Restoring Riparian Ecosystems: The Challenge of Accommodating Variability and Designing Restoration Trajectories. 2005. Hughes, F.M.R., Anglia Polytechnic University, Cambridge and Chelmsford, England, f.hughes@anglia.ac.uk; A. Colston and J.O. Mountford. **Ecology and Society** 10(1):12. Online: www.ecologyandsociety.org/vol10/iss1/art12/.

These researchers discuss the mobile and unpredictable nature of riparian systems, the limitations of relying on reference sites, and restoration approaches that strive to mimic riparian habitat mosaics. The authors suggest that a range of ecological outcomes should define short- and long-term goals, and present the case of the drastically (and likely irreversibly) altered Wicken Fen in southeastern England as an example. The project planners hope to acquire more than 9,000 acres (3,700 ha) to create a self-regulating landscape comprised of wet grasslands, reed beds, and aquatic habitats. Though many novel habitats are expected to appear, it is hoped that the large scale of the project will compensate for losses to localized random events. As a beginning, the project has introduced free-roaming grazers (Konig ponies) and water level controls.

COASTAL & MARINE COMMUNITIES

92

Exploring Causes of a Seagrass Transplant Failure in the Potomac River (Virginia)

Edward R. Schenk and Nancy B. Rybicki, U.S. Geological Survey, MS 430 National Center, 12201 Sunrise Valley Drive, Reston, VA 20192, 703/648-4746, Fax: 703/648-5484, eschenk@usgs.gov, nrybicki@usgs.gov

In 2003 and 2004, the U.S. Geological Survey monitored a seagrass transplant site and a reference site, both located within the Chesapeake Bay watershed in Northumberland County, Virginia. The transplant site was one of six project sites where attempts to transplant submerged aquatic vegetation (SAV) has only been marginally successful since 2000. It was believed that transplant projects at two of those sites on the Maryland shore of the Potomac River failed due to riverbed accretion at one site and erosion at the other (Reel 2003 and 2004).

The goal of the transplanting project was to mitigate the destruction of 33.7 acres (13.64 ha) of SAV in Alexandria, Virginia. The Potomac mesohaline (brackish water with 5 to 18 ppt salinity) was selected for mitigation because the water quality met SAV habitat requirements, propagule flux measurements (Rybicki and others 2001) indicated a lack of propagules reaching the region, and natural seagrass beds had declined in the Potomac mesohaline after the 1930s.

In April 2003, the eelgrass (*Zostera marina*) planted in fall 2002 was present, but the fall 2002 widgeon grass (*Ruppia maritima*) had not survived. Each month during the growing season (March-November) of 2003 and 2004, we visited both sites to measure habitat variables, including sedimentation and erosion, shoot length and burial, salinity, and light attenuation.

In healthy eelgrass beds, the standing crop peaks in June or July with shoots greater than 4 inches (10 cm) throughout the growing season (Orth and Moore 1986). Between May and July 2003, eelgrass shoot length decreased at the transplant site while increasing at the reference site, and by October there was no live eelgrass at either site. In 2004, eelgrass length at the transplant site never exceeded 4 inches, and eelgrass was not present beyond June. At the reference site eelgrass was shorter in 2004 than in 2003 but the plants survived through October. Water clarity was sufficient at both sites, with the transplant and reference sites receiving a two-year median of 25 percent and 33 percent light at 3.3-ft (1-m) depth, respectively. Both sites were above the median 22 percent light level set as a habitat requirement for the mesohaline Chesapeake Bay.

The eelgrass transplant failure may have been due to above-average precipitation during both years. The increased precipitation drove salinity below eelgrass tolerance limits (10 ppt) 54 percent of the time at the transplant site and 11 percent of the time at the reference site during the combined 2003 and 2004 growing seasons (Figure 1). When salinity was above the requirement, it was often late in the growing season (July, August, or September).

Eelgrass growth and survival could have also been limited by low sediment-nutrient concentrations and poor substrate at the transplant site. In 2003, sediment ammonia concentrations were ten times lower at the transplant site than at the reference site. In 2004, sediment ammonia concentrations increased at the transplant site, but were still nearly half the concentration of the reference site. Sediments at the transplant site also contained three times less organic material than the reference site. The high (93 percent) percent of sand and the low organic content (less than 0.5 percent) of the sediments could have slowed the growth and expansion of eelgrass at the transplant site. The low amount of nitrogen and organic matter and the high proportion of sand at the transplant site may have stunted eelgrass growth, making the plants vulnerable to salinity fluctuations.

