REFEINING PROGRESS

WORKING TOWARD A SUSTAINABLE FUTURE

MINNESOTA SUSTAINABLE DEVELOPMENT INITIATIVE

FEBRUARY 1994

ENVIRONMENTAL QUALITY BOARD / MN PLANNING

To the people of Minnesota

A year ago, I asked 105 business and environmental leaders to become partners in charting new ways of doing business. I asked that they consider how we might unify the goals of environmental protection and economic development.

Redefining Progress: Working Toward a Sustainable Future is the product of their efforts. It raises fundamental questions about government and business that every citizen of Minnesota needs to consider. It suggests steps Minnesotans can take to secure a future that includes both economic prosperity and environmental health.

I thank these leaders for their commitment to Minnesota's future.

Now that this first important step has been taken, I ask every citizen to consider the ideas offered. We have begun the discussion, but much more is needed before the changes contemplated can take place.

I look forward to bringing this discussion to you so together we can consider how best to secure Minnesota's environmental and economic future.

Warmest regards,

Arne H. Carlson

ARNE H. CARLSON
Governor

The **Minnesota Environmental Quality Board** is an environmental policy forum. Its membership consists of the heads of nine state environmental agencies, five citizens and a representative of the governor serving as chair. **Minnesota Planning**, charged with developing a long-range plan for Minnesota, provides staff to the Environmental Quality Board.

Acknowledgments

Redefining Progress: Working Toward a Sustainable Future is a report of the Minnesota Sustainable Development Initiative. The Initiative consists of the 105 citizens serving on seven teams appointed by the governor, the agencies and staff supporting these teams and the staff and members of the Minnesota Environmental Quality Board, which guides and coordinates the Initiative. Commissioner Rod Sando, Chair of the EQB Strategic Planning Committee, committee members, and Robert Dunn, EQB Chair, lead the Initiative along with the 14 team co-chairs. The chapters on Settlement, Manufacturing, Agriculture, Energy, Forestry, Minerals and Recreation were prepared respectively by the team members and lead staff supporting those teams. Team members are listed at the end of the *Setting a Course* chapter and separately in each chapter. The co-chairs and lead staff for each team are as follows:

Settlement: Barbara Lukermann and Molly Woehrlin, Team Co-Chairs; Marilyn Lundberg, lead staff.
Manufacturing: Robert Bringer and Martin Kellogg, Team Co-Chairs; Abby McKenzie and Scott Peterson, lead staff.
Agriculture: D'Wayne DeZiel and Robert Rupp, Team Co-Chairs; Paul Burns, lead staff.
Energy: Henry Savelkoul and Linda Thrane, Team Co-Chairs; Mike McCarthy, lead staff.
Forestry: Charles Pottenger and Dick Skok, Team Co-Chairs; Mike Kilgore, lead staff.
Minerals: Nelson French and William Ulland, Team Co-Chairs; Dave Olson and Maryanna Harstad, lead staff.
Recreation: Cindy Hayden and Dave Lime, Team Co-Chairs; Tim Kelly, lead staff.

The *Setting a Course* chapter was a collective effort of Initiative team members originating from joint team meetings held in October and November. John Wells, Initiative coordinator, and Rolf Nordstrom of the Environmental Quality Board staff penned the chapter based on the directions set at these meetings and in team reports. Team co-chairs, staff and EQB members reviewed a draft chapter to ensure that it accurately represented Initiative directions.

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Upon request, *Redefining Progress: Working Toward a Sustainable Future* will be made available in an alternative format, such as Braille, large print or audio tape. For TDD, contact Minnesota Relay at 612-297-5353 or 1-800-627-3529 and ask for Minnesota Planning.

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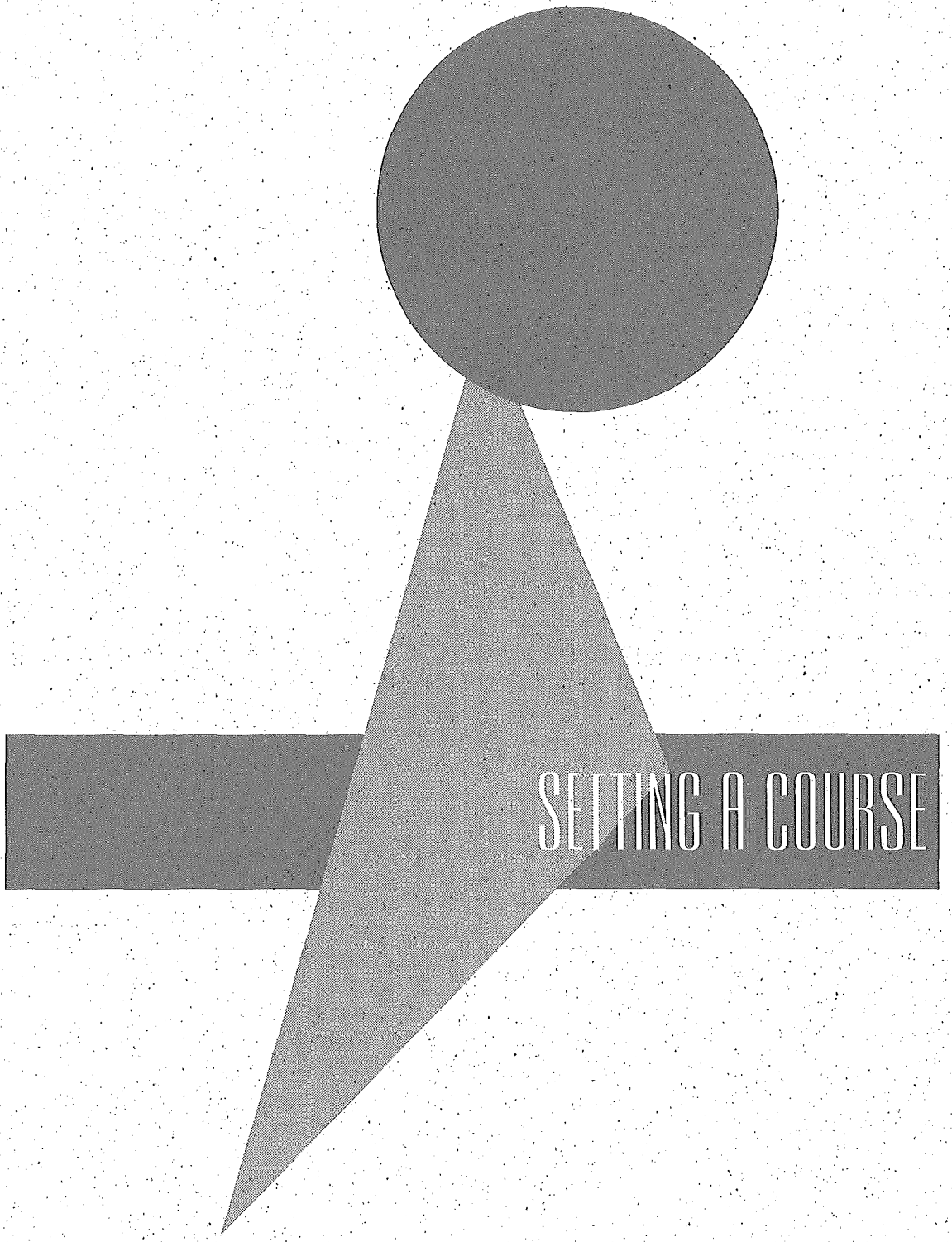

SETTING A COURSE

INTRODUCTION

The goal of sustainable development is a healthy economy in a healthy environment. To achieve this goal, Minnesotans must recognize the interdependence of the environment and the economy and work together to improve environmental protection and economic development. They also must think as much about the needs of future generations as about their own needs. Global markets, environmental conditions, population growth and resource consumption bring challenges to Minnesota. Minnesotans must set a course to meet these tests head on to fulfill the great promise of this state's future. To help them do this, Governor Arne H. Carlson and the Environmental Quality Board inaugurated the Minnesota Sustainable Development Initiative on January 29, 1993.

> Sustainable development promises to redefine our relationship to the earth and to change our notions about progress. – *Building the Sustainable Corporation,* National Wildlife Federation Corporate Conservation Council.
>
> We have the power to reconcile human affairs with natural laws and to thrive in the process – people can build a future that is more prosperous, more just and more secure – but hope for the future is conditional on decisive political action. – *Our Common Future,* World Commission on Environment and Development.
>
> "Minnesota will have sustained economic growth consistent with environmental protection." – *Minnesota Milestones* and *Economic Blueprint for Minnesota*

In this venture, 105 citizens representing environmental, business, government and public interests explored seven areas of economic activity and environmental significance: agriculture, energy, forestry, manufacturing, minerals, recreation and settlement. These areas were selected by the EQB, Minnesota's state environmental policy forum, because of their importance to Minnesota's economy and environment and because they involve significant connections between environmental protection and economic development.

Initiative teams were appointed by the Governor and the EQB for each of the seven areas. Each 15-person team was led by two co-chairs, one each from the environmental and economic communities. Each team was supported by a lead state agency and staff leader, along with a number of advisors from other agencies.

The work of the seven Initiative teams focused on the goal of improving environmental protection and economic development. Within this goal, the EQB also established four common themes:

- The needs of the present must be met without sacrificing the ability of future generations to meet their own needs.
- Minnesota cannot continue to develop economically unless its citizens protect the environment.
- Continued economic development will be needed to pay for important environmental initiatives.
- Attention must be paid to long-term effects of both environmental and economic decisions.

Each team was given an issue statement to define its basic mission in the context of the Initiative's common themes. Each team developed a vision of sustainable development for its area, along with its own principles, issues and strategies. The vision for the future set forth in *Minnesota Milestones*, the state's *long-range plan, and Economic Blueprint for Minnesota* also served as a beginning point for the teams.

This report presents the seven separate visions and sets of principles, issues and strategies developed by the Minnesota Sustainable

INITIATIVE TEAMS AND ISSUES

AGRICULTURE:	How can agricultural systems better achieve environmental and economic sustainability simultaneously?
ENERGY:	How can energy be used more efficiently and energy systems or alternatives be chosen to meet Minnesota's needs, while reducing adverse effects on the environment and the economy?
FORESTRY:	How can forest ecosystems be sustained for a wide range of uses and values?
MANUFACTURING:	How can Minnesotans integrate quality manufacturing job growth at rates faster than the national economy, protection of human health and conservation of natural resource systems and ecosystems for future generations?
MINERALS:	How can Minnesota's diverse mineral resources be explored and developed and its mineral products used efficiently in a manner that sustains the economy and the environment?
RECREATION:	How can Minnesota's changing natural resource systems, as well as the recreational opportunities and associated recreation and tourism industries that they support, be sustained?
SETTLEMENT:	How can Minnesotans shape the patterns of where people live and work to sustain the environment and the economy?

Development Initiative teams. The work of the teams forms the core of the Initiative. The report also presents the vision, principles, issues and strategies that describe the overall change in direction suggested by the Initiative. The work of the teams is the well from which the Initiative's overall directions have been drawn and the source of their innovations.

The Initiative's directions describe a Minnesota where quality of life is achieved through sustainable use of energy and natural resources and the economy diversified, globally competitive and in harmony with the environment. To guide decision-making, ten principles are specified. These are: efficiency, collaboration, responsibility, interdependence, stewardship, equity, foresight, creativity, diversity and prevention.

The overall Initiative direction encompasses six central issues and 20 strategies to help Minnesotans move toward a sustainable future. These are:

- **Education:** Minnesotans need more information about how their actions affect the long-term viability of their communities, the economy and the environment. Strategies include:
  - Continue the forum represented by the Initiative teams.
  - Encourage others to develop initiatives.
  - Build on efforts outlined in *A Greenprint for Minnesota.*

- **Incentives and disincentives:** The number and effect of existing incentives and disincentives for sustainable development are

unknown. Strategies include:

Assess Minnesota incentives and disincentives.

Redirect state investments.

- **Accounting of costs and benefits:** Incomplete accounting of environmental costs and benefits leads to inefficient decisions by the public and private sectors, including consumers. Strategies include:

  Pursue opportunities for full-cost accounting.

  Promote using and sharing full-cost information.

- **Knowledge and information management:** Existing data and knowledge are inadequate to determine the extent to which Minnesota is on a sustainable course. Strategies include:

  Inventory the resource base.

  Chart environmental quality trends.

  Value natural resources.

  Foster technologies that support sustainable development.

  Make optimal use of information technology.

- **Land and natural resource use:** Minnesota lacks a coordinated approach to the use of its land and related natural resources. Strategies include:

  Foster sustainable communities.

  Promote manufacturing that sustains communities.

  Integrate resource management.

  Identify and understand the effects of policies affecting land and natural resource use.

- **Roles of government, the private sector** evolve among government, business and citizen interests. Strategies include:

  Make Minnesota a model.

  Create strategic alliances.

  Change institutions to support sustainable development.

  Extend strategic planning for sustainable development within governments and the private sector.

The changes in business and environmental management suggested by the Initiative are extensive and fundamental. They will demand a variety of efforts by Minnesotans over a number of years.

This report is a work in progress for Minnesotans to consider and build upon as they join together to implement a sustainable vision for the future. The Governor and the Environmental Quality Board expect to hear citizen views and the perspectives of team members at the 1994 Congress on Sustainable Development on February 24 and 25. This discussion is the initial call to all Minnesotans to consider a future based on development that is sustainable. Their reaction to this call will be a "reality check" for both the Initiative and the congress participants.

The congress also will advise the Governor and the board about the next steps needed to sustain the Minnesota environment and economy in the long run. The Initiative's working papers and the reactions to them are only the beginning of an extended effort to redefine progress to secure Minnesota's future. Such a change as sustainable development requires nothing less.

VISION FOR A SUSTAINABLE MINNESOTA

The Minnesota Sustainable Development Initiative was created to foster a future in which Minnesotans work together to sustain their communities, their economic security and the natural environment that makes both possible. The Initiative envisions a future where businesses grow and prosper while respecting the natural and human environments that support them.

This vision reflects teamwork and optimism and is based on the efforts of people who believe in Minnesota, appreciate its natural beauty, recognize the opportunities here and are committed to pass on a good quality of life to their children and future generations. The Initiative's vision describes a 50-year destination toward which all Minnesotans hopefully will move. In this future:

- We Minnesotans make commitments and choices to preserve all the options future generations will need to secure the quality of life we now enjoy.

- We see sustainable development as an exciting, fundamental change in the way we define social progress, do business and protect the environment.

- We view the health of our natural environment, the strength of our community and our economic security as interdependent.

- We maintain our quality of life through sustainable use of energy and natural resources, recognizing that population growth, resource consumption and lifestyle choices determine the options we leave for future generations.

- Our communities are places where all citizens enjoy rich opportunities in education, employment, involvement in community and appreciation of the environment.

- Our economy is healthy, diversified, globally competitive and in harmony with Minnesota's ecosystems; it provides all citizens ample opportunity for a fulfilling life.

- Our natural environment is biologically and ecologically diverse and able to provide the resource benefits, products and services needed for the indefinite future.

- We continually work to change our political and economic systems so that the actions of individuals, corporations and governments lead naturally to a better world.

We embrace this vision because we believe in our state and in the future of our children. And in so doing, we help move our state and our country toward a new kind of development — development that is sustainable.

PRINCIPLES

Principles are the enduring values that guide decision-making. The 10 principles of the Minnesota Sustainable Development Initiative show the way to move toward the Initiative's vision of where Minnesota should be in 50 years. These principles are:

Interdependence: *Integrate long-term economic, environmental and social considerations into all decisions to reflect their inherent interdependence.* The economy depends on a healthy ecosystem, and a healthy ecosystem depends on the long-term perspective made possible by economic security. Both affect and are affected by social conditions and actions. Long-term economic prosperity and social well-being depend on a healthy resource base. Minnesotans cannot maintain healthy ecosystems and livable communities without economic stability. These connections prescribe the need for holistic management approaches.

Collaboration: *Invite cooperation and unify efforts between governments, business, nonprofit organizations, citizens and others to address interdependence.* Interdependence makes cooperation a prerequisite to developing sustainable policies. Governments, businesses, nonprofit organizations, educators, religious leaders and individual citizens must forge new alliances. This principle also describes Minnesota's relationship to other states and nations. It implies that sustaining Minnesota depends on investing in the prosperity of others.

Stewardship: *Balance resource use and conservation between present and future generations so that future generations are not compromised.* Minnesotans need to manage their economy and natural environment in ways that allow all citizens to enjoy a high quality of life today while ensuring that future generations can meet their own needs. This principle recognizes that Minnesotans are accountable to future generations and to one another for the decisions they make. While it is difficult to anticipate exactly what future generations will need, Minnesota's natural resources must be used in ways that leave as many options as possible open to those who will follow. Stewardship means that Minnesotans will not exceed the environment's ability to regenerate natural resources or absorb waste.

Diversity: *Maintain diverse biological, economic and social systems.* All forms of life help sustain and stabilize natural systems. Reducing diversity in any part of the system threatens the stability of the whole. This is true as well for economic and social systems. Cultural diversity and a wide range of economic opportunities increase Minnesota's flexibility and pool of strengths, thus promoting sustainability.

Foresight: *Avoid irreversible decisions and outcomes.* Minnesotans will need to chart a sustainable course in the face of many scientific, social and economic uncertainties. Erring on the side of caution is necessary. Not only must Minnesotans seek to avoid irreversible decisions, they also must avoid creating new problems when solving old ones. Minnesotans must learn to work with uncertainty and flexibility.

Prevention: *Anticipate and prevent social, economic and environmental problems rather than attempt to solve them after the fact.* Avoiding potentially adverse outcomes, even those that may be reversible, is important because remedying problems is usually more difficult and expensive than preventing them.

Efficiency: *Make the most of present and future benefits to Minnesotans with a minimum of expense, energy, natural resources and waste.* Efficiency calls for achieving the greatest public good for the lowest cost, using

as little energy and other natural resources as is necessary, while creating a minimum of waste. It also suggests that those who benefit from an activity pay its full social, economic and environmental costs. Making choices that are the most efficient requires that individuals and organizations understand the long-term costs and benefits of their decisions.

Equity: *Ensure all Minnesotans equal opportunities to contribute to the economy, enjoy the environment and participate in decisions that affect them.* A sustainable, and thus stable, society must ensure all its citizens the right to shape their future and strive to reach their full potential. This principle also encompasses the concepts of social justice and various individual, public and private rights.

Creativity: *Seek creative approaches to problems.* Creativity will be a key ingredient as Minnesotans seek ways to make development more sustainable, as they ask each other to consume less and as they change the very way they view social progress, government, business success and personal growth.

Responsibility: *Ask all Minnesotans to take responsibility for sustaining the state's communities, economy and environment.* Citizens must educate themselves about the economic, environmental and social systems that shape their lives, use this knowledge to make informed choices and take responsibility for the consequences of their decisions. Responsibility also includes the concepts of accountability, balancing public trust with private rights and accepting that with all rights comes the duty to act in accord with those rights.

The Minnesota Sustainable Development Initiative urges that Minnesotans work toward sustainable development based on these principles and that these values guide legislators, government administrators, business people and citizens in judging the sustainability of their actions.

ISSUES AND STRATEGIES

Minnesotans need to overcome problems in six central areas if they are to move toward the vision of the Minnesota Sustainable Development Initiative. The areas are:

- Education
- Incentives and disincentives
- Accounting of costs and benefits
- Knowledge and information management
- Land use
- Roles of government, the private sector and citizens

The fundamental changes in business and environmental management sought by the Initiative demand a variety of efforts and responses by Minnesotans. To begin, Minnesotans need more information about how their actions affect the long-term viability of their communities, economy and environment. They need to identify and remove disincentives for sustainable development, while augmenting incentives. Many disincentives evolve because the marketplace does not fully account for the effects of pollution and natural resource depletion. Full-cost accounting provides a tool to do this, but its use is hindered by knowledge gaps. Better use of existing information management technology also is necessary. More coordinated, integrated and wise management of land and community resources is another key to sustainable development. Citizens, the private sector and government collectively have the ability to address these issues and move Minnesota and the nation toward a more sustainable society.

> "We will have an ethic of stewardship, not only over the land but also toward natural systems and natural resources. This ethic will result in rich soil, clean water, clear air, diverse biological systems and productive wildlife habitat."
> – Agriculture Team
>
> "An informed citizenry will play a primary role in successfully pursuing sustainable development principles in Minnesota. The educational programs must begin at the kindergarten level and continue through adulthood, emphasizing how daily decisions affect sustainable development."
> – Minerals Team
>
> "Many business executives are not well informed about the concepts of sustainable manufacturing, nor do they understand the necessity or benefits of such practices. This knowledge is essential in adopting policies and practices that will achieve sustainable manufacturing."
> – Manufacturing Team

These issues and the 20 strategies that address them comprise the strategic directions called for by the Initiative. They are extensive because much needs to be done and broad because different approaches are possible. They were identified through the work of the Initiative teams. Related issues and strategies are presented in the team reports.

Education

Minnesotans need more information about how their actions affect the long-term viability of their communities, the economy and the environment. Citizens lack understanding about the issues of sustainable development, from the interdependence of social, economic and environmental problems to the collective, long-term effects of their daily actions. They also tend to think more of today's needs and less about those of future generations. Most of society is geared toward the short-term, yet sustainable development requires a longer-term perspective. Because sustainable development is not yet established as a social value, a fundamental educational effort is needed to begin changing basic understanding and behaviors.

- **Continue the forum represented by the Initiative teams.** Perhaps the most promising aspect of the Minnesota Sustainable Development Initiative is that it has brought together business and environmental interests outside of real crisis to discuss issues of mutual

concern. Some of its greatest successes may be the ties forged among its participants. The new appreciation for the "other side" already has changed the way some team members do business and protect the environment. The forum of these teams is a significant educational experience for participants as well as those with whom they interact, including the Environmental Quality Board. It needs to be continued in some fashion to continue the flow of advice and ideas among Initiative participants, interested citizens and the EQB.

■ **Encourage others to develop initiatives.** Although the Initiative is the state's effort to identify ways Minnesota can move toward a sustainable future, it is not strictly a state government responsibility. All Minnesotans need to become informed about sustainable development if the changes it requires are to occur. Citizens from across the state and all walks of life need opportunities to discuss sustainable development and build consensus about their future. Communities, businesses, private organizations and others should be encouraged to develop their own initiatives for sustainable development. Demonstration projects and governor's awards might be good ways to encourage and help others learn from exemplary efforts in sustainable development.

■ **Build on efforts outlined in *A Greenprint for Minnesota.*** The behavioral changes needed to encourage individual, corporate and government responsibility require a new focus on education. *A Greenprint for Minnesota*, the state plan for environmental education, calls for the EQB to promote a "vision of sustainable development and problem prevention." Minnesotans need to view good business and sound environmental protection as positive and compatible. Widespread education about sustainable development is not only a prerequisite for garnering public support for the idea, but also may provide a competitive advantage for Minnesota's economy. A citizenry that is both environmentally and economically literate could be a decisive factor in maintaining and improving the state's economic position. A public that understands the needs of urban and rural communities, farmers and small businesses will better understand the need to work together in protecting the environment on which these depend.

> "... government subsidies, incentives and other forms of intervention ... distort the pricing of goods and services ...." – Manufacturing Team
>
> "Sustainability implies maximizing efficiency. One significant means of achieving efficiency is through recycling: incorporating recycling potential into product design, incorporating recycling techniques into operational processes and using recycled products in industrial development. Incentives for recycling must be developed; likewise, disincentives must be removed." – Minerals Team
>
> "Existing government programs to encourage investment, like loans or grant programs, do not reward sustainable investments and generally do not consider environmental impacts." – Manufacturing Team

Incentives and Disincentives

The number and effect of existing incentives and disincentives for sustainable development are unknown. They derive from government and business policies and citizen preferences. Government policies and programs shape behaviors through loans, grants, subsidies, tax policy and regulations. Cultural and institutional factors, convenience and habit all influence government, business and consumer behaviors. Little recognition or reward exists for sustainable behaviors. Since business and government practices often are a response to consumer demand, Minnesotans need to understand the influence of these incentives and work to change those that impede movement toward a sustainable society.

■ **Assess Minnesota incentives and disincentives.** The state should review public laws and administrative policies to identify

opportunities for correcting those actions that encourage unsustainable public policies, business practices and individual behavior. An alliance of business, government and consumer groups should design audit frameworks for assessing government and business practices that incorporate the Initiative principles.

■ **Redirect state investments.** State loans, grants and subsidies should be redirected to foster cooperative ventures that promote and develop sustainable products and practices. The state also should consider strategic sharing in the risk of private-sector investments in sustainable development. State involvement should be considered when its demonstration payoff or experimental nature is significant.

We attempted to have this report printed on recycled paper made from 100 percent post-consumer waste paper, but its cost was so much higher than the traditional paper stock that we could not justify using it. As a compromise, we used 100 percent post-consumer paper for the report's cover, spine and chapter dividers. In a sustainable economy, the high-recycled content paper would have been *cheaper* than the paper made with lower-recycled content or with virgin resources. – Environmental Quality Board staff

"The team struggled with the concept of full cost accounting and strongly suggests that further understanding of this emerging economic science is a key component of successfully implementing a sustainable development vision for Minnesota." – Minerals Team

Accounting of Costs and Benefits

Incomplete accounting of environmental costs and benefits leads to uninformed and thus inefficient decisions by the public and private sectors, including consumers. Because public and private decisions often do not fully account for the effects of pollution and natural resource depletion, people make choices that do not reflect the real cost to society. Somebody pays, but they may live downwind or downstream and never be able to reclaim their losses. Often, all Minnesotans pay in the form of a degraded environment, health problems or increased cost of government regulation.

Full-cost accounting and accurate pricing of goods and services will require long and painstaking efforts. Even were it possible today to assign all the true costs of production, a single state acting alone to include these costs in product pricing would, in the short run at least, place its companies at a competitive disadvantage in the marketplace. In the long run, however, a state may actually enhance its competitive advantage by encouraging companies to improve their efficiency. Setting the standard for producing goods and services with the least environmental impact, lowest regulatory expense and little or no waste could help keep Minnesota's economy strong in a global market increasingly constrained by environmental concerns. In addition, establishing a product's full cost would allow companies to deal with external costs in the market rather than through taxes and government regulation.

■ **Pursue opportunities for full-cost accounting.** Minnesota should identify and pursue opportunities to move the state and nation toward markets and government actions that fully account for the environmental and social costs of decisions. The state and nation should use market forces to protect the environment, promote sustainable energy systems and conserve natural resources. Settlement patterns should reflect true costs. Manufacturing cost accounting should include internal and external costs at all steps of a product's life cycle.

While these strategies are long-term, the concept is not new. Increasingly, the trend has been toward greater internalization of environmental costs. One example is the Minnesota law that requires upfront consideration of the costs of cleaning up and closing landfills as part of the landfill permit approval process. Important near-term opportunities may be possible, such as helping

businesses establish information systems that account for wastes and other product life cycle impacts, experimenting with markets to complement or replace command-and-control approaches or beginning to substitute taxes on waste and pollution for those on income or property.

■ **Promote using and sharing full-cost information.** National and state accounting of economic indicators does not consider effects on natural resources. Such statistics as the gross national or state product do not fully convey a nation's or state's well-being. For example, the Exxon Valdese oil spill registered as a significant boost in the GNP, despite its great damage to natural resources. The issue is important because it affects how people view progress. Does the cost of cleaning up such a spill really increase wealth? Minnesota should track national and international efforts to formulate accounting systems that provide a truer picture of well-being and consider its own approaches to begin to establish a full-cost state accounting system.

Other information-sharing techniques also warrant attention. Consumers must be willing to make wise choices in what they buy and expect businesses to routinely produce environmentally friendly products. A standard system of product labeling would help consumers make informed decisions about the costs of their product choices.

"The marketplace – where most goods and services are priced – is not effective, by itself, in pricing environmental and natural resources that are owned in common by all people." – Recreation Team

"By reducing taxes on activities that should be encouraged, like capital investment, and by using the tax system to provide incentives for reducing resource use and pollution, the tax system could help Minnesota business improve efficiency and increase innovation." – Manufacturing Team

"... consumers are not adequately educated about the consequences of their purchasing choices." – Manufacturing Team

"Whether paid directly as cleanup costs or indirectly as diminished health, productivity or opportunity, environmental degradation reduces our existing wealth and the potential for ourselves and our descendants to create new wealth." – Energy Team

Knowledge and Information Management

Existing data and knowledge are inadequate to determine the extent to which Minnesota is on a sustainable course. People do not fully comprehend Minnesota's social, economic and environmental systems or their linkages and thus often act without an understanding of consequences.

■ **Inventory the resource base.** Knowledge of the quality, diversity and quantity of the state's energy and natural resources is basic to understanding how Minnesotans must care for and allocate them to meet present and future needs. The state should complete an inventory of its resource base, building on such efforts as the county biological survey, county soil survey and national wetlands inventory. This state inventory would identify ecologically critical areas, resources for renewable energy development, cultural and recreation resources, mineral deposits and other features.

■ **Chart environmental quality trends.** Minnesota needs to routinely track trends in environmental quality to judge progress toward sustainable development. The state should establish a system of environmental indicators based on monitoring specific biological resources and ecological systems. Biological monitoring could be linked to improved routine collection of chemical and physical data, and biological, air, land and water data bases could be integrated in a readily accessible network that builds on existing information systems.

Although a great deal has been learned in the last 20 years about how ecosystems function and respond to human-caused disturbances or pollution, scientists need to refine this understanding to judge the effects of contaminants and the wisdom of specific natural resource uses.

■ **Value natural resources.** To the extent that Minnesotans can reasonably assess charges for the depletion of natural resources or harm to the environment, they will encourage smarter choices both by consumers and businesses. While Minnesotans likely will never be able or want to assign dollar values to such ecosystem features as wilderness or biodiversity, a clearer understanding of them will enable citizens to make market forces work for environmental protection.

Without comprehensive monitoring, it [cannot be] known whether efforts to achieve sustainable outdoor recreation are successful or unsuccessful. – Recreation Team

"The real value of natural and environmental resources is not reflected in current pricing methods. As a result, these resources tend to be overused and degraded." – Recreation Team

"... existing clean technologies are underutilized or need further development because business has concerns or lacks information about the cost and performance of these products. – Manufacturing Team

"Sprawl jeopardizes the natural environment and agricultural land and creates inefficient settlement patterns." – Settlement Team

■ **Foster technologies that support sustainable development.** Minnesota should encourage research on sustainable development technologies in agriculture, energy, manufacturing, transportation and other areas. It should redirect government dollars for research and development to this end and provide consistent and long-term support for such goals as invigorating rural and urban communities and developing renewable energy and value-added processes that are efficient, available and affordable. Opportunities to share new technology also need to be pursued, which may require a change in federal antitrust laws to allow greater sharing of information among companies in related industries.

■ **Make optimal use of information technology.** Decision-makers, from farmers and county commissioners to CEOs, need to make better use of existing information management technology. They also need better access to integrated information on related social, economic and environmental issues. Minnesota's Land Management Information Center, for example, has made significant progress over the last decade in developing integrated land and water information systems. This information should be integrated with social and economic data and a capability created to quickly package it to inform those making decisions that affect all three sectors.

Land and Natural Resource Use

Minnesota lacks a coordinated approach to the use of its land and related natural resources. Land and natural resource availability and quality are affected by a variety of policies and decisions on agriculture, energy, economic development, housing, environmental protection, resource management and transportation. These often are made in isolation at various levels of government in a way that fails to recognize their interconnections.

■ **Foster sustainable communities.** Urban sprawl has occurred relatively unimpeded by traditional zoning and land use as small communities in greater Minnesota lose people and jobs. Minnesotans need to create a new framework that ties together all the factors influencing land use and community development, from reducing sprawl and adverse environmental effects to providing affordable housing, efficient transportation and ample employment opportunities. The

framework should foster integrated planning and investment by federal, state, regional and local governments and by private developers. Shared and strategic management of land, community resources and infrastructure investment would be important results.

■ **Promote manufacturing that sustains communities.** Much of rural Minnesota faces continuing erosion of its economic vitality, communities and environment. A range of government policies and investment strategies should be considered to encourage sustainable agricultural, energy, forest and minerals-related value-added processing (i.e., processing that enhances the value of materials when creating a product). Development of value-added industry presents important opportunities to enhance the vitality of rural Minnesota.

■ **Integrate resource management.** Several federal and state resource investment programs strive for the wise use and management of Minnesota's land and water resources, including the Conservation Reserve, Wetlands Reserve, Re-invest in Minnesota, Clean Water Partnership and State Cost-Share programs. Still, water and land resources continue to be degraded and habitat destroyed by polluted runoff to surface waters or infiltration to ground water. Minnesota needs a watershed- and ecosystem-based framework within which these programs can be integrated. The framework should build on existing energy and natural resource planning efforts.

■ **Identify and understand the effects of policies affecting land and natural resource use.** Minnesotans do not adequately understand which government activities promote sustainable use of land and other natural resources and which discourage it. Constitutional requirements, regulations, tax policies, investment and procurement practices and other factors may play a role. The disincentives for sustainable development created by these actions and policies, whether federal, state or local, must be identified, understood and eliminated.

"Our management will reflect that the most effective way to sustain the multitude of forest products and services is to maintain the health of the ecosystems that produce them." – Forestry Team

"Although Minnesota lacks fossil fuel reserves, it can gain economic benefits by adding value to its own renewable resources: wind, biomass, solar and water." – Energy Team

"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 inter-dependent." – Agriculture Team

"Many hidden subsidies keep the cost of living down, obscuring the true price of many items. This hinders city redevelopment, making undeveloped land much cheaper to develop." – Settlement Team

Roles of Government, the Private Sector and Citizens

New roles and relationships must evolve among government, business, nonprofit organizations, citizen interests and others. Although governments profoundly shape behavior and policy, they alone cannot create sustainable communities. Minnesotans must determine what roles government, the private sector and individuals should play in promoting economic prosperity, protecting natural resources and enhancing social well-being.

■ **Make Minnesota a model.** The state can serve as a model for sustainable development by applying the Initiative principles in its own operations. Opportunities range from more sustainable management of state land and integration of state environmental and economic goals to using the state's purchasing power to encourage sustainable commercial practices.

■ **Create strategic alliances.** Alliances among government, business, environmental and community interests are a prerequisite to carrying out the Initiative's strategies. Strategic alliances would be instrumental in planning to sustain communities, change agricultural systems, invest cooperatively in renewable energy technologies and create full-cost accounting audits. The drive for these alliances must come from all four interests, but government is in a good position to foster them.

■ **Change institutions to support sustainable development.** Changes in how Minnesotans approach their environment and economy ultimately must be reflected in institutional change. Introducing the concept of sustainable development into the missions of Minnesota's environmental and economic development agencies is an important step. Structural change must be reflected in specific procedures and requirements to ensure that government is responsive to new technologies, markets and processes and that obsolete, unsustainable activities are abandoned.

"To nurture a prosperous, sustainable manufacturing economy requires reductions of tax and regulatory burdens that do not achieve environmental goals or improve manufacturers' competitiveness."
– Manufacturing Team

"Economic and environmental issues are addressed singly at all levels of government, including both the legislative and executive branches, resulting in policies that are not consistent with achieving sustainable development."
– Manufacturing Team

"Sustainable development needs to be institutionalized as a cornerstone from which future state economic development and environmental policies are developed and judged."
– Forestry Team

■ **Extend strategic planning for sustainable development within governments and the private sector.** The state must be strategic in identifying the environmental and economic actions it takes. It should integrate these actions within a strategic plan for sustainable development. The EQB, its member agencies and the Department of Trade and Economic Development should continue their commitment to developing a coordinated trategic plan for the environment and the economy based upon the principles and strategies of the Minnesota Sustainable Development Initiative. Communities and the private sector should develop their own strategic plans for sustainable development.

The changes in business and environmental management suggested by the Initiative are extensive and fundamental. They will demand a variety of efforts and responses by Minnesotans over a number of years, beginning with the 1994 Congress on Sustainable Development. The congress will provide the first extensive opportunity for citizens to discuss the Initiative's work. It also will advise the Governor and the board on the next steps that should be taken to sustain the Minnesota environment and economy for the long run. Using the feedback from the congress and the teams' recommendations as a point of departure, the Environmental Quality Board will chart the Initiative's next phase.

THE INITIATIVE TEAMS

The Minnesota Sustainable Development Initiative team members were appointed by the Governor and the Environmental Quality Board at the beginning of 1993. The team members include:

Agriculture

C. Merle Anderson, LCMR Citizens Advisory Committee
Greg Anderson, Polk County Soil and Water Conservation District
George Boody, Land Stewardship Project
Tom Cochrane, Minnesota Agri Growth Council
D'Wayne DeZiel, team co-chair, Minnesota Association of Soil and Water Conservation Districts
Mary Hanks, Department of Agriculture
Greta Hesse-Gauthier, The Nature Conservancy
Vern Ingvalson, Minnesota Farm Bureau Federation
Kristin Juliar, Region 9 Development Commission
Ralph Lentz, Minnesota Association for Sustainable Agriculture
Wally Nelson, retired director, University of Minnesota Lamberton Experimental Station
Dave Nomsen, Pheasants Forever
Robert Rupp, team co-chair and former editor, The Farmer Magazine
Kent Thiesse, Blue Earth County Extension Office
Donald Wyse, Minnesota Institute for Sustainable Agriculture

Energy

Elliott Bayly, World Power Technologies
Dick Braun, University of Minnesota Center for Transportation Studies
Charlotte Brooker, Izaak Walton League
Pat Davies, former EQB member
Roger Head, Indian Affairs Council
Gary Johnson, Northern States Power Company
Larry Johnson, Minnesota Ethanol Producers
Christine Kneeland, LCMR Citizens Advisory Committee
Mitch Pearlstein, Center for the American Experiment
Henry Savelkoul, team co-chair, attorney
Russ Susag, 3M
Linda Thrane, team co-chair, Cargill, Inc.
Jim Ulland, initial team co-chair, Commissioner of Commerce
Lillian Warren-Lazenberry, former Public Utilities Commissioner

"Our legacy to future generations will be threefold: a healthy farming economy, vigorous rural communities and a healthy natural environment." – Agriculture Team

"... [E]nergy systems shall rely on diverse energy sources that are accessible, affordable, renewable, reliable and that minimize or mitigate environmental degradation." – Energy Team

"This state will be characterized as one that optimizes efficient use of its forest resources." – Forestry Team

"Minnesota manufacturers will lead the nation in designing, producing and distributing quality products in the safest, most ecologically and economically efficient manner possible." – Manufacturing Team

Forestry

Pat Alberg, Hubbard County Commission
Judy Bellairs, Sierra Club
Rod Bergstrom, Minnesota Timber Producers Association
Eric Bloomquist, Rasmussen Millwork Inc./Colonial Craft
Steve Eubanks, Chippewa National Forest
Marv Finendale, United Paperworks International
Nancy Gibson, LCMR Citizens Advisory Committee
Howard Hedstrom, Hedstrom Lumber
Paul Jensen, Boise Cascade Corporation
Richard Knoll, Minnesota Forestry Association
Norma Martin, Minnesota Deer Hunters Association
Garrett Ous, Minnesota Association of County Land Commissioners

Charles Pottenger, team co-chair, Potlach Corporation
Dick Skok, team co-chair, former Dean, University of Minnesota College of Natural Resources
Gerry White, Leech Lake Tribal Council
Jack LaVoy, Lake Superior Paper, Inc.

Manufacturing

Robert Bringer, team co-chair, 3M
Anita Duckor, Northern States Power Company
Walter Eisner, United Recycling
Barbara Hughes, American Lung Association
Diane Jensen, Clean Water Alliance
Martin Kellogg, team co-chair, UFE Inc.
Jerry Larson, Andersen Corporation
Alfred Marcus, University of Minnesota Strategic Management Research Center
Mike McMonagle, Superior Plating
Jerry Ostroski, Synertec, Inc.
Robert Reid, DPRA, Inc.
Anita Ryan, St. Paul Brass and Aluminum
Kris Sigford, Center for Environmental Advocacy
Mike Tuohy, Tuohy Furniture Company
Frederick Weyerhaeuser, Clearwater Management Company

"Minnesota will continuously improve its mineral industry to support the needs of future generations." – Minerals Team

Minnesotans "will provide ... a diverse array of quality opportunities so present and future generations can enjoy the benefits of outdoor recreation." – Recreation Team

"Rural areas, small cities and urban neighborhoods throughout the state *will be* desirable and economically viable places for people to live and work." – Settlement Team

"This report should be the start of a statewide process by which complex, oftentimes competing, issues can be discussed in the context of a broader vision." – Minerals Team

Minerals

Brian Bensen, Sherburne County
Bill Brice, Minnesota Department of Natural Resources
David Deleo, Cypress Northshore Mining
Rondi Erickson, Bay West
Nelson French, team co-chair, The Nature Conservancy
John Green, University of Minnesota Duluth Department of Geology
G.B. Morey, Minnesota Geological Survey, University of Minnesota Institute of Technology
Dennis Hendricks, U.S. Steel Corporation
John Lamb, Minnesota Project
Steve Raukar, St. Louis County Commission
Mike Robertson, Larkin, Hoffman, Daly, Lindgren
Bob Rootes, United Steelworkers of America
William Ulland, team co-chair, American Shield Company
Lewis Wade, U.S. Bureau of Mines
Jonathan Wilmshurst, Shiely Company

Recreation

Dennis Asmussen, Department of Natural Resources
Dutch Cragun, Cragun Resort
Bob DeVries, LCMR Citizens Advisory Committee
Dave Ewart, State Council of Trout Unlimited
Janet Green, National Audubon Society
Bill Hansen, Sawbill Canoe Outfitters
Cindy Hayden, team co-chair, Lake Superior Magazine
Jennifer Hunt, Voyageurs Region National Park Association
Greg Lais, Wilderness Inquiry, Inc.
Dave Lime, team co-chair, University of Minnesota Department of Forest Resources
Don O'Brien, Crow Wing County Land Use Task Force
Barb Soderberg, U.S. Forest Service, Boundary Waters Canoe Area
Eugene Strommen, Lake Minnetonka Conservation District
Susan Wilson, The Nature Conservancy

Settlement

Mary Anderson, former chair, Metropolitan Council

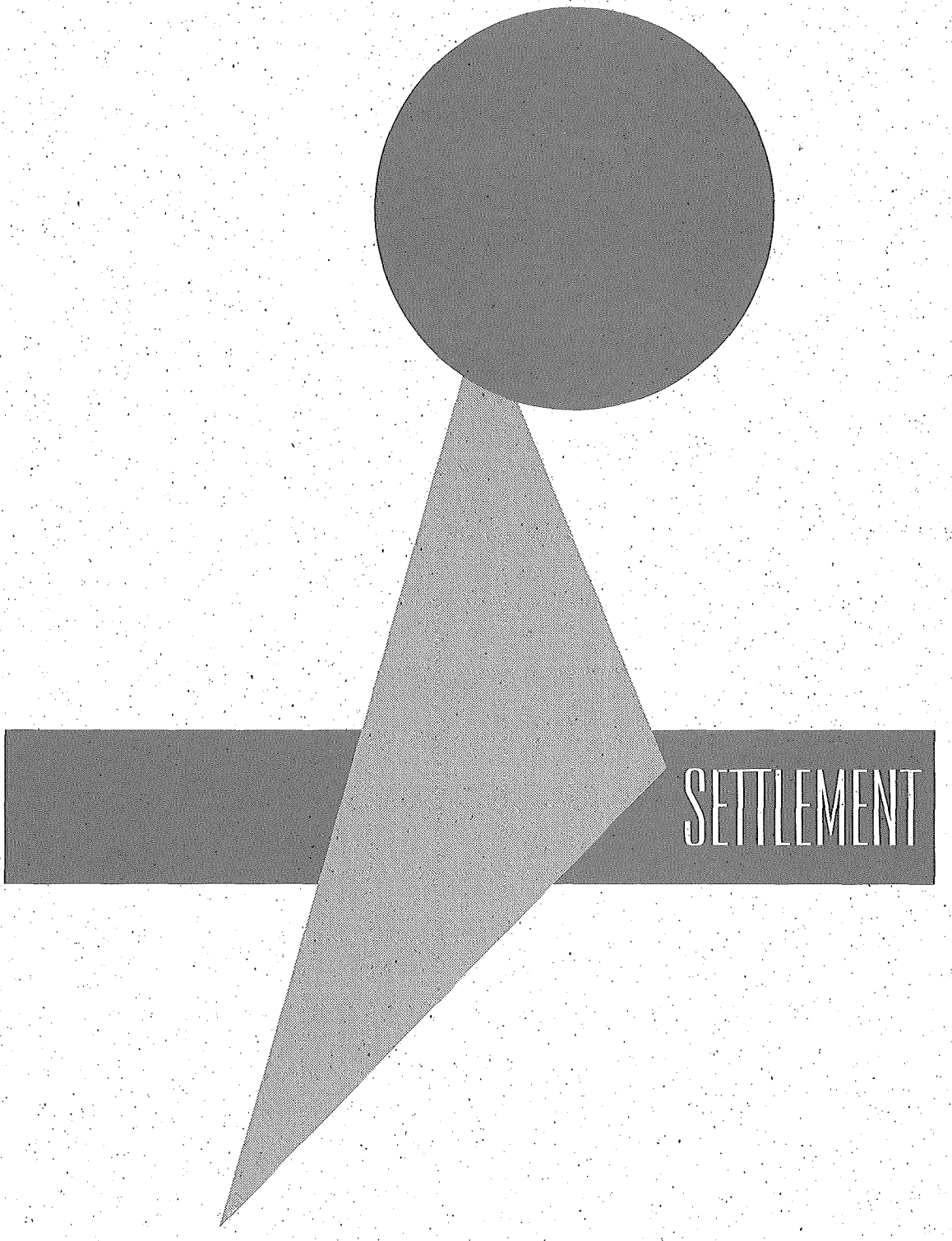
Joan Archer, Builders Association of Minnesota
Patricia Baker, LCMR Citizens Advisory Committee
Franklin Denn, Minnesota Association of Townships
John Feda, former commissioner of Education
David Hartley, The Hartley Company
Gunnar Isberg, Metropolitan Waste Control Commission
Barbara Lukermann, team co-chair, Hubert H. Humphrey Institute, University of Minnesota
Cecilia Martinez, Macalester College
Thomas Moore, St. Cloud Chamber of Commerce
Dave Neiman, former zoning administrator, Crow Wing County
George Orning, former vice president of the International Coalition for Land and Water Stewardship
Richard Robinson, Minnesota Chippewa Tribe
Beth Waterhouse, The Minnesota Project
Molly Woehrlin, team co-chair, former Rice County Commissioner

The team reports are presented in the following order:

Where we live: Settlement

Where and how we work: Manufacturing, Agriculture, Energy, Forestry, Minerals

Where we enjoy the outdoors: Recreation


SETTLEMENT

REPORT OF

THE SETTLEMENT TEAM

Minnesota Sustainable Development Initiative

January 1994

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SUMMARY

The Settlement Team examined patterns of where people live and work in Minnesota. It found that current settlement patterns are not designed to sustain the natural environment, provide for efficient and economical delivery of services nor address social needs of an increasingly diverse population.

To obtain sustainable settlement patterns that meet today's needs without jeopardizing the well being of future generations, Minnesota needs to change its manner of managing land. Often development occurs in unincorporated areas throughout the state. Much of the growth is taking place on land that is environmentally sensitive and on productive agricultural land. An increase in land used per dwelling adds to the cost of providing services. In areas with declining populations, public investment in infrastructure is made without sufficient evaluation of long-term need or accompanying economic development strategies to ensure efficient investment. Poorly managed development threatens natural resources and increases costs to taxpayers.

The state has a fragmented planning and land-use management system. Multiple entities make critical decisions affecting land use without regard for their broader consequences. Many issues are regional, yet there is no consistent management approach to deal with relevant environmental, infrastructure or social needs that cross local political boundaries.

Many factors, including lifestyle preferences, transportation technologies, job location, and housing costs shape where people live and work. To make the present patterns more sustainable the Team recognized and addressed these factors. To reach the future envisioned, the Team developed guiding principles, goals and strategies to reach the goals.

The goals and strategies center on fostering sustainable communities throughout the state that provide a sense of community, protect the environment and have efficient public investment. To create the conditions to make that possible it recommends:

- Creating a structure for cooperative, multi-level planning and decision-making;
- Employing state development policies that foster sustainable goals;
- Providing usable information that brings together environmental, economic and social components;
- Applying market forces and tax policies to achieve sustainable development decisions; and
- Increasing educational efforts to increase citizen understanding.

Glossary

Amenity-based development: Residential and business development in areas valued for scenic, natural or recreational characteristics, such as bluffs, lakes or forest lands.

Aquifer: An underground bed or layer of earth, gravel or porous stone that contains water.

Biodiversity: The variety and abundance of life and its processes.

Commutershed: An area from which the majority of workers travel to a shared work destination.

Ecoregion: An area with similar soils, land surface, natural vegetation and land use.

Karst or karst terrain: Topography of fractured or channeled limestone, dolomite or gypsum, formed by the dissolution of these rocks by rain and underground water. Karst topography is characterized by closed depressions, sinkholes and underground drainage.

Non-point source pollution: Land management or land-use activities that contribute to pollution as a result of runoff, seepage or percolation: pollution that cannot be traced to a single source, such as one factory or treatment plant.

On-site sewage system: Individual sewage or waste-water treatment systems that rely on natural decomposition of wastes at the site where they originate. Most consist of underground septic storage tank where waste is stored and separated into solids and liquids, and a drain field where the liquids are distributed into the soil for filtering and natural decomposition.

Permeable soils: Soil types that allow rapid infiltration and movement of water through the soil, such as sand and mixtures of sand and gravel.

Urban forest: Public and privately owned forested areas in the urban environment including wooded preserves, city and county parks and boulevard and yard plantings.

Watershed: The surrounding land area that drains into a lake, river or river system.

Wetlands: Low-lying lands that frequently have standing water on them, such as swamps, marshes and meadows.

INTRODUCTION

Team Charge

The Settlement Team was one of seven Teams established by Governor Arne Carlson and the Environmental Quality Board as part of the Minnesota Sustainable Development Initiative. Its charge is to examine:

> *"How to shape the patterns of where people live and work in order to sustain Minnesota's environment and economy."*

The Team consists of leaders from across the state representing a diverse array of interests that include local government, business, industry, academia and non-profit organizations.

Team Members:
Barbara Lukermann, Co-Chair, St. Paul
Molly Woehrlin, Co-Chair, Northfield
Mary Anderson, Golden Valley
Joan Archer, Blaine
Patricia Baker, Minneapolis
Franklin Denn, Monticello
John Feda, Marshall
David Hartley, Duluth
Gunnar Isberg, Eagan
Cecilia Martinez, Inver Grove Heights
Thomas Moore, St. Cloud
Dave Neiman, Brainerd
George Orning, Moorhead/New Brighton
Richard Robinson, Cass Lake
Beth Waterhouse, Minnetonka

Team Staff:
Staff Leader: Marilyn Lundberg, EQB
Facilitator: Katherine Barton, Department of Natural Resources

Staff Advisors:
Doug Wise, Department of Agriculture
Art Persons, Department of Health
Jonette Kreideweis, Department of Transportation
Kathleen Wallace, Department of Natural Resources
Bart Bevins, Department of Trade and Economic Development
Vicky Cook, Pollution Control Agency
Anne Hurlburt, Metropolitan Council

Team Process

The Team met 11 times between March and November 1993. It heard from the following presenters:

- Marilyn Lundberg and Jay Fonkert, Minnesota Planning, discussing the Team's background paper *Settlement Patterns and Sustainable Development*;

- Dr. John Borchert, Professor Emeritus University of Minnesota, discussing current trends in settlement patterns and forces underlying these trends;

- Keith Wendt, Department of Natural Resources, discussing effects of settlement patterns on natural resources;

- Mark Larson, Diane Marsh, Martha McMurry and Deb Pile, Minnesota Planning, discussing trends and issues for sustainable development regarding Minnesota's diverse population;

- John Riley, Chair of the Regional Transit Board, discussing transportation issues and their effects on settlement patterns.

