



Project Progress To Date

*Statewide Conservation and Preservation Plan
Preliminary Plan – Phase I
July 17, 2007
Revised Sept. 20, 2007*

KEY PROJECT TEAM MEMBERS

The Statewide Conservation and Preservation Plan project team is composed of many leading experts in science, natural resources, data analysis and modeling, planning, land use, policy implementation and facilitation of large, complex projects.

Many of the University of Minnesota faculty involved are recognized locally, regionally, nationally, and internationally for their scientific expertise. In addition to holding prominent leadership and research positions at the University of Minnesota, they have served on advisory committees to the U.S. Federal government, in joint Canadian-U.S. scientific and policy groups, and have contributed their time and experience to advisory groups to the United Nations. They sit on the editorial panels for leading scientific journals, and several hold highly prestigious international fellowships.

The private consultant team members are widely recognized within the industry for their experience and applied knowledge, and all bring a strong regional, and in some cases national, reputation for skill and excellence. Two are current or past owners of their own planning firms, and several are widely published. Many have been members or board members of regional, local, and national professional organizations, and have served leadership roles in those organizations.

Members of the project Core Management Team and resource team leads are listed below. There are more than 30 additional academic and professional staff who have participated in the project to date.

University of Minnesota:

Todd Arnold, PhD; Associate Professor, Department of Fisheries, Wildlife and Conservation Biology

George Host, PhD; Senior Research Associate & Landscape Ecologist, Natural Resources Research Institute;
Director, Natural Resources Geographic Information System Laboratory, Duluth

Anne R. Kapuscinski, PhD; Professor, Department of Fisheries, Wildlife and Conservation Biology; Co-director,
Ecosystem Science and Sustainability Initiative

Lance Neckar, MLA; Professor, Department of Landscape Architecture

Gerald Niemi, PhD; Professor of Biology; Director of the Center for Water and the Environment, Natural
Resources Research Institute, Duluth

Ingrid Schneider, PhD; Associate Professor, Forest Resources; Director of the University's Tourism Center.

Matt F. Simcik, Ph.D. Associate Professor, Environmental Health Sciences

Sangwon Suh, PhD; Assistant Professor, Department of Bioproducts and Biosystems Engineering

Deborah Swackhamer, PhD; Professor, Environmental Health Sciences; Interim Director, Institute on the
Environment

Mary Vogel, MA; Co-director, Center for Changing Landscapes

CR Planning:

Jean Coleman JD, MA; Attorney and Land Use Planner; owner, CR Planning, Inc.

Bonestroo:

Paul Bockenstedt, MA; Senior Ecologist and Project Manager

Elizabeth Gould, B.S.; Project Scientist and ecologist

John Shardlow, BS; Senior Principal and Director of Planning; past-president and owner, DSU

Randy Neprash, PE; Civil Engineer, Water and Natural Resources Group

Ciara Schlichting, MS, AICP; Senior Planner

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Project Overview

With funding from the LCCMR, the Statewide Conservation and Preservation Plan (SCPP) is being developed by a public-private partnership consisting of faculty from the University of Minnesota-Twin Cities and the Natural Resources Research Institute at the University of Minnesota-Duluth, and the consulting firms of Bonestroo and CR Planning, Inc. (see facing page) The SCPP is being developed in two phases: a Preliminary Plan (this report) and a Final Plan (to be completed in June, 2008).

The primary objective of this Preliminary Plan is to provide the LCCMR with an update on overall progress, and to present preliminary conclusions that would help inform the LCCMR's funding strategy for the coming fiscal year.

Project Structure

Research and Analysis Teams made up of faculty and consultant advisors were formed to examine six natural resource categories: air, land, wildlife, water, fish, and outdoor recreation. These six teams identified pertinent data and studies for assessing the status of resources and drivers of change for each natural resource category. They also identified and gathered a preliminary set of existing plans and policies related to natural resource conservation and preservation at all levels of government. Using this cumulative information, the resource teams identified and prioritized key

issues or drivers of change. Based on strategic criteria developed at a meeting with the full LCCMR, the core management team formed recommendations for key issues to be investigated in the second phase of the project, the final plan.

An *Information Systems Team* has created a project intranet to facilitate inter-team communication and act as an archive for data and policy documents and project outputs, and has created maps and data representations to illustrate and document project team findings.

