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Directions

For Natural Resources

An Ecosystem-Based Framework for Setting Natural Resource Management Priorities

Minnesota Department of Natural Resources

Strategic Plan
July 1997

Minnesota Department of Natural Resources

RESOURCE MANAGEMENT GUIDANCE DOCUMENT

I. EXECUTIVE SUMMARY

Background

Use of Minnesota's natural resources is increasing. Resource use is shaped by local, national, and global demands and pressures. Minnesota's natural resources provide distinct economic and social benefits. But the pattern of increasing use raises concerns for the health of certain ecological communities and the sustainability of vital ecosystems. Furthermore, stakeholders demand more involvement in natural resource decision making, and ask for a wider variety of products and amenities from natural systems. This can lead to increased conflict and new challenges for resource managers.

The DNR developed a foundation to address these concerns with ***Directions*** 1995. Here DNR outlined its vision:

"to work with people to manage the state's diverse natural resources for a sustainable quality of life."

DNR's vision hinges on the concept of sustainability. To DNR, sustainability means protecting and restoring the natural environment while enhancing economic opportunity and community well-being. DNR endorsed ecosystem-based management as its method to achieve sustainabiliy, and uses the concept of ecosystem integrity as a benchmark to measure progress toward sustainability goals (see sidebar).

These concepts helped build cohesiveness for DNR activities, but many staff felt they were too broad to truly guide resource management on the ground. To address this, the DNR's strategic planning process involved a range of field teams and stakeholders in developing statewide resource management priorities.

Process: The process began with area and regional staff meetings in the summer of 1996. Additional input was sought from department planners, program managers, operations managers, the EBM Coordinating Network, the Senior Managers Council, and the Commissioners Management Team. A stakeholder survey and follow-up focus groups gathered additional input from stakeholders.

This effort resulted in a number of findings and decisions that provide guidance for priority setting. They do not, nor do

SUSTAINABILITY, ECOSYSTEM-BASED MANAGEMENT, AND ECOSYSTEM INTEGRITY

Sustainability means protecting and restoring the natural environment while enhancing economic opportunity and community well-being. Sustainability addresses three related elements: the environment, the economy, and the community. The goal is to maintain all three elements in a healthy state indefinitely.

Sustainability is the expected result of all DNR resource management activities. DNR will work with partners to protect and restore ecosystems so that their resources can be used indefinitely by present and future generations. Cooperative partnerships will seek options to reconcile human needs and demands with the capacity of ecosystems to meet those demands.

Ecosystem-Based Management is the process of sustaining ecosystem integrity through partnerships and interdisciplinary teamwork. Ecosystem-based management focuses on three interacting dimensions: the economy, the social community, and the environment. Ecosystem-based management seeks to sustain ecological health while meeting socioeconomic needs.

Ecosystem-based management requires that DNR interdisciplinary teams work with the public to develop and implement sustainability goals for entire ecosystems. This is different from the old model of working separately to improve individual resources.

Ecosystem integrity is a measure of the capacity of ecosystems to renew themselves and continually supply resources and essential services. Ecosystem integrity is the degree to which all ecosystem elements -- species, habitats, and natural processes -- are intact and functioning in ways that ensure sustainability and long-term adaptation to changing environmental conditions and human uses.

Resource professionals must work closely with citizens to develop practical measures of ecosystem integrity. Benchmarks of ecosystem health will help identify clear targets for restoring degraded ecosystems and help evaluate progress toward reaching sustainability goals.

Applying Priorities

As a strategic guidance document, this is not intended to provide staff with specific directions on which programs to emphasize or de-emphasize. Those decisions cannot be made centrally, since the knowledge of local needs and conditions is held by area and regional staff.

This document presents a preliminary status report on Minnesota's natural resource base. It outlines a desired direction and provides examples of science and community-based approaches to sustaining that natural foundation.

Each region will need to determine which statewide natural resource issues apply in their part of Minnesota and select those that deserve high priority for attention. Working with area teams, regional teams should identify the strategies needed to address the high priority items. This should be an inclusive process that is implemented in partnerships with local communities.

Area and regional staff provided the main suggestions that undergird this document. Their suggestions highlighted the concern for habitat losses and the need for an ethic of resource and land stewardship. Those goals are the heart of the guidance provided by this document. First steps in implementing selected strategies will be identified in biennial work plans developed at area and regional levels. Strategies and goals may be applied in many ways.

- *Area staff cannot possibly address all resource management needs and opportunities arising in their area. They have always developed priorities to address the most important issues. Working as teams, area staff may use the guidance document in several ways. Recognizing habitat loss as a top priority, teams may wish to prioritize important habitat types and locations. They may then select from their numerous issues those with the greatest potential for addressing habitat loss issues.*

- *Regional staff and eventually all area teams will develop spending plans. The high-priority projects may be those that address habitat loss with an integrated approach or that capitalize on a significant environmental education opportunity.*

Time and process will refine these goals and strategies. Cooperative efforts between area, regional and central office staff will clarify how the guidance document will translate into specific program priorities.

they intend to define specific priorities for any program, region, or area. Those decisions must be made at local levels.

This document provides: 1) two primary goals for carrying out DNR's vision of sustainabilty, 2) a framework for priority-setting, based on our best understanding of citizen perspectives, social and economic forces, and current status and trends of Minnesota's ecosystems, 3) preliminary statewide resource management priorities that are based on this framework, 4) examples of ecosystem-based approaches for addressing these priorities, and 5) strategies for attaining DNR's fundamental goals.

Goals

The DNR endorsed the following goals to implement its vision of sustainability:

1) to maintain, enhance, or restore the health of Minnesota ecosystems so that they can continue to serve environmental, social, and economic purposes.

2) to foster an ethic of natural resource stewardship among all Minnesotans.

Framework and Basis for Priority Setting

Citizen Perspectives: Surveys conclude that most Minnesotans feel that the state's natural environment generally is in good shape. However, many citizens indicate that there are environmental problems in their locality. DNR will need to work closely with citizens to address their local problems and to develop a mutual understanding of statewide resource conditions.

Economic, Social, and Environmental Forces: These forces include consumerism, political and lifestyle shifts, demographic trends, technology, and nature itself. Understanding how these forces shape natural resource use and demand helps define long term resource management priorities and strategies. For example, population growth creates demand for housing sites, timber, mineral resources, and clean water. Changing demographics create new demand for recreation opportunities. The underlying forces influence an increase — often a dramatic increase — in the use of Minnesota's natural resources.

Ecosystem Status, Priorities, and Approaches: Minnesota's ecosystems — extensive forests, lakes, rivers and wetlands, agricultural lands and prairie grasslands — are the foundation of the state's economy and quality of life. Minnesota has developed a first-class outdoor recreation system based on these ecosystems. Scientific resource management supports a diverse resource-based industry and yields a habitat mix of rich diversity.

However, increased demand on natural resources along with changes in land use and outdoor recreation will challenge DNR's ability to meet its vision of ecosystem sustainability.

- ***Many ecological communities in Minnesota require restoration and improved management to reverse trends in declining environmental health.***

- ***Land use conversion continues to fragment and reduce the extent of ecological communities.***

These losses weaken the ability of natural ecosystems to renew themselves and to provide resource products and essential ecological services on a sustained basis. To address this concern, DNR needs to assess status and trends of ecosystems and resources, and set priorities based on this assessment. With input from field teams and assessment of ecosystem data, DNR's strategic planning process identified preliminary management priorities for forests, waters and wetlands, agricultural lands, and sensitive and threatened habitats:

Forests:

1) Protecting riparian areas,
2) ensuring forest soil productivity,
3) maintaining wildlife diversity, and
4) managing for healthy and resilient forest ecosystems across landscape scales.

Waters and Wetlands:

1) Reducing non-point source pollutants,
2) achieving no-net loss of wetlands,
3) managing shoreline development,
4) controlling spread of exotic species, and
5) protecting groundwater systems.

Agricultural lands:

1) Improving water quality, and
2) enhancing habitat and diversity within agricultural landscapes.

Sensitive and Threatened Habitats:

1) Accelerating collection and delivery of habitat information,
2) Maintaining representative examples of habitats in sufficient extent to sustain essential ecological processes and viable populations of plants and animals, and
3) Retaining features of threatened habitats in more intensively managed lands and waters.

DNR Management Responsibilities

To address these priorities, DNR will use ecosystem-based approaches and will become more of a science-led and community-based organization. DNR staff will emphasize the following strategies:

- ***Expand development of partnerships with organizations and other agencies to develop common resource management objectives.***
- ***Promote integrated approaches to managing resources.***
- ***Accelerate the collection, interpretation, and dissemination of scientific information describing Minnesota's ecosystems and natural resources.***
- ***Expand efforts to provide technical assistance to citizens and local government.***
- ***Improve communication with all stakeholders and citizens.***
- ***Establish environmental education as a cornerstone for developing a natural resource stewardship ethic among all Minnesotans.***
- ***Establish standards for evaluating and monitoring ecosystem health and effectiveness of ecosystem-based management efforts.***
- ***Improve integration of budgeting and planning across area, regional and state levels.***
- ***Place more authority with area staff to manage budget and staffing priorities.***

Next Steps: Disciplines, regions, and areas will use this document to help develop strategic natural resource plans, work plans, and budget priorities. For example, regions will work with areas to review these goals and strategies and define how they will be applied in each geographic area. Once priority resource areas and actions are determined, work plans and budget recommendations will be developed to reflect the priorities.

Support bureaus will use this document to define their role in providing services that further resource management priorities. Support bureaus will need to work closely with regional management teams and divisions to identify support needs.

Given the complexity of DNR resource management programs, setting interdisciplinary priorities will resolve past conflicts but may pose new issues. The DNR will develop a process for reaching consensus on resource priorities that can be used at the point where differences arise.

Over the longer term, the DNR will continue to integrate resource management priorities into existing departmental processes (discipline planning, budget development, regional resource plans, work plans, spending plans, etc.). Over time, integration and coordination in setting priorities will improve. So also will efforts to include stakeholders in the process.

II. CITIZEN PERSPECTIVES

Stakeholder and citizen perspectives will continue to influence DNR strategic directions. Several recent studies give insight to stakeholder perspectives on resource management.

SURVEY SOURCES

Himle Horner: Summary and Report on Research Conducted on Sustainable Development, surveys of Minnesota residents, 1996

Focus Groups: Stakeholder focus groups provided detail on responses generated in stakeholder survey by TK Associates (core associates: Dec. 1996, Jan. 1997)

Stakeholder Survey: An independent telephone survey of 130 stakeholders for opinions on DNR's approach of working comprehensively with the community, environment and economy (TK Associates: Sept. 1996)

Southeastern Minnesota: Environmental and Landuse Survey of Residents of Wells Creek Watershed and Southeastern Minnesota, Minnesota DNR and United States Forest Service, 1994.

Cannon River: Survey of Cannon River valley residents for their perspectives on resource issues and management needs. (The Nature Conservancy, 1995)

- ***Citizens place high priority on the natural environment and believe that the natural environment is generally healthy.***

In southeast Minnesota, 87% said that their quality of life depends on the environment (*Southeastern Minnesota*). Minnesotans' environmental values will continue to be a keystone around which resource management strategies can be developed.

- ***Stakeholders strongly support the balance between economy, the community and the environment sought through sustainable development approaches.***

Ninety-six percent of those surveyed ranked sustainable development approaches as very important and 59% were satisfied with how the DNR is carrying it out (*Southeastern Minnesota*). Seventy-six percent of citizens responded that sustainable development closely or somewhat closely reflects their ideas (*Himle Horner*).

- ***Stakeholders prefer local approaches to managing environmental concerns and feel the DNR should focus more management effort on the local community.***

Citizens feel that sustainable development strategies are most effective when implemented at the regional level (*Himle Horner*). More than 90% indicated that community interaction is very important and 96% said that coordinating programs with local communities also is very important. Partnering was suggested as the area where DNR needs to improve the most (*Focus Group*). Two thirds of stakeholders indicated that the DNR needs to provide more technical information to local decision makers and needs to bring local interests together for group decisions on resource issues (*Stakeholder Survey*).

