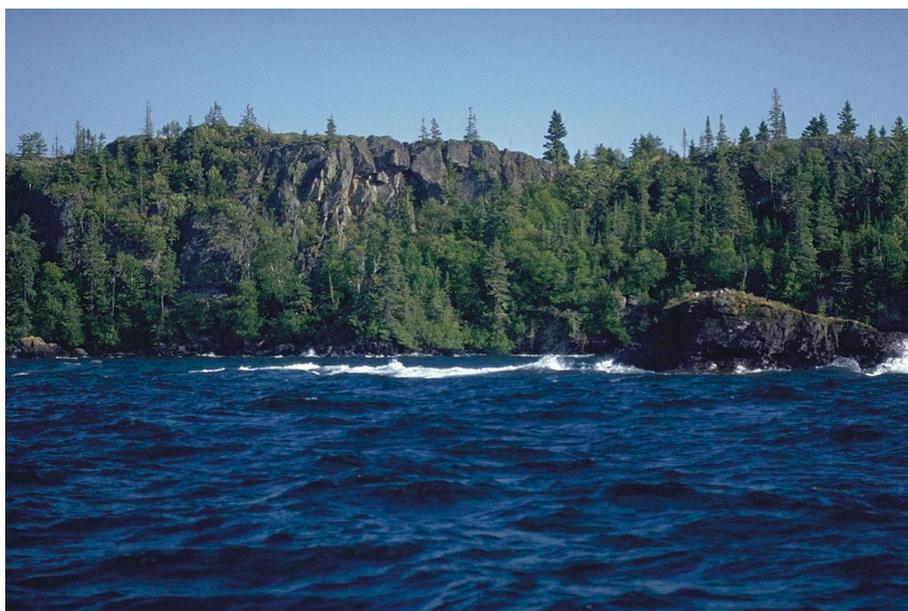


Chapter 9

Developing Sustainability in the Lake Superior Basin



Isle Royale National Park , Lake Superior, MI
Photograph by: Mark E. Hodgkins, U.S. Fish and Wildlife Service

Lake Superior Lakewide Management Plan
2000

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Chapter 9

Developing Sustainability in the Lake Superior Basin

Lake Superior Lakewide Management Plan

EXECUTIVE SUMMARY

In developing a management plan for Lake Superior, government agencies have historically kept in mind a larger goal of developing regional sustainability so as to restore and preserve a range of social, economic, and environmental values in the region. This chapter reviews a variety of issues and actions relevant to identifying, monitoring, and affecting conditions relevant to ensuring basin-wide sustainability. In conjunction with the work of other committees in the Lake Superior Binational Program, it provides a basis for assessing where we are as a society in the watershed and projecting how close we are to achieving our “Vision for Lake Superior,” and suggesting where we need to go to sustain a regional human presence in the years to come.

Perhaps the greatest challenge to achieving regional sustainability rests in the lack of a clear, agreed upon definition for what “sustainability” means for a wide range of constituencies. Combined with the fact that what is or is not viewed as sustainable at any given point in time may not be the same in the future, and that the true measure of a sustainable society is on the scale of generations rather than years, this challenge is somewhat daunting. Furthermore, an understanding of what constitutes sustainability will always be a moving target insofar as environmental conditions and social priorities change. At the very least, we must conserve existing resources in the basin so that future residents are not left without access to vital elements of daily life. Any plan for developing sustainability must be also flexible and responsive to changes in the social, economic, and environmental conditions of the region. Many argue, as well, that planning for sustainability requires ongoing education and persuasion much more so than the implementation of specific laws and regulations. It is a quite complex process requiring the use of several measures taken over time, interpreting the meaning of those indicators within a social and political context, and demonstrating measurable results in allocating time and effort in the drive toward achieving a sustainable society. Nonetheless, we believe that this chapter outlines a prudent and practical blueprint for beginning the process.

To guide our efforts in the years to come, we have focused on five indicators for developing regional sustainability: reinvestment in the natural capital of the basin, the quality of life in the area, attending resource consumption patterns, citizens’ awareness of capacity their for sustainability and various measures of economic vitality. As an initial attempt to measure these indicators, and following another study endorsed by the Binational Program dealing with the attitudes and values of decision makers in the basin, we have completed most of a “Baseline Sustainability Indicators” project to observe the status of basin-wide sustainability at present. In particular, this project focused on examining a wide range of existing data-bases to determine the extent to which we could observe trends in sustainability without having to create new indexes or gather novel forms of information. To date, at least some data has been obtained for most of the socioeconomic sustainability measures, and likely sources of at least partial information for 23 more indicators have been identified. In the end, we hope to identify at least 15 to 20 measures

that appear most promising as our primary sustainability indicators, based on the current availability of data, the likelihood that comparable data will be available in the future, the suitability of the measures in their present form, and their overall value as indicators of the human dimensions of ecosystem health. Eventually, the final project report will contain graphic representations of the information in the database, descriptions of relevant studies and reports, and recommendations for compilation or generation of additional baseline data in subsequent years.

Based on a preliminary review of the incomplete database, it seems apparent that a variety of social and economic conditions may threaten the long-term sustainability of the watershed. In particular, a relatively depressed regional economy may be fostering conditions which work against the incorporation of sustainability principles into daily life and further encouraging ill-advised use of basin resources. However, the data also suggests that various countervailing demographic forces may also influence the adoption of more benign technology and land use planning on a watershed scale.

In addition to collecting data regarding socioeconomic and attitudinal data in the basin, we have proposed a series of additional projects, some of which have already commenced. A number of these projects are primarily oriented toward further assessing the status of sustainability in the basin and include:

Actions

- A “Sustainable Forestry Practices” initiative that consists of comparing and contrasting forestry practices in the basin (including harvesting and resource modification) and establishing a system by which the processes can be periodically assessed in light of the basin-wide sustainability of forest resources.
- A “Community Awareness” review that seeks to formally survey residents of the basin as well as initiate person-to-person dialogue regarding sustainability issues.
- A review of the status of “Sustainability Education” in the region in order to gain a better picture of the extent to which sustainability principles are currently being incorporated into environmental education programs.

Alternatively, a number of other projects primarily focus on ways of changing social and personal behavior, such as:

- A “Communicating Economic Values” project aimed at improving the visibility and demonstrating the economic importance of natural resource systems in the basin for resource decision-making.
- A project that evaluates the value of various economic instruments (e.g., user fees, pollution charges, permit trading programs, performance bonds) applicable to the Lake Superior basin.

- A project promoting water conservation which builds upon Canadian efforts by expanding the “toilet replacement rebate and water use audit” programs in Thunder Bay.
- A “Marketing Waste Reduction and Energy Efficiency” initiative which will develop an information and assistance campaign tailored to alerting small businesses, health care organizations, and educational systems in the basin to various energy and waste assistance programs.
- A program designed to further facilitate mercury reduction by expanding current emphases on thermostat, button battery, and fluorescent lamp recycling.

These and additional action items, some of which already have sponsors and funding as well as some that represent our “next steps,” are listed in Figure 9-1 on the next page:

Figure 9-1. Action Summary

Project	Lead Agency/ Funding Source	Funded	Needs Funding
Teaching the Value of Economic Instruments	Environment Canada	X	
Promoting Water Conservation	Thunder Bay 2002	X	
Mercury Reduction	U.S. EPA and Thunder Bay 2002	X	
Baseline Sustainability Indicators	Michigan Tech. University (CEM funding)	X	
Sustainable Forestry Practices Inventory	USDA Forest Service	X	
Communicating Economic Values	Not Determined (GLNPO funding)		X
Marketing Waste Reduction & Energy Efficiency	N. Michigan University (GLNPO funding)		X
Promoting Riparian Buffers	Not Determined (unknown funding)		X
Sustainable Forestry Practices Inventory	Sigurd Olsen Institute (USDA funding)		X
Community Awareness Review	N. Michigan University (CEM funding)		X
Sustainability Education Review	Gt. Lakes Aquarium (unknown funding)		X
Comparing Sustainability Indicators	Not Determined (unknown funding)		X
Understanding Sprawl	Not Determined (unknown funding)		X
Watershed Management Promotion	Not Determined (unknown funding)		X
Environmental Industrial Design Demonstration	Not Determined (unknown funding)		X

9.0 ABOUT THIS CHAPTER

In developing a management plan for Lake Superior, government agencies have historically kept in mind a larger goal of developing regional sustainability so as to restore and preserve a range of social, economic, and environmental values in the region. This chapter reviews a variety of issues and actions relevant to identifying, monitoring, and affecting conditions relevant to ensuring basin-wide sustainability. In conjunction with the work of other committees in the Lake Superior Binational Program, it provides a basis for assessing where we are as a society in the watershed and projecting how close we are to achieving our “Vision for Lake Superior,” and suggesting where we need to go to sustain a regional human presence in the years to come. Section 9.1 describes what the problem is. Sections 9.2 and 9.3 lay out the Lake Superior sustainability objective and the current status and trends in sustainability in the Lake Superior basin. Finally, Sections 9.4 and 9.5 outline strategies for future initiatives and next steps toward implementing those initiatives.

9.1 PROBLEM IDENTIFICATION

Typically, when we consider the risks associated with environmental problems in the Lake Superior basin, we rarely look beyond the remediation of existing problems. Watersheds can be rehabilitated; municipalities, industries, and citizens can be held accountable; or the air can be purified and the threat seems to “go away.” However, in order to ensure that history does not repeat itself, a more fundamental puzzle must be solved: How shall we sustain our society so that the Lake Superior of tomorrow is healthy as well? In other words, how should we act in society so as to realize the “Vision for Lake Superior” which begins this planning document.

9.1.1 General Introduction

The main reason to pursue a Lakewide Management Plan (LaMP) for Lake Superior is because people have concluded that our actions in the past and present potentially harm our use of the Lake in the future. If we assume that humans and nature can coexist in harmony and that we need not choose between having a sound economy versus having a healthy environment, those living in the Lake Superior basin must begin to develop a sustainable society throughout the region. That is, we need to find a way to balance the use of available resources in the watershed with the sort of living conditions we seek to maintain or improve upon. And, in order to create a sustainable society, it is not enough to simply guarantee that the natural and social environment is preserved so that we may continue to reap benefit at the present time. The indispensable fact is that what we do today will surely influence the lifestyles of future generations. Thus, a viable LaMP must certainly take into account the extent to which citizens in the region can prosper and sustain themselves in the years to come. This is not to suggest that agencies such as the U.S. EPA should attempt to “manage” society in way that exceed their legislative mandates and authority. Rather, it is expected that agencies responsible for restoring and protecting the Lake Superior basin ecosystem, as well as citizens and industry, should cooperate and pool their considerable resources so as to ensure that society does not inadvertently undermine the natural foundation upon which it rests.

Since its inception, the “Broader Program” for the Lake Superior region has often recognized the larger goal of sustaining a human presence in the watershed that does not jeopardize the natural fabric of the basin. Consequently, this chapter of the LaMP reviews steps we have taken or will take to identify, monitor, and affect various social and economic indicators relevant to achieving the goal of restoring and protecting the Lake Superior basin ecosystem.

9.1.2 Defining Sustainability

Despite differences of opinion, definitions of “sustainability” generally share a variety of attributes. Essentially, planning for sustainability in the Lake Superior basin involves making decisions about where we want to be in comparison with existing conditions. At the very least, we must conserve existing resources in the basin so that our descendants can enjoy the same quality of life as the present generation, if not a qualitatively better standard of living. Additionally, in order to predict how we may best ensure regional sustainability, we need to bear in mind a variety of issues:

- What is or is not sustainable at a given point in time may not be the same in the future. An understanding of what constitutes sustainability will always be a moving target because we cannot control all of the social and environmental factors that are associated with the process of sustaining valued lifestyles. Thus, any plan for developing sustainability must be flexible and responsive to changes that follow social and natural cycles such as migration trends or climate change.
- The environment, economy, and social structure of a region are interdependent; to make policy which preferences one over the others will ultimately result in the collapse of all three. Thus, in the long run, social, economic, and environmental needs must receive equal footing in planning for and identifying progress toward sustainable lifestyles.
- As a dynamic process, developing and measuring sustainability requires attention to how society and the environment change over the span of many years; the true measure of a sustainable society is on the scale of generations rather than years. Thus, planning and assessment is a much more complex process than, for example, rehabilitating a single stream or eliminating a specific chemical in the environment.
- Since processes directed at achieving and maintaining sustainability must themselves be enduring, we need to encourage and respect a diversity of perspectives regarding the manner in which society makes progress toward sustainability. Effective policy truly depends on a political consensus that favors long-term advances over short-term benefits. Thus, planning for sustainability requires ongoing education and persuasion much more so than merely attempting to enforce laws and regulations that may not be wholly supported by most citizens.

9.1.3 Conceptual Challenges

Even though the idea of sustainability has long provided a foundation for the Lake Superior Binational Program, how we should go about facilitating sustainable practices on the ground has been more problematic. Indeed, the very concept of “sustainable development” has prompted all sorts of reactions from various public and private sectors around the globe. To promote practices which provide for sustainable outcomes necessitates consideration of a variety of issues that go beyond the mere prevention of pollution; to produce a truly sustainable society means that we must grapple with issues that are more general in scope than those associated with other aspects of the LaMP. Furthermore, insofar as a focus upon a reduction in chemical loadings to the Lake or the restoration of habitat has garnered the lion’s share of attention in recent years, work toward implementing projects designed to improve our chances of sustainability in the region has somewhat lagged behind the rest of the planning process. Though progress has been made, we are still a long way from promoting a full range of social and economic initiatives that will make for a sustainable future.

In order to effectively manage the process of developing sustainability in the Lake Superior basin, planning for the LaMP must deal with three fundamental barriers that cannot be wished away. Although these obstacles can be surmounted, each poses something of a challenge regarding how we think about and act so as to promote regional sustainability.

9.1.3.1 Integrating Complex Data from Diverse Sources

As with other aspects of the LaMP, there can be no single best indicator of sustainability--we must turn to a suite of measures taken over time. Some of these indicators are fairly tangible and can be approached as one would the physical assessment of ground water pollution or wildlife populations. Most measures, however, are much less concrete and will find their worth in projects that attempt to alter the distinctly social fabric of the watershed. To integrate physical and social assessments of sustainability requires a substantial investment in time, effort, and finances especially for the creation of new indexes to measure complex social interactions; it also requires the development of reports that are easily understood by citizens and policy makers alike. Additionally, we need to focus on the basin as a whole, rather than become fixated on one or two components of the larger system. Furthermore, there may be some warrant in considering the extent to which what we do in the basin to enhance regional sustainability could either enhance or adversely affect global conditions (e.g., placing a moratorium on logging, mining or other extractive actions in the watershed might result in the use of developing countries’ resources beyond sustainable levels). This sense of getting "the big picture" is complicated by the need to appreciate a human and natural ecosystem which steps to a cadence far in excess of typical monitoring intervals. Thus, the problem is that the complexity of fostering sustainability may lead us to an inappropriate reliance on quick-fix, “end-of-pipe” solutions to environmental threats, rather than dealing with the identification, monitoring, and remediation of more serious shortcomings located “up stream” in society itself.

9.1.3.2 Dealing with the Political Context

It should be obvious that observing and modifying social practices is a more time consuming process than installing the best technology for pollution prevention or remediating a degraded stream. The fact is that we exist within a political context that can hinder changing the way we live and work just as easily as it might provide additional opportunities for sustainability. Our society is one of competing agendas, alliances, and bedrock philosophies, and much depends upon what sector of society is driving the political process. For example, often times people shy away from a serious focus on what sustainability necessitates because they find little risk in behaving as they always have, or because they do not foresee the absence of seemingly abundant resources, or because they fear the loss of short-term benefits in light of long-term comparative advantages, or because they simply do not know how to act otherwise. To engineer a more sustainable society in the Lake Superior basin requires an evolutionary change in world view and local practices so as to not be seen as attacking the established social and economic order. And it is not as if there generally exists a powerful group of women and men who actively resist promoting sustainability. Rather, it is typically the case that competing values regarding what should be done when, how, and by what agency results in policy paralysis. It is not an easy task to create consensus and move society to the adoption of measurable and sustainable behaviors.

9.1.3.3 Demonstrating Measurable Results

It is sometimes argued that the issue of sustainability is too “process” oriented and that one never gets to the point at which we see a “product.” For example, even if our monitoring efforts indicate where we need to go regarding basin-wide sustainability, how will we know we have arrived at that desired end if sustainability is, indeed, a moving target? We may assume that commitment to sustainability results in a series of independent actions that, integrated over time, will reflect a gradual improvement in the ability of the Lake Superior ecosystem to support the social and economic lives of its inhabitants. However, public accountability for the LaMP process often hinges on demonstrating relatively immediate results, which does not fit the time frame for sustainability planning. As a consequence, people may begin to focus on more observable short-term targets when committing money or effort to a LaMP-related project. Since few of us have the capacity to see across the generations, nor is anyone likely to live long enough to take a good look back, most people cannot justify the expense of sustainability in their daily lives. Therefore, it is crucial that we specify reasonably tangible measures and outcomes that permit us to actually observe movement toward sustainability.

