

Practical Methods to Protect and Enhance Habitats

A Summary of the Habitat Session from the Practical and Cost-Effective Watershed Management Conference May 3, 1996, Livonia, Michigan

Compiled and Edited

by

Rouge River Remedial Action Plan Advisory Council's Habitat Subcommittee

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Introduction and Overview

The basic intent of watershed management is similar to ecosystem-based management. An ecosystem approach accounts for the interrelationships among land, water, air, and living things, including humans, and involves all user groups in comprehensive management. An ecosystem approach can be symbolized as a circle with three equal compartments representing social, economic, and environmental interests (Figure 1). The operating principle of an ecosystem approach is that no segment of the circle can be sacrificed and all are essential to maintain a functional and sustainable ecosystem. In addition, an ecosystem approach to watershed management works to ensure win-win solutions among economic, environmental, and societal interests.

Figure 1. An ecosystem approach to watershed management.



What watershed planning and management and ecosystem-based management are trying to accomplish is to comprehensively address contaminant (e.g., point and nonpoint sources, contaminated sediment remediation), physical (e.g., flow augmentation, streambank stabilization, physical habitat modification), and biological (e.g., stocking/harvesting, wetland restoration and enhancement, food web manipulation) management alternatives that will achieve locally-based, ecosystem goals. Such site-specific, ecosystem goals are established based on ecosystem characteristics, public needs, and scientific, regulatory, and resource management input.

Historically, many people have believed that when environmental concerns win, economic concerns lose, and vice-versa. That doesn't have to be the case. Watershed and ecosystem-based management provide a balance among environmental, economic, and societal issues, forming win-win situations.

On May 3, 1996 a Practical and Cost-Effective Watershed Management Conference was held in Livonia, Michigan. The conference attempted to move beyond theory to practice by presenting practical and cost-effective methods for implementing watershed management. The conference included technical sessions on:

- practical methods to protect and enhance habitats;

- storm water management;
- theory, practice, and institutional arrangements; and
- funding local activities to put watershed management in action.

Over 300 people participated, including township, village, and city elected officials; planning and zoning officials; government managers and staff; developers; builders; consultants; planners; engineers; landscape architects; park and subdivision design and review consultants; road commissioners and staff; drain commissioners and staff; citizen groups; property owners; and other stakeholders. The purpose of this summary report is to:

- present an overview of the key ideas and findings from the technical session on practical methods to protect and enhance habitats;
- present the extended abstracts from all papers presented at the technical session on practical methods to protect and enhance habitats; and
- identify key methods manuals and resource documents relative to protecting and enhancing habitats (see Appendix A).

Watershed management is not a new concept, however, its practical application is. Watershed management attempts to apply an ecosystem approach. An ecosystem approach is both a way of doing things and a way of thinking. Themes inherent in an ecosystem approach:

- an ecosystem as "home" (i.e., humans are part of ecosystems, not separate from them; it is the difference between "house" that is viewed as external and detached, and "home" where people see themselves in even when not there);
- everything is connected to everything else (i.e., the interconnectedness of all ecosystem components, including society, economy, and environment);
- sustainability (i.e., a commitment to environmentally-sustainable economic development);
- understanding places (i.e., the more people understand the bioregion in which they live, the more they will perceive it as "home" and the more they will harmonize their decision-making accordingly); and
- integrating processes (i.e., integrating economic decision-making with environmental decision-making).

Adopting an ecosystem approach to watershed management means undertaking holistic planning, research, and management. In governmental regulatory and resource management agencies, adopting an ecosystem approach has initiated a shift from a narrow perspective of managing a single environmental medium (e.g., water, air) or a single resource (e.g., fish, trees) to a broader perspective that focuses on managing human uses and abuses of watersheds or bioregions, and that addresses all environmental media and resources in a comprehensive and systematic fashion. For example, Fisheries Division of Michigan Department of Natural Resources, Land and Water Management Division and Surface Water Quality Division of Michigan Department of Environmental Quality, and Michigan's Office of the Great Lakes have all adopted a common approach to watershed management and agreed to cooperative action.

Table 1. Michigan's approach to watershed management as adopted by Fisheries Division, Land and Water Management Division, Surface Water Quality Division, and the Office of the Great Lakes, May 1995.

<p>Watershed Management is a process of decision-making regarding uses and modifications of lands and waters within a watershed. This process provides a chance for communities to balance diverse</p>
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goals and uses for local resources, and to consider how their cumulative actions may affect long-term sustainability of these resources.

Human modifications of lands and waters directly alter delivery of water, sediments, and nutrients, and thus fundamentally alter aquatic systems. People have varying goals and values relative to uses of local land and water resources. Watershed management provides a framework for integrated decision-making, where we strive to: 1) assess the nature and status of the watershed ecosystem; 2) define short-term and long-term goals for the system; 3) determine objectives and actions needed to achieve selected goals; 4) assess both benefits and costs of each action; 5) implement desired actions; 6) evaluate the effects, actions and progress toward goals; and 7) re-evaluate goals and objectives as part of an iterative process.

As a form of ecosystem management, watershed management encompasses the entire watershed system, from uplands and headwaters to floodplain, wetlands and river channels. It focuses on the processing of energy and materials (water, sediments, nutrients, and toxics) downslope through this system. Of principle concern is management of the basin's water budget, that is the routing of precipitation through the pathways of evaporation, infiltration, and overland flow. This routing of groundwater and overland flow defines the delivery patterns to particular streams, lakes, and wetlands; and largely shapes the nature of these aquatic systems.

Watershed management requires use of the social, ecological, and economic sciences. Common goals for land and water resources must be developed among people of diverse social backgrounds and values. An understanding of the structure and function - historical and current - of the watershed system is required, so that the ecological effects of various alternative actions can be considered. The decision process also must weigh the economic benefits and costs of alternative actions, and blend current market dynamics with considerations of long-term sustainability of the ecosystem.

At the federal level, considerable emphasis is also being placed on management of places, instead of simply managing programs. U.S. Environmental Protection Agency refers to this as "place-based environmental management" (i.e., the work of agencies and organizations should be driven by ecological, economic, and social needs of communities and ecosystems). Critical success factors for place-based environmental management include:

- government activities being driven by the issues faced by particular ecosystems and the economies founded upon them;
- results measured in terms of restoration and protection of ecosystem integrity, which includes health of humans and other species;
- use of an ecosystem approach which requires coordinated, integrated action by federal, state, tribal, and local agencies, between government and private enterprises, and, most importantly, between government and the people for whom services are being provided; and
- availability of quality data and information on the resources to be protected for local empowerment that moves communities to action.

Such national emphasis will undoubtedly provide greater impetus to implement an ecosystem approach within local watersheds and bioregions.

Education and cooperative learning are fundamental to the success of cooperative, watershed management. No one has all the answers. Everyone is on the learning curve. The process of cooperative learning must ensure respect for different perspectives, while striving for agreement on common goals and actions. Like "place-based environmental management", watershed-based

educational processes must be founded on a sense of place that is linked to concepts of an ecosystem approach and bioregionalism.

Within the process of implementing an ecosystem approach to watershed management there is a need to initiate short-term actions while undertaking long-term planning. This is referred to as adaptive management where priorities are set, actions are implemented, and monitoring of effectiveness is performed in an iterative fashion for continuous improvement. Emphasis should be placed on a step-wise approach to implementation, with demonstration of incremental progress in order to sustain momentum required to realize the vision and goals of watershed management.

