Ecological engineering, design, and construction considerations for marsh restorations in Delaware Bay, USA

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Abstract

Public Service Electric & Gas of New Jersey is restoring approximately 4050 ha of salt marsh along Delaware Bay, USA, to offset possible effects on fish populations in the Bay from their existing once-through cooling system. Planning for this effort started with addressing three questions: Do marshes contribute significantly to fish production? How much marsh produces how much fish? Which marshes should be restored? There is ample evidence that salt marshes produce fish. The area of marsh necessary to offset potential losses was calculated from a simple aggregated food chain model and multiplied by four to provide a comfort level to the regulatory agencies. Marshes chosen for restoration were former salt marshes at appropriate tidal elevations. Planning involved experts in marsh ecology, hydrology, and engineering working with the company and regulatory agencies to establish clearly defined goals for the project. Design followed the advice of the experts and construction was overseen to follow the design. Long-term follow up is through adaptive management that is scheduled to continue for about a decade, depending upon progress of the restoration toward its goals. © 2002 Elsevier Science B.V. All rights reserved.

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1. Introduction

The New Jersey (USA) Department of Environmental Protection (NJDEP) issued a draft New Jersey Discharge Pollutant Elimination System (NJDES) permit for the Salem Generating Station of Public Service Electric & Gas Company (PSE&G) in 1990. The generating station is located on the shores of Delaware Bay, a 194 000 ha estuary on the East Coast of the USA. The draft permit required retrofitting the Salem Station with two cooling towers to replace the once-through cooling system that was installed when the generating stations were built in the 1980s. The once-through cooling system catches, releases and may damage fish and invertebrates at the intake...
screens and kills eggs and larvae that pass through the screens and cooling system. PSE&G believed the cost of retrofitting the stations with cooling towers would be excessive. Rather than launching an extensive legal battle with the permitting agency, PSE&G management suggested alternative ways to deal with the problem. These included redesigning intake screens, testing the use of sound as a deterrent to fish approaching the intakes, building fish ladders on dammed streams, and restoring degraded salt marshes along Delaware Bay shores. The restored marshes were to replace potential fish losses by creating fish habitat and food sources.

In this paper we describe planning and design aspects of restoring Delaware Bay salt marshes. Since the project is still in its early stages, the available data are preliminary. Articles with data from the restoration projects will start publishing in 2000.

2. Do marshes contribute significantly to fish production

The first challenge the company faced was to convince the regulatory agencies that salt marshes contribute to the well being of those species that have the potential to be affected by the power plant. This involved explaining why *Spartina patens* (Ait.) Muhl. and *Spartina alterniflora* Loisel.-dominated salt marshes are more valuable for fish production than diked marshes or those dominated by *Phragmites australis* (Cav.) Trin. Ex Steud.

Drainage features of *Spartina*-dominated marshes, especially the smallest tidal creeks, have been shown to be critically important to nekton production in a marsh. Weigert and Pomerory (1981) wrote: ‘our present view of the food web of the marsh and estuary suggests that the preservation of fisheries depends as much upon the protection of the smaller tidal creeks as upon protection of the marsh and its *Spartina* production.’ Haines (1979) commented: ‘that the ‘true’ nursery-ground of the estuary is ‘perhaps not so much the large open water rivers and sounds as the salt marshes and narrow tidal creeks.’ She added that a major export of marsh plant production may occur ‘not as particulate detritus but as living organisms.’ Reduced drainage density, as in diked or *Phragmites*-dominated marshes, is known to affect the use of the intertidal marsh by small fish and shellfish (Kneib, 1997).

Kneib (1994, 1997) focussed on accessibility to forage sites by young nekton. Using flume weirs located at relatively low and high intertidal elevations in two marshes with different drainage densities, he demonstrated that:

- fish densities at high tide were greater in the high drainage density sites; and
- fish were significantly more abundant in high than in low intertidal habitats at the high drainage density site, while no significant difference was seen at the low drainage density site.

