SANTA MONICA BEACH RESTORATION PILOT PROJECT

OVERVIEW

This pilot project aims to restore approximately three acres of sandy coastal habitats located on the beaches of Santa Monica by utilizing existing sediments to transform a portion of the current beach into a sustainable coastal strand and foredune habitat complex resilient to sea level rise. A broad set of partnerships is proposed to actively restore three acres and passively restore two additional acres of a highly impacted beach system to bring back a diverse, endemic-rich, coastal plant and wildlife community which has been almost completely extirpated from the Los Angeles region. Returning broad ecosystem functions will create increased protection for coastal infrastructure and residences from sea level rise and erosion while providing a vital refuge for invertebrates, birds, and rare coastal vegetation species. This pilot project will also serve as a model for the region, showing that heavy recreational use of beaches and meaningful habitat restoration are not incompatible goals.

BACKGROUND

Over 17 million visitors frequent the beaches of Santa Monica every year. Southern California beach systems and associated wildlife are highly impacted by threats, including native species extirpation and extinction, erosion, non-natural sediment and sand transport through mechanical means, pollution, and loss of natural morphology due to daily vegetation and top soil removal through grooming and other regular maintenance (Dugan et al. 2003). However, these systems also offer essentially the last line of defense in terms of natural "softscape" protection. As a vital part of our coastline, beaches and dunes support and protect our homes, roads, and infrastructure, providing a natural buffer from sea level rise (SLR) as well as from tidal and wave action from the ocean. Beach habitats and dunes are critical in managing sand transport to create resilient beach morphologies, which naturally adapt to climate change impacts. By restoring natural processes to impacted beach systems, we will improve their ecological and utilitarian functions, and serve as a model for similar projects statewide.

Since the 1960s, beaches in the Los Angeles area have been subjected to the continuous removal of natural features as they begin to develop. Mechanical maintenance of beaches has significant impacts on the physical and biological processes of natural beach and dune ecosystems (Dugan et al. 2003, Dugan and Hubbard 2009, Hubbard et al. 2013). Over much of the state, and in many parts of the country, beaches are not frequently groomed, but are instead allowed to develop natural features, such as low dunes away from active recreation areas. These features not only support native, and in many

cases, rare and endemic species of plants and animals, they also provide a cost-effective buffer to storm surges and other regular, predictable threats, including SLR and increased erosion.

In addition to providing habitat for avifauna, including Federally-designated "Critical Habitat" (USFWS) for the threatened western snowy plover (*Charadrius nivosus alexandrius*), coastal strand habitats have a varied native vegetation community, including species such as red sand verbena (*Abronia maritima*), dune evening-primrose (*Camissoniopsis cheiranthifolia*), and beach saltbush (*Atriplex leucophylla*), and provide a vital habitat for invertebrate species. Thus, the current condition of groomed and flattened sand with vegetation removed provides almost no habitat value and removes all of the ecosystem services (Dugan et al. 2003, Hubbard et al. 2013, Gilburn 2012). Without vegetation, erosion is more frequent and there is nothing to trap wind-driven aeolian transport of sand (Nordstrom et al. 2011).

Future, restored conditions would include no mechanized 'flattening' of the sand and removal of vegetation. After seeding and planting vegetation, sandy coastal strand habitats and plant hummocks would develop, which would then support higher levels of the ecological community (e.g. invertebrates, birds). Recent scientific literature highlights the need for ecosystem-level, rather than species-level, beach restoration planning to achieve the greatest ecological benefits (e.g. Schlacher et al. 2008).

PROJECT DESCRIPTION

As an alternative to traditional hardscaping options, this project will evaluate a living, restored shoreline with a diverse wildlife community as an alternate approach to combat climate change. Seeded and planted specialized coastal strand and foredune vegetation will grow, develop, and begin trapping sand transported by wind. Wind-driven sand will bump into vegetation, fall, and accrete, naturally increasing the elevation of plant hummocks over time to an estimated height of 2-3 feet. Additional trapping of sand will occur through the deployment of sand fencing (Nordstrom et al. 2011). Because beach dunes accrete sediment transported from the ocean they will continue to grow concurrently with rising sea levels. This dynamic process can continue as long as the vegetation community is robust and healthy. This process has repeatedly been demonstrated in the scientific literature as well as in pilot projects in other California counties, such as the Surfer's Point restoration project in Ventura County (Figure 1). The preferred site is a single contiguous zone of beach managed by the City of Santa Monica (Map 1). Permitting, implementation, and post-restoration maintenance and monitoring will be coordinated and conducted by The Bay Foundation (TBF).

FIGURE 1. PHOTOGRAPHS SHOWING THE SUCCESSFUL RESTORATION PROJECT AT SURFER'S POINT, VENTURA COUNTY, BETWEEN SEPT. 2012 (PRE-RESTORATION) AND MAY 2013 (ONE YEAR POST-RESTORATION). INVERTEBRATES, BIRDS, AND NATIVE VEGETATION ARE ALL PROMINENT RESIDENTS.

A diverse set of entities have shown support for this project including: CA Department of Parks and Recreation (DPR), City of Santa Monica, Santa Monica Bay Restoration Commission, University of California, Santa Barbara, Loyola Marymount University, Audubon Society, California Native Plant Society, Heal the Bay, Friends of Ballona Wetlands, several elected officials, and additional expert scientists.

IMPLEMENTATION

Fencing is an integral part of the project and TBF will coordinate with the City of Santa Monica to decide on fencing material and design. Additionally, TBF will recommend a plant pallet for seeding and container stock to be reviewed by the City of Santa Monica. Signage may also be evaluated as part of the project. Recommendations on logistics and details of the project will be provided by TBF, and consultation with the City of Santa Monica will influence final decisions (see "Task" table, below). Funding for fencing, plants and seeds, signs, and any additional needed supplies will be provided by TBF.