9.2 SUSTAINABILITY OBJECTIVES

In the process of building the Lake Superior LaMP, the “Developing Sustainability” Committee of the Binational Program has consistently relied on a set of ecosystem targets established in the mid-1990s. Both the general- and sub-objectives for sustainability were created out of public input and in consideration of what we know about environmental social science. And, in comparison with most outcomes identified in other portions of the LaMP, these targets are cast in terms of assessing human behavior that affects the land, water, air, and other life forms in the watershed.

9.2.1 General Objective

As noted at the beginning of the LaMP, the following objective underscores a distinctly social aim for our efforts in the basin, focusing primarily upon how we should go about the business of using resources at our disposal:

Human use of the Lake Superior ecosystem by all people in the watershed should be consistent with the highest social and scientific standards for sustainable use. Land, water and air use in the Lake Superior ecosystem should not degrade it, nor any adjacent ecosystems. Use of the basin's natural resources should not impair the natural capability of the basin ecosystem to sustain its natural identity and ecological functions, nor should such use place at significant risk the socioeconomic and cultural foundations for any group of citizens in the watershed, nor should we deny current and future generations the benefits of a healthy, natural Lake Superior ecosystem. Policies directed at the wise management of natural and social resources in the basin should not usurp the right of local communities to determine their future within the guidelines established by existing statutes and regulations. Technologies and development plans that preserve natural ecosystems and their biodiversity should be encouraged.

There are a number of noteworthy features embedded within this general objective, each of which help orient the specific sorts of projects we undertake as part of the LaMP for Lake Superior:

- Government, industry, and private citizens alike should be bound to the shared goals of sustainability.
- Decisions should be based on our best scientific understanding of how technology, economics, and society can affect the sustainable use of the natural ecosystem.
- No particular sector of current and future society should bear an inequitable burden in forging sustainable practices.
- Autonomous communities within the basin should be empowered to lead the way toward sustainability.
- Education, more than regulation, is a cornerstone in the process of achieving sustainability.

Ideally, the general objective can provide guidance in identifying specific, action-oriented principles that can shape social behavior.

9.2.2 Sub-Objectives

In order to evaluate our progress toward meeting the general objective, four sub-objectives have been specified and serve to direct the sorts of monitoring and projects we believe will help secure sustainability in the Lake Superior basin. Each sub-objective points to a range of specific actions we may take in the years to come.

9.2.2.1 Ensuring Environmental Integrity

The first sub-objective, that “public and private decisions should be based on understandings, rooted in formal and informal educational settings, which contribute to the integrity and stability of social and biotic communities,” reaffirms the role of education in creating a sustainable regional society. We should be promoting a range of educational opportunities which help people to appreciate the need for living in harmony with the natural ecosystem in the basin.

9.2.2.2 Resources and Services as Environmental Capital

The second sub-objective clarifies the relationship between resource use and resource value: “The Lake Superior ecosystem provides resources and services to humans. These include air, water, fiber, minerals, energy, waste transport and treatment, food, recreation, and spiritual sustenance. These resources should be valued as environmental capital, in the same way that other capital is assigned value.” In other words (and in consideration of the need to balance the social, environmental, and economic dimensions of sustainability), we should undertake sustainability projects that maximize the economic relationships between different types of concrete and abstract commodities which are integral to daily life.

9.2.2.3 Sustainable Technology and Design

“Institutional capacity to integrate technology and sustainable design should be developed within the Lake Superior ecosystem that are compatible with existing and emergent social conditions” serves as the third sub-objective. Here, the focus is upon encouraging the incorporation of practical technology that is within financial reach of citizens who work and play in the region.

9.2.2.4 Basin-Wide Planning

The final sub-objective for developing sustainability within the LaMP framework suggests projects that optimize regional land-use planning: “The basis for guiding sustainable development at the scale of the Lake Superior ecosystem (especially in reference to community land use or comprehensive planning) should be the pattern of land, water, and air use, as these affect ecological, social, and economic processes.” In particular, we should be careful to monitor where we are in process of striving for sustainability, so as to better identify the specific actions we need to take in the future. Furthermore, we should recognize that while State and Federal policy can be influential, it is the local units of government that generally have jurisdiction over the use of the land. And, sometimes, regulations from beyond a locality may somewhat usurp the ability of local units of government to direct resources in more appropriate ways. For

example, money obtained from timber sales on State Forests returns to a general fund and is not available for local activities (e.g., road maintenance, watershed reparation) designed to mitigate logging related non-point source impacts to Lake Superior tributaries.

9.3 CURRENT STATUS AND TRENDS IN THE BASIN

In 1995, the Lake Superior Binational Program published a discussion draft document entitled Ecosystem Principles and Objectives for Lake Superior (EPO), which was developed on the basis of input from experts and citizens living in the basin rather than simply incorporating measures originating elsewhere (e.g., those mentioned in Section 6.3 below). Along side other foci, the EPO provided a detailed summary of the rationale and specific monitoring indicators for basin-wide sustainability; a complete version of the “developing sustainability” portion of that document can be accessed via the world wide web at <<http://www.cciw.ca/glimr/lakes/superior/pdf/lstupind5.pdf>>. In 1998, so as to best monitor the current status of regional sustainability, the Superior Work Group narrowed the wide range of sustainability indicators in the EPO to a suite of five “best bet” measures that might guide the work of the Developing Sustainability Committee’s efforts. The following categories of sustainability indicators thus provide a framework for assessing where those living in the Lake Superior watershed are in the process of achieving basin-wide sustainability:

- Reinvestment in the Natural Capital of the basin. Of all the indicators in the EPO, this measure seems to best capture the spirit of sustainability. Simply put, we want to monitor the balance between what is extracted from the social and natural basis for life in the basin with what is returned to the land and society, as well as to promote projects designed to facilitate an equitable balance in the future. This suite of indicators includes: the amount of sustainable forestry occurring on the land; the extent of watershed management or restoration programs; native fisheries and wildlife stocking; exotic species control and native plant repatriation; reclamation of mining operations and industrial sites; and replacement of wetlands and biotic diversity.
- “Quality of Human Life” Indexes. Several existing EPO indicators focus on the extent to which natural and social forces in the watershed impact upon citizens’ lifestyles (e.g., migration patterns, social service demands). This omnibus measure of life, incorporating a range of social indicators, serves as a basis for projects intended to benefit the quality of life in the basin in accordance with other ecological or economic values. For example, with baseline measures in hand, we can compare the quality of life in different communities, institute remedial programs, and track changes over time. This suite of indicators includes: incidence of crime; demographics of migration (especially the loss of extended families in the basin); demands for social services; transportation infrastructure status; extent of recreational and cultural opportunities; citizen involvement in decision making; public access to lakeshores; and population density.
- Resource Consumption Patterns. We should consider the types and quantities of resources that are consumed in the basin, especially as these demands influence various natural and social structures. In particular, we want to focus on energy production and consumption,

water availability and use trends, and waste stream loadings (e.g., landfill capacity versus recycling trends). This suite of indicators includes: availability of recycling programs; amount of forest and mining resources that remain in the basin; types and quantities of electric power generation; quality and volume of aquifers; amount of and stressors related to tourism; depletion of wildlife and fisheries; landfill capacity and incineration volume; degree of urban sprawl; and loss of native flora.

- Awareness of Capacity for Sustainability. Clearly, education in formal and informal settings is a necessary component in any drive toward regional and global sustainability. And education is especially important if we are committed to fostering sustainability through processes of voluntary compliance rather than by way of regulation and enforcement. We need to appreciate what people are learning in schools and organizations or from the media, to implement a range of educational programs focusing on what sustainability means for those in the basin (and, more importantly, for those yet to come), and to assess the extent to which a growing awareness is reflected in social conduct. This suite of indicators includes: depth of environmental and sustainability education curricula in schools; promotion of resource conservation programs; incorporation of ecological design into building codes; extent of zoning regimes; popular support for environmental regulations; community outreach programs by natural resource agencies; and media coverage of sustainability-related issues. It should be noted, however, that monitoring trends in this suite of indicators will be difficult given the inherent subjectivity of what actually constitutes “awareness.” For example, the Clean Michigan Initiative overwhelmingly supported by voters in 1998 was derided by some environmental organizations as favoring urban economic interests at the expense of larger environmental needs. Nonetheless, funding from that initiative is now supporting a number of remediation projects that contribute to sustainability. In this case, it is difficult to determine which group (i.e., voters, policy makers, non-governmental organizations) actually demonstrated a greater awareness of the issues at hand.
- Economic Vitality Measures. Any broad-scale program to ensure a sustainable world must give equal consideration to economics along with issues of ecology and society; without a healthy economy, social and environmental policies in a democratic system are not in themselves sustainable. The broader Binational Program can be well served by our understanding the threats and opportunities to the economic health of the watershed, drawing upon extant econometric models of vitality, and communicating such patterns and trends to the public. For example, while it is arguable that those living in poverty have a lesser impact on the ecosystem due to their relatively meager capacity to participate in a consumer society, the opposite could be just as true insofar as poverty may hasten the depletion of wood lots, require the diversion of community resources that could be directed at environmental protection, and so on. Furthermore, with a baseline overview of the economy, projects can be implemented to demonstrate sustainable alliances between environmental and economic sectors in the basin. This suite of indicators includes: per capita income; cost of living; extent of poverty; local employment trends; regional trade balance; diversity of community economies; facilitation of transitional economics; value-added industry; and regional or local tax bases.

The foregoing set of “best bet” indicators for developing sustainability served as the basis for initiating two projects, each of which more-or-less focus on the sub-objectives of education, economic relationships, incorporation of practical technology, and land-use planning.

9.3.1 Baseline Sustainability Indicators Project

This project was designed to develop baseline data for a suite of socioeconomic sustainability indicators drawn from the EPO and represented by the “best bet” measures noted in the previous section. In particular, the project contractee (Michigan Technological University’s GEM Center for Science and Environmental Outreach) focused on examining a wide range of existing data bases to determine the extent to which we could observe trends in sustainability without having to create new indexes or gather novel forms of data. To do so required, first, establishing a protocol for obtaining, managing, and analyzing baseline data relevant to the sustainability indicators in order to discern current conditions, project trends, and identify gaps in the data.

Evaluating the time and effort required to render each data source useful for developing the proposed sustainability indicators was also an important component. A search of the Internet regarding Federal, State, Provincial, and local agencies provided some data, such as 1990 U.S. Census block-demographics. The 1996 Canadian Census data had to be purchased once the appropriate reporting unit was identified. Census demographic data is thus available across the entire watershed and has the advantage of collection at regular time intervals. Other data covers only part of the watershed or is derived from a one-time study, and so may be less useful. However, such studies may address particular indicators better than some traditional measures designed for other purposes and may be replicated elsewhere in the future. Therefore, accumulating information from one-time or geographically limited studies was part of this project from its inception.

As sources of data are located and obtained, both trends and gaps in data by geographic area or time have begun to emerge (see Section 9.3.3 below for a synopsis). Some of the current gaps are an artifact of the stage of the information search; information may well be available for some indicators as the project continues. For other indicators, the most promising sources of information may not yield usable data. Some measures that are highly relevant to sustainability, especially the measures of the awareness of the capacity for sustainability, either do not exist yet or appear difficult to quantify. For example, it probably will be difficult to determine popular support for environmental regulations without a survey focused on that topic. Media coverage of sustainability-related issues can theoretically be documented but obtaining such information consistently across geographic and time boundaries will be challenging.

The project has a goal of identifying at least 15 to 20 measures that appear most promising as initial sustainability indicators, based on current availability of data, the likelihood that comparable data will be available in the future, suitability of the measures in their present form, and overall value as indicators of the human dimensions of ecosystem health. The final project report will contain graphic representations of the information in the database, descriptions of relevant studies and reports, and recommendations for compilation or generation of additional baseline data in subsequent years. Much of this information will be suited for viewing on the Internet and may be available at <<http://www.cciw.ca/glimr/lakes/superior/dsc.html>>.

9.3.1.1 Project Protocol

A basic challenge of this project is to create a database for the Lake Superior watershed from information that is reported within political, census, or organizational boundaries that generally do not coincide with the hydrographic limits of the watershed. In some cases, a number of data-reporting units fall completely within the basin and must be joined together for analysis. Sometimes, only part of a given reporting unit falls inside the watershed; that unit must be counted in, out, or given a weighting factor to reflect how much is to be counted in the basin. To analyze such data, one must superimpose the watershed boundaries on the data boundaries. Geographic information system (GIS) software, which combines relational database and mapping features based on spatial coordinates, is best suited to this task.

In order for sustainability indicators to be consistently evaluated over time, it is important to document the source of all data, digital or printed, and how the data was manipulated for use in the project. Such information is known as “metadata,” or data about data, and is similar to documenting a chain of ownership. Documentation regarding the metadata is part of the Quality Assurance Project Plan approved by Region 5 of the U.S. Environmental Protection Agency for this project.

Digital data was imported into ArcView 3.1 GIS software from the Environmental Systems Research Institute (ESRI), where it could be linked to maps for analysis. Some data was brought into ArcView by counties and merged into a database for the 24 U.S. counties that are at least partly in the Lake Superior watershed. Other information was available for the entire U.S. or a region larger than the watershed and had to be selected or clipped to the watershed boundary in cookie-cutter fashion, using ArcView's features.

For U.S. data reported by census block group (CBG), available for all 24 counties, the population is 423,907 in CBGs that are mostly within the Lake Superior watershed. An additional 212,717 persons reside in CBGs mostly outside the watershed in those same counties. The land area in the 24 counties represented by CBGs mostly in the watershed is 42,606 km². CBGs mostly outside the watershed contain 49,123 km². Therefore, while 54 percent of the land area of the 24 counties falls outside the Lake Superior watershed, two-thirds (67 percent) of the population lives in the watershed (see Appendix 1 available at <http://www.cciw.ca/glimr/lakes/superior/dsc.html>).

To determine if data reported at the county level should be considered in or out of the Lake Superior watershed for a given county, ArcView was used to select individual CBGs that fall mostly or wholly within the boundary of the Lake Superior basin. The population represented by all the CBGs in a county that is mostly inside the watershed was compared to the population in the remaining CBGs. If more people resided within the watershed, that county was included in the data analysis. The sixteen U.S. counties considered in the watershed by this process are Alger, Baraga, Gogebic, Houghton, Keweenaw, Luce, Marquette, and Ontonagon, Michigan; Ashland, Bayfield, Douglas, and Iron, Wisconsin; and Carlton, Cook, Lake, and St. Louis, Minnesota. The eight counties that are partly in the Lake Superior watershed, but mostly outside,

are Chippewa, Mackinac, Iron, and Schoolcraft in Michigan; Vilas in Wisconsin; and Aitkin, Itasca, and Pine in Minnesota.

In Ontario, the political and census boundaries are somewhat more complex. The area that includes the Lake Superior watershed consists of 36 census subdivision units, including parts of three large "unorganized" districts, two cities, 13 First Nations reserves, one town, and 18 townships. Census reporting units and dates differ from those used in the U.S. While the U.S. Census is conducted the first year of each decade (i.e., 1980, 1990 and so on), Canadian Census data is collected at five-year intervals (i.e., 1991, 1996, etc.).

The census enumeration area (EA) in Canada is the smallest standard geographic area for which census data is reported. The EA is also the nearest equivalent to the census block group level in the U.S. and was therefore the initial unit of choice for obtaining most basic census demographic data. However, the Statistics Canada 1996 Census Dictionary indicates that nearly one-half of all EA boundaries changed between the 1991 and 1996 censuses. Such variability would be problematic for tracking socioeconomic sustainability indicators over time. Another drawback to data reported by EA is that land area and population density data are not reported at that level. Therefore, the next larger census unit, the census subdivision (CSD), was the chosen measure for Canada. CSDs are roughly comparable to minor civil divisions (city, village, township, county) in the U.S. Of the 36 CSDs within the Lake Superior watershed, five are First Nations reserves that did not participate in the 1996 Census. "Area Profiles" were purchased from Statistics Canada for the other 31 Lake Superior basin CSDs, along with files that could be converted to ArcView shapefiles for mapping of the data. Thus, the total population represented by the 31 CSDs was 253,225 in 1991 and 255,475 in 1996.

As with U.S. census block groups, it is necessary to decide how to handle the four CSDs that are only partly within the Lake Superior watershed: Thunder Bay, Unorganized (population 8,168, most of which probably lives in the watershed); Algoma, Unorganized, North Part (population 7,450); Sudbury, Unorganized, North Part (population 7,463); and Sault Ste. Marie (population 81,476, at least half of which probably lives in the watershed). At least half the land area of Thunder Bay, Unorganized and Sault Ste. Marie appear to be in the watershed, but only about one-third of Algoma, Unorganized and one-ninth to one-tenth of Sudbury, Unorganized. Therefore, if entire CSDs are considered either in or out of the watershed, Thunder Bay, Unorganized and Sault Ste. Marie would be counted in; the Algoma and Sudbury unorganized CSDs would be counted out. By that method, the total population of the Lake Superior watershed in Ontario was calculated as 238,695 in 1991 and 240,562 in 1996.

An alternative, which is not necessarily more accurate, is to apply a multiplier to each of the four units based on how much of their land areas fall within the watershed. The population would then be calculated as 197,693 in 1991 and 199,052 in 1996, or about 40,000 persons less than the previous method. Although the population grew overall during the five-year period, 18 CSDs lost population, 12 gained, and one did not report in 1996. The population change in individual CSDs ranges from a loss of 33.8 percent to a gain of 24.0 percent. Consequently, the 1990/1991 combined population of the Lake Superior watershed in Canada and the U.S., using the multiplier method for Ontario, is 621,600.

