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1997 Project Abstract

For the Period Ending June 30, 1999

This project was supported by the Environment and Natural Resources Trust Fund [ML 1997, Chap. 216, Sec. 15, Subd. 14(a)]

TITLE:	**Environmental Indicators Initiative - Continuation**
PROJECT MANAGER:	Keith Wendt
ORGANIZATION:	Department of Natural Resources
ADDRESS:	Box 10, 500 Lafayette Road, St. Paul, MN 55155-4010
WEB SITE ADDRESS:	www.dnr.state.mn.us/eii/
LEGAL CITATION:	ML 1997, Chap. 216, Sec. 15, Subd. 14(a)
APPROPRIATION AMOUNT:	$250,000

Statement of Objectives

This project continues the statewide environmental indicator development process initiated in the 1995-97 biennium. The goals of the Environmental Indicators Initiative (EII) are to:

1) create the first statewide indicator framework along with environmental indicators capable of assessing and communicating the health of Minnesota's environment, and
2) build a network of resource professionals and citizens to monitor progress in restoring and sustaining the state's ecosystems.

This project selects indicators and builds monitoring networks through regional workshops and partnerships with projects focused on sustainable resource issues and ecosystems within specific geographic areas.

Overall Project Results

EII completed *Developing Environmental Indicators for Minnesota*, a series of publications to educate and elicit feedback from indicator user groups. EII conducted workshops focused on ecosystems within the Prairie Parkland and Eastern Broadleaf Forest ecoregions to foster indicator development and identify opportunities and challenges for environmental monitoring in the states agricultural and forested regions. EII built partnerships and provided technical assistance to both local and statewide groups to develop indicators for monitoring specific ecosystems and their benefits. These partners included the Cannon River Watershed Partnership, DNR Metro Region Interdisciplinary Initiatives, the Minnesota Forest Resources Council, the interagency Water Management Unification Task Force, and others who have collaboratively worked with EII to select and test indicators. EII staff revised and improved the "EII indicator selection framework" after testing it with these partners. The framework has proven ideal for developing coherent natural resource assessments and plans that effectively organize diverse information on the causes and consequences of environmental change and the effectiveness of resource management programs.

Use and Dissemination of Project Results

In collaboration with its partners, EII developed indicators for measuring and communicating the status and trends in water resources at local and statewide scales, for measuring the sustainability of forests and evaluating forest management practices, and for evaluating the effectiveness of efforts to protect watersheds in the Twin City metropolitan area. Regular environmental monitoring using these indicators will provide critical information to decision makers and help document the status and trends of Minnesota's ecosystems.

Final Status Rpt.
Date of Report: July 1, 1999
Date of Work Program Approval: June 21, 1997
Project Completion Date: June 30, 1999[1]

LCMR Work Program Update Report

I. PROJECT TITLE: ENVIRONMENTAL INDICATORS INITIATIVE - CONTINUATION

Project Manager:	Keith Wendt
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Total Biennial Project Budget:

$ LCMR:	$ 250,000
$ LCMR Amount Spent:	$ 250,000
$ LCMR Balance:	$ 0

A. Legal Citation: ML 1997, Chap. 216, Sec. 15, Subd. 14(a)

Appropriation Language: This appropriation is from the trust fund to the commissioner of natural resources for the second biennium of a three biennium project to create a framework for selecting and monitoring environmental indicators to assess and communicate Minnesota's environmental health status and trends.

B. Status of Match Requirement: none[2]

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[1]This date represents the end of the second of three biennia planned to complete this "continuation" project. All final products thus would be submitted on or before June 30, 2001.

[2]While there is no non-state match during this biennium, significant state contributions have been made, including a 25% mobility assignment to assist with workshop activities in the agricultural region and a 20% cost share to support EII staff work in the metropolitan area.

II. PROJECT SUMMARY AND RESULTS:

This project continues the statewide environmental indicator development process initiated in the 1995-97 biennium. As outlined in the original work program, the overall goal of the Environmental Indicators Initiative (EII) is to create the first statewide framework to select and monitor an integrated set of environmental indicators capable of assessing and communicating Minnesota's health status and trends.

General goals, approach, and results for the EII project are as follows:

A. Goals for Environmental Indicators

1) Assess the status of Minnesota ecosystems—forests, lakes, and prairies—and their ability to provide benefits.
2) Understand trends in ecosystem health.
3) Anticipate emerging environmental problems.
4) Monitor progress in restoring and sustaining ecosystems.

B. Approach

1) Evaluate and catalog existing monitoring data–describe their potential to inform environmental indicators that assess statewide ecosystem health.
2) Conduct regional workshops of resource professionals and engage place-based sustainability projects to develop core environmental indicators for selected ecosystems.
3) Summarize the extent and condition of Minnesota's ecosystems in "state of the environment" type reports.
4) Design a statewide Environmental Indicators Network to ensure consistent and collaborative collection of data on environmental indicators.

C. Results for 1997-99

1) Indicators and reports developed from indicator selection workshops and place-based sustainability projects.
2) An informal Environmental Indicators Network connected through technical assistance and other outreach activities.

III. PROGRESS SUMMARY:

1st Biennium Progress (1995-1997)

During the first biennium, the EII Task Force—representing Environmental Quality Board Agencies, industry, academia, and nonprofit conservation efforts—achieved consensus on an approach for a statewide environmental monitoring framework and related indicators. A formal *EII Communications Plan* identified the stakeholders needed to build broad consent for development and implementation of indicators. An *EII Program Coordination Matrix* identified over 100 related efforts. EII staff used this matrix to collaborate with and serve the needs of many statewide and local initiatives. The matrix was also used to help generate the list of participants who attended the first indicators workshop in April 1997. Specific progress by project objective follows:

Objective A. Review and Catalog Existing Environmental Data

EII completed a *Catalog of Databases and Information Sources* containing over 180 entries from a variety of institutions, including more than 14 local, state, and federal agencies. We sent the catalog to monitoring interests to obtain feedback on its general format and completeness. The workshop process continues to identify specific indicators to form a more complete evaluation of the quality and quantity of environmental data in Minnesota. EII shared the current draft catalog with several other initiatives (e.g., Forest Resources Council) and distributed it to all participants and observers attending the indicators workshop in April 1997.

EII staff developed *brief summaries* of the extent and condition of Minnesota's air, groundwater, and major ecosystems to assist workshop participants in evaluating indicators. Each of the summaries contained concise information on important ecological characteristics, benefits, pressures, status and trends, and major policies and programs relevant to a particular system—agricultural, forest, lakes, prairie, rivers, streams, urban/developed, and wetlands. EII staff also completed more *refined descriptions* for six ecosystems under Objective B and established a reference library on indicator-related literature with a *Selected Bibliography*.

