GREAT LAKES REGIONAL COLLABORATION

APPENDIX X

SUSTAINABLE DEVELOPMENT STRATEGY TEAM

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INTRODUCTION

This report was prepared by the Sustainable Development Strategy Team for the Great Lakes Regional Collaboration. The charge to this Team was to create the component of the Great Lakes Restoration and Protection Strategy that would address a priority issue of the Great Lakes Governors and Mayors, "*Adopt sustainable use practices that protect environmental resources and may enhance the recreational and commercial value of our Great Lakes.*"

Human reliance on the services provided by an ecosystem requires that we ensure the ecosystem's ability to recover and restore itself from that use (UN, 2005). These "*ecosystem services*" are processes carried out by natural ecosystems that benefit human societies and economies. This report will not attempt to provide the definitive interpretation of what sustainable development means. The subjectivity of this concept was not a real obstacle to this Team's deliberation, and we elected to look to the definition of sustainable development of the UN Brundtland Commission for general reference " … *development that meets the needs of the present without compromising the ability of future generations to meet their own needs*." This definition is generally consistent with the tribal planning perspective of considering the impacts of all decisions on the next seven generations.

Efforts to apply sustainable development are visionary in nature, and require the ability to look at the future with an open mind. Other Strategy Teams have addressed issues where natural resources had been altered or degraded by past human activities in some way and considered actions to restore and protect the resource. In contrast, this Team focused on the current and future human activities to view their impacts on the natural resources and the economic and social well-being of the human community.

The sustainable development issue was evaluated with respect to six categories of human uses of the region's natural resources:

agriculture and forestry;
industrial activities;
land use and development;
recreation, tourism and fishery;
transportation, and;
water infrastructure.

For each category, a workgroup of the Team assembled background information on the status and trends of existing uses, identified sustainable practices, evaluated their potential impacts from economic, ecological and societal perspectives, and recommended actions to promote key sustainable practices in the Great Lakes Basin. An effort was made to include recommendations for actions by all stakeholder sectors (individual/household; private; public/governmental; non-profit).

This Team report provides separate chapters on the evaluations of each of the workgroups. Following this is a discussion on overarching issues, including research and indicator needs. Human health and tribal concerns were integrated into the workgroup chapters. The report concludes with a summary that provides the three major recommendations of the Sustainable Development Strategy Team and a review of key actions.

AGRICULTURE AND FORESTRY

I. Introduction

This paper was prepared to gather information on the status of agriculture and forestry practices in the U.S. portion of the Great Lakes basin, the current application of sustainable practices, and impediments and opportunities to increase the application of sustainable agriculture and forestry practices. The paper supported the identification of action items recommended for implementation through the Great Lakes Regional Collaboration process.

A. Background

In 1995, the breakdown of the four general land use classes in the U.S. portion of the Great Lakes basin was as follows:

- 42% forest;
- 24% agriculture;
- 33% water;
- 1% urban lands.[1]

Agriculture

In 1929, 21.9% of the population was engaged in agricultural activities. By 2002, the percentage dropped to 02.44%. Acreage in agricultural production dropped from 974 million acres to 941 million acres. Despite these statistics, corn production rose from 2,135 million bushels to 9,008 million bushels and wheat from 824 million bushels to 1,616 million bushels. This increase in production and yields is due to the use of technology (i.e., agronomic, seed varieties, mechanical, and biological advances), fertilizers, and pesticides. These advances are the main reason that so few people can produce a surplus of food for a population that more than doubled between 1929 and 2002 (121 million to 288 million). Today the average farmer feeds his family and 125 additional persons.

The increase in the use of technology (i.e., agronomic, seed varieties, mechanical, and biological advances), fertilizers, and pesticides, has helped the transformation of the nation's economy, society, and environment that allows most of the population to pursue other non-farm employment and leisure activities. Further, economic incentives provided in the farm bills help to ensure that farmers can continue to farm, but have driven, in some cases, which crops they choose to plant, how much of different chemicals to apply, and which federal programs to enroll in. These and other factors , such as the ability to detect an active ingredient in part per billion or less, have led to an increase awareness of nonpoint source pollution. Sustainable agricultural practices such as Best Management Plans (BMPs), and integrated pest management programs (that significantly reduce the amount of agricultural chemicals applied) are being utilized and further advanced to address soil erosion, sedimentation, agricultural chemical run-off, species and habitat protection needs.

Forestry

The Great Lakes basin has a long history as a significant producer of forest products. As forests regenerated following depletion of forests in the mid to late 1800s due to unchecked logging and land clearing for agriculture, the forest products industry expanded rapidly. Today the Great Lakes basin has a highly diversified wood-based industry, with substantial activity across a wide spectrum of primary and secondary processing and distribution.

[1] http://www.epa.gov/glnpo/basicinfo.html

Forestland in the Great Lakes basin is a source of timber products that feeds wood-based industries that have a significant impact on sustaining the forest landscape across the basin, and on the vitality of the communities, urban and rural, in each state, particularly in the rural communities where the forests are located. Over 337,000 people are employed in the wood and paper industry in the US Great Lakes Basin. In 2003 the payroll income for the basin was over $17.5 billion, approximately one-third of the forest industry income for the entire US. Well managed forests also produce water, fish, wildlife, recreation and scenic beauty.

Family forest owners own 60 percent of the forestland in the basin, and private wood-based industries forest products industry owns 5 percent. Public ownership is dominated by state, county and municipalities with 23 percent of the basin forestland, and the USDA Forest Service manages 11 percent.[2]

In view of the robustness of the basin's wood-based industry, it is tempting to take it for granted. Despite past successes, however, there appears to be cause for concern about the future. The cost of wood raw materials in the region is now among highest in the world and availability of fast-growth, low-cost, environmentally certified wood raw material is increasing globally.

Most forest harvesting occurs on family forests followed by state and local forestland. Family forest landowners harvest timber, but they don't seek professional assistance to help them plan and conduct the harvest. A timber harvest is the critical time in the life of a forest. Depending on forest type, the harvest determines the condition of the future forest for the next 60 to 100 years, and impacts the water, fish, wildlife, and aesthetics of land for the next 15 to 20 years or longer.

B. Definition of Sustainable Agriculture and Sustainable Forestry

What is Sustainable Agriculture?

There are many different definitions of sustainable agriculture spanning from those that focus on the use of natural fertilizers and farming techniques (usually organic) to those that focus on better management of chemicals in supporting agricultural production. Still others focus on system-based approaches to protecting the environment while ensuring a food supply that can support a growing population.

Definitions commonly cite the necessity of balancing and promoting the three major sustainability values of environment, economy, and society, although some emphasize one of the three sustainability values in particular, usually the environment or economy. The differences reflect the wide range of interests represented by organizations involved in, or concerned with, sustainable agriculture.

Many definitions of sustainable agriculture highlight the importance of maintaining resources for future generations, a theme derived from the broader concept of sustainable development. The definition of United Nation's World Commission on Environment and Development based its definition on a report entitled "Our Common Future," commonly called the Brundtland Report: *"Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*"[3] It defines sustainable agriculture as agricultural and agri-food systems that are economically viable and meet society's need for safe and nutritious food, while conserving or enhancing natural resources and the environment for future generations.[4]

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[2] Sustaining the Future of the Forest Industry in the Upper Great Lakes Region:2004. Found at http://www.lsfa.org

[3] USDA, Office of the Secretary Dan Glickman, Secretary's Memorandum 9500-6 on Sustainable Development, September 13, 1996. Found at http://www.usda.gov/agency/oce/oce/sustainable-development/secmemo.htm

[4] SustainableAg.net, An Educational Resource For Sustainable Agriculture. Found at: http://www.sustainableag.net/glossary_r-z.htm

In the United States, The *Food, Agriculture, Conservation, and Trade Act of 1990 (FACTA)* defines sustainable agriculture as:

> "An integrated system of plant and animal production practices having a site-specific application that will, over the long term:
> 1. Satisfy human food and fiber needs
> 2. Enhance environmental quality and the natural resource base upon which the agricultural economy depends
> 3. Make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls
> 4. Sustain the economic viability of farm operations
> 5. Enhance the quality of life for farmers and society as a whole."[5]

What is Sustainable Forestry?

Definitions of sustainable forestry share themes present in the definitions of sustainable agriculture above, including the preservation of resources for future generations and the importance of balancing environmental, economic, and societal wellbeing. Some focus on sustainability of forests while others focus on the perpetuity of forest yields.

Most accepted definitions draw on the seven criteria adopted during the 1995 Montreal Process Working Group, which included the United States and several other countries with temperate and boreal forests.

> "[Sustainable forest management is] the stewardship and use of forests and forest lands in a way, and at a rate, that maintains their biodiversity, productivity, regeneration capacity, vitality, and potential to fulfill, now and in the future, relevant ecological, economic, and social functions at local, national, and global levels, and that does not cause damage to other ecosystems – note criteria for sustainable forestry include (a) conservation of biological diversity, (b) maintenance of productive capacity of forest ecosystems, (c) maintenance of forest ecosystem health and vitality, (d) conservation and maintenance of soil and water resources, (e) maintenance of forest contribution to global carbon cycles, (f) maintenance and enhancement of long-term multiple socioeconomic benefits to meet the needs of societies, and (g) legal, institutional, and economic framework for forest conservation and sustainable management."[6]

Conclusion

Collectively, the definitions provided here for sustainable agriculture and sustainable forestry demonstrate that these terms are not uniform and static; rather they will continue to develop and evolve over time. The Brundtland Commission expresses this evolution in a summary statement:

> "…in the end, sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with future as well as present needs."[7]

II. Status and Trends

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[5] Public Law 101-624, Title XVI, Subtitle A, Section 1603 (Government Printing Office, Washington, DC, 1990) NAL Call # KF1692.A31 1990]. Found at: http://www.nal.usda.gov/afsic/agnic/agnic.htm

[6] The Dictionary of Forestry (Helms 1998) cited in the National Report on Sustainable Forests 2003 (USDA, FS-766, February 2004). Found at: http://www.fs.fed.us/research/sustain/documents/SustainableForests.pdf

[7] 1987 United Nation's World Commission on Environment and Development, cited in the National Report on Sustainable Forests 2003 (USDA, FS-766, February 2004). Found at: www.fs.fed.us/research/sustain/documents/SustainableForests.pdf

A. Status and Trends in Agricultural Practices

Of the basin's agricultural land, about 65 percent of the farmland is cropland, and approximately 35% of the cropland grows corn. Changing population and land use demands are placing pressures on land use.[8] Areas near metropolitan areas are undergoing significant urbanization, surbanization, and exurbanization as development occurs. A 1996 study by the Great Lakes Commission noted that nearly two-thirds of the farmland in the Great Lakes basin is located within 31 miles (50 kilometers) of medium and large cities. Farmland loss in the U.S. portion of the Great Lakes basin between 1982 and 1997 was more than 4 million acres, representing nearly 49 percent of the total farmland loss for the eight Great Lakes states during this period.

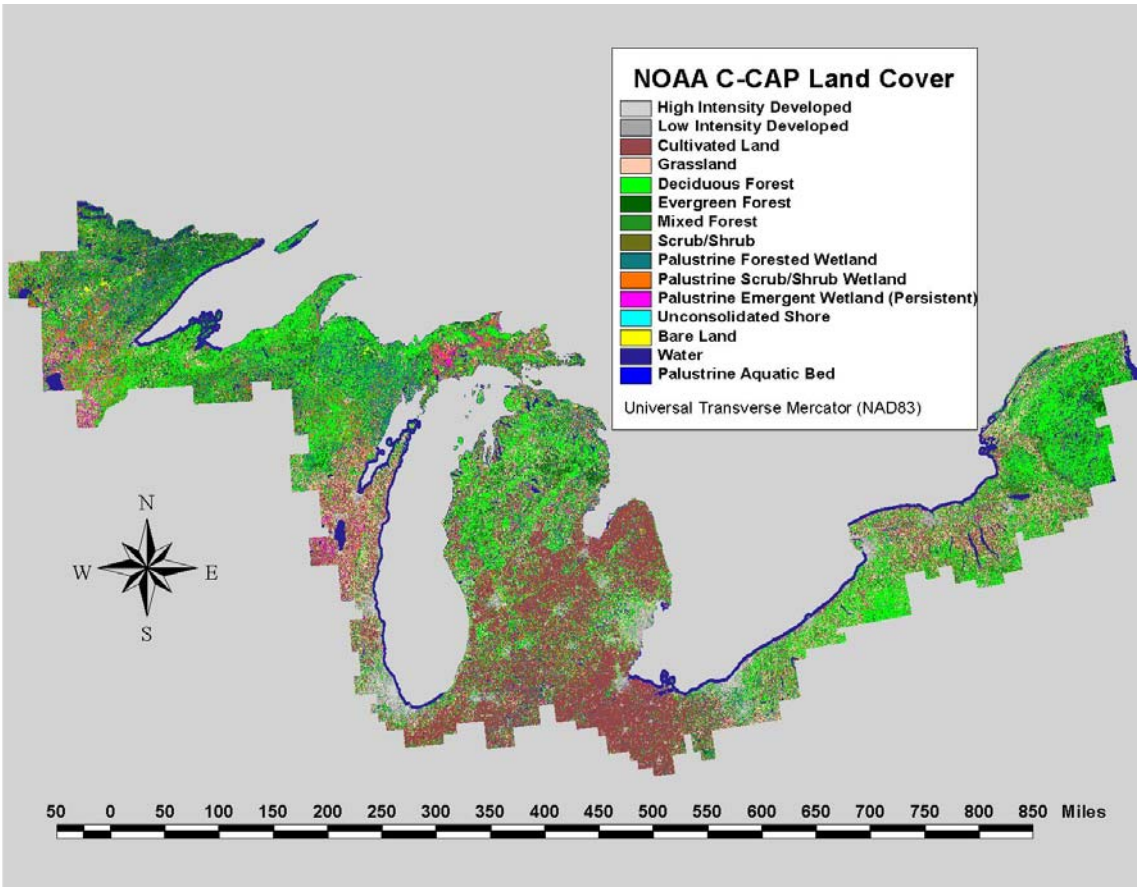

Figure 1 Land Use in the Great Lakes Basin

The Census of Agriculture[9] shows the trend of loss of farmland continuing between 1997 and 2002 in the Great Lakes basin States of Indiana, Michigan, Minnesota, Ohio, and Wisconsin.[10]

- The total number of farms and acres being farmed has decreased slightly in the Great Lakes region. Farm losses are usually concentrated in coastal and existing urban areas where the value of land is increasing at a faster rate than in more rural areas. The total cropland decrease in Indiana, Michigan, Minnesota, New York, Ohio, and Wisconsin was 10,558 acres.

[8] http://atlantic.evsc.virginia.edu/regionalization/kbs/docs/great_lakes.htm
[9] http://151.121.3.33:8080/Census/Create_Census_US.jsp
[10] Illinois and Pennsylvania were excluded from the analysis due to the limited acreage in production in the Great Lakes basin portions of each state

- The number of small (between 10 and 49 acres) and large farms (over 1000 acres) increased while the number of mid-sized farms (between 501 and 999 acres) decreased. The number of farms over 1000 acres increased as larger, corporate farming is becoming more prevalent in the region. Smaller, so-called "hobby farms," of between 10 and 49 have increased in number. These smaller farms are more likely to use organic farming techniques, which use fewer chemical pesticides and fertilizers for crops, and to use grazing and small scale animal operations.
- The number of acres of irrigated land increased between 1997 and 2002. However, the total percentage of irrigated farms is just over 2% of all acres farmed.

The practice of no-till farming, i.e., leaving soil undisturbed from harvest to planting, became more prevalent throughout the 1990s as information about the method and its benefits spread through education. The percentage of no-till farms, however, reached a plateau in the 2000s.[11] (See table below for national figures.) No-till is most effective in regions with harsh winters because persistent freezing temperatures serve to control pests (i.e., weeds, disease, and insects). When milder winters occur, the no-till method fails to control pests. The practices of no-till farming and integrated pest management (IPM) are often a trade-off because tilling sufficiently reduces pests to the point where IPM is effective, i.e., no supplementary pesticides or herbicides are necessary.[12]

1990-2002
Conservation Tillage Trends
(Millions of Planted Cropland Acres)[13]

Tillage System	1990	1992	1994	1996	1998	2000	2002
No-Till/Strip-Till*	16.9 (6.0%)	28.1 (9.9%)	38.9 (13.7%)	42.9 (14.8%)	47.8 (16.3%)	52.2 (17.6%)	55.3 (19.6%)
Ridge-till*	3.0 (1.1%)	3.4 (1.2%)	3.6 (1.3%)	3.4 (1.2%)	3.5 (1.2%)	3.3 (1.1%)	2.8 (1.0%)
Mulch-till*	53.3 (19.0%)	57.3 (20.2%)	56.8 (20.0%)	57.5 (19.8%)	57.9 (19.7%)	53.5 (18.0%)	45.0 (16.0%)
Conservation Tillage Subtotal	**73.2 (26.1%)**	**88.7 (31.4%)**	**99.3 (35.0%)**	**103.8 (35.8%)**	**109.2 (37.2%)**	**109.1 (36.7%)**	**103.1 (36.6%)**
Reduced-till (15-30% cover)	**71.0 (25.3%)**	**73.4 (25.9%)**	**73.2 (25.8%)**	**74.8 (25.8%)**	**78.1 (26.2)**	**61.3 (20.6%)**	**64.1 (22.8%)**
Intensive-till (<15% cover)	**136.7 (48.7%)**	**120.8 (42.7%)**	**111.4 (39.3%)**	**111.6 (38.5%)**	**106.1 (36.2)**	**127.1 (42.7%)**	**114.3 (40.6%)**
All Planted Acres	281.0	282.9	283.9	290.2	293.4	297.5	281.4

Perennial crops are frequently cited as an effective soil conservation technique, however, they are not an attractive option for farmers, who receive no financial return on planting them. Perennial crops do not generate sales and do not receive commodity supports, therefore, farmers have an economic disincentive to plant them.[14]

Recent interest and investment in technology that uses ethanol as a replacement for hydrocarbon fuels has raised the issue of the sustainability of corn farming. Debate continues over whether sustainable methods of corn production would be sufficient to meet potential demand if ethanol replaces hydrocarbons. If the

[11] Personal Communication with Jane Frankenberger, Purdue University
[12] Personal Communication with Gerald Winn, USEPA
[13] http://www.ctic.purdue.edu/Core4/CT/CTSurvey/NationalData.html
[14] Personal Communications with John Dutra, Mid America CropLife Association, and Gerald Winn, USEPA

ethanol industry grows, it will likely create new incentives to plant corn and maximize yield by increasing the use of fertilizer.[15]

Use of chemical fertilizers, pesticides, and herbicides help provide healthy crops and larger harvests of inexpensive food. It is critical that these products be handled, used, and disposed of to prevent negative impacts on water resources and aquatic habitats. Instructions for doing so and the specific application quantities and methods approved by U.S. EPA are detailed on pesticide/herbicide product labels. Failure to follow these instructions can result in nutrient enrichment of ground and surface waters and pesticide runoff contamination. Some of this can also be due to poor drainage management. "Subsurface drains have been found in numerous studies to increase losses of nitrate-N through the enhanced leaching of the soil profile (as reviewed by Gilliam et al., 1999), and there is a critical need to evaluate the potential of improved drainage water management systems to reduce nitrate loads." There are programs in operation and under development that will assist farmers in better managing pesticide and water management.[16]

Ongoing controversy surrounds the widespread use of atrazine as an herbicide and the increasing use of genetically modified seeds. The potential for water contamination prompted the regulation of atrazine in 1992 with both the Maximum Contaminant Level Goal (MCLG) and Maximum Contaminant Level (MCL) being set at 3 parts per billion (ppb). Public water supplies have also been required to collect water samples every three months for one year and test for atrazine. If atrazine was above 1ppb, then testing had to be continued every three months. If atrazine was above 3ppb, then the water was treated with granular activated charcoal. Since atrazine's regulation, only licensed applicators may purchase and apply the herbicide.[17] Genetically modified seeds hold the promise of reducing or eliminating the need for pesticides as the seeds are bred to enhance natural resistance to pests and diseases. The disadvantage of this development is a loss in genetic diversity and the possible unforeseen concentration of undesirable or detrimental crop characteristics.[18]

The research conducted for this paper did not identify data characterizing the extent of BMP applications in the Great Lakes basin. However, the following two subsections identify the range of BMPs applicable to the agricultural and forestry sectors. In addition, the number of acres placed into the Conservation Reserve Program provides an indication of the extent of conservation practices observed in the basin.

The Conservation Reserve Program (CRP) is a voluntary program for agricultural landowners. Through CRP, farmers receive annual rental payments and cost-share assistance to establish long-term, resource-conserving covers on eligible farmland.[19] The Commodity Credit Corporation (CCC) makes annual rental payments based on the agriculture rental value of the land, and it provides cost-share assistance for up to 50 percent of the participant's costs in establishing approved conservation practices. Participants enroll in CRP contracts for 10 to 15 years.

The program is administered by the CCC through the Farm Service Agency (FSA), and program support is provided by Natural Resources Conservation Service, Cooperative State Research and Education Extension Service, state forestry agencies, and local Soil and Water Conservation Districts.

The cumulative number of acres in CRP in the Great Lakes States are summarized below.

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[15] Saturday Noon Show, WGN-Radio, AM-720, April 2, 2005 and other assorted recent news reports.
[16] United States Land Grant Colleges and Universities Great Lakes Regional Water Program, http://www.uwex.edu/ces/regionalwaterquality/FocusAreas/agriculture/npm.htm
[17] http://www.epa.gov/safewater/dwh/c-soc/atrazine.htm
[18] Personal Communication with Gerald Winn, USEPA
[19] http://www.fsa.usda.gov/dafp/cepd/crp.htm

Table 2. Cumulative CRP Acreage Enrollment through FY 2003[20]

State	*Total Acres*
Illinois	975,216
Indiana	298,520
Michigan	309,724
Minnesota	1,714,180
New York	60,676
Ohio	301,531
Pennsylvania	133,930
Wisconsin	640,340

In addition to the CRP, scores of other federal resources are available to support BMP and other sustainable practice implementation. These resources are cataloged at http://cfpub.epa.gov/fedfund.

B. Status and Trends in Forestry Practices

Forest Resources

Forestland ownership is divided into private and public. Private forestland is split into family forest and industrial ownerships. A family forest landowner is a private landowner who does not operate a wood-using plant; these landowners own 60 percent of the forestland in the basin. Private landowners with wood-based industries own 5 percent of the basin's forestland. Public ownership is dominated by state and local ownership with 23 percent of the basin's forestland, and the USDA Forest Service manages 11 percent with other federal ownership totaling 1 percent.

Forest type is a forestland classification used in making forest management decisions. There is a gradual transition from fast growing forest types, dominated by early successional aspen-birch, to slower growing forest types, similar to late successional maple-beech-birch forest type (primarily sugar maple). The bulk of these shifts occurred between the 1950s and 1980s, and recent trends show slower rates of change. Maple-beech-birch is the most common forest type with 37 percent total forestland, and aspen-birch, oak-hickory, and spruce-fir are the next most common. Age structure and composition data suggest a continuation of current cover type trends for some time to come. Between 1980 and 2000, the large-diameter forest acres increased by 30 percent, medium-diameter forestland decreased by 15 percent, and small-diameter forestland increased by 9 percent.[21]

Wood-Based Industries

Wood-based industries have a significant impact on sustaining the forest landscape across the basin, and on the vitality of the communities, urban and rural, in each state, particularly in the rural communities where the forests are located. This vital industry contributes employment and income as well as products to help meet local demand.

Most forest harvesting occurs on family forests followed by state and local forestland. National Forests harvest very little timber. Forests in the basin are growing 3 times more wood than is harvested. If we factor in natural tree mortality, we are growing 1.5 times more wood than we harvest. Over the past 50 years, the total volume of wood in the basin has increased steadily because growth has consistently exceeded harvest and morality. As forests continue to mature, the annual rate of growth is expected to be slower in the next 50 years. Nevertheless, at the anticipated rates of growth and removals inventories of hardwoods and softwoods are projected to increase through 2050.

[20] U.S. Dept. of Agriculture, Conservation Reserve Program Fiscal Year 2003 Summary, November 2004.
[21] USDA Forest Service, North Central Research Station, Forest Inventory and Analysis plot data.

One of the more interesting developments in forestry over the past several decades has been the rapid establishment of large areas of tree plantations around the world. Wood from these plantations is typically low-cost and is often certified as produced on sustainable forests. Substantial volumes of plantation wood will enter wood markets within the next one to two decades. In the five-year-period between 1995 and 2000, the percentage of global wood harvest obtained from plantations rose from 12 percent to 23 percent, and this figure is expected to rise to near 45 percent by 2020.

Over the short term, it is likely that low-cost wood fiber from these plantations will flow to existing manufacturing centers around the world. Over the longer term, capital for establishment and modernization of manufacturing facilities is likely to shift toward regions having the lowest manufacturing costs. While raw material cost alone does not define manufacturing costs, the significance of this factor in the forestry sector is large; as a result, regions characterized by high wood costs will need to focus on reducing costs associated with other factors of production or providing increased value in the supply chain in order to remain competitive.[22]

Forest Certification's Role in Forest Sustainability

In the past 10 years, forest certification has played a significant role in ensuring that forest-types in the US and Canada are being managed sustainably by measuring forest management related variables and reporting publicly the results. Several forest certification programs contribute to the increasing forest area under responsible management in the great lakes basin, including the American Forest & Paper Association's Sustainable Forestry Initiative® (SFI) program, Canadian Standards Association, Forest Stewardship Council, and the Tree Farm System. These forest certification programs have common elements that focus on ensuring the principles of sustainable forestry are maintained through a system of performance measures and indicators. Various analysis have been carried out on the similarities and differences of the programs, essentially finding that, scientifically, there are no real differences in the environmental and silvicultural practices required by participants.

Some certification programs, such as the SFI and Tree Farm, ensure that harvests are done by loggers trained in sustainable forestry practices and follow Best Management Practices. SFI participants, who have the greatest presence in the basin, must additionally invest in research within the realm of forestry and share their technology and stewardship knowledge with non-industrial private landowners who own most of the forestland in the U.S.

Under the SFI Program alone, more than 14.3 million acres are enrolled in the lake states of IL, IN, MI, MN, NY, OH, PA, and WI. Additionally, there are 8.4 million acres enrolled under the SFI program in Ontario.

Family Forest Owners

Forest parcel size and fragmentation are two forest ownership characteristics that impact management and use of family forestland. Forest parcel sizes are getting smaller and the number of forest landowners is increasing. Fragmentation occurs when large blocks of continuous forestland are broken into smaller blocks of forestland surrounded by non-forestland uses.

As family owned forests decrease in size and are fragmented, they are less likely to be harvested for forest products, and they will also decrease in water, fish, wildlife, and recreation production. Today, 95 percent of the family forest landowners in the basin own less than 100 acres of land. They control 62 percent of the family forestland. The primary reasons they own forestland are aesthetics, privacy, nature

[22] Sustaining the Future of the Forest Industry in the Upper Great Lakes Region:2004. Found at http://www.lsfa.org

protection, family legacy, and hunting and fishing. Their least common reason for owning forestland is timber production. When asked, these same family forest landowners listed a timber harvest as one of the highest recent (past 5 years) activities they have done on their land. Finally, when they harvest timber or do anything else on their land, only 3 percent have a written management plan and only 12 percent seek professional forestry advice.

Family forest landowners harvest timber, but they don't seek professional assistance to help them plan and conduct the harvest. A timber harvest is the critical time in the life of a forest. Depending on forest type, the harvest determines the condition of the future forest for the next 60 to 100 years, and impacts the water, fish, wildlife, and aesthetics of land for the next 15 to 20 years or longer.

Urban and Community Forestry

Urban and community forests, whether growing in a yard or on public land (street and park), add beauty to the city or town and also produce environmental benefits. Environmental benefits include energy savings, storm water runoff reduction, and air pollutant uptake.

A model simulation using costs from Minneapolis, MN arborists, tree growth curves, regional climate, building characteristics, air pollutant concentrations, and prices was recently completed to determine economic benefits of different size trees for the Upper Midwest. Average annual net benefits (benefits minus costs) per computer grown tree for a 40-year period were:

- $3 to$15 for small tree
- $4 to $34 for a medium tree
- $58 to $76 for a large tree

Benefits associated with energy savings and property value accounted for 80 percent of the estimated savings. Rainfall interception (which reduces storm water runoff), atmospheric carbon dioxide reductions, and improved air quality were the next most important benefits.

Urban and community forest planting should focus on large trees, where space is available. For energy usage reduction, trees located opposite west-facing walls provide the greatest net heating and cooling energy savings.[23]

III. Obstacles to Implementing Sustainable Agriculture and Forestry Practices

The following section outlines several impediments to the achievement of sustainable practices.

A. Obstacles to Implementing Sustainable Agriculture

Watershed Planning

One view on adopting sustainable agriculture in the Great Lakes basin is that it will require adopting an integrated, watershed-based approach to the application of sustainable agricultural practices and the measurement of their effects. The current approach, which is organized by state and county, does not allow managers to determine whether and how sustainability efforts (e.g., erosion control, filter strips, and nutrient management planning) impact water quality in tributaries and lakes (e.g., sediment load, chemical and microbial concentration). While NRCS data is broken down by watershed, it is only available by eight-digit HUC, which is an insufficient level of detail for managing and measuring watershed quality.[24]

[23] Personal Communication with Jill Johnson, USDA Forest Service
[24] Personal Communication with Gerald Winn, USEPA

Agricultural Price Supports

Agricultural price supports, or subsidies, are intended to provide farmers with sufficient income to ensure the long-term survival of agriculture in the United States so that there are sufficient supplies of inexpensive food for the nation's population.

There is a belief that government agricultural subsidies often help perpetuate unsustainable practices. Among the criticisms are:

- Subsidies often stimulate greater use of chemical inputs, despite their environmental and public health harms. Farmers will use more fertilizers and insecticides to grow crops that receive higher subsidies to increase yields.
- Farm subsidy programs often fail to reward good stewardship by focusing on a handful of major crops and "put resource-conserving crop rotations at a financial disadvantage"[25]. Farmers receive no government incentives for sustainable practices such as growing clover or alfalfa to enhance soil fertility.
- Government-funded research perpetuates chemical-intensive agriculture. Only 34 of the 30,000 agricultural research projects on the USDA's Current Research Information System for 1995 had a strong organic focus. [26]

Subsidies have created incentives that sometimes interfered with more traditional farming strategies for preserving land such as rotational planting. Rotational planting methods have been used as part of traditional farming methods to sustain lands over a long period of time. This means that a farmer plants several crops such as corn, beans, hay, wheat, and other crops in different fields each year, rotating them annually or over a period of years. When crops such as corn and wheat were given more favorable treatment under price support programs, there was less incentive to rotate to crops that had less intensive negative effects or positive effects on land.

Subsidies may also create a disincentive to use certain best management practices. For example, conservation tillage tends to increase the variability in yields on acreage. This can be offset by a reduction in cost for conservation tillage relative to traditional tillage. However, there may be less incentive to use conservation tillage because subsidies are based on average yield.[27] Using conservation tillage can, therefore, decrease the amount of subsidies that a farmer can obtain from the federal government.

Subsidies are currently under scrutiny due to the belief that they violate international trade rules. A potential replacement for programs that subsidize specific crops is one that provides monetary incentives for farms that utilize sustainable agricultural practices.[28]

Bank Financing Requirements

In order to secure a loan, some banks and financial institutions require farm operations to enroll in specific federal programs that guarantee price supports and are linked to higher yields. This encourages increased use of fertilizers and pesticides that farmers might otherwise not engage in. Further, these

[25] Faeth P, Westra J. Alternatives to corn and soybean production in two regions of the United States. In: Agricultural Policy and Sustainability: Case Studies from India, Chile, the Philippines and the United States. Washington, DC:World Resources Institute, 1993, quoted in "How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture". (see below)

[26] Leo Horrigan, Robert S. Lawrence, and Polly Walker, "How Sustainable Agriculture Can Address the Environmental and Human Health Harms of Industrial Agriculture," Center for a Livable Future, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland, http://ehp.niehs.nih.gov/members/2002/110p445-456horrigan/horrigan-full.html

[27] Personal Communication with Gerald Winn, USEPA

[28] Personal Communication with Gerald Winn, USEPA

institutions sometimes require the purchase of specific equipment that might not be compatible with sustainable agriculture.[29]

The Increase in Concentrated Animal Feeding Operations

Animal feeding operations in the Great Lakes basin have tended to become more concentrated, allowing for more concentrated collection of animal waste products. If poorly controlled, these concentrations of waste products can contaminate surface and ground waters, cause odor problems, and serve as a source of infectious disease. For example, past manure management practices tended toward field application of waste products at all times of the year, resulting in contaminated runoff to rivers and streams. Current best practice calls for the collection of animal waste in lagoons and field application of the manure only at appropriate times of the year as natural fertilizer.[30]

Concentrated Animal Feeding Operations (CAFOs) are generally defined as facilities that have 1000 or more animal units (see full definition below). These CAFOs must have a wastewater discharge permit. Farms with fewer than 1000 animal units are not required to have a waste discharge permit under Federal regulations, but some States may choose to regulate these smaller operations.

CAFOs have become more common due to the increased demand for meat products and because it keeps the price of these meats sold to consumers low. Costs per animal are generally lower, but the potential for environmental harm increases. Traditional animal farms do not have a concentration of animals on the farm. Animals are allowed to roam and graze over a larger area and waste is dispersed over this larger area over a longer time period.

The number of cattle farms and cattle sold decreased between 1997 and 2002. The number of hog farms decreased by almost 22%, but the total number of hogs sold increased by over 28%. This indicates that there was an increase in larger hog farms, but a decrease in the number of cattle and calves and farms holding cattle. Similarly, the number of poultry farms increased by over 55% and the number of broiler poultry sold increased by just over 13%. The average number of total poultry sold per farm decreased from over 37,000 to almost 27,000. Still the average number of cattle sold per farm increased from 34 to 45 over that 5-year period and the average number of hogs sold per farm increased from 948 to 1,552.[31]

A watershed-based approach at a sufficiently refined level is necessary – particularly in the Great Lakes basin – to measure and prove success rates, and thereby to justify further expenditures toward implementing BMPs. In areas with fewer CAFOs, data are undisclosed in order to protect CAFO identity and privacy. This further hinders efforts to accurately measure and address contamination sources by watershed.[32]

Measuring Environmental Effectiveness of Outreach Programs

One issue raised by several workgroup participants is that there is a need for a more effective measurement of environmental effectiveness of federal outreach programs. NRCS organizes its effective outreach efforts by county, but this county-based approach creates difficulties in measuring environmental effectiveness. This is because environmental effectiveness is best measured on a watershed basis. If funding priorities were based on watersheds, they would allow the programs to more effectively target environmental programs.

[29] Personal communication with Jack Dutra
[30] Personal Communication with Gary Overmeier, Great Lakes Commission
[31] Census of Agriculture, http://151.121.3.33:8080/Census/Create_Census_US.jsp
[32] Personal communication with Gerald Winn, USEPA

Concentrated Animal Feeding Operation (CAFO): An animal feeding operation (AFO) that has the potential to discharge pollutants into surface water and that meets one of the following criteria:

- Contains more than 1,000 animal units;
- Contains 301-1,000 animal units and discharges pollutants through a man-made device (e.g., pipes, ditches, drains) directly into a water body, or discharges into a surface water drainage course passing through the operation;
- Is designated a CAFO after a site inspection determines that the operation is or has the potential to be a significant polluter, no matter its size.

Regardless of its size, an AFO is not a CAFO if it is managed so that it will not discharge pollutants except in the case of a 25-year, 24-hour storm event

Animal Units: An Animal Unit (AU) is a unit of measurement used by EPA and USDA to measure the size of animal feeding operations. The number of animal units is one of the factors used to determine if an operation should be considered a concentrated animal feeding operation (CAFO). An AU is equal to approximately one beef cow. Therefore, 1,000 beef cows equal 1,000 AU. There are multipliers for other types of animal feeding operations. For example, 1,000 AUs equal 700 mature dairy cows, 2,500 swine, 10,000 sheep, 55,000 turkeys and between 30,000 and 100,000 laying hens or broilers depending on the animal waste management system.

Federal Program Disincentives

Federal programs often have conflicting incentives that may not encourage sustainable farming. For instance, there are programs that encourage the maintenance of water quality such as conservation and BMP programs. These incentives do not coincide with programs that encourage productive farming, such as price supports and subsidies. Further, even programs that encourage sustainability are often not coordinated and create confusion regarding integration.[33]

There are often financial disincentives for farmers to enroll in conservation programs. Under the 2002 Farm Bill, the Conservation Reserve Program (CRP) provides farmers with income for easements that farmers use to supplement their income and also to reduce their tax burden. In several states, there is a different tax rate for agricultural and unplanted land. In states without this distinction, there is no tax incentive to allow easements because farmers pay the same property tax rate whether they plant or not.

The Farmland Preservation Program has potential to encourage more sustainability, but the program is slow to gain momentum. Under the program, counties put together boards to review applications – they pay 30-50% of shared cost. Grant money goes to states to cost-share with local governments to buy development rights to former farmland, but cost-sharing is still expensive because the local community may not have the resources for the program. Further, the process of approval can be lengthy as a farmer goes from the local, to the county, to the federal approval processes.[34]

Public Education

There are significant outreach efforts through NRCS and state extension services, but there is likely need to provide additional resources to educate farmers and the public regarding sustainable agricultural practices. Specifically, some of the problems related to education and outreach include the following:

- Some farmers need more hands-on assistance with implementing the practices;
- Some assistance agents (for such organizations as NRCS and State Extension Services) providing assistance do not have the necessary time to assist farmers who need the additional assistance;

[33] Personal communications with Gerald Winn, USEPA, Jack Dutra, Mid America Crop Life Association, Larry Clemens, The Nature Conservancy

[34] Personal communication with Gerald Winn, USEPA

- Some farmers do not have the resources to purchase the necessary equipment to implement the practices.[35]

Education alone, without addressing the incentives for agricultural sustainability, cannot change practice. It is, however, a part of a broader process of change and adjustment.[36]

B. Obstacles to Implementing Sustainable Forestry

Wood-Based Industries

There are a number of positive factors favoring continued health of wood-based industry. Among these are a positive forest growth and harvest ratio across the basin, highly educated work force, stable economy, favorable location relative to major North American markets, and likelihood of significant growth in wood products consumption in the U.S. and Canada as well as offshore.

In view of the robustness of the basin's wood-based industry, it is tempting to take it for granted. Despite past successes, however, there appears to be cause for concern about the future. The cost of wood raw materials in the region is now among highest in the world and availability of fast-growth, low-cost, environmentally certified wood raw material globally is increasing.

Issues of concern that are obstacles to application include the following:

1. **Fiber Supply:** The inconsistent, unpredictable wood supply from public land leads to increased dependence upon private forest lands; ever-increasing stumpage fees and the short supply of certain species challenge retooling of manufacturing.
2. **Research:** It is necessary to study the opportunities for value-added forest products and products that can be made from later successional, higher-cost wood to help industry find a market niche for these products. Applied research is needed for renewable and alternative energy systems.
3. **Land Use Planning:** Though the basin has increased focus on wise land use planning, the value of forests and forested landscapes is mostly ignored in land use planning with few notable exceptions. Furthermore, the lack of alternate plans to address urban development pressures places increasing pressure on timberland cost and benefit equations for small and large woodland owners.
4. **Certification:** The lack of access to wood from certified forest lands denies access for local companies to customers who must verify their sustainability commitment to their own customers. The high cost or lack of access to certification for a range of ownerships is the root cause of this concern.
5. **Education and Outreach:** Consumers are driven by cost and there remains an undercurrent of distrust between many consumers and the forest products industry, even though the industry has by and large embraced sustainable forest management. Consumers allow themselves to believe the forest resource is declining and misunderstand the concept of renewable forests. Consumers seldom seem willing to pay for enhanced working conditions and benefits or environmental protection. The industry has not been effective in its public relations efforts. Few understand the concepts of sustainable forest management.
6. **Transportation:** The inconsistencies in regulatory policy among the states from weight limits to bridge specification, the deteriorating rail infrastructure and lack of a competitive structure to rail and inadequate intermodal systems raise production costs. Existing truck systems may introduce invasive species, which present a cost to forest health and production.[37]

Family Forests Owners

[35] Personal Communication with Larry Clemens, The Nature Conservancy
[36] Personal Communication with Larry Clemens, The Nature Conservancy
[37] Sustaining the Future of the Forest Industry in the Upper Great Lakes Region: 2004. Found at: http://www.lsfa.org

Continued health of local wood-based industry is important not only from an economic standpoint, but from a sustainability perspective as well. The availability of harvest options to forest managers, and thus local markets for wood, is essential for long-term sustainability of the basin's forests. The interconnectedness of the economic and environmental components must be understood. Having a robust forest industry in the Great Lakes basin reduces incentive to further subdivide and develop forest lands, which facilitates forests producing water, non-timber products, fish and wildlife, scenic beauty, and a place to recreate. The incentive to convert forestland to alternative uses is reduced because landowners can achieve a reasonable income through sustainable forest management.

Furthermore, having markets for the full range of products, from saw timber to pulp, encourages landowners to manage their forest for the long-term. A range of commercial options is available to landowners, which reduces the incentive for landowners to "high-grade" (destructively cut) forests for their immediate log value, at the expense of the future forest.

In addition, the fact that forests in the basin have considerable value associated with their wood products provides incentives for landowners to expend resources to address threats to the long-term ecological condition of the forest, such as the spread of invasive species.

Family forest owners need education, technical assistance, and incentives to help them implement practices that bring benefits not only to themselves, but also to the general public. There are critical times in a forest's growth that family forest landowners need assistance to maximize their own benefits and benefits to the public:

1. Regenerating a forest after a fire, windstorm, or harvest.
2. Keeping the forest healthy so it can sustain stresses such as drought, insects, diseases, and invasive plants.
3. Professional assistance during a harvest not only protects water, wildlife, and soil, but it also increases landowners' profit from the sale.

Urban and Community Forestry

City and town administrators need education, technical assistance, and incentives to help them plan, plant, and maintain their forests. Even though they don't have timber harvests, they can utilize the wood when they remove trees or when a windstorm blows them down. The sources of urban and community forestry financial and technical assistance are also decreasing. One difference for cities and towns is that they have non-governmental organizations and private volunteers that can do some the work needed, especially in larger cities.

IV. Recommended Actions

A. Recommended Actions for Sustainable Agriculture

1. The federal government should modify existing agricultural price support programs to encourage the use of sustainable practices such as conservation tillage and crop rotation.
2. State governments should review their tax laws to encourage the use of easements for environmental buffers and other practices that are considered sustainable.
3. Animal feeding operations should adopt practices that produce no measurable runoff into streams and tributaries.
4. More resources should be made available through loan and grant programs that assist farmers in converting to sustainable agricultural practices.
5. Environmental reporting and assessment should be required at the watershed, not county, level. Existing county-based programs should coordinate on a watershed basis to better prioritize funding decisions.

B. Recommended Actions for Sustainable Forestry

Wood-Based Industries

Certification, bio-energy, and transportation are three key issues that need immediate attention and can be implemented in the short-term.