A limitation of the U.S. Bureau of the Census 1990 census block group-demographics and Statistics Canada 1996 census subdivision-demographics is that no data are reported for previous years. A call to the Census Bureau's customer service center confirmed that census block group-demographics files are available only for 1990. To date, no other source of Canadian demographic data from other years has been located. However, the USA Counties 1998 CD-ROM has large quantities of demographic and economic data from the Census Bureau and other sources, reported by county, state, and U.S. levels. Such information is useful for identifying trends within the basin over time for different socioeconomic factors and comparing them with trends across Michigan, Minnesota, Wisconsin, and the United States as a whole.

After the 2000 Census, trends since 1990 can be examined at the finer geographic scale of census block groups, which are more closely fitted to the Lake Superior watershed boundaries. However, it should also be noted that the USA Counties CD contains considerably more data than the U.S. Census files, including some topics, such as crime, that are not in the Department of Commerce database at all. It is recommended that both forms of U.S. Census data be used in the future.

Some USA county data is available directly from the Internet via <http://venus.census.gov/cdrom/lookup>, but the tables are not set up for conversion to a spreadsheet. Similarly, some data is available from Statistics Canada in the form of community profiles for census subdivision units at <http://ww2.statcan.ca/english/profil>. However, the data is much more limited in scope than the 1996 Census "Area Profiles for user-specified Census Subdivisions" purchased from Statistics Canada for the 31 Lake Superior basin census subdivisions for which data were available.

The primary advantage of using census data for both the U.S. and Canada is that large amounts of relevant data are collected at regular intervals, generally yearly or every ten years, and made available to the public. The disadvantage is that census data addresses only about one-quarter of the 39 socioeconomic sustainability measures in the EPO and are unevenly spread across the suite of "best bets" measures.

9.3.1.2 Current Project Status

As of March 2000, at least some data had been obtained for 14 of the EPO socioeconomic sustainability measures, plus four related measures. Likely sources of at least partial information for 23 more indicators had been identified. No information or potential sources were identified for the remaining two measures, under the "Awareness of the Capacity for Sustainability" indicator. Information gaps will be discussed in more detail in the Section 9.3.1.4 of this chapter. The status of each measure is summarized in Table 9-1. Some of the data obtained does not address the measure directly or completely, which is indicated by double symbols in the table and described in more detail under the appropriate indicator at the end of this section.

At a Lake Superior Monitoring Conference sponsored by U.S. EPA and Environment Canada in Sault Ste. Marie, Ontario (October, 1999) some effort focused on evaluating the feasibility and relevance of each sustainability measure. Feasibility is the likelihood that data is currently

available in some form for a comparative measurement. Relevance is the perceived importance of the measure as an indicator of socioeconomic sustainability within the Lake Superior watershed. It was determined that the six measures constituting the “Reinvestment in Natural Capital” indicator have medium-to-low feasibility but high relevance. The eight measures of the “Quality of Human Life” indicator have high feasibility and medium relevance. The nine measures of the “Resource Consumption” indicator have medium-to-low feasibility and high relevance. The seven measures of the “Awareness of the Capacity for Sustainability” have low feasibility but high relevance. And the nine measures of the “Economic Vitality” indicator have high feasibility and medium-to-high relevance.

The data obtained to date has generally confirmed the earlier assessments of feasibility. The project has obtained or created databases for the following measures across the entire watershed, primarily from census data, except as noted:

Reinvestment in Natural Capital:

No data bases yet available.

Quality of Human Life Indicator:

Incidence of Crime (serious crime per 100,000 population, by 16 basin counties in the U.S. only; comparable information available but not yet obtained from the Canadian Bureau of Justice Statistics).

Demographics of Migration, especially loss of extended families (family and non-family households, single-parent households, same house previous year or five years previous, relatives 65 and older in the household for 540 census block groups and 16 basin counties in the U.S. and 31 census subdivisions in Ontario).

Demands for Social Services (U.S. only: supplemental security income and Aid to Families with Dependent Children payments by 16 basin counties in the U.S.; households receiving public assistance, persons in homeless shelters, and persons on the street by 540 U.S. census block groups).

Population Density (by 540 U.S. census block groups and 16 basin counties in the U.S., by 31 census subdivisions in Ontario)

Resource Consumption Indicator:

Types and Quantities of Electric Power Generation (U.S. only, U.S. Geological Survey water-use data).

Quality and Volume of Aquifers (U.S. Geological Survey water-use data by watershed for public, commercial, domestic, industrial, power, mining, livestock, irrigation, and sewage treatment; Environment Canada municipal water-use data for municipalities with population greater than 1,000, only six of which are in the Lake Superior basin).

Landfill Capacity and Incineration Volume (U.S. only; list of closed and operating landfills in eight basin counties in Michigan and volume of solid waste deposited in 1998; landfill size and total waste contained in landfills for four basin counties in Minnesota).

Degree of Urban Sprawl (can be tracked visually by mapping changes in population density over time in 540 U.S. census block groups; other indicators are changes in aggregate and average travel time to work, amount of farm land, and urban vs. rural population by 16 basin counties in the U.S.; changes in population density for the Canadian census subdivisions will be less effective as measures of sprawl because the 31 subdivisions are typically larger than the U.S. census block groups).

Additional Data (changes over time in percentage of homes using gas, fuel oil, electric, wood, coal, or other heat by 540 census block groups and 16 basin counties in the U.S.).

Awareness of the Capacity for Sustainability:

General Education (highest level of educational attainment by 540 U.S. census block groups and 16 counties in U.S., by 31 census subdivisions in Ontario).

Table 9-1 Status of Sustainability Indicator Data Acquisition as of March 2000

Measure	Canada	USA
Reinvestment in Natural Capital		
The amount of sustainable forestry occurring on the land.	NP	NP
The extent of watershed management or restoration programs.	NP	NP
Native fisheries and wildlife stocking.	NP	NP
Exotic species control and native plant repatriation.	NP/NY	NP
Reclamation of mining operations and industrial sites.	NP	NP
Replacement of wetlands and biotic diversity.	NP	NP
Quality of Human Life		
Incidence of crime.	NY	YY
Demographics of migration (especially loss of extended families).	YY	YY
Demands for social services.	NN	YY/YN
Transportation infrastructure status.	NP	NP
Extent of recreational and cultural opportunities.	NP/NN	NP/NN

Table 9-1 Status of Sustainability Indicator Data Acquisition as of March 2000

Measure	Canada	USA
Citizen involvement in decision making.	NP	NP
Public access to lake shores.	NP	NP
Population density.	YY	YY
Educational attainment.	YY	YY
Type of commute to work.*	YY	YY
Resource Consumption		
Availability of recycling programs.	NN	NP
Amount of forest and mining resources that remain in the basin.	NP/NY	NP
Types and quantities of electric power generation.	NP	YN
Quality and volume of aquifers.	YN/NP	YN/NP
Density of and stressors related to tourism.	NP	YN/NP
Depletion of wildlife and fisheries.	NP	NP
Landfill capacity and incineration volume.	NP	YN/NP
Degree of urban sprawl.	NP	YY
Loss of native flora.	NP	NP
Type of heating fuel by household.*	NN	YY
Duration of commute to work, aggregate and average.*	NN	YY
Awareness of the Capacity for Sustainability		
Depth of environmental and sustainability education curricula.	NN	NP
Promotion of resource conservation programs.	NP	NP
Incorporation of ecological design into building codes.	NN	NP
Extent of zoning regimes.	NN	NP
Popular support for environmental regulations.	NN	NN
Community outreach programs by natural resource agencies.	NP	NP
Media coverage of sustainability related issues.	NN	NN
Per capita income.	YY	YY
Cost of living.	NN	YY/NN
Extent of poverty.	YY	YY
Local employment trends.	YY	YY
Regional trade balance.	NN	NP
Diversity of communities' economies.	YY	YY
Facilitation of transitional economics.	NN	NP
Value-added industry.	NN	NP
Regional and local tax bases.	NP	YN/NP

YY =Data obtained and analyzed.

YN =Data obtained, but not yet analyzed.

NY =No data obtained, but source(s) confirmed.

NP =No data obtained, but potential source(s) identified.

NN = No data obtained; no potential sources identified.

* = Additional related measures not identified in the EPO.

A combination of symbols indicates that the data exists in multiple levels with different acquisition status.

**Economic Vitality
Indicator:**

Per Capita Income (also household income by 540 census block groups and 16 basin counties in the U.S.; by 31 census subdivisions in Ontario; also family income by 16 U.S. counties in the basin).

Cost of Living (U.S. only; median mortgage payments and rent as percentages of median household and family income by 16 U.S. counties in the basin).

Extent of Poverty (persons and children in poverty by 540 census block groups and 16 basin counties in the U.S.; low-income families by 31 census subdivisions in Ontario; also elderly in poverty by 16 basin counties in the U.S.).

Local Employment Trends (by sector and job type for 540 U.S. census block groups, 16 basin counties in the U.S., and 31 census subdivisions in Ontario).

Regional and Local Tax Bases (property taxes, state and federal support by 16 basin counties in the U.S. only).

As can be seen from Table 9-1 and the list above, data from Canada has been somewhat harder to obtain than from the United States. Some of the Canadian data is also in a form that provides a less detailed picture of the Lake Superior watershed (e.g., census data that can be divided only into 31 blocks across the Ontario portion of the watershed, compared to 540 census block groups on the U.S. side). However, part of the information gap is the result of the contractee's greater familiarity with sources of information in the U.S., which were pursued at the onset. More recently, much of the Canadian data has been obtained, and promising sources of additional data have now been identified (and will be included in the final project report, as well as the next iteration of the Lake Superior LaMP in 2002).

9.3.1.3 Observing Trends

After the 2000 U.S. Census and 2001 Canadian Census results are released, additional trend information for some socioeconomic measures will be available, especially for portions of the Lake Superior basin that are in Canada. In the meantime, the best source obtained so far for documenting existing trends is the USA Counties 1998 CD-ROM. The following are summaries of some trends that have been examined. The Excel tables with the data downloaded from USA Counties 1998 for the 16 Lake Superior watershed counties, the states of Michigan, Minnesota, and Wisconsin, and the U.S. overall are included as Appendix 2 available at <<http://www.cciw.ca/glimr/lakes/superior/dsc.html>>.

In all cases, reference to the 16 U.S. Lake Superior watershed counties or the Ontario census subdivisions means those units considered as a whole. Individual counties or subdivisions may deviate from the overall trends, as is frequently noted in the discussion. Not all Ontario census subdivisions reported data in all categories, particularly income. Each measure indicates the number of subdivisions included. Much of the Ontario data represents a 20 percent sample, resulting in rounding errors, particularly noticeable if the sample population is small. For example, numbers whose sum should be 100 percent may total 95 or 105 percent.

Population per Square Mile, Urban and Rural

The following statistics on population also relate to both the "Quality of Human Life" and the "Resource Consumption Patterns" indicators:

The population per square mile declined between 1980 and 1990 in 15 of 16 Lake Superior watershed counties in the U.S. Population density increased during the same period for the U.S. and each of the three states. Overall, the losses in population in the watershed were from "urban" parts of the counties, which had a population decrease of 15.4 percent. The rural population in the counties rose 2.1 percent overall (ranging from a 13.5 percent decrease in Luce County to a 64.7 percent increase in Gogebic County). Baraga (and perhaps Gogebic) County apparently had some "urban" areas shrink below the threshold value so that they were classified as rural in 1990. Both Baraga and Gogebic declined in total population by 6 to 8 percent. Overall population for the 16 counties dropped 4.0 percent from 1980 to 1990 and 8.0 percent from 1970 to 1990. The U.S. population increased 101.9 and 9.8 percent during the same periods.

Population densities within the basin in 1980 ranged from 2.9 in Cook County, Minnesota, to 40.7 in Marquette County, Michigan. In 1990, those values had dropped to 2.7 and 38.9, respectively. For the U.S., the 1980 population per square mile was 64.0. Minnesota's population density was 51.2, Wisconsin's was 86.5, and Michigan's was 162.6. In 1990, the values had increased to 70.3, 55.0, 90.1, and 163.6, respectively.

For the 31 participating Ontario census subdivisions that are part of the Lake Superior watershed, data from Statistics Canada shows an overall population density of 1.29 and 1.28 persons per square kilometer in 1991 and 1996, respectively. If the Algoma and Sudbury unorganized districts, which lie mostly outside the watershed, are removed from the data set, density increases to 2.19 and 2.17 persons per square kilometer. The population density in 1991 ranged from 0.08 in Thunder Bay, Unorganized, to 1,393 persons per square kilometer on the Pic Mobert South First Nations Reserve. The urban areas of Sault Ste. Marie and Thunder Bay had densities of 367.8 and 352.9, respectively.

Population Migration

The following statistics on population migration relate to the "Quality of Human Life" indicator:

Of U.S. residents age five years or older, 51.6 percent lived in the same house in 1985 and 1990, down slightly from 52.3 percent who lived in the same house in 1975 and 1980. In Michigan, Minnesota, and Wisconsin, 53.2 to 53.6 percent of residents lived in the same house in 1975 and 1980, while 53.5 to 54.6 percent lived in the same house in 1985 and 1990. Overall, residents of the 16 Lake Superior counties were slightly less likely to have moved to a different house in either five-year period, with 54.5 percent in the same house in 1980 as they were in 1975 and 55.3 percent in the same house in 1985 and 1990. The range for 1975-80 was from 44.8 percent in Marquette County, Michigan, to 62.3 percent in Keweenaw County, Michigan. In 1985-90, the range was 49.6 percent in Marquette to 62.9 percent in Iron County, Wisconsin.

Overall, slightly more than three-quarters of persons five years and older resided in the same county in 1975-80 and in 1985-90 in the 16 counties, the three states, and the U.S. (Some may not have lived in the same county during 1985-90 as they did in 1975-80, however.) The same-county-of-residence range in 1975-80 was from 65.8 percent in Houghton County, Michigan, to 81.2 percent in Alger County, Michigan; the national average was 76.8 percent. In 1985-90, the same-county range was 66.4 percent in Houghton and Keweenaw Counties to 78.8 percent in Douglas County, Wisconsin, compared to the national average of 76.3 percent.

During both periods, Keweenaw County stood out from the other 15 counties in that only 4.4 and 6.7 percent of residents, respectively, moved elsewhere in the same county. The other counties ranged from 13.5 to 25.3 percent of residents in 1975-80 and 13.8 to 22.3 percent of residents in 1985-90 who moved within the same county. In other words, if Keweenaw County residents moved at all, they generally moved from another county.

For the 540 U.S. TIGER census block groups that lie mostly within the Lake Superior watershed, 56.9 percent of the 423,907 residents lived in the same house in 1985 and 1990, and 21.0 percent moved within the same county during the same period. Therefore, 77.9 percent of residents within the watershed lived in the same county in 1985 and 1990, a figure 2.5 percentage points higher than was calculated for the 16 Lake Superior watershed counties from the USA Counties 1998 CD-ROM.

In the 29 Ontario census subdivisions (CSDs) that lie mostly in the Lake Superior watershed, 62.7 percent of residents did not move between 1991 and 1996. An additional 27.2 percent moved within the same CSD; therefore, 90.0 percent resided in the same CSD in 1991 and 1996. The percentage of non-movers ranged from 51.2 in Lake Helen to 81.8 in Whitesand, both First Nations Reserves. The percentage of non-movers plus non-migrants (same CSD) ranged from 69.8 in Lake Helen to 95.2 in Prince Township. (CSDs with fewer than 100 residents were excluded, given that the 20 percent sample exaggerates percentages.)

Family and Nonfamily Households and Households with Seniors

The following statistics on household and family structure relate to the "Quality of Human Life" indicator:

In 1980, 71.8 percent of households in the 16 U.S. Lake Superior watershed counties were classified as "family" households, compared to 73.2 percent nationwide and from 71.8 to 74.9 percent in Michigan, Minnesota, and Wisconsin. By 1990, the percentage of family households had declined in all 16 counties (to 67.2 percent overall for the watershed), the three states (to 68.6 to 71.3 percent), and the U.S. (to 70.2 percent). Nonfamily households increased from 28.2 to 32.8 percent of all households in the Lake Superior watershed over the same period.

Although there was a steady increase in the number of married-couple households between 1970 and 1990 in the U.S., Minnesota, and Wisconsin, all but two of the 16 Lake Superior counties and Michigan overall showed an increase in 1980 but a decrease in 1990. The other two counties (Gogebic and Ontonagon) decreased each decade. The number of married-couple households as a

percentage of family households declined between 1980 and 1990 within the watershed but remained higher than the national average. Nationally, 82.1 percent of family households were headed by married couples in 1980 and 78.6 percent in 1990. In the 16 Lake Superior counties, 85.8 percent of family households in 1980 and 82.4 percent of family households in 1990 were headed by married couples.

Between 1970 and 1990, the number of persons per household declined steadily in the Lake Superior watershed (from 3.06 to 2.45), the three states, and the U.S. (from 3.11 to 2.63). The decline in the Lake Superior watershed was faster than in the U.S. overall but only slightly faster than the three states.