Session participants recognized that one of the major challenges in ensuring that habitat is adequately addressed in watershed management efforts is that "habitat has no home" (i.e., physical habitat often "falls through the cracks" and does not receive adequate attention in traditionally separate water quality management and fish and wildlife management programs). To address this challenge there must be a concerted effort to ensure that habitat is an integral part of community master plans. Critical components of a process to ensure that habitat is incorporated into community master plans include:

- compile habitat inventory;
- develop public participation;
- form intergovernmental coordinating committee; and
- develop public/governmental partnership in plan development.

Options to be considered in plan development include:

- no action alternative (i.e., no development can result in habitat preservation, however, it can also translate into an economic "loss" for communities, depending upon the situation, by passing up an opportunity to modify hardened shorelines and enhance habitat);
- fully engineered alternative (i.e., construction of breakwalls and marinas is viewed as a "win" for development, yet a "loss" for habitat because such construction is often limited in or devoid of sinuosity or habitat value); and
- soft engineering alternative (i.e., an approach that ensures a "win" for development through marina construction or other development and a "win" for habitat by achieving sinuosity of shorelines and modification of structures to enhance habitat).

Higher priority must be given to soft engineering alternatives to achieve "win-win" outcomes for habitat and economic development, so as not to preclude future options.

There is no doubt that higher priority must be given to adequate monitoring and assessment, including inventories and classifications systems. Session participants suggested that individuals must get involved up-front in project planning to adequately address habitat and ensure adequate assessment and monitoring. In addition, habitat rehabilitation and enhancement projects should be viewed as experiments, so as to help ensure follow-up assessment in order to guide future habitat projects.

From a strategic perspective, greater emphasis needs to be placed on "piggy backing" habitat protection and rehabilitation on other local and regional planning and development initiatives. For example, communities can capitalize on the opportunity of waterfront redevelopment to ensure that habitat gets incorporated into master plans. Effective communication and strong partnerships will be essential to achieve this. Although a systematic and comprehensive process of habitat conservation, rehabilitation, and restoration will be a long-term endeavor, considerable opportunities exist to move

forward with short-term actions which will benefit habitat and other issues (e.g., land use, economy, agriculture, recreation). Some examples of practical actions include:

- incorporate habitat protection into master, land-use, and watershed plans, zoning ordinances, etc.;
- seek permanent protection for ecologically significant habitats by purchasing land, establishing easements, etc.;
- ensure that individuals with fish and wildlife expertise get involved up-front in project planning for waterfront redevelopment, shoreline modification, sediment remediation, navigational structures, etc. to adequately address fish and wildlife enhancement opportunities and ensure adequate assessment and monitoring;
- ensure that agencies like state and local transportation departments, departments of public works, parks and recreation departments, and others incorporate ecological techniques which enhance fish and wildlife (e.g., bioengineering, incidental habitat enhancement of physical structures, willow posts, set backs, road crossings) into operating manuals and day-to-day operations; and
- establish citizen stewardship programs to help inventory habitat and work with landowners and agency personnel to enhance habitat.

Additional practical actions need to be identified. As well, the values and benefits of these practical actions need to be quantified and communicated to all stakeholders to ensure continued progress toward healthy and sustainable watersheds and ecosystems.

Extended Abstracts from the Habitat Session

Presented in the following pages are the extended abstracts from the habitat session. Readers are also encouraged to see Appendix A for a list of methods manuals and resource documents relative to protecting and enhancing habitats.

Melding Wetlands, Wildlife, and Water Quality With Stormwater Design

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Introduction

As natural resource consultants, Resource Management Group, Inc. (RMG) is often charged with the responsibility of assisting a client in meeting environmental or local zoning regulations. With the responsibility comes the opportunity of creating innovative solutions to environmental problems which result in a win-win situation for the environment and the proposed project. Usually, economics drive the willingness of a client to propose or consent to innovative resource protection or enhancement measures; however, more and more people are realizing good watershed stewardship is good economics and new approaches to old problems are becoming more common. This presentation is an extremely brief discussion of the problems being faced, the opportunities before us, and the results we may be able to attain by melding of wildlife, wetlands, and water quality with stormwater design.

Objectives

With many developments, engineering and site planning, in compliance with zoning regulations, dictate the design of the project. The primary objectives of stormwater control infrastructure are to

control the amount of runoff leaving a site and attempt to improve the quality of stormwater entering lakes, streams, or rivers. Habitat considerations are usually last on the list, well below the aforementioned, dwelling density, and others. Lack of awareness is probably the reason for wildlife habitat loss. The objective of this conference and our work at RMG is to inform people how to create more win-win for wildlife.

Discussion

For many years, stormwater control equated to large rectangular pits, surrounded by a chain link fence, which were constructed and forgotten. Present day, evolving best management practices for stormwater management involves a "treatment train" approach with basins which are blended with the landscape and mitigate wildlife habitat impacts. Stormwater treatment with the system approach often includes natural or created wetlands as a key component of the design.

Wildlife concerns should be more of a consideration in development and professional biologists need to be involved in those decisions. In all cases, development is disrupting to wildlife to some degree. The old line of "the birds and bunnies will move across the road" is not ecologically correct; loss of habitat equates to loss of wildlife. The degree of impact depends on the quality of the habitat; maintaining a *diversity* of vegetation provides better wildlife habitat.

Many wildlife species are mobile, having daily, seasonal, or annual migrations. Some are less mobile and have a smaller "home range" where they spend their entire lives. The less mobile species will suffer most by destruction or alteration of their habitat. Analysis of wildlife habitat should exceed the boundaries of the project area and be evaluated on a landscape (watershed) basis. Wildlife travel corridors *between* areas of quality habitat can be as important to wildlife as the habitat itself. Roads, especially roads carrying large volumes of high speed traffic, are not good wildlife habitat. Bisecting high quality wildlife habitat components with roads can impair wildlife populations in perpetuity, due to constant mortality by vehicles as animals attempt to move between habitat units to feed, rest, or raise young.

A professional biologist should determine the wildlife species inhabiting a project site and determine the ecological relationships between the habitat on the site and the animals living there. With this basic understanding, biologists must be an integral part of the development team and be given appropriate consideration for input to the site design. Mitigating measures should be employed to *avoid* impact on valuable habitat wherever practical, *minimize* impacts which cannot be avoided, and *compensate* for unavoidable impacts to wildlife.

Most frequently, wildlife habitat protection is not a *requirement*, except for upland open space requirements, regulated woodlands and wetlands. The "open field" habitat type is most often sacrificed because it is not regulated, *per se*, unless it is saved as upland open space (i.e. non-wetland or woodland). Even then, wildlife ecology is not considered; only where it is not possible to place lots or parcels is natural open field habitat preserved, but not as a result of a valuable wildlife use. Wetlands, which often have a diverse and important wildlife component, are generally well-protected by local, state, and federal regulations. The same is true with riparian habitat, streams, rivers, and lakes.

The following three **E**'s should be considered when planning the stormwater treatment system for a proposed development. **E**ngineering requirements must be followed to ensure the proper functioning of the system and to comply with local regulations. **E**cology should be a strong consideration, allowing the project design team to blend the stormwater system with the natural environment which

existed prior to development. **E**conomics, not from the perspective of reducing costs of stormwater design and construction, but from the proven adage that good land stewardship is good economics. In the long term it *pays* to follow the three **E**'s, because the quality and long term effectiveness of the stormwater treatment system will help to make the development more attractive.