- Terry Stone, Executive Director RDC 9 and Mayor of Madelia, discussing settlement issues in south central Minnesota;

- Ron Harnack, Director of Board of Water and Soil Resources, discussing the accomplishments and problems with local water planning;

- Marilyn Lundberg, Minnesota Planning, discussing the League of Women Voters publication *Affordable Housing*;

- Robert Engstrom, Robert Engstrom Company, discussing development issues relating to sustainable development;

- Anne Hurlburt, Metropolitan Council, discussing the strength and weakness of the Metropolitan Council's strategies for guiding growth and development;

- Nan Swift, Minnesota Department of Transportation, discussing Mn/DOT's vision of settlement patterns;

- John Katz and Marilyn Lundberg, Minnesota Planning, discussing the environmental and fiscal costs, findings and conclusions from the EQB's *Growth Management Study*;

- Barbara Lukermann, Molly Woehrlin and Marilyn Lundberg, Settlement Team Co-Chairs and Staff, discussing feedback from their presentation on the Settlement Team's recommendations at the *1993 Minnesota State Planning Conference*;

- Tony Ruppert, Minnesota On-Site Sewage Treatment Contractors Association, discussed the recommendation of the PCA's Unsewered Area Advisory Committee.

Based on information from the presenters, news articles, publications, and discussion, the Team compiled lists of settlement trends and issues and the barriers to sustainable development. It then developed a 50-year vision for sustainable settlement, guiding principles, goals, and strategies to accomplish that vision.

CONTEXT

Past and current trends

When Europeans began streaming into Minnesota in the mid-19th century, they created a very different pattern of settlement than the native population had maintained. Railroads and rivers shaped early settlements. A dense farm population evolved along with extensive development of the state's vast forest and mineral resources.

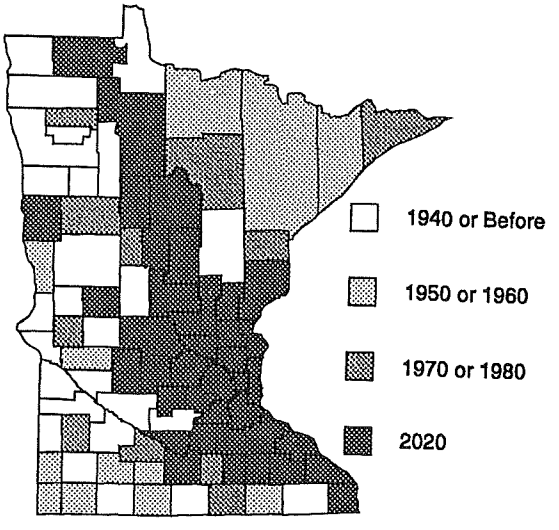
Many rural counties reached their highest population levels in or before 1940. These counties are mostly located in the western part of the state and are heavily agricultural. Presently, growth is occurring in a band from southeastern Minnesota through the Twin Cities to north central Minnesota. Population decline is most pronounced in the productive agricultural areas in western Minnesota.

Changing growth patterns are related to lifestyle preferences, housing markets, declines in the farming population and the boom and bust cycles in the mining industry. Extensive highway networks now provide a vast commuter area that allow a separation of where people live, work and play.

Settlement has concentrated in and around metropolitan centers with significant development occurring outside cities in unincorporated areas. The use of land per dwelling is increasing. For instance, in the Twin Cities area, the per-capita amount of land used to accommodate population growth increased dramatically with the addition of the area's second million residents. The first million people occupied approximately 160 square miles, the second million required more than 3 times that or about 560 square miles.

Looking Ahead

Population projections by the Demographer's Office at Minnesota Planning show a moderate growth for the next 30 years at 15.5 percent. Most of this growth is expected to concentrate in three major metropolitan areas: St. Paul-Minneapolis, St. Cloud, and Rochester. In fact, projections indicate that the majority of Minnesota's counties will have fewer people in 2020 than in 1990--many experiencing at least 40 years of population decline. The number of people over 45 will grow rapidly and the elderly will



Peak Population Years: Historical and Projected
Source: State Demographer

outnumber children in most areas of the state. Racial and household composition of our cities will become more diverse in Greater Minnesota as well as in the Twin Cities area.

Land Use Changes and Biological Communities

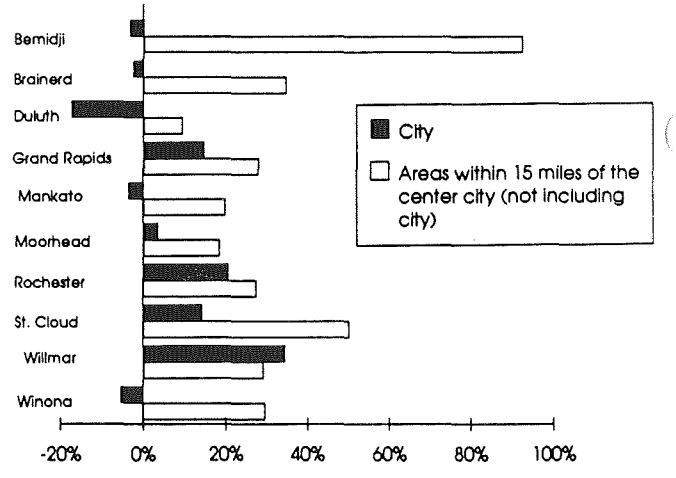
As Minnesota's settlement patterns change, it is important to consider the effects on the biological community. While loss of wetlands, forests and grasslands may be apparent, the loss of the plants and animals that depend on them may be less so. Often, changes to the ecosystem are made incrementally and adverse effects are not considered or even understood. To protect biodiversity, land use changes need to reflect a context of the watershed, landscape and ecoregion.

Development and other major land use changes fragment biological communities. It changes the balance between predators and prey. Research has shown that many species, such as wolves and butterflies are adversely affected by density and urban land uses such as roads. Increasing numbers of dogs and cats wreak havoc on bird and small mammal populations. More information needs to be gathered about this topic before key habitats, unique areas, or species are lost.

Land Use, Urbanization and Density

As communities grow or lose population, they shape Minnesota's environmental quality as well as its economy. Much growth is occurring in places with fragile environments. Scenic areas, valuable resource lands and places sensitive to pollution are prime candidates for new development. Growth brings concurrent needs. Requirements for roads, water and sewer systems, schools and stores are more or less efficiently met depending upon where people locate. For example, 1,000 people locating in St. Paul will find a variety of physical and social services already in place. Whereas, 1,000 people in scattered five acre lots may oblige new investment of public or private funds to support their desires.

Land use changes occur continually throughout Minnesota. Both growth and decline pose their own particular environmental and economic problems. In growing areas, new physical and social systems need to be developed to support the growth.



Population Growth Near Regional Centers 1970-1990
Source: Minnesota Planning

While land use changes are apparent in growing areas, areas of declining population may also have significant land use changes taking place. For example, Lake County had a 20 percent population

decline between 1980 and 1990, due to a downturn in the mining industry. However, while residential population is declining, seasonal or part-time residents are increasing, especially along the North Shore corridor. This leads to a more dispersed population in rural areas and possible difficulty in providing needed services. In addition, many cities are seeing declining population in the urban core combined with rapid growth in the suburban fringe.

Settlement Effects on Agricultural and Forestry Land

Settlement patterns are altering the amount and type of land in agriculture and forestry. In growing areas, there is the problem of conversion of farmland for residential development. Attendant with this are conflicts about the compatibility of residential and agricultural lifestyles. When urban folks move near farms, conflicts may arise over regular farming operations.

There also is a long-term national and state trend toward very small farms and very large farms. In Minnesota between 1974 and 1987, the number of farms (a minimum cash return of $1,000) under ten acres increased by 74 percent, while those between ten and 50 acres increased by 38 percent. These small farms can create the same pressures as large lot rural development.

Surveys show a decrease in agricultural land between 1982 and 1987 of 237,200 acres. Much of the agricultural land lost is not obvious, but a result of subtle losses scattered across the state.

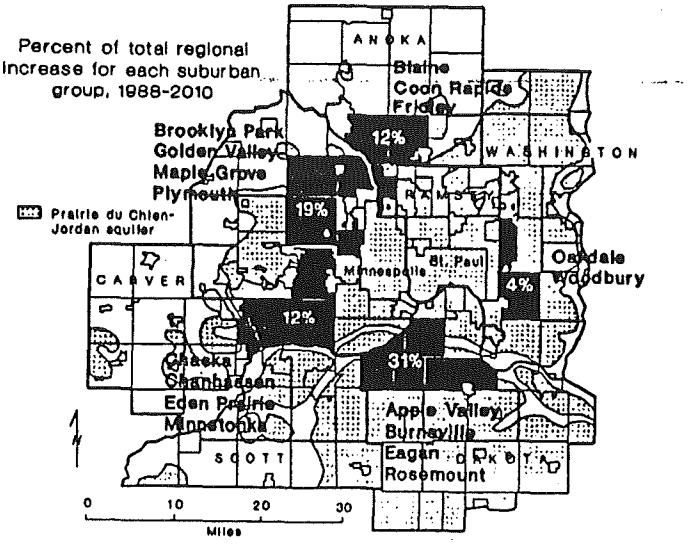
Forest land has shrunk by nearly 50 percent since 1880 because of land clearing for cropland and, more recently, roads and urbanization. Forty-three percent of Minnesota timber land is privately owned, thus easily subject to modification. The contribution this private land makes to the total forest resource base, however, varies considerably across Minnesota. In the central hardwood region for example, which includes the high growth area from southeastern Minnesota up through the St. Cloud area to Otter Tail County, 82 percent of the forest land is in private ownership. Development pressures will affect future forest resources directly through land conversions, as well as indirectly, through the spread of oak wilt related to urbanization.

Water Supply Issues

Wherever people live and work, they need adequate water supplies. Water quantity varies around the state with some communities experiencing sparse supplies. Most communities develop their water supplies independently, with no attempt to share systems with adjacent communities. Yet water does not respect political boundaries: one community's residential, commercial and industrial development can affect another's water quantity and quality.

Surface water sources, such as the Mississippi River, offer a good water supply for nearby communities. Minneapolis and St. Paul rely predominately on the Mississippi River to supply 18 communities with water. These two utilities account for two-thirds of the surface water used for public supplies in Minnesota. However, the Mississippi River poses problems during drought. In 1988, controversy erupted between northern Minnesota and the Twin Cities over allocation of the Mississippi River,

illustrating conflicts in use. In addition, the Mississippi is susceptible to pollution and spills, which also may threaten water supplies.



Predicted Municipal Water Demand
Source: Metropolitan Council

Since the early 1900s, ground water is increasingly used for municipal supplies, agriculture and industry. Most public systems in the state rely on ground water. Of 708 municipal appropriation permits in 1990, 675 were for ground-water sources compared with 33 permits for surface water. Much of the growth in use is in areas that are very sensitive to ground water pollution.

Two million people are served by public wells from about 11,000 public water supply systems (17,000 wells). About one million people are served by private wells, with between 7,000 and 12,000 new wells constructed each year.

The Twin Cities provide a good example of the relationship between water supply and growth. Three areas expected to have significant growth rely solely on ground water as their source of supply. However, two of the three areas are not on the Prairie du Chien-Jordan aquifer--the most productive aquifer in the region--potentially posing water supply problems for these areas in the future. If this reliance on ground water continues, by the year 2010 more than 200 new large-capacity wells will be needed for growth in the Metropolitan area alone.

Many new developments opt for individual wells to supply their needs, adding substantially to the number of conduits that could bring pollution to an aquifer. For example, because of city/town conflicts, one subdivision proposed to develop over 100 individual wells rather than connect to an available community water supply.

Water treatment and wellhead protection requirements are changing due to tightening standards. Individuals, municipalities and businesses will need to examine how water supply, quality and land use affect where people live and work.

Water Quality Issues--Surface Water

Roads, shopping centers and housing units affect lakes, streams and wetlands by measures such as filling, sedimentation, runoff and ground water discharge. Point discharges from municipal and industrial facilities are also key factors in water quality.

Minnesota has made major strides in addressing pollution problems from municipal and industrial facility discharges.

This is shown by water quality improvements in bodies of water receiving municipal and industrial discharges, such as the Mississippi and St. Louis Rivers.

Storm water discharges can exceed water quality standards and can be a source of significant problems. In addition, non-point pollution--the result of the actions of many--also seriously influences water quality in wetlands, lakes and rivers. In 1990, 78 percent of river miles and 89 percent of lake acres that were assessed showed some degree of impairment. This impairment is primarily due to non-point source pollution.

Nine million acres of Minnesota wetlands have been drained, and approximately five million acres remain. Much of this loss was from the expansion of agriculture, but losses due to development of homes and businesses has had significant local impact. Wetlands play a vital role in maintaining surface- and-ground water quality. They slow down stormwater, filter pollutants and recharge ground water.

The Metropolitan Council has evaluated how well lakes meet the intended uses in the region. Based on surveys since 1980, they found more than 90 percent of the lakes evaluated were found to suffer from some level of impairment and more than 25 percent suffer severe impairment. Modelling results suggest lake quality degradation, especially in developing areas.

Water Quality Issues—Ground Water

The use of ground water is increasing and safeguarding its quality is crucial. The ground-water system is complex and information about its quality is sketchy. However, there are large portions of the state where aquifers are easily polluted from activities on the land surface. Unplanned and uncontrolled development poses many hazards to ground-water quality.

Special studies point out some problems with ground water quality. For instance:

- In monitoring conducted by the Pollution Control Agency, 40% of wells sampled in the sand plain region of central Minnesota show signs of nitrate contamination. Nitrate sources include human and animal waste, chemical fertilizers and industrial waste.

- One or more pesticides were found in 39% of the wells sampled in susceptible areas in the state. Concentration of pesticides were generally low, but samples from 16 of the drinking water wells exceeded drinking water limits.

- Surveys showed that 8% of community systems (e.g., municipalities) and 25% of non-community water systems (e.g., schools, offices) monitored had volatile organic chemicals exceeding acceptable drinking water levels. This type of contamination is primarily caused by leaking underground storage tanks and improper disposal of industrial and household wastes. There are about 40,000 large, and an unknown number of smaller, underground storage tanks and many are leaking. Communities with declining populations pose problems from abandoned tanks.

- Abandoned wells offer a direct path for pollutants into ground water. There are an

estimated 800,000 to 1,600,000 abandoned wells in Minnesota. Of these, 300,000 to 370,000 have the potential to degrade municipal water supplies, and the remaining number could endanger ground water quality.

Special Problems from On-Site Septic Systems

How residential units and businesses treat sewage has environmental as well as economic repercussions. For example, housing developments with on-site sewage systems are occurring with no consideration of the consequences to ground water quality or the feasibility of economically installing community sewage treatment later.

Twenty-seven percent or 491,925 of the housing units in Minnesota are not connected to a public sewer. With a 13 percent increase in the total number of housing units between 1980 and 1990, the increase in unsewered units increased 22 percent. Most of the unsewered units are located in small cities, rural subdivisions, lakeshore areas and unincorporated areas of the state.

An informal survey of county planning and zoning administrators conducted by the MPCA indicated that 70 percent of the on-site systems are failing to provide adequate treatment or do not meet minimum state design and treatment standards. This presents a tremendous hazard to water quality. Currently, only 48 counties have adopted county-wide technical standards for on-site systems. This means 39 counties are not employing standards except in shorelands.

Transit Issues and Roads

Sprawl, traffic congestion, commuting distances and job location are tied to energy consumption and air quality as well as quality of life and other social impacts. Yet rarely are they considered together. Development in one community may affect traffic patterns in another. Current patterns of development have lengthened the distances between work, home, services and recreation. Increased sprawl inhibits the possibility for efficient mass transit systems.

Much, but not all of the St. Cloud to Twin City and the Duluth to Twin Cities growth occurs along highway corridors. Without highway access, growth in these corridors would have been smaller, perhaps by a significant degree. An overlay of major roads shows strong correlations between roads and density growth. The major exception is Interstate 90, where population decline continues. Thus, highways seems to be a factor only if it connects population to recreation destinations or employment centers.

During the past forty years, the number of vehicles and the number of miles Americans drive have increased at a rate roughly three times that of population growth. While there have been significant strides in making car emissions cleaner, these advances cannot keep up with the sheer numbers of miles travelled. For example, it is anticipated that tail pipe emissions standards will result in a 10 percent average fleet reduction in carbon monoxide, nitrous oxides, and hydrocarbons between 1989 and 2000. Yet due to the increase in travel, these same

pollutants are expected to increase by 30 percent between 1989 and 2000.

A Metropolitan Council survey of the Twin Cities showed that the number of trips per day has increased by 74 percent from 1970. Most people travel alone. Besides home and work, the most popular destination is shopping.

In spite of problems from cars, support for transit systems is lacking in much of Minnesota. A constitutional amendment restricting gas tax proceeds to highway purposes ensures that most funding goes for roads. Transit planning and highway planning are not coordinated. Twenty Minnesota counties are without a public transit system and an additional 23 counties have only a municipal public transit system. The 1991 Intermodal Surface Transportation Efficiency Act changed federal transportation policies and provides Minnesota the potential to address transit issues from a broader perspective than automobiles.

Costs Associated with Pollution

Built-up areas pose a disadvantage for redevelopment due to costs associated with cleaning up polluted land. If public or private water supplies are polluted, options for safe supplies are expensive. In addition, neither the FHA nor the VA will authorize mortgage funds if drinking water standards are not met.

In 1989 the Freshwater Foundation surveyed 21 Minnesota cities and 18 companies and found that the estimated costs to 17 Minnesota cities from ground-water contamination totalled $24,045,500. This figure did not include an estimated $13 million in jobs that could have come from potential new business in just one city with prime commercial property compromised by pollution.

Industries skip over land with possible pollution to land that is uncontaminated. This means that areas with services already available may lose out to other areas that eventually will require more physical and social services. This can be especially significant in smaller cities where sites contaminated may be key commercial locations.

Fiscal Stress on Local Government

Local governments experience an array of fiscal pressures to meet general welfare needs, whether they are growing areas, declining core cities, or declining rural areas. In declining areas, the public investment in physical and social systems may not be used to their full potential, while new investment may be needed in other places. In established cities, maintenance or replacement of existing structures pose special problems. Growing areas are confronted with increased pressure for public services.

A 1989 Wright County study found that the cost of providing public services for low density development was up to four times more than providing the same service in the City of Buffalo. It also found that the differences will be even greater when public systems for sewage treatment and water supply are added.

Development of large-lot detached housing eventually affects traffic congestion and

water and air pollution. This type of development may ultimately destroy the very rural character that made an area attractive. In addition, it can increase costs for services. For example, wooded areas which are scenic and harbor wildlife are very attractive to homebuilders. Each new development creates more pressure for services. Local units of government often assume that the only way to pay for these demands is to create more tax base through more development. And so it goes.

In the 1960s and 1970s there was substantial federal funding for sewage, water, recreation and transit systems. Much of the federal funding is now gone, leaving a greater burden on the state and local governments. Many local governments are concerned about decreasing federal and state aid, citizen resistance to property tax increases and increasing mandates that come without funds.

Affordable Housing and Housing Costs

There is agreement that there is a lack of housing within the income range of those who desire housing. Owing to the complexity of the many factors involved, there is less agreement on what causes the problem in specific places and what may be appropriate solutions. However, it is clear that one of the factors driving people toward the urban fringe and rural areas is the is the lower cost of living relative to that in the cities. Land costs, housing costs and taxes are often lower. Ironically, people often look for a comparable level of services in these rural settings, while fighting tax increases to pay for those services.

Regional Costs

Development pressures may cross local jurisdictions. Mismatches may occur between contiguous municipalities. For example, a municipality may ignore the financial and environmental effects on adjacent jurisdictions from a local development. These effects could include water pollution and increased traffic congestion. The adjacent municipality may not be represented in the decision-making process. Yet it may incur extra expenses from this development. In many cases these extra costs constitute a subsidy to the project. The Twin Cities has a development framework and a fiscal disparities program to guide growth and share taxes. Other regions do not.

Government Framework for Settlement

State Framework: Minnesota does not have an explicit, comprehensive state framework for guiding settlement patterns. In addition, there is a mismatch between various local and regional political boundaries, hydrologic systems and ecosystems.

Minnesota has many laws and rules aimed at environmental protection. It mandates land-use standards for several kinds of areas, including wetlands, shoreland, flood plains, wild and scenic rivers and critical areas. Its regulatory programs cover numerous activities such as water appropriation, pesticide use, well construction and pollution discharges. Other programs, such as environmental review, bring environmental protection concerns into the local planning process.

Some state and federal programs may actually exacerbate environmental and economic problems associated with settlement. Programs may be aimed at achieving specific goals with little or no consideration for related land use pressures. For example, expanded roads or housing subsidies may promote housing in rural areas without services. This may later increase pressure for services that are costly to provide.

Regional Planning: In the late 1960s, 13 regional development commissions were established across Minnesota (including the Metropolitan Council) to aid regional considerations. Subsequently, RDCs 10 (southeast Minnesota), 7W (central Minnesota) and 4 (west central), all in environmentally sensitive areas, were abolished. The Metropolitan Council provides a regional focus in guiding development in the seven county metropolitan area.

Twin Cities Planning: Minnesota has different planning requirements for local governments within the seven county metropolitan area than for those outside. In the seven county metropolitan area, the Metropolitan Council's Development and Investment Framework directs plans for sewers, parks, transportation, and airports. Local governments are required to develop local plans to conform to these regional systems. Further, tax base sharing through the fiscal disparities law is used to more nearly equalize the resources of the many local governments and enable them to provide their local share of the systems.

Local Framework: Counties, cities and towns make basic decisions regarding land use patterns. They have a variety of tools to use, such as comprehensive planning and zoning.

Outside the Twin Cities region, local governments have an option--not a requirement--to plan and adopt implementation measures. Yet the comprehensive planning process is central to deciding the types and location of developments. Counties, cities and townships all may use planning and plan implementation authorities. Thus city, county, and township may all have differing goals, with little to ensure coordination. While township plans are to be as stringent as their county plan, this is meaningless if there is no county plan. The implications of this include the following:

- Of the 80 counties outside the Twin Cities area: Sixty have comprehensive land use plans with only 35 prepared or updated since 1980; 63 have zoning ordinances with 28 using density standards; and 69 have subdivision regulations.

- Of the 715 cities outside the Twin Cities area: Twenty-four cities have populations greater than 10,000, but most have populations less than 500. Many cities do not have comprehensive plans or land use plans. Most of the existing plans are probably outdated or inconsistent with existing zoning ordinances.

- Of the 1761 townships outside the Twin Cities area: Approximately 100 townships have comprehensive plans and nearly 200 have zoning ordinances.

- Development in the urban fringe area is often a contentious issue. There is no

framework in place to require joint planning and zoning efforts by cities and towns. While provisions for cooperation exist, animosity and differing goals frequently set local governments at odds.

- Counties outside the Twin Cities, and watershed management organizations within the Twin Cities region, have developed and are carrying out local water plans. Through these two planning processes, local governments develop priorities and actions relating to water.

BARRIERS AND ISSUES OF SUSTAINABLE DEVELOPMENT

The Team identified a number of barriers to developing sustainable settlement patterns. They include:

- Sprawl jeopardizes the natural environment and agricultural land and creates inefficient settlement patterns.

- Lifestyle preferences are accommodated without taking into account their full cost on the environment and to essential public investment.

- Public infrastructure investment and tax policies greatly impact where and how people live and businesses locate but they are not necessarily guided by sustainable development principles.

- Support and funding is lacking for transit systems. Transit planning is not coordinated between the Twin Cities and the rest of the state, nor with highway planning.

- Lack of state guidelines, political fragmentation, overlapping authorities, and differing requirements all contribute to a governmental framework that hinders sustainable development decisions at the local and regional level.

- The political boundaries established for decision making are not geared to protecting the environment. Land use planning needs to be coordinated with resource protection, but now jurisdictions that share resources often differ in their approach and commitment to resource protection.

- The cost and issues surrounding cleaning up polluted land is a deterrent to urban development and redevelopment.

- Growth related environmental problems are managed on a case by case or issue by issue basis at all levels of government.

- Community and political leadership focuses on achieving short term goals rather than long term values.

- Mechanisms to ensure enforcement of both local and state regulations are inadequate.

- Local decision makers lack access to integrated natural resource data bases when land use plans and decisions are made.

- People lack an awareness of the environmental, social and economic implications of certain settlement patterns.

A VISION OF MINNESOTA IN 50 YEARS

Overview

Minnesota is a beautiful state with the diverse plant and animal life and landscapes enjoyed in the 1990s. A solid agricultural base and diverse local economies support a lively network of cities and towns linked to strong regional centers. Growth is managed to conserve resources and enhance quality of life. Rural areas, small cities and urban neighborhoods throughout the state are desirable and economically viable places for people to live and work. People share the goal of leaving future generations a clean environment.

Environment

Communities are geared toward protecting the environment from contamination and degradation. Production processes and household consumption minimize waste and rely on renewable energy sources. Water supplies, waste treatment, and other public needs are provided efficiently and conserve resources. Energy efficient transportation options are accessible for rural and urban areas. Polluted land and water are cleaned up and pollution prevention guides decisions for both public and private investment.

Livability

Communities and neighborhoods are designed to contribute a "sense of belonging", while offering lifestyle choices for a diverse population. Urban development patterns are more compact, reducing land consumption and allowing more people to work and play close to home. Urban forests, open spaces and accessible recreational facilities contribute to personal and community well-being, and conserve amenity areas for future enjoyment.

Economics/Equity

Communities are safe and friendly places for Minnesota's culturally diverse population regardless of income level. Responsibility for social needs are broadly shared by all sectors of society. There is good access to education, health care and jobs. Housing and support services for low income, disadvantaged and elderly are readily available in both older and newer residential areas. Reinvestment makes older urban neighborhoods desirable places for mixed income populations. Opportunities exist for meaningful employment provided by a skilled work force, at wages that provide an adequate standard of living. Transportation and telecommunication bind the state together supporting both urban and rural prosperity.

Governance

A regional, state and global perspective supports local decision-making on land use and public investment. Governance is collaborative and fair--unifying various political jurisdictions. Decisions are based on full accounting of environmental, economic, and social costs. Information, which is used for decisions, is readily available for all units of government, integrates a broad spectrum of environmental components, and supports commonly held goals and values.

PRINCIPLES FOR SETTLEMENT PATTERNS

Principles for Decision Making

- Factor long-term economic, environmental and social costs into development and infrastructure decisions.

- Mesh local land use decisions (representing all socio-economic groups) with regional and state decision-making to reflect hydrologic unit and ecosystem needs.

- Base decisions on sound, up-to-date, understandable information.

- Support and reward risk-taking and innovation.

Environmental Principles

- Preserve and enhance the quality of natural ecosystems and corridors between them.

- Pursue opportunities to reduce consumption levels and increase efficiency.

- Prevent adverse environmental effects and integrate decision-making for environmental elements.

- Protect sufficient agricultural, forest, water resources and open lands to preserve choices.

- Reduce the exposure of people and property to natural hazards.

Economic Principles

- Use full cost pricing for guiding decisions based on environmental, economic and social factors.

- Maintain a sense of local environmental and economic needs, yet recognize global competition.

- Maximize the use of the investment in existing infrastructure (e.g., roads, sewers, public buildings) and ensure new infrastructure development is economically sound.

- Sustain investment in large and small communities and rehabilitate and reuse buildings and infrastructure.

Social Principles

- Ensure equitable access for all to education, housing, jobs, health care, mobility, and recreational opportunities.

- Respect lifestyle choices while striving for efficient and environmentally responsible land uses.

- Strengthen family farms, small towns, and regional centers throughout the state as an alternative to concentrated population growth in the Twin Cities' commuter zone.

- Promote a sense of place and aesthetic quality in communities.

GOALS AND STRATEGIES

Goal 1

To foster sustainable communities throughout the state that provide a sense of community, protect the environment and have efficient public investment.

Issues

Many communities today have not developed using sustainable development principles. Communities need to develop and redevelop in a way that provides quality and secure communities for diverse lifestyles, while ensuring the well being of future generations. Individuals and households are often shielded from the consequences of their lifestyle choices. Public policies are needed to prevent adverse environmental effects, reduce sprawl, conserve energy, promote renewable fuels and decrease waste. Government and the private sector need to work toward developments that foster a sense of community and are worth sustaining. Minnesota's population is becoming increasingly diverse and communities need to prepare to meet the needs of minorities and those with limited incomes.

Strategy components:

1. Promote local assessments by communities to evaluate their sustainability. Communities would evaluate their energy efficiency, water use, waste generation, protection of resource and agricultural lands, integrated infrastructure development, avoidance of natural hazards, and affordable housing.

2. Encourage communities to:

   a. Cluster development (housing or industrial) to emphasize preservation of natural resources, including agricultural land.

   b. Funnel development to where sewers exist.

   c. Ensure infrastructure investments and services emphasize conservation and efficiency when providing for such things as water supply, waste water treatment and roads;

   d. Provide adequate park and open space for recreation and leisure;

   e. Maintain, protect or restore natural areas and urban forests;

   f. Provide for transit options other than the automobile and have separate bike and walking paths;

   g. Embrace racial and cultural diversity within the community;

   h. Address the need for affordable housing; and

   i. Cut down on the need for long-distance travel for jobs, shopping and schools.

3. Promote environmental conservation and personal lifestyle changes at the

individual, household and neighborhood level by supporting private efforts. An example is the Global Action Plan for the Earth's *Household EcoTeam Program*, which promotes household and neighborhood evaluation of such things as household waste and water, energy and transportation efficiency.

4. Support state uniformity in building code components for energy efficiency, health and safety to help achieve sustainability.

5. Invest in new technologies to serve cluster development with small scale centralized waste treatment systems. For areas relying on individual sewage treatment systems, ensure that MN Rule 7080 (standards for individual sewage treatment systems) is mandatory statewide. License people who design, build, inspect and maintain individual sewage treatment systems. At the time of sale or building permit, require that on-site systems be inspected to ensure they meet standards.

6. Enlist the private sector, such as homebuilders, utilities, professional societies, to help achieve sustainable development goals. Encourage the development of pilot projects, handbooks, models, etc. to reach wider audiences.

7. Have the state provide incentives to achieve affordable housing in areas where jobs are and use incentives to achieve a variety of housing types and costs.

8. Work with the lending community to encourage their financing of non-traditional buildings, such as energy efficient earth homes.

Goal 2

To create an interactive, integrated decision-making process which balances the protection of long-term environmental quality with efficient economic investments and provides for social needs.

Issues

A workable governmental framework is necessary to address natural resource issues at the same time that decisions are made on the location and density of commercial, industrial and residential development and affordable housing. Presently, state, regional and local governments lack the vision, structure and collaboration needed to shape sustainable development decisions. The existing political boundaries make it difficult to prevent adverse environmental effects, provide for economically sound public investment or meet the needs of minorities and the poor. Planning is haphazard and badly fragmented. Since the consequences of many decisions go beyond local government, there is a need for determining environmental strategies, planning for certain public investments and ensuring equitable access to such things as housing and jobs by strengthening local planning, regional approaches, and state leadership.

Strategy Components:

1. Require each county (except in the Twin Cities Metropolitan Area) to assume responsibility for preparing a comprehensive plan with the collaboration of its cities, townships and citizens.

Counties will have authority to assure the consistency of city and township plans with its plan. (This is similar to the local water planning process.) In the Metropolitan Area, strengthen the Metropolitan Council's role for sustainable development policies and require local plans to conform with those policies. Ensure that plans throughout the state mesh together. Base the plans on sustainable principles for environmental, economic and equity outcomes.

a. Ground plans in the ecosystem, watershed and ground water systems and the long-term sustaining of natural resources.

b. Ensure there is participation in integrated land use planning at the local and regional level across the state.

c. Implement plans with a comprehensive set of tools that include incentives, regulation and consistent enforcement to preserve resources on a regional basis.

2. Provide for cooperative regional frameworks that cover the state. Examine what kind of structure would best accommodate planning for environmental, economic and equity needs. The cooperative regional frameworks should be based on commutersheds, hydrologic systems, ecosystems or other appropriate systems. The geography of the region would shift with what issue or problem is being addressed.

a. Ensure that there is a regional structure with a secure means of financing that covers the state.

b. Ensure that there are regional plans with teeth to ensure conformance.

c. Tie water, sewers, transportation, schools, etc. into a single package of infrastructure planning (state-regional-local special purpose district) with an integrated capital improvement program.

3. Have the state provide the leadership and the framework for this collaborative planning process. It will integrate agencies' programs and policies, and provide guiding principles for regional and local plans.

a. Empower local governments to develop creative comprehensive plans for sustainable development by rewarding innovation and experimentation through such means as providing regulatory flexibility.

b. Have the state streamline the permitting process by concentrating on what needs to be done and allowing local government to achieve the desired outcome.

c. Have the state link local aid to planning.

Goal 3

To have state development policies that:

1) *ensure growing areas develop in a sustainable manner and internalize development costs;*

2) *discourage sprawl development and redirect investment to already developed areas;*

3) *assure a full array of services in declining areas is provided through regional centers with investment priorities decided by region.*

Issues:

Minnesota needs policies for development and public investment that ensure equity and efficiency, and protect natural resources and agricultural lands while recognizing lifestyle preferences. Though Minnesota's patterns of growth and decline are shaped by major economic trends and lifestyle choices, public policies and investments contribute significantly. All levels of public policies, such as for roads, agriculture and housing, greatly influence where people live, work and play and need to be better directed. Barriers exist to investment in cities--both small and large.

The extensive highway networks expedite commuting long distances with no transit options in many places. Decisions about public investment, such as for roads and sewers, often lack consideration of their effects on sprawl or delivery of services. Sprawl is occurring throughout the state. In both growing and declining areas there is a need to protect natural resources and agricultural land and to provide efficient public investment. Better local, regional and state approaches are vital.

Strategy components:

1. The state should create incentives for diversified jobs and economically viable agriculture in Greater Minnesota.

2. Share tax base by region (similar to Metro Fiscal Disparities).

3. Establish priorities and share infrastructure costs on a regional basis. Use forecasts for population and jobs to guide infrastructure planning in both growing and declining areas.

4. State aids and incentives should bolster development where existing infrastructure exists rather than supporting new development in places that will require new investment in roads or sewers. This will help ensure that lands used for agriculture, forest and other resource lands are safeguarded.

5. Give priority to the use of Tax Increment Financing (TIF) to redevelopment or to cover pollution abatement costs.

6. Require major urban centers to have a transit plan which identifies alternatives to travel by single occupancy vehicles (e.g., dial a ride, bus service, fixed guideways, rideshare, van pool). The state transportation plan should aim at reducing energy consumption and ensure that there is some level of transit within and between regional centers and that transit planning is coordinated between the Twin Cities and Greater Minnesota. The state should provide adequate and stable funding for transit options.

7. The state should ensure that there is a statewide telecommunications system in place.

8. Examine state and federal settlement related policies and programs, such as housing and transportation policies, to see what changes are needed to support sustainable development principles.

Goal 4

To provide usable information for decision-makers that brings together integrated environmental components with economic and equity-related information in order to improve the planning for settlement patterns.

Issues

There is little environmental trend information and much information available has major gaps. The understanding about such things as ground water quality and biological systems is poor. Available information relates to single issues and is not integrated with related information. For decision-makers to use information, it needs to be analyzed and understandable. Good information is needed to make decisions, to understand environmental capacities and to make tradeoffs. Much of the existing information is not compatible with other information, making it difficult or impossible to compare.

Strategy components

1. Develop a computer network of resource data bases that are available through PCs for local government.

2. Collate and put into a usable form available environmental information. Identify gaps and commit research to fill gaps.

3. Develop baseline and trend information and share among state and local governments. Accelerate GIS systems, County Geologic Atlases, Biological Surveys.

4. Create a process to keep a current natural resource inventory (ex. Forestry GEIS) including land use needs (demand for agriculture, residential, community and industrial land).

5. Research new technologies for protection, prevention, conservation and the development of sustainable alternative energy sources (e.g., waste treatment technology, solar, wind power).

Goal 5

To use market forces and tax policies to encourage sustainable development and redevelopment decisions, to save energy and to prevent pollution.

Issues

Many hidden subsidies keep costs of living down, obscuring the true price of many items. The market does not reflect true costs. This hinders city redevelopment, making undeveloped land much cheaper to develop. Those moving to the countryside are protected from the societal costs of sprawl. Cities have the infrastructure in place to accommodate growth and development should be guided to developed areas before new areas are opened. For example, developments may be sited without regard to the cost of extending sewers. Later, when sewers are needed, these homeowners are not assessed the full cost of extending sewers. To avoid this kind of problem, there is a need to ensure that related costs are paid at the time of development. There is also a need to ensure that existing developments without public sewer or water bear the brunt of the costs of obtaining those services.

Tax policies do not foster sustainable goals. Local governments are competing for tax base, often promoting inefficient land use choices.

Strategy components

1. Formulate user or impact fees based on the full costs associated with certain location or lifestyle choices, such as detached homes on large lots. There should be adequate planning for water and sewers when developing to ensure the costs are born as part of the development. Change legislation to allow local governments to assign the full costs associated with benefitted properties. For example, allow cities to charge homeowners the full costs of hooking up to a sewer when they are in a development with failing septic systems. Examine what alternatives are available to deal with poor siting decisions that have already been made. If there are subsidies for public investment costs relating to existing developments, make them income related.

2. Have the Department of Revenue examine the existing system of state aid to local government to see whether it supports sustainable communities (protects the environment and promotes economic efficiency and equity).

3. Divide the tax burden equitably. For example, is the Department of Revenue's recommendation for dividing taxes with one third of the revenue coming from property, sales and income taxes the right strategy?

4. Provide tax incentives to local government to encourage cooperation in sound resource management and incentives for mediation of conflict.

5. Strengthen the Metropolitan Urban Service Area (where growth is funnelled to areas that have sewers) and promote a similar system for places outside the seven county area to manage growth to maximize the current investment in infrastructure.

Goal 6

To increase educational efforts to secure citizen understanding, involvement and support for decisions necessary to support sustainable development.

Issues

Changing individual behavior is difficult and can be unpopular for those recommending it, but it is important if we are to have sustainable development. A number of factors make it difficult for citizens and community leaders to understand the implications of certain settlement related location and lifestyle choices. The lack of ecosystem awareness and understanding about the consequences of environmental choices are barriers to wise land use management. Short political timeframes make long-range planning for the environment and infrastructure difficult.

Strategy components

1. Educate citizens and officials about sustainable principles, sustainable communities and environmental consequences of actions by:

   a. Strengthening environmental education in schools, especially

targeting the real life relationships between our life choices and our resources. Using field work and real life examples, highlight the significance of resources such as agriculture, forestry and minerals to Minnesota's economy

b. Developing partnerships with local officials. An example would be holding combined county, city and township seminars.

c. Working with business groups such as the Minnesota Business Partnership, church groups, nonprofit organizations and agricultural organizations to devise strategies to educate special segments of the population.

d. Using an Environmental Congress to build citizen understanding.

e. Working with the lender community to promote funding of developments that meet sustainable goals.

2. Develop a sustainable development package for target groups that relates information about the environment, the economy and equity. Promote a better understanding of the biological community and the interconnections between land use practices and resources. Use information from studies such as biological surveys and ground water atlases for this educational effort.

3. Provide information to policy makers and their staff about new environmental technologies and their pros and cons. Provide technical assistance to help with local application.

4. Develop ways to recognize communities that are progressing toward sustainability. This could be like the Star City designation.

CROSS-TEAM ISSUES, PRINCIPLES AND STRATEGIES

Subcommittees of the Agriculture and Settlement Teams met and agreed that the two Teams have similar components of Vision, Principles and Strategies.

Vision

Both Teams envision a solid agriculture base with thriving, economically diverse rural communities. They see small cities and urban neighborhoods throughout the state as desirable and economically viable places for people to live and work.

Principles

The Settlement Team proposes protecting sufficient agricultural, forest, water resources and open lands to preserve choices. It also proposes strengthening family farms, small towns, and regional centers throughout the state as an alternative to concentrated population growth in the Twin Cities' commuter zone.

The Agriculture Team proposes that community-based needs must drive the directions of research and education in relation to the sustainable development of agriculture. It also proposes that sustainable development of agriculture depends on the continued existence of viable rural communities.

Strategies

The Agriculture and the Settlement Teams agree that uncontrolled development is an issue that affects all Teams. They both are supporting a planning effort aimed at achieving more sustainable land uses.

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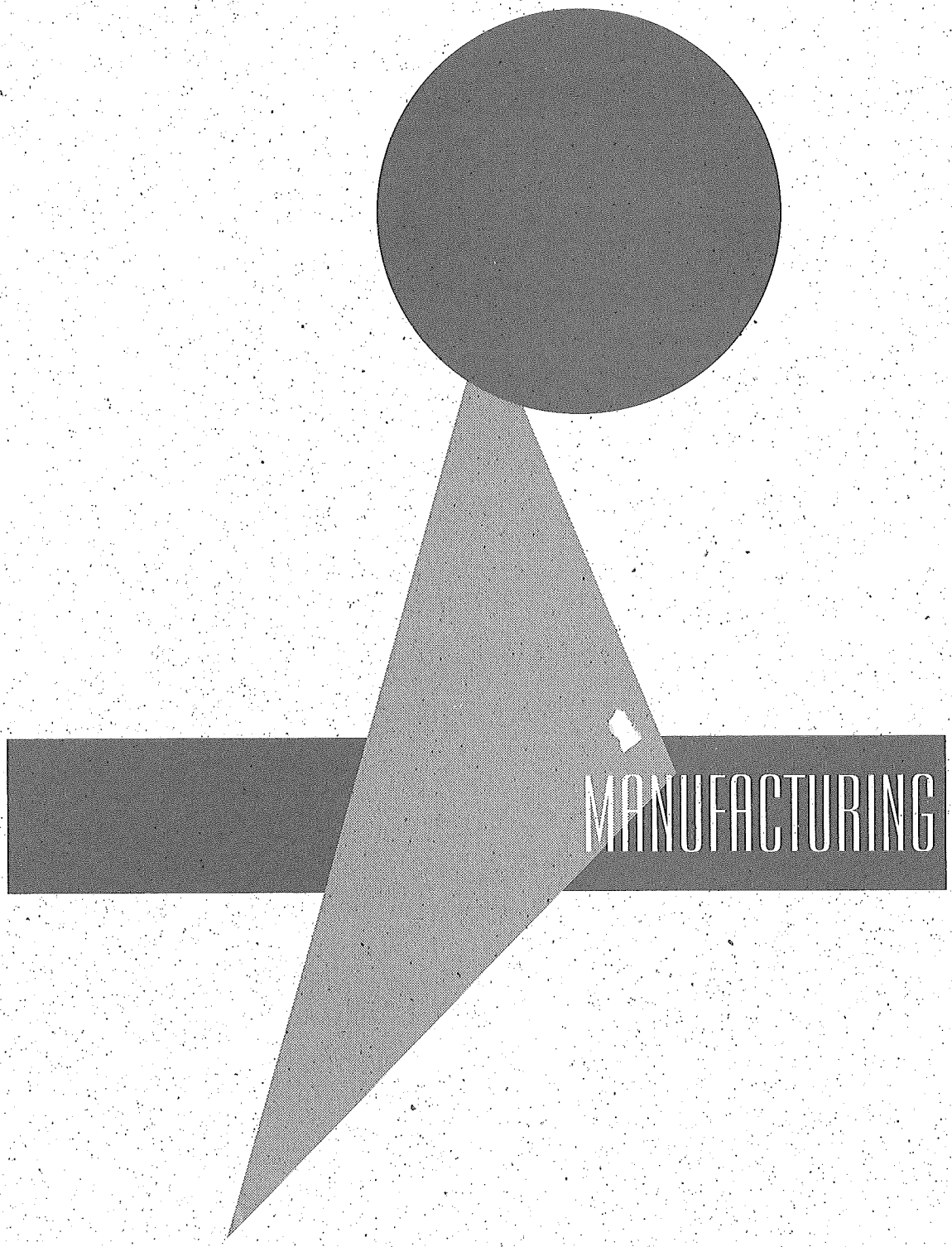
MANUFACTURING

REPORT of the MANUFACTURING TEAM

Minnesota Sustainable Development Initiative

1993

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REPORT of the MANUFACTURING TEAM

Minnesota Sustainable Development Initiative

EXECUTIVE SUMMARY

The Sustainable Development Initiative (SDI) was established by Governor Arne Carlson to develop a comprehensive strategy to protect eco-systems and preserve natural resources while stimulating economic growth. Because a strong manufacturing sector is critical to the health of the state's economy, the Manufacturing Team was one of seven teams established to examine sustainable development. This is the final report of the Manufacturing Team.

Sustainable development is in the best interest of Minnesota's businesses, consumers and government. Businesses will be more competitive as they reduce waste and increase efficiency. Government can free itself from unproductive regulatory activities to provide critically needed services. And consumers can use and enjoy products that contribute to a cleaner, healthier environment without sacrificing resources for future generations.

The Manufacturing Team established the following long-term vision:

> To ensure a healthy, growing Minnesota economy and preserve resources and ecosystems for future generations, Minnesota manufacturers will lead the nation in designing, producing, and distributing quality products in the safest, most ecologically and economically efficient manner possible.
>
> To accomplish this goal, the price of products will more closely reflect their true cost to society; then consumers can make environmentally sound buying decisions.

The team developed seven strategies for achieving that vision. These strategies aim to position Minnesota as a state that supports its manufacturing industries as they progress to sustainable manufacturing practices, and not to increase government burdens on Minnesota's manufacturers.

STRATEGIES

1. Create alliances at all levels between consumers, business and government to achieve sustainable development.
2. Educate consumers, business and government about sustainable manufacturing principles and practices.
3. Conduct research and development to improve: a) our understanding of environmental impacts and costs, b) the quality of public policies for supporting sustainable development, and c) the availability of clean technology and products.
4. Promote use of current information and adoption of "best practices" for sustainable manufacturing by providing technical business assistance.
5. Encourage growth of sustainable manufacturing by reducing business taxes and regulatory burdens and discourage pollution by increasing fees on pollution and waste generation.
6. Provide incentives to invest in sustainable technologies and products, and recognize leadership.
7. Better quantify costs and impacts of resource use and environmental degradation.

REPORT of the MANUFACTURING TEAM

Minnesota Sustainable Development Initiative

INTRODUCTION

On January 29, 1993, Governor Arne Carlson announced the Sustainable Development Initiative (SDI), a year-long, statewide effort to develop long-term strategies for achieving sustainable development. Although precise definitions differ, the phrase "sustainable development" generally means meeting society's current needs, providing jobs and a livable income to today's citizens, while ensuring that natural resources and eco-systems are preserved for future generations.

Past approaches have all too often been based on the premise that environmental protection could be achieved only through a lower standard of living or by foregoing economic growth. Under this premise, environmental protection often failed because the top priority for most of the world's people is their economic well-being and hope for a better life for their children. The SDI is based on the premise that the goals of environmental protection and economic growth are not mutually exclusive and continuing the adversarial approach can be counter-productive. Businesses, environmentalists and regulators increasingly recognize that we cannot maintain a healthy, growing economy unless we protect the environment. Conversely, a sound economy is necessary to provide the investment required to achieve a healthy environment.

Team Members and Charge

As part of the Sustainable Development Initiative, seven teams examined various aspects of sustainable development. The charge of the Manufacturing Team is as follows:

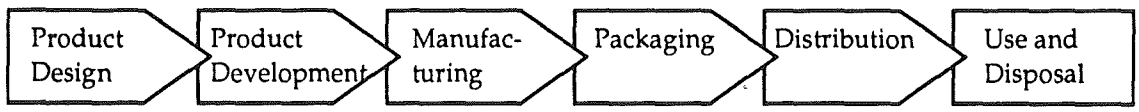
"In order to promote sustainable development in Minnesota, the Manufacturing Team will develop a strategy to integrate the state's goal of quality manufacturing job-growth at rates faster than the national economy while protecting human health and conserving natural resources and eco-systems for future generations."

The team consisted of recognized leaders from businesses, environmental organizations and academia. A complete listing of members is included in Appendix A. The team was staffed by the Minnesota Department of Trade and Economic Development and the Department of Natural Resources. The entire initiative was coordinated by the Environmental Quality Board.

Scope

Within the manufacturing sector, decisions made at each stage of the product life cycle affect the product's impact on the environment. Sustainable manufacturing can be achieved only by taking an integrated approach to resource conservation and pollution prevention at all stages of the product life cycle, from the product's design to its use and disposal. As a result, the team decided to use the product life cycle as its scope for developing strategy for sustainable development in the manufacturing sector. The stages of the product life cycle are described in Figure 1 below.

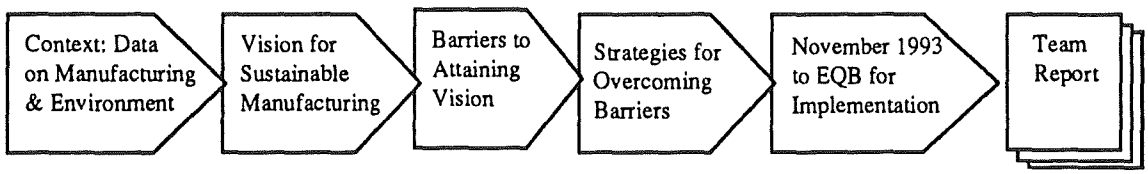
FIGURE 1
Product Life Cycle



Process

The Manufacturing Team met monthly from February through November, 1993. The team began its process by reviewing information about the economic contribution of the manufacturing sector, trends in its environmental impact and the concept of sustainable manufacturing. During the spring, the group developed vision statements for each stage of the product life cycle and guiding principles for sustainable manufacturing. Over the summer, core barriers to achieving the visions were identified and developed. Following this process, strategies and recommendations for overcoming these barriers were prepared. (See Figure 2 - Team Process.) (Appendix B includes a complete schedule of meetings.)

FIGURE 2
Team Deliberation Process



CONTEXT

Although Minnesota's manufacturing sector showed exceptional strength throughout the 1980s, past performance does not guarantee future success and Minnesota manufacturers face new challenges in the years ahead. While some evidence, especially energy data, suggests that manufacturers have reduced their generation of pollution and resource consumption in recent years, the manufacturing sector continues to have a significant impact on the environ-

ment. Clearly, Minnesota must move aggressively to develop policies that help Minnesota manufacturers improve efficiency, increase their global competitiveness and protect the environment. (See Appendix C for a detailed discussion of the economic contribution of Minnesota's manufacturing sector and the sector's environmental impact.)

The Manufacturing Team's examination revealed that complete information about environmental impacts does not now exist for developing policies and tracking progress. The team found an absence of goals for levels of pollution/emissions or use of natural resources that are sustainable in our natural systems. Team members also discovered that few indicators exist to measure both economic performance and environmental impacts. In addition, changes throughout the 1980s in reporting requirements and coverage for toxic chemical releases, hazardous waste shipment, and air emissions prevent trend analysis.

As a result, the team was unable to determine the "sustainability" of current trends. This was true both for the reasons listed above and because the trends are too recent to suggest permanent changes at this point. The team agreed that federal and state agencies should:

1. Set goals or targets needed for each major area of environmental impact, including pollution, natural resource use and eco-system preservation;
2. Collect reliable, consistent data to measure our progress toward those goals;
3. Define more clearly the process of moving toward sustainable development, balancing growth and environmental protection;
4. Develop and advance our scientific knowledge of the sustainable carrying capacity of our ecosystems; and
5. Strive for continuous improvement in reducing resource use and preventing pollution, even in the absence of goals or targets.

VISION

Based on the available environmental and economic information and an analysis of current problems inhibiting sustainable manufacturing the team identified a five to 10-year vision for sustainable manufacturing. This vision represents an ideal or ultimate goal and is not intended to be easily or quickly achievable.

