

Canoeing in the Boundary Waters Canoe Area (BWCA) in northeastern Minnesota. The BWCA is a specially managed recreational area within the Superior National Forest. Many of the lakes are designated as non-motor lakes.

gram, which requires that it must have a potential rate of at least 2 tons per acre. To date Minnesota ranks fifth in contracted CRP acres with 1.5 million acres.

Minnesota became a state in 1858, with St. Paul as its capital. It is 406 miles long and 358 miles wide. The largest county is St. Louis, which is also the second largest county in the United States. Water flows in three directions-to the Hudson Bay, to the Atlantic, and to the Gulf of Mexico. The number of lakes larger than 10 acres is 15,201. Navigable rivers are the Mississippi, Minnesota, St. Croix, Rainy, St. Louis Red River of the North, and the Red Lake River. The largest lake is the Red Lake, 440 square miles. It is well known that Minnesota lies on the western shore of Lake Superior (locally known as the North Shore) with approximately 140 miles of shoreline. Average mean temperature of 44 degrees, summer mean of 70 degrees F. Average precipitation 24.71 inches, and annual snow fall 42.3 inches. The state bird is the Loon; flower, Pink and White Lady Slipper; fish, Walleye; tree, Red Pine (or Norway Pine); grain, wild rice; mushroom, Morell; drink, Milk; and the State motto, L'Etiole du Nord (The North Star), and the State song, Hail Minnesota.

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Wetland Mitigation Banking—How It Works in Minnesota

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Minnesota widely advertises its 10,000 lakes, but it has many more wetlands. The glaciers that created Minnesota's famous lakes also formed thousands of low areas which eventually developed into wetlands. These wetlands vary according to the state's major ecological units or biomes. Northeastern Minnesota is characterized by boreal forests and extensive peat bogs. Western Minnesota is characterized by tallgrass prairie with its pothole wetlands. Southeastern Minnesota is characterized by hardwood forests and high plateaus which are dissected by numerous streams and floodplain forest wetlands.

Wetlands provide valuable and essential habitat for fish and wildlife and maintain environmental quality by removing excess nutrients and sediments from watercourses. Since settlement, the draining or filling of wetlands for agriculture and urban development have caused the loss of many of the state's wetlands. The Minnesota Department of Transportation (Mn/DOT) fills wetland habitat in the course of improving and maintaining the state's highway system. During the past two decades, actions affecting wetlands have been regulated by a variety of federal and state laws and regulations. To insure that wetland impacts were assessed and mitigated in an appropriate and efficient manner, Mn/DOT in cooperation with other state and federal agencies has developed wetland mitigation banking. In this banking system the loss of unavoidable wetland habitat is offset by wetland enhancement, restoration and creation.

Activities in Minnesota's wetlands are regulated by the Army Corps of Engineers (in consultation with the U.S. Fish and Wildlife Service) and the Minnesota Department of Natural Resources. When federally funded transportation projects affect wetlands, it is Mn/DOT's responsibility to mitigate these losses (Executive Order 11990). Wetland Habitat Mitigation Banking is a formal procedure that quantifies and qualifies both wetland impacts and wetland mitigation. It encourages maximum use of resources and opportunities available on or adjacent to highway projects. Mitigation banking promotes cost effectiveness by allowing projects affecting wetlands to proceed without costly delays.

Mn/DOT has, in the past, mitigated wetland impacts without a mitigation banking process. However, the old ad hoc approach to mitigation sometimes resulted in problems including high cost for the amount of mitigation gained, project delays, and loss of the wetland resource. Significant and moderate level impacts were mitigated, but much time was spent in coordination and negotiation with natural resource agencies. Coordination was done on a case-bycase, piecemeal basis. Agreements reached on a given project might not necessarily apply to other projects. Cost effec-

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Fig. 1. Mitigation banking flow chart for debits and credits.

tiveness of on-site mitigation was variable. High costs were not always indicative of the quality of the benefit received by the wetland resource.

