5.3.38 Dune Formation

Sand Dune near Monterey Bay
Photo Credit: Rose Laird

Ecological Requirements

- RCIS Regions: Monterey Bay Coastline, Salinas River and Associated Corridor
- RCIS Natural Communities: Coastal Dune
- Ecosystem function: Reduce wave damage and landward movement of shoreline, winter storm and flood protection (SRSBDR 2016, USACE 2020)
- Variation influenced by littoral sand supply, rainfall variation, shoreline changes, wind direction, and vegetation (Neuman et al. 2019, NOAA 2019, USFWS 1998b)
- Dominated by primary successional plant species which contribute to dune building and stabilization, as well as different dune zones: beach and fore dunes, mid dunes, and rear dunes (Neuman et al. 2019)
- Non-native plant species negatively impact dune ecosystem health
- Full account available: *Recovery Plan for Seven Coastal Plants and the Myrtle's Silverspot Butterfly* (USFWS 1998b)
- RCIS Conservation Target: High (Important ecosystem function creating a unique habitat)

Associated Non-Focal Species

- Northern California legless lizard (*Anniella pulchra*)
- Menzies' wallflower (*Erysimum menziesii*)
- Monterey larkspur (*Delphinium hutchinsoniae*)

Climate Change Vulnerability Assessment

Dunes in the RCIS area are found along the shoreline of Monterey Bay and are some of the most at-risk to the effects of climate change and are projected to have some of the greatest losses in current spatial distribution, because of greater and more frequent wave action, resulting in erosion and shoreline retreat (USFWS 2009). In addition, the representative plant species used in the climate change vulnerability assessments for coastal dunes had low adaptive capacity scores (Thorne et al. 2016), meaning they do not physiologically respond well to changing conditions. When combined with projected impacts of sea-level rise and changes in temperature and precipitation, coastal dunes are very vulnerable to climate change. Conservation strategies targeting non-climate stressors, such as recreation, land use changes, pollution, and invasive species, as well as allowing space for inland migration of dune formation and coastal ecosystems, can help create new areas of suitable habitat that will help reduce the pressures of climate change on coastal dunes, as well as with other focal and non-focal species. The goals, objectives, and actions shown in Table 5-61 aim to protect, enhance, and restore present day dune formation to create resiliency to projected climate changes.

Figure 5-35 shows dunes in the RCIS area.