> To ensure a healthy, growing Minnesota economy and preserve resources and eco-systems to meet the needs of future generations, Minnesota manufacturers will lead the nation in designing, producing and distributing quality products in the safest, most ecologically and economically efficient manner possible.

> To accomplish this goal, the price of products will more closely reflect their true cost to society; then consumers can make environmentally sound buying decisions.

Guiding Principles

Each stage of the product life cycle has impact on the product's resource requirements and generation of waste and pollution. As a result, the team also developed guiding principles to suggest the long-term direction that manufacturers and policy makers should work toward at each stage of the product life cycle.

PRODUCT CONCEPT: Incorporate the full cost of the product from every stage of the product life cycle into the price of the product.

PRODUCT DEVELOPMENT AND DESIGN: Design quality products to take responsibility for impacts throughout the life cycle.

MANUFACTURING: Produce quality products in the safest, most ecologically and economically efficient manner possible.

PACKAGING: Use the minimum packaging necessary, that is designed for recycling or reuse.

DISTRIBUTION: Distribute products with the least amount of waste and energy consumption.

PRODUCT USE: Use products in a manner that is not destructive to the environment.

DISPOSAL: Develop systems that price waste disposal based on the volume of waste generated.

Themes

From the process of developing the guiding principles, several over arching themes emerged. These themes, like the vision statement, are ideals — not intended to be easily or quickly achieved — that suggest the long-term goals toward which strategies should move us. The themes are:

1. Produce clean products from clean factories.
2. Achieve environmental protection with public acceptance.
3. Develop a true understanding of the costs/benefits of sustainable development, including consumer responsibility.
4. Strive to minimize product disposal.
5. Use what we need and leave enough for our children.

BARRIERS

Clearly, Minnesota is far from achieving the team's vision for sustainable manufacturing. Current public policy, business operating practices and consumer buying habits create significant impediments to reaching that vision.

Key barriers to attaining the vision for sustainable manufacturing are identified and discussed below. The barriers describe the "root problems" currently preventing sustainable manufacturing. As such, they suggest the core issues that must be addressed by strategies for sustainable manufacturing.

A. Education

There has not been adequate education about sustainable development or the consequences of current manufacturing and consumption practices at any level.

Consumers/Public: The public does not fully understand the concept of sustainable development: what it means both in terms of environmental protection and economic growth. There has been inadequate general education on the topic, including value education about the benefits of sustainable manufacturing practices. Sustainable development has not been adequately established as a social value.

In addition, consumers are not adequately educated about the consequences of their purchasing choices. The most important tool for providing this information is the price of the product/service. Currently, however, the total cost of producing product is not included in the prices, so the public does not receive the correct information about the impact of their purchases.

Professional: Systems of higher education provide little training to technical workers and professionals in specific sustainable manufacturing concepts and techniques. Sustainable manufacturing principles are not now regularly identified in curriculum for engineering, business, journalism or in technical training programs. Professional and technical personnel are not likely to have the knowledge or skills to advocate for or implement sustainable manufacturing/business practices without this education.

Manufacturing: Education and information sharing among Minnesota's manufacturers about sustainable development practices has not occurred widely. Programs like Minnesota Technical Assistance Program (MNTAP), which currently deliver pollution prevention assistance, do not have the resources to fully educate and inform Minnesota's manufacturing community about sustainable principles and technologies.

Government: Public policy leaders have not received adequate education about the concepts of sustainable development and policy approaches to encouraging sustainable development, especially non-regulatory approaches. Public officials at all levels, including the Legislature and executive branch agencies, are not well-informed about policy alternatives that both encourage growth and protect the environment.

B. Recognition of Complete Environmental Costs

Sustainable manufacturing practices require measurement of both resource consumption and pollution generated at each stage in the life cycle (i.e., production, distribution and consumption). However, the assessment of, and accounting for, all impacts incurred in the production and use of goods and services does not occur and systems for making such assessments rarely are in place.

Conventional accounting practices can take into consideration only those costs that are internal to the business operation and readily measurable, such as resource and material purchase costs. Generally excluded from these costs are the real, but difficult to measure, costs of environmental deterioration, pollution, and depletion of natural resources and eco-systems. An exception is when these costs are partially accounted for in regulatory compliance costs. In addition, government subsidies, incentives and other forms of intervention further distort the pricing of the goods and services and make full-cost accounting even more difficult.

Recognizing environmental costs can play a useful role in determining the true cost of a good or service. By making the environmental costs of business decisions more explicit, recognizing environmental costs would increase efficiency and create fewer undesirable impacts. Many barriers to assessing environmental costs, and hence to sustainable development, exist:

- adequate definition of the boundaries of the resource and environmental impacts associated with a product or process (how far back or forward to go in the production chain);
- proper assessment of resource use and of the amounts of the many different types of emissions that flow into the land, air and water at each stage in the production-to-use chain;
- insufficient knowledge and information about the harm and damage that the different types of pollutants cause; and
- no simple or easy way to convert state-of-the-art knowledge of harm and damage that exists into comparable monetary units, e.g.,
  - how much is an endangered species worth?
  - how much are people willing to pay for scenic beauty?
  - what is the dollar value of missed working days or impaired work functioning?
  - what value should be placed on a human life?
  - what is the future value of finite natural resources?

C. Technology Adoption

Development, commercialization and use of clean technology and customer-accepted sustainable products has not been adequate.

Currently existing clean technologies are under-utilized or need further development, because business has concerns or lacks information about the cost and performance of these products. For example, non-toxic solvents and cleaners are now available but not yet widely used in industry.

There is also a lack of convenient, cost-competitive "green" products, which are perceived to be similar in quality to conventional products. In addition, many green products are often more expensive than more conventionally produced substitutes.

Development and use of clean technology and products can be further impeded by: segmentation of technology, research, business and educational institutions. The private sector has little incentive to share existing knowledge of and information about proven sustainable technologies. In fact, proprietary development of technology has been the key to the success of many Minnesota companies. Anti-trust restrictions also inhibit company-to-company technology sharing.

D. Public Policy

Economic and environmental issues are addressed singly at all levels of government, including both the Legislative and Executive branches, resulting in policies that are not consistent with achieving sustainable development.

Examples: 1) Tax policy has not been developed taking into consideration its impact on sustainable manufacturing. 2) Existing government programs to encourage investment, like loans or grant programs, do not reward sustainable investments and generally do not consider environmental impacts. 3) The organizational structure of the Executive Branch often segments economic growth and environmental protection programs.

Existing information is inadequate to establish trends and effective targets. Our scientific understanding of sustainable demands on eco-systems and on the health impacts of environmental degradation is not adequate to set targets. The correct data elements are not currently being collected in order to monitor trends or assess these impacts. Periodic changes in reporting requirements and coverage prevent trend analysis for many types of pollution. The quality of existing data is also limited by measurement and collection problems.

Moreover, government has no generally accepted method for valuing ecosystems or costing environmental degradation. As a result, we are not able to adequately evaluate the economic benefit vs. the environmental cost of specific economic activities to develop effective public policy.

Current public policies are focused on "Command and Control" approaches. While use of these techniques may continue to be necessary, they have limitations. For example, command and control regulations may reduce or eliminate choices in methods to reduce emissions. This can prevent businesses from reaching the most effective or efficient solutions and reduce the incentive to create and innovate. Rather, government should set scientifically-sound health and environmental standards and then give industry flexibility in achieving those standards.

Alternative strategies, like emission taxes, are also currently under-utilized. Education and technical assistance are also under-utilized. Information and technology transfer programs about effective, clean technologies/methods have not fully reached their pollution or waste reduction potential.

Current policies often do not recognize the need for businesses to stay competitive in national and international markets. Minnesota's manufacturers compete in domestic and international markets. On average, nearly 70 percent of the output from Minnesota's manufacturing sector is exported to markets outside the state's borders. When regulations or taxes impose a cost for Minnesota manufacturers that is not borne by other manufacturers, it reduces the ability of manufacturers to compete effectively in these markets, for sales or resources. A level playing field between Minnesota manufacturers and their counterparts in other states or nations is essential to achieve sustainable manufacturing.

Government does not currently do long-term planning and goal setting for sustainable development. The short-term focus of political institutions discourages a long-term view. Without a comprehensive plan, fragmented policies will continue. Without measurable goals it is difficult to tell whether adequate progress is being achieved.

For example, government policies and programs have not adequately assessed the relative risk of environmental problems so that the highest risk problems can be addressed first. Today, large amounts of money are being spent on superfund clean-up. Yet, some evidence suggests that these are not the most dangerous environmental problems. We need to improve the ability to compare the risks associated with various types of pollution problems and invest funds in the areas where they will provide the greatest benefit.

E. Manufacturing Economics: Taxation and Regulation

Manufacturing growth and environmental protection are inextricably linked. The challenge is to meet the needs of current generations without degrading the environment so that future generations will be able to meet their needs.

Many studies document that high tax rates constrain both economic growth and business investment. (See T. Bartik, Who Benefits from State and Local Development Policies?, citing 70 studies.) Thus, high taxes not only slow job creation, but also drain away limited financial resources needed to make investments in sustainable technologies and products. To accomplish sustainable manufacturing growth, Minnesota needs to look upon its manufacturing industries less as a taxation opportunity and more as a source of wealth creation from which all of its citizens benefit. These benefits come not only from direct employment, but also from supporting services.

By reducing taxes on activities that should be encouraged, like capital investment, and by using the tax system to provide incentives for reducing resource use and pollution, the tax system could help Minnesota business improve efficiency and increase innovation.

World markets, which consider quality as a given, are increasingly competitive. In these markets, only the very cost competitive manufacturing centers will exist, let alone grow. To nurture a prosperous, sustainable manufacturing economy requires reductions of tax and regulatory burdens that do not achieve environmental goals or improve manufacturers competitiveness.

F. Sustainable Business Practices

Businesses in Minnesota have been dramatically changing their methods of operation to compete in global markets. These changes include adoption of quality management techniques, employee empowerment, cross-functional teams, and concurrent product development and engineering. The purpose of these changes is: 1) to compete more effectively through manufacturing improvements which include waste and emissions reductions and 2) to reduce the time needed to introduce new products into shrinking windows of market opportunity.

However, current regulatory approaches do not adequately encourage these innovations and efficiency improvements. Environmental solutions that are prescribed through regulation inhibit, and at times prevent, the introduction of newer and more sustainable products and processes. Government policies do not now consistently reward sustainable practices or investments in clean technology, such as offering reduced regulatory involvement and faster permit issuance for new products.

Regardless of the rapid change that is occurring, some businesses, especially small businesses, have not been able to move as rapidly toward sustainable manufacturing practices. Many business executives are not well informed about the concepts of sustainable manufacturing, nor do they understand the necessity or benefits of such practices. This knowledge is essential in adopting polices and practices that will achieve sustainable manufacturing. Small business, especially, lacks the expertise and resources to adopt the changes required for sustainable manufacturing.

G. Investments

Development of sustainable manufacturing products and processes requires significant business investment. Investments in sustainable products and processes may require significant research and development, long-term payback, or may be directed toward broad social goals. Those types of investments are difficult to make because of domestic and international competition for markets and resources. These investments are also inhibited by the short-term focus of financial markets that do not adequately reward businesses for those investments.

Barriers to increased business investment in sustainable products and processes include:

- The cost of capital, or market interest rates, rises as risk of the investment grows. Sustainable Development projects frequently involve both untested technologies and long development horizons, which often increases capital costs to prohibitive levels.

- Small companies, which represent the vast majority of manufacturers and the majority of new jobs, face greater constraints on investment resources. In addition, lenders often impose more stringent loan requirements on small borrowers, thus discouraging sustainable investments among small business.

- Risks associated with real or potential liability discourage private business from developing new products, including clean products, processes and materials. Risk also prevents businesses from purchasing or redeveloping polluted sites.

- Government investment and procurement practices and policies do not adequately support sustainable investment.

STRATEGIES

Introduction

These strategies and recommendations aim to establish Minnesota as a state government that supports its manufacturing industries as they progress to sustainable manufacturing practices. The recommendations are designed to create jobs by improving the efficiency of manufacturing businesses, not to increase government burdens on manufacturing.

Businesses, consumers and government are all stakeholders in Minnesota and sustainable development is in the best interest of all Minnesotans. By reducing waste and, in turn, increasing efficiency, businesses become more globally competitive. As sustainable policies and practices are implemented, government can free itself from unproductive regulatory activities to provide critically needed services such as education and technical assistance. Finally, by moving to a sustainable economy, the public will enjoy a cleaner environment and be able to use products knowing that future generations will have sufficient resources and a viable environment.

> A non-partisan council should be established to monitor and ensure implementation of the strategies listed below and issue a yearly report documenting progress and reassessing each strategy.

STRATEGY 1: STRATEGIC ALLIANCES

Create alliances between government, business and consumers to achieve sustainable development. Government includes all levels of government — state, federal and local — and all branches of government, including both the Legislative and Executive branches.

Government should:

1.1 Create a clear statement about the desirability of sustainable manufacturing.

1.2 Use the services and programs of existing agencies to promote sustainable development, such as Minnesota Technology, Inc.; University of Minnesota; Office of Waste Management; Minnesota Department of Trade and Economic Development; and the Pollution Control Agency.

1.3 Establish cross functional groups to advise and direct integration of sustainable development policies into all government programs and services. For example, ensure that technical advisory committees among state agencies have members with knowledge and expertise about sustainable development so that sustainable development works at all policy levels.

1.4 Use existing forums and boards of manufacturers, consumers and government officials to maintain an ongoing dialog about sustainable development to identify areas of potential integration and consolidation and direct resources to areas of greatest return.

Business should:

1.5 Continue the dialog for long-term sustainable manufacturing growth in Minnesota, through ongoing cooperative research, seminars and conferences involving leaders and technical specialists from academia, government, industrial and environmental areas.

1.6 Develop a process to explore sustainable development concerns with regulators and environmentalists. Issues could be reviewed, for example, through an annual symposium sponsored by the Governor.

1.7 Support industry specific workshops to improve efficiency, reduce waste generation and report on other sustainable manufacturing methods and processes, in conjunction with government.

Government and business should:

1.8 Act as leaders in adopting "best practices" in sustainable development, including energy efficiency, waste recycling, purchasing and pollution prevention practices.

1.9 Fully inform consumers of environmental impacts through pricing and labeling.

STRATEGY 2: EDUCATION/INFORMATION

Educate consumers, business and government about sustainable manufacturing principles and practices.

2.1 Conduct joint government/industry seminars to educate legislators, agencies and staff.

2.2 Integrate sustainable development concepts in K-12 curricula, including both environmental and economic aspects.

2.3 Work with existing educational programs to promote sustainable manufacturing and introduce full-cost accounting in university and technical curricula, such as MBA, legal, engineering and public policy programs.

2.4 Incorporate sustainable development into training for manufacturing practitioners. Establish an institute for sustainable development training.

2.5 Encourage state business organizations to educate members on principles of sustainable development. Special attention should be paid to small businesses.

2.6 Develop and execute a plan for public education about the costs of environmental impacts and the need for sustainable development.

2.7 Communicate that sustainable development covers the spectrum from pollution prevention, to product development and measurement of environmental impacts at all stages of the product life cycle.

STRATEGY 3: RESEARCH AND DEVELOPMENT

Conduct research and development to improve: a) our understanding of environmental impacts and costs, b) the quality of public policies for supporting sustainable development and c) the availability of clean technology and products.

Government, in conjunction with business, should:

3.1 Examine existing research, and where gaps exist conduct additional research, on resource and environmental impacts and societal effects.

3.2 Improve the ability to measure and quantify the cost of environmental effects to appropriately cost products.

3.3 Redirect public dollars to conduct research on sustainable manufacturing processes and products and to identify other opportunities where needs can be met at lower social costs.

3.4 Work with existing public policy or business research centers to meet these research needs.

STRATEGY 4: TECHNICAL ASSISTANCE

Promote use of current information and adoption of "best practices" for sustainable manufacturing by providing technical business assistance.

4.1 Use existing public/private technology programs, such as Minnesota Technology Inc.; MNTAP; Office of Waste Management; and the Minnesota Pollution Control Agency, to:

a. provide technical assistance and carry out demonstration projects, with emphasis on small business.

b. conduct waste prevention seminars which include examples presented by peers.

c. provide technical information on the spectrum of sustainable development topics including packaging and post-consumption disposal.

d. provide other technical assistance as determined necessary.

4.2 Make technical assistance available for businesses for establishing information systems that account for wastes.

4.3 Revise licensing process to improve the return on investments in new processes, especially for sustainable manufacturing. For example, government could buy the license and give away the technology.

4.4 Support modification of federal anti-trust laws to allow greater sharing of information between companies in related industries.

4.5 Develop a one-stop location for business development assistance and information.

STRATEGY 5: TAXES AND REGULATION

Encourage growth of sustainable manufacturing by reducing business taxes and regulatory burden and discourage pollution by increasing fees on pollution and waste generation.

5.1 Review statutes, regulations, permit structures, taxes and fees to provide relief from command and control systems whenever possible through:

a) direct cost assessment,

b) cost-effective incentives for reduced consumption of resources or reduced waste generation.

5.2 Improve the tax climate for Minnesota manufacturers, especially property, sales and employment taxes, to encourage their investment and growth in Minnesota.

5.3 Tax targeted emissions on an escalating scale to give polluting industries the economic incentive to develop non-polluting technologies and the time to do it. These increases should be tax neutral, that is any increases should be offset by reductions in other business taxes, so that total taxes on business are not increased.

5.4 Shift the full costs of waste disposal to the generators of waste and users of products by establishing volume-based disposal fees.

5.5 Move aggressively to consolidate and simplify the current permitting system to a one-stop environmental permitting system, where all environmental permits for a business project could be obtained through a single permitting process.

5.6 Promote timely government response and consistent government policy as a significant business development factor.

STRATEGY 6: INCENTIVES AND RECOGNITION

Provide incentives to invest in sustainable technologies and products and recognize leadership.

Incentives

6.1 Provide incentives that have traditionally encouraged technology and product development such as:

a. limits on lender liability for pollution reduction investments,

b. pollution reduction tax credits and incentives,

c. elimination of the sales tax on capital equipment.

6.2 Support loan availability by modifying eligibility requirements for existing state business financing programs to include investments in pollution prevention/reduction.

6.3 Increase attractiveness of sustainable investments to private capital by creating a secondary market for loans on pollution reduction, prevention and clean up projects.

6.4 Use the state's purchasing power to encourage the development of sustainable manufacturing processes by purchasing as much as possible from companies that use sustainable methods and resources.

Recognition

6.5 Expand and develop recognition and award systems for:

a. Individual company progress toward integrating sustainable manufacturing practices throughout the product life cycle.

b. Government agency effectiveness in assisting and facilitating industry to improve their practices versus controlling industry practices.

STRATEGY 7: INDICATORS/MEASUREMENT

Better quantify costs and impacts of resource use and environmental degradation.

7.1 Develop an effective and dynamic database for environmental accounting and statistics, leading to the ability to project full-cost accountability and create effective pricing impacts.

7.2 Determine what is being monitored and what data is being collected, conduct a gap analysis and prioritize the needs based on environmental importance.

7.3 Develop consistent and consolidated systems to measure resource use and waste generation by the Pollution Control Agency, Department of Natural Resources, Department of Transportation, Department of Public Service and other involved agencies.

7.4 Examine and develop ways to reduce the burden of reporting data to the government, including electronic filing.

CONCLUSION

This report does not provide a precise definition of sustainable development, i.e., the levels of growth, consumption and pollution that can be accommodated and yet preserve healthy ecosystems and adequate resources for future generations. Information, data and measurement systems have not yet been adequately developed to provide that definition. As a result, this remains a task for future efforts.

Nevertheless, the report is clear about the direction that Minnesota must head in order to ultimately reach a sustainable development path. That direction is toward more efficient resource use, and reduced waste and pollution. In order to make significant progress toward this goal, Minnesota must create an environment that encourages continuous improvement in both public policies and business practicies.

This report provides sweeping recommendations for creating such an environment and moving Minnesota aggressively toward a sustainable future. We believe that through these strategies Minnesota can lead the way to a future that is both economically and environmentally secure.

APPENDIX A

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Manufacturing Team

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APPENDIX B

Sustainable Development Initiative
Manufacturing Team

SCHEDULE OF MEETINGS

DATES	MAIN TOPIC
Monday March 8, 1993	Introductions and overview of topic and process.
Tuesday April 6, 1993	Context, economic contribution and environmental impacts of manufacturing, and establish scope of problem.
Monday May 10, 1993	Develop vision and guiding principles for sustainable development. Identify barriers to sustainable development.
Tuesday June 8, 1993	Finalize barrier statements and review visions.
Friday July 9, 1993	Finalize barrier statements and strategy brainstorming.
Friday August 6, 1993	Refine strategies.
Friday September 10, 1993	Synthesize strategies.
Tuesday October 5, 1993	Finalize strategies and review draft report.
Wednesday November 3, 1993	Finalize report.

APPENDIX C

CONTEXT

Contribution to Economy

A healthy, growing manufacturing sector is essential for the prosperity of Minnesota's citizens. The largest source — more than one-fifth — of Gross State Product (GSP), the total value of output from the economy, in Minnesota comes from the manufacturing sector. Manufacturing is slightly more important to Minnesota's economy than it is for the country as a whole (Figure A.1). Nationally the service sector is most important, followed by manufacturing.

FIGURE A.1
Minnesota Gross State Product by Sector

Sector	Gross Product ($ Millions)	Percent of Total
Manufacturing	$19,766	21.1%
Finance, Insurance, Real Estate	17,188	18.4
Services	15,963	17.1
Trade	15,568	16.6
Government	9,122	9.7
Transportation, Communications, Public Utilities	8,272	8.8
Construction	3,453	3.7
Farms	3,457	3.7
Agricultural Services	356	.4
Mining	413	.4
TOTAL	$93,559	100.0%

SOURCE: U.S. Department of Commerce, Bureau of Economic Analysis, (1989 GSP is the most recent data available from the Department of Commerce).

Manufacturing also is the state's largest economic sector in terms of wage income. Manufacturing accounts for more than 80 percent of our exports to international markets and offers an average wage per job that is nearly 30 percent above the statewide average.

Both because of the high share of basic income from manufacturing and the higher wages paid in that sector, it generates more spin-off jobs than other sectors. According to the 1991 Economic Report to the Governor, every job created in the manufacturing sector creates another 1.5 jobs in our economy. A job created in the service sector adds only another two-tenths of a job and a finance sector job creates an additional nine-tenths of a job. For all these reasons, the health of the manufacturing sector is especially important to the economic health of the state.

Structure

One of the unique strengths of Minnesota's manufacturing sector is its diversity with significant employment in high technology industries and in resource-based manufacturing. The state's largest manufacturing industry is the industrial machinery/computer industry. Minnesota leads in such other high-tech industries as scientific instruments. In addition, a new environmental products and services industry of more than 200 firms is emerging in Minnesota.

The state's manufacturing sector also reflects its resource base of timber and agricultural land. In terms of GSP, the second largest manufacturing industry is the paper and allied products industry. In terms of employment, Minnesota's second largest manufacturing industry is printing and publishing. Processed food products is Minnesota's third largest manufacturing industry in terms of both employment and GSP. Among food processing activities, Minnesota is highly specialized in grain milling and dairy processing, with nearly three times the national concentration of employment in both.

Recent Economic Performance

Minnesota's manufacturing sector showed strength and vitality throughout the 1980s. According to the U.S. Department of Labor, Minnesota's manufacturing employment grew by 7.72 percent between 1980 and 1990. In sharp contrast, manufacturing employment nationwide and in the Midwest declined by 5.9 percent and 7.6 respectively over the same period.

According to the U.S. Department of Commerce, real manufacturing GSP in Minnesota grew by 74 percent between 1980 and 1989, a rate that was nearly 90 percent above the U.S. average and among the fastest growing manufacturing sectors in the nation. This rate of growth in manufacturing sector output was comparable to growth in both Germany and Japan.

Future Prospects

Although Minnesota's manufacturing sector prospered and thrived during the 1980s, it clearly participated in the national recession during 1991 and 1992. After peaking in 1990, employment in Minnesota's manufacturing sector declined by several thousand jobs and has stagnated at approximately 395,000 jobs. These past three years demonstrate that the growth experienced by Minnesota manufacturers during the 1980s is not guaranteed in the future.

Slow growth in the domestic economy and increasing international competition mean that Minnesota's manufacturers will need to lead the nation in efficiency and quality to continue to create new jobs in the future. Yet signs suggest that Minnesota's manufacturers are finding it difficult to meet these challenges.

For example, the productivity of Minnesota's manufacturing sector, as measured by output per worker, dropped from 10th highest among the 50 states in 1987 to 24th highest in 1991. This drop in ranking occurred because the growth rate of Minnesota's productivity declined sharply as compared to other states.

Data on Minnesota's exports to international markets provide further evidence of the challenges Minnesota's manufacturers face. After excluding computer exports, Minnesota manufacturers sell about 30 percent less of their output in international markets than the U.S. average for these same industries. Because international markets will be an important source of growth during the next decade, Minnesota's manufacturing community must be able to compete in that arena.

Impact on Environment

Given manufacturing's economic contribution, it is not surprising that the sector also impacts the environment. The team found limited data and analysis available on the environmental impacts of current consumption and production practices, including Minnesota's manufacturing sector. For example, information to the team presented did not include environmental impacts of packaging waste, product transportation or from inputs into the manufacturing process such as energy and natural resources. In addition, it is not currently possible to separate out the manufacturing sector's contribution to certain types of pollution, such as water pollution. As a result, the information examined did not provide a complete picture of the full impact of the manufacturing sector on the environment.

Nevertheless, the team examined the existing available information. Data was presented on the manufacturing sector's impact on: air emissions, toxic chemical releases, hazardous waste shipments, and water and energy consumption.

Air Emissions: Little data is available about air pollutants from the manufacturing sector. The Minnesota Pollution Control Agency (PCA) is only beginning to measure pollutants by economic sector and recent changes in measurement methods have made trend analysis of existing data impossible.

According to PCA data, the manufacturing sector generally accounts for 10 percent to 25 percent of total air emissions depending on the particular source category. However, the manufacturing sector accounted for more than 70 percent of "volatile organic" (VOC) emissions in both 1990 and 1986 (VOC emissions include fumes from solvents and petroleum chemicals). (See Figure A.2)

FIGURE A.2
Manufacturing Point Source Emissions by Category

	Total Suspended Particulate	Lead	Carbon Monoxide	Sulfur Oxides	Nitrogen Oxides	Volatile Organics
1986						
Tons	16,159	210	9,581	20,761	14,877	37,722
% of Total	26.3%	77.9%	13.7%	15.2%	11.1%	76.4%
1990						
Tons	17,693	15	11,117	13,783	14,389	36,738
% of Total	20.6%	16.05%	13.7%	11.3%	9.7%	70.7%

SOURCE: Minnesota Pollution Control Agency, 1993.

Toxic Chemical Releases: According to the Minnesota Pollution Control Agency's Toxic Release Inventory (TRI), reported toxic chemical releases from Minnesota manufacturers have been declining steadily in Minnesota since the late 1980s. After peaking in 1989 at 83.3 million pounds of chemical releases, releases have declined nearly 50 percent by 1992.

According to the Minnesota TRI, releases to virtually every medium declined between 1988 and 1991, with the exception of off-site transfers. As with other data series, changes in reporting requirements distort this category. Increases in off-site transfers were primarily due to changes in reporting requirements between 1988 and 1991.

Hazardous Waste Shipments: Minnesota manufacturers in 1991 produced 57,161 tons of hazardous waste, 77.4 percent of the total reported tons of hazardous waste produced in Minnesota.

Through the mid-1980s, reported levels of hazardous waste shipments increased, primarily because reporting and industry compliance improved. However, preliminary data from the Minnesota Office of Waste Management suggests that 1992 shipments of hazardous waste declined by 10 percent from 1991 levels.

Water Use: According to the Minnesota Department of Natural Resources, water use for industrial processing increased during the 1980s, but declined slightly in 1990 and 1991. Unclear, however, is whether the decrease was the result of the recession or conservation.

In what may be a hopeful sign, industrial water use declined per unit of industrial output during the 1980s. Industrial processing water use per unit of manufacturing output declined steadily over the period from 3.3 gallons per dollar of GSP in 1985 to 2.7 gallons per dollar of GSP in 1989.

FIGURE A.3
Industrial Energy Use

	1977	1980	1985	1989	1990
Industrial Energy Use (Trillion Btus)	279	272	267	289	291
Manufacturing Gross State Product (Billions of Dollars)	$10.7	11.8	16.1	20.5	NA
Btus per $ of GSP (Thousand Btus)	26.1	23.1	16.6	14.2	NA

NOTE: GSP in constant dollars,
GSP data is not available after 1989.

SOURCE: Minnesota Department of Public Service; U.S. Department of Commerce.

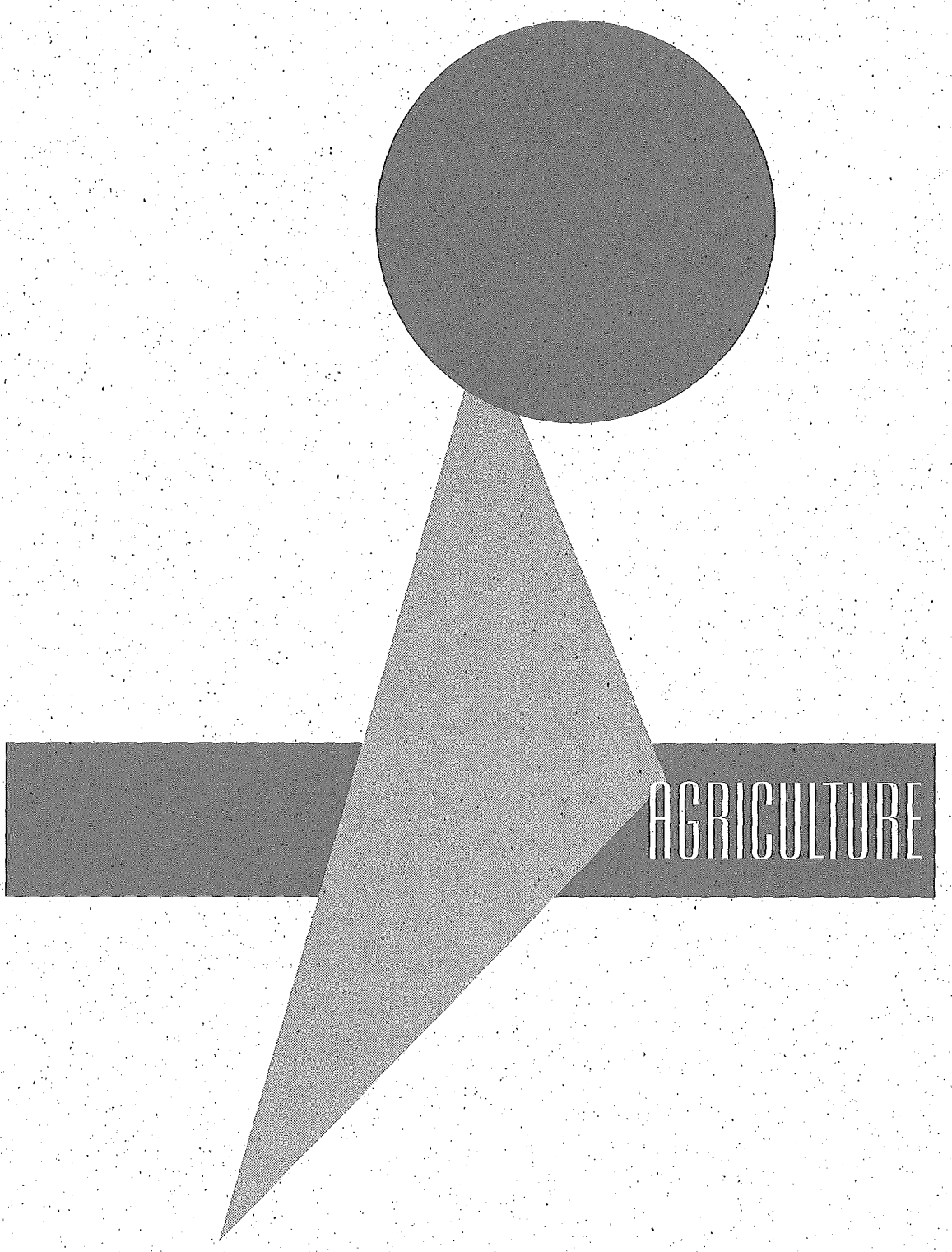
Energy Use: Excellent data is available on long-term energy use by sector from the Minnesota Department of Public Service. After peaking in 1975 at 312 trillion Btus, total energy use for industrial purposes declined by more than 10 percent by 1985, then began growing again in the last few years. (See Figure A.3).

Energy use trends suggest that the manufacturing sector is moving toward less-resource intensive and more sustainable practices. Energy consumption per dollar of GSP declined during the 1980s. In 1980, the manufacturing sector consumed 23.1 thousand Btus of energy per dollar of GSP. By 1985 that rate had dropped to 16.6 thousand Btus per dollar of GSP then to slightly more than 14 thousand Btus per dollar of GSP in 1989.

In sharp contrast, the residential and transportation sectors demonstrated rapid growth in energy consumption over this period.

Conclusion

Clearly, it is more important than ever for Minnesota to develop policies that help Minnesota manufacturers improve efficiency and increase their competitiveness, and protect the environment and preserve our natural resources.


AGRICULTURE

AGRICULTURE TEAM

Minnesota Sustainable Development Initiative

Coordinated by
the Minnesota Environmental Quality Board

DRAFT REPORT

JANUARY 1994

AGRICULTURE TEAM

Minnesota Sustainable Development Initiative

January 1994

DRAFT REPORT

MINNESOTA DEPARTMENT OF AGRICULTURE
90 WEST PLATO BOULEVARD
ST. PAUL, MINNESOTA 55107

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EXECUTIVE SUMMARY

The Agriculture Team heard presentations on several areas of interest to agriculture, especially current areas of impact and stress. Several areas of environmental impacts from agricultural activities are challenges facing agriculture today. Agriculture is also facing particular economic challenges and cultural change.

The team identified several general categories of **critical issues** currently facing agriculture in Minnesota:

A. Fragmented understanding and information delivery
B. Public acceptance of agriculture
C. Complex contradicting uncoordinated bureaucratic policies
D. Balanced management tools
E. Total management; working with nature
F. Achieving financial stability
G. Cost of change; sustaining agricultural stability

The team also identified the following **guiding principles** for the sustainable development of Minnesota Agriculture:

A. Sustainable development of agriculture must use production methods which result in the opportunity for on-farm profitability.
B. Sustainable development of agricultural practices and processing must be environmentally sound.
C. Sustainable development of agriculture must be an appropriate fit with the social fabric of the community.
D. Sustainable development of agriculture needs to be based on a range of information and experience, including research.
E. Community-based needs must drive the directions of research and education in relation to the sustainable development of agriculture.
F. Sustainable agriculture must be rewarding; the term "reward" includes such concepts as personal value, money, and societal benefits within the definition.
G. Sustainable development of agriculture treats plants and animals well and nurtures wildlife.
H. Sustainable development of agriculture sustains the farmer on the land and the environment.
I. Sustainable development of agriculture depends on the continued existence of viable rural communities.
J. All individuals involved with the sustainable development of agriculture must be treated fairly.
K. It is appropriate to educate the general public, including farmers, in regards to all aspects of farming.

The strategies for addressing the issues were identified under the following **goal areas**:

Goal 1. Achieve a healthy, natural environment by fostering stewardship of our soil, water, air, and wildlife resources.
Goal 2. In order to develop an environmentally sound, economically viable and socially acceptable agriculture, encourage systems changes.
Goal 3. Keep people on the land and encourage young people to enter farming in order to support a network of economically diverse rural communities.
Goal 4. Insure vigorous rural communities that provide the social, economic, physical and

cultural infrastructure to sustain agriculture.

Goal 5. To provide the cultural infrastructure to sustain agriculture, increase the linkages between urban and rural people.

Goal 6. Make information accessible to farmers so they can creatively implement sustainable production.

Goal 7. Support agricultural research and technological development that bolsters healthy profitable farm families, vigorous rural communities and a healthy natural environment.

INTRODUCTION

TEAM CHARGE

How agricultural systems can better achieve environmental and economic sustainability simultaneously.

TEAM MAKE-UP

D'Wayne DeZiel, Co-Chair
Minnesota Association of Soil and Water Conservation Districts (MASWCD)

C. Merle Anderson
Chair, Legislative Commission on Minnesota Resources (LCMR) Citizens Advisory Committee
Board Member, Watonwan County Soil and Water Conservation District (SWCD)
Farmer

Tom Cochrane
Minnesota Agri Growth Council

Greg Anderson
District Manager, West Polk SWCD

Mary Hanks
MN Department of Agriculture
Sustainable Agriculture Program

Greta Hesse-Gauthier
The Nature Conservancy

Kristin Juliar
Region 9 Development Commission

Vern Ingvalson
MN Farm Bureau Federation

Robert Rupp, Co-Chair
Former Editor, the Farmer Magazine. Retired

Ralph Lentz
President, Minnesota Sustainable Farmers Association

Farmer

George Boody
Land Stewardship Project

Wally Nelson
Former Director, Minnesota Agricultural Experiment Station, Lamberton, MN, Retired

Dave Nomsen
Minnesota Chapter, Pheasants Forever

Kent Thiesse
Minnesota Extension Agent, Blue Earth County

Donald Wyse
MN Institute for Sustainable Agriculture

Facilitators: Mirja Hanson, Charlie Petersen and Georgie Peterson , Dept. of Administration

Team Staff: Paul Burns, Douglas Wise, MDA; Gregg Downing, EQB; Wayne Edgerton, DNR; Paul Hansen, DTED; Kevin Johnson, OWM; Jerry Larson, DOT; Rita Messing, DOH; Paul Schmiechen, MPCA

TEAM PROCESS AND SCOPE OF WORK

Team Highlights:

- Reviewed and discussed the background paper on agriculture in Minnesota.
- Devoted most of one meeting to presentations relating to the economic sustainability of agriculture. Guest speakers included former North Dakota Governor George Sinner, University of Minnesota Professor Wilbur Maki and Agricultural Consultant Pat Henderson.
- Devoted most of another meeting to presentations by a panel of agency environmental experts on the impacts of agriculture on the environment. Speakers included Greg Buzicky and John Hines, MN Department of Agriculture; Wayne Anderson, MN Pollution Control Agency; Roger Mussetter, U.S. Department of Agriculture Soil Conservation Service; and Tex Hawkins, U.S. Fish and Wildlife Service.
- Devoted part of another meeting to presentations on current programs and efforts currently underway addressing agricultural environmental impacts, or current "Sustainable Agriculture" efforts. Speakers included Peter Buessler, MN Department of Natural Resources; Mary Hanks, MN Department of Agriculture's Energy and Sustainable Agriculture Program; Ron Kroese, Land Stewardship Project; Ralph Lentz, Sustainable Farming Association of Minnesota; and Don Wyse, Minnesota Institute for Sustainable Agriculture.
- Listed prior accomplishments and setbacks to economic prosperity and resource protection in agriculture.
- Evaluated strengths and weaknesses in present efforts to move toward sustainable development in Minnesota agriculture.
- Listed threats and opportunities for future efforts toward sustainable development in Minnesota agriculture.
- Identified critical issues and topics to be addressed in future sustainable development discussions. Seven "issue areas" were identified by the team.

Summary of Key Discussion Points:

At the April meeting, Douglas Wise, Minnesota Department of Agriculture (MDA), reviewed the background paper on Minnesota Agriculture. Team members identified information gaps, accomplishments and setbacks.

Economic issues related to Minnesota agriculture were presented by invited guest speakers. Dr. Wilbur Maki, University of Minnesota Agricultural and Applied Economics Professor, discussed "The Importance of Minnesota's Food and Agriculture Industry". George Sinner, American Crystal Sugar Vice President of Public and Government Affairs and former Governor of North Dakota, evaluated the economic sustainability of farmer-owned cooperatives such as American Crystal Sugar. Agriculture public relations and communications consultant Pat Henderson discussed international agricultural trade issues with the team.

At the May meeting, the first half of the morning session was devoted to hearing presentations from a panel of agency environmental experts on studies and programs assessing the impacts of agriculture on the environment.

- John Hines, MDA, discussed the Ag. Department's Water Quality Monitoring program. The goal of that program is to define long-term impacts of normal agricultural chemical use on water quality. He also reviewed the pesticide use survey conducted by the department in 1990.

- Greg Buzicky, MDA, reviewed the cooperative Ag. Department-Pollution Control Agency Groundwater Act and the Nitrogen in Minnesota Groundwater study. He handed out statewide Best Management Practices (BMP's) fact sheets for fertilizer and discussed MDA's efforts in developing and promoting BMP's.

- Wayne Anderson, Minnesota Pollution Control Agency (MPCA) discussed the Minnesota River Assessment Project. The goal of the program is to reduce BOD pollution in the Minnesota River by 40% at Shakopee. He also discussed the Clean Water Partnership Program, citing changes which have occurred as a result of the program and discussing a couple of examples, including Big Stone Lake.

- Roger Mussetter, USDA, Soil Conservation Service, discussed the National Resources Inventory (NRI), conducted every five years to track land use changes and to estimate soil erosion caused by wind and water. Data from the 1992 NRI is to be released next winter.

- Tex Hawkins, U.S. Fish and Wildlife Service discussed the effects of farming practices on wildlife habitats. He stated that ephemeral and seasonal wetlands are critical to migratory waterfowl. He also indicated that willing farmers should be enabled and encouraged to provide wildlife habitat areas by restoring wetlands and installing buffer strips and windbreaks.

General consensus was, during a 1 1/2-hour discussion period which followed the presentations, that solutions can be implemented most effectively on a local level through the targeting of small watersheds, and partnerships between local and state entities when local government is fully committed to the project.

During the afternoon session, Ag. Team members grouped critical agricultural concerns into seven "issue areas". Those areas include: (1) Fragmented Understanding and Information Delivery, (2) Public Acceptance of Agriculture, (3) Complex, Contradictory, Uncoordinated Bureaucratic Policies, (4) Balanced Management Tools, (5) Total System Management/Work with Nature, (6) Achieving Financial Stability, (7) Cost of Change/Sustaining Agriculture Stability. Also during the May meeting:

- Peter Buesseler, DNR, gave a presentation on biodiversity and agriculture.

- Team members Mary Hanks, MDA's Energy and Sustainable Agriculture Program; Ron Kroese, Land Stewardship Project; Ralph Lentz with the Sustainable Farming Association of Minnesota; and Donald Wyse with the Minnesota Institute for Sustainable Agriculture, reviewed goals and current activities of their respective organizations.

- Team members developed a list of significant accomplishments and major setbacks of past efforts to balance economic prosperity and resource protection in agriculture.

- They also listed strengths and weaknesses of present efforts to move toward sustainable development in Minnesota agriculture.

- Team members listed threats and opportunities to developing future efforts toward sustainability in Minnesota agriculture.

- Members also listed 39 changes they expect to see occur in Minnesota agriculture in the next 10 years.

- Team members developed a draft "vision statement" for sustainable development in Minnesota agriculture.

- They also listed 11 "guiding principles" to be used as criteria, or guides, in developing strategies for sustainable development in Minnesota agriculture.

- The team began developing strategies for sustainable development in Minnesota agriculture. Eight different strategy areas were identified:
  (1) Stewardship (Education, Recognition, Incentives), (2) Systems Change,
  (3) Keep Farmers on the Land, (4) Rural Economic Development (Refocus Development, Diversified and Value-Added Agriculture), (5) Conservation Programs, (6) Linkages Between Urban and Rural, (7) Information Accessibility, and (8) Agricultural Research/Technology.

On July 19:

Individual team members and staff briefly discussed the June 21 joint meeting with the other teams and reported on the small group sessions they attended.

Team members each listed elements of the long-term vision they would like to see regarding agriculture's legacy for the next generation and agricultural changes during the next 20-50 years. Ideas generated by team members were grouped into five areas: (1) productivity and profitability, (2) healthy environment, (3) successful communities, (4) an agricultural industry is highly valued by society, and farmers are provided with full information to make decisions, and (5) farmer empowerment.

On August 10:

- Team members reviewed the 39 changes they expect to see occur in Minnesota agriculture in the next 10 years.

- Members began developing strategies for sustainable development in Minnesota agriculture. Eight different strategy areas were identified.

Summary of Key Discussion Points:

The International Planning Committee for a Sustainable Agriculture Summit being organized by Agenda 21: Sustaining The Earth Summit, a nonprofit organization, briefly discussed their efforts with the team. The Sustainable Agriculture Summit will be held in the Twin Cities in June of 1994. Miguel Angel Nunez from Venezuela provided the Team with an overview of agriculture in his country and some current sustainable agriculture efforts in Venezuela. Mr. Nunez stated that the rural population is now only 7% of the total population and intensive agriculture hasn't solved the country's problems. He indicated that sustainable agriculture is becoming more important in Venezuela because in his country, attempts to follow IMF Agricultural Policies have created enormous distress and dislocation. Don Mooers, Volunteers in Overseas Cooperative Assistance (VOCA) discussed agriculture in Russia. Mooers said the Russian government has kept food prices down, so farmers have had to cut inputs, whereas before, the inputs cost nothing. He stated that consumers are distrustful of traditionally raised food and are looking for alternatives. Another major problem in Russia is lack of an adequate food distribution system.

Team members reviewed and revised the draft vision statement. The 11 principle statements were also review-resulting in no changes.

Team members each listed strategies or actions that could be taken to help achieve the future

vision for Minnesota agriculture. Individual strategies were then listed and grouped according to similarities. Eight different strategy areas were identified: (1) recognition of stewardship, (2) assistance programs to attract and keep farmers on the land, (3) incentives for rural economic development, (4) diversified and value added agriculture, (5) strengthen conservation programs funding/flexibility, (6) educate society on the value of agriculture, (7) improved information accessibility, and (8) stimulate agricultural research and technology.

On September 7:

- Team members reviewed the vision statement. They also broke into small groups to continue to develop the strategies.
- Members developed "activities" for strategy areas.

On September 21:

- Team members continued to develop the activities for the strategy areas.

On October 18:

- Teams met in an all-team session in the morning to discuss cross-cutting issues.
- The team discussed those cross-cutting issues, and how they related to the team strategies and activities.

On November 15:

- Teams met again in an all-team session in the morning to discuss cross-cutting issues.
- Team members continued to develop the activities for the strategy areas and revised the format for the strategies section.

On December 14:

- Team members completed the development of the strategies section, and completed their work as a team.

CONTEXT

The text for this section was reprinted, with some editing, from parts of the Minnesota Agriculture Background Paper, prepared for the Sustainable Development Initiative.

Agriculture is an extremely complex industry. It involves management of a large amount of land and operates on very narrow financial margins. Agriculture is extremely diverse. Each crop or livestock enterprise presents a different challenge to the farm operator and calls for unique management practices. Seldom do two farmers have the same operation.

Agriculture has been both the object of criticism and the source of innovation in the sustainable development area. This is in part because the success of agriculture from the very beginning has been highly dependent on natural resources. If soil is washed or blown away, if there is inadequate water, or if pests overtake crops, agriculture cannot sustain itself. Each such event directly impacts survival of a family farm. Throughout its history agriculture has evolved by introducing new farming techniques and land management practices.

The concept of sustainable agriculture has been around for a long time as a movement within the agriculture community. This movement has continually brought to the forefront the issues of sustaining agriculture from an economic, social and environmental perspective.

Current Sustainable Efforts In Agriculture

In an effort to keep this paper brief and readable, this section contains only a sampling of federal, state and local government programs and activities directed at making agriculture more sustainable. It does not include the numerous efforts of private and nonprofit groups, and innovative programs from other states.

Federal Programs

Conservation Reserve Program. The Conservation Reserve Program (CRP) is the most significant environmental initiative taken by the federal farm programs to date. Authorized under the 1985 Food Security Act and re authorized by the 1990 Farm Bill, the CRP has markedly reduced soil erosion, its primary objective, and has redressed the imbalance of row-crop lands to grasslands. It has reduced off-site effects of agriculture (especially sedimentation), improved water quality, enhanced fish and wildlife habitat, supported farmers' income and reduced surplus farm commodity production. Minnesota currently has approximately 1.9 million acres enrolled in the CRP. Initial CRP contracts will expire in 1996. Elimination of the CRP has been proposed as a cost saving measure in federal budget reduction discussions. In a national survey, a sizable portion of CRP contract holders indicate they intend to return those idled acres to annual crop production under a conservation plan, if the program is terminated. Historically, experience with the Soil Bank Program of the 1956 Agricultural Act indicates the majority of contracted land will be returned to previous management practices. Since the CRP was targeted to highly erodible lands, emergence of land from the program poses a public policy question. A good portion of total CRP lands in Minnesota are of critical importance to preserving soil and water resources. It is important that these lands be identified.

Other Programs. On the national level, such programs as the Soil Conservation Service's Special Practice 53 (SP35), provide farmers with cost-sharing incentives to encourage adoption of farm management systems which incorporate the use of Integrated Pest Management (IPM) and nutrient management practices. SP53 requires participants to follow an Integrated Crop Management (ICM) farming system to demonstrate the use of crop management measures which

minimize the amount of pesticides and/or nutrients used on the farm while maintaining farm income. The ICM system must target a reduction in pesticide or nutrient applications on the land of at least 20%. Minnesota has SP53 projects in 11 counties, which are also involved in the Anoka Sand Plain Water Quality Project. The Anoka Sand Plain Water Quality Project is a cooperative effort of the Agricultural Stabilization and Conservation Service, the Minnesota Extension Service, the Soil Conservation Service, and the Soil and Water Conservation Districts in the 11-county Anoka Sand Plain area. Six townships in Olmsted County are also participating in the SP53 Program.

The Sustainable Agriculture Research and Education Project (SARE), which is administered through the USDA Cooperative State Research Service, is another federal grants program designed to make farming methods safer for farmers and consumers and harmless to water supplies and the environment. SARE-related research was funded at $6.7 million in 1992. The project promotes good stewardship of the natural resource base and better understanding of sustainable agriculture. It facilitates scientific investigation through partnerships among farmers, environmentalists, scientists, educators, agribusinesses, nonprofit organizations and government. In 1990 and 1991, Minnesota received $226,953 in SARE funding for four projects, two at the University of Minnesota and one each at the Land Stewardship Project and the Rodale Institute. All four projects involve, in part, research on or implementation of IPM strategies in crop or animal systems.

State Programs

MDA Sustainable Agriculture Program. The Minnesota Department of Agriculture's Energy and Sustainable Agriculture Program (ESAP) was initiated in 1987 with Exxon Oil Overcharge Funds and the duties defined in the 1989 Groundwater Act to address concerns about the impact of conventional agricultural practices on farm profitability, health and the environment. The purpose of the program is to demonstrate and promote alternative practices which are energy efficient, environmentally sound, profitable and which enhance the self-sufficiency of Minnesota farmers.

The ESAP provides grants of up to $25,000 to fund on-farm research and demonstration projects to develop more environmental and profitable farming practices. A $1 million revolving loan fund was set up in 1988 to provide low interest equipment or improvement loans to farmers to aid in their transition to sustainable agriculture practices. The ESAP provides information and education through a variety of publications, on-farm demonstrations and training sessions. In 1992, the ESAP initiated the Mentor Program, which connect novice farmers and farmers who want to make a transition to sustainable practices with experienced sustainable farmers.

MDA Agricultural Land Preservation Program. In 1984, the Minnesota Legislature adopted the Agricultural Land Preservation Policy Act to preserve farm and forest land and guide nonfarm growth to the most appropriate locations. After beginning as a pilot program with five counties (Douglas, Kandiyohi, Waseca, Winona and Wright) in 1986, the Agricultural Land Preservation Program became available to all counties (except those within the Twin-Cities metropolitan area, which are under a similar program entitled the Metropolitan Agricultural Preserves Program).