An *External Communications Team* laid the groundwork for connecting the project to stakeholder groups and the general public (see Public Engagement section below).

A *Cost/Benefit Analysis Team* has been formed, and contributed to the analysis of drivers that was the foundation for the project's funding recommendations to the LCCMR.

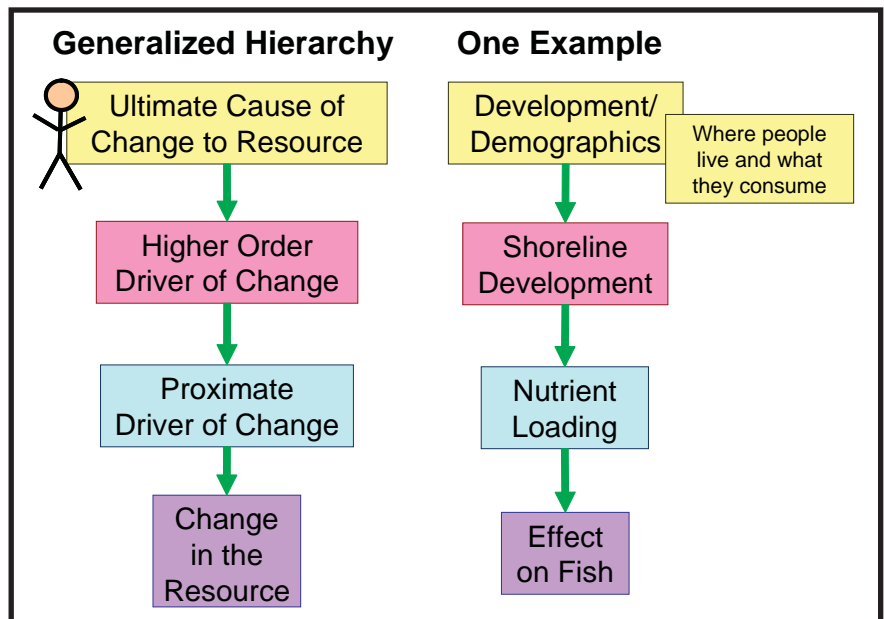


Figure 1: Conceptual hierarchy of drivers. Proximate drivers directly impact the resource. Higher order drivers are often where policy/investment choices operate. Credit: Jean Coleman, CR Planning.

A *Core Management Team* made up of representatives from each of the teams and an LCCMR staff member has overseen the process, ensured cross-communication among the teams and between the Project and the LCCMR.

A *Support Team* comprised of students from the University of Minnesota and staff from CR Planning and Bonestroo provided staff and logistical support to the Research and Analysis Teams.

Identifying and Analyzing Drivers of Change

A major focus of the first phase of the project has been identifying the key drivers of change affecting each natural resource area. Each research team began by identifying proximate drivers, those acting most closely upon the resource, and then mapping them to higher order drivers (see Figure 1, facing page).

The teams, with the assistance of outside experts from relevant state and federal agencies, then ranked

Air Quality	Biodiversity
Water Quality	Abundance of Resource
Habitat Quality	Economic Health
Soil/Land Quality	Aesthetics
Fish and Wildlife Health	Cultural/Spiritual Value
Human Health	

Table 1: Sustainability Elements

these drivers by their relative impact on a common set of “elements of sustainability” (see Table 1 and “Definition of Sustainability” below). As an example, for the Fish resource, the proximate driver Nutrient Loading affects sustainability elements Water Quality (medium), Fish Health (high), and Human Health (low), among others.

The rankings were mathematically analyzed to rank the proximate drivers in order of total impact (integrated across elements of sustainability) on the resource. The drivers with the broadest impact were selected for review in this report.

Definition of Sustainability used by the Minnesota 2050 Project¹ and the Minnesota Statewide Conservation and Preservation Plan

Sustainability means ensuring that all future Minnesotans have the opportunity to enjoy lives as rich and meaningful as our own, and in a natural environment that is at least as clean, intact, and healthy as that which we enjoy today. We are defining sustainability in the context of the Minnesota 2050 and SCPP projects to mean the persistence of important components and functions of Minnesota’s economy, environment and society up to and beyond the year 2050. ‘Sustainability’ is not an end point or a static state, but rather a dynamic condition that responds to:

- trends in the systems themselves;
- policies that influence those systems; and
- influences external to Minnesota such as climate change, macroeconomic trends, and fossil fuel availability.

