

MICHU-Q-86-001

Michigan
Sea Grant
Extension

Michigan
Sea Grant
College Program

BIENNIAL
REPORT
1985-1986

DEDICATION

This report is dedicated to the memory of Dr. John H. (Jack) Judd, who served Sea Grant with distinction for 17 years. He was associate director, executive officer and coordinator of Great Lakes research for the New York Sea Grant Institute, assistant director of the Michigan Sea Grant College Program, associate program director of the National Sea Grant College Program, and program leader for Michigan Sea Grant Extension.

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INTRODUCTION

Michigan, more than any other state, is intimately involved with the Great Lakes. It is the only state that lies almost entirely within the basin, and it boasts the longest freshwater coastline in the world -- 3,288 miles. Four of the five large lakes touch its shores and, coupled with the smaller lake, straits and rivers that connect them, shape its peninsulas. The state is a leader -- regionally, nationally and internationally -- in economic, environmental, legal and social issues of the Great Lakes ecosystem. As Michigan observes its sesquicentennial, it celebrates both past achievements and future prospects, many of them connected with the Great Lakes.

Many problems, both environmental and social, face the Great Lakes region. The physical dynamics of the lakes are especially evident in the rising and falling water levels and accompanying shoreline erosion. Water quality, although generally very good, has been persistently threatened by toxic and hazardous substances and other pollutants since the turn of the century. Diversions and consumptive uses of Great Lakes water have heightened the awareness of government and private interests of the limitations of the resource. Competition among public and private groups for access to and use of the shoreline continues in many communities.

Management of Great Lakes fisheries for commercial and sport interests has put pressure on the state's natural resources agency to find innovative solutions that provide for both interests.

The Michigan Sea Grant College Program respects these dynamics and has responded to them by providing pertinent and current information to many participants in Great Lakes decision making, as well as important training and education for resource users.

A Decade of Distinction

Michigan Sea Grant Extension -- or Marine Advisory Service, as it was originally named -- has just completed its first 10 years of service to Michigan through the Cooperative Extension Service (CES) of Michigan State University.

Prior to 1977-78, Michigan's marine advisory services consisted of several specialists or subject matter experts at the University of Michigan (UM) and Michigan State University (MSU) who, through Sea Grant, expanded their knowledge base and provided local problem-solving support while working within their campus departments. They were coordinated through UM, and a very

small portion of the Sea Grant Extension budget supported field-based operations.

In 1977, management of Sea Grant Extension was transferred to MSU, enabling it to operate in conjunction with the university's CES network of county offices and campus-based professional staff. Five field agents were placed in CES offices in strategic cities, and each was assigned to serve a district of seven to 14 of the 41 coastal counties.

The CES philosophy of "helping people put knowledge to work" has heavily influenced Sea Grant Extension. Sea Grant Extension's objective is to bring to the public for practical application the best Great Lakes and coastal-related information available. Sea Grant Extension agents involve CES staff members from home economics, 4-H and agriculture, as well as natural resources and public policy, the program area in which Sea Grant Extension operates, in spreading the Sea Grant Extension program in coastal areas. This multiplies the effect of the Sea Grant agents' efforts and is particularly important because the County Extension directors often have close connections with decision makers in their communities.

All 81 Michigan County Extension directors were surveyed in 1985 and 1986 to determine the amount of time they spent on Great Lakes programming. The range of time spent by those responding (23% in 1985 and 36% in 1986) was from 0 to 50 percent. Although inland counties were underrepresented and indicated only a

small amount of effort, results showed there was an additional 1.33 FTE of Sea Grant programming effort expended in the state in 1985 and 1.85 FTE in 1986.

Each Sea Grant Extension agent is responsible to the total team for leadership in one or more subject areas. At the same time, agents respond to the myriad of concerns, issues and questions generated by the residents of their districts.

Sea Grant Extension has developed contacts with some significant resource user groups, and those relationships have grown as client needs have changed. For example, when Sea Grant Extension began to offer programming to the charterboat captains of the state, there was little organization within the group, which totaled fewer than 200. Sea Grant was almost their sole source of professional information and education. The number of state-licensed charterboats now approaches 1,000, and the Michigan Charterboat Association is well established. This group still depends on Sea Grant Extension for professional education and communication, but it has developed internal leadership that also provides educational and communication linkages.