Sometimes extra mitigation measures were possible on a given project, but there was no incentive to do a better job than warranted by the project's impacts. When mitigation more than compensated for project impacts, the extra effort went unrewarded. Small impacts, not mitigated on-site and too small to warrant off-site mitigation, caused much work and costly delays. Sometime they "fell through the cracks" and were not mitigated. This meant a loss to the wetland resource with all the concommitant adverse impacts to wildlife and to the human population.

The banking guidelines were developed with the active involvement of the cooperating federal and state agencies: Federal Highway Administration, U.S. Fish and Wildlife Service and the Minnesota Department of Natural Resources. They were issued in the form of a Minnesota Department of Transportation Technical Memorandum, which is binding on Mn/DOT's operating districts.

The banking process has solved the problems identified above by speeding up inter-agency coordination, standardizing the approach to mitigation requirements, and outlining a means of mitigation acceptable to all agencies involved (see Figure 1). An accounting system keeps track of both impacts and mitigation to make sure that maximized mitigation efforts are being rewarded. Banking also provides Mn/DOT with the opportunity to mitigate off-site, if on-site mitigation is not practicable. WHMB consists of treating wetland impacts as debits and wetland mitigation as credits. The accounting process where the two cancel one another out is the bank account. Similar to a checking account, the WHMB account ideally maintains a positive balance.

Debits come about when a construction project (1) affects wetlands, (2) on-site mitigation is *not* feasible, and (3) the entire impact is debited. These kinds of projects typically involve little or no right-of-way acquisition and include bridge replacements, shoulder regrading and addition of turn lanes. Debits can also enter the account when a construction project (1) impacts wetlands, (2) onsite mitigation *is* feasible but does not entirely compensate for the impacts, and (3) the excess impact is debited. These kinds of project involve some right of way acquisition (where ponds can be created or small wetlands enhanced within right of way limits) including straightening of dangerous curves and upgrading from two lane to four lane divided highway.

Credits come about when a construction project (1) impacts wetlands, (2) on-site mitigation *more than* compensates for the impact, and (3) the excess mitigation is credited to the bank. Such projects include borrow areas where the removal of material needed for construction leaves behind depressions that extend down to the ground water table.

Credits also enter the account when a construction project does not incur wetland impacts, but Mn/DOT takes advantage of on-site opportunities to enhance, restore, or create wetlands. Such projects may involve rest areas where wetlands are created or enhanced for aesthetic purposes as well as wildlife habitat. When pond construction is needed along the roadway for stormwater detention, the pond designs can incorporate features (gradual slopes, shallow depths, etc.) which makes them attractive and beneficial to wildlife. In addition to on-site mitigation measures, WHMB gives Mn/DOT the opportunity to provide off-site mitigation in areas away from highway projects where enhancement and restoration can be undertaken on a larger scale. Off-site mitigation may be accomplished on public lands or private lands. Easements or fee title are obtained by Mn/DOT, and the improvement project is constructed. Usually the completed mitigation project is turned over to natural resource agencies for upkeep and management.

To use a banking concept, a common denominator or currency is needed to represent both impacts (debits) and mitigation (credits). To derive this currency, wetlands are evaluated on their particular quality as well as type and size. The procedure used in Mitigation Banking is a modified version of the Habitat Evaluation Procedure (USFWS 1976). Patterned after the USFWS method, it is an ecologically based procedure which evaluates wetlands on the basis of quality, type, and size. A habitat value is derived by evaluating the food, cover, and reproductive potential of a wetland for eight species of wildlife representing four feeding niches and four reproductive niches. This habitat value represents the value of a particular wetland on a per-acre basis. This per-acre value is then multiplied by the total acreage of the basin to arrive at the number of habitat units representing the wetland's worth.

The habitat evaluation procedure allows a numerical value to be assigned to a given wetland based on its type, size and particular value to wildlife. In the banking procedure the same analysis is applied to impact areas as well as mitigation areas, thus insuring a consistent method for accounting of both debits and credits. Because the wetlands in Minnesota's ecological regions vary in frequency of occurrence and species composition, consistency is also maintained by locating mitigation in the same ecological region as the wetland losses.