Objective B. Indicator Development and Ecosystem Descriptions

EII staff prepared detailed *descriptions* of six ecosystems—agricultural, forest, lakes, wetlands, rivers & streams, and groundwater—and identified nearly six hundred *candidate indicators* for consideration by workshop participants. The first of four proposed indicator selection workshops occurred in April 1997 in the Eastern Broadleaf Forest Province and involved 35 participants. Products of the first workshop included:

1) a summary of *participant indicator needs*;
2) rankings of *potential indicator selection criteria*;
3) *evaluations of proposed indicators* for six ecosystems;
4) a *set of "top" indicators* to address management goals of the Cannon River Watershed/Big Woods ecosystem;
5) *resource maps/GIS products* for the Cannon River watershed pilot project;

6) a *television segment* on the EII for the "Environmental Journal";
7) *workshop evaluations* and feedback on overall workshop design;
8) *enhanced relationships* and potential members of the *EII Network*;
9) a *comprehensive notebook* for all workshop participants;
10) and a preliminary list of *indicators.*

Objective C. Design Environmental Indicators Network

EII made significant progress toward establishing a preliminary EII Network by initiating the development of an *EII Program Coordination Matrix* and a formal *EII Communications Plan* to identify and effectively communicate with key audiences and potential EII Network members. EII staff developed and disseminated hundreds of *informational handouts* describing the EII, its progress, and potential ways various customers might use indicators.

EII staff *targeted technical assistance* to several ongoing efforts to develop and apply environmental indicators in a management context. For example:

- at the state/policy level — staff collaborated with the Minnesota Planning Agency on indicator development with the Sustainable Development Initiative and future Minnesota Milestones reports;
- at the agency and programmatic level — staff provided ongoing assistance in environmental indicator development with the Forest Resources Council and helped with the strategic planning processes of the Pollution Control Agency and Department of Natural Resources;
- at the local level — staff assisted the Cannon River Watershed Partnership with resource management planning and environmental indicator development.

EII *color slide presentations* (abstracts available) reached many resource professionals and potential network members at statewide conferences, including Minnesota Conference on Sustainable Development, MN Waters '96, a joint annual meeting of the Society of American Foresters/American Fisheries Society/The Wildlife Society, and a regional conference on Sustainable Communities. Newsletter articles, press releases, a radio interview, and a recent segment on the cable television show "Environmental Journal" reached thousands of members of the general public. EII staff also initiated or participated in numerous *meetings with potential collaborators* and/or indicator users, including:

American Fisheries Society
Basin Planning Initiative (PCA)
Brainerd Lakes Chamber of Commerce
Cannon River Watershed Partnership (Private/The Nature Conservancy)
Chippewa National Forest
Citizens for a Better Environment
Community Environmental Technical Assistance Program, CBE
County Biological Survey (DNR)
Cross Roads Resources
Dakota County Indicators Project
DNR Region 4 and 5 ecosystem pilot projects
Ecological Classification System Project (DNR)

First Nations Development Institute
Fond du Lac Grand Portage Mille Lacs and Red Lake Bands of Chippewa Indians
Forest Resource Management Partnership
Forest Resources Council
Forest Generic Environmental Impact Statement (DNR)
Gap Analysis Program (GAP National Biological Survey)
Grand Portage Environmental Department
Great Lakes Forest Alliance
Great Plains Partnership (Public/Private/Interagency)
Great Lakes Assessment (US Forest Service)
Green Mountain Institute, VT
Greenways and Natural Areas Initiative (DNR Metro Region)
Hamline University (environmental education)
Indicator researchers (Univ. of MN)
Lake Superior Binational Program Indicators project
Lake State Forestry Alliance
Lake Superior Cooperative (U.S./CAN)
Local Government Annual Reporting System
Metropolitan Council
Minnesota Sustainable Communities Network, OEA
Minnesota Milestones, MP
Minnesota Wetlands Conservation Planning project
Mississippi River Team (DNR)
Mississippi Headwaters Board
MPCA Comparative Risk Assessment Project
MPCA Environmental Indicators Project
National Water Quality Assessment Program (USGS)
Natural Resources Inventory Information Committee (DNR)
Northeast Minnesota Lakeshore Initiative
Project Green 2020 (Steele County)
School of Public Health (Univ. of MN)
Society of American Foresters
State Environmental Goals and Indicator Project (U of FL/EPA)
Superior National Forest
Sustainable Development Initiative (EQB)
Sustainable Agriculture Program (MDA)
Sustainable Waters Initiative (DNR)
U.S. Army Corps of Engineers
U.S. EPA Large Rivers Initiative
U.S. EPA Regional Environmental Monitoring and Assessment Program, Duluth
U.S. EPA State Environmental Goals and Indicator Project, FL
Urban Ecology Coalition
U.S. Fish and Wildlife Service Region 3
Water Resources Committee (EQB)
Western Center for Environmental Decision-Making, CO

Task Force members provided valuable links to numerous national and international efforts. All these outreach activities expanded project support, improved project design, expedited review of existing information, and minimized duplication of effort. These activities provided critical insights that will help shape the development of the Environmental Indicators Network.

2nd Biennium Progress (1997-1999)

Result 1: Environmental Indicators **Completion: 6/99**

Communication Products

EII completed a series of publications (collectively titled *Developing Environmental Indicators for Minnesota*) designed to educate and elicit feedback from various audiences and indicator user groups:

- *The Environmental Indicators Initiative: An Overview* and an EII *Executive Summary* are being distributed upon request.
- *Developing Environmental Indicators: A Workshop Report* summarizes the outcomes of the first regional workshop and will be updated to include results of future workshops.
- *Minnesota Ecosystems* highlights the ecology, status, and trends of Minnesota's ecosystems and air and groundwater resources.
- *Environmental Indicators Catalog of Databases and Information Sources* describes sources of monitoring information in Minnesota.
- Issues of *Environmental Indicator Fact Sheets* have been used to guide discussion and disseminate information on indicators and their uses in Minnesota.

Next steps focus on distributing these publications widely in print and electronic form and on providing a means by which input and queries from citizens and stakeholders can help refine the publications and guide the initiative.