Activities that provide future generations with degraded natural resources, reduced economic opportunities or diminished social well-being are inherently less sustainable than policies and actions that maintain or improve these systems. The following are important components and functions of Minnesota’s environmental, economic and social systems whose persistence (or absence) determine sustainability:

- air and water quality and quantity that support human health, economic uses, and the health of Minnesota’s aquatic and terrestrial ecosystems;
- maintenance or recovery of forest, grassland, savanna and aquatic ecosystem habitat, biodiversity, and productivity functions and the economic and ecological services these functions provide;
- maintenance of agricultural ecosystems that balance maximum positive economic gain with minimal negative environmental effects;
- the ability of the economy to generate enough revenue to pay for the state’s needed imports, provide jobs for employable Minnesotans, and sustain Minnesota households at levels above poverty;
- the natural resource base needed to support Minnesota’s economic sectors and transportation needs with energy and material inputs, or the economic ability to import these inputs;
- economic, environmental and societal systems matched to the state’s dynamic climate system.

¹ The Minnesota 2050 Project’s partnership with the SCPP is described later in this Introduction; see also App. vi

Project Progress

Natural Resource Assessment - Trends

The first European settlers to arrive in Minnesota were met with an amazing sight. As they looked west, tall-grass prairie stretched as far as the eye could see, across the southwest half of the state and beyond. Arid bluffs, with their exposed gravelly soil, stood under the scorching summer heat and drying winds, home to species that thrived on those conditions. Depressions on the rolling land below supported pockets of wetland. Bison, American elk, and gray wolves roamed the prairie; species such as Sprague's pipits, chestnut-collared longspurs, bobolinks, and western meadowlarks filled the air which was clear and clean. Fire was a regular visitor to the prairie that burned through the open grasslands.

Looking to the north, the landscape changed and became more rolling, the climate wetter and fires less frequent, allowing trees to establish and dominate the landscape. Dense forests of oak, elm, and sugar maple stretched through central Minnesota, populated by white-tailed deer, raccoons, gray and fox squirrels, wood ducks, wild turkeys, red-shouldered hawks, Cerulean warblers, Blanding's turtles, and Copé's gray tree frogs. Scrub oak woodlands marked the transition between prairie to the southwest and the mixed conifer-hardwood forests and brushlands of north central Minnesota, and the conifer forests, bogs, and swamps of northeast Minnesota. There were many unique species in these forests, including wolverine and woodland caribou, moose, Canada lynx, great gray owl, spruce grouse, northern goshawk, fisher, pine marten, forest salamanders and wood turtles.

And then there was the water. Large to small streams flowed clear and sparkling under the prairie sun, and shade-dappled through the forests, writhing with abundant brook trout. Wetlands, groundwater, and warm to cold water lakes created a patchwork of diverse water forms across the landscape. The largest

cold water body, Lake Superior, and its tributary rivers held over 70 native fish species.

As European settlement expanded, things changed. The landscape and the species it supported were disrupted by logging, agriculture, settlement, development, and mining activities. Ninety-nine percent of Minnesota's tall grass prairies disappeared beneath the plow. Many fish and other aquatic wildlife declined precipitously due to unregulated fishing and massive changes to aquatic habitats. Several wildlife species also disappeared altogether from Minnesota, including American Bison, wolverine, woodland caribou, and the passenger pigeon, which is now globally extinct. Some species, such as the grey wolf, suffered persecution and near extinction as a result of social intolerance. World War II brought the use of pesticides and other chemicals, which found their way into the water, fish, and birds; and some, such as the bald eagle, nearly went extinct. Air quality declined as economic activity grew.

Recreation was valued by Minnesota's earliest residents. Minnesota's first state park, Itasca, was established in 1891 by the legislature to protect the headwaters of the Mississippi and provide residents with a natural retreat. Starting in the 1960s, awareness of the declining state of our resources began to increase and several laws were enacted to address water and air quality issues, to regulate the taking of fish and to protect endangered species. These actions have had tremendous positive impacts. Water quality has improved, and significantly impaired fish communities recovered. Populations of the bald eagle and gray wolf have rebounded. Air quality has improved, with aggregate emissions of regulated pollutants dropping by 15% from 1985 to 2005.