1. Certification actions.
    - Establish a certification task force to develop core standards.
    - Conduct a pilot on family forest lands that is cost effective and has support from legislation and incentives.
    - Conduct a U.S National Forest pilot project.
    - Invest in a Master Logger Program.
2. Bio-Energy Actions
    - Implement a regional Bio-Energy Task Force that includes energy, environmental protection, and pollution control at state and federal levels, U.S. Forest Service, local energy companies, legislative bodies, research organizations, as well as diverse forest resources representations.
    - Identify barriers to biomass energy production, appropriate regulations, and incentives for improved energy cleanliness and efficiency.
    - Consider the role of many wood-based industries who already are producing all their energy from mill waste.
    - Consider the assignment of carbon credits.
    - Consider the potential of energy farms.
    - Research and evaluate the economies of scale, regulatory barriers, incentives, and transportation efficiencies needed for co-generation.
3. Transportation Actions
    - Conduct a coordinated transportation policy analysis that is multi-sector with public involvement that brings regional harmony regarding road, water, and rail.
    - For road transportation address weight limits.
    - For rail transportation encourage competition to improve services and lower costs, add more tracks, spurs, and cars.
    - For water transportation, seek appropriations to improve port facilities.

For long-term actions, seek opportunities to maintain competitiveness, although operational changes will likely be needed, particularly on the part of commodity producers. Possible strategies include focusing to a greater extent on supply chain advantages stemming form proximity to major markets, shifting a greater portion of production from commodity to specialty products, and streamlining all aspects of business operations. Other strategies might involve actions to expand availability and predictability of locally available wood supplies, reducing barriers to importation of wood raw materials, or further developing technologies for using agriculturally derived fiber in combination with wood.

Family Forest Owners

Actions that maintain and improve wood-based industries would also prevent some of the reduction in owner size, prevent poor harvesting practices, and increase good forest management. These actions would primarily help landowners with more than 100 acres of land. Landowners with less than 100 acres would be less likely to be motivated by income from timber sales because harvests occur at too long an interval to be an incentive for them.

Family forest owners with less than 100 acres will benefit from more education, technical assistance, and financial incentives. They need to know the forester or some other natural resource professional that will help them make the decisions necessary to maintain a healthy, productive forest that meets their needs

and society's. This service will not come through the traditional one-on-one technical assistance provided for landowners in the last century. The new model will combine federal, state, and local governments with private industry, non-governmental organization, and private individuals, working together on a watershed or another identifiable feature on the landscape. They will work together to keep forests healthy so they can reach their individual goals.

Urban and Community Forestry

Cities and towns need education, technical assistance, and financial assistance to manage their forests, but most of them do not have the financial resources to hire the technical assistance they need to keep their forests healthy. The *Midwest Community Tree Guide: Benefits, Costs, and Strategic Planting* is a tool that can help cities and towns demonstrate the benefits of planting and managing their forests. Armed with this information, cities and towns can guide their planning and motivate their volunteers and other partners.

V. Cross Cutting Issues

Cross-cutting issues within the Sustainable Development Strategy Team are:

- Land use and development
- Agriculture
- Industrial activity
- Transportation
- Water supply
- Recreation, tourism and fishery

Cross-cutting issues with other Issue Area Strategy Teams are:

- Nonpoint Source Strategy
- Invasive Species Strategy
- Habitat/Species Strategy

Forestry			
Status/Sustainability	**Challenges/Trends**	**Cross-Cutting**	**Recommendations**
Economy Future of Wood-Based Industries	Cost of wood raw material, certified wood, land use planning, education and outreach, and transportation.	Industrial activity, transportation.	Certify forests, establish bio-energy, improve transportation.
Environment Harvesting timber. Regenerating forests. Healthy forests.	Professional forestry assistance to family forest owners. Forest parcel size and fragmentation	Land use development, water supply, and Recreation	Methods to Educate, assist, and help them manage their land.
Society Wood products they need. Healthy forests, water, wildlife, fish, recreation, and scenic beauty.	Poor timber harvests. Small parcel size and fragmented forests	Land use and development and recreation.	Methods to educate, assist, and help family forest owners manage their lands.

INDUSTRIAL ACTIVITIES

I. Principles of Sustainable Development for Industrial Activity

Gro Harlem Bruntland, 1987. Our Common Future: The World Commission on Environment and Development: "Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs."

Industries committed to sustainable development will:

- Foster the health and safety of employees in the industry and provide healthy, safe, and environmentally sound operations and products.
- Continue industry, worker, citizen information exchange and provide equal input on decisions affecting public, occupation, environmental health.
- Promote support for workers in transition due to sustainable production.
- Conduct business with high ethical standards in their dealings with employees, customers, suppliers, and the community.
- Demonstrate social responsibility by promoting values and initiatives that show respect for people and communities.
- Embrace the goal to reduce reliance on fossil fuels and mined resources, make greater use of renewable energy sources, and conserve other natural resources whether they originate within or outside of the basin.
- Have active Environmental Management Systems (EMS) that include risk assessment and risk management principles.
- Adopt "the continuous application of an integrated preventive environmental strategy to processes, products, and services to increase efficiency and reduce risks to humans and the environment" (United Nations Environment Programme UNEP).
- Commit to Design for the Environment (DFE). Promote cost-efficient best management practices for and design of infrastructure so as to minimize the harmful impact of human activity on the environment and maximize cost-saving.
- Develop corporate eco-literacy and systemic thinking capabilities.
- Engage stakeholders and independent third parties in constructive dialogue to help implement sustainable development.
- Build on knowledge of sustainability and willingly share it with others.
- Emphasize innovation as it is important not only for industry but for all regional stakeholders to improve practices and products to achieve sustainability.
- Develop an effective approach to governance where policies are established and executed with a mix of command and control, voluntary initiatives and economic instruments.
- Support a regional approach to sustainable development as it leads to a competitive advantage knowing that sustainable development opportunities and activities are not constrained by regional boundaries.

II. Defined Major Industries Included in this Document

- Food
- Textile
- Apparel and other textile products
- Lumber and wood products
- Furniture and fixtures
- Paper and allied products
- Printing and publishing

- Chemical and allied products
- Petroleum and coal products
- Rubber and misc. plastic products
- Leather and leather products
- Stone, clay and glass products
- Primary metal industries
- Fabricated metal products
- Machinery, except electrical
- Electric and electronic equipment
- Energy production
- Transportation equipment
- Instruments and related products
- Automotive manufacturing

III. Defined Issues, Sustainable Practices in the Region and Barriers to Sustainable Development in the Industrial Sector

A. Eco-system realities

Past industrial practices for some industries in the region have reduced the productivity of the region's natural resources upon which business and industry rely to create their products. Invasive species impact water quality and infrastructure operations, land use practices impact sedimentation of navigable waterways impairing transportation of goods, hazardous waste management practices impact groundwater quality, fossil fuel use impacts both air and water quality, as well as environmental and public health. Mining depletable resources without a strategy to recover the products containing those resources for re-use further degrades the natural resource base of the Great Lakes region and impacts the profitability of businesses that rely on those resources. The multitude of stressors on our regional environment is also taking its toll on our regional biodiversity as well, with consequences that are difficult to predict but certain to occur.

Sustainable business practices must address land, air and water restoration issues, while concurrently transitioning to advanced strategies of resource use, to ensure continued opportunities for sustainable economic growth and to preserve the quality and productivity of the natural resource base. Information to enhance corporate change and transition policies is crucial, therefore a robust system of informational feedback loops will be extremely important to allow coordinated exchange of information between scientists, government, citizens and business owners to synergize business practice. Implementation of active Environmental Management Systems (EMS) and Pollution Prevention (P2) Programs are specific tools that businesses can rely on to protect and restore regional ecosystems, both of which require indicator information to evaluate results. Additional strategies to recover raw materials from manufactured products needs more widespread implementation throughout the great lakes basin.

B. Culture

If the goal of sustainability is to be achieved in the industrial sector, a number of things have to occur. Sustainability must become a part of a company's culture and an integral factor in its business planning process. Accounting systems that reflect the true costs and/or savings associated with activities such as waste disposal, beneficial re-use, recycling and product take-back must be developed and utilized. Industry needs to have consumer and government support of this cultural change. Similar systems must be instituted by all stakeholders to provide for consistency.

Eco-literacy must also be achieved, not only by industry but the consumer and general public as well. Eco-literacy is defined as "…individuals and communities understanding the complex nature of the natural and built environments resulting from the interaction of their physical, biological, social, economic, and cultural aspects, and acquiring the knowledge, values, attitudes and practical skills to participate in a responsible and effective way in anticipating and solving environmental problems, and in the management of the quality of the environment" [1977 UNEP Intergovernmental Conference on Environmental Education (held in Tbilisi, Georgia, USSR)]. History has demonstrated that unless there is a demand for green-based products and services, their existence within the free market system will be short lived. The same requirements apply for the success of government or community based initiatives. Without the support of the citizens, success will be limited.

C. Finance and Economics

For the region to sustain development, the manufacturing sector must remain financially viable and contribute to a growing economy, while ensuring the continued viability and productivity of regional natural resources. To do so, businesses must be able to compete in the international marketplace, earn a good return on investment, and maintain strong bond ratings to attract capital, and have access to well-designed infrastructure (transportation, communication, utilities) and reliable energy sources. Companies further need a trained, creative, and healthy workforce and, in turn, must be able to provide employees fair wages and benefits, which ultimately impact local economic vitality and enhance community quality of life.

Certain tax policies, including various tax subsidies, impair market mechanisms that would place sustainable practices at an economic advantage. To remove the economic barriers to sustainable business practices, tax shifting and changes to tax subsidy policies need to occur. In fact, a comprehensive approach to sustainability must include an updated tax policy, accounting treatment and government programs to create incentives and the means for businesses to pursue sustainable practices. Government grants and loans, outreach and training programs, low interest loans, production tax credits, rebate programs and continued support for public benefit funds can spur investment in renewable energy, pollution prevention, energy efficiency, and environmental management systems. To facilitate transition to sustainable technologies, collaborative partnerships and research and development funding is needed.

D. Product Stewardship

Another key to sustainability rests in the society's attitudes toward the design, marketing, use, re-use, and end-of-life disposition of products. Past concepts such as style-over-function, materialism, planned obsolescence, and a preference for disposability or reuse, etc., need to yield to new thinking, i.e., product stewardship. Society needs to give attention to – and reward – existing and new product designs demonstrating durability, recyclability, and material selection that minimize environmental impacts and energy consumption. An essential element of this concept is the principle of life-cycle assessment, where environmental affects of materials and products are evaluated from cradle to grave, including impacts of mining, transportation, manufacturing, use, re-use or recycling, and disposal.

Numerous examples of product stewardship are already in place. For example, the scrap recycling industry promotes a design-for-recycling concept to encourage manufacturers to consider ease of disassembly and recovery of product components when a product reaches the end of its useful life. U.S. automobile companies have adopted programs and purchasing initiatives to challenge their suppliers to identify and eliminate toxic components of parts and materials. Energy companies are moving into markets for renewable energy products as an alternative to traditional fossil fuel production. The steel industry promotes life-cycle assessment to demonstrate the environmental advantages of steel over competitive materials in auto and construction markets. The Department of Energy promotes Energy Star

homes and appliances to encourage designs and products resulting in substantially reduced energy use. Other examples of progress and trends could be cited, but much more can be done.

To accomplish more on product stewardship, a number of barriers need to be overcome. For one, public attitudes and consumer patterns need to change. Conscious efforts must be made to purchase products that are durable, recyclable, and produced by environmentally responsible companies. Companies in turn need to concentrate on improving their environmental image by concentrating their R&D and marketing efforts on more environmentally acceptable, but also economically sustainable, products and manufacturing processes, and encourage their suppliers and customers to do the same. Communication to promote public awareness and understanding are essential in all of these efforts, and labeling represents just one means of enhancing communication. Governments can do their part by showing leadership in purchasing policies, providing economic incentives wherever possible, and promoting public awareness of concepts of product stewardship and life-cycle assessment.

E. Recycling and Reuse

An extensive number of industrial recycling activities occur on a daily basis within large, medium and small industries as detailed in the Product Stewardship section. Consumer recycling initiatives have provided all stakeholders with a general education regarding recycled product opportunities that can occur within the paper, glass, plastic, aluminum and steel industries. Increased participation in these programs is a societal must; there are too few participating. Consumer demand for products utilizing recycled materials is neither high nor consistent.

Reuse of waste materials, as a component of recycling, is an underutilized opportunity due to a variety of factors. Individual states track waste generation with varying degrees of detail. Some tracking report formats include waste-to-reuse opportunity information. A lack of consistency among the report formats regarding waste generation and reuse opportunities hinders progress in a regional initiative.

At present, it is difficult to identify and quantify all industrial recycling and waste-to-reuse activities in a format that would be readily available and user friendly for stakeholders. If such a summary were available, educated and concerned consumers could utilize it as a reference tool to increase consumer demand and support for industrial recycling and waste-to-reuse activities. Additionally this type of report format could form the basis of a better understanding of the constraints and barriers related to market demand for recycled products and reuse opportunities in industrial settings.

The industrial community responds to consumer demand. Consumer demand is driven primarily by product pricing and availability. To support the continuation and expansion of recycling initiatives and waste-to-reuse activities, it is imperative for all stakeholders to:

- improve participation in current recycling programs;
- work to identify potential new recycling efforts;
- increase demand for products which utilize recycled materials;
- recognize and reward industries that focus upon recycled product development;
- encourage and ensure regulatory support of recycling and waste-to-reuse efforts within industry to accomplish the above;
- improve tracking report formats to encourage waste exchanges and to ensure consistency among states; and,
- develop local and state specifications to promote waste-to-reuse opportunities as a competitive alternative.

IV. Recommendations

Create a high-level multi-agency governmental steering body with the authority to provide leadership; develop strategy; establish goals; propose, coordinate, fund and assess progress on actions and projects relating to sustainable development. This group should have the authority and responsibility to:

1. Analyze and recommend changes in tax policy to create incentives for consumers and businesses adopting sustainable development practices and disincentives for environmentally destructive activities.
2. Create a national consensus, drawing upon the expertise of the National Academy of Sciences, to develop indicators and metrics for sustainability and a corresponding national database to track and evaluate sustainability trends and progress toward goals, and ensure the staff necessary to collect and evaluate the data.
3. Develop educational materials and training modules for both the business community and the public at large. Conduct outreach programs, and facilitate governmental R&D assistance leading to sustainable manufacturing and business practices.
4. Promote manufacturing and management practices that use resources more efficiently and increase recycling, including life cycle assessment and product stewardship.
5. Provide governmental financial incentives such as grants, low-interest loans, or tax incentives to develop renewable energy technologies, energy efficiency, and pollution prevention in the business sector.
6. Continue screening new industrial and agricultural chemicals to prevent the introduction of environmentally harmful substances and continue assessments of existing chemicals.
7. Evaluate and draw on existing programs and governance models across the region to better disseminate information and harmonize state/provincial action (e.g., US/Canada Binational Toxics Strategy, State of the Lakes Ecosystem Conference (SOLEC), Sound Management of Chemicals Workgroup (SMOC), International Joint Commission (IJC)).

V. Who Should Lead? With Sustainability, it's a decentralized collaborative process that is dependent upon geographic location and the local community desires.

Sustainable development has two distinct characteristics that need to be incorporated into any governance structure:

- Sustainable development is a decentralized collaborative process dependent upon geographic location and local needs; and,
- Sustainable development opportunities often lie outside of the boundaries of an individual manager's sphere of control. They tend to be systemic in nature and require the cooperation and/or interaction of multiple organizational entities.

Framework for Organization: Leadership on any specific sustainable development (SD) activity can come from anywhere in the system. What is necessary is a forum in which the sustainable development opportunity can be assessed, and subsequent SD planning processes can be facilitated and coordinated with key participants in that system who may have to take action, or who may be affected by the new process and/or outcome. Governments are often ideally suited to provide the necessary forum, hence our recommendation #7; however, Good Neighbor Dialogues, where industrial facilities and residents of the surrounding neighborhood meet to discuss issues of common interest, have also proven to be useful. The demand for sustainable development actions requires a breadth of resources and societal input in addition to any level of government (local, state, and federal), their policies, and programs. Key participants include:

- Business investment decision-makers;

- Industry watch-dog organizations such as the accounting standards board, government regulatory agencies, etc.;
- Industrial trade organizations for information feed-back loops, education and training;
- Research institutions for new product design and manufacturing processes, education and training;
- Education institutions;
- Non-governmental organizations/ non-profit for information dissemination, community education/outreach, support and networking, to facilitate the participation of general public/communities in processes; and,
- Other stakeholders in the systems' processes or outcomes.

VI. How Can Actions Be Prioritized?

Actions can be prioritized through local, regional, state and federal visioning processes. Everyone is going to do it a little differently based on the values of the people, community make up, the quality and availability and condition of the natural resource base, and the political will. The important task is the process, not determining the starting point.

LAND USE AND DEVELOPMENT

I. Summary

Summary of Land Use and Development Trends and Issues

- Land consumption to new development out-pacing forecasts for population and jobs growth, even in areas of decline resulting in consumptive development practices resulting in unhealthy and polluting urbanization.
- Development trends resulting in loss of habitant and natural areas that are negatively impacting waters of the Great Lakes from storm water run-off, wastewater overflows and ground water depletion.
- Development markets loosening housing types, jobs-housing balance with resulting social inequities.
- Development forces loosening or undermining traditional communities and their historic building resources.
- Building types and their disperse location causing unsustainable consumption of nonrenewable energy resources for building and transportation demands.

Sustainable Land Use and Development Goals

- Implement effectiveness and consistency of sustainable land use planning and development practices at the state, regional and local levels to protect and improve the quality of the Great Lakes ecosystem and the economic vitality of the upper Midwest economy.
- Facilitate the outcome effectiveness of local government development policies and private development practices to improve community livability, health and equity.
- Establish regional programs to guide sustainable development by utilizing existing programs, agencies and funding.
- Marshal the 26 Great Lakes basin Metropolitan Planning Organizations (MPO) and Regional Planning Organizations (RPO) to implements basin-wide sustainable land development program as representative bodies certified by USDOT, authorized by states' governors and governed by local elected officials.
- Leverage USDOT support for integrating land use and transportation planning to incorporate sustainable development principles for Smart Growth through Regional Transportation Plans (RTP).
- Enable regional plans to seek consistency with local land use plans with integrates transportation and other infrastructure with land use models and prioritized project funding, including rural RPO plans.
- Support Great Lakes basin governors to create compatible, consistent state planning programs supporting sustainable land use and development practices.
- Direct existing federal program funds for transportation, clean water, clean air, protected and endangered species, community development and economic development into state sponsored, regionally coordinated, and local priority efforts.

II. Description and Trends

In releasing its "Sustainable America" report in March 1996, The President's Council on Sustainable Development offered a series of operating principles to guide efforts toward a sustainable future. One such principle states that "environmental progress will depend on individual, institutional and corporate responsibility, commitment and stewardship." The President's Council placed a special focus on "sustainable communities" and the role of brownfields redevelopment and greenfields preservation in achieving sustainability. Nine years later, these principles still hold true, but the challenge remains of

putting them into practice at a scale and with a timeliness to reverse or even slow the challenges we face for healthy, livable, vital future for the Great Lakes Basin.

A. Land Use in the Great Lakes Basin and Region

The Great Lakes basin covers nearly 300,000 square miles (800,000 square kilometres), about a two-thirds of which is land. Most of that land is forested (about 40 percent) or used for agriculture (about 30 percent). The remainder, broadly categorized as "developed areas" or the "built environment," – including industrial, commercial, residential, institutional, and transportation uses – takes up less than 10 percent of the basin's area. The built environment is concentrated in 17 metropolitan areas (11 in the U.S. and 6 in Canada), where nearly 27 million of the basin's 33 million-plus people live.38 Like historic contamination in Great Lakes waters, this built land area includes a disproportionate number of brownfields sites – a legacy of the region's industrial past. Despite its small share of total land area, the impacts of the built environment are the most remarkable and far reaching. With most of the Great Lakes region's metropolitan areas located on or near the Great Lakes or their tributaries, the built environment has particular consequences for the water resources of the Great Lakes.

Sprawl: The Predominant Land Development Pattern

The Population-Land Consumption Mismatch: Since World War II, the human footprint on the land around the Great Lakes has been transformed by a major shift in land development patterns from high-density urban development to low-density suburban and rural development. This shift reflects that of the nation at large and has happened at a rate unparalleled in American history. Over several decades, the Great Lakes went from being a region of distinct cities, towns and rural areas to one of metropolitan areas dominated by suburbs comprised of strip malls and segregated bedroom communities connected by vast amounts of wide lane highways and roads.[39]

Despite a relatively stable U.S. population around the Great Lakes, people and the development supporting them continue to spread out. From 1970 to 1990 the binational population of the Great Lakes Basin – that portion of the region that drains into the Great Lakes – increased by less than 1 percent.[40] During that time the four largest metropolitan areas on the U.S. side of the Great Lakes – Chicago, Detroit, Cleveland and Milwaukee – experienced significant population loss in their central cities, and significant growth in their suburbs.[41] Data show that Milwaukee, Flint, Buffalo/Niagara Falls and Youngstown-Warren experienced virtually no population growth but continued to sprawl out (consume land and related natural resources) at an average rate of 26 percent.[42]

Between 1990 and 2000, population of the Great Lakes region (eight Great Lakes states) increased at a slight 6.6 percent – a rate less than half of the national population increase during that decade. Most of the 66 Great Lakes metropolitan statistical areas continue to gain population while nearly half of medium and large cities have been losing population.[43] This increase in metropolitan populations is primarily due

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[38] Thorp, S., Rivers, R. and Pebbles, V. 1997. Impacts of Changing Land Use. Background Paper for the State of the Lakes Ecosystem Conference. U.S. Environmental Protection Agency, Chicago, Illinois and Environment Canada, Burlington, Ontario. ISBN 0-0662-26034-1.

[39] Pebbles, V. and Blais, P. 1999. Changing Land Use and Reurbanization. Unpublished paper.

[40] Thorp, Rivers, et al.

[41] Pebbles and Blais, 1999.

[42] Kolankiewicz, L. and R. Beck. 2001. Weighing Sprawl Factors in Large U.S. Cities: A report on the nearly equal roles played by population growth and land use choices in the loss of farmland and natural habitats to urbanization. NumbersUSA. SprawlCity, Arlington, VA.

[43] Pebbles, V. and Thorp S. 2001. Linking Brownfields Redevelopment and Greenfields Protection for Sustainable Development. Great Lakes Commission, Ann Arbor, Michigan.

to the migration of people within the region – from inner cities to areas on the urban fringe – rather than from people moving to the Great Lakes region from elsewhere.

Land Consumption and Population Growth in Selected Great Lakes Metropolitan Areas: 1982-1996*			
Metropolitan Area	Percent Population Growth	Percent Urbanized Area Growth	Ratio of Area Growth to Population
Detroit, MI	-1.1	19.6	---
Rochester, NY	-3.1	15.5	---
Buffalo-Niagara Falls	0.0	52.0	---
Chicago-NW Indiana	10.9	44.2	4.1
Cleveland	6.3	23.8	3.8
Average of 5 Metro Areas	2.6	31	---
*Adapted from U.S. EPA, 2001[44]			

Urban Form and the Density Factor

It is not the shift from urban to suburban that is as important for sustainable development as is the density of that shift. The following examples illustrate that over the past three decades the increase in land consumption for development has far outpaced the increase in population.

Research carried out in the mid-1990s for the Michigan Society of Planning Officials (MSPO) which looked at residential development densities, indicates that from the mid 60's to the mid 90's, dwelling units per acre in Michigan were cut by more than half. For southeast Michigan alone, a 1.6 percent increase in population has increased urbanized land by 28 percent.

- From 1970 to 1990 the Chicago metropolitan area grew in population by a mere 4 percent, but spread its inhabitants across 35 percent more land.
- Between 1982 and 1997, the population of the Milwaukee Metropolitan Area grew by 6.5 percent while its urbanized area grew by 24.9 percent and vehicle miles traveled increased 23 percent.45
- Between 1982 and 1997 the Duluth region spread out over 30.7 percent more land while losing 7.5 percent of its population.[46]
- From 1960 to 1990 Ohio's population grew by only 13 percent while the amount of urban land expanded by 64 percent.
- From 1969 to 1990 population in Pennsylvania's largest metropolitan areas grew by 13 percent while the amount of developed land in these areas increased by 81 percent.[47]

With low density development, fewer people occupy more land. As the density of development decreases, more roads and highways are needed to connect these areas that at the same time become less feasible to support with public transit. The urban form characteristic of sprawl also creates more impervious surfaces roads, rooftops and parking lots to connect far-flung shops, homes and workplaces and, house the automobiles necessary to get there and then park as alternative modes of transportation are often not practical or available. Impervious surfaces are a key contributor to the degradation of on Great Lakes water quality and are discussed elsewhere in this report

[44] U.S. Environmental Protection Agency, 2001. Our Built and Natural Environments: A Technical Review of the Interactions Between Land Use, Transportation, and Environmental Quality. Adapted from Table 2-3 based on research conducted by the Texas Transportation Institute.

[45] GHK International Ltd. 2003. Forecast and Analysis of Urban Development in the Great Lakes Basin. Final Report Prepared for the Great lakes Regional Office of the International Joint Commission.

[46] GHK International Ltd. 2003. Forecast and Analysis of Urban Development in the Great Lakes Basin. Final Report Prepared for the Great lakes Regional Office of the International Joint Commission.

[47] Pebbles and Blais, 1999.

In sum, the rate of land consumption continues to far outpace population increases and most of this occurs at the expense of farmland and open space. For the most part, the new demands for major new public investment in the full range of infrastructure, and/or the use of outdated utilities standards are especially related to water resources for both supply and treatment. Nearly two-thirds of the farmland in the region is within 50 miles of medium and large cities. Between 1982 and 1997, the amount of developed, non-federal land increased by 27 percent and more than 11 million acres of farmland was converted to other uses--an area greater than the surface of lakes Erie and Ontario combined.[48]

Characteristics of Sprawl

For this document, sprawl is defined as extensive low-density disjointed development on previously undeveloped land. Sprawl is both a land development pattern and an urban form. The common characteristics of sprawl are listed in the figure below.

The Sprawl Cycle: Socio-Economic Dimensions of Current Land Development Trends

Sprawl is a trend that is influenced by a plethora of economic, social, institutional and cultural factors. Technological advances and business and marketing strategies spur demographic shifts and alter consumption patterns in favor of privacy, local control, and flexible personal transportation. Federal, state and local policies respond by establishing an array of subsidies, incentives and regulations that encourage low-density suburban development. Financial institutions follow these market demographics and resist financial support "market innovations." This development creates job and housing opportunities in suburban and exurban areas for those who can afford it. This attracts more residents who migrate out of urban centers and older suburbs, undermining the tax base, leading to further disinvestment and decay. Meanwhile increase population and tax base in the suburbs attracts more businesses, which attract more residents, and the cycle continues. As outlying areas are developed, their natural features and quality of life attributes that attracted people and businesses in the first place are compromised by traffic congestion, single-market housing, bare asphalted parking lots and strip malls. At current rates, the metropolitan area commuter might be spending nearly 80 hours a year sitting still on congested roads.

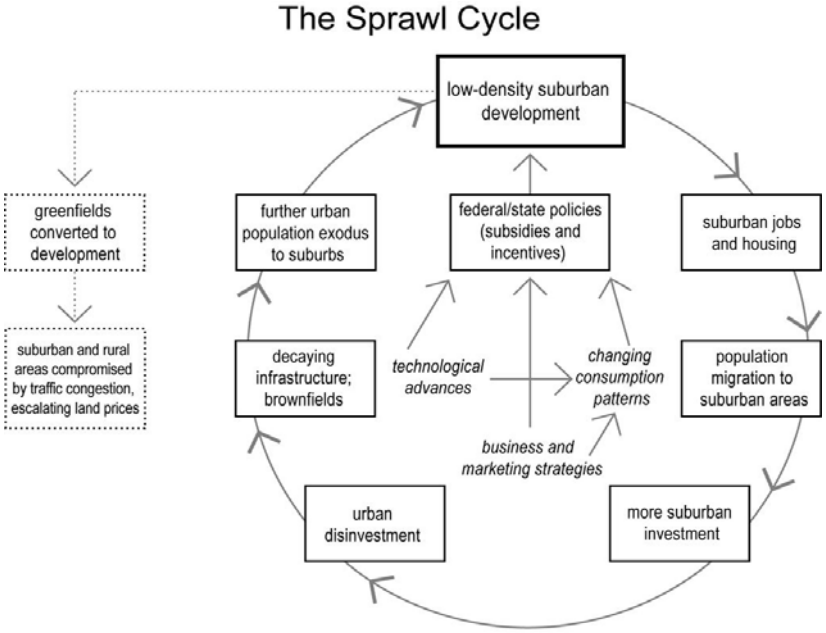

Diagram courtesy of Victoria Pebbles

[48] Pebbles, V. and Thorp S. 2001. Linking Brownfields Redevelopment and Greenfields Protection for Sustainable Development. Great Lakes Commission, Ann Arbor, Michigan.

B. Deterrents to Sustainable Development: Sprawl Incentives and Subsidies

While some of this is attributable to increases in real income, smaller household size (people having fewer children) and technological advances, the trend to sprawl is supported and indeed subsidized by a suite of policies and institutions at the federal, state and local level that encourage low-density development and segregated land uses. For example, U.S. public policies enacted after World War II created the Interstate Highway system and provided government-backed mortgage insurance for new suburban houses. By 1999, U.S. home ownership reached a national all time high of 66 percent and most of this was in the suburbs. Federal funding and subsidies for private automobile transportation infrastructure, sewer and water infrastructure and state and local funding for public services – everything from new schools to libraries and fire houses – have created deeply entrenched institutions and policies that favor for new construction in previously undeveloped "greenfield" areas over investment in already built areas. These "transparent" subsidies for sprawl are complemented by a suite of "hidden" or not-so-obvious subsidies, that do not account for the true and full cost of providing the myriad services that support modern lifestyles, including:

- Average cost pricing whereby consumers pay the same for public services regardless of the incremental costs associated with providing those services based on location
- Lacking or inadequate impact fees to cover capital investments/environmental impacts
- Property tax policies based on type of land use rather than the cost of services being provided
- Property taxes that tax building rather than land in urban areas and thereby discourage denser/more efficient development in urbanized areas
- Lack of capability or willingness to quantify and account for ecological services (and damages to them); and
- Ineffective and duplicative land use planning and inconsistencies with development policies and practices.

Transportation policies and funding proclivity to support highway and automobile interests are among the most resounding in driving current land development patterns. Evidence exists that average U.S. private transportation costs are under-priced by as much as 47 percent.[49] Research indicates that U.S. metropolitan regions would be as much 12 percent smaller on average if the full costs of private transportation costs were internalized. Put another way, metropolitan areas would preserve 12 percent more agricultural land and open space just by accounting for the full costs of private transportation.[50]

C. Projected Trends

A comparison of projected population and land consumption figures indicates what we can expect if current land development patterns continue.

- In Michigan, from 1990 to 2020, an almost 12 percent population increase will result in 60-80 percent more developed land. In terms of actual land area, this converts to the development of between 1.4 and 2 million acres of land. This is the same amount of land that served 9 million people in 1978, but will accommodate only 1.1 million people in the year 2020 if current trends continue.
- For southeastern Michigan alone, which is anchored by the Detroit metropolitan area, a 6 percent increase in population is expected to result in a 40 percent increase in land consumption between 1990 and 2020.

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[49] T. Litman, Transportation Cost analysis for Sustainability, Victoria Transport Policy Institute, (1999).

[50] McGrath, D.T. 2005. More Evidence on the Spatial Scale of Cities. Forthcoming paper in the *Journal of Urban Economics*.

- The five-county area surrounding Cleveland is expected to lose 3 percent of its population while increasing its residential land base by 30 percent between 1980 and 2010;
- Further from the lakes, a four-county area in southeastern Pennsylvania is expected to convert more than 200,000 acres of open space to urban uses between 1990 and 2020 – a 47 percent increase in developed land.[51]
- The Chicago Metropolitan region anticipates a 25 percent growth in employment and population, but a 55 percent increase in the amount of urbanized land.[52]

Table (Land Consumption Forecast in Selected Great Lakes Metropolitan Areas) shows forecasts for sprawl (e.g., land consumption in Selected Great Lakes Metropolitan Areas to 2025.

Land Consumption Forecast in Selected Great Lakes Metropolitan Areas				
Urbanized Area	Est. 2000 Land Area in mi2	2025 Land Area Forecast in mi2	Change in mi2	Percent Change 2000-2025
Chicago	1766	2640	695	39.3
Detroit	1238	1549	311	25.1
Cleveland	650	985	335	51.6
Milwaukee	546	833	287	52.5
Buffalo	323	571	248	76.7
Total	4223	6578	1876	
Average				49.0
Adapted from McGrath, 2000.[53]				

Unless significant shifts in policies that affect land use and development at all levels are modified to redirect current urbanization patterns and urban form, we can expect the populations of Great Lakes Cities to remain relatively stable or decline while rural and suburban areas continue to experience accelerated rates of development. This consumption of land and dispersal of once tight community networks, the sacrifice of personal time to ever longer commutes, and degradation of environmental resources is simply not sustainable. A new green urban and sustainable community vision is needed to capture the hearts, minds and investment priorities of the American public.

Smart Growth – A Name for Sustainable Development

While land consumption and its related resource consuming patterns have grown exponentially in the last three decades, a number of countervailing trends have been gaining interest of policy makers, developers and the public alike, and provide the stepping stones into what can be hoped is a sustainable future for the Great Lakes basin.

- Public initiatives to fund open space acquisition
- Main Street and Downtown Revitalization
- Community Reinvestment Act
- ISTEA allowance for environmental, historic and amenity concerns
- Growth of transit projects and plans in metro areas
- Historic Tax Credits
- Cluster, conservation and mixed use development standards
- Back to the city trends and in-city housing
- Urban forestry and urban biodiversity efforts

[51] Pebbles and Blais, 1999.
[52] Chicago Openlands Project, 1999. Under Pressure—Land Consumption in the Chicago Region, 1998-2028.
[53] *McGrath, D. 2000. 2025 Urban Land Area Forecasts for the US Top 20 Coastal Metropolitan Regions. Unpublished study presented at the Coastal Society; Portland, Oregon, 2000. Great Cities Institute, Illionois-Indiana Sea Grant, Chicago, IL.*

- Increase in State planning programs and legislation
- Green Building technology

These trends are mostly indicators of what is possible. There are a sufficient and increasing number of demonstrations of these sustainable development practices that neither public officials nor the private sector need be leery of their application. In fact major private development associations such as the Urban Land Institute and the National Association of Homebuilders are actively championing their application. However, in anecdote after anecdote researchers hear some of the strongest resistance to wide application of these practices can be traced back to a vocal public resistant to change, skeptical of "urban densities" and demanding an increased road capacity to relieve their morning commutes. Ironically, an increasing number of private developers see a fast growing market for the new urbanism, walkable, transit oriented development as the "Starbucks" indicator shows.

The challenge now is to find ways to take these best practice demonstrations (which will be explored in following sections) to a scale that will make a difference to the environmental quality, the community livability and economic viability of a sustainable Great Lakes Basin.

III. Sustainable Practices: From Exploitation to Stewardship

The World Commission on Environment and Development – the Brundtland Commission – has defined sustainable development as use of the land and land-based resources that meets the needs of the present without compromising the ability of future generations to meet their own needs. However, as described in Part One, the trends of current growth and development practices creating waste and destroying and disregarding land based resources will not successfully see us through even this century. An increasing body of research is showing that are growth and development practices are not only hard on the environment but also increasingly hard on people – a core value of sustainable development has always included social equity and environmental justice for all sectors of our increasingly diverse population. http://155.33.32.224/iuhr/pdf/submitted_abstract_panels_block2/sa_2.3_furumoto_dawson.pdf

The land and the places we are developing for human activities are increasingly being regarded as a stewardship responsibility for all as we face the challenges of the 21st century. The challenge at every level of government and with every type of private development is to put into practice widely supported principles of sustainable land use and development at a scale and on a schedule that will make a difference to the quality of the Great Lakes and its supporting land based resources and communities. Several overarching issues are particular challenges to the development of the Great Lakes Basin:

- The global importance of the fresh waters of the Great Lakes
- The geographic significance of the basin for its biodiversity where prairie and plains savannahs meet eastern deciduous forests and northern conifer forests
- The land-based industrial legacy and community heritage shared by the metropolitan regions of the Great Lakes Basin
- The national and international importance of regional centers within the basin as critical national and global transportation centers
- The historic and continuing tradition as the American heartland center for multi-cultural diversity
- The greater Chicago region, including Milwaukee, WI and Gary, IN is the largest non-sea coast metropolitan region in North American

Natural land-based (along with water and air) resources must remain sound if our lives are to be healthy and our land is to support our economic potential and social vitality. This document proposes that, if the goals of sustainable land development are to meet the needs and acknowledged challenges of the economy, the environment, and communities, a transformation will be needed from competition to

collaboration between interests that plan for, development and manage the land. To do this, a path to development must be envisioned that emphasizes efficient, careful and integrated resource utilization, protection and reuse.

Agencies, coalitions and volunteers throughout the basin are at work to protect, restore and enhance the natural and historic assets of the region. A notable example is Chicago Wilderness, a coalition of over 180 organizations. Chicago Wilderness has focused on the mission of championing biodiversity in this highly developed region and thus defined biodiversity[54].

Biodiversity simply means biological diversity. It is the variety of natural communities, plant and animal species, and even genes that exist within a particular place. Biodiversity is essential to a healthy environment, to human health, and to the economy. Healthy, diverse ecosystems provide us with clean air and water, and resources like food and ingredients for medicines. And as anyone who has spent some time outdoors can tell you, the great diversity of life on Earth is also a source of inspiration and wonder! Chicago Wilderness' attention grabbing name is not the oxymoron some would imagine. As Illinois has been intensively developed from its Lake Michigan industrial corridor to its state wide agriculture economy, with mining in the south and more river industry on the Mississippi, 90% of the state's natural environment has been lost in the two centuries of European settlement. However, 75% of the remnants of the original prairie and savannah habitats that remain are in the metropolitan Chicago region. These are a stewardship responsibility, an asset legacy and development challenge shared throughout the Great Lakes Basin.

A. Principles and Practices for Sustainable Development of the Land

The promise offered from sustainable development seeks a balance between the values that drive land development from a range of individual desires and aspirations with those of community goals and shared interests. At the same time, the land itself is governed by its own set of natural laws. The challenge for sustainable development practice is to seek the balance between human values, community goals and natural systems.

Some issues of sustainability are negotiable in nature, and some are not. In general, human perspectives on sustainable places will be more within people's control, than with scientific realities. The field of sustainable practices has been burgeoning over the last decade and the research, planning, public policy and best practices information is growing rapidly. Our goal here is only to set out some guideposts relevant to sustainable development practices in general and create some markers specifically relevant to the Great Lakes Basin.

Much of this section draws directly from the institutional and research work of the broader field of sustainability that includes topical areas such as Green Buildings, Smart Growth, New Urbanism, Conservation Design, Neo-Traditional Design and Context Sensitive Design.

B. Guides For Local Planning

In the conflicts and debates that consistently emerge around land use issues, we often forget that land use plans are not regulations per se, but public articulations of a community's values that will guide decisions, and actions. Some of these actions include the range of resulting regulation that guides development from zoning to subdivision ordinances and building codes. What follows are well reasoned sets of principles intended as guides to sustainable development practices. Each set has its own individual character with many shared underlying values.

[54] Chicago Wilderness

Given the consideration, deliberation, vetting and crafting that went into the referenced sets, we have chosen to present them in their entirety and not attempt to combine, summarize and thereby create another set of principles. All of these are well documented and supported, and we present them as resources for private developers, planning agencies, public utilities and elected officials to use and apply as best fits their own vision, mission and responsibilities.

Included as appendices are the Hannover Principles developed by William McDonough and Michael Braungart, and the three part set of the Ahwahnee Principles also developed by a team of the leading practitioners of sustainable development. The Hannover Principles were among the first to comprehensively address the essential areas of land related sustainability, relating the interdependence of the built environment with nature and proposing a new responsibilities as stewards to protect it. The Principles are based on a set of values that encourage all of us – individuals, organizations, governments and businesses – to link long term sustainable considerations with ethical responsibility. Sustainable development will require a continuous working relationship between natural processes and human activity.

The Ahwahnee Principles are practice oriented and have been developed in three versions: one oriented toward sustainable economic development, another for community livability and a third aimed specifically at water resources, especially relevant for development in the Great Lakes Basin. Since land use and development has a special responsibility for the stewardship and quality of Great Lakes waters, the Ahawhnee Water Principles are also included in this report.

Included in the report are the Principles for Smart Growth developed by the Sustainable Communities Network with extensive supporting information on their web site: http://www.sustainable.org. In Addition, the Smart Growth Principles succinctly capture much of the intentions of the other sets and provides concise guidance for those responsible for land development decisions.

Smart Growth was an emergent strategy in the last decade to counter the unplanned, inefficient and consumptive patterns of land development generally termed "sprawl." In the last few years, Smart Growth has been accepted by organizations as diverse as the Urban Land Institute, the Sierra Club, and American Planning Association to the Urban League and League of Women Voters. Smart Growth and sustainable development go hand in hand.

The Smart Growth principles for sustainable development provide a framework to shape planning goals at the local and regional levels. Sustainability will not be achieved by depending on individual, well intentioned projects. Sustainable development must become the norm for the Great Lakes basin and not an innovative exception to current practices and trends.

C. Smart Growth Principles[55]

Create a Range of Housing Opportunities and Choices

Providing quality housing for people of all income levels is an integral component in any smart growth strategy. Housing is a critical part of the way communities grow, as it is constitutes a significant share of new construction and development. More importantly, however, is also a key factor in determining households' access to transportation, commuting patterns, access to services and education, and consumption of energy and other natural resources. By using smart growth approaches to create a wider range of housing choices, communities can mitigate the environmental costs of auto-dependent development, use their infrastructure resources more efficiently, ensure a better jobs-housing balance, and

[55] Smart Growth Principles, Smart Growth Network

generate a strong foundation of support for neighborhood transit stops, commercial centers, and other services.

Create Walkable Neighborhoods

Walkable communities are desirable places to live, work, learn, worship and play, and therefore a key component of smart growth. Their desirability comes from two factors. First, walkable communities locate within an easy and safe walk goods (such as housing, offices, and retail) and services (such as transportation, schools, libraries) that a community resident or employee needs on a regular basis. Second, by definition, walkable communities make pedestrian activity possible, thus expanding transportation options, and creating a streetscape that better serves a range of users -- pedestrians, bicyclists, transit riders, and automobiles. To foster walkability, communities must mix land uses and build compactly, and ensure safe and inviting pedestrian corridors.

Encourage Community and Stakeholder Collaboration

Growth can create great places to live, work and play -- if it responds to a community's own sense of how and where it wants to grow. Communities have different needs and will emphasize some smart growth principles over others: those with robust economic growth may need to improve housing choices; others that have suffered from disinvestment may emphasize infill development; newer communities with separated uses may be looking for the sense of place provided by mixed-use town centers; and still others with poor air quality may seek relief by offering transportation choices. The common thread among all, however, is that the needs of every community and the programs to address them are best defined by the people who live and work there.

Foster Distinctive, Attractive Communities with a Strong Sense of Place

Smart growth encourages communities to craft a vision and set standards for development and construction which respond to community values of architectural beauty and distinctiveness, as well as expanded choices in housing and transportation. It seeks to create interesting, unique communities which reflect the values and cultures of the people who reside there, and foster the types of physical environments which support a more cohesive community fabric. Smart growth promotes development which uses natural and man-made boundaries and landmarks to create a sense of defined neighborhoods, towns, and regions. It encourages the construction and preservation of buildings which prove to be assets to a community over time, not only because of the services provided within, but because of the unique contribution they make on the outside to the look and feel of a city.

