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Overview of Vol.7, No.4 - Riverine and Palustrine Wetlands

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In the United States, it is difficult to find a river that has not been subject to some type of alteration. It is estimated that only approximately 2 percent of the stream mileage in the United States remains unaltered by human-induced changes such as impounding, channelization, and dredging (Palmer 1993). The loss of wetlands in the United States has also been well documented. At least half of all wetlands have been lost or destroyed nationwide in the past century alone (American Rivers). Although this reduction in unaltered rivers and palustrine wetlands is not the direct motivation of the individual restoration projects discussed in this chapter of *Restoration and Reclamation Review*, it does highlight the importance of reviewing both successful and unsuccessful river and palustrine wetland restorations. The information from these long-term efforts (all projects in this chapter are at least 12 years old in 2001) can help improve the success of current and future restorations.

Restoration of any river, lake, or wetland first requires a careful consideration of its watershed. Rivers, however, pose a unique challenge to the restorationist. Instead of serving merely as a water reservoir from its position in the low point of a watershed, a river is a flowing system, and its configuration is actually controlled by its watershed. Urbanization, industrialization, and agriculture can damage a river's ability to transport the watershed's sediment and water, change the river's morphology, and result in reduced habitat for plants and animals in the riverine ecosystem.

Not surprisingly, then, is the manipulation of channel morphology in river restorations. Chad Buran discusses the efforts of groups in northern California to restore the Mattole River's historical salmon habitat. Logging and road construction altered river morphology, reduced the river's sediment transport capacity, and resulted in sediment covering high quality salmon spawning habitat. One solution the site managers developed was to increase the meander of a three-mile section of the stream in order to mimic the historical flow patterns. Similarly, Jill Liske describes the efforts of restorationists in Nebraska to compensate for the Platte River's reduced instream flow. Upstream water divertment has resulted in a narrower channel, bank stabilization, and the loss of floodplain wet meadows and mesic prairie, important crane roosting habitat. Unable to increase stream flow, site managers have contoured areas of the river's floodplain to enhance site hydrology to encourage the growth of wetland species typical of wet meadows.

In addition to channel manipulation, Buran and Liske detail other techniques that site managers used to correct problems instigated by watershed changes. Most of the techniques used in the Mattole River were aimed at substrate rehabilitation and bank stabilization. Buran describes the installation of scour structures to improve and create salmon habitat. Bank stabilization techniques included the installation of wing dams, rock deflectors, and the planting of riparian vegetation. Conversely, Liske details the removal of riparian woody vegetation on the Platte River because the historically shifting channel beds were the preferred roosting habitat of cranes.

Unfortunately, river restoration is not as simple as returning the river to its, for example, pre-European settlement morphology by using channel manipulation and bank and substrate rehabilitation techniques. A river is a function of its current watershed. Since the watersheds of the majority of rivers in the United States have been impacted in some way, restoring to pre-settlement conditions is normally not an attainable or necessarily desirable goal. Site managers of the Mattole and Platte Rivers are not under the illusion that their respective rivers should look exactly as they did 200 years ago. Their actions were and are goal-driven. The loss of salmon habitat in the Mattole River and crane habitat in the Platte River were the catalysts for each restoration project, and any restoration project's goals should guide the actions that

are subsequently taken. This illustrates the extreme importance of setting goals before a project begins, but it also makes it more difficult to compare the successes of different river restoration projects.

The third river restoration essay supports this point. None of the restoration techniques used in the Platte and Mattole Rivers have been implemented (as of yet) in the Cuyahoga River in Ohio, the focus of Jeff Zeitler's paper, because the Cuyahoga faces an entirely different problem: it is the victim of high pollutant levels from the long history of discharge from industrial and sewage treatment plants in its watershed. Because rivers are flowing, pollutant accumulation is not often an issue, but the Cuyahoga's pollution was compounded by the fact that it is a low gradient and dammed river. Pools behind dams, in drinking water reservoirs, and in a dredged navigation channel seriously lacked dissolved oxygen. Zeitler points out that pollution and the lack of oxygen resulted in habitat suitable for only the most pollution tolerant fish species. Two goals of the restoration project are to meet biological and water quality standards and to maintain sustainable habitat for two animal species that necessitate an increase in riparian cover. The river's site managers have chosen to focus on the goal of reducing the river's pollutants. Can we say that the Mattole and Platte River projects have made more progress than the Cuyahoga River project? The Cuyahoga does not yet have suitable habitat for some keystone animal species unlike the Mattole and Platte Rivers, but Cuyahoga restorationists have made significant progress toward reducing a stressor that the other two projects did not have. When a stressor (pollution) is as significant as it is in the Cuyahoga River, attempts at increases in animal habitat may not be prudent until the pollution is alleviated.