Even so, today 27% of all mammal species, 31% of all bird species, and 32% of all fish species in Minnesota are recognized as Species of Greatest Conservation Need by the Minnesota Department of Natural Resources (DNR). On the plant side, only 5% of land areas surveyed under the County

Biological Survey remain as remnant native plant communities, and 256 native plant species are listed as special concern, threatened, or endangered. There are fish consumption advisories for most lakes in Minnesota, due to the ubiquitous, air borne presence of mercury in our waters. And although emissions of regulated air pollutants have fallen, carbon dioxide emissions have increased significantly – going up 53% from 1985 to 2005. The growth of carbon dioxide is not only one of the top challenges for Minnesota air quality – its effect on climate change will be one of the greatest challenges for all of Minnesota’s resources into the foreseeable future.

Natural Resource Assessment - Drivers

A number of compelling factors are driving significant changes in Minnesota’s natural resources – changes that are occurring now and changes that are projected into the future. As mentioned above, Minnesota’s once abundant terrestrial wildlife – birds, mammals, reptiles, amphibians – now has numerous species whose populations are in decline. The most significant driver of this change is the **loss and degradation of critical habitats** necessary to support these species, habitat losses caused by the increasing **fragmentation** of forest and prairie remnants, the **homogenization** of forest species, and **changes in the species mix** found on the landscape. Increasing removal of aquatic vegetation along shorelines and within lakes is also altering essential habitat for game and non-game fish communities.

Minnesota’s famous lakes, rivers, and streams are increasingly impaired by **solids and nutrient loading**, and **contaminants** such as **mercury, pesticides, endocrine disrupters, and pharmaceuticals**. The Minnesota Pollution Control Agency has identified **2,250 impaired water bodies** in Minnesota; and this with **90% of the State’s surface waters yet**

to be tested. These impairments are degrading aquatic habitat by changing aquatic vegetation, water clarity, habitat physical structure, and dissolved oxygen levels; all of these are negatively impacting fish. And all of the fish in Minnesota lakes and rivers have some amount of mercury in them, which has resulted in a fish advisory for most lakes across the state.

Another major driver impacting fish populations is **invasive aquatic species**. Minnesota waters now contain sixteen invasive aquatic plants, invertebrates, and vertebrates – including Eurasian watermilfoil, zebra mussels, and sea lamprey – which threaten native fish through competition, predation, and habitat alteration. Through these same interactions, **invasive terrestrial plant and animal species** are also drivers of change in wildlife and native plant communities.

Changing land use is clearly the “driver behind the driver” in many of these cases. **Widespread development** of natural, agricultural, shoreline and forestry lands for residential, commercial, industrial, and transportation uses is having major impacts on the land and water resources in terms of changes in vegetative land cover. These changes are the primary



Figure 2: Boating and swimming should be avoided and a fish consumption advisory is in effect because of contaminated sediments in this West Duluth water.

Credit: CR Planning, Inc.