Indicator Development

Workshops: In June 1998, EII conducted a two-day workshop—*Healthy Farmland Forum*—which focused primarily on agricultural systems and to a lesser extent on the other ecosystems in the Prairie Parkland ecoregion. This workshop brought together indicator practitioners, farmers, and other stakeholders to capitalize on their sense of stewardship. Participants articulated the information needs in rural communities and the role of indicators in supplying those needs in a series of activities and discussions. The Office of Management and Budget Services, DNR, funded a 0.25 FTE mobility assignment to assist in planning and conducting the workshop.

Attendees included representatives from:

Blue Earth River Basin Initiative
Institute for Agriculture and Trade Policy
Land Stewardship Project
Minnesota Departments of Agriculture and Natural Resources
Minnesota Farm Bureau
Pollution Control Agency
University of Minnesota's Department of Soil, Water, and Climate

Agricultural Experiment Station
farming communities

The workshop resulted in improvements to indicators for agricultural regions, identification of the opportunities and challenges for environmental monitoring in agricultural communities, and creation of a foundation for an information-sharing network of citizens and professionals based on indicators.

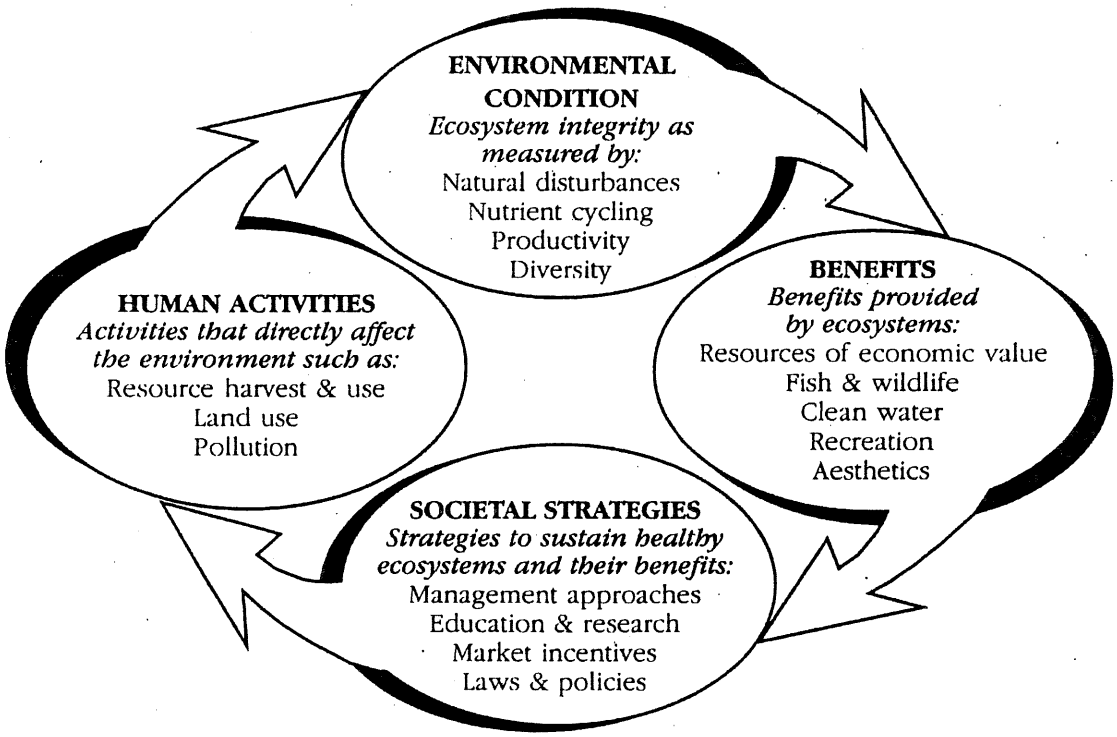
The workshop that had been planned for forests in the forested portion of the state was redirected in favor of an alternative strategy developed with the Forest Resources Council (see Result 2). We will reconsider the need for a workshop or series of workshops to be conducted solely by EII pending the outcome of indicator development activities with the Forest Resources Council and the DNR Division of Forestry described in **Result 2**.

Partnerships: EII established and is maintaining working relationships with local and statewide groups needing indicators for specific resource issues, ecosystem types, and geographic areas. Collaborative partnerships help build the monitoring networks and help ensure that indicators provide information that is useful in decision making. See **Result 2** for a report of progress in using this strategy for indicator development.

EII revised and improved the ***EII framework*** for indicator selection after testing it with local groups (see figure below). Most environmental issues are complex, and definitive information on the causes of environmental change is rare. For these reasons, identifying appropriate remedies to environmental problems requires a deliberate, comprehensive assessment of the issues. The EII framework allows local decision makers to conduct comprehensive assessments of environmental issues in a way that identifies high-priority information needs and effective management strategies. The EII framework encourages users to be explicit in articulating the ***benefits*** they desire from the ecosystems in which they live. Given these expectations, users can seek the technical and scientific expertise to identify the ***environmental conditions*** that will promote sustained production of benefits. They can also identify the ***human activities*** that cause detrimental environmental change and threaten the flow of benefits. Finally, appropriate ***strategies*** can be identified to restore environmental conditions or alter the human activities responsible for degradation.

For example, a community whose economic livelihood depends in part on water-based recreation (canoeing, boating, fishing) may deem this natural resource-based ***benefit*** to be a high priority. Water clarity (low suspended sediment content, a measurable ***condition of the environment***) is important in attracting outdoor recreation enthusiasts to the area. Farming (a ***human activity***), also an important source of income for residents of the watershed, may increase the amount of sediment in surface waters and decrease the attractiveness of the area for water-based recreation. Encouraging conservation tillage practices or financing the construction of riparian buffers to trap eroded sediments may be appropriate ***strategies*** for improving and maintaining water quality. The EII framework empowers citizens to examine the relationships between their natural

Framework for Illustrating Indicator Relationships



resource management goals and the activities that affect them and to determine appropriate courses of action. Indicators are a natural outcome of this process.

Result 2: Environmental Indicators Network **Completion 6/99**

Pilot Projects and Partnerships

A. Cannon River Watershed Partnership

The Cannon River Watershed Partnership (CRWP) used the EII framework to develop indicators to help citizens monitor watershed conditions and pinpoint causes of environmental change. EII provided technical information and guidance documents.

- In a follow-up to the first April 1997 EII workshop in March and April 1998, EII helped participants review research and monitoring projects within the watershed and discuss strategies for integrating monitoring and enhancing the usefulness of indicators to area citizens.
- EII staff participated in a locally sponsored "River Summit" that communicated indicator information to decision makers and explored alternative strategies for sustaining a healthy watershed.
- EII staff were members of the Partnership's Technical Advisory Committee (TAC). With guidance from EII, the TAC and CRWP staff have selected indicators for monitoring the condition of surface waters and guidelines for communicating this information to watershed residents and decision-makers (see Attachment 1).