Kneib (1994) also concluded that the arrangement of creeks seemed to control the extent to which fish use potential foraging habitats in the intertidal marsh. Marshes dissected by numerous tidal channels were used more by fish than were marsh habitats characterized by low drainage densities. Kneib (1994) and others (e.g. McIvor and Odum, 1986; Hettler, 1989; Kneib and Wagner, 1994) observed spot (*Leiostomus xanthurus* Lacepede), anchovy (*Anchoa mitchilli* Valenciennes), spotted sea trout (*Cynoscion nebulosus* Bloch & Schneider), and white perch (*Morone americana* Gmelin) in intertidal marshes. For spot, Hodson et al. (1981) showed young individuals entering the marsh had fuller stomachs than individuals from adjacent tidal creeks.

Two critical points emerge from these observations. First, functional *Spartina*-dominated salt marshes contribute significantly to estuarine fish production. Second, *Phragmites*, by changing access to the marsh and by raising the elevation of the marsh plain, contribute less to estuarine fish production than do *Spartina* marshes.

Both predator avoidance and access to a rich food source are advantages for fishes that follow the creeks into the marsh and onto the marsh plain. Zimmerman and Minello (1984), Rozas and Odum (1987), McIvor and Odum (1986, 1988), Hettler (1989), Murphy (1991), Kneib (1991), Rozas and Reed (1993) showed that fish regularly
follow the rising tide onto the vegetated marsh plain to feed or seek refuge from predators (also Laffaille et al., 1998; Miller and Guillory, 1980; Talbot and Able, 1984; Targett, 1985). Fish reach the marsh plain from subtidal creeks that have gently sloping profiles or through corridors created by small intertidal rivulets that drain the marsh surface. Rozas et al. (1988) made the following observations in their work in Virginia tidal marshes.

- Fishes were on average three times more abundant in rivulet flumes than in those on creek bank sites (only bay anchovy, *A. mitchilli*, was more abundant at creek bank sites).
- Intertidal marsh plain habitats were used extensively by several species. The two most abundant, mummichogs (*Fundulus heteroclitus* (L.)) and banded killifish (*F. diaphanus* Lesueur) moved into the marsh with an average of <10% of their stomach volume filled. When leaving the marsh, mummichogs averaged 80% gut fullness, banded killifish 60%.

The importance of the edge between the water and the vegetated marsh was examined using drop samplers in Barataria-Caminada Bay, Louisiana, by Baltz et al. (1993). Fish were observed concentrated near the interface between the *Spartina* marsh and open water, with habitat suitability steadily declining with distance from the marsh edge. Among the relevant taxa collected closer to the marsh edge were juvenile bay anchovy (*A. mitchilli* ) and young of year spot (*L. xanthurus*). Protection from predators and the availability of food were thought to contribute to the use of marsh edge habitat.

Browder et al. (1989) noted that production of fish might be more dependent on the land–water interface (edge) than on wetland acreage alone. They cited the studies of Faller (1979), Dow (1982), Gosselink (1984) who found statistically significant relationships between fishery production and edge in neighboring areas, and the work of Zimmerman et al. (1984) who found that brown shrimp (*Penaeus aztecus* Ives) densities were highest in areas of higher shoreline ‘reticulation’. Using a stochastic computer model, Browder et al. (1989) examined the relationship between land–water interface and shrimp catch in Louisiana estuaries during the period 1960 and 1967 (a period of rapid marsh disintegration). They found a significant relationship accounting for 49% of the variation in catch during this period. Edge alone accounted for 32% of the variance in the catch, a remarkable number given that fisheries effort was not included as an independent variable in their model and the inherent variability in marsh systems and fisheries catch statistics. Teal and Howes (2001), analyzing data from the 1880s, found a positive correlation between marsh edge and fish catches on Long Island.

2.1. Influence of *Phragmites australis* dominance on marsh function

Weinstein and Balletto (1999) discussed the effects of an invasive form of *P. australis* on use of the intertidal marsh by nekton. Previously published data suggest that *P. australis* negatively influences the habitat value of the marsh by elevating the marsh plain and filling in the microtopographic relief of the marsh surface (Johnston et al. 1991; Windham 1995). The former influences the hydroperiod of the marsh, i.e. the extent, frequency, depth and duration of flooding. The latter influences access to the marsh surface by nekton (Boesch and Turner, 1984; Rozas et al., 1988; Kneib, 1997). The steep banks of many *P. australis* lined tidal creeks also negatively influence the survival of small fishes by exposing them to increased predation (McIvor and Odum, 1988).