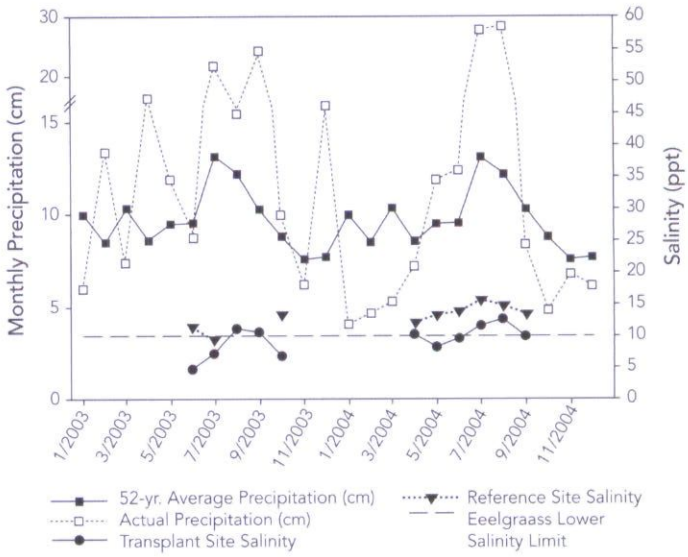

Figure 1. Precipitation and salinity during 2003 and 2004 at seagrass transplant site and reference site. Precipitation data from Norfolk International Airport.

The 2003 and 2004 combined mean monthly elevation range (n = 10) was between 0.1-2.0 inches (0.4-5.1 cm) and 0.03-4.4 inches (0.1-11.2 cm) for the transplant and reference sites, respectively. The percent of shoot that was buried was greater at the transplant site (22 percent) than at the reference site (11 percent), although both percentages were below levels shown to be detrimental to eelgrass survival (Veermaat and others 1997). Monitoring data support the conclusion that salinity and sediment nutrients, not erosion or accretion, were the primary factors responsible for the decline of eelgrass at both sites.

For mesohaline sites, transplanting several species of SAV with different salinity tolerances would increase the probability of successful revegetation despite salinity fluctuations. Further monitoring at this and other reference sites would provide a better understanding of the relations among SAV growth and light attenuation, salinity, sediment characteristics, sedimentation and erosion, and would lead to the increased capability to choose SAV transplant sites where the likelihood of success is the greatest.

References

Orth, R.J. and K.A. Moore. 1986. Seasonal and year-to-year variation in the growth of *Zostera marina* L. (eelgrass) in the lower Chesapeake Bay. *Aquatic Botany* 24:335-341.

Reel, Justin. 2003. Memorandum of Field Investigation, 197-73-BR5M00-2. Potomac Crossing Consultants, Baltimore, MD.

___ 2004. Memorandum of Field Investigation, 197-73-BR5M00. Potomac Crossing Consultants, Baltimore, MD.

Rybicki N.B., D.G. McFarland, H.A. Ruhl, J.T. Reel and J.W. Barko. 2001. Investigations of the availability and survival of submersed aquatic vegetation propagules in the tidal Potomac River. *Estuaries* 24:407-424.

Vermaat, J.E., N.S.R. Agawin, C.M. Durarte, S. Enriquez, M.D. Fortes, N. Marba, J.S. Uri, J.S. and W. van Vierssen. 1997. The capacity of seagrasses to survive increased turbidity and siltation: the significance of growth form and light use. *Ambio* 26:499-504.

93

FROM: Abstracts of the 7th International Conference on Shellfish Restoration

93.1

Restoring Bay Scallop (*Argopecten irradians*) in Rhode Island: Progress and Pitfalls of the North Cape Oil Spill Program. Hancock, B., NOAA-RIDEM Shellfish Restoration Program, NOAA Restoration Center, 28 Tazwell Dr., Narragansett, RI 02882; J. Turek, N. Lazar, J. Catena, A. Ganz and J. Holly.

These authors discuss the early results of a mitigation program that, in September and October 2003, introduced 2.1 million hatchery grown, disease-free scallops into four shallow estuarine ponds along the Rhode Island coastline. Post-release surveys in 2003 indicated good rates of survival, although starfish and crab predation was high at some sites. Surveys done in 2004 found high rates of scallop mortality, however.

93.2

A Novel Approach to Bay Scallop (Argopecten irradians) Restoration in Pine Island Sound, Florida: Release of Competent Larvae. Leverone, J.R., Mote Marine Laboratory, 1600 Ken Thompson Parkway, Sarasota, FL 34234; W.S. Arnold, S. Geiger and J.M. Greenawalt.