Sea Grant Extension's outreaches to young people, particularly through the 4-H program, have also evolved. Early in Sea Grant Extension's history, a Sea Grant/4-H agent conducted a three-year demonstration project in Detroit (Wayne County) to teach urban youths about their Great Lakes heritage. In 1983, Michigan

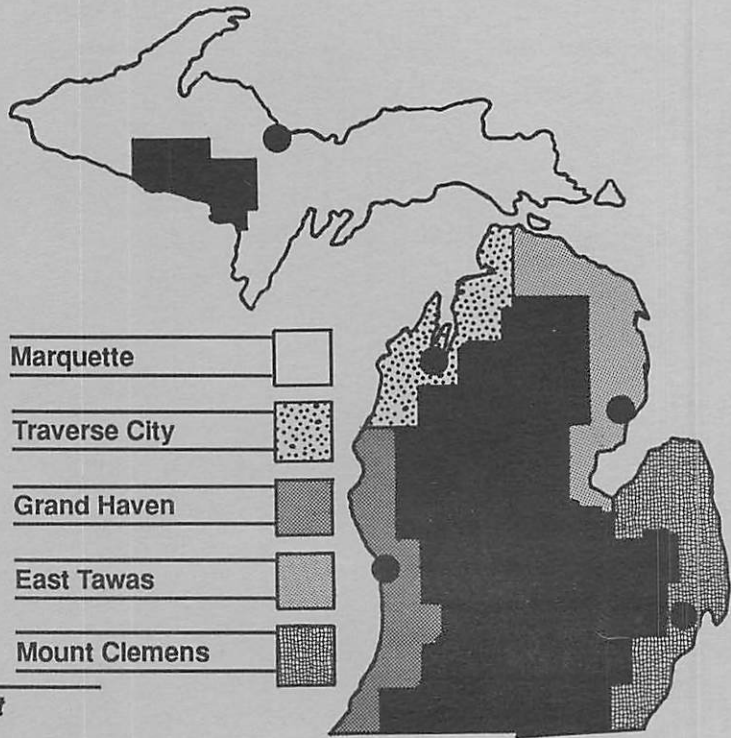
4-H began a Great Lakes and natural resources camp on Beaver Island, staffed by Sea Grant and other Extension specialists. In 1985, CES created the position of Sea Grant/4-H district agent to provide Great Lakes materials and programs to the youth audience in southwestern Michigan's rural coastal communities.

Sea Grant Extension has strengthened its relationship with various departments of the College of Agriculture and Natural Resources at MSU and tapped the resources of UM researchers, too. Agents diagnose local problems and convey them to scientists/specialists in a systematic way so that researchers can respond with immediate advice or formulate applicable research.

The communication staff at UM served Sea Grant Extension's needs for several years. A full-time communication specialist was hired by MSU's ANR

Information Services in 1984 to facilitate expanded Sea Grant Extension media and communication efforts and to supplement UM communication support for Sea Grant researchers at MSU. Meanwhile, field agents developed communication skills and media contacts within their districts and with some regional and national outlets.

The Sea Grant Extension program leader is integral to all Sea Grant Extension activities, a catalyst for program planning, evaluation, communication and staff training. His guidance and support, as well as his liaison with other aspects of the Sea Grant Program and CES, facilitate many developments for Sea Grant Extension. He and CES regional supervisors confer to guide agents in their work plans and to evaluate their performance. Sea Grant Extension has had three program leaders since 1977: Eugene F. Dice (1977-84), John H. Judd (1984-86) and John D. Schwartz (1987-).



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Personnel and Areas of Emphasis

Campus Administrative

John H. Judd, Ph.D., *Program Leader**

Carol Y. Swinehart, *Communication Specialist*

Sylvia Trentz, *Secretary*

Terese B. Heineman-Baker, *Secretary*

Sonya Little, *Office Assistant*

Campus Specialists

Niles R. Kevern, Ph.D., *Fisheries*

Donald Garling, Ph.D., *Fisheries and Aquaculture*

Lee Jacobs, Ph.D., *Fish Waste Utilization*

Alden Booren, Ph.D., *Food Science*

Edward M. Mahoney, Ph.D., *Economic Impacts*

Maureen McDonough, Ph.D., *Market Segmentation*

Daniel J. Stynes, Ph.D., *Economic Impacts*

Lee Somers, Ph.D., *Diving and Water Safety*

Shari L. McCarty, M.S., *4-H Youth Specialist*

Field Staff

Stephen R. Stewart, M.S., *Southeast District -- Computer Applications, Bottomland Preserves, Coastal Erosion, Marina Industry*