Windham’s (1995) study demonstrated that the invasion of *P. australis* into *S. patens* marshes is a primary cause of physical change in brackish tidal marshes in New Jersey. Johnston et al. (1991) showed that depth to water table and maximum elevation of the marsh plain were positively correlated with age of *Phragmites* stands, percent *Phragmites* coverage, and *Phragmites* biomass in the Mullica River, New Jersey. Changes in salinity (which decreased linearly with increases in *Phragmites* age, biomass, and proportional abundance) and higher redox values at high tide were also correlated with the presence of *Phragmites*. However, only aboveground plant biomass varied with species composition along the transition zone.
at the invading edge of the *Phragmites* stand. The failure of maximum elevation to be identified as dependent on species composition in transition zones was probably due to the time required for this relationship to develop (Bertness, 1991; Windham, 1995). In sum, these papers indicate that while *Phragmites* does tend to invade higher, brackish portions of marshes, the invasion and spread itself results in a higher, drier, more oxygenated marsh sediment.

Thus, *Phragmites* rapidly builds up the marsh plain, resulting in creek channels that have steep banks rather than gently sloped ones. Many of the first and second order creeks are filled in by rhizomes and the sediments they accumulate, reducing average drainage density and the abundance of tidal creeks over the entire marsh (our observations). It is these geomorphological (structural) features of salt marshes that *P. australis* negatively influences. Consequently, ready access to the marsh plain is denied to young fishes, including resident species (Able, personal communication) and their survival is reduced in *Phragmites*-dominated habitats.

3. How much marsh produces how much fish

The company’s second challenge was to determine how much salt marsh to restore to provide adequate compensation for potential fish loss at the generating station. Although there is no evidence from bay-wide sampling that the generating station has affected fish populations in the Bay, PSE&G had detailed records by species of fish mortality at the intake screens and larvae and eggs killed by passing through the cooling system. PSE&G staff and consultants used population models to calculate what the losses in adult populations could be, given the losses at the station. These equivalent adult populations were then used, with an aggregated food chain model based upon published trophic studies of marsh food webs (e.g. Rountree and Able, 1992) to project the marsh area needed to produce these populations. In discussions with NJDEP, PSE&G agreed to multiply the 980 ha (2425 acres) calculated by about four, resulting in about 4050 ha (10 000 acres) to be restored. The increase was to accommodate uncertainties in data, calculations and local environment.

Weinstein (1983, 1998), Weinstein et al. (1984), Weinstein and O’Neil (1986) investigated the population dynamics and production of spot, *L. xanthurus*, in tidal salt marshes in Virginia. Marsh residency, growth and survival were studied for 3 years using mark-recapture techniques to estimate production of spot while they were resident in meso-polyhaline tidal creeks of the Guinea Marshes, York River. Mean values for instantaneous mortality and emigration rates for the 3-year study were about 0.012 and 0.005, respectively. Mark-recapture estimates of population density suggested that about $50 \times 10^6$ spot would be present in the 5 ha marsh at the peak of recruitment. By applying known relationships between mortality rates, growth and production over time (Weinstein, 1998), at least $4.5 \times 10^6$ age 0+ spot survived to late fall to accompany adults on their off-shore migration. These individuals represented spot that had direct initial ties to the marsh, although about a third of them emigrated. This also assumes, of course, that survival and growth rates of spot in Virginia tidal salt marshes are of about the same magnitude as those in Delaware Bay marshes. Even without the additional incremental production of spot (that stay in open waters of the estuary throughout the year) from detritus exported to the estuarine food web, the estimated production of spot from salt marshes agrees closely with the estimates produced by the aggregated food chain model (Weinstein, 1998).

4. Which marshes to restore

The third challenge the company faced was to acquire degraded marsh that would be suitable for restoration. The marshes selected included three, diked, salt hay farms and seven undiked marshes overrun with *P. australis*. Diked salt hay farms are almost completely restricted from tidal exchange with the Bay and cannot make any significant contribution to Bay fish production. Marshes dominated by *Phragmites* contribute less to fish
production than *Spartina* marshes as described above. The salt hay farms were the first areas restored under the Estuarine Enhancement Program that PSE&G established under the 1994 permit from NJDEP. The information that follows describes only the salt hay farm restoration process.