In 2003, these authors oversaw a bay scallop restoration project in west Florida that released late-stage scallop larvae into industrial containment booms that were set into a shallow seagrass meadow. Each boom isolated the water column and enclosed an area of 93.6 yd^2 (78 m^2). Five spat collectors were placed inside each boom. By 2004, the researchers found that scallops in the booms were growing well and that their density was two orders of magnitude greater than the resident population within Pine Island Sound.

93.3

Benthic Macrofaunal Assemblages on Restored and Unrestored Eastern Oyster (*Crassostrea virginica*) Reefs in Chesapeake Bay: Implications for Finfish Species. Rodney, W., 0105 Cole Field House, University of Maryland, College Park, MD 20742; and K.T. Paynter.

Rodney and Paynter suspect that finfish populations will benefit from the establishment of restored oyster reefs in Chesapeake Bay. They found that restored reefs contained significantly more fish prey species than unrestored reefs with the total motile macrofauna density an order of magnitude higher on restored reefs, epifaunal density more than twice as high, and sessile macrofauna density two orders of magnitude higher.

93.4

The Role of Oysters and Adaptive Resource Management in Setting Restoration Targets for Southwest Florida Estuaries. Volety, A.K., Coastal Watershed Institute, Florida Gulf Coast University, 1050 FGCU Boulevard, Fort Meyers, FL 33965; S.G. Tolley, M. Savarese, E. Rsanake, L. Haynes, J.T. Winstead, T. Barnes and P.H. Doering.

Working in the Caloosahatchee Estuary near Fort Meyers, these researchers found that freshwater releases in the range of 500 to 2,000 cfs will result in the best levels of water salinity for oyster reproduction and survival. They recommend limited freshwater releases during the winter (a time when oysters are not spawning) and decreased releases in the summer (when oysters are spawning) to decrease oyster population infections from *Perkinsus marinus* and to provide suitable conditions for oyster reef establishment and survival in the Caloosahatchee River. However, the river's hydrologic pulse is currently designed to benefit agricultural and urban interests in the area and not oysters.

94

Delaware Bay Salt Marsh Restoration. 2005. **Ecological Engineering** 25(3):199-314.

This issue of *Ecological Engineering* includes ten articles related to salt marsh restoration projects and techniques in Delaware Bay, between the Delaware and New Jersey coasts. Topics cover site history, wetland mitigation, salt hay farming, stream order analysis, large-scale wetland restoration, effects of restoration on juvenile fish, control of common reed (*Phragmites australis*), and adaptive management.

95

GAO Criticizes Chesapeake Bay Restoration Effort. 2006. Anon. **National Wetlands Newsletter** 28(1):22.

The U.S. Government Accountability Office released a report in late 2005 that severely criticized the multi-billion dollar restoration efforts in Chesapeake Bay. The report, Chesapeake Bay Program: Improved Strategies are Needed to Better Assess, Report, and Manage Restoration Program, charged that "the lack of independence in the Bay Program's reporting process has led to negative trends being downplayed and a rosier picture of the bay's health being reported than may have been warranted." The GAO also noted that the program's assessment tools were inadequate to measure the success of the restoration project. The Chesapeake Bay Program is a partnership, which was created in 1983, between the states of Maryland, Pennsylvania, and Virginia; the District of Columbia, the Chesapeake Bay Commission, and the U.S. Environmental Protection Agency.

96

Habitat Restoration: The Silver Lining in Alabama's Hurricane Recovery. 2005. Anon. **Coastal Services** 8(4):2-3.

This article describes a partnership among federal, state, and local coastal resource management agencies that, within six months of 2004's Hurricane Ivan, dredged Alabama's storm-damaged Perdido Pass (a navigation channel) and used the dredge material to rebuild dunes that had been swept away from an environmentally important conservation area. The project cost $750,000 and used pre-storm surveys of the area to guide restoration. The surveys, the relationships among agencies in an established interagency working group, and the flexibility granted in the emergency situation all contributed to the project's swift success.

97

Eastern Oysters (*Crassostrea virginica*): Demise and Restoration in New Hampshire. 2005. Greene, J., Dept. of Zoology, University of New Hampshire, Durham, NH; jenn.greene@unh.edu. **All About Wetlands** 1(3):1-2, 11.

The eastern oyster was a vital part of the Great Bay/Piscataqu River estuarine system for thousands of years until overharvesting between 1874 and 1879 nearly depleted the population. Since the 1950s, two infectious and fatal protozoans have decimated the remaining population and hampered restoration efforts. New plans call for increased efforts to restore oysters in the area through the use of disease-free oyster transplants that are raised in tanks. Greene reports that new experiments are also underway that examine how reef size affects coral reef development and success. At this point, she says that there has been some success in restoring the eastern oyster, but much remains to be learned.