- ***The DNR performs its services well but does not always communicate issues and concerns effectively to the public.***

Most citizens conclude that the DNR is performing well. In the statewide telephone survey, there was a 79% satisfaction rate with DNR projects and programs. In the southeastern Cannon River Area, 65% said that DNR programs do a "good job" (*Cannon River*). The DNR, however, is not effective at communicating important issues to the public. 42% concluded that the DNR should do more communication with local people (*Stakeholder Survey*). Citizens raised concerns about one-way communication, not knowing where to get information, weak electronic communications, and the DNR not knowing what the public wants. Citizens are not well informed about resource management issues and what the DNR is doing to manage those issues (*Focus group*).

- ***The DNR needs to provide more focus on certain resource issues.***

Stakeholders support management efforts to protect habitat. Citizens affirmed two natural resource priorities as important - water quality and ecosystem management (*Stakeholder Survey*).

III. SOCIAL, ECONOMIC, AND ENVIRONMENTAL FORCES

Economic, social and environmental forces create changes in resource demand and challenge current natural resource management practices. Resource agencies must understand these forces and how they drive resource use and pressures in order to manage ecosystems effectively.

- ***Demographic shifts will influence who uses resources, what resources are in demand, and where resources are used.***

The state's population is growing; the fastest growing group is people of color. The state's population also is aging, and baby-boomers soon will be reaching retirement age. Minnesotans are well-educated and family income is high. Family size has declined while the number of single parent families has increased. Population is growing in urban areas, suburban areas and in and around rural communities throughout the state. With urbanization, fewer people have direct connections with the natural landscape. This can influence the public's environmental views and values.

- ***Residential development will continue to expand into once rural areas.***

Surveys and market preferences indicate that most Americans prefer a single family dwelling in a non-urban setting. The availability of large tracts of undeveloped land at comparatively inexpensive prices has supported a rural land development growth in many parts of Minnesota. Many Minnesotans have home site choices not readily available in other areas of the U.S. These trends probably will continue. Much of the land supporting these residential sites is wooded, hilly, and near water. These same landscapes are important elements of the state's natural ecosystem and critical to sustaining high quality outdoor recreation opportunities, such as hunting, fishing and canoeing.

- ***Technology will reshape how natural resources are used, will create new issues in resource management, yet will offer new solutions to some complex issues.***

Technology creates opportunities and concerns. Technology offers opportunities for new recreation use. Jet skis, roller blades, mountain bikes, off-road vehicles, etc. have created new markets, and further changes can be expected.

Minnesota Demographic Profile

- Minnesota's population increased from nearly 4.1 million in 1980 to 4.6 million in 1994, a 12.1% increase — the fastest growth rate in the Upper Midwest.
- Minnesota's population is expected to increase to nearly 5.1 million people by 2020.
- Nearly 80% of Minnesotans live in cities.
- The average family income in Minnesota is higher than the national average and is the highest in the Plains region.
- Minnesota's population of 45 to 64 year olds grew faster than the national average. This age grouping is the fastest growing age category in Minnesota.
- Minnesota has the highest high school graduation rate in the nation.

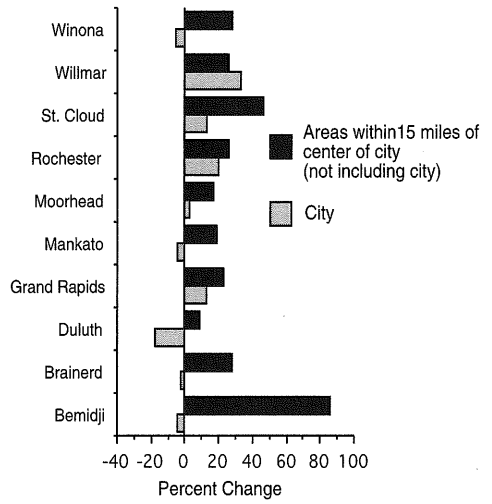
Source: *Change in Minnesota, Minnesota Department of Trade and Economic development*

Development/Ecosystem Relationships

"Development fragments biological communities. Often changes to the ecosystem are made incrementally and adverse affects are not considered or even understood. The many political boundaries further complicate the already difficult task of protecting ecosystems."

Source: *Settlement Patterns and Sustainable development, Minnesota Planning, March 2, 1993.*

Suburban Population Growth Near Regional Centers: 1970 - 1988



Source: *Settlement Patterns and Sustainable development, State Planning Agency, U.S. Census Bureau, March 2, 1993*

Personal Income and Earnings by Natural Resource Industry in Minnesota: 1989 to 1995

	1989	1995	%
	(millions of dollars)		increase
Mining	328	641	31%
Lumber Mfg.	611	869	42%
Furn. Mfg.	154	226	47%
Paper Mfg.	1,577	1,958	24%
Primary Metal Mfg.	233	313	34%
Food and Kindred Prod. Mnfg.	1,498	2,019	35%
Total Earnings in Minnesota	59,647	82,302	38%

Source: *Survey of Current Business, October, 1996, United States Department of Commerce*

Continued advances in communications and computing will improve information sharing and problem solving capacity. Bio-technology may improve the productivity of some natural resource processes and the ability to manage resource pests such as exotic species and plant diseases. Technology also can generate concerns such as new or more intensive demand on natural resources. Many technology-driven changes will be unpredictable in their advent and impacts.

- ***Political shifts will influence how resource decisions are made and what values will influence the public.***

Shifts in responsibilities from the federal level to the state will continue. Local participation in resource management decisions will grow as citizens and local government develop better understanding of resource management needs. Interests in privatization of public services will continue. DNR efforts to cultivate partnerships at the local level may restore some public trust. Social problems will remain difficult in the short term; the public focus will continue to be on crime, education and housing issues.

- ***Economic forces will define several conditions important to resource management, including resource use, customer needs and wants, and revenues available for managing natural resources.***

The natural resource sector of the state economy continues to grow and change. Between 1989 and 1995, earnings in key natural resource sectors in Minnesota grew at a healthy rate (see sidebar). Employment also expanded in most of these natural resource sectors. Recent expansions announced in the mineral and timber industry sectors suggest that natural resource based industries will continue to grow in Minnesota.

Natural resource industries in Minnesota that once served mostly local markets increasingly are part of the global economy. Demand as well as production centers in other nations have much greater influence on Minnesota natural resource industries. Global market influences are less predictable but may suggest higher demand and less volatility for natural resource products.

Forest Industry In Minnesota

"In the 1980s, an unprecedented $1.5 billion of capital investment were made in pulp, paper, and particle board facilities. The associated wood fiber demand from the state's forests was also unprecedented: a 70 percent increase in harvest activity occurred between 1980 and 1991. In the early 1990s, additional capital investments totalling nearly 2.2 billion occurred, requiring an additional 1 million cords of wood fiber annually."

***Source**: Sustainable Forestry Initiatives in Minnesota, an unpublished paper authored by Michael A. Kilgore, David C. Zumeta and Gerald A. Rose.*

Implications of a Consumer Society

High consumption lifestyles give Americans a wealth of options. Options include living space, transportation, food, technology and the items we use to make life easier, safer, healthier or more entertaining. Clearly, the twentieth century is closing on the most gadget rich, technology driven, product fulfilled society ever. The downside of consumption is found in our landfills. Despite recycling, Minnesota generates more waste than ever before. Annual per capita rate of waste generation in greater Minnesota grew from 1,540 pounds per person in 1991 to 1,740 pounds per person in 1994. (Consolidated Solid Waste Report, Office of Environmental Assistance, July, 1996). Options for increasing waste recycling are limited by the high collection costs incurred in Minnesota's low density settlement patterns.

In the social realm, increasing poverty in urban areas will complicate DNR efforts to provide services to a broader mix of the state's population. While survey findings conclude that Minnesotans highly value their natural heritage, greater concerns for education, public assistance and corrections may limit revenue available for resource management.

- ***Consumerism will define the scope and direction of resource demand.***

America's affluence allows society to consume commodities at a rapid rate. Despite efforts to recycle and reduce waste, America's consumer society creates large demands on natural resources. Even in outdoor recreation and leisure pursuits, use of more sophisticated equipment can influence resource management needs and demands.

Increasingly, other nations are becoming consumer societies. As third world nations begin to prosper, their consumption of goods and services will grow. With supply and demand markets now being global, trends in other nations can greatly influence demand for resource products in Minnesota.

- ***The natural environment itself is a powerful underlying force that helps define resource management issues and opportunities.***

Existing environmental conditions are a force, as they establish a baseline from which gains and losses will be measured and managed. The natural environment has a powerful but unpredictable ability to influence resource trends. Demands created by drought, floods, wildfire and pathogens often will require a shift in managing resources to address crisis situations. Historical environmental conditions provide information for evaluating ecosystem health and guidance for ecological restoration.

DNR plays a major role in managing resources to meet the demands shaped by economic and social and environmental forces. To develop long-term, sustainable strategies, the DNR must take a lead role in helping Minnesotans understand how the state's ecosystems and resources will respond to increased pressures and alternative management actions.

"We cannot have a healthy economy for very long without maintaining and restoring the environment that supports the economy. Conversely, we cannot cordon off the natural world as if humans have no place in it and as if we can lead prosperous lives without using the earth's resources."

– Governor Arne H. Carlson

"We abuse land because we regard it as a commodity belonging to us. When we see land as a community to which we belong, we may begin to treat it with love and respect."

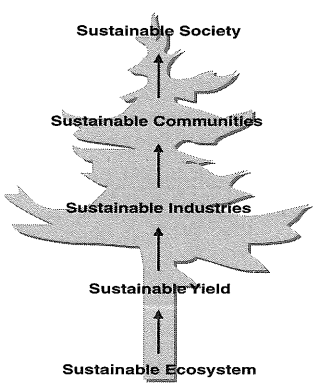
– Aldo Leopold

"Health is the capacity of the land for self-renewal. Conservation is our effort to understand and preserve this capacity."

— Aldo Leopold

The Sustainability Concept

Sustainable Societies meet the needs of the present generation without compromising the ability of future generations to meet their own needs. Sustainable societies are fundamentally built on **Sustainable Communities**. Communities are where natural environments are conserved or degraded, where people's needs are met or frustrated, and where ecological, social and economic factors are integrated. Sustainable communities are in turn dependent on **Sustainable Industries** that provide jobs and livelihood for people. Industries, in turn, are dependent on **Sustainable Yield** of natural resources — for example, clean air and water, consistent timber supplies, and recreational amenities. Sustained yield is in turn dependent upon a biologically **Sustainable Ecosystem**. Maintaining the health of ecosystems is the most fundamental strategy for achieving sustainability. It is fundamental because humans, like all living things, depend on ecosystems as life-support systems.



IV. ECOSYSTEM STATUS, PRIORITIES, AND APPROACHES

Overview: Increased demand on natural resources along with changes in land use and recreation interests will challenge DNR's ability to achieve its vision of ecosystem sustainability. To DNR, sustainability means protecting and restoring the natural environment while enhancing economic opportunity and community well-being. Sustainability addresses three related elements: the environment, the economy, and the community. The goal is to maintain all three elements in a healthy state indefinitely.

- ***Sustainability depends on healthy ecosystems.***

Healthy ecosystems are productive and diverse. A productive ecosystem yields a continual flow of resource goods and services. A diverse ecosystem contains a variety of species and habitats, also called biodiversity. With this variety, ecosystems are better able to survive and adapt to changing conditions ranging from natural events such as drought, flood, or fire to human activities such as timber harvesting, fishing, and water extraction. Biodiversity is like an insurance policy for sustainability; it helps maintain the ability of ecosystems to renew themselves in the face of continued use and disturbance.

- ***Increased demand for natural resources and development pressures pose challenges for the sustainability of the state's ecosystems.***

Because communities and economies are dependent on healthy ecosystems, ecosystem degradation will ultimately reduce economic opportunity and quality of life. Minnesota's ecosystems respond to increased pressures in a variety of ways. In many areas, management efforts are successfully reversing trends in ecosystem decline and are improving environmental health. However, in other areas, evidence documents ecosystem degradation, simplification, and fragmentation.

- ***Managing and conserving natural resources is a continuously changing, long-term enterprise.***

Society has succeeded in addressing many environmental problems that emerged in the 1960's and 70's, such as recovery of some wildlife species, and abatement of point sources of pollution. But as problems are solved, new ones emerge. Today's problems are more subtle, complex, and unpredictable. Examples include non-point-source pollution, toxic contamination of wildlife, habitat alteration and destruction, and overall loss of biodiversity.