The number of households with persons 65 years of age or older increased nationwide, in all three states, and in 15 of the 16 Lake Superior counties (all except Keweenaw) between 1980 and 1990. The percentage of all households with senior residents increased nationally from 22.8 to 24.1 over the same period and from 26.8 percent to 29.6 percent in the Lake Superior watershed counties. The percentages of households with seniors in both 1980 and 1990 were higher by 3.0 to 6.7 percentage points in the Lake Superior counties than in their respective states.

In the 29 Ontario census subdivisions mostly within the Lake Superior watershed for which 1996 data is available, 72.3 percent of all private households were classified as family, higher than the 16 U.S. Lake Superior counties in either 1980 or 1990. The range for areas with at least 100 households was from 62.5 percent in Beardmore Township to 96.9 percent in Prince Township. Of those families, 84.2 percent were headed by married couples, ranging from 70.6 percent in Fort William First Nations Reserve to 105.0 percent in Beardmore and 97.6 percent in Conmee Township.

The average number of persons per family in 1996 was 3.03, with 44.1 percent two-person, 23.5 percent four-person, and 22.6 percent three-person families in the Ontario Lake Superior watershed. The average number of persons per household was 2.55, somewhat higher than the U.S. counties in 1990.

The Canadian census does not report the number of households with persons age 65 or older, but does provide more detail about whether the seniors live alone, with family, or with others. In the 29 census subdivisions mostly within the Lake Superior watershed, 61.3 percent of seniors live in families. Of the 38.8 percent who do not live with their immediate families, 82.0 percent live alone, 14.4 percent live with relatives, and 3.2 percent live with non-relatives.

Family, Household, and Per Capita Income

The following statistics on household, family, and per capita income relate to the "Economic Vitality" indicator:

In 1979, 14 of the 16 U.S. Lake Superior watershed counties had median family and household incomes below the national and Michigan, Minnesota, and Wisconsin medians. Only Lake and St. Louis Counties in Minnesota were above the U.S. median and comparable to the state

medians. The median U.S. family income was \$19,917, and the median household income was \$16,841. The 16 Lake Superior counties ranged from median family incomes of \$11,705 in Keweenaw County, Michigan and \$12,138 in Iron County, Wisconsin, to \$21,959 in Lake County and \$20,903 in St. Louis County, Minnesota. Median household income ranged from \$9,076 in Keweenaw County and \$9,944 in Iron County to \$20,382 in Lake County.

By 1989, all 16 Lake Superior counties were well below the national and state median family and household incomes. The median U.S. family income was \$35,225 and the three states ranged from \$35,082 to \$36,916. In contrast, the 16 counties ranged from \$18,459 in Keweenaw County to \$31,150 in St. Louis County. The median U.S. household income was \$30,056, and the states were \$29,442 to \$31,020. The 16 counties ranged from \$13,821 in Keweenaw County to \$25,137 in Marquette County, Michigan.

Among the 3,143 U.S. counties ranked by median family income, the 16 Lake Superior counties ranked from #229 to #2,963 in 1979 and from #873 to #3,012 in 1989, an average drop in ranking over the decade of 233 places. Similarly, the median household income rank for the Lake Superior counties ranged from #167 to #3,055 in 1979 and from #1,091 to #3,077 in 1989. The average drop in median household income ranking between 1979 and 1989 for the counties was 290 places. Only 66 counties (2 percent of the U.S. total) ranked lower than Keweenaw County in 1989 household income. The 1993 median household income for the 16 U.S. Lake Superior counties continued to lag the national median of \$31,241 and state medians of \$32,200 in Wisconsin to \$33,239 in Minnesota. The range was \$19,424 in Keweenaw County to \$30,541 in Marquette County. However, the counties showed some recovery in median household income rank in 1993, ranging from #882 to #2,888, an average gain in rank of 152 since 1989.

Clearly, median family and household income within the U.S. Lake Superior watershed counties is below the national median and state medians for Michigan, Minnesota, and Wisconsin. After losing ground between 1979 and 1989, the 16 counties did improve their median household income rank somewhat by 1993.

In Ontario, \$57,429 was the average family income in 1996 (in Canadian dollars, equivalent to U.S. \$42,165 at the 1.362 1995-96 average exchange rate) for the 23 Census subdivisions mostly in the Lake Superior watershed that reported income data. The range was from \$38,408 (U.S. \$28,200) in Fort William First Nations Reserve to \$76,235 (U.S. \$55,973) in Terrace Bay Township. Average household income was \$49,884 (U.S. \$36,626), ranging from \$37,613 (U.S. \$27,616) in Fort William to \$67,809 (U.S. \$49,786) in Terrace Bay.

The 1996 average per capita income for all persons 15 years and older was \$26,243 (U.S. \$19,268). Again, Fort William had the lowest average income at \$18,944 (U.S. \$13,909), but Manitouwadge Township topped the list at \$37,047 (U.S. \$27,200). For persons 15 years and older who were not living in a family unit, average income was lower overall at \$22,858 (U.S. \$16,783), ranging from \$14,642 (U.S. \$10,750) at Fort William to \$38,816 (U.S. \$28,499) at White River Township.

Mean per capita income for the 535 populated U.S. census block groups (CBGs) that are mostly in the Lake Superior watershed (in 24 counties) was \$11,029 in 1990. The range was \$1,440 for a CBG representing Marquette Branch Prison to \$43,262 for a CBG southwest of Marquette.

Housing Costs

The following statistics on housing costs also relate to the "Economic Vitality" indicator. No direct information is available on the cost of living within the 16 U.S. Lake Superior basin counties as compared to other areas, but some inferences can be made from housing costs.

The median monthly mortgage payments for the 16 U.S. Lake Superior counties in 1980 ranged from \$252 in Keweenaw County, Michigan, to \$381 in Marquette County, Michigan, compared to \$366 nationally and \$363 to \$381 in Michigan, Minnesota, and Wisconsin. In fact, Marquette was the only county whose median mortgage payment was at or above the median for the U.S. and the three states. In 1990, monthly mortgage payments within the watershed were considerably below the U.S. and states, ranging from \$402 in Ontonagon County, Michigan, to \$564 in Marquette County, Michigan. The national median had risen to \$737, and the three states ranged from \$651 to \$724.

A similar pattern exists for monthly gross rent. In 1980, the median rent ranged from \$164 in Baraga County, Michigan, and Ashland County, Wisconsin, to \$228 in Marquette County, Michigan. The national median was \$243, and the three states ranged from \$234 to \$250. By 1990, the gap between the 16 Lake Superior watershed counties and the U.S. and state medians had grown larger. The 16 counties ranged from \$231 in Keweenaw County, Michigan, to \$333 in Marquette County, Michigan. The national median in 1990 had risen to \$447, while the three states ranged from \$399 to \$423.

As a partial gauge of the cost of living within the Lake Superior watershed, the median monthly mortgage and rent payments in 1980 and 1990 can be calculated as a percentage of median household income in 1979 and 1989, respectively. In 1980, the median mortgage payments as a percent of median household income in 11 Lake Superior counties were higher than the U.S. median of 26.1 percent and the medians of 22.7 to 25.9 percent for Michigan, Minnesota, and Wisconsin. One county's median equaled that of the U.S. but was higher than any of the three states. Four counties had a median mortgage as a percent of household income lower than the U.S. The median mortgage payment in 1980 ranged from a low of 15.0 percent of median household income in Lake County, Minnesota, to 35.4 percent in Iron County, Wisconsin.

In 1990, only five Lake Superior counties had median mortgage payments as a percentage of household income higher than or equal to the U.S. median of 29.4 percent. Eleven counties had lower mortgage percentages than the U.S. median, though only four were less than the state values of 25.2 to 28.1 percent. The range was 21.0 percent in Lake County, Minnesota, to 35.9 percent in Keweenaw County, Michigan. Median rent as a percentage of median household income in 1980 was lower than the U.S. value of 17.3 percent in 10 of the 16 U.S. Lake Superior counties, though only five were below the state averages (15.6 to 15.9 percent). The values

ranged from 12.9 percent in Lake County, Minnesota, to 26.4 percent in Keweenaw County, Michigan.

The median rent as a percentage of median household income in 1990 is 17.8 for the U.S. and 16.3 to 16.4 percent for the three states. Values for the 16 Lake Superior counties range from 13.9 percent in Lake County, Minnesota, to 20.1 percent in Keweenaw County, Michigan. Twelve counties have lower rent percentages than the U.S., and seven have lower rent percentages than Michigan, Minnesota, or Wisconsin.

In summary, mortgage payments as a percentage of household income were generally higher in the Lake Superior watershed counties than in the U.S. and the three states in 1980. By 1990, both mortgage and rent payments in most of the 16 counties were lower as a percentage of household income than in the U.S. or the three states overall. As housing costs make up a significant portion of the cost of living, it appears that, at least for 1990, the cost of living may be lower in the Lake Superior watershed counties than in the country as a whole. However, considerable variability exists among the 16 Lake Superior watershed counties.

Extent of Poverty

The following statistics on the extent of poverty in the basin relate to the "Economic Vitality" indicator as well:

For persons of all ages within the U.S. Lake Superior watershed for whom poverty status was established, 10.4 percent were below the poverty level in 1979. That figure had risen to 14.5 percent in 1989, a rate of increase higher than the states of Michigan, Minnesota, and Wisconsin and the U.S. overall over the same period. The U.S. poverty rate for 1979 was 12.4 percent and 13.1 percent in 1989. The 1979 poverty rate for counties within the Lake Superior basin ranged from a low of 4.4 percent in Lake County, Minnesota, to a high of 17.0 percent in Houghton County, Michigan. In 1989, those same counties again were the extremes, with rates of 9.5 percent and 21.0 percent, respectively.

For persons age 65 and older within the Lake Superior watershed, 13.9 percent fell below the poverty level in 1979 and 12.5 percent in 1989, paralleling improvements in the U.S. and the three states over the same decade. However, the poverty rate for seniors was higher within the watershed in 1989 than for any of the three states overall, which ranged from 9.1 percent in Wisconsin to 12.1 percent in Minnesota. The 1989 rate was only slightly below the national average of 12.8 percent, whereas the 1979 rate within the basin was 13.9 percent, compared to the national average of 14.8 percent.

Poverty rates among families within the U.S. Lake Superior basin rose from 7.3 percent in 1979 to 10.2 percent in 1989. Although the 1989 rate within the basin was about the same as for the U.S. overall (10.0 percent), the Lake Superior counties had family poverty rates higher than their respective states. Among children 18 years of age or younger, the poverty rate rose from 10.6 percent in 1979 to 17.1 percent in 1989 within the basin. The poverty rate also increased in 1989 nationwide to 17.9 percent and in the three states overall (to 12.4 percent in Minnesota, 14.6

percent in Wisconsin, and 18.2 percent in Michigan), but the Lake Superior basin rate jumped 6.5 percentage points from 1979 to 1989, compared to 1.9 points for the U.S.

In summary, with the exception of persons 65 and older, the trend of persons, families, and children in poverty within the U.S. Lake Superior watershed ran counter to sustainability between 1979 and 1989. In addition, the poverty rates increased faster over the period within the watershed than for the U.S. overall.

Although no trend information has been obtained for Ontario, data is available from 1996 on the percent of low-income economic families, unattached individuals, and private households. Low-income families are defined as families who spend 20 percentage points more of their income on food, shelter, and clothing than the average Canadian family of comparable size and degree of urbanization. Economic families are a group of two or more persons who live in the same dwelling and are related to each other by blood, marriage, common-law or adoption.

In 1996, 12.8 percent of economic families in the 22 Canadian census subdivisions mostly within the Lake Superior watershed that report this income data were low-income families. Among unattached individuals, 38.7 percent are low income, and 15.6 percent of all private households are low income. The highest percentage of low-income economic families (18.1) was in Gillies Township, with Sault Ste. Marie not far behind at 16.6; the lowest percentage (2.6) was in Conmee, Neebing, and Oliver Townships. Results were similar for private households, with 15.6 percent considered low income. Again, Gillies and Sault Ste. Marie had the largest low-income percentages, at 28.7 and 19.4, respectively. Neebing and Oliver Townships had the smallest percentage of low-income private households, 1.8 and 2.7, respectively. The percentage of low-income unattached individuals ranged from 0.0 percent in Neebing and Dorion to 60.5 percent in Prince Township and 45.7 percent in Sault Ste. Marie.

Incidence of Crime

The following statistics on the incidence of crime relate to the "Quality of Human Life" indicator:

Serious crimes (crime index) per 100,000 population reported by police to the Federal Bureau of Investigation (FBI) for the 16-county U.S. Lake Superior watershed area are significantly below the national average in 1977, 1980, 1985, 1990, and 1995. The only counties that are above or near the national crime rate are Luce County, Michigan, in 1980; Cook County, Minnesota, in 1995; and Douglas County, Wisconsin, in 1977, 1980, 1990, and 1995. The crime rate within the watershed is also below the average for the three states, except Wisconsin in 1977, which had a slightly lower rate. As is the case for the rest of the U.S. and the three states, the crime rate fluctuates up and down over time and varies considerably from county to county. The eight Michigan counties within the watershed are consistently well below the crime rate for Michigan overall. The four Minnesota counties within the watershed are generally below the average crime rate for Minnesota, except for Cook County, which was higher in 1990 and 1995, and St. Louis County in 1977. Of the four Wisconsin counties within the Lake Superior watershed, only Douglas County is significantly above the statewide average, except for 1985 (which, along with 1986 and 1987, shows an order of magnitude drop in the number of crimes from previous and

subsequent years, believed to be erroneous). Ashland County was above the Wisconsin crime rate in 1977 but still well below the U.S. average.

The national crime rate per 100,000 in 1977 was 5,046, compared to 3,853 for the watershed (range 1,773-5,747). In 1980, the national rate of 5,893 compares with 4,245 for the watershed (range 1,765-6,033). In 1985, the national rate was 5,242 and the watershed rate was 3,030 (range 1,266-4,077). The national rate of 5,826 in 1990 compares with a watershed rate of 3,377 (range 1,709-6,087). In 1995, the national rate was 5,356, while the watershed rate was 3,288 (range 1,241-6,117).

In terms of sustainability, it is certainly heartening that serious crime is consistently less of a problem within the Lake Superior watershed than it is for the United States as a whole. However, it cannot be said that crime is decreasing over time, which would be an even more positive indicator.

Employment Trends

The following statistics on the civilian unemployment rate relate to the "Economic Vitality" indicator:

For five years chosen from annual data (1975, 1980, 1985, 1990, and 1995), the civilian unemployment rate in the 16 U.S. Lake Superior basin counties averaged about 2.1 points above the U.S. average and above the averages for their respective states. For example, the unemployment rate in the four basin counties in Minnesota was consistently higher than for Minnesota overall, 2.8 points on average but nearly double the Minnesota rate of 6.0 percent in 1985.

The civilian unemployment rate for 1975 was 8.5 percent in the U.S., 12.5 percent in Michigan, 5.9 percent in Minnesota, and 7.0 percent in Wisconsin. The 16-county basin average was 8.3 percent, ranging from 6.2 percent in Iron County, Wisconsin, and Lake County, Minnesota, to 22.0 percent in Luce County, Michigan.

In 1980, the U.S. rate dropped to 7.1 percent, but the three states changed very little. The basin counties rose 2.1 points to 10.4 percent, ranging from 7.8 percent in Douglas County, Wisconsin, to 15.9 percent in Keweenaw County, Michigan.

The U.S., Minnesota, and Wisconsin rates changed little between 1980 and 1985, but Michigan dropped 2.5 points to 9.9 percent, while the basin counties rose to 11.9 percent, 4.7 points above the U.S. and higher than any of the three states. In fact, Cook County, Minnesota, had the lowest rate in the basin at 8.6 percent but was still 1.4 points above the U.S. average. Keweenaw County had the highest rate at 26.8 percent, with Ontonagon and Baraga Counties not far behind at 20.1 and 19.4 percent, respectively.

Unemployment dropped in all locations except Cook County in 1990, to 5.6 percent for the U.S. and 7.6, 4.9, 4.4, and 7.2 percent in Michigan, Minnesota, Wisconsin, and the 16 basin counties, respectively. The 16-county range was 5.7 percent in Ontonagon to 15.2 percent in Keweenaw.

The trend continued generally downward in 1995 to unemployment rates of 3.7 to 5.4 percent in the U.S. and the three states and 6.7 percent for the 16 counties, ranging from 5.2 percent in Lake County, Minnesota, to 13.1 percent in Keweenaw County.

In the 29 Ontario census subdivisions mostly within the Lake Superior watershed, the 1996 unemployment rate for the population 15 years and over was 11.5 percent. For the population 25 years and older, the unemployment rate was 9.1 percent. By location the rates ranged from 0 to 100 percent; the extremes, which occur in adjacent First Nations reserves, appear to be the result of small populations and the 20 percent census sample. The most populated areas, Sault Ste. Marie and Thunder Bay, had unemployment rates for persons 25 years and older of 9.4 and 8.6 percent, respectively. Of areas with population greater than 200 in the labor force, the range was from 2.3 percent in Terrace Bay Township to 31.0 percent in Beardmore Township.