This program provides technical assistance to counties in preparing Land Use/Agricultural Land Preservation Plans and official controls implementing the plans. After approval of the plan and official controls by the Commissioner of Agriculture, property owners in agricultural zoning districts can file restrictive covenants on their land, creating an "Agricultural Preserve" which further restricts the land's use exclusively to agriculture or forestry. Property owners filing covenants receive a $1.50 per acre per year property tax credit, plus other benefits, such as limitations on local government's ability to annex the property and assess it for nonfarm public improvements.

MDA Fertilizer and Pesticide Programs. Under the Comprehensive Groundwater Protection Act of 1989, the MDA is charged with protecting water resources from agricultural chemical contamination and to prevent degradation. MDA's Agronomy Services Division is responsible for regulation of pesticide and fertilizer mixing, loading, storage, sales and application. It also administers the only program in the United States which provides reimbursement for cleanup of pesticide fertilizer spills or incidents. The Agricultural Chemical Response and Reimbursement Account uses surcharges on pesticide and fertilizer licenses and registrations to support a fund which can provide reimbursement for cleanup costs up to $189,000 per incident. The division has also developed voluntary Best Management Practices (BMP's) for nitrogen fertilizer and atrazine.

MDA Plant Protection Division. The MDA's Plant Protection Division serves and protects farmers, businesses and consumers with a wide variety of programs. The Plant Pest Survey, Detection and Biological Control Program monitors the incidence, distribution and potential damage to Minnesota crops by insects, plant diseases and weed pests. Monitoring also includes surveys for naturally occurring biological control agents. Biological control of the European Corn Borer, using egg and larval parasites, has reached a significant point, leading to the development of implementation strategies. Information generated by state-coordinated surveys, detection and biological control activities are published in the Minnesota Pest Report during the growing season.

The Apiary Program is responsible for detection and control of diseases and pests of honeybee's. The Nursery Inspection Section inspects and certifies all perennial nursery stock offered for sale as apparently free of dangerous pests and diseases and in a healthy, vigorous growing condition. Certification allows free movement of stock into other states and Canada. The Fresh Fruit and Vegetable Inspection Section provides voluntary shipping point and terminal inspection to assure proper grade and condition of fresh fruits and vegetables.

MDA RFA. The MDA's Rural Finance Authority (RFA) was created in 1986 to "preserve and develop the state's agricultural resources." The RFA provides financial assistance to beginning and, in some cases, established farmers through programs that offer low interest rates. To date, the RFA has helped nearly 400 beginning farmers purchase agriculture property. The "Aggie Bond Program" is a cooperative opportunity for the state to utilize a federal program to assist beginning farmers and agricultural enterprises. Based on tax-exempt bonds, the interest rate on these loans is from 1.5% to 3% below the rate normally available. The RFA also has a direct loan program for manufacturing grade dairy farmers who want to upgrade to Grade A.

BWSR Programs. The Board of Water and Soil Resources (BWSR) operates several programs which assist farmers in improving soil and water conservation efforts on their land. The BWSR provides funding to local Soil and Water Conservation Districts to cost-share with landowners on projects which directly reduce soil erosion. The BWSR implements the Reinvest in Minnesota (RIM) program, which enables farmers to retire certain marginal lands from agricultural production through the purchase of conservation easements. The BWSR has an abandoned well sealing and inventory cost-share program. The BWSR also coordinates the implementation of local water planning and the Wetlands Conservation Act by local units of government. To assist with the preparation and implementation of local water plans, the BWSR provides matching grants to local units of government.

MPCA Feedlot Program. The Minnesota Pollution Control Agency's (MPCA) Feedlot Program was established in 1971 to address pollution related to feedlots. That program requires feedlots of over 10 animal units to be covered by a permit for new facilities, expansion or modification of existing facilities. Also, a permit is required when investigation of a complaint reveals a pollution problem. The MPCA can delegate the permit authority to counties for feedlots containing fewer than 1000 animal units. To date, 26 counties have assumed permit authority under the program.

Minnesota River Assessment Program. The Minnesota River Assessment Program (MnRAP) which began in July 1989, is now being completed. The focus of that program will soon shift to developing an implementation plan to address non point and other pollution (i.e. Minnesota River Implementation Program or MnRIP). A major finding of MnRAP was that non point pollution from agriculture runoff is one of the significant contributors to contamination of the Minnesota River.

Agriculture has a large stake in any remedial or preventive efforts undertaken in the watershed. Counties that lie entirely or partly in the watershed form a significant part of Minnesota's agricultural base. According to 1990 data, about 35% of all land in farms and 1/3 of all farms lie in these counties. Approximately 1/2 of all farm receipts from crops and 1/5 of receipts from livestock were accounted for by these farms. Nearly 1/2 of all hogs and 1/4 of all dairy and cattle raised in Minnesota come from these 28 counties.

Resolving agricultural non point pollution will involve 28,000 individual producers, all with varying resources and management styles requiring decisions to be made independent of one another.

Minnesota Institute for Sustainable Agriculture. In February, 1992 the University of Minnesota formed the Minnesota Institute for Sustainable Agriculture (MISA) to serve as a catalyst to focus and invigorate University efforts toward sustainable agriculture. The Institute is developing a model curriculum on sustainable agriculture for post-secondary educational institutions. It outlines research priorities and provides grants for research on sustainable agriculture and plans to hold sustainable agriculture conferences for academic researchers, farmers and interested citizens.

Minnesota Agricultural Experiment Station (MAES) organizes and supports faculty and staff from the University of Minnesota's Colleges of Agriculture, Natural Resources, Human Ecology, Veterinary Medicine, and Biological Sciences. These scientists conduct research on production, harvesting, processing, quality and marketing of food and other agricultural products as well as on forest and forest products, human nutrition, family and community life, recreation and tourism and overall environmental quality to citizens of Minnesota.

Minnesota Extension Service. The Minnesota Extension Service (MES) is a major outreach arm of the University of Minnesota offering relevant, research-based, non-formal education to people throughout the state. The MES mission is: "to involve people in improving the quality of life and enhancing the economy and the environment through education, applied research and the resources of the University of Minnesota." The MES has staff in each county which works closely with farmers and other local citizens to improve the farm economy while protecting the environment.

Local Government Initiatives

Land Use Planning and Development Controls. During 1991, a survey of county zoning administrators obtained information on building permits in rural areas, comprehensive plans and official controls for the 80 counties located outside of the Twin City metropolitan area.

Of the 80 non metropolitan counties, 55 (69%) have prepared and adopted comprehensive or land use plans. Of those 55, 39 had adopted plans prior to 1980. Of these 39 early plans, 12 have been updated and 7 are currently being updated. When those are completed, 35 of the 80 counties (44%) will have plans prepared or updated since 1980.

Of the 80 non metropolitan counties, 62 (76%) have countywide zoning. Forty-two had adopted their ordinances prior to 1980. Thirty-one have been updated since 1980 or are in the process of being updated. Of the 62 with zoning ordinances, 28 use density standards as a method of protecting agricultural land. The most common density standard used calls for one nonfarm

dwelling per 40 acres (17 counties). Four counties have density standards more restrictive than 1/40, and seven have density standards less restrictive. Minimum lot sizes vary from .2 acres (10,000 square feet) to 15 acres. According to the County Land Use Survey, 69 counties have adopted subdivision regulations and 53 have ordinances regulating the construction of septic systems. Three counties have adopted agricultural soil erosion control ordinances.

Local Water Plans. With enactment of the Comprehensive Local Water Management Act by the Minnesota Legislature, counties were given authority to adopt local water plans, under the coordination of BWSR. The Act provides direction for development of plans and funding to assist with cost. The purpose of the water plans is to "(a) identify existing and potential problems and opportunities for the protection, management and development of water and related resources; and (b) develop objectives and carry out a plan of action to promote sound hydrologic management of water and related land resources, effective environmental protection and efficient management". To date, all non metropolitan counties have either completed or are nearing completion of the plans. Funding has been provided for implementation of the plans, and most counties are now actively implementing their plans.

Soil and Water Conservation Districts. County Soil and Water Conservation Districts (SWCD) implement a variety of conservation programs at the local level. SWCD's coordinate federal, state and local technical assistance and cost-share funds to conserve soil and protect water resources. SWCD's provide assistance to landowners in developing plans to control soil erosion from construction sites, farms and public lands. Tree planting programs, flood control practices, drought management and other land cover programs are implemented by the local SWCD. SWCD's also develop and carry out educational programs focused on preserving local soil and water resources.

ISSUES OF SUSTAINABLE DEVELOPMENT OF AGRICULTURE IN MINNESOTA

SUSTAINABLE. DEVELOPMENT IN AGRICULTURE CRITICAL ISSUES LISTING

What critical issues and topics need to be the focus of a relevant dialogue about sustainable development in Minnesota agriculture?

A. Fragmented understanding and information delivery

Specific issues suggestions:
- Improve communication, e.g. nitrogen report
- Computer bulletin boards
- Need one-on-one communication and education
- Communication, information and education factors affect all issue areas

B. Public acceptance of agriculture

Specific issues suggestions:
- Agriculture socially acceptable
- Initiation of a land ethic through education; "whole" system recognition, values of stewardship
- Socially acceptable agriculture

C. Complex contradicting uncoordinated bureaucratic policies

Specific issues suggestions:
- Agency cooperation with local government units; MDA, MPCA, DNR, BWSR, SCS and ASCS; can they work together or should they be under one new super agency?
- Cooperation by federal, state and local agencies; the biggest fear among producers is that there will be three separate sets of regulations and recommendations to follow. We must strategize for cooperation among agencies at all levels.
- Consistency in final recommendations; when farmers comply with rules and regulations, don't change the rules of the ball game.

D. Balanced management tools

Specific issues suggestions:
- Emphasis on education and voluntary adoption; education and voluntary efforts organized at a local level with support from federal, state, and local agencies seems to be the best alternative. Use of enforcement such as fines, prison and restrictions only in very severe violations where intent by producer can be verified. U.S. Fish and Wildlife Service and other groups are a threat of enforcement

E. Total management; working with nature

Specific issues suggestions:

- Ecosystem based management
- Holistic integrated farm management plans; instead of presenting a "recipe" for successful farm management, assuming applicability to most farms, understand the uniqueness of each farm operation and the myriad options and opportunities available. No "one plan fits all". Plans based on quality of life production and landscape goals of the producer and his family.
- Ecological based management
- Deal with systems, not just a single factor focus
- Environmentally sound practices; must identify crop and livestock production' practices that are acceptable from an environmental standpoint and those that are not. We must differentiate between "facts" 'and the "rumors' or "'perceived facts" in making these determinations.
- Biodiversity; focus on importance of biodiversity on ecosystem level, farm landscape, soil biodiversity as well as crop, livestock, wildlife, etc. How do we increase biodiversity and maintain economic viability.
- Go for the long-term. Develop long-term goals and visions; develop a vision for Minnesota and base decisions on whether a recommended action moves Minnesota toward the goals or visions.
- Determine what is the workable management unit for agriculture
- Use solar-based farming approaches in anticipation of the end of cheap oil
- Total resource management; people management, energy, biological diversity, maximum voluntary input, land-use diversification, education, whole system recognition
- Plant diversity improves farming; e.g. rotation decreases pest problems and legumes decrease nitrogen input
- One-on-one management; farmers and trusted advisor develop and maintain implementation techniques to address environmental and other issues
- Livestock dispersal
- Reward the good stewards

F. Achieving financial stability

Specific issues suggestions:
- Value added niche marketing
- Integrated non animal systems for energy
- Farmers capturing more farm-based wealth (value added)
- Small cooperative marketing groups
- Economically viable alternatives; we must give producers alternatives that are adaptable and are economically viable. Solution must meet these criteria for a large number of producers and not a small select group.

G. Cost of change; sustaining agricultural stability

Specific issues suggestions:
- Who pays the bill for problems?
- Remain economically viable and competitive in world market
- Maintain profitability in order to sustain comparable quality of life
- Investment in alternatives
- Maintaining productivity while protecting environment
- More young farmers; develop ways to pass down farms to the next generation

AGRICULTURE TEAM VISION FOR SUSTAINABLE DEVELOPMENT

Agriculture in Minnesota will continue as a primary contributor to the state's economy and will be in harmony with the environment as it provides a meaningful living for farmers and produces food and other products. Society will place a high value on agriculture and the natural world. Our legacy to future generations will be threefold: a healthy farming economy, vigorous rural communities and a healthy natural environment.

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. We will have an ethic of stewardship, not only over the land but also towards natural systems and natural resources. This ethic will result in rich soil, clean water, clear air, diverse biological systems and productive wildlife habitat. Inherent in this ethic is societal trust in the individual farmer to creatively implement this ethic of stewardship on the land. All Minnesotans will understand the unique demands and environmental costs of agricultural production.

Agriculture will be sustainable only if farmers are able to make a profitable living on the land and young people are encouraged to enter farming. Enough farms will exist to support a network of thriving, economically diverse rural communities. These communities in turn will provide the social, economic, physical and cultural infrastructure to sustain agriculture. Productive farms and thriving communities will create new opportunities for increased rural populations exhibiting a wide range of ages, talents and lifestyles.

To make this vision for sustainable development of agriculture a reality, we will develop strategies to reach this goal and principles to guide us on the way.

AGRICULTURE TEAM GUIDING PRINCIPLES

A. Sustainable development of agriculture must use production methods which result in the opportunity for on-farm profitability.

B. Sustainable development of agricultural practices and processing must be environmentally sound.

C. Sustainable development of agriculture must be an appropriate fit with the social fabric of the community.

D. Sustainable development of agriculture needs to be based on a range of information and experience, including research.

E. Community-based needs must drive the directions of research and education in relation to the sustainable development of agriculture.

F. Sustainable agriculture must be rewarding; the term "reward" includes such concepts as personal value, money, and societal benefits within the definition.

G. Sustainable development of agriculture treats plants and animals well and nurtures wildlife.

H. Sustainable development of agriculture sustains the farmer on the land and the environment.

I. Sustainable development of agriculture depends on the continued existence of viable rural communities.

J. All individuals involved with the sustainable development of agriculture must be treated fairly.

K. It is appropriate to educate the general public, including farmers, in regards to all aspects of farming.

STRATEGIES FOR ADDRESSING ISSUES

Minnesota Sustainable Development Initiative
Agriculture Team

Goal 1. Achieve a healthy, natural environment by fostering stewardship of our soil, water, air, and wildlife resources.

Strategy Components:

1. In order to promote a stewardship ethic toward land and people, integrate on-farm profitability, environmental health, and quality of life for the family and communities into educational programs.

   a. Reorient existing ag education programs to reflect this integrated concept.
   b. Fund hands-on educational opportunities to enable agencies, non-profits or other groups to implement community-identified educational programs such as: on-farm research and demonstration, farmer-to-farmer networks, grazing or marketing clubs, etc.

2. Identify and recognize good stewards.

   a. Joint recognition by MDA and MES of the Sustainable Farmer of the Year.
   b. Recognition of farm stewardship practices by the media, SWCDs (Conservation Farmer of the Year, awards from farmer and commodity organizations.

3. Fund incentives for stewardship practices by rewarding the stewards as well as encouraging better stewardship.

   a. Allow flexibility in state and federal conservation programs
      - Link implementation of programs to watershed-areas or eco-regions
      - Find an appropriate funding strategy for the long term
      - Set priorities for Federal and State conservation programs at "grass roots" level (e.g. Tie locally developed stewardship ratings to the federal farm program payments.
      - Allow acres in conservation practices (e.g. shelter belts, native planting, farm forests) to be counted as set-aside acres and provide penalties for destroying those same practices.

   b. Consider new innovations and new approaches to encouraging stewardship of land, natural systems and natural resources.
      - Property tax credits and easements for maintaining practices or habitats, and or maintaining abandoned farm sites in a non cropped status.
      - Consider opportunities to cost share and other viable options
      - Encourage research to gain new information
      - Encourage farmers and local regulators to talk to each other.

   c. Reauthorize and fund state and federal conservation programs.
      For Federal programs:
      - Prioritize land for long-term set aside.
      - Identify "stages" for what should be done for certain vulnerable lands.

- For future contracts, stipulate land use when contract expires (outcomes more than practices).
- Stipulate that certain marginal land cannot be returned to production.

For State programs:
- Fund state conservation programs (e.g. RIM)
- Create revenue.

Goal 2. In order to develop an environmentally sound, economically viable and socially acceptable agriculture, encourage systems changes.

Developing a sustainable agriculture is both a goal and a process. Critical parts of the process emphasize long-term considerations and dialogue which include direct participation by local communities, farmers, non-profit organizations, industry, government and educational institutions. To effectively carry out the strategies outlined below requires fundamental systems changes by all involved. The following strategies provide several specific steps toward developing a sustainable agriculture.

Strategy Components:

1. Develop models that involve all people in the dialog and decision-making, resolving local, state, and national public policy issues.

2. Identify ways to assist private sector to adjust to sustainable development initiatives: networking; innovation with small businesses; local involvement; linkages to connect private sector, government, and public education (such as AURI).

Goal 3. Keep people on the land and encourage young people to enter farming in order to support a network of economically diverse rural communities.

Strategy Components:

1. Encourage FmHA, MDA and others to develop an integrated beginning farmer program that addresses the social barriers faced by perspective farmers as well as the financing and sustainable management and skills required for success.

2. Develop innovative methods to facilitate intergenerational transfer of farms that provide a win-win situation for the seller and buyer.

3. Keep productive farmland near cities in farming through innovative growth management.

4. In order to keep farmers on the land, make community driven economic opportunities available. See **Rural Economic Development Strategies (Goal 4).**

5. Evaluate federal, state, and local laws for impact on property rights, both individual and public.

Goal 4. Insure vigorous rural communities that provide the social, economic, physical and cultural infrastructure to sustain agriculture.

Strategy Components:

1. Support agricultural production.

a. Provide flexibility, expanded options and incentives with less regulation.
   - Give tax credits for natural areas, wetlands and wildlife habitat.
   - Revise environmental laws for greater flexibility, allowing for site specificity and greater choice of options.
   - Exempt sales tax or provide tax credit on pollution control and abatement equipment.
   - Shift property tax to reflect services rendered.

b. Encourage diversified production.
   - Develop specialty crops
   - Expand animal agriculture
   - Encourage and support market driven, niche production.
   - Fund the research and development of new products such as products from waste recycling and composting (e.g. AURI, cooperative efforts)

2. Refocus community development.

   a. Provide incentives for multi-community cooperation such as Prairie Visions.
   b. Explore local joint power agreements between government units; increase funding for programs that encourage joint agreements; increase state and federal initiative that encourage joint agreements (e.g. encourage cooperation among educational facilities, industry, AURI, DTED, MDA and MES)..
   c. Develop telecommunication "highway" system keeping in mind cost, quality, etc.
   d. Explore recreational opportunities and community centers.
   e. Gather groups and information regarding strategic planning at community level.

3. Develop industry in rural areas.

   a. Promote value added processing plants.
   b. Explore creative financing to assist small business start-ups and expansions.
   c. Expand farmers markets in rural areas.
   d. Expand agricultural technical and service training in rural areas including the use of private/public partnerships.
   e. Provide tax incentives for industry to move from urban to rural areas.
   f. Use resources such as "Advantage Minnesota."

4. Promote agriculture.

   a. Market the benefits and responsibilities of living in rural areas.
   b. Use public relations to show the good things that are happening in farming.
   c. Market the benefits of locating in rural Minnesota to industry.
   d. Design creative pilot programs for rural development and advertise the successes.
   e. Intensify agriculture presentations by farm groups at the legislature, county commissioner and rural development commission meetings working throughout the state.
   f. Coordinate rural economic development agencies and organizations by region.

5. Encourage cooperation and coordination between efforts in promoting agricultural sustainability.

Goal 5. To provide the cultural infrastructure to sustain agriculture, increase the linkages between urban and rural people.

Strategy Components:

1. Include information on the importance of agriculture in public education and other units of

local government.

a. Integrate agriculture into on-going K through 12 school curricula - social sciences, natural sciences, math, language arts, etc. - building partnerships among the Departments of Education and Agriculture, industry, and farm organizations.
b. Re-design education programs, at all levels, to meet the career needs of agriculture in the future.

2. Fund rural and urban dialogues in many forms.

a. Exchange people of different ages between communities, churches and schools.
b. Sponsor joint events involving urban and rural people such as agriculture industry day targeted to urban audience.
c. Initiate projects involving urban and rural resources such as composting yard waste on farms, forming Community Supported Agriculture farms, etc.
d. Encourage and promote farm recreation opportunities by reducing barriers from the Department of Health and from the cost to cover liability for farm vacation businesses.

3. Increase grassroots involvement in public policy discussions and process.

a. Encourage agriculture organizations to form linkages to groups working in other social issues.
b. Present agriculture issues workshops for new legislators as part of orientation.

4. Expand knowledge of agriculture by local, state, federal and university personnel.

Goal 6. Make information accessible to farmers so they can creatively implement sustainable production.

Strategy Components:

1. Fund training, by appropriate entity, for farmers in the use of computer networks.

2. Facilitate interpretation and application of facts and research through existing (e.g., MES, MISA etc.) and new delivery systems.

3. Encourage apprenticeships for consultants with farmer networks.

4. Support the consulting industry through increased educational opportunities.

5. Provide continuing baseline funding for farmer-to-farmer network associations.

6. Hire an ombudsperson to assist producers for regulatory, marketing and production information at the MDA to also promote coordination among local, state and federal agencies.

Goal 7. Support agricultural research and technological development that bolsters healthy profitable farm families, vigorous rural communities and a healthy natural environment.

Strategy Components:

1. Emphasize change in agricultural research to recognize the interconnected and interdependent natural system and the need for whole farm research focus.

a. Increase state and federal funding of research initiatives that reflect this change in focus.
b. Bring people together to talk about research needs and availability.
c. Base research on the needs of people in an area.
d. Provide continuity of funding for research with a long-term focus.
e. Develop a team approach (which includes farmers) to the process of identifying research needs, planning the research and the method for disseminating the information.
f. Require information on how research affects a number of different issues.
g. Increase citizen level involvement in the early stages of formulating basic research.

2. Develop policy and fund research on environmentally friendly agriculture inputs.

   a. Integrate high yield farming economies with sustainable farming and profitability and quality of life.
   b. Provide continuity of funding.
   c. Disseminate the results from socially acceptable research to a broad audience.
   d. Monitor research on an on-going basis to make appropriate changes as we discover more; monitor to see if we are having the intended impact and moving toward the benchmarks.
   e. Before research or technologies are initiated, determine their sustainability by applying the SDI agricultural sustainability vision and principles.

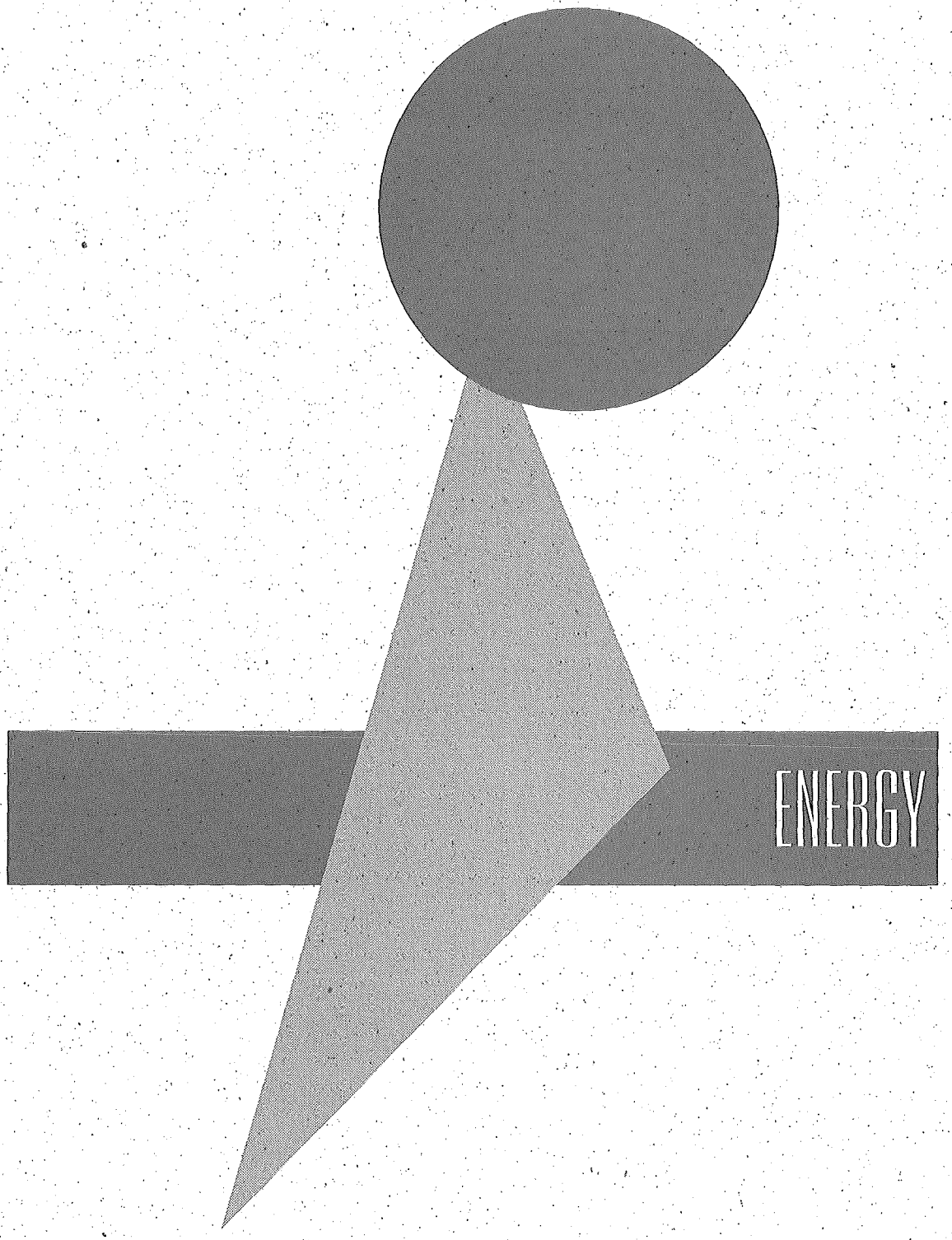
3. Fund research and development of renewable energy sources.

   a. Shift from fossil fuels to more renewable sources of energy.
      - Conduct appropriate research on sustainable production and marketing of biomass crops.
      - Integrate research efforts with other sustainable areas (e.g., disease and pest management).
      - Fund research on how to meet local energy needs with locally available supplies and resources.
      - Require information on how new energy sources might affect other sustainable development issues.

   b. Reduce energy consumption.
      - Generate more solar wealth with lower inputs.
      - Evaluate the current societal distribution and consumption patterns and what it would take to build a renewable-based system.
      - Focus on end-use research.

CROSS-TEAM ISSUES, PRINCIPLES AND STRATEGIES

The main issue identified in this process as a "cross-team" issue is non-farm development in rural areas. The issue was identified in one of the "all-team" meetings when members of the Agriculture Team and the Settlement Team actually disagreed over the meaning and impact of this issue. A subsequent meeting of some members of each team to discuss this issue resulted in agreement that this issue has significant implications for both agriculture and the rest of society. Both groups identified a need to examine the impacts of rural development and develop policies and programs to ensure that this development occurs in an orderly and cost-effective fashion.


ENERGY

Final Report

ENERGY TEAM

Minnesota Sustainable Development Initiative

January 6, 1994

Energy Team Mission

"To more effectively use energy and choose energy systems or alternatives to meet Minnesota's present and future needs, while reducing adverse effects on the environment and economy"

Energy Team Members

Henry Savelkoul, Co-Chair
Linda Thrane, Co-Chair
Elliott Bayly
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Roger Head
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INTRODUCTION

SUSTAINABLE DEVELOPMENT INITIATIVE

The Sustainable Development Initiative (SDI) was inaugurated by Gov. Arne Carlson and the Environmental Quality Board (EQB) on Jan. 29, 1993. Building on the Minnesota Milestones and the Economic Blueprint for Minnesota, the initiative's mission is to explore the means of "meeting the needs of the present without sacrificing the ability of future generations to met their own needs."

Gov. Carlson appointed seven, 15-member teams to explore issues in energy, agriculture, forestry, manufacturing, minerals, recreation and settlement. The teams have produced reports, including this Energy Team Report, to provide the basis for the 1994 Minnesota Congress on Sustainable Development. The Congress will support the EQB's adoption of an Environmental Strategic Plan, revision of the Economic Blueprint for Minnesota, and possible legislative and agency initiatives.

ENERGY TEAM MEMBERS AND STAFF

Energy Team members and their affiliations are:

Henry Savelkoul, Co-Chair	Peterson, Savelkoul, Schlichting, & Davies, LTD.
Linda Thrane, Co-Chair	Cargill, Inc.
Elliott Bayly	World Power Technologies
Dick Braun	U of M Center for Transportation Studies
Charlotte Brooker	Izaak Walton League
Pat Davies	Former Environmental Quality Board Member
Roger Head	Indian Affairs Council
Larry Johnson	Ethanol consultant
Gary Johnson	Northern States Power Company
Christine Kneeland	Legislative Commission on MN Resources
Mitch Pearlstein	Center of the American Experiment
Russ Susag	3M
Lillian Warren-Lazenberry	Former Public Utilities Commissioner
James Ulland	Nature Conservancy, MN Board of Directors

Each team is supported by a lead state agency and a number of advisors from other agencies. The Department of Public Service is the lead agency for the Energy Team. Agency staff and contacts are:

Mike McCarthy, Staff Team Leader	Department of Public Service
Terri Yearwood, Facilitator	Department of Natural Resources
John Hynes	Environmental Quality Board
Kathy Kramer	Pollution Control Agency
Gerry Larson	Department of Transportation
Rita Messing	Department of Health
Tim Nolan	Office of Waste Management
Patricia Newman	Department of Trade & Economic Development
Olin Phillips	Department of Natural Resources

APPROACH

The Energy Team met monthly from February through November 1993. The team began its process by reviewing information about energy supply, use, prices and related government regulation. Team members assembled and shared background information. Outside experts briefed the team on specific issues. By July, the team decided to establish work groups on transportation, electricity and heating to more directly involve staff and other outside parties to explore issues and case studies.

Team members realized early that 15 volunteers in 10 months could not completely address every issue possible during the next half century related to energy production, distribution and use. Instead, the team chose to focus on creation of a Vision Statement and Guiding Principles for policy decisions leading to sustainable energy development. Team members believe these will be of greatest lasting value with applicability to issues not yet before decisionmakers.

To provide illustration and explanation, critical issues were identified and a limited number of strategies were identified to address these issues. A few key case studies were examined to provide greater clarity, on a narrow scope. Discussion of critical issues, strategies and case studies also provided feedback for the team to refine and further develop its Vision Statement and Guiding Principles.

CONTEXT

ENERGY SOURCE AND USE TRENDS

In 1990, Minnesota spent $6.8 billion on energy. As shown in Figures 1 through 4, petroleum accounts for 35.4 percent of primary energy used in Minnesota, 49.4 percent of consumer end-use energy usage and 46.8 percent of consumer energy expenditures. Coal provides 28.4 percent of the state's energy, primarily for electricity generation which in turn accounts for 38.5 percent of energy expenditures. Natural gas provides 19.7 percent of primary energy, accounts for 26.8 percent of consumer end-use energy and 14.4 percent of consumer energy expenditures. Energy consumption grew

4.4 percent annually from 1960 to 1973, with annual expenditures growing at 6.4 percent. Following the price shocks and reduced consumption from 1974 to 1979, energy consumption resumed annual growth of 1.5 percent through the 1980's. Prices grew at 1 percent annually during the 1980s.

Figure 1: Primary Energy Use By Fuel Type

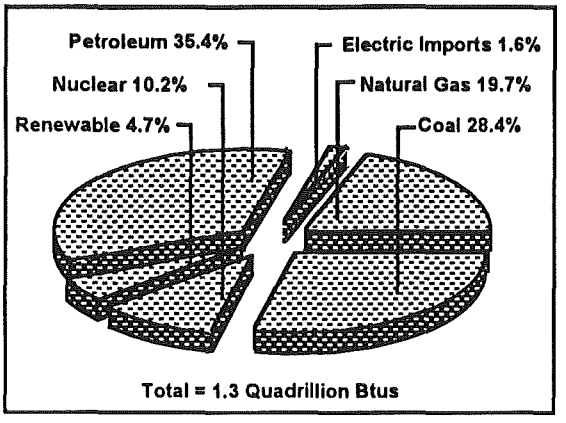


Figure 2: 1990 Consumer End-Use Energy Consumption

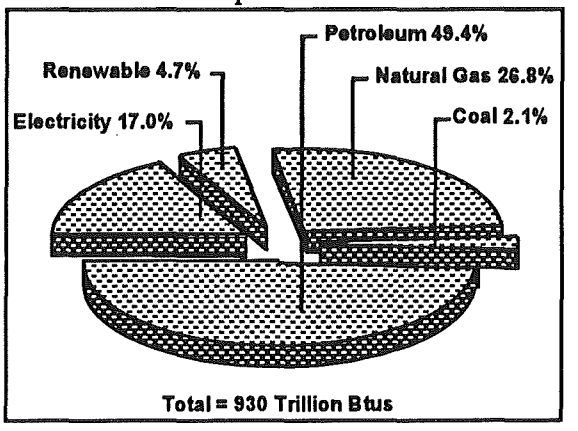


Figure 3: 1990 Consumer Energy Expenditures

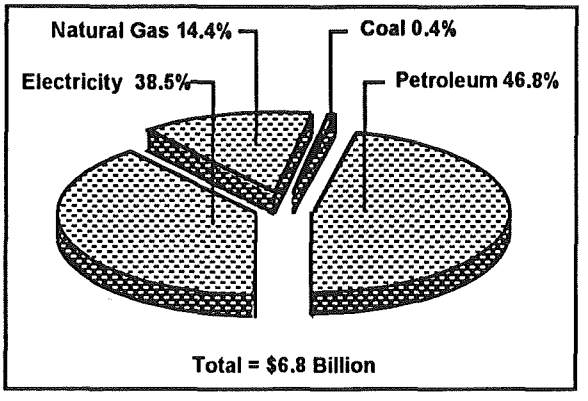
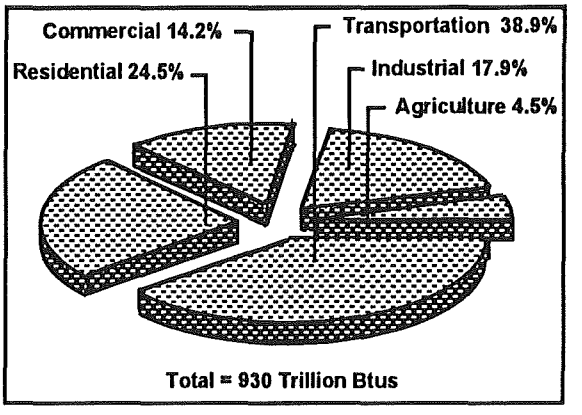


Figure 4: 1990 Energy End-Use By Sector



Energy end-use by sector is as follows: transportation, 38.9 percent; residential, 24.5 percent; industrial, 17.9 percent; commercial, 14.2 percent; and agriculture, 4.5 percent.

PROGRAM TRENDS

Both in private industry and in government, projects are being considered less in isolation and more in a broader context. State-regulated utilities are implementing "integrated resource planning," which addresses effects of components throughout the utility on overall economic and environmental performance. Similarly, government decisionmaking is increasingly linking economic, environmental and social effects.

Government is providing more latitude for parties to achieve a desired end result, specifying how to do so less often. An example of this is the U.S. Environmental Protection Agency (EPA) program for controlling air emissions related to acid rain. Instead of requiring power plants to install certain equipment, or to use certain fuels, utilities are left to select their own means to comply with standards that specify an end result. This provides incentives to be innovative and cost effective. Market mechanisms are increasingly relied on to carry out such initiatives.

Minnesota is also becoming more a part of competitive regional and national energy markets, and increasingly affected by national energy legislation and regulation. Petroleum has long been part of wider markets, but changes in federal law during the past 10 years are making natural gas and electricity part of such markets as well. The "unbundling" (separation) of natural gas production from its transmission and distribution began in the mid-1980s under order of the Federal Energy Regulatory Commission (FERC). At that same time, FERC began a process giving everyone equal access to interstate pipelines, allowing many buyers and sellers to bargain for gas sales. After many years of legal battles and regulatory proceedings, local natural gas utilities will complete implementation of this process during 1994. For the first time in half a century, both wholesale and retail natural gas buyers and sellers are dealing in a largely competitive market, with all its inherent risks and benefits.

The electric industry is following a similar path. Various FERC initiatives since 1987 began increasing wholesale competitive sales and providing greater access among utilities to their electric transmission lines. This process was greatly accelerated by Congress's passage of the Energy Policy Act (EPACT) of 1992. A key aspect of the act opened access of utility transmission lines to all parties (utility and non-utility alike) wishing to conduct wholesale transactions. Although many aspects of the EPACT are still being put in place by Federal agencies and industry, there is widespread consensus that a competitive electrical generation market is already emerging.

The Energy Policy Act of 1992 contains many other energy provisions in its 1,021 pages. Fifty provisions are directed at increasing energy efficiency (e.g., minimum levels for certain lighting, heating and air conditioning standards). Other provisions promote vehicles powered by electricity, ethanol, natural gas and other alternatives. These and other federal initiatives will affect availability of alternative fuels and technologies for transportation, electricity generation and the use of natural gas and electricity in Minnesota for many years.

ENVIRONMENTAL CONTEXT

In 1990, Minnesota's energy suppliers and utilities used over 1.3 quadrillion Btus of various primary energy types to provide 930 trillion Btus ultimately consumed by Minnesota's citizens. In the process 840,000 tons of carbon monoxide, 250,000 tons of nitrogen oxides, 350,000 tons of sulfur dioxide, 335,000 tons of volatile organic compounds and 157,000 tons of particulate matter were emitted. In addition, the use of coal and nuclear fuels results in solid waste requiring disposal. Electric transmission has raised concerns among some regarding electromagnetic fields, and stray voltage. The transmission of oil and natural gas through pipelines has land-use impacts, and the movement and storage of petroleum products carries some risk of spillage.

Energy use affects both the economy and environment of the state. Minnesotans need energy policies that balance and sustain both their need for a strong economy and a clean environment. To this end, the SDI Energy Team sought to construct a Vision and set of Guiding Principles to assist decision makers in this important, but difficult balancing.

DEVELOPING THE SUSTAINABLE ENERGY VISION

The Energy Team's Vision Statement underwent substantial revision four different times. Key to its development was the balancing of economic and environmental interests. Critical aspects of this balancing was recognition of two points. First, there are costs not incorporated into prices without government intervention. Second, potential choices that are too costly to be competitive will lack long-term public support as individuals and organizations make economic and political decisions. Many team members feared that government intervention could be misused to protect a polluter, or conversely, that unrealistic costs could be assessed on certain parties giving competitors an unfair market advantage.

Also important to the development of the Energy Team Vision was the recognition that there are both short-term and long-term aspects of the journey to a sustainable energy future. Accepting the need for a transition period will help avoid short-term economic mistakes that would ultimately undermine public support for the long-term process.

The role of population in Minnesota's sustainable energy future also was the subject of substantial discussion. Clearly population growth creates potential new demand for energy. But population growth also generates new sources of labor and creativity that can be applied to developing future efficient, clean energy systems. The state's population is growing slowly both from births and immigration. In 1991, the state's population was 4,431,361, up from 4,375,099 in 1990. The fertility rate stood at 1.9 percent in 1990, up from 1.87 percent in 1980. In 1991, 67,020 babies were born in

Minnesota and 7,461 immigrants moved into the state. In 1990, 68,000 babies were born and 6,627 immigrants moved to Minnesota. Thus the number of births is declining slightly and immigration is growing slightly.

Although the state's population growth is relatively small, the Energy Team stressed the importance of population control at the state, national and international level. It urged Minnesota officials to support state family-planning programs that give people the information and means to control the size of their families. It also urged that Minnesota strongly support international family-planning programs aimed at giving families throughout the world the same birth-control tools.

The team also discussed the importance of population distribution to the state's future energy needs. Higher population density lowers the per-person cost of capital-intense projects and minimizes many transportation needs. It also allows use of larger energy systems that provide economies of scale. That gives urban areas greater choice of energy systems, such as natural gas and electricity distribution systems, and the opportunity to develop alternative heating, electricity and transportation systems in the future.

However, population concentration also creates the need to transport energy to a central location, increases travel to outdoor recreation and concentrates solid wastes and air and water emissions. Thus future energy-facility siting decisions and urban planning must balance the benefits of sufficient population mass in residential and work locations to gain energy economies of scale, but also enable sufficient dispersion to provide proximity to renewable fuels and other resources. In rural areas, especially, residents need access to diverse sources of energy that suit their particular situation. Smaller scale energy systems, based on biomass, solar or wind, as well as small energy cogeneration facilities that draw from industrial sources, are especially appropriate.

Although most team members initially favored lowered energy use per person within Minnesota, later insights moved consensus away from this conclusion. New or expanded commercial activity within the state could produce products with great energy efficiency, but still increase Minnesota's total energy use to an extent that average use per person would rise. This would be particularly true for products that would be consumed outside of Minnesota. If new industry displaced inefficient, dirty production elsewhere, the regional or national environment could experience a substantial environmental benefit as a result. Such expanded energy use in Minnesota would enhance both the economy and the environment, precisely the goal of sustainable development. The case would be further strengthened if renewable energy was used.

ENERGY VISION STATEMENT
SUSTAINABLE DEVELOPMENT INITIATIVE

To secure our prosperity, and that of our children and their descendants, we must eventually create energy systems that meet our needs using only the amount of energy that can be renewed on a sustained basis. These systems shall rely on diverse energy sources that are accessible, affordable, renewable, reliable and that minimize or mitigate environmental degradation. Sustainability must permeate energy decisionmaking – by businesses, individual citizens and government. Minnesotans must be free to make economically and environmentally sound energy choices, helped by education, market-based price and supply information, and government policies.

Minnesota's livelihood, as well as public support for sustainable energy systems, depends on energy availability and affordability. Effective markets must continuously foster innovative, diverse and competitive energy systems by rewarding changes in production, distribution and consumption that respond to price signals. During the transition to more sustainable energy practices, Minnesotans will conserve nonrenewable supplies by using all energy with maximum efficiency and minimum damage to the environment. Prudent use will prolong the availability of traditional resources for future generations and for more essential or higher-value uses. Although Minnesota lacks fossil fuel reserves, it can gain economic benefits by adding value to its own renewable resources: wind, biomass, solar, and water. Government incentives that support research and help introduce new energy resources to the marketplace are appropriate.

Sustainable energy systems must enhance Minnesota's environment. Energy choices that degrade the environment impose costs that hurt the state's economy and quality of life and burdens future generations. Whether paid directly as cleanup costs, or indirectly as diminished health, productivity or opportunity, environmental degradation reduces our existing wealth and the potential for ourselves and our descendants to create new wealth. Sustainable practices will also encourage the responsible distribution and size of the human population and minimize negative effects on our communities and environment. Animal and plant habitat must be sufficiently protected to retain species.

Energy regulation by government must protect public health and safety, and the environment. New technologies and changing markets require government coordination among jurisdictions and regions to ensure that those who create costs do not shift them across borders or onto future generations. Government policies should not discriminate among states, products, suppliers or consumers. Minnesota must be a force in ensuring that sustainability is part of energy policymaking at the national and global level.

Truly sustainable energy systems must enhance both Minnesota's environment and economy. This vision is for Minnesotans today and tomorrow. Education, research and markets must encourage better use of traditional energy source for electricity, heat and transportation fuels, and promote the production and use of renewable fuels in Minnesota. Sustainable development must tap into all Minnesotans' desire to protect their legacy to their children. With a strong state commitment to sustainable energy production and use, Minnesota's natural beauty and prosperity will endure.

GUIDING PRINCIPLES FOR SUSTAINABLE ENERGY DEVELOPMENT

Developing Guiding Principles was much harder and time consuming than expected. Energy Team members extensively debated the role of government in energy markets, reliance on market mechanisms and competition, and the consideration of "externalities."

GUIDING PRINCIPLES FOR SUSTAINABLE ENERGY

Promote public education and acceptance of sustainable energy principles.

Reduce energy waste and enhance efficiency of energy production, distribution and use.

Encourage experimentation and innovation in alternative ways to produce, distribute and use energy.

Protect the environment. Prevent pollution. Minimize emissions, solid waste and adverse environmental consequences. Costs not considered by the market (i.e., externalities) will be considered through government processes insofar as they can be identified and measured.

Diversify energy supplies to ensure adequacy and reliability.

Discourage artificial boundaries to shared technologies and systems.

Encourage availability of reliable, renewable and nonpolluting energy sources. Remove disincentives for renewables.

Minimize transportation needs and energy use by more alternative human interaction and use of less energy-intensive means of transportation.

Energy prices and allocation will be determined by the market, reflecting a preference for self-regulating systems to government systems (minimum regulation). Government must prevent unfair market competition.

Government subsidies should be rare, short term and be directed to specific outcomes.

The cost of government regulation must not exceed its benefit.

Enhance Minnesota's economic competitiveness.

Consider present alternative, and subsequent, uses of land.

Minimize negative effects of human population growth on human communities and the environment. Facilitate population dispersion but encourage sufficient clustering to gain scale economies of energy, social and waste-management systems. Provide sufficient animal and flora habitat to retain species.

Avoid creating regional disparities through state and/or national taxes.

Improve lifestyle options.

Ensure public health and safety.

Public institutions should be examples.

Encourage voluntary initiatives.

Discussion of the role of government balanced a desire for minimum government intrusion against the need for a facilitator, or referee. The team readily accepted a role for government in protecting public health and safety. However, the extent and manner in which externalities should be considered continued to be a problem.

The team agreed that there are problems measuring externalities and that they could be considered in pricing to the extent they could be identified and measured. Some parties had argued that otherwise unregulated externalities should not be included in energy prices (e.g. cannot allocate Minnesota's share of the Gulf War). Others argued that government's explicit roles to incorporate external costs into prices since, by definition, markets do not.

ISSUES AND STRATEGIES:

Issue 1: How do we move Minnesota to less use of fossil fuels?

> **Strategy:** Promote conservation and efficiency. The state could directly and indirectly support research, information dissemination, and coordination among firms. Financial support may be appropriate to begin experimental or demonstration projects, but not for ongoing subsidies of facilities or industries. Laws and regulations should encourage cost-effective reductions in energy used in energy production, distribution and various consumer purposes.
>
> **Strategy:** Promote development and use of alternative energy sources. The state could directly and indirectly support research, information dissemination, and coordination among firms. Financial support may be appropriate to begin experimental or demonstration projects, but not for ongoing subsidies of facilities or industries. Laws and regulations should encourage cost-effective substitution of renewable energy sources for nonrenewable sources.

Issue 2: Present heating, electricity and transportation research does not focus on renewable energy or sustainable practices. How can we encourage research to lower the costs of renewable energy and sustainable practices?

> **Strategy:** Create state incentives for Minnesota companies to invest cooperatively in research and development of energy technologies or systems that improve fuel-use thermal efficiency or promote use of renewable energy. Company owners (including utility shareholders) should profit from successful research in these areas. Although cooperative research would be encouraged, Minnesota companies should retain equity in, or royalty rights to, research successes.
>
> **Strategy:** Provide incentive shareholder return for utilities which implement new cost-effective, renewable energy technologies, or efficiency practices, developed through its own research (or cooperative research sponsored by the utility).

Issue 3: Energy providers face a changing and uncertain regulatory framework.

Strategy: The state shall promote uniform standards throughout regional markets.

Issue 4: Transportation uses 39 percent of Minnesota's end-use energy. The goal is to move people and materials most efficiently. What alternatives might reduce single-occupancy vehicle use without significantly eroding mobility and convenience?

Strategy: Reduce the need to travel as often or as far. Encourage greater use of telecommuting, or four-day 40-hour weeks, and other measures which may reduce the need for commuting. Encourage mixed land use communities to place residential, work and recreational opportunities closer together.

Strategy: Within the transportation sector, focus on the efficient movement of people and goods, rather than the simple movement of vehicles. Coordinate with public and private parties to reach development location decisions compatible with transportation infrastructure. Examine enabling legislation and funding.

Strategy: Provide preferences for high-occupancy vehicle use. Such preferences may include, but not be limited to, parking advantages (e.g., cheaper, enclosed, or with electric outlets), exclusive use of designated lanes including metered ramp lanes during commuter rush hours, reduced tolls in the advent of toll roads, and other measures to be developed.

Strategy: Improve use of mass transit. Mass transit can be an energy saving alternative to personal cars. How can ridership be cost-effectively increased?

Approach: Improve comfort and convenience for mass-transit users.

Approach: Improve rider information (including more signage for routes, schedules and costs) and public-education programs.

Approach: Develop more suburb to suburb systems.

Approach: Improve interface with other forms of transportation.

Car--Increase use of park and ride facilities.

Bicycle--Place bike racks, or "pay for park" enclosures similar to airport luggage storage lockers, at bus stops, co-locate bike rentals, or transport bike with the rider.

Pedestrians-- Consider feeder vans directly connecting pedestrian traffic with main bus lines in residential neighborhoods and business areas during commuter rush hours.

Other mass transit-- Develop and encourage coordination with employer mass transit programs targeted to specific large facilities. Coordinate schedules and routes to connect with rail and air services. Provide adequate signage at all interface locations.

Issue 5: Of the 39 percent of Minnesota's end-use energy used for transportation, a substantial portion is used moving materials and products (i.e., nonpassenger travel). What alternatives might lower transportation energy use per unit of gross state product?

Strategy: Emphasize multimodal transportation for both metropolitan and Greater Minnesota that focuses on connecting different types of transportation. Such plans should consider direct economic, social and environmental effects. An example of an intermodal connecting point would be a site to load and unload semitrailers using railroad "piggy back" transport.

Strategy: Encourage water transport to play a larger role in Minnesota's multimodal transportation future. Waterway transportation is under-used, shifting material and product transport to highways and rail.

Approach: The state will take a stronger role in federal cargo preference rules and other laws and rules that are barriers to efficient commercial navigation in Minnesota.

Approach: Ensure that commercial navigation is included as an important element in Minnesota's multimodal transportation plan.

Issue 6: Present petroleum fuels for cars and trucks are nonrenewable, produced outside of Minnesota, and often imported from areas with substantial political and military risks. How can Minnesota move toward reliance on a renewable transportation fuel?

Strategy: Encourage use of ethanol as an alternative fuel and fuel additive. *This is a short-term strategy* since the ethanol industry is substantially further developed than many other alternative fuel industries. Continued state support is warranted through this industry's startup phase. Encouragement can be in several ways:

Demonstration projects -- The use of ethanol in various forms, vehicles and engines and circumstances will provide operating experience with which to make improvements and increase visibility to the public.

Supply production and distribution -- The state could provide planning and coordination support to businesses seeking to establish the supply infrastructure for ethanol fuels. In limited cases, short-term financial incentives may also be appropriate.

Research and development -- The state should encourage both university and industry research in alcohol production and use. The state could also provide business "incubator" services to firms in limited cases.

Strategy: Encourage the use of renewable vehicle fuels other than ethanol. *This is a longer term strategy,* which could include hydrogen or electricity driven vehicles. Encouragement can be in several areas:

Use demonstration projects -- The use of renewable fuels in various forms, vehicles and engines and circumstances will provide operating experience with which to make improvements, and visibility to the public.

Supply production and distribution -- The state could provide planning and coordination support to businesses seeking to establish the supply infrastructure for new renewable fuels. In limited cases short term financial incentives may also be appropriate.

Research and development -- The state should encourage both university and industry research in renewable transportation fuel production and use. The state could also provide business "incubator" services in limited cases.

Strategy: Encourage congressional action to increase gradually the nation mileage standard (the CAFE standard). Lowering fuel consumption per vehicle mile could lower the amount of nonrenewable fuel consumed and lower Minnesota's fuel imports.