Ecosystems

An ecosystem is a geographic area including all the living organisms (people, plants, animals, and microorganisms), their physical surroundings (such as soil, water, and air), and the natural cycles that sustain them. All of these elements are interconnected. Managing any one resource affects the others in that ecosystem. Ecosystems can be small (a single stand of aspen) or large (an entire watershed including hundreds of forest stands across many different ownerships).

Ecosystem Features and Management Implications:

- *Ecosystems are resilient, but they have limits. Ecosystems can be stressed beyond their capacity to recover and generate resources.*
- *Ecosystems are dynamic, they constantly change. Management cannot maintain ecosystems unchanged, but management can conserve them undiminished in their capacity to support future generations.*
- *Ecosystem resilience depends on diversity. Diversity within ecosystems allows them to adapt to changing conditions.*
- *Ecosystem change is not completely predictable. Consequently, management must be adaptive; continuously adjusted in response to new knowledge.*

Environmental Indicators Initiative

The Minnesota Environmental Indicators Initiative will develop and implement the state's first comprehensive framework to assess, monitor, and communicate the overall health of Minnesota's environment. A task force representing environmental agencies, academia, industry, and conservation interests guides the project. Major objectives are to: 1) catalog and evaluate existing environmental monitoring efforts, 2) summarize the extent and condition of Minnesota's major ecosystems, 3) develop a scientifically sound and socially relevant set of environmental indicators, and 4) design a statewide Environmental Indicators Network for the consistent collection of environmental data and reporting of indicators.

These newer problems often result from cumulative impacts of small-scale actions that alone do not raise great concern. For example, draining a one-acre wetland will not cause waterfowl populations to crash or significantly increase flooding risk. But draining many wetlands over large regions can decimate waterfowl populations, and increase flooding potential. Examples of cumulative problems abound. Small impacts add up, often unnoticed, and by the time socity recognizes a problem it can be extremely difficult to solve. New approaches that address these cumulative, larger scale impacts are needed.

The Ecosystem Approach

Ecosystem-based management approaches evolved to meet today's complex problems and to address increasing and conflicting demands on the natural resource base. For natural resource managers, ecosystem based management means building on their best management traditions and extending focus from single resources to address multiple resources within whole ecosystems. Ecosystem-based management means building public-private partnerships to accomplish common goals aimed at long-term sustainability of entire land and water systems.

Minnesota DNR plays a vital role in providing reliable and accurate information on the status of Minnesota ecosystems. Using the best available science, DNR is participating in cooperative alliances with citizens to define a range of desired ecosystem conditions and tailor management plans for local ecosystems across the state. DNR also participates in the Environmental Indicators Initiative, an effort to develop indicators of ecosystem health to help guide public policies and private action toward sustainability.

The following pages profile four ecosystem classes as DNR priorities — forests, waters and wetlands, agricultural lands, and rare and sensitive habitats. Each ecosystem is described with:

1) ***ecosystem status and trend information,***
2) ***priority sustainability issues, and***
3) ***highlights of citizen-based efforts working to ensure ecosystem integrity and resource benefits.***

RECOVERING FOREST WILDLIFE POPULATIONS

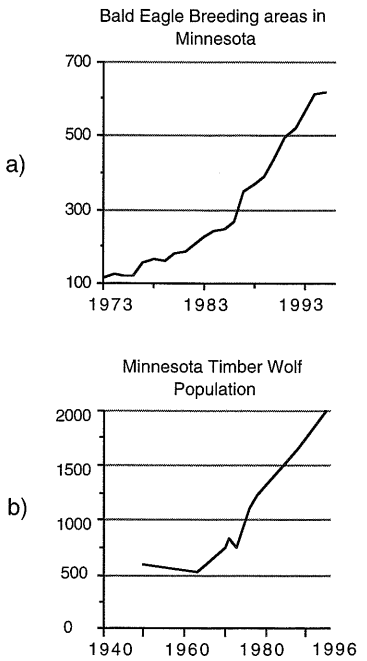


Figure 1.

a) Minnesota surpassed the federal Bald Eagle Recovery Plan Goal of 300 occupied breeding areas in the 1980's .

b) Minnesota surpassed the federal Timber Wolf Recovery Plan goal of 1251-1400 wolves in the 1980's.

Source: Status of Wildlife Populations Report, MN DNR 1996.

Forests cover one-third of the state's 54 million acres. They cross several distinct climatic zones resulting in a complex diversity of deciduous, coniferous, and mixed forest communities. The Minnesota Natural Heritage Program recognizes 23 distinct forest communities. These range from the extensive Aspen/Birch forests to communities of relatively small geographic extent such as Upland White-Cedar forests and Black Ash Swamp forests (MNDNR 1993a).

Minnesota forests are a cornerstone of the state's environmental and economic health. They purify air and water, protect soils, and maintain diverse plant and animal communities. Forests support the forest products industry, valued at 7.8 billion dollars, and provide 58,000 jobs. Healthy forest ecosystems are the foundation for diverse recreational opportunities and a thriving tourism industry (MNDNR 1995).

STATUS AND TRENDS

Minnesota's forests have seen great changes in the past 150 years. Between 1850 and 1900, vast expanses of Minnesota's original 31 million acres of forest were harvested to provide lumber and to clear land for settlement. By 1900, this harvesting reduced forest acreage to about 12 million acres (Forest Inventory Analysis, 1995). With regrowth and scientific management, today's second forest has emerged healthier than it was at the turn of the century.

Forests now cover 17 million acres and growth exceeds harvest for most tree species (Forest Inventory Analysis, 1995). The populations of many forest-dependent wildlife species are stable. Population numbers of some federally threatened species, such as Gray Wolves and Bald Eagles, have recovered, in part, because of forest habitat protection (Fig. 1). Citizens have become more involved in forest management through local projects, educational

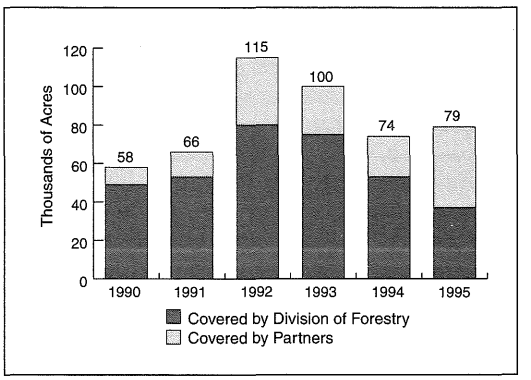


Figure 2. *Working with landowners, DNR and partners have prepared forest stewardship plans for 492,000 acres of private lands.*

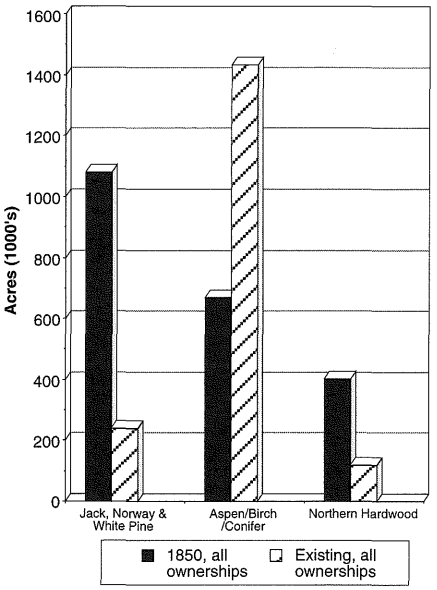


Figure 3. *Past and present forest composition of the Headwaters Woodlands Landscape showing decline in pine and northern hardwoods.*
Source: DNR Region 1 Resource Management Plan.

programs and development of Forest Stewardship Plans (Fig. 2).

Despite improvements, numerous forest management challenges remain. Historical loss of forest acreage, change in species composition, and shift in age structure have decreased the diversity of Minnesota forests . Traditionally, forest management has been applied on a stand-by-stand basis with little attention to landscape level diversity. This approach can lead to simplification of the forest. For example, significant decline of pine and northern hardwood forests has occurred since the 1800's; in place of a mixed forest, aspen now covers a much greater proportion of the landscape (Fig. 3), (Jaakko Poyry 1992a).

Some forest types and age classes are now rare. The once contiguous "Big Woods" maple basswood forest of south central Minnesota has been converted to small, disconnected parcels (Fig. 4). The consequences of forest fragmentation include the eventual loss of sensitive species (Table 1). Old-growth forests once covered an estimated 51% of the state's forest area, but today occupy less than 4% of the total forest area (Jaakko Poyry 1992a).

BIRD SPECIES SENSITIVE TO FOREST FRAGMENTATION

Red Shouldered Hawk
Barred Owl
American Redstart
Red-eyed Vireo
Yellow Throated Vireo
Pileated Woodpecker
Acadian Flycatcher
Northern Waterthrush
Louisiana Waterthrush
Northern Parula
Black-and-white Warbler
Hooded Warbler
Black-throated-blue Warbler
Cerulean Warbler
Canada Warbler
Cerulean Warbler
Ovenbird
Scarlet Tanager

Source: GEIS on Timber Harvesting, 1992.

Table 1. *Fragmentation of forests may reduce their ability to maintain healthy populations of sensitive bird species.*

Forest Cover in Erin Township, Rice County, MN, 1850-1991

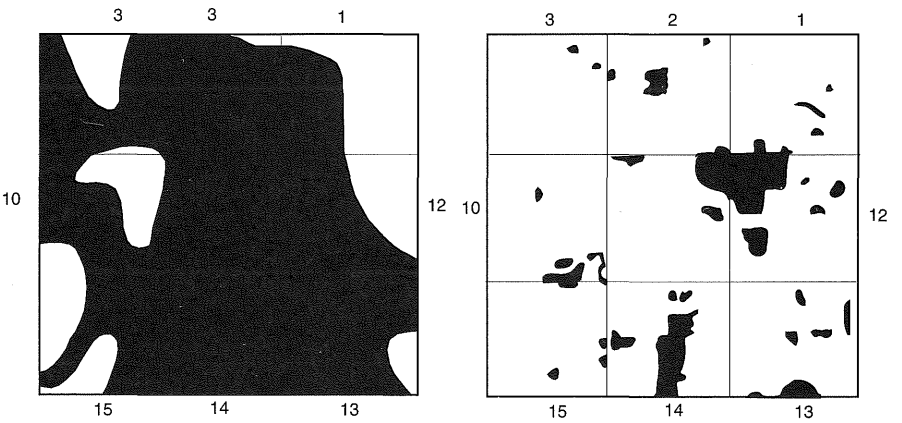


Figure 4. *Conversion of forest for agriculture and development has reduced the size of forests in the Big Woods ecoregion to small discontinuous fragments.*

Sustainability Issues

New strategies and techniques are needed to respond to improved understanding of forest ecosystems and to meet changing demands on forest resources.

Since 1980, the amount of wood harvested from Minnesota forests has increased by 54 percent (from 2.4 million cords to 3.7 million cords per year). Continuing increases in demand will likely bolster annual harvest to 4.67 million cords by the year 2000 (Fig. 5) (MN DNR 1995). This increased harvest supports the state's current forest-based economy, but poses potentially negative consequences for the long-term health and productivity of forest ecosystems.

The Minnesota Forestry Generic Environmental Impact Statement (GEIS) provided a comprehensive study of these potential impacts under current and increased levels of timber harvesting. Building on the GEIS, The Minnesota Forest Resources Council (FRC) identified priority forest management issues. Some of these are:

1) ***Protecting riparian areas,***
2) ***ensuring forest soil productivity,***
3) ***maintaining wildlife diversity, and***
4) ***managing for healthy and resilient forest ecosystems across landscape scales.***

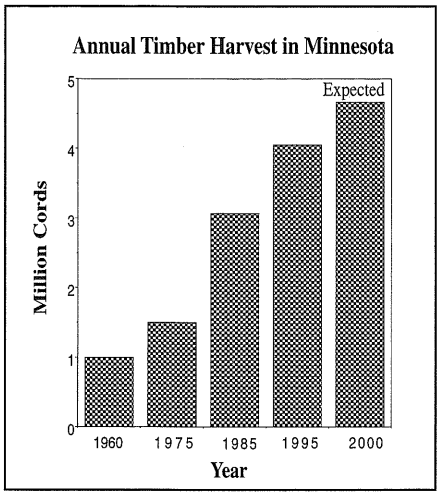
Forested riparian areas are critical to wildlife and maintenance of healthy aquatic ecosystems. The percent of forest cover within a watershed is one of the best predictors of stream water quality in Minnesota (Jaakko Poyry 1992c). Loss of forests along streams and lakes increases soil erosion and pollution run-off, impacting wildlife, fish, and human health.