Labor Force by Industry Sector and Occupation Classification

The following employment statistics relate to the diversity-of-local-economies measure of the "Economic Vitality" indicator:

The U.S. census (U.S.A Counties 1998) divides employment into 11 industry and 4 occupation categories (plus unemployed workers), while the Canadian census uses 18 industry and 10 occupation categories, the latter divided into 57 subcategories. To compare statistics from the U.S. and Ontario portions of the Lake Superior watershed, the Canadian categories were grouped prior to analysis to correspond as closely as possible to their U.S. counterparts. The groupings appear in Appendix 2 (available at <www.cciw.ca/glimr/lakes/superior/dsc.html>) in the tables on employment by industry sector and occupation. Both the U.S. and Canadian censuses report employment data for persons 15 years and older. Summary statistics appear in Table 9-2 for the U.S. and the 16 Lake Superior counties (1980 and 1990) and for the 29 Ontario census subdivisions that lie mostly within the Lake Superior watershed (1996).

In the 16 U.S. counties that border Lake Superior, the top employment sector was professional and related services (health, education, etc.), which employed 22.8 and 26.3 percent of the labor force in 1980 and 1990, respectively. Those percentages are higher than in the U.S., Michigan, Minnesota, and Wisconsin. The professional services category was third nationwide in 1980 (19.0 percent) and first in 1990 (21.9 percent). In Michigan, it ranked second (19.2 percent) in 1980 and first in 1990 (21.4 percent). Professional services employed the largest number of Minnesota workers in 1980 and 1990, with 21.0 and 23.8 percent, respectively. In Wisconsin, professional services employed 19.2 percent in 1980 and 21.4 percent in 1990, second place in both cases.

Table 9-2 Employment by Industry Sector

16 U.S. Lake Superior Watershed Counties					
<i>Rank 1980</i>	<i>Industry Category</i>	<i>Workers 1980 (percent)</i>	<i>Rank 1990</i>	<i>Industry Category</i>	<i>Workers 1990 (percent)</i>
1	Professional and Related Services	22.8	1	Professional and Related Services	26.3
2	Wholesale and Retail Trade	19.3	2	Wholesale and Retail Trade	21.0
3	Manufacturing	11.0	3	Manufacturing	10.2
4	Unemployed Workers	10.2	4	Unemployed Workers	9.0
5	Mining	7.9	5	Transportation, Communications, and Other Public Utilities	6.7
6	Transportation, Communications, and Other Public Utilities	7.2	6	Public Administration	5.1
7	Public Administration	5.4	7	Construction	5.0
8	Construction	5.4	8	Personal, Entertainment, Recreation Services	4.3
9	Personal, Entertainment, Recreation Services	3.8	9	Mining	4.0
10	Finance, Insurance, and Real Estate	3.3	10	Finance, Insurance, and Real Estate	3.8
11	Business and Repair Services	2.0	11	Business and Repair Services	2.9
12	Agriculture, Forestry, and Fisheries	1.6	12	Agriculture, Forestry, and Fisheries	1.7
United States					
<i>Rank 1980</i>	<i>Industry Category</i>	<i>Workers 1980 (percent)</i>	<i>Rank 1990</i>	<i>Industry Category</i>	<i>Workers 1990 (percent)</i>
1	Manufacturing	21.0	1	Professional and Related Services	21.9
2	Wholesale and Retail Trade	19.1	2	Wholesale and Retail Trade	19.9
3	Professional and Related Services	19.0	3	Manufacturing	16.6
4	Transportation, Communications, and Other Public Utilities	6.8	4	Transportation, Communications, and Other Public Utilities	6.6
5	Unemployed Workers	6.5	5	Finance, Insurance, and Real Estate	6.5
6	Finance, Insurance, and Real Estate	5.6	6	Unemployed Workers	6.3
7	Construction	5.5	7	Construction	5.8
8	Public Administration	4.9	8	Public Administration	4.5
9	Business and Repair Services	3.9	8	Business and Repair Services	4.5
10	Personal, Entertainment, Recreation Services	3.9	10	Personal, Entertainment, Recreation Services	4.3
11	Agriculture, Forestry, and Fisheries	2.8	11	Agriculture, Forestry, and Fisheries	2.5
12	Mining	1.0	12	Mining	0.6

Table 9-2 Employment by Industry Sector

29 Ontario Lake Superior Watershed Census Subdivisions					
<i>Rank 1996</i>	<i>Industry Category*</i>	<i>Workers 1996 (percent)</i>	<i>Rank 1996</i>	<i>Industry Category*</i>	<i>Workers 1996 (percent)</i>
1	Professional and Related Services	19.6	7	Public Administration	6.6
2	Wholesale and Retail Trade	16.3	8	Construction	5.7
3	Personal, Entertainment, Recreation Services	15.1	9	Business and Repair Services	3.5
4	Manufacturing	13.5	10	Finance, Insurance, and Real Estate	3.3
5	Unemployed Workers	11.5	11	Agriculture, Forestry, and Fisheries	2.8
6	Transportation, Communications, and Other Public Utilities	8.1	12	Mining	2.1

*Grouped by comparable U.S. industry category. See Appendix 2 available at www.cciw.ca/glimr/lakes/superior/dsc.html for more information.

The second largest number of Lake Superior county workers in both 1980 and 1990 were employed in wholesale and retail trade, 19.3 and 21.0 percent, respectively, somewhat higher percentages than in the U.S., Michigan, and Wisconsin. In all areas examined except Keweenaw County, Michigan, the percentages were at least slightly higher in 1990 than in 1980.

Manufacturing employed 11.0 percent of Lake Superior county workers in 1980 and 10.2 percent in 1990, a much lower level than the U.S. and the three states. In 1980, manufacturing employed the largest percentage of workers in the U.S. (21.0), Michigan (27.0), and Wisconsin (26.6), though it ranked only third in Minnesota (19.1 percent). In 1990, manufacturing had dropped into third place nationwide (16.6 percent), while remaining in first place in Michigan and Wisconsin and third place in the Lake Superior counties.

With more than half of the workers in the 16 counties employed in professional and related services, retail, and manufacturing, none of the other job sectors employed more than 10 percent of the workforce. The fourth largest number of employees in the Lake Superior basin counties were unemployed, 10.2 percent in 1980 and 9.0 percent in 1990. Nationally, unemployed workers comprised the fifth largest category in 1980 (6.5 percent) and sixth largest in 1990 (6.3 percent); the "unemployed" category ranked fourth to sixth in the three states both years.

Mining ranked fifth in employment in the basin in 1980 (7.9 percent) but dropped to ninth by 1990 (4.0 percent). Nevertheless, mining was considerably more important to the Lake Superior basin economy than to the U.S. or the three states as a whole. In 1980, mining employed 16.1 percent of workers in Lake County, Minnesota, 14.6 percent in Ontonagon County, Michigan, and 12.3 percent in Marquette County, Michigan. By 1990, mining still employed 13.5 percent of Ontonagon County workers, but only 5.5 percent of Lake and 6.3 percent of Marquette County workers. In the U.S. and the three states, mining ranked last of the twelve categories, employing from 0.1 to 1.0 percent of workers in 1980 and 0.1 to 0.6 percent in 1990.

In Ontario, the educational and health and social service divisions together are comparable to the U.S. professional and related services category. As in the 16 U.S. Lake Superior watershed counties for 1980 and 1990, these industry sectors employed the largest number of workers in 1996 (20.2 percent) in the Ontario census subdivisions that lie mostly in the Lake Superior watershed. Likewise, wholesale and retail trade employed the second largest number of workers, 16.8 percent. In third place, employing 15.6 percent of workers, were the categories believed to be comparable to the U.S. "personal, entertainment, and recreational services" category, consisting of accommodation, food, and beverage service and other service. The fourth largest category, at 14.0 percent, was manufacturing, followed by unemployed workers at 11.5 percent.

The employment sector statistics for the U.S. and Canadian portions of the Lake Superior basin are generally similar. The main difference is that mining employs a smaller percentage of workers in the 29 Ontario census subdivisions than the 16 U.S. counties. However, mining declined by nearly 50 percent in the U.S. counties between 1980 and 1990, and the Ontario data is from 1996, which may reflect a continued decline in mining employment over time throughout the region. The other difference is that the category corresponding to personal, entertainment, and recreational services employs a larger percentage of workers in Ontario (15.1 percent in 1996) than in the U.S. counties (4.3 percent in 1990). Part of this variation may result from different groupings of job sectors under similar headings in the U.S. and Canada, a possibility that requires clarification.

The process of combining the 57 Canadian occupational categories reported in the census subdivision profiles into the equivalent of the four major categories used in the USA Counties 1998 CD required more subjective judgment than the industry sectors. One obvious difference is that the sum of the percentages in the four U.S. occupational categories is about 72 percent of the labor force, while the Canadian occupations add up to approximately 100 percent. Again, more detail is available at <www.cciw.ca/glimr/lakes/superior/dsc.html> in Appendix 2.

The relative ranking of the four occupational categories is the same for the 16 Lake Superior counties, the U.S., Michigan, Minnesota, and the 29 Ontario Lake Superior watershed census subdivisions: (1) technical, sales, and administrative support, (2) managerial and professional specialty, (3) operators, fabricators, and laborers, and (4) precision production, craft, and repair. In Wisconsin, the ranking is the same for 1990, but in 1980, category three employed 0.8 percent more workers than category two. The percentages of the work force employed in each category are summarized in Table 9-3

Mode and Duration of Travel to Work

The following statistics on transportation relate to both the "Quality of Human Life" and the "Resource Consumption Patterns" indicators:

Table 9-3 Employment by Occupational Category

16 U.S. Lake Superior Watershed Counties					
<i>Rank 1980</i>	<i>Occupational Category</i>	<i>Workers 1980 (percent)</i>	<i>Rank 1990</i>	<i>Occupational Category</i>	<i>Workers 1990 (percent)</i>
1	Technical, sales, and administrative support	23.4	1	Technical, sales, and administrative support	26.2
2	Managerial and professional specialty	18.7	2	Managerial and professional specialty	21.1
3	Operators, fabricators, and laborers	16.2	3	Operators, fabricators, and laborers	13.7
4	Precision production, crafts, and repair	13.6	4	Precision production, crafts, and repair	11.1
United States					
<i>Rank 1980</i>	<i>Occupational Category</i>	<i>Workers 1980 (percent)</i>	<i>Rank 1990</i>	<i>Occupational Category</i>	<i>Workers 1990 (percent)</i>
1	Technical, sales, and administrative support	28.3	1	Technical, sales, and administrative support	29.7
2	Managerial and professional specialty	21.2	2	Managerial and professional specialty	24.7
3	Operators, fabricators, and laborers	17.1	3	Operators, fabricators, and laborers	13.9
4	Precision production, crafts, and repair	12.1	4	Precision production, crafts, and repair	10.6
29 Ontario Lake Superior Watershed Census Subdivisions					
<i>Rank 1996</i>	<i>Occupational Category</i>	<i>Workers 1996 (percent)</i>	<i>Rank 1996</i>	<i>Occupational Category</i>	<i>Workers 1996 (percent)</i>
1	Technical, sales, and administrative support	49.1	3	Operators, fabricators, and laborers	14.9
2	Managerial and professional specialty	25.6	4	Precision production, crafts, and repair	10.2

Census statistics on the mode and time spent traveling to work can be interpreted as measures of sprawl and lifestyle choices. Trends are not yet available for travel time to work because data was collected for the first time as part of the 1990 census. However, a geographic trend can be noted in that the average travel time to work in 1990 for the 16 U.S. Lake Superior counties (15.8 minutes) was lower than the U.S. as a whole (22 minutes) or the three states (17 minutes in Wisconsin to 21 minutes in Michigan).

The trend in mode of travel to work, however, is not positive for sustainability in any of the geographic areas. Between 1980 and 1990, the percentage of workers driving alone to work within the Lake Superior watershed rose from 57.7 percent to 72.8 percent, an increase of 15.1 percentage points, or 26 percent, a rate of increase higher than the U.S. or any of the three states overall. However, the 1990 rates remain slightly higher for the U.S. (73.2 percent) and the states (73.8 percent in Minnesota to 81.5 percent in Michigan) than within the Lake Superior basin.

Over the same period, the percentage of workers within the watershed who carpool dropped from 22.9 percent to 13.6 percent, a 40 percent decrease. Similar declines occurred in the U.S. and in the three states overall. The percentage of workers within the Lake Superior watershed who carpool was slightly greater than for the U.S. and the states in both 1980 and 1990.

The number of people walking to work also declined between 1980 and 1990 in all geographic areas examined. In the Lake Superior basin, the percentage dropped from 11.4 in 1980 to 7.1 in 1990. The percentage of walkers in the U.S. and the three states ranged from 4.5 to 8.5 percent in 1980 and 3.1 to 5.5 percent in 1990, so a greater percentage of workers walk to work in the watershed than in the larger geographic areas.

Public transportation, mainly buses, carried 3.5 percent of Lake Superior basin workers in 1980 and 1.8 percent in 1990. In the U.S. overall, 6.4 percent of workers in 1980 and 5.3 percent in 1990 rode public transit. The three states ranged from 2.5 percent to 5.5 percent in 1980 and 1.6 to 3.6 percent in 1990. Less than one half percent of workers in the Lake Superior basin, the three states, and the U.S. overall bicycled to work.

The number of people working at home in the watershed increased from 2.6 percent in 1980 to 3.6 percent in 1990, the only even slightly positive commuting trend toward sustainability. The actual number of people working at home increased in all areas, except for Ashland County, Wisconsin, and Baraga County, Michigan, but the percentage of home workers was unchanged in Minnesota and declined slightly in Wisconsin between 1980 and 1990.

The number of vehicles per occupied housing unit for the 16 U.S. Lake Superior watershed counties was 1.65 in 1990, comparable to the national average of 1.67 and somewhat lower than the 1.72 to 1.77 vehicles per occupied housing unit in Michigan, Minnesota, and Wisconsin.

In Ontario, 1996 data for the 28 Lake Superior watershed census subdivisions that reported the mode of travel to work does not include a category "drove alone," as in the U.S. However, 79.0 percent of workers are reported as drivers and 8.3 percent as passengers. Walkers made up 7.6 percent of workers, while 3.0 percent rode public transportation, and 1.0 percent bicycled. The

Canadian data is also divided into categories for males and females. More men than women drove (82.0 vs. 75.3 percent), while more women were passengers (10.2 percent of women, 6.8 percent of men). Walkers were only 5.9 percent of men but 9.6 percent of women. Men were twice as likely as females to bicycle to work, though only 1.4 percent of them chose that means of transportation.

Educational Attainment

Although not a direct measure of environmental education, the following statistics relate to the "Awareness of Capacity for Sustainability" indicator:

The highest level of educational attainment of persons 25 years of age and older (referred to as "adults" below) within the Lake Superior watershed is also relevant to the "quality of human life" indicator. In 1980, 70.0 percent of adults in the 16 U.S. Lake Superior watershed counties completed 12 or more years of school, compared to the national average of 66.5 percent and state rates of 68.0 percent in Michigan to 73.1 percent in Minnesota. By 1990, the rates had risen to 78.4 percent in the watershed, 75.2 percent nationally, and 76.8 to 82.4 percent in the three states.

However, only 13.7 percent of adults in 1980 and 16.1 percent of adults in 1990 in the Lake Superior watershed had completed college, compared to 16.2 and 20.3 percent of adults nationally for the same years. The Lake Superior counties' proportion of college graduates also lagged the three states in both years, and the educational attainment gap widened. The percentage of adults in the watershed who had some college or an associate degree was at or just above the U.S. averages of 15.7 in 1980 and 24.9 percent in 1990.

Census information from Ontario on educational attainment is not directly comparable to U.S. data because it is based on persons age 15 and older and is from 1996. Including data from 15- to 24-year-olds, many of whom have not completed their education, skews the results toward a lower overall educational attainment level than in the U.S.

In the 29 census subdivisions mostly in the Lake Superior watershed, 11.0 percent of the population age 15 and older did not complete 9th grade, while 13.8 percent completed secondary school and 29.9 more obtained a trade certificate or other non-university education. An additional 10.7 percent obtained a bachelor's degree or higher and 8.9 percent had some college education. Of persons 15 and older, 63.3 percent had completed at least secondary school.

Adjusting the university education figures by subtracting the number of current students age 15-24 from the population 15 and older raised the population with at least a bachelor's degree to 12.1 percent, those with some college education to 10.1 percent, and those who had completed at least secondary school to 65.9 percent.

By location, the percentage of the population that had completed less than grade 9 ranged from 4.3 in Connee Township to 35.7 percent in Pic Moberg South Reserve. The attainment of a bachelor's degree or higher ranged from 0.0 percent in Dubreuilville Township and Lake Helen, Pays Plat, Pic Moberg North and South, and Whitesand Reserves to 20.1 percent (adjusted for

current students) in Prince Township. In Prince Township 31.3 percent had some university education, while no residents of Pays Plat, Pic Moberg North, or Whitesand Reserves had attended college.

Agricultural Lands

The following statistics on farm land relate to the “Resource Consumption Patterns” indicator:

Between 1978 and 1992, the number of farms in the 16-county U.S. Lake Superior watershed declined from 3,771 to 2,618, or 30.6 percent. Nationally, the decline in the number of farms was 14.7 percent over the same period. Declines in Michigan, Minnesota, and Wisconsin ranged from 21.4 to 23.9 percent. The decline in the percent of land in farming from 1982 to 1992 was 1.8 percent for the U.S. overall and 2.3 to 5.0 percent in the three states. Fourteen of the 16 Lake Superior counties declined at a rate as low as or lower than the national average (1.8 percent to no change); only Carlton County, Minnesota, and Ashland County, Wisconsin, declined faster, by 5.3 and 2.6 percent, respectively. While 41.8 percent of U.S. land was in farming in 1992, along with 27.7 percent of Michigan, 50.4 percent of Minnesota, and 44.5 percent of Wisconsin, the only watershed counties with 10 percent or more farm land were Bayfield, Wisconsin (10.3 percent), and Carlton, Minnesota (20.6 percent). The other counties ranged from 0.1 to 8.4 percent.