Salt hay farms are areas of salt marsh that in their natural, unmodified state, lie at the highest tidal levels, between mean high tide and mean higher high tide. They are flat, have a firm turf that supports haying equipment, and are flooded and drained by tidal creeks. The farmers built dikes around these marshes to minimize flooding, especially during harvest periods. They installed culverts with tide gates in the dikes to drain storm flooding and rainwater. They filled in many of the tidal creeks to facilitate harvest of the hay. The result of these actions was transformation of a normal high salt marsh into an agricultural field filled with salt tolerant grasses. The absolute and relative elevation of these diked marshes fell, because the sediments dried, the organic matter oxidized and because, they were cut off from new sediment sources transported by normal tides. Undiked salt marshes in Delaware Bay accrete sediment as sea level rises (Redfield, 1972). Diking affected not only elevation, but also vegetation within the marsh. Rainfall washed out the salt from the sediments and the salt was not replenished, because, the dikes kept out all but the highest tides. Freshening of the sediment lead to invasion of plants not as salt tolerant as *Spartina* species, specifically, *P. australis*. By 1993–94, when PSE&G acquired the farms, nearly half of the area once predominantly *Spartina*-covered was covered by *Phragmites*.

The salt hay farms being restored are Commercial, Dennis, and Morris River Township (MRT)(Fig. 1). The Dennis marsh is the smallest, occupying about 148 ha. MRT, 425 ha, was first diked in 1810, but a winter storm in late 1992 (before the site was acquired by PSE&G) breached the dikes in several places and led to uncontrolled flooding. Since the drainage channels had been modified to accommodate hay production, they were inadequate to handle normal tidal flooding. The result was that the site did not drain and most of the vegetation drowned. Commercial is the largest site with over 1600 ha of marsh. It was diked for about 45 years, although it was farmed for a much longer period, likely more than 100 years. The dikes in both Dennis and Commercial were intact when restoration began. The construction phase of restoration, that consisted of dredging the larger, first and second order channels (numbering from the largest up (Weishar et al., 1998)) and connecting them to the Bay waters, was completed in August 1996 at Dennis, in November 1997 at MRT and in February 1998 at Commercial.

5. Path to success

Salt marsh restoration needs well-stated goals both as to the ultimate state of the restored marsh and the time expected to achieve the goals. The Estuarine Enhancement Program’s goals are to develop fully functional salt marshes by restoring normal tidal circulation, reducing *Phragmites* domination, and revegetating restored marshes with desirable salt marsh species, principally *S. alterniflora*, *S. patens* and *Distichlis spicata* (L.) Greene. Success would be measured by comparing the restoration sites to adjacent, functional marshes on the basis of vegetation, hydrology, geomorphology and fish use. Successful salt marsh restoration depends upon choosing a suitable site, good planning and design, the ability to carry out the construction as designed, and continued monitoring, evaluation and adaptive management.

5.1. Suitable site

The ideal characteristics of a site for salt marsh restoration are:
- a site that was previously a salt marsh;
- a site where the elevations are still suitable for growth of marsh vegetation, i.e. where the marsh plain lies near mean high tide;
- a site where propagules can arrive by natural processes;
- a site in an area that can supply sediment to restore the marsh surface to elevations similar
to nearby natural salt marshes, especially if the current marsh plain level is near the lower limit for marsh vegetation.

The proper hydrology must be attainable. Not only must the tides be able to flood the site, but also the tide driven water must have channels through which the marsh plain can drain. Drainage is essential so that the areas above mean tide level are exposed at least half of the time. This exposure is necessary for the survival of desirable marsh grasses. The ocean tides have sufficient driving force to flood any open site that is at the proper elevation. But friction can prevent drainage of the site unless there is sufficient area in tidal channels to carry the water off again.

Another requirement for restoration is the availability of propagules of marsh organisms to colonize the site. The ideal sources are adjacent, healthy salt marshes and the natural process of colonization by wind, tide and migration. Encouraging natural colonization is preferable to introducing plants and animals. Planting vegetation is expensive, particularly if genetic stocks adapted to the region are used. The seeds of most salt marsh plants are dispersed by water and should reach all areas of a marsh that have proper tidal exchange. Fishes, crustaceans, and mollusks are also dispersed by water and by active migrations, insects, spiders and mites can migrate from adjacent marshes.