Make Development Decisions Predictable, Fair and Cost Effective

For a community to be successful in implementing smart growth, it must be embraced by the private sector. Only private capital markets can supply the large amounts of money needed to meet the growing demand for smart growth developments. If investors, bankers, developers, builders and others do not earn a profit, few smart growth projects will be built. Fortunately, government can help make smart growth profitable to private investors and developers. Since the development industry is highly regulated, the value of property and the desirability of a place are largely affected by government investment in infrastructure and government regulation. Governments that make the right infrastructure and regulatory decisions will create fair, predictable and cost effective smart growth.

Mix Land Uses

Smart growth supports the integration of mixed land uses into communities as a critical component of achieving better places to live. By putting uses in close proximity to one another, alternatives to driving, such as walking or biking, once again become viable. Mixed land uses also provide a more diverse and sizable population and commercial base for supporting viable public transit. It can enhance the vitality and perceived security of an area by increasing the number and attitude of people on the street. It helps

streets, public spaces, and pedestrian-oriented retail again become places where people meet, attracting pedestrians back onto the street and helping to revitalize community life.

Preserve Open Space, Farmland, Natural Beauty and Critical Environmental Areas

Smart growth uses the term "open space" broadly to mean natural areas both in and surrounding localities that provide important community space, habitat for plants and animals, recreational opportunities, farm and ranch land (working lands), places of natural beauty and critical environmental areas (e.g. wetlands). Open space preservation supports smart growth goals by bolstering local economies, preserving critical environmental areas, improving our communities' quality of life, and guiding new growth into existing communities.

Provide a Variety of Transportation Choices

Providing people with more choices in housing, shopping, communities, and transportation is a key aim of smart growth. Communities are increasingly seeking these choices -- particularly a wider range of transportation options -- in an effort to improve beleaguered transportation systems. Traffic congestion is worsening across the country. Where in 1982 65 percent of travel occurred in uncongested conditions, by 1997 only 36 percent of peak travel occurred did so. In fact, according to the Texas Transportation Institute, congestion over the last several years has worsened in nearly every major metropolitan area in the U.S..

Strengthen and Direct Development towards Existing Communities

Smart growth directs development towards existing communities already served by infrastructure, seeking to utilize the resources that existing neighborhoods offer, and conserve open space and irreplaceable natural resources on the urban fringe. Development in existing neighborhoods also represents an approach to growth that can be more cost-effective, and improves the quality of life for its residents. By encouraging development in existing communities, communities benefit from a stronger tax base, closer proximity of a range of jobs and services, increased efficiency of already developed land and infrastructure, reduced development pressure in edge areas thereby preserving more open space, and, in some cases, strengthening rural communities.

Take Advantage of Compact Building Design

Smart growth provides a means for communities to incorporate more compact building design as an alternative to conventional, land consumptive development. Compact building design suggests that communities be designed in a way which permits more open space to preserved, and that buildings can be constructed which make more efficient use of land and resources. By encouraging buildings to grow vertically rather than horizontally, and by incorporating structured rather than surface parking, for example, communities can reduce the footprint of new construction, and preserve more greenspace. Not only is this approach more efficient by requiring less land for construction. It also provides and protects more open, undeveloped land that would exist otherwise to absorb and filter rain water, reduce flooding and stormwater drainage needs, and lower the amount of pollution washing into our streams, rivers and lakes.

D. The Ahwahnee Water Principles for Resource Efficient Land Use

Preamble

Cities and counties are facing major challenges with water contamination, storm water runoff, flood damage liability, and concerns about whether there will be enough reliable water for current residents as well as for new development. These issues impact city and county budgets and taxpayers. Fortunately there are a number of stewardship actions that cities and counties can take that reduce costs and improve the reliability and quality of our water resources.

The Water Principles below complement the Ahwahnee Principles for Resource-Efficient Communities that were developed in 1991 (see Appendix). Many cities and counties are already using them to improve the vitality and prosperity of their communities.

Community Principles

- Community design should be compact, mixed use, walkable and transit-oriented so that automobile-generated urban runoff pollutants are minimized and the open lands that absorb water are preserved to the maximum extent possible. (See the Ahwahnee Principles for Resource-Efficient Communities)
- Natural resources such as wetlands, flood plains, recharge zones, riparian areas, open space, and native habitats should be identified, preserved and restored as valued assets for flood protection, water quality improvement, groundwater recharge, habitat, and overall long-term water resource sustainability.
- Water holding areas such as creek beds, recessed athletic fields, ponds, cisterns, and other features that serve to recharge groundwater, reduce runoff, improve water quality and decrease flooding should be incorporated into the urban landscape.
- All aspects of landscaping from the selection of plants to soil preparation and the installation of irrigation systems should be designed to reduce water demand, retain runoff, decrease flooding, and recharge groundwater.
- Permeable surfaces should be used for hardscape. Impervious surfaces such as driveways, streets, and parking lots should be minimized so that land is available to absorb storm water, reduce polluted urban runoff, recharge groundwater and reduce flooding.
- Dual plumbing that allows grey water from showers, sinks and washers to be reused for landscape irrigation should be included in the infrastructure of new development.
- Community design should maximize the use of recycled water for appropriate applications including outdoor irrigation, toilet flushing, and commercial and industrial processes. Purple pipe should be installed in all new construction and remodeled buildings in anticipation of the future availability of recycled water.
- Urban water conservation technologies such as low-flow toilets, efficient clothes washers, and more efficient water-using industrial equipment should be incorporated in all new construction and retrofitted in remodeled buildings.
- Ground water treatment and brackish water desalination should be pursued when necessary to maximize locally available, drought-proof water supplies.

Implementation Principles

- Water supply agencies should be consulted early in the land use decision-making process regarding technology, demographics and growth projections.
- City and county officials, the watershed council, LAFCO, special districts and other stakeholders sharing watersheds should collaborate to take advantage of the benefits and synergies of water resource planning at a watershed level.
- The best, multi-benefit and integrated strategies and projects should be identified and implemented before less integrated proposals, unless urgency demands otherwise.
- From start to finish, projects and programs should involve the public, build relationships, and increase the sharing of and access to information. The participatory process should focus on ensuring that all residents have access to clean, reliable and affordable water for drinking and recreation.
- Plans, programs, projects and policies should be monitored and evaluated to determine if the expected results are achieved and to improve future practices.

E. Practices for Context Sensitive Transportation Design Solutions

The development history of the Great Lakes Basin is as much a transportation story as an industrial story. The metropolitan corridor stretching from Rochester and Buffalo through eight states to Duluth is an economic corridor twice as long as either the Boston to Washington or San Francisco to San Diego corridors. The Great Lakes corridor also shares an economic interdependence from ore mines to steel mills to manufacturing plants to world-wide distribution is not matched in any other macro-metropolitan region.

This legacy provides a heritage of entrepreneurial drive, industrious work, extraordinary infrastructure and urban development unmatched in the 20th century. Now moving into the 21st century, we are challenged to renovate, recycle and often remediate the industrial residuals. But, most important for sustainable development, we must look to these facilities and their lands as critical development assets in the coming decades.

Transportation is the related legacy that continues in a role essential to the basin's economic future and transportation's own land based sustainability challenges. With Chicago at the hub of the nation's rail network, the interstate system followed and Chicago O'Hare now can claim to be the busiest airport in the world connected with some 12 other major international air hubs in the basin. Apart from the sustainability challenges facing transportation itself and its impacts on the natural systems of air and water, these systems of road, rail and runway themselves are major consumers of land.

"Context Sensitive Design[56] is an inclusive approach to transportation development that integrates and balances community, aesthetic, and environmental values with traditional transportation safety and performance goals. Context sensitive design requires careful and imaginative planning to reflect community values, meet transportation goals, provide safety, and respect the natural and man-made environment within the established budgets and schedules. Context sensitive design requires early and continued input from both multidisciplinary professionals and stakeholders. It addresses both what can be done technologically to meet transportation demands and what may be done to enhance the design outcomes for transportation users, adjacent community residents, and the environment. This transportation planning approach is seen as adding lasting functional and aesthetic value for both the communities they traverse and serve and the users."

"Thinking Beyond the Pavement "Qualities and Characteristics"

- Qualities of Excellence in Transportation Design
- The project satisfies the purpose and needs as agreed to by a full range of stakeholders. This agreement is forged in the earliest phase of the project and amended as warranted as the project develops.
- The project is a safe facility for both the user and the community.
- The project is in harmony with the community, and it preserves environmental, scenic, aesthetic, historic, and natural resource values of the area, i.e., exhibits context sensitive design.
- The project exceeds the expectations of both designers and stakeholders and achieves a level of excellence in people's minds.
- The project involves efficient and effective use of the resources (time, budget, community) of all involved parties.
- The project is designed and built with minimal disruption to the community.
- The project is seen as having added lasting value to the community.
- Policies supporting sustainable land development

While sustainability is a total societal responsibility, every level of government must be proactively engaged if beneficial goals of a healthy, vital, livable Great Lakes basin are to be achieved.

[56] USDOT http://www.fhwa.dot.gov/csd/

As discussed earlier, the hundreds and thousands of local land use plans, development ordinances are all either contributing building blocks to basin-wide sustainability or they become detrimental factors that perpetuate land consumption, water and air degradation and loss of natural habitat and local legacies. Our challenge is to find acceptable ways to bring sustainable development practices to scale with enough participation from the local governments that control development that there will be an improvement in the environmental quality of the Great Lakes, in the quality of life for all people in the basin, in the global competitiveness and vitality of the economic forces that drive the future of the nine state region.

Regional agencies and county governments can all contribute to implementing sustainable development practices, but states are critical to providing reasonable, consistent guidelines, support and assistance to local governments in their planning activities. Local governments will need guidance and support to produce plans for development that achieve enough land conservation, water resource management, community livability, sustainable economic practices and supporting transportation choices to see progress in the basin.

Within the last five years nearly every state in the basin has enacted some state level planning initiative that directly relates to sustainable development principles and practices. These state actions are summarized in the table below and further described in the Appendix. However, none approaches the thoroughness of model state planning acts such as Washington State's Growth Management Act. At its simplest, the 15 year old act requires municipalities in urban areas to produce a local comprehensive plan. We want to emphasize that the municipality produces their own plan – not the state. However, the state act lays out guidelines for what topics the plan must address as Illinois has done in its Local Planning Technical Assistance Act.

The Washington program also specifies that local plans should be consistent with that community's development regulations and ordinances, thus ensuring that the goals of the plan are implemented in public decision-making, funding and project follow through. Inter-jurisdictional coordination is support by the requirement that within the county all municipal plans are based on a set of official population and job forecast and that land development is planned to accommodate that grow with municipal boundaries and agreed on annexation agreements. The county acts as the coordinator of these growth agreements.

In the fifteen year the act has been in place, the state planning office, regional planning agencies and smart growth organization have provided the technical assistance to the municipalities that today ensures region-wide sustainable development patterns in major metropolitan regions.

In the Great Lakes Basin, all metropolitan areas as required to develop similar forecasts to guide regional transportations planning by the Metropolitan Planning Organizations (MPO) and sustainable development guidelines could reasonably be adopted as state requirements in coordination the federally funded Regional Transportation Plans (RTP).

This or some similar basin wide strategy is needed if the Great Lakes region is to develop in ways that are sustainable and utilize land resources in ways that compliment the assets of the Great Lakes and its communities.

State	Program/Initiative	Purpose
IL	Illinois Local Planning Technical Assistance Act http://law.wustl.edu/landuselaw/IllinoisTechAssist.txt	"Encourage local planning by a set of comprehensive land use categories" Encourages multi- jurisdictional planning to preserve the spectrum and historic, economic

	Local Legacy Act' http://www.ilga.gov/legislation/94/hb/09400hb1052.htm	and social based resources
MI	Michigan Land Use Leadership Council http://www.michigan.gov/gov/0,1607,7-168-21975-62542--,00.html http://www.michiganlanduse.org/	"Make cities more attractive places to live and work; grow in a way that is sustainable; minimize the negative effects of land use patterns"
MN	Minnesota Smart Growth http://www.1000fom.org/principles_of_sg.htm	"The application of the sustainable development concept to land use issues"
OH	Ohio Balanced Growth Initiative http://www.glc.org/landuse/ohroundtable/ohiobgi.html	"Protect and restore Lake Erie and its watersheds to assure long term competitiveness, ecological health and quality of life"
PA	Growing Smarter and Growing Greener http://www.growinggreener2.com/default.aspx?id=1	"To plan for the future health and vitality of our communities" "To protect and restore our natural resources so we can revitalize Pennsylvania's economy and improve our quality of life"
WI	Comprehensive Planning & Smart Growth http://www.doa.state.wi.us/pagesubtext_detail.asp?linksubcatid=366&linkcatid=224&linkid=	"Asking how our communities' growth can be shaped. . . a proactive discussion of how and where new development should be accommodated"
WA	Washington State Growth Management Act http://www.mrsc.org/subjects/planning/compplan.aspx	A state planning act passed in 1990 that provides a recently enacted program of state guidance supporting sustainable local planning and development

F. Programs For Funding And Financing

All forms of public and private financing (including tax structures) often become the determining factors when attempting to implement sustainable development projects on the ground – especially when they are being done as exceptions and variances to standing zoning, ordinances and regulations. This subject will require its own study. Many of the problems associated with financing innovative projects that deviate from the market norm run into unresponsive financial institutions as described by the Brooking Institute ("Financing Progressive Development." Christopher B. Leinberger, Founding Partner, Arcadia Land Company 2001).

A two decade old program, Community Reinvestment Act (CRA) has provided funding and financing for difficult neighborhood redevelopment and home financing as also described in another Booking Institute report ("Creating a Scorecard for the CRA Service Test: Strengthening Banking Services Under the Community Reinvestment Act: Policy Brief #96" by Michael Stegman, Kelly Cochran, Robert Faris 2003).

Other local tools being used for funding land conservation come from organization such as the Trust for Public Lands and the Nature Conservancy. Financial tools are funding easements for special uses such as aesthetics, agriculture and conservations. Historic properties federal tax credits are providing the incentive to save many existing buildings rather than former tax policies that gave incentives for demolition and

new construction. Every state, county and municipality along with many local taxing authorities (schools, libraries and parks for instance) will either provide incentives and impediments for sustainable development. For instance, one disincentive for family farms in urbanizing areas has the standard to assess property by it potential (zoned) use. Once an area has been rezoned, many small farmers or other large area land owners are forced to sell. Some areas have developed taxing policies to assess by use instead of potential use such as the Michigan "Use-value property tax assessments."

Public and private funding and financing should be studied at all levels from federal and national to the Great Lakes States to ensure that sustainable development is possible after every effort is make to plan, enact policy and design projects are guided by principles for smart growth.

G. Projects: Sustainable Development Examples

After planning, policy-making and site design, sustainable development becomes measured by the projects that are built on the land and with land based resources. The practices for "building green" has been rapidly advancing and major cities such as Chicago are adopting energy conservation practices into their building codes and requiring major new construction use increasing percentages of recycled building materials.

The US Green Building Council has developed an extensive program for green building design certification for several major construction categories such as commercial construction, renovation and residential building. The LEED (Leadership in Energy and Environmental Design) program57 is setting the standards for sustainable building design and construction. While certifications entail extensive and technical considerations, green building can be summarized to address several major concerns:

- Sustainable site design and building siting
- Energy efficient performance through natural and technical means
- Using renewable and recycled building materials
- Environmental healthiness of building interiors for users with considerations for natural lighting, air and material toxicity
- Resource consumption and impact on the environment (especially water)

Building Greene[58]

The buildings in which we live, work, and play protect us from Nature's extremes, yet they also affect our health and environment in countless ways. The design, construction, operation, maintenance, and removal of buildings takes enormous amounts of energy, water, and materials, and generates large quantities of waste, air and water pollution, as well as creating stormwater runoff and heat islands. Buildings also develop their own indoor environments, which present an array of health challenges. Where and how they are built affects wildlife habitat and corridors and the hydrologic cycle, while influencing the overall quality of human life.

As the environmental impact of buildings becomes more apparent, a new field called green building is gaining momentum. Green or sustainable building is the practice of creating healthier and more resource-efficient models of construction, renovation, operation, maintenance, and demolition. Research and experience increasingly demonstrate that when buildings are designed and operated with their lifecycle impacts in mind, they can provide great environmental, economic, and social benefits. Elements of green building include:

Examples Of Sustainable Development Projects

[57] LEED. http://www.usgbc.org/DisplayPage.aspx?CategoryID=19
[58] U.S. EPA. http://www.epa.gov/greenbuilding/

GREEN BUILDING
Chicago Green Building Center
Chicago City Hall Green Roof

SUSTIANBLE DEVELOPMENT
Conservation Design
Coffee Creek, IN
Prairie Crossing, IL

Neo-Traditional Communities
Bigalow Homes, Aurora, IL
North Town Center, Chicago

Transit Oriented Development
Arlington Heights, IL
Evanston, IL

Main Street Revitalization
Racine, WI
Sheboygan Falls, WI
Shelbyville, IN
Bowling Green, OH
Chagrin Falls, OH

Brownfield and Industrial Redevelopment
Rouge Rive Plant, MI
Waukegan Harbor, IL
Menomonee Valley Redevelopment, WI
Duluth Waterfront Redevelopment, MN

SMART GROWTH PLANNING
Chicago Wilderness Biodiversity Recovery Plan, IL, IN, WI
Schaumburg Biodiversity Plan, IL
Chicago Green City Principles, IL
Northeastern Illinois "Common Ground" Regional Framework Plan, IL
Neighbors Building Neighborhoods, Rochester, NY
Tughill Commission Circuit Riders & Councils of Government Program, NY

CONTEXT SENSATIVE TRANSPOTATION SOLUTIONS & INFRASTRUCTURE
Paris Lexington Highway Reconstruction, KY
Duluth Urbanized Area Growth Impact Study, MN

IV. Priority Recommendations for Sustainable Development in the Great Lakes Basin

The following recommendations from the Sustainable Development Team Land Use and Development Workgroup are presented first in a table summary organized by the Team's five recommendation categories. Following this summary the recommendations are described in narrative form under the related action summaries.

Recommendation Summary

Recommended Action	*Lead*	*Time-frame*	*Costs*	*Benefits*
(A) Align institutions to value ecological resources.				
Create Sustainable Development Guidelines for the Great lake Basin based on established principles (LEED, Smart Growth Principles) through a Great Lakes Sustainable Development Council. Participating governors, mayors and regional councils will establish interagency coordination teams to work with Basin-wide Council. Under EO, related federal agencies will establish interagency support team.	Great Lakes Governors, participating mayors and regional agencies with appointed council with 3 appointments from each state representing environment, economy and community interests.	By mid-2006	Funded from existing state and federal programs	Advisory recommendations to ensure coordinated application of guidelines and existing programs such as the LaMPs
(B) Ensure/promote ecological conservation.				
Great Lakes Collaboration will establish a technical team to promulgate recommended Sustainable Development standards for building design, area design (LEED model) and sustainable land use planning (Smart Growth Principles) and other best practice models such as the LaMP plans for application in the basin's planning, zoning and development standards and regulations.	Great Lakes Coordination Council or Ad Hoc Committee with University and other research centers (Sustainable Land Research Consortium)	2006-2009	Redirected NSF, UTC, NOAA and other related basin research funds	Create Basin wide standards and guidelines
(C) Promote and integrate regional planning with public infrastructure maintenance, land use, and development,				
Create a 3-year sustainable land use and transportation plan demonstration project with a competitive selection of 3 to 6 GL Basin MPOs to develop integrated sustainable regional land use plans with the current Regional Transportation Plans	MPOs with Coordination Council and related Basin-wide organizations	2006-2009	50% of selected MPOs RTP funding with cooperating agencies' existing appropriations	Put in place a major application of sustainable development through well established transportation planning in Basin's urbanized metropolitan planning areas
Create a 3-year sustainable land use and rural plan demonstration project with a	MPOs with Coordination Council and related	2006-2009	50% of selected RPOs	Put in place a major application of sustainable

Recommended Action	*Lead*	*Time-frame*	*Costs*	*Benefits*
competitive selection of 3 to 6 GL Basin RPOs to develop sustainable regional land use plans with current rural infrastructure plans (water, waste water and power)	Basin-wide organizations		infrastructure funding with cooperating agencies' existing appropriations	development through well established rural planning in Basin's stressed rural planning areas
Form multi-state research team to benchmark and monitor performance indicators of participating demonstrations and comparable non-participating areas	University and NGO team under Coordinating Council (Sustainable Land Research Consortium)	2006-2012	Extension of best practice research funding	Provide research base for program Sustainable Development demonstration program and its wider application in GL and nationally
(D) Develop incentive programs that promote sustainability across all sectors.				
Establish Basin-wide coordinated funding priorities for urban redevelopment with focus on brownfields with participating municipalities with demonstration MPO regions	Participating municipalities with MPOs, Coordination Council and related Basin-wide organizations	2006-2009	50% RTP funding from related state and federal funds	Provides incentive-based participation of local governments
(E) Brand the Great Lakes as a competitive place to live, work, do business, and recreate.				
Sustainable Land Use best practices, demonstrations and monitor outreach of planning, development and land use organizations through established communication vehicles (print, electronic and web)	Demonstration coordinating committee	2006-2009	N/A	Use applied work as message vehicle

State & Local Governments Sponsored Sustainable Land Use and Green Design

(A) Align institutions to value ecological resources.
Create Sustainable Development Guidelines for the Great lake Basin based on established principles (LEED, Smart Growth Principles) through a Great Lakes Sustainable Development Council. Participating governors, mayors and regional councils will establish interagency coordination teams to work with Basin-wide Council. Under EO, related federal agencies will establish interagency support team.

The Great Lakes governors and participating mayors will sponsor a basin-wide program to build on Michigan’s and Chicago's lead and appoint a Great Lakes Sustainable Development Council that will development and promote guidelines for all new buildings and major renovations over 50,000 square feet for state or municipal agencies, universities, community colleges and schools be LEED (Leadership in Energy and Environmental Design) certified. This effort is designed to ensure that all new or significantly renovated state and municipal facilities (including buildings and landscaped campuses) are energy

efficient in operation and maintenance and are designed to have minimal impact on the environment. Furthermore, these governmental entities will use their existing governance process to encourage sustainable design commitments in the private sector as evidenced by LEED certification of commercial construction, neighborhood design, and facility operations. (E.g. incentives could include zoning density bonuses or certification) www.usgbs.org

Support Sustainable Community Design

(E) Brand the Great Lakes as a competitive place to live, work, do business, and recreate.
Sustainable Land Use best practices, demonstrations and monitor outreach of planning, development and land use organizations through established communication vehicles (print, electronic and web)

Coordinate and focus all federal, state programs that result in public investments, including tax policy, real estate policy, public infrastructure and services, economic development, land use and environmental protection, to give preference or additional funding attention to those local jurisdictions with projects and communities that encourage and practice sustainable development. Specifically:

- Sewer and water investments that leverage sustainable concepts and do not cause sprawl. Create incentives for the major loan grant programs, (in particular USDA Rural Utilities and State SRF) in this regard to give preference to those projects that advance sustainability for economic as well as environmental Initiatives that encourage preferred land uses for water quality and economic benefits. Example, the working lands of agriculture and forest management. Encouragement for regional input on local growth initiatives
- compact, multi-dimensional, multi-use and integrated land use patterns
- infrastructure to encourage walking, bicycling, and transit that is interconnected and provides access to employment, education, recreation, entertainment, shopping, and services
- appropriately scaled and economically healthy “town/city centers” that contain local businesses at the neighborhood level and a range of commercial, residential, cultural, civic, and recreational uses in town centers
- use of natural features and energy flows, including solar energy, natural drainage and vegetation protected and integrated as part of the functioning infrastructure to conserve resources and minimize waste
- unique
- attractive historic, cultural and social public gathering places that reflect the local culture
- variety of housing choices to serve a wide range of economic levels and age groups
- ample supply of specialized open space in the form of squares, greens and parks in neighborhoods and town/city centers and in the form of agricultural greenbelts or wildlife corridors that clearly defines the edge of a city, town or metropolitan area.

Protect Natural Areas, Rural Communities and Landscapes by implementing Sustainable Growth strategies specific to each region.

(B) Ensure/promote ecological conservation.
Great Lakes Collaboration will establish a technical team to promulgate recommended Sustainable Development standards for building design, area design (LEED model) and sustainable land use planning (Smart Growth Principles) and other best practice models such as the LaMP plans for application in the basin's planning, zoning and development standards and regulations.

Strategies include the following:

- Provide rural communities and counties with financial and technical support to adopt and manage sustainable forms of development that:
  - Encourage clustered development patterns centered on existing communities

  - Preserve natural landscapes and functions as economic as well as environmental assets.
  - Coordinate land use development among adjacent counties and communities.
- Promote uniform state land use legislation to guide development with the Great Lakes Coastal Zone while still respecting each community's identity.
- Promote regional planning commissions to provide land use planning assistance and coordination among rural communities along the Great Lakes Coastal Zone.
- Provide sustaining grants for land use capacity building at the local and regional level.
- Develop a uniform and consistent set of land use development indicators upon which to assess growth patterns and provide local officials with reliable data upon which to base land use decisions.
- Promote development consistent with the community's ability to accommodate such growth considering institutional capacity, infrastructure, and landscape values and conditions.

Create a Great Lakes basin demonstration program

(C) Promote and integrate regional planning with public infrastructure maintenance, land use, and development,
Create a 3-year sustainable land use and transportation plan demonstration project with a competitive selection of 3 to 6 GL Basin MPOs to develop integrated sustainable regional land use plans with the current Regional Transportation Plans
Create a 3-year sustainable land use and rural plan demonstration project with a competitive selection of 3 to 6 GL Basin RPOs to develop sustainable regional land use plans with current rural infrastructure plans (water, waste water and power)
Form multi-state research team to benchmark and monitor performance indicators of participating demonstrations and comparable non-participating areas

Create a Great Lakes basin demonstration program of coordinated goals, guidelines, incentives and performance indicators by engaging a representative selection of urban MPOs and rural RPOs to create integrated land use and transportation plans and/or utility plan advancing sustainable development principles with incentives for local planning consistence by redirecting existing federal and state program funds.

Conduct multi-state, multi-institutional research on thoroughness, consistency and currency of regional, transportation, utility plan, and watershed plans with related local comprehensive plans across Great lakes basin and evaluate for effectiveness to active sustainable development principles for Smart Growth.

Establish performance indicators to measure progress of Great Lakes land use plans and resulting development practices for Great Lakes basin research sample and monitor Great Lakes basin sustainable development progress with an annual report card.

Federal Funding and Capacity Programs Summary

While some programs listed in the funding appendix are proposed for reorganization and reallocation, it is clear in the President's "Strengthening America's Communities" initiative (See below) that the goals and purposes of these programs will be supported and strengthened. At the same time the reauthorization of TEA-21 is moving forward as a $284 billion six-year appropriation, the Farm Security and Rural Investment Act is in place until 2008 and the Clean Water Act remains a solidly support national program.

The President's Executive Order creating the Great Lakes Collaboration is a strong commitment to support interagency collaborations to benefit the future of the Great lakes as a national resource. These

programs are all legislated as strong sate and local government partnerships as reflected in the above recommendations.

All of the Great Lakes basin states have funded "Urban Transportation Centers" through federal transportation funds. These centers have been charges to do research on direct transportation issues, but have the capacities to expand their research by partnering with any number of other university or nonprofit land use and resource research institutions. Reviewing current federal transportation planning funding (TEA-21) and US DOT programs and policy the mechanisms are in place to support a Great Lakes Sustainable Land Use Planning Demonstration Program (See Appendix – US DOT. Numerous other federal programs could be channeled to support and interagency program. The following are examples of related federal program web sites).

The demonstration would be supported with existing federal and state program funds such as US DOT TEA-21 funds, U.S. EPA Clean Water Act funds, HUD CDBG funds and DOC EDA funds as a proportional multi-year (50%) match to TEA-21 Regional Transportation Planning funds to support technical assistance, research evaluation and performance monitoring for integrated, sustainable land use planning.

Invest in Urban Areas

(D) Develop incentive programs that promote sustainability across all sectors.
Establish Basin-wide coordinated funding priorities for urban redevelopment with focus on brownfields with participating municipalities with demonstration MPO regions

To respond to the region's industrial legacy, including a disproportionately high proportion of brownfields compared to most other regions in the country, the federal government will support the investment by Great Lakes governors and mayors in their urban cores by providing a minimum of $120 million per year to the U.S. EPA's Brownfield Redevelopment Program with an appropriate allocation to address the significance of brownfields in the Great Lakes region for investment in clean up and redevelopment of Brownfield sites, blighted properties, and historic structures around the Great Lakes, with priority given to those sites adjoining the Great Lakes waterways. Sustainable design and redevelopment of the sites will be encouraged. This effort will serve to direct future growth toward our urban environments where we can capitalize on existing infrastructure commitments and enable people to enjoy, value and protect the adjoining natural resources.

Incentives to encourage redevelopment and clean-up of environmentally contaminated property will include clearer guidelines for avoidance of liability (e.g. aligning federal and state law so liability is causation-related; consistent application of federal law protecting buyers of known contaminated property). Economic incentives like tax increment financing or real estate tax assessment freezes will encourage redevelopment of waterfront Brownfield sites with clean up of conditions in adjacent waters included as expenses eligible for TIF recovery. Open space in lake and riverfront developments will be encouraged by providing liability protections to qualified conservation organizations that hold conservation easements or similar interests. Qualified private consultants will assist with cleanup signoff to facilitate Brownfield redevelopment process.

RECREATION, TOURISM AND FISHERY

I. Background

Sustainability Strategy Team Recreation Workgroup Vision Statement
A sustainable Great Lakes ecosystem that ensures environmental integrity and that supports, and is supported by, economically viable, healthy human communities.

Sustainability Definition
The United Nations Bruntland Commission report used: development that meets the needs of the present without compromising the ability of future generations to meet their own needs. In alignment with this sentiment is the Anishinaabeg Seventh Generation Principle that each generation considers the impact of its decisions on the next seven generations.

Public Support Indicators
In April 1996, a national poll conducted by Roper Starch Worldwide, Inc. found broad support (66%) for the goals of sustainable development. In July 2002, a post 9/11 poll of Great Lakes residents registered almost exactly the same broad support — 64% in a poll conducted by Belden, Russoneuo and Steward, funded by the Joyce Foundation.

II. Summary

Recent studies document the economic benefit of Great Lakes recreation, boating, fishing and tourism and place it in the multi-billions of dollars annually. Suggested recommendations from the other seven strategy teams are necessary to sustain the "nature" upon which the nature based recreational activities depend. For cost accounting, other recommendations may "cost" in the short term, but the gain in recreation, boating, fishing, tourism and human health pay back will bring long term gain for the region's economy. There are also a number of work group recommendations that must be implemented if the economic potential of the recreation, boating, fishing and tourism sector can be realized.

The work group research identified needs for a brand identity and Great Lakes wide marketing strategy, infrastructure to support nature-based recreational activities to their potential, and the need for collaborative governance and measuring tools. The challenge of working across eight diverse, cold winter states can be turned into a brand identity of cold, freshwater fish found all through the long and diverse journey following the maritime, Native American and westward expansion of the country.

While the recommendations of the workgroup are not resource neutral, a key ingredient is adapting programs models from other regions and adopting them in the Great Lakes (*Adapt and Adopt*). One way to leverage resources is to avoid duplication of effort, connect together small efforts into a larger effort and continually look for collaboration or joint efforts (*Connect and Collaborate*). Since the condition of the environment is the draw, we must be careful to promote and develop with preservation in mind (*Preserve and Promote*).

III. Recommendations

Brand Identity and a Marketing Umbrella for Nature Based Tourism: *Adapt and Adopt*
Nature Based Tourism would emphasize "Great Lakes, Great Journeys" type of brand that could include a Maritime Heritage Corridor as well as early native American and settlers culture and scenic byway. Federal, State, Tribal collaboration on a Great Lakes Recreation Pass that would allow access or discounts to museums and regional activities could facilitate and promote multi-agency destinations. Current programs must be reviewed and a determination made on whether a new concept is needed.

Recreation Infrastructure and Resources: *Connect and Collaborate*
Resources for recreational harbor dredging are an ongoing expense item while many capital projects like boat ramps and terminals, brownfield retro-fits, land purchases or easements for trails, parks and fish passage ways. Once completed these types of projects have and can be maintained by local fees or taxes. A major funding source for capital projects has been the Federal Land and Water Conservation Fund and a replacement for the state portion will need to be found. A web site will need to be developed for funding sources for recreation projects at all levels well as for the "Marketing Umbrella." Recreation friendly transportation corridors and connections need to be developed, presented on line and could be maintained through a partnership of private providers. "Green Tourism" and "Green Marinas" certification programs should be adapted and adopted for the Great Lakes.

Governance and Reporting on Measurement, Tools: *Preserve and Promote*
An open dialogue is necessary to maintain partnership efforts between Great Lakes preservers and promoters. Lakewide Management Plans (LaMPs) bring the multi-media issues together by lake basin but they need to nest into a Great Lakes wide organization. The need to clearly identify and protect fish spawning areas, underwater historic and/or natural sites and to more broadly educate the public about the designated flyways are programs that need to be reviewed and reemphasized. Many of these have a trust responsibility assigned to agencies. There are a number of successful, large collaborative efforts such as in the Adirondack Park area. The Milwaukee, WI office of Americans Outdoors provides a multi-agency customer service center model and the Great Lakes National Program Office promotes policy coordination by co-locating other agency managers in their office.

IV. Purpose

The purpose of the workgroup report is to provide information related to current and future human activities and impacts on the Great Lakes Basin with recommended actions to promote sustainable use practices that protect environmental resources and public health and continue the recreation economy and quality of life activities that include boating, fishing, outdoor activities, history and nature based tourism. These activities may enhance or are essential to the recreational, commercial and societal values of the Great Lakes. This workgroup report will outline solutions for many of the presented challenges with the expectation that more in-depth suggestions on the root problems will be addressed in the appropriate GLRC Strategy Team. The topic of fishing will be addressed from a commercial, sport and cultural view. The important role that transportation plays in tourism needs to be addressed but no research has been done to date. A transportation system that is sensitive to the needs of travelers and their recreation equipment is also key to promoting the Great Lakes.

V. Introduction

For thousands of years the abundant natural resources of the Great Lakes system attracted inhabitants to its shores. The fresh water, abundant and diverse fishery, stands of trees, mineral wealth and fertile soils formed the basis for the quality of life and the economy. The opportunity of using water for drinking, power and transportation was a key element in the economic equation of the time. The magnitude and diversity of the Great Lakes adds a challenging dimension to most endeavors. The lake system contains roughly 20% of the earth's fresh surface water supply, spanning 750 miles from west to east and serving as the boundary between two countries.

The interaction of Great Lakes' residents with their ecosystem today is still based on natural resources but is less hands-on, for while the plows still till the soil, the pork belly "futures" get sold in the Chicago Commodities Exchange pit far removed from the resource. More interaction is now self-selection of activities in which residents are seeking quality of life by being outside, often on or near the water. The interaction we term "recreation" is so highly valued by society that special purpose governmental units on

the federal, state, tribal and local levels are charged with protecting natural resources by providing and promoting recreation services utilizing public funds. Recreation takes place on the land, on the water and in the water and there is even under water scuba recreation and a National Marine Parks and Underwater Preserve at Thunder Bay, Lake Huron. Scuba diving at old ship wrecks and other natural phenomenon in the lakes is a growth sport and opportunities abound to discover other natural and cultural sites.

An entire industry exists to entice visitors to share the region's natural resource-based activities. Studies document that these nature-based tourism activities provide a significant net positive gain for the health of the residents and to the region and national economy. To sustain this interaction with a positive net gain to the economy, the environment and society, critical coastal areas must be open and accessible; water must be of high quality and sufficient quantity; sensitive cultural, habitat and biodiversity areas protected; and attention paid to climate change and lake level interaction.

The Green Infrastructure movement is catching on as a way to educate and inform communities of the important values of open space. Stated simply, green infrastructure is the system of connected parks, trails and stream corridors that provide conservation and recreation benefits to a community. This connected system is as important as infrastructure as more traditionally thought or infrastructure such as roads and utility corridors for electric power transmission, water and sewer and public safety.

Benefits in communities with well developed green infrastructure include a higher quality of life for residents. Healthy green infrastructure also minimizes non-point source pollution problems, provides transportation alternatives, and improves overall environmental quality and public health.

Development pressures within the Great Lakes basin will continue to increase. Great Lakes communities must consider growth management planning to insure that future community expansion either residential or industrial does not have any negative impacts on the important resource values of the Great Lakes.

Local, state, tribal, provincial and federal government agencies have widely varied natural resource ethics and cannot deliver all that is needed to ensure a future of protection for the great lakes. Ultimately local stewardship of important resources will cumulatively protect the Great Lakes. Recreation and economic development partnerships should be interested in long-term resource stewardship. Government agencies can be a partner with these locally driven groups and the cumulative effort is usually the strongest way to effect stewardship of resources as in the Lakewide Management Plan example. A Great Lakes basin partnership could be formed and charged with the future well-being of this world-class resource. This partnership would provide the necessary forum to bring together all sides and the lake by lake watershed scale of the various Great Lakes issues. This partnership could be a clearinghouse of resource information to provide the tools for the region's communities to plan and implement projects that positively influence and not degrade the Great Lakes.

Ultimately plans need to meet very simple tests to determine their potential impact on the Great Lakes. The Great Lakes partnership should provide guidance, tools and help build capacity to enable the region to plan, develop, grow and prosper while adhering to common measures. Projects should be; clean, green, accessible, affordable, diverse, attractive, open, connected and usable

VI. Documented Trends: Trends that impact sustainability and translate into challenges or benefits.

<u>Regional Recreation Trends</u>

1) Post 9/11, energy and time constrained life styles equals recreation use closer to home putting pressure and attention on local recreation facilities and natural resources
2) The graying of the population may also impact the closer-to-home need for recreation

3) Cities are re-developing working waterfronts into recreation amenities, and other brown to green field activities, rust belt to service economy and tourism
4) Growth/sprawl predicted for the coastal counties by 2040 is 20-25%, leading to land coverage/runoff, ground water mining and habitat destruction.
5) Health issues nationwide are being tied to the need to exercise, which will add to the need for trails and local recreation areas.
6) Recreation that provides a journey from one place to another on both land and water is gaining in popularity and demand. Examples are "Rails to Trails," water trails, scuba trails and bike to work trails. On road bike trails for commute and/or travel are needed and should continue to be recognized in Federal Transportation legislation and funding.

Recreation	Culture
BeachCast	The Arts
Biking	Historic Sites
Birding	Lighthouses
Boating	Museums
Camping	Shipwrecks
Canoeing & Kayaking	
Cruises	
Fall Colors	
Festivals	
Golfing	
Hiking	
Hunting & Fishing	
Islands	
Parks	
Scuba Diving	
Sports	
Tours	
Winter Activities	

Regional Marketing Trends

7) Web-based tourism information provides new, expanded audience for marketing efforts.
8) Great Lakes Recreation Pass development has been introduced into the Michigan Legislature's Spring 2005 session. The pass would allow visitors to purchase one pass and gain entrance to a host of parks and recreation sites and would require passage in other Great Lakes States. The program is modeled after a similar program Oregon and Washington.
9) In 2000, cruise ships began plying the basin again after the end of the industry in early 1960. There were 300 passengers in 2000 and 6,000 in 2004. Also in 2004, ferry service in the basin began in Lake Michigan and Lake Ontario (Christopher Wright Cruising the Great Lakes, Inc.)
10) There is no "branding" of Great Lakes fish, ports, trails, etc. also no cross branding of recreation opportunities and no collaborative advertising in national publications.

Regional Environment and Health Trends

11) Some terrestrial fauna is making progress as eagles expand Great Lakes nesting, and wolves are no longer classified as endangered by USFWS.
12) The basin-wide aquatic food web picture is more mixed. Invasive species are not being prevented or controlled, yet some species like sturgeon and coastal brook trout are being successfully reintroduced.
13) Dams are being removed with the result of native aquatic species are returning to dam-free streams.
14) Subsistence fishing is most prevalent in Lake Superior and northern Lakes Huron and Michigan. This trend will continue as guaranteed by Federal/ Tribal Nation treaties.
15) Over the last 25 years, the top angler effort in the US Great Lakes has been for yellow perch (USFWS National survey) and the sport fishery has become significantly less diverse over time.

16) Long-term fish contamination monitoring by federal, state and tribal programs has documented the continual decline of pesticides and PCBs in Great Lakes fish, although levels still require fish advisories.
17) EPA, FDA, states and tribes began a new dialogue in 2004 and are working to determine new guidelines for fish that account for both risks from contamination and the health benefits from a high fish diet.
18) The forage base for large predator sport fish is becoming unstable presenting a unique opportunity to enhance the forage base with native species.

Regional Governance Trends

19) As federal and state budgets tighten, recreation funding is falling while demand is growing. Recreation has infrastructure needs like harbor dredging, access, terminals, and transportation connections.
20) There is no Great Lakes sport fishery harvest database, although economic value and hours of fishing effort are well documented.
21) The 1955 *Convention on Great Lakes Fisheries* created the Great Lakes Fishery Commission. This bilateral agreement affirms the need for two nations to collaborate on protection and management of the fishery resource, based on biological capacity rather than short-term policies. As fish resources become more limited, jurisdictions must allocate between sport and commercial fishing setting up conflict.
22) Measurement tools are being developed to be able to use the "Green" Label, examples, Maryland's Green Marinas Program, US Green Building Council's LEED for new construction, Melbourne Principles for Sustainable Cities — a development of the Brundtland Commission tailored as a "green label" for cities. More "green" labels are being applied in many Great Lakes City activities.
23) Collaboration on a number of levels and with different goals have helped develop awareness and stewardship and need to continue. (GLFC, Lakewide Management Plans, etc.)

Regional Economy Trends

24) The price commercial fisherman can get for their catch continues to decline despite healthy retail prices. The destruction of the World Trade Center on 9/11 disrupted the wholesale market and it has not recovered.
25) The Great Lakes supports year-round angling, yet 56% of anglers did not fish as much as they wanted (USFWS National Survey)
26) Charter boat operations have declined 25% since 1994 due to lack of fish, impacts of exotic species and industry economics (Sea Grant Great Lakes Charterboat Report 2003). (Please see Figure 1 below, Economic Value of Great Lakes Resources, adapted from "Wisconsin's Waters: A Confluence of Perspectives", Wisconsin Academy of Sciences, Arts and Letters, Volume 90, 2003, edited by Curt Meine; Figure 1, page 122).