Soil productivity is the foundation for maintaining forest benefits. Timber practices that remove woody debris and cause soil compaction and erosion can degrade long-term soil productivity. Sustainable management will require increased monitoring to measure trends in soil productivity. It will also require a better understanding of the relationship between timber harvesting techniques and soil productivity.

Diverse wildlife populations depend on healthy forests. Some species such as deer and ruffed grouse are abundant in Minnesota's forests. Other species, such as the red-shouldered hawk and the Louisiana waterthrush currently are of special concern (Jaakko

Forest Resources Council

Created by the Sustainable Forest Resources Act of 1995, the Minnesota Forest Resources Council provides a forum to discuss forest management issues and to provide sound forest management recommendations to the governor and to federal, state, county, and local governments. The Council's 13 governor-appointed members represent a broad array of organizations holding commercial, recreational, scientific, and conservation interests in Minnesota's forests. This diverse membership helps ensure that the Council's policies and practices will result in long-term sustainable management of Minnesota's forest resources.



Source: MNDNR and Minnesota Forest Resources Council

Figure 5. *Continuing demand for wood is expected to raise the annual harvest level to 4.67 million cords by the year 2000.*

Poyry 1992b). Forest clearing and fragmentation could alter bird populations that depend on large tracts of forest interior for reproduction and survival (Robinson et al. 1995). Environmentally sensitive forest harvest practices are necessary to the protect the full range of native forest plants and animals.

Healthy ecosystems across landscape scales: Traditionally, forest management was applied on a stand-by-stand basis (stands are usually 1-50 acres). However, at this scale, multiple goals are difficult to reconcile, such as biodiversity conservation, different types of recreation, and different intensities of management and harvesting. Hence, many of the most pressing forest sustainability issues are best addressed at a landscape scale (landscape scales are usually 100's to 1000's of acres) with coordination across different forest landowners. DNR will participate with the Forest Resource Council's newly created Landscape-level Forest Resources Program in efforts to develop a landscape-level planning and coordination framework.

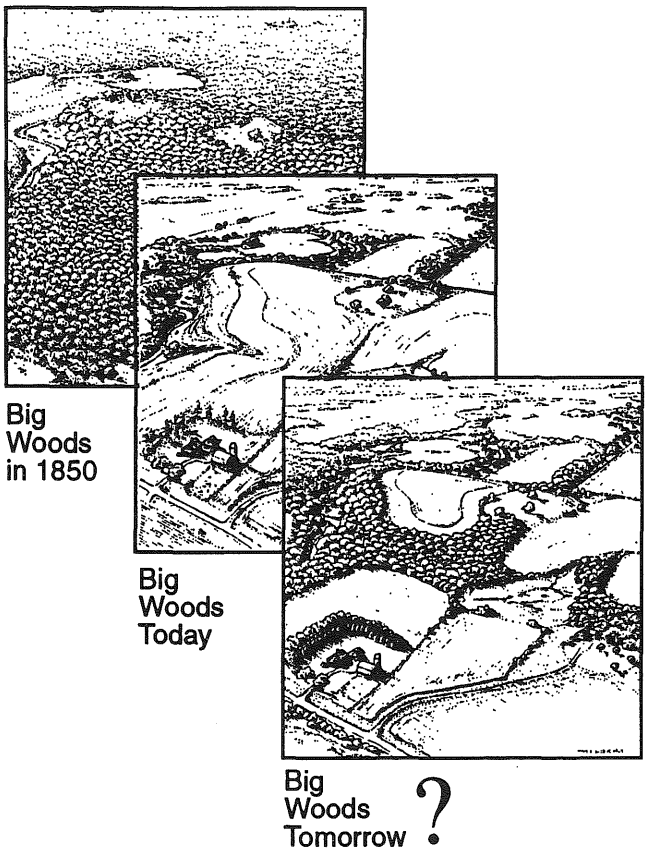
Ecosystem-based Management Approach

DNR will work with partners and citizens to cooperatively define future forest conditions and to accomplish common goals for ecosystem sustainability. For example, the Big Woods Project is implementing innovative approaches to increase the size of the forest land base and reduce its fragmentation in the Big Woods Landscape (see Big Woods case study). In another initiative, DNR will work with all forest landowners to increase the presence of White Pine on ecologically appropriate landscapes (see White Pine case study).

The ecosystem-based approach extends management focus to larger geographic scales with the goal of maintaining forest health, productivity, and a diversity of forest habitats across entire landscapes. A forest system with high ecological integrity will have a mosaic of young, mature, and old-growth forests that maintains a diverse assemblage of species necessary for long-term adaptation in a continuously changing environment. New management techniques are being integrated into forestry practices to enhance ecological integrity. These include increased emphasis on uneven-aged management, extended rotations, retaining snag and den trees, and application of Best Management Practices.

Case Study – The Big Woods

What is the future of The Big Woods?



The "Big Woods" Maple-Basswood forest once covered 3,420 square miles of south central Minnesota. Today only a few thousand acres of isolated forest tracts remain. Local groups working with agency partners have developed a vision for restoring forest connectivity and vitality to the landscape.

THE BIG WOODS PROJECT

The Big Woods Project, a model effort initiated by local groups and concerned citizens, is working to improve the Big Woods ecosystem in south-central Minnesota. The goal of the project is to "protect, maintain and restore healthy and biologically divers natural areas as part of the social and economic environment in eastern Rice County". Project activities include:

- Maintain and restore Big Woods forest remnants,
- Protect and restore connectivity to these forest patches,
- Improve the overall quality of the landscape by providing habitat for important plant and animal species, and
- Reduce erosion and improve water quality.

Partners include the Cannon River Watershed Partnership, Seven Mile Woods Association, the river Bend Nature Center, Friends of the Big Woods, the Nature Conservancy, and the regional office of the MN Department of Natural Resources.

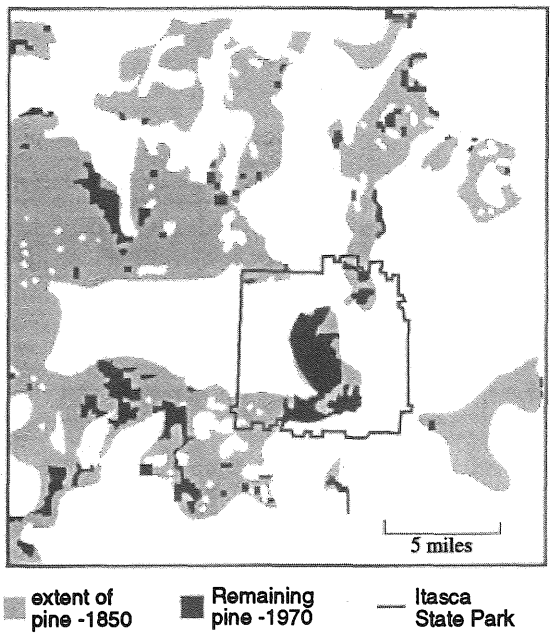
Case Study – White Pine Forest

What is the future of Minnesota's White Pine Forest?

WHITE PINE REGENERATION STRATEGIES WORK GROUP

Substantial declines in white pine in Minnesota forests resulted from harvesting in the late 1800s and early 1900s, clearing of forested land for agricultural and other uses, the introduction of blister rust from Europe, an increased deer population that often feeds on white pine, and emphasis on management of tree species other than white pine.

In response to widespread public concern about the white pine resource in Minnesota, a White Pine Regeneration Strategies Work Group was appointed in 1996 by DNR. This multi-disciplinary team recommended significantly increasing the role and presence of white pine in Minnesota. In a recently completed report they recommended doubling the number and acres of young white pine trees in Minnesota within the next seven years. The work group stressed that it will require the combined efforts of all concerned stakeholders to achieve this and other recommended goals.



Distribution of white pine/red pine: Itasca State Park Environs 1850 - 1970

MISSISSIPPI RIVER WATER QUALITY DOWNSTREAM OF THE TWIN CITIES

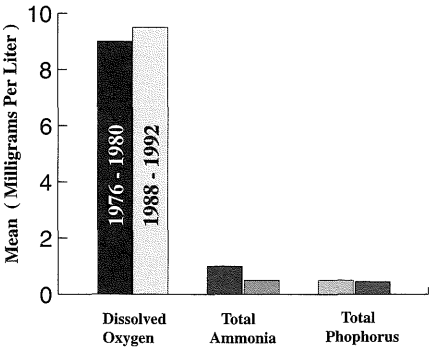


Figure 6. *Trends in water quality indicators suggest overall improvement for 3 indicators over the last 20 years in response to upgrading wastewater treatment and increasing efforts to reduce runoff pollution. Source: MN Pollution Control Agency.*

DECLINES IN TROPHY SIZED FISH

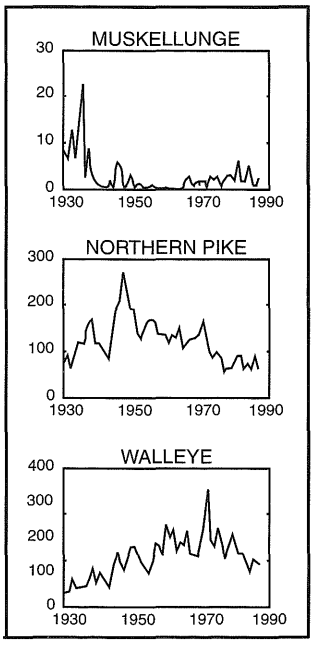


Figure 7. *Numbers of large muskellunge and northern pike in the Park Rapids area declined after the 1930's and 40's; large walleye have declined since their peak in the 1970's. Source: Olson and Cunningham 1989.*

Minnesota enjoys an abundance of high quality aquatic resources. Clean and adequate supplies of water maintain the state's tourist industry, support residential development, and provide for irrigation, electricity, and other economic endeavors. Water is the lifeblood of the environment, essential to plant and animal life and human health.

STATUS AND TRENDS

Lakes, Rivers, and Streams: Minnesota has over 92,000 miles of streams and rivers, and over 15,000 lakes. Minnesotans and out-state visitors spend over $900 million per year on fishing and related activities (MN DNR 1996). Our aquatic ecosystems show both signs of improvement and evidence of deteriorating quality.

- *Mississippi River water quality measurements show improvements; concentrations in ammonia and phosphorous have decreased since 1976, and dissolved oxygen has increased (Fig. 6) (MPCA 1993).*

- *PCB concentrations in Metro Area carp have declined six-fold since 1973. These levels, however, still exceed the MN Department of Health's recommendation for human consumption (MPCA 1995).*

- *Over the last 20 years, only 5% of all river miles in Minnesota have been assessed for water quality (MPCA 1994).*

- *The total number of fish harvested in the state has remained basically stable over the last 30 years, but numbers of trophy sized fish caught in the Park Rapids area have declined (Fig. 7) (Olson and Cunningham 1989).*

- *The Minnesota river is currently considered "one of the state's most highly polluted waters," often exceeding federal water quality standards for nutrients, fecal coliform, sediment, and dissolved oxygen (MPCA 1994).*

- *From 1967 to 1984, the number of cabins and homes around lakes increased by 74%, and rapid lakeshore development trends continue. Shoreland development often impairs water quality and fish and wildlife habitat (MN Environmetal Quality Board 1991).*

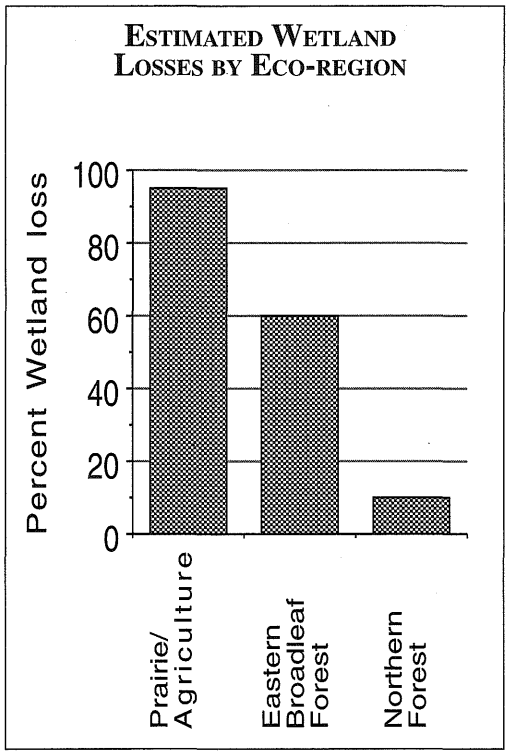


Figure 8. Wetlands losses vary substantially by ecoregion. Source: MN DNR Division of waters.