EII will continue to work with the CRWP in the next biennium in using the EII framework to select indicators for groundwater resources and terrestrial systems.

B. DNR Metro Region Initiatives

EII staff worked closely with the DNR Metro Region and its interdisciplinary projects (Metro Greenways, Neighborhood Wilds, and the Metro Trout Stream Initiative). This partnership is developing an indicator-based method of evaluating the effectiveness of Metro environmental management programs. We used the EII framework to help DNR resource professionals identify

1) potential consequences of rapid development on area natural resources,
2) current interdisciplinary strategies to address development pressures, and
3) environmental conditions needed to sustain the quality of Metro Region natural resources.

We provided regional staff with a draft list of indicators that might be incorporated into regular monitoring to evaluate the effectiveness of their activities in maintaining area environmental quality (see Attachment 2). DNR Metro Region staff are currently evaluating the feasibility of incorporating indicator-based monitoring into their routine activities. EII will continue this partnership into the next biennium.

C. Forest Resources Council

EII assisted the Forest Resources Council (FRC) in completing a landscape-level assessment of

forests in northeastern Minnesota. EII staff formed a partnership with the FRC to produce *Review of the Availability and Accuracy of Information about Forests: Phase I Report* (see Attachment 3). This publication identifies the information needed for comprehensive resource monitoring of forests. EII staff used two approaches in this effort:

1) EII interpreted FRC goals for achieving their vision of sustainable forest management. Based on our experience with environmental information, we suggested information that would be useful in measuring progress toward achieving those goals.

2) We compared the FRC's definition of sustainable forest management (as articulated in their major goals) to definitions used by other national and regional forest sustainability Criteria and Indicators efforts. Although there were strong similarities between the FRC and the Criteria and Indicators approaches to sustainable forest management, there were fundamental differences between the indicators that each would suggest for monitoring forest resources and management practices.

- Water Management Unification Task Force

EII staff brought environmental indicators expertise to the Water Management Unification Task Force (convened by Minnesota Planning) in its preparation of the new Minnesota Water Plan due to the Legislature in September 2000.

Minnesota Water Plan 2000 is a key component of Governor Ventura's Water Management Unification Initiative. The Initiative uses the state's major river basins as a geographic basis to coordinate existing efforts of local and state agencies by recognizing regional differences in water resources and their management. The Task Force developed a framework to guide plan development that consists of four goals (based on Minnesota Milestones), 10 objectives, and approximately 30 indicators. These goals, objectives, and indicators describe desired conditions for the state's water resources and how we will measure progress in creating, restoring, or maintaining those conditions (see Attachment 4). EII will continue its involvement in the Water Management Unification Task Force in the next biennium.

- Other partnerships

EII also has established working relationships with DNR's *Oak Savanna Landscape Team*, the *Northeast Minnesota Lakeshore Initiative* (DNR and partners), the *Mississippi River Team* (DNR), and the *Mississippi Headwaters Board*. EII goals for these interactions is twofold: EII will test and refine indicators (Result 1) and help consolidate an indicator monitoring network (Result 2) while also providing technical assistance in selecting and using indicators.

IV. OUTLINE OF PROJECT RESULTS:

Section II: PROJECT SUMMARY AND RESULTS describes activities and accomplishments during the second biennium. This section outlines those specific activities that will be carried forward into the third biennium.

Result 1 : Environmental Indicators **Completion: ongoing**

The principal methods for indicator selection will be through (1) regional workshops involving natural resource scientists, managers and decision-makers and (2) working relationships with local and statewide groups focused on specific resource issues, ecosystems, and geographic areas. Background information, including potential indicators, supporting databases, and summaries of region-specific resource conditions and issues will be compiled in a workbook to support the workshop process. Results will include the following:

a. environmental indicator workbooks with ecosystem characterizations, selection framework & criteria, and a database catalog

b. indicator selection workshops—two major ecoregions and urban areas:

* Laurentian Mixed Forest Region (completion 6/99)
* Prairie Parkland Region (completion 7/98)
* Urban (completion 6/99)

c. environmental indicators for the following ecosystem classes: groundwater, streams, rivers, lakes, wetlands, prairie, forest, agricultural systems, urban, air

d. environmental indicator analysis with respect to data availability and existing monitoring

e. preliminary indicators report based on results of all workshops

Budget: $188,000 Balance: $ 0

Result 2 : Environmental Indicators Network **Completion: ongoing**

a. consulting pool and network member review and feedback on selected indicators and workshop results/recommendations

b. extensive communication and feedback from various target audiences and/or indicator user groups on utility of indicators approach and selected indicators

c. technical assistance to pilot projects applying indicators on a trial basis (e.g., Cannon River Watershed Partnership, Dakota County)

d. indicator training sessions that introduce indicators and their potential applications to

interested groups, projects, or programs.

e. progress report on implementation of indicator network

Budget: $62,000 Balance: $ 0

V. DISSEMINATION:

Selected indicators and informational materials will be disseminated through a variety of mechanisms based on recommendations from workshop participants and the Environmental Indicators Network. Possible mechanisms include direct mailing, DNR/PCA Web site, press releases, radio and television, popular articles and newsletters, professional conferences, targeted presentations to selected audiences, the State Fair, school curricula, citizen science programs, and future Minnesota Milestones and "state of the environment" reports.

VI. CONTEXT:

A. Significance:

The EII establishes the first statewide framework for the effective collection, interpretation, and public communication of environmental health status and trends. The program integrates data from existing environmental inventory and monitoring efforts, identifies information gaps, and adopts new environmental indicators as needed to ensure consistent measurement of ecological health statewide. Many excellent "indicator" initiatives have recently emerged in Minnesota. However, to date none assess or integrate all ecosystem types (e.g., forests, rivers, agricultural systems, etc.) or the complete range of potential measures of environmental health (i.e., pressure, state, and response indicators).

Most environmental issues are complex, and definitive information on the causes of environmental change is difficult to document. For these reasons, identifying appropriate remedies to environmental problems requires a deliberate, comprehensive assessment of the issues. The EII framework allows local decision makers to conduct comprehensive assessments of environmental issues in a way that identifies high priority information needs and effective management strategies.