Regional use of Sustainable Practices Trends

27) Wetland mitigation, wetland banking
28) Brownfield renovation
29) Rails to Trails
30) Low Impact Development (rain gardens, green roofs, permeable pavement, wetland/flood retention)
31) Conservation Buffer Strips on Streams, other CRP land
32) Conservation Easements, Development Rights Purchase
33) Revenue sharing
34) Public outreach via signage, regional maps

Determination of Carrying Capacity

35) EPA's list of impaired waters, 303D or TMDL List, President's Ocean Report

36) Advisories for fish and beaches
37) Waste Water Infrastructure (almost half of Combined Sewer Overflow Systems are in the Great Lakes states)
38) Expectations of technology (cleaner/quieter boat motors) and beyond
39) SOLEC paper by William Rees on unsustainable ecological footprint of Great Lakes

VII. Economic Value of Great Lakes Resources

Use Values		Non-Use Values		
Direct	**Indirect**	**Option**	**Existence**	**Bequest**
Commodities	**Recreational Use**	**Eco-buffers**	**Rare biota**	**Climate**
bottled water	swimming	conservation easements	fish	maintain carbon balance
beer, food, fish	boating	future recreation options	plants	productivity
Hydropower	fishing	(NPS)	birds	lake levels
(NPS)	trails	(habitat)	(habitat)	(PBT)
		Future unknown		
(coastal health)	(coastal health)	**commodities**	(invasives)	**Recreation**
		maintenance of biodiversity for future		
Residential use	(NPS)	options	**Preservation**	wilderness
		biotechnology		
Drinking	(AOC sediment)	opportunities	wilderness	water-based amenities
Sanitation	**Real Estate Value**	(habitat)	unique geologies	trails
(NPS)	residential	(invasives)	historic artifacts	(NPS)
Industrial use	commercial	(PBT)	islands	(coastal health)
		Great Lakes		
Paper	(AOC sediment)	**Literacy/Stewardship**	maritime heritage	(invasives)
			underwater	
Cooling	(coastal health)	(indicators)	preserves	(AOC sediments)
			rare coastal habitats (dunes,	
	Ecosystem			
(PBT)	**Function**		alvars, etc.)	**Rare biota**
Transportation	fish habitat		(habitat)	fish
Commodities	filtering		(invasives)	plants
	biological			
Passengers	diversity			birds
(PBT)	(habitat)			(habitat)
(invasives)	(PBT)			(invasives)
(coastal health)	(AOC sediment)			
Tourism	(coastal health)			
nature based	(invasives)			
city based				
water based				
(AOC sediment)				
(habitat)				
(coastal health)				

Figure 1, Economic Value of Great Lakes Resources

Use of the Resource: The Great Lakes provide opportunities for a complex menu of tourists attractions and activities that are both public and commercial.		
Status/Sustainability	**Challenges**	**Recommendations/Timing**
Economy The Great Lakes support recreational activities that generate billions in regional economic activity but states have not joined together to "brand" the Great Lakes as a whole, and the sub-branding opportunities like maritime or Native American history. Of the NPS 27 Heritage areas, only 6 are in the Great Lakes I and M Canal, IL Erie Canal, Maumee Valley, OH, Fox/WI, WI Ethnic Settlement Trail (LK MI Coast), Lac du Flambeau	# No Great Lakes Tourism identity / brand; # Access to fishing opportunities; # Access to lakes; # Access to wetlands and other bird watching hot spots #Access to public transportation	# Joint state marketing "Great Lakes, Great Journeys" for nature based -tourism, recreational fisheries; #Great Circle concept must be expanded, Great Lakes Maritime Heritage scenic by-way, etc. A (large) portion of the nations 821 lighthouses are in the Great Lakes (MI has 100) #Explore proposing the Great Lakes as a National Maritime Heritage Corridor, an area of significant cultural, natural or recreation importance, a scenic byway, Sub-areas could also be designated # Develop a Great Lakes Recreation pass, accepted across a number of partner agencies #Of 821 US Light Houses, 100 in MI, etc. must be preserved, promoted
Environment Nature based tourism is a world wide trend that could be capitalized on if we can preserve enough nature to visit and enjoy, we have the world's largest fresh water system, sand dunes, island, and 150 species of fish. Many studies have called for preservation of these globally rare elements of the ecosystem	# Preservation of the unique elements of the ecosystem # Reduce contaminant burden; habitat loss; water supply and quality. # Restore brownfields/waterfronts # Use native species	Green technology and practices for industry, agriculture and home as well as tourism and marinas. Review Maryland's Green Marina Program and the United Nations Environmental Program on Sustainable Tourism adapt and adopt for the Great Lakes
Society Highly valued by society as economic engine for jobs, nature-based tourism	#Capturing some part of the tourism's economic boom where tourism ranks as the number one export earner, Ahead of automotive products, chemicals, petroleum and food. Source: World Trade Organization #The National Park Service estimated that direct and indirect expenditures related to visits to national, state, local And private parks was estimated at $22 billion annually to the US economy (1993 $, study)	Public education to get society to provide resources and support for green technology in order to make the connection to nature-based tourism Great Lakes, Green Coasts.

Use of the Resource: The Great Lakes provide a very diverse set of recreational opportunities in close proximity to large population centers for residents and tourists.		
Status/Sustainability	**Challenges**	**Recommendations/Timing**
Economy # Growth and 20% sprawl on average is predicted for the coastal counties producing competition for land and infrastructure funding. # Recreation, tourism, boating and fisheries fuel multi-billion dollar economic activity. Sport fishing over a billion dollar economic impact, Great Lakes Recreational Boating study (2/05)$22 billion dollar impact, Il Assoc. of Park Districts Economic Impact on state of local park and recreation agencies (2/05) &1.64 bill	# 80% of the US shoreline's 10,000 miles is in private hands, # Industry (AG) and local government investments needed # Brownfields utilized # No "brand identity" for Great Lakes and its assets	# CAFOs regulated, advanced manure management, buffer strips, watershed management plans implemented, low impact development pilots (green roofs, rain gardens, etc) # The 2002 Brownfields Act authorizes up to $250 million annually for re-development approaches that can include conversion of industrial lands to water-front parks, landfills to golf courses and rail corridors to recreation trails.
Environment Existing on-shore sensitive habitat areas, shore marinas and boat ramps and under water spawning areas can potentially conflict with use	Research and monitoring needed on lake levels, temperature and snow pack and climate change	
Society Highly valued by society for quality of life and health effects For example: Michigan Sea Grant funded MSU 2004 survey on wetland values showed 60% of Michigan residents valued wetlands as place to enjoy outdoors, 25% for bird watching and all agreed that top two threats were shoreland development and urban expansion. kaplowit@msu.edu	The Task Force on Community Prevention Services strongly recommends creation of and/or enhanced access to places for physical activity. The Land and Water Conservation Fund provides resources toward implementing this important, evidence-based recommendation" John J Librett, Scientist, National Center for Chronic, disease and Health Protection. The National Park Service 2004 Survey of states estimated unmet demands for recreation facility development and open space acquisition funding, 76% of the states reported needs exceeding 50%. Of the 11 states reporting 90% unmet needs, 4 — half the Great Lakes states — were over 90%. (LWCF 2004 Annual Report)	# Large public investment and education needed for purchase and protection of open space to provide public access # Wastewater treatment infrastructure improvements and watershed management to control episodic "flashes" in stream events # Identify model programs in cities to share Best Management Practices # Expand native landscaping materials for private lands # Green guidelines for great lakes sensitive landscapers/ nurseries # Adapt/adopt the Habitattitude program on not releasing fish and aquatic plants

Use of the Resource: The Great Lakes provide opportunities for commercial and sport water trails in coastal and near shore and under waters of the lakes.		
Status/Sustainability	**Challenges**	**Recommendations/Timing**
Economy Recreational and tourism opportunities	No Great Lakes identity / brand	Collaborative Marketing: Great Lakes, Great Journeys across the basin
Environment Water must meet contact water quality standards Zebra mussels have created clearer waters good for scuba activities	Access, Protect sensitive coastal areas, boat yards prevent invasives, fuel spills	Green technology and practices for industry, boat yards, deal with present ANS and NPS.
Society Existing Water Trails LK SUP: MN 151 miles, no needs WI 96 miles, 80 needed MI 255 miles,120 in planning,260 needed LK MI: WI 365 in planning, no need MI none, 735 miles needed IL 68 miles, no needs IN none, 42 miles needed LK HU: MI 125 miles, 560 needed 17 miles Detroit R. in planning LK ERIE: none MI 30 miles needed, OH 215 needed, PA 42 miles needed LK ON none, NY 325 needed	2289 miles of trails ID, as needed, NOAA has one Great Lakes Marine Sanctuary, more needed, Recreation funding programs being cut Whose job is it to publish trails, ID gaps, Safety issues	Public education to get collaboration, needs to provide support for water access. National Park Service Rivers and Trails staff can facilitate locally driven efforts

Use of the Resource: The Great Lakes provide recreational boating opportunities throughout the region which has led to the development of a substantial recreational maritime industry offering a multitude of economic, sport and recreational benefits to the region's population.		
Status/Sustainability	**Challenges**	**Recommendations/Timing**
Economy Recreational Maritime Industry has a substantial direct and indirect economic impact in the manufacturing, retail sales, and tourism sectors of the region's economy. $22 billion	The industry is dependent upon continuous governmental support of infrastructure (dredging, marina construction, launch ramps, sustainable fish populations, clean water, navigation aids, weather reporting, safety and rescue operations). The industry is also sensitive to recessions and targeted taxes.	Return greater portion of fuel taxes paid by boaters to boating projects and services. Education and marketing which emphasizes the importance of recreational maritime industry to the region and which highlights recreational boating opportunities available on the Great Lakes. Expansion of urban marinas to meet need.
Environment Recreational boating is dependent upon a sustainable fish population, clean water, and navigable waterways. Air and water discharges attributable to recreational boating can have deleterious effect on the environment it needs to survive.	Sustaining fish population, minimizing discharges into air and water, dredging of lakebeds and finding strategies for maintaining water levels.	Adapt/adopt Maryland's green marina and boat yard programs, continuing research into engine technology, re-establishment of sustainable fish populations, research and assessment of dredging and water loss problems. Responsible planning of marina expansions.
Society Highly valued by society for sport, recreational and historical reasons. Regulated by feds, localities, states and provinces.	Facilitating further growth of recreational maritime industry without unduly contributing to environmental problems.	Publicity and marketing to recognize importance of industry;

Use of the Resource: The Great Lakes provide year-round fishing opportunities for commercial, subsistence, recreation, and research purposes.
Recreational Fishery: $4+ Billion
Commercial Fishery: $270 Million
Strengthening Families: Priceless

Vision: A Great Lakes with abundant and healthy fish populations with no need for any fish consumption advisories, in which each Great Lakes citizen is a well-informed and active stakeholder.

Status/Sustainability	Challenges	Recommendations/Timing
Economy Commercial: Wholesale and Retail Fish products furnished. Vigorously regulated tribal and state commercial fishers with trap net or gill net gear generate $270 million yearly. Fish buyers, processors, and fish house and restaurant retailers provide more jobs. Subsistence: Native Americans in court-affirmed treaty rights conduct subsistence fisheries for traditional and healthy sustenance. Commercial and Subsistence: Native American 1836 treaty ceded territory regulation by Consent Order of 2000 (see www.1836cora.org for Consent Decree and regulations). Recreation: Recreational and tourism opportunities. The Great Lakes recreational fisheries generate over $4 billion in regional economic activity.	Access to fishing opportunities. Insufficient fish rehabilitation resources: for example, USFWS cannot produce enough lake trout eggs. No Great Lakes identity / brand. No Great Lakes identity, brand. Market prices for fish poor; continue to decline while retail prices increase. Access to Great Lakes fish products. Loss of traditional food choices so that Diabetes becomes more prevalent; choosing, cleaning and preparing fish safely for mothers and children, adults and seniors.	Commercial: Market "The Great Lakes" for eco-tourism, commercial fish sales. Support fish marketing initiatives. Support private and government sector initiatives. Regional fish advisories based on science, with more monitoring of more species in more places more often. Subsistence: Support federal treaty obligations. Support recreational drug prevention programs. Support local food security initiatives. Support correct treaty education for all citizens in order to promote understanding and reduce social conflict. Recreation: Market "The Great Lakes" for eco-tourism, recreational fisheries. Support private and government sector initiatives, to market fishing for residents and visitors, attract visitors. Public information regarding safe fish consumption and responsible angling.
Environment All fisheries depend on healthy and abundant fish stocks, which depend on adequate habitat for spawning, rearing of young and foraging. Forage base must be stable, and be made up of primarily indigenous species.	Fish contaminant concerns need to be addressed, as does the need for basin-wide fishery management. Public education for citizens to care for the resource and be active and responsible stakeholders needs to be in place. (See MSU's Project FISH.)	Public education to get society to provide resources and support for green technology and basin-wide fishery management.

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Society General: According to the Roper Report, new and significant forces are viewing recreation as a means to achieve important public policy objectives, including federal health interests (Centers for Disease Control and Prevention) federal tourism and economic development agencies and anti-crime agencies. Commercial: Highly valued by society for consumer access to quality retail fish, and jobs opportunities. Regulated by feds, tribes, First Nations, states, province. Subsistence: Highly valued by society for tribal heritage. Regulated by feds, tribes, First Nations, states, province. Recreation: Highly valued by society for sport heritage, jobs, recreation, and tourism opportunities. Regulated by feds, tribes, First Nations, states, province.	Commercial: Consumers not apprised of contaminant levels AND Omega-3 fatty acids and other nutrients in Great Lakes fish, other fish and other foods, so they may make healthy choices. Subsistence: Public education concerning history and legal background federally recognized Indian tribes' treaty rights is badly lacking. Native American heritage for social, conservation and health recreation and economic purposes needs to be maintained. Recreation: Sport heritage for, social, conservation and health recreation and economic purposes needs to be supported, especially in urban areas.	General: PUBLIC HEALTH ISSUE: Support HACCP. Seafood safety regulations. Educate public about how to choose, clean and cook fish to reduce contaminants up to 90%. Educate consumers about the benefits of eating fish: AHA, USDA, etc. encourage two meals of fish per week. Omega-3 fatty acids plentiful in whitefish, trout, salmon: encourage consumption. Encourage use of green technology in energy and other industrial endeavors such as mining, agriculture, steel production, etc. Commercial and Subsistence: Regional rather than lake-wide fish advisories for fish caught for commercial purposes. Promote consistent messages. Recreation: Regional rather than lake-wide fish advisories for fish caught for personal consumption. Promote consistent messages.

Use of the Resource: The Great Lakes Region provides excellent opportunities for land and water based trail experiences. Trails and associated greenways contribute to the environmental quality of the region and are significant features in the economic health within the basin as well as contributing to the health of residents. Quality of life within the basin relies on a growing trail network.		
Status/Sustainability	**Challenges/ Trends**	**Recommendations-short/long term**
Economy Trail recreation can be a significant contribution to a local or regional economy. There are several economic benefits of trails, some direct, some indirect. Expenditures of trail users varies from about $7 a day to significantly more if an overnight stay is included. Economic benefits include direct expenditures by agencies to develop and operate trail systems. Indirect economic benefits include reducing public costs (floodplain impacts and public health cost reduction) as well as real estate value enhancement, and quality of life impacts resulting in other activities such as corporate relocation decisions.	Development dollars and operational funds sometimes challenging to obtain Property rights issues are often obstacles for development	Proactive policy to facilitate trail development such as right of first refusal on railroad right of way proposed abandonment, Dedicated acquisition and development funding programs at federal, state and local level Incentives for developers to set aside common areas for trail development and linkages Recognize that trails and greenways are considered part of a healthy community's infrastructure and institutionalize trail development , keep as part of US Transportation funding
Environment Trails and Greenways can provide significant opportunities to address habitat protection, especially along stream corridors and lakeshores. Significant environmental education opportunities exist with proper interpretive signage and programming. Increased transportation use of trails reduces traffic congestion and contributes to air quality improvements. Trails and greenways can provide buffers between development and open space, filtering sediments, providing an aesthetic filter from developed areas.	Competing land uses pit short term economic gains with longer term and possibly more subtle environmental benefits Existing industrial/urban landscapes are difficult to envision in having any ecological value	Assemble existing information about benefits of trails and greenways, make available at every opportunity for public education Require/provide incentives for developers to set aside and provide for trails and greenways as a way to protect/improve water quality Integrate funding programs for recreation, transportation and environmental enhancement to recognize the cross cutting benefits provided by trails and their associated greenways, Partner with brownfields and rails to trails programs Utilize the Lakewide Management Planning process to facilitate information sharing, common goals.

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Society Trails and greenways contribute to a higher quality of life for the basin's residents. Each state has identified trail development as a priority in their comprehensive outdoor recreation plans. Countless surveys continue to identify trails as the community amenity that citizens want access to closer to home. Communities that are nice to live and work in, become better tourist destinations with less required tourism infrastructure. An inter-connected system of land and water trails is already evolving in the Great Lakes Basin. More coordination would help deliver an on-the-ground system, faster.	Competition from traditional development activities, change is difficult to implement Resistance within traditional transportation planning and development groups continues to exist that hampers increased trail and greenway development. Shrinking government budgets eliminate programs useful for trail and greenway protection and development (LWCF for example)	Validate the role of trails and greenways as infrastructure Continue valuable partnership programs that enhance the ability of local, state and regional partnerships to flourish Further document success stories as demonstrations to communities considering change Provide technical assistance to facilitate success through programs like Cooperative Extension Service, state universities and federal programs like the NPS Rivers & Trails Program

TRANSPORTATION

I. Introduction

Transportation, in all its forms and across all modes, is an integral part of modern life. It is a major cost of conducting business in the global market place of the 21st Century, taking a full 10 percent of the gross national product of developed countries. In the U.S., transportation systems are made up of a complex blend of public and private resources. Efficient infrastructure and multi-modal systems for transporting both commodities and people are the hallmarks of developed, competitive nations.

This effort reviews the transportation resources available within the Great Lakes States Transportation Corridor and tries to understand some of the opportunities and threats posed by existing systems. While all forms of transportation cause environmental pressures and degradation, they also provide economic and social access and opportunity. Optimizing each mode within a balanced system that leverages the strengths and minimizes the weaknesses of each mode is essential in creating a plan for sustainable transportation development within the region.

In a recent paper by the Transportation Research Board, Informing Transportation Policy Choices, we are reminded of how complicated and necessary it is for us to understand the role of transportation:

> "The shape and prosperity of modern life depend heavily on extensive and efficient transportation. In the United States, transportation's scope and scale are truly enormous. So, too, are its consequences for personal mobility, urban form, employment, economic efficiency, public health, the environment, and dependence on foreign sources of petroleum. Although many aspects of transportation are handled through the private sector, the public role in economic, safety, and environmental regulation and the provision of the infrastructure and transportation services is broad and complex. Many of the most controversial policy choices at the national, state and local levels depend heavily on technical analyses of the consequences of current or changed [transportation] policies."

II. Current State of Use and Projected Trends

In evaluating the sustainable use and development of transportation systems within the Great Lakes region, the primary focus should be placed on the rail, highway, and maritime modes that comprise the Great Lakes Transportation System (GLTS). The GLTS is a multi-modal system. Movements of goods and commodities flow from ship to rail and truck, and from rail and truck to ship, in synchronized trade patterns. Some of the most successful trades rely on multi-modal connections, such as:

- Low-sulfur coal railed to Great Lakes loading ports from Wyoming and Montana for shipment by self-unloading vessels throughout the Lakes, and
- Grain hauled by truck and rail from Prairie States and Provinces to Duluth-Superior and Thunder Bay for shipment to other Great Lakes ports by lake carriers and direct export by ocean freighters.

The major rail and highway hubs of the mid-continent – such as Chicago, Toronto, Detroit and Toledo – are major ports as well. More than 40 provincial and interstate highways and nearly 30 rail lines link the 65 major and regional ports of the system with consumers and industries all over North America.

However, each mode of transportation also has deleterious impacts to the Great Lakes ecosystem, as well as negative social impacts. Current practice and the potential increase of movement of goods by rail or highway present adverse impacts to air quality, congestion in urban areas, land use, and other environmental and social factors. Current practice and potential expansion of maritime transportation present adverse impacts from maintenance dredging, introduction of invasive species, and other environmental and social factors.

An analysis of sustainable transportation thus should address one unified transportation system representing multiple modes of transportation, and must evaluate the economic, environmental, and social impact of each. Taking an integrated systems approach is necessary to create a unified transportation plan that optimizes the value of each mode, while minimizing associated risks. The present and future capabilities and limitations of each mode must be determined to best recommend how the system can be developed and efficiently utilized in a balanced and sustainable manner. An assessment of the environmental impacts of each mode is needed to better understand the physical, chemical, and biological conditions in which each mode operates, and how current and future operations impact those conditions. Finally, assessments are needed to determine how the social and economic structures within the region are impacted by each mode, and by the transportation system overall.

Current projections indicate that the volume of domestic and international trade is expected to continue to grow based on potential economic increases within the region, creating increased need for transportation resources. It is imperative that we begin today to create an integrated Great Lakes States transportation plan, to both seize available opportunity and avoid unwanted impacts and consequences that are part of all transportation systems.

A. Maritime Component

The maritime component of the GLTS in U.S. waters is comprised of the five Great Lakes and their navigable connecting channels: the St. Marys River, the Straits of Mackinac, the St. Clair/Detroit River System, and the Welland Canal. The Great Lakes are a binational resource, covering 95,170 square miles of water surface (about 61,000 in the U.S. and 34,000 in Canada), defining a 10,000-mile coastline, and reaching 602 feet above sea level. More than 100 commercial and recreational ports operate in the Great Lakes and are an integral part of this waterway system. There are four operational commercial cargo locks in the U.S. waters of the Lakes. Two locks on the St. Marys River – Poe and MacArthur – are known collectively as the Soo Locks. Chicago Harbor Lock, used mostly for recreational traffic, is located at the junction of the Chicago River and Lake Michigan. Black Rock Lock in Buffalo, NY is located on the Black Rock Channel, which connects the Niagara River and the New York State Barge Canal.

All five of the Great Lakes are deep enough for deep draft navigation in open waters, though ice conditions halt vessel traffic for 2-3 months on most routes. Constraints to navigation are presented by periodic water level reductions in connecting channels, approaches to harbors, and the harbors themselves. Connecting channels are maintained to allow a minimum of 25.5 feet of safe draft. Vessel loadings beyond 25.5 feet in higher water years increase the efficiency of the system and are frequently accommodated; however, in low water years, channel depths may support only the minimum drafts.

The system connects with the Atlantic Ocean through the St. Lawrence Seaway, a series of two U.S. and five Canadian locks constructed in 1959 to allow passage of deep draft ocean vessels into the GLTS. The system also connects with the Ohio River System (ORS) through the Cal Sag and Chicago Sanitary Ship Canal at Chicago. Ships moving on this vast inland system are tug-barge combinations and self-propelled vessels capable of drafting up to 34 feet, though the system limits safe draft to 25.5 feet.

The Great Lakes maritime component has a major economic impact on the North American economy. According to an economic impact study conducted in 2000, the U.S. component of the Great Lakes/St. Lawrence Seaway System generated $3.4 billion of business revenue to firms providing transportation and cargo handling services. A total of over 152,000 jobs are in some way related to approximately 200 million tons of cargo moved on the system annually, about 44,000 of which are generated directly by Great Lakes/Seaway activity. For individual ports in the system, trade has been a catalyst for billions of dollars in capital investment and industrial growth. The base economies of many Great Lakes ports and

the Midwest were defined by cost effective access to raw materials provided by the waterway. The Great Lakes and St. Lawrence Seaway have provided U.S. and Canadian farmers of the Great Plains an economical route to the world markets for roughly 10 million to 14 million metric tons a year of wheat, corn, soybeans, and other products in recent years.

Maritime commerce on the Great Lakes involves three general trade communities: traffic moved on the Seaway, which is overseas import/export trade by ocean-going vessels; inter-lake domestic trades contained within the Great Lakes; and cargo transiting the Seaway and Great Lakes from Eastern Canada. Ocean-going vessels primarily import products such as finished steel and export grain on break bulk ships. The domestic U.S. and Canadian-flag fleets service the other two market segments primarily with self-unloading bulk ships. Their major cargos are iron ore, limestone, coal, and grain. In recent years, the U.S.-flag fleet has been moving about 120 million tons annually (primarily in the upper four Lakes), the Canadian-flag fleet 60 million tons (primarily via the Seaway and Lakes), and the ocean-going vessels 20 million tons (via the Seaway and Lakes).

As an artery for international trade, the St. Lawrence Seaway has allowed industries throughout the heartland of North America to participate competitively in a wide range of export markets. More than 2.2 billion tons of cargo, estimated at $200 billion, has moved to and from the U.S., Canada, and nearly 50 other nations since the Seaway opened in 1959. In a single season in 2003, approximately 40.848 million metric tons passed through the Seaway, representing a total cargo value of $7 billion. This same year, approximately 4,000 vessel transits were recorded through the various lock sections of the Seaway. Over the history of the Seaway, approximately 50 percent of Seaway tonnage has moved to and from overseas ports, especially in Europe, the Middle East, and Africa, but in more recent years the percentage has been down to the 25 to 40 percent range. The Seaway is the most direct route to central North America from many European ports.

In terms of environmental impact, there are important issues to address in the movement toward sustainable marine transportation in the Great Lakes/Seaway System. Most prominent is the introduction of aquatic invasive species via transoceanic ships' ballast tanks. The majority of the aquatic nuisance species identified in the system since the Seaway opened in 1959 has been attributed to the ballast discharge of ocean-going ships.

Also to be addressed are the impacts of navigation dredging in the system, as dredging affects both the ecological health of the system and its hydrology. In addressing this issue, it is critical to assure that the difference between new dredging and maintenance of the existing system be taken into account. New dredging, either in the form of deepening existing channels or creating new channels, is conducted to increase the capacity of the system. Maintenance dredging is conducted to maintain a uniform depth of the existing navigation channels. Lack of adequate maintenance dredging can have immediate negative economic impacts, as has been demonstrated recently by the cumulative impact of low lake levels and Federal budgetary decisions. Because the capacity of the existing system has not been achieved, significant increases in maritime commerce can be attained without the need for new dredging.

There are also some major benefits of maritime transportation. It is the most cost effective, clean, fuel efficient, and safest way to transport cargo. Because of this, there are certainly opportunities to its use within an integrated, multi-modal transportation network.

B. Highway/Truck Component

Highway transportation within the Great Lakes states relies on a diverse and extensive road network. Six Great Lakes states (Illinois, Minnesota, Michigan, Ohio, Wisconsin, and New York) contain 1.3 billion

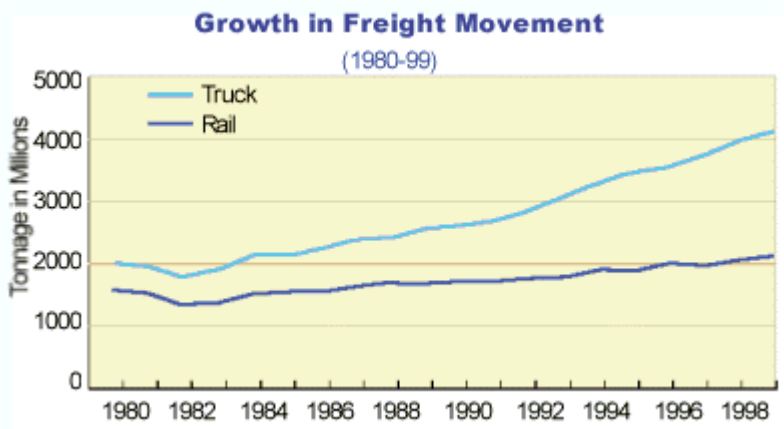
miles of public roadway, including 9,000 miles of interstate freeway. These roads are shared by personal, commercial, and public transportation – buses, cars, trucks, and other vehicles.

Highway transportation provides major commercial benefits to the region and the nation. Freight delivered to and from the upper Midwest by truck accounted for more than 30% of all U.S. trucked freight shipments by value (Adams et al., 2005).

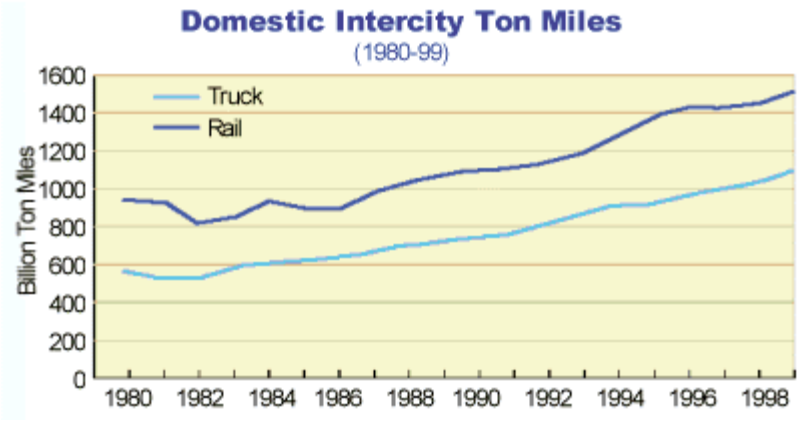
Environmental issues relating to highway transportation include impacts to air quality and energy consumption. The need for expanding infrastructure, building more roads, holding yards and warehouses, overpasses, bridges, and causeways creates the potential to affect habitat. Increasing traffic volumes and urban sprawl are also major concerns.

Air pollution emissions from motor vehicles have dropped considerably since 1970 (U.S. EPA, 2001). VOC emissions are down 59 percent, and CO emissions are down 43 percent. These reductions in emissions have occurred along with increasing populations, 147 percent growth in gross domestic product (GDP), and 143 percent growth in vehicle miles traveled (U.S. Bureau of Economic Analysis, 2000, U.S. Census Bureau, 2000). Although similar progress from an emissions point of view has not been realized with NO_X, current regulatory emission and fuel programs should help reduce the rate of growth in NO_X emissions in the future (U.S. EPA, 2001).

Midwest urban areas have experienced increases in traffic congestion in recent years. For example, urban traffic in the Minneapolis area grew by 26% between 1982 and 1999. Milwaukee, Detroit, and Chicago's urban congestion grew 18-20% during the same period (Texas Transportation Institute, 2001).



The amount of freight moved nationally grew by 50 percent between 1980 and 1999. Trucks hauled 49 percent of the freight in 1999, more than doubling the tonnage they carried in 1980. Rail carriers hauled 25 percent of the freight in 1999, down from 29 percent carried in 1980.



The overall national growth in domestic intercity ton-miles for all modes increased by 49 percent between 1980 and 1999. Over this period of time, rail ton-miles increased 61 percent and truck ton-miles increased 97 percent. With this growth in the movement of freight comes the potential for increased emissions and the increased importance of emission controls and fuel technologies to garner emissions benefits (Wilson, 2001).

By 2020, highway freight movement is expected to grow by more than 20 percent. Iif passenger travel increases by 25% during this same period (slower than the growth during the last 20 years), mid-west highways that are currently congested will become less safe and less efficient (Adams et al., 2005). The Upper Midwest Freight Corridor Study concludes that it is unlikely that highway expansion alone can address the current and growing congestion problem (Adams et al., 2005).

C. Rail Component

The upper Midwest is the rail crossroads of the nation. All major U.S. and Canadian railroads converge in Chicago (Adams et al., 2005 Upper Midwest Freight Corridor Study). Rail transportation within six Great Lakes states (Illinois, Minnesota, Michigan, Ohio, Wisconsin, and New York) travels on a total of 20,400 miles of class 1 rail line (class 1 rail lines generate 91% of all rail revenue), and a total of 58,000 miles of track line serving inter-modal terminals. At least five cities in the Great Lakes Basin have rail-based transit systems (Cleveland, Chicago, Syracuse, Buffalo, and Kenosha), with a total of more than 1,500 miles of commuter, light, or heavy passenger rail track.

Rail freight also provides major commercial benefits to the region. Freight delivered to and from the six states by rail accounted for more than 40% of all U.S. rail freight shipments by value (Adams et al., 2005). Five of the 10 largest traffic generators of rail freight are in or close to the upper-midwest (Adams, et al., 2005). The Upper Midwest Freight Corridor Study concludes that many segments of the rail network are congested and some serve as system bottlenecks (Adams, TM, et al. 2005, Upper Midwest Freight Corridor Study).

Environmental issues relating to rail transportation include impacts to air quality and energy consumption. The need for expanding infrastructure, building more track, holding yards and warehouses, overpasses, bridges, and causeways creates the potential to affect habitat.

III. Sustainable Practices

The UN Brundtland Commission has defined sustainable development as "…development that meets the needs of the present generation without compromising the ability of future generations to meet their own

needs." Sustainable development is often pictured as a three-legged stool with the legs representing the three essential elements of sustainability: the environment, economic development, and social equity. The previous section addresses how the GLTS contributes to the economic development leg. This section will address the other two legs of the stool: what transportation practices are necessary to sustain economic development, while also sustaining the environment and social equity for future generations.

There are a number of transportation practices that should be considered in developing an overall strategy for the Great Lakes. Sustainable transportation practices include:

1. Coordinated multi-modal regional transportation planning. No one mode can operate effectively alone. The modes must work together to create an efficient and sustainable system. The system that we have, based on competition between ports and modes, is not creating efficiencies and does not seem to be sustainable in the long-run. All forms of transport should work efficiently together. Environmental effects of each of the modes should be eliminated or minimized. Highway use needs to take into consideration both commercial and personal and public transportation. All modes should minimize polluting air emissions, eliminate introduction of invasive species, maintain biological and physical integrity, maximize public access to the waterfront, and maintain green-space.

   Bottlenecks must be minimized to create a smooth-flowing, integrated system. Short-sea shipping should be used as appropriate and dredging new deep channels should only be considered when long-term economic, social, and environmental factors make it the right choice.

   An integrated plan should be developed that is transparent and includes broad stakeholder and public involvement. The plan should also include permit-streamlining principles (streamlining does not mean "review permits faster", but to conduct early interactive reviews as part of a comprehensive plan to consider, avoid, and/or mitigate environmental impacts). The integrated plan should include commercial, public, and personal transportation through the use of highway, rail, port, and airport infrastructure and develop effective and efficient connections between the transportation modes.

2. Prevent/control introductions of invasive species as a national priority. Many scientists believe that the most serious threat to the Great Lakes is aquatic invasive species. The largest source of those invaders is ballast water from ocean-going vessels.

3. Reuse of industrial properties to avoid urban sprawl. Port development and the creation of intermodal transportation hubs and storage facilities can be done in a way that prevents urban sprawl (i.e., by re-using industrial properties). This brownfield redevelopment allows scarce urban land to be put to productive use and prevents port and industrial expansion into green-space. The need for more warehouse/rail yard/storage space should be met by reusing existing industrial properties. It is possible to significantly expand Great Lakes marine transportation without greatly expanding the footprint of the shore-side infrastructure.

4. Avoid building new highways and rail corridors that compete with other land uses. Public transportation should be encouraged to get personal vehicles off the roads and use highway infrastructure more efficiently.

5. Apply environmentally sound dredging practices and beneficial reuse of dredged material to restore habitat and minimize the need for dredging where possible by applying integrated sediment management.

Marine transportation will require some maintenance dredging. Best practices should be implemented to reuse dredged material beneficially where possible. Contaminated sediment must be dredged safely (i.e., using best technologies to avoid sediment release) and, where technically feasible, processed for beneficial reuse. Where beneficial reuse is not an option, contaminated materials must be disposed of in confined facilities (either upland or in CDFs). Upstream/watershed-wide sources of sediment should be controlled to reduce the need for dredging. By controlling upstream contaminant sources, the need to dredge contaminated sediment downstream can be reduced.

6. Reduce energy consumption through a variety of approaches (including applying energy efficient technologies). All systems (i.e., ships, port infrastructure, trucks, and rail) should use the most efficient technologies. Pollutant emissions are also of great concern from all of the modes, especially in non-attainment areas.

7. Apply other best practices in port development and shipping. Practices must be conducted in environmentally sound ways to avoid or mitigate habitat alterations. The use of soft shorelines, fish windows, and reusing existing industrial property (brownfields) could avoid most habitat impacts. Best practices include waste minimization/pollution prevention and controlling storm-water releases.

In order to develop recommendations, an assessment of how these practices are currently being applied in the region is necessary:

1. Regional transportation planning. There is no comprehensive regional transportation planning effort currently underway. There is some planning that focuses on one mode or on transportation within a sub-region. Examples include special area management plans for Duluth-Superior and exploration of short-sea shipping opportunities (e.g., Memorandum of Cooperation on short sea shipping). Nine states are working together to implement the vision of Midwest high-speed rail (see public transportation below). It appears that a variety of states are trying to complete statewide traffic management plans, and that the Great Lakes-St Lawrence Seaway is managed across state and international boundaries. The Upper Midwest Freight Corridor Study conducted by six states and three university transportation centers is a regional perspective on understanding the dynamics of freight movements. The study looks at the regional nature of freight and the benefits of multi-jurisdictional cooperation in the Great Lakes. However, this effort has no direct connection to maritime transportation.

2. Control of invasive species. Activities of note include, in 2002, the St Lawrence Seaway Development Corporation proposed joint regulations with Canada to make compliance with applicable shipping industry codes for ballast water management a mandatory prerequisite for clearance of a commercial vessel for transiting the seaway system (www.epa.gov/fedrgstr/EPA-IMPACT/2002/January/Day-24). A number of states have introduced or enacted their own ballast water legislation, which will lead to non-uniform regulation and uncertainty for the maritime community. Since 1994, ocean-going vessels transiting the Great Lakes/St. Lawrence Seaway system have been required to exchange ballast at sea, prior to entering the Seaway (www.porterie.org/great_lakes_ports.html). The Shipping Federation of Canada has provided a code of best practices for ballast water management to control the introduction and spread of harmful aquatic organisms and pathogens (www.michigan.gov/deq/0,1607,7-135-3313_3677_8278-16217).

   Currently, the U.S. Congress is considering legislation, the National Aquatic Invasive Species Act (NAISA), to protect U.S. waterways from the invasion of aquatic invasive species and the

environmental and economic damage they cause. The Senate bill is numbered S. 770; the House bills are numbered H.R. 1592 and H.R. 1593. NAISA 2005 would reauthorize and strengthen the National Invasive Species Act of 1996. The bill provides for development and implementation of a strong permanent ballast water discharge standard that will eliminate the risk of introductions from the No. 1 pathway of entry for aquatic invasive species to U.S. waters: the release of ballast water of ocean-going vessels originating in foreign ports. NAISA also provides for rapid response when new invaders are discovered, controlling those species that are established, and researching pathways of introduction, as well as prevention and control technologies.

3. Reuse of abandoned properties is being applied throughout the region. Examples include the Port of Greater Cincinnati Development Authority's River Road Maritime facility, consisting of some 60 acres at the former Penn Central Railroad Riverside rail yards, which may be redeveloped as a state-of-the-art maritime industrial campus that will include surrounding properties. A significant asset, the inter-modal infrastructure, is already in place. When completed, this project will have a major impact through the potential creation of more than 300 jobs, the leveraging of more than $100 million in private investment, the improvement of transportation facilities for Cincinnati businesses, and the development of a traditional port facility. The City of Toledo and the Toledo-Lucas County Port Authority received $9,000,000 in grants from the Clean Ohio Revitalization Fund to redevelop brownfields along the Maumee Riverfront.

4. Public transportation. The Environmental Law and Policy Center is working with a broad coalition to develop "Midwest high speed rail" to reduce reliance on air and road infrastructure (www.elpc.org/trans/rail/rail.htm). 125 miles of track are currently being upgraded for high-speed service and nine states are working together to implement the vision.

5. Responsible dredging policies and practices. The Great Lakes Dredging Team, formed in 1996 as a partnership of federal and state agencies, was created to assure that dredging operations in Great Lakes harbors and connecting channels are conducted in a timely and efficient manner, while meeting environmental protection, restoration, and enhancement goals. The Dredging Team has been particularly active in such areas as management of dredged material ("Decision Making Process for Dredged Material Management, 1998"); design and management of confined disposal facilities ("Confined Disposal Facilities Fact Sheet, 2003"); promotion of beneficial use of dredged material (Testing and Evaluating Dredged Materials for Upland Beneficial Use: A Regional Framework for the Great Lakes, 2004"); and promotion of best dredging operational practices. For the past two years, the Great Lakes Dredging Team has worked toward development of a process to determine "environmental windows" for Great Lakes dredging operations. An environmental window refers to the time period within which dredging activities will have minimal adverse ecological impact on affected areas.

6. Energy efficiencies. The 2004 Natural Resources Canada study "Energy Efficiency Trends in Canada, 1990-2002" provides data on cargo tonne-km carried and greenhouse gas emissions by transport mode. These data show that greenhouse gas emissions per tonne-km for trucking fell by a factor of 1.5 between 1900 and 2002 (www.greatlakes-seaway.com/en/aboutus/competetiveness.html). The STREET Act (Securing Transportation Energy Efficiency for Tomorrow Act of 2003) authorizes the Secretary of Transportation to establish a research partnership to develop and demonstrate technologies to increase fuel economy, reduce emissions, and lower costs of marine and rail transportation and increase the efficiency of inter-modal transfers. The Act also establishes a grant program for projects designed to reduce fuel consumption on federal-aid highways and roads, and requires that EISs quantify and consider energy impacts as environmental consequences of federal-aid highway and transit projects.

7. Other best practices for ports. Great Lakes ports should incorporate best environmental management practices (EMPs) into their operations and strategic plans. Development of EMPs, as defined by the American Association of Port Authorities, includes first identifying pathways that could potentially lead to impacts on the environment and defining in broad terms the extent of those potential impacts. Two categories of EMPs then follow: 1) Source control EMPs designed to prevent pollutants from entering a pathway to environmental impact, and 2) Treatment control EMPs to remove pollutants after they have entered the pathway but before environmental impact occurs. Also recommended are construction EMPs for development projects at port facilities such as demolitions, rehabilitation of structures and bulkheads, and construction of new buildings and infrastructure. All EMPs should include a comprehensive program of environmental monitoring to measure their effectiveness, and a rigorous training program for port personnel.

Several factors have limited the effectiveness of these and other practices. These factors include:

1. Lack of investment. There are separate processes set up for funding the different modes, and these tend to compete with each other rather working together. Highways seem to get most of the funding, probably due to the impact on personal transportation.

2. Lack of leadership. This is similar to the investment issue. There are numerous federal, state, regional, and local agencies with an interest in the GLTS. Formation of the Great Lakes Collaboration and the Great Lakes Interagency Task Force are a necessary first step toward filling this void.

3. Uncertain roles for major players. The previous issue deals with leadership. Other roles also need to be defined for the federal government, states, local communities, private sector, and NGOs. A coordinated plan defining roles is needed to get everyone moving in the same direction.

4. Lack of planning. There are great demands for immediate action and calls for "no more studies." While it is true that we do not suffer from a lack of knowledge, we also do not have a clear path and a defined set of priorities.

5. Short sightedness. There is too much focus on short-term action, primarily driven by federal and state budget cycles and short political terms.

6. No incentives to work together.

IV. Recommended Actions

1. Development of methods, technologies, and strategies to eliminate the introduction and spread of invasive species via maritime commerce and other transportation modes must be recognized and pursued as a national priority.
   - Timeline: Near term.
   - Lead entities: Federal governments of U.S. and Canada.

2. The Great Lakes/St. Lawrence corridor needs a comprehensive intermodal transportation plan incorporating both the economic needs of the North American mid-continent and the environmental protection and restoration of the Great Lakes/St. Lawrence ecosystem. This planning should utilize performance metrics for specific transportation modes, using newly generated data to develop such coefficients as air and water quality, fuel efficiency, safety, and cost. The objective would be to

increase efficiencies across all modes, and ultimately develop a sustainable, integrated transportation system for the region. The transportation planning process should build in the capability for adaptive management to respond to evolving conditions such as water level lowering from climate change. It should also address the social and economic impacts of policy and taxation on regional transportation. For example, as part of development of a short sea shipping/modal shift component of a regional transportation plan, tax reforms such as the shifting of fuel taxes to promote improved efficiency across all modes of commercial transportation, and the shifting of maintenance dredging or cargo taxes off of vessels that fall under a certain draft, should be considered.

- Timeline: Near term.
- Lead entity: Ad hoc entity with broad public/private participation, such as Great Lakes Dredging Team and Great Lakes Panel on Aquatic Nuisance Species.

3. Promote a strategy for environmentally responsible dredging and dredged material management in the Great Lakes through an enhanced role for the Great Lakes Dredging Team. The GLDT should be empowered and encouraged to address more policy issues and have a greater advocacy role. A Great Lakes dredging strategy should assure that resources for operation and maintenance dredging in the Great Lakes be allocated on the basis of 1) equity with other port ranges in the U.S., and 2) return on the investment of the federal tax dollar.
   - Timeline: Near term.
   - Lead entity: Great Lakes Dredging Team.