Wetlands: Minnesota has over 10.6 million acres of wetlands, and is second only to Louisiana and Alaska with respect to wetland acreage still remaining. Wetlands provide numerous benefits, including flood mitigation, improved water quality, wildlife and fisheries habitat, and scientific and educational uses. Programs have been effective in maintaining and restoring Minnesota wetlands, but losses continue from development and agricultural practices (NRCS 1996).

- *54% of Minnesota's original wetland acreage remains (NRCS 1996).*
- *Net wetland losses in Minnesota averaged 2,650 acres per year between 1982-1992 (NRCS 1996).*
- *Historically, wetland losses were caused mainly by conversion to agriculture. Today, urban development is a major cause of wetland losses in Minnesota (NRCS 1996).*

Groundwater and Water Use: Groundwater supplies are much larger than the volume of water in lakes, rivers, and wetlands. Seventy-five percent of Minnesotans depend on groundwater for residential supplies. Though Minnesota has extensive high quality groundwater sources, pressures on ground and surface water sources are increasing (Fig. 9). Public water use has increased nearly eight times faster than population growth over the past 35 years (MNEQB 1992).

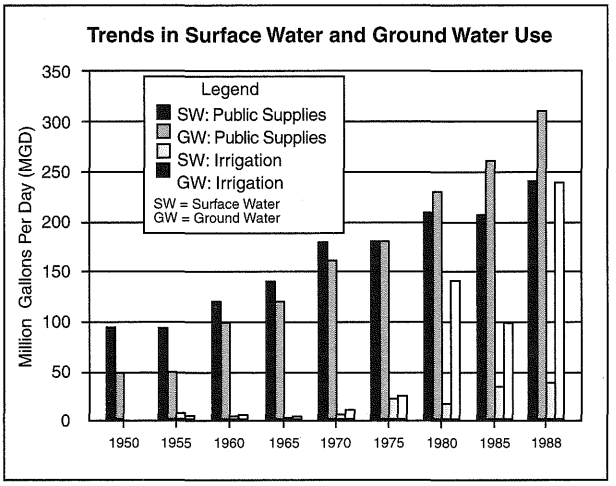


Figure 9. Surface and groundwater use has increased over the last 50 years. Source: MN DNR Division of Waters.

- *At least 70% of all septic systems in Minnesota are inadequately treating wastewater. This means that nearly 300,000 septic systems may be contaminating ground or surface water (MPCA 1994).*
- *A 1989 survey of 21 Minnesota cities and 18 companies revealed that groundwater contamination has cost the cities over $24 million and the companies $43 million (Freshwater Foundation).*
- *During 1992-3, 62% of wells sampled contained nitrates, and 7% exceeded the Minnesota Department of Health Risk Standard. Elevated nitrates can have adverse health impacts on infants, children, and pregnant women (MPCA 1994).*

Sustainability Issues

Growing demand for water, development pressures, and pollution will continue to stress aquatic and wetland ecosystems. Sustaining aquatic and wetland ecosystems will require accelerated efforts in many areas, including:

- ***reducing non-point source pollutants,***
- ***achieving no-net loss of wetlands,***
- ***managing shoreline development,***
- ***controlling spread of exotic species, and***
- ***protecting ground-water systems.***

Non-point source pollution primarily includes runoff of nutrients, sediments, and toxic chemicals from urban and rural landscapes. These inputs increase turbidity of water, increase populations of undesirable plants, change communities of fish and animal species, and increase water treatment costs. Non-point sources contribute significant pollutants for 95% of rivers that fail to meet designated use standards in Minnesota (MPCA 1994). Use of Best Management Practices in forests and agricultural lands have helped reduce these inputs, and more widespread use will directly benefit aquatic systems.

No-net-loss of wetlands is closer to becoming a reality in Minnesota due to various state and federal programs that encourage alternative land uses, restoration and mitigation (Minnesota Board of Water and Soil Resources 1996). Because of their ecological and economic importance, achieving no-net-loss of wetlands continues to be a high priority for Minnesotans. The Minnesota Wetlands Conservation Plan provides a framework to improve wetland conservation while addressing concerns of landowners.

Managing shoreline development will be especially important as the number of lake homes continue to rise. On popular lakes, lot densities sometimes exceed those in urban areas. Removal of shoreland and aquatic vegetation allows sediment and chemicals to enter water bodies. As more shoreline is developed, cumulative inputs will have greater impacts on the aquatic plant and animal communities. Loss of shoreline vegetation also directly affects fish and waterfowl populations by removing critical spawning, feeding, and nesting habitat.

Wetland Conservation Efforts in Minnesota

Recognizing the economic and ecological costs of wetland losses has stimulated efforts to slow development and degradation of wetlands. Minnesota has long been a leader in wetlands protection. In the 1950's, wetlands protection began with the DNR's "Save the Wetland's Program." Under this and similar programs, more than 1,000 Wildlife Management Areas (WMA's) were established, totaling nearly 900,000 acres. Wetlands cover about one half of these acres.

Today, the most comprehensive wetland policy is the 1991 Wetland Conservation Act. This act calls for "no-net-loss" and strives for increased wetland acreage. Changes in 1996 increased flexibility of the law and reduce financial burdens on farmers.

Minnesota Wetlands Conservation Plan

This plan, to be completed by June 1997, builds on past policies and provides an "umbrella" wetlands policy framework to help coordinate different agency responsibilities and address concerns of landowners and local governments. It involves the combined efforts and contributions of a diverse group of experienced citizens and professionals throughout Minnesota. Major features include:

- *Enhancing the role of responsible local government units (LGU's) as primary point-of-contact for applicants and regulating agencies.*
- *Getting more and better information to LGU's and landowners to help with evaluating options and making informed decisions.*
- *Accounting for regional differences and avoiding "one-size-fits-all" wetlands policy.*
- *Providing guidance for wetland restoration and mitigation for different management settings across the state.*

Exotic species are a growing concern in many Minnesota lakes, rivers and wetlands. They compete with native plants and animals, sometimes eliminating them from an area. Although often productive, exotics frequently are not useful as a food source for other native animals, and may grow densely enough to interfere with boating, fishing and swimming. The DNR Exotic Species Program is tracking the occurrence and introduction of exotic species in Minnesota's waters and wetlands, and in several cases is effectively limiting their spread.

Exotic Species in Minnesota's Aquatic Habitats

Species	1996 Occurrence
Eurasian watermilfoil	79 lakes total
purple loosestrife	548 lakes
flowering rush	10 lakes
curly-leaf pondweed	65 of 87 counties
zebra mussel	Duluth Harbor, Lake Pepin
rusty crayfish	> 12 counties
ruffe	Duluth Harbor

Source: *DNR Exotic Species Program*

Table 2. *Introduction of exotic species can undermine the health of ecosystems and displace desired native species.*

Groundwater systems are under increased pressure. In some regions, heavy use of groundwater limits supply, particularly during drought years. Chemical and bacterial contamination of groundwater supplies further limit groundwater use, and are expensive to mediate. For example, it would cost Clear Lake $350,000 for a nitrate removal system to bring their water supply up to safe drinking water standards.

Straight River Watershed

The DNR's Divisions of Waters and Fish and Wildlife, in partnership with local units of government, citizen groups, conservation organizations, and other agencies, are leading a comprehensive study of the Straight River watershed. The study examines available water supplies, current uses of its ground water system, and the effect of ground water use on the unique resources of the region. Located in Hubbard and Becker Counties, the Straight River is one of the premier brown trout fisheries in the Upper Midwest. The cool, clean water supplied by ground water resources is the key element in the trout fishery of the Straight River, providing the low temperatures necessary for successful trout reproduction, growth and survival. Recent increases in irrigation for the continued development of potato farming in the area could put the Straight River trout population at risk because of the potential increasing water temperatures that may result. In addition, there is a growing concern that nitrates and nitrogen based fertilizers could eventually pose a threat to public health. Field staff from state and local agencies will collect data on the river to provide additional information needed to determine the extent to which ground water use is affecting water supplies and quality, stream flow conditions, and fish habitat. Information gathered will be used to develop computer models of possible impacts to the Straight River and its watershed associated with groundwater pumping.

Ecosystem-based Management Approach

Wetlands, streams, and lakes are the lowest spots on the landscape; hence they receive pollutants and other impacts from a wide variety of upland activities. Threats to aquatic environments can be addressed only from the larger and more comprehensive perspective of their surrounding watersheds. Problems such as non-point-source pollution cross political and jurisdictional boundaries and must be addressed by all affected communities. To improve the health of watersheds and aquatic systems, DNR works with communities, local governments, and private groups in comprehensive watershed partnerships. Based on successful pilot efforts (see Big Sandy and Leech Lake sidebars), DNR will expand the number of watershed projects and accelerate efforts to provide up-to-date and accurate natural resource information to watershed participants. New efforts are underway on the Mississippi River and Metro Trout Stream Watersheds to bring together citizens and resource practitioners to gain understanding of aquatic ecosystems and develop innovative ways to manage them sustainably (see case studies).

Tri-County Leech Lake Watershed Project

The Tri-County Leech Lake Watershed Project, in north central Minnesota, provides a mechanism for both intergovernmental and private citizens' cooperation to develop a long range comprehensive watershed management plan. The project spans 750,000 acres of forest land and lakes in northern Minnesota. Land ownerships are diverse, and include private residential and industrial land, the Leech Lake Indian Reservation, and the Chippewa National Forest.

Recent Accomplishments:

- *Secured funding for the City of Federal Dam wastewater treatment system and other private, commercial wastewater projects in the watershed.*
- *Completed a stormwater runoff report for Walker, MN; reports are underway for Federal Dam, Longville, Akeley, and Laporte.*
- *Completed forest stewardship plans for six landowners in the Necktie River sub-watershed.*
- *Began regular circulation of a Leech Lake Watershed Newsletter.*
- *Initiated development of an informational video and project brochure on Leech Lake Watershed issues.*

Big Sandy Area Lakes Watershed Project

This project is a comprehensive, grassroots partnership that aims to preserve and improve water quality in the Big Sandy Area Lakes Watershed. The effort works to sustain valuable and vulnerable shoreland habitat and promote Best Management Practices with all landusers.

Recent accomplishments:

- *Completed Phase I of Clean Water Partnership Project (MNPCA funded) involving diagnostic studies as the basis for corrective actions to improve watershed water quality.*
- *Local citizens and work teams are completing Phase II of the Partnership to carry out water quality improvements.*
- *Produced an educational video on watershed issues and Best Management Practices.*
- *Initiated collaborative development of an interpretive display at Savanna State Park on local geology, cultural history, and natural resource issues.*

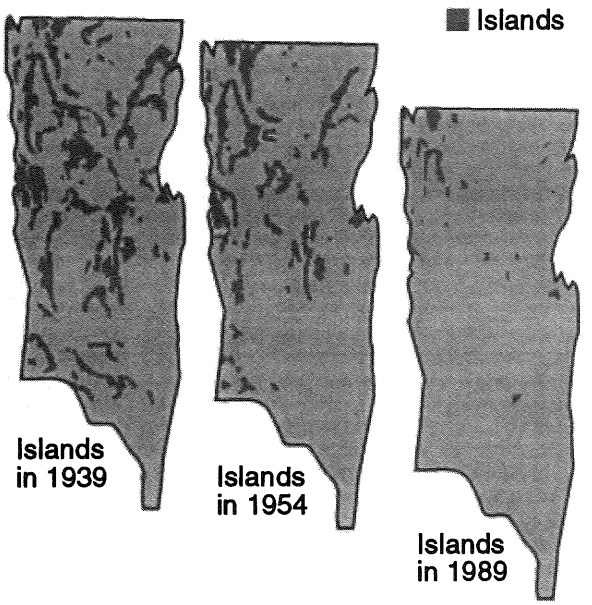
What is the future of the Mississippi River Ecosystem?

