California MLPA Master Plan Science Advisory Team
Draft Background Information on Wetland Restoration Activities in the MLPA South Coast Study Region

Revised March 26, 2009

Introduction

Wetlands provide important functions for wildlife and humans. Wetlands include estuaries, salt marshes, lagoons and mudflats. Wetlands are key feeding, foraging, and rearing areas for many migratory birds and provide nursery habitat for a variety of fish and invertebrate species. Additionally, wetlands provide "ecosystem services" to humans, including filtering of some pollutants and buffering storm surges and flooding impacts. However, in the Marine Life Protection Act (MLPA) South Coast Study Region (SCSR), much of the original wetland habitat has been lost or altered due to human encroachment[1].

To compensate for this extreme loss, many agencies have undertaken wetland restoration or construction projects in areas such as estuaries, salt marshes, lagoons and mudflats (see Table 1). Wetland restoration for purposes of the MLPA includes the following efforts: 1) restore or replace wetlands already degraded or destroyed, and 2) create new wetlands in areas not previously supporting wetland habitats.

The general goal of wetland restoration is to bring the environment back to a natural, or pre-disturbance, condition. Whether that goal is achieved is an important concern for the MLPA. If restored wetlands are included in proposed marine protected areas (MPAs), scientists and policy makers need to understand how well they will meet the goals of the act. If restored or created wetlands are functionally and biologically similar to natural wetlands, these areas might also meet the goals of the MLPA when included in MPAs.

Summary of Wetland Studies in MLPA South Coast Study Region

Several studies in the SCSR have investigated the ability of restored and created wetlands to mimic natural wetlands. Each of these studies used a single species or taxonomic group as a proxy to compare restored wetland habitat to natural wetland habitat.

Three studies investigated fish species in wetland habitats. Williams and Zedler[2] monitored fish assemblages in natural and reconstructed wetland channels in Sweetwater Marsh National Wildlife Refuge in San Diego Bay and found no significant differences between the two types of channels, except that California killifish were more abundant in the reconstructed channels. Likewise, Cohen and Bollens[3] found no significant differences between restored and natural wetland sites along the Napa River (in San Francisco Bay) when they investigated the diets of two fish species. Finally, Talley[4] found no significant differences in species richness or dominance of fish communities at constructed and natural wetland sites in Mission Bay. However, fish were more abundant at the natural sites, while the constructed site had more

1 Zedler, J.B. 2001. Handbook for Restoring Tidal Wetlands. CRC press, Boca Raton, Florida.
2 Williams, G.D. and J.B. Zedler. 1999. Fish assemblage composition in constructed and natural tidal marshes of San Diego Bay: relative influence of channel morphology and restoration history. *Estuaries* 22(3A): 702-716.
3 Cohen, S.E. and S.M. Bollens. 2008. Diet and growth of non-native Mississippi silversides and yellowfin gobies in restored and natural wetlands in the San Francisco Estuary. *Mar. Ecol. Prog Ser.* 368: 241-254.
4 Talley, D.M. 2000. Ichthyofaunal utilization of newly-created versus natural salt marsh creeks in Mission Bay, California. *Wet. Ecol. Manag.* 8: 117-132.

large fish and fewer small fish. Talley[5] attributed the difference in size structure to the geomorphology of the sites (the constructed site had fewer small channels), and he recorded extreme site fidelity at all sites using stable isotope analyses.

Other studies focused on shorebird utilization of restored wetland sites, and in general, they yielded similar results. Armitage et al.[5] found shorebird diversity at created wetlands in Mugu Lagoon to be higher than or equal to diversity at natural wetlands on four out of five sampling dates, and observed no differences in behavior between the sites. Similarly, Wilcox[6] found higher numbers of dabbling ducks and nesting waterbirds (including the endangered California least tern) in restored wetland sites in Newport Bay compared to natural wetland sites. However, migratory shorebirds were more abundant at natural sites than at restored sites, though numbers at restored sites increased throughout the study. The author notes that the infaunal community at the restored site might not have been fully developed, since the study took place immediately after restoration. He also attributes the increase in breeding birds to the creation of islands in the restored wetland, which provided safe habitat not present in the natural wetland. However, Zedler[7] concluded that restored wetlands in San Diego Bay did not provide adequate breeding habitat for clapper rails, since the vegetation was too short for nest building.