4. Promote short sea shipping in the Great Lakes/St. Lawrence Seaway System to relieve congestion and to reduce air emissions in heavily used railroad and highway corridors in the region. Short sea shipping routes, which are already the foundation of maritime commerce in the Great Lakes system, should incorporate greater intermodal partnership and integration to create more efficient and environmentally sound movements of freight and people within the Great Lakes basin.
   - Timeline: Near term.
   - Lead entity: Federal government, through the Maritime Administration.

5. Support best management practices at Great Lakes/St. Lawrence ports by providing more outreach and encouragement for such guidelines as environmental management practices (EMPs) aimed at preventing harmful impact to the Great Lakes ecosystem and responding effectively to potentially harmful events such as spills and toxic releases.
   - Timeline: Near term.
   - Lead entities: Industry-driven coalitions and professional organizations such as the American Great Lakes Ports Association and the American Association of Port Authorities.

6. Support and encourage land use planning at Great Lakes/St. Lawrence ports and harbors that will accommodate both sustainable and economic growth at the local and regional levels, while assuring restoration and protection of the Great Lakes/St. Lawrence ecosystem. A responsible port land use strategy should address both new development of port/harbor facilities and redevelopment of existing facilities, and should recognize the importance of maintaining as full a range of options as possible for future generations.
   - Timeline: Long term.
   - Lead entities: Local municipalities and port authorities, with federal guidance as articulated by the Coastal Zone Management Act and supported by NOAA personnel and services at the national, state, and local levels.

WATER INFRASTRUCTURE

I. Background and Purpose

This paper as prepared to support the Sustainable Development Strategy Team under the Great Lakes Regional Collaboration (GLRC). The GLRC was convened under an Executive Order to identify recommended actions to restore the Great Lakes ecosystem. This paper focuses specifically on drinking water and wastewater infrastructure needs in the Great Lakes basin.

II. Status of Water Infrastructure Needs in the United States

The Natural Water Cycle as Part of Water Infrastructure

Water infrastructure is more than the physical plant that holds and transports water for wastewater treatment or in a drinking water delivery system. Protecting watersheds and source waters from contamination is also a critical component of water resource and infrastructure management. The following sections address these components of water infrastructure management by summarizing the findings of: 1) U.S. EPA's Clean Water Needs Survey, 2) U.S. EPA's Drinking Water Needs Survey, and 3) the source water protection assessment programs administered by the States.

A. Findings of the Clean Water Needs Survey

As required by the Clean Water Act (CWA), the U.S. EPA, in partnership with the States, conducted the Clean Watersheds Needs Survey (CWNS) in 2000. The objective of the CWNS 2000 was to identify and document the cost of projects needed to address water quality and public health problems. The resulting report provided an analysis of the capital investment necessary to meet the Nation's needs within three broad categories[59]:

1. Wastewater treatment and collection systems:
   Eligible costs include the replacement, rehabilitation, or expansion of collection systems and treatment plants; construction of new treatment plants; correction or elimination of combined sewer overflows (CSOs); and replacement or rehabilitation of individual on-site systems and construction of decentralized treatment systems. Modeled costs include the correction of wet weather sanitary sewer overflows (SSOs).
2. Municipal storm water management programs:
   Eligible costs include the capital costs for meeting the municipal requirements of the Storm Water Phase I and II National Pollutant Discharge Elimination System (NPDES) regulations, however, only those storm water management programs with municipal separate storm sewer systems (MS4s) that are covered by an NPDES permit can submit their needs under this category, and only for the portion of needs for developing and implementing the program.
3. Non-point source pollution control projects:
   Eligible costs include implementation of NPS management programs under section 319 and implementation of CCMPs for estuaries under section 320 of the CWA, e.g., implementing agricultural best management practices (BMPs), replacing leaking underground storage tanks, replacing privately owned failed septic systems with new on-site systems, restoring habitat.

A "need" was defined in the CWNS 2000 as a water quality or public health problem that existed as of January 1, 2000 and an associated abatement cost that was eligible for funding under the CWSRF [Clean Water State Revolving Fund program established under Title VI of the CWA]. Information about privately owned wastewater facilities or wastewater treatment facilities that serve industrial facilities, military installations, and national parks was not gathered for the survey because those facilities are not

[59] http://www.epa.gov/owm/mtb/cwns/2000rtc/cwns2000-chapter-1.pdf

eligible for funding under CWSRF programs. Likewise, needs that were not eligible for Federal assistance under Title VI of the CWA, such as operation and maintenance (O&M) costs, house connections to sewers, and costs to acquire land that is not used as part of the treatment process, were not reported as eligible needs in the CWNS 2000. The CWNS 2000 did not request data for needs and facilities that serve American Indians because the Indian Health Service (IHS) conducts a separate survey and provides a report to Congress annually under Public Law 86-121.[60] Due to data limitations, needs related to non-point source (NPS) pollution, sanitary sewer overflows (SSOs), and municipal storm water management programs could not be fully documented, and were therefore estimated based on the use of models developed by EPA.[61]

According to the CWNS analysis of needs by watershed, the total needs for the Great Lakes Basin are $14,918 million (in January 2000 dollars). The regions (i.e., six-unit watersheds) requiring the largest portions of funding are St. Clair-Detroit, Southwestern Lake Michigan, Southern Lake Erie, and Western Lake Erie (22%, 19%, 14%, and 12% of total needs respectively).

CWNS Needs for the Great Lakes Watershed[62]

Region	***Sub-region (4-digit watershed)***	***Accounting Unit (6-digit watershed)***	***CWNS 2000 Needs (Jan. 2000 dollars in millions)***
Great Lakes	Eastern Lake Erie – Lake Erie	Eastern Lake Erie	$1,330
		Lake Erie	$39
	Northeastern Lake Michigan – Lake Michigan	Lake Michigan	$30
		Northeastern Lake Michigan	$16
	Northeastern Lake Ontario – Lake Ontario – St. Lawrence	Lake Ontario	$118
		Northeastern Lake Ontario	$154
		St. Lawrence	$203
	Northwestern Lake Huron	Northwestern Lake Huron	$27
	Northwestern Lake Michigan	Fox	$268
		Northwestern Lake Michigan	$154
	Southeastern Lake Michigan	Southeastern Lake Michigan	$917
	Southeastern Lake Ontario	Oswego	$717
		Southeastern Lake Ontario	$224
	Southern Lake Erie	Southern Lake Erie	$2,152
	Southern Lake Superior-Lake Superior	Lake Superior	$21
		South-central Lake Superior	$39
	Southwestern Lake Huron-Lake Huron	Saginaw	$177
		Southwestern Lake Huron	$3
	Southwestern Lake Michigan	Southwestern Lake Michigan	$2,797
	Southwestern Lake Ontario	Southwestern Lake Ontario	$244
	St. Clair-Detroit	St. Clair-Detroit	$3,333
	Western Lake Erie	Western Lake Erie	$1,750
	Western Lake Superior	Northwestern Lake Superior	$51
		Southwestern Lake Superior	$16
		St. Louis	$138
Great Lakes Total			**$14,918**

[60] http://www.epa.gov/owm/mtb/cwns/2000rtc/cwns2000-chapter-2.pdf
[61] http://www.epa.gov/owm/mtb/cwns/2000rtc/cwns2000-chapter-1.pdf
[62] CWNS 2000, Table F-1; http://www.epa.gov/owm/mtb/cwns/2000rtc/cwns2000-appendix-f.pdf

The CWNS analysis by watershed does not indicate categories of needs, however, this level of detail is provided at the State level. The total needs for the eight Great Lakes States is calculated to be $66.063 billion (in January 2000 dollars), with nearly half (49%) of that funding in Category V – Combined Sewer Overflow Correction. The second-largest category on a total State basis is Category I – Secondary Wastewater Treatment, which is calculated to require 23% of total needs.

CWNS Needs for the Great Lakes States[63]

Category of Need	*CWNS 2000 Needs (Jan. 2000 dollars in millions)*	*Percentage of Total Needs*
I – Secondary wastewater treatment	$15,423	23%
II – Advanced wastewater treatment	$1,960	3%
IIIA – Infiltration/ inflow correction	$1,984	3%
IIIB – Sewer replacement/ rehabilitation	$4,879	7%
IVA – New collector sewers and appurtenances	$3,218	5%
IVB – New interceptor sewers and appurtenances	$1,844	3%
V – Combined sewer overflow correction	$32,254	49%
VI – Storm water management programs	$169	0%
VII – NPS pollution control	$4,332	7%
TOTAL	**$66,063**	**100%**

Category VII – Non-point Source Pollution Control amounts to only 7% of the States' total needs. This category is broken down in greater detail among 11 non-point sources, the greatest of which is "Urban" within the eight Great Lakes States.[64]

- Agriculture (cropland) – 8%
- Agriculture (animals) – 10%
- Silviculture – 0%
- Urban – 31%
- Ground water protection (unknown source) – 3%
- Marinas – 0%
- Resource extraction – 1%
- Brownfields – 8%
- Storage tanks – 11%
- Sanitary landfills – 15%
- Hydro-modification – 14%

Conservation Practices

States and provinces are implementing water conservation practices to varying degrees across the Great Lakes region. In some areas these practices are encouraged; in other areas they are required. Guidelines for water conservation measures span across sectors: municipalities, water suppliers, individual water users, and industrial water users.

Best Management Practices for Water Conservation, Grouped by Category[65]

[63] CWNS 2000, Table A-1; http://www.epa.gov/owm/mtb/cwns/2000rtc/cwns2000-appendix-a.pdf . Great Lakes States include: Illinois, Indiana, Michigan, Minnesota, New York, Ohio, Pennsylvania, and Wisconsin.
[64] CWNS 2000, Table A-2; http://www.epa.gov/owm/mtb/cwns/2000rtc/cwns2000-appendix-a.pdf
[65] Great Lakes Commission, 2002, *Selected Guidelines of Water Conservation Measures Applicable to the Great Lakes-St. Lawrence Region*. http://www.glc.org/wateruse/wrmdss/finalreport/pdf/water_conservation_guidelines.pdf

Financial	• Incentives to improve water conservation, including retrofits • Conservation pricing/rate structures • Metering and sub-metering for industrial uses • Universal metering/sub-metering with commodity rates for public supply water
Programmatic	• Reports on water use and unaccounted-for flow • Leak detection and repair; reductions for water utility operations • Integrated resource planning • Water system pressure management to reduce volume of water used • Water recirculation and reuse in industrial processes
Technological	• Low-flow plumbing fixtures and other water-efficient appliances • Efficient equipment for industrial/commercial facilities and agriculture
Informational	• Promoting efficient practices in industrial/commercial facilities and agriculture • Encouraging efficient water use and equipment for landscapes, including graywater • Public information and school education programs • Advocating use of native and drought-tolerant turf and plants

The Great Lakes Commission conducted a survey in March 2003 to evaluate the current state of water conservation practices in the public water supply sector in the Great Lakes region. A representative pool of 525 municipal water supply facilities in the Great Lakes region were surveyed, and over 25% responded from Illinois, Michigan, Minnesota, New York, Pennsylvania, Ohio, Ontario and Québec. Major trends among survey respondents include the following:[66]

- Meter calibration and replacement and leak detection and repair are among the most practiced conservation activities by water systems surveyed in the Great Lakes region.
- The least practiced conservation activities include subsidizing low-flow plumbing fixtures and the application of inverted pricing blocks for water rates.
- More than half (65%) of the respondent facilities do not operate under a formal conservation plan.
- Education programs exist within less than half of the facilities (48%) responding.
- Bill inserts seem to be the preferred approach to consumer education.

The incidence of specific water conservation practices among respondent facilities is as follows:

- Meter calibration and replacement – 63.2%
- Leak detection – 60.2%
- Consumer education – 48.1%
- Water restrictions – 44.4%
- Water audits – 21.8%
- Increase percent of metered connections – 20.3%
- Industrial/commercial/institutional advice – 9.0%
- Install/subsidize point-of-use (POU) low-flow fixtures – 7.5%
- Inverted pricing blocks (i.e., water rates increase as usage increase) – 3.0%

B. Findings of the Safe Drinking Water Needs Survey

The survey found that the total infrastructure need nationwide is $150.9 billion for the 20-year period from January 1999 through December 2018. Of this total, 68 percent, or $102.5 billion, is needed now to ensure the provision of safe drinking water. American Indian and Alaska Native Village systems represent $2.2 billion of the total national need.

[66] Briefing Paper: "Summary of Current Water Conservation Practices in the Public Water Supply Sector of the Great Lakes-St. Lawrence Region" http://www.glc.org/wateruse/conservation/pdf/FinalDraftConBrief.pdf

With $81.9 billion in needs over the next 20 years, transmission and distribution projects represent the largest category of need. This result is consistent with the fact that transmission and distribution mains account for most of the nation's water infrastructure. The other categories, in descending order of need, are treatment, storage, source and a miscellaneous category of needs called "other." The Great Lakes states account for 31.71% of the total need (although this includes areas outside the Great Lakes basin, including New York City). Our estimate is that the basin needs is approximately 25%, which is similar to the basin need for clean water needs.

The Great Lakes states account for 30.33% of the current need of drinking water infrastructure upgrades.

Total Need By Category (20-Year Need in Millions of January 1999 Dollars)

	Transmission and Distribution	Treatment	Storage	Source	Other	Total	Percentage of Regional Subtotal
Illinois	3,392.20	1,459.70	850.6	358.6	88.4	**6,149.50**	13.91%
Indiana	890.8	379.7	295.1	114.3	13.7	**1,693.60**	3.83%
Michigan	4,545.60	1,330.30	601.8	268.6	42.1	**6,788.40**	15.36%
Minnesota	1,346.90	994.4	453.1	247	58.1	**3,099.50**	7.01%
New York	8,590.80	2,852.70	994.3	674.4	43.1	**13,155.30**	29.76%
Ohio	2,585.70	1,022.90	798.8	401	150.5	**4,958.90**	11.22%
Pennsylvania	3,148.30	939.9	800.2	313.5	56.2	**5,258.10**	11.90%
Wisconsin	1,634.70	723.9	496.6	224.2	18.6	**3,098.00**	7.01%
Subtotal	**26,135.00**	**9,703.50**	**5,290.50**	**2,601.60**	**470.70**	**44,201.30**	
National Total	**81,925.80**	**28229.9**	**17918.8**	**9476.4**	**1845.1**	**139,396.00**	
Percentage National	31.90%	34.37%	29.52%	27.45%	25.51%	31.71%	

Current Need By Category (20-Year Need in Millions of January 1999 Dollars)

	Transmission and Distribution	Treatment	Storage	Source	Other	Total	Percentage of Regional Subtotal
Illinois	2,582.60	1,076.40	440.9	218.7	73.5	**4,392.10**	14.46%
Indiana	716.7	214.9	135.9	61.9	11.5	**1,140.90**	3.76%
Michigan	2,367.80	802.5	327.5	143.7	33.4	**3,674.90**	12.10%
Minnesota	875.3	468.4	208.2	133.7	32.4	**1,718.00**	5.66%
New York	6,925.30	2,481.80	665.8	412.1	33.3	**10,518.30**	34.64%
Ohio	2,235.90	704.3	443.3	259.4	73.6	**3,716.50**	12.24%
Pennsylvania	2,347.40	550	360.1	188.2	36.4	**3,482.10**	11.47%
Wisconsin	1,047.50	359.5	190.2	117.2	10.4	**1,724.80**	5.68%
Subtotal	**19,098.50**	**6,657.80**	**2,771.90**	**1,534.90**	**304.50**	**30,367.60**	
National Total	**64,267.50**	**18965.9**	**9709.4**	**5682.7**	**1507.6**	**100,133.10**	
Percentage National	29.72%	35.10%	28.55%	27.01%	20.20%	30.33%	

Regulations	Total Need
Existing SDWA Regulations	
Surface Water Treatment Rule[1]	$19.4
Total Coliform Rule[1]	$0.5

Nitrate/Nitrite Standard[1]	$0.2
Lead and Copper Rule	$1.2
Total Trihalomethanes Standard	$0.1
Other Regulations[2]	$0.5
Subtotal National Need	**$21.9**
Costs Associated with Proposed or Recently Promulgated Regulations (Taken From EPA Economic Analyses)[3]	$9.3
Total National Need	**$31.2**

C. Other Reports of Wastewater and Drinking Water Infrastructure Needs

The Clean Water and Drinking Water Infrastructure Gap Analysis
Source: http://www.epa.gov/OWM/gapfact.pdf

Progress in Water Quality: An Evaluation of the National Investment in Municipal Wastewater Treatment (EPA-832-R-00-008; June 2000)
Sources: http://www.epa.gov/OWM/wquality/index.htm , http://www.epa.gov/OWM/wquality/benefits.htm

The Congressional Budget Office's (CBO) report on Future Investment in Drinking Water and Wastewater Infrastructure (November 2002)
Source: http://www.cbo.gov/showdoc.cfm?index=3983&sequence=0
This study provides background information on the nation's water systems, presents CBO's estimates of future costs for water infrastructure under two scenarios--a low-cost case and a high-cost case--and discusses broad policy options for the federal government. In keeping with CBO's mandate to provide objective, impartial analysis, this report makes no recommendations. Note: Data is given on a national level only, not broken out by state.

The Subcommittee on Water Resources and Environment Hearing on Meeting the Nation's Wastewater Infrastructure Needs (March 19, 2003)
Source: http://www.house.gov/transportation/water/03-19-03/03-19-03memo.html
Note: Data is given on a national level only, not broken out by state.

Reports by the Water Infrastructure Network (WIN)
Source: http://www.win-water.org/win_reports/reports.html
Report titled "Clean & Safe Water for the 21st Century: A Renewed National Commitment to Water and Wastewater Infrastructure" http://www.amsa-cleanwater.org/advocacy/winreport/winreport2000.pdf
Note: Discussion is on a national level.

III. Source Water Programs

Under the 1996 amendments to the Safe Drinking Water Act (SDWA), the states were directed to complete source water assessments to determine whether public water system source waters in the state were susceptible to contamination. A one time grant from the DWSRF was provided to the states in 1997 to assist with the assessments. All assessments were to be completed by 2003 and made available to the public.

The source water assessment programs created by states differ since they are tailored to each state's water resources and drinking water priorities. However, each assessment must include four major elements:

- Delineating (or mapping) the source water assessment area,
- Conducting an inventory of potential sources of contamination in the delineated area,
- Determining the susceptibility of the water supply to those contamination sources, and
- Releasing the results of the determinations to the public.

To date, most source water assessments have been completed by the states. However, the one element common to the state sources water programs is that, by and large, they do not require any activities to control potential contaminant sources. As a result, although many source water assessments found that public water systems are highly susceptible to contamination, no federal funding sources have been earmarked to manage source water contaminant threats. Instead, funding and technical resources can be drawn from other programs to manage source water areas, as described below.

IV. Resources Available for Water Infrastructure Upgrades and Source Water Protection

A. Clean Water State Revolving Loan Fund and Grants

When the U.S. Congress amended the Clean Water Act in 1987, Title VI of the new act replaced the Construction Grants program with the Clean Water State Revolving Fund (CWSRF) program. Through the CWSRF program, each state and Puerto Rico now maintain revolving loan funds to provide independent and permanent sources of low-cost financing for a wide range of water quality infrastructure projects. Funds to establish or capitalize the CWSRF programs are provided through Federal government grants and State matching funds (equal to 20% of Federal government grants). CWSRF monies are loaned to communities and loan repayments are recycled back into the program (i.e., the "revolving" feature) to provide an ongoing funding source for additional water quality protection projects.[67] Key features of the program are:

- Low interest rates (i.e., below market rates) and flexible terms (e.g., repayment schedule)
- Significant funding for non-point source pollution control and estuary protection
- Assistance to a variety of borrowers including municipalities, communities of all sizes, farmers, homeowners, small businesses, and nonprofit organizations
- Partnerships with other funding sources including banks, nonprofits, local governments, and other federal and state agencies to provide the best water quality financing source for their communities.[68]

CWSRF programs provide funding for water quality protection projects for wastewater treatment, non-point source pollution control, watershed protection or restoration, and estuary management.

- Examples of the types of wastewater treatment projects funded include the planning, design, and construction of publicly owned wastewater treatment facilities (both secondary and advanced treatment works); building or rehabilitating sewer collection systems; sanitary, storm water, and combined sewer overflow correction; storm water management; alternative treatment technologies; and water reuse and conservation projects.
- Examples of funded non-point source and estuary protection activities include watershed management; wetlands protection and restoration; contaminated urban, rural, and agricultural runoff control; conservation tillage and other projects to address soil erosion; development of streambank buffer zones; brownfields remediation; groundwater protection; habitat protection; conservation easements and land acquisition; and estuary management and improvement projects

[67] http://www.epa.gov/owmitnet/cwfinance/cwsrf/basics.htm
[68] http://www.epa.gov/owmitnet/cwfinance/cwsrf/index.htm

including restocking fish, restoration of wildlife habitat, provision of marine sewage pump-out facilities, and others. [69]

Since the CWSRF program is managed largely by the States, project eligibility varies according to each State's program and priorities. Eligible loan recipients may include communities, individuals, citizens' groups, and non-profit organizations. States have the flexibility to target resources to their particular environmental needs and address their highest-priority water quality issues. States also may customize loan terms to meet the needs of small and disadvantaged communities.[70]

For the eight states in the Great Lakes Basin, the total CWSRF allotment for the most recent year (2004) was just over $487 million. Of this total, New York received the largest portion (30% or nearly $148 million) and Minnesota received the smallest portion (5% or nearly $25 million). The total Great Lakes States' allotment to date over the existence of the CWSRF program (1989-2004) is over $8 billion, with New York again receiving the largest portion at nearly $2.5 billion over that time.

Clean Water State Revolving Fund (CWSRF) Title VI Allotments ($)[71]
Great Lakes States, FY 2004 and FY 1989-2004

State	***FY 2004 Title VI State Allotment***	***FY 1989 - 2004 Title VI State Allotment***
Illinois	$60,543,600	$1,016,450,700
Indiana	$32,261,900	$541,635,900
Michigan	$57,560,200	$966,362,400
Minnesota	$24,604,700	$413,082,300
New York	$147,758,000	$2,480,672,900
Ohio	$75,361,500	$1,265,224,200
Pennsylvania	$53,026,800	$890,252,300
Wisconsin	$36,190,400	$607,590,200
Great Lakes States Total	**$487,307,100**	**$8,181,270,900**
National Total	**$1,342,035,000**	**$22,393,725,200**

B. Safe Drinking Water State Revolving Loan Fund and Grants

Congress authorized the Drinking Water State Revolving Fund (DWSRF) program in the 1996 Amendments to the Safe Drinking Water Act (SDWA). SDWA provides funding to help public water systems make infrastructure upgrades necessary to ensure the continued provision of safe drinking water and help states undertake activities to support their drinking water programs. EPA awards capitalization grants to states that are used for low-cost loans and other types of assistance to public water systems to finance the costs of infrastructure projects needed to achieve or maintain compliance with SDWA requirements. These funds can also be used to fund a range of activities including source water protection, capacity development, and operator certification.

Loans in the program must have interest rates that are less than market rate and repayment terms of no more than 20 years. States have funded a wide range of activities through the set-asides that fall under several broad categories, such as:

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[69] http://www.epa.gov/owmitnet/cwfinance/cwsrf/cwsrf_diagram.htm and http://www.epa.gov/owmitnet/cwfinance/cwsrf/cwsrf.pdf
[70] http://www.epa.gov/owmitnet/cwfinance/cwsrf/basics.htm and http://www.epa.gov/owmitnet/cwfinance/cwsrf/cwsrf.pdf
[71] http://www.epa.gov/owmitnet/cwfinance/cwsrf/cwsrfallots.pdf

- Enhancing the technical, financial, and managerial capacity of public water systems in an effort to make systems more sustainable and to promote long-term compliance with the law.
- Enhancing operator certification programs to ensure that operators of public water systems are properly trained in the operation of facilities and meeting requirements under the law.
- Providing technical assistance to small systems, which often have limited financial resources and face a great challenge in meeting new SDWA requirements.
- Facilitating partnerships with institutions of higher learning, water system professional and trade organizations, government officials, and the general public to carry the message of the importance of drinking water safety.
- Enhancing support for state drinking water programs to implement new programs and build existing programs in the areas of regulatory oversight, data systems, and source water protection.
- Promoting source water protection to manage potential sources of contamination and prevent pollution from reaching sources of drinking water.
- Promoting water conservation.

C. Other Wastewater Funding Sources

Minnesota Wastewater Infrastructure Fund (WIF)
Source: http://www.deed.state.mn.us/programs/pfawif.htm

USDA Rural Utilities Service (RUS) Water and Wastewater Disposal Loans and Grants
Source: http://www.usda.gov/rus/water/programs.htm#PROGRAMS
Program fact sheet at: http://www.usda.gov/rus/water/docs/wwfact.pdf
Includes: Water and Waste Disposal Loans and Grants, Technical Assistance and Training (TAT) Grants, Solid Waste Management Grants, Emergency Community Water Assistance Grants, and Rural Water Circuit Rider Technical Assistance.

Water Quality Cooperative Agreements
Source: http://www.epa.gov/owmitnet/cwfinance/waterquality.htm
Under authority of Section 104(b)(3) of the Clean Water Act, EPA makes grants to state water pollution control agencies, interstate agencies, and other nonprofit institutions, organizations, and individuals to promote the coordination of environmentally beneficial activities. These activities include storm water control, sludge management, and pretreatment. Among the efforts that are eligible for funding under the Section 104(b)(3) program are research, investigations, experiments, training, environmental technology demonstrations, surveys, and studies related to the causes, effects, extent, and prevention of pollution. EPA's Regional Offices select grant proposals that are most likely to advance the states' and EPA's ability to deal with water pollution problems. EPA also manages grants that address concerns of a national scope. Section 104(b)(3) grants may not be used to fund ongoing programs or administrative activity.

Water Pollution Control Program Grants
Source: http://www.epa.gov/owmitnet/cwfinance/pollutioncontrol.htm
Section 106 of the Clean Water Act authorizes EPA to provide federal assistance to states (including territories, the District of Columbia, and Indian Tribes) and interstate agencies to establish and implement ongoing water pollution control programs. Prevention and control measures supported by State Water Quality Management programs include permitting, pollution control activities, surveillance, monitoring, and enforcement; advice and assistance to local agencies; and the provision of training and public information. Increasingly, EPA and states are working together to develop basin-wide approaches to water quality management. The Water Pollution Control Program is helping to foster a watershed protection approach at the state level by looking at states' water quality problems holistically, and

targeting the use of limited finances available for effective program management. At present, the program is seeking ways to streamline the grants process to ease the administrative burden on states.

Community Development Block Grant (CDBG) Programs
Source: http://www.hud.gov/offices/cpd/communitydevelopment/programs/index.cfm
Communities receiving CDBG funds from the State may use the funds for many kinds of community development activities including, but not limited to:

- Acquisition of property for public purposes;
- Construction or reconstruction of streets, *water and sewer facilities*, neighborhood centers, recreation facilities, and other public works;
- Demolition;
- Rehabilitation of public and private buildings;
- Public services;
- Planning activities;
- Assistance to nonprofit entities for community development activities; and
- Assistance to private, for profit entities to carry out economic development activities (including assistance to micro-enterprises).

D. Other Source Water Funding Sources

States have different funds available for infrastructure upgrades. Eligibility is based upon size and need of the water infrastructure. The programs range from those that serve smaller or larger utilities to others are available to individual homeowners to upgrade their wells and septic systems. Below is an example of programs available in Wisconsin for upgrading drinking water infrastructure. Other states have similar ranges of programs.

- Clean Water Fund Program (CWFP)- DNR
- Clean Water Fund Small Loan Program (SLP)- DNR
- Community Development Block Grant Housing - DOA
- Federal-State Relations - DOA
- Home Improvement Loan Program - (HILP) - DVA
- Home Improvement Loan Program - (HILP) - WHEDA
- Housing Cost Reduction Initiative - (HCRI) - DOA
- Housing Cost Reduction Initiative - (HCRI) -Foundation for Rural Housing, Inc.
- Personal Loan Program (PLP) - DVA
- Primary Mortgage Loan Program and Purchase and Rehabilitation Loan Program - DVA
- Private Sewage System Replacement or Rehabilitation Program (Wisconsin Fund) - Commerce Dept.
- Rural Community Assistance Program (RCAP) - WISCAP
- Safe Drinking Water Loan Program (SDWLP) - DNR
- Section 504 Repair Loan and Grant Program - USDA RD
- State Trust Fund Loan Program (STF) - Board of Commissioners of Public Lands
- Water and Wastewater Grant and Loan Program - USDA RD
- Well Compensation Grant Program - DNR
- Wisconsin Community Development Block Grant Program (CDBG) - Commerce Dept.
- Wisconsin Rural Water Association (WRWA)

Utilities may also charge fees that are used to fund infrastructure upgrades as well as protect source water and storm water management areas.

Other funding resources include the following:

Catalog of Federal Funding Sources for Watershed Protection
Source: http://cfpub.epa.gov/fedfund/
The Catalog of Federal Funding Sources for Watershed Protection Web site is a searchable database of financial assistance sources (grants, loans, cost-sharing) available to fund a variety of watershed protection projects. To select funding programs for particular requirements, use either of two searches below. One is based on subject matter criteria, and the other is based on words in the title of the funding program. Criteria searches include the type of organization (e.g., non-profit groups, private landowner, state, business), type of assistance sought (grants or loans), and keywords (e.g., agriculture, wildlife habitat). Searches result in a listing of programs by name. Click on each program name to review detailed information on the funding source.

Funding for Source Water Protection Activities
Source: http://www.epa.gov/safewater/dwsrf/pdfs/fs_dwsrf_swp-funding-matrix.pdf
This comprehensive matrix lists Federal funding sources for specific source water protection activities under the categories of polluted runoff control, resource protection and restoration, and wastewater. The document provides detailed information on fund eligibility and objectives, annual dollars committed, and how to contact each fund.

V. Recommended Actions

The Sustainable Development Strategy Team has prioritized five recommended actions related to water infrastructure:

- Refocus guidance and criteria for EPA water infrastructure funding programs to promote conservation planning (e.g., priority for loans or grants to recipients having plans and/or ordinances that reduce impacts on all ground or surface water).
- Enhance and implement education to promote conservation practices to reduce water demand on existing infrastructure (e.g., existing project WET and Water Riches curricula to educate K – 12 children about water conservation practices).
- Support the development of end user treatment and reuse systems for pharmaceuticals, endocrine disruptors, personal care products (PCPs) and other chemical products to relieve the treatment responsibilities for public utilities and environmental impact on the Great Lakes.
- Fund replacement and major maintenance of water infrastructure (water supply piping, water treatment systems, sewer piping and sewage treatment facilities) through full Federal, financial support of the Clean Water State Revolving Loan Fund program under the Clean Water Act for municipal wastewater facilities. (Congress to lead.)
- Fund replacement and major maintenance of water infrastructure (water supply piping, water treatment systems, sewer piping and sewage treatment facilities) through full federal, financial support of the Drinking Water State Revolving program under the 1996 amendments to the Safe drinking Water Act for drinking water systems. (Congress to lead.)
- Promote the development and acceptance of green infrastructure through the standards and community development plans. Green infrastructure may include storm water harvesting, storm water infiltration systems, multi-purpose piping systems (NFPA 13-D), controlled flow roof systems, green roof systems and onsite storm water treatment and detention. (Local governments to lead.)

OVERARCHING ISSUES

Each Strategy Team was tasked to consider several overarching issues in its evaluations: research needs, indicators, human health and tribal issues. This chapter will focus on the first two of these, and refer the reader to the workgroup chapters for discussions related to the others.

Applied research is needed to promote the development of technologies that promote or enhance sustainable practices, including:

- more efficient technologies to conserve and reuse water;
- more efficient manufacturing processes that minimize waste and energy consumption and use "greener" materials;
- additional technologies and strategies for prevention and control of invasive species;
- renewable energy technologies;
- enhanced tools to evaluate the effectiveness of agriculture, forestry and land use BMPs, and;
- additional cost-effective technologies for managing contaminated sediments.

In addition to applied research for technology development, there are a number of more basic research needs for sustainable development, such as:

- improved methods for evaluating the long-term ecological and human-health effects of new chemicals and materials, and;
- research to support science-based policies for ecosystem services.

One of the most important research needs for sustainability the development of tools for accurately valuing the ecosystem services provided by Great Lakes resources. These kinds of socio-economic tools are necessary to develop and apply indicators and metrics for sustainability.

The development of sustainability metrics and indicators should be national in scope, such as the ongoing effort by the Sustainable Water Resources Roundtable, a subcommittee of the Advisory Committee on Water Information. Members from this Team participated in a workshop on sustainability research sponsored by the Roundtable in Ann Arbor, Michigan on April 5-6, 2005.

A regional database of sustainability indicators should be established to track and evaluate sustainability trends and progress toward national or regional goals. Within the Great Lakes his should build on the process initiated by SOLEC.

A set of indicators and other tools for evaluating trends, along with a coordinated regional database are essential to the formulation and maintenance of regional sustainable development strategy. However, dedicated resources are needed to develop data on the economic, ecological and social costs and benefits of proposed actions to guide the analysis of their sustainability and prioritization for funding. Without this kind of data, it is not possible to justify immediate decisions, nor develop of a credible system of indicators and metrics.

SUMMARY

The sustainable development issue was examined with respect to six categories of services provided by the region's ecosystems: land use and development; agriculture and forestry; transportation; industrial activities; water infrastructure, and; recreation, tourism and fishery. An evaluation of current and future human activities in the Great Lakes Basin highlights trends that continue to draw on ecosystem services and economic competitiveness, including:

- loss of natural and agricultural lands to development at rates far exceeding population growth;
- leveling or decline in conservation tillage practices;
- fragmentation of privately owned forest lands into smaller tracts and decreasing levels of active management on public forest lands;
- increased demands on ecosystems for recreation;
- aging transportation infrastructure that impedes more efficient intermodal systems;
- an aged water and wastewater infrastructure unable to handle current demands;
- disconnected programs for planning and management of ecosystem services;
- practices and policy disincentives that deter sustainability, and;
- outdated perceptions of the region ("rust belt") which fail to promote the potential of its sustainable ecosystem services.

Each workgroup of the Sustainable Development Strategy Team identified a number of actions to promote sustainable development practices for their respective categories of ecosystem services. These include actions for all governmental and stakeholder sectors. An analysis of these actions highlighted the following three major recommendations of the Sustainable Development Team:

1. Adapt and maintain programs that promote sustainability across all sectors;
2. Align governance to enhance sustainable planning and management of resources, and;
3. Build outreach that brands the Great Lakes as an exceptional and competitive place to live, work, invest and play.

Each of these recommendations is discussed and a subset of actions presented, with emphasis on near-term actions that can deliver measurable results.

1. Adapt and maintain programs that promote sustainability across all sectors

The most important decisions impacting sustainability are made by individuals, whether as consumers of goods and services, owners of lands and businesses, or users of infrastructure. The sustainability of decisions made by consumers and users of ecosystem services may be influenced by a variety of factors, including public policies and market-based practices. However, the costs for ecosystem services provided to consumers rarely reflect their true value. For instance, the price of an item may include its materials, production and delivery costs, but not the costs of its disposal after use nor all ecological or societal costs associated with its creation or disposal. To compensate for this, programs to support sustainability across all sectors must include a combination of incentives (credits) for sustainable practices and disincentives (taxes) for non-sustainable practices to reflect their true costs. Programs are also needed to develop more efficient technologies or strategies to conserve resources, minimize adverse impacts, and maximize the services they provide. Examples of actions to create and maintain programs to promote sustainability across all sectors include:

Action	Lead
Modify current agricultural price support systems to encourage sustainable practices such as conservation tillage and buffer strips	Federal
Revise policies that result in public investments (e.g., tax policy, real estate policy, public infrastructure and services, economic development, land use and environmental protection) to give preference or additional funding attention to those projects and communities that encourage and practice sustainable actions	State and Local
Practice manufacturing and management that use resources more effectively and efficiently including life cycle assessment and product stewardship (i.e., green product design and consumption), pollution prevention, and increased recycling	Industry
Provide monetary incentives to reduce water demand on existing infrastructure through conservation practices, including sanitary reuse systems, storm water harvesting, multi-purpose piping systems and low-flow or dual flow flush toilets	Local
Refocus EPA water infrastructure funding guidance and criteria for EPA to promote conservation planning (e.g., priority for loans or grants to existing communities with plans and/or ordinances that reduce ground or surface water impacts)	Federal
Return a greater portion of fuel taxes paid by recreational boaters to support projects that restore ecosystem services	State
Develop additional technologies and strategies to eliminate the introduction and spread of invasive species via maritime commerce and other transportation modes	Federal
Promote sustainable forestry practices through private sector programs (e.g, Sustainable Forestry Initiative © SFI Program, American Tree Farm System, Forest Stewardship Council), tax incentives for keeping private lands in productive timber rather than development, and equal sustainable forestry standards for "green wood" from public and private forests	Industry, Private, Federal, State, & Tribal
Provide incentives (e.g., tax increment financing, real estate tax assessment freezes, funding for demolition and associated infrastructure repair or replacement) to encourage clean-up and redevelopment of brownfield sites, blighted properties, and historic structures around the Great Lakes, with priority given to those sites adjoining the Great Lakes waterways	State and Local
Provide incentives (e.g., grants, low-interest loans, or tax incentives) to develop renewable energy technologies, energy efficiency, and pollution prevention in the business sector	Federal and State
Require all new public buildings and major renovations over 50,000 square feet for state or municipal agencies, universities, community colleges and schools be LEED (Leadership in Energy and Environmental Design) certified	State, Tribal and Local
Adapt, adopt and certify "green" programs for energy conservation, marinas, industry, forests, and other ecosystem services	Industry, Private, Federal and State

Among the most critical actions necessary to promote sustainability is to eliminate or modify existing programs that encourage non-sustainable practices. For example, some tax laws and federal infrastructure aid programs inadvertently encourage urban sprawl and agricultural subsidies tend to discourage conservation tillage practices. Another group of actions represent existing incentive programs that have greater potential to promote sustainability, but are under funded or need to be modified for greater effect.

Numerous examples of sustainable practices have been successfully applied by municipalities and the private sector. The challenge is to encourage communities and regions to adapt and adopt sustainable practices for their specific suite of ecosystem services and/or to scale-up these practices into programs at a regional or business-sector level. One approach is to develop specific metric for sustainability, such as a set of standards for "green" marinas, sustainable forestry, or for sustainable urban, suburban and rural

development. The integration of sustainable activities and cooperation within and among governmental jurisdictions is a key to success.

2. Align governance to enhance sustainable planning and management of resources

As a practice of balancing economic, societal and ecosystem needs, sustainable development faces a number of handicaps. While the Great Lakes ecosystems are not aligned by political boundaries, human management of ecosystem services is. Our ability to balance the three legs of the sustainable development stool is challenged by the disconnection between economic drivers and the planning and management of ecosystem services. It is further confounded by the absence of a common metric or currency to value these services. To address these handicaps, it is necessary to realign governance institutions to sustain ecosystem services and integrate the planning and management of these services. Examples of actions to realign governance to enhance sustainablity are:

Action	Lead
Create a high-level, multi-agency, governmental steering body with the authority to provide leadership by promoting community and regional vision of sustainability; develop strategy; establish goals; propose, coordinate, fund and assess progress on actions and projects relating to sustainable development	Federal
Conduct a three-year Great Lakes Sustainable Development Demonstration to develop consistent, sustainable land use plans that are integrated with regional transportation plans and other public infrastructure plans. Support with existing, but focused federal and state program funds.	State, Local, Federal, and Tribal
Realign state, regional, and local agencies and programs to institutionalize regional sustainable land use, transportation and infrastructure planning and management based on the experience from the three-year demonstration	State and Local
Establish and network regional partnerships of Great Lakes promoters and preservers emphasizing stewardship (e.g., consider New York State Tug Hill Commission as a model)	Locals, Business and NGOs
Develop a comprehensive intermodal transportation plan for the Great Lakes transportation corridor recognizing the unique opportunities for waterborne transportation in the Great Lakes/St. Lawrence system	Federal
Create a regional Bio-Energy Task Force to develop a Great Lakes Regional Renewable Energy Policy	State, Industry, Federal, Tribal and Academia
Standardize and integrate reporting of ecosystem services and their values at the watershed level to better track and prioritize sustainable funding and policy decisions	Federal and State

It is recommended that the Great Lakes Regional Collaboration redefine its framework to become the prototype of a regional advocate for sustainable development. This represents a significant shift in focus, and may necessitate specific federal legislation and dedicated funding. This recommendation is an initial step toward the national advocate envisioned in the first action, above. The potential payback is for the Great Lakes to become a national, if not global laboratory for sustainable development, led by a Regional Collaboration that is future-oriented and actively engaged in promoting sustainable economic development in the region.

A theme that runs through several recommended actions is the integration of planning and management of ecosystem services, including land use, transportation, and water infrastructure. Existing programs for

planning future ecosystem services are disjointed from the management of existing infrastructure. Federal and state funding programs are aligned by single purposes and do not foster integration.

3. Build outreach that brands the Great Lakes as an exceptional and competitive place to live, work, invest, and play

Outreach is necessary to promote sustainable behavior in consumers and users of ecosystem services. Marketing applies the same communication techniques to attract new development and users of these services. A combination of these tools is recommended to promote sustainable development in the Great Lakes Basin. Specific objectives of this outreach and marketing are to educate users and consumers on sustainable alternatives available and the consequences of decisions, build a sense of ownership and pride in regional ecosystems, and attract new residents and businesses to the region with abundant ecosystem services and a society where sustainability is practiced. Examples of outreach to brand the Great Lakes as an exceptional and competitive place to live, work, invest and play include:

Action	Lead
Develop a brand identity and system-wide marketing strategy for the Great Lakes	GLRC
Evaluate and draw on existing programs across the region to better disseminate information (e.g., Binational Toxics Strategy, SOLEC, SMOC, IJC, LaMPs and RAPs)	GLRC
Renew federal and state commitment to Great Lakes Dredging Team to provide outreach for environmentally responsible dredging and dredged material management	Federal and State
Joint state, tribal and local marketing of nature-based tourism, recreational fishing, and related development (e.g., Great Lakes recreational pass, expansion of Great Lakes circle concept of scenic by-ways, etc.)	State, Tribal and Local
Outreach to promote manufacturing and management practices that use resources more efficiently, including pollution prevention and increased recycling, incorporating life cycle assessment, and stewardship in product designs	Industry
Raise public awareness of the gap left by recent policy change to the Land and Water Conservation Fund (LAWCON) that eliminated funding incentives to state and local agencies for purchase and protection of open space to provide public access to watersheds	Locals and NGOs
Education and technical assistance to landowners on sustainable forestry practices	Federal
Enhance and implement education to promote conservation practices to reduce water demand on existing infrastructure (e.g., existing project WET and Water Riches curriculum to educate K-12 children about water conservation practices)	Local and Tribal

Marketing to promote growth of businesses and jobs in the Great Lakes region needs to be fully integrated with outreach that educates and promotes sustainable behavior. This represents a significant shift for some advocates for ecosystem restoration, but is critical to create a message that is progressive and focused. A Great Lakes Regional Collaboration, re-focused as described in the second recommendation, should take the lead in developing a marketing and outreach strategy for the region.