Issue 7: Given that residences use 24.5 percent of Minnesota's total energy consumption, how can home buyers be helped to improve their energy efficiency?

Strategy: The state should create, or sponsor creation of, an energy-efficiency rating for dwellings and require this rating for all dwellings sold as standard disclosure information. Presently, there is no easy way for a home buyer to assess the overall energy-efficiency of their prospective purchase. A standard energy efficiency rating formula should be adopted by the state, then widely distributed allowing many parties the ability to make such determinations on their own , or provide the assessment as a service. Although imperfect, performance ratings for vehicles and appliances do provide the consumer valuable information with which to compare alternatives and make good decisions. A home energy-efficiency rating would do the same, creating a builder or seller incentive to improve competitiveness by improving their property's energy-efficiency rating. Such a rating may also be tied to energy-efficiency home-mortgage discounts.

Strategy: Encourage retrofitting of existing residences for improved energy efficiency. Many efficiency improvement investments pay for themselves within two or three years and provides continuing savings each following year.

Strategy: Encourage more efficient new construction through improved building design, education of builders, architects and engineers, and implementation of building codes. Many opportunities for efficiency become prohibitively difficult or expensive if not part of original construction.

Strategy: Encourage individual owners, builders and landscapers to use location and strategic tree plantings to shelter and cool buildings. Provide education, planning and coordination to implement urban reforestation programs.

CONCLUSION

The SDI Energy Team believes that its Vision and Guiding Principles mark the path to sustainability for both present and future decisionmakers. The team also trusts that its Issues and Strategies, while far from comprehensive, will provide participants in the Minnesota Congress on Sustainable Development several points on which to focus their efforts.

During the Energy Team's discussions the following issues were recognized as important, but time and resource limitations did not allow their being fully addressed. The team encourages their future pursuit.

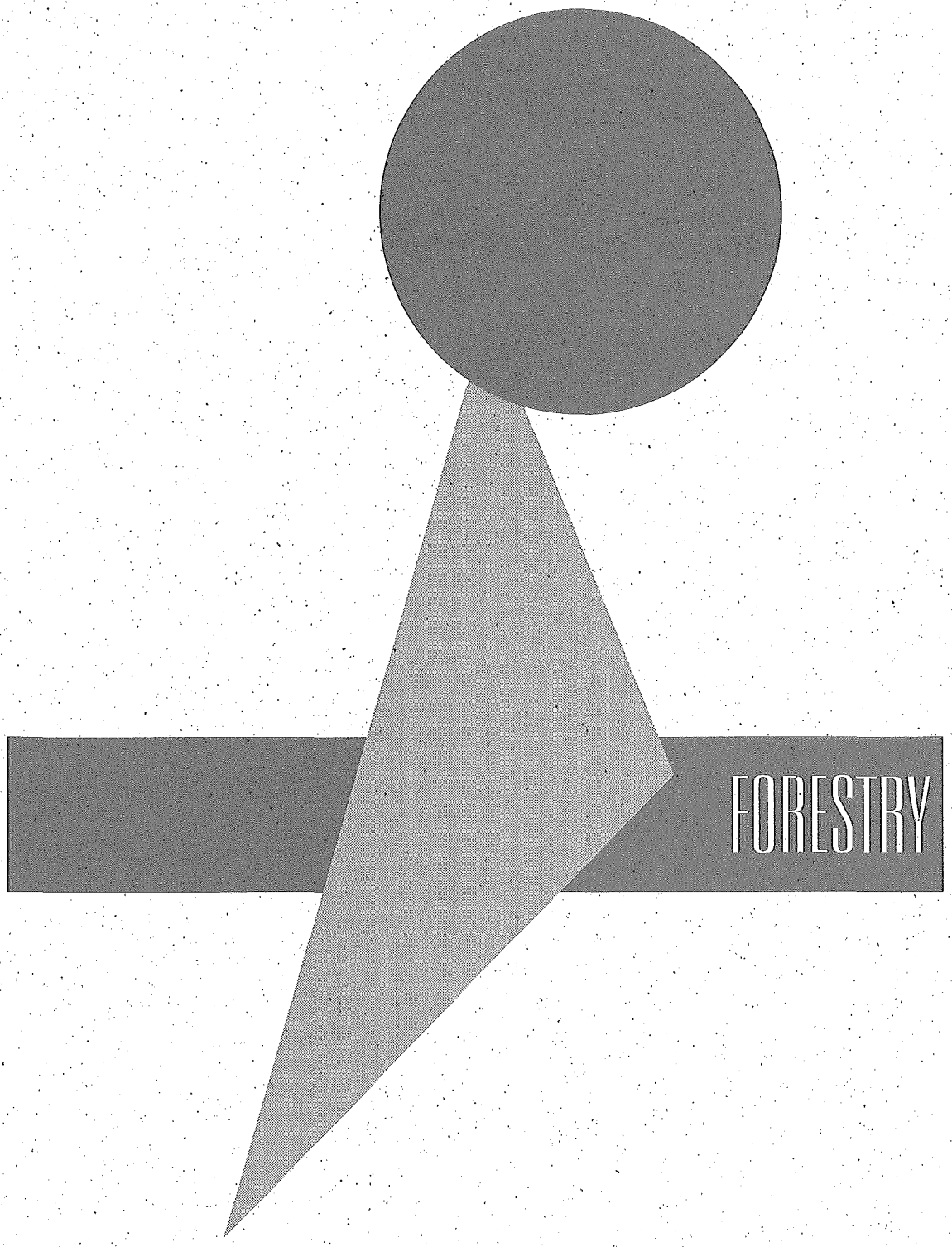
Social equity: The state should explore ways to ensure that a social safety net is in place as the old system of command and control regulation is replaced by more competitive energy markets. Restructuring to rely on less direct government control will require new structures to protect consumers, particularly low-income consumers to ensure they continue to have access to reliable, reasonably priced energy.

Proactive assessment of state regulatory structure: As the restructuring of energy markets continues, the state should anticipate, and prepare for, change just as energy industries are. The state's regulatory structure should be responsive to these changes, abandoning obsolete activities, and rising to meet new challenges as the public interest requires.

Minnesota renewable resource inventory: There does not appear to have been a comprehensive survey of Minnesota's potential to produce multiple forms of renewable energy, nor an assessment of such production on the state's economy, settlement patterns, or other parts of the Sustainable Development Initiative. Such a survey could be designed to be done in several interconnecting, but independent initiatives. For example, alcohol fuels in transportation has issues that should be addressed at least from four perspectives:

Transportation and utility infrastructure: What is the effect on settlement, and the feedback of changing settlement on future infrastructure needs?

Manufacture of energy machinery and energy efficiency products (e.g., wind turbines, prepackaged cogeneration units, compact florescent lights, sensors and related software) as a source of job creation.


FORESTRY

MINNESOTA ENVIRONMENTAL QUALITY BOARD'S SUSTAINABLE DEVELOPMENT INITIATIVE

FORESTRY TEAM REPORT

December, 1993

FORESTRY TEAM

Minnesota Sustainable Development Initiative

"sustaining forest ecosystems for a wide range of uses and values"

INTRODUCTION

On January 29, 1993, the Minnesota Environmental Quality Board (EQB) initiated a major year-long effort that focuses on sustainable development. Termed the "Sustainable Development Initiative" or SDI, its purpose is to examine the utility and effectiveness of the state's current policies and programs aimed at maintaining both a healthy economy and environment. To address this dichotomous focus from a broad perspective, the EQB established seven teams: agriculture, energy systems, recreation, settlement, manufacturing, mineral system and forestry. The following is the report of the Forestry Team, which was charged to look at issues involved with "sustaining forest ecosystems for a wide range of uses and values".

The Forestry Team consisted of the following 16 individuals:

Dr. Richard Skok - Co-Chair
Dr. Charles Pottenger - Co-Chair
Ms. Pat Alberg
Ms. Judy Bellairs
Mr. Rod Bergstrom
Mr. Eric Bloomquist
Mr. Steve Eubanks
Mr. Marv Finendale
Ms. Nancy Gibson
Mr. Howard Hedstrom
Mr. Paul Jensen
Mr. Richard Knoll
Mr. Jack LaVoy
Ms. Norma Martin
Mr. Garrett Ous
Mr. Gerry White

Staff to the Team was provided by Mike Kilgore-EQB, and Mirja Hanson, Charles Petersen and Georgie Peterson of the Department of Administration's Management Analysis Division.

Forestry Team Activities

The Forestry Team met nine times between March and November, 1993. During the Team's first three meetings, outside speakers were invited to provide the Team information on various aspects of forest resources and their management. The intended purpose of these presentations was to give the Team access to information that would enhance their appreciation and understanding of the trends, conditions and issues related to sustainable development of forest resources in the state as well as national and global context. This information was viewed by the Team as essential to providing a context for its deliberations on what the critical sustainable development issues are in Minnesota, as well as identifying changes in current policies, programs and practices needed to sustain Minnesota's forests for a variety of uses and values.

The following individuals provided the Forestry Team information on various perspectives relating to forest resource management, use and protection:

- Dr. Richard A. Skok, Dean Emeritus, College of Natural Resources, University of

Minnesota. Dr. Skok provided a historical overview of national and state trends and conditions of forest resource management and use. Included in this presentation were historical perspectives on: the extent of forest land area, forest growth and removal rates, forest ownership patterns and forest use. Dr. Skok discussed many of these forest resource characteristics as they occur in Minnesota, with contrast to other Lake States forests (Michigan and Wisconsin). He suggested a broad framework for consideration of public policy options for sustainable objectives which range as follows: education, technical assistance, voluntary guidelines, incentives, government regulation and government operation/ownership.

- Dr. Michael Kilgore, Environmental Quality Board. Dr. Kilgore discussed with the Forestry Team the Timber Harvesting Generic Environmental Impact Statement (GEIS) being prepared by the EQB. The focus of this presentation was on defining the GEIS in terms of its objectives and important study parameters, the process used to prepare the GEIS, some of the major preliminary findings and conclusions of the GEIS, and broad recommendations that will likely be part of the draft GEIS.

- Dr. James Bowyer, Head, Department of Forest Products, gave an overview of broad demographic and societal consumption trends in the U.S. as well as worldwide; how those trends could affect demands on forests and other resources in the future; the impacts of using wood as well as nonwood substitutes in building and manufacturing processes; and suggested considerations for the Forestry Team as they develop strategies to address sustainable development of the state's forest resources.

- Dr. John Kotar, University of Wisconsin, Madison. Dr. Kotar provided the Forestry Team with an overview of biological processes and considerations related to ecosystem dynamics and biological diversity. Dr. Kotar's presentation included a discussion of natural successional processes associated with forested environments, and how disturbance (human or natural) affects their character and function.

- Dr. Paul Ellefson, Department of Forest Resources, University of Minnesota. Dr. Ellefson discussed with the Forestry Team alternative policy and program options available to states that could influence the manner in which forests are used and managed. Identified in this discussion were the different *direct* (e.g., education, technical and financial assistance, taxes, regulation) and *indirect* (e.g., forest protection and research) mechanisms that can be used to influence forest management, as well as important factors that need to be considered in when selecting specific strategies.

In addition to these presenters, the Forestry Team convened a panel of natural resource managers to obtain a broad perspective on sustainable development issues. Included on the panel were: Ray Hitchcock, Assistant Commissioner - MN DNR; Garrett Ous, President - MN Association of County Land Commissioners; Steve Eubanks, Supervisor - Chippewa National Forest-USDA Forest Service; and Richard Knoll, President - Minnesota Forestry Association. Each presenter made a brief presentation of the major issues related to sustainable development from their organization's perspective.

Subsequent to these presentations, the Forestry Team met monthly throughout the summer and

fall of 1993 to: 1) identify the current state of Minnesota's forest resources; 2) define important issues currently surrounding their use, management and protection; 3) create a vision of what the state's forests should look like in 50 years; 4) establish guiding principles that could be used as a decisionmaking framework to ensure forest resources are managed in a sustainable manner; and 5) recommend general strategies that should be considered to move the state's forests toward realizing the vision established by the Team.

CONTEXT

Defining Sustainable Development in a Forestry Context

From a forestry perspective, the term "sustainable development" creates numerous meanings and interpretations. Recent focus, however, has broadened the more traditional definition of sustainable development that emphasizes wood fiber production to one that recognizes the complex relationships and interdependencies between forest ecosystems and economic and social systems. The range of interests represented by the SDI's Forestry team reflects this contemporary definition by acknowledging the many "issues involved with sustaining forest ecosystems for a wide range of uses and values. There is no consensus within the forestry profession or among its many stakeholders on a definition of sustainable forestry. Given this reality, the Forestry Team did not try to define sustainable development in concrete, measurable terms, but rather discussed forest resources sustainability as a concept relating to how forest ecosystems are managed in a manner that recognizes the dynamics of their interplay with economic and social forces in such a way as not to close off value options for future generations.

Minnesota's Forest Resources -- The Setting

The term "forest resources", as defined by the Forestry Team, recognizes a range of outputs and services provided by forests that includes both commodity and other values attributable to consumptive as well as nonconsumptive uses. The following highlights the current status, recent trends and projected future conditions of several aspects of Minnesota's forest resources. Many of these trends and observations are based substantially on the information and analysis generated through Minnesota's Generic Environmental Impact Statement (GEIS) on timber harvesting. Inclusion of GEIS information in this report does not necessarily reflect the Forestry Team's endorsement of this study's findings.

Biophysical Characteristics of the Resource

Forest Resource Base. Minnesota currently has approximately 17 million acres of forest land -- about one-third of the state's total land area. The vast majority of this is located in northern, central and extreme southeast Minnesota. Estimates are that the state's forest land base was nearly twice that in the last century. Extensive logging in the late 1800's and early 20th Century, coupled with land clearing practices that sought to convert the forest to agricultural uses and more recent losses as a result of urbanization as well as infrastructure development, are major factors that reduced the amount of forest land in Minnesota to its current level. Although the most substantial losses of forest land occurred over 70 years ago, the state has lost over 2.5 million acres of forest land in the last 40 years.

There are three basic categories of Minnesota's forest land. These three are based on definitions used in the national inventory system applied at the state level. The first, *unproductive forest land*, consists of forest land not capable of growing trees at a rate considered to be viable for

commercial timber production. Lowland black spruce bog is an example of forest land classified as unproductive. The second category is *reserved forest land.* This land, although capable of growing trees at biological levels acceptable for commercial purposes, is protected from timber harvesting by legislation. The Boundary Water Canoe Area Wilderness (BWCAW) is the largest single block of reserved forest land in Minnesota. Any forest land not considered reserved or unproductive is classified as *timberland.* It is important to recognize that just because land is classified timberland does not mean it is automatically available for harvesting or other management activities. Management objectives and nonformal constraints imposed by various ownership groups as well as economic considerations may preclude such land from actually being available for harvest.

The following table illustrates the breakdown of the timberland and reserved and unproductive forest land categories, based on periodic inventories of the state's forests in 1990, 1977, 1962 and 1953. As is evident by this table, substantial shifts can occur in the amount of acreage in a particular category over a relatively short period. For example, the substantial increase in reserved forest land that occurred between the 1962 and 1977 inventories was largely a result of establishing the BWCAW.

Forest land area in Minnesota by major land class for 1953-1990 (thousand acres).

Year	All Forest Land	Timberland	Reserved Forest Land	Unproductive
1990	16,715	14,773	1,113	828
1977	16,709	13,695	1,179	1,835
1962	18,445	15,412	470	2,563
1953	19,344	18,098	428	818

Sources: various USDA-Forest Service statewide forest resource inventories

Area Change in the Forest Land Base. A survey of logging activities conducted as part of the GEIS study estimates around 200,000 acres of forest land experienced some form of timber harvesting in 1990. Of this total, it was estimated 71 percent of the harvesting activity is by clearcutting and clearcutting with residuals (some trees are left standing), which account for 34 and 37 percent of the total area affected, respectively. Thinning and selective logging are found on nearly 20 percent of all forests experiencing some form of harvesting activity.

This survey suggests timber harvesting and forest management in Minnesota is not resulting in a loss of forest land area. Of the forest land subject to some form of timber harvesting activity, virtually all is converted back to a forested condition either through natural or artificial regeneration. However, projections about the future of Minnesota's forest land base indicates losses to other nonforest uses may continue. The GEIS projected that over the next 50 years, the total area of *forest land* is expected to remain stable, but a loss of between 3 and 7 percent is expected in the *commercial timberland* base. This drop is anticipated as more forested areas

are reserved from harvest to accommodate growing interest in increased preservation.

If one looks across the state, however, it is apparent that certain regions are expected to experience different trends with respect to changes in total forest land area. Based on historical trends and current land use policies, it is anticipated that northern Minnesota is likely to experience a five to ten percent loss of forest land cover over the next 50 years. Primary factors contributing to this loss are urbanization and infrastructure development. The southern part of the state, in contrast, is expected to gain forests as marginal agricultural land is converted to a forested condition. While the percentage increases may be substantial (36-45 percent projected increase in forest land area in that region), the relatively small contribution these areas make to the state's total forest resource base are not large enough to offset decreases projected to occur in northern Minnesota. Consequently, a slight loss of timberland land statewide is expected.

Forest Disturbance. The GEIS examined the extent to which forest land was subject to disturbance over a ten year interval ending in 1987. This analysis indicates that approximately 79 percent of the state's timberland was not disturbed in the ten year study period. Of the 21 percent that was disturbed, timber harvesting and natural disturbance (e.g., fire, insect and disease, windstorm) were the most common factors, each impacting about 8.5 percent of the timberland surveyed over the past ten years.

The GEIS also examined the proportion of the state's total timberland base that is likely to be harvested over the next 50 years at varying degrees of harvest intensity. Assuming the current level of harvesting of approximately 4 million cords per year continues for the next 50 years, 7.2 million acres are projected to experience some form of harvesting at least once over the 50 year period between 1990 and 2040, and 7.6 million acres will never be harvested over this same period. Increasing the level of statewide harvest 1 million cords per year to 5 million cords suggests the total timberland area harvested over the next 50 years will be 8.6 million acres, with 6.2 million acres not impacted by harvesting. At a very high harvest level of 7 million cords annually, 10.5 million of the 14.8 total timberland base will likely be harvested over the next 50 year period.[1]

In reviewing these figures, it is important to recognize these projections take into account the possibility of a particular stand being harvested twice during the 50 year study period (which will likely increase per acre timber productivity), and that harvesting includes thinning practices. It is equally important to note that these projections look at disturbance only on timberland. While natural disturbance certainly occurs on reserved and unproductive forests, timber harvesting and other management activity is essentially nonexistent on these 2 million acres.

Age-Class and Covertype Structure. An important characteristic to understanding Minnesota's forests is its composition in terms of the types of trees present (referred to as covertypes) and the age-class distribution of each covertype. Both variables have substantial influence on a number of important resource parameters such as available wildlife habitat, diversity of plant

[1] For more detailed information regarding how these estimates were derived, see the technical paper: Maintaining Productivity and the Forest Resource Base, Jaakko Pöyry Consulting, 1992, listed among references in this report.

and animal organisms and recreational and economic opportunities. There are 14 major forest covertypes recognized in Minnesota. The aspen covertype is, by far, the most common, comprising 31 percent of the state's total net wood volume. Like all other major covertypes, the distribution of aspen among different age classes is not balanced. In particular, aspen in the 25 and 35 year-old age class is less common, relative to other age classes. Recent analyses suggest this age-class imbalance may present short-term supply problems for aspen, given existing harvest levels, particularly in the years 2010-2020.

Old Forests. Old forests -- those considered older than a normal harvest age based on economic and biological criteria -- are a desired component of Minnesota's wooded landscape. At present, the state has limited acres of these forests. However, projections of forest conditions 50 years hence suggest substantial increases in the amount of old forests present in Minnesota. In several instances, this increase is several times current acreage amounts. The amount of old white pine forests, for example, is expected to increase nine times its current acreage. Increases of like magnitude are expected in white spruce and several hardwood covertypes. Given existing levels of timber harvesting, Minnesota's forests 50 years hence are projected to contain a significantly larger acreage of old forests. The primary reason for this trend is that the overall age of Minnesota's forests is expected to increase over time assuming current and near-term increases in harvesting activity.

Soil Productivity. Maintenance of site productivity is key to sustainable forest management, as adverse impacts on soil resources affect a variety of resource parameters such as water quality, aquatic ecosystems, wildlife habitat and recreation and aesthetic resources. A critical component of maintaining productive forest lands in a sustainable environment is ensuring soil nutrients are present in adequate amounts.

Wildlife Populations. There are over 180 wildlife species residing in Minnesota's forests. The dynamic nature of forest succession results in continually changing habitat quality and availability, irrespective of whether human activity is present. Human-induced activities such as timber harvesting will also have an influence on the future structure of this resource. If the land management practices keep the land in a forested state, then the impact on wildlife habitat will be primarily one of redistribution in which certain forest-dependent species may benefit while others may be adversely impacted. Practices that convert forest land into other nonforest uses, however, will have dramatically different impacts. Conversion of forest land to more intensive uses may result in substantial to nearly complete loss of wildlife habitat. Conversions to other extensive land uses (e.g., agriculture), while negatively impacting all forest-dependent species, may have a positive impact on the habitat availability of certain nonforest species.

The GEIS examined the relationship between three statewide levels of timber harvesting and the availability of wildlife habitat for some 173 wildlife species -- 27 mammals, 138 birds, and 8 reptiles and amphibians (herps). The following table summarizes the projected statewide impacts on wildlife habitat over the next 50 years at three rates of harvest. At current and marginally higher harvest levels, the habitat of more forest-dependent wildlife species will be enhanced than adversely affected when viewed from a statewide perspective over a 50 year horizon. However, as timber harvesting substantially increases, the data suggests habitat of the majority of forest-dependent wildlife species will be adversely affected.

Number of forest-dependent species projected statewide to: decrease by at least 25 percent, remain stable, or increase by at least 25 percent at three harvesting scenarios.
***Base* = 4 million cords/yr.; *Medium* = 5 million cords/yr.; *High* = 7 million cords/yr.**

Specie Group	Decreasing			Stable			Increasing		
	Base	Med	High	Base	Med	High	Base	Med	High
Mammals	0	2	4	26	23	20	1	2	3
Birds	5	8	43	111	106	61	22	24	34
Herps	0	1	1	6	5	6	2	2	1
All	5	11	48	143	134	87	25	28	38

Source: Jaakko Pöyry Consulting, Inc. 1992

It is important to note that the assumed temporal and spatial scales can substantially influence the extent and distribution of projected impacts on wildlife habitat. The following table identifies the adverse impacts these same three levels of harvest are projected to have on wildlife when analyzed on an ecoregion basis.

Number of species projected to be significantly and adversely impacted (>25 percent decline for a species in a given ecoregion) on all forest lands by scenario.

Species Group (Number of Species)	Scenario		
	Base	Medium	High
Small Mammals (22)	6	6	8
Large Mammals (5)	0	0	0
Birds (138)	39	69	78
Amphibians and Reptiles (8)	1	1	5
All (173)	46	76	91

Source: Jaakko Pöyry Consulting, Inc. 1992

Biodiversity. The term "biodiversity" can be defined a number of ways -- from simply the range and abundance of plant and animal species present, to the ecological structures, functions and processes that occur at various scales ranging from an individual species to large landscapes. Increasingly, forests are being recognized for their importance in maintaining biodiversity and the wide-ranging values biologically diverse forests provide. For example, biodiversity can contribute to conserving genetic strains of forest trees and other plants adapted to localized site

conditions or local populations with natural resistance to disease. Biological diversity can also protect species that may someday produce economically valuable products, as well as these rare species that have important, yet unknown, roles in functioning ecosystems.

Given the vast number of plant and animal species associated with forested environments, managing to protect biodiversity on a specie-by-specie basis becomes impractical, except for the protection of known rare species. Alternatively, approaches to protecting forest biodiversity seek to manage the landscape by maintaining reasonable representation of the various ecosystems. From a land management perspective, this essentially means applying timber harvesting and other forest management activities in ways that mimic as closely as possible natural processes and patterns.

Water Quality. Existing research suggests the degree to which timber harvesting and other human activities that remove trees from a site (either temporarily or permanently) impact the overall quality of Minnesota's water resources is quite minimal when cumulative impacts are examined on a geographically-broad scale such as a watershed. In Minnesota, a set of voluntary guidelines have been developed which are aimed at reducing the impact timber harvesting and associated management activities (e.g., road development) have on water quality. Although voluntary, recent field inspections indicate that landowner compliance with these practices is relatively high, ranging from 90 percent on county lands to just over 70 percent on private forests not owned by forest product industries. Recent studies suggest timber harvesting and other activities that *temporarily* remove forest cover are not impacting the overall quality of the state's water bodies to any great degree. Localized impacts do occur, however, with certain practices that remove vegetative cover in areas immediately adjacent to lakes, streams, rivers or wetlands. In these instances, the likely impacts will have the greatest adverse effect in those areas surrounding or immediately downstream from the activity area, and the impacts will typically dissipate in their severity in a short period of time.

Economic and Socioeconomic characteristics of the Resource

Forest Products Manufacturing. Minnesota's forests provide important raw material inputs to a major manufacturing segment of the state's economy. In 1990, the value of forest-based products manufactured in Minnesota was more than $6.2 billion, making it the state's second largest manufacturing industry. There are several types of products produced from the state's forests. However, this segment of the manufacturing industry is dominated by the 13 pulp, paper and hardboard mills and its six board mills, which collectively account for over 85 percent of all primary forest products manufacturing value.

Other industries that use the products produced by primary forest products manufacturers, termed secondary forest products manufacturers, produce a wide range of products such as furniture, dimension and flooring products, kitchen cabinets, and windows. The value of products produced by secondary manufacturers is over 3.5 times the contribution made by primary forest products manufacturers. Together, these two segments of the forest products industry employ approximately 58,000 people statewide.

Minnesota has experienced an unprecedented infusion of capital investments in wood products manufacturing in recent years. Within the past seven years, the nearly $1.5 billion invested in

pulp and paper facilities has increased total annual wood consumption to it current level of 4 million cords -- a 70 percent increase since 1980. At the present time, a number of additional capital investments in pulp and paper manufacturing are being considered. If these proposed expansions occur, Minnesota could experience an added annual wood fiber demand of one million cords by the middle to end of the decade.

In addition to these potential capital investments that use virgin wood fiber, two new pulp mills that produce deinked market pulp from recovered paper are expected to become operational in Minnesota shortly, and another deinked market pulp mill is also being considered in Minnesota which could be online by the end of the decade. Together, these mills have the *potential* to significantly affect the demand for wood consumed in the state, as they are expected to produce enough deinked pulp to replace an equivalent of roughly 400,000 cords or wood each year.

Tourism and Outdoor Recreation. The state's forests also provide a setting for another large sector of the economy -- the outdoor recreation and tourism industry. In 1985, the most recent data available, outdoor recreation accounted for 2.5 percent of all economic activity and over three percent of total employment in Minnesota. While one-third of the total economic activity is generated in the Twin Cities metropolitan area, outdoor recreation can be very important to certain areas of the state. In northeastern Minnesota, for example, outdoor recreation accounts for over ten percent of all economic activity in that region. There are several components that collectively make up the state's outdoor recreation and tourism industry. Key among these are the approximately 1,350 resorts, the majority of which are located in northern Minnesota. Because of their strong dependence on the character and quality of the surrounding environment, Minnesota's resort community has a strong interest in sustaining the forest resource in a manner that protects its recreational and aesthetic value.

Aesthetic Values. An important value provided by forests is its aesthetic quality or appeal. Individual perceptions and attitudes on forest attractiveness vary enormously. Certain characteristics often viewed as enhancing the aesthetic value of forest resources are the diversity of plant and animal species and types and size of trees present. Sustainable forestry must also consider such values, despite their subjective nature.

Urban Forests. The wooded landscape surrounding the state's towns and large urban centers are an important component of the state's forest resource. These urban forests are typically not managed as a source of wood fiber, but rather for the nonconsumptive and amenity values they provide such as creating aesthetically pleasing environments, shade and shelter for energy conservation and habitat for wildlife. From a sustainability standpoint, the threat to urban forests appears greatest in two areas -- fragmentation and loss to insects and disease. The fragmentation of Minnesota's urban forests, which is almost exclusively the result of residential and commercial development, can have severe adverse impacts on local wildlife populations, particularly where habitat is fragmented to the point where viable populations are no longer able to survive. Similarly, recent experiences with oak wilt and Dutch elm disease are evidence that major insect and disease outbreaks can adversely affect the integrity of urban forests where the diversity of tree species has not received adequate attention. Discussion regarding forest resource sustainability must not only recognize the ecological and amenity contributions made by urban forests, but identify means by which these ecosystems are maintained.

Institutional characteristics of the Resource

A key to understanding sustainable development as it relates to Minnesota's forests is acknowledging the institutional setting within which forestry is practiced. The following discusses three key aspects of the institutions whose actions directly impact the degree to which forest management and use is conducted in a sustainable manner.

Forest Land Ownership. Ownership of the state's forest land is approximately evenly split between public and private owners. Of the nearly 15 million acres of timberland in Minnesota, 7.6 million acres (51 percent) is owned and managed by federal, state and county governments. The state is the largest single public forest land manager, with over 3 million acres of timberland. County governments in Minnesota manage 2.5 million acres, and the USDA Forest Service manages 1.8 million acres of timberland. The remaining 49 percent is largely held by small, nonindustrial private forest (NIPF) landowners, including roughly 500,000 acres managed by Native American tribes. Although there are roughly 130,000 individual forest land owners statewide, the NIPF group collectively accounts for 90 percent of all privately-held timberland in the state. Forest industry owns 750,000 acres of Minnesota's timberland. The following table illustrates the 1990 distribution of timberland by major ownership.

Timberland Area in Minnesota by ownership class, 1990 (thousand acres).

All Classes	National Forest	State	County	Other Public	Forest Industry	NIPF[1]
14,774	1,821	3,078	2,506	198	751	6,420

[1] includes 500,000 acres managed by Native American Tribes

Source: Miles and Chen 1992.

Management and Planning Direction. The degree to which forest resources will be managed on a sustainable basis depends, to a great extent, on the management direction and philosophy of the major forest landowner groups. As previously indicated, public land management organizations are responsible for approximately one-half of the state's forest land. Forest industries and Native American communities also have articulated policies and programs directed at forest management and protection on their lands. The remaining forest land is primarily NIPF, which collectively represents about 43 percent of the state's timberland and controlled by an estimated 130,000 owners.

All federal and state and most county forest lands are under some form of multiple use management. The mandates formulating management directions vary considerably, with those of the federal government most embodied in legislation addressing national resource management and environmental protection concerns. State legislation also provides mandates for multiple-use management of state-owned forests. In contrast, the nearly 2.5 million acres of county timberland are substantially under the jurisdiction of 14 county land departments. Management direction provided to the county lands varies considerably, and the policies and programs articulating this direction are developed independently by their respective county boards.

All public landowners in Minnesota do some form of planning. At the county level, planning can take the form of formal documents or annual activity reports, although formal planning processes are not common to most counties. At the state level, planning includes development of a comprehensive statewide resource assessment, five-year program direction, as well as regional and unit plans for the state forest system. The USDA Forest Service has the most complex planning process of the three. Included in this process are broad-scale resource assessments and program plans, as well as individual plans for each of the national forests.

While policies of each ownership class differ in their specifics, all are grounded by three fundamental principles or concepts. Forest lands are to be managed under a multiple use philosophy; the amount of each commodity produced should not exceed the sustained yield of the resource; and production of all activities should be designed and carried out so the resource base is preserved in a manner referred to as nondegradation.

Policies Influencing Timberland Availability. Specific forest land is formally removed from availability for timber harvesting though legislation (e.g, state parks, BWCAW). In addition, the policies and management practices of landowners also may impact the extent to which timberland is actually available for harvesting. Protecting riparian corridors (i.e., areas adjacent to waterbodies) and old-growth forests, implementing extended rotation forestry on a certain portion of their lands, and defining areas determined economically unavailable for harvest are but a few such practices that reduce the amount of timber actually available for harvest.

The GEIS developed estimates of the extent to which timberland is actually available for harvesting and other management activities. While gross approximations, these estimates provide insight on the degree to which current policies and practices constrain timberland availability at any given point in time. It was estimated that in 1991, 1.8 million of the state's 14.7 million acres of timberland were unavailable for the full range of timber harvesting activities typically practiced in the state due to applying Best Management Practices for water quality, creating wildlife buffers, managing a portion of the forest on extended rotations, protecting old-growth stands and establishing maximum allowable sale quantities. When considered by ownership, GEIS projections indicate that annual timberland availability ranges from 64 percent for national forests to 98 percent for industrial forest lands. It is important to note that these estimates were based on existing economic and management conditions.

Context Assessment -- Forestry Team

Using the information from the GEIS as well as that obtained from the invited speakers and panel discussions, the Forestry Team assessed the current situation regarding Minnesota's forest resources. This assessment was based on observations in three areas: 1) past conditions and trends; 2) the present situation; and 3) likely future conditions. The following summarizes those characteristics considered particularly important by team members:

Past

Accomplishments

- Forests have rebounded from the unsustainable harvesting practices and policies of conversion that occurred in the early part of this century. Today, these resources support a strong forest products and outdoor recreation industry.

- Voluntary forest management practice programs have experienced a very high level of compliance (70-90 percent).

Setbacks

- There has been a loss or reduction of certain important plant or animal communities.

- Previous timber harvesting and land use practices were not sustainable, and have created certain undesired forest resource covertype and age class conditions.

- Loss of forest land to other uses has been substantial.

Present

Strengths

- Minnesota has a relatively stable forest land base. Therefore, sustainable development discussions can focus beyond resource base stability to how Minnesota's forest resources should be used and further enhanced.

- There has been an increased effort to convene cross-stakeholder groups like the Forestry Team to discuss and develop sustainable development strategies.

Weaknesses

- There is a general lack of geographic and resource data; and gaps in existing mechanisms that allow this information to be shared among forest land managers.

- Existing tax incentives to manage for non-market forest resource objectives are either inadequate or nonexistent.

- The current mix of public and private landowners makes coordinated forest resource management on a geographically-broad scale very complex.

Future

Challenges

- Increased world populations will place increasing demands on our natural (including forest) resources.

- Unplanned development in rural areas can fragment important forest ecosystems.

- Funding patterns for forest resources are typically very short-term (one to two years), and do not provide the stability needed for achieving long-term sustainable development goals.

- While significant progress has been made in research to enhance the ability to select the appropriate management methods and practices to achieve desired forest resource outputs and conditions, significant gaps in our knowledge base exists.

Opportunities

- Managing forest resources on a sustainable basis can be accomplished without undue regulatory influence.

- There is growing interest in creating market incentives for owners to manage for non-timber forest resource outputs.

- Processes and methodologies exist to respond to resource management concerns before they become crisis situations.

ISSUE FOCUS -- SUSTAINING MINNESOTA'S FORESTS

Based on the context assessment, the Forestry Team identified eight major *issue areas* as being critical to sustaining the state's forest resources to achieve both economic and environmental goals. These are not necessarily consensus issues among the Team, but rather issues identified by one or more of its members as important for sustainable development.

Improved resource information systems. There needs to be a better understanding of forest ecosystem functions, as well as the trade-offs that will occur, under alternative management options. Linkages between forest-based research and forest land management practices needs to be made clearer. Additionally, resource information needs to be collected and analyzed on broader scales to allow for better management at the landscape level.

Preparation for future demands/crises. Given the projected future demographic trends, there will be increased pressure on use of the state's natural resources, including its forests. Alternative options for material substitution need to be explored and developed.

Financial incentives for better sustainable management. Forests provide an array of benefits such as timber, provide wildlife, recreational opportunities, aesthetic enjoyment and environmental protection. In order to provide the right mix of these desired outputs, both public and private forests need the right "signals". At present, incentives are variable for providing some nonmarket outputs and nonexistent for others.

Improved cooperative land management. An increased focus on managing forest resources on a geographically-broader landscape basis will require better cooperation and coordination among the public and private forest resource managers. New processes and tools to enhance multi-ownership resource coordination are needed.

Comprehensive stakeholder education. The public's understanding and appreciation of forest ecosystem processes and functions is often incorrect. The dynamic nature of public preferences for use and management of Minnesota's forests requires the development of effective mechanisms for not only identifying the changing attitudes and preferences, but responding to these in a meaningful way.

Enhanced forest biodiversity. Efforts need to be made to protect and enhance the diverse and productive nature of the state's forest resources at some level yet to be identified.

Maintaining economic viability. Strategies need to be developed to support the economic viability of Minnesota's forest products industry while at the same time managing our forest resources in a sustainable manner. Predictable timber supplies are essential to the long-term health and survival of this industry, and their role in providing economic stability to rural Minnesota communities.

Efficient/fair decision-making systems. Increasing demands on the state's forest resources will result in increasing conflicts over their use and management. Stakeholders of Minnesota's forests need to be identified and brought together, and means identified that will efficiently and fairly resolve these value conflicts.

Vision Statement

Considering the existing resource, social, economic and institutional influences, the Forestry Team developed a vision of what Minnesota's forest resources should be like in fifty years. The following describes this vision in terms of the desired condition and characteristics of the resource as well as its management and use.

> **In future generations, Minnesota's forest lands will encompass 18+ million acres. Forest ecosystems will be more healthy and productive than they are today. They will also be more diverse in the type and size of the tree species present to maintain the natural plant and animal communities associated with the state's ecoregions.**
>
> **Minnesota's forests will be managed for a variety of stakeholders. They will make a significant contribution to the people's needs through both consumptive and nonconsumptive means. Minnesota's forests will provide the raw materials needed for a strong and diverse forest products manufacturing sectors and support a vibrant outdoor recreation and tourism industry, while addressing environmental imperatives from a local to global perspective. This state will be characterized as one that optimizes efficient use of its forest resources.**
>
> **The owners and managers of Minnesota's forests will conduct management practices that recognize long-term land stewardship goals. Our management will reflect our understanding that the most effective way to sustain the multitude of forest products and services is to maintain the health of the ecosystems that produce them. To that end, both public and private managers will work cooperatively to ensure that forest practices address both site-specific and larger landscape-level management goals that protect the overall integrity of the range of forest ecosystems found in Minnesota.**

PRINCIPLES FOR SUSTAINABLE DEVELOPMENT

In developing a set of guiding principles, the Forestry Team felt it was important that certain underlying assumptions associated with these principles be articulated. While the strategies for sustainable development developed by the Forestry Team and identified in a latter section

will be guided by these principles, certain underlying assumptions need to be explicit. One assumption of particular note is the assumed scale of irreversibility. The Team recognized that sustainability questions focused on forest resource issues are most appropriately addressed within the context of large geographic areas defined by particular analyses and based on sound science. As such, the principles developed are intended to be used as a broad framework with which forest resource decisionmaking is applied at a landscape level and not on a site-by-site basis.

Similarly, the Forestry Team believed it was important that these principles be considered as a framework for evaluating the long-term health and sustainability strategies for the forest resource, rather than making short-term judgements. The Team also emphasizes that these principles should be considered in aggregate in order to serve as a useful framework for sustainable forest resource decisionmaking. Finally, the principles (as well as strategies) were developed with the recognition that various levels of government assume the authority and responsibility for making decisions that affect the sustainability of the forest resource over which they have jurisdiction.

Forest Resource Base

Increased Resource Base

- Actions that increase the forest land base should be supported.

Forest Productivity

- Promote the long-term productive capability, quality and capacity of Minnesota's forests.

Landowner Rights

- Society shall consider landowner rights in exercising its interests in forest stewardship.

Flexibility

- Resource policies and actions that prevent irreversible outcomes for forest uses should be supported.

Diversity

- Forest resource diversity shall be managed on the appropriate geographically-broad basis.

Forest Health

- Encourage the maintenance, restoration and enhancement of Minnesota's forest ecosystems.

Forest Resource Use

Balancing Objectives

- Economic, social and environmental consequences shall be considered in the use of forest resources.

- Responsibility and accountability for sustaining the environment and economy in a spirit of partnership and open cooperation should be acknowledged.

Efficient Resource Use

- The use of wood fiber should be optimized through efficient harvest and utilization, through recycling processes, and through extended life of wood materials.

- Both renewable and non-renewable resources should be wisely and efficiently used.

Global Considerations

- Local actions should take into account global consequences.

Human Actions

- Humans are part of natural systems including the forest environment, and this linkage should be acknowledged in policies affecting forest resources.

Value Added Processing

- Minnesota should maximize intra-state, value-added processing from its forest resources.

Forest Resource Management

Forest Stewardship

- Forest resources shall be managed for the benefit of present and future generations.

- Ecological processes and biological diversity shall be maintained and enhanced.

- Use of renewable forest resources shall be on a sustainable basis.

- Landowners should be encouraged to consider the public's interest in applying wise stewardship on their lands.

- Adverse impacts on wildlife, biodiversity, water resources, soils and nontimber and timber resources should be minimized.

Landscape Management

- Multiple ownership cooperation in addressing forest resource management should be encouraged.

Forest Resource Economic Potential

- Forest management should take into account the full range of forest products, values and uses.

Information Management

- Management decisions should be based on scientifically sound, accurate and up-to-date information.

Public Education

- Public understanding of natural and human-induced actions on forest ecosystem processes shall be achieved as an essential basis for attaining sustainable forest resource management objectives.

SUSTAINABLE DEVELOPMENT STRATEGIES

Using the principles as a framework for decisionmaking, the Forestry Team examined alternative actions that could be recommended as a means of addressing the eight major forest resource issue categories. Specifically, emphasis was placed on identifying actions that would move Minnesota's forests towards the future vision developed by the Team in a manner consistent with the guiding principles. The following identifies six major strategies to attaining forest resource sustainability, along with their corresponding specific attributes and elements.

1) **Develop a forest resources assessment and evaluation program sensitive to Minnesota needs.**

   - Develop an ecologically-based classification system useful to landscape-level planning efforts that can be applied and used across ownerships.

   - Establish continuous monitoring and evaluating methods for determining existing forest resource processes and conditions, and means of incorporating the results into forest management decisionmaking.

   - Encourage strong interaction between research and resource managers to promote the relevance of research as well as the rapid transfer of science and technology to forest practices and techniques.

   - Coordinate such a program with resource information available from states and Canadian provinces with similar forest environments.

   - Identify opportunities for developing improved measures for evaluating long-term forest resource sustainability.

2) **Develop means to coordinate the design and implementation of policies and practices that address identified forest resource issues.**

   - Establish an on-going process and mechanism (e.g., board, commission, council, committee) that involves stakeholder input to evaluate and provide direction for public policy regarding integrated resources management.

   - Examine existing state programs directed at forest resources to ensure they support practices consistent with the guiding principles for sustainable development, and encourage federal and local governments to initiate the same reviews.

- Examine the adequacy of existing programs, policies and funding directed at private forest management, with a focus on identifying ways of encouraging sustainable forest resource practices.

- Examine ways of improving the delivery of public programs directed at private forest owners and managers, and making these programs more client-oriented.

- Examine the adequacy of existing programs, policies and funding directed at state and county forests to assure adequate funding to ensure sustainable forest resource practices.

- Seek opportunities to coordinate cross-ownership planning and management of forest resources.

- Review past studies of Minnesota's forest resources for proposals consistent with sustainability principles.

3) **Identify needed changes in the state's policies, programs and infrastructure that would improve the delivery of sustainable forest resource education.**

- Require all publicly funded K-12 environmental education programs include a sustainable forestry component in their curriculum.

- Establish a task force to work with Minnesota's Department of Education and Natural Resources as well as other affected agencies to develop natural resource sustainable development curriculum.

- Develop programs that educate the public on resource sustainability concepts.

- Develop an education program for use within the natural resource profession, including loggers, resource managers, wood-using industries and related economic sectors.

- Seek opportunities to identify the resources needed to adequately support environmental education.

- Develop programs to educate the public on ways to extend the useable life of forest resources, including means to extend the timber resource base (see strategy #6 below).

4) **Increase urban forestry programs.**

- Review the adequacy of existing programs and agency coordination in administering urban forestry programs, as well as the need to establish more

uniform urban forestry program standards among local units of government.

- Evaluate the adequacy of federal, state and county highway standards as they impact urban forests.
- Identify incentives that will encourage urban forestry programs to diversify native tree specie plantings.
- Encourage the state to establish a "no-net-loss" policy for its urban forests.
- Encourage adequate financial support for the state's urban reforestation programs.

5) **Maintain or improve the economic viability of forest resources by:**

- Encouraging public forest resource agencies to place greater emphasis on economic stability in developing management plans.
- Encouraging public resource agencies to provide predictable, affordable supplies of timber resources.
- Identifying opportunities that encourage expansion of value-added enterprises.
- Encouraging public resource management and economic development organizations to recognize the full spectrum of forest resource values in the development of their resource planning and economic development programs.

6) **Provide incentives to extend the timber resource base by:**

- Increasing manufacturing efficiency in wood use.
- Reducing construction waste.
- Reducing the use of disposable products.
- Increasing recycling.
- Encouraging research in new building product technology.
- Increasing long-term productivity of timberlands.
- Increasing the useable life of wood products.

CONCLUSIONS -- NEXT STEPS

In reflecting on their work over the past nine months, the Forestry Team identified a number of concerns relating to the use of the information contained in their report as well as subsequent initiatives and actions that address sustainable development within the state. Among these are the following:

- **Sustainable development needs to be institutionalized as a cornerstone from which future state economic development and environmental policies are developed and judged.** The EQB's Sustainable Development Initiative serves as a good initial effort to establish a sustainability dialogue among business, government and environmental leaders. However, if this Initiative is to have a lasting impact on how future state policy addresses long-term resource sustainability, the EQB needs to identify appropriate mechanisms that will enable such a dialogue to be maintained and establish linkages between this dialogue and the policy development process. The success of sustainability policies rests on adopting and committing to a long-term view.

- **The EQB and other state policymakers need to acknowledge the importance of the sustainable development initiative by allocating the resources necessary to implement the strategies suggested by this and the other six teams.** The seven teams have identified a large number of recommendations directed at achieving sustainable development goals. The state's commitment to embodying sustainable development as an fundamental policy concept will be judged, to a large degree, by the extent to which follow-up actions to implement the SDI recommendations are pursued. The Forestry Team strongly recommends adequate funding be provided to implement the strategies identified as a result of this initiative.

- **There is a substantial need to educate business leaders and state policymakers at all levels of government about sustainable development concepts, as well as the specific information and recommendations contained in this and the other six SDI team reports.** The information generated by the various teams can further the public's understanding of sustainable development concepts, issues and strategies. To make the most effective use of this initiative, the EQB should identify opportunities to disseminate the reports of the Forestry and other SDI teams to affected public and private interests.

- **The integrity of the Forestry Team's report on sustainable development needs to remain intact as the EQB prepares its integrated policy documents relating to the Sustainable Development Initiative.** The Forestry Team's report contains several elements that may be appropriate for the EQB to consider as it prepares its integrated report on the Sustainable Development Initiative. However, many of the ideas and recommendations contained in this report are directed specifically at the sustaining Minnesota's forests. Additionally, the nature of the Team's work process created strong linkages between the specific work products developed (i.e., issues, vision, principles and strategies). Thus, a full understanding and appreciation of the Team's findings, conclusions and recommendations can only be gained by maintaining the report in its entirety.

- **The Forestry Team considers its vision and guiding principles for sustainable development especially important outcomes of this initiative.** The issues and corresponding strategies identified in this report are recognized as being condition-dependent, whose importance and relevance will likely change over time in response to changing social preferences and forest resource conditions. The vision and strategies, however, are two elements of this report that are recognized by the Team as being condition-independent, and therefore provide a useful framework for achieving long-term sustainable development objectives.

- **Addressing broader (global) issues such as population growth are fundamental to fully achieving long-term sustainable development objectives.** The Forestry Team recognizes that the ability to sustain a healthy economy and environment ultimately depends on curbing the growing demands being placed on the world's resources. Also recognized is the fact that increasing global demand for resources does have an impact on the policies directed at sustaining the resources located within the state's boundaries. The Forestry Team believes that unless the issue of global consumption is addressed, the actions taken in Minnesota will have minimal impact on the long-term sustainability of its resources.

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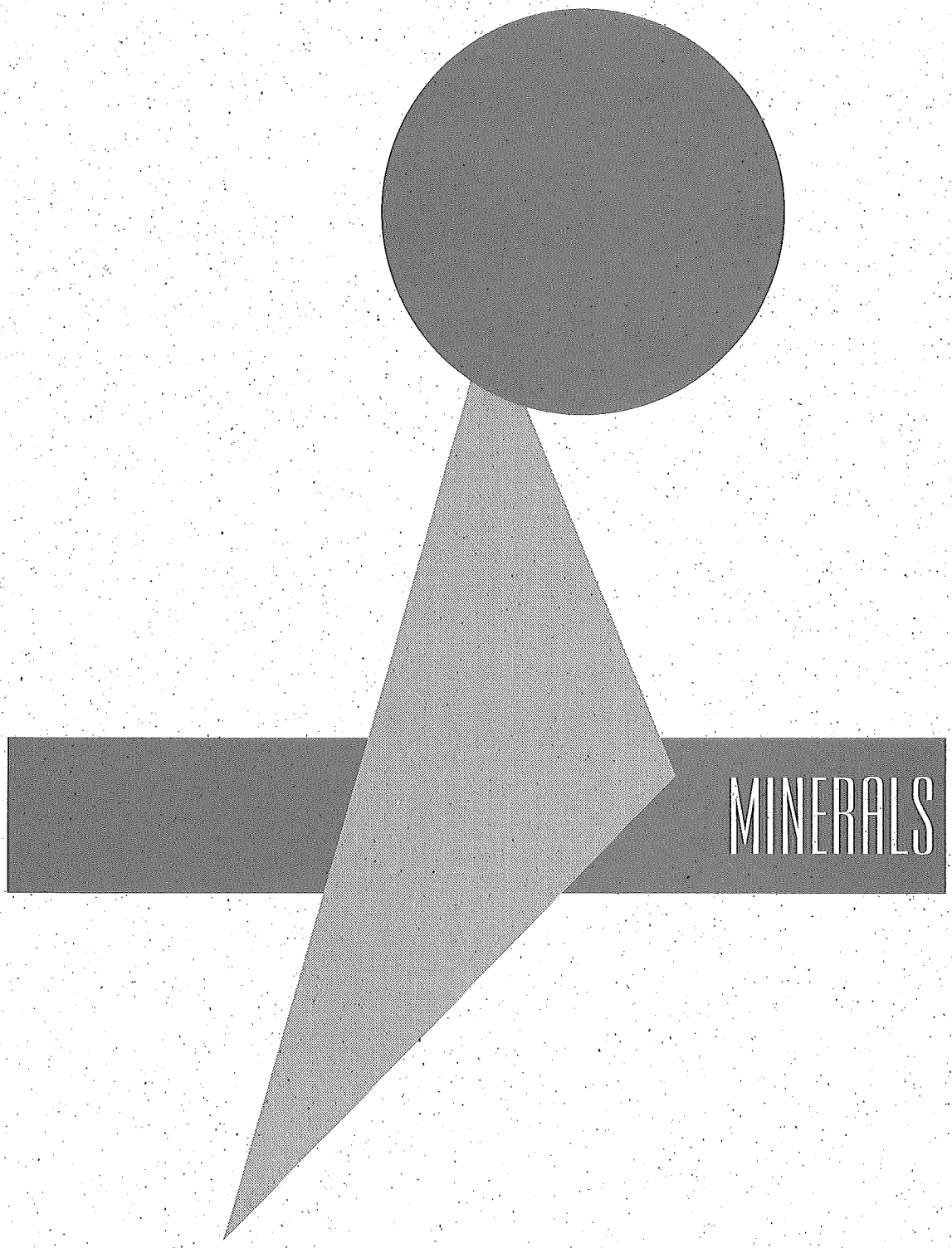
MINERALS

Mining, Society, and the Environment

Report by the Minerals Team of the Minnesota Sustainable Development Initiative

January 3, 1994

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EXECUTIVE SUMMARY

Statement of the Task

Sustainable Development and Mineral Development first appear to be incompatible concepts. Individual mineral deposits are finite and therefore can be depleted; mining them also has an impact on the environment; they are often very valuable; and their location is fixed. By adopting the definition of Sustainable Development given by the Environmental Quality Board -- "meeting the needs of the present without sacrificing the ability of future generations to meet their needs" -- the minerals team was able to reconcile this apparent contradiction and move forward with a series of proposals that, if made into actions, will go far to satisfy the needs of today and improve the prospects for tomorrow.

