coastal Plans and other planning documents incorporate sea level rise and adaptations, this Plan may be amended to incorporate those plans directly or by reference. Regardless, the Plan should be updated at least every five years, if funding is available.