Success of Wetland Mitigation Projects

By Rebecca L. Kihslinger

Wetland mitigation accounts for a significant annual investment in habitat restoration and protection, but is it a reliable conservation tool? This article concludes that despite the nationwide goal of "no net loss," the federal compensatory mitigation program may currently lead to a net loss in wetlands acres and functions.

The nation's 1989 goal of achieving a "no overall net loss" of wetland acres and functions has a significant influence on how the regulatory agencies administer §404 of the Clean Water Act and, in particular, the decisions they make about compensatory mitigation for permitted losses. Each year approximately 47,000 acres of wetland mitigation are required under the §404 program (ELI 2007) to compensate for about 21,000 acres of permitted losses (Martin et al. 2006), a potential gain of 26,000 acres annually. Although the amount of compensatory mitigation required provides a significant buffer in meeting the "no net loss" goal, the required compensation must be implemented on the ground and the restored wetlands must successfully replace lost wetland acres and functions in order to achieve the goal.

The success of wetland mitigation projects can be judged on whether a project meets its administrative and ecological performance measures. Administrative performance refers to the degree to which compensatory mitigation projects meet their permit requirements, such as submitting monitoring reports in a timely manner. Ecological performance refers to meeting ecological standards that ultimately result in a compensatory wetland that replaces lost aquatic resource functions.

In 2001, the *National Wetlands Newsletter* published *Count it by Acre or Function: Mitigation Adds Up to Net Loss of Wetlands* (Turner et al. 2001), providing further insight to a National Research Council (NRC) report that found that compensatory mitigation failed to achieve the national policy of no net loss of wetlands. This article reviews recent literature to determine whether or not compensatory mitigation projects required by state and federal agencies are meeting administrative and ecological performance measures. Most of the studies evaluated permittee-responsible (also known as project-specific) mitigation projects. However, some more recent evaluations deal more specifically with wetland mitigation banks.

Administrative Performance

Turner and colleagues' (2001) seminal review of the success of mitigation implementation found that mitigation projects across the country often fail to comply with their permit conditions. Of 19 reviewed studies, 10 found that the majority of evaluated projects were compliant with permit conditions, while 9 studies found that only 4 to 49% of the projects were fully compliant.

More recent studies have similar findings. Of seven studies evaluating the percent of sites meeting 100% of the required permit conditions, four found that the majority of the projects reviewed complied with all permit conditions (Ambrose and Lee 2004—69%; Cole and Shaffer 2002—60%; Minkin and Ladd 2003—67%; Sudol and Ambrose 2002—55%), while three found that only 18 to 46% of projects complied with all permit conditions (Ambrose et al. 2006—46%; Brown and Veneman 2001—43%; MDEQ 2001—18%). Ambrose and colleagues (2006) found that, on average, permitees met 73% of permit conditions. A 2002 study of compensatory mitigation in New Jersey found that on average mitigation projects met only 48% of their design requirements and permit specifications (Balzano et al. 2002). Monitoring, submission, and long-term maintenance requirements seem to be the criteria that most often go unmet, while vegetation criteria are more frequently achieved (Ambrose et al. 2006, Ambrose and Lee 2004).

A lack of monitoring and oversight of mitigation projects may contribute to low success rates. Cole and Shafer (2002) found that fewer than 10% of permit files reviewed in their Pennsylvania study contained required monitoring reports. In 2005, the U.S. Government Accountability Office (GAO) published a review of the U.S. Army Corps of Engineers' oversight of compensatory mitigation in a representative sample of Corps districts. The GAO found that the districts performed limited oversight to determine the status of required compensatory mitigation (GAO 2005). The districts did, however, provide somewhat more oversight for mitigation conducted by mitigation banks and in-lieu fee mitigation than for permittee-responsible mitigation. For the 60 mitigation banks that were required to submit monitoring reports, 70% of the files showed that the Corps had received at least one monitoring report. The percentage of the mitigation bank files with evidence that the Corps conducted an inspection ranged from 13 to 78%.

Ecological Performance

Studies of the ecological performance of compensatory mitigation have shown that compensatory wetland projects fail to replace lost wetland acres and functions even more often than they fail in their administrative performance. In fact, permit compliance has been shown to be a poor indicator of whether or not mitigation projects are adequately replacing the appropriate habitat types and ecological functions of wetlands.

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Replacing Acres

Several studies have questioned the success of wetland compensatory mitigation in replacing lost wetland acreage. In its comprehensive national study on compensatory mitigation, the NRC reported that between 70 to 76% of mitigation required in permits is actually implemented (NRC 2001). A review of mitigation sites in Michigan found that only 29% of the permits implemented the required amount of mitigation (MDEQ 2001). A study in California found that 46% of sites met acreage requirements (Ambrose and Lee 2004). Several other studies have had similar results, suggesting that the §404 program is failing to compensate for lost wetland acres (Balzano et al. 2002, Johnson et al. 2002).

Replacing Functions

In addition to not meeting acreage requirements, mitigation wetlands often do not replace the functions and types of wetlands destroyed due to permitted impacts. Turner and colleagues (2001) found that an average of only 21% of mitigation sites met various tests of ecological equivalency to lost wetlands. Two recent studies compared mitigation sites to *impact sites*. One found that only 17% of the sites evaluated successfully replaced lost functions (Minkin and Ladd 2003). The other study determined that 29% of the sites were successful in this regard (Ambrose and Lee 2004). The former study also found that 50% of the mitigation sites evaluated were actually non-jurisdictional riparian and upland habitat. Four studies comparing mitigation sites to *reference wetlands* found that fewer than 50% of the sites evaluated were considered ecologically successful (Ambrose et al. 2006—19%; Johnson et al. 2002—46%; MDEQ 2001—22%; Sudol and Ambrose 2002—16%). Ambrose and colleagues' statewide study of 143 permit files in California found that 27% of the constructed mitigation did not even meet the jurisdictional definition of a wetland (Ambrose et al. 2006).