Issues and Vision

Minerals are necessary for our daily lives. Mining is necessary to replenish the supply of minerals not met by recycling, reuse, and conservation. Although the team recommends increased efforts at recycling and reuse, it will be necessary to extract minerals from the ground if the country is to preserve its standard of living and if other parts of the world are to improve their standards. Mining is also one of the few occupations available in Greater Minnesota that pays the good wages important to quality of life.

Mining has its costs, both environmental and social. Open pit iron mining has created great disturbances on the land; future nonferrous mining in the state may cause water pollution; and sand and gravel operations, or other industrial mineral operations, may harm fragile ecosystems. The closing of mining operations can result in the dislocation of people dependent on the industry as well as require the reclamation of the land.

These issues are particularly important for Minnesota. The state has a large iron ore industry, a thriving sand and gravel industry, and the potential for a very important nonferrous mineral industry. It also needs high-paying jobs and an increased tax base in Greater Minnesota while preserving some of the cleanest water and air in the country.

The team's vision is to balance these needs for minerals, jobs, and protection of the environment, a vision best realized in the context of sustainable development and full cost accounting. Minnesota will continually improve its mineral industry, one that is environmentally sound, to support the needs of future generations. The mining industry will meet society's needs through reuse, recycling and recasting of minerals products, as well as through mining new resources. A skilled, fairly compensated work force will have diverse employment opportunities, many of them provided by value-added mineral industries. And Minnesota will maintain its environmental well-being and economic position in the global marketplace while advancing the principles of sustainable development.

Principles and Recommendations

The team recommends a number of principles to accomplish this goal:

- Encouraging the use of ***holistic management***, in which both critical environmental and cultural resources of the state are protected, recognizing at the same time the value of environmentally sound mineral development. A first step towards accomplishing this goal is to obtain an inventory of ecologically critical sites and mineral resources for intelligent land-use decisions and for incorporating the concepts of ecosystem and mineral potential into public and private planning.

- Encouraging ***public awareness*** through education and partnerships between the public and private sectors to insure that the principles of sustainable development are incorporated into decision-making.

- Encouraging recycling, reuse, and conservation so that our resources are used with the highest degree of ***efficiency***. Metals, because of their inherent characteristics and their value, are highly recyclable, except where manufacturing processes have made this uneconomical. Products should be designed with the goal of recycling.

- Developing regulations that are protective of the environment, cost effective, understandable, open to public participation, and have agency roles coordinated and clearly defined.

- Developing a ***sustainable*** minerals ***economy*** to ensure quality jobs and minimal social disruption caused by mine closing. Several strategies may help to accomplish this: increased knowledge of the state's mineral resources so that the industry is not dependent on one metal, iron; local value-added processing so that the maximum economic impact from mining is kept in Minnesota; the development of environmental technologies, which not only ensures safe operation of mines in Minnesota but also becomes an export industry for the region; and an educational system that fosters a skilled and flexible work force.

- Fostering ***strong and stable research***: environmental, geological, and metallurgical. Fortunately, Minnesota has several institutions with the potential to lead the state in its pursuit of a sustainable minerals economy. Among these are the Minnesota Geological Survey, the Natural Resources Research Institute, and the Department of Natural Resources, as well as private laboratories and research groups. It is critical that this research have long-term funding and that the research be accountable and directed to specific goals.

Finally, the minerals team spent considerable time examining the taconite industry. The industry is currently shrinking as demand for its single product, the taconite pellet, falls. This shrinking market is linked to the decline of the blast furnace as a method of making steel, and little can be

done in Minnesota to reverse the trend. The team recommends that revenue from the taconite production tax be used to cushion the economic impacts of this decline and provide for the reclamation of abandoned mines, in cases where the operator is financially unable to do so.

The team has, however, identified an important opportunity that may stabilize the decline of this industry and perhaps begin to reverse the trend. That opportunity lies with direct reduced iron (DRI), a value-added process that can use Minnesota iron ore to make a metallic iron product. There is currently in the United States a large, unsatisfied demand for DRI for use in the place of expensive scrap iron in minimill and some blast furnace steel-making. The team received testimony that this demand will be met in the next five years by the construction of several DRI plants. Currently, consideration is being given to the construction of several plants in North America, including Minnesota.

It is critical for Minnesota to act in this five year "window of opportunity" to secure a significant portion of the DRI market for Minnesota iron ore. To accomplish this, the team recommends a ten year moratorium on the taconite production tax on new taconite going to DRI, for plants under construction by the year 2000.

Conclusion

The ***vision*** statement, guiding ***principles,*** and ***recommendations*** of the minerals team for the Sustainable Development Initiative resulted from approximately nine months of information gathering, sharing, and deliberations. Equally as important as the recommendations, however, is the process by which they were developed. This report should be the start of a statewide process by which complex, oftentimes competing, issues can be discussed in the context of a broader vision. If the minerals team can serve as an example, it is clear that initiating a broad dialogue between various interests, starting from a shared vision and working towards strategies, can itself become a mechanism for building consensus to support integrated management of our natural resources.

PART I

VISION, PRINCIPLES, AND RECOMMENDATIONS

Introduction

The Minnesota Sustainable Development Initiative began in early 1993 under the sponsorship of the Minnesota Environmental Quality Board. Seven teams were formed to address the complex connections between economic growth and environmental protection. The minerals team was asked to "examine how we can explore and develop the state's diverse mineral resources, and efficiently use mineral products, in a manner that sustains both the economy and environment, without compromising the ability of future generations to meet their needs." The team used this definition of sustainable development as a framework for its discussions.

The team's objectives included:

- generating a vision statement to portray a desired condition for the mineral industry fifty years into the future,
- developing principles to guide future decisions regarding mineral resources, and
- providing recommendations to address distinct issues that are already evident, while recognizing the dynamic nature of current conditions.

Process of the Minerals Team

Members who participated in the development of the minerals team's report demonstrated a diverse range of concerns and expertise. The team was composed of representatives from the minerals industry, the environmental community, government, academia, and research organizations. These members and their affiliations are:

Nelson French, co-chair	The Nature Conservancy
William Ulland, co-chair	American Shield Company
Brian Bensen	Sherburne County Planning and Zoning
Bill Brice	Minnesota Department of Natural Resources
David Deleo	Cyprus Northshore Mining
Rondi Erickson	Bay West, Inc.
John Green	University of Minnesota, Duluth
Priscilla Grew	Minnesota Geological Survey

Dennis Hendricks	USX Corporation
John Lamb	The Minnesota Project
G.B. Morey	Minnesota Geological Survey
Steve Raukar	St. Louis County Commissioner
Michael Robertson	Larkin, Hoffman, Daly & Lindgren, Ltd.
Bob Rootes	United Steelworkers of America
Lewis Wade	U.S. Bureau of Mines
Jonathan Wilmshurst	Shiely Company

Addresses of the team members and supporting staff are included in Appendix A.

Time constraints and the extent and complexity of minerals issues prompted the team to decide on select areas for meaningful policy recommendations. Not all mineral commodities mined or quarried in Minnesota could be discussed. Focus groups were formed to explore environmental and economic concerns associated with three core sectors of Minnesota's mineral industry:

- ferrous: iron ore and taconite,
- nonferrous metallics, and
- sand and gravel.

The Minerals Team met twelve times throughout 1993. In addition, focus groups met separately to explore concerns specific to their topics. The team's energy was initially directed toward establishing a solid information base. Presentations were heard on a wide range of subjects including minerals research, geologic mapping, environmental geology, recycling, minerals resource inventories, mineland reclamation, corporate restoration of wildlife habitat, taconite taxes, mine waste drainage mitigation, and clean air regulation. A complete list of presentations is provided in Appendix B.

The team toured a major sand, gravel, and limestone operation and its associated reclamation areas in the Twin Cities metropolitan area. The team also met representatives of the Iron Range Resources and Rehabilitation Board and the Natural Resources Research Institute in northeastern Minnesota, toured active and reclaimed taconite mining sites on the Mesabi Iron Range, and visited the Department of Natural Resource's waste characterization research facility. Focus group members also traveled to northwestern Minnesota to examine issues of sand and gravel mining in the sensitive beach ridge formations of Glacial Lake Agassiz.

Structure of the report

Results of the team's work are contained in Part I of this report. This work consists of a ***vision*** statement, which was developed to illustrate a long-term view of environmental and economic features of Minnesota's mineral industry; ***principles***, which are the guiding concepts for individual actions; and ***recommendations***, which are realizable strategies. Background information is provided when needed.

Part II of the report provides supporting information on Minnesota's bedrock and surficial geology. This section also discusses economic and environmental issues that are faced by three sectors of the mineral industry examined by the team: ferrous, nonferrous metallics, and construction aggregates. Appended material furnishes supporting information referred to in Parts I and II.

Vision

Minnesota will continuously improve its mineral industry to support the needs of future generations. At the same time, mineral exploration, mining, and reclamation will be environmentally sound. Mine operators and owners will participate in protecting ecologically critical areas and cultural resources while preserving land use options for the future.

The state's mineral industry will provide mineral commodities for society's needs through reuse, recycling, and recasting of minerals products, as well as through the replenishment of existing minerals supplies through mining. Mine operators and owners in the state will be good corporate citizens and innovative leaders in the development of new technology.

A skilled, fairly compensated work force will have diverse employment opportunities, many of them provided by value-added mineral industries. During cyclical downturns in the mineral industry, technical education and retraining will enable workers to sustain their quality of life.

Minnesota will maintain its environmental well-being and economic position in the global marketplace while advancing and implementing principles of sustainable development. Decisions for managing Minnesota's minerals resources will be made through a partnership of the private sector, government, and citizens.

Principles

HOLISTIC MANAGEMENT

- *The integrity of the state's ecosystems must be maintained and protected.*
- *Ecologically critical sites and unique environmental and cultural resources must be protected.*
- *Mineral resource potential must be considered in land-use decisions.*
- *All planning for mineral development must address reclamation and subsequent land use.*

PUBLIC AWARENESS

- *The concepts of sustainable development must be incorporated into educational programs and institutions.*
- *Educational programs must be based on economic and scientific principles. The programs must also contain information about the role of minerals in Minnesota's economy.*

EFFICIENCY

- *Energy conservation, waste reduction, reuse, and recycling must be encouraged.*
- *Knowledgeable and professional regulators must establish cost-effective, coordinated, and understandable permitting processes, which incorporate public participation.*
- *Public agencies must be accountable for clearly defined, non-duplicative, regulatory roles and must work together in decision-making with citizens and the private sector.*

SUSTAINABLE ECONOMY

- *The minerals economy must be diversified and strengthened through additional research, increased value-added processing, and the further development of mining-related environmental technologies.*
- *We must continue to refine our knowledge of mineral and other resources.*
- *Principles of full cost accounting must be pursued.*
- *A fair and equitable tax system must be established.*
- *A broadly-skilled, fairly-paid local work force must be encouraged.*
- *The social consequences of mine development, mine closure, and other major changes affecting mining-based communities must be managed through careful planning.*

STRONG AND STABLE RESEARCH

- *Programs demonstrating the state's leadership in minerals research and related environmental technologies must be enhanced.*

Recommendations

Holistic Management

A sustainable minerals industry will be achieved through balancing the protection of natural and cultural resource with environmentally sound minerals development and management. Successful balancing requires understanding ecological systems in planning for minerals development, along with identifying the location of resources requiring protection, along with the location of mineral resources needed for economic development. Holistic management looks beyond minerals development to include planning for environmentally sound reclamation and for subsequent use of mined areas.

Principle: The integrity of the state's ecosystems must be maintained and protected.

RECOMMENDATION: Encourage the consideration of ecosystems in public and private sector strategic planning.

Background: Ecosystems. An ecosystem is all the interacting populations of plants, animals, and microorganisms that live at a site, or unit of land, in addition to their physical environment. Ecosystems are identified, characterized, and delineated at various scales for ecological resource planning and management. Delineated as ecological units, they are segments of the landscape that have relatively uniform climatic, geophysical, and "natural" vegetative attributes that cause them to behave and respond relatively uniformly and predictably.

The issue of scale is extremely important in understanding ecological systems. Ecosystems are multi scale. They range in size from a prairie pothole wetland, to a regional forest, to the entire biosphere. Different environmental indicators of ecosystem integrity apply at different scales; there is no one "proper" scale for measuring ecosystem integrity.

RECOMMENDATION: Inventory ecosystems and mineral resources to enable a comprehensive analysis of costs and benefits for land-use decisions.

Principle: Ecologically critical sites and unique environmental and cultural resources must be protected.

Currently, state and federal law affords protection to certain lands within Minnesota. Mining is excluded from over 1.5 million acres of federal and state land in Minnesota. Federal and state laws prohibit the use of federal and state waters or lands for mining within the Boundary Waters Canoe Area Wilderness (BWCAW) and Voyagers National Park. State lands located in small watersheds that flow directly into the BWCAW or state lands located within principal recreational entrances and travel corridors

Holistic Management, con't.

into the BWCAW are withheld from leasing by a commissioner's order. Federal lands located within a Federal Mining Protection Area adjacent to the BWCAW are, similarly, not leased.

State law prohibits mining of state lands in the Upper Mississippi River Headwaters Corridor. State law (Minn. Stat. sec., 84.035-.036, 1992) also prohibits any exploration or mining of state lands that would significantly modify or alter the cores of the eighteen peatland scientific and natural areas identified in the *Recommendations for the Protection of Ecologically Significant Peatlands in Minnesota* (Minnesota Department of Natural Resources, 1984). It is also state policy not to lease within other scientific and natural areas, state parks (possible exceptions are parks established due to association with mining), and in proximity to Lake Superior.

Many other state lands are excluded from public lease sales or offered for lease only with additional conditions that address concerns about special features or use. For example, information maintained by the State Historic Preservation Office of the Minnesota Historical Society is used to exclude lands containing burial mounds. As another example, sites containing possible ghost towns on state lands may be leased only with an additional provision that requires establishment of protective measures prior to exploration.

The state's recently adopted reclamation rules for nonferrous metallic minerals apply these exclusion standards for mining on any lands in the state. State reclamation rules also have standards for prohibiting surface disturbance in proximity to the excluded lands.

RECOMMENDATION: Increase financial support from the Legislative Commission on Minnesota Resources to complete County Biological Surveys of all Minnesota counties by the year 2000.

Background: Minnesota County Biological Survey. The Minnesota County Biological Survey (MCBS) began in 1987 in order to assess the status of the state's biological diversity and its unique natural resources. It is a county-by-county survey funded primarily by the Legislative Commission on Minnesota Resources (LCMR). It is conducted by the Natural Heritage and Nongame Wildlife programs of Department of Natural Resources' Division of Fish and Wildlife, Section of Wildlife. The fundamental objective of the MCBS is to systematically identify locations of Minnesota's rare natural ecosystems, their component natural communities, and rare species.

The county-by-county survey identifies natural areas -- defined as remnants of natural vegetation that have escaped significant human alteration and are representative of the Minnesota landscape prior to European settlement in the 1800s. Such areas are made up of natural communities, which are distinctive groups of native plants and animals living together under similar environmental conditions.

Holistic Management, con't.

The Natural Heritage Program has developed a classification of natural communities (they have no legal protection in Minnesota with the exception of calcareous fens) that is used by MCBS in the evaluation of potential natural areas. The Program has also evaluated and ranked community types according to their relative rarity and endangerment throughout their range and considers the identification, protection, and management of natural communities and ecosystems a high priority.

MCBS also identifies locations of selected rare plants and rare animals. This includes searches for species that are officially listed under the provisions of the Federal Endangered Species Act of 1973, Pub. L. No. 93-205, 87 Stat. 884 and/or Minn. Stat. sec. 84.0895 (1992), and for those species that are proposed for state or federal listing. Federally-listed species are categorized as endangered, threatened, or candidates for listing. State-listed species are classified as endangered, threatened, or of special concern. Endangered species are provided the highest level of legal protection under federal and state laws.

MCBS targets several other species that are not legally protected. Some species are under consideration for listing and are in the review process. These fall into the categories of candidate species, proposed endangered, proposed threatened, and proposed special concern. Other rare species requiring further field survey to determine their status are categorized as non-listed rare species.

RECOMMENDATION: Identify and complete other resource inventories, such as the National Wetlands Inventory, that can be used in making land-use decisions, which include those dealing with mineral resource development.

Background: National Wetlands Inventory. The National Wetlands Inventory is a computerized database of wetlands delineated by the U.S. Fish & Wildlife Service. Wetland types are classified by plant and soil type and frequency of flooding characteristics. The Inventory was designed to be used for wildlife, wetland, and land-use planning.

Principle: Mineral resource potential must be considered in land-use decisions.

Typically, as units of government begin land-use planning (determining the suitability or allocation of land for various uses), the focus of the planning is on the surface expression or areal extent of a specific type of land, whether it be for agricultural, forestry, commercial, industrial, or residential use. Most often, the potential for the extraction of mineral resources is not considered even though the best use of a specific parcel of land may be an extractive use. An example of such unintegrated planning is in areas where

Holistic Management, con't.

suburban sprawl has resulted in the construction of buildings over valuable aggregate deposits thus precluding the extraction of aggregate from that location. This becomes an important issue when aggregate is in short supply and the outcome necessitates using higher-cost material from distant locations.

RECOMMENDATION: Support the identification of mineral resources for land-use planning, emphasizing those areas where conflict is likely to arise.

A. Accelerate sand and gravel inventories in the high-growth corridor that extends from Rochester north through the Twin Cities Metropolitan Area to St. Cloud and in the Glacial Lake Agassiz Beach Ridge area in northwestern Minnesota.

> **Background: Existing Aggregate Inventories.** The following two state programs address issues of aggregate planning: the Aggregate Mapping Program of the Minnesota Department of Natural Resources and the County Geologic Atlas Program of the Minnesota Geological Survey.
>
> The statewide aggregate mapping program, which is mandated by Minn. Stat., sec. 84.94 (1992)(see Appendix C), identifies and classifies potential aggregate resources in counties outside the Twin Cities metropolitan area. The work is focused on those areas of the state where urbanization or other factors may result in a loss of aggregate resources to development. To date, Department of Natural Resources mapping has been completed in Sherburne, Wright, and Isanti counties and is currently in progress in Clay County. Aggregate mapping is scheduled for Benton and Blue Earth counties. The projected rate of completion is one county every three years.
>
> At the completion of the mapping, the geologic information is provided to the county governments to be incorporated into zoning and land-use plans that could preserve aggregate resources for future use. Digital map data are provided to the counties that use geographic information systems for land-use analysis.
>
> The county geologic atlas program, which produces compilations of detailed geologic and hydrologic information in an interpretive and descriptive form, also evaluates near-surface geological resources such as sand and gravel resources or crushed rock. To date, of the seven county atlases that have been completed, Dakota, Hennepin, Olmsted, and Winona counties have opted to contract for geologic resources plates (maps).

B. Complete inventories of known mineral deposits, such as copper-nickel, titanium, manganese, kaolin, and dimension stone.

C. Identify areas with potential for occurrences of minerals.

Holistic Management, con't.

RECOMMENDATION: Support a policy allowing mineral exploration in areas that contain other critical natural resources, only if those critical resources can be protected during exploration.

RECOMMENDATION: Protect identified mineral resources as reserves for future use.

Principle: All planning for mineral development must address reclamation and subsequent land use.

RECOMMENDATION: Provide funding for reclamation, using existing tax revenues paid by the mining industry, when the owner or operator cannot finance the reclamation (due to bankruptcy or other factors that might delay the reclamation).

A. Amend the Aggregate Material Tax, Minn. Stat., sec. 298.75 (1992), to:

   1. make the tax optional for all Minnesota counties;
   2. prohibit the transfer of funds from a county's special reserve fund (for reclamation) to the road and bridge fund until all pits, quarries, or deposits in a county have been reclaimed; and
   3. allow the Aggregate Material Tax monies allocated to the special reserve fund to be used for reclamation of pits, quarries, or deposits abandoned for more than 10 years *regardless of ownership.*

Background: Aggregate Material Tax. The Aggregate Material Tax, Minn. Stat., sec 298.75, (1992) (see Appendix D) is currently collected by twenty-two counties in the state where aggregate is being mined. Subd. 7. of the statute states:

> ". . . all money collected as taxes under this section shall be deposited in the county treasury and credited as follows, for expenditure by the county board . . . (c) Ten percent [of the money collected goes] to a special reserve fund . . . for expenditure for the restoration of abandoned pits, quarries, or deposits located upon public and tax forfeited lands within the county.
>
> If there are no abandoned pits, quarries or deposits located upon public or tax forfeited lands within the county, this portion of the tax shall be deposited in the county road and bridge fund for expenditure for the maintenance, construction and reconstruction of roads, highways and bridges."

B. Develop a means to use a portion of the Taconite Area Environmental Protection Fund, which is funded through Taconite Production Tax

Holistic Management, con't.

revenue, as a mechanism to provide partial financial assurance for reclamation of lands disturbed by taconite mining after 1980.

Background: Taconite Area Environmental Protection Fund. The 1990 Legislature adopted legislation that will make financial assurance a mandatory requirement for the taconite industry. 1993 Minn. Laws, Chap. 172, sec. 5, subd. 2, mandated a study of financial assurance be submitted to the legislature. Based on the findings of the study, which will address the strengths of various financial assurance instruments and the feasibility of establishing financial assurance pools, the financial assurance requirements of the Ferrous Rules will be rewritten. Study participants include the Minnesota Department of Natural Resources (DNR), the ferrous industry, environmental organizations, the state investment board, the Iron Range Resources and Rehabilitation Board (IRRRB), and the Minnesota Pollution Control Agency (PCA).

The Taconite Production Tax, Minn. Stat., sec. 298.23-.24 (1992) (see Appendix E), is a severance tax paid on concentrates or pellets produced by the various taconite companies. It is paid "in lieu of" ad valorem taxes on taconite and lands containing taconite (*Minnesota Mining Tax Guide*, 1993). Taconite companies make the production tax payments directly to Cook, Lake, St. Louis, Itasca, Crow Wing, and Aitkin counties and to the Iron Range Resources and Rehabilitation Board. The monies are then distributed to a variety of recipients including cities and townships; school districts; counties; IRRRB-managed funds; and other miscellaneous funds, such as Taconite Property Tax Relief (fund).

The Taconite Area Environmental Protection Fund, Minn. Stat., sec. 298.223, subd. 1, (1992) (see Appendix F), which was created by the 1977 legislature and funded through the Taconite Production Tax, was created for the purpose of "reclaiming, restoring, and enhancing those areas of northeast Minnesota that are adversely affected by environmentally damaging operations involved in mining and producing taconite and iron ore concentrates." It was established to provide funding to reclaim lands disturbed by mining prior to 1980.

Holistic Management, con't.

RECOMMENDATION: Reclaimed areas should be safe, stable, environmentally sound, and compatible with surrounding land uses. Those involved in the reclamation planning should consider restoring the site to resemble the original landscapes or other progressive strategies.

Background: Restoration and Reclamation Techniques. One example of restoring a mined site to a facsimile of the surrounding landscape occurred on an abandoned gravel pit on Bluestem Prairie in Clay County. Gravel mining ceased in 1986, after which the Nature Conservancy acquired the tract where the gravel mining occurred. In 1988 the Conservancy reclaimed this heavily disturbed area by restoring a "natural" hydrologic flow, improving the landscape (but not the original terrain), and revegetating the gravel pit area with native plants of the Bluestem Prairie community.

Another example of an innovative approach to reclamation is the impending agreement between Eveleth Mines and the Minnesota Department of Natural Resources to allow Eveleth Mines to stockpile low-grade iron ore materials in the mined-out Leonidas Pit adjacent to their Thunderbird North Mine. The benefits of managing mine stockpiles in this manner include: improved community safety, reduced costs for Eveleth Mines, and avoidance of the visual impacts of above-ground stockpiling.

Public Awareness

An informed citizenry will play a primary role in successfully pursuing sustainable development principles in Minnesota. The public and private sectors have a responsibility for providing the information necessary for the general public to understand the concepts of sustainability, including the relationships between a healthy economy and a healthy environment. For the minerals industry in particular, the public needs to be aware of the social and economic value this industry brings to Minnesota. The educational programs must begin at the kindergarten level and continue through adulthood, emphasizing how daily decisions affect sustainable development.

Principle: The concepts of sustainable development must be incorporated into educational programs and institutions.

RECOMMENDATION: Incorporate the concept of sustainable development into K-12 curriculum to include the following topics:

A. the importance of minerals to Minnesota's economy and society;

B. social responsibilities associated with sustainable development (to support environmentally responsible companies, to share costs of environmental protection and management, and to adopt environmentally responsible habits, such as recycling and minimizing waste);

Public Awareness, con't.

C. the importance of recycling and the necessity of replenishing supplies of recycled material with virgin raw materials; and

D. the need for responsible stewardship in decisions affecting mineland development, reclamation, and restoration.

Principle: Educational programs must be based on economic and scientific principles. The programs must also contain information about the role of minerals in Minnesota's economy.

RECOMMENDATION: The private sector, government, and citizens should establish local partnerships to promote communication and awareness.

RECOMMENDATION: Education programs should enhance public discussion and understanding of full cost accounting.

Efficiency

Sustainability implies maximizing efficiency. One significant means of achieving efficiency is through recycling: incorporating recycling potential into product design, incorporating recycling techniques into operational processes, and using recycled products in industrial development. Incentives for recycling must be developed; likewise disincentives must be removed. Another important means of maximizing efficiency is through regulatory and permitting processes that reduce duplication of responsibilites, encourage cooperation and coordination among regulators, and include a partnership of government agencies, private industries, and citizens in decision-making.

Principle: Energy conservation, waste reduction, reuse, and recycling must be encouraged.

RECOMMENDATION: Incorporate recycling into product design.

Background: Recycling and Design. Recognizing the need to recycle materials, increase efficiency, and reduce waste, the concept of "green" or environmental design is being incorporated into the manufacturing process in some parts of the world. Japan, certain European countries, and even some states in the U.S. are considering, or have implemented, regulations to disassemble and recycle automobiles. Currently, German and Japanese automakers, such as BMW, Volkswagen, and Mazda, are designing automobiles that can be disassembled upon retirement in order to recycle the materials used in building the automobile.

This concept differs from the process of "shredding" old automobiles in the U.S. to provide scrap material for steel-making. Because the shredding process does not separate the various material components in automobiles, the low-end scrap supply in the U.S. is being diluted with steel substitutes (such as plastics),

Efficiency, con't.

coated steel, and various alloys used to build lighter cars. As a result the quality of the scrap steel supply in this country is seriously declining and, for many applications, becoming less valuable, while the cost of high-quality scrap is increasing dramatically.

RECOMMENDATION: The private sector should incorporate recycling techniques and recycled materials into its operations. For example, compost could be used to reduce the use of petroleum-based fertilizers in reclamation. If such a compost facility were to be built on the Mesabi Iron Range, it could supply mixed municipal waste compost for mineland reclamation.

RECOMMENDATION: Encourage the use of recycled materials in new construction. Materials that can be recycled for construction include concrete, asphalt, roof shingles, utility ash, glass, rubber, sewage ash, and water treatment sludge.

Principle: Knowledgeable and professional regulators must establish cost-effective, coordinated, and understandable permitting processes, which incorporate public participation.

RECOMMENDATION: Support the recommendations of the Mining Simulation Project.

Background: Mining Simulation Project. The Mining Simulation Project was a cooperative study undertaken in 1989 by representatives of Minnesota's environmental community, the state's mining industry, the Minnesota Department of Natural Resources, and the Minnesota Pollution Control Agency ". . . to identify and resolve environmental issues associated with base and precious metal mining in a neutral atmosphere before a commercial mining development is announced." Utilizing three mineral development scenarios sited in environmentally sensitive areas, study participants examined the following seven topics: exploratory drilling; environmental review and permitting processes and procedures; land-use conflicts; water quality and quantity; air quality; design operation, closure, and post-closure care; and financial assurance.

The specific recommendations of the study, *Report on the Mining Simulation Project, 1990*, are included in Appendix G.

Efficiency, con't.

Principle: Public agencies must be accountable for clearly defined, non-duplicative, regulatory roles and must work together in decision-making with citizens and the private sector.

RECOMMENDATION: Continue to encourage and support cooperative agreements between government agencies and between the public and private sectors. Agency leaders should continue to re-examine, refine, and renew their commitment to the agreements.

Background: Cooperative Agreements. An example of such an agreement is the *Memorandum of Agreement between the Minnesota Pollution Control Agency and the Minnesota Department of Natural Resources* (see Appendix H). It was developed to enhance the efficiency of the permitting process used in the regulation of the mining industry in Minnesota through the establishment of specific procedures for coordinating the regulatory and non-regulatory functions of the two agencies.

RECOMMENDATION: Continue the Sustainable Development Initiative to bring citizens, the private sector, and government together to explore long-term strategies, to develop long-term policies, and to develop a plan for long-term funding of the Initiative.

RECOMMENDATION: The Environmental Quality Board should be developed as a forum to address issues of duplicative responsibility and conflict among state agency relating to Minnesota's Environmental Policy.

RECOMMENDATION: Rules and regulations for implementing state policy must be developed with full allowance for public participation.

Sustainable economy

The mining industry plays a significant role in creating wealth for Minnesotans. A major consideration for supporting the industry is that it creates good jobs. In order to meet the principles of sustainability, however, emphasis must be given to ensuring a trained work force that can adjust to the cyclical nature of the mining, while minimizing the associated socio-economic effects of mine closure. In addition, the state must look for new opportunities for creating wealth through mining. One area with potential is in value-added processes that keep more jobs and products in Minnesota. Maintaining a healthy economy is important also as it relates to our ability to address environmental issues: mineral resources must be available to maintain economic activities and jobs that provide financial resources for environmental protection.

Principle: The minerals economy must be diversified and strengthened through additional research, increased value-added processing, and the further development of mining-related environmental technologies.

Sustainable Economy, con't.

RECOMMENDATION: Encourage value-added processing that meets environmental standards through research, tax, and other governmental policies.

RECOMMENDATION: Encourage the construction of Direct Reduced Iron (DRI) facilities on the Mesabi Iron Range to take advantage of the current "window of opportunity" in the steel scrap substitute market, and place a ten year moratorium on the Taconite Production Tax for pellets going into Minnesota DRI production for facilities under construction prior to the year 2000.

Background: Direct Reduced Iron (DRI). Direct reduction is defined as any process in which metallic iron is produced by the reduction of iron ore or any other iron oxide below the melting temperature of any materials involved. The product of a direct reduction process is called direct reduced iron (Sibakin, 1980).

DRI is used with low-residual steel scrap by minimills in thin-slab/flat-rolling technology that has revolutionized the steel industry. The development of this new technology, coupled with low labor costs and the relatively inexpensive capital investment for a 1 million ton per year facility, has enabled minimills to capture approximately thirty-seven percent of the steel market from the traditional integrated steel industry. Moreover, integrated steel will be under continued pressure from the minimills whose share of the total market is projected to reach forty-two percent by the year 2000 (Paine Webber, 1993).

The projected market for DRI used by minimills (and by blast furnaces in some cases) is about 4 million tons per year. Currently, this new market is being explored by a number of companies that are planning the construction of plants to produce steel scrap substitute material. If Minnesota is to take advantage of this opportunity -- to supply DRI for steel-making and thus retain a portion of its North American market share for pellets -- it is imperative that a DRI facility be constructed in the state relatively quickly. Not withstanding unforeseen events, the "window of opportunity" is likely to be closed by the year 2000.

The moratorium on the Taconite Production Tax (see Appendix E) for new pellets going into DRI would be a means for northeastern Minnesota to share the risk of building such a facility. The rewards for shared risk include the economic opportunities provided by a strengthened taconite industry.

RECOMMENDATION: Minnesota's mineral industry should have economical, reliable, and clean energy supplies.

Sustainable Economy, con't.

Principle: We must continue to refine our knowledge of mineral and other resources.

RECOMMENDATION: The Minerals Coordinating Committee should develop geologic information for mineral potential, land-use, and water planning. Efforts should be made to provide a stable, long-term source for funding for this research.

Background: Minerals Coordinating Committee. The Minerals Coordinating Committee was established by the legislature to provide for the diversification of the state's mineral economy through long-term support of mineral exploration, evaluation, environmental research, development, production, and commercialization. The Committee membership consists of the director of the Division of Minerals of the Department of Natural Resources, the deputy commissioner of the Minnesota Pollution Control Agency, the director of the Minnesota Geological Survey, the dean of the Institute of Technology, University of Minnesota, and the director of the Natural Resources Research Institute.

Principle: Principles of full cost accounting must be pursued.

RECOMMENDATION: The Environmental Quality Board should begin an analysis of full cost accounting and develop a program to increase public awareness of the concept of product life-cycle, its environmental effects, and its social costs and benefits. The entire minerals sector should support this effort.

RECOMMENDATION: The Environmental Quality Board should develop programs that explore the interrelationships between full cost accounting and the concept of sustainable development, particularly with respect to the unique attributes of the minerals sector.

Principle: A fair and equitable tax system must be established.

RECOMMENDATION: Severance tax revenue should be used to address the social and ecological costs of extracting mineral resources.

Principle: A broadly-skilled, fairly-paid local work force must be encouraged.

RECOMMENDATION: Technical schools, colleges and universities -- with potential financial support from the private sector and the Iron Range Resource and Rehabilitation Board -- should provide Minnesota citizens with the necessary skills to be productive in the rapidly-changing work place.

Sustainable Economy, con't.

Principle: The social consequences of mine development, mine closure and other major changes affecting mining-based communities must be managed through careful planning.

This principle suggests cross-team issues with the Manufacturing and Settlement teams on the management of the social aspects of mine closure, which include issues such as retraining, relocation, the availability of social services.

RECOMMENDATION: The Northeast Minnesota Economic Protection Trust Fund Act (2002 Fund) should become a model for nonferrous mineral industries.

Background: Northeast Minnesota Economic Protection Trust Fund Act. Recognizing that a decline in the taconite industry would result in severe economic dislocations and unemployment, the state legislature created the trust fund in 1977 "to be devoted to economic rehabilitation and diversification of industrial enterprises where these conditions ensue as the result of the decline of such a single industry."

The priority for using the fund includes the following purposes:

(1) projects and programs that are designed to create and maintain productive, permanent, skilled employment, including employment in technologically innovative businesses;

(2) projects and programs to encourage diversification of the economy and to promote the development of minerals, alternative energy sources utilizing indigenous fuels, forestry, small business, and tourism; and

(3) projects and programs for which technological and economic feasibility have been demonstrated.

The complete act, Minn. Stat., sec. 298.291-298.298 (1992), is included in Appendix I.

Strong and Stable Research

The key to success in the above areas is in a research program that maintains Minnesota's leadership in the pursuit of a sustainable minerals industry. Areas such as understanding ecological systems and developing technologies for improving products and process efficiencies require consistent, long-term support.

Principle: Programs demonstrating the state's leadership in minerals research and related environmental technologies must be enhanced.

RECOMMENDATION: Support research that leads to a better understanding of ecological systems.

Strong and Stable Research, con't.

RECOMMENDATION: Support environmental research for developing improved reclamation technology and techniques.

RECOMMENDATION: Support research for pollution prevention. For example, minimize the production of hazardous wastes in minerals processing by developing alternatives for solvents.

RECOMMENDATION: Financial support should be provided for long-term geologic, mining, mineral processing, and value-added research.

RECOMMENDATION: Support research for improving energy efficiency.

RECOMMENDATION: The Legislature, the Legislative Commission on Minnesota Resources, state agencies, the financial community, and private sector should place a high priority on long-term research projects. The funding goal of the Legislative Commission on Minnesota Resources should be to provide an equal balance of support to short-term and long-term research projects.

RECOMMENDATION: Project review for government-sponsored research and inventory projects should be required both before the projects begin and after the projects are completed by a panel of technical peers.

RECOMMENDATION: Support research for Direct Reduced Iron to improve the quality of the product and the efficiency of the process.

RECOMMENDATION: Support research programs that address the recycling of mineral resources, such as recycling steel reverts from blast furnaces.

RECOMMENDATION: Support the Department of Natural Resources' Mine Waste Drainage Quality Prediction research as a long-term program.

Background: Mine Waste Drainage Quality Prediction. Exploration for gold, titanium, and other nonferrous minerals is presently occurring in Minnesota. If an economic deposit is discovered and mined, waste rock, tailings, and the mine itself may remain as permanent alterations to the landscape. Although some of these mine wastes may be environmentally innocuous, many of them present a potential for adversely affecting the quality of water resources. Minnesota Rules, Chapter 6132, the Nonferrous Metallic Mineral Mineland Reclamation Rules, became effective on March 24, 1993. These rules require -- prior to development of a nonferrous mineral resource -- the quantification of the mass and composition of potential mine wastes, and the determination of the release of acid and trace metals from these wastes (drainage quality prediction). This information will be used to identify the types of water quality control required to protect the water resources of the state and to integrate these control measures into mineral resource development plans.

Strong and Stable Research, con't.

There is a general consensus among professionals in the field of environmental management of mine waste, that the pre-operational prediction of mine waste drainage quality is a conceptually sound approach for protecting water resources. Furthermore, it is recognized that mine waste drainage quality is largely determined by mine waste composition. Drainage quality prediction is, however, a relatively new field of study, and the precise relationship between a specific mine waste and its associated drainage quality is generally unknown. Consequently, for mine waste in general, the prediction of the quality of mine waste drainage based on composition is tenuous. Short-term laboratory dissolution tests, which are used to predict the quality of drainage from mine waste, are similarly a new development, and substantial uncertainty remains as to their design, as well as the interpretations of their results.

In Minnesota there is little information available on the characteristics of, or drainage quality from, nonferrous wastes because there is presently no mining of base or precious metals. The lack of such information increases the complexity of drainage quality prediction, as well as the environmental review and permitting process for proposed mineral development projects. Therefore, long-term dissolution tests on well-characterized mine wastes are imperative to establish the relationship between the composition of mine waste and the quality of its drainage. Appropriate mine waste management measures can then be integrated with mining plans to reduce or eliminate sources of non-point pollution discharge to Minnesota waters.

Conclusions

In March 1993, a diverse group of Minnesotans concerned about the future were assembled as the Minerals Team of the Sustainable Development Initiative. At the outset the team recognized that at some level the basic principle of sustainability is inconsistent with mineral extraction as it has been practiced in Minnesota and around the world. Minerals are non-renewable resources, mineral extraction alters the environment to varying degrees, and mineral commodity prices are determined in the international market. The team also recognized the inherent value of minerals to the quality of life in Minnesota and the general welfare of society. The group embraced within its mission the World Commission on the Environment and Development's characterization of the sustainable development of minerals as paths of social, economic, and political progress that "meet the needs of the present without sacrificing the ability of future generations to meet their own needs."

The vision statement, guiding principles, and modest number of recommendations of the minerals team resulted from approximately nine months of information gathering, sharing, and deliberations. Given more time, the team certainly could have made more recommendations. Equally as important as the number of recommendations, however, is the process by which they were developed. The team recognizes that this set of materials is a draft for participants in the Minnesota Congress on Sustainable Development to review, discuss, and expand upon. The team expects critical review and constructive criticism. In other words, this product is just a beginning, perhaps the start of a process by which complex, oftentimes competing, issues can be raised and discussed in the context of a broader vision.

The team struggled with the concept of "full cost accounting" and strongly suggests that further understanding of this emerging economic science is a key component of successfully implementing a sustainable development vision for Minnesota. This is one of many issues that deserves further discussion in a continuing process modeled after the current Sustainable Development Initiative.

If the minerals team's discussions serve as an example, it is clear that by initiating a broad dialogue between various interests, starting with a shared vision and working towards principles and recommendations, itself becomes a mechanism for building consensus to support the integrated management of our natural resources. The process to date has been a key first step in a long overdue modification of the private and public discussion about our common future.

Part II

TECHNICAL BACKGROUND

Part II of this report contains technical information used by the minerals team to frame the discussions of the team recommendations. It contains an overview of the state's geology and background statements for three sectors of the state's mineral industry: the taconite industry, the sand and gravel industry, and a potential nonferrous metallic industry.

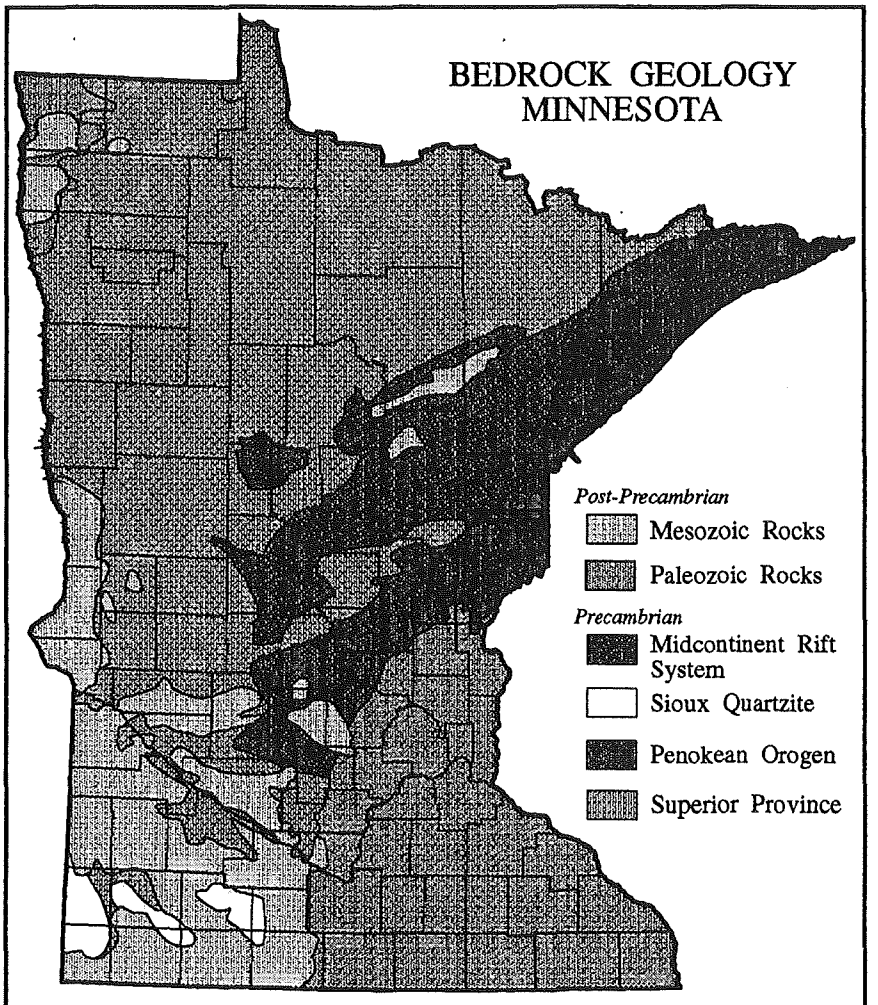
The geology section provides a context for which all discussion of the state's mineral economy was based, but it also provides a sense of the potential the state has for commodities currently not mined. The taconite industry is the state's largest employer among the minerals industry and is also the segment of the industry that is under the most pressure to restructure to maintain its competitiveness. In regard to industrial minerals, the discussion was restricted to sand and gravel mining. Although Minnesota has a significant industrial minerals industry, which includes crushed rock, dimension stone, silica sand, and low-grade kaolin clay producers, time simply did not permit the team to address concerns pertaining to them. However, many of the issues raised in regard to the other mineral sectors, especially construction aggregates (sand and gravel), also pertain specifically to the other industrial minerals operations in the state.

Minnesota's Geology

Minnesota's geologic setting is highly varied. Much of the state is underlain by combinations of Precambrian rock types and structures that are known from other places to be associated with important deposits of metallic minerals. The understanding of the Precambrian geologic framework has improved significantly within the past decade particularly since the availability of the high-precision aeromagnetic and gravity surveys funded by the Legislative Commission on Mineral Resources. The data from these surveys have been integrated with the results of a follow-up scientific test-drilling program and outcrop-based geologic mapping to produce revised interpretive maps of Precambrian terranes in the drift-covered parts of Minnesota. These maps, which are more detailed and sophisticated than their predecessors, provide new regional concepts and exploration targets. Equally important is new information being developed on the distribution, thickness, and stratigraphic complexity of the Cretaceous and Quaternary overburden in Minnesota, which provides realistic parameters on the technical difficulties and costs to be faced by explorationists working where the bedrock is buried by glacial drift.

Precambrian

The major Precambrian subdivisions of Minnesota are (see Fig. 1): (1) the Superior Province (Superior Craton) of late Archean age (2,500 Ma), which includes a dominantly greenstone-granite terrane to the north and a much older gneiss terrane in the south; (2) the Penokean orogen of Early Proterozoic age (Ca 1800 Ma); (3) the Sioux Quartzite of Early Proterozoic age (1770-1600 m.y.); and (4) the Midcontinent rift system, a rift that developed in Middle Proterozoic time (Ca 1100-1000 m.y.).



Generalized from: Morey, G.B., 1993, Geologic map of Minnesota - Bedrock geology: Minnesota Geological Survey State Map Series S-19, Scale 1:3,000,000.

Fig. 1 Geologic Map of Minnesota.

Superior Province. To date, belts of Archean greenstone (the so-called greenstone belts) in northern Minnesota, and the major fault zones within and between them, have attracted the greatest interest in gold exploration because of their geologic similarity to producing greenstone-belt gold districts in Ontario. The Vermilion district, a moderately well exposed greenstone belt within the Wawa-Shebandowan subprovince of the Superior Craton, also has been the site of considerable base-metal (Zn,Cu,Pb) exploration. Although both kinds of commodities occur in greenstone belts, they require different exploration strategies. Many of the gold deposits in Ontario occur along major linear structural breaks that can be recognized in the aeromagnetic data, even where the rocks are covered by glacial deposits. In contrast, volcanic-hosted, massive base-metal sulfide deposits that contain copper and zinc, by analogy with those found in Canada and elsewhere, can be expected to occur at the tops of sequences where host rocks of felsic composition are abundant. These deposits, because of the sulfide constituents, also are amenable to geophysical exploration.

The greenstone belts are separated by intrusions of granitic rocks that have batholithic dimensions. Several of these batholiths, however, are composed of smaller pluton-size intrusions, some of which are extremely alkalic in composition. These alkalic plutons have some economic interest as the future source of rare-earth elements, such as those utilized in the electronics industry.

An intriguing and little-understood subunit of the greenstone-granite terrane is the so-called "quiet zone" where geophysical expressions imply numerous faults that could be favorable targets for gold exploration. However, a thick glacial cover in the area will make exploration both difficult and expensive.

The Archean gneiss terrane of southwestern Minnesota consists predominantly of quartzofeldspathic gneisses and younger granitoid intrusions with a long and eventful Precambrian history. The gneisses formed from volcanic and sedimentary rocks may be analogous to greenstone-belt associations and therefore have gold and base-metal potential.

Penokean Orogen. The Early Proterozoic Penokean orogen of east-central Minnesota consists of a strongly folded and faulted belt on the southeast, overlain by one or more depositional basins on the northwest. The folded and faulted belt contains sedimentary and volcanic rocks of moderate to low metamorphic grade and are similar to rocks in Wisconsin where at least eight known base-metal sulfide deposits of future, but considerable, economic significance are scattered. The Wisconsin deposits are dominated by copper and zinc and, accordingly, are similar to volcanic-hosted deposits in Archean greenstone belts. The economic potential of rocks within the depositional basins on the northwest side of the folded and faulted belt is poorly known. However, the largest of these, the Animikie basin, is fringed

on the north by the major iron deposits of the Mesabi range. These deposits will remain a major source of taconite for the United States steel industry for decades. The southwestern side of the basin is fringed by units that contain appreciable manganese resources. The manganese resource is too small to be extracted by conventional mining methods, but the manganese may be extracted someday by in situ mining techniques currently being developed by the U.S. Bureau of Mines. Lastly, parts of the basin, particularly in the Cuyuna range and in Carlton and Aitkin counties, have some potential for base-metal and precious metal deposits unlike those typically associated with other Precambrian rocks. These sedimentary-exalative-like deposits are just now beginning to be understood.

Post-folding "Penokean" plutons of granite and related igneous rocks extend southward from central Minnesota to Iowa. The Penokean plutons are an important source of dimension stone in east-central Minnesota and parts of the Minnesota River Valley. Similarly they are, and will continue to be, an important source of crushed rock.

Sioux Quartzite. The Sioux Quartzite rests unconformably atop Archean and Proterozoic rock in southwestern Minnesota. The Sioux is a dominantly red sandstone sequence that may contain placer gold deposits. Serious exploration of the Sioux is hampered, perhaps fatally, by poor exposure and a generally thick cover of Cretaceous rocks and Quaternary glacial deposits.

Midcontinent Rift System. The rocks of the Midcontinent rift system, the last of the major Precambrian subdivisions in Minnesota, consist dominantly of rift-related basaltic flows and intrusions, and post-rifting sandstone and shale. Prominent among the rift-related intrusive rocks is the Duluth Complex, a very large multiple intrusion that consists dominantly of troctolitic and anorthositic units. The Duluth Complex has attracted considerable attention as a potential source of copper, nickel, vanadium, titanium, cobalt, and platinum-group elements in a variety of discrete geologic settings. Non-economic occurrences of these metals have been found in several different rock types and structural settings within the complex. Exploration for platinum-group elements is currently underway. The economic development of many of the commodities in the Duluth Complex, however, depends more on metallurgical and beneficiation techniques than on regional geologic research. Nonetheless, geology remains important because mining and beneficiation must be tailored to specific deposits, which requires detailed mineralogic and petrologic studies not yet undertaken.

There also is an excellent potential for copper and silver deposits in the post-rift rocks that underlie parts of central and southeastern Minnesota. Both native copper and stratiform copper sulfides (+ silver) have been found in the same or broadly similar sedimentary rocks in Michigan (White Pine) and Wisconsin. As has been documented many times, such units are pyrite-rich and act as very efficient traps for copper and silver in oxidized, sulfate-rich ground water.

Much of the Precambrian bedrock in western Minnesota is marked by a clay-rich interval that in places is more than 300 feet thick. The clay is the product of a profound period of subaerial weathering prior to late Cretaceous time. Although widespread, kaolinite produced during this weathering event, and reworked by subsequent sedimentary processes, may be a significant economic commodity in the future. Lastly, it is interesting to speculate about the nature of an Archean lode-gold or a volcanic-hosted base-metal sulfide deposit after they had been modified and secondarily enriched by subaerial weathering processes.

Post-Precambrian

Post-Precambrian rocks occur in southern and northwestern Minnesota. They can be subdivided into two broad groups based on dominant rock types and stratigraphic age. These rocks are important sources of industrial commodities and have the potential for additional mineral development.

Paleozoic Rocks. Rocks of Paleozoic age occur in the southeastern one-third of the state and a small area in northwestern Minnesota. They are mostly marine sandstone, shale, limestone, and dolomitic limestone. The limey rocks in southeastern Minnesota have some potential for Mississippi Valley-type lead-zinc deposits. Two Paleozoic sandstone units in the southeast are currently being mined for silica sand. Some beds of dolomitic limestone are quarried for use as dimension stone, and certain other dolomitic limestone units are very important sources of aggregate. Beds of dolomitic limestones also have been studied recently for their potential use as sources of lime. Paleozoic shales units have been used also in the brick-making industry.