An additional study indirectly investigated shorebird utilization of restored habitats. Huspeni and Lafferty[8] investigated trematode parasite abundance and diversity at a site in Carpinteria marsh before and after restoration, and compared them to a natural site. The authors found trematode abundances and diversity increased dramatically over the six years following restoration, to the point that they were statistically similar to natural sites. Since the trematodes they investigated require an avian definitive host, the authors concluded birds were moving between the natural and restored sites and utilizing both of them.

Finally, Armitage and Fong[9] found that adult snails had insufficient dispersal distances to colonize a restored wetland from an adjacent natural wetland in Mugu Lagoon, though juveniles and subadults appeared to move to the restored area. They concluded that managers should not assume that relatively sedentary species will be able to colonize nearby restored habitat. Janousek et al.[10], however, found that microphytobenthic assemblages at constructed wetland sites in the Tijuana estuary quickly mirrored those at nearby natural sites, suggesting benthic algae and diatoms might not be as dispersal-limited as the snails in Mugu Lagoon.

Conclusion

5 Armitage, A.R., S.M. Jensen, J.E. Yoon, and R.F. Ambrose. 2007. Wintering shorebird assemblages and behavior in restored tidal wetlands in Southern California. *Rest. Ecol.* 15(1): 139-148.
6 Wilcox, C.G. 1986. Comparison of shorebird and waterfowl densities on restored and natural intertidal mudflats at upper Newport Bay, California, USA. *Col. Waterbirds* 9(2): 218-226.
7 Zedler, J.B. 1993. Canopy architecture of natural and planted cordgrass marshes: selecting habitat evaluation criteria. *Ecol. App.* 3(1): 123-138.
8 Huspeni, T.C. and K.D. Lafferty. 2004. Using larval trematodes that parasitize snails to evaluate a saltmarsh restoration project. *Ecol. App.* 14(3): 795-804.
9 Armitage, A.R. and P. Fong. 2004. Gastropod colonization of a created coastal wetland: potential influcences of habitat suitability and dispersal ability. *Rest. Ecol.* 12(3): 391-400.
10 Janousek, C.N., C.A. Currin, and L.A. Levin. 2007. Succession of micro-phytobenthos in a restored coastal wetland. *Estuar. Coasts* 30(2): 265-276.

Overall, these studies show that restored wetland habitat can function in a similar way to natural wetland habitat, at least with respect to the measured parameters. With the exception of a few, sedentary species, most wetland restoration projects had statistically similar species assemblages in both constructed and natural wetlands. It is important to note that species assemblages are not the only measure of a restored wetland's success. Reactors for success are size of restored area and location – is it large enough to provide buffer searchers caution, therefore, that wetland restoration in the SCSR needs greater oversight and regional collaboration to ensure that restored and natural wetlands provide high quality habitat and function as a network[11].

Table 1. Wetland Restoration Projects in the MLPA South Coast Study Region

Location	County	Size (acres)	Project Status
Santa Barbara	Santa Barbara	39	Completed
Carpinteria Salt Marsh Nature Park	Santa Barbara	20	Completed
Carpinteria Salt Marsh, UC Natural Reserve Sysytem	Santa Barbara	30	Starts Fall 2009
Storke Ranch Habitat Enhancement Demonstration Project	Santa Barbara	1	Completed
Goleta Slough	Santa Barbara		Possible plan
Santa Clara River Mouth	Ventura		In process
Mugu Lagoon	Ventura		Completed
Ballona Wetlands Complex	Los Angeles	600	In process
Malibu Lagoon	Los Angeles	23	
Malibu Creek	Los Angeles	1319 (including riparian areas)	
Dana Point Harbor	Orange		Pending
Santa Ana River Mouth	Orange		In process
Upper Newport Bay	Orange		Partially completed
Bolsa Chica Estuary	Orange	600	Completed
Batiquitos Lagoon	San Diego		Completed
Mission Bay	San Diego		Plan in place
San Diego Bay	San Diego		Partially completed
Tijuana River Estuary	San Diego		Partially completed
San Luis Rey River Wetlands	San Diego		Possible plan
San Elijo Lagoon	San Diego		In process
San Mateo Creek/San Onofre Creek	San Diego		Possible plan
Cabrillo Salt Marsh	San Diego	3.25	In planning
San Diegito River Mouth	San Diego		In process
Los Penasquitos Lagoon	San Diego		In planning

11 Zedler, J.B. 1996. Coastal mitigation in Southern California: The need for a regional restoration strategy. *Ecol. App.* 6(1): 84-93.

Location	County	Size (acres)	Project Status
Buena Vista Lagoon	San Diego		In process