Compensatory mitigation as required under §404 may also result in a shift in wetland type. For example, a study of 31 mitigation sites in Indiana found failure rates of 71% for forested mitigation sites, 87% for wet meadow areas, and 42% for shrub areas, but only 17% of the shallow emergent areas and 4% of open water areas were failures (Robb 2001). These results indicate that mitigation may be resulting in the replacement of forested wetland sites with shallow emergent and open water community types. Similar results have been reported in New Jersey, where a study of that state's mitigation program found that emergent wetlands were the only wetland type that achieved a greater than 1:1 replacement ratio, while forested wetlands were successfully replaced at a ratio of only 0.01:1 (Balzano et al. 2002). A Pennsylvania study of 23 §404 permits issued from 1986 to 1999 showed that only 45% of the mitigation wetlands were of the same type as the impact sites and that the mitigation had resulted in a shift from wetlands dominated by woody species to less vegetated mitigation wetlands and a replacement of scrub-shrub, emergent, and forested wetlands with open water ponds or uplands (Cole and Shaffer 2002).

Several recent studies of bank sites indicate that banks are generally no more successful at replacing lost acres and functions than permittee-responsible mitigation. A 1999 study reported a net loss of 21,000 acres of wetlands due to inclusion of enhancement and preservation as mitigation methods at bank sites (Brown and Lant 1999). A more recent comprehensive review of 12 mitigation bank sites in Ohio found that 25% of the bank areas studied did not meet the definition of wetlands (Mack and Micacchion 2006). Of the actual wetland acreage, 25% was considered in poor condition, 58% was fair, and 18% was good quality in terms of vegetation as compared to natural reference wetlands. The study also found that amphibian community composition and quality was significantly lower at banks than at natural forest, shrub, or emergent wetlands and that pond-breeding salamanders and forest-dependent frogs were virtually absent from the bank sites. Overall, of the banks studied, three were mostly successful, five were successful in some areas and failed in others, and four mostly failed. A recent study from Florida found that of the 29 banks evaluated, 70% fell within the moderate to optimal range of function. Although the baseline conditions of most sites were in the high functional range, most of the projects relied upon enhancement, rather than restoration, as the mitigation method (Reiss et al. 2007).

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Mitigation and Wildlife Habitat

Many compensatory mitigation projects do not include wildlife criteria in their design and performance standards (NRC 2001). Only a handful of studies on compensatory mitigation attempt to address the ability of compensatory mitigation to replace wildlife habitat lost through the §404 program. These studies indicate that compensatory mitigation sites are not effectively replacing lost wildlife habitat. One study reported that over half of the mitigation sites evaluated did not adequately compensate for wildlife habitat services lost due to permitted activities (Ambrose and Lee 2004). Only 41% of the studied sites had successfully replaced wildlife habitat and connectivity, while replacement failed at 38% of sites (25 of these sites were considered extreme failures). In Washington state, 55% of the sites surveyed in one study had only a moderate contribution to wildlife functions (Johnson et al. 2002), while in

New Jersey the wildlife suitability assessment criteria achieved the lowest score of all the assessment criteria used to evaluate mitigation sites (Balzano et al. 2002). The New Jersey study reported that, on average, mitigation sites provided limited protective cover, adjacent food sources, and nesting habitat for wildlife and that there were moderate human impediments to wildlife use of the sites.

Conclusion

Although wetland mitigation accounts for a significant annual investment in habitat restoration and protection, it has not, to date, proven to be a reliable conservation tool. Despite the nationwide "no net loss" goal, the federal compensatory mitigation program may currently lead to a net loss in wetlands acres and functions. On the high end, Turner and colleagues (2001) estimated that the §404 program may lead to an 80% loss in acres and functions. The success of compensatory mitigation could be enhanced by improving permit conditions and requiring clearly defined performance standards (Ambrose et al. 2006, NRC 2001, Turner et al. 2001). However, there are currently no national guidelines or models for developing ecological performance standards. Permits should clearly define performance standards that are based on ecological criteria such as community structure, soil, hydrology, amphibian communities, and vegetation (Fennessy et al. 2007). Currently, many permits simply require a certain percentage of herbaceous cover as a criterion for accessing the success of mitigation site because it is easily measured and may quickly reach required thresholds. However, percent herbaceous cover may not be a sufficient surrogate for most wetland functions (Cole and Shafer 2002).

Mitigation success may also be improved by making site selection decisions within the context of a watershed approach (NRC 2001). In 2002, the Corps issued guidance in support of the watershed approach, and draft compensatory mitigation regulations issued jointly by the U.S. Environmental Protection Agency and the Corps in 2006 may codify the approach. Under the watershed approach outlined in the proposed mitigation rule, there also may be opportunities for mitigation to support habitat conservation objectives (Bean and Wilkinson 2008). Improved compliance monitoring would also help to ensure the success of mitigation projects. As a recent GAO study indicates, many Corps districts have limited oversight of compensatory mitigation projects (GAO 2005). Increasing post-implementation monitoring and tying required monitoring periods directly to achieving final performance criteria would improve both the administrative and ecological performance of mitigation sites. ■

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