Mesozoic Rocks. Rocks of Mesozoic age occur in the southwestern, west-central, and northwestern parts of the state; however, small outliers of these strata occur throughout the state. Most of the rocks are of Cretaceous age, but thin sequences of Jurassic strata occur in the subsurface in far northwestern Minnesota. These rocks are mostly non-marine sandstone and contain locally abundant bodies of gypsum. Cretaceous rocks are widespread, but they crop out only sparingly in southwestern Minnesota, and along the Mesabi range. The sequence includes shale, sandstone, and claystone, mostly of marine and mixed marine-non-marine origins. Units of shale and claystone are used in southwestern Minnesota by the brick-making industry. Kaolin along the walls of the Minnesota River Valley is currently being mined for use in the cement and brick-making industries and other deposits are presently being explored for high-quality kaolin to be used in the paper industry.

Quaternary

The surficial deposits that cover bedrock in most of the state are the result of multiple glaciations during the most recent ice age. These glacial deposits consist of till (a mixture of clay, silt, sand and rocks), sand, gravel, silt and clay. Since most of the state was glaciated as recently as 12,000 years ago, the surficial deposits are relatively unweathered, and therefore provide the fertile soils that sustain the state's agricultural economy. These

surficial deposits are also important sources of mineral resources, most notably construction sand and gravel. Unfortunately, the disintegrating glaciers left an unequal distribution of sand and gravel deposits throughout the state.

In addition to sand and gravel, other mineral resources are extracted from surficial deposits in Minnesota. Silt and clay that was deposited in glacial lakes is increasingly sought after as lining and covering material for sanitary landfills. Peat, which has accumulated since the glaciers retreated, is mined for horticultural uses and has been studied for use as fuel. Marl, a lime-rich sediment, is mined locally for use as additive to agricultural soils.

Speculative Deposits

The role of several less conventional or speculative deposits in Minnesota's economic future should be considered when examining the state's mineral potential. Three examples from the 1980s illustrate the importance of this class of deposits.

In 1968, the first example of a new class of uranium deposit, the so-called "unconformity-related deposits," was discovered in Northern Territory, Australia. Shortly thereafter, other deposits of this class were found in other places in Australia as well as in Saskatchewan, Canada. As the name implies, these deposits occur along unconformities, generally between strata of Early and Middle Proterozoic age. Using this criterion, explorers recognized that such deposits could exist in Carlton and parts of Pine and Kanabec counties, where a major Early-Middle Proterozoic unconformity had been mapped previously. The search ended five years later, not because it was established that the area lacked uranium, but because so many new deposits of the class were found that the worldwide market price of uranium plummeted.

The search for diamonds in Minnesota also shows how the search for unconventional kinds of deposits can lead to exploration activity. Diamonds occur in South Africa and Australia in igneous rocks called kimberlites that typically occur as swarms of very small (.5 mile in diameter) plutons. These plutons, though of much younger age, are typically found in Precambrian terranes. Geologic mapping by the U.S.. Geological Survey found several kimberlitic plutons in the southeastern part of the Upper Peninsula in Michigan. After that, the search broadened to Minnesota; aeromagnetic data established that parts of east-central and southwestern Minnesota were characterized by anomalies like those associated with kimberlite swarms.

Lastly, the idea of a possible petroleum resource in Minnesota could not even be mentioned in the early 1980s. Today, because an estimated 10 percent of the world's discovered petroleum resources are contained in rift-related rocks of various ages, and because rocks at the world famous White Pine copper mine in Michigan contain liquid hydrocarbons, the petroleum industry believes that the sedimentary parts of the Midcontinent Rift System are a favorable exploration target. Exploration in the rift system has now reached the point where drilling has been done in Kansas, Iowa,

and Michigan, and Wisconsin. There is no scientific reason why drilling should not also take place in Minnesota in the immediate future.

These examples have two things in common. First, their original discoveries occurred more or less by accident. Second, and more importantly, exploration has progressed in Minnesota because there already existed geologic studies in the form of maps and reports. Exploration for speculative kinds of deposits can occur only where there is a previously established knowledge base.

Summary

The state's geology is complex and variable from place to place. Likewise, mineral potential also varies from place to place, and there is no reason at this time to exclude any part of the state from having at least some potential for mineral development. Aeromagnetic data has shown that many previous ideas regarding the geology of the buried parts of the state were erroneous. Collective geological knowledge is so vague that it is not even possible at this time to consider the full range of mineral deposits that could occur in these areas. Nonetheless, it is safe to conclude that the mineral potential of these unknown areas will increase as geologic knowledge increases.

Iron Ore and Taconite

Beginning with the first commercial shipment in 1884, the red iron ore or natural ore of Minnesota was destined to play a significant factor in America's history. In addition to providing employment for the region's immigrants, the iron ore mined in Minnesota's natural ore mines produced steel to build railroads, bridges, building, cars, and hundred of other items for an expanding nation.

As the natural iron ore deposits began to be depleted, industry began to look for alternative feed for the steel mills. Research in the 1950s and 1960s, completed cooperatively by industry, the University of Minnesota, and the U.S. Bureau of Mines, developed the technology to turn low-grade taconite into a consistent, high-grade blast furnace feed. Thus was born the taconite mining industry.

Between 1955 and the early 1970s, eight taconite plants were built, and subsequently expanded, leading to a boom in northeastern Minnesota's economy. As the mining companies prospered, the communities and the entire region prospered as well. By 1981, all expansions of the taconite plants had been completed and the industry was shipping over forty-seven million tons of pellets and iron ore and employing 11,630 workers. The boom, however, was short lived. An excess supply of steel products glutted national and international markets forcing steel mills to shut down marginal plants and reduce steel-making capacity. The following year, 1982, was a disaster for the industry, employees, and communities throughout the mining area. Only twenty-two million tons were shipped and employment dropped to 7,626. One Minnesota plant closed due to an owner's bankruptcy.

Today, Minnesota's taconite industry has apparently stabilized at a shipment level of thirty-eight to forty million tons annually, but there is currently an excess of iron ore in North America and the steel industry is changing dramatically. Minnesota's taconite industry will be fortunate to maintain the current levels of production.

Another market force is currently developing -- the Electric Furnace (minimills). The Electric Furnace does not require iron ore as a feed stock; instead, it uses scrap metal from old buildings, bridges, cars, and other sources. Initially, the product of these minimills was of low quality, but through improvements in technology, minimills have improved the quality and the variety of products produced. These operations have continued to gain market share compared to the large blast furnaces and finishing mills of the integrated steel companies. Today, the minimill share of the steel market is about thirty-seven percent and increasing rapidly.

Taxation

Taxes have and will continue to play an integral part of the financial structure of the iron industry in Minnesota. The industry pays a variety of taxes including production tax, occupation tax, sales and use tax, ad valorem taxes, motor fuel tax, and payroll taxes. These taxes are used to support schools, cities, counties, townships, property tax relief (in the taconite relief area), IRRRB programs, and the state's general fund.

Much of Minnesota's current mining tax policy was initially developed in the late 1950s, when the natural ore deposits were beginning to "play out". The iron mining industry's future depended on developing and commercializing a process that would turn the abundant low-grade taconite into some type of value-added product that could feed the blast furnaces. The new industry would require commitments of hundreds of millions of dollars that would not occur without a change in the tax climate to encourage investment. In response, a coalition of industry and citizens proposed the taconite amendment, which was enacted in 1964 by the state legislature. The new amendment modified the occupation and ad valorem taxes associated to taconite. The production tax remained.

Since the taconite amendment's passage in 1964, tax laws have been modified numerous times through legislative action. The taconite industry today is paying $2.56 per long ton of pellets produced (excluding motor fuel and payroll taxes).

The taconite production tax, which is the primary tax the industry pays along with the corporate income tax, is a severance tax paid on a long ton of concentrate or pellets produced. It is paid "in lieu of" ad valorem taxes on taconite and land containing taconite. With some exceptions, it also excludes land and structures used in the production of taconite from ad valorem taxes. The 1993 taconite production tax raised $83,405,958. The rate is $2.054 per taxable ton and based on a three year average of 40,606,338 tons produced. The funds generated were dispersed to a wide variety of state and local agencies.

The production tax rate automatically escalates based on increase in the gross national product implicit price deflator. The escalator takes affect each year unless the rate is frozen or changed by the legislature. Currently, the legislature has frozen 1992 and 1993 rates but the escalation will resume in 1994.

For information about the other mining taxes, one should consult the *1993 Minnesota Mining Tax Guide* published by the Minnesota Department of Revenue.

Reclamation

Open pit taconite mines affect air quality, affect water quality, and disturb the land. These taconite mines require large tracts of land for operations that can last up to fifty years. Acreage must be available for the open pits, the plant site, waste dumps, lean ore stockpiles, and tailing basins. Both the surface overburden and the lower-grade lean ore must be removed from the top of the iron-bearing formation before mining can begin. Stockpiles of these materials can cover thousands of acres.

The tailings basins also consume large acreages. To turn the low-grade taconite into a high iron content pellet, a process of crushing, grinding, and concentrating takes place. This process requires three tons of taconite feed to make one ton of pellets. The two tons of waste generated in this process are called tailings, which are fine mineral particles suspended in water. These tailings are discharged into a large disposal area called a tailings basin. Because the tailings are susceptible to wind and water erosion, vegetative cover must be established through hydroseeding and mulching. Periodic maintenance may be required to maintain adequate cover.

To place all this into perspective, in 1993 taconite plants projected that they would mine 111,650,000 tons of crude ore to produce 42,970,000 tons of pellets. In addition, another 82,315,000 tons of soil and waste rock would be removed to uncover the crude ore.

The 1980 mineland reclamation law required each company to submit a long range mining plan that would address the future use of the land after complete termination of mining activities. In addition, annual plans detailing interim phases of mining and reclamation are submitted to and reviewed by the DNR. Since 1980, the mining companies have reclaimed 4,727 acres of dumps, stockpiles, tailing basins, plant sites, and pit walls. In 1992, 458 acres of tailing basins were subject to temporary reclamation to suppress fugitive dust. In addition, an average of 10,000 trees have been planted annually which are not required.

The 1980 law empowered the commissioner of natural resources to require financial assurance under certain prescribed conditions. To date those conditions have not existed at any of the taconite mining operations. Reclamation work has been performed in a timely manner and in compliance with the law, even at companies that have had financial problems or that have been forced to close. However, because of a number of unexpected bankruptcies that resulted from the economy of the 1980s,

and for several other reasons, many unrelated to the iron industry, the 1990 legislature determined that more protection against failure to perform reclamation was necessary. The legislature therefore removed from the law the conditions that had restricted the triggering of financial assurance, thereby making financial assurance a mandatory requirement. However, because of the iron mining industry's favorable record of reclamation compliance, the legislature directed the department to investigate methods by which the iron industry may be able to provide the necessary financial assurance protection, while minimizing adverse economic impacts on any individual mine operator. A decision on what will be required will be made by July 1, 1994.

When discussing the mining industries environmental history, two of the more difficult environmental issues come to mind. The first is the disposal of tailings into Lake Superior by Reserve Mining Company and the second the disposal of waste by the LTV Steel Co. at the Dunka mine. The first event received much publicity. The operator and the state eventually agreed to an on-land disposal system that is in full compliance of the law.

The second issue is the acid mine runoff from LTV Steel's Dunka Pit waste dumps. This pit was developed in an area where the waste is composed of sulfide type rocks. When stockpiles are subjected to rain and snow, the reaction caused an acid runoff. When this problem was discovered, LTV Steel Co., the DNR, and the PCA worked cooperatively to identify causes and methods to mitigate impacts. Results of these studies have been currently implemented by LTV to the stockpiles. This mine, which is the only taconite mine in Minnesota developed with a sulfide rock overburden, will be mined out and closed in 1994.

Future Opportunities

Analysts predict that Minnesota's iron ore production industry will continue to evolve. The steel industry and iron ore industry are now competing on a global basis. Mr. Michael Locker of Locker Associates gave the minerals team his insights on the Future Prospects of the North American Iron Ore Industry at a September meeting.

According to Locker, many factors have contributed to the reduced demand for iron ore. One factor is the growth of the Electric Furnace. The Electric Furnace share of the crude steel production grew from nineteen percent during the early 1970s to thirty-seven percent in 1992. The growth of the minimill marketshare, which utilizes scrap for feed, reduces the need for iron ore. The integrated steel industry also become more efficient, reducing the need for iron ore. Steel imports have replaced domestic steel production further, reducing iron ore requirements. Collectively, these factors have contributed to the decline of the iron ore industry.

Locker suggested, however, that there are opportunities for the industry to maintain its current market share and to develop new markets. The first opportunity is to supply low residual iron units to both the Integrated Steel and the Electric Furnace steel makers. Direct reduction technology, such as FASTMET and IRON CARBIDE processes, offer high potential. These

processes are fully developed and ready to be applied to a full scale commercial plant. These plants typically have an annual capacity of 500,000 tons and cost between $40 and $60 million to build. Several of these plants have been committed to or are being considered for construction in North America.

Another technology that offers potential is the direct smelting process. The COREX, DIRECT IRON ORE SMELTING (DIOS), and HI-SMELT are available processes. This process produces a molten iron product similar to blast furnace hot metal. Under current designs, the capacity would be limited to 300,000 to 1,000,000 tons per year. No costs were available for a commercial plant, but the cost would be more than the direct reduction plants.

Locker concluded his analysis by making two recommendations to the state. The first is to build a base to secure future demand by producing new iron ore products. The "window of opportunity" is open for direct reduction for three to five years and direct smelting for five to seven years. For the long term, he suggested that the industry should look at future steel making innovations and adjust the iron ore feed accordingly. The second recommendation was to reduce the dependence on pellets. This could be achieved by encouraging integrated steel mills to adopt minimill technology and install next generation smelting technology. As in the past, responsibility for raising capital for these initiatives must primarily come from local and regional bodies.

Nonferrous

Nonferrous minerals in this report are defined as base metals such as copper, zinc, and nickel; precious metals such as gold, silver, and platinum; and other metallic minerals that are usually sold as metal oxides such as titanium and vanadium. These metals are not currently mined in Minnesota although many experts believe that the potential for commercial deposits does exist in the state.

Exploration

Historically, several short spurts of exploration activity for nonferrous minerals have occurred, beginning with the Lake Vermilion gold rush of 1865. This was followed by ninety years of nonferrous inactivity, while exploration and development interest focused on iron ore. In the mid-1950s, the interest in nonferrous minerals was renewed with the discovery of large copper-nickel deposits in northeastern Minnesota. Soon companies became interested in exploring for other base metals, precious metals, titanium, and diamonds.

While significant copper-nickel and titanium deposits have been discovered, other base or precious-metals discoveries have not been made. However, many experts believe that continuing industry exploration, coupled with geological and mineral research programs, will lead to valuable discoveries of these minerals. The reason for this optimism is that Minnesota has similar geology to neighboring Canada where many valuable deposits have

been discovered. It is surmised that the primary reason for a lack of discoveries in Minnesota is that much of our bedrock is covered with a thick mantle of glacial drift. As more exploration is conducted and geological research increases our knowledge, discoveries will most likely occur.

Development Potential -- Risks and Rewards

Meanwhile, ongoing research on copper-nickel and titanium deposits may one day solve the metallurgical problems that are hindering development. For the most part, the development of the large low-grade copper-nickel deposits has been frustrated by the difficulty of beneficiating the ore into high-grade copper and nickel concentrates that can be processed by existing smelters. The smaller, but high-grade, titanium deposits will probably become commercial once technology is developed to remove deleterious magnesium from the ore.

A nonferrous industry has the potential to provide substantial economic benefits for rural Minnesota but carries with it the risk, if done wrongly, to damage the environment. Alternatively, the sustainable development philosophy provides guidance for policy makers, the public, and the private sector to prepare and plan for this new industry.

Although nonferrous mining could occur in all parts of the state, at present, development is most likely in the northern third. In most cases, the physical disturbance associated with mining will be relatively small (a few hundred acres per mine), with development of the large copper-nickel deposits in northeastern Minnesota being the most likely exception.

A single nonferrous mine could directly create 200 to 300 high-paying jobs and have a life of ten to twenty years or more. Again, copper-nickel development is an exception that would result in substantially larger employment from long-lived mines. Since mines tend to occur in clusters, the development of one mine may likely be followed by others in the area. The life of the "mining camp" may be quite long, as witnessed by the 110-year history of iron mining in the state and in the long mining life of many areas in Canada with similar geology. However, nonferrous mining is unlikely to rival iron mining in its economic impact or its impact on the ecosystem. More reasonably, it could be viewed as a partial replacement for a gradually declining iron ore industry.

Two primary societal risks are associated with nonferrous metallic mining. The first is the relocation of people and subsequent economic dislocation if mining proves to be a short-term, boom-bust phenomenon. The second is water pollution resulting from the mining of ores containing sulfide minerals (some ores do not contain sulfides and pose little risk to groundwater, while some mining techniques such as heap leaching pose an elevated risk).

The societal benefits are the production of needed materials and the creation of well-paying jobs in rural Minnesota. The minerals team believes

that with proper planning, the societal benefits can be enhanced and the risks can be reduced.

Global Issues

In addition to local interests, nonferrous mining carries with it several aspects of global responsibility. As the developing countries progress, their need for minerals will increase dramatically. Furthermore, developed countries have a long-term obligation to efficiently use resources so that other societies can develop. Our society has often demonstrated the "not in my backyard" mentality. In other words, we would allow the minerals to come from other countries -- many with low environmental standards -- so that this country is spared any environmental impacts. Such an attitude, which is essentially one of exporting pollution, is inconsistent with our ethical responsibilities.

The goal of sustainable development is to provide for the needs of today without compromising the ability of future generations to meet their needs. In the areas of nonferrous mining this means responsibly meeting today's mineral needs while leaving material and natural resources for future generations. This can be accomplished through recycling, reuse, and conservation, as well as by developing, identifying, and keeping available the resources needed to replenish the stream of recycling materials.

Moreover, meeting today's needs cannot be done at the expense of leaving our children a degraded environment. The environment must be protected through a rigorous and professional regulatory system, continual research aimed at identifying and solving environmental problems before they occur, well thought-out reclamation plans, and knowledge of the state's ecosystem and other important resources so that policy-makers can make wise and long-term land-use decisions.

In addition to the environmental considerations stated above, a sustainable nonferrous minerals industry must be economically viable. This can be achieved though the development of a diverse spectrum of mineral resources, a skilled work force, fair taxation, and efficient and streamlined permitting process. The encouragement of value-added processing that builds new industries and jobs from the base of raw material extraction is also vital. In the case of titanium, for example, value-added processing in Minnesota could more than double the investment and the employment, while increasing the profitability of the operation.

Construction Aggregates

Sand and gravel mining is an important industry in Minnesota that contributes significantly to the state's mineral economy. In 1992, Minnesota ranked sixth nationally in the production of sand and gravel with production of 37.6 million short tons valued at $98.7 million (Minerals Industry of Minnesota, USBM, to be published in March, 1994). Construction sand and gravel is used in concrete aggregates, concrete products, asphalt, road base, fill, snow and ice control, and other miscellaneous uses. Nationally, as in Minnesota, demand for construction aggregates is steady at approximately eight tons per capita, per annum.

Compared to other states, Minnesota enjoys a relative abundance of materials suitable for construction aggregates. The most widely available is sand and gravel of glacial or glaciofluvial origin, but there are also abundant resources for crushed rock including limestone deposits in southeastern Minnesota and granitic bedrock in the central and northern parts of the state. In 1991, production was reported in 77 of 87 counties by 210 companies; however, seventy-five percent of the total production is within the urbanized corridor form Rochester north through the Twin Cities metropolitan area to St. Cloud. In these urbanized areas, deposits are being depleted at a fairly rapid rate, thus, a maturing industry has increasingly relied on recycled concrete and asphaltic waste to supplement the use of virgin material.

Individual mines are efficient although they are also major consumers of energy. The key issue relating to efficiency is the transportation of the products to the marketplace. Because sand and gravel is relatively inexpensive to mine but expensive to transport, most operations are located close to where the resource will be used. A rule of thumb is that delivery distances over fifteen miles result in a doubling of the price. Further depletion of high-quality deposits close to the market will result in the need to mine remote, or poor quality deposits. This situation is becoming common in more urban areas and will inevitable result in higher production costs, higher transportation costs, and increased volumes of heavy trucks on the roads. None of these consequences work in favor of a sustainable economy.

Product use is one key area that still merits research in the industry. Construction aggregate products are essentially non-degradable when compared to alternatives such as wood. This durability would be consistent with the concept of a sustainable infrastructure -- demonstrated by the many functional stone structures around the world that are now hundreds of years old.

Land Use

Competing land uses are becoming an escalating concern for the construction aggregates industry and the public. Perhaps the most acute problem is in urban areas where a high population growth creates the need for substantial quantities of aggregate. This same burgeoning population demands aesthetically pleasing landscapes as well as a quality of life free from the noise, dust, traffic, and safety concerns that are often associated with this industry. The result is that urbanization often precludes the development of high-quality deposits of aggregate.

Conflicts often arise in rural areas as well. An example is in northwestern Minnesota where gravel resources are found on the beach ridges of former Glacial Lake Agassiz in the Red River Valley where the presettlement vegetation was predominantly prairie grasses. In the nineteenth century when most of the prairie was lost to plowing and agriculture, the beach ridges were not farmed because the soils were poor compared to the rich

soils found in the old lake bottom. Consequently, remnants of the original native prairie were inadvertently preserved on the beach ridges.

These same beach ridges are also the primary sources of sand and gravel for the region. The resulting land-use pattern (see Fig. 2) depicts the current land allocation on the Felton Prairie complex in Clay County. The prairie remnants, denoted in shades of yellow, are being encroached upon by gravel mining operations that are supplying aggregate to the population centers of Fargo and Moorhead.

Regulation

In the past, sand and gravel mining has not been a major environmental concern of the public. Today, however, greater public scrutiny, coupled with stricter permit conditions and more stringent environmental review, are the standards with which the industry must comply in Minnesota. The most extensive review of sand and gravel operations takes place at the local level of government. Each county, township, and city has the authority to regulate sand and gravel mining though zoning ordinances and land-use planning. Although the treatment of sand and gravel mining varies from one county to the next, many communities effectively regulate these extractive uses. Two prominent examples are the comprehensive gravel mining plan developed by the city of Maple Grove in Hennepin County and the creation of a gravel mining district -- developed by a coalition of local aggregate operators and the public -- in the city of Elk River in Sherburne County.

Although regulatory procedures are now helping to deal with land-use conflict, there is a need for greater efficiency and expediency in permitting gravel operations, without compromising values. This is being helped by the fact that the public is now beginning to understand that gravel mining is a temporary use of the land, to be followed by another land use that can be compatible with the surrounding landscape or integrated into a community plan.

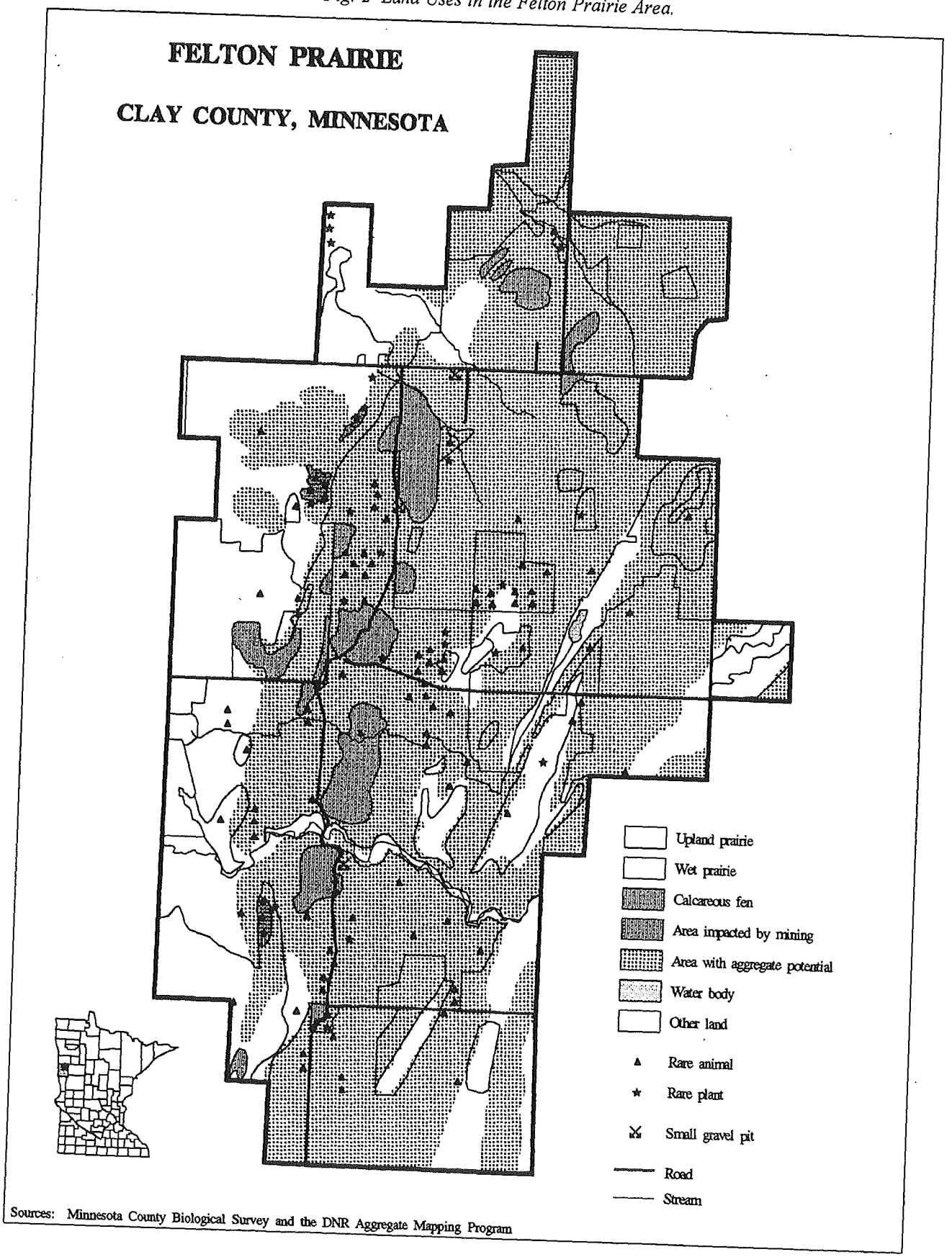
Reclamation

Although numerous examples are found throughout the state of depleted gravel pits that have been successfully reclaimed to such uses as agriculture, forestry, and parks, a negative image of sand and gravel mining remains -- the industry has also left a legacy of approximately 2,500 abandoned, or intermittently active, gravel pits throughout the state.

The problems associated with unreclaimed pits can be substantial. Often, the resulting landscape is characterized by randomly located piles of rock and stripping material sometimes resting on remaining gravel reserves, an absence of original topsoil, steep slopes that are unsafe and eroding, lack of a suitable vegetative cover, and scattered garbage from illegal dumping. Reclaiming such landscapes can be a costly endeavor. Not only are the costs higher, but the results are often more disappointing compared to what might have been accomplished if reclamation had been a planned activity.

In the last decade, however, the industry has improved its performance dramatically in terms of reclamation. Companies and community planners now recognize that mining is an interim use of the land and that

Fig. 2 Land Uses in the Felton Prairie Area.



reclamation must be performed in a meaningful way with an eye to the larger landscape context and to future long-term use. This has become the pattern in part through the more stringent planning conditions for new permits, but also through the planning and conservation practices that are routinely employed by many of the progressive aggregate companies in the state.

APPENDICES

APPENDIX A

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APPENDIX B

LIST OF PRESENTATIONS

U.S.. Bureau of Mines mission, goals, and research efforts. April 6, 1993. Lewis Wade, Director, USBM Twin Cities Research Center. A summary of the Bureau of Mines' activities and research of innovative mining techniques. Also, a tour of the Center's facilities.

Minnesota Geological Survey research and mapping. April 6, 1993. Priscilla Grew, Director, MGS. A discussion of MGS activities and the impact that research findings may have on the future of mining.

Environmental geology and environmental impacts of mining. April 6, 1993. John Green, University of Minnesota, Duluth, Geology Department. A description of classification of mineral reserves and resources, copper mining processes, and mine compliance.

Sand and gravel overview. April 29, 1993. Cindy Buttleman, DNR. A summary of the sand and gravel industry in Minnesota which included it's value, volume, size, inventory needs, environmental regulations, trends, reclamation, and taxes.

Sherburne County sand and gravel planning and Elk River Master Plan. April 29, 1993. Brian Bensen, Planning and Zoning Administrator, Sherburne County. A description of the successful cooperative effort by the City of Elk River and Sherburne County to address land use conflicts and mining issues.

Aggregate mapping program. April 29, 1993. J.D. Lehr, DNR. A report on the process of sand and gravel inventory in Minnesota, sources of information, and inventory limitations.

Aggregate recycling. April 29, 1993. Warren Pladsen, DOT. A report on recycled products, recycling methods, demonstration projects, and aggregate supply studies for the Twin Cities Metropolitan area.

DNR minerals research. May 27, 1993. Arlo Knoll, DNR. A summary of cooperative work to predict types of mine waste that will produce acid drainage, to investigate methods for control of acid and metal release, and to apply laboratory and field results.

Predicting mine waste drainage quality. May 27, 1993. Kim Lapakko, DNR. A description of laboratory tests and field data comparisons conducted to predict mine waste drainage quality from a variety of waste samples.

Mitigation of mine drainage problems. May 27, 1993. Paul Eger, DNR. A description of studies of active and passive methods to reduce acid and metals in mine waste drainage.

Natural Resources Research Institute. May 28, 1993. Thys Johnson, Director, NRRI Center for Applied Research and Technology Development.

A summary of NRRI's research in waste utilization, industrial application, and environmental remediation and protection.

Applied and environmental mineral research. May 28, 1993. Jerry Niemi, Director, NRRI Center for Water and the Environment. A discussion of environmental research areas which include land use, air and water quality, pollution prevention, recycling and reclamation.

Iron Range Resources and Rehabilitation Board. May 28, 1993. Brian Hiti, IRRRB Special Projects. An historical overview of the IRRRB, and a description of IRRRB divisions.

Taconite Taxes. May 28, 1993. Tom Schmucker, Department of Revenue. Information on production tax distribution and tax forecasts in a reduction scenario.

IRRRB Budget. May 28, 1993. Brian Hiti, IRRRB Special Projects. A summary of the IRRRB budget request for fiscal year 94.

IRRRB mineland reclamation. May 28, 1993. Ray Svatos, IRRRB Mineland Reclamation. A discussion of mineland reclamation on abandoned lands.

Governor's Task Force on Mining and Minerals. May 28, 1993. Brian Hiti, IRRRB Special Projects. A summary of the Task Force's recommendations.

IRRRB Direction. May 28, 1993. Jim Gustafson, Commissioner, IRRRB. A discussion of the board's emphasis toward strengthening industry, tourism, and regional economic diversification.

Minntac mining and mineland reclamation. May 28, 1993. Tom Kingsley, Minntac. A description of plant maintenance, and proposed changes to the mine's hauling system.

Clean air regulation (NOX emissions). May 28, 1993. Nick Brasculi, Minntac. A discussion of major environmental impacts of stack emissions, water discharge and waste, and efforts to monitor and reduce significant levels of NOX and SO_2.

Environmental impacts of ferrous and nonferrous mining. June 21, 1993. Don Arnosti, State Director, Minnesota Audubon Society. A description of major impacts occurring in air quality, reclamation, water quality, and land use.

Minerals issues and sustainability. June 21, 1993. Ernest Lehmann, President, Minnesota Exploration Association. A description of the economic importance of the minerals sector, reserve estimates, limits of recycling, responsible development, and areas for improvement.

Corporate Restoration of Mined Areas. July 29, 1993. Joyce Kelly, President, Wildlife Habitat Enhancement Council. A summary of WHEC's

broad based coalition between corporate and conservation interests, and the numerous benefits of proactive wildlife projects.

Framework Geology. July 29, 1993. G.B. Morey, Minnesota Geological Survey. An overview of the history of geologic accomplishments, Minnesota's geologic setting and mineral potential, exploration models, and research needs.

Sustainability in the Materials World. August 26, 1993. James F. Lemons, U.S.. Bureau of Mines. A description of the need to view materials with respect to their full costs, benefits, and performance, i.e., materials life cycles.

Status and Future of U.S.. Taconite and Iron Ore Industry. September 30, 1993. Michael Locker, Locker Associates. An analysis of the evolution of the iron ore production industry and factors influencing market opportunities.

APPENDIX C

Minnesota Statute Chapter

84.94 AGGREGATE PLANNING AND PROTECTION

Subdivision 1. **Purpose.** It is the purpose of this act to protect aggregate resources; to promote orderly and environmentally sound development; to spread the burden of development; and to introduce aggregate resource protection into local comprehensive planning and land use controls.

Subd. 2. **Definition.** For the purpose of this act, "municipality" means a home rule charter or statutory city, or a town.

Subd. 3. **Identification and classification.** The department of natural resources, with the cooperation of the state geological survey, departments of transportation, and energy, planning and development, outside of the metropolitan area as defined in section 473.121, shall conduct a program of identification and classification of potentially valuable publicly or privately owned aggregate lands located outside of urban or developed areas where aggregate mining is restricted, without consideration of their present land use. The program shall give priority to identification and classification in areas of the state where urbanization or other factors are or may be resulting in a loss of aggregate resources to development. Lands shall be classified as:

(1) identified resources, being those containing significant aggregate deposits;

(2) potential resources, being those containing potentially significant deposits and meriting further evaluation; or

(3) subeconomic resources, being those containing no significant deposits.

As lands are classified, the information on the classification shall be transmitted to each of the departments and agencies named in this subdivision, to the planning authority of the appropriate county and municipality, and to the appropriate county engineer. The county planning authority shall notify owners of land classified under this subdivision by publication in a newspaper of general circulation in the county or by mail.

Subd. 4. **Local action.** Each planning authority of a county or municipality receiving information pursuant to subdivision 3 shall consider the protection of identified and important aggregate resources in their land use decisions.

History: *1984 c 605 s 1*

APPENDIX D

Minnesota Statute Chapter

AGGREGATE MATERIAL TAX

298.75 AGGREGATE MATERIAL REMOVAL; PRODUCTION TAX.

Subdivision 1. **Definitions**. Except as may otherwise be provided, the following words, when used in this section, shall have the meanings herein ascribed to them.

(1) "Aggregate material" shall mean nonmetallic natural mineral aggregate including, but not limited to sand, silica sand, gravel, building stone, crushed rock, limestone, and granite. Aggregate material shall not include dimension stone and dimension granite.

(2) "Person" shall mean any individual, firm, partnership, corporation, organization, trustee, association, or other entity.

(3) "Operator" shall mean any person engaged in the business of removing aggregate material from the surface or subsurface of the soil, for the purpose of sale, either directly or indirectly, through the use of the aggregate material in a marketable product or service.

(4) "Extraction site" shall mean a pit, quarry, or deposit containing aggregate material and any contiguous property to the pit, quarry, or deposit which is used by the operator for stockpiling the aggregate material.

(5) "Importer" shall mean any person who buys aggregate material produced from a county not listed in paragraph (6) or another state and causes the aggregate material to be imported into a county in this state which imposes a tax on aggregate material.

(6) "County" shall mean the counties of Stearns, Benton, Sherburne, Carver, Scott, Dakota, Le Sueur, Kittson, Marshall, Pennington, Red Lake, Polk, Norman, Mahnomen, Clay, Becker, Wilkin, Big Stone, Sibley, Hennepin, Washington, and Ramsey.

Subd. 2. A county shall impose upon every importer and operator a production tax equal to ten cents per cubic yard or seven cents per ton of aggregate material removed except that the county board may decide not to impose this tax if it determines that in the previous year operators removed less than 20,000 tons or 14,000 cubic yards of aggregate material from that county. The tax shall be imposed on aggregate material produced in the county when the aggregate material is transported from the extraction site or sold, when in the case of storage the stockpile is within the state of Minnesota and the highways are not used for transporting the aggregate material. The tax shall be imposed on an importer when the aggregate material is imported into the county that imposes the tax.

If the aggregate material is transported directly from the extraction site to a waterway, railway, or another mode of transportation other than a highway, road or street, the tax imposed by this section shall be apportioned equally between the county where the aggregate material is extracted and the county to which the aggregate material is originally transported. If that destination is not located in Minnesota, then the county where the aggregate material was extracted shall receive all of the proceeds of the tax.

Subd. 3. By the 14th day following the last day of each calendar quarter, every operator or importer shall make and file with the county auditor of the county in which the aggregate material is removed or imported, a correct report under oath, in such form and containing such information as the auditor shall require relative to the quantity of aggregate material removed or imported during the preceding calendar quarter. The report shall be accompanied by a remittance of the amount of tax due.

If any of the proceeds of the tax is to be apportioned as provided in subdivision 2, the operator or importer shall also include on the report any relevant information concerning the amount of aggregate material transported, the tax and the county of destination. The county auditor shall notify the county treasurer of the amount of such tax and the county to which it is due. The county treasurer shall remit the tax to the appropriate county within 30 days.

Subd. 4. If the county auditor has not received the report by the 15th day after the last day of each calendar quarter from the operator or importer as required by subdivision 3 or has received an erroneous report, the county auditor shall estimate the amount of tax due and notify the operator or importer by registered mail of the amount of tax so estimated within the next 14 days. An operator or importer may, within 30 days from the date of mailing the notice, file in the office of the county auditor a written statement of objections to the amount of taxes determined to be due. The statement of objections shall be deemed to be a petition within the meaning of chapter 278, and shall be governed by sections 278.02 to 278.13.

Subd. 5. Failure to file the report and submit payment shall result in a penalty of $5 for each of the first 30 days, beginning on the 15th day after the last day of each calendar quarter, for which the report and payment is due and no statement of objection has been filed, as provided in subdivision 4, and a penalty of $10 for each subsequent day shall be assessed against the operator or importer who is required to file the report. The penalties imposed by this subdivision shall be collected as part of the tax and credited to the county revenue fund. If neither the report nor a statement of objection has been filed after more than 60 days have elapsed from the date when the notice was sent, the operator or importer who is required to file the report is guilty of a misdemeanor.

Subd. 6. It is a misdemeanor for any operator or importer to remove aggregate material from a pit, quarry, or deposit or for any importer to import aggregate material unless all taxes due under this section for the previous reporting period have been paid or objections thereto have been filed pursuant to subdivision 4.

It is a misdemeanor for the operator or importer who is required to file a report to file a false report with intent to evade the tax.

Subd. 7. All money collected as taxes under this section shall be deposited in the county treasury and credited as follows, for expenditure by the county board:

(a) Sixty percent to the county road and bridge fund for expenditure for the maintenance, construction and reconstruction of roads, highways and bridges;

(b) Thirty percent to the road and bridge fund of those towns as determined by the county board and to the general fund or other designated fund of those cities as determined by the county board, to be expended for maintenance, construction and reconstruction of roads, highways and bridges; and

(c) Ten percent to a special reserve fund which is hereby established, for expenditure for the restoration of abandoned pits, quarries, or deposits located upon public and tax forfeited lands within the county.

If there are no abandoned pits, quarries or deposits located upon public or tax forfeited lands within the county, this portion of the tax shall be deposited in the county road and bridge fund for expenditure for the maintenance, construction and reconstruction of roads, highways and bridges.

History: *1980 c 607 art 19 s 5; 1Sp1981 c 1 art 10 s 17-19; 1982c 523 art 13 s 1; 1983 c 342 art 14 s 1; 1984 c 652 s 1; 1986 c403 s 1,2; 1993 c 375 art 9 s 41, 42*

APPENDIX E

Minnesota Statute Chapter

TAX ON TACONITE AND IRON SULFIDES

298.23 TACONITE AND IRON SULFIDES DEFINED.

For the purpose of sections 298.23 to 298.28, "taconite" is defined as ferruginous chert or ferruginous slate in the form of compact, siliceous rock, in which the iron oxide is so finely disseminated that substantially all of the iron-bearing particles of merchantable grade are smaller than 20 mesh and which is not merchantable as iron ore in its natural state, and which cannot be made merchantable by simple methods of beneficiation involving only crushing, screening, washing, jigging, drying, or any combination thereof. "Iron sulfides" are defined as chemical combinations of iron and sulphur (mineralogically known as pyrrhotite, pyrites or marcasite), in relatively impure condition, which are not merchantable as iron ore and which cannot be made merchantable by the simple methods of beneficiation above described.

History: *1941 c 375 s 1; 1947 c 93 s 1; 1957 c 362 s 1*

284.24 TAX ON TACONITE AND IRON SULFIDES

Subdivision 1. (a) For concentrate produced in 1990 there is hereby imposed upon taconite and iron sulfides, and upon the mining and quarrying thereof, and upon the production of iron ore concentrate therefrom, and upon the concentrate so produced, a tax of $1.975 per gross ton of merchantable iron ore concentrate produced therefrom.

(b) For concentrates produced in 1991 and subsequent years, the tax rate shall be equal to the preceding year's tax rate plus an amount equal to the preceding year's tax rate multiplied by the percentage increase in the implicit price deflator from the fourth quarter of the second preceding year to the fourth quarter of the preceding year. "Implicit price deflator" for the gross national product means the implicit price deflator prepared by the bureau of economic analysis of the United States Department of Commerce.

(c) The tax shall be imposed on the average of the production for the current year and the previous two years. The rate of the tax imposed will be the current year's tax rate. This clause shall not apply in the case of the closing of a taconite facility if the property taxes on the facility would be higher if this clause and section 298.25 were not applicable.

(d) If the tax or any part of the tax imposed by this subdivision is held to be unconstitutional, a tax of $1.975 per gross ton of merchantable iron ore concentrate produced shall be imposed.

(e) Consistent with the intent of this subdivision to impose a tax based upon the weight of merchantable iron ore concentrate, the commissioner of revenue may indirectly determine the weight of merchantable iron ore concentrate included in fluxed pellets by subtracting the weight of the limestone, dolomite, or olivine derivatives or other basic flux additives included in the pellets from the weight of the pellets. For purposes of this paragraph, "fluxed pellets" are pellets produced in a process in which

limestone, dolomite, olivine, or other basic flux additives are combined with merchantable iron ore concentrate. No subtraction from the weight of the pellets shall be allowed for binders, mineral and chemical additives other than basic flux additives, or moisture.

Subd. 2. There is hereby imposed upon taconite and iron sulfides, and upon the mining and quarrying thereof, and upon the production of iron ore concentrate therefrom, and upon the tailings so produced an additional tax of 10 cents per 2,000 pounds of tailings produced. For the purposes of this subdivision tailings mean the solid and liquid waste materials resulting from the beneficiation process.

The tax imposed by this subdivision shall only apply to those tailings from a taconite facility which are not deposited on land in accordance with permits issued by the pollution control agency and the department of natural resources.

The proceeds of the tax imposed by this subdivision shall be deposited in the general fund of the state.

Subd. 3. (a) A credit in the amount of not to exceed four cents per gross ton of taxable iron ore concentrate produced shall be allowed against the tax imposed by subdivision 1, with respect to the production of iron ore concentrate from taconite plants which, together with the lands upon which they are located and lands used in connection with the mining, quarrying and concentration of taconite and buildings, machinery, equipment and other fixtures used in the production of taconite, and notwithstanding the provisions of section 298.25, have by law been made subject to direct taxes for the payment of principal and interest on bonds issued by a school district or city.

(b) Notwithstanding clause (a), a credit of not to exceed seven cents shall be allowed a producer for the payment of taxes for bonds, and interest on them, issued by independent school district No. 703, for which the producer's property has been made subject to direct taxes.

(c) The credit allowed in this subdivision shall be allowed against taxes payable in the calendar years following the issuance and sale of the bonds until the total credit allowed in all years equals the total liability of the producer for direct taxes for the payment of the bonds and interest. If necessary to equal the total liability of the producer, the credit may be taken in years after the years when the taxes for the bond principal and interest were paid.

The amount of credit allowable hereunder in any year with respect to production from any plant subjected to direct taxes shall not exceed the amount of the direct taxes levied in the prior year against the plant for the bonds and interest and the indebtedness secured thereby, except if the credit allowed does not equal the amount levied in the prior year, then the unused credits of prior years may be used for the deficiency.

Subd. 4. A credit shall be allowed against the tax imposed by subdivision 1, in the amount of $250,000 per year to any taconite producer that builds a water filtration and treatment plant in 1984 at a cost in excess of $1,000,000 in order to alleviate the contamination of water resulting from the disposal of taconite tailings on land. This credit shall be available

against taxes paid in 1985, 1986, and 1987. The commissioner of iron range resources and rehabilitation shall pay these credits from the taconite environmental protection fund created in section 298.223.

History: *1941 c 375 s 2; 1947 c 93 s 2; 1951 c 613 s 1; 1969 c 1156 s 1; 1973 c 123 art 5 s 7; 1977 c 423 art 10 s 10,11; 1979 c 303 art 10 s 13; 1Sp1981 c 1 art 10 s 14; 1982 c 523 art 30 s 2; 1984 c 502 art 7 s 14,15,22 subd 2; 1984 c 655 art 2 s 23 subd 1; 1Sp1985 c 14 art 10 s 15; 1986 c 441 s 11; 1Sp1986 c 1 art 4 s 43; 1987 c 268 art 9 s 37; 1990 c 604 art 10 s 18*

APPENDIX F

Minnesota Statute Chapter

298.223 TACONITE AREA ENVIRONMENTAL PROTECTION FUND.

Subdivision 1. Creation; purposes. A fund called the taconite environmental protection fund is created for the purpose of reclaiming, restoring and enhancing those areas of northeast Minnesota located within a tax relief area defined in section 273.134 that are adversely affected by the environmentally damaging operations involved in mining taconite and iron ore and producing iron ore concentrate and for the purpose of promoting the economic development of northeast Minnesota. The taconite environmental protection fund shall be used for the following purposes:

(a) to initiate investigations into matters the iron range resources and rehabilitation board determines are in need of study and which will determine the environmental problems requiring remedial action;

(b) reclamation, restoration, or reforestation of minelands not otherwise provided for by state law;

(c) local economic development projects including construction of sewer and water systems, and other public works located within a tax relief area defined in section 273.134;

(d) monitoring of mineral industry related health problems among mining employees.

Subd. 2. **Administration.** The taconite environmental protection fund shall be administered by the commissioner of the iron range resources and rehabilitation board. The commissioner shall by September 1 of each year prepare a list of projects to be funded from the taconite environmental protection fund, with such supporting information including description of the projects, plans, and cost estimates as may be necessary. Upon recommendation of the iron range resources and rehabilitation board, this list shall be submitted to the governor by November 1 of each year. By December 1 of each year, the governor shall approve or disapprove, or return for further consideration, each project. Funds for a project may be expended only upon approval of the project by the governor. The commissioner may submit supplemental projects for approval at any time.

Subd. 3. **Appropriation.** There is hereby annually appropriated to the commissioner of iron range resources and rehabilitation such funds as are necessary to carry out the projects approved and such funds as are necessary for administration of this section. Annual administrative costs, not including detailed engineering expenses for the projects, shall not exceed five percent of the amount annually expended from the fund.

Funds for the purposes of this section are provided by section 298.28, subdivision 11, relating to the taconite environmental protection fund.

History: *1977 c 423 art 10 s 20; 1980 c 607 art 7 s 4; 1Sp1981 c 4 art 2 s 31; 1Sp1985 c 14 art 10 s 13; 1988 c 719 art 19 s 18; 1993 c 369 s 110*

APPENDIX G

NONFERROUS MINERAL PROJECT: REPORT ON THE MINING SIMULATION PROJECT

7.0 JOINT CONCLUSIONS AND RECOMMENDATIONS

7.1 Conclusions and Recommendations about the Environmental Review and Permitting Process and Procedures

7.1.1 Exploratory Drilling

Although there have been instances elsewhere in the country of ground water contamination resulting from exploratory drilling for oil, gas and coal, we are unaware of instances of ground water contamination from exploratory drilling for metallic minerals in Minnesota. There are drillhole closure requirements currently in place. However, we recommend that the Commissioner of Health with the advice of the Advisory Council on Wells and Borings review additives commonly used in drilling fluids to determine which if any additives being used by exploratory drillers present potential hazards and should be restricted.

7.1.2 Environmental Review and Permitting Process/Procedure

7.1.2.1 Based on the existing Memorandum of Agreement (MOA) between DNR and MPCA, the Interagency Coordinating Committee (ICC) should establish a process to accomplish the following:

1. At the time a project proposal is submitted to the RGU, establishment of an interagency environmental review and permitting team.

2. Identification and standardization of data and map needs to the extent possible.

3. Identification of monitoring requirements as soon as possible after the pre-application conference.

4. Evaluation of the practicality of joint hearings.

5. Early development of a project-specific chart to complete environmental review and permitting.

6. Frequent meetings between the project sponsor and the interagency team to monitor project progress.

7.1.2.2 An informative and cooperative environmental review and permitting process requires early and frequent involvement of local authorities, interest groups and the general public. Both the project sponsor and the ICC should promptly develop a plan and procedure to supplement the public participation requirements of the existing process to include:

1. Holding additional public informational meetings during and prior to the environmental review process.

2. Establishing advisory committees of local government representatives and others with potential interest in the project as appropriate.

7.1.2.3 All parties recognize that a thorough, complete and germane analysis of issues will provide an efficient process and maximize environmental protection. The participants recommend that all parties to a mine development project commit to the existing environmental review and permitting processes provided in law as they may be modified from time to time.

7.1.2.4 In cases where rules or laws conflict, the most stringent requirements will apply.

7.1.3 Land Use

Land-use decisions are largely value-based. They should be grounded on an evaluation system which considers benefits and costs of the project to the affected area. Therefore, it is recommended that the Environmental Quality Board rules be amended to require a cost/benefit analysis to inventory all benefits and costs pertaining to any new mining proposal, including those costs and benefits that are not quantifiable in dollar values. The extent of the cost/benefit analysis should be established in the Environmental Review scoping process.

7.1.4 Water Quality and Quantity

Impacts on water are among the more significant environmental concerns related to any mining development in Minnesota.

The basis for the successful minimization of impacts on water is dependent on accurate and complete:

1. Collection of base-line monitoring data and information;
2. Characterization of mine wastes;
3. Determination of receiving water criteria;
4. Determination of operating procedures and mitigative measures; and
5. Collection of operational and postclosure monitoring data.

Existing and proposed regulations for base- and precious-metal mining operations in Minnesota will need to address this issue.

7.1.5 Air Quality

Existing air quality regulations, strictly applied, appear to be sufficient to handle expected impacts of mining and milling operations.

7.1.6 Design/Operation/Closure/Postclosure Care

The applications for MPCA and DNR permits must include closure/postclosure plans, a well-defined mine design and operational plans. In order to produce these plans effectively, data and information needs of these agencies must be identified and coordinated early in the process. The

use of common documents to supply these needs will be considered by the agencies. The plans must be updated periodically. At the time of closer, the closure plan(s) will be reviewed and implemented.

If waste characterization is not conclusive as to acid-production potential, metal release or other hazards, the regulatory decisions should be approached in a conservative manner.

7.1.7 Financial Assurance

Financial assurance for regulatory requirements must be in place before the development of a base- or precious-metal mine. Financial assurance can be provided in a variety of forms, but must reflect projected closure/post-closure costs as well as credible accident clean-up costs. This determination must consider third party and administrative costs and be reviewed and adjusted yearly.

The use of a single financial assurance package to fulfill requirements of both agencies will be considered.

7.2 Conclusions as to Methodology of the Study

7.2.1. The case study approach was an effective technique for identifying likely "real life" issues, focusing discussion and training participants in reviewing and permitting mining development projects or other projects with high potential for disputes over environmental or land-use issues.

7.2.2. The case study approach allowed parties to consider issues on a more objective and less emotional level than would be likely if the participants first faced these issues in a real life, make-or-break, context. The case study approach facilitated understanding and accommodation of divergent viewpoints.

7.2.3. Visits to active operations and with state and provincial regulatory personnel proved useful for all participants.