The EII framework encourages users to be explicit in articulating the ***benefits*** they desire from the ecosystems in which they live. Given these expectations, users can seek the technical and scientific expertise needed to identify the ***environmental conditions*** that will promote sustained production of benefits. They can also identify the ***human activities*** that cause detrimental environmental change and threaten the flow of benefits. Finally, appropriate ***strategies*** can be identified to restore environmental conditions or alter the human activities responsible for

degradation.

The EII will produce more comprehensive report cards or "vital signs" for Minnesota's ecosystems at various scales from local to regional to statewide. Through the EII, coordination within and between existing monitoring programs and comparability of data will be enhanced. Standardized and consistent reporting will help consolidate and maximize the effectiveness of related public and private monitoring programs. Such integration of sampling frameworks will also minimize costly duplication of effort and facilitate more widespread, community-based environmental monitoring.

The Environmental Indicators Initiative will ultimately enable citizens, policy-makers, and resource managers to better answer such fundamental questions about Minnesota's environment as:

- How clean is the air and drinking water in our urban/developed areas?
- What is the condition of our many lakes and rivers?
- Do our lakes and rivers support safe swimming and healthy fish populations?
- Are Minnesota's forests and farmlands productive and able to sustain both wildlife and human needs into the future?
- How are broad changes in land use and human development in one area likely to affect the environmental health in other areas, both near and far?

In sum, the Environmental Indicators Initiative will develop and present scientifically sound information to help all Minnesotans assess whether present and future environmental health is being sustained.

B. Time:

As designed, the EII is scheduled to take six years to develop and implement a statewide framework for the monitoring and reporting of environmental indicators. A third biennium will:

1) test and validate statewide environmental indicators (selected from all workshops),
2) use selected indicators to report on the "state of the environment," and
3) implement the Environmental Indicators Network to institutionalize consistent and integrated monitoring and reporting of environmental indicators.

C. Budget Context:

	July 1995- June 1997 Prior expenditures on this project	July 1997- June 1999 Expenditures on this project	July 1999- June 2001 Anticipated future expenditures on this project
1. LCMR	$350,000	$250,000	$400,000
2. Other State	$	$	$
3. Non State Cash*	$ 18,000	$	$
4. In-kind Match**	$ 54,000	$ 80,000	$ 54,000
TOTAL	$422,000	$330,000	$454,000

(In-kind match represents U.S. Fish and Wildlife Service salary support)*

*(** Value of voluntary service of Task Force members)*

1997-99 LCMR BUDGET:

Personnel	$240,000
Equipment	$ 0
Acquisition	$ 0
Development	$ 0
Other -Workshops	$ 10,000
TOTAL	$250,000

VII. COOPERATION:

Primary cooperators are members of the EII Task Force. Several Task Force members are managers of related indicator projects or indicators research within their respective organizations. However, zero LCMR funds will be used to support the EII Task Force. Cooperators and staff, along with their affiliations and time allocated to the project (in parentheses), are as follows:

EII Task Force:

Mr. Kim Chapman, The Nature Conservancy (5%)
Mr. Mohamed T. Elnabarawy, 3M Company (5%)
Dr. George Host, Natural Resources Research Institute (5%)
Dr. Tim Kelly, Department of Natural Resources (5%)
Ms. Lee Pfannmuller, Department of Natural Resources (5%)
Dr. Carl Richards, Natural Resources Research Institute (5%)
Dr. Kurt Rusterholz, Department of Natural Resources (5%)
Mr. Paul Schmiechen, Pollution Control Agency (Co-Chair 10%)
Dr. Paul Toren, Environmental Quality Board (5%)
Mr. Keith Wendt, Department of Natural Resources (Co-Chair 15%)
Mr. Mark Zumwinkle, Department of Agriculture (5%)

EII Staff*:

Clarence Turner, Ecologist Coordinator (100%)
Faith Balch, Ecologist (100%)
Laura Preus, Ecologist (75%)

*(*A total of $240,000 of the 1997-99 LCMR funding will support EII staff)*

VIII. LOCATION:

Statewide — Indicator selection workshops will be conducted for each of Minnesota's major ecoregions plus urban environments. Workshop participants will be selected to represent issues, resources, and institutional responsibilities throughout each region.

IX. REPORTING REQUIREMENTS:

Periodic work program progress reports will be submitted not later than :

April 21, 1998
December 1, 1998

A final work program report and associated products will be submitted June 30, 1999, or by the completion date as set in the appropriation.

X. RESEARCH PROJECTS:

ATTACHMENT 1

Preliminary Surface and Ground Water Indicators for the Cannon River Watershed
developed in partnership with the EII by the Cannon River Watershed Partnership

The mission of the Cannon River Watershed Partnership (CRWP) is to protect and improve the surface and groundwater resources and natural systems of the Cannon River Watershed by

- coordinating existing local and state government and citizen resources in implementation of local water plans,
- instilling a sense of watershed pride through education, information, and special events, and
- providing for cooperative management and protection of the watershed.

EII staff—working as members of a CRWP Technical Advisory Committee—developed a comprehensive set of environmental indicators to help CRWP convey to watershed residents the causes and consequences of environmental change. These indicators, when collected regularly in a monitoring program, will help citizens:

- document whether the environmental ***benefits*** they desire are achieved.
- track the ***environmental conditions*** needed to sustain those benefits.
- identify the ***human activities*** most likely linked to the environmental change threatening the flow of benefits.
- assess the effectiveness of ***management strategies*** already in place.

The following indicators have been selected to date:

Indicators of the ***Benefits*** sought from ecosystems
• **Acres and river miles of fishable, swimmable waters** • **Miles of trails for hiking, biking** • **Number of boat accesses (motor and canoe)** • **Number of swimming accesses** • **Number of trail users** • **Number of recreational water users** • **Frequency of flooding** • **Property loss due to flooding** • **Tourism dollars** • Adequate **quality and quantity of ground water** for economic, social and ecological benefits

Indicators of ***Environmental Condition***

- **Percent of land area eroding at > T**
- **Sediment loads** in surface water
- **Nutrient loads** in surface water
- **Bacteria** in surface water (**percent of time over standard)**
- **Water clarity**
- **Trophic state** of lakes
- **Number of lakes/river miles achieving designated uses**
- **Flow regime** (peak and base flows)
- **Percent of stream banks with excessive erosion**
- **Length and width of vegetated corridors along water bodies**
- **Connectivity and fragmentation of natural areas**
- **Wildlife abundance**
- **Indices of community health** (ICI, IBI)
- **Spawning areas accessible**
- **Number and size of game fish**
- **Percent of wells contaminated** (by aquifer)
- **Groundwater levels**
- **Area available for recharging groundwater**