The following practices are part of the blueprint to accomplish the three **E**'s:

- evaluate wildlife habitat units and wildlife use and locate wildlife travel corridors, both on and off the property;
- assess alternatives and determine the measures to be used to mitigate unavoidable impacts.
- design flat basin slopes, particularly near the permanent water elevation in wet bottom basins, to promote a wider transition of habitat. This practice requires additional property (i.e. "cost"), but creates an easier-to-maintain basin which provides additional open space buffer, blending the basin with the landscape and increasing value of the adjacent lots ("return").
- incorporate adequate storage capacity for accumulation of coarse sediment (sand) and plan an area where finer sediments (silt and clay) can settle from the water column, usually wetlands.
- since the basins are used for erosion control during site construction, they should be regraded to original specifications after construction is completed and all disturbed areas are stabilized.
- provide an area for equipment access for future maintenance of the basins.
- design the geometry of the basin to facilitate basin maintenance, primarily sediment removal.
- aerate stormwater with non-mechanical means at every opportunity to increase evaporation of volatile constituents and increase dissolved oxygen.
- install and maintain plantings to provide wildlife habitat, improve water quality, and meld the stormwater treatment systems with the landscape. Mowing is not recommended because it disturbs habitat, violates the natural character of the open space, and is not a needed expenditure.

Conclusion

Given the obvious benefits to the environment and good economic sense of innovative stormwater management, it is incumbent upon landowners to take the responsibility for good stewardship of wildlife resources in the use of their land and it is incumbent upon natural resource professionals and governmental units to educate people about the watershed approach to planning and land use. Only through education and commitment will proper due be given to all aspects of our natural systems.

Evolution of Streambank Stabilization and Watershed Restoration in N. Michigan

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The Huron-Manistee National Forests are located in northern Michigan within a day's drive of one quarter of the nation's population. Its most prized features include the northwoods rivers and streams. People use these rivers for fishing, canoeing, or just to find solitude from an urban setting. They also provide habitat for many aquatic and riparian-dependent species, some which are threatened or endangered. Unfortunately, many of these streams carry excessive sand, degrading aquatic habitat. Thus, a great deal of energy and resources applied to northern Michigan rivers is oriented towards erosion control to reduce sediment delivery.

Traditionally, much of the river restoration work undertaken in northern Michigan has focused on streambank erosion. It was demonstrated from research on the Pine River, a typical northern Michigan stream, that slightly more than half of the sand bedload was directly attributable to eroding

streambanks. Initially, stabilization was done on a site-by-site basis, with site selection often being dictated by the squeaky wheel philosophy. However, in the 1980s a more systematic approach was adopted and eroding streambank inventories were done for entire river systems. This yielded a "big picture" perspective. This systematic approach also drew attention to the challenge of mixed private, state, and federal land ownership patterns within many northern Michigan forested watersheds. While ownership may be mixed, it was recognized that rivers within these watersheds have a total disregard of both property and political boundaries. Water resource problems anywhere along a watercourse will have an impact on downstream riparian values; therefore ownership of these problems had to be taken on by all riparian landowners.

The systematic streambank erosion inventories also pointed out the high costs associated with the big picture approach. For instance, it was estimated that it would take \$1.5 million to stabilize the 100 severe and moderately eroding streambanks in 40 miles of the Pere Marquette River system. Obviously, no one agency or organization had the financial resources to take on such a project. Thus, a partnership between state, federal, and private organizations was developed to address such a large-scale river restoration project. Six partners (Michigan Department of Natural Resources, Pere Marquette Watershed Council, Trout Unlimited, Mason-Lake Soil Conservation District, Northwest Michigan Resource Conservation and Development Council, and the U.S. Forest Service) have collaborated to stabilize these eroding streambanks over the past 10 years.

Concurrent with the evolution of streambank stabilization from the site scale to the landscape scale, the techniques employed have also changed over the years. Historically, wooden structures were often used to stabilize eroding streambanks. However, while many of these structures were initially successful in stabilizing eroding streambanks, most became defunct due to lack of maintenance and subsequently were damaged or lost during high flow events. Recognizing this problem, the majority of eroding streambanks are now stabilized using fieldstone riprap. Wisconsin "LUNKER" structures are also being incorporated. These structures enhance the traditional riprap stabilization by simulating a natural undercut bank. In areas where equipment access is limited, techniques such as whole-tree revetments are used. All techniques are being done through a bio-engineering approach, that being combining vegetation with the structural technique. This vegetation adds a "living" aspect to the stabilization which increases the structural integrity of it. It also helps maintain the outstanding scenic character of our northwoods rivers, many of which are designated National Wild and Scenic Rivers or State Natural Rivers.

Our outlook towards streambank stabilization is also changing from a species orientation to more of an aquatic ecosystems perspective. Initially stabilization focused entirely on improving spawning and rearing habitat for trout and salmon. However, taking an ecosystems viewpoint meant considering the needs of all riparian-dependent species. For instance, it was discovered that the wood turtle, a State "species of special concern", uses southerly exposed eroding streambanks for its nesting habitat. The needs of wood turtles are now integrated into streambank stabilization programs as important nesting sites are identified and protected.

Management of large woody debris, especially as it relates to recreational watercraft, has also become part of erosion control programs. Woody debris can protect fragile streambanks, especially during flood events. In a sense, it functions similar to a baffle system, dissipating stream energy during higher flows. Remove it and the erosive power of stream flows is increased and streambank erosion can be greatly accelerated. The U.S. Forest Service, in cooperation with the Michigan DNR and river user groups, has developed guidelines for woody debris removal on National Forest streams which balance safety concerns for boaters with aquatic ecosystem protection. At the same time, we have a goal of long-term woody debris recruitment from our riparian forests.

While streambank stabilization has evolved from the site scale to the landscape scale as part of river restoration programs, resource managers have also realized that we needed to broaden our vision beyond the stream, looking at the entire watershed. Another key piece of the sediment delivery puzzle in northern Michigan watersheds are road-stream crossings, especially when viewed from a cumulative perspective across the landscape. Similar to the large-scale streambank erosion inventories conducted in the 1980s, watershed-wide inventories of road-stream crossings began in the early 1990s. Each crossing has been assigned a severity ranking along with recommended actions for reducing sediment delivery. These inventories, when combined with the comprehensive streambank erosion inventories, have allowed managers to use a landscape approach in determining priorities in watershed restoration efforts.

Habitat Development on Industrial and Private Property: The St. Clair River Waterways for Wildlife Program

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Corporations own about 25% of the privately owned land within the United States. National programmatic efforts to preserve and protect our natural resources for future generations should and need to include the corporate sector. The Wildlife Habitat Council (WHC) with its corporate and conservation members, is demonstrating that corporations can and are willing to act in a voluntary manner to protect the environment. WHC is a non-profit, non-lobbying organization established in 1983 as a joint venture between the corporate and conservation communities. The Council encourages and aids corporations in the development and establishment of voluntary wildlife management programs on corporate lands. WHC members currently manage nearly 300,000 acres of property for wildlife at over 350 sites internationally.

Through the *Waterways for Wildlife* program, WHC is working with Detroit Edison, Ontario Hydro, Terra International, Consumers Power, Ford Motor Company and other corporate and conservation groups to establish and implement an international watershed management plan for the St. Clair River which flows between Michigan and Ontario. The *Waterways for Wildlife* Project is a WHC program that is designed to promote voluntary cooperative habitat enhancement efforts on a regional scale. The programs are driven by both the private and public sectors and involve multiple landowners. *Waterways for Wildlife* projects are built around wildlife enhancement efforts initiated by WHC member corporations along river corridors. These successful efforts are used as models to encourage participation from neighboring public and private managers.