Catherine Irwin, *Secretary*

Charles Pistis, M.S., *Southwest District -- Charterboat Captains, Marina Industry, Tourism and Waterfront Development*

Betty Williams, *Secretary*

John C. McKinney, M.S., *Northwest District-- Coastal Erosion, Tourism, Great Lakes Management, International*

Rosemary McGee, *Secretary*

Jon P. Peterson, M.S., *Northeast District -- Bottomland Preserves, Diving Accident Management, Tourism Development*

Gloria Sterling, *Secretary*

Ronald E. Kinnunen, M.S., *Upper Peninsula -- Fisheries (Commercial, Aquaculture), Bottomland Preserves, International*

Joan McKeown, *Secretary*

Joan C. Stuecken, *4-H Southwest District -- Youth Education*

* On January 1, 1987, the vacancy created by Dr. Judd's death in July, 1986, was filled by John D. Schwartz.

PROFESSIONAL DEVELOPMENT & RECOGNITION

Personnel Developments and Operations

Sea Grant Extension program leader John H. (Jack) Judd died July 19, 1987, after an extended illness. Adger Carroll, assistant director of CES for Natural Resources and Public Policy, assumed leadership of Sea Grant Extension until the position could be filled, and field and campus staff members performed various functions normally assigned to the program leader. Sea Grant Extension agents John McKinney and Ronald Kinnunen served on the search committee for the new program leader, John D. Schwartz.

Professional Development

Through opportunities provided on campus and elsewhere by the CES, the program leader, agents and the communication specialist continually upgrade their professional education. For instance, agents and other staff members have received training in computer and communications technology, coastal

engineering and international outreach, and have attended Sea Grant and other conferences.

Sea Grant Extension agents have also served as leaders of network committees and taught courses for their CES peers. Steve Stewart serves on the computer committee of the Michigan Association of Extension Agents, attempting to enable more productive use of both hardware and software by his colleagues. Stewart also helped teach a core course on natural resources and public policy for MSU Cooperative Extension's annual school. John McKinney helped plan a course on tourism development. Ronald Kinnunen is leading a group of district agents to help new county Extension directors in the Upper Peninsula develop significant natural resources and public policy programming.

Charles Pistis and Joan Stuecken both led "workshops on the move" concerning natural resources and the Great Lakes during the 1986 annual meeting of the National Association of Extension Home Economists in Grand Rapids. In 1986, Jon Peterson was elected to the board of the Michigan Community Development

Society, and Charles Pistis to the West Michigan Marine Association board.

Recognition

The Sea Grant Extension team is respected and recognized by peers and clients alike for its performance and leadership. In 1985-86, all full-time agents and the communication specialist were honored with at least state-level awards.

Ronald Kinnunen, Jon Peterson and Stephen Stewart received Michigan Extension's highest honor, the John A. Hannah Award for Program Excellence for their work on bottomland preserves.

Peterson and Kinnunen received the Great Lakes Sea Grant Network Award for Excellence for their programing in dive accident management.

John McKinney received a Presidential Citation from the Michigan Association of Extension Agents for his achievements as an agent with less than 10 years' experience.

Charles Pistis was given an Extension Achievement Award by the National Association of County Agricultural Agents for outstanding performance as a Michigan agent with less than 10 years' experience. Pistis was featured in the special "Tribute to the Great Lakes" issue of Michigan Natural Resources Magazine, which was coordinated by communicator Carol Swinehart and distributed to all participants in the World Conference on Large Lakes, as well as the magazine's 100,000 subscribers and 20,000+ newsstand buyers.

The Alger County Board of Commissioners presented Ronald Kinnunen with an award of appreciation for his contributions. His paper, "Pathology of Sea Lamprey-Inflicted Wounds on Rainbow Trout," was published by the Great Lakes Fishery Commission.

The Council for the Advancement and Support of Education awarded the television program "Superior Today" a bronze medal in its feature programs and documentaries category, recognizing the work of producer Carol Swinehart.

