

Dune Restoration

A DOI Nature-Based Solutions Roadmap Fact Sheet



Coastal dunes are large mounds of sand deposited on the landward side of a beach. Dune formation is reliant on coastal winds blowing in the onshore direction, allowing sand to accumulate when it encounters an obstacle on the beach.¹ Highly variable processes of sand deposition, accretion, and erosion result in a diversity of dune morphologies.² Dune vegetation, which often forms symbiotic relationships with fungi, helps stabilize the sand and reduce dune erosion.³

TECHNICAL APPROACH

Dune restoration aims to stabilize dunes by facilitating the natural dune creation processes.⁴ While each of the following techniques can be applied independently, the most successful projects combine multiple techniques.

- Dredging sand from offshore sources and transporting it onto the beach via piping
- Placing sand using heavy machinery. Sand mined from inland sources and taken to the restoration site can be used.⁵
- Planting dune grasses. Dune grasses are critical for stabilizing sand in the dune and supporting biodiversity.⁶ Planting dune grasses is challenging due to often harsh and windy conditions so straw or netting can be used to establish a stable substrate.
- Installing fences to help trap sand deposited by the wind, building up the dune.⁷
- Reducing beach grooming

BENEFITS

Climate Threat Reduction

- Storm protection
- Reduced flooding
- Sea level rise adaptation and resilience
- Carbon storage and sequestration

Social and Economic

- Property and infrastructure protection
- Reduced erosion
- Increased property values
- Reduced or avoided costs
- Jobs
- Mental health and wellbeing
- Cultural values

Ecological

- Enhanced biodiversity
- Increased primary productivity
- Reduced runoff

SITE SUITABILITY FACTORS

- ✓ Near existing dunes
- ✓ As far as possible from mean high water
- ✓ Parallel to the beach berm
- ✓ Straight morphology
- ✓ Windy conditions
- ✗ Adjacent to seawalls, bulkheads, or groins
- ✗ Heavy pedestrian or vehicle traffic
- ✗ High grazing pressure
- ✗ Major inflections in the seaward face of the dune
- ✗ Narrow beaches
- ✗ Arid regions

EXAMPLE PROJECT

The Abbot’s Lagoon Coastal Dune Restoration Project was conducted by the National Park Service at Point Reyes National Seashore. The restoration involved mechanical removal of invasive plants to allow native plants to recolonize the existing dunes, in addition to grading that softened unnaturally high and low dune features. This helped restore natural dune processes that support 11 threatened and endangered species.



Native dune vegetation at the site. Photo credit: [National Park Service](#)

REFERENCES

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KEY RESOURCES

Title and Link	Site Suitability	Design and Construction	Monitoring Guidance	Example Projects
Beach and Dune Restoration	✓	✓	✓	✓
Coastal Dunes: Dune Protection and Improvement Manual for the Texas Gulf Coast	✓	✓	–	✓

LEARN MORE

Visit the DOI Nature-Based Solutions Roadmap for more information on dune restoration, other nature-based solutions, and principles and considerations broadly relevant for nature-based solutions projects. The dune restoration summary includes additional details on each section included in this fact sheet, plus information on operations and maintenance, common barriers, and more resources and example projects.

Explore the Roadmap



Full Roadmap Document



Dune Restoration Section

www.nicholasinstitute.duke.edu/roadmap