Examples of Mitigation Banking Projects in Minnesota

On-site mitigation measures have included the creation or enhancement of small wetlands within highway-right-ofway. Off-site mitigation measures have included restoration of drained wetland basins, enhancement of existing wetlands (Figures 2 and 3) and wetland creation during borrow operations (Figures 4 and 5).

Lamperts Marsh, a 28 acre wetland in the northern prairie pothole region, was enhanced by adding an elbow to the highway centerline culvert at its inlet (Figure 2). The water level increase of approximately one foot changed Lamperts Marsh from a seasonally inundated, cattail-choked basin, with a habitat value of approximately 65 points per acre, to an open water marsh, with a habitat value of approximately 92



Fig. 2. Spring runoff flows over the culvert outletting Lamperts Marsh. Before the elbow was added, much of this water drained off, leaving the marsh in a seasonally wet condition.



Fig. 3. While the center of Lamperts Marsh opens up, remnants of the dense cattail stand are still visible.

points per acre, (Figure 3). The cost of the venture was estimated at \$2,000. The amount of wildlife habitat units gained can offset future impacts to approximately 8 acres of marsh habitat in the prairie pothole region.

The Lake George Borrow Pit was created when borrow removal penetrated the ground water table in the boreal forest region. The 40-acre borrow site, adjacent to the highway for which the borrow was needed, contains 8 small wetland basins of various sizes and depths (Figure 4). When the site has completely revegetated, it will support a 12-acre wetland complex including fresh meadow, shallow marsh, and deep marsh wetland types (Figure 5). The habitat value gained was approximately 84 points per acre. Because the borrow was needed for highway improvements, the project was done at little extra cost to Mn/DOT. These gains can offset future impacts to approximately 12 acres of marsh habitat in the boreal forest region of Minnesota.

The banking mitigation process insures that decisions



Fig. 4. Excavation of borrow from the Lake George Borrow Pit resulted in a series of basins that will eventually become a wetland complex.



FIg. 5. The Lake George Borrow Pit wetlands complex is in Minnesota's northern boreal forest region. made within banking guidelines follow a consistent, standardized approach to impact assessment and mitigation requirements between various agencies (Figure 1). Mutual agreement among all the agencies is needed for a project to successfully go through the bank. While this means a single no-vote can stop the progress of a project, it also means no one agency must follow a course of action it does not want.

Mitigation banking was not intended to apply to all projects. Its purpose is to make coordination and mitigation easier for most projects, especially those with small areas of impact. Banking as a process will become ineffective if burdened by controversial projects or projects that require special documentation, such as those projects affecting public park lands or federal management areas.

The importance of mitigation banking for the resource and for the various agencies involved is that the agency responsible for construction projects does not have to mitigate all impacts on site, especially where mitigation would not be cost-effective. The establishment of a few large mitigation areas can compensate for many small impacts. This saves time by avoiding project delays and increases the costeffectiveness of mitigation efforts. Large mitigation areas (15–20 acres or more) are considered to be of more benefit to wildlife. The overall result is increased benefits to the wetland resource as well as the taxpayer.

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The College of Natural Resources (CNR) at Utah State University announces the Quinney Visiting Scholar Program made possible by a grant from the Joe and Jessie E. Quinney Foundation. Awards are available for established scholars who would like to spend between three and twelve months in the College of Natural Resources at Utah State University.

The purpose of the program is to facilitate interchange between the scholars and the students and faculty of CNR in new, exciting areas of teaching, research, and management of natural resources. It will provide an opportunity for the visiting professionals to explore new and innovative ideas free from the demand of their work place. It will also broaden the perspectives of the CNR students and faculty. Letters of inquiry should be directed to the Dean, College of Natural Resources, Utah State University, Logan, Utah, 84322-5200.