Indicators of ***Human Activities***

- **Land cover and land use**
- **Protected acres in permanent vegetative cover (cover type)**
- **Discharge from waste water treatment plants**
- **Livestock access to shorelands**
- **Percent of floodplains developed**
- **Per capita impervious surface area**
- **Number of public ditches or tiles enlarged to handle greater flow**
- **Acres of wetlands destroyed**
- **Percent of stream miles channelized**
- **Number of dams**
- **Number of abandoned and illegal dumps**
- **Toxic release inventory**
- **Water use per capita**

Indicators of *Management Strategies*
• **Percent of properties complying with shoreline or wild and scenic ordinances** • **Acres enrolled in land retirement programs** • **Acres of trees planted through programs** • **Percent of farmland with conservation practices** • **Number of communities with erosion control ordinances.** • **Degree of compliance with erosion control ordinances** • **Number of acres with nutrient management plans** • **Effectiveness of feedlot ordinances** • **Number of waste water treatment plants meeting nutrient reduction goals** • **Number of farms upgraded to reduce livestock pollution** • **Number of communities that restrict impervious surfaces** • **Acres of wetlands created or restored** • **Effectiveness of farmland protection ordinances** • **Amount of lands for public access** • **Miles of trails** • **Number of communities with plans to maintain floodplains in natural states** • **Amount of hazardous waste recycled or collected** • **Number of abandoned and illegal dumps cleaned up** • **Number of industries reducing hazardous materials use** • **Percent of conforming septic systems** • **Percent of septic systems pumped on schedule** • **Water conservation by residents and industry**

ATTACHMENT 2

Draft Indicators for Evaluating the Interdisciplinary Program of the DNR Metro Region

EII and Metro Region DNR staff are experimenting with indicators for evaluating the effectiveness of Metro resource management activities. To begin the process of indicator selection and evaluation, EII and Metro staff examined three interdisciplinary projects: *Metro Greenways*, *Metro Trout Stream Watershed Protection*, and *Neighborhood Wilds*. These projects include management strategies (listed in the table below) which address the infiltration capacity of watershed, nutrient and sediment loads in surface waters, and the availability, quality, and spatial distribution of terrestrial and aquatic habitats. The indicators below will provide information on the effectiveness of the management strategies in changing environmental conditions responsible for desired benefits.

The preliminary set of indicators for the Metro Region are:

Indicators of ***Benefits***
• **Acres and river miles of fishable and swimmable waters** • **Groundwater quantity and quality** • **Number of public access sites, acres of land accessible to the public** • **Miles of trails** • **Number of natural and cultural sites connected by trails and greenways** • **Recreational user satisfaction** (Hunting, fishing, hiking, biking, birding, etc.) • **Value of residential property**
Indicators of ***Environmental Condition***
• **Peak and base streamflows** • **Stream water temperature** • **Watershed infiltration capacity** (acres of natural vegetation and constructed ponds) • **Nutrient and chemical composition of runoff** • **Miles of stream buffered by vegetation** • **Percent of stream buffer that consists of native vegetation** • **Naturalness of stream channel** (sinuosity, bank composition) • **Percent of stream miles with overhanging vegetation** • **Presence of remnant, presettlement vegetative communities and threatened, endangered and special concern species** • **Aquatic macroinvertebrate populations** • **Population levels of wetland and aquatic game and non-game plant and animal species of interest**

- **Acres of interior habitat**
- **Index of habitat connectivity or dispersion**
- **Acres of restored habitat and percent of restoration using native vegetation**

Indicators of ***Human Activities***

- **Land cover** (artificial surfaces, cultural vegetation, row crops, natural and semi-natural vegetation)
- **Land Use**
- **Densities of residential and commercial development**
- **Undeveloped Lands**
  Ownership
  Permanently Protected
  Planned development densities

Indicators of ***Management Strategies***

- **Number of projects to increase watershed infiltration capacity**
- **Percent of nutrients, heavy metals, etc. removed from runoff** by infiltration ponds and vegetation buffers
- **Number of communities that have implemented stormwater Best Management Plans**
- **Miles of streambank on which vegetation has been re-established**
- **Percent of re-established streambank vegetation that consists of native species**
- **Acres of land in permanent protection status**
- **Acres of habitat restored**
- **Percent of restored habitat that consists of native vegetation**
- **Miles of stream channel restored** (dechannelized, undammed)
- **Number of communities that have conducted natural resource inventories**

ATTACHMENT 3

Review of the Availability and Accuracy of Information about Forests: Phase I Report

Prepared by

Minnesota Forest Resources Council
Forest Resource Information Management Committee

In partnership with the

Environmental Indicators Initiative

January 11, 2000

Introduction

This report is the culmination of the first phase of a two-phase review of the availability and adequacy of information on the state's forest resources. The report was prepared through a partnership between the Minnesota Forest Resources Council Forest Resources Information Management Committee (IMC) and the Minnesota Department of Natural Resources Environmental Indicators Initiative (EII). The report includes one or more baseline questions for each of the eleven MFRC goals developed in conjunction with the vision statement (see Common Vision and Major Goals section below). Indicators are identified for each baseline question. Together the baseline questions and indicators presented in this report represent a major step forward in identifying the information needs for achieving the common vision for Minnesota's forest resources.

Background

In fall of 1998, the MFRC created the Forest Resources **I**nformation **M**anagement **C**ommittee (IMC). The origins of the IMC date back to the MFRC's development of a vision statement in late 1997 and early 1998. Eleven goals for achieving the vision and twenty-one major forest resource topics – topics that have considerable influence over the state's ability to realize the vision – were identified by the MFRC along with the vision statement. The topic *availability and accuracy of information about forests* was judged important enough by the MFRC to warrant immediate study. The IMC was constituted shortly thereafter and charged with studying the availability and adequacy of the state's forest resources information. The IMC has adopted a two-phase review process (described below), of which this report marks completion of the first phase.

Phase I Review Process

The phase I review process entailed three major steps. First, questions by which progress toward achieving the goals can be measured were developed. These questions were called *baseline questions* in order to signify their importance. They were derived from interpretation of goals by EII staff; consultations among EII staff, the IMC, IMC staff, and MFRC staff; and EII staff's collective experience in the field of environmental monitoring.

Second, the EII undertook a review of several regional, national, and international Criteria and Indicator (C&I) projects underway or recently completed. A total of five C&I projects were reviewed (see Sources). The review 1) provided the means to compare and contrast the goals with C&I developed by international, national, and regional forestry groups addressing sustainability, and 2) suggested additional information that might make the information review more comprehensive.