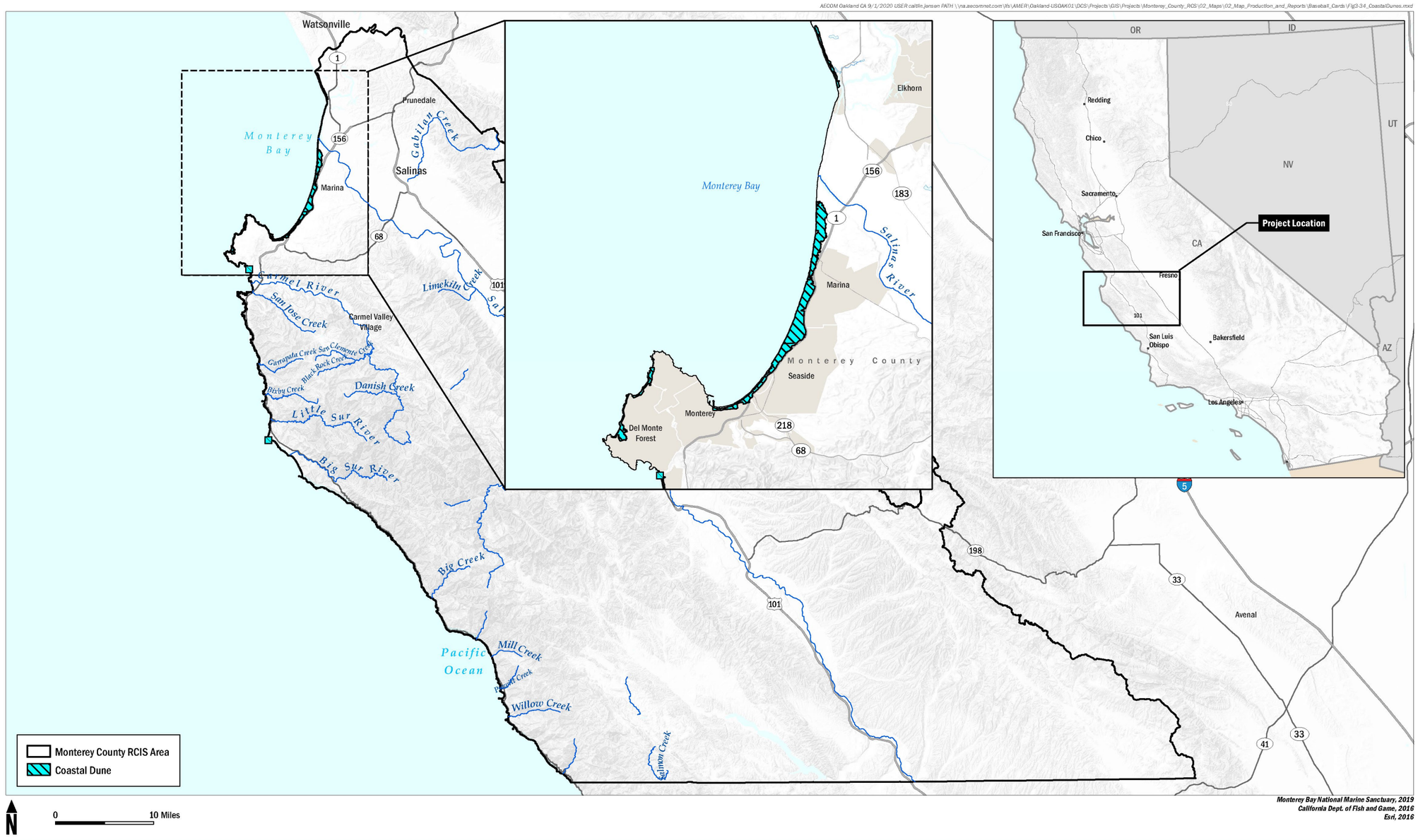

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FIGURE 5-35
Coastal Dunes in the RCIS Area

Figure 5-35. Coastal Dunes in RCIS Area

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Dune Formation Priorities, Goals, Objectives, and Actions

All Regional Conservation goals, objectives, and actions apply to dune formation. Water actions 1.1.1, 1.1.7, 1.2.3, 1.2.4, 1.2.5.

Other species-specific actions that apply to Dune Formation include:

- BLUE 1.2.1, 1.2.2, 1.3.1
- MG 1.2.1
- MS 1.2.1, 2.1.1, 2.1.2
- WSP 1.2.7, 1.3.1, 2.1.1, 2.1.2

Table 5-61 summarizes specific goals, objectives, and actions for dune formation.

Conservation Priorities

- Protect and preserve existing intact coastal dune habit along the Monterey Bay shoreline, particularly near the mouth of the Salinas River.
- Protect and preserve lands adjacent to coastal dunes, to allow inland dune migration and shoreline retreat.

Table 5-61. Dune Formation Goals, Objectives, and Actions

Goal	Objective	Threats	Co-Benefits	Action
Dune Goal 1. Promote resiliency from climate change-induced coastal retreat by encourage dune formation to maintain coastal dune communities for focal and non-focal species	Dune Objective 1.1: Enhance, restore, and create new coastal and beach systems by promoting physical processes that contribute to dune formation with a focus on locations with high resilience to projected climate changes. Measures progress toward achieving this objective by acres of dunes and adjacent/associated enhanced, restored, and/or created.	• Decrease in beach sediment sources • Climate change • Erosion	• Climate change resilience • Flood control • Other focal/ non-focal species • Biodiversity	Dune 1.1.1: Conduct beach nourishment instead of coastal armoring and create additional coastal dune systems where feasible and informed by modeled sea-level rise projections (Hutto et al. 2015).
Dune Goal 1.	Dune Objective 1.1:	• Coastal armoring • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.2: Install living shorelines using shoreline stabilization techniques informed by modeled sea-level rise projections.

Goal	Objective	Threats	Co-Benefits	Action
Dune Goal 1.	Dune Objective 1.1:	• Coastal armoring • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.3: Relocate infrastructure that are barriers to shoreline retreat (Neuman et al. 2019).
Dune Goal 1.	Dune Objective 1.1:	• Habitat loss, degradation, fragmentation • Climate change • Recreation • Erosion	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.4: Eliminate unnecessary beach access points and plan new access points in areas that minimize erosion hazards, to protect landform integrity (Neuman et al. 2019).
Dune Goal 1.	Dune Objective 1.1:	• Habitat loss, degradation, fragmentation • Climate change • Sand mining	• Climate change resilience • Other focal/ non-focal species • Biodiversity • Water quality	Dune 1.1.5: Promote positive sediment dynamics by preserving normal river flows, such as the Salinas and Pajaro rivers (Neuman et al. 2019).

Goal	Objective	Threats	Co-Benefits	Action
Dune Goal 1.	Dune Objective 1.1:	• Habitat loss, degradation, fragmentation • Climate change • Sand mining	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.6: Promote the cessation of sand mining throughout the RCIS area, to promote climate change benefits of dune presence.
Dune Goal 1.	Dune Objective 1.1:	• Habitat loss, degradation, fragmentation • Climate change • Erosion	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.7: Install sand fences to promote retention of sand and other materials.
Dune Goal 1.	Dune Objective 1.1:	• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	Dune 1.1.8: Protect, enhance, and restore adjacent habitat to allow future dune migration because of sea-level rise.

Goal	Objective	Threats	Co-Benefits	Action
Dune Goal 1.	DUNE Objective 1.2: Enhance, restore, and create new coastal and beach systems by promoting natural processes contributing to dune formation, with a focus on locations with high resilience to projected climate changes. Measures progress toward achieving this objective by the acres of dunes and adjacent/associated habitat enhanced, restored, and/or created.	• Habitat loss, degradation, fragmentation • Climate change	• Climate change resilience • Other focal/ non-focal species • Biodiversity	DUNE 1.2.1: Remove non-native vegetation in transition zone habitat to allow dune ecology to transition to mid-dune habitats (Neuman et al. 2019).
Dune Goal 1.		• Habitat loss, degradation, fragmentation • Climate change • Recreation	• Climate change resilience • Other focal/ non-focal species • Biodiversity	DUNE 1.2.2: Install buffers and signs and designate/update trails to delineate public access and reduce negative impacts on biotic factors.

Sources: Neuman et al. 2019; USFWS 1998b