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NEWS & COMMENT

ECOLOGY:

Restored Wetlands Flunk Real-World Test

[David Malakoff](#)

VINELAND, NEW JERSEY--To the untrained eye, a roadside salt marsh 8 kilometers south of downtown San Diego may look like any other urban wetland: a lush carpet of tall grass teeming with fish and birds. In fact, the 12-hectare plot in the Sweetwater National Wildlife Refuge is a kind of ecological counterfeit, created in 1985 to replace natural wetlands destroyed by construction projects. But restoration ecologists were unable to fool Nature. After intense scientific scrutiny, U.S. Fish and Wildlife Service (FWS) officials last January determined that the ersatz marsh has failed to attract light-footed clapper rails--an endangered bird for which it was supposed to provide habitat--and ordered the owner of the land, the California transportation department (Caltrans), to undertake further restoration work. "It was a mistake to assume that a constructed wetland would become equivalent to a natural system," says ecologist Joy Zedler of the University of Wisconsin, Madison, whose 10-year study of the Sweetwater marsh led to FWS's ruling.

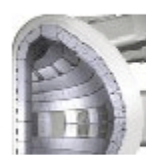
Setbacks at Sweetwater and many other sites came under the spotlight last week at a tidal wetlands meeting* here that questioned the assumptions now driving a wetlands restoration boom in the United States. The U.S. Department of Agriculture estimates that since 1982, restoration and creation projects have added more than 400,000 hectares of fresh- and saltwater wetlands to the nation's inventory. And last February, the Clinton Administration unveiled a clean-water initiative that calls for government agencies to aid efforts to create 80,000 hectares of new wetlands each year over the next decade. The plan says new marshes should be "functionally equivalent" to natural systems, meaning they should be as good as undisturbed wetlands at processing nutrients, storing floodwaters, and sheltering wildlife.

But ecologists are still debating whether it will be possible to churn out wetlands that work like the real thing. Some, including Zedler, worry that many wetlands engineers have failed to learn from past mistakes. Others are more optimistic, saying that projects considered failures today may still prove successful in time.

Such natural healing was the idea behind the Sweetwater marsh. Caltrans wetland designers assumed that once the site had been graded to the right slope and tidal flow had been restored, nature would slowly mold the marsh into a form that would support three endangered species--the clapper rail, the least tern, and the bird's beak, a small plant--that were being driven to extinction by Caltrans development. But it didn't work out that way. For one thing, Zedler and her research team, then at San Diego State University, discovered that *Spartina* cordgrass--transplanted from nearby wetlands to provide nesting sites for the clapper rail--refused to grow to 90 centimeters, the bird's preferred height. The problem, team member René Langis found, was the marsh's sandy, nutrient-poor soil. To fix that, colleagues Kevin Gibson and Kathy Boyer added nitrogen fertilizer, which spurred the grass to grow taller. But unpredictably, the added nutrients allowed pickleweed, another marsh plant, to outgrow the desired grass.

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Zedler's team also found that Sweetwater accumulated less nitrogen and produced less organic matter than nearby "reference" wetlands. Overall, using 11 criteria--such as grass height and invertebrate counts--the researchers concluded in 1990 that the created wetland was at best less than 60% equivalent to a natural marsh. When that estimate was released, Zedler recalls, "proponents of [the project] said we just had to be patient and give it a little more time. Well, now it's been 13 years, and it is still not functionally equivalent." She and San Diego State's John Callaway predict it will take at least 20 more years for the new marsh to match the reference sites for just one criterion: soil nitrogen. By other measures, Sweetwater may take much longer to resemble a natural wetland, they say.

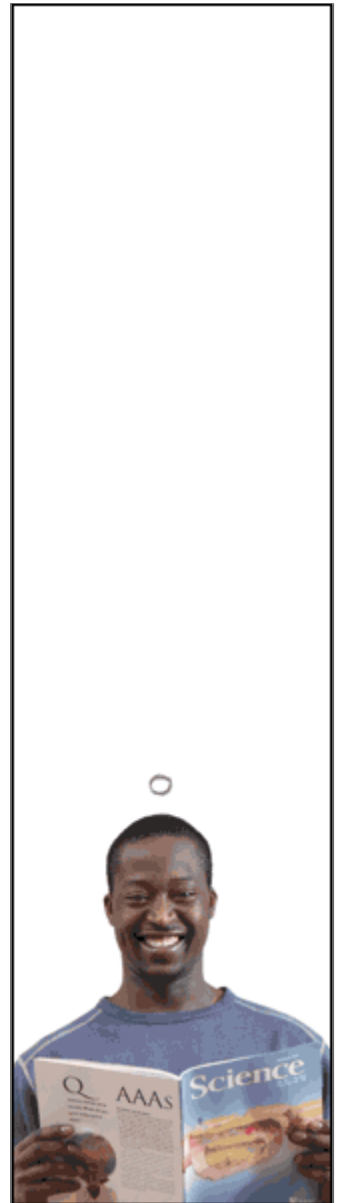
Based on Zedler's findings, FWS faulted the project for producing stunted grass--a violation of an agreement between FWS and Caltrans requiring the wetland to have the tall vegetation favored by the clapper rail. To compensate for the flaw, Caltrans must now restore other potential rail habitat on the Sweetwater refuge by removing debris that has clogged tidal channels. But the restored marsh, Zedler believes, will "never provide tall grass habitat for clapper rails, because the soils are too coarse to hold nitrogen."

Some wetland experts, however, argue that time is on Sweetwater's side. "A tidal wetland constructed on sand is going to take more than just a decade to approach natural function," says Ed Garbisch of Environmental Concern Inc., a nonprofit wetlands restoration group in St. Michaels, Maryland. Zedler's reference wetlands, he argues, "do not provide a legitimate comparison--she should compare her site to natural wetlands that are being created on [similar] mineral soils," such as those found at some river mouths.

Three years ago, the need for such one-to-one comparisons led ecologist William Mitsch of Ohio State University, Columbus, to launch one of the largest wetland experiments in the nation by building two identical 1-hectare freshwater wetlands along the Olentangy River in Columbus, Ohio. Mitsch believes that the two marshes--one stocked with plants and animals by hand, the other by nature--will eventually be indistinguishable. At the meeting, he presented data suggesting they are becoming just that, with both plots showing similar growth patterns. "The convergence in such a short a time has surprised us," he says.

But perhaps the largest current test of nature's ability to reclaim lost wetlands with just a nudge from people is currently playing out along the Delaware Bay in New Jersey. There, an electric utility--Public Service Electric and Gas Company--is using heavy equipment to breach dikes protecting farmland and surrender it back to the sea. By the end of 1999, the company--forced by regulators to undertake the \$100 million project--hopes to re-create 2500 hectares of tidal marsh in an attempt to boost the bay's seafood stocks and replace millions of fish killed by operations at one of its nuclear power plants. Such megaprojects, which typically include long-term monitoring programs, should help settle longtime debates over how best to restore tidal marshes, Zedler and others say.

But government officials keen on rebuilding the nation's wetlands may have to be more patient, says John Teal, an ecologist with the Woods Hole Oceanographic Institution in Massachusetts. "Regulators typically want creation and replacement right away," he says, "but it's going to take time for Mother Nature and Father Time to do their work."



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