The St. Clair River *Waterways for Wildlife* program will focus on engaging corporate and private landholders in management of their properties to achieve project objectives as identified by the general program participants in a plan scheduled for release during the summer of 1996. Although just beginning, the St. Clair River *Waterways for Wildlife* program has achieved some notable early results including engaging conservation, corporate, and natural resource agencies in joint discussions regarding habitat enhancement activities in the watershed, coordinating a joint reforestation effort on the Darcy McKeough Floodway Channel between the St. Clair Region Conservation Authority and Detroit Edison, establishing an international Steering Committee of conservation organizations and corporations to spearhead the project, partnering with the Rural Lambton Stewardship Network and the Ontario Ministry of Natural Resources on several restoration and management projects, and aiding Detroit Edison in the expansion of their wildlife management program at the Belle River Power Plant and other properties in the St. Clair River Basin. Through the *Waterways for Wildlife* program for the St. Clair River, project participants are protecting and enhancing habitat along the river, using scarce

financial resources more efficiently, contributing to the long-term health and viability of the river and protecting habitat for riparian, upland, and prairie-associated wildlife.

Design Of Structures, Trails And Bike Paths

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The design of environmentally sensitive improvements for recreational uses goes far beyond decisions regarding practical and cost effective construction techniques and materials. While these questions are important in the overall process, first and foremost one must be totally familiar with the site and the characteristics that make it unique. Secondly, one should have a good understanding of the type, frequency and intensity of both the existing and the anticipated uses. Maintenance and budget are obvious concerns, also. Not until all of this information has been gathered can appropriate solutions to specific design issues such as the what, the where and the how be more easily derived.

Site Information

- Review soils information, aerial maps, utilities locations, wetlands and woodlands, flood plain limits, drainage patterns, view sheds.
- Familiarization with previous planning efforts, studies and/or impact reports that may have been conducted.
- Investigate existing and proposed adjoining land uses.
- Review local and state regulations including woodlands and wetlands ordinances.
- Walking tour with local authorities to tap knowledge of site specific opportunities and constraints.

Usage Information

- Determine user characteristics such as type (hikers, runners, bikers, etc.), frequency (daily, weekly, seasonally, etc.) and intensity (volume of users during use periods).
- Investigate the possibility of inappropriate and/or unintentional use.

Staff Requirements and Maintenance Needs

- Understand the implications of limited maintenance capability in terms of available personnel, equipment and budget.
- Determine fire and rescue requirements.

Budget

- Determine the maximum construction budget available after administrative costs, permit fees, design and engineering fees and contingencies have been deducted.
- Investigate potential additional funding sources.

Basic Design Standards

Boardwalks, Decks and Overlooks

- Layout and location: Usually best to field locate in conjunction with local experts.
- Scale: Dependent upon use, both type and intensity. Also consider the setting.

- Width: 5' minimum for 2-way traffic; 6 - 8' average for typical nature area; 10 - 12' for high use areas.
- Gradients: Boardwalk gradient cannot exceed 5% without handrails and landings at minimum 30' intervals. Maximum gradient is 8.33%.
- Handrails: 34 - 38" tall.
- Guardrails: 42" minimum height. Maximum opening between banisters is 4". Wide top rails can obstruct the view of those seated nearby.
- Materials: Treated wood is usually the material of choice although recycled plastic \blacklozenge wood \blacklozenge is becoming more common. Galvanized metal substructure is slightly more costly. All fasteners should be galvanized.

Bike Paths

- Layout and location: Consider all likely points of access and, if appropriate, include an adequate staging area. Typically, routes are pre-determined by existing roadways and/or old railroad right-of-ways.
- Width: 8' minimum for 2-way traffic; 10 - 12' is common in heavy use areas.
- Gradients: Dependent upon existing topography. Maximum gradients are similar to roadway standards. Absolute maximum slope should not exceed 20%, desirable maximum 12%.
- Materials: Asphalt, concrete, limestone or slag (in this area).
- Construction: Provide 2 - 4% cross slope or crown to shed water. Maintain 96" minimum headroom.

Trails

- Layout and location: Usually best to field locate to take best advantage of existing vegetation and topography.
- Width: 3' minimum*; 5 - 6' average for typical nature trail; 8 - 10' in high use areas.
- Gradients: Usually conforms to existing topography. For barrier-free access, gradient must conform to those listed under Boardwalks above.
- Materials: Asphalt, limestone, slag, woodchips.
- Construction: Provide a crown or cross slope of 2 - 4%. (*The Americans with Disabilities Act of 1991 stipulates that exterior walk widths must be a minimum of 48" wide with a maximum 2% cross slope. The widths and cross slopes listed here are for non-accessible backwoods trails.*) Maintain 80" minimum headroom. Do not allow significant water to drain across the path surface. Utilize water breaks and drainage structures to control run-off.

Case Studies

Structures and Trails

- Bandemer Park, Ann Arbor: Decks and docks constructed of treated lumber screwed and nailed in place. Docks supported on concrete foundations with sleeves that allow the deck structure to float free if high water or ice were to lift it up. So far this has not occurred. Paths are 3" asphalt on 6" aggregate base in high use areas and 2" slag on 4" aggregate base in other areas.
- Furstenburg Park, Ann Arbor: Decks and boardwalks constructed of treated lumber screwed and nailed in place. Adjustable metal support posts on limestone foundation beds. One boardwalk section is built of recycled plastic - slight difference in color but identical to the wood sections in terms of construction. Paths are asphalt in the higher use areas including

within the woods. Surprisingly compatible. Paths leading to the boardwalks are 5" slag with no base. This is a standard that the City of Ann Arbor has had good success with in the past.

- West Bloomfield Trail and Nature Preserve, West Bloomfield: Treated lumber decks screwed and nailed. Grade beam foundation except in areas accessible to equipment for concrete placement. Rails-to-Trails section consists of 4" limestone fines with no base. Maintenance needs have been minimal. Sloped areas are paved in asphalt. Within the nature area, accessible trails are constructed of 4" limestone fines while all other hiking trails are woodchip surfaced. In low wet areas, an aggregate base course was installed with a geotextile soil separator for stabilization.

Paths and Trails

- Paint Creek Trail, Rochester: 21AA limestone installed at a compacted depth of 4" on an old railroad bed. Surface is uniform and firm with little observable damage resulting from horses that also use the trail. Entire length was leveled and excavated prior to the installation of the limestone.
- Buhr Park Pathway, Ann Arbor: 4" of compacted 23A limestone base with 2" of compacted 21AA limestone wearing course. This path carries much service traffic and is holding up well. Similar to the Paint Creek Trail in surface characteristics. The advantage in specifying a slightly larger aggregate base at this location was that this material was also being used for parking lot base construction and was therefore less expensive.
- Dodge Park Trail, Sterling Heights: Path surface consists of a 50/50 mix of 30A slag (available from Levy Corp.) and ♦ limestone athletic meal ♦ (from Michigan Foundation). Compacts nicely and has excellent drainage, however does not hold well on slopes. Because of the slag content, it may displace more easily.