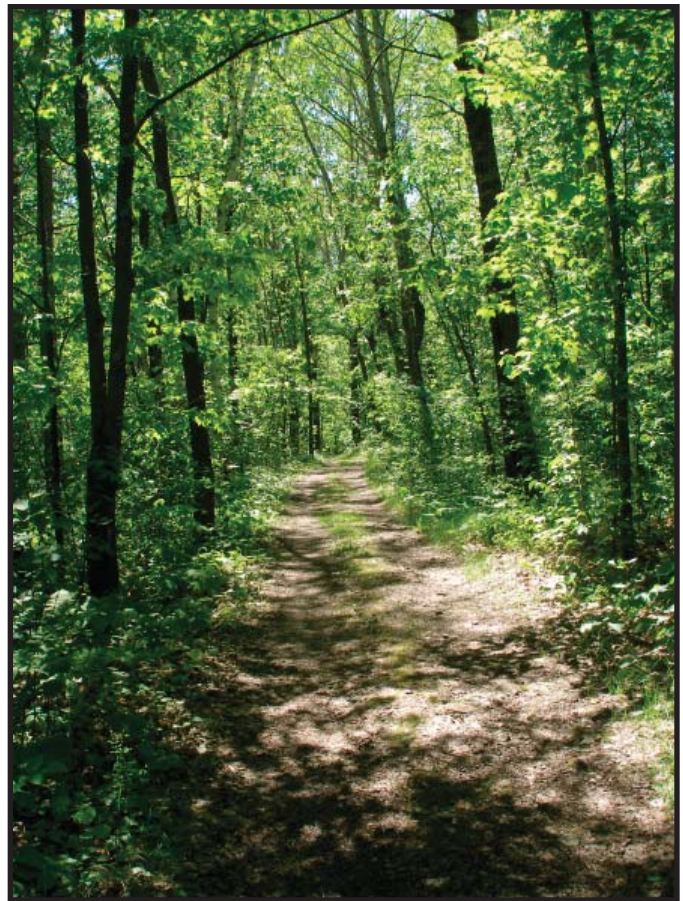
cause of habitat loss and degradation discussed above. In addition, the type of management practices used on agricultural and forestry lands is also altering land cover; in particular, as acres of annual row crops increase, the amount of perennial land cover decreases. This change is negatively impacting the land resource through **soil erosion, loss of soil structure, nutrient loading, and contaminants.**

Changing land use is also a prime driver of **hydrologic modifications** such as **drainage tiles and ditching** on agricultural lands, and **increases in impervious surfaces** associated with developed lands. These hydrologic modifications, in combination with the changes in vegetative land cover, are resulting in the water impairments described above.

Finally, changing land use is driving changes in **access to outdoor recreation resources.** Shoreland development and changing ownership and management of forest lands in particular are creating barriers for non-owners to use lakes and forests for recreational purposes. In addition, **demographics and lifestyle preferences** are changing the demand for, and use of, different types of recreational resources. Most Minnesotans participate in outdoor activities that are dependent on our natural resources: hiking, boating, fishing, bird watching, hunting. Over 82% believe outdoor recreation is important to their lives. Conserving, protecting and improving our natural resources is critical to our lives and our environment

Climate Change - The Wild Card

Looming behind all of the changes described above is the wild card of climate change, whose effects may in the end outweigh all of the other drivers. Climate change will also exacerbate negative effects of other drivers on natural resources. The burning of fossil fuels for electricity generation, heating and cooling, and transportation are increasing in Minnesota and the entire world, leading to ever increasing concentrations of carbon dioxide and other greenhouse gases in the well-mixed global atmosphere. There is no doubt that greenhouse



*Figure 3: Hiking trail in Banning State Park.
Credit: Michael Kelberer, University of Minnesota*

gas concentrations will remain elevated and in fact continue to rise for at least another 50 or 100 years or more. This will happen even if humanity greatly reduces future greenhouse gas emissions in order to avoid even greater climate change. There is an unprecedented consensus among international scientific groups regarding the effects of these greenhouse gases on future climate. The Intergovernmental Panel on Climate Change indicates that it is virtually certain that climate over land will warm in the future, with best estimates being that global temperatures will increase by 1.8 to 4.0 °C (3.2 to 7.2 °F) by the year 2090-2099 (relative to 1980-1999 levels). Warming is expected to be greater at high latitudes, and in Minnesota warming is anticipated to be approximately twice as great as the global mean rise.

The best scientific estimates are for Minnesota to have summers 7 to 16 °F warmer by 2095 (compared to 2000) and winters 6 to 10 °F warmer

by 2095. Those represent enormous climate shifts in a relatively short time period. Moreover, the average temperatures are not the only ways in which climate will change. It is believed to be very likely that rainfall and storms will get more intense (i.e., a greater fraction of precipitation will fall in fewer events) and that droughts will occur more often and cover more area than at present.

While the specific regional impacts of climate change are still being studied, it is extremely likely that climate change will interact with and amplify all of the other drivers described above to intensify their impact on all of the state's resources. For example, climate change is expected to affect the frequency and intensity of wildfires and wind-storms, and the spread of agricultural and forest diseases and insect pests (both native and exotic). Minnesota's geographic location at the interface of the three great North American biomes—tallgrass prairie, eastern deciduous forests, and northern boreal forests—also makes it much more sensitive to potential climate change than a region embedded in the center of a large biome.