PROGRAM AREA GOALS

Using the knowledge developed by Sea Grant research and the philosophy and methodology of the CES, Sea Grant Extension has made significant progress during the past two years toward accomplishing the following program area goals:

1. Establishing and maintaining dialogue with Great Lakes resource users, planners, researchers and educators,

2. Increasing the knowledge of all Michigan citizens on Great Lakes matters,

3. Collecting, analyzing and transferring technical information in formats understandable to users of Great Lakes resources,

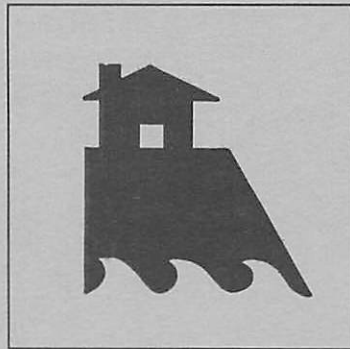
4. Promoting understanding and cooperation among users and managers of resources by serving as an identifiable clearinghouse of information and assistance,

5. Identifying the problems of the users of the Great Lakes environment and its resources so that research, Extension and educational programs can respond appropriately.

GREAT LAKES WATER LEVELS, SHORELINE EROSION, COASTAL FLOODING

Greater than average rain and snowfall in the Great Lakes Basin over the past 15 years caused a coastal crisis in early 1985. In certain areas, water rose to levels unprecedented in the 20th century, in stark contrast to the record low levels of the 1960s, vividly illustrating the unpredictable nature of these fluctuations. Combined with high water levels, storm action washed away 90 percent of some beaches. Despite the efforts of Michigan's Coastal Zone Management Program to require adequate setback of structures in high risk erosion areas and to regulate coastal protection devices, millions of dollars in damages resulted from these storms.

Each of the Great Lakes presents a somewhat different challenge to those who would protect Michigan's shorelines. Because of prevailing winds and the natural structure of the coast of the state's Lower Peninsula, Lake Michigan's impact on bluffs and dunes has been particularly devastating. The emergency services coordinator of one northwestern Michigan



county reported damage to 60 of its 100 miles of shoreline. Coastal flooding is the prevalent threat to the flatter shoreline of Saginaw Bay, Lake St. Clair and Lake Erie. Property owners and governments throughout the region have been perplexed

by this situation, with the former struggling to preserve their stretches of shoreline and the latter grappling with the dilemmas of their constituents and trying to protect public facilities.

During and after a period of high water levels in the 1970s, Sea Grant projects demonstrated the effectiveness of various shore protection devices. The program published both technical reports and a public information booklet, *Shoreline Erosion: Questions and Answers*, which has been revised to address current needs and is widely used by Sea Grant Extension, the DNR and other groups.

In early 1985, it became clear that Sea Grant Extension could play a significant supporting role in the current high water

situation. Sea Grant Extension was recognized as a credible source of Great Lakes information and services by Michigan's Coastal Zone Management Program, its parent Department of Natural Resources, the Soil Conservation Service, other natural resources agencies, the U.S. Army Corps of Engineers, realtors, property owners' organizations and many coastal community leaders.

Agents organized more than 20 programs, most of which were cooperative efforts with other natural resources or coastal management agencies, elected government officials, and public service and property owner organizations. Information presented included background on the high water situation and tips on protection and relief strategies. Many of the more than 3,000 participants indicated that they would benefit from the information, and a number of them requested follow-up programs and individual consultations.

As a consequence of an agent's presentation to tax assessors in one county, 100 coastal property owners received at least a 10 percent reduction in assessed valuation. Those whose structures were less than 20 feet from shore were granted 50 percent reductions. Total reductions amounted to almost \$500,000. Through site visits and with a computer program developed by Sea Grant Extension, agents have analyzed erosion-prone shoreline property for about 1,000 property owners. This analysis has helped people evaluate their options for erosion control. In

numerous instances, owners examined their property's characteristics in conjunction with their uses of it and their financial resources and have opted not to invest substantial amounts of money (potentially a large percentage of the parcel's value) in ineffective structural solutions.

Through a systematic effort by one district agent, all owners of high erosion risk property in one county were surveyed, and 86 questionnaires/ analyses were completed. Those responding were invited to a meeting to learn more about their protection options. A substantial percentage of those who did not attend said that the computer analysis provided by the agent contained sufficient information for them to decide on a suitable strategy.