Reshaping Shorelines for Habitat in Lake Superior's North Shore Areas of Concern

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Introduction

Along the north shore of Lake Superior, the International Joint Commission has designated four sites for development of Remedial Action Plans (RAPs) to restore and protect water quality. During the early stages of RAP development, it was clear that the loss of fish and wildlife habitat, one of fourteen use impairments outlined in the 1987 Great Lakes Water Quality Agreement, had occurred in each of Thunder Bay, Nipigon Bay, Jackfish Bay and Peninsula Harbour Areas of Concern (AOCs). Community input in each of the AOCs involved the development of specific "Water Use Goals," and emphasized the need to address incidental habitat in the context of social, economic as well as ecological issues. As a result, a number of habitat projects were developed to restore specific degraded habitat and demonstrate new techniques that could be applied to other areas in the Great Lakes basin.

In the summer of 1990, habitat projects submitted for the North Shore AOCs were approved under the federal Great Lakes Cleanup Fund (CUF). The newly formed Lake Superior Programs Office (LSPO), a cooperative initiative with Environment Canada, the Department of Fisheries and Oceans and the Ontario Ministries of Natural Resources and Environment and Energy, was responsible for the coordination and administration of the Lake Superior RAPs and CUF habitat projects. Initial financial support of \$4.4 million from the Great Lakes Cleanup Fund has generated an additional \$10.3 million

over a five year period from more than 34 project partners representing federal and provincial agencies, municipalities, industry, community organizations and the public.

Program goals for habitat projects include improving ecosystem health in the AOCs and encouraging public involvement and understanding of environmental concerns in the Lake Superior basin. Individual projects aim to demonstrate our ability in restoring degraded habitat, increasing habitat diversity, developing experimental techniques to restore fish populations and in-situ treatment of contaminated sediments. Extensive monitoring of projects allows documentation of successes and transfer of knowledge and technology to other AOCs. Since 1990, the LSPO has evolved from the development of concepts to the implementation and completion of many projects.

A number of habitat projects in Thunder Bay and Nipigon Bay deal exclusively, or in part, with degraded or lost nearshore aquatic habitat. Remedial actions, identified through extensive public consultation in each community, have focused on specific themes including breakwall construction, island construction, shoreline reshaping and wetland creation and restoration. Three completed examples of incorporating habitat enhancements into shoreline development are presented.

Sanctuary Island

Degradation of aquatic habitat in tributaries entering Thunder Bay harbour was identified by the RAP Team and the RAP Public Advisory Committee as a major impairment in the AOC. Work at the mouth of McVicar Creek has restored spawning habitat for native fish, restored physical attributes of the Creek and will prevent future bank erosion. Sanctuary Island, a 205 metre crescent-shaped island, was constructed adjacent to the mouth of McVicar Creek. This island/wetland complex has created diverse new fish and wildlife habitat and new recreational opportunities for the public along this section of the Thunder Bay waterfront. Habitat enhancements such as in water rock shoals and sediment traps, and planting pods on the island itself have been successful in increasing the aquatic and terrestrial habitat diversity of this structure. In addition, submergent aquatic vegetation has colonized the leeward side of the Sanctuary Island between the Island and mainland.

McKellar Ponds

On the McKellar River in Thunder Bay, dredging for commercial shipping has transformed this once productive arm of the Kaministiquia River delta into a straight, steep banked channel. Two 1.5 ha lagoons have been excavated at the river mouth to create a unique area of shallow, productive habitat for fish spawning, waterfowl nesting, fish and wildlife viewing and educational opportunities. Post construction assessment has verified use of the ponds by a number of fish species, benthic organisms, wildlife and waterfowl.

Red Rock Marina

In Nipigon Bay, the Township of Red Rock initiated construction of a marina/park in the summer of 1991. The Nipigon Bay RAP Team and RAP Public Advisory Committee have worked closely with the Waterfront Development Steering Committee to incorporate environmental components into the breakwater design. Construction has been completed to overlay a standard armour stone breakwall with suitable habitat enhancements designed to increase diversity in the nearshore aquatic ecosystem, improve public access and provide improved aesthetics and additional recreational opportunities to marina/park users. The completed breakwater is the first of its kind in Ontario, and will provide an excellent model for future waterfront developments in the Great Lakes basin. This demonstration

project will be directly applicable to not only marina developments, but a wide variety of structures that are designed to harden shorelines for the purpose of erosion control and/or storm protection.

Conclusion

Successful implementation of the Lake Superior Cleanup Fund Program can be attributed to committed partnerships at all levels of program delivery. The Lake Superior Programs Office has provided a demonstration where federal and provincial agencies, in times of severe financial constraint, can effectively share resources and expertise to reduce program costs, minimize overlapping mandates and develop real partnerships with industry and the public. The combined efforts of the agencies, industry and the public have resulted in the restoration of habitat in Nipigon Bay and Thunder Bay.

Controlling Sediment Delivery At Road/Stream Crossings in Northwest Michigan

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In 1985, the Northwest Michigan Streambank Erosion Inventory found moderately and severely eroding streambanks and road/stream crossings to be the two primary sources of sediment pollution to the majority of the rivers in northwest Michigan. Recent road/stream inventories have determined that severely eroding crossings can deliver up to 500 tons of sediment per year while moderately eroding sites deliver up to 100 tons per year. The cumulative effect of sedimentation from these crossings is tremendous. Excessive and bedload destroys fish and wildlife habitat by filling deep pools, decreasing hydrologic diversity and covering spawning gravel and aquatic substrate. The sediment also degrades water quality by carrying oils, greases and other pollutants into the water.

The Northwest Michigan Resource Conservation and Development Council has pioneered the road/stream inventory, ranking, costing, mapping and database methods on the Pere Marquette, Pine and Little Manistee watersheds. With inventories in hand, the RC&D; Council has been successful in bringing together non-traditional partners and funding sources to address problem crossings on a prioritized, worst-first basis. During 1993 to 1995, the RC&D; Council has received four different watershed wide grants totalling more than \$400,000 from the Michigan Department of Transportation ISTE program to help improve many of the most severe crossings on the Pine and Pere Marquette watersheds. Road commissions, private interest groups and water quality agencies cooperate on the projects. This funding would not have come without the inventories.

Best Management Practices (BMPs) are selected to best control erosion and sediment delivery for each unique stream crossing condition and are recognized as the most effective treatments for controlling sedimentation. Recommended BMPs include: drainage control structures such as culvert replacement or extension, diversions and sediment basins. Each measure will eliminate or significantly reduce sedimentation immediately after installation, and will continue to control this primary nonpoint source in the future.

A road/stream inventory also provides for continued implementation of BMPs as participants are educated through the inventory process. Road commissions begin to evaluate all crossings from both a transportation and water quality aspect. They then incorporate water quality improvements into routine improvements or enhancements, and work with neighboring road commissions teaching them how to improve crossings in adjacent watersheds.