Climate change will have direct effects on Minnesota's resources as well. Global warming will directly impact agricultural crops, forests, wetlands and other vegetation communities. Historically rapid climate change in this century has resulted in existing Minnesota vegetation being mis-matched with their finely tuned temperature adaptations – in other words, they will live in habitats to which they are no longer as well suited climatically. Exactly how badly mis-matched vegetation will be is not yet known.

The issue is more challenging for long-lived perennial vegetation that dominates forests, grasslands, and wetlands. Climate change could negatively impact the state's natural vegetation if higher temperatures and associated temperature and moisture extremes cause physiological stress, and if species are unable to migrate north and/or east fast enough to keep up with the rate of climate change. It is likely that in the northern forests, spruce, fir,

and birch will diminish and be steadily replaced by oaks and maples if the climate is relatively moist, or by scrub oak if it becomes drier. Cold-adapted fish and wildlife species, such as lake herring and moose, are also likely to decline or disappear, and adverse impacts on many northern species are possible, and in fact, likely. Minnesota may lose its cold water fish, its winter sports, and a good portion of its tourism economy. The very natural resources we manage for, and the ways in which we manage them, may need to change radically in the next 50 to 100 years, and we need to begin now the careful deliberations necessary to do so intelligently, effectively and in an informed matter.

Climate change should be considered as a fact from a policy standpoint. To effectively manage in the face of climate change will require understanding of the potential bounds of that change, the implications of such change, and the alternative strategies we could employ to optimally sustain our natural and economic resources into the distant future.

Public Engagement and Outreach

The major public engagement effort will come in phase II of the project – when the public and environmental stakeholder organizations will have the benefit of the well-organized scientific information of the Preliminary Plan to base their input on. During the project's second phase it will:

- Hold focused conversations with a broad range of stakeholder groups about Preliminary Plan information and the development of final plan recommendations; and
- Link the Preliminary Plan information to the development of statewide environmental scenarios by the Minnesota 2050 project.

Meanwhile, the SCPP project team has undertaken a number of efforts to lay the groundwork for connecting with interested citizens and stakeholder groups across Minnesota regarding the development of the SCPP.

First, a project website has been established (www.mnconservationplan.net). The site contains information about the project (purpose, structure, contact information) and invites visitors to get involved during the planning process. The site will provide public access to plan materials as they become available, and will provide an easy way for stakeholders to provide feedback on these materials.

A project brochure has been designed and printed, and is being distributed at stakeholder meetings (e.g. The Minnesota Sustainable Tourism Conference and the State Fair).

A database of stakeholder organizations has been created. These organizations have agreed to relay information about the SCPP project (news releases) to their memberships. The first news release went out in May, and focused on the launch of the web site as a platform for stakeholder input and a way for stakeholders to monitor the project's progress.

To leverage its outreach budget to the greatest extent possible, the preliminary plan phase partnered with public outreach efforts by the Minnesota 2050 project and the Campaign for Conservation. Each effort involved a series of workshops inviting members of the public to articulate their visions for the future of Minnesota's natural heritage. See Appendix VI for more on these outreach efforts.

Preliminary Funding Priorities

As part of the Preliminary Plan process, the project team was asked to provide an initial set of recommendations to inform the LCCMR's 2007 request for proposals. Each resource team reviewed the data that had been collected, identifying current trends in the condition of the resource, key issues (drivers of change) related to that resource, and issues that affected more than one resource. Based on this review and the collective expertise of the participants, the project team recommended that the LCCMR focus funding priorities on these key areas:

- Identify, protect and manage land areas that provide benefits to multiple natural resources.
- Establish statewide habitat corridors using consistent methodology and criteria.
- Acquire important data on a regular basis (e.g., LIDAR, parcel and land cover).
- Manage development to decrease effects on natural resources.
- Increase understanding of potential effects of climate change on natural resources.
- Increase understanding of effects of contaminants on natural resources.

Please see Appendix III for more detail on these preliminary recommendations.

“[In 2050] we did walk through the area’s state park to see the last Norway pine. The unique thing about the tree it now has leaves and not needles.”

—Minnesota 2050 Project participant