Home Heating Fuel

The following statistics on home heating fuel also relate to the “Resource Consumption Patterns” indicator:

Although home heating is not specifically included in any of the sustainability measures identified in the EPO, it is somewhat similar to types and quantities of electric power generation. In 1980, the most common primary source of home heating in the 16-county U.S. Lake Superior watershed was fuel oil or kerosene, followed by utility gas, bottled-tank-LP gas, electricity, wood, and coal/coke. By 1990, utility gas had increased by 21.7 percent, displacing fuel oil, which decreased by 37.2 percent. Moving from fifth into third place, with an increase of 134.5 percent since 1980, was wood heat. Bottled, tank, and LP gas gained 5.4 percent but dropped into fourth place, while the number of homes with electric heat rose 32.5 percent but dropped into fifth place. Homes using coal or coke heat declined by 67.9 percent.

In the U.S. as a whole, the relative rankings did not change from 1980 to 1990. Electric heat increased most (60.5 percent), while remaining in second place behind utility gas, which rose 9.8 percent. Fuel oil decreased by 23.3 percent but remained in third place. Bottled, tank, and LP gas increased 15.6 percent, wood heat increased by 40.1 percent, and coal/coke declined 28.8 percent. Nationally, 57 percent of homes heated with gas in 1990, 26 percent used electric heat, 12 percent used fuel oil, 4 percent used wood, and 0.4 percent heated with coal or coke.

Of the total 180,565 homes in the watershed counties in 1990, 87,280 (48 percent) were heated with gas, 53,248 (29 percent) with fuel oil, 24,626 (14 percent) with wood, 14,086 (8 percent)

with electricity, and 402 (0.2 percent) with coal or coke. Of some concern to sustainability within the basin is the trend toward increased use of wood heat, which typically releases more pollutants to the air than sources such as natural gas. Also, the source of the wood for fuel is probably trees within the watershed, while most of the other sources probably come from outside the watershed.

Other Trends

Data relevant to other temporal trends in the U.S. part of the basin has been obtained but not yet analyzed in either Excel or ArcView. This data, for 16 basin counties in the U.S., includes local tax base (percent of revenue from property taxes and state/federal payments, plus per capita expenditures). Some trend data on unemployment and cost of living has also been obtained from the Bureau of Labor Statistics. In addition, 1991 census data from Statistics Canada, if available in a usable format, will expand the coverage of some existing trends.

9.3.1.4 Gaps in the Data

Table 9-1 in Section 9.3.1.2 shows the status of data acquisition for each sustainability indicator. Gaps in the data are of two types. Most gaps simply represent measures that have not yet been investigated fully. However, some of the gaps are in measures that may be difficult to quantify uniformly across the basin, if at all. Many such measures relate to the "Reinvestment in Natural Capital" and "Awareness of the Capacity for Sustainability" indicators. Some measures, such as the extent of recreational and cultural opportunities or media coverage of sustainability-related issues, are so open-ended that it would be hard to know when to stop acquiring data. A sampling method would, thus, need to be devised.

Some promising data was gathered at an inappropriate scale, commonly at the State, Provincial, or Federal levels. A number of studies, surveys, and databases that are available from Statistics Canada's Canadian Socioeconomic Information Management system initially appeared promising. Statistical Data Documentation System reports have titles such as "Environmental Statistics," "Industry Statistics for Environmental Applications," and "Pollution Abatement and Control Survey." Some of the reports even indicated that data was reported by major drainages or census units, including those in Ontario. However, calls to several of the contacts revealed that the published reports do not contain data at that level of geographic detail. Furthermore, a host of data is currently available only to "internal sponsors," though it may eventually be made public.

Other survey reports, such as "Environmental Protection Expenditures in the Business Sector 1995," are based on 2,000 to 3,000 surveys distributed across Canada. Again, the finest geographic reporting level is by province. Obviously, data from the Province of Ontario as a whole is not likely to represent the sparsely settled regions north of Lake Superior. Yet it is encouraging that such environmental statistics are now more commonly collected and that data is becoming available in digital form for use with GIS software. The major limitations, not surprisingly, remain funding and staff resources in various agencies.

Cost of living is an example of a measure for which we have obtained somewhat indirect information, in the form of rent and mortgage payments as a percentage of household or family

income. The U.S. Bureau of Labor Statistics (BLS) was expected to be the best source of cost-of-living information. Unfortunately, the BLS compiles statistics for the entire six-state Midwest region and report data only by U.S. city averages and Midwest city class sizes (population greater than 1.5 million, 50,000 to 1.5 million, and less than 50,000). No information specific to the Lake Superior watershed is available. State agencies typically rely on the BLS for cost of living information. Perhaps the Federal Reserve Bank of Minneapolis has some relevant information, but such seems unlikely.

The remainder of the Baseline Indicators Project will concentrate on (1) contacting as many potential data sources as possible to determine which gaps are truly problematic, (2) obtaining and importing data into ArcView, where it can be displayed optimally on maps of the watershed, and (3) recommending where future efforts might focus to eliminate gaps in the suite of socioeconomic sustainability indicators. In the meantime, we can also turn to another study that, though not as comprehensive as the Baseline Sustainability Indicators Project, may compensate for some of our informational shortcomings in the area of basin residents' attitudes toward sustainability.

9.3.2 Survey of Community Decision Makers

In 1997, at the request of those who manage "protected areas" (i.e., public parks and preserves) in the Lake Superior basin, the Binational Program co-sponsored an extensive survey of community decision makers in the region. Based on the assumption that "core" protected areas in the region serve as a primary focus for ecosystem management practices, and that their existence contributes significantly to the social and economic well-being of basin residents, business and industrial leaders, educators, media managers and governmental representatives reported their perceptions regarding the relationship between protected areas in the basin and sustainable development. Research objectives included the production of a representative profile of basin decision makers' knowledge of and attitudes regarding the role of protected areas in the respondents' social and economic spheres.

9.3.2.1 Project Protocol

The sample for this study consisted of 336 community leaders geographically close to eighteen communities located near major protected areas in the Lake Superior basin. Open-ended and forced choice questions were used for the purpose of obtaining characteristics of community leaders which included age, gender, occupation, length of residence, and knowledge of what protected areas exist in their vicinity. In addition, twenty-eight questions examined their attitudes regarding the environmental, social, and economic benefits derived from having land set aside for protection; Table 9-4 identifies the topics of inquiry regarding respondents' attitudes and knowledge about protected areas. Two separate probes for most of the topics of inquiry were constructed to include assessments of both local protected areas as well as other parks and preserves found throughout the Lake Superior basin; both positively and negatively worded statements were constructed in order to prevent a response set bias, such as checking only favorable responses (e.g., Agree Strongly).

Table 9-4 Issues Included in the Attitudes and Values Survey

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| <p>A. The role of protected areas regarding social and environmental sustainability.</p> <p>B. The extent to which various protected should be opened for development.</p> <p>C. The degree to which preserves serve as part of a larger network representing the ecosystem of the Lake Superior basin.</p> <p>D. The assumption that regulations for protected are too restrictive.</p> <p>E. The amount of support for establishing “buffer zones” around protected areas.</p> <p>F. The perception that protected areas provide a service for tourists more than residents.</p> <p>G. The belief that local communities receive tangible benefits from the presence of protected areas.</p> <p>H. The extent to which protected areas are seen as hampering economic services and development.</p> <p>I. The perceived ability of private enterprise to wisely manage protected areas as well as federal, state, or provincial governments.</p> <p>J. The belief in the need to create more protected areas to preserve the natural environment.</p> <p>K. The degree to which aquatic portions of the Lake Superior watershed should be protected as well.</p> <p>L. The perceived values mostly served by protected areas in the Lake Superior basin.</p> <p>M. The perceived percentage of Lake Superior basin lands protected.</p> <p>N. The perceived percentage of economic dependence on protected areas in the Lake Superior basin.</p> |
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9.3.2.2 Findings

Generally, respondents from Canadian communities showed more positive attitudes toward the role of protected areas, as well as a more unified perception of issues, than respondents from the United States. Most community leaders seemed to have a good general knowledge of the natural areas near where they live and held a favorable opinion of government management of protected areas, while rejecting the idea that private enterprise could accomplish the task as well. Also, it is evident from the results of the survey that the majority of community leaders believed that the inherent ecological values of protected areas may be compromised by private enterprise and that it would be difficult for entrepreneurs not to be biased by profit margins at the expense of protected areas’ values. However, although respondents demonstrated a positive perception of protected areas and their relationship to sustainability across the basin, a large portion of the

community leaders believed that existing parks and refuges should allow for more development and resource extraction and either rejected or were unsure about the desirability of creating more protected areas in the region. Despite the fact that most respondents believed that protected areas should include portions of Lake Superior itself, they seemed to be less sure of the role of aquatic protections in their own backyard. It is probable that most basin residents are unfamiliar with what aquatic protections involve, what restrictions may be implemented, and the environmental, social, and economic benefits that may evolve from such a designation.

It is important to note that, with the exception for attitudes regarding protected areas' link to sustainability, the aforementioned positive impressions of resource management policies are not exceptionally strong. For example, most respondents merely "agree" rather than indicate greater levels of belief strength and/or enthusiasm for suggested policies. This relative lack of polarization in attitudes may serve as an opportunity for persuasive efforts directed at changing the ways basin residents view the role of protected areas in their daily lives.

In general, distinctions between subgroups of respondents based on demographic variables reported in the study were marginal. Yet, one of the more noteworthy contrasts observed in the study was between Canadian and United States respondents. United States respondents favored greater extractive development, perceived protected areas to be more restrictive with respect to human use, viewed protected areas as hampering economic services to a greater extent, and were more opposed to the need for creating additional protected areas than did their Canadian counterparts. Also, a respondent's "length of residence" was the one consistently significant predictor of attitudes toward sustainability and protected areas; the longer one lived in the region, the more favorable were their attitudes toward protected areas.

Granting the relatively small overall differences in perception, community leaders generally perceived protected areas as contributing to their communities in relation to the tangible benefits that accompany fostering sustainable development. Yet they exhibited less favorable attitudes towards preservation of protected areas in their own vicinity than in general. For instance, respondents were less opposed to resource extraction in local protected areas; were less accepting of restrictions being placed on local protected areas; had a slightly less favorable view of the economic burdens posed by nearby protected areas; and were less agreeable to preserving aquatic regions near their communities. This response pattern suggests that community leaders are perhaps less accepting of environmental policies when they perceive local economic growth and job opportunities to be potentially at risk. Hence, this study provides some evidence in support of the traditional finding that citizens' attitudes toward natural resource policies and protected areas are grounded in local, rather than regional, national or global concerns over economic viability and lifestyle choice.

Although attitudes regarding the role of government intervention to protect the natural environment are generally positive, they clearly differed from location to location. As a case in point, one can consider the divergent social contexts surrounding the communities of Bayfield and Ashland, Wisconsin and Ontonogan, Michigan (i.e., two of the research sites in this study). The communities adjacent to Ashland have, for some time, been participating in a wide variety of sustainable development initiatives designed to maintain or improve the local economy, work in

harmony with federal and state natural resource agencies, and draw upon the natural bounty of the region to entice tourism. By and large, this has been a successful partnership. In contrast, Ontonogan residents have often been at loggerheads with government policies to protect the environment. Most recently, the U.S. Environmental Protection Agency was seen as fomenting closure of a major mining operation in the region, though the ongoing economics of the operation probably played a larger role. Consequently, the differing attitudes toward, for example, the role of local protected areas in the service of sustainability mandate rather different approaches to communication and policy in the future.

This study suggests that basin residents are generally ambivalent toward the prospect of protected areas or sustainable development in the region. Much of this uncertainty may be due to the general lack of knowledge people have regarding the issue of sustainability. People seem to intuitively know that protected areas are important but lack sufficient information to understand the general range of benefits afforded by parks and preserves. Hence, information campaigns should be initiated to raise the level of knowledge prior to suggesting changes in natural resource policy. And this is especially true in the case of using the idea of ecosystem management to drive local decision making. Since “neutral” attitudes are more malleable than those which are polarized, this finding offers an excellent opportunity for local administrators to examine the specific pattern of responses for their areas, contact decision-makers in those communities, and actually mitigate some of the ambivalence observed at present. To this end, those interested in reading the full report of the study can access its on-line version at <http://www.nmu.edu/sbp/content.html>.

9.3.3 Summary of Status and Trends

It should be apparent that, given the relative paucity of baseline data we have accumulated thus far (especially that of Canadian origin), it is somewhat premature to draw general conclusions regarding the status and prospect for basin-wide sustainability in the Lake Superior region. Such will require the generation and analysis of data over time, as well as a careful cross-referencing of information. Furthermore, insofar as much of our data deals with mostly economic concerns, we should be wary of unduly emphasizing economic sustainability over social and environmental components in the sustainability triad, even though the regional economy is a necessary component of sustainability in the basin. And it may be significant that much of the data does not account for economic and social changes that have accompanied the general economic upswing of the late 1990s. Nonetheless, even at this early date we can make a number of observations regarding opportunities for education, general understandings of economic relationships, incorporation of practical technology, and wise land-use planning that may be tested as information comes to augment the research reported above. For example:

- Although the average educational background of basin residents seems to be cultivating a host of pro-sustainability understandings and values, the relative impoverishment of the region may further encourage the continued haphazard consumption of watershed resources (e.g., previously undisturbed countryside, carbon-reservoirs of burnable wood). To compensate for such consumptive drives, we must find ways to enhance the regional economy in ways that balance social and environmental needs.

- The relatively lower cost of living in the region (e.g., housing costs), combined with a seemingly higher quality of life (e.g., travel times to work, crime incidence), may attract more and more immigrants to the region, thereby placing greater stress upon natural and social systems to the detriment of sustainability. Consequently, land use patterns are impacted by newcomers' inclinations to develop home sites and services beyond the existing suburban fringe, thereby reducing the amount of agricultural and recreational lands.
- As urban populations decline, and more people move into undeveloped countryside, greater pressure will be placed on transportation and service infrastructures; with rising levels of poverty and lowered tax-bases, less effort may be directed at conservation-oriented measures such as mass transit and the use of environmentally benign energy sources. Thus, it is even more imperative that innovative technologies be adopted to off-set citizens' tendencies to live for the present and forget about the future.
- As with elsewhere in Canada and the United States, the general population of the Lake Superior basin is aging and, in the coming years, may become more amenable to accepting lifestyle changes that promote sustainability. It will be important to further enfranchise (e.g., through continuing education and media outreach) this aging population in the collective process of promoting sustainability.

Of course, speculations such as these must stand the test of time and will likely be modified as we learn more about what may or may not be sustainable in the Lake Superior basin. In the meantime, however, we can and should move ahead with the Binational Program's sustainability initiative.

9.4 STRATEGIES FOR FUTURE INITIATIVES

With the release of this LaMP, the Lake Superior Binational Program is positioned to begin implementing a range of projects designed to further promote sustainability in the basin. As noted earlier, the actual implementation of projects will not be an easy task. Certainly, any project that monitors or improves upon the ability of local citizens to manage their lifestyles in a sustainable manner must deal with the challenge of integrating complex data, working within political contexts, and demonstrating measurable results. Furthermore, insofar as the projects we envision should encompass a wider field of action than typically associated with specific habitat or pollution remediation or protection projects, the monetary cost of the initiative will be significant. And, without much doubt, we can anticipate that any strategy for change will require a sizable investment in effort from government agencies, regional industries, and citizens in the basin. Consequently, the "commitments" we make for the next two years (i.e., when the LaMP will be updated in 2002) and beyond must be considered in light of the resources that may or may not become available to support the program.

A central element in planning for the future of the Binational Program will be an invigorated process of involving the general public in the process. To augment input from the Lake Superior Binational Forum, we anticipate holding a series of meetings in various communities around the

basin. The purpose of these meetings will be to publicize the LaMP, gather public input and commentary, and encourage collective action. Subsequently, ideas generated through the course of this “road show” will be used to fine-tune the various projects described below, including the hosting of further meetings and forums.

In the following sections of this chapter we outline a series of projects that we believe can be initiated in the near future. The strategy we have adopted proceeds along two tracks and has been adapted from a framework used by BioForest Technologies Inc. of Sault Ste. Marie, Ontario to develop forest management plans in Canada and the United States. On the one hand, some of the projects are directed at measuring indicators that should be considered gauges of sustainability in the region. Here, the primary focus is upon assessing the extent to which we are moving toward or away from sustainable lifestyles. On the other hand, other projects mostly deal with levers, or attempts to influence and change behavior so as to better promote sustainability. The intent here is not as much directed at manipulating behavior as it is designed to engage citizens in a proactive discussion of the issues at hand. It should be noted, however, that such gauges and levers are not wholly independent of one another; gauging where we are provides the impetus to leverage projects that modify social conditions which, in turn, must be continually monitored. For example, the previously discussed Baseline Sustainability Indicators project provides information that helps to answer a variety of questions including:

- To what extent are local transitional economies (e.g., the shift from a mining- to an ecotourism-based structure) compatible with forecasted levels of supply and demand?
- To what extent does a change in demographic characteristics (e.g., the flight of younger generations in search of economic opportunities, the growth in a “second home” real estate market) affect the consumption of natural and social resources?
- To what extent do emerging sustainable forestry practices, in comparison with more intensively extractive approaches, maintain the natural capital of the Lake Superior basin?
- To what extent does the current configuration of community economies in the watershed allow for the long-term viability of resource policies?
- To what extent are current efforts to conserve energy and resources resulting in significant efficiencies for the amount of “waste” being discharged into the basin ecosystem?

