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Project Facilitates the Natural Reseeding of Mangrove Forests (Florida)

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During the past century, Florida lost 23 percent of its mangrove forests, primarily due to historic mosquito management practices, coastal land filling, and development (Lewis and others 1985). The restoration of these forests is critical since they provide diverse values and functions, including coastal protection, preservation of regional biodiversity, flood attenuation, and water quality (Saenger 2003). Here, we describe how we facilitated the natural reseeding of a 4.8-acre (1.9-ha) mangrove forest at Cross Bayou in Pinellas County as part of a negotiated settlement to provide restoration following an oil spill in Tampa Bay in 1993.

Along coastlines where mangroves are successfully reproducing, seed production is generally abundant and propagule limitation is unlikely (Lewis 2005), so we expected mangroves would regenerate naturally. Eliminating planting can save approximately $59,305 per acre ($24,000/ha) in restoration costs, assuming typical planted mangrove costs of $2 each on 3-ft (0.9-m) centers. Of the mangrove species that dominate Florida wetlands, black mangroves (*Avicennia germinans*) and white mangroves (*Laguncularia racemosa*) do not naturally establish among red mangroves (*Rhizophora mangle*) below +15.7 inches (+40 cm) mean sea level, however, seedlings establish naturally from floating seeds at higher elevations (Teas and others 1976).

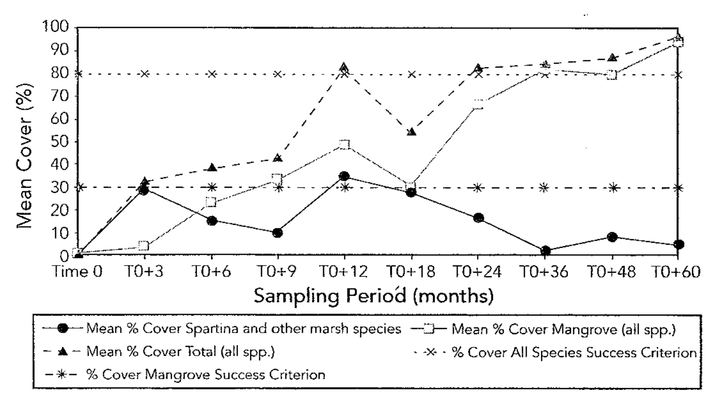

Figure 1. Mangrove cover increased from 3.7 percent to 94.7 percent within five years of eliminating invasives and regrading the site to intertidal elevations. The project met the required success criterion within three years of regrading.

Beginning in March 1999, we cleared the site of all invasive plants, including Brazilian pepper tree (*Schinus terebinthifolius*), Australian pine (*Casuarina* spp.) and melaleuca (*Melaleuca quinquenervia*), using chainsaws and 3-percent Garlon sprayed on foliage. Using surrounding natural mangrove forests as a hydrogeomorphic model, we then removed 189,000 yds^3 (5,352 m^3) of dredged material and regraded the site to intertidal elevations favorable to naturally occurring mangroves. In addition, we excavated two dendritic tidal creek systems connected to Cross Bayou through the site to enhance flushing within the developing forest. On the bare ground, we planted smooth cordgrass (*Spartina alterniflora*) sprigs on 2-ft (0.6 m) centers as a cover crop to trap mangrove seeds from adjacent forests at high tide and allow rapid secondary succession to mangroves (Lewis 1982a and b, Lewis 1990).

We measured species composition, stem density, percent cover, and plant height. Mangrove seedlings initially grew at densities of 207.7 trees/yd^2 (173.7/m^2) within three months, then decreased to a mean of 48.1/yd^2 (40.2/m^2) after five years. Mangrove cover increased linearly from 3.7 percent after grading to 94.7 percent after five years (Figure 1), and met the agency established cover success criterion within three years. As the mangrove canopy grew, the cordgrass was shaded out. White and black mangroves rapidly attained mean heights of 5.4 ft (1.6 m) and 2.8 ft (0.86 m), respectively, within five years. In addition, button mangrove (*Conocarpus erectus*) and endemic halophytic herbaceous species colonized the uplands.

We recommend the following five steps to eliminate the cost and labor of actively replanting mangrove forests (Lewis 2005): 1) determine why mangroves are not naturally present in a coastal site that should support them, 2) correct the defective conditions or pick another site, 3) refer to local reference mangrove sites and measure local tidal elevations to best understand the normal topography and subtle topographic changes that control intertidal flooding depth, duration and frequency, and 4) design the restoration to mimic the normal hydrology at a local reference site. The location of the Cross Bayou restoration site at the mouth of a historic tidal creek helped ensure its success, since reconstruction of tidal creeks within the site assured cyclical tidal flooding and drainage, and encouraged immigration of fish and other marine organisms.