Advice from Sea Grant Extension agents was sought by government units and agencies, too, because publicly owned infrastructure facilities have been jeopardized by erosion and flooding. Agents have helped officials assess their actual and potential damages and their options for controlling and minimizing destruction, as well as strategies for financing repair and protection solutions. For example, the U.S. Forest Service incorporated into its management plan information from a Sea Grant Extension computer analysis indicating that the agency would lose \$15,000 worth of real estate annually from nine of its shoreline campgrounds if it took no protective action. In several instances,

communitywide rather than individual approaches were adopted, because they minimized the financial burden on single owners and were more effective against the overall problem.

People in areas normally vulnerable to coastal flooding may in time become familiar with procedures for preparing for such disasters. In early 1986, however, many Michigan residents who had previously escaped damage were endangered. To meet their needs, Sea Grant Extension and Extension Home Economics compiled a 50-page handbook covering 60 pertinent topics, such as filling sandbags and using them effectively, preparing one's family for evacuation, preventing and minimizing flood damage to household goods, maintaining oneself at home during a flood, cleaning up damaged

property and filing flood insurance claims. Numerous local emergency service agencies, dozens of private organizations and hundreds of individuals used the book. It was adopted by at least a dozen coastal counties and several noncoastal ones confronted by stream flooding in the fall of 1986. One property owner said that Sea Grant Extension/CES's initiatives prompted other agencies to take more concrete and helpful action.

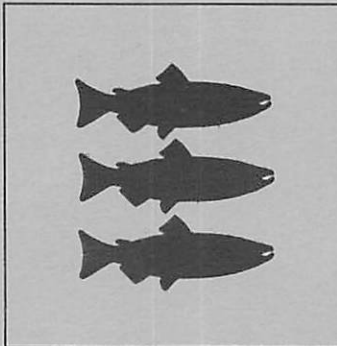
Sea Grant Extension agents have become recognized by the news media as reliable sources of information. Each agent has been interviewed numerous times, several have appeared in broadcast reports or on television or radio programs, and one wrote an article for a national Extension publication, thus reaching hundreds of thousands of additional people.

FISHERIES

Today's Great Lakes fishery is a blend of native and nonnative (both accidental and introduced) species that is being managed in an effort to maintain its ecological integrity and to obtain maximum economic benefits. It still experiences some of the stresses that once jeopardized its very

existence. Although sea lampreys no longer decimate the lake trout, they still pose a problem in the Great Lakes. Excessive numbers of dead alewives once fouled the basin's beaches; now their decline poses a different dilemma because predator fish depend on them as a food source. Contaminants in water and fish continue to disturb both fishery managers and public health officials.

The human and economic dimensions of the Great Lakes fishery are dynamic. Sport and commercial fishing interests have historically competed for fishing space and species and have often conflicted in their demands for access to the resource. During the past 20 years, the state's fishery management program has emphasized the development of the Great Lakes sport fishery, and the economic



consequences for the state have been substantial.

The commercial fishery has had two major components: Native American tribal and state-licensed operations. During 1985, the conflict among these interests over the Great Lakes fishery in Michigan reached apparent

resolution with the pretrial settlement of a federal lawsuit brought against the state by Native American fishing interests. This 15-year agreement redistributed fishing areas among tribal and state-licensed commercial fishermen. It also provided for exclusive sport fishing zones and cooperative fishery management. Both sport and commercial groups trusted Sea Grant Extension to provide valid and unbiased data about the fishery, even during the difficult and tension-filled stages of the tribal lawsuit. All components of the Great Lakes fishery have benefited economically from the information provided by Sea Grant Extension.

Commercial



Michigan's state-licensed and tribal commercial fisheries are experiencing a difficult transition. Many of the state-licensed commercial operations are being displaced by tribal ones, and as a result of the uncertainty surrounding the Great Lakes commercial fishery, a proposed Upper Peninsula fish processing plant has been put on hold.

Sea Grant Extension serves Michigan's commercial fishing industry through such educational efforts as workshops and its newsletter, Commercial Fisheries Newline, such technical assistance as developing computer software, and consultations on individual problems.