MISSISSIPPI RIVER ADAPTIVE ENVIRONMENTAL ASSESSMENT

The Minnesota DNR in cooperation with the Upper Mississippi River Basin Association is sponsoring a series of workshops to explore sustainable futures for the river. Workshop objectives are to:

- develop an integrated, science-based understanding of the Upper Mississippi River as a natural system;
- chart the relationships among ecological, economic, and social conditions; and
- use this integrated understanding to explore alternative management options that reconcile multiple demands.

The ultimate goal is development of a management program that sustains the use of the river as a navigation system and an internationally significant ecological area.



Since construction of the lock and dam system the island habitats in Pool 8 have steadily eroded. The Mississippi's mosaic of islands, open water and marshes create habitat for abundant fish and wildlife.

AGRICULTURAL LANDS

"For agriculture to be sustainable, farm management and farm policy will recognize that each farm is part of a larger natural system and that every element in this system is interconnected and interdependent"

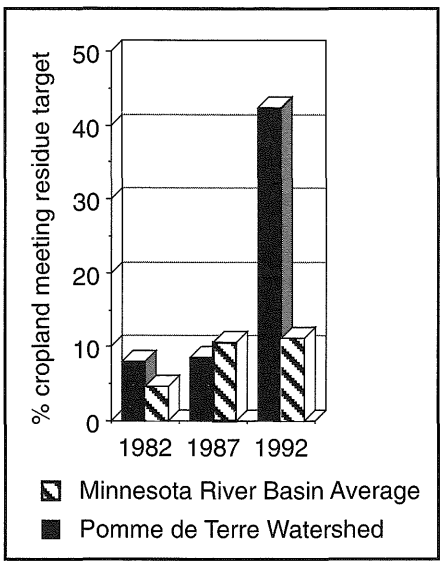
– MN Sustainable Development Initiative Agriculture Team

Agricultural lands occupy more than 45% of Minnesota. They represent a changing pattern of croplands, pastures, woodlands, livestock, soils, water, and wetlands. These lands are vital components of the state's economy and environment. Food and fiber production and related industries provide livelihoods for a significant number of Minnesotans. Surface and groundwater quality, soil maintenance, wildlife and fish populations, and aquatic ecosystems directly depend on the health of agricultural landscapes.

Soil and water conservation are concerns of the agricultural community. In recent years this concern has broadened to include sustainability of whole watersheds and ecosystems. New alliances among farmers, citizens, local governments, private organizations, and other agencies are working to improve the health of agricultural lands and watersheds. DNR will accelerate its role in these partnerships by focussing on the following:

1) Helping diverse groups to better understand each other and develop shared sustainability goals, and

2) providing scientific information on ecosystem status and trends to increase understanding of the consequences of management options.



Source: Natural Resources Inventory

Figure 10. *Increases in Crop Residue Management in the Minnesota River Basin help reduce sediment runnoff.*

STATUS AND TRENDS

Careful land stewardship will sustain agricultural productivity and improve environmental quality. Minnesota is making progress toward sustainability, but continuing problems remain that require new approaches.

PROGRESS

- *Environmentally sensitive agricultural practices are being incorporated into farm management. These include Best Management Practices for fertilizer and manure application, conservation tillage and residue management, maintaining filter strips of vegetation or trees near stream banks, and rotational grazing practices.*

- *Between 1982 and 1992, use of residue management practices in the Minnesota River Basin increased considerably (Fig. 10). Sediments in the Minnesota river have declined by 25% (Mallatawntri et al. 1996).*

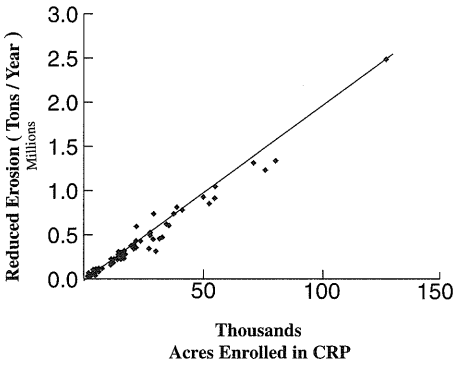


Figure 11. *Reduced Soil Erosion attributed to Conservation Reserve Program (CRP) Enrollment (USDA ASCS Data for Each County). CRP converts highly erodible or environmentally sensitive croplands to permanent vegetative cover. Program goals are to reduce soil erosion, enhance fish and wildlife habitat, improve water quality, and protect soil resources.*

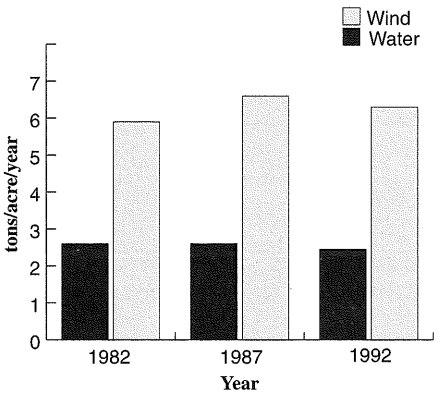


Figure 12. *Erosion Rates on Minnesota Croplands. Source: USDA Natural Resources Conservation Service.*

- *From 1996 to 1997, the tally of "River-Friendly Farmers" in the Minnesota River Basin increased from 70 to 120. The Minnesota Alliance for Crop Residue Management awards River-Friendly status to farmers when they satisfy 10 criteria for on-farm nutrient, soil, and resident management (Alliance for Crop Residue Management).*

- *Between 1985 and 1995, 1.8 million acres of farmlands were enrolled in the Conservation Reserve Program (CRP). /RP reduces erosion and provides habitat for wildlife (Fig. 11) (NRCS).*

Concerns

- *Agricultural practices continue to be major contributors of non-point-source pollution to surface and ground waters. A recent survey showed that of all environmental problems, Minnesotans are most concerned about water quality.*

- *Wind erosion exceeds acceptable rates on 59% of Minnesota cropland and water erosion exceeds acceptable rates on 9% of cropland (NRCS, 1992 data).*

- *Conversion of non-crop agricultural areas with permanent vegetative cover (woodlands, pastures) into row-crop production decrease wildlife values and poses erosion and water quality concerns. For example, over 40% of non-CRP grasslands in the Glacial Lake Agassiz area of Northwestern Minnesota have been converted in the last 10 years (NRCS, 1992 data).*

- *Increasing size and number of feedlots pose challenges for manure management and water quality (MPCA 1995).*

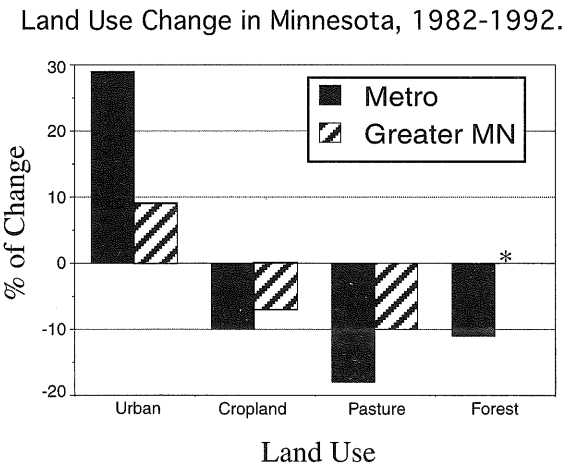


Figure 13. *Between 1982 and 1992, urban landuses grew in Minnesota, while acreage in cropland and pasture declined. Forest acreage declined in the 7 county Metro Area, but remained stable* in greater Minnesota. Source: MN Agricultural Economist no. 684.*

Minnesota River Initiative

In 1992, Governor Arne Carlson challenged Minnesota to make the Minnesota River swimmable and fishable by the year 2002. The Minnesota River is the state's most polluted river. Bacteria, nutrients, and sediments are the main pollutants, originating mainly from non-point sources.

The Minnesota River Initiative is a network of projects of many different organizations, agencies, and local governments and citizens aimed at restoration of the river ecosystem. The foundation of the initiative began with the Minnesota River Assessment Project, conducted mainly by MPCA. A Citizen Advisory Committee (CAC) report gave recommendations to address pollution in the river. Now, the Minnesota River Basin Joint Powers Board is a key component of the overall initiative. The 39 county board works to fulfill recommendations of the CAC Report and coordinate efforts of many different restoration and clean-up activities. The Joint Powers Board is currently developing a framework to implement watershed management through partnerships in each of the 12 major watersheds in the Minnesota River Basin.

Specific efforts to restore the Minnesota River include: The Minnesota River Implementation Project which established best management practices demonstration projects in each watershed; the River Friendly Farmer Program that recognizes farmers for good land practices; designation of 300 miles of road along the river as scenic byway to enhance appreciation and tourism potential for the Minnesota River; exploration of soil stabilizing alternative crop production in riparian areas such as hybrid poplar; and the Conservation Reserve Enhancement Program (see below).

All of these efforts make up the Minnesota River Initiative. Together they will bring the Governor's challenging goal closer to reality.

Conservation Reserve Enhancement Program

This program, developed by state environmental agencies (Board of Water and Soil Resources [BWSR] as lead agency), seeks USDA financial commitment to obtain voluntary perpetual conservation easements on environmentally sensitive lands in the Minnesota River Watershed. Goals include continuous enrollment of 100,000 acres of frequently flooded cropland along the river's floodplain, 30,000 cropland acres along principle tributaries, 30,000 acres of filter strips, and 30,000 acres of prairie pothole wetlands of high potential for filtering and storing runoff.

Sustainability Issues

A number of forums on agricultural sustainability, such as the Sustainable Development Initiative's Agriculture Team and the Glacial Lake Agassiz Citizen Forums, have identified broad sustainability goals. These efforts conclude that to be sustainable, agricultural systems must maintain a healthy farm economy, vigorous rural communities, and a healthy natural environment.

Within these broad goals, DNR will focus on working in partnerships to address the following issues:

- ***Improving water quality***
- ***enhancing habitat and diversity within agricultural landscapes.***

DNR will provided technical expertise to help rural communities maintain clean water supplies, enhance habitat quality of lakes, rivers, wetlands, forests, and grasslands, and improve recreational and tourism opportunities. Ecosystem-based approaches provide a framework for addressing these issues in partnership with rural communities.

Rotational Grazing: Increasing Diversity and Profitability on the Farm

Rotational grazing is a farming system currently being implemented and tested by farmers in Minnesota. Under rotational grazing, pastures are divided into small areas (2-3 acres) called "paddocks." Livestock graze on a paddock for a short period of time, giving individual paddocks a period of rest between grazing events. Rotational grazing provides substantial and continuous vegetative cover which reduces erosion and can mitigate and reduce threats to water quality and aquatic ecosystems. Well managed pastures improve soil structure and quality, decrease the amount of chemical and nutrient runoff entering water systems, reduce pesticide use and replace synthetic fertilizer with manure.

A team of farmers, researchers, consultants, non-profit personnel, and agency representatives including DNR is evaluating the benefits of rotational grazing to farmers and the environment. A participating farmer converted 150 acres of row crops to rotational grazing paddocks in 1993. The farmer's costs decreased because fewer inputs (such as heavy machinery and pesticides) were needed. Plant diversity on paddocks increased, as did grassland nesting birds that are uncommon in row-cropping systems.

ECOSYSTEM-BASED MANAGEMENT APPROACH

Issues such as non-point source pollution, habitat quality, and landscape diversity cross political and jurisdictional boundaries, and must be addressed by all affected communities. Growing networks of citizens, farmers, government agencies, and private groups are addressing these and other sustainability issues at watershed and landscape levels. Based on the success and experience of pilot projects, such as Heron Lake, Wells Creek, and Glacial Lake Agassiz Interbeach Area, DNR will help expand and develop new watershed and landscape partnerships.