Finally, indicators – quantitative or qualitative measures that provide information – were developed for each baseline question. Indicators reported are a select set of all possible indicators – those judged to be most effective at answering the question. Several questions, particularly those related to process type goals, were such that quantifiable indicators were not readily discerned.

Proposed Phase II Review Process

The second phase will build on the first phase through the examination of the state's ability to provide the information necessary to answer the baseline questions and indicators. A sampling of questions that may be addressed in the second phase include:

Are programs in place to collect the information needed?
Where are the gaps between information needed and that which is available?

Is the information accurate?
Is the information collected at frequent enough intervals and at appropriate scales?
Is the information collected in a manner that allows the identification of trend?
Is the information comparable to historical data sources?
Is the information available to the policy makers, planners, managers, and citizens who may need the information?

The IMC plans to initiate the second phase in February 2000 and complete it by August 2000. A final report that highlights major findings of the information review along with IMC recommendations for programmatic responses will be submitted to the MFRC by November 2000.

Common Vision and Major Goals

Common Vision

Minnesota's forests are managed with primary consideration given to maintaining long-term ecosystem integrity and sustaining healthy economies and human communities. Forest resource policy and management decisions are based on credible science, community values, and broad-based citizen involvement. The public understands and appreciates Minnesota's forest resources and is involved in and supports decisions regarding their use, management, and protection

Major Goals for Achieving a Common Vision

1. **Minnesota's Forest Land Base is Enlarged and Protected.** No net loss of forest land occurs and some previously forested areas are returned to forest cover. The forest land base is protected from decreases and fragmentation caused by land-use changes.
2. **Forest Ecosystems are Healthy, Resilient, and Functioning.** Forests are composed of appropriate mixes of cover types and age classes required to maintain wildlife and biological diversity.
3. **Forests are Sustainably Managed.** Forests are managed to ensure economic, social, and ecological sustainability. Forest management activities enhance the diversity of the state's forests and support the long-term sustainability and growth of the many sectors that depend on them.
4. **Forest-Based Economic and Recreational Opportunities are Large.** The role and contribution of forests to the state's economic and social well-being are acknowledged. Economic opportunities for Minnesota's forest-based industries, including tourism and wood-based businesses, are large, sustainable, and diverse.
5. **Forest Practices are Implemented in Effective and Efficient Ways.** Forest practices are implemented in ways that maximize their effectiveness while minimizing the costs of their administration. Guidelines suggesting appropriate practices are scientifically based, practical, easy to understand, their rationale clearly stated, and their application consistent where possible and appropriate.
6. **Forest Landscape-Level Planning is Coordinated and Involves Collaboration.** Landscape-level planning is based on ecological landscapes and involves collaboration among landowners, users, stakeholders, and the public.
7. **Public and Private Rights and Responsibilities are Recognized.** Forest practices that achieve certain public benefits recognize and respect the inherent rights, responsibilities, interests, and financial limitations of public and private forest landowners.
8. **Forest Research Programs are Effective and Adaptive.** Information is provided by effective and coordinated basic and applied research programs. Forest practices and landscape planning/coordination activities are based on the best available information and technology and can be readily adapted to new information or changing resource conditions.

9. **Multi-Resource Information Systems are Compatible and Comprehensive**. Landowners, managers, and stakeholders have access to information systems that are capable of providing comprehensive information about forest resources.
10. **Forest Policy Development is Effective and Supportable**. Policies and programs focused on forest resources are developed and supported by processes that collaboratively move forward to resolve issues and accommodate a wide-range of constituencies.
11. **Program Funding is Committed and Sustained**. Sustainable, adequate, and long-term funding is available to accomplish the vision and the goals for the state's forests.

	FRC Goals	Baseline Questions	Indicators
Forest base	**Minnesota's Forest Land Base is Enlarged and Protected**	How much forest land is there?	Area of forest land, timberland, and total land area.
		How extensive are areas of continuous forest cover?	Extent, location, and spatial pattern of areas of continuous forest cover. Changes in ownership within areas of continuous forest cover.
		What laws, rules, administrative policies, land use plans, and local ordinances exist to protect the extent of existing forest?	Extent, location, and spatial pattern of forest land by landowner and administration category. Extent, location, and spatial pattern of forest land protected from conversion to non-forest uses by laws, rules, administrative policies, land use plans, and local ordinances.
Ecosystem Health	**Forest Ecosystems Are Healthy, Resilient and Functioning**	What is the condition of the terrestrial habitat in forested areas?	Extent, location, and spatial pattern of natural plant communities. Extent, location, and spatial pattern of forest types, age classes, size classes, site index, basal area, and productivity classes. Status of state and federal endangered/threatened/special concern species. Listing of sensitive species that are monitored by agencies, institutions, and programs.
		What is the condition of the aquatic resources in forested areas?	Index of Biological Integrity. Status of state and federal endangered/threatened/special concern species. Listing of sensitive species that are monitored by agencies, institutions, and programs.
		How extensive are disturbances in forested areas?	The extent, location, and spatial pattern of disturbance by type and severity class.
		How are disturbed forests recovering?	Land use and cover class of disturbed areas. Composition and stocking of forest regeneration.
		How does tree growth compare to mortality and removals?	Growth, mortality, and removals by species.

	FRC Goals	Baseline Questions	Indicators
Economies and communities	**Forest-Based Economic and Recreational Opportunities Are Large.**	What is the status and economic value of manufacturing of fiber and raw materials from Minnesota's forests?	Location, capacity, and products produced by facilities of Minnesota's wood-based industry. Economic value, number of employees, and wages paid in the primary manufacturing of Minnesota fiber and raw material. Economic value, number of employees, and wages paid in the secondary manufacturing of Minnesota fiber and raw material. Import and export levels of raw materials and products.
		What is the availability of recreational opportunities and their economic value?	Amount of forest land available for public use. Number and type of facilities available for recreation and tourism. Expenditures of individuals participating in forest recreation and tourism.
		What is the status and economic value of special products (non-timber) from Minnesota's forests?	List of special products produced. Gross sales of special products produced from Minnesota's forest resources.
Management	**Forests Are Sustainably Managed.**	Please see questions for (1) Forest Ecosystems are Healthy, Resilient, and Functioning, and (2) Forest-Based Economic and Recreational Opportunities are Large.	
	Forest Practices are Implemented in Effective and Efficient Ways.	Are guidelines (e.g. Best Management Practices, silviculture guides) that suggest appropriate practices to promote sustainability in place?	List of sources that provide guidance.
		To what extent are existing guidelines that promote sustainability implemented?	Forest area managed in accordance with guidelines. Number of loggers and forest managers who participate in guideline education programs. Compliance monitoring results.
		How effective are existing guidelines that promote sustainability?	Effectiveness monitoring results.
		How efficient are guidelines that promote sustainability?	Compliance monitoring results.