Table 2. ROAD/STREAM CROSSING CHARACTERISTICS

(Source: Inventory by the Northwest Michigan R.C.&D.; Council, Inc., of 450 crossings 1992-1994)

	TOTAL	<10	11-14	15-18	19-25	26-30	>30
Width of Road Surface (ft)	437	11 2%	50 11%	97 22%	212 49%	46 11%	21 5%

	TOTAL	<5	5-9	10-14	15-19	20-24	25-29	30-39	40-49	50-65
Width of Stream Channel (ft)	667	223 33%	137 21%	94 14%	56 8%	48 7%	25 4%	46 7%	26 4%	12 2%

	TOTAL	0-1	2-4	5-8	9-12	13-20	>20
Fill of Depth Over Culverts (ft)	640	203 32%	286 45%	75 12%	46 7%	18 3%	12 2%

	TOTAL	Vertical	1:1	1.5:1	2:1	>2:1
Current Slope of Embankments	860	302 35%	197 23%	161 19%	111 13%	89 10%

	TOTAL	Flat or away from crossing	1-5%	6-10%	>10%
Slope of Approaches	882	263 30%	449 51%	145 16%	25 3%

	TOTAL	Gravel	Paved	Sand	Sand/Gravel
Road Surface	421	41 10%	154 37%	108 26%	136 32%

	TOTAL	Bridge Out	Single Box	Bridge	Single Culvert	Twin Culverts	Triple Culverts	Five Culverts
Current Crossing Type	432	2 0.5%	17 4%	108 25%	219 51%	72 17%	13 3%	1 0.1%

Managing Open Spaces for Biological Diversity

David Borneman, Natural Area Preservation Coordinator, City of Ann Arbor, Department of Parks and Recreation

1831 Traver Rd., Ann Arbor, Michigan 48105

Introduction

The citizens of Ann Arbor, Michigan (pop. 111,000) are proud of their parks. They have repeatedly shown their support by voting to tax themselves to generate additional revenue to improve the park system. A 5-year "Parkland Acquisition Millage" was approved in 1988 to add additional acreage to the park system, much of it to be preserved in a natural, undeveloped state. As a result of this millage, the current city park system stands at 133 parks, containing approximately 2,000 acres, one-half of which are undeveloped. In 1993, as the "Parkland Acquisition Millage" was drawing to a close, the voters overwhelmingly supported a new .37 mil "Park Maintenance and Repair Millage." This 5-year millage generates nearly \$1 million per year, with more than 15% of it earmarked specifically for "Natural Area Preservation and Management."

A portion of these funds was used to create a new permanent position with the Department of Parks and Recreation entitled, "Natural Area Preservation Coordinator." The primary mission of this position is to "preserve, protect, and care for the natural areas of Ann Arbor, especially those in the City's park and recreation system." Additionally, the Natural Area Preservation (NAP) Coordinator serves as an in-house environmental consultant to the other divisions within the Parks Department (Recreation, Operations/Maintenance, Forestry/Horticulture, Planning, and Administration), as well as other departments within the city. But the main work of the NAP Division falls into two categories: Ecological Assessment, and Ecological Restoration and Stewardship.

First Step - Ecological Assessment

Aldo Leopold once said, "The first step of intelligent tinkering is to save all the parts." Before we start tinkering with our natural ecosystems and trying to do "restoration," we need to make sure we save all the parts. That means we need to inventory what the various parts of the ecosystem are, and also try to assess the status of these natural areas. This was done in a general way by several city-wide assessments of natural features. Some attempt was also made to identify and map the various natural communities within the city. Although this effort gave a general impression of where the natural areas were within the city, it did not provide any answers to some of the key questions such as: Which area has the highest priority for management? How should it be managed? What are the ecological threats to this natural area? Within a given park, where is the best place to locate a trail to minimize environmental impact?

To answer these specific questions, NAP launched a city-wide inventory of the plants, butterflies, frogs, and breeding birds within the parks and other natural areas. In the first summer, 1994, 75 volunteers adopted parks in which they attempted to inventory every tree, shrub, and wildflower species present. They were trained by three staff botanists who offered six hours of free on-site plant identification training every week. By the end of the summer, volunteers had spent 300 hours sharpening their plant taxonomy skills. The training paid off; in the 50 natural areas inventoried in the past two summers, 926 species of plants have been recorded, 17 of which are listed as "endangered," "threatened," or "special concern" in the State of Michigan. The other inventories have yielded equally informative (and impressive) data after only one year: 52 butterfly species (1 of special concern), 8 of southern Michigan's 11 frog and toad species, and 87 breeding bird species.

Interpreting the Assessment - Setting Priorities

So what can an inventory of the plant and animal life of each natural area tell you? It can begin to provide answers to many questions. Is this site populated with native or alien species? What were the original plant and animal communities on this site? How easily can these communities be restored? How has this site changed over time? How will various management practices effect this site? Are there any legally-protected, threatened or endangered species here? Which natural areas are most threatened by invasive species? What type of recreational activities are appropriate in this natural area?

Although these inventories will be repeated and refined in coming years, they have already provided valuable information for us to use when making management decisions. Once the location of a rare species is identified and mapped, we can steer development away from that site. By knowing more about the local populations of butterflies, we can make wiser decisions about the best response to the infestation of Gypsy moths which have just reached Ann Arbor. Data on frog populations will help us monitor the ecological health of wetlands in the city, especially those affected by stormwater development from new subdivisions. As more and more information about a site's natural features is

compiled, the overall ecological significance of the site, and the restoration potential of the site, begin to emerge.

So far, the main focus of the inventory efforts has been in the city's park system to help us better manage those sites. In the future, what is most needed is a similar area-wide effort in all the undeveloped properties. If a region-wide inventory of natural features can be done without regard to property boundaries, then decisions on zoning and development patterns can be made much more wisely, and without the narrow-focused debates brought on by proposals to develop individual plots of land.

Until such a comprehensive planning effort is accomplished, we must rely on other stop-gap measures. For 15 years, the city has been struggling to develop a fair but effective "Natural Features Ordinance." NAP staff are involved in these efforts and have helped to strengthen the wording of the ordinance, such as by providing more protection for large, landmark trees on a site. In the city's new "Wetland Preservation Ordinance," NAP staff used their expertise on the most troublesome invasive plant species of southeast Michigan to help develop the "Invasive Species List" for the ordinance. This lists over 100 species of invasive plants which may not be planted in a wetland mitigation. We have also developed a Native Landscaping brochure to help developers and homeowners find alternatives to commonly-used, exotic, horticultural species.

Ecological Restoration and Stewardship

Perhaps worrying about what species are being planted in the city seems like a trivial matter. But within Ann Arbor's natural areas, invasive species have emerged as the #1 ecological threat. Whether it's Gypsy moths, Zebra mussels, purple loosestrife, buckthorn, honeysuckle, or something else, non-natives are overrunning the natural systems.

What do we mean by natural? As our definition of natural, we look at the ecological systems in southeastern Michigan as they were immediately prior to European settlement in the late 1700s and early 1800s. Luckily, those environmental conditions are not as mysterious to us as they may first appear. In the early 1800s, surveyors from the federal General Land Office laid out the townships with their 36 square-mile sections that create the checkerboard appearance so evident to an airline passenger flying over the Midwest. The survey for the Ann Arbor area was done in 1819, five years before the city was even founded. To the careful reader, the survey notes - available in county courthouses in most Midwest counties - give details about the type and size of ecosystems present in each square mile of land. They even reveal which tree and shrub species inhabit the area.

Although 1819 was a long time ago for us, it was just yesterday to the plant and animal species which have lived in this environment for millennia. Although the landscape has changed drastically in the 177 years since then, the climatic and environmental factors to which those native organisms are adapted have not changed appreciably. The plants best adapted to live in southeast Michigan then are still the same ones best adapted to live here now - and the ones most important to the native butterflies and other animals that use them as food.

What does all of this mean to the management of natural areas? A major activity of NAP staff is to physically remove invasive plant species in an attempt to restore the native flora of the Ann Arbor area. We cut and remove shrubs, and herbicide their stumps. We re-introduce fire as a natural process in fire-dependent communities. Just this spring alone, we have conducted 17 prescribed ecological burns in city parks to help restore the native prairie and oak savanna ecosystem once present in the Ann Arbor region. We also collect native seeds and sow them in landscapes we are trying to restore.