THE GLACIAL LAKE AGASSIZ ECOSYSTEM STEWARDSHIP PROJECT

Northwest Minnesota's Glacial Lake Agassiz Interbeach Area contains 190,000 acres of pasture land, almost 40% of the state's CRP lands (approx. 750,000 acres) and an estimated 75,000 acres of native prairie. Statewide, forage and grasslands contribute 15-20% of cash farm income, provide primary habitat for many wildlife species, are important in reducing soil erosion, and are home to over 40% of Minnesota's rare and endangered species. The continuing decline of grass and forage based agriculture in the region, expiration of CRP contracts, and accelerating loss of biodiversity has brought the future of this ecosystem to a crossroad.

The Glacial Lake Agassiz Ecosystem Stewardship Project brings together a network of multi-agency projects plus individual efforts, to better serve the region's interrelated environmental and economic problems. This Partnership believes that region-wide, collaborative efforts can make a real and lasting improvement to stewardship of the Glacial Lake Agassiz Interbeach Area.

Activities include:

- *landowner workshops and field tours*
- *grassland demonstration projects*
- *community education activities*
- *cooperative resource assessments*
- *multi-agency/stakeholder training*
- *internet information resources*

WELLS CREEK WATERSHED PARTNERSHIP

Wells Creek winds through 18 miles of scenic blufflands in southeastern Minnesota. The creek's watershed encompasses 52,000 acres of fields, forests, hills, and bluffs and is home to 1500 people. Wells Creek Watershed partners are working together to implement actions to sustain the ecological and economic vitality of the watershed.

Recent accomplishments:

- *A citizen steering committee and a technical work group developed a watershed plan with goals, objectives, and action steps.*
- *Conducted a local resident survey to document citizen priorities for watershed land-use and environmental issues.*
- *Established a local volunteer network for monitoring the health of the creek.*
- *Developed GIS maps displaying land use and natural resource conditions.*
- *Sponsored field demonstrations of riparian and woodland management techniques, rotational grazing, and prairie burning.*

HERON LAKE WATERSHED RESTORATION PROJECT

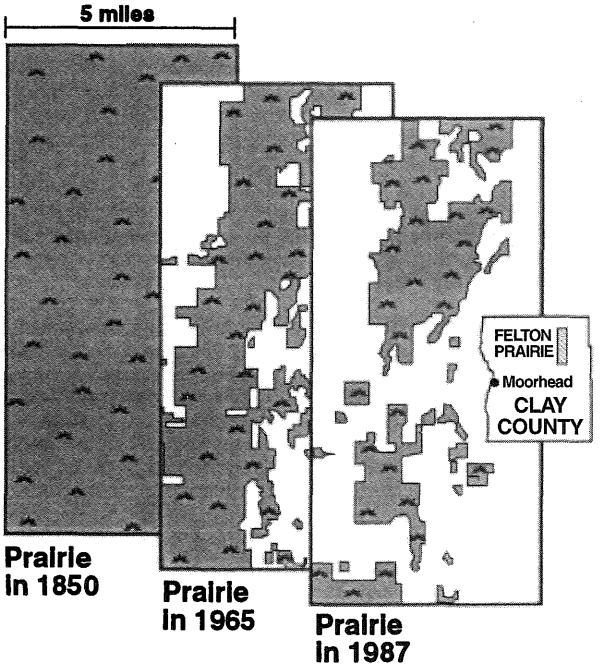
Dozens of public and private groups and individuals are working together to reverse the degradation of the Heron Lake watershed, historically one of the richest wildlife and waterfowl areas in Southwestern Minnesota. Partners include local counties, municipalities, and families, as well as local and national conservation organizations, hunting and fishing organizations, and governmental organizations.

Recent accomplishments:

- *Acquired 4,100 acres that will be restored to wetland and native prairie to improve water quality and wildlife habitat.*
- *Established the Heron Lake Environmental Learning Center.*
- *Installed an electric fish barrier on the Heron Lake outlet to exclude undesirable fish species.*
- *Implemented a private lands grass buffer project.*
- *Investigated ways to mitigate impacts of municipal waste water on surface water and initiated a public use plan for the Heron Lake system.*

Case Study – Prairie Ecosystems

What is the future of Minnesota Prairie?



Land use changes have fragmented the once contiguous prairie of Clay County's beach ridges landscape. Despite these changes, traditional grazing practices along with establisjment of reserves maintain the area as one of the largest prairie remnants in the upper Midwest. The area harbors 25 state listed rare plant and animal species.

CLAY COUNTY BEACH RIDGES FORUM

Clay County's beach ridges, remnants of Glacial Lake Agassiz, support agriculture, gravel mining, and native prairie. In 1995, a local forum was organized to allow landowners, aggregate producers, supporters of native prairie, government agencies and the interested public to discuss, in a neutral setting, the future of the gravel and prairie resources. Forum goals include:

- Provide key information about the beach ridges to landowners, gravel operators, land managers and the public,
- Protect natural resources (both prairie and gravel) and avoid future conflicts,
- Recommend ways to improve reclamation.

The forum will produce computer-generated maps, an information handout, and a draft plan for the beach ridges that has value and relevance to the people of Clay County.

Sensitive and Threatened Habitats

Minnesota contains a rich variety of natural habitats or ecological community types. The Minnesota Natural Heritage Program identifies fifty-seven ecological community types with 196 sub-types that cover a wide range of forest, water, wetland, and agricultural land-forms and water bodies. The quality of these habitats exists along a continuum from undisturbed and intact to severely degraded. This diversity of habitats and the scope of threats to their maintenance poses challenges and opportunities.

Natural habitats maintain resilience of ecosystems, provide recreational, aesthetic, and scientific benefits, and provide homes to common as well as rare and endangered species. Remaining high quality examples of habitat types serve as important benchmarks for evaluating the health of impacted sites. They are also the building blocks to begin restoration of larger ecosystems.

Status and Trends

Minnesota has made significant progress toward protecting threatened and high quality habitats. The state's 115 Scientific and Natural Areas now protect 172,000 acres of high priority habitats. A significant number of threatened habitats and sensitive features have been protected in the state's system of state parks, wildlife management areas, and state forest and trust lands. Private landowners, organizations such as The Nature Conservancy, and federal agencies also play a major role in protecting threatened habitats.

Healthy Habitats and Ecosystems are a Foundation for Outdoor Recreation

The linkage between healthy ecosystems, quality of life, and a sound economy are clearly played out in outdoor recreation. Minnesota public agencies have developed a large array of parks, trails, public accesses, and other outdoor recreation facilities. In addition to the organized facilities, public forest land, lakes, and rivers provide for diverse outdoor recreation activities. These facilities and public areas support the broad range of winter and summer recreation activities for residents and tourists.

Minnesota excels in providing outdoor recreation opportunities largely because of the natural resources available in the state. The extensive forests, unpolluted lakes and rivers, and the state's prairie grasslands are the foundations for the state's outdoor recreation system.

Outdoor recreation opportunities are a major contributor to quality of life. Minnesota ranks high on most national quality of life assessments, due in large part to outdoor recreation opportunities available here. Outdoor recreation also accounts for a major component of the state economy and is especially crucial in many localities.

Blufflands Initiative

Southeastern Minnesota's Bluffland area is one of the state's natural treasures. Jagged rock outcrops, wooded slopes, bluff prairies, trout streams, and fertile valleys cross the region. More than 30 natural plant communities harbor more than 100 rare animals and plants, more than anywhere else in the state.

Citizens in the region are increasingly concerned about the future of the Blufflands. Habitats are lost as residential development increases. The Blufflands Initiative works with citizens, private organizations, elected officials, local units of governments, and state and federal agencies in seven counties to employ an ecosystem approach in land use decision-making. Such tools as comprehensive plans, conservation easements, cluster development, and Best Management Practices on private lands are used to minimize habitat losses caused by development and maintain quality of life in the region.

Minnesota County Biological Survey

The Minnesota County Biological Survey (MCBS) began in 1987 to assess biological diversity state-wide. The survey's goals are to identify significant natural areas and to collect and interpret data on the distribution and ecology of natural communities, rare plants, and rare animals. This information, housed in the Natural Heritage Information System, serves as a foundation for the management and conservation of areas of ecological significance. So far, surveys have been completed in 29 counties, and are underway in 12 more. Published maps that display the results of the survey are now available for 12 counties. Another outcome is publication of the book, Minnesota's St. Croix River and Anoka Sandplain: a Guide to Native Habitats.

Despite progress, much needs to be done. Threatened habitats, such as old-growth forests and prairies, once defined much of Minnesota's landscape but are now reduced to scattered remnants. Other habitats, such as Calcareous Fens, were always rare and continue to decline in extent. Conservation action is required to maintain the state's most endangered habitats:

- *Less than 1% of native prairie remains.*
- *1/10 of 1% of bigwoods (maple-basswood forest) remains.*
- *Less than 1/10 of 1% of oak savanna remains.*
- *Less than 4% of old growth forests remains.*

More common natural habitats also continue to decline in extent and quality. Conservation action is needed to protect habitats such as riparian areas, wildlife migratory corridors, aspen parklands, shorelands and blufflands.

Sustainability Issues

The sustainability of high quality natural habitats will require increased efforts within three major themes:

- ***Accelerate collection and delivery of information on the distribution, abundance, and security of native habitats and species so that management priorities for protection can be identified.***
- ***Maintain representative examples of all natural habitats in Minnesota, in each of the eco-regions that the habitats originally occupied, and in sufficient extent and distribution to sustain essential ecological processes and maintain viable populations of plants and animals.***
- ***Where possible, retain features of threatened habitats in more intensively managed lands.***

Ecosystem Based Management Approach

Minnesota's habitats cross many ownerships, from extensive private lands to state, county, and federal holdings. Ecosystem-based management uses partnerships and the best available science to integrate a variety of land-uses, management activities, and habitat protection levels across Minnesota's landscapes. The cumulative effects of these activities determine the overall health of ecosystems and the diversity of habitats that ecosystems will support.

Protecting natural habitats is a key component of maintaining ecosystem health. Aldo Leopold stated: "To keep every cog and wheel is the first rule of intelligent tinkering." Threatened habitats provide "cogs and wheels" -- species and ecological processes that are important to the functioning and resilience of ecosystems.

Protection of natural habitats must be integrated with economic and recreational uses in the larger landscape. On a landscape scale, a network of natural habitats can be maintained through careful design and use of protected areas along with incentives that encourage private landowners to conserve habitats. A system of corridors and greenways can connect the highest quality natural areas of a region in order to retain critical natural processes and species viability while providing additional recreational and aesthetic benefits. In the seven-county Twin Cities area, nearly three dozen community leaders are taking this approach in the Metro-Greenways Project. This approach complements the already extensive statewide network of State Parks, State, County, and National Forests, and Scientific and Natural Areas. This ensures long-term conservation of high-quality habitats that support a full variety of plants and animals.

Metro Greenways and Natural Areas Initiative

With significant natural areas continuing to disappear in the face of rapid urban growth, the DNR and partners have launched a long-term initiative to preserve and enhance the integrity of natural systems within the seven-county metro region. The effort has already resulted in identification of many of the remaining areas worthy of protection. A collaborative of nearly three dozen community leaders from across the region has started developing a vision for connecting these scattered islands of habitat by means of natural corridors or greenways that would maximize environmental and recreational benefits.

These benefits include:

- *Minimizing the impacts of habitat fragmentation by allowing species to move between areas that would otherwise be isolated by human activity;*
- *Protecting water quality;*
- *Providing recreational opportunities for hikers, bikers, birdwatchers, and others;*
- *Maintaining property values;*
- *Providing natural aesthetic relief within an urban landscape.*

Case Study — Metro Area Trout Streams

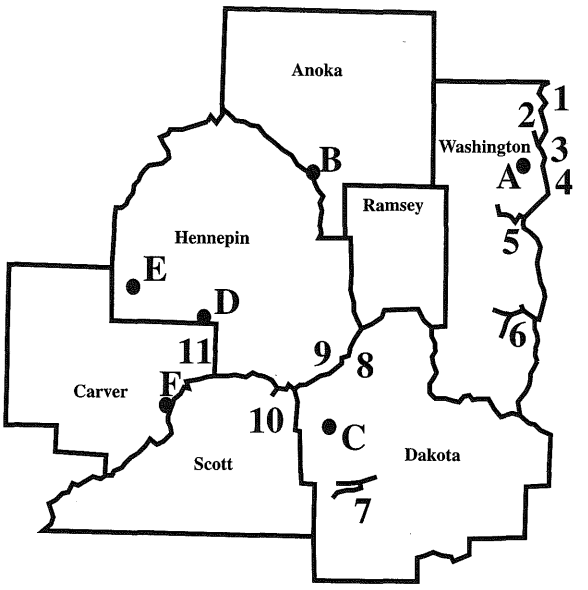
What is the Future of Metro Area Trout Resources ?