ATTACHMENT 1
Publications and Online Resources

General

- The President's Council on Sustainable Development. May 1999. Towards a Sustainable America - Advancing Prosperity, Opportunity, and a Healthy Environment for the 21st Century.
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Accounting

- Office of Energy and Technology, State of Pennsylvania. Environmental Financial Management: Incorporating Environmental Costs and Considerations into Decision-making Review of Tools and Software http://www.dep.state.pa.us/dep/deputate/pollprev/Tech_Assistance/toolbox/costacct.htm

Cleaner Production

- UNEP. Cleaner Production in Assessment in Industries http://www.uneptie.org/pc/cp/understanding_cp/cp_industries.htm
- Cleaner Production in China. China-Canada Cooperation Project in Cleaner Production http://www.chinacp.com/eng/cpprojects/canada/cccpcp_news01.html

Integrated Waste Management/Recycling

- Ohio State University Fact Sheet. Community and Household Recycling Efforts http://ohioline.osu.edu/cd-fact/0112.html

- City of Burlington, VT Legacy Project. Sustainable Strategies in Action: Waste Disposal. http://www.cedo.ci.burlington.vt.us/legacy/strategies/14-org-recycling-main.html

- EcoSuperior – Serving Thunder Bay and the Lake Superior Basin www.ecosuperior.com

Product Redesign

- USEPA. Green Chemistry. Tools and Literature. http://www.epa.gov/greenchemistry/tools.html

Product Stewardship

- Product Stewardship Institute http://www.productstewardship.us/resources.html

Smart Growth

- Ahwahnee Principles for Economic Development http://www.lgc.org/ahwahnee/econ_principles.html
- Asheville, NC Smart Growth Plan http://www.ci.asheville.nc.us/planning/plan2025/plan2025.htm
- Blackberry Creek, IL: http://www.aces.uiuc.edu/grassroots/cases/bbcreek01.htm
- Brooking Institute: Investing in a Better Future: http://www.brookings.edu/urban/pubs/200403_smartgrowth.pdf

- Brooking Institute: Smart Growth:
  http://www.brookings.edu/es/urban/issues/smartgrowth/smartgrowth.htm
- Brownfields One Stop Shop:
  http://urban.csuohio.edu/glefc/whatwedo.htm#6
- Canadian International Development Agency:
  http://www.acdicida.gc.ca/cida_ind.nsf/0/7931673388ca99b18525656b004d7890?OpenDocument
- Center For Neighborhood Technology:
  http://www.safeenergy.org/pbillinois.htm.
- Chicago Center for Green Technology:
  http://www.cityofchicago.org/Environment/GreenTech/
- Chicago Green City Principles, IL:
  http://www.mcdonough.com/writings/living_city.htm
- Chicago Wilderness Biodiversity Recovery Plan:
  http://www.chicagowilderness.org/pubprod/brp/index.cfm
- Coffee Creek, IN:
  http://www.coffeecreekwc.org/
- The Countryside Program
  www.countrysideprogram.org
- DOT Planning, Environment & Realty:
  www.fhwa.dot.gov/planning
- EcoCity Cleveland:
  http://www.ecocitycleveland.org/
- Florida Sustainable Communities Center:
  http://sustainable.state.fl.us/fdi/fscc/resource/index.html
- Ford Rouge River Plant:
  http://www.ford.com/en/goodWorks/environment/cleanerManufacturing/rougeRenovation.htm
- Funders Network for Smart Growth:
  www.fundersnetwork.org
- Grand Rapids Master Plan:
  http://www.ci.grand-rapids.mi.us/index.pl?page_id=2658
- Great Lakes Sustainable Land Use:
  http://www.glc.org/bridges/
- Growth Management Leadership Alliance:
  http://www.liaa.org/default.asp
- Hanover Principles:
  http://repont.tcc.virginia.edu/classes/tcc315/Resources/ALM/Environment/hannover.html
- Honolulu Sustainable Communities Plan:
  honoluludpp.org/planning/june18/eh.pdf
- LaMP Chapter 9:
- Smart Growth Leadership Institute:
  http://www.sgli.org/
- Smart Growth Online:
  www.smartgrowth.org http://www.epa.gov/glnpo/lakesuperior/summaryeditionLaMP2000.pdf
- Land Information Access Network:
  http://www.liaa.org/default.asp
- Land Use and Economic Development in Statewide Transportation Planning:
  http://www.fhwa.dot.gov/hep10/state/
- Land Use and Transportation Coordination:
  http://www.planning.dot.gov/Documents/DomesticScan/domscan603.htm

- Land Use Impacts of Transportation: A Guidebook:
  http://www.google.com/search?client=safari&rls=en-us&q=Land+Use+Impacts+of+Transportation:+A+Guidebook&ie=UTF-8&oe=UTF-8
- LEED Building and Neighborhood Standards:
  http://www.usgbc.org/DisplayPage.aspx?CategoryID=19
- Lincoln Land - Planning for Sustainable Development : Measuring Progress in Plans:
  http://www.lincolninst.edu/pubs/pub-detail.asp?id=58
- Lincoln Land Institute: Land Use and Transportation in the Metropolitan Planning Process:
  http://www.planning.dot.gov/Documents/LandUse/contents.htm
- Maryland Smart Growth Program:
  http://www.lincolninst.edu/pubs/pub-detail.asp?id=58
- Massachusetts Smart Growth:
  http://www.mass.gov/ocd/docs/SDPrinciples_color.pdf
- Menomonee Valley Redevelopment, WI:
  http://www.renewthevalley.org/
- Michigan Land Use Institute:
  http://www.mlui.org/
- Minnesota:
  http://www.regionalpartnerships.umn.edu/
- National Center for Smart Growth:
  http://www.smartgrowth.umd.edu/
- NIPC Sustainable Development & Green Infrastructure Resources:
  http://www.nipc.org/environment/sustainable/content.htm#NaturalLandscaping
- Noteworthy MPO Practices in Transportation-Land Use Planning Integration:
  http://www.planning.dot.gov/
- Pennsylvania, Governors and Smart Growth:
  http://www.postwritersgroup.com/archives/peir0224.htm
- PLACE3S:
  http://www.energy.ca.gov/places/
- PlaceMatters:
  www.PlaceMatters.com
- Recycling America's Land:
  http://www.usmayors.org/uscm/brownfields/descriptions.htm
- Schaumburg Biodiversity Recovery Plan, IL:
  http://www.ci.schaumburg.il.us/vos.nsf/schaumburg/MFRK-62NP7C
- Smart Communities Network:
  http://www.sustainable.doe.gov/
- Smart Growth America:
  http://www.smartgrowthamerica.com/
- SOLEC Land Use Indicators:
  http://emml.mtu.edu/gem/community/planning/solec.html
- Sustainable Dimensions Department – UN:
  http://www.fao.org/WAICENT/FAOINFO/SUSTDEV/index_en.htm
- Sustainable Portland:
  http://www.sustainableportland.org/
- Sustainable Racine:
  http://www.sustainable-racine.com/
- Tampa - Hillsborough Sustainable Communities:
  http://sustainable.state.fl.us/fdi/fscc/news/local/thsus2.htm

- TCRP Report 93 Travel Matters: Mitigating Climate Change with Sustainable Surface Transportation:
  http://trb.org/publications/tcrp/tcrp_rpt_93.pd
- TCRP Report 95 Land Use and Site Design: Traveler Response to Transportation System Changes:
  http://gulliver.trb.org/publications/tcrp/tcrp_rpt_95c15.pdf
- The GREEN Institute, Minneapolis, MN:
  http://www.greeninstitute.org/
- The Springfield Township MI Native Vegetation Enhancement Project:
  http://www.epa.gov/ecopage/springfieldtwp/
- ULI Smart Growth Network:
  http://smartgrowth.net/Home/sg_Home_fst.html
- Water and Smart Growth: The Impact of Sprawl on Aquatic Ecosystems:
  http://www.fundersnetwork.org/info-url_nocat2778/info-url_nocat_show.htm?doc_id=214281
- What-If Site:
  http://www.what-if-pss.com/
- Wisconsin Smart Growth:
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ATTACHMENT 2
Examples of Agricultural and Forestry Best Management Practices

A. Agricultural Best Management Practices

Best management practices (BMPs) are the key components of an integrated management plan for achieving sustainable agriculture. These include[72]:

- Agroforestry
  Agroforestry covers a range of tree uses on farms, including inter-planting trees (such as walnuts) with crops or pasture, growing shade-loving specialty crops in forests, better managing woodlots and windbreaks, and using trees and shrubs along streams as buffer strips.
- Alternative Marketing
  Farmers and ranchers across the country are finding that innovative marketing strategies can improve profits. Direct marketing of agricultural goods may include selling at farmers markets, roadside stands, or through the internet; delivering to restaurants and small grocers; and running community-supported agriculture (CSA) enterprises.
- Cover Crops/Perennial Crops
  Growing plants such as rye, clover, or vetch after harvesting a grain or vegetable crop or intercropping them can provide several benefits, including weed suppression, erosion control, and improved soil nutrients and soil quality.
- Crop/Landscape Diversity
  Growing a greater variety of crops and livestock on a farm can help reduce risks from extremes in weather, market conditions, or pests. Increased diversity of crops and other plants, such as trees and shrubs, also can contribute to soil conservation, wildlife habitat, and increased populations of beneficial insects.
- Filter Strips/Buffer Strips
  Filter strips are land areas of either planted or indigenous vegetation, situated between a potential, pollutant-source area and a surface-water body that receives runoff. Runoff may carry sediment and organic matter, and plant nutrients and pesticides that are either bound to the sediment or dissolved in the water. A properly designed and operating filter strip provides water-quality protection by reducing the amount of sediment, organic matter, and some nutrients and pesticides, in the runoff at the edge of the field before runoff enters the surface-water body. Filter strips also provide localized erosion protection since the vegetation covers an area of soil that otherwise might have a high erosion potential.[73]
- Integrated Pest Management (IPM)
  IPM is an approach to managing pests by combining biological, cultural, physical, and chemical tools in ways that minimize economic, health and environmental risks.
- Native Planting
  Planting species that naturally occur in the region reduces the need for specialized watering treatment, fertilizers, pesticides, and herbicides. Native plant species support native insect and wildlife species, and are less susceptible to native pests and diseases.
- No-Till Farming/Low-Till Farming
  The soil is left undisturbed from harvest to planting. Planting or drilling is accomplished in a narrow seedbed or slot created by disk openers. Coulters, residue managers, seed firmers, and modified closing wheels are used on the drill or planter to ensure adequate seed to soil contact. In a properly designed no-till system, pest (weeds, disease, and insect) control is accomplished

[72] http://www.csrees.usda.gov/nea/ag_systems/in_focus/sustain_ag_if_practices.html
[73] http://ohioline.osu.edu/aex-fact/0467.html

primarily with the cultural practices of rotation, sanitation, and competition. Judicious use of herbicides may be used to provide the crop with a competitive advantage over the weeds.[74]

- Nutrient Management Planning or Comprehensive Nutrient Management Planning (CNMP)
  Proper management of manure, nitrogen, and other plant nutrients can improve the soil and protect the environment by preventing overloads of waste management systems. Increased use of on-farm nutrient sources, such as manure and leguminous cover crops, also reduces purchased fertilizer costs.
- Organic Farming
  Organic farming is a production system which avoids or largely excludes the use of synthetically compounded fertilizers, pesticides, growth regulators, and livestock feed additives. To the maximum extent feasible, systems rely on crop rotation, crop residues, animal manures, legumes, green manure, off-farm organic wastes, mechanical cultivation, mineral bearing rocks, and aspects of biological pest control to maintain soil productivity, to supply plant nutrients and to control weeds, insects and other pests.[75]
- Rotational Grazing
  Management-intensive grazing systems take animals out of the barn and into the pasture to provide high-quality forage and reduced feed costs while avoiding manure buildup.
- Soil Conservation
  Many soil conservation methods, including strip cropping, reduced tillage, contour plowing, and no-till, help prevent loss of soil caused by wind and water erosion.
- Water Quality/Wetlands/Agricultural Drainage Management
  Water conservation and protection have become important parts of agricultural stewardship. Practices such as planting riparian buffer strips and meandering, grass waterways can improve the quality of drinking and surface water, as well as protect wetlands.

In addition, BMPs are designed for specific causes of water quality impairment:

- Sediment[76]
  - Practice conservation tillage. To control erosion, leave at least a 30 percent residue from the previous crop on the soil surface after planting the new crop.
  - Leave as many areas in grass as possible to reduce erosion and intercept sediment from fields. Do not plow turnrows, field borders, or traffic lanes. Use strip cropping, vegetative filter strips, and borders.
  - To control erosion from raindrops, plant a cover crop or green manure crop during fallow years and leave crop residue on fields in winter.
  - Install grassed waterways and vegetative filter strips in and around fields.
  - Convert highly erodible cropland areas to grass or trees.
- Nutrients
  - Perform soil analysis on a regular basis to determine fertilization rates needed to achieve desired yields. Never overfertilize.
  - Reduce autumn use of nitrogen fertilizers and band fertilizers where possible.
  - Apply fertilizer in split applications at the proper time to reduce potential loss from one heavy application. Monitor soil pH to achieve maximum use of phosphates.
  - Employ contour farming and soil conservation practices to reduce erosion and prevent run-off containing sediment and nutrients. Use crop residues, forested streamside management zones, buffer strips, and grassed waterways to trap sediment that may have attached fertilizer particles.
  - Reduce the need for fertilizer with cover crops, including legumes and green manure crops.

[74] http://www.no--till.com/
[75] http://www.agriculturelaw.com/links/dictionarym-s.htm
[76] http://www.epa.gov/ogwdw/sourcewater.html

- Pesticides
  - Use integrated pest management techniques, scouting fields often. Spray insecticides only when pest populations warrant application, the possibility of drift is low, and run-off is at a minimum.
  - Maintain spray equipment in good working order. Never overfill spray tanks.
  - Utilize crop rotation, strip cropping, and field borders to minimize the need for pesticides.
- Animal Wastes
  - Evaluate your operations to prevent animal wastes from contaminating water sources. Install waste management measures such as no-discharge lagoon systems and composting bins.
  - Check waste management systems and practices regularly to be sure they are functioning properly and follow a regular maintenance schedule.
  - Use animal wastes in an approved manner as a soil amendment on crop and pasture lands.

B. Forestry Best Management Practices

A number of BMPs are also recommended for forestry management in the Great Lakes basin:[77]

- Preharvest Planning

  Identify sensitive areas such as wetlands, erosion-prone areas, and threatened or endangered aquatic species habitat areas. Time the activity for the season or moisture conditions when the least impact to the environment will occur. Locate roads, landings, and skid trails outside of streamside management zones and previously identified sensitive areas. Size, site, and design temporary and permanent stream crossings to prevent failure and minimize the number of crossings.
- Streamside Management Zones

  Establish and maintain a streamside management zone adjacent to surface waters which is sufficiently wide and includes a sufficient number of canopy species of trees to provide bank stability and buffer against detrimental changes in the temperature regime of the water body.
- Road Construction and Reconstruction

  Use suitable materials to surface roads planned for all-weather use by truck traffic. Design road systems to avoid high erosion or sensitive areas. Ensure that the design of the road prism and the road surface drainage are appropriate to the terrain and that the road surface design is consistent with road drainage structures.
- Road Management

  Properly maintain permanent stream crossings and approaches to reduce the likelihood that stream overflow will divert onto the road. Inspect roads to determine the need for structural maintenance. Close and stabilize temporary spur roads and seasonal roads after harvesting to control and direct water away from the roadway. Revegetate to control erosion and stabilize banks and road surfaces. Remove all temporary stream crossings.
- Timber Harvesting

  Locate landings outside of streamside management zones. Protect stream channels and significant short term drainage from logging debris and slash material. Use appropriate areas to store, drain, and dispense petroleum. Recycle or properly dispose of all waste materials.
- Site Preparation and Forest Regeneration

  Suspend operations during wet periods if equipment begins to cause excessive soil disturbance. Do not conduct mechanical site preparation and mechanical tree planting in streamside management zones.
- Fire Management

[77] http://www.epa.gov/watertrain/**forestry**

All bladed firelines for prescribed fire and wildfire should be plowed on contour or stabilized with water bars or other appropriate techniques if needed to control excessive sedimentation or erosion of the fireline.

- Revegetation of Disturbed Areas

  Revegetate disturbed areas using seedlings or planting promptly after completion of the earth-disturbing activity.

- Chemical Management

  Prescribe the type and amount of pesticides appropriate for the insect, fungus, or herb-like species. Conduct applications by skilled and, where required, licensed operators according to the registered use, giving special consideration to impacts on nearby surface waters.

ATTACHMENT 3

Additional References from Land Use & Development

Key to Attachment

A: Hannover Principles
B: Ahwanhnee Economic Development Principles and Community Development Principles;
C: Principles for Smart Growth
D: Context Sensitive Transportation Solutions
E: Great Lakes Basin State Planning Initiatives -
F: Washington State Comprehensive Planning/Growth Management Act
G: Financing & Funding:
1. Investing In A Better Future: A Review Of The Fiscal And Competitive Advantages Of Smarter Growth Development Patterns
2. A Guidebook Of Financial Tools (U.S. EPA)
3. Index Of New And Substantially Revised Tools

H: LEED™ Rating System 2.0
I: Federal Programs

A. The Hannover Principles[78]

- Insist on rights of humanity and nature to co-exist in a healthy, supportive, diverse and sustainable condition.
- Recognize interdependence. The elements of human design interact with and depend upon the natural world, with broad and diverse implications at every scale. Expand design considerations to recognizing even distant effects.
- Respect relationships between spirit and matter. Consider all aspects of human settlement including community, dwelling, industry and trade in terms of existing and evolving connections between spiritual and material consciousness.
- Accept responsibility for the consequences of design decisions upon human well-being, the viability of natural systems, and their right to co-exist.
- Create safe objects of long-term value. Do not burden future generations with requirements for maintenance of vigilant administration of potential danger due to the careless creation of products, processes or standards.
- Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.
- Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate the energy efficiently and safely for responsible use.
- Understand the limitations of design. No human creation lasts forever and design does not solve all problems. Those who create and plan should practice humility in the face of nature. Treat nature as a model and mentor, not and inconvenience to be evaded or controlled.
- Seek constant improvement by the sharing of knowledge. Encourage direct and open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility, and re-establish the integral relationship between natural processes and human activity.
- The Hannover Principles should be seen as a living document committed to the transformation and growth in the understanding of our interdependence with nature, so that they may adapt as our knowledge of the world evolves

[78] Hannover Principles, William McDonough, 1992

- The next set, the Ahwahnee Principles, like the Hannover principles have been fostered by a group of accomplished planning, design and development professionals who have been instrumental in inventing the sustainable development field[79][80].

B. Ahwahnee Principles

AHWAHNEE PRINCIPLES FOR ECONOMIC DEVELOPMENT

Preamble

Prosperity in the 21st Century will be based on creating and maintaining a sustainable standard of living and a high quality of life for all. To meet this challenge, a comprehensive new model is emerging which recognizes the economic value of natural and human capital. Embracing economic, social, and environmental responsibility, this approach focuses on the most critical building blocks for success, the community and the region. It emphasizes community-wide and regional collaboration for building prosperous and livable places. While each community and region has unique challenges and opportunities, the following common principles should guide an integrated approach by all sectors to promoting economic vitality within their communities, and in partnership with their neighbors in the larger region.

1. Integrated Approach

Government, business, education, and the community should work together to create a vibrant local economy, through a long-term investment strategy that:

- encourages local enterprise
- serves the needs of local residents, workers, and businesses
- promotes stable employment and revenues by building on local competitive advantages
- protects the natural environment
- increases social equity
- is capable of succeeding in the global marketplace.

2. Vision and Inclusion

Communities and regions need a vision and strategy for economic development according to these principles. Visioning, planning and implementation efforts should continually involve all sectors, including the voluntary civic sector and those traditionally left out of the public planning process.

3. Poverty Reduction

Both local and regional economic development efforts should be targeted to reducing poverty, by promoting jobs that match the skills of existing residents, improving the skills of low-income individuals, addressing the needs of families moving off welfare, and insuring the availability in all communities of quality affordable child care, transportation, and housing.

4. Local Focus

Because each community's most valuable assets are the ones they already have, and existing businesses are already contributing to their home communities, economic development efforts should give first priority to supporting existing enterprises as the best source of business expansion and local job growth. Luring businesses away from neighboring communities is a zero-sum game that doesn't create new wealth in the regional economy. Community economic development should focus instead on promoting local entrepreneurship to build locally based industries and businesses that can succeed among national and international competitors.

[79] Ahwahnee Principles, Peter Calthorpe, Michael Corbett, Andres Duany, Elizabeth Moule, Elizabeth Plater-Zyberk, and Stefanos Polyzoides. Editor: Peter Katz, Judy Corbett, and Steve Weissman. 1998-2004.

5. Industry Clusters
Communities and regions should identify specific gaps and niches their economies can fill, and promote a diversified range of specialized industry clusters drawing on local advantages to serve local and international markets.

6. Wired Communities
Communities should use and invest in technology that supports the ability of local enterprises to succeed, improves civic life, and provides open access to information and resources.

7. Long-Term Investment
Publicly supported economic development programs, investments, and subsidies should be evaluated on their long-term benefits and impacts on the whole community, not on short-term job or revenue increases. Public investments and subsidies should be equitable and targeted, support environmental and social goals, and prioritize infrastructure and supportive services that promote the vitality of all local enterprises, instead of individual firms.

8. Human Investment
Because human resources are so valuable in the information age, communities should provide life-long skills and learning opportunities by investing in excellent schools, post-secondary institutions, and opportunities for continuous education and training available to all.

9. Environmental Responsibility
Communities should support and pursue economic development that maintains or improves, not harms, the environmental and public health.

10. Corporate Responsibility
Enterprises should work as civic partners, contributing to the communities and regions where they operate, protecting the natural environment, and providing workers with good pay, benefits, opportunities for upward mobility, and a healthful work environment.

11. Compact Development
To minimize economic, social, and environmental costs and efficiently use resources and infrastructure, new development should take place in existing urban, suburban, and rural areas before using more agricultural land or open space. Local and regional plans and policies should contain these physical and economic development planning principles to focus development activities in desired existing areas.

12. Livable Communities
To protect the natural environment and increase quality of life, neighborhoods, communities and regions should have compact, multi-dimensional land use patterns that ensure a mix of uses, minimize the impact of cars, and promote walking, bicycling, and transit access to employment, education, recreation, entertainment, shopping, and services. Economic development and transportation investments should reinforce these land use patterns, and the ability to move people and goods by non-automobile alternatives wherever possible.

13. Center Focus
Communities should have an appropriately scaled and economically healthy center focus. At the community level, a wide range of commercial, residential, cultural, civic, and recreational uses should be located in the town center or downtown. At the neighborhood level, neighborhood centers should contain local businesses that serve the daily needs of nearby residents. At the regional level, regional facilities should be located in urban centers that are accessible by transit throughout the metropolitan area.

14. Distinctive Communities
Having a distinctive identity will help communities create a quality of life that is attractive for business retention and future residents and private investment. Community economic development efforts should help to create and preserve each community's sense of uniqueness, attractiveness, history, and cultural and social diversity, and include public gathering places and a strong local sense of place.

15. Regional Collaboration
Since industries, transportation, land uses, natural resources, and other key elements of a healthy economy are regional in scope, communities and the private sector should cooperate to create regional structures that promote a coherent metropolitan whole that respects local character and identity.

Ahwahnee Principles for Resource-Efficient Communities

Preamble:

Existing patterns of urban and suburban development seriously impair our quality of life. The symptoms are: more congestion and air pollution resulting from our increased dependence on automobiles, the loss of precious open space, the need for costly improvements to roads and public services, the inequitable distribution of economic resources, and the loss of a sense of community. By drawing upon the best from the past and the present, we can plan communities that will more successfully serve the needs of those who live and work within them. Such planning should adhere to certain fundamental principles.

Community Principles

1. All planning should be in the form of complete and integrated communities containing housing, shops, work places, schools, parks and civic facilities essential to the daily life of the residents.
- Community size should be designed so that housing, jobs, daily needs and other activities are within easy walking distance of each other.
- As many activities as possible should be located within easy walking distance of transit stops.
- A community should contain a diversity of housing types to enable citizens from a wide range of economic levels and age groups to live within its boundaries.
- Businesses within the community should provide a range of job types for the community's residents.
- The location and character of the community should be consistent with a larger transit network.
- The community should have a center focus that combines commercial, civic, cultural and recreational uses.
- The community should contain an ample supply of specialized open space in the form of squares, greens and parks whose frequent use is encouraged through placement and design.
- Public spaces should be designed to encourage the attention and presence of people at all hours of the day and night.
- Each community or cluster of communities should have a well-defined edge, such as agricultural greenbelts or wildlife corridors, permanently protected from development.
- Streets, pedestrian paths and bike paths should contribute to a system of fully-connected and interesting routes to all destinations. Their design should encourage pedestrian and bicycle use by being small and spatially defined by buildings, trees and lighting; and by discouraging high speed traffic.
- Wherever possible, the natural terrain, drainage and vegetation of the community should be preserved with superior examples contained within parks or greenbelts.
- The community design should help conserve resources and minimize waste.
- Communities should provide for the efficient use of water through the use of natural drainage, drought tolerant landscaping and recycling.
- The street orientation, the placement of buildings and the use of shading should contribute to the energy efficiency of the community.

Regional Principles

- The regional land-use planning structure should be integrated within a larger transportation network built around transit rather than freeways.
- Regions should be bounded by and provide a continuous system of greenbelt/wildlife corridors to be determined by natural conditions.
- Regional institutions and services (government, stadiums, museums, etc.) should be located in the urban core.
- Materials and methods of construction should be specific to the region, exhibiting a continuity of history and culture and compatibility with the climate to encourage the development of local character and community identity.

Implementation Principles

- The general plan should be updated to incorporate the above principles.

- Rather than allowing developer-initiated, piecemeal development, local governments should take charge of the planning process. General plans should designate where new growth, infill or redevelopment will be allowed to occur.
- Prior to any development, a specific plan should be prepared based on these planning principles.
- Plans should be developed through an open process and participants in the process should be provided visual models of all planning proposals.

C. Smart Growth Principles[81]

Create Range of Housing Opportunities and Choices

Providing quality housing for people of all income levels is an integral component in any smart growth strategy. Housing is a critical part of the way communities grow, as it is constitutes a significant share of new construction and development. More importantly, however, is also a key factor in determining households' access to transportation, commuting patterns, access to services and education, and consumption of energy and other natural resources. By using smart growth approaches to create a wider range of housing choices, communities can mitigate the environmental costs of auto-dependent development, use their infrastructure resources more efficiently, ensure a better jobs-housing balance, and generate a strong foundation of support for neighborhood transit stops, commercial centers, and other services.

Create Walkable Neighborhoods

Walkable communities are desirable places to live, work, learn, worship and play, and therefore a key component of smart growth. Their desirability comes from two factors. First, walkable communities locate within an easy and safe walk goods (such as housing, offices, and retail) and services (such as transportation, schools, libraries) that a community resident or employee needs on a regular basis. Second, by definition, walkable communities make pedestrian activity possible, thus expanding transportation options, and creating a streetscape that better serves a range of users -- pedestrians, bicyclists, transit riders, and automobiles. To foster walkability, communities must mix land uses and build compactly, and ensure safe and inviting pedestrian corridors.

Encourage Community and Stakeholder Collaboration

Growth can create great places to live, work and play -- if it responds to a community's own sense of how and where it wants to grow. Communities have different needs and will emphasize some smart growth principles over others: those with robust economic growth may need to improve housing choices; others that have suffered from disinvestment may emphasize infill development; newer communities with separated uses may be looking for the sense of place provided by mixed-use town centers; and still others with poor air quality may seek relief by offering transportation choices. The common thread among all, however, is that the needs of every community and the programs to address them are best defined by the people who live and work there.

Foster Distinctive, Attractive Communities with a Strong Sense of Place

Smart growth encourages communities to craft a vision and set standards for development and construction which respond to community values of architectural beauty and distinctiveness, as well as expanded choices in housing and transportation. It seeks to create interesting, unique communities which reflect the values and cultures of the people who reside there, and foster the types of physical environments which support a more cohesive community fabric. Smart growth promotes development which uses natural and man-made boundaries and landmarks to create a sense of defined neighborhoods, towns, and regions. It encourages the construction and preservation of buildings which prove to be assets to a community over time, not only because of the services provided within, but because of the unique contribution they make on the outside to the look and feel of a city.

[81] Smart Growth Principles, Smart Growth Network

Make Development Decisions Predictable, Fair and Cost Effective

For a community to be successful in implementing smart growth, it must be embraced by the private sector. Only private capital markets can supply the large amounts of money needed to meet the growing demand for smart growth developments. If investors, bankers, developers, builders and others do not earn a profit, few smart growth projects will be built. Fortunately, government can help make smart growth profitable to private investors and developers. Since the development industry is highly regulated, the value of property and the desirability of a place are largely affected by government investment in infrastructure and government regulation. Governments that make the right infrastructure and regulatory decisions will create fair, predictable and cost effective smart growth.

Mix Land Uses

Smart growth supports the integration of mixed land uses into communities as a critical component of achieving better places to live. By putting uses in close proximity to one another, alternatives to driving, such as walking or biking, once again become viable. Mixed land uses also provide a more diverse and sizable population and commercial base for supporting viable public transit. It can enhance the vitality and perceived security of an area by increasing the number and attitude of people on the street. It helps streets, public spaces and pedestrian-oriented retail again become places where people meet, attracting pedestrians back onto the street and helping to revitalize community life.

Preserve Open Space, Farmland, Natural Beauty and Critical Environmental Areas

Smart growth uses the term "open space" broadly to mean natural areas both in and surrounding localities that provide important community space, habitat for plants and animals, recreational opportunities, farm and ranch land (working lands), places of natural beauty and critical environmental areas (e.g. wetlands). Open space preservation supports smart growth goals by bolstering local economies, preserving critical environmental areas, improving our communities' quality of life, and guiding new growth into existing communities.

Provide a Variety of Transportation Choices

Smart growth uses the term "open space" broadly to mean natural areas both in and surrounding localities that provide important community space, habitat for plants and animals, recreational opportunities, farm and ranch land (working lands), places of natural beauty and critical environmental areas (e.g. wetlands). Open space preservation supports smart growth goals by bolstering local economies, preserving critical environmental areas, improving our communities' quality of life, and guiding new growth into existing communities.

Strengthen and Direct Development towards Existing Communities

Smart growth uses the term "open space" broadly to mean natural areas both in and surrounding localities that provide important community space, habitat for plants and animals, recreational opportunities, farm and ranch land (working lands), places of natural beauty and critical environmental areas (e.g. wetlands). Open space preservation supports smart growth goals by bolstering local economies, preserving critical environmental areas, improving our communities' quality of life, and guiding new growth into existing communities.

Take Advantage of Compact Building Design

Smart growth provides a means for communities to incorporate more compact building design as an alternative to conventional, land consumptive development. Compact building design suggests that communities be designed in a way which permits more open space to preserved, and that buildings can be constructed which make more efficient use of land and resources. By encouraging buildings to grow vertically rather than horizontally, and by incorporating structured rather than surface parking, for example, communities can reduce the footprint of new construction, and preserve more greenspace. Not only is this approach more efficient by requiring less land for construction. It also provides and protects more open, undeveloped land that would exist otherwise to absorb and filter rain water, reduce flooding and storm water drainage needs, and lower the amount of pollution washing into our streams, rivers and lakes.

D. Practices for Context Sensitive Transportation Design Solutions

The development history of the Great Lakes Basin is as much a transportation story as an industrial story. The metropolitan corridor stretching from Rochester and Buffalo through eight states to Duluth is an economic corridor twice as long as either the Boston to Washington or San Francisco to San Diego corridors. The Great Lakes corridor also shares an economic interdependence from ore mines to steel mills to manufacturing plants to world-wide distribution is not matched in any other macro-metropolitan region.

This legacy provides a heritage of entrepreneurial drive, industrious work, extraordinary infrastructure and urban development unmatched in the 20th century. Now moving into the 21st century, we are challenged to renovate, recycle and often remediate the industrial residuals. But, most important for sustainable development, we must look to these facilities and their lands as critical development assets in the coming decades.

Transportation is the related legacy that continues in a role essential to the basin's economic future and transportation's own land based sustainability challenges. With Chicago at the hub of the nation's rail network, the interstate system followed and Chicago O'Hare now can claim to be the busiest airport in the world connected with some 12 other major international air hubs in the basin. Apart from the sustainability challenges facing transportation itself and its impacts on the natural systems of air and water, these systems of road, rail and runway themselves are major consumers of land.

"Context Sensitive Design82 is an inclusive approach to transportation development that integrates and balances community, aesthetic, and environmental values with traditional transportation safety and performance goals. Context sensitive design requires careful and imaginative planning to reflect community values, meet transportation goals, provide safety, and respect the natural and man-made environment within the established budgets and schedules. Context sensitive design requires early and continued input from both multidisciplinary professionals and stakeholders. It addresses both what can be done technologically to meet transportation demands and what may be done to enhance the design outcomes for transportation users, adjacent community residents, and the environment. This transportation planning approach is seen as adding lasting functional and aesthetic value for both the communities they traverse and serve and the users."

"Thinking Beyond the Pavement "Qualities and Characteristics"

Qualities of Excellence in Transportation Design

- The project satisfies the purpose and needs as agreed to by a full range of stakeholders. This agreement is forged in the earliest phase of the project and amended as warranted as the project develops.
- The project is a safe facility for both the user and the community.
- The project is in harmony with the community, and it preserves environmental, scenic, aesthetic, historic, and natural resource values of the area, i.e., exhibits context sensitive design.
- The project exceeds the expectations of both designers and stakeholders and achieves a level of excellence in people's minds.
- The project involves efficient and effective use of the resources (time, budget, community) of all involved parties.
- The project is designed and built with minimal disruption to the community.
- The project is seen as having added lasting value to the community.

E. Great Lakes Basin State Planning Initiatives

[82] USDOT http://www.fhwa.dot.gov/csd/

Illinois Local Planning Technical Assistance Act[83]

The act includes a definition of a comprehensive plan, 10 elements that must be included in a plan, and incentives for communities to follow it, including state preferences for project funding and eligibility for technical assistance grants (if money is appropriated).

A comprehensive plan is defined as identifying and including plans for:

- Issues and opportunities
- Land use and natural resources
- Transportation
- Community facilities
- Telecommunications infrastructure
- Housing
- Economic development
- Natural resources
- Public participation
- May include identification of natural hazards, agriculture and forest preservation, human services, community design and historic preservation and provision for adoption of subplans
- The elements dealing with telecommunication, housing and natural resources are new to traditional definitions of what is included in a plan. While the act does not mandate any content, it does require that the community look at the issues listed.

Another reason to follow the act's guidelines is to move toward consistency throughout the state. The act says state agencies can give preferences to communities with updated plans.

Illinois Local Legacy Act[84]

June 6, 2003

Following years of hard work for its passage, State Rep. David Winters (R-Rockford) welcomed the Local Legacy Act (HB 231) as the first step in protection of natural and cultural resources and the underpinning for good planning in counties around the state.

The Local Legacy Act creates comprehensive coordinated county-municipal planning, which emphasizes protecting natural, historic and agricultural resources through a countywide, unified vision.

Counties and municipalities that choose to participate will create a county-municipal partnership for the purposes of inventorying and then creating plans to protect natural areas, farmland and cultural or historic resources. Interested counties can form a local steering committee consisting of county board members, municipal officials and local residents to oversee the procedure.

A local legacy inventory is looked upon as the foundation of countywide planning. With an inventory in place, development can avoid those features the community already has deemed to be valuable and should be preserved. Illinois has a rich natural and cultural heritage, including historic sites, natural areas, and rich farmland. As counties and municipalities grow, they often do not have the opportunity to consider which resources are most important to them. Consequently, they may inadvertently imperil a historic structure, sever a potential natural corridor or fragment farmland into unsustainable remnants. The program encourages municipalities and counties to exchange information and develop a shared vision and it is locally driven.

CHARGE TO THE COUNCIL

[83] Campaign for Sensible Growth
[84] Campaign for Sensible Growth

A. The Council is advisory in nature and shall:

1. Identify the trends, causes, and consequences of unmanaged growth and development.
2. Provide recommendations to the Governor and the Legislature designed to minimize the negative economic, environmental, and social impacts of current land use trends; promote urban revitalization and reinvestment; foster intergovernmental and public-private land use partnerships; identify new growth and development opportunities; and protect Michigan's natural resources, including farmland and open space, and better manage the cost of public investments in infrastructure to support growth.

B. In exercising its duties the Council may:

1. Evaluate the effectiveness of current state, regional, and local land use laws, including but not limited to zoning and planning laws, housing laws, building codes, and annexation laws.
2. Survey developers, builders, contractors, farmers, planners, engineers, surveyors, environmentalists, historic preservationists, attorneys, academics, citizen groups, others in the private sector, state agencies, and local governmental agencies about problems associated with current land use trends and current policies and suggested policy changes.
3. Stimulate statewide discussion on problems related to current land use trends, identifying best development practices and alternative land use and capital investment solutions.
4. Review model legislation and studies on land use techniques and collect information on states that have developed innovative solutions to similar land use challenges.
5. Identify any state programs or regulations that directly or indirectly encourage or subsidize low-density development and outward migration from urban areas.
6. Identify public information, training, and technical assistance related to land use needed by state, regional, and local agencies.
7. Identify incentives or techniques for sharing the benefits of economic growth and eliminating or reducing fiscal competition among local units of government and for fostering intergovernmental cooperation.
8. Propose innovative and cooperative land use approaches that will accommodate and guide growth and development through cooperation and partnerships on a local and regional basis; ensure the construction of adequate supporting services and infrastructure, including utilities, storm water management systems, and transportation; provide opportunities for or eliminate barriers to affordable housing; protect the environment and historic and scenic resources; enhance community livability; preserve farmland; and minimize negative impacts on natural resources.

Members of Minnesota's Smart Growth Network
endorse the following
Principles of Smart Growth:

- Make efficient and effective use of land resources and existing infrastructure by encouraging development to areas with existing infrastructure or capacity to avoid costly duplication of services and costly use of land.
- Provide a mix of land uses to create a variety of housing choices and opportunities.
- Make development decisions predictable, fair and cost-effective.
- Provide a variety of transportation choices including pedestrian friendly neighborhoods.
- Maintain a unique sense of place by respecting local cultural and natural environmental features.
- Conserve open space and farmland and preserve critical environmental areas.
- Encourage stakeholder collaboration and community participation rather than conflict.
- Provide staged and managed growth in urban transition areas with compact development patterns.
- Enhance access to equitable public and private resources for everyone.
- Promote the safety, livability and revitalization of existing urban and rural communities.

Ohio's Balanced Growth Program

Background

The Ohio Lake Erie Commission (OLEC) appointed a Balanced Growth Task Force to make recommendations about the future protection and restoration of the Lake Erie watershed which were accepted on
April 14, 2004. The Task Force was comprised of property owners, government officials, business leaders, conservationists, academia, agriculture, and other stakeholder groups.

OLEC is an agency of the State of Ohio comprised of the Directors of the Ohio Environmental Protection Agency and the Departments of Natural Resources, Health, Transportation, Development, and Agriculture. They are charged with making policies to protect and restore Ohio's most valuable natural resource, Lake Erie.
Recommendations

The Balanced Growth Task Force recommended that the state provide a voluntary, incentive-based program for balanced growth in the Ohio Lake Erie basin. It calls for the creation of a locally driven planning framework that includes:

- A new focus on land use and development planning in the major river tributary watersheds of Lake Erie. The goal is to begin to link land-use planning to the health of watersheds and the Lake.
- The creation of Watershed Planning Partnerships composed of local governments, planning agencies, nonprofit organizations, and other parties in each watershed. Participation in these partnerships would be voluntary but encouraged by incentives.
- The locally determined designation of Priority Conservation Areas and Priority Development Areas in each watershed.
- The development of suggested model regulations to help promote best local land use practices that minimize impacts on water quality.
- The alignment of state policies, incentives, and other resources to support watershed planning and implementation for Balanced Growth.
- The development of measurements of progress of the Balanced Growth Program.

Pennsylvania’s Growing Greener

"I strongly believe that we must act now to create new jobs and spur economic growth. We simply cannot sit back and watch our economy diminish, hoping a new national tide will move us forward. As a state, the best next step we can take to revitalize our state is to reclaim and improve our natural resources, which will add tremendous new vigor to our economy." -Governor Edward G. Rendell

A critical effort that will be coordinated across state government, Growing Greener II will revitalize the towns and cities all across Pennsylvania that are struggling as a result of a changing economy.

The original Growing Greener legislation was signed into law by Governor Ridge on December 15, 1999. Called the Environmental Stewardship and Protection Act, funds were allocated to four state agencies for their work in farmland preservation, state park and local recreation projects, waste and drinking water improvements and watershed restoration programs. This has been the one investment - $1.2 billion - in Pennsylvania's history dedicated to restoring and protecting Pennsylvania's environment.

In June 2002, Governor Mark Schweiker signed legislation that increased the funding for Growing Greener, extending it until 2012. Though authorized funding levels have been established, revenue shortfalls have affected actual spending. As a result of the tough economy, even Growing Greener has suffered, and will only receive about 79% of the funding the program was authorized to receive this year. If we do not take action, it could be as low as 65% next year.

Begun under Governor Casey, another program called the Hazardous Sites Cleanup Fund, or HSCA, is the primary funding source for the state's nationally recognized Land Recycling Program operated by the Department of Environmental Protection that rehabilitates contaminated industrial sites for productive use. Otherwise known as the "brownfields" program, the Hazardous Sites Cleanup Fund has cleaned up more than 1,350 properties and created and/or retained 30,000 jobs.

Currently, the state is home to 11,000 sites in need of remediation. Next year, the HSCA fund will have revenue of only $6 million to address cleanup costs of over $50 million, and the fund is likely to zero out in subsequent years. The fund is drying up due to the phase down of the Capital Stock and Franchise tax. Since this funding stream no longer supports the program, the Hazardous Sites Cleanup program has relied on Hazardous Waste Fees and recovered cleanup costs, but these sources only provide about $4 million per year. We must continue the good work supported by the Hazardous Sites Cleanup Fund.

Wisconsin Comprehensive Planning Grant Program

The Comprehensive Planning Law was developed in response to the widely held view that state planning laws were outdated and inconsistent with the current needs of Wisconsin communities. Commonly recognized as Wisconsin's "Smart Growth" legislation, significant changes to planning-related statutes were approved through the 1999-2001 state biennial budget. Under the new law, any program or action of a town, village, city, county, or regional planning commission after January 1, 2010 that affects land use must be guided by, and consistent with, and adopted Comprehensive Plan, s. 66. 1001, Wis. Stats. What is Smart Growth? There are various definitions for the term, however, for Wisconsin, the statutes focus on the development and implementation of local comprehensive plans as well as provide a grant program to assist local government in the development of comprehensive plans.

F. Washington State Comprehensive Planning/Growth Management Act[85]

Introduction

Washington cities and counties have prepared comprehensive plans for many years; however, growth management in Washington took on new meaning with the passage of the Growth Management Act (GMA) by the Washington Legislature in 1990. The GMA was enacted in response to rapid population growth and concerns with suburban sprawl, environmental protection, quality of life, and related issues. The GMA has been amended several times, and is codified in many chapters but primarily in Chapter 36.70A RCW.

The GMA requires the fastest growing counties and the cities within them to plan extensively in keeping with state goals on:

- sprawl reduction
- concentrated urban growth
- affordable housing
- economic development
- open space and recreation
- regional transportation
- environmental protection
- property rights
- natural resource industries
- historic lands and buildings
- permit processing

[85] Municipal Research and Services Center of Washington

- public facilities and services
- early and continuous public participation
- shoreline management.

Twenty-nine counties are either required to fully plan under the GMA or have chosen to do so. These counties make up about 95 percent of the state's population. The remaining ten counties must plan for critical areas and natural resource land only under the GMA.