Education

In addition to physically altering the landscape and restoring native ecosystems, education of the public is vital. All the millages and grants in the world cannot protect the natural areas of Ann Arbor or anywhere else if the environmentally-damaging attitudes and behaviors of people don't change. It does no good to remove honeysuckle from a park if the neighbors keep planting it in their backyards. It does no good to set aside a natural area if there is no will to care for it, or even an appreciation of why it is special.

In an attempt to reach out to the public and involve them in local stewardship issues, and to multiply the efforts of a limited number of staff, we have launched a major Volunteer Stewardship Campaign. At least twice a month, NAP staff hold volunteer work days in one of the 50 or so natural areas in the city park system. The work usually involves cutting and hauling invasive shrubs, but the impact - we hope - goes much further. After spending three hours on a Saturday morning hauling brush and learning some natural history, citizens develop a kinship with their neighborhood park. They keep an eye on it when staff are not present. And they think twice before planting that honeysuckle in their backyard.

Land Protection and Conservation Methods

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The Southeast Michigan Land Conservancy (SMLC) is a non-profit charitable corporation serving the seven county southeast Michigan region. The mission is to preserve parks, open space and natural areas for environmental protection and wildlife habitat, and to enhance the quality of life for area residents.

SMLC protects land by purchasing it, by accepting donations of land, and by holding conservation easements on land to protect critical natural features. Since incorporating in 1988, SMLC has protected 655 acres through 15 projects with a land value of \$3 million. Of these projects, three have been land purchases, seven have been land donations, and five have involved conservation easements.

In general, there are four principle conservation methods available to protect land (i.e., land acquisition, purchase of development rights, planning and zoning, and conservation easements).

Land Acquisition

The Michigan Natural Resources Trust Fund (MNRTF) is the principle funding source for land acquisition in the state. It is a constitutionally-protected fund which derives its revenue from royalties on the extraction of oil, gas, and minerals from state lands. There is a 25% local match requirement, although this may be supplied by the landowner. The MNRTF can also fund less than fee simple ownership (purchase of development rights). Local governments must have an adopted Recreation Master Plan on file with the Michigan Department of Natural Resources to be eligible for grants. Citizens may also nominate lands for acquisition. The application deadline is April 1st. For grant materials and further information contact:

Recreation Grants Section
Administrative Services Division
Michigan Department of Natural Resource
P.O. Box 30425

Lansing, MI 48909-7925
Phone: (517) 373-9125

Purchase of Development Rights (PDR)

The Michigan Department of Natural Resources administers a fund under PA 116, the Farmland and Open Space Preservation Act, to purchase development rights on critical farmland. Applications have to be submitted by April 1st. Grant information is available from:

Michigan Department of Natural Resources
Farmland and Open Space Preservation Unit
P.O. Box 30028
Lansing, MI 48909-7528
Phone: (517) 373-3328

Local communities can also enact programs to purchase development rights. At present, Peninsula Township near Traverse City is the only Michigan community with an adopted PDR program. Other communities, however, are investigating this effective planning tool.

Planning and Zoning

Local governments retain significant authority to shape their local landscape. Properly enacted zoning can be used to protect agriculture, rural residential and conservation features. Zoning can be bolstered by cost-effective Purchase of Development Rights programs. Numerous studies have documented that most new development is a net tax drain on a community, leading to higher taxes to pay for the increased demands for infrastructure, schools, police and fire, etc.

Conservation Easements

A conservation easement is a legal agreement a property owner makes to restrict the type and amount of development that may take place on his or her property. Each easement has restrictions which are tailored to the particular property and to the interests of the individual owner.

To understand the easement concept, think of owning land as holding a bundle of rights. A landowner may sell or give away the whole bundle, or just one or two of those rights. These may include, for example, the right to construct buildings, to subdivide the land, to restrict access, or to harvest timber. To give away certain rights while retaining others, a property owner grants an easement to an appropriate third party.

The specific rights a property owner forgoes when granting a conservation easement are spelled out in each easement document. The owner and the prospective easement holder identify the rights and restrictions on use that are necessary to protect the property - what can and cannot be done with it. The owner then conveys the right to enforce those restrictions to a qualified conservation recipient, such as a land trust organization or public agency.

Why Grant a Conservation Easement?

People grant conservation easements to protect their land or historic buildings from inappropriate development while retaining private ownership. By granting an easement in perpetuity, the owner may be assured that the resource values of his or her property will be protected indefinitely, no matter who the future owners are. Granting an easement can also yield tax savings, as discussed below.

What Kind of Property Can be Protected by an Easement?

Any property with significant conservation or historic preservation values can be protected by an easement. This includes forests, wetlands, farms, endangered species habitat, beaches, scenic areas, historic areas, and more. Land conservation and historic preservation professionals can help you evaluate the relative features of your property.

Who Can Grant an Easement? To Whom Can They Grant It?

Any owner of property with conservation or historic resources may grant an easement. If the property belongs to more than one person, all owners must consent to granting an easement. If the property is mortgaged, the owner must obtain an agreement from the lender to subordinate its interests to those of the easement holder so that the easement cannot be extinguished in the event of foreclosure.

If an easement donor wishes to claim tax benefits for the gift, he or she must donate it or sell it for less than fair market value to a public agency or to a conservation or historic preservation organization that qualifies as a public charity under Internal Revenue Code Section 501 (c) 3. The Southeast Michigan Land Conservancy, as well as most land trust organizations, meet this criterion.

Holding an easement, however, is a great responsibility. A property owner should make sure that the recipient organization has the time and resources to carry out that responsibility. An organization that accepts the donation of an easement typically will ask the owner to make a contribution toward the costs of monitoring and defending the easement in perpetuity or will establish a monitoring fund from other sources.

How Restrictive is an Easement?

An easement restricts development to the degree that is necessary to protect the significant values of that particular property. Sometimes this totally prohibits construction, sometimes it doesn't.

If the goal is to preserve a pristine natural area, for example, an easement may prohibit all construction, as well as activities that would alter the natural character of the land. If the goal is to protect farm land, however, an easement may restrict subdivision and development while allowing for structures and activities necessary for and compatible with the agricultural operation. Even the most restrictive easements typically permit landowners to continue traditional uses of the land.

How Long Does an Easement Last?

An easement can be written so that it lasts forever. This is known as a perpetual easement. Where state law allows, an easement may be written for a specified period of years, and this is known as a term easement. Only gifts of perpetual easements, however, can qualify a donor for income and estate tax benefits. Most recipient conservation and historic preservation organizations accept only perpetual easements.

An easement runs with the land - that is, the original owner and all subsequent owners are bound by the restrictions of the easement. The easement is recorded at the county records office so that all future owners and lenders will learn about the restrictions when they obtain title reports.

What are the Grantee's Responsibilities?

The grantee organization or agency is responsible for enforcing the restrictions that the easement document spells out. To do this, the grantee monitors the property on a regular basis, typically once a year. Grantee representatives visit the restricted property, usually accompanied by the owner. They determine whether the property remains in the condition prescribed by the easement and documented at the time of the grant. The grantee maintains written records on the monitoring visits. The visits also keep the grantee and the property owner in touch. If a monitoring visit reveals that the easement has been violated, the grantee has the legal right to require the owner to correct the violation and restore the property to its condition prior to the violation.

Must an Easement Allow Public Access?

Landowners who grant conservation easements make their own choice about whether to open their property to the public. Some landowners convey certain public access rights, such as allowing fishing or hiking in specified locations or permitting guided tours once a month. Others do not.