RESTORATION MONITORING AND MAINTENANCE

Accurate and robust scientific monitoring is a vital part of any restoration project. Monitoring is used to assess successful project implementation; for example, in this project, monitoring will allow an assessment of accretion rates of sand and elevation increases to combat sea level rise. TBF will be implementing a biological, physical, and social monitoring plan before the restoration to collect baseline data, for the duration of the restoration project, and several years afterwards to assess success. Additional "control" data along the adjacent unrestored beach will be collected as part of a before-after-control-impact ecological assessment monitoring program. Specialist scientists such as ornithologists and botanists are partners in this project and will use their expertise to advise both the final monitoring program and its implementation. Data will be collected for up to ten years to evaluate the ecological health of the created coastal strand ecosystem and its potential for long-term adaptation to accelerated rates of sea level rise. Funding for monitoring and maintenance will be provided by TBF.

Adaptive management may be implemented based on the success of the project as interpreted by the beach managers and the City of Santa Monica. The monitoring components and resulting data will be integral in determining the success of the project both from a socio-economic and ecological perspective. TBF, with the help of our existing volunteer internship program, will also undertake a hands-on, community-level maintenance strategy without the use of mechanized equipment, including trash removal and invasive species removal throughout the duration of the project and for no less than ten years afterwards. Evaluation of the project will occur annually and will be provided to the City.

MAP 1 – GENERAL PROJECT LOCATION

TASKS, TIMELINE, AND RESPONSIBILITIES

TASKS	ESTIMATED COMPLETION	RESPONSIBLE ORGANIZATION
1. *Conduct Preliminary Outreach*: Targeted outreach to community stakeholders will be conducted via a diverse strategy of public meetings, a press release, newsletters, websites, and social media.	Ongoing throughout	TBF
2. *Conduct Baseline Monitoring*: Monitoring will occur for pre-restoration physical conditions, human use, and biological community.	Spring 2016	TBF & Consultants
3. *Implement Community Hands-on Dune Habitat Restoration*: Volunteer groups and partner community organizations will conduct non-mechanized, hands-on native vegetation planting, dune restoration, and installation of sand fencing and potential interpretive signage. Periodic volunteer beach clean-up days will also be implemented as needed as part of this task through partner groups.	Late Summer – Fall 2016	TBF
4. *Conduct Post-Restoration Monitoring & Maintenance*: Repeat monitoring to assess restoration success and remove non-native vegetation (if applicable).	Immediately following restoration through 10 years	TBF
5. *Complete Data Analyses and Deliverables*: Final post-restoration report will include results, statistics, volunteer and outreach data, and photos. Additional reports will be developed annually following restoration.	Summer 2017	TBF
6. *Conduct Post-Restoration Outreach and Education*: Outreach will include tours for stakeholder groups and students, posting online through websites and social media, press releases, newsletters, and meetings to present the results of this pilot project to interested groups.	Spring 2016 – Summer 2017	TBF

REFERENCES

Dugan, J. E., D.M. Hubbard, M. McCrary, M. Pierson. 2003. "The response of macrofauna communities and shorebirds to macrophyte wrack subsidies on exposed sandy beaches of southern California." Estuarine, Coastal and Shelf Science 58S: 25-40.

Dugan, J.E., Hubbard, D.M., Rodil, I.F., Revell, D.L., and Schroeter, S. 2008. Ecological effects of coastal armoring on sandy beaches. 2008. Marine Ecology. 29(1): 160-170

Dugan J.E., D.M. Hubbard. 2010. "Loss of coastal strand habitat in southern California: the role of beach grooming." Estuaries and Coasts, 33(1): 67-77.

Gilburn, A.S. 2012. "Mechanical grooming and beach award status are associated with low strandline biodiversity in Scotland." Estuarine, Coastal and Shelf Science. 107:81-88

Grifman, P.M., J.F. Hart, J. Ladwig, A.G. Newton Mann, M. Schulhof. 2013. "Sea Level Rise Vulnerability Study for the City of Los Angeles." USCSG-TR-05-2013.

Hubbard, D.M., J.E. Dugan, N.K. Schooler, S.M. Viola. 2013. Local extirpations and regional declines of endemic upper beach invertebrates in southern California. http://dx.doi.org/10.1016/j.ecss.2013.06.017

National Oceanic and Atmospheric Administration Coastal Services Center, 2012. Incorporating Sea Level Change Scenarios at the Local Level, a companion report for Technical Considerations for Use of Geospatial Data in Sea Level Change Mapping and Assessment.

* Nordstrom, K.F., Jackson, N.L., and Korotky, K.H. 2011. "Aeolian transport across beach wrack." Journal of Coastal Research. 1(59):211-217

* Nordstrom, K.F., Jackson, N.L., Korotky, K.H., and Puleo, J. 2011. "Aeolian transport rates across raked and unraked beaches on a developed coast." Earth Surfaces, Processes, and Landforms. 36:779-789

* Nordstrom, K.F., Jackson, N.L., Freestone, A.L., Korotky, K.H., and Puleo, J. 2012. "Effects of beach raking and sand fences on dune dimensions and morphology." Geomorphology. 179:106-115

Schlacher, T.A, Dugan, J., Schoeman, D.S., Lastra, M., Jones, A., Scapini, F., McLachlan, A., and Defeo, O. 2007. "Sandy beaches on the brink." Diversity and Distributions. 13:556-560

* United States Fish and Wildlife Service (USFWS). 2007. "Recovery Plan for the Pacific Coast Population of the Western Snowy Plover (*Charadrius alexandrinus nivosus*)." In 2 volumes. Sacramento, California. xiv + 751 pages.