The GMA provides a framework for regional coordination, and counties planning under the GMA are required to adopt county-wide planning policies to guide plan adoption within the county and to establish urban growth areas (UGAs). Local comprehensive plans must include the following elements: land use, housing, capital facilities, utilities, transportation, and, for counties, a rural element. Shoreline master program policies are also an element of local comprehensive plans.

The GMA establishes the primacy of the comprehensive plan. The comprehensive plan is the starting point for any planning process and the centerpiece of local planning. Development regulations (zoning, subdivision, and other controls) must be consistent with comprehensive plans (see separate page on development regulations). State agencies are required to comply with comprehensive plans and development regulations of jurisdictions planning under the GMA.

G. Financing and Funding

1. Investing In a Better Future: A Review of the Fiscal and Competitive Advantages Of Smarter Growth Development Patterns

Mark Muro and Robert Puentes
A Discussion Paper Prepared by The Brookings Institution Center on Urban and Metropolitan Policy
March 2004

I. INTRODUCTION

Are bad times potentially good times for smart growth? Do tight budgets and a spotty economy make this the right Time—rather than the wrong time—to look at getting the most benefit for development efforts? On the face of it, the argument that curbing sprawl and fostering more efficient compact development can help governments economize and businesses and regions prosper appears powerful.

Efficiency has always been a core promise of smart growth. For years, the move to more compact settlements has held out the possibility of saving taxpayers some of the cost of building infrastructure serving new development far from traditional population centers. And yet, this dollarwise aspect of the movement to create developments of greater benefit to the community has received little attention in recent years—a period, by no coincidence, of unprecedented economic prosperity and budget surpluses. Instead, during the good years, smarter growth was mostly pursued as a quality-of-life agenda aimed at enhancing the livability of suburbia. Through the 1990s boom, the smart growth agenda was associated by turns with expensive state and local expenditures on farmland preservation, sizable open space projects, environmental protection, urban design initiatives, downtown revitalization, congestion relief, social equity discussions, and reducing school crowding. More recently an emphasis on human health and the reduction of obesity emerged. In short, while reformers continued to develop and advance fiscal and economic arguments for reducing population dispersal and revitalizing older neighborhoods, their greatest emphasis remained elsewhere. But now this could be changing. With the collapse of the 1990s stock market bubble, the September 11th terrorist attacks, the onset of economic sluggishness, and serious state and local budget deficits, a tense new climate of austerity has sharpened debates over growth, government spending, and economic development—and changed the calculus for reform.

Most notably, the imperatives of controlling costs and jump-starting the economy have come to dominate the agendas of both governments and businesses, given that growth rates and tax collections may well remain depressed for several years or longer.

Businesses—struggling to restore pre-slump profit levels—are aggressively seeking creative ways to accelerate growth and promote efficiency. For their part, states and local governments— squeezed by record budget shortfalls—are looking desperately to curb wasteful spending.

Suddenly, public officials are being forced to consider not just short-term budget cuts but policy reforms that will lead to long-term efficiencies. And no wonder: The states alone faced an aggregate $100 billion in budget shortfalls this year and last, thanks to a "perfect storm" of woes that includes a slow economy that has slammed tax revenues, soaring Medicaid expenses, and huge new security costs associated with the threat of terrorism.1 Only Arkansas, New Mexico, and Wyoming say they will face no budget problems in 2004.

In this environment, it is inevitable that opportunities to rethink how communities grow, and how they invest public dollars, would get another look. And they are getting it.

Notwithstanding their mostly rhetorical justifications for action, governors and advocates alike have begun to promote ideas such as the reuse of existing buildings, compact design to reduce infrastructure costs and traffic congestion, and limits on sprawl as a fiscal and economic tonic in hard times. "No longer should taxpayers be forced to bear the burden of new roads, schools, and sewers every time a McMansion is built or a mall is erected," declared Gov. James E. McGreevey of New Jersey last year, in the most direct gubernatorial embrace ever of smart growth as a fiscal remedy. And a month later Maryland's former Governor Parris Glendening, now president of the Smart Growth Leadership Institute, connected the moment and the message in a conference speech. "The infrastructure costs savings associated with smart growth are more imperative as officials are forced to make tough funding decisions," asserted Glendening, who first popularized a fiscally oriented concept of growth in gaining passage of Maryland's 1997 Smart Growth Areas Act. "Sprawl is fiscally irresponsible," Glendening told a reporter.2 Other sitting governors have also made the connection. In South Carolina, Gov. Mark Sanford's Quality of Life Task Force found that in order for the state to deal with its $57 billion infrastructure deficit, state agencies and local governments will have to carefully plan and prioritize how infrastructure investments are made.3 In Michigan, Gov. Jennifer Granholm created a land use leadership council based in part on the premise that rapid metropolitan decentralization "is hampering the ability of this state and its local governments to finance public facilities and service recently noted that encouraging more compact development patterns would help the state save money.

All of which raises the question: Is it true? How much does unplanned growth cost and can governments really save money and jump-start economies by applying smarter ideas before approving the next development project? What are the facts of the case for looking at community growth needs and benefits as a budgetary and economic strategy? This paper addresses those questions. Prompted by the growing interest in the fiscal benefits of compact development patterns (as well as the persistent obscurity of relevant information on the question), this report seeks to weigh the extent to which supporting smart growth development patterns can be considered a way to be smarter with money.

To do that, these pages survey the best academic empirical research literature probing the fiscal and economic implications of alternative land development patterns and conclude that, yes, thinking through growth and its impact on communities can save taxpayers money and deliver important benefits to business and regions. The paper is organized as follows. First, a brief initial section defines smart growth development patterns for the purposes of this review. Next, it lays out the basic arguments for why compact, mixed-use development holds out important fiscal, economic, and community benefits. A third

section then reviews the evidence on the three major clusters of probable fiscal/economic gains identified by the literature—savings of public infrastructure and service costs, gains in private-sector economic development, and suburban prosperity benefits from reducing core distress. Finally, the conclusion reiterates that, despite some caveats, supporting smarter growth development patterns amounts to smart policy for the smart money. 5 Keith Schneider, "Turfism is an Anachronism: Granholm Responds to Council Report, Sets Priorities to Strengthen Cities, Lasso Sprawl," Great Lakes Bulletin News Service, November 4, 2003. Available at www.mlui.org/growthmanagement/fullarticle.asp?fileid=16589.

II. DEFINING SMART GROWTH AND SMART DEVELOPMENT PATTERNS

Broadly defined, "smart growth" refers to a new way of thinking about how communities, cities and towns, and entire metropolitan regions grow and develop. This new thinking asserts that current patterns of growth and decline are harmful to communities, undermine urban economies and broader environmental objectives and exacerbate deep racial, ethnic and class divisions. Smart growth proponents argue that these growth patterns, popularly known as "sprawl," are not inevitable but result at least in part from major governmental policies that distort the market and facilitate the excessive decentralization of people and jobs.

Almost never does smart growth mean no growth; instead, it entails accommodating it in a way that maximizes its benefits and reduces as much as possible its frequent negative side effects. More specifically, smart growth refers to an overall set of broad goals and policies designed to counteract sprawl. These usually include:

- limiting outward expansion,
- encouraging higher density development,
- reducing travel by private vehicles,
- revitalizing older areas, and
- preserving open space.

Promoting more affordable housing may or may not be an explicit goal of smart growth programs. In investigating whether smart growth saves money, the paper narrows the usual definition and makes at least one crucial assumption that some may find troublesome: It deems smart growth development patterns essentially a matter of two rather crude land-use characteristics— compactness and density.

This admittedly limited definition of smart growth is necessitated by the limited scope of the academic literature to date. So far, the economics-of-development literature has primarily focused on the fiscal implications of providing infrastructure and services under different physical patterns of development, whether spread-out or more densely clustered. Consequently, any assessment of the economic implications of smarter growth must begin with that work—and with a definition of “smart growth” that reduces the doctrine’s many dimensions to its simplest impact on the physical form of development. Clearly, this proxy definition fails to capture the full social, environmental, and design dimensions of smart growth, and leaves aside the much broader panoply of goals (such as transportation choice and social equity) and tools (such as open space preservation) that constitute the smart growth paradigm.

Nevertheless, this narrower emphasis clearly captures two fundamental tenets of smart growth. And it has the critical benefit, in lieu of abundant research on smart growth per se, of focusing on the elements of smart growth—compactness and density—that have been evaluated most thoroughly in the academic literature. (See Anthony Downs, "What Does 'Smart Growth' Really Mean?" Planning, April 2001.)
In this fashion, the sections that follow present the most important academic research and empirical findings on three key dollarwise contributions of smart growth development patterns. Specifically, they review research findings that contend that smart growth can: Reduce the public costs of providing new

infrastructure and delivering new services improve a region’s economic performance Bring economic gains to suburbs as well as cities

To be sure, this typology hardly encompasses all the benefits of smart growth. For example, “softer”—although theoretically quantifiable—potential benefits of smart growth such as preserving open spaces or protecting farmland go unmentioned except to the extent that they produce budget savings for governments or amenity gains for families and businesses. Nor do potential transportation benefits receive much discussion, including savings on individual households' costs. Instead, priority has been given here to quantifiable gains in a few widely studied areas where rough consensus exists in the research literature. “Much” if not “general” agreement exists on each of the major measurable benefits of smart growth identified in these three areas. That means that policymakers, advocates, and the general public can take the following review as a reliable, if not comprehensive, survey of the likely fiscal, economic, and community gains of more compact development patterns.

Which is not to say this review ignores the contention that sprawl-style suburbanization offers certain benefits. Dispersed, low-density living clearly remains a popular preference among American households. What is more, significant evidence suggests that such development patterns bring with them lower land and housing costs—a significant factor in a nation with serious housing affordability challenges.7 To that extent, the several “benefits” of sprawl may offset some of the fiscal and economic benefits of concentrating development. And yet, that does not change the importance of the economic benefits outlined here.

It should be cautioned, however, that much of this literature fails to consider the role—and hidden costs—of public policy in facilitating such development. Transportation policies support the expansion of road capacity at the fringe of metropolitan areas and beyond, which enables people and businesses to locate miles from urban centers but still benefit from metropolitan life. Tax and regulatory policies have also given added impetus to people’s tendencies to move further and further out. For example, the deductibility under the federal tax code of mortgage interest and property taxes appears spatially neutral but in practice favors suburban communities, because they have higher home-ownership rates and higher-income residents.

Superfund and other environmental policies, for their part, have helped make the redevelopment of urban land prohibitively expensive and cumbersome, increasing the attraction of suburban greenfields. At the same time, costs such as increased infrastructure outlays, air pollution, or associated urban disinvestment frequently go uncalculated in discussions of the benefits of sprawl.

III. FISCAL, ECONOMIC, AND REGIONAL PROSPERITY BENEFITS: STATING THE CASE

The claim that smart growth holds out potential fiscal benefits to governments is at once intuitive and longstanding. The arguments for economic and regional prosperity benefits, meanwhile, are newer but not novel either. Fundamentally geometric, both arguments turn on the recognition that it matters where and how development occurs in a region.

In this regard, 70 years have passed since planners recognized that different locations, patterns, and types of growth might have different fiscal and economic implications. And it has been 30 years since a series of systematic fiscal impact studies began showing, with specific dollar values, that more compact, less sprawling development patterns can reduce the capital and operations costs governments incur from new growth. Even the recent economic work that is beginning to tease out the potential economic and regional boons of smarter growth patterns reflects economic and fiscal theories that go back decades.

But now the confluence of a generation of sprawling development, a changing national economy, and the fiscal problems of localities calls for another look at the relationship between development patterns and fiscal and economic outcomes.

Fiscal Benefits

On the fiscal side, the logic is straightforward. For 50 years planners and engineers have hypothesized two related ways urban form can decrease public capital and service-delivery costs (Wheaton and Schussheim 1955, Kain 1967, Knaap and Nelson 1992, Carruthers and Ulfarsson 2003):

- Economies of scale—because the marginal cost of serving additional population decreases as more residents cluster within a smaller geographic area. Also referred to as "density efficiencies" (Greenwood 2003)
- Economies of geographic scope—because the marginal cost of serving each additional person decrease as each person locates more closely to existing major public facilities Together these theories suggest that more compact and dense settlement can reduce government capital and operation costs.

For instance, in terms of capital spending, smarter, more compact growth should entail smaller outlays to extend roadways, sewers, water lines, and other infrastructure to reach each new consumer. This follows from the fact that reducing the distance between houses and businesses can be expected to reduce the necessary length of streets, sidewalks, storm drain systems, and sewer and water lines.

Similarly, by pursuing more compact development patterns, states and localities could reduce their per capita outlays on service delivery such as maintaining their roads and providing water, solid waste, transit, and school bus services. Again, the argument is geographical and geometric. Fire departments may be able to respond to more emergencies or get to major accidents faster with less personnel if development is more compact. Better bus service can be provided to more commuters with shorter routes and fewer vehicles in a more densely populated, more compact service area.

Nor are these potential efficiencies trivial. Spending on capital and services makes up fully one-quarter of annual state and local outlays, underscoring the importance of examining the savings smart growth seems to offer. Over the year 1999–2000, states and localities spent:

- Nearly $140 billion on capital outlays for such infrastructure (shaped by development patterns) as elementary and secondary schools, highways, sewer lines, solid waste management, and utility systems (e.g., water, electric, gas supply)[9]
- More than $200 billion on recurring expenditures to provide such services (also influenced by development patterns) as highway maintenance, police and fire protection, trash collection, and utility service. Considering that these outlays represent almost 20 percent of the $1.7 trillion states and localities spent during 1999–2000, realizing even modest percentage savings from smart growth could save taxpayers billions. And such savings grow only more attractive in light of economic stagnation, weakening federal support for states and cities, and the twin challenges many states face with shrinking revenue bases and increasing mandatory spending.

Economic Development Benefits

But this is only the fiscal side of smart growth. Largely overshadowed by these more pennywise considerations has been a more positive recognition of the larger economic benefits of reorienting scattershot development. 8 Of course, higher densities also impose greater loads on street and sewer lines, which may also impose costs.

These and other state and local government finance figures come from U.S. Census Bureau, “State and Local Government Finances by Level of Government and by State: 1999–2000.” Available at www.census.gov/govs/estimate/00s100us.html (March 2003)

To begin with, smart growth policies and practices in many circumstances create real estate value. That is, they may be expected to enhance property values, and so provide an important economic benefit to regions and localities.

In terms of residential land and housing process, numerous studies have illustrated that when the supply of housing is spatially contained (as in some smart growth and growth management regimes) housing prices in those areas increase (Katz and Rosen 1987, Fischel 1990, Glaeser and Gyourko 2002).10 Other such as Nelson (2000) contend that containment results in higher housing prices, not due to limits on the supply of housing, but rather from the creation of benefits such as heightened convenience, enhanced public transit, and lower service costs. Other studies, such as Segal and Srinivasan (1985) and Lillydahl and Singell (1987) suggest the potential for growth management policies to increase property values across the region. These effects suggest that smart growth may also have significant positive effects on land and house prices, either by limiting the supply of developable land or increasing the overall desirability of the community. In this fashion, some aspects of smart growth such as urban containment or land conservation may raise housing costs if they are not accompanied—as true smart growth ordains—by increases in housing density and supply. But they also may enhance regions' tax bases, create wealth through housing appreciation, and boost property tax collections. In that sense, smart growth may well create substantial value by enhancing the real estate market. But there are other potential gains that merit even closer consideration. Most notably, a variety of new urban scholars has begun in recent years to suggest that important productivity gains accrue to economies that foster dense labor markets, vibrant centers, efficient transportation systems, and a high "quality-of-place"—all objectives of the smart growth movement.

These scholars start from the premise, foreshadowed over 100 years ago by Alfred Marshall, that density is a fundamental purpose of cities (Bogart). They also assume—with economists like Robert Lucas, Paul Romer, and Edward Glaeser— that in the "knowledge economy" clusterings of talented people, or "human capital," represent a prime driver of aggregate economic growth. In this view, cities play a key role in spurring growth because they facilitate companies' access to suppliers, contractors, and the regional labor pool, and because they catalyze the sort of "agglomeration" efficiencies or "knowledge spillovers" that result from the sharing of information, ideas, technology, and opportunities. 10 It is important to note that housing prices are uncertain and depend greatly on the type of regulation imposed. It is also important to note that to reduce the negative impacts on housing affordability, regionally-based smart growth and growth management efforts typically have inclusionary elements specifically intended to broaden choices to more housing segments (Nelson and others 2002; Nelson and Duncan 1995).

So what kind of city works best in economic terms? Building on the theory that knowledge and efficiency matter most, the new urban thinkers come very close to endorsing key tenets of smart growth as strategies for competitiveness.

- Ciccone and Hall (1996) have shown that average labor productivity increases with the employment density of counties
- Cervero (2000) demonstrates that higher productivity levels can be found in cities that are compact—and served by efficiently integrated transportation systems
- And Nelson and Peterman (2000) have found a positive association between the presence of growth management and the improvement of a metropolitan area's market share as measured by personal income.

In a more qualitative vein, the economic development expert Richard Florida (2000) argues that attributes like compact "24-7" urban scenes, subway or light rail systems, and sustainable development spur growth because they appeal to the affinity for such qualities among highly educated, highly mobile "knowledge workers" who "vote with their feet." His econometric and focus group evidence suggests that such

workers seek out smart growth attributes and that providing them can enhance regions' "ability to attract talent and develop high technology industries.

To be sure, this second economic argument for smart growth remains less well established than the fiscal contention—and relates to the spatial tenets of smart growth per se less directly. Nevertheless, the growing case for the economic benefits of the sort of focused development favored by smart growth parallels that for fiscal savings, and offers a tantalizing complement to it.

Once again: How and where development occurs—those crucial preoccupations of smart growth—appear to matter. Once again: Reducing sprawl, promoting urban focus, and encouraging more compact development (along with providing good transportation links) may well enhance outcomes.

Smart growth, in short, appears to offer a promising tool for economic development as well as for fiscal management. "Growth management" is also a term that requires some definition. We define growth management as the deliberate and integrated use of the planning, regulatory, and fiscal authority of state and local governments to influence the pattern of growth and development in order to meet projected needs. Included in this definition are such tools as comprehensive planning, zoning, subdivision regulations, property taxes and development fees, infrastructure investments, and other policy instruments that significantly influence the development of land and the construction of housing. Growth management is often distinguished from growth control. Where growth management accommodates projected development in a manner that achieves broad public goals, growth controls limit or ration development. Typical growth control tools are moratoria, permitting caps, development quotas, and the like (Nelson and others, 2002).

Regional benefits

Finally, smart growth seems to offer another benefit: To the extent it fosters urban revitalization, it may well promote the economic well-being of the suburbs as well as the city.

In this connection, the growing literature on urban-suburban "interdependence" provides evidence that policies that promote reinvestment and prosperity in the urban core have the power to enhance not just the overall competitiveness of a region but the economic health of all of its parts. (Greenstein and Wiewel 2000).

Informing this claim is the fundamental intuition of the "interdependence" literature that the fates of cities and their suburbs are linked. To be sure, the diverging paths of cities and suburbs since World War II has seemed for decades to dramatize the separateness of urban and suburban interests in the U.S. In region after region, after all, the fast growth of seemingly successful suburbs just miles from sagging core neighborhoods tended (especially to suburban interests) to confirm the suburbs' independence.

Suburban well-being had seemed to detach from that of the centers. Yet for all that, the recognition that cities and suburbs have become adjacent sub-units of encompassing regional economies has increasingly made clear the relatedness of city and suburban fortunes (Pastor 2000).

Neal Peirce (1993), for example, has argued that all parts of a region are "in it together" when regions compete as "city-states" in the global economy to train and mobilize the workforce, lure business relocations, and assemble amenities. Henry Cisneros (1995) has emphasized the need for suburban interests to recognize that "political borders do not seal off the problem of concentrated poverty." And Myron Orfield (1997) has shown that problems once confined to central cities, such as crime, unemployment, and tax-base erosion, tend eventually to undercut the stability of the suburbs.

At the same time, systematic cross-sectional studies have gone farther and increasingly suggested the interrelation of urban and suburban fortunes, and the likelihood of substantial spillover effects from one kind of community to another. Analyses by Richard Voith (1992), H.V. Savitch and colleagues (1993), and Larry Ledebur and William Barnes (1993), for example, have all associated central city decline and

wide urban-suburban prosperity gaps with regional stagnation, as measured by slowed income growth. These assessments suggest that urban decay can undercut the attractiveness of the entire region by harming its ability to maintain the physical infrastructure, reducing the number of regionally valued amenities, weakening its agglomeration economies, and imposing other social costs manifested by high crime, poor health, and unproductive workers (Voith 1992).

Conversely, and even more on point, rigorous empirical calculations by Voith (1998) and Pastor (2000) have shown, respectively, that boosting central city income growth and reducing core poverty each tend to improve overall metropolitan area income growth. This work demonstrates that to a measurable degree suburban welfare depends on central-city welfare.

Hence the claim about smart growth: To the extent smart growth places a high priority on reinvesting in older established neighborhoods and regional centers as opposed to facilitating decentralization, it will likely tend to improve the region's economic performance and benefit city dwellers and suburbanites alike.

This, then, is the third and culminating contention about smart growth's virtue as a fiscal and economic strategy: By focusing greater attention on the center city smart growth will over time generate growing economic benefits across the entire region, including the suburbs. In short, smart growth benefits the suburbs as well as the city.

IV. SMART GROWTH'S BENEFITS: WHAT THE RESEARCH SAYS

So: Given these lines of arguments, what exactly does the research say? What are the impacts of smart growth on fiscal, economic, and regional health, specifically?

According to recent and established scholarship, smart growth appears to offer governments the possibility of quantifiable fiscal savings over time through the reduction of capital-facility and service-delivery costs. It also promises regional economic and productivity gains. Finally, it likely will enhance both urban and suburban income levels.

A. Smart Growth Reduces the Cost of Providing Infrastructure and Delivering Services

A number of conclusions about the fiscal benefits of smart growth can be drawn from the voluminous literature that investigates the costs of alternative development patterns. These benefits to state and local governments, while diverse, tend to be associated with the provision of infrastructure and, to a lesser extent, with the provision of services.

Savings on Capital Facility Costs

Serious work on the infrastructure costs of new growth goes back 30 years, and repeatedly concludes that more compact development patterns can save governments money.

Of principal interest here is a series of "cost of sprawl" studies published in the 1970s, 1980s, and 1990s that has exposed the specific fiscal implications of how and where development takes place in a region. Prior to this work, the planners' contention that compact development reduces infrastructure and service outlays remained largely that: a contention based on a quite frail empirical foundation (Frank 1989). Only a handful of "fiscal impact" studies had examined the costs of public facilities associated with various development patterns before the 1970s. And still fewer considered costs or savings other than those generated within or immediately adjacent to a particular local development. Over time, however, fiscal impact analysts widened their scope and began to endorse the superior cost-effectiveness to taxpayers of compact—as opposed to sprawling—development by providing harder and more useful numbers on region-scaled development alternatives.

The pioneer "costs of sprawl" study prepared by the Real Estate Research Corporation (1974) for the federal government estimated the public costs of a large range of densities (single family to high-rise) as well as those of differing large-scale community prototypes, ranging from "high density planned" development to "low density sprawl." Frank (1989) soon gathered and critiqued all of the early research and concluded that high-density development generated the lowest costs, while Duncan (1989) reached the same conclusion through case studies of actual communities in Florida. And the reach of the research continued to widen. Through the 1990s Robert Burchell and his associates produced a series of large-scale "cost of sprawl" modelings for whole states and regions (Burchell and others 1998). More recently another Burchell-led team that included Anthony Downs of the Brookings Institution took the analysis to a national scale with "The Costs of Sprawl— 2000" (Burchell and others 2002). These analyses calculate that "compact" (compared to "current") growth patterns could reduce 25-year road-building outlays 12 to 26 percent. And the national tabulation put the infrastructure differential between sprawl and planned growth—meaning, the potential savings of smart growth—at over $100 billion over 25 years, for a savings of about 11 percent.

Of these assessments and others, of course, it bears noting that care must be taken in wielding the conclusion that smarter growth can reduce public facilities costs.

Local conditions, rules, and practices condition everything about development costs, making it hard to generalize from one study to another. Likewise, fiscal impact studies remain heavily determined by their authors' particular modeling and accounting techniques. This, unfortunately, enlarges the role of practitioners' individual assumptions and methodologies (which are not always explicit or clear) in particular studies, and tends to make the studies incompatible. Not all of the studies, for example, consider the same costs or categorize them the same way. Nor do they assess precisely comparable changes in development pattern. And many conflate local subdivision savings from clustering or dwelling type with savings associated with more dispersed development patterns. As a result, the studies sometimes differ in their assessment of cost savings by orders of magnitude.

All of which can make it hard to generalize findings and apply them. Still, the fact remains that a near consensus now exists. As the congressional Office of Technology Assessment summarized: "Though there is a good deal of disagreement on the assumptions and calculations for such estimations, there is general agreement that decreased density leads to increasing public and private development costs" (Office of Technology Assessment 1995).
Here, then, are some of the key research findings pointing to the likely savings in infrastructure costs of smarter growth (all cost figures are those quoted at the time of original publication):

- Real Estate Research Corporation (1974). RERC broke new ground by reporting that three "planned" development patterns—consisting of higher densities, more diverse dwelling types, and more contiguousness—reduced the public infrastructure cost of accommodating 10,000 new units by as much as 47 percent. RERC's basic study method was to compare detailed estimates of the costs associated with building five hypothetical new communities assembled out of mixes of six different neighborhood types, ranging from single-family houses to high-rise apartments. This work-up revealed that providing the infrastructure to support high-density planned development cost about half as much, at $5,167 in 1973 dollars, than the $9,776 required to accommodate low-density sprawl. Shortened utility lines produced the largest savings. Two of the major criticisms of this study, meanwhile, somewhat cancel each other. While the analysis erred in not fully providing for the school costs associated with high-density growth, it also underestimated the costs of facilities by failing to address the need for new regional facilities external to the hypothetical communities (Frank 1989; Benfield, Raimi, and Chen 1999). Correcting the first error would have reduced the cost difference

between high density, planned growth and low-density sprawl. Addressing the second omission would likely have increased the difference.

- Frank (1989). Frank's contribution was to reanalyze all of the major research available prior to 1989 using updated cost numbers. Conducted for the Urban Land Institute, Frank's synthesis harmonized the various findings into an equivalent-dollar summary table comparing eight different development patterns, and allowing for consideration of a development's distance from existing facilities. What Frank found was stark. By his calculations, the per-dwelling-unit public cost of providing streets, sewers, water systems, storm drainage, and schools to new residents varied sharply from $20,300 (1987 dollars) in the densest, most centralized configuration to $92,000 for houses 10 miles from central facilities on 1 dwelling-unit (d.u.)-per-four-acres (ac.) "estate" zoning. Within this 80 percent variation were other telling comparisons. Most notably, Frank calculated that moving to closer-in compact growth at 12 d.u. with half the units multifamily could cut to $24,000, or halve, the $48,000 per home capital costs of low-density (3 d.u./ac.) sprawling growth 10 miles from central services. Another note: Throughout Frank's tabulations utility costs occupy a surprisingly large share of the per-unit costs. His work has the capital cost of streets varying from $29,898 per unit on the fringe down to $1,843 in core high-rise neighborhoods. By contrast, outlays for sewers, water lines, and storm systems vary from $49,551 to $5,789.
- Duncan and others (1989). Duncan advanced the study of growth costs by widening the inquiry beyond density, and focusing on the broader "regional" costs of different scenarios. To probe these issues, Duncan's team examined the total public facility expenses associated with eight actual (as opposed to hypothetical) developments in Florida. These case studies represented five different development patterns (compact, contiguous, satellite, linear, and scattered). The result: The public capital and operating costs for close-in, compact development were much lower than they were for fringe, scattered, linear, and satellite development. To be specific, the costs per dwelling unit ranged all the way from a low of $9,252 for downtown Orlando (1989 dollars) to a high of $23,960 to serve new homes in Wellington, a low-density fringe development. And the study went further. By deeming the "compact" and "contiguous" growth cases "planned" and the others "unplanned" the analysis estimated the savings that might accrue from smarter, planned growth. This estimate concluded that planned growth could save significantly on road costs (60-percent savings over unplanned growth) and on utilities (40-percent savings), but only modestly on schools (7.4-percent savings)
- Burchell and others (1992, 1997a, b); Burchell, Dolphin, and Galley (2000). Teams led by Robert Burchell of Rutgers University supplied additional evidence by applying a nearstandard methodology to a series of modelings of statewide alternative growth scenarios throughout the 1990s. Starting in New Jersey, these comparisons of development-as-usual ("trend") and more compact ("planned") development attempted to quantify the 20-year road and water/sewer cost savings that would accompany other resource savings. In each case, Burchell's calculations projected solid savings from modestly increased densities and shifting growth closer to population centers. For example, the modelings projected that shifting from sprawl to planned growth could reduce total road-building expenditures 12 percent in South Carolina, 12 percent in Michigan, and 26 percent in New Jersey. On water and sewer infrastructure the savings ran from 8 percent in New Jersey to 13 percent in South Carolina to 14 percent in Michigan. A 2000 update of the 1992 New Jersey assessment, meanwhile, quantifies the potential savings in current dollars. Overall, Burchell's team projected that New Jersey could shave $2.32 billion, or 15 percent, off its total road and water/sewer infrastructure bill between 2000 and 2020 by adopting the state's moderately rigorous draft development plan. He calculated that more than half ($1.46 billion) of the savings would result from a 13 percent reduction in water/sewer expenditures due to more efficient clustering, more use of existing infrastructure, and more attached and multifamily housing. Local road savings came in at $870 million—a 23 percent reduction (Of such findings, it should be noted that all depend—like most modelings—on massive assumptions about the future distribution of households and their consumption of resources. It should also be remembered that each study adopts a different, locally bound definition of "compact" development, making it hard to gauge the aggressiveness of land-use change needed to produce the noted savings.

Still, the consistency of the sizable identified savings adds credence to the claim that smart growth can yield fiscal efficiencies).

- Burchell and others (2002). Moving the argument to the national level, another Burchell-led team broadened the analysis even further with "The Costs of Sprawl—2000," a 50-state projection. This time the modelers projected the potential 25-year savings of reducing "trend" sprawl in all non-urban areas by 25 percent and relocating the curbed growth to the already urbanized portions of developed counties. To achieve this, the researchers found that controlled growth could be accomplished with only a 20-percent increase in density and a 10-percent increase in floor area ratio (FAR) for non-residential uses. The result: The calculations identified national infrastructure savings on the order of the state ones. On the road front, Burchell's simulations estimated that a saving of 188,300 lane miles of local roads and $110 billion could be achieved by 2025 with more compact growth patterns. This represents a saving of 11.8 percent in state and local road costs. Water and sewer savings were smaller. Thanks to more compact growth patterns, the combined cost savings of lower tap-in fees and 4.6 million fewer lateral lines offers an infrastructure saving of $12.6 billion, or 6.6 percent, over 25 years (Table 4). How much of the utility savings flow to local governments and how much flow to property developers and occupants of new homes, however, remains unclear in the report.

Abundant academic research confirms, then, that smart growth holds out significant potential savings to governments on one-time infrastructure outlays by comparison with the spending required by low-density sprawl. Repeatedly the research suggests that adopting smart growth could reduce some states' and localities' capital expenditures by 10 to 20 percent at least and maybe more.

2. Savings on Service Delivery Capital costs are one-time costs to be defrayed over the useful life of facilities. Usually they are associated with major infrastructure construction. Equally significant, though, are a whole series of recurring additional costs to communities that can also be influenced by regional growth patterns. These outlays range from the cost of operating and maintaining roads, sewers, and other infrastructure to the annual cost of providing basic services like police and fire protection, school buses, emergency medical coverage, trash collection, utilities, and transit. To varying degrees, these expenditures have also been shown to be ripe for economies of scale and geographical scope, although Ladd (1992) has raised the possibility that after declining at many densities such costs actually rise in very dense counties, perhaps due to the "harshness" of traffic congestion, crime rates, and other conditions. Public works outlays, in any event, can be reduced in many compact communities because fewer lane-miles and shorter sewer and water pipes can be serviced and repaired less expensively. Likewise, compact cities require fewer police and fire stations per capita than more sprawling areas because more households live within the acceptable response time of established service providers. In view of that, many of the analyses that report the infrastructure savings associated with smarter growth do the same for operating accounts and services. Here are some of the findings:

- Real Estate Research Corporation (1974). RERC's early tally of the "costs of sprawl"— including those associated with infrastructure construction—also broke out the operating and maintenance costs generated by its five hypothetical new communities. Once again planning growth and mixing neighborhood elements reduced the public's costs—though by a lesser amount than they did for infrastructure costs. According to RERC, the year-10 public operating costs for 10,000 new units came to $1,030 per unit for a high-density planned development compared to $1,203 a unit for a sprawling, low-density community (1973 dollars). That represented a 14 percent saving for the most planned alternative.
- Burchell and others (1992, 1997a, b); Burchell, Dolphin, and Galley (2000). Burchell's modelings of statewide growth scenarios also suggest that better planning can make government operations more efficient. In each case, Burchell's studies project modest fiscal benefits when they compare the public service costs and the revenues associated with planned as opposed to trend development. In New Jersey, Burchell's analysis concluded that the 1992 state plan's modestly increased densities and slightly more concentrated growth pattern offered an annual

$400 million, 2-percent, fiscal advantage to localities and school districts. This advantage reflected the ability under the state plan for localities to save $112 million annually by drawing on usable excess operating capacity in already developed areas as well as efficiencies of delivery. For instance, reductions in lane-miles of local roads were assumed to reduce municipal maintenance and debt service costs. Similarly, school districts were projected to realize a $286 million annual financial saving from more efficient use of existing facilities. Projections in other states located slightly larger but comparable fiscal savings on operations and service delivery. A nearly 4-percent cost-revenue gain was forecast in Michigan and a 5-percent savings in South Carolina. More recently the 2000 update of the 1992 New Jersey assessment projected a 4-percent, $107-million annual operations-service saving by 2020. Set beside a 13-percent revenue gain from more planned growth, this service saving could help the state improve its net fiscal position by $160 million in 2020, according to Burchell. “Steering growth toward urban areas causes the fiscal deficit associated with growth to shrink,” the Burchell team concludes. But it also adds of New Jersey’s overall trends that “by no means will the deficit be reduced enough to render the costs versus revenues of growth anything but negative.”

- Bollinger, Berger, and Thompson (2001). This University of Kentucky analysis compared the relative costs of government in 10 Kentucky counties, and associated large differences in service costs with the counties’ growth patterns. This assessment reveals that the per unit costs for police, fire, highway, schools, sewer, and solid waste services were consistently lowest in counties whose growth was more concentrated in established areas between 1987 and 1997, and highest in the counties with the most dispersed growth. Among counties containing center city of a major metropolitan area, households in compact Fayette County (which includes Lexington) actually save $1.08 in service costs for every additional 1,000 new residents in their community while those in spread-out Jefferson County (home of Louisville) see their taxes go up by $36.82 every time their sprawling county accomodates1,000 new residents. Similarly, the arrival of 1,000 new residents in Shelby County (a relatively focused suburb) costs each household $88.27 while in dispersed Pendleton County it costs households $1,222.39. And in small-town counties the results are the same: Warren County (with growth focused in Bowling Green) can accommodate 1,000 new residents at a cost of $53.89 per household while in sprawling Pulaski County such growth costs each household $239.93. The bottom line: More established places accommodate growth at lower costs than newer, more spread-out ones, with fire protection, schools, and police driving much of the result.
- Burchell and others (2002). The massive national projection of “The Costs of Sprawl— 2000” also quantifies public service savings and fiscal benefits from controlled growth, albeit ones smaller than it projects for infrastructure. Using per-capita service-cost estimates, this analysis estimates that localities could reduce their public-service costs by a collective $4.2 billion a year, or 3.7 percent, after 25 years if the country were to embrace controlled growth nationwide. Comment the authors: “The decrease in costs is possible because, under controlled growth development, more development will take place in developed areas where public service costs may be more expensive, but public-service demand can be absorbed more readily due to the excess capacity found there.”
- Grow Smart Rhode Island (1999). This innovative assessment, prepared by H.C. Planning Consultants, Inc., and Planimetrics, LLP, deserves special mention, because it supplements an unusually clear accounting of the infrastructure, service, and other savings of a “compact cores” scenario with a striking analysis of the fiscal benefits of avoiding urban decay— another goal of smart growth. On the infrastructure and service-cost side, the study's accountings conform to expectations. Compact development could reduce Rhode Island’s 20-year infrastructure costs by $243 million—or about 40 percent—concluded the study. And it could reduce the operating costs of that infrastructure by $181 million over the 20 years— or 37 percent, with 80 percent of the savings coming from more efficient utility operation.

But now the study goes farther: Turning to the revenue side of the equation, the report details huge additional savings from compact growth. First, the analysis observes that compact growth could reduce suburban and rural towns' projected sprawl-related deficits by as much an average $10.6 million per year over the 20 years. That represents an additional saving of $212 million. Then, looking to the cores, the analysis concludes that more compact development would help core cities even more by reversing urban decline. In this fashion, the report shows that smart growth in Rhode Island could increase core cities' property tax revenues by $39 million annually or $782 million over 20 years. All told, these gains hold out the possibility of a 20-year, $1-billion improvement in the state's fiscal position. Add on the savings in infrastructure and service costs savings and compact growth promises to save Rhode Islanders some $1.4 billion over 20 years.

- Speir and Stevenson (2002). Finally, Speir and Stevenson recently found that "lot size (or density) is the spatial attribute that has the most impact on water and sewer costs." They demonstrated that dispersed large lots at low densities result in significantly higher public service costs than smaller lots closer together. Once again, a series of detailed analyses confirms that smart growth can reduce states' and localities' per-unit costs—in this case for operations, maintenance, and service delivery. The consensus is clear: All things being equal, governments can save taxpayers money by channeling development into established areas where services can be provided more cheaply.
- Smart Growth Improves Economic Performance But these are savings primarily for governments. It also appears that smart growth may well improve regional economic performance. Granted, comparatively little empirical work has addressed this possible connection. Nevertheless, urban economists have long theorized that urban form influences economic outcomes. And now, researchers have actually begun to demonstrate that such key smart-growth goals as compactness, density, well-integrated land-use and transportation, growth management systems, and rejuvenated urban centers may each be associated with enhanced economic growth. In each case, smart growth goals like compactness, density, and "quality of life" enhancement seem to support—or at least be associated with—modestly strengthened economic performance. Presumably, this is because such urban qualities improve productivity by enhancing businesses' access to quality workers. Here are a few of the most suggestive findings of this type:
- Ciccone and Hall (1996). Ciccone and Hall have quantified the economic benefit of density, which reduces transportation costs, puts more workers and companies in close contact, and promotes beneficial exchange among workers and organizations. Using county-level data on employment density and state-level data on productivity, they used statistical modeling to estimate that doubling employment density increases average productivity by around 6 percent. More tangibly, they found that workers in the 10 densest states produced $38,782 of value annually while those in the 10 least dense states produced only $31,578 in output– about 25 percent less. Overall, Ciccone and Hall attributed more than half of the variance of output per worker across states to differences in the density of economic activity, rather than other factors like the size of the cities or public investment levels there.
- Cervero (2000). Cervero confirmed these findings and extended them, demonstrating that compact, "accessible" cities with efficient transportation links were more productive than more dispersed places. His analysis consisted of two separate modelings using data from the 1990s—one at the "macro" level, based on cross-comparisons among 47 U.S. metropolitan areas, and the other at a more "micro" scale, involving comparisons among sub-regions of the San Francisco Bay Area. In each case, the economic benefits of compactness and concentration outweighed such negative impacts as freeway congestion. Focused, accessible cities in which firms lie close to labor markets and the transportation infrastructure works swiftly enjoy greater economic output per worker.

- Nelson and Peterman (2000). Nelson and Peterman add another element: They conclude that metropolitan areas that practice growth management actually can improve their economic performance relative to other regions. To do that, their regression analysis of 182 mid-sized metro areas in the 1970s and 1980s assessed changes in the relative share of total personal income garnered by 26 metros that were deemed to utilize some form of growth management, whether urban growth boundaries, urban service limits, or regionalized planning. What they found was a positive association between growth management and improved economic performance. Those communities that engaged in growth management realized about a 1-percent improvement in their market share (as measured by personal income) between 1972 and 1992, relative to other metros, all other things being equal. Apparently restraining sprawl can yield sufficient taxpayer savings, efficiency gains, and quality-of-life benefits to boost economic development.
- Carlino (2001). Finally, Carlino links denser local economies to increased patenting activity—a key measure of idea generation and economic vitality. Employing multiple regression analysis, his exploration of 1990s data from 270 metropolitan areas reveals that patenting was significantly greater during the decade in regions with higher employment density. For example, the number of patents per capita rose, on average, 20 to 30 percent in a metro for every doubling of density. Given that local employment density varied by 2000 percent in this sample, Carlino's results imply that denser places are enjoying significant innovation edges over less-dense competitors. In sum, significant empirical evidence is beginning to point toward a tantalizing association of economic productivity and compact, centered, and efficient regions. To that extent, a new more positive vision of smart growth as an economic boon should increasingly complement the older claim of fiscal benefits.

B. **Smart Growth Benefits Suburbs as Well as Cities** On the link to suburban economic benefits, numerous studies suggest the tie but only a few recent ones do so with unimpeachable rigor. At least 10 of the 13 city-suburb statistical analyses reviewed by Gottlieb (1998) going back to the 1960s show a link between central city and suburban economic performance, central city and metropolitan economic performance, or greater spatial equality and metropolitan economic performance.

However, as Gottlieb points out many of the studies utilize fairly rudimentary statistical tools, turn on raw correlations of city and suburban health, and fail to prove that suburban prosperity depends on city vitality. That is, they prove that city and suburban health tend to move together, but they don't necessarily prove causation. For example, relatively few of these investigations go so far as to ensure that some "exogenous" (outside) variable, such as the emergence of a fast-growing industry in the region, did not trigger growth in both the city and suburbs (Pastor 2000).

More recently, though, a series of more sophisticated econometric investigations have responded to such methodological concerns and provided more rigorous evidence that improving conditions in a regional core can improve performance across the region and in the suburbs. These exercises—most notably by Richard Voith and Manuel Pastor Jr.—indicate that the reinvestment end of smart growth may well help all residents of a region.

- Voith (1998). Controlling for the weaknesses of simple correlational analysis, Voith has shown that income gains in central cities—often resulting from efforts to invest in families and other assets in urban centers—also benefit the entire regional economy. His modeling considered patterns of growth in income, house prices, and population in cities and suburbs between 1970 and 1990 for virtually all metro areas, and found that city income growth positively affected suburban growth in all three indices—at least in larger cities. More specifically, Voith calculated that in the Philadelphia region a 1-percent increase in the 10- year city income rate would result in an additional $1.2 billion in cumulative suburban income and $900 million in aggregate house appreciation, for a total benefit of $2.1 billion (or 2.8 percent) in the suburbs (1982–4 constant

dollars). In short, shoring up older urban centers— as smart growth attempts to do—can build wealth for entire metropolitan areas, city and suburbs alike.

- Pastor and others (2000). Similarly rigorous regression work by Pastor's group demonstrates that in 74 major metropolitan areas reductions in central city poverty rates led to metropolitan income growth. To paraphrase Pastor, targeted efforts to alleviate central city poverty eventually seem to "trickle up" to improve incomes across the whole region.
- Haughwout and Inman (2002). Haughwout and Inman presented strong evidence that the finances of the central city and the welfare of its suburbs are closely related. And they recommend suburban aid in funding anti-poverty programs in the city. So another line of evidence can be evaluated: To the extent smart growth qualifies as an anti-poverty program with its strong emphasis on urban-core reinvestment and sustaining mixed income neighborhoods, it appears likely to benefit suburban people too by improving the region's overall economic performance. Again, smart growth appears good for growth, according to significant empirical research. So if suburban interests ask, "What's in it for me?" the answer seems increasingly clear: Boosting the core helps boost whole regions.