7.2.4. Field trips to the case study sites, as well as the case study discussions, provided an opportunity for the members of the various communities to gain insights into others' viewpoints. Interaction should improve future communications between the groups.

APPENDIX H

MEMORANDUM OF AGREEMENT BETWEEN THE MINNESOTA POLLUTION CONTROL AGENCY AND THE MINNESOTA DEPARTMENT OF NATURAL RESOURCES FOR ESTABLISHING PROCEDURES FOR COOPERATIVE INVOLVEMENT IN THE REGULATION OF MINING INDUSTRIES IN MINNESOTA

With numerous agencies regulating the mining industry in Minnesota, it is important that there be a good understanding of individual roles and permitting authorities to minimize duplication of effort and streamline the regulatory process for the industry as well as the agencies. A Memorandum of Agreement (MOA) was developed between the Minnesota Department of Natural Resources and the Minnesota Pollution Control Agency in order to expedite and make the permitting process more efficient.

DESCRIPTION

The Minnesota Pollution Control Agency (PCA) and the Minnesota Department of Natural Resources (DNR) each have major authorities and responsibilities for the regulation of metallic mineral and peat mining activities in the state. These authorities and responsibilities frequently overlap, resulting in duplication of work effort.

PURPOSE AND OBJECTIVES

To promote efficiency, reduce duplication of work efforts, and improve communications, this Memorandum of Agreement (MOA) between the PCA and the DNR establishes procedures for coordinating regulatory and non-regulatory functions for mining activities. It also identifies authorities and establishes procedures to be followed by the PCA and the DNR.

IMPLEMENTATION

The MOA shall be implemented by each agency's mutual acceptance of the designated areas of responsibility defined in the Authorities and General Provision sections of the MOA, and the coordinating procedures and activities of an Interagency Coordinating Committee (ICC) defined in the Specific Provisions section of this MOA.

AUTHORITIES

Nothing in this MOA shall be construed as altering the statutory authorities of the PCA or the DNR.

1.) The PCA is mandated to enforce state laws and regulations addressing air and water pollution, solid and hazardous waste disposal, and noise control. As such, the PCA is recognized as the lead agency for:

- identification and evaluation of air quality impacts,

- solid and hazardous waste disposal and management,
- noise control and abatement,
- establishment and enforcement of effluent limitations, water quality standards, and compliance monitoring,
- regulation of groundwater quality and surface water quality point and non-point source pollution,
- implementation of EPA's CERCLA program and the state's MERLA program.

2.) The DNR is mandated to enforce state laws and regulations addressing mineland reclamation, alteration of protected waters, water appropriations, and dam safety. As such, the DNR is recognized as the lead agency for:

- reclamation of lands disturbed by mining after August 1980, including the siting, design, construction, operation and deactivation of all mining facilities,
- mining activities affecting the alteration of protected waters (coordination of these activities covered under protected waters Cooperative Agreement dated October, 1984),
- mining activities affecting the quantity aspects of the taking or disposing of water,
- mining activities associated with the location, construction materials, operation and ultimate safety of dams,
- serving as the Responsible Government Unit for the environmental review of mining projects.

GENERAL PROVISIONS

It is mutually agreed that:

1.) The PCA and DNR shall coordinate regulatory activities, so as to not duplicate or contradict requirements of either agency or deviate from the lead roles outlined in the AUTHORITIES section.

2.) The PCA and DNR shall cooperatively identify and resolve mining-related environmental problems of mutual concern, including, but not limited to, those associated with new proposals, reclamation matters, violations of permit provisions, air or water quality standards violations, and monitoring results.

3.) Where compliance monitoring or other reliable information shows that air quality standards or water quality effluent limitations or standards have

been violated and remedial action may affect the terms or conditions of both agencies' permits, the DNR and PCA shall meet to resolve changes in their permitting requirements.

4.) The PCA and DNR shall exchange and utilize, to the extent practical, all resource information, including permit applications, associated with environmental impact evaluation and mining proposals.

5.) Additional agreements will be developed where needed, in the form of an addendum to this agreement, or memoranda/letters referencing this agreement.

6.) The PCA and DNR shall use the attached RESPONSE DIAGRAM for interagency environmental review and regulatory coordination of new industry proposals.

SPECIFIC PROVISIONS

The PCA and DNR shall form an Interagency Coordinating Committee (ICC), comprised of the following representatives:

PCA Division of Water Quality - Permits Unit Supervisor
PCA Office of Planning and Review - Resource Development Coordinator
DNR Minerals Division - Mineland Reclamation Manager
DNR Waters Division - Mining Hydrologist

The ICC shall be responsible for:

1.) Keeping each agency's management and staff informed of pertinent mining development issues or problems.

2.) Coordinating and/or supplying input to the environmental review process for mining proposals.

3.) Coordinating all inter- and intra-agency permitting matters for mining.

4.) Coordinating review and input of new mining-related rules or regulations.

5.) Coordinating identification and resolution of any mining-related environmental problems of mutual concern, including, but not limited to, those associated with new proposals, reclamation matters, violations of permit provisions, air or water quality standards violations, and monitoring results.

6.) Coordinating PCA and DNR regulatory programs so as to minimize duplicative requirements, particularly with respect to non-point source pollution and mineland reclamation.

7.) Initiate the involvement of appropriate technical, administrative, or managerial staff.

8.) Coordinating PCA and DNR involvement associated with actions proposed by other federal, state and local governmental units associated with mining.

The ICC members shall meet no less than quarterly to discuss matters of joint agency interest. Matters requiring more immediate attention shall be dealt with on an as-needed basis.

MODIFICATION, TERMINATION AND EXPIRATION

The Agreement shall become effective upon the signature of both parties and shall remain effective until modified or terminated. This Agreement may be amended or reissued upon the written mutual agreement of both of the parties. This agreement shall be amended to include the state's administration of the EPA's proposed Subtitle D Mining Waste Program upon the EPA's promulgation of rules and guidelines for Subtitle D.

The DNR or the PCA may cancel this agreement by written notification to the other party. Termination shall occur thirty days after written notification is received. Termination may occur earlier by the mutual agreement of both parties.

Signed on September 21, 1987 by the Commissioner of the Department of Natural Resources and the Commissioner of the Pollution Control Agency.

APPENDIX I

Minnesota Statute Chapter

NORTHEAST MINNESOTA ECONOMIC PROTECTION TRUST FUND ACT

298.291 CITATION.

Sections 298.291 to 298.294 shall be known as the "northeast Minnesota economic protection trust fund act."

History: *1977 c 423 art 10 s 25; 2Sp1982 c 2 s 4*

298.292 POLICY.

Subdivision 1. **Purposes.** The legislature is cognizant of the severe economic dislocations and widespread unemployment that result when a single industry on which an area is largely dependent, experiences a drastic reduction in activity. The northeast Minnesota economic protection trust fund is hereby created to be devoted to economic rehabilitation and diversification of industrial enterprises where these conditions ensue as the result of the decline of such a single industry. Priority shall be given to using the northeast Minnesota economic protection trust fund for the following purposes:

(1) projects and programs that are designed to create and maintain productive, permanent, skilled employment, including employment in technologically innovative businesses;

(2) projects and programs to encourage diversification of the economy and to promote the development of minerals, alternative energy sources utilizing indigenous fuels, forestry, small business, and tourism; and

(3) projects and programs for which technological and economic feasibility have been demonstrated.

Subd. 2. **Use of money.** Money in the northeast Minnesota economic protection trust fund may be used for the following purposes:

(1) to provide loans, loan guarantees, interest buy-downs and other forms of participation with private sources of financing, but a loan to a private enterprise shall be for a principal amount not to exceed one-half of the cost of the project for which financing is sought, and the rate of interest on a loan shall be no less than the lesser of eight percent or an interest rate three percentage points less than a full faith and credit obligation of the United States government of comparable maturity, at the time that the loan is approved;

(2) to fund reserve accounts established to secure the payment when due of the principal of and interest on bond issued pursuant to section 298.2211;

(3) to pay in periodic payments or in a lump sum payment any or all of the interest on bonds issued pursuant to chapter 474 for the purpose of constructing, converting, or retrofitting heating facilities in connection with district heating systems or systems utilizing alternative energy sources; and

(4) to invest in a venture capital fund or enterprise that will provide capital to other entities that are engaging in, or that will engage in, projects or programs that have the purposes set forth in subdivision 1. No investments may be made in a venture capital fund or enterprise unless at

least two other unrelated investors make investments of at least $500,000 in the venture capital fund or enterprise, and the investment by the northeast Minnesota economic protection trust fund may not exceed the amount of the largest investment by an unrelated investor in the venture capital fund or enterprise. For purposes of this subdivision, an "unrelated investor" is a person or entity that is not related to the entity in which the investment is made or to any individual who owns more than 40 percent of the value of the entity, in any of the following relationships: spouse, parent, child, sibling, employee, or owner of an interest in the entity that exceeds ten percent of the value of all interests in it. For purposes of determining the limitations under this clause, the amount of investments made by an investor other than the northeast Minnesota economic protection trust fund is the sum of all investments made in the venture capital fund or enterprise during the period beginning one year before the date of the investment by the northeast Minnesota economic protection trust fund.

Money from the trust fund shall be expended only in or for the benefit of the tax relief area defined in section 273.134.

History: *1977 c 423 art 10 s 26; 2Sp1982 c 2 s 5; 1983 c 46 s 1; 1983 c 357 s 2; 1Sp1985 c 14 art 10 s 22; 1987 c 386 art 8 s 2*

298.293 EXPENDING FUNDS.

The funds provided by section 298.28, subdivision 11, relating to the northeast Minnesota economic protection trust fund, except money expended pursuant to Laws 1982, Second Special Session, chapter 2, sections 8 to 14, shall be expended only in an amount that does not exceed the sum of the net interest, dividends, and earnings arising from the investment of the trust for the preceding 12 calendar months from the date of the authorization plus, for fiscal year 1983, $10,000,000 from the corpus of the fund. The funds may be spent only in or for the benefit of those areas that are tax relief areas as defined in section 273.134. If during any year the taconite property tax account under sections 273.134 to 273.136 does not contain sufficient funds to pay the property tax relief specified in Laws 1977, chapter 423, article X, section 4, there is appropriated from this trust fund to the relief account sufficient funds to pay the relief specified in Laws 1977, chapter 423, article X, section 4.

History: *1977 c 423 art 10 s 27; 1978 c 721 art 9 s 4; 2Sp1982 c 2 s 6; 1983 c 46 s 2; 1Sp1985 c 14 art 10 s 23*

298.294 INVESTMENT OF FUND.

The trust fund established by section 298.292 shall be invested pursuant to law by the state board of investment and the net interest, dividends, and other earnings arising from the investments shall be transferred on the first day of each month to the trust and shall be included and become part of the trust fund. The amounts transferred, including the interest, dividends, and other earnings earned prior to July 13, 1982, together with the additional amount of $10,000,000 for fiscal year 1983, which is appropriated April 21,

1983, are appropriated from the trust fund to the commissioner of iron range resources and rehabilitation for deposit in a separate account for expenditure for the purposes set forth in section 298.292. Amounts appropriated pursuant to this section shall not cancel but shall remain available unless expended.

History: *1977 c 423 art 10 s 28; 3Sp1981 c 2 art 7 s 6; 2Sp1982 c 2 s 7; 1983 c 46 s 3*

298.295 [Repealed, 1983 c 46 s 8]

298.296 OPERATION OF FUND.

Subdivision 1. **Project approval.** The board shall by August 1 of each year prepare a list of projects to be funded from the northeast Minnesota economic protection trust with necessary supporting information including description of the projects, plans, and cost estimates. These projects shall be consistent with the priorities established in section 298.292 and shall not be approved by the board unless it finds that:

(a) the project will materially assist, directly or indirectly, the creation of additional long-term employment opportunities;

(b) the prospective benefits of the expenditure exceed the anticipated costs; and

(c) in the case of assistance to private enterprise, the project will serve a sound business purpose.

To be proposed by the board, a project must be approved by at least eight iron range resources and rehabilitation board members and the commissioner of iron range resources and rehabilitation. The list of projects shall be submitted to the governor, who shall, by November 15 of each year, approve or disapprove, or return for further consideration, each project. The money for a project may be expended only upon approval of the project by the governor. The board may submit supplemental projects for approval at any time.

Subd. 2. **Expenditure of funds.** Before January 1, 2002, funds may be expended on projects and for administration of the trust fund only from the net interest, earnings, and dividends arising from the investment of the trust at any time, including net interest, earnings, and dividends that have arisen prior to July 13, 1982, plus $10,000,000 made available for use in fiscal year 1983, except that any amount required to be paid out of the trust fund to provide the property tax relief specified in Laws 1977, chapter 423, article X, section 4, and to make school bond payments and payments to recipients of taconite production tax proceeds pursuant to section 298.225, may be taken from the corpus of the trust. On and after January 1, 2002, funds may be expended on projects and for administration from any assets of the trust. Annual administrative costs, not including detailed engineering expenses for the projects, shall not exceed five percent of the net interest, dividends, and earnings arising from the trust in the preceding fiscal year.

Principal and interest received in repayment of loans made pursuant to

this section, and earnings on other investments made under section 298.292, subdivision 2, clause (4), shall be deposited in the state treasury and credited to the trust. These receipts are appropriated to the board for the purposes of sections 298.291 to 298.298.

Subd. 3. **Administration.** The commissioner and staff of the iron range resources and rehabilitation board shall administer the program under which funds are expended pursuant to sections 298.292 to 298.298.

History: *2Sp1982 c 2 s 9; 1983 c 46 s 4; 1984 c 654 art 2 s 121; 1987 c 386 art 8 s 3; 1993 c 369 s 112*

298.297 ADVISORY COMMITTEES.

Before submission of a project to the board, the commissioner of iron range resources and rehabilitation shall appoint a technical advisory committee consisting of one or more persons who are knowledgeable in areas related to the objectives of the proposal. Members of the committees shall be compensated as provided in section 15.059, subdivision 3. The board shall not act on a proposal until it has received the evaluation and recommendations of the technical advisory committee or until 15 days have elapsed since the proposal was transmitted to the advisory committee, whichever occurs first.

History: *2Sp1982 c 2 s 10; 1983 c 46 s 5*

298.298 LONG-RANGE PLAN.

Consistent with the policy established in sections 298.291 to 298.298, the iron range resources and rehabilitation board shall prepare and present to the governor and the legislature by January 1, 1984 a long-range plan for the use of the northeast Minnesota economic protection trust fund for the economic development and diversification of the tax relief area defined in section 273.134. The iron range resources and rehabilitation board shall, before November 15 of each even numbered year, prepare a report to the governor and legislature updating and revising this long-range plan and reporting on the iron range resources and rehabilitation board's progress on those matters assigned to it by law. After January 1, 1984, no project shall be approved by the iron range resources and rehabilitation board which is not consistent with the goals and objectives established in the long-range plan.

History: *2Sp1982 c 2 s 11; 1983 c 46 s 6*

298.30 [Renumbered 117.47]
298.31 [Private]
298.32 [Repealed, 1975 c 437 art 11 s 7]

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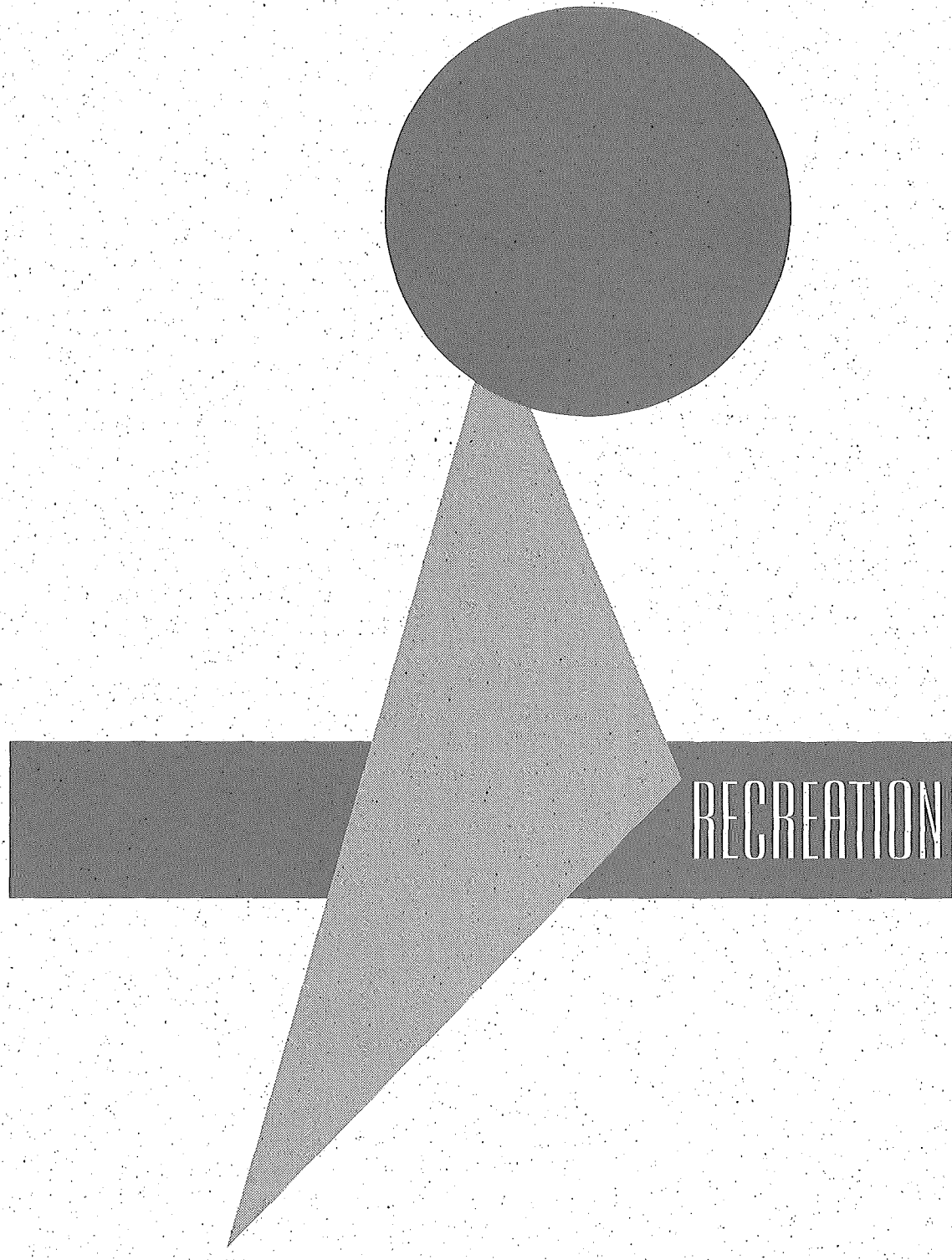
RECREATION

Report of the

RECREATION TEAM

of the

Minnesota Sustainable Development Initiative

November 1993

Vision for sustainable outdoor recreation

Provide — through responsible private and public economic development, community development, and environmental stewardship — a diverse array of quality opportunities so present and future generations can enjoy the benefits of outdoor recreation.

Recreation Team Members

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INTRODUCTION

Sponsored by the Environmental Quality Board, the Minnesota Sustainable Development Initiative was announced by Governor Arne Carlson in January 1993. The Initiative is designed to find new and creative ways to balance the economic, social and environmental goals of Minnesotans. Goals are balanced by having the various actors—from both the private and public sectors—come together, recognize there interdependencies and work cooperatively to shape their shared future.

Sustainable development is an intergenerational strategy, as indicated in an often quoted definition (WCED, 1987): "Sustainable development is development that meets the needs of the present generation without compromising the ability of future generations to meet their own needs." The core idea of sustainable development is the long-term conservation of the capacity to meet needs. For outdoor recreation, this core idea was translated by the Recreation Team into the long-term capacity of Minnesota to produce a diverse array of recreation benefits. Defining this recreation capacity and identifying how to conserve it over the long-term are major themes of the Team's report.

Outdoor recreation is one of seven teams in the Initiative. The other six are: agriculture, energy, forestry, manufacturing, minerals and settlement. Members of each team were appointed by the Governor and the Environmental Quality Board. Members were chosen to represent a wide range of interests. The charge to each team—although variously stated—is to take the first steps in moving sustainable development from concept to practice in Minnesota.

Team Process

The topic of sustainable development is broad, and the Recreation Team found it challenging to get its arms around the topic in 10 team meetings: March 8, April 13, May 11, June 21, July 13, September 14 and 28, October 18 and 28, and November 15. The team's progress, although substantial, is only a beginning in the full design and implementation of sustainable development.

A structured approach was followed to explore the topic. First, the team crafted a vision for sustainable outdoor recreation. Next, it formulated issues concerning the vision. Issues are problems or barriers that prevent the vision from being realized. The team next worked on principles to guide the selection of strategies. Lastly, the team created strategies to deal with the issues so the vision could be achieved.

Team Members and Staff

Team members and their affiliation are:

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VISION

The vision statement defines the long-term goals of sustainable outdoor recreation. It forms the context for the generation of issues, which are problems and barriers to achieving the vision. The statement, with accompanying definitions of key terms, is as follows:

Provide — through responsible private and public economic development, community development, and environmental stewardship — a diverse array of quality opportunities so present and future generations can enjoy the benefits of outdoor recreation.

diverse array (of quality opportunities) means:

- full spectrum of recreation landscapes:
  - a spectrum from lightly modified to heavily modified by people;
  - a spectrum that spans Minnesota ecological settings.
- full range of opportunities that affords a diversity of benefits.

quality opportunities means:

- opportunities that are compatible (do not conflict) with non-recreational activities and other recreation uses.
- opportunities that are affordable.
- opportunities with environmental and natural resource conditions that are compatible with the recreation landscape.
- opportunities that are accessible:
  - public resources (lands and waters) that are open to the public;
  - opportunities that are not regularly full to capacity;
  - opportunities accessible to all people;
  - opportunities near to where people live, when feasible.

benefits of outdoor recreation means:

- personal benefits:
  - better physical health and health maintenance;
  - better mental health and health maintenance;
  - personal development and growth;
  - personal appreciation/satisfaction.
- socio-cultural benefits:
  - community satisfaction;
  - reduced delinquency;
  - community/political involvement;
  - family bonding.
- economic benefits:
  - local and regional economic growth;
  - increased productivity;
  - reduced on-the-job accidents.
- environmental benefits:
  - environmental ethic;
  - protection of particular sites;
  - political involvement in environmental issues.

development (in "economic development, community development") means:

- getting qualitatively better, irrespective of quantitative growth.

environmental stewardship means:

- maintaining the functioning of natural systems so their resource values, products and services are conserved for an indefinite future.
- balancing human needs with the capabilities of natural systems to meet those needs.
- identifying the acceptable levels of environmental change.

GUIDING PRINCIPLES

Principles are important in the design of strategies to deal with issues, because they embody lasting values, outcomes and procedures with which strategies are expected to be consistent. The strategies developed by the Recreation Team share much with the Team's principles, mainly because the same people developed both. The two have not been rigorously compared, however. In practice, a full comparison of strategies and principles is a lengthy and, many times, sophisticated task. For example, the important principle concerning the equity effects of implementing a strategy requires economic analysis, a task that is well beyond the scope of the Team's work.

The principles presented here provide guidance for future work on the design of strategies. The Team built on existing efforts when selecting principles. Principles are grouped into four topical categories: general, environmental, economic and social.

GENERAL PRINCIPLES

The public should have access to public lands and waters.

Anticipating and preventing problems are better than trying to react and fix them after they occur. (Ontario, 1992)

The best decisions are those based on sound, accurate and up-to-date information. (Ontario, 1992)

A balance must be struck between the quality and quantity of social, economic and environmental development.

The spirit of compromise is fundamental to sustainable development decisions, because sustainable development balances social, economic and environmental goals.

A key role of government, acting for society, in sustainable development is to determine how society values its common property resources and how to inject these values into societal affairs. (NOTE: the "value" of a resource includes, among other values, its use value.)

Sustainability implies an ecological approach to planning and management.

Strategies should provide government agencies and private decision makers with needed information. (Project 88, 1991)

Strategies should lead to reasonable implementation, monitoring and enforcement costs. (Project 88, 1991)

Strategies should be flexible in the face of changes in tastes, technology, or resource use. (Project 88, 1991)

The purpose and nature of the strategy should be broadly understandable to the general public. (Project 88, 1991)

The strategy should be truly feasible, in terms of both enactment by a legislative body and implementation by the appropriate departments or agencies. (Project 88, 1991)

ENVIRONMENTAL PRINCIPLES

We must live off the interest our environment provides and not destroy its capital base. (Ontario, 1992)

ECONOMIC PRINCIPLES

Accounting must reflect all long-term environmental and economic costs and benefits, not just those of the current market. (Ontario, 1992)

Strategies should be cost-effective. (Project 88, 1991)

Balance private property rights with the public's long-term economic, environmental and social needs.

A sound economy is required to implement strategies and make progress towards social and environmental goals.

SOCIAL PRINCIPLES

We must respect the rights of future generations. (Ontario, 1992)

The effects of strategies should be equitably distributed, and any inequities should be resolvable through government action. (Project 88, 1991)

Invite broad public participation in developing strategies.

ISSUES AND STRATEGIES

Issues are problems or barriers that prevent the Team's vision from being realized. Strategies are ways to deal with the issues so the vision can be achieved.

The strategies developed by the Recreation Team are mostly broad directions to follow in beginning to resolve issues. They are intended to be seminal ideas, worthy of serious consideration for further work.

The vision statement indicates that central concern of sustainable outdoor recreation is the long-term capacity of Minnesota to produce a diverse array of recreation benefits. It further indicates that this long-term capacity rests upon management of resources and provision of recreation opportunities. These two topics are further defined in the vision statement as:

Management of resources:

- maintaining a full spectrum of recreation landscapes:
  - a spectrum from lightly modified to heavily modified by people;
  - a spectrum that spans Minnesota ecological settings.
- maintaining environmental and natural resource conditions that are compatible with the recreation landscape.

Provision of recreation opportunities:

- providing a full range of opportunities that affords a diversity of benefits.
- providing opportunities that are affordable.
- providing opportunities that are compatible (do not conflict) with non-recreational activities and other recreation uses.
- providing opportunities that are accessible:
  - public resources (lands and waters) that are open to the public;
  - opportunities that are not regularly full to capacity;
  - opportunities accessible to all people;
  - opportunities near to where people live, when feasible.

The Team generated issues and related strategies for "management of resources" separate from "provision of recreation opportunities," and the results are presented in two sections below.

Prior to the sections on issues and strategies, selected background information is presented. The background information is focused on the topic at hand and is not intended to provide a general overview of outdoor recreation in Minnesota. The latter can be found in the most recent State Comprehensive Outdoor Recreation Plan (MN DNR & MN DTED, 1990). The Plan includes—among other topics—the contribution of outdoor recreation to the state and regional economies in Minnesota, and the redistribution of dollars among Minnesota regions due to recreation travel and associated spending.

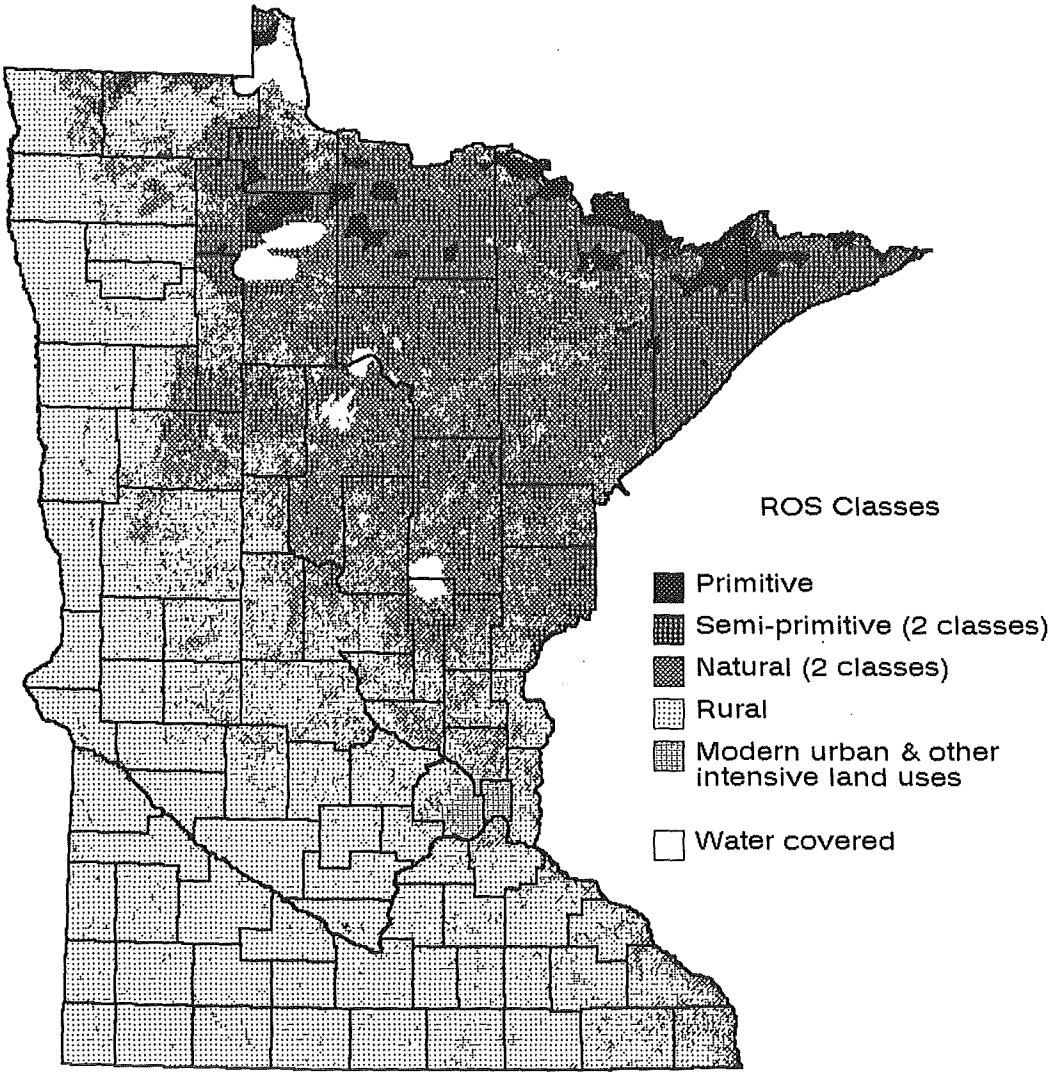
Background: Management of Resources

Minnesota is fortunate to possess a full spectrum of recreational landscapes from lightly modified to heavily modified by people (Figure 1). It is the intent of sustainable outdoor recreation to retain this full spectrum, as well as to have compatible environmental and natural resource

Figure 1

Recreation Opportunity Spectrum (ROS)

(adapted by MN DNR for use with MLMIS)



Source: MN DNR, 1984-89 Statewide Comprehensive Outdoor Recreation Plan.

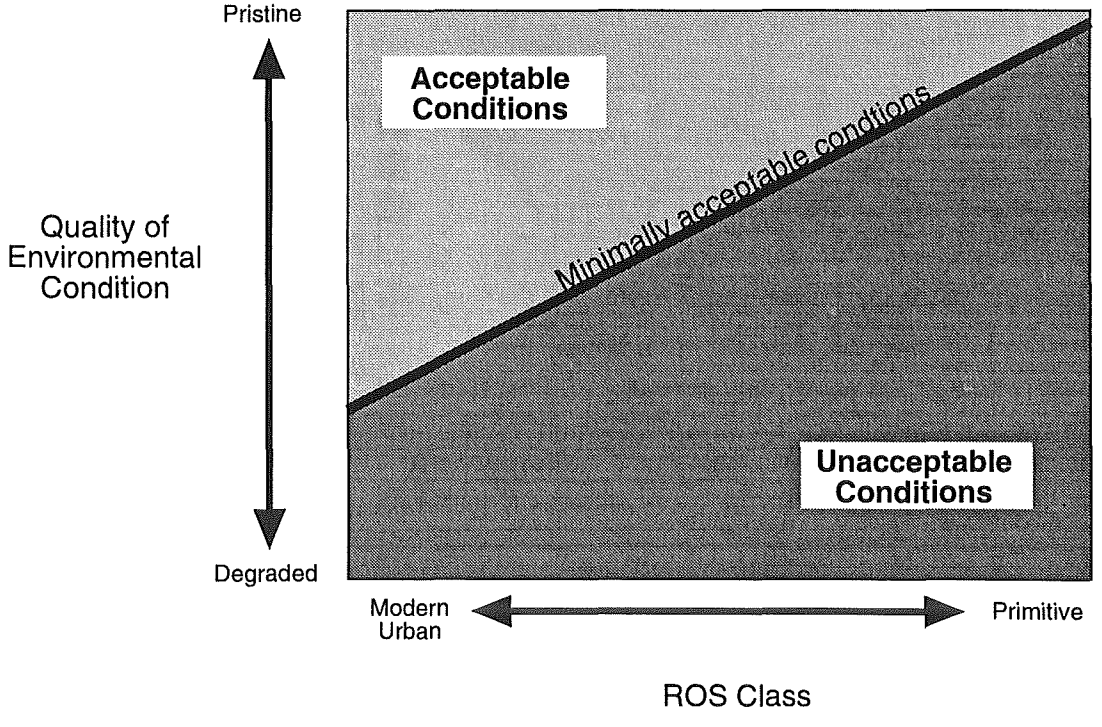
conditions in each part of the spectrum (Figure 2). In concept, the conditions of water, air, aesthetics and vegetation/wildlife must be close to pre-European settlement conditions at the primitive end of the spectrum in order to qualify as lightly impacted by people. Any deterioration in these conditions represents a significant deterioration. As the setting becomes more heavily modified by people, the minimally acceptable conditions are less stringent.

Most of the primitive and semi-primitive lands in Minnesota are under public ownership, so public land management will be a critical to maintaining the full spectrum of recreational landscapes.

Not all of the lands within any class are of equal recreational appeal, a fact that will need to be kept in mind if this aspect of sustainable outdoor recreation is used further. For example, the extensive peatlands of northern Minnesota are as "primitive" as the Boundary Waters Canoe Area Wilderness, yet the latter is a more desirable place to recreate. Another good example is shorelands, which tend to be more desirable than uplands. Virtually all Minnesota resorts (98%) are on shorelands.

Figure 2

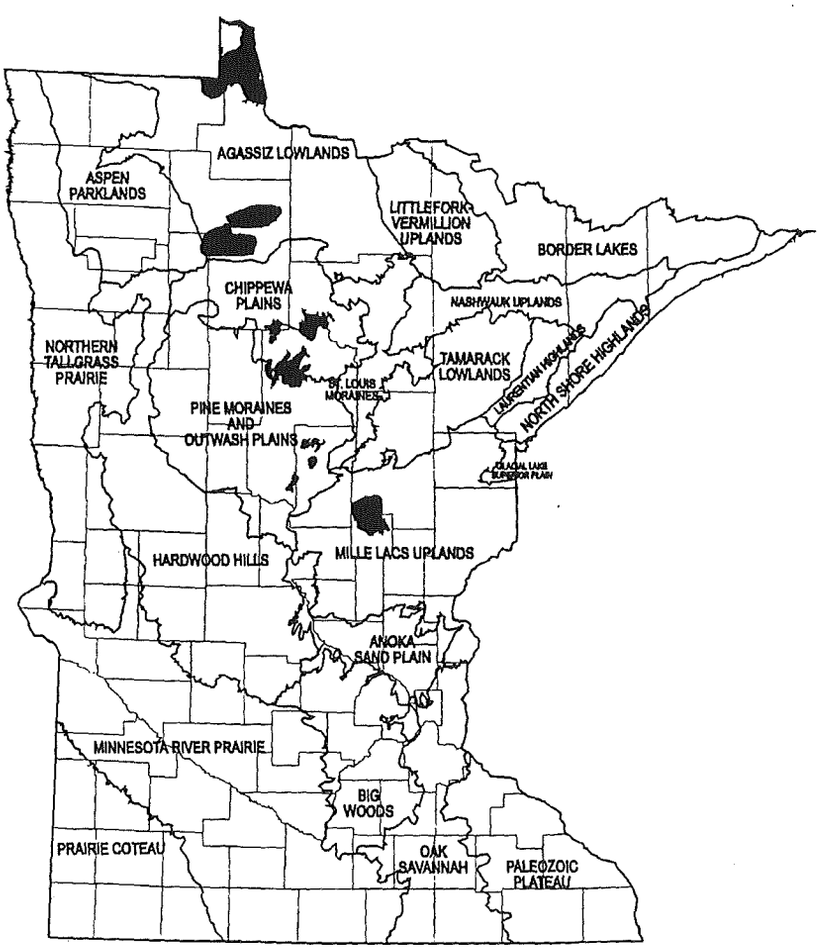
General Schematic on the Relationship Between Recreation Opportunity Spectrum (ROS) Class and Acceptable Environmental Condtions



The peatlands referenced above, however low in recreational appeal, are an important ecological setting, and it is the intent of sustainable outdoor recreation to offer opportunities that span Minnesota ecological settings. A classification system of ecological settings is contained in the Ecological Classification System (ECS) currently under development. ECS is hierarchical, with broader regions at upper levels of the classification system and smaller regions at lower levels. The subsection level is displayed on Figure 3. This level is very similar to the Landscape Regions that have been used in the past as a natural region framework for outdoor recreation planning by the Department of Natural Resources.

Figure 3

Ecological Classification System (subsection level)



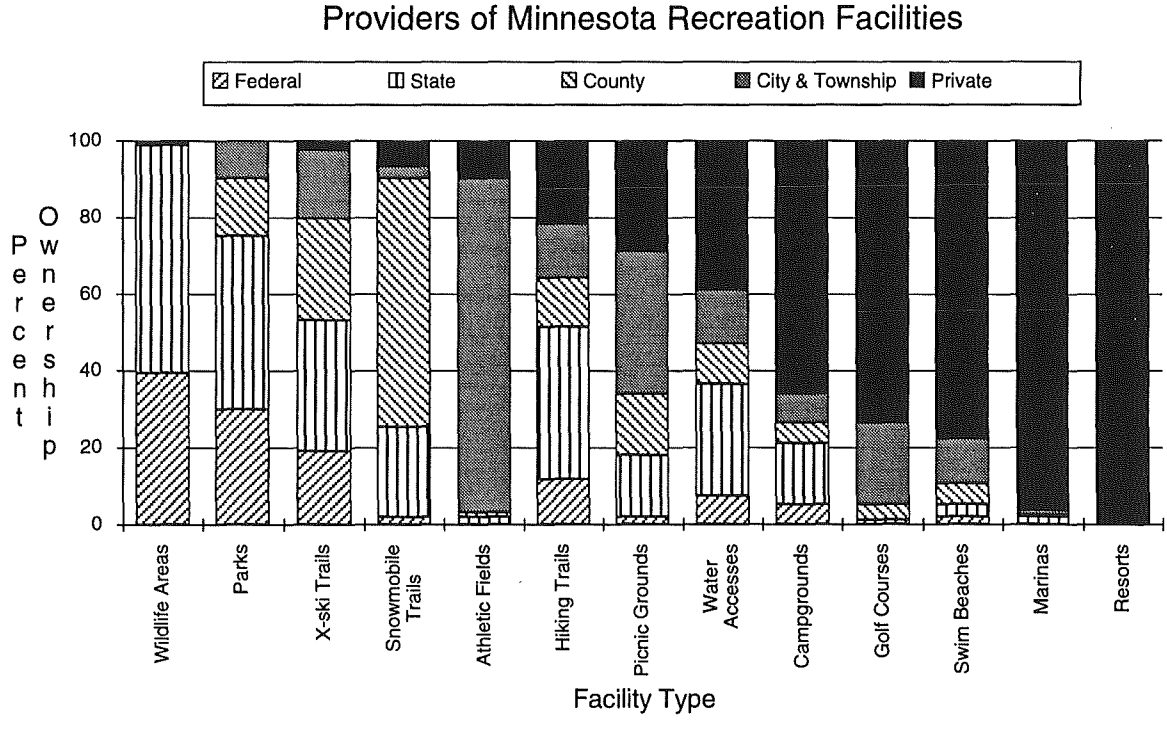
Source: Bryan Hargrave. 1993 (draft). The Upper Levels of an Ecological Classification System for Minnesota. MN DNR, Division of Forestry.

Background: Provision of Recreation Opportunities

Outdoor recreation in Minnesota is supplied through a mix of private and public offerings. Certain facilities have been traditionally supplied by the private sector, with others supplied by various levels of government (Figure 4). Nearly all wildlife areas and the majority of parkland, trails, athletic fields, picnic grounds and water access are supplied by government. The majority of marinas, campgrounds, swim beaches and golf courses, and virtually all resorts are provided by the private sector.

This pattern of development will probably continue into the future, with the same actors being called upon to develop the same facilities as they have in the past. The broader levels of government will likely be called on to supply the resource-extensive areas such as wildlife areas and parks and primitive areas. Local government will likely continue to develop facilities for local population such as athletic fields. The private sector will probably continue to supply overnight accommodations and attendant facilities at recreation destinations (i.e., resorts, campgrounds, marinas, swim beaches and water access). All major actors will most likely continue to develop certain facilities such as water access.

Figure 4



Source: MN DNR, 1984-89 Statewide Comprehensive Outdoor Recreation Plan.

Issues and Strategies: Management of Resources

1. ISSUE: Most resource management is unintegrated and short term. As a result, current management would have great difficulty trying to deal with a recreation vision that —to be realized—requires substantial long-term cooperation among all levels of government and the private sector. For example, there are numerous public and private actors that determine how heavily modified a landscape is by people. The actions of these people will need to be coordinated over a long period of time if lightly modified landscapes are maintained for future generations.

STRATEGY: Create integrated, interdisciplinary long-range management plans for natural resources in Minnesota. The plans would be comprehensive and address the resource needs of outdoor recreation among other activities. All levels of government and interested citizens would contribute to these plans in an open and public process.

Land use would be an integral part of the plans, because land use largely determines how heavily modified a landscape is by people and has such a major influence on natural resources for recreation and other uses.

There are a number of items to consider when formulating these plans. For example:

- Nonpoint source pollution (nonpoint source pollution is pollution associated with water runoff).
- Growing population and resource demands on a finite resource base.
- Protection and restoration of aquatic ecosystems becoming a part of the mission of all environmental and natural resource agencies and boards.
- Integrated management teams that are accountable for ecosystem health.
- Monitoring, evaluation, enforcement and publicity mechanisms.
- Visual management practices and sensitive visual management areas.
- Road design, construction and management that incorporates both recreational landscape and transportation needs.

2. ISSUE: Nonpoint source pollution severely degrades the aquatic resources on which so much recreation depends. It also contributes to public health problems and the general degradation of aquatic ecosystems.

STRATEGY: Minnesota needs a framework to deal with nonpoint source pollution. Principle components of this framework should be:

- Mandatory best management practices.
- Within watersheds, implement site-specific management practices.
- Professionally managed watershed teams, comprised of representatives of all levels of government and interested citizens.

3. ISSUE: The real value of natural and environmental resources is not reflected in current pricing methods. As a result, these resources tend to be overused and degraded. The marketplace—where most goods and services are priced—is not effective, by itself, in pricing environmental and natural resources that are owned in common by all people. This lack of effective pricing has been a major contributor to our current resource problems.

STRATEGY: Adopt full-cost pricing (i.e., fully internalizing externalities) as a long-term strategy to ensure that incentives for resource use are in line with values society places on these resources. Full-cost pricing can be implemented in a number of ways, including government regulation, market mechanisms or the implementation of a long-range resource plan like the one called for above. Full-cost pricing may be difficult to implement completely, but moving toward more complete implementation is a worthwhile goal and has been a definite trend over the last few decades. For example, the effective cost of using air and water resources for waste disposal is considerable higher today than it was a few decades ago.

4. ISSUE: Government has created a large number of incentives (through such mechanisms as taxes and subsidies) that affect the use and, thus, possible degradation of environmental and natural resources.

STRATEGY: Evaluate current incentives to identify those public practices that are adversely affecting resource conditions, and recommend changes in incentives to positively impact resource conditions. This evaluation would be wide ranging. Examples of items that should be evaluated for their resource effects are:

Local government reliance on property taxes (e.g., incentive to intensify land use).
Tax deductibility of mortgage interest on second homes (e.g., incentive to build on undeveloped shoreland).
Agricultural commodity programs (e.g., incentive to farm marginal lands).
Public timber sales policies (e.g., incentive to harvest timber).
Shortsighted nature of public bonding programs (e.g., incentive to overlook the broader public good).

5. ISSUE: Accurate and comprehensive resource inventorying and monitoring is necessary to measure the extent, quality and condition of recreation resources addressed in the vision statement. Without such measurements, it is not known whether efforts to achieve sustainable outdoor recreation are successful or unsuccessful.

STRATEGY: Minnesota needs to initiate the inventorying and monitoring programs necessary to measure progress toward sustainable outdoor recreation. The monitoring program should include a publicly funded citizen monitoring component.

6. ISSUE: Enforcement of existing laws, regulations and contracts is inadequate.

STRATEGY: Enforcement of compliance with existing laws, regulations and contracts should be more certain.

STRATEGY: The duties of conservation officers should be expanded to include the enforcement of environmental laws and regulations.

STRATEGY: Encourage public input to enforcement agencies to ensure they understand public concerns. Citizen advisory groups are one method of providing public input.

STRATEGY: Public and peer enforcement needs to be encouraged.

STRATEGY: Public education efforts should be targeted on enforcement issues.

7. ISSUE: There is an on-going need to evaluate the effectiveness of existing resource management programs.

STRATEGY: Legislative auditors should conduct a major audit of expenditures of state funds for natural resource management by ecological units to see what is getting accomplished.

STRATEGY: Minnesota's shoreland management program should be evaluated to see if it is achieving the goals (such as public health and aesthetics of shoreland) that it is intended to. Examining the effectiveness of this program is a major recreation topic, because shorelands are primary recreation resources in Minnesota.

8. ISSUE: Minnesota has public health risks associated with outdoor recreation (e.g., fish unsafe to eat, or water unsafe for swimming and—in limited places where water is intended to be consumed by recreators—for drinking).

STRATEGY: The state should identify public health risks and accelerate programs to minimize potential health problems. The state should develop a policy and a message regarding recreation opportunities with public health risks, and it should ensure that the creation and promotion of such opportunities is done with care. For example, effective signing as to health risks needs to accompany new fishing piers on waters where the fish are unsafe to eat.

Issues and Strategies: Provision of Recreation Opportunities

9. ISSUE: Popular sites and their special resources are often adversely affected because of the impact of some users (e.g., impacts due to noise, speed or intoxication) and—in the case of water—the impact of riparian land owners. Impacts can be to natural resources and other attributes of a desired experience (e.g., solitude and tranquillity).

STRATEGY: Mandatory public education is needed concerning environmental stewardship.

STRATEGY: Riparian land owners need to be made fully aware of their potential impacts on the water resource.

STRATEGY: "Eligibility requirements" for some users are needed to demonstrate appropriate knowledge and behavior.

STRATEGY: The impact of noise should be reviewed by state and local government.

STRATEGY: Better enforcement is needed to minimize these adverse impacts. Enforcement individuals need to be educated to deal effectively with these impacts.

10. ISSUE: Public is not aware of diverse opportunities available, nor where or how to gain access to them.

STRATEGY: Research is needed to better understand how people learn about opportunities and make decisions on recreation trips.

STRATEGY: Improved information delivery systems are needed to get the information on diverse opportunities to the public.

11. ISSUE: Some opportunities are not accessible because they are regularly full. It may not be cost-effective to rectify this by providing additional opportunities if suitable alternatives exist that are underutilized.

STRATEGY: Some recreators can be directed from overutilized to underutilized times and/or opportunities though:

Peak period pricing, with discounts for the economically disadvantaged.
Information on overutilized and underutilized times and places.
Reservation systems.

STRATEGY: Expand opportunities for those that are regularly full by:

Restoring resources to increase available opportunities.

Subcontracting with private sector to lower costs so more opportunities can be provided within the same budget (e.g., state parks and public water accesses).

Increasing the supply of public and private opportunities.

12. ISSUE: Decision makers are not well informed about benefits and opportunities that people seek. This is often true for the benefits and opportunities sought by certain cultural groups, the disabled, and seniors.

STRATEGY: Conduct research to identify and monitor benefits people seek.

STRATEGY: Develop and employ measures of public recreational experiences and benefits in long-term policies, programs and management actions. For example, assess planning frameworks (such as the Recreation Opportunity Spectrum and Limits of Acceptable Change) as methods to specify goals and objectives and to maintain desired conditions.

STRATEGY: Training and education of decision makers is needed concerning the provision of a diversity of opportunities and benefits. Decision makers should possess such diversity knowledge for hiring and promotion. Training and education could be experiential, or could be delivered through lectures, continuing education and short courses.

13. ISSUE: There is often conflict among recreation uses and between recreation and non-recreational activities.

STRATEGY: Need to develop and test better conflict resolution processes. Expanded public input should be central to any new process.

STRATEGY: Conduct research into conflict identification and resolution. The research could be funded through user fees, user education and licensing validation processes.

STRATEGY: The most appropriate user-management technique needs to be applied to resolve conflicts. Techniques to avoid conflicts include rationing of use, dispersion of use, segregation of uses, behavioral restrictions on certain uses, and the education of users on what constitutes appropriate behavior.

STRATEGY: Provide additional resources and opportunities when the conflict is due to congestion.

14. ISSUE: There are serious equity issues (who pays, who gains) in providing outdoor recreation.

STRATEGY: As possible models for outdoor recreation, examine the rationale of who pays and who benefits in other systems, including public education, health care and YMCA camping programs.

STRATEGY: Public and private service providers should be encouraged to develop systems that recover costs and provide more equitable opportunities (e.g., sliding scale fees, passes to economically disadvantaged groups, and service programs for persons who cannot afford to pay).

STRATEGY: Identify and develop alternative public and private funding sources to provide more equitable distribution of outdoor recreation opportunities. These funding sources should be directed toward groups who could greatly benefit from outdoor recreation from outdoor recreation but who currently do not have adequate opportunities (e.g., disadvantaged children and families, and persons with disabilities).

STRATEGY: Locating recreation opportunities near where people live increases affordability as well as access.

15. ISSUE: Opportunities are not accessible for all people, including people with disabilities and people from varying social and cultural backgrounds.

STRATEGY: Recreation needs of all people need to be determined through research. The State Comprehensive Outdoor Recreation Plan should be responsible for making these determinations.

STRATEGY: Utilize universal designs for facilities and programs. Develop non-punitive incentives to get the designs adopted.

STRATEGY: Provide training for public and private service providers on accessibility needs.

STRATEGY: Disseminate information on accessible facilities, programs and services. Uniform "accessibility" criteria need to be developed and applied in assembling this information. The Minnesota State Council on Disabilities should be a clearinghouse for this information.

16. ISSUE: Developing recreation opportunities near where people live is often difficult because of the competing uses for lands and waters.

STRATEGY: Providing recreation land or money to purchase recreation land should be a condition of development.

STRATEGY: Ensure that recreation opportunities are included when land is redeveloped. As parts of cities and other settled areas are redeveloped, there are excellent opportunities to dedicate land for recreation and aesthetic opportunities, and to build in facilities such as walking paths and bike trails.

STRATEGY: Opportunities can be expanded by restoring natural resources near or in settlement areas.

STRATEGY: Because public access to public resources is so important, public agencies should ensure that private development does not close off access to public resources (e.g., complete private development of lakeshore) or raise substantially the eventual cost of access acquisition. To ensure this, public agencies need to monitor private development trends and acquire access at favorable times.

17. ISSUE: Certain recreation opportunities are undersupplied.

STRATEGY: Increase public land acquisition of open space in areas of high recreational demand and critical/unique natural and cultural resources.

STRATEGY: Develop improved legislation and programs to promote donation to the state, exchange with the state and purchase by the state of recreationally significant resources.

STRATEGY: Make privately owned recreational resources more accessible and attractive to recreators through public-private partnerships.

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