The answer to these and other questions will help guide funding proposals for projects designed to improve conditions on the ground and change attitudes or perceptions. In turn, we can employ various projects to slowly change lifestyles through voluntary commitments that equally weight social, economic, and environmental considerations.

It is also important to recognize that the “developing sustainability” component of the LaMP is complemented by the work of other committees in the Binational Program. In a number of cases, the sorts of measures comprising our suite of “best bet” indicators are being monitored and acted upon by other groups. In reviewing the strategies being adopted by other Lake Superior Work

Group committees at a monitoring workshop held in 1999, it became apparent that there is an appropriate degree of overlap between thematic emphases in the LaMP: the Habitat Committee (Chapter 6) is assessing the amount of watershed management and restoration occurring in the basin, wetland replacement rates, lakeshore access, and the growth of urban sprawl; the Aquatics Committee (Chapter 8) is reviewing the status of native fisheries, wetland fauna, and the quality and volume of aquifers in the region; the Terrestrial Wildlife Committee (Chapter 7) also focuses on riparian restoration, wildlife depletion and stocking, and the status of native flora and fauna; the Human Health Committee (Chapter 5) deals with water quality while the Chemical Committee (Chapter 4) examines the role of economic incentives as well. And, to varying extent, each committee also includes an education component. Thus, we anticipate that substantial efficiencies in how much time, effort, and money we will have to direct at specific gauge- or lever-oriented projects will be realized by meshing our sustainability initiatives with those of other committees.

9.4.1 “Gauges” for Basin-Wide Sustainability

The following three projects are primarily aimed at monitoring the extent to which principles of sustainability are understood and incorporated into the actions of a major industrial sector in the basin, the lives of common citizens in the watershed, and educational systems that surround Lake Superior. In addition, each gauge-oriented project points to the types of levers we may wish to pursue if we find a significant disparity between the ideals of sustainability and what is actually happening on the ground.

9.4.1.1 Sustainable Forestry Practices Inventory

The overwhelming majority of the land-base in the Lake Superior basin consists of “working” forests administered by public agencies and private organizations. Currently, a range of sustainable forestry practices have been instituted on these lands: the Ontario Ministry of Natural Resources follows “adaptive management” practices on Crown Land, the Canadian Standards Association promotes forest-product guidelines, U.S. companies typically adopt Sustainable Forestry Initiative criteria or self-imposed targets through the ISO process, State lands have begun to standardize their practices, and the USDA National Forest Service has its own regimes. However, we do not have a compendium of (among other issues) the scope, structure, administrative guidelines, yields, or efforts to coordinate with adjacent local and regional management practices. Such baseline data would be useful in projecting trends in the reinvestment in natural capital pertaining to basin flora, suggesting avenues for educational outreach, and assessing the projected economic vitality of the watershed. Thus, this project will consist of comparing and contrasting sustainable forestry practices in the basin (including harvesting and resource modification) and establishing a system by which the processes can be periodically assessed in light of basin-wide sustainability of forest resources, including those beyond a historical emphasis on fiber production.

One outgrowth of developing an inventory of sustainable forestry practices may be an eventual partnering with government and industry to maximize sustainable yields while protecting the larger ecosystem and serving residents of the basin well into the future. For example, the Ottawa

National Forest has already committed itself to developing and refining local forest unit criteria and indicators for sustainable forestry. The project goal is to identify and test the conditions that are necessary to sustain ecological, economic, and social systems, and the measures needed to assess how forest management is influencing sustainability at the local level. The ultimate utility of this effort will be to provide forest managers and partners with feedback which can be used to monitor and improve forest management planning. Such will include discussions with U.S. Forest Service staff and local stakeholders associated with each forest unit. Five other National Forests are now developing similar indicators nation-wide.

Eventually, the USDA Forest Service hopes to implement the use of local unit criteria and indicators on forest land units over a three year period to demonstrate the practicality and value of forest monitoring systems focused on sustainability. This effort will involve applying the criteria through on-the-ground monitoring and, thereby, evaluating sustainability to improve forest management. The effectiveness and efficiency (i.e., costs) associated with implementing this scheme could then be evaluated for broader application within the Lake Superior basin.

Alternatively, a number of local economic development organizations, such as Northern Initiatives in the central Upper Peninsula of Michigan, have previously sought public funding to examine and improve upon the “Best Management Practices” of small forest contractors who work in the woods for government agencies and private industry. It may be possible to partner with such organizations so as to improve their chances of obtaining grants aimed at securing the sustainability of timber industries while protecting the larger resources provided by the forests in the basin.

9.4.1.2 Community Awareness Review

The drive toward sustainability must be grounded in the actions of local communities and, arguably, long-term sustainability is poorly understood by most citizens in the basin, especially to the extent that all three parts of the sustainability triad must be taken into consideration. There have been some notable attempts to cultivate sustainability awareness in the basin, such as the “sector” workshops hosted by the Lake Superior Forum dealing with issues such as mining, forestry, and sustainability in general. Additionally, collaborations such as the “Thunder Bay 2002” group have worked to generate interest in sustainability within specific communities. This project, however, is more comprehensive in that it seeks to (a) formally survey residents of the basin and (b) initiate person-to-person dialogue through the use of community-based facilitators in twenty-two Lake Superior communities. “Town-Hall” meetings will be held in the selected communities with the purpose of assessing what residents know about sustainability and the opportunities such provides. Comments and ideas that come out of these sessions will be distilled, collated, and provided back to participants, the greater communities they represent, regional civic organizations, and local media or government agencies.

As a follow-up to gauging what those in the watershed think about sustainability, subsequent informational campaigns targeted at community knowledge-assets and knowledge-deficits may be initiated; such would include orienting both the general public and specific sub-groupings (e.g., business professionals, county and city governmental officials) to resources available

through the internet. Measures of changes in the public's awareness and behavior will then be conducted to, in turn, fine-tune further contacts. Not only does this project contribute to the focal indicators of sustainability education and quality of life in the watershed but it may also serve to modify the political context within which basin residents act towards regional sustainability.

9.4.1.3 Reviewing the Status of Sustainability Education

Whenever the subject of developing sustainability arises, someone inevitably argues that the best way to transform society and to encourage voluntary action is through formal education. This is a very probative argument insofar as our best chance for eventually changing the way people act is to contact them as they are in the formative process of learning about the environment and our relationship to it. Unfortunately, previous nation-wide studies of environmental curricula suggest that, although today's students know a lot more about the environment than their predecessors, such knowledge is often fragmented and based on competing philosophies (e.g., the role of recreational hunting). Certainly, a lot of "education" occurs in the informal settings of family and community life but, if we want to optimize the use of our financial resources, we should focus on what gets taught in primary and secondary schools. Hence, the intent of this project is to gain a better picture of the extent to which sustainability principles are currently being incorporated into environmental education programs in the basin. By collecting information from educational centers (e.g., the Lake Superior Center, Wolf Ridge Environmental Learning Center), Offices of Environmental Assistance, and as many schools and science teachers as possible within the region regarding what is being taught at present, programs can be compared and evaluated with an eye toward determining if existing educational emphases on the economic, social, and environmental aspects of sustainability have the capacity to change the lifestyles of citizens over time. Appropriate reports will be drafted and disseminated across the study area.

To promote the goals of the Binational Program, we believe that an assessment of what is currently being taught about sustainability will allow us to provide teachers with an integrated package of educational resources tied to the sustainability theme. There are a variety of ways we will proceed to leverage enriched educational opportunities in our schools. The U.S. Department of Education, the President's Council on Sustainability, and various State agencies have developed compendia of environmental education programs focusing on the sustainability issue that can be given a Lake Superior "spin" and shared with teachers in the basin through partnership agreements. Such will involve assembling a relatively digestible educational program dealing with sustainability issues (stratified for various educational levels), perhaps even linked to annual events (e.g., Earth Day, Arbor Day), to be sent to educators in the watershed. Additionally, through a variety of means (e.g., a dedicated page on the Binational Program's web site), we will also alert teachers to more specific sources of information (e.g., elements of environmental design, regional land-use planning) housed at the Federal, Provincial, and/or State level.

9.4.2 "Levers" to Promote Basin-Wide Sustainability

The following three projects are intended to act as levers for changing the status of sustainability in the Lake Superior basin. Specifically, they will focus on improving stakeholder's

understandings of sustainable economics, the management of water resources, and the marketing of conservation programs. In a number of ways, each complements the wide range of community-based programs already underway throughout the watershed that have not been initiated by the Binational Program (e.g., the Sturgeon/Otter and Chocolay watershed projects in Michigan). In addition, each lever-oriented project includes a monitoring component which allows us to gauge the effectiveness of our attempts to alter lifestyles and business practices.

9.4.2.1 Communicating Economic Values and Teaching the Value of Economic Instruments

This project focuses on two separate dimensions. First, we will identify and assess the utility of specific “economic instruments” (e.g., user fees, pollution charges, permit trading programs, performance bonds) applicable to various business sectors located in the Lake Superior basin. Historically, market-based mechanisms and other incentives for environmental management have been touted at all levels of government as offering opportunities to encourage resource protection and conservation. However, their utility in a northern watershed like the Lake Superior basin may be considerably different than what has been applied to other regions of Canada and the United States. Consequently, some effort is required to identify which specific tools might have applicability in the context of the Lake Superior LaMP, and to communicate the viability of such avenues to basin residents. Second, in a similar vein, we want to improve the visibility and demonstrate the economic importance of natural resource systems in the basin for resource decision-making. Some effort has been expended over the last decade to “monetize” the value of Great Lakes basin resources (e.g., wetlands, fisheries, water supply, biodiversity). This portion of the project will generate approximations of the economic value of resources in the Lake Superior ecosystem. Based on existing literature, we will compile current monetary estimates of Great Lakes ecosystem values, then extrapolate those values to the Lake Superior basin. Along with information regarding various economic instruments, these estimates will be disseminated to industry and civic decision-makers by way of sector-specific direct mailings. Emphasis will be placed upon demonstrating the relationship between values for Lake Superior basin resources, their management via market-based incentives for conservation and pollution protection, and the long-term sustainability of regional economies.

To evaluate the worth of this project, stakeholders in the basin will be surveyed after they have received information concerning economic values and instruments. In particular, we will probe the extent to which businesses and local governments begin to change the way in which they manage revenue streams and profit margins given both self-interest and the sustainability of the basin environment. By collaborating with organizations such as the Upper Lakes Environmental Resource Network (ULERN) in Canada and the U.S. EPA Office of Policy and Innovation, we should be able to tailor subsequent approaches to encouraging changes in stakeholder’s reinvestment in natural capital and the use of advanced technology to support an environmentally benign economy in the region.

9.4.2.2 Promoting Water Conservation

Water is a central component of life in the Lake Superior basin, galvanizing attention in a variety of arenas, including policies aimed at preventing diversions of the resource out of the watershed. Perhaps more importantly, efficient water use is also an important component of sustainability. This project builds on the work of Thunder Bay 2002 and the City of Thunder Bay by continuing to expand on a number of local initiatives. These include the toilet replacement rebate program, which provides \$125 towards the purchase of an ultra low flush toilet in residential, commercial and institutional buildings, and water audits that involve on-site assessments and recommendations for reducing water use (in addition to energy and solid waste use) in all sectors. These programs, in addition to the existing “downspout disconnection” program and the rain barrel promotion, which offers rain barrels to encourage the reuse of rainwater from rooftops, provides the elements of a comprehensive water conservation program. Newsletters, fact sheets and brochures will be disseminated to encourage local and adjacent communities to adopt water efficient practices.

Program effectiveness will be gauged by a range of indicators such as the number of water audits completed, the number of replaced and/or retrofitted water-using fixtures, the adoption levels of downspout disconnections and rain barrel installations, augmented where possible by actual water and energy bill savings. Ultimately, the main indicator of progress will be sustainable levels of municipal water pumpage and use, recognizing that many different factors affect total water pumpage. This project involves collaboration with a number of agencies, businesses, groups and funding organizations. Dissemination of the Thunder Bay experience to the remainder of the Lake Superior basin is a fundamental element of this project.

A related initiative focuses on the importance of developing and implementing pollution prevention planning and procedures in the pulp and paper sector. Water and energy are two commodities used in huge quantities in this industry. The Provincial Papers mill in Thunder Bay has expressed interest in partnering with Thunder Bay 2002 to develop efficiencies related to water and energy use at the mill. This project will examine core mill processes to identify operations where water and energy efficiencies could be most successfully implemented. This would be followed by implementation of those measures determined to be practically and economically feasible. Successes would be disseminated to other mills.

9.4.2.3 Marketing Waste Reduction and Energy Efficiency

A major component of advancing sustainability in the Lake Superior basin involves pitching pollution prevention measures to those located in the watershed. Currently, a wide array of state, federal, and provincial initiatives have been established to assist the private sector in reducing waste and conserving energy. Occasionally, agencies participating in the Binational Program and the Lake Superior Forum have hosted workshops dealing with waste reduction and energy efficiency. Large industries in the basin likely understand the range of assistance that is open to them, given their compliance with governmental regulations or the institutionalization of accrediting regimes (e.g., the ISO process). However, most of the smaller employers in the region, may ignore what information they receive regarding pollution prevention because they do not view such programs as relevant to their immediate interests, do not believe that they have the resources to participate, and/or eschew arrangements that could infringe on their rights to operate

in a profitable manner. Arguably, the span of programs sponsored by Federal (e.g., U.S. EPA's ENERGY STAR program) and State agencies (e.g., Michigan's Business Pollution Prevention Partnership sponsored by the Department of Environmental Quality) find their greatest marketability in areas of heavy industry and metropolitan populations which are quite unlike what we find in the Lake Superior catchment. Thus, this project will develop an omnibus information and assistance campaign tailored to the needs of local residents which will alert small businesses, health care organizations, and educational systems to various energy and waste assistance programs, as well as leverage the use of technical expertise (e.g., Michigan's RETAP initiative) regarding waste stream reductions, increases in energy efficiency, and the use of alternative energy sources or emerging technologies.

In submitting this project for GLNPO funding, we will ensure that the marketing firm contracted to create and manage the campaign will include mechanisms to gauge the effectiveness of the initiative. A number of assessment alternatives present themselves including the monitoring of requests for assistance, self-reports of energy savings and waste reductions, and audits of energy use or recycling capacity. As an added incentive, those businesses participating in various programs will be singled-out as "success stories" to be shared with local media and included in subsequent LaMP progress reports.

9.4.2.4 Facilitating Mercury Reduction

The Lake Superior Binational Program has developed a load reduction schedule that anticipates achieving zero discharge of mercury by the year 2020. Industrial pollution prevention strategies will be an essential component to achieving this target. And, through a variety of projects noted in Chapter 4 of the LaMP, a good deal of progress has been made toward reducing mercury loading to the Lake Superior ecosystem. For example:

1. A Michigan Pollution Prevention Task Force was convened so as to identify actions that could be taken to reduce mercury emissions and discharges. The Task Force was comprised of representation from industry, trade associations, environmental, government, and academic groups. Through their monthly deliberations, a final report was developed containing over seventy consensual pollution prevention recommendations that are now being implemented.
2. A Marquette Community Mercury Reduction Task Force has been formed to reduce the amount of mercury discharged to the environment in the central Upper Peninsula of Michigan. Administered by Marquette Area Wastewater Treatment Plant personnel, along with representatives from the Sierra Club, MDEQ, the Marquette County Solid Waste Authority, Northern Michigan University and citizens at large, this project has resulted in a number of accomplishments including the collection of mercury containing wastes from small businesses, households and public institutions, educational outreach to the general public, and the development of an estimate for mercury discharge sources from the Marquette area.
3. The Western Lake Superior Sanitary District has sponsored a "Zero Discharge Pilot Project" aimed at lowering mercury concentrations in municipal sludge and effluent. Their reduction

program continues through a variety of ongoing initiatives such as Clean Shop, which provides small businesses with a hazardous waste depository, and burn barrel education projects.

