

Wetland Restoration

Introduction

Development and filling in of wetlands has significantly reduced their historic footprint along the California coast.¹ Surviving wetlands, primarily found within the San Francisco Bay, have been negatively impacted by the introduction of invasive grasses and shifting water and sediment inflows.² Rising sea levels exacerbate these issues, squeezing existing wetlands between coastal development, and preventing them from naturally migrating inland.³ Wetland restoration projects can be pursued in areas where wetlands persist or previously existed. Specifically, restoration can allow tidal wetlands to proliferate in areas that have been diked or otherwise altered from their original condition.⁴

Wetland restoration is intended to reestablish or rehabilitate an impaired wetland.⁵ Once restored, operative wetlands provide a range of ecosystem services based upon their salinity, temperature, and geomorphic gradients. These services include increasing floodwater storage capacity, buffering storm surge, limiting saltwater intrusion into freshwater aquifers, and reducing coastal erosion, as well as increasing habitat in the region.⁶ Wetland restoration is suitable where wetlands, such as salt ponds, have been converted to agricultural lands or altered for other human use, but that remain largely undeveloped, allowing them the possibility of returning to their previous state. Additionally, conserving adjacent areas for wetlands to migrate landward is a strategy embraced by state

agencies, such as the Bay Conservation and Development Commission, for dealing with sea level rise.⁷

Tradeoffs

Wetland restoration is considered a “green” engineering solution, meaning that it can carry with it certain environmental co-benefits. The Clean Water Act,⁸ the Emergency Wetlands Resources Act,⁹ and similar laws, acknowledge the water quality, recreational, economic, flood, and erosion control benefits of wetlands. Wetlands’ protective benefits and buffering characteristics are even more important in light of rising seas and extended storm surge events, as restored tidal wetlands can buffer coastal communities and sequester carbon.¹⁰

Wetland restoration can be a less-expensive alternative to competing “gray” armoring alternatives.¹¹ Even so, these comparisons often only represent construction costs, and therefore do not account for the additional economic benefits that healthy wetlands bring about. These benefits can include local tourism, recreation, and flood protection revenues.¹² Restored wetlands can typically sustain themselves without much additional maintenance and operations costs. This cost savings is a huge consideration for choosing wetland restoration projects over competing armored solutions. Still, depending on the project design, its expanse, and any necessary land acquisition, wetland

1 Walter G. Duffy et al., *Wetlands*, in *ECOSYSTEMS OF CALIFORNIA*, 669, 673 (Harold Mooney & Erika Zavaleta eds., 2016).

2 *Id.*

3 *Id.* at 674.

4 B.J. Grewell et al., *Estuarine Wetlands*, in *TERRESTRIAL VEGETATION OF CALIFORNIA* 124 (Michael Barbour et al. eds., 3rd ed. 2007).

5 Mary E. Kentula, *Wetland Restoration and Creation*, U.S. GEOLOGICAL SURVEY, <https://water.usgs.gov/nwsun/WSP2425/restoration.html> (last visited Aug. 14, 2017).

6 *See generally* MATTHEW HEBERGER ET AL., *THE PACIFIC INSTITUTE, THE IMPACTS OF SEA-LEVEL RISE ON THE CALIFORNIA COAST* (2009).

7 *Climate Change Policies Fact Sheet*, SAN FRANCISCO BCDC, <http://www.bcdc.ca.gov/BPA/SLRfactSheet.html> (last visited Aug. 14, 2017).

8 33 U.S.C. §§ 1251 *et seq.*

9 16 U.S.C. §§ 3901 *et seq.*

10 Laura Tam, *Climate Adaptation and Sea-Level Rise in the San Francisco Bay Area*, AMERICAN PLANNING ASSOCIATION, <https://www.planning.org/planning/2012/jan/waterwarriorsside2.htm> (last visited Aug. 14, 2017).

11 *Reducing Climate Risks with Natural Infrastructure*, THE NATURE CONSERVANCY, <https://www.nature.org/ourinitiatives/regions/northamerica/unitedstates/california/ca-green-vs-gray-report-2.pdf?redirect=https-301> (last visited Aug. 14, 2017).

12 MOLLY LOUGHNEY MELIUS & MARGARET R. CALDWELL, 2015 CALIFORNIA COASTAL ARMORING REPORT: MANAGING COASTAL ARMORING AND CLIMATE CHANGE ADAPTATION IN THE 21ST CENTURY 12 (2015) (“The value of wetlands protecting coastal communities globally has been estimated at \$6,923 per hectare per year.”).

restoration projects may have a higher initial capital cost than armored strategies.