Trout Streams

1 Falls Creek
2 Gilbertson Creek
3 Old Mill Creek
4 Willow Creek
5 Brown's Creek
6 Valley Creek
7 Vermillion River
8 Kennaley's Creek
9 Unnamed 1, 4, & 7
10 Eagle Creek
11 Assumption Creek

Trout Lakes

A Square Lake
B Cenaiko Lake
C Lac Lavon
D Christmas Lake
E Little Long Lake
F Courthouse Lake



Metro Trout Stream Watershed Protection Initiative

In the Fall of 1996, a consortium of biologists, anglers, and conservation interests released a report documenting the loss of urban trout streams. This document spurred the DNR and local partners to build a community-based collaborative process to save the remaining Metro Trout Streams. The effort formulates sustainable development strategies that balance social, economic, and environmental needs within each trout stream watershed. This effort may serve as a foundation for future resource management efforts throughout the region. The benefits from saving the metro region's few remaining trout streams are far reaching. They include: improving water quality, increasing recreational opportunities, maintenance of property values historically associated with preservation of natural features, and continued high quality of life in the metro region.

V. DNR MANAGEMENT RESPONSIBILITIES

DNR Vision Statement

"We will work with people to manage the state's diverse natural resources for a sustainable quality of life."

The DNR vision statement is shaped by statute and by citizen needs and expectations. That vision defines the current range of DNR programs and services. The variety of services is always changing as new programs are added and new techniques are developed to accomplish goals. Changes will continue as the DNR, in partnership with citizens, develops new strategies to sustain healthy, productive communities and Minnesota's quality of life.

Establishing Priorities: DNR budget appropriations probably will continue to fluctuate. Appropriations for some programs have remained relatively static resulting in reduced purchasing power. However, appropriations for some new programs have been and probably will continue to be available. Many strategies developed by DNR planning processes will be funded through existing budget appropriations.

Some DNR programs -- for example--public safety, recreation services, and public land management, will continue to need support. They provide a quality service expected by the public. Other programs will be de-emphasized to support new strategies.

This document provides statewide guidance for making these shifts. Discipline, regional and area teams, working closely with citizens and stakeholders, will make the actual decisions on which programs to de-emphasize and how to implement new strategies. Area and regional teams have the responsibility to make these decisions through the resource and budget planning processes. Many of these shifts have been occurring formally and informally for some time as area and regional teams establish priorities in the face of rising work loads.

DEDICATED ACCOUNTS

Dedicated accounts will continue to provide funding for special resource management programs. Legislative guidelines for use of these accounts will continue to be followed. However, stronger emphasis on ecosystems-based management may suggest different approaches to reaching objectives set forth in dedicated accounts. The DNR will work closely with dedicated account stakeholders in developing new approaches.

TRADITIONAL AND EVOLVING ECOSYSTEM BASED MANAGEMENT APPROACHES

Traditional:

1. *program driven, focus on separate programs*
2. *performance measured by program goals and objectives*
3. *discipline based mission, goal, priorities and budgets*
4. *emphasis on regulatory strategies*

Ecosystem-Based Management:

1. *place based, program and budget integration, to address interrelated natural resource and community issues*
2. *performance measured by indicators of environmental and community improvements*
3. *interdisciplinary and citizen-based goal setting for whole ecological communities*
4. *emphases on collaboration, voluntary compliance and technical assistance.*

Source: *Region IV/V Ecosystem Based Management Report, 1995*

Goals

The DNR working with citizens, governmental partners and other stakeholders will pursue two goals to support the sustained use of Minnesota's ecosystems and natural resources. The DNR will seek to:

- ***Maintain, enhance or restore the health of Minnesota ecosystems so that they can continue to serve environmental, social and economic purposes.***

The DNR will continue a balanced approach to resource management. DNR sustainability initiatives are broadly focused. They address the needs for natural resource enhancement, for economic development, and for protecting and restoring the natural environment upon which people and economies depend.

Current trends are creating an imbalance. Loss and degradation of many native habitats and ecological communities threaten the basis of ecosystem sustainability. Priority concerns are the once-extensive native habitats that are now relatively rare and native habitats that are sensitive to development pressure. These habitats of concern still maintain native species composition and interaction characteristic of their ecoregion and are not greatly altered by development activity. Habitats of concern include: native prairies, wetlands, blufflands, oak savannas, river corridors, shorelands, and pristine ecological communities. If current trends continue, damage to these ecological communities will impair the resilience of local and regional ecosystems necessary for economic and community well being.

Providing the best scientific information available, the DNR, working cooperatively with citizens, will seek:

- ***To foster an ethic of natural resource stewardship among all Minnesotans.***

Area, regional and discipline teams, working with partners and citizens will seek to foster a broad understanding of how natural systems function, how individual actions result in environmental consequences, and how stewardship principals are consistent with sound economics.

Strategies

The DNR will become more of a science-led and community-based organization responsive to resource needs at the local as well as the state level. To accomplish this, DNR staff will emphasize the following strategies.

- ***Expand development of partnerships with organizations and other agencies to develop common resource management objectives.***

Partnership development has been a high-priority DNR strategy. Area staff have been especially successful in developing local partnerships. Efforts to develop partnerships and coalitions will expand. They will include stakeholders groups and government agencies with similar resource management objectives and with the capacity to implement projects. The DNR will give high priority to partnerships that preserve or restore important ecological communities, especially those that are rare or threatened.

- ***Promote integrated approaches to managing resources.***

The DNR has been actively promoting integrated approaches (watershed and landscape projects) for several bienniums. This allows a more holistic and longer term approach to managing resources. This approach implements the community focus, including both communities of interest and communities of place. Internally, the DNR has been forming area staff into landscape and watershed teams. The DNR will expand these efforts and will continue to look for opportunities to use integrated approaches.

The DNR will undertake specific planning and budgeting measures to support area staff involvement in cooperative management efforts with communities.

- ***Accelerate the collection, interpretation, and dissemination of scientific information describing Minnesota's ecosystems and natural resources.***

The DNR will continue to collect and disseminate science-based information and basic surveys *(forest, fisheries, wildlife, natural areas, and minerals inventories)* and the interpretation needed to use the information effectively. The DNR will focus on integrating existing databases and using this information to foster sound decisions on resource use and management. That includes applying science-based information to assess the effectiveness of management policies and programs.

Native Habitats and Land Use Development

Healthy ecological communities are the basis for the state's natural resource industries, including agriculture, forestry and outdoor recreation. Land conversion, such as residential subdivisions, alters ecological communities. In some cases, the land use conversion permanently reduces the potential benefits that an ecological community or native habitat holds for other economic, environmental or community interests.

Conversion of land from one use or cover to another is an ongoing condition. Underlying forces identified in Section III drive these changes. The concept of land stewardship suggests guidance to the land conversion process. That guidance would seek to protect rare and sensitive ecological communities and insure that land conversion continues in keeping with the long term goals of sustainability.

Cooperative approaches can guide land conversion in ways that enhance sustainability and maintain ecological communities. The foundation for these approaches was developed in *Design with Nature* by Ian McHarg. McHarg advocated development concepts that respect the natural environment and ecological communities.

DNR: A Community Based Organization

The concept of community includes people in a community of place and people with a community of interest. Community of place is geographic and includes people living in a location, such as the municipality of Blackduck, or a watershed, such as Wells Creek. A community of interests includes people who share a common need or perspective. Deerhunters are people with a community of interest regardless of where they reside.

DNR is a community based organization. DNR offices and staff are situated throughout the state. DNR staff interact closely with local communities and interest groups.

DNR will become even more community based. DNR staff will have greater freedom and support to work closely with communities, citizens, other government agencies and interest groups as they develop cooperative approaches on a broad range of resource issues.

DNR: A Science Based Organization

The DNR will use the best available scientific knowledge as a foundation for decision making. Scientific information will be used to build a common understanding of complex natural resource problems. Solid scientific information helps increase citizen understanding of options to address problems, the social, economic, and ecological consequences of each option, and the trade-offs between management alternatives.

- ***Expand efforts to provide technical assistance to citizens and local government.***

Stakeholders indicated that the DNR should place a higher priority on providing technical information to local decision makers. The DNR will continue to work closely with municipal, township, and county agencies that make land use and resource decisions. Recommendations for early coordination with developers, local government and citizens developed as part of the Environmental Review process will be implemented at all levels. The DNR will provide information early in decision-making processes. The DNR will use its expanded Geographic Information Systems (GIS) capacity to help resource users and decision makers understand linkages between resource use and sustainability.

DNR also will provide assistance to private landowners through such programs as the Private Forest Management Program. The DNR will continue to promote best management practices in timber management, agriculture, and other sectors.

- ***Improve communication with all stakeholders and citizens.***

Stakeholders concluded that the DNR needs to improve communications with citizens, local government, and stakeholders. The DNR will expand its communication efforts in order to develop a better mutual understanding of resource management conditions, issues, and strategic priorities. Improved communication includes listening to communities and citizens to understand their needs and perspectives.

- ***Establish Environmental Education as a cornerstone for developing a natural resource stewardship ethic among all Minnesotans.***

DNR will elevate the role of environmental education in resource management. The purpose will be to encourage citizens and organizations to implement sustainable resource practices. To accomplish this, the DNR will work with landowners; resource users, including the business community; and the general public. Shifts to such concepts as sustainable agriculture already are occurring but will require a better understanding of how individual decisions affect sustainability.

The short-term objective is to continue to support existing environmental education programs—State Parks Programs, Project Wild, Project Learning Tree, MinnAqua, Project Wet, etc.—and work

closely with schools, colleges, environmental education centers, and other education providers to implement this strategy.

The long-term objective is to develop a comprehensive assessment of how to move forward with existing programs and how environmental education opportunities can be explored at all organizational levels. For example, state parks provide an excellent opportunity to deliver environmental education messages and to model sustainable resource practices.

- ***Establish standards for evaluating and monitoring ecosystem health and the effectiveness of ecosystem based management efforts.***

The objective will be to develop more effective means of linking program evaluation and environmental outcomes and planning processes and budgeting. The DNR will create an Office of Management and Budget to provide an evaluation and monitoring function that will tailor management efforts towards sustainability goals. The Minnesota Environmental Indicators Project will monitor and document the health and status of Minnesota ecosystems.

- ***Improve integration of budgeting and planning across area, regional, and state levels.***

The DNR will integrate resource management priorities into existing departmental processes - discipline planning, budget development, regional resource plans, and spending plans. The process has begun and will be accelerated in the 1998/1999 biennium.

- ***Place more authority with area staff to manage budget and staffing priorities.***

The objective will be to give area staff more flexibility in working with communities. DNR area management teams will have additional budget authority and latitude for establishing work priorities within the mandates of the DNR mission.

NEXT STEPS

This is a guidance document. It does not, nor is it intended to, define specific priorities for any program, region, or area. Instead, it provides a general framework for making priority decisions. It highlights two crucial goals for the DNR and strategies designed to achieve the goals.

Disciplines, regions, and areas will use the guidelines to develop strategic natural resource plans, work plans, and budget priorities. For example, regions will work with areas to review these goals and strategies and define how they will be applied in each geographic area. Once priority resource areas and actions are determined, work plans and budget recommendations will be developed to reflect the priorities.

Support bureaus will use this document to define their role in providing services that further resource management priorities. Support bureaus will need to work closely with regional management teams and divisions to identify support needs.

Given the complexity of DNR resource management programs, setting interdisciplinary priorities will resolve past conflicts but may pose new issues. The DNR will develop a process for reaching consensus on resource priorities that can be used at the point where differences arise.

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