4. Legislation in the State of Minnesota has established a goal of 70 percent reduction in mercury emissions by 2005. Statutes now require the Minnesota Pollution Control Agency to request facilities that emit over 50 pounds of mercury per year to develop voluntary reduction agreements. To date, several Facilities in the Lake Superior basin have indicated a willingness to participate in the program.
5. For several years, the City of Superior Toxics Reduction Committee has implemented Binational Program work on a local scale, focusing first on mercury and now branching out to deal with other bioaccumulative substances. The group sponsors business training sessions and school-based educational programs.
6. More recently, Thunder Bay 2002 has proposed or has already initiated a range of Binational Program sustainability projects related to mercury, including:
 - Thermostat Recycling. This project will focus on recycling standard wall-mounted thermostats which have been removed from use. Literally millions of thermostats which contain mercury are used in homes and businesses across North America. When they are removed from use, these thermostats are often disposed of at landfill sites. This project would serve to divert mercury from the landfill, redirecting it to a recycling facility where mercury would be extracted and reused.
 - Button Battery Recycling. For the past three years retailers such as Wal-Mart, Japan Camera, Radio Shack, Mappins Jewelers and Zellers have sponsored a program to recycle button batteries in Thunder Bay. In Sault Ste. Marie, a similar program has been running for two years. Button batteries are the small batteries found in watches and other small electronic equipment. Each battery can contain as much as 2.4 grams of mercury. Under this program, retailers collect batteries received from customers in receptacles placed in highly visible locations on their sales counters. Efforts are now being expended to continue the program in Thunder Bay and Sault Ste. Marie and to extend it to the town of Marathon on Lake Superior's North Shore.
 - Fluorescent Lamp Recycling. Mercury from fluorescent tubes is the second largest source of mercury being released into the environment. In North America, four hundred million tubes containing mercury are disposed of annually. In mid-October a partnership was formed with Recool Canada, a Thunder Bay recycling company, which will transport bulbs to a Minnesota firm for recycling. Landfilling of fluorescent tubes is illegal in Minnesota and recycling of the mercury in these lights is mandatory. This arrangement is especially important since Thunder Bay is far beyond an economical distance to fluorescent light recycling facilities in Ontario and equipment to reliably remove and recycle mercury is extremely expensive.

A strong information campaign is an integral “lever” of a successful pollution prevention program for mercury, as well as other critical pollutants. In this regard, the Developing Sustainability Committee intends to work with various programs to inform basin residents about the Canadian and U.S. experiences and expand the programs to other communities around the Lake. Information on successful Lake Superior and Great Lakes pollution prevention efforts will be distributed to the public, industries and municipalities in the Lake Superior basin, using newsletters, the Binational Program’s web site, and press materials. To monitor progress, periodic updates will highlight the level of participation in the various programs outlined above and the volume of mercury diverted from waste streams for subsequent reuse.

9.4.3 Organizational Challenges

In order to utilize the strategies embodied in the gauges and levers projects noted above, as well as to wisely move on to new initiatives, the Developing Sustainability Committee of the Lake Superior Work Group will have to contend with a pair of issues that may hinder its efforts. To cultivate basin-wide sustainability in general, as well as to effectively manage proposed projects, we should pay close attention to who is helping to design various initiatives and what financial resources can be made available to assist the process.

9.4.3.1 Improving Committee Expertise

Although the subject of sustainability has received a good deal of interest in Canada and the United States, rarely do we find government agencies establishing formal departments such as those associated with pollution prevention, health, or the protection of flora and fauna. The scope of sustainability is such that individuals with the necessary interests and expertise are generally dispersed across the range of more narrowly focused government programs. Thus, identifying appropriate agents who can commit time and effort to the work of the Developing Sustainability Committee has posed something of an ongoing problem. Furthermore, many of those with the requisite skills and knowledge to manage sustainability on a regional basis are employed in the private sector and are beholden to professions that limit their ability to participate.

Recognizing that committee staffing is under-developed at present, we now intend to seek-out and entice a wider range of membership drawn from both the public and private sectors. Ideally, these individuals would be residents of the Lake Superior basin but, as with other committees of the Lake Superior Work Group, we may have to turn to expertise from without. And, at present, there is a need to secure assistance from three types of individuals:

- An education specialist familiar with processes of formal and informal environmental education.
- An individual acquainted with the process of sustainable community building, preferably one who specializes in “green” avenues toward significant economic development.

- A “social forces” expert who understands that developing regional sustainability calls for more than merely the sociological assessment of demographics.

In addition, there likely exist a number of individuals who currently participate in community-based programs directed at protecting natural resources (e.g., watershed management projects), encouraging sustainable economic development (e.g., chambers of commerce), and social welfare (e.g., local community foundations) that could play a vital role in infusing principles of sustainability into daily life. By way of an invigorated public outreach program, the Binational Program may offer such citizens the opportunity to contribute their voices to the effort.

9.4.3.2 Funding Future Initiatives

Since the United States has substantially reduced the amount of funds available through the CEM grant-process at U.S. EPA, it will be necessary to obtain support through hitherto unexploited sources for grants. Unfortunately, this shift in sources of financing sustainability projects comes at a time when we are on the verge of more fully implementing a range of initiatives. As a consequence, the work of the Developing Sustainability Committee will be largely dependent upon arranging partnerships with other, more financially endowed organizations and crafting grant proposals for a wider array of public agencies and private foundations.

9.5 NEXT STEPS

As we work toward releasing the next LaMP progress report in 2002, the Lake Superior Work Group will be implementing a range of ecosystem-based projects and further building upon our abilities to manage nuances of the LaMP. As with the work of other committees, we will be forging ahead with the sustainability initiative. The following section briefly outlines the areas upon which we will be concentrating.

9.5.1 Secure Additional Funding and Expertise

As noted in the previous section, it is important that the Developing Sustainability Committee improve upon the expertise of its membership and find the financial wherewithal to support its projects. In terms of finding additional committee members, we will mostly rely upon the professional contacts existing among those currently contributing to the Binational Program. Alternatively, some ongoing assistance may initially grow out of contracting specialists on a project-by-project basis, and others may be drawn into the sustainability initiative by simply participating in one or more of the projects we intend to undertake.

Funding projects in the future may pose more of a problem since we will be vying for limited dollars in competition with not only other organizations in North America but perhaps even with other committees of the Lake Superior Work Group. Nonetheless, one of our first priorities will be to initiate a dialogue with various public (e.g., the National Center for Environmental Research and Quality Assurance, U.S. EPA’s Sustainability Challenge Fund) and private (e.g., the North American Fund for Environmental Cooperation, organizations affiliated with the Environmental Grantmaking Foundation) grantors so as to better position ourselves for the

competitive process. We will also seek out professional brokers (e.g., ULERN) to assist us where possible.

9.5.2 Complete the Baseline Sustainability Indicators Project

As indicated in Section 9.3.1 above, the Baseline Sustainability Indicators project should be completed shortly after release of the LaMP 2000 document. A good deal of Canadian information has yet to be entered into the database and we will undoubtedly find that existing sources of information are insufficient for surveying our full range of sustainability indicators. In particular, we anticipate having to identify a number of new research projects directed at assessing the general categories of “Reinvestment in Natural Capital” and “Awareness of Capacity for Sustainability.” We also expect to use the framework of the current study as a basis for securing additional funding so as to merge data generated by upcoming census operations in the U.S. and Canada, as well as provide directions for additional studies (e.g., examining trends in population since the 1990 U.S. census in light of subsequent changes in the regional economic base). And the completion of the current project will provide more comparison points for use in interpreting or developing other new initiatives. For example, the system currently being employed draws upon a variety of data-bases generated through the use of different methods and we will want to develop metrics which allow us to create aggregate indicators representing each of the “five best” indicators noted above in Section 9.3 of this chapter.

When the Baseline Sustainability Indicators project is finally completed in 2000, the Developing Sustainability Committee will organize a public comment period for review and refinement of the document. In particular, regional stakeholders experienced in the human dimensions of natural resource management will be asked to comment on the report, suggest directions for future research, and consider implications for ensuing policies at the local level. Again, it should be stressed that some of the social and economic forces at work in the basin and more-or-less measured by the Baseline Sustainability Indicators project may not be amenable to change given the pragmatic reach of local units of government, especially in a context of voluntary cooperation. Nonetheless, the data may be useful in shaping information campaigns and suggesting ways to better restore and protect the Lake Superior ecosystem.

9.5.3 Commence New “Gauges” and “Levers” Initiatives

Recognizing that we will most likely form partnerships with other existing programs so as to maximize funding opportunities, there are a number of new sustainability projects on our collective horizon. For example:

- The Natural Resources Research Institute at the University of Minnesota - Duluth has determined that as much as 80 percent of the phosphorus loadings in basin watersheds can be attributed to road runoff, consisting mostly of fertilizer leaching from the maintenance of lawns. With the establishment of new zoning regulations and the installation of municipal sewer systems (driven by developers servicing in-basin migrants and the growth in vacation homes), more pressure will be exerted on the ecosystem by a reduction in buffers around riparian areas. To compensate for the potential threat of additional phosphorus loadings to

the system, we may want to promote the voluntary use of more hardy native groundcovers that require less invasive fertilization.

- Across the Great Lakes basin there exist or are currently being developed a wide range of monitoring regimes that more or less index the subject of sustainability. For example, the State of the Lakes Ecosystem Conference (SOLEC) process has spent considerable time and effort in devising a scheme by which land-use and stewardship might be assessed following an integrated collection of targets and indicators. The Great Lakes Protocol Workgroup of U.S. EPA has sought to establish consensus among the lake states for assessing the quality and quantity of drinking water sources in the region as well. Furthermore, the Terrestrial Wildlife Committee of the Lake Superior Work Group has suggested that we should also incorporate aspects of the Montreal Process and local land unit indicators for sustainable development. At some point, it will be useful to compare and standardize these indicators so as to optimize the use of agency resources directed at the sustainability initiative since, to date, we have only attacked the problem in a piecemeal fashion (e.g., as was attempted in 1998 when the SOLEC and EPO indicators were compared).
- One of the major contributors to the loss of biodiversity, and some would argue a major threat to sustainable development, is urban sprawl. Although the presence of urban sprawl is not as prevalent in the Lake Superior basin as elsewhere, cities such as Duluth, Marquette, and Thunder Bay have begun to witness fragmentation in the hinterlands surrounding their metropolitan areas; as residents relocate in “fringe” areas, services follow which contribute to increases in energy consumption, erosion caused by run off from impervious surfaces, and habitat destruction. Currently, we know little about what prompts people to move out of cities or how to convince citizen that denser populations are in their long-term best interests. To complement existing overtures designed to control urban sprawl (e.g., the development of “Smart Growth” criteria for urban expansion being promulgated in Minnesota), we have suggested partnering with the U.S.DA Forest Service’s North Central Experiment Forest Station to explore the communicative dimensions of the problem and to suggest avenues for persuading those living in the basin to remain closer to urban settings.
- In recent years there has been a substantial growth in the number of watershed management projects in the basin. Most of the time, these programs focus on water quality, aquatic habitat restoration, and sedimentation reduction. Occasionally, a number of existing and emerging watershed have banded together and have secured funding for extending their focus into broader issues associated with sustainability in general (e.g., the Central Lake Superior Watershed Partnership). The Developing Sustainability Committee may wish to craft a compendium of such watershed management programs, demonstrate how various programs can work within an evolving regulatory context (e.g., the National Pollution Discharge System will soon be requiring that best management practices be adopted to control storm water drainage), and encourage the systematic modification of existing programs in light of sustainability principles. For example, some have suggested that we investigate the possibility of providing municipalities with financial assistance (from either state or federal sources) so as to purchase, rehabilitate, and further protect degraded sections of urban water-courses. Additionally, there are several watersheds in the basin (most notably on the North

Shore of Lake Superior) that, due to their remoteness and relative lack of adjacent development, do not currently have citizens cooperating to restore and preserve the resource. This project might also attempt to cultivate awareness among citizens in those watersheds as to the benefits accrued through the development of watershed management plans.

- Some members of the Lake Superior Binational Forum have advocated an ambitious option for both safeguarding water quality and furthering economic productivity in the basin that embodies the practices of industrial ecology, full cost accounting and life cycle analysis, and a commitment to the virtual elimination of bioaccumulative toxins. The proposal here is twofold: First, to create a project and investment fund to finance “green” industrial and business start-ups in the basin. Such could, over time, have a substantial impact on economic development in the basin while promoting the practical use of sustainable technology. Second, an attempt would be made in Canada and the United States to create two “Eco-Industrial Parks,” perhaps in a partnership with Cornell University’s “Work and the Environment” initiative. A number of attractive possibilities are presented by this emphasis including the use of existing brownfield locations and “renaissance zones,” establishing co-generation relationships with the relevant local utilities, extensive recycling and reuse of waste, environmentally sound reliance on local employees, and sustainable contributions to local economic infrastructures. In either case, the Developing Sustainability Committee could be drawn upon to help the Forum in slowly developing guidelines for assisting communities in search of “greener” economies.

9.5.4 Co-Host Sustainability Forums

In addition to the community awareness review described above, a number of other general or sector-specific sustainability workshops could be hosted in partnership with local organizations or Public Advisory Committees tied to Remedial Action Plans for formally designated “Areas of Concern” in the basin. In this case, the focus of the workshops would be adapted to each location. Some workshops would deal with fairly tangible issues such as managing urban encroachment, storm water permitting requirements, or (in co-operation with established U.S. EPA Superfund plans) to discuss the potential for including habitat restoration as part of site remediation efforts. Other forums might focus on more abstract concerns. For example, research suggests that forested areas in the Lake Superior basin do not represent significant or salient components in citizens’ descriptions of where they live, what activities they engage in, and what their preferences are for valued lifestyles. If this is generally the case, it is important to alter perceptions so as to enfranchise the public in the process of demanding that forestry practices adopt the principles of sustainability. By drawing upon the community leaders and local expertise found in various basin communities, such forums will help to generate further ownership in the broader program of the LaMP.

9.5.5 Engage Media Campaigns for Public Outreach

As most of us recognize, the general public remains not only ignorant of the Binational Program itself but also, more specifically, the very concept of “sustainability.” Thus, a primary objective becomes one of increasing public awareness of (a) what sustainability means in the context of basin-life, (b) how individuals and communities can contribute to the overall goal of sustaining a valued quality of life in the watershed, and (c) ways in which the Developing Sustainability Committee can help facilitate the process of ensuring long-term sustainability. Of course, this is something of a marketing challenge wherein we must communicate a simple, unified message that equally embraces the ecological, social, and economic dimensions inherent in the concept of sustainability. In some respects, what is called for is akin to a “50 Things You Can Do To Sustain the Basin” communication campaign patterned after a brochure currently being developed by the Lake Superior Forum.

A variety of media can be employed to suit our purposes. Initially, we may produce a brochure featuring the Binational Program’s Vision Statement, a simple definition of sustainability, easily accomplished suggestions for behavior, and references for further information. This brochure would be made available to the public at a variety of venues around the basin (e.g., visitor centers, service-oriented businesses, government offices). Follow-up projects would include the use of alternative media focusing on the same basic themes, perhaps patterned after the public involvement strategies being adopted for publicizing the entire LaMP after its release. In addition, there may be a warrant for providing press releases when the baseline sustainability indicators project is completed.

9.5.6 Building Community Capacity

In the coming years it will be imperative that we continue to enhance the ability of communities to focus on sustainability on a day-to-day basis. For example, we hope to work with U.S. EPA regarding current Superfund commitments to enhance local capacity for responding to emergencies, preventing further releases of toxic materials into the basin ecosystem, and provide outreach and education on “brownfields” redevelopment to local land use planners and decision makers. Not only will such initiatives reduce the need to secure broad-scale funding through the Binational Program, but it will also cultivate local autonomy.

We believe that one of the most efficient mechanisms for building community capacity will come through the widespread accessing of the Binational Program’s web page or e-mail listserves such as the “Sustainable Communities Network” (< mnsn@mr.net>). Thus, we hope to highlight local success stories on the Binational Program’s site that can be emulated by others around the basin, as well as orient the broader public to selected sources on the world-wide web that focus on rural sustainable development. As an illustration, the following two web sites may be of particular use:

- “Online National Library for the Environment” (<<http://www.cnie.org>>), managed by the Committee for the National Institute for the Environment.

- “Sustainable Development - ONLINE” (<<http://susdev.eurofound.ie>>), managed by the European Foundation for the Improvement of Living and Working Conditions (contains more than 300 sites, including excellent examples of initiatives from Finland).

In addition, a variety of other sites have been included in the LaMP 2000 document that may provide citizens with the resources necessary to change lifestyles and promote sustainability in the Lake Superior basin:

- Corporations and Sustainable Development (<<http://www.betterworld.com>>)
- Center of Excellence for Sustainable Development (<<http://www.sustainable.doe.gov>>)
- The Citizens Network for Sustainable Development (<<http://www.citnet.org>>)
- Smart Growth Network (<<http://www.sustainable.org>>)
- Communities by Choice (<<http://www.communities-by-choice.org>>)
- Sustainable America (<<http://www.sustainableamerica.org>>)
- Sustainable Development Information System
(<<http://www.sdinfo.gc.ca/SDinfo/en/default.htm>>)
- International Institute for Sustainable Development (<<http://iisd.ca>>)
- Canadian Sustainability Report (<<http://www.sustreport.org>>)
- State of the Lakes Ecosystem Conference (SOLEC) sustainability indicators
(<<http://www.epa.gov/glindicator>> or <<http://www.cciw.ca/solec/>>)
- Minnesota’s Interactive Directory of Environmental Education Resources
(<http://www.seek.state.mn.us/>)
- New Road Map Foundation (<<http://www.newroadmap.org>>)
- Simple Living Network (<<http://www.simpleliving.net>>)
- Hennepin County (MN) Indicators of Community Sustainability
(<<http://www.co.hennepin.mn.us/opd/opd.htm>>)
- Fostering Sustainable Behavior (<<http://www.cbsm.com>>)
- Minnesota Sustainable Development Initiative
(<<http://www.mnplan.state.mn.us/SDI/index.html>>)
- World Resources Institute (<<http://www.wri.org>>)