The success of wetland restoration projects can depend on their specific locations. These projects might also take decades to be fully realized.¹³ This time horizon can be problematic as some wetlands may be lost to sea level rise before their functions can be fully restored. These realities compel planners to act soon and focus on feasible wetland sites that anticipate future sea level changes and have enough space to migrate landward as seas rise.¹⁴

Legal Considerations

Wetlands have a specific legal definition in the California Coastal Act.¹⁵ Development and restoration projects within these defined areas are subject to California Coastal Commission (“CCC”) permit and environmental mitigation requirements.¹⁶ As conditions of permitting a wetland restoration project, the CCC may require additional measures, such as promoting public access, including, for example, interpretive educational programs and construction limitations.¹⁷

Wetlands restoration will also require compliance with a number of federal and state environmental laws.¹⁸ Environmental impact statements and consultations with state wildlife managers will be required for locations

featuring threatened or endangered species.¹⁹ Wetlands that have been designated as environmentally sensitive habitat areas (ESHAs) are governed by more stringent state wetland protection provisions.²⁰

Examples

The California State Coastal Conservancy has conserved or restored wetlands across 50,000 acres of California’s coast through various partnerships.²¹ Some of these projects have included vital wetland remnants along California’s south coast and the U.S. west coast’s largest wetland restoration project in San Francisco Bay’s South Bay Salt Ponds.²² Other wetlands restoration projects have included the Giacomini Wetlands within Point Reyes National Seashore²³ and the Sears Point Wetland Restoration Project in Sonoma County.²⁴ Wetlands restoration projects have been undertaken by state actors, non-governmental organizations, and private businesses alike, demonstrating the wide range of benefits they may provide.

Researchers

Jesse Reiblich, Early Career Law & Policy Fellow: jesselr@stanford.edu
Eric Hartge, Research Development Manager: ehartge@stanford.edu
Cole Sito, Legal Intern

13 Successfully restoring the functions of a wetland system can take as many as ten to fifty years. See Kentula, *supra* note 5.

14 See generally *Principles of Wetland Restoration*, ENVIRONMENTAL PROTECTION AGENCY, <https://www.epa.gov/wetlands/principles-wetland-restoration> (last visited Aug. 14, 2017).

15 See CAL. PUB. RES. CODE § 30121 (“‘Wetland’ means lands within the coastal zone which may be covered periodically or permanently with shallow water and include saltwater marshes, freshwater marshes, open or closed brackish water marshes, swamps, mudflats, and fens.”).

16 CAL. PUB. RES. CODE § 30601(2); CAL. PUB. RES. CODE § 30233.

17 CAL. COASTAL COMM’N, STAFF REPORT TH19A APPLICATION No. 4-07-098 (MALIBU LAGOON STATE PARK), available at <https://documents.coastal.ca.gov/reports/2010/8/Th19a-8-2010.pdf>.

18 For a list of compliance requirements prepared by the California State Water Resources Control Board see *Nonpoint Source Encyclopedia 6B – Restoration, Rehabilitation and Mitigation of Wetlands and Riparian Areas*, CALIFORNIA ENVIRONMENTAL PROTECTION AGENCY, https://www.waterboards.ca.gov/water_issues/programs/nps/encyclopedia/6b_restr_mit.shtml (last visited Nov. 4, 2017).

19 16 U.S.C. §§ 1531–1544.

20 *Bolsa Chica Land Trust v. Super. Ct.*, 83 Cal. Rptr. 2d 850, 862-63 (Cal. Ct. App. 1999).

21 *California’s Coastal Wetlands*, STATE OF CALIFORNIA COASTAL CONSERVANCY, http://scc.ca.gov/webmaster/brochures/Wetlands_Brochure.pdf (last visited Aug. 14, 2017).

22 *Id.*

23 See NAT’L PARK SERV., CASE STUDY 12: RESTORING THE GIACOMINI WETLANDS FROM AGRICULTURAL LANDS, POINT REYES NATIONAL SEASHORE, CALIFORNIA, available at https://www.nps.gov/subjects/climatechange/upload/CAS_Case_Study_12.pdf.

24 Press Release, Sonoma Land Trust, Sonoma Land Trust and Ducks Unlimited Kick off Construction of Sears Point 960-acre Wetland Restoration Project on San Pablo Bay, (June 6, 2014), available at https://www.sonomalandtrust.org/news_room/press_releases/1406-sears-point.html.



This research was completed in collaboration with Stanford Law School and the Natural Capital Project with support by the Stanford Woods Institute for the Environment through the Realizing Environmental Innovation Program.