Palustrine wetlands are quite different in function from riverine systems. Although restoration of either system requires a review of its hydrology, palustrine wetlands are much more sensitive to changes in hydrology. If a newly restored wetland drains completely when it should be full, it will fail, or if the water is too high for a long period of time, the submergent vegetation will die. Swan Lake, a large prairie pothole in Minnesota, was a victim of the latter. In his essay, Cyrus Mahmoodi outlines the decline of Swan Lake following the installation of an inadequate water control structure in 1957 and the encroachment of intensive farming practices near the lakeshores. A prolonged stabilized water depth resulted in the reduction in abundance and diversity of emergent and submergent vegetation. This, in addition to intensive farming practices, caused the lake's historically high duck production to plummet. Since the restoration's goal was the very specific one of improving the lake's health so that it produced 10,000 ducks per year, site managers needed to look at improving native aquatic and watershed vegetation. Thus, their actions were centered on improving water level management to encourage the reestablishment of submergent vegetation (waterfowl food) and purchasing and restoring upland duck breeding habitat.

Although the size and hydrologic cycle of vernal pools is extremely different than Swan Lake's, restoring hydrology was also the primary issue in vernal pool restoration in California, the focus of Eric Van Thomme's paper. Development has damaged or obliterated many vernal pools, the home of several endangered plant species and important migratory bird resting areas. Since the goals of this restoration were to mitigate the loss of vernal pools, the site managers wanted to duplicate existing pools. Fortunately, the site managers had quality reference sites available for study, a valuable item for any aquatic restoration but one that is often unavailable. Van Thomme details the managers' reliance on reference pools in constructing the new pools. When the first constructed pools held water too long, site managers re-evaluated the reference pools and decided that the constructed pools were excavated too deeply. Once the hydrology of the constructed pools was corrected, the second phase of revegetation was relatively simple.

A notable aspect of Van Thomme's paper is the attention the site managers gave to post-construction maintenance and monitoring and the relative success of the project. Before the vernal pool construction even began, the U.S. Fish and Wildlife Service planned long-term monitoring and management to

evaluate the project's success. Although they currently know that the vernal pool restorations have been relatively successful, a more important point is that they will know if the project is **long-term** success or not because of the monitoring and management they will continue to perform. Thus, this group of vernal pool restorations provides valuable data for other vernal pool restoration projects.

The presentation of long-term river and wetland restoration projects in this volume of *Restoration and Reclamation Review* begs a question: how do we improve the success of future river and wetland restoration projects by reviewing these and other long-term restoration projects? It is impossible to compare a successful restoration of one river or wetland to another since each is complex and unique and since each project sets its own goals. However, there are important aspects to note in each project in this chapter. Each of the papers exemplifies the need for recognition that both watershed and site-scale examinations are needed to develop the best techniques to be implemented, and it is likely that the best plan will include modifications on both scales, if possible. Even with the best planning, however, mid-course corrections are common and should be expected. Each restoration project in this chapter implemented a plan or technique that needed to be reevaluated. It should also be recognized that completely successful river and wetland restorations are not the norm. Most of the long-term projects in this chapter have made excellent progress but have not yet reached the goals that were laid out for them years ago. So, how will we know if these and other projects are ultimately deemed successful? The need for complete documentation and long-term monitoring of all restoration projects cannot be over-emphasized, and planning for both should be included in the beginning stages of a restoration project. By adding case studies to the body of literature we have today, we can glean the successful (and unsuccessful) aspects of similar projects and apply them to our own.

References

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