	FRC Goals	Baseline Questions	Indicators
Management	**Forest Landscape-Level Planning Is Coordinated and Involves Collaboration.**	What groups are dealing with forest resource issues that affect large areas and multiple landowners?	List of groups, their purpose and geographic extent.
		To what extent are landowners coordinating forest planning and management activities?	Area of forest land where planning and management activities are influenced by landscape-level planning and coordination activities.
		To what extent is strategic planning occurring?	Area of forest land that is part of strategic planning effort (assessment, issue identification, goals, and strategies).
	Public and Private Rights and Responsibilities are Recognized.	Do existing laws, rules, administrative policies, local ordinances, land use plans, direction documents, and guidelines recognize public and private rights and responsibilities?	List of laws, rules, administrative policies, local ordinances, land use plans, and guidelines that affect private landowner's rights and responsibilities. List of laws, rules, administrative policies, local ordinances, land use plans, and direction documents that define public rights and responsibilities.
	Forest Policy Development is Effective and Supportable.	Are processes in place to provide collaboration in forest policy development?	List of processes, their purpose and geographic extent.

	FRC Goals	Baseline Questions	Indicators
Enabling conditions	**Forest Research Programs Are Effective and Adaptive.**	Are research programs responsive to the need of practitioners?	Researchers and practitioners perceptions as to the adequacy and applicability of research?
		Are mechanisms in place so researchers know what's needed?	Researchers and practitioners perceptions as to the transfer of information and needs between the communities.
	Multi-Resource Information Systems Are Compatible and Comprehensive.	How comprehensive are the existing information resources in the state?	Periodic review of the availability and accuracy of information on forests in Minnesota.
		To what extent are information from multiple landowners compatible?	List of efforts and accomplishments to coordinate common data standards and information reporting.
	Program Funding Is Committed and Sustained.	What activities are missing or are performing inadequately.	List of programs and their purpose.

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PUBLIC REVIEW DRAFT

Preparing for Minnesota Water Plan 2000

To paraphrase a famous state resource on radio: Minnesota, where the rivers are strong, the lakes are good looking and the fishing is above average.

When the average American hears *Minnesota*, chances are the first image that comes to mind is water. Home to the nation's largest river and big clear lakes teeming with fish, Minnesota is the water capitol of the United States. Minnesotans, as well as tens of thousands of travelers who generate the state's $9 billion tourism economy, count on clean, clear water for drinking, cooking and recreation. What should Minnesotans be doing in the upcoming decade to protect this prized resource?

This review draft is a starting point for public discussions that will take place through February 2000 about the condition of Minnesota water resources and how to measure results through goals, objectives and progress indicators. The outcome will be a new *Minnesota Water Plan,* due to the Legislature in September 2000.

Minnesota Water Plan 2000 is a major component of Governor Jesse Ventura's Water Management Unification Initiative. Key elements of this initiative include:

- Focusing on major river basins, such as the Minnesota, Mississippi and Red rivers, to recognize the differences in water resources throughout the state and local water priorities.
- Staying flexible to coordinate efforts with the work of existing local boards, activities and major programs, such as the joint powers boards and the Pollution Control Agency's basin planning.
- Unifying efforts through interagency teams and cooperating with the many groups in each basin.
- Measuring results by selecting water objectives with targets for 2010 and tracking how Minnesota is doing.

This review draft presents four goals, 10 objectives and 29 indicators. The model for creating these tools was *Minnesota Milestones 1998*, a project that measured progress toward 19 state goals in the 1990s. Refocusing the *Milestones* environmental goals on water, the Environmental Quality Board Water Resources Committee and a Water Management Unification Task Force suggest these objectives and indicators. The draft also provides available trend information to show the condition of water resources in Minnesota; if information is lacking, the indicator is presented as a "snapshot in time." In many basins, local information may be better and can be used to augment the data in this draft.

INSIDE

Goals, objectives and indicators at a glance

Goal: Minnesotans will improve the quality of water resources

Objective A: Protect and improve water quality in streams

Measure levels of pollutants in streams:

Indicator 1: Phosphorus

Indicator 2: Nitrogen

Indicator 3: Ammonia

Indicator 4: Biochemical oxygen demand

Indicator 5: Total suspended solids

Indicator 6: Fecal coliform bacteria

Objective B: Protect and improve lake water quality

Indicator 7: Secchi transparency in lakes

Objective C: Prevent degradation of ground-water quality and reduce concentrations of contaminants

Measure levels of pollutants in ground water:

Indicator 8: Nitrate

Indicator 9: Chloride

Indicator 10: Volatile organic compounds

Indicator 11: Total atrazine

Indicator 12: Fecal coliform bacteria

Goal: Minnesotans will conserve water supplies and maintain the diverse characteristics of water resources to give future generations a healthy environment and a strong economy

Objective D: Maintain ground-water levels to sustain surface water bodies and provide water supplies for human development

Indicator 13: Water levels in wells

Objective E: Maintain flow of rivers and streams within historical range of variation

Indicator 14: Trends in stream flow

Objective F: Maintain the quality and diversity of Minnesota's lakes and wetlands while acknowledging regional variation

Indicator 15: Changes in wetland acres

Goal: Minnesotans will restore and maintain healthy ecosystems that support diverse plants and wildlife

Objective G: Ensure that aquatic environments have conditions suitable for the maintenance of healthy self-sustaining communities of plants and animals

Indicator 16: Blue-winged teal population

Indicator 17: Mallard population

Indicator 18: Percent of lakes where loons reproduce successfully

Indicator 19: Number of territories occupied by bald eagles

Indicator 20: Frog and toad populations

Indicator 21: Aquatic invertebrates population

Indicator 22: Walleye population

Objective H: Limit introduction and spread of exotic species

Indicator 23: Number of water bodies with Eurasian watermilfoil

Indicator 24: Miles of waterways and number of lakes and reservoirs with zebra mussels

Goal: Minnesotans will have reasonable and diverse opportunities to enjoy the state's water resources

Objective I: Provide appropriate access to water recreation sites

Indicator 25: Number of sites for boat launching

Indicator 26: Number of public fishing piers

Indicator 27: Miles of stream easements

Objective J: Improve or maintain the quality of water recreation

Indicator 28: Boater satisfaction by surveys

Indicator 29: Angler satisfaction by surveys