If an income tax deduction is to be claimed, however, some types of easements require access. If the easement is given for recreation or educational purposes, public access is required. For scenic easements, much of the property must be visible to the public, but physical access is not necessary. Access generally is not required for easements that protect wildlife or plant habitats or agricultural lands. For historic preservation easements, either visual or physical access is required, depending on the nature of the property or building to be preserved.

How Can Donating an Easement Reduce a Property Owner's Income Tax?

The donation of a conservation easement is a tax-deductible charitable gift, provided that the easement is perpetual and is donated "exclusively for conservation purposes" to a qualified conservation organization or public agency. Internal Revenue Code Section 170 (h) generally defines "conservation purposes" to include the following:

- the preservation of land areas for outdoor recreation, or for the education of the general public
- the protection of relatively natural habitats of fish, wildlife, plants, or similar ecosystems
- the preservation of open space - including farm land and forest land - for scenic enjoyment or pursuant to an adopted governmental conservation policy; in either case, such open space preservation must yield a significant public benefit
- the preservation of historically important land areas or buildings.

To determine the value of the easement donation, the owner has the property appraised both at its fair market value and at its fair market value with the easement restrictions. The difference between these two appraised values is the easement value. Detailed federal regulations govern these appraisals.

An example: A property has an appraised fair market value of \$100,000. Mrs. Price, the landowner, donates a conservation easement to the Southeast Michigan Land Conservancy. The easement restrictions reduce the property's market value to \$64,000. Thus, the value of her gift of the easement is \$36,000. Assuming the easement meets the conservation purposes test, Mrs. Price - like any donor of appreciated property - is eligible to deduct an amount equal to 30 percent of her adjusted gross income each year for the total of six years, or until the value of the gift has been used up. If Mrs. Price has an annual adjusted gross income of \$60,000, she can deduct \$18,000 a year (30% x \$60,000) until she has used up the \$36,000 value. In this case, she will use up the gift in two years (2 x \$18,000 = \$36,000), if her incomes does not change.

This is just a simple example. Easement donors may qualify for greater tax savings, especially when state income tax deductions are applicable. Potential easement donors should seek legal counsel.

How Can Granting an Easement Reduce a Property Owner's Estate Tax?

Many heirs to large historic estates and to large tracts of open space - farms in particular - face monumental estate taxes. Even if the heirs wish to keep their property in the existing condition, the federal estate tax is levied not on the value of the property for its existing use, but on its fair market value, usually the amount a developer or speculator would pay. The resulting estate tax can be so high that the heirs must sell the property to pay the taxes.

A conservation easement, however, often can reduce estate taxes. If the property owner has restricted the property by a perpetual conservation easement before his or her death, the property must be valued in the estate at its restricted value. To the extent that the restricted value is lower than the unrestricted value, the value of the estate will be less, and the estate will thus be subject to a lower estate tax. (Note that if the property owner donates the easement during his or her lifetime, he or she may also realize income tax savings.)

Even if a property owner does not want to restrict the property during his or her lifetime, the owner can still specify in his or her will that a charitable gift of a conservation easement be made to a qualified organization upon the owner's death. Assuming that the easement is properly structured, the value of the easement gift will be deducted from the estate, reducing the value on which estate taxes are levied. Again, a lower tax results.

Can Granting an Easement Reduce an Owner's Property Tax?

Property tax assessments are usually based on the property's market value, which reflects the property's development potential. If a conservation easement reduces the development potential of the property, it may reduce the level of assessment and the amount of the owner's property taxes.

The actual amount of reduction, if any, depends on many factors. In Michigan, however, assessors are required to consider the impact of a conservation easement upon the property's market value.

APPENDIX A

Selected Methods Manuals and Resource Documents Relative to Protecting and Enhancing Habitats

- *Artificial Habitats for Marine and Freshwater Fisheries* (1991)
Editors: William Seaman, Jr. and Lucian M. Sprague
Academic Press, Inc.
ISBN 0-12-634345-4
- *Design of Stormwater Wetland Systems: Guidelines for Creating Diverse and Effective Stormwater Wetlands in the Mid-Atlantic Region* (Publication Number 92710) (1992)
Author: Mr. Tom Schueler
Metropolitan Washington Council of Governments, 777 North Capitol St., N.E., Suite 300,
Washington, D.C. 20002-4201
- *Ecosystem Management for Parks and Wilderness* (1988)
Editors: D. Johnson and J. Agee
University of Washington Press, Seattle, Washington

- **Entering the Watershed: A New Approach to Save America's River Ecosystems (1993)**
 Author: B. Doppelt, M. Scurlock, C. Frissell and J. Karr
 The Pacific Rivers Council
 Island Press, Washington D.C. and Covelo, California
- **Guidelines for Streambank Restoration (1994)**
 Georgia Soil and Water Conservation Commission
 P.O. Box 8024, Athens, GA 30603
 Telephone Number: 706-542-3065
- **Habitat Conservation Planning: Endangered Species and Urban Growth (1993)**
 Author: Timothy Beatley
 Available from: Marketing Department, University of Texas Press, P.O. Box 7819, Austin, TX
 78713-7819
 Telephone Number: 1-800-252-3206
- **Locating, Constructing and Managing Islands for Nesting Waterfowl (1994)**
 John T. Lokemoen and Terry A. Messmer
 Published by The Berryman Institute Logan, Utah
- **Methods of Modifying Habitat to Benefit the Great Lakes Ecosystem (1995)**
 Editors: J.R.M. Kelso and J.H. Hartig
 Can. Inst. Sci. Tech. Inf. Occas. Pap. No.1
 Available from: Great Lakes Fishery Commission, 2100 Commonwealth Blvd., Suite 209, Ann
 Arbor, Michigan 48105-1563
 Telephone Number: 313-662-3209
- **National Ecosystem Management Forum Meeting Summary (1994)**
 Keystone Center, Keystone, Colorado
- **Natural Channel Design: Perspectives and Practice (1994)**
 Editor: Dan Shrubsole
 Based on the First International Conference on Guidelines for Natural Channel Systems
 Niagara Falls, Ontario
 ISBN 0-9694535-7-4
- **Natural Channel Systems: An Approach to Management and Design (1994)**
 Ministry of Natural Resources, Natural Resource Information Centre, Room M1-73
 Macdonald Block, 900 Bay Street, Toronto, Ontario M7A 2C1
- **Nature Reserves: Island Theory and Conservation Practice (1990)**
 Author: Craig L. Shafer
 Smithsonian Institution Press, Washington and London
- **Rehabilitating Great Lakes Habitats - A Resource Manual**
 Contact Person: Ms. Donna Stewart
 Environment Canada, Environmental Conservation Branch, 4905 Dufferin St., Downsview,
 Ontario M3H 5T4
 Telephone Number: 416-739-5829

- Restoration of Aquatic Ecosystems: Science, Technology and Public Policy (1992)
National Research Council (U.S.), National Academy Press
- Techniques for Wildlife Habitat Management of Uplands (1994)
Neil F. Payne and Fred Bryant
McGraw Hill Inc., Washington, D.C. 840 pp.
ISBN 0-07-048963-7
- Techniques for Wildlife Habitat Management of Wetlands (1992)
Neil F. Payne
McGraw Hill Inc. New York, New York 549 pp.
ISBN 0-07-048955-4
- The Lake Leelanau Watershed: Landowner's Handbook (1996)
Mark Stone, Fen's Rim Publications and Mary A. Taylor, South Lake Leelanau Steering
Committee
Available from: Northwest Michigan Resource, Conservation & Development Council, 3193
Logan Valley, Traverse City, MI 49684
Telephone Number: 616-946-6817