In 1985, Sea Grant Extension coordinated a Great Lakes Commercial Fisheries Workshop in Mackinaw City. At least 35 participants gained knowledge about investment analysis for their operations, financial services offered by the National Marine Fisheries Service, the Marine Weather Reporting Service (MAREPS), safety and acceptability of smoked Great Lakes whitefish, handling fish wastes and contaminants in fish. Of the commercial fishing operations surveyed at the meeting, five reported that they had converted to loran-c navigation, five had changed their fish handling practices and one had developed a merchandising plan, all as results of attending a previous workshop sponsored by Sea Grant Extension. During

1985, Sea Grant Extension worked with several key leaders of the Michigan Fish Producers Association on projects such as self-insurance, fish processing plant feasibility and marketing. Several articles prepared by Sea Grant Extension were published in the association's newsletter, Commercial Fisheries News, and The Fisherman: The News Journal of the Freshwater Fisheries. In 1985 and 1986, Sea Grant Extension made presentations about Sea Grant organization and activities, capitalization rate analysis for commercial fishing operations, and cold water near-drowning and hypothermia at the association's annual conferences.

Through presentations at its annual conference and personal contacts, the commercial fishing industry has become familiar with investment pricing computer models developed by Sea Grant Extension. Approximately eight commercial fishermen have analyzed their businesses using these models. In most cases, this was their first introduction to computer applications. The new federal treaty with Native Americans has led the state of Michigan to buy out some state-licensed fishing businesses. The state had proposed to make payments over a number of years, basing them on present valuations. Sea Grant Extension responded by developing a computer model that allowed fishing businesses and the Michigan Fish Producers Association to compare lump-sum payments with equivalent payments over time. This model took into account the time value of money and the opportunity cost of receiving payments in

installments instead of in a lump sum. Association negotiators used this model during talks with the state in 1984 and 1985.

A Sea Grant Extension agent arranged for a natural resources commissioner and the Alger County Extension director to experience Lake Superior commercial fishing, which resulted in the commissioner's investigating some costly state regulatory procedures. The agent also worked with an Extension colleague to solve a rodent problem at a commercial fishery warehouse where there was potential for damage to nets valued in excess of \$280,000.

The capabilities of the purse seine boat Argo are now being tested in southern Lake Huron. Sea Grant Extension has provided information about this former Sea Grant project to those currently involved to facilitate explanation of the project to anglers and other interested persons.

Aquaculture



Commercial aquaculture in Michigan consists primarily of raising trout in ponds, both for fee-fishing and for sale to other Michigan commercial enterprises. At this time, the food-producing industry is not competitive with out-of-state fish businesses in markets outside Michigan. Raising bait fish is another aspect of the industry that has potential for further

development, and several new operations begin each year.

Sea Grant Extension answers many questions about the development of the aquaculture industry in Michigan. Agents provide information about such topics as farm pond management, aquaculture development for fish-out and food production, bait minnow production, fish disease management, and crayfish and bullfrog production to encourage production of only species that have proven viable in Michigan.

Every year, CES's aquaculture specialist holds several programs about aquaculture in each district. Sea Grant Extension, in cooperation with the CES and the Michigan Department of Natural Resources, sponsored a statewide workshop for commercial fish culturists in September 1986. It focused on fish diseases, permits needed, marketing, MSU and Sea Grant aquaculture research, chemicals for use in fish culture and formation of a cooperative.

As a result, a steering committee, consisting of CES, Sea Grant and industry representatives, developed an aquaculture organization -- The Michigan Fish Growers Association. Sea Grant Extension and CES specialists assisted industry leaders in drafting bylaws. Pertinent information is now included in the Commercial Fisheries Newslines, and approximately 80 people in the aquaculture industry now receive it.

Charter Fishing



Perhaps the clearest example of an industry that has skyrocketed in response to Great Lakes fishery success is charterboat fishing. Throughout the Great Lakes, the number of licensed charterboats has grown from a few dozen in each state in 1975 to between 500 and 1,000 per state in 1985. Michigan's charterboat fleet has increased nearly five fold since the late 1970s, from fewer than 200 to nearly 1,000 licensed vessels. About 920 licensed Michigan captains booked some 62,000 charters in 1985.

During the past few years, charter captains have increasingly turned to the tourism market, and a third of Michigan captains' clients now come from out of state. A 1985 study by the MSU Department of Park and Recreation Resources and Sea Grant Extension estimated that Michigan's charter captains have \$31 million invested in boats and equipment, and their customers spend approximately \$59 million each year. Charterboat activity is concentrated in a few locations, where it has a major impact on the local economies. This has stimulated communities such as Grand Haven and Frankfort to showcase their charterboats at public marinas.