V. PULLING IT ALL TOGETHER: SMART GROWTH AS SMART MONEY

The case can be made, then: A portfolio of provocative evidence suggests quite strongly that smart growth has the potential to reduce governments' capital facility costs, reduce their costs of delivering services, and improve regional economic performance as well. Using the Burchell group's national projections, which reflect a single methodology and a national scope, it appears on the fiscal side that:

- Capital facilities projects offer the largest promise for reducing the fiscal demands of development using smart growth. By the Burchell group's calculations, shifting to a modestly more compact development pattern could yield percentage savings in the low double digits (around 11 percent) from 25-year capital outlay estimates for roads and water/sewer lines. Road building savings are key. Nationally, road building promises almost 10 times the 25- year dollar savings ($110 billion versus $12.6 billion) and twice the percentage savings (11.8 percent versus 6.6 percent) of water and sewer link construction.
- Operations/maintenance and service delivery spending, meanwhile, hold the potential for more moderate savings of perhaps $4 billion a year, or 3.7 percent, according to the same assessments. Over 25 years, however, these operational savings could begin to approach those to be wrung from local infrastructure costs. Of these savings it can be said that they are solid, but not spectacular; long-term rather than immediate. That the American economy represents an $11-trillion enterprise (rising to $20 trillion in 2025) may help to put these meaningful but not massive savings in perspective. At the same time, econometric work suggests potentially more potent benefits of smart growth may accrue on the wider economic front:
- Productivity and overall economic performance may be improved to the extent smart growth elevates regions' employment density and improves transportation efficiency
- Likewise, regional and suburban prosperity may be increased to the extent smart growth improves the fortunes of the center city by channeling new development into urban cores. These productivity, prosperity, and equity benefits of smart growth will become especially tantalizing as states and regions seek to enhance their competitiveness as the economy picks up.

Suggestions for Future Research

Of course, much more work needs to be done to strengthen the fiscal and economic case for smart growth. On the fiscal side, while numerous studies suggest the benefits of more compact growth, the evidence remains hard to interpret, and harder to translate. The primary reason is that modeling dominates the literature and remains heavily determined by the parameters and definitions of the particular study. Case

studies bring the models down to earth but remain strongly affected by factors specific to particular localities. Meanwhile, the absence of standardized measures of expenditure, service levels, sprawl, and "smart growth" make it hard to draw universal conclusions beyond the general conclusion that low-density-development is more expensive to support. Generalizations are therefore difficult to make. For this reason, a crying need remains for a widely publicized, systematic, and authoritative synthesis and comparison of the best studies conducted in different states and regions. Similarly, it must be said that the prominence of modeling brings with it an air of the theoretical. In this connection, Bunnell (1997) has rightly observed that for fiscal impact research to become more meaningful and educationally useful, "greater emphasis needs to be placed on empirical studies that examine actual patterns of development, in actual geographic and fiscal contexts."

Such "reality-based" research—especially comparing differently planned neighboring communities operating under similar fiscal, tax, and service structures—would "tell the story" in a more tangible way. Especially useful for those concerned with smart growth would be detailed fiscal studies comparing paragon smart growth communities with nearby traditional ones operating within similar tax, regulatory, and service structures. Clearly a shortcoming of this essay has been its reliance on studies assessing such proxy characteristics as density or compactness in lieu of the full panoply of "smart growth" characteristics, ranging from centeredness and walkability to mixed uses and transportation choice.

Similarly, the state of knowledge on aggregate economic impacts remains suggestive, but far from decisive. Complex statistical and mathematical analysis comes into play even more in this field, making its conclusions less satisfying. Some "findings" feel more like mathematical exercises than real-world empirical discoveries. And many studies—while intriguing—lack rigor.

Cases in point are some of the studies asserting an association between smart growth-type urban interventions and enhanced economic growth on the basis of simple correlations. As Pastor and Gottlieb caution, simple correlations cannot confirm the order of events. Already noted was the possible intrusion on such correlations of outside effects like a region-wide economic boom that lifted multiple cities and their suburbs. So too might a booming suburban economy drag a sagging center out of the doldrums and improve prosperity across the region, even though it might appear that core enhancement boosted the suburbs. Clearly the possibility of a relationship between urban form and character and overall economic performance must remain a major area of concerted investigation.

Moreover, the fiscal and economic benefit of numerous other aspects of alternative growth patterns remains unquantified. Suffice it to say that much more work needs to be done to evaluate the real fiscal and economic value of redevelopment and reinvestment; transit investment as compared to highway construction; mixed-use versus single-use development; conservation; and historic preservation.

VI. CONCLUSION

And yet, the dollarwise benefits of smart growth can clearly be affirmed. With governments, regions, and states under increased pressure to reduce costs and reenergize slumping economies, abundant evidence confirms that embracing smart growth can help on both scores.

Best known are the fiscal benefits. By concentrating households nearer existing infrastructure and service networks, the adoption of smart growth by municipalities and regions can reduce the costs of providing new roads, new water lines, and fire protection to a given number of new residents. Communities should in this fashion recognize that sprawl contributes to budgetary distress and that better managing development patterns can play a role in controlling rising costs and framing long-term solutions. At the same time, though, newer research points beyond these likely incremental cost savings to a more speculative, more exciting, benefit. Smart growth, it seems, may also hold some power to enhance the performance of whole economies, as well as incomes across whole regions, including in the suburbs.

In this fashion, advocates of smart growth have before them a powerful insight that well complements their longstanding fiscal claims with a more alluring vision of enhanced prosperity. More and more, it looks they can answer the business elite's question, "What's in it for me?" with a confident "Plenty!"

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2. A Guidebook of Financial Tools (U.S. EPA)
April 1999 Revision

FOREWORD

The future course of environmental management in America is increasingly being viewed in the context of "sustainable systems." Such systems must exhibit sufficient institutional, technical, managerial and financial capacity to prosper and endure. The question of how to pay for - or how to sustainably finance - the continuing demands for pollution prevention and ecosystem protection is a central theme for the work of the U.S. Environmental Protection Agency’s (EPA) Environmental Financial Advisory Board and the Agency’s network of university-based Environmental Finance Centers. This Guidebook is intended to be a working tool to enable practitioners in the public and private sector to find the appropriate methods to pay for environmental protection efforts. The genesis of this 1999 Guidebook remains the 1992 report of U.S. EPA’s State Capacity Task Force on Alterative Financing Mechanisms. This report was so well-received that a significant expansion seemed the natural thing to do. In a real sense, this and future Guidebook updates will remain as final drafts. The reason is not the lack of information needed to ensure completion: quite the contrary. We found in pulling together this extraordinary amount of material that there is so much going on that by press times we always have more tools to be added. Therefore, we have determined to continue to undertake periodic updates of the Guidebook. To this end, we ask Guidebook users (via Appendix F) to send us suggestions for new tools and changes and additions to those listed. The main laboratories for this fascinating environmental financing experimentation are, not surprisingly, found at the regional and local levels. The financing arrangements that will characterize how we will pay for the next generation of pollution prevention and ecosystem prevention are even now being formed in this crucible.

We remain deeply indebted to the members of the Environmental Financial Advisory Board and the Directors and Staff of the Environmental Finance Centers for their contributions to this body of work. Without the efforts on the part of these worthy practitioners in the finance arena, the Guidebook would remain an unfulfilled goal. Special thanks are also due to past and present U.S. EPA Environmental Finance Program staff -- Victoria Kennedy, William Bivens, and Tim McProuty. Finally, Ms. Diane Doyle of GCI Information Services must be thanked for her efforts to ensure the accuracy of Internet addresses throughout the Guidebook and for loading the entire document on the Environmental Finance Program's Web site.
John C. Wise
Executive Director, Environmental Financial Advisory Board

OVERVIEW OF THE U.S. EPA GUIDEBOOK[86] APRIL 1999 REVISION

A number of criteria are used throughout this Guidebook to compare the current use and potential effectiveness of individual tools relative to one another in each section. The criteria are discussed briefly in the single page narratives of the individual financial tool write-ups, chiefly under the "Advantages" and "Limitations" headings. The comparative criteria also are summarized in matrix form at the end of most sections.

The comparative criteria are meant to describe and compare single financial mechanisms with others within each section, in order to give the reader some sense of the prevalence of use and potential longer-term effectiveness of individual mechanisms. The criteria used in this Guidebook are drawn from the general literature on revenue raising and financing mechanisms, and the experience of States, localities and the private sector in using particular tools. Necessarily, some comparisons are somewhat subjective, since data on many tools are not available, for example, data on the incidence of actual use. Other criteria depend on public or private sector viewpoints, for example, whether a tool is considered relatively easy to use, readily accessible, or reasonably priced. Thus, the comparative criteria are meant to provide the reader some perspective on the large of number of tools presented in this Guidebook, and some reasons why one or another tool might be utilized.

At the end of each section, the authors' judgments as to how individual tools might be compared to one another are summarized in a Comparison Matrix, with ratings of "High", "Moderate", and "Low" assigned to make these comparisons. On occasion, some numerical value or objective data are presented, such as the number of States using a tool or money raised or spent, and these data are summarized at the bottom of the chart. However, most typically the ratings, while incorporating such data, are for comparison purposes only.

Stars (*) also are used in the list of opening list of tools described in each section, as well as in the matrices, to provide the reader with a summary of which tools have been most highly rated. The stars (*) are meant to provide some measurement, necessarily subjective, of past effectiveness, and a sense of those financial mechanisms which seem the most durable, i.e., able to stand the test of time. Tools which may be short-lived, for example, tools which depend on tax code changes or special assistance program, are not considered durable. Ten sections in this Guidebook use six, and sometimes seven, criteria to compare individual financial tools presented in the individual section. However, Section 2C on "Grants" does not have a comparison matrix.

For the ten sections, the criteria are the same for the most part, with several exceptions as noted below, and some variation in terms of emphasis or nuance in each section, as described in the narratives accompanying each section and each tool. A total of nine comparative criteria are described below.

1. Actual Use: All sections of the Guidebook give some indication of current State and local government, and/or private sector, use of a particular funding mechanism. Actual (current) use may give some indication of the stage of development of individual tools, i.e., how long they have been in existence, how widely available or applicable they are on a geographic basis, and their acceptability. Financing mechanisms presented in Section 1 "Tools for Raising Revenue", must be dedicated to environmental protection, as opposed to being used for non-environmental purposes, to be counted. The number of States using a particular tool does allow some numerical data to be included in the ratings from "High" to "Low", for example, high use might mean that a tool is used in over twenty-five States, as opposed to low use, for example, under ten States.

[86] EPR: The *Guidebook's* location on the World Wide Web (Internet address) is: http://www.epa.gov/efinpage/guidbk98/index.htm

Actual use cannot measure the potential effectiveness of newly created tools, since by definition they are in their infancy.

2. Revenue Size: This criterion gives an indication of the relative annual sum of money that is raised or invested within States, annually, as a result of using the financial mechanism, or in some instances the potential sum of money. Revenue size is used in all sections, but only rarely is accompanied by dollar amounts since in most cases these data have not been collected nationwide. In those cases where actual use of a tool is low either because it is new or because it is not dedicated to the environment, potential revenue size is estimated. For example, tobacco taxes are widely used by States but typically not dedicated to environmental protection. However, since these taxes yield comparatively large revenues, size is rated "High". Revenue size gives some indication of the actual or potential effectiveness of a particular financing tool in terms of environmental benefits, although it is not presented in relationship to total environmental needs. Low revenue size may not mean that a tool is ineffective, because it may be offset by other criteria scoring high, for example, the ability to leverage other financial resources, or the ability to enhance environmental awareness. However, low revenue size may signal problems, for example, it might suggest levying an environmental fee or tax cannot be justified in terms of added administrative costs, time and political difficulties. A proliferation of many small programs may be confusing and burdensome, leading to a decline in public acceptability.

3. Revenue Stability: This criterion is used only for Section 1 "Raising Revenue" and for Section 2B "Loans". Here, the relative stability and predictability of annual revenues is compared for each tool to indicate whether the revenue source can be relied upon and readily estimated, audited, and factored into budgetary decisions. Revenue stability can influence the dedication and use of taxes, fees and special changes (e.g., low-to-moderate), but stable revenue receipts would be suitable for funding State operating budget costs such as personnel, and larger, steady revenue streams could be used for capital for infrastructure construction. Many factors can contribute to revenue instability. Examples include consumer product substitution, pollution "havens" in different geographical areas, political decision-making, tax laws and general economic conditions. Revenues from pollution control fines, penalties and cost-recovery are unpredictable and may result only after protracted legal negotiations.

4. Revenue Cost/Savings: Revenue cost/savings is used in six sections. This criterion relates the rough dollar cost of the financial tool to the user with the amount of revenue saved or accessed as a result of using the tool. For example, private bond insurance is relatively costly but it can lower interest costs substantially through improved bond ratings, and may be critical to attracting bond investors. Similarly, private sector use of surety and performance bonds may enable a project to move forward. Privatization can result in lower construction, operations and maintenance costs, which may be translated into lower user fees, compared to the public alternative. Refinancing, while incurring new bond issuance fees and legal costs, can lower annual interest payments considerably.

5. Administrative Ease: Administrative ease is used as a comparative criterion in all sections, addressing practical issues pertaining to both the providers and users (clients) of the financial tool. Such issues include the basic complexity or simplicity of the mechanism, demands on staff time to process paperwork, handle applications and red tape, and the flexibility provided in the administration and use of a financial tool. For Section 1 "Raising Revenue", administrative factors are of special concern to the government imposing the tax, fee or fine, for example, the administrative costs of imposing new fees, particularly establishing collection system, and the costs of legal enforcement proceedings for pollution fines and penalties. For the other sections, administrative ease also can refer to the users of the financial tool, for example, whether the tool

is complicated to understand, whether using it is burdensome in terms of staff time and paperwork, whether expensive legal advice is required, whether voter approval must be sought. Tools which provide hands-on technical assistance can be administratively time-consuming for the provider, but on the other hand are easy to use for the client.

6. Equity: Equity also is used in all ten sections, with varying nuances as described in the text. Equity in some sections is used to compare the extent of direct public participation in the choice to use a given tool, or even how to structure the tool. For example, any bond or other local fund-raising device which requires local voter approval is described as highly equitable. Equity also is used extensively to compare the accessibility of the financial tool to small versus large potential users and to compare the costs of the tool for different clients or those who pay. Tools are most equitable if they reflect affordability concerns or special circumstances of the user, for example, in the case of fees and taxes adopting graduated or nonregressive rate structures. Taxes which are paid for by non-residents as well as residents, both of whom may benefit from an environmental improvement, also are highly equitable. Tools are relatively inequitable if all users pay the same price regardless of economic circumstances, if small users pay more since investment is considered more risky or if certain businesses pay much more than others. Some tools are simply not available to certain small users if they are too costly or complicated, and thus are not particularly equitable.

7. Cost/Benefit Relationship. The cost/benefit relationship applies only to Section 1 "Raising Revenue" and Section 8 "Community-Based Environmental Protection". Here, the relationship addresses "who pays" the tax or fee or other costs and "who benefits" from subsequent environmental project investment with the dollars collected. A high or close cost/benefit relationship results when people who pay can see or directly benefit from specific environmental projects, such a temporary local sales tax add-on to acquire park land. A high cost/benefit relationship may enhance the public acceptability of the financing mechanism. A high cost/benefit relationship also describes situations in which the "polluter pays" principle is applied, although this may result in inequities if costs are economically burdensome. In many sections, a high cost/benefit relationship clearly is present since the users who purchase the financing tool do so for their own benefit, such as a loan or credit enhancement device.

8. Financial Leveraging: This criterion is used in half of the sections to compare the ability of individual financial tools to leverage, free up or attract additional dollars from other sources. For example, State Revolving Funds selling bonds to make loans are highly financially leveraged, since more projects can be initiated in the short-term. Loans are more leveraged than grants, and loans under 100% are further leveraged. Financial outreach, or technical assistance, is a leveraging device since local managerial capacity is heightened which adds to investor willingness to extend credit. Small businesses similarly can make improve their capacity to attract investment by steps such as preparation of business plans and Internet use. Some locally approved tax and voluntary community-based environmental protection fund raising are matched by other public and private sector monetary grants or donations.

9. Environmental Benefits: Environmental benefits can result in a variety of ways, some direct and others less tangible. The most obvious environmental benefit occurs when an environmental project proceeds as a result of using the tool, such as construction of a drinking water treatment plant or brownfields redevelopment. However, other environmental benefits may be more indirect. For example, pollution prevention and recycling, "green" products and marketplace substitutions, conservation easements and development rights purchases, lands placed in trusts, and other measures may forestall or delay impact of pollution, although difficult to measure in the short-term. Paying an environmental tax may result in heightened public awareness of

environmental problems and public financing possibilities, as well as change subsequent polluting behavior. Some financial tools call attention to positive as well as negative environmental impacts and provide incentives to increase environmental financing. Other mechanisms enhance the popularity and acceptability of additional pollution control regulations. Hands-on technical assistance and outreach may increase local capacity to pay for and manage critical environmental assets. Involving the private and nonprofit sectors in project funding, operations and maintenance vastly multiples the possibilities for environmental progress. In this Guidebook, only those financial tools which have no known environmental impact or are neutral are described as "Low."

3. Index of New and Substantially Revised Tools (U.S. EPA)

Department of Agriculture
Alternative Agricultural Research and Commercialization (AARC) Corporation
Forest Service, Cooperative Forestry Assistance
Forest Service, Economic Action Programs
Forest Service, Landowner Assistance Programs
Forest Service, Urban and Community Forestry Program
Natural Resource Conservation Service, Environmental Quality Incentives Program (EQIP)
Rural Business-Cooperative Service, Intermediary Relending Program
Rural Utilities Service, Distance Learning and Telemedicine Loans and Grants
Wetlands Reserve Program
Appropriate Technology
Barter and Payment-In-Kind
Capital Appreciation and Zero Coupon Bonds
Capital Planning and Budgeting
Co-Funding
Department of Commerce
National Oceanic and Atmospheric Administration (NOAA)
Coastal Services Center Cooperative Agreements
Coastal Zone Management Administration/Implementation Awards
Community Foundations
Community Reinvestment Act
Conservation Easements
Cooperative Extension Systems
Corps of Engineers, Civil Works Projects
Development Rights Purchases
Differential Pricing – Replaces Previous Version, See Section 7
Direct Source (Equipment) Financing
Discounting (Economic)
Environmental Capital Network (ECN)
Environmental Due Diligence
Environmental Protection Agency (U.S. EPA)
Brownfields Workforce Development
Environmental Education and Training Grant Programs
Environmental Justice Initiative and Small Grants Program
Environmental Monitoring For Public Access and Community Tracking (EMPACT) Grants Program
Underground Storage Tank Trust Fund Program Grants
Section 319 Nonpoint Source Pollution Control Grants
Superfund Technical Assistance Grants
Wetlands Protection Development Grants
Export-Import (Ex-Im) Bank

Federal Emergency Management Agency (FEMA)
Flood Mitigation Assistance
Hazard Mitigation Assistance
Financial Due Diligence
Fiscal Impact Analysis
Foundations: Program-Related Investments
Franchise Fees
Green Code of Conduct, ISO 14000 Voluntary Environmental Standards
Department of the Interior
Fish and Wildlife Service, National Coastal Wetlands Conservation Grants Program
Fish and Wildlife Service, North American Wetlands Conservation Act Grant Programs
Joint Ventures
Life-Cycle Assessment/Costing/Design
Local Aquifer Protection Fees
Local Sales Taxes
Mezzanine Financing
Micro-Loan Funds
Mini/Baby Bonds (Replaces Mini Bonds in Section 2A, not Mini Bonds for Stream Restoration in Section 8)
Miscellaneous Selective Sales Taxes
National Cooperative Bank
National Credit Union Administration
Pay-As-You-Go
Property Parcelization
Real (Ad Valorem) Property Taxes
Refinancing Loans and Bonds
Regionalization
Risk Management and Insurance
Small Business Administration (SBA)
Angel Capital Electronic Network
Section 7(a) Loan Guarantees
Short Term Loans and Revolving Lines of Credit (CAPLines)
LowDoc and FA$TRAK Loan Programs
Minority and Women's Prequalification Pilot Loan Program
Section 7(m) Microloans
Section 504 Certified Development Companies
Surety Bond Program
Small Business Innovation Research Program
SRF Clean Water Private Beneficiary Bonds
SRF Drinking Water Principal Subsidies
State Grant Programs
Structured Municipal Bonds
Tolls
Department of Transportation
Federal Transit Administration, Livable Communities Initiative
Transportation Equity Act for the 21st Century (TEA-21)
Department of the Treasury
Community Development Financial Institutions Fund
Internal Revenue Service
Accelerated Depreciation
Amortization of Pollution Control Facilities

Brownfields Cleanup Tax Deduction
Deduction of Agricultural Conservation Expenses
Employee Stock Ownership Plans (ESOP)
Expensing of Assets
Reforestation Tax Credit and Amortization
Rehabilitation Tax Credits
Value Analysis/Engineering/Management

H. LEED™ Rating System 2.0

Project Checklist U S Green Building Council Copyright © 2001 by the U.S. Green Building Council. All rights reserved. LEED™ is a registered trademark of the U.S. Green Building Council. LEED™ Rating System 2.0 iii

PROJECT CHECKLIST
Sustainable Sites
Erosion & Sedimentation
Control Site Selection
Urban Redevelopment
Brownfield Redevelopment
Alternative Transportation,
Reduced Site Disturbance,
Stormwater Management
Landscape & Exterior Design to Reduce Heat Islands
Light Pollution Reduction
Water Efficiency
Water Efficient Landscaping
Innovative Wastewater Technologies
Water Use Reduction
Energy & Atmosphere
Fundamental Building Systems
Commissioning Minimum Energy Performance
CFC Reduction in HVAC&R Equipment
Optimize Energy Performance,
Renewable Energy Additional
Commissioning Ozone Depletion
Measurement & Verification
Green Power
Materials & Resources
Storage & Collection of Recyclables
Building Reuse
Construction Waste Management
Resource Reuse
Recycled Content Local/Regional Materials
Rapidly Renewable Materials
Certified Wood
Indoor Environmental Quality
Minimum IAQ Performance
Environmental Tobacco Smoke (ETS)
Control Carbon Dioxide (CO2)
Monitoring Increase Ventilation Effectiveness

Construction IAQ Management Plan
Low-Emitting Materials
Indoor Chemical & Pollutant Source Control
Controllability of Systems
Thermal Comfort, Daylight & Views
Innovation & Design Process
Innovation in Design

I. U.S.DOT and Examples of Other Federal Programs Applicable to Sustainable Development Recommendations

U.S. DEPARTMENT OF TRANSPORTATION
The Transportation Equity Act for the 21st Century (TEA-21), enacted on June 9, 1998, authorized up to $194.8 million for grants to establish and operate up to 33 University Transportation Centers (UTC http://utc.dot.gov/current.html) throughout the U.S. in FY 1998 - 2003. Ten of these centers, which are designated as Regional Centers, were selected by competition in 1999. The other 23 UTCs are located at universities named in TEA-21. After a limited competition among the named universities in FY 2002, the program will comprise 26 centers. All UTCs are required to match federal funds dollar for dollar.

TEA-21 established 13 new UTCs, and reauthorized 14 existing UTCs and six centers formerly known as University Research Institutes (URI) previously funded under the Intermodal Surface Transportation Efficiency Act of 1991 (ISTEA). TEA-21 established education as one of the primary objectives of a university transportation center, institutionalized the use of strategic planning in university grant management, and reinforced the program's focus on multi-modal transportation.
TEA-21 - Transportation Equity Act for the 21st Century
Moving Americans into the 21st Century
A SUMMARY - Protecting Our Environment
http://www.fhwa.dot.gov/tea21/sumenvir.htm
Congestion Mitigation and Air Quality Improvement
The Congestion Mitigation and Air Quality Improvement program, continued in TEA-21 at a total authorized funding level of $8.1 billion for the 6 years of the Act, provides a flexible funding source to State and local governments for transportation projects and programs to help meet the requirements of the Clean Air Act. Eligible activities include transit improvements, travel demand management strategies, traffic flow improvements, and public fleet conversions to cleaner fuels, among others. Funding is available for areas that do not meet the National Ambient Air Quality Standards (nonattainment areas), as well as former nonattainment areas that are now in compliance (maintenance areas). Under ISTEA, only nonattainment areas were included in the funding formula. Funds are distributed to States based on a formula that considers an area's population by county and the severity of its air quality problems within the nonattainment or maintenance area. Further, greater weight is given to carbon monoxide nonattainment and maintenance areas.

A State may transfer up to 50 percent of its increase in CMAQ funds compared to what it would have received if the CMAQ program were funded at $1.35 billion per year nationwide. The funds may be transferred to other Federal-aid programs, but can be used only for projects located in nonattainment and maintenance areas.

Transportation Enhancements (TE)
Transportation enhancement activities continue to be funded through a 10 percent setaside from STP funds. In order to maximize the use of available TE funding, TEA-21 provides innovative financing alternatives for meeting matching requirements. The list of activities eligible for transportation enhancement funds is expanded, but all projects must relate to surface transportation. Newly eligible are

safety education activities for pedestrians and bicyclists, establishment of transportation museums, and projects to reduce vehicle-caused wildlife mortality. Provision of tourist and welcome center facilities is specifically included under the already eligible activity "scenic or historic highway programs." In addition, 1 percent of the transit urbanized area formula funds distributed to areas with populations greater than 200,000 must be used for transit enhancement projects specified in the Act.
TEA-21 allows a State to transfer some of its TE funds to other programs. The maximum amount that may be transferred is up to 25 percent of the difference between the State's current year TE setaside and the State's FY 1997 TE setaside.

Bicycle Transportation and Pedestrian Walkways
TEA-21 continues and expands provisions to improve facilities and safety for bicycles and pedestrians. The eligibility of NHS funds is broadened to include pedestrian walkways, and safety and educational activities are now eligible for TE funds. Other changes ensure the consideration of bicyclists and pedestrians in the planning process and facility design.

Recreational Trails Program
A total of $270 million in contract authority is authorized for FYs 1998-2003 to provide and maintain recreational trails. States must establish a State recreational trails advisory committee that represents both motorized and nonmotorized recreational trail users. Of funds distributed to a State, 30 percent must be used for motorized use, 30 percent must be used for nonmotorized use, and 40 percent must be used for diverse trail uses (any combination—the diverse category may overlap with the others). The Federal share is raised to 80 percent (from 50 percent), and Federal agency project sponsors or other Federal programs may provide additional Federal share up to 95 percent. Soft match provisions are allowed, including soft matches from public agencies. The National Recreational Trails Advisory Committee is reactivated until the end of FY 2000.

National Scenic Byways Program
TEA-21 authorizes a total of $148 million for technical assistance and grants to States for the purposes of developing scenic byway programs and undertaking related projects along roads designated as National Scenic Byways, All-American Roads, or as State Scenic Byways.

Transportation and Community and System Preservation Pilot
The Transportation and Community and System Preservation Pilot program is a comprehensive initiative of research and grants to investigate the relationships between transportation and community and system preservation and private sector-based initiatives. States, local governments, and metropolitan planning organizations are eligible for discretionary grants to plan and implement strategies that improve the efficiency of the transportation system; reduce environmental impacts of transportation; reduce the need for costly future public infrastructure investments; ensure efficient access to jobs, services, and centers of trade; and examine private sector development patterns and investments that support these goals. A total of $120 million is authorized for this program for FYs 1999-2003.

Planning
The core metropolitan and statewide transportation planning requirements remain intact under TEA-21, emphasizing the role of State and local officials, in cooperation with transit operators, in tailoring the planning process to meet metropolitan and State transportation needs.
Continuing at both the metropolitan and statewide level are provisions concerning fiscal constraint, planning horizon, and public involvement, with modification to the list of named stakeholder groups to add freight shippers and public transit users. Current MPOs remain in effect unless redesignated, and retain responsibility for adopting the metropolitan transportation plan.
Metropolitan transportation planning funding remains a 1 percent takedown from certain authorized programs in Title 23 and in Title 49 has changed to specific funding levels. Funding for State Planning

and Research supported activities remains a 2 percent setaside of certain apportionments in Title 23 and in Title 49 has changed to specific funding levels.
The key change in the new legislation is the consolidation of 16 metropolitan and 23 statewide planning "factors" into seven broad "areas" to be considered in the planning process, both at the metropolitan and statewide level. A new section exempts plans, transportation improvement plans, project or strategy, and certification actions from legal review for failure to consider any one of the "areas." The growing importance of operating and managing the transportation system is recognized as a focal point for transportation planning.
Metropolitan planning area boundaries may be maintained as they currently reflect nonattainment areas, at the existing limits on the date of enactment, or they may be extended to reflect increases in nonattainment area boundaries at the discretion of the Governor and the MPO. For new MPOs, the boundaries will reflect the nonattainment area boundaries based on agreements between the Governor and local officials.
Other changes are included to further ensure the involvement of local officials, especially local officials in nonmetropolitan areas; strengthen the financial aspects of the planning process; and improve coordination, cooperation, and public involvement. MPOs and States will be encouraged to coordinate the design and delivery of federally funded non-emergency transportation services. The requirement for a stand-alone major investment study is replaced with a directive that such analyses under the planning provisions of TEA-21 and the National Environmental Policy Act are to be integrated.

Streamlining
The Secretary will establish a coordinated environmental review process for the DOT to work with other Federal agencies in ensuring that major highway and transit projects are advanced according to cooperatively determined time frames. The coordinated process will use concurrent, rather than sequential, reviews. It will allow States to include their environmental reviews in the coordinated environmental review process. The Act also authorizes the Secretary to approve State requests to provide funding to affected Federal agencies in order to meet established time limits. If the Secretary finds that a project-related environmental issue has not been resolved with another Federal agency, the heads of the two agencies will meet within 30 days (of the Secretary's finding) in order to resolve the issue.

Ozone and Particulate Matter Standards
New and revised National Ambient Air Quality Standards (NAAQS) for ozone and particulate matter (PM) were promulgated in July 1997. Included in the PM NAAQS were new standards for PM2.5—fine particles less than 2.5 microns. TEA-21 ensures the establishment of the new monitoring network for PM2.5 and, within appropriated totals under the Clean Air Act, requires the Administrator of the Environmental Protection Agency (U.S. EPA) to provide financial support to the States for 100 percent of the cost of establishing and operating the network.
The Act also codifies the timetables for designating areas regarding whether they are attaining the new PM2.5 NAAQS and the revised ozone NAAQS. The U.S. EPA is to issue final designations for ozone areas in July 2000, and for PM2.5 areas the earlier of 4 years after the State receives PM2.5 monitoring data or December 31, 2005. The U.S. EPA Administrator is also required to submit to Congress a field study of the PM2.5 Federal Reference Method within 2 years. TEA-21 requires U.S. EPA to harmonize the schedules for State submissions of regional haze and PM2.5 air quality plans.

FHWA RESOURCE CENTER
HTTP://WWW.FHWA.DOT.GOV/RESOURCECENTER/TEAMS/PLANNING/LUT.CFM

PLANNING TEAM
Land Use and Transportation Planning

Scenario Planning

The FHWA 2004 National Performance Plan includes a strategic initiative to ""Promote scenario planning and other innovative approaches to improve the quality of statewide and metropolitan transportation plans and programs (i.e., long-range plans, STIP, and TIP)".

FHWA defines scenario planning as follows:

"Scenario planning provides a framework for developing a shared vision for the future by analyzing various forces (e.g., health transportation, economic, environmental, land use, etc.) that affect growth. Scenario planning can be done at the statewide level or for metropolitan areas. Scenario planning tests various future alternatives that meet state and community needs. Effective scenario planning will actively involve the public and elected officials on a broad scale, educating them about growth trends and tradeoffs, and incorporating their values and feedback into future plans."

To promote this strategic initiative, FHWA Office of Planning has offered to provide technical assistance such as:

1) providing feedback on scenario planning efforts that are being planned or implemented,
2) providing information on similar efforts around the country, and
3) identifying resources, handbooks and tools that may be available to support scenario planning efforts.

The Federal Highway Administration's & Federal Transit Administration's 2004 Transportation Planning Excellence Awards

Co-sponsored by the American Planning Association
http://www.fhwa.dot.gov/planning/tpea04/index.htm
Transportation Planning Excellence Awards Criteria

Nominations are reviewed by a panel of qualified and experienced judges from across the transportation profession. Each nomination is evaluated against a number of defined the criteria below. In addition to satisfying these criteria, successful candidates must be superior within the specific category in which they are nominated. Summaries should address as many criteria as possible/applicable.

1. Innovation

What innovative approaches have been used? What makes these efforts unique?

2. Partnerships

What partnerships have been formed to facilitate the development and implementation of this project? How have these partnerships made a difference? What institutional mechanisms are in place to foster the continuation of these partnerships?

3. Demonstrated Results/Replicability

What has been the result of these efforts? What has been implemented? How are results being measured? To what extent can these efforts be replicated in other areas of the country?

4. Intermodalism

To what extent do these efforts address multimodal transportation options, including bicycle, pedestrian, transit, and automobile?

5. Equity

What initiatives have been undertaken to ensure that these efforts are implemented in an equitable manner? What measures have been undertaken to minimize the impacts on any one community? What efforts have been made to involve all members of the community?

6. Sustainability

How does this project seek to protect the environment and minimize the impact of transportation and land use on communities? What provisions have been used to ensure the long-term viability of this effort?

7. Resources and Funding

What are the Federal, State, and local resources that made this planning possible? Have funds been dedicated toward implementing this project? How have Federal funds been leveraged?

US HUD
CDBG
HTTP://WWW.HUD.GOV/OFFICES/CPD/COMMUNITYDEVELOPMENT/PROGRAMS/INDEX.CFM
The Community Development Block Grant (CDBG) program works largely without fanfare or recognition to ensure decent affordable housing for all, and to provide services to the most vulnerable in our communities, to create jobs and expand business opportunities. CDBG is an important tool in helping local governments tackle the most serious challenges facing their communities. The CDBG program has made a difference in the lives of millions of people living in communities all across this Nation.

The annual appropriation for CDBG is split between states and local jurisdictions called "entitlement communities". Entitlement communities are central cities of Metropolitan Statistical Areas (MSAs); other metropolitan cities with populations of at least 50,000; and qualified urban counties with populations of at least 200,000 (excluding the population of entitled cities). States distribute the funds to localities who do not qualify as entitlement communities.

HUD COMMUNITY PLANNING AND DEVELOPMENT
The Office of Community Planning and Development (CPD) seeks to develop viable communities by promoting integrated approaches that provide decent housing, a suitable living environment, and expand economic opportunities for low and moderate income persons. The primary means towards this end is the development of partnerships among all levels of government and the private sector, including for-profit and non-profit organizations.
Consistent with these objectives, the Office of Community Planning and Development has developed a set of underlying principles that are used in carrying out its mission.

US Department of Commerce - Economic Development Administration
http://www.eda.gov/AboutEDA/Programs.xml
INVESTMENT PROGRAMS

Public Works
The Public Works Program empowers distressed communities to revitalize, expand, and upgrade their physical infrastructure to attract new industry, encourage business expansion, diversify local economies, and generate or retain long-term, private sector jobs and investment.
Economic Adjustment Assistance Program
The Economic Adjustment Program assists state and local interests to design and implement strategies to adjust or bring about change to an economy. The program focuses on areas that have experienced or are under threat of serious structural damage to the underlying economic base.
Research and National Technical Assistance
The Research and Technical Assistance Program supports research of leading edge, world class economic development practices as well as funds information dissemination efforts.
Local Technical Assistance
The Technical Assistance Program helps fill the knowledge and information gaps that may prevent leaders in the public and nonprofit sectors in distressed areas from making optimal decisions on local economic development issues.
Partnership Planning
EDA’s Partnership Planning programs help support local organizations (Economic Development Districts, Indian Tribes, and other eligible areas) with their long-term planning efforts and their outreach to the economic development community on EDA’s programs and policies.

University Center
The University Center Program is a partnership of federal government and academia that makes the varied and vast resources of universities available to the economic development community.

Environmental Protection Agency
The Clean Water Act (CWA http://www.epa.gov/watertrain/cwa/) is the cornerstone of surface water quality protection in the U.S.. (The Act does not deal directly with ground water or water quantity issues.) The statute employs a variety of regulatory and nonregulatory tools to sharply reduce direct pollutant discharges into waterways, finance municipal wastewater treatment facilities, and manage polluted runoff. These tools are employed to achieve the broader goal of restoring and maintaining the chemical, physical, and biological integrity of the nation's waters so that they can support "the protection and propagation of fish, shellfish, and wildlife and recreation in and on the water."

Evolution of CWA programs over the last decade has also included something of a shift from a program-by-program, source-by-source, pollutant-by-pollutant approach to more holistic watershed-based strategies. Under the watershed approach equal emphasis is placed on protecting healthy waters and restoring impaired ones. A full array of issues are addressed, not just those subject to CWA regulatory authority. Involvement of stakeholder groups in the development and implementation of strategies for achieving and maintaining state water quality and other environmental goals is another hallmark of this approach.

Department of Agriculture
Farm Security and Rural Investment Act of 2002, which governs Federal farm programs for the next 6 years, was signed into law on May 13, 2002. Its provisions support the production of a reliable, safe, and affordable supply of food and fiber; promote stewardship of agricultural land and water resources; facilitate access to American farm products at home and abroad; encourage continued economic and infrastructure development in rural America; and ensure continued research to maintain an efficient and innovative agricultural and food sector.

Urban and Community Forestry Program enhances the livability of towns, communities, and cities by improving the stewardship of urban natural resources.

Mission Statement: The USDA Forest Service and State Forestry Agencies, in partnership with national and local organizations provide a comprehensive approach to the stewardship of urban trees and forest resources. This approach helps ensure the vitality of communities by engaging people where they live, work, and play. The Program provides financial and technical assistance to plan, protect, establish, and manage trees, forests, and related resources. The outcome is to restore and sustain the health and quality of the natural and human environments in urban areas.

Goal: Provide technical and financial assistance to help improve the livability of cities and communities through managing urban forest resources to promote a healthy ecosystem.

Department of Interior
Fish and Wildlife Service
The U.S. Fish and Wildlife Service (FWS) is the Department of Interior's (DOI) Bureau charged with the mission to conserve, protect, and enhance fish, wildlife, and plants and other habitats for the American people.
Habitat Conservation Planning Assistance
Provides financial assistance to States and Territories to support the development of Habitat Conservation Plans (HCPs) that provide for the conservation of imperiled species while allowing economic activities to proceed.

North American Wetlands Conservation Act
To provide funding assistance to promote conservation of wetlands and associated habitats for migratory birds and other wildlife
Land and Water Conservation Fund
Over its first 30 years, LWCF has provided more than $8.8 billion to acquire new federal recreation lands and as grants to state and local governments. For discussion purposes, we can divide the total Fund effort into the "State side" -- that is grants to State and local governments.
Over 37,000 grants to states and localities have been approved under the LWCF grants program for acquisition, development and planning of outdoor recreation opportunities in the U.S..
National Heritage Area Program
A "National Heritage Area" is a place designated by the U.S. Congress where natural, cultural, historic and recreational resources combine to form a cohesive, nationally distinctive landscape arising from patterns of human activity shaped by geography. These patterns make National Heritage Areas representative of the national experience through the physical features that remain and the traditions that have evolved in the areas. Continued use of the National Heritage Areas by people whose traditions helped to shape the landscapes enhances their significance.

National Heritage Areas are a strategy that encourages residents, government agencies, non-profit groups and private partners to collaboratively plan and implement programs and projects that recognize, preserve and celebrate many of America's defining landscapes. The heritage areas seek short and long-term solutions to their conservation and development challenges by fostering relationships among regional stakeholders and encouraging them to work collaboratively to achieve shared goals.

National Oceanic and Atmospheric Administration
http://www.noaa.gov/coasts.html
The coastal ocean, which includes oceans and coasts, bays and estuaries and the Great Lakes, is economically, politically and socially critical to the nation. More than half of the U.S. population lives in coastal counties. Coastal areas are hubs of commerce, home to many major American corporations, ports and transportation networks. The coasts are used by millions of Americans annually for recreation and support a surging tourist trade. Coastal waters are rich in living and nonliving marine resources that sustain prosperity and economic growth nationwide. A healthy, vibrant coast means vigorous and growing economic opportunities. NOAA promotes sustainable economic development, jobs and prosperity along the nation's coasts through building partnerships with state and local governments to revitalize urban waterfronts and develop innovative, cost-effective coastal zone management plans that balance competing demands for recreation, tourism, development, commercial growth, environmental protection, transportation and fisheries

Strengthening America's Communities
http://www.commerce.gov/SACI/index.htm
America's changing economy is strong and getting stronger. But America's economic strength is not felt equally throughout the Nation. In low-income communities and in communities where traditional industries do not employ as many workers as they did a generation ago, opportunity can appear out of reach. President Bush believes that communities can make the transition to vibrant and strong economies because of the entrepreneurial spirit, vision, and hard work of those who live there. The job of government is to inspire, to help remove barriers to growth, to be accountable for taxpayer dollars, and to ensure results for programs aimed at making a difference in peoples' lives.

Building on existing economic and community development efforts, the President will propose a new initiative to help strengthen America's transitioning and most needy communities, while making better use of taxpayer dollars by reforming and restructuring many of the existing Federal economic and community development programs. The President's initiative, to be proposed in his Fiscal Year (FY) 2006

budget, will consolidate 18 existing programs, simplify access to the Federal system, set new eligibility criteria, and establish strong accountability standards all in exchange for the flexible use of the funds so that communities most in need will be assisted. The new $3.71 billion unified grant-making program will better target assistance and achieve greater results for low-income persons and economically-distressed areas.

COASTAL AMERICA - PRESIDENT'S WETLANDS INITIATIVE
A Partnership Among Federal, State, And Local Governments And Private Alliances
To Protect, Preserve, and Restore Our Nation's Coastal Ecosystems
www.coastalamerica.gov
On the first anniversary of the President's wetlands initiative, the Bush Administration today released "Conserving America's Wetlands: Implementing the President's Goal." The new report highlights first-year progress pursuant to the President's goal of restoring, improving, and protecting the quality and quantity of three million acres of wetlands by 2009. The President's 5-year goal calls for restoring at least one million acres of additional wetlands; improving the condition of at least one million acres of existing degraded wetlands; and extending protection to at least one million additional acres of imperiled wetlands. The President also committed federal agencies to make better use of the array of federal programs that can contribute to the wetland goal. According to the report, specific achievements between Earth Day 2004 and Earth Day 2005 include:
• 328,000 acres restored or created;
• 154,000 acres improved; and
• 350,000 acres protected.

The report also includes a description of the key federal programs contributing to the goal and their planned accomplishments for FY 2006. The President's 2006 budget requests continued funding for the programs to support an additional 1.6 million acres to be restored or created, improved, and protected by September 30, 2006. In releasing the report, Council on Environmental Quality Chairman James Connaughton said, "President Bush strongly supports using innovative programs and incentives to encourage private stewardship and cooperative conservation partnerships. As this report demonstrates, working collaboratively with private landowners and local officials has proven remarkably effective in improving and sustaining America's wetlands." Coastal America is a partnership among federal, state and local governments and private alliances to protect, preserve and restore our nation's coastal ecosystems. Federal partners include: Departments of Agriculture, the Air Force, the Army, Commerce, Defense, Housing and Urban Development, the Interior, the Navy, State, Transportation; the Environmental Protection Agency; and the Executive Office of the President.