There needs to be a sufficient sediment supply to raise the level of the marsh plain if, as in the case of the diked salt farms discussed here, the marsh plain has not kept up with sea level rise. If the plain is at a suitable level already, accumulation of organic matter from marsh production

Fig. 1. Map of Delaware Bay, USA, showing the location of the diked salt hay farms and the Salem generating station. New Jersey is to the right, Delaware to the left.
may be sufficient to keep up with sea level rise. In Delaware Bay, the high sediment load in the water is sufficient to maintain the marsh plain. In the Delaware Bay restoration, the 2175 ha of restored marshes are surrounded by some 80 000 ha of functioning salt marsh and exposed to the high sediment load in the waters of Delaware Bay.

5.2. Planning process

The planning process involved marsh ecologists, botanists specializing in wetlands, hydrologists, coastal geologists and design and construction engineers. PSE&G held a series of meetings with these experts in 1994–96. Participants in the hydrology meetings discussed the tidal cycles and their relationship to the ecology of the dominant marsh plants and fauna. Given the ecological requirements, the hydrologists and engineers reached consensus on a design to achieve the necessary flooding and draining of the sites. This was based on the topography of the sites to be restored (acquired from aerial photography), ground surveying and on comparisons with adjacent, reference marshes.

Once a design was proposed, the hydrodynamics of the site were modeled to assure the system would function as planned. This process was straightforward for the two smaller sites. However, the large 1600 ha commercial site required more steps in design and modeling, because of its size and configuration (Weinstein et al., 1999). Before restoration, the northwest portion of the site adjacent to the upland was flooded through a meandering tidal creek where high water lagged behind that in the Bay by about 2 h. To prevent continuous flow across the site, which could prevent sedimentation and settling of seeds, the final design included ‘regional berms’ that divided the site into sections. Fetch berms were also included to limit wave build-up and promote sediment and seed settling (Weishar et al., 1996).

The planning process incorporated the concepts of ecological engineering into the design (Mitsch, 1996). This meant that planning and modeling assumed as little physical alteration of the site as was necessary to get the process started. At all three salt hay farm sites, the design included excavating or dredging only the largest first and second order channels (number from largest to smallest). Natural forces and time were expected to provide design details. The smaller third and higher order creeks were allowed to develop by themselves, eroding from the marsh plain as we had observed in other marshes. This ensures stream formation determined by water flow, topography, weather and the developing biology. The berms were designed to last only long enough to allow the proper hydrology and biology to develop. Although a small amount of experimental planting was included in the design, most of the vegetation development was also left to nature.

5.3. Construction

Implementing the designs on the sites was a challenge since there is relatively little experience among excavating companies working in salt marshes. Many channels were dredged by impounding water on the sites to allow the dredges to operate and using dredge spoils to create high marsh areas. These had to be over-filled since they would settle by both dewatering of the spoils and compaction of underlying marsh sediments. High marsh lies between mean high tide and mean higher high tide level. Fine grasses and grass-like plants about 30 cm tall occupy them. In this restoration project, high marsh areas are important for providing habitat for locally threatened and endangered birds. Since the elevation is critical for the establishment of high marsh, it was necessary to attempt, during construction, to account for the different settling characteristics of the dredged materials at each disposal site. Subsidence has occurred in varying degrees, depending upon the nature of the sediments beneath the spoils and the nature of the spoils themselves. The process is not complete 2 years after construction, although the values so far have ranged from a few centimeters for sandy spoils deposited on thin marsh sediments to 30–70 cm for silty spoils deposited on thicker marsh sediments.

Other channels were excavated with long-reach excavators operating from moveable mats made of heavy timber. The construction of the tidal
creeks, dikes, and berms required some design modifications due to unexpected difficulties. These included changes in sediment properties that interfered with dredging and, in several areas, the presence of so many stumps buried by sea level rise that dredging was impossible. The largest changes in design were forced by a storm that opened a breach in the original perimeter dike at MRT in a place not dictated by the formal design. This resulted in a realignment of one of the dredged channels to allow nature to follow its preferred flow pathways. PSE&G required all changes (except the storms) to be agreed to by the ecologists and hydrologists as well as the project engineers.

Once the dredging and excavating were completed, selected dikes were breached and the systems were allowed to develop. The rest of the dikes were allowed to remain until destroyed by natural processes. In the 2 years since the sites were opened to the tides, the dikes have eroded in several places and now resemble the bay front in adjacent marshes. Pre- and post-construction maps for Dennis are shown in Fig. 2.

