CHAPTER 6

San Dieguito Lagoon Wetland Adaptation

This chapter includes a range of adaptation measures to address flooding along the San Dieguito lagoon. This is relevant to the River Valley and San Dieguito lagoon. Permitting for some adapation measures may be processed through federal, state or City entities as summarized in Section 6.3.

Vulnerability assessment:

- As sea level rises and flooding increases, the lagoon will experience “habitat creep” as the various habitat ranges are more frequently flooded. For example, as existing wetland habitats experience more frequent flooding, vegetated wetland habitats will be “drowned out” and convert to intertidal mudflats and subtidal habitat.
- Existing pickleweed marsh habitat could drown and be lost with 3 feet of sea-level rise unless the habitat bands are allowed and able to “migrate” upland as sea level rise and flooding increase
- Cordgrass low marsh habitat could be lost with 3 to 5.5 feet of sea-level rise, such that almost all of the San Dieguito Lagoon Wetland Restoration would be converted to intertidal mudflat and subtidal open water.
- Salt marsh habitats are expected to migrate upstream along the San Dieguito River with sea level rise; however, the River corridor is relatively narrow and the overall vegetated marsh acreage will be greatly reduced.

Wetland adaptation options:

- Allow/facilitate wetland conversion and transgression
- Sediment placement
- Wetland expansion/restoration

Wetland adaptation monitoring:

- Wetland habitat loss

6.1 Adaptation options

6.1.1 Adaptation option: allow/facilitate wetland conversion and transgression

Allowing and facilitating wetland conversion and transgression is an adaptation strategy that would allow wetlands to grow into higher elevation areas as sea-level rises. Wetland vegetation establishes in areas of certain elevations relative to the tidal water levels to achieve a certain frequency of tidal inundation. As sea-level rises, the frequency of inundation increases and

plants in these elevation ranges drown out. However, the seeds of the next generation of plants can survive if they establish at higher elevations. In this way, wetlands can “migrate” or transgress upslope.
Allowing wetland transgression to happen naturally could be done in areas with existing transitional and upland habitat. In areas with development, wetland conversion could be facilitated by setting back infrastructure and development in certain key areas to leave room for marshes to migrate in the future. This could be done by setting policy that prevents any new development in the uplands surrounding wetland habitat.

Within the existing marsh basins in San Dieguito Lagoon, the salt marsh is expected to move upslope as water levels rise. However, the steep slopes will limit the amount of salt marsh in these areas. Salt marsh is also expected to move further upstream along the San Dieguito River to keep up with sea-level rise; however, the River corridor is relatively narrow and the overall vegetated marsh acreage will be greatly reduced. Acquiring upland areas near the existing marsh will be key to the sustainability of wetland habitat.

Table 6.1.1 summarizes benefits and constraints of allowing and facilitating wetland conversion and transgression. Creating space for wetlands to migrate will preserve wetland habitat until the rate of sea-level rise exceeds the migration rate. While allowing wetlands to migrate will provide more wetland habitat over time, this would come at the expense of transitional and upland habitats or developed areas. Wetlands also provide benefits such as flood and erosion protection and sequestration of greenhouse gases in the vegetation and wetted soils (see Appendix A for additional information).

Table 6.1.1
Wetland conversion and transgression benefits and constraints summary

Benefits	Constraints
• Preserves wetland habitat	• Potential loss of upland and transitional habitat
• Reduces flood and erosion risks	• Potential loss of development area
• Sequesters additional greenhouse gases in the new vegetation and soils	• Less effective over time with increasing rates of sea-level rise
	• Limited existing areas for transgression

As a next step subsequent to this Adaptation Plan, a detailed San Dieguito Lagoon Wetland Habitat Migration Assessment should be performed in conjunction with the City of San Diego and other lagoon stakeholders to further assess the potential for San Dieguito Lagoon wetland habitats to migrate upstream and to upland areas adjacent to Lagoon to further develop adaptation measures that facilitate habitat migration. This assessment will include a spatial wetland migration analysis to identify areas where salt marsh habitats will or could migrate to. It will also identify and evaluate measures to preserve these potential habitat migration areas and corridors, including potential land acquisition, use designations, zoning buffers, setbacks, and conservation easements.

6.1.2 Adaptation option: sediment placement

Sediment placement on the marshplain is an adaptation strategy that would allow wetland accretion to keep up with sea-level rise. Wetland vegetation establishes in very specific elevation zones relative to tidal water levels. If/when the tidal water levels increase, the vegetation needs to establish at higher elevations as well. This can either be done through natural transgression if there is accommodation space or by placing sediment to actually raise the surface elevations.

Sediment placement in a marsh is a relatively new, but promising adaptation measure. The first sediment placement project on the West Coast was completed in April 2016 at the Seal Beach Wetlands in Huntington Beach. Clean dredged material from the Huntington Harbor was placed in an 8-10 inch layer over a roughly 7 acre area (USFWS 2016, Figure 6.1). Monitoring is being completed to track the outcomes of the project and inform future projects.