References

Lewis III, R.R. 1982a. Mangrove forests. Pages 153-172 *in* R.R. Lewis III (ed.), Creation and restoration of coastal plant communities. Boca Raton, FL: CRC Press.

__. 1982b. Low marshes, peninsular Florida. Pages 147-152 *in* R.R. Lewis III (ed.), Creation and restoration of coastal plant communities. Boca Raton, FL: CRC Press,

__. 1990. Creation and restoration of coastal plain wetlands in Florida. Pages 73-101 *in* J.A. Kusler and M.E. Kentula (eds.) Wetland creation and restoration: The status of the science. Washington, D.C.: Island Press.

___. 2005. Ecological engineering for successful management and restoration of mangrove forests. *Ecological Engineering* 24(4 SI): 403-418.
Lewis III, R.R., R.G. Gilmore Jr., D.W. Crewz and W.E. Odum. 1985. Mangrove habitat and fishery resources of Florida. Pages 281-336 *in* W. Seaman (ed.), Florida aquatic habitat and fishery resources. Eustis, FL: Florida Chapter, American Fisheries Society
Saenger, P. 2003. *Mangrove ecology, silviculture and conservation*. Dordrecht, Netherlands: Kluwer Academic Publishers.
Teas, H. J., W. Jurgens and M. C. Kimball. 1976. Plantings of the red mangrove (*Rhizophora mangle* L.) in Charlotte and St. Lucie counties, FL. Pages 132-161 *in* R.R. Lewis III and D. P. Cole (eds.), Proceedings of the Second Annual Conference on Restoration of Coastal Vegetation. Tampa, FL: Hillsborough College.

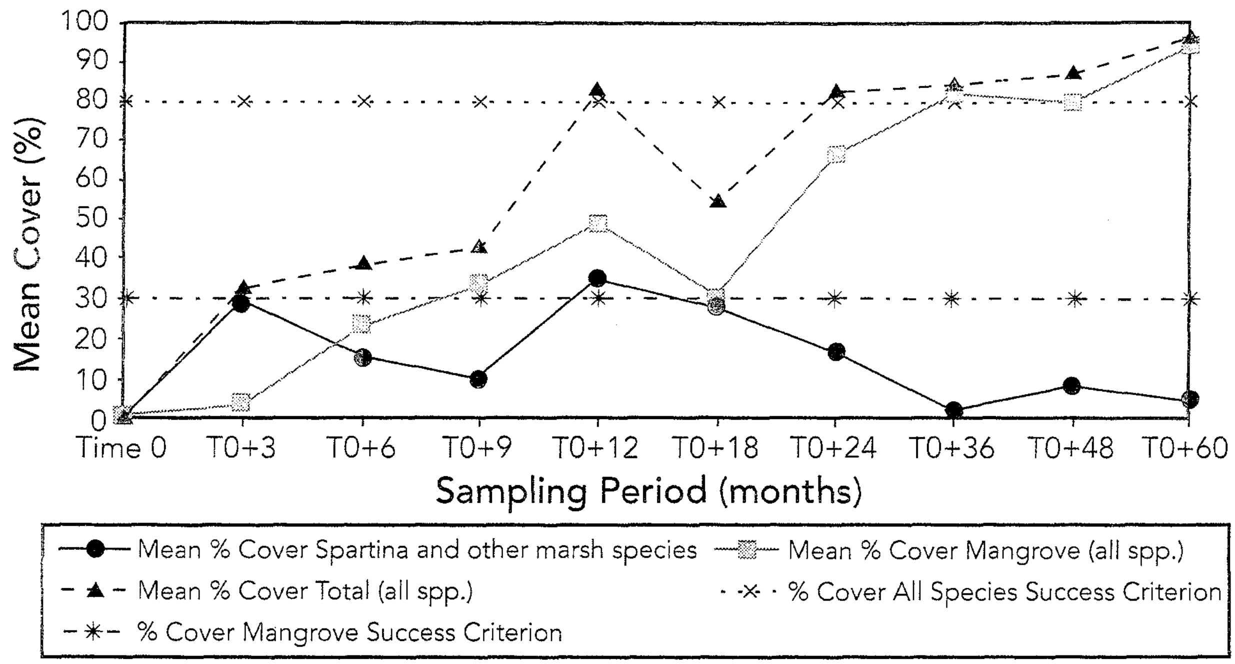

Figure 1. Mangrove cover increased from 3.7 percent to 94.7 percent within five years of eliminating invasives and regrading the site to intertidal elevations. The project met the required success criterion within three years of regrading.

ERRATA: Cost savings on planting should read "*...$9,680 per acre ($22,222/ha...*"

Excavated materials should read "*...7,000 yd^3 (5,552 m^3)...*"

Initial volunteer seedling density should read "*...145.2 trees/yd^2 (173.7/m^2)...*"

Final volunteer seedling density should read "*...33.6 trees/yd^2 (40.2/m^2)...*"