5.4. Continued data collection, evaluation and adaptive management

In situ observations, aerial surveys and comparisons to natural marshes along Delaware Bay are made regularly, following monitoring programs established for each site, to evaluate the course of restoration.

Nearly all the salt marshes on the New Jersey shore of Delaware Bay have been diked or modified (Weinstein et al., 1999). A number of these have been restored ‘naturally’ as a result of storms breaching dikes. For those events that occurred within the last few decades, aerial photographs have allowed the restoration designers to reconstruct the process of restoration in terms of marsh creek development and vegetation coverage. Some marshes where the dikes were breached by storms suffered severe erosion and full restoration is incomplete after 15–20 years. Nature and weather treated others more gently. From these the expected time of 10–15 years for restoration was proposed (Weinstein et al., 1997). The selection of reference marshes, criteria in terms of hydrology and ecology, and an adaptive management team that includes scientists, engineers, and managers is similar to the Hydrogeomorphic Method proposed by the USA Army Corps of Engineers (Brinson, 1996).

Adaptive management is the process where deviations from expected restoration goals and schedules are evaluated and, when necessary, corrected (National Research Council, 1992). The foundation of adaptive management is an understanding of tidal marsh ecology based on current literature and historical observations.

For the salt hay farm wetland restoration sites, tidal flow with suitable flooding and draining of the marsh plain was to be reestablished within 2 years following completion of channel construction. Other site characteristics desired at the end of the restoration process are:

- Open water constituents of the restored sites will be ≤ 20% of the total marsh area, with the potential to range up to 30% for the Maurice River Township Salt Hay Farm Wetland Restoration Site to sustain valuable shorebird habitat.
- Phragmites coverage will be < 5% of the total vegetated area of the marsh plain (≤ 4% of the total marsh).
- No less than 95% of the marsh plain (76% of the total marsh) will be covered by *Spartina* species with other native marsh grasses and other desirable marsh vegetation.

Under adaptive management, if the restoration does not occur on schedule, then assessment, intervention and management steps follow. These steps may include data collection, comparisons with reference sites, review of alternative corrective actions, advisory committee suggestions, NJDEP approval, and a decision as to whether or not corrective actions are warranted. Examples of areas of concern include excessive ponding that will prevent recolonization by *Spartina*, upland flooding, tidal occlusion, berm erosion before vegetation is well-established, slow (less than 9% per year increase) recolonization by *Spartina*, slow reduction in *Phragmites* coverage toward the goal of < 5% of the marsh plain.
Fig. 2. Pre- and post-restoration maps of the Dennis site. Top part shows a diked marsh of approximately 148 ha, measuring about 2.2 km from east to west before restoration. Bottom part shows six creeks that were dredged and restored to flow with the Bay or adjacent creeks and the remaining dikes. The post-restoration map also shows a road that was improved to give public access to the tidal creek.
An example of a corrective action addressed some areas of ponding on the marsh surface in the newly opened salt hay farms. To correct this, we made small channels in high areas along the dredged channels in some cases to initiate formation of the smaller channels that would facilitate drainage of the marsh plain. This procedure worked well and the areas so treated developed proper drainage within a few weeks. At other spots we allowed natural erosion to achieve the same effect.

Although the construction was completed in late summer 1996 at the first site, we already have evidence from observations of vegetation development and fish use that the restorations are on their way to success. Quantitative data that support these observations are being collected and analyzed as a part of adaptive management and will be published. Some preliminary data are given in Table 1.

### 6. Summary

Public Service Electric & Gas of New Jersey suggested salt marsh restoration as a substitute for cooling tower construction that had been suggested to offset possible effects on fish populations in Delaware Bay. There is ample evidence that salt marshes produce fish. The area of marsh necessary to offset potential losses was calculated from a simple aggregated food chain model and multiplied by four to provide a comfort level to the regulatory agencies. The sites were suitable former salt marshes at appropriate tidal elevations. Proper planning and design occurred through meetings among experts in marsh ecology, hydrology, and engineering and the company and regulatory agencies, all of whom developed clearly defined goals for the project. Construction was managed to follow the design. Long-term follow up is through adaptive management that is scheduled to continue for about a decade, depending upon progress of the restoration toward its goals.

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### Table 1

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<tr>
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