Figure 6.1
Sediment Placement on the Marsh at Seal Beach

SOURCE: USFWS 2016

Table 6.1.2 summarizes benefits and constraints for sediment placement. Sediment placement would allow marshes to keep up with sea-level rise, reduce flood and erosion risks, and provide an opportunity for beneficial reuse of sediment. However, because sediment placement is a relatively new method, there are still many unknowns related to the impacts to the marsh. Additionally, permitting is likely to be challenging until this becomes a more common practice. Placing sediment in wetlands requires careful and unique consideration, engineering, and construction. Over time, more and more sediment would need to be placed to keep up with sea-level rise, so sediment placement would become more expensive over time. Sediment placement has the potential to be compatible with River channel dredging as an integrated wetland/River flood management adaptation strategy

Table 6.1.2
Sediment placement benefits and constraints summary

Benefits	Constraints
• Preserves wetland habitat • Reduces flood and erosion risks • Option for beneficial reuse of sediment	• Potential temporary impacts to the march • Potentially challenging to permit • More expensive way to dispose of sediment • More expensive over time as increasing rates of sea-level rise will require more sediment

6.1.3 Adaptation option: wetland expansion/restoration

Wetland expansion or restoration is an adaptation strategy that increases the area of marsh. Restoration can range from planting native plants in upland or transition zones to significant grading of marshplain or channels to achieve the appropriate elevations for tidal inundation. Restoration can be combined with allowing wetland transgression (Section 6.1.1) as upland and transitional areas become available. For example, grading channels into a site might be necessary to bring tidal waters further back, but revegetation could occur through natural recruitment.

Wetland restoration is compatible with the levees with partial retreat adaptation measure for River flooding. In this scenario, the transition and upland habitat areas could be designed to allow for wetland habitat migration with sea-level rise, thereby increasing wetland resiliency to sea-level rise.

Table 6.1.3 summarizes the benefits and constraints of wetland restoration. Creating new wetlands through restoration will preserve wetland habitat until the rate of sea-level rise is faster than the rate at which marshes can migrate. While restoring wetlands will provide more wetland habitat over time, this would come at the expense of transitional and upland habitats or developed areas.

Wetlands also provide benefits such as flood and erosion protection and sequestration of greenhouse gases in the vegetation and wetted soils.

Table 6.1.3
Wetland expansion/restoration benefits and constraints summary

Benefits	Constraints
• Creates new wetland habitat • Reduces flood and erosion risks • Sequesters additional greenhouse gases in new vegetation and soil	• Potential loss of upland and transitional habitats • Potential loss of development area • Less effective over time with increasing rates of sea-level rise

6.2 Wetland adaptation monitoring

The main criterion for initiating consideration and planning for wetland adaptation is habitat loss/conversion. With 2 ft of sea-level rise, existing high marsh (pickleweed) habitat is expected to drown out and move upslope into the existing transitional habitats. With 3 ft of sea-level rise, low marsh habitat (cordgrass) will move into areas that are currently mid marsh (pickleweed) and high marsh. As a result, mid and high marsh will be squeezed into the transition zone. With 5.5 ft of sea-level rise, all salt marsh habitat will be squeezed into the elevation band where transitional habitat occurs today, which is a smaller area than the existing wetland area.

Adaptation planning would be needed when existing high marsh converts to mid marsh and squeezes into the transition zone, which is likely to result in loss of high marsh habitat functions (e.g., loss of high tide refugia). As wetland conversion continues with sea-level rise, upland and transitional areas could be allowed to convert to marsh through wetland transgression. With enough sea-level rise (e.g., 1 ft of sea-level rise), this adaptation strategy is not expected to be effective and restoration in other higher elevation areas or placement of sediment in existing marshes would be needed. Table 6.2.1 presents monitoring criteria with wetland conversion thresholds to initiate consideration of adaptation measures. Table 6.2.2 provides lead times to begin advance planning before adaptation measures could be in place to limit risk.

Table 6.2.1
Wetland monitoring criteria to consider adaptation options

Criteria & Thresholds	Wetland Conversion	Pickleweed / Cordgrass Mudflat	Cordgrass Mudflat Open Water	Mudflat Open Water	Open Water
Adaptation Options	**Protect**		Sediment placement		
	Accommodate	Conversion and transgression			
	Retreat		Wetland expansion, migration and restoration		

Table 6 2.2
Lead times for planning wetland adaptation options

Risk	Actions	Lead Times	Adaptation Options
Lagoon wetlands	**Protect**	**5-10 years**	Sediment placement
	Accommodate	**5-10 years**	Wetland conversion and transgression
	Retreat	**10-20 years**	Wetland expansion, migration and restoration

6.3 Wetland adaptation coastal permitting

Coastal Development Permit review and approval for wetland adaptation measures may be processed through the City of Del Mar's Local Coastal Program (LCP) and/or by the California Coastal Commission as well as the US or California Fish and Wildlife Service, the US Army Corps of Engineers, and California Regional Water Quality Control Boards. Table 6.4 summarizes the likely coastal permitting mechanisms relevant to developing the LCP amendment for beach adaptation measures. Other approvals and permits would also be required and would need to be addressed separately.

Table 6.4
Summary of likely California Coastal Act approval and permitting process for wetland adaptation measures

Adaptation Measure	LCP Jurisdiction	CCC Jurisdiction	Note
Allow/facilitate wetland conversion & transgression	✔	✔	• Future wetland area zoning • Expand lagoon overlay zone to accommodate sea-level rise • San Dieguito Lagoon Restoration / SONGS Mitigation Project consideration
Sediment placement		✔	• Below mean high water • Component of Sediment Management Plan
Wetland expansion / restoration	✔	✔	• Future wetland area zoning • Component of partial Valley/Fairgrounds retreat