Many of the people entering charter fishing are not only new captains, but are also new business persons. Although many have excellent fishing skills, it takes

more than that to provide customers a satisfying Great Lakes fishing experience and to show a profit. Captains need a blend of fishing, tourism and business knowledge, skills, initiative and ingenuity to succeed as the field becomes more crowded. They need to cooperate and to develop professional associations if their business is to be perceived as a community asset instead of a potential nuisance or liability.

Sea Grant Extension has worked extensively with the charter industry for several years through such educational efforts as workshops and a newsletter (Great Lakes Troller), such technical assistance as computer software development, and consultations with individual captains and local associations.

A major effort during 1985 was the charterboat marketing study, funded by the MSU Agricultural Experiment Station, the CES and the Michigan Charterboat Association. Sea Grant Extension agents helped design and test the questionnaire and identified and recruited 83 charter captains to participate. The captains distributed questionnaires to their customers and provided confidential information about their business operations. The charterboat association offered a drawing for a free charter trip as an incentive to customers to complete and return the questionnaire.

The study demonstrated that nearly 250,000 people visit the state's coastal communities annually for the primary purpose of charter fishing and that they

have an impact on other local businesses of approximately \$23 million. Local charterboat associations and the state organization have used this information to encourage state policy makers and communities to provide facilities such as special dockage and programs that enhance the industry.

Based on the charterboat marketing study and patterned after the highly successful Sea Grant boater spending impacts model, Sea Grant Extension is developing a computer model on spending impacts of charterboats that should allow most coastal communities to assess the impact of a charter fishing fleet on their local economies and help them determine whether and how to support public/private development of the industry.

During 1984-86, Sea Grant Extension sponsored a total of 16 regional workshops for charter captains. A total of 859 people attended these meetings, and many of them participated in more than one session. Sixty-seven percent of the people participating in 1984-85 had less than three years' experience. Two workshops were joint efforts of Michigan, Wisconsin and Minnesota Sea Grant programs. Program topics included fisheries information, use of loran-c equipment, participation in MAREPS weather forecasting, business management and promotion strategies.

Through Sea Grant Extension support, captains in the Grand Haven area succeeded in obtaining public dockage and fish cleaning facilities during 1984. As a

result of participating in the 1985 Sea Grant workshops, 16 Grand Haven captains decided to cooperate in promotional activities. They developed joint literature, advertising and other ventures. Pentwater is also expanding charterboat facilities, based upon information provided by Sea Grant Extension, and other communities are considering such developments. As a result of the 1986 workshops, particularly the presentations about the charterboat marketing study, several captains reported their intention to change marketing practices.

In 1985, Sea Grant Extension hosted a Great Lakes Network Charterboat Industry Workshop at Spring Lake. Representatives of all the Great Lakes states' charter industries, as well as Network advisory agents, were exposed to Michigan research and Extension efforts through presentations by Sea Grant Extension staff members about facility development in western Michigan, the charterboat investment computer model and preliminary results of the charterboat marketing study, which other Great Lakes states are using as a model for their efforts with the industry. Many more people have learned about these subjects through the published proceedings.

Sea Grant Extension has developed computer models to help both current captains and those interested in getting into the charter business, to analyze the financial feasibility of chartering and determine break-even charter fees under

various financial and operational assumptions. This encourages the potential captain to assess many "what-if" situations without having to commit capital, and it allows the working captain to determine the effects of an expansion, for example, on the viability of the total charter operation. To date, more than 160 Michigan charter captains have learned about these analysis tools, primarily through regional seminars, and up to 40 charter operators have used them to examine their current and/or proposed operations. In addition, at least five other states' Sea Grant Extension programs have reviewed the models for future use with their clients.

Sport (General)



Michigan's 1.4 million licensed anglers tally some 23.4 million fishing days statewide, about 7.3 million on the Great Lakes, and another 1.7 million for anadromous species (fish that swim upstream from the lakes to spawn in connecting lakes and streams). Economic impacts of angling are comparable to those for boating because about 57 percent of Great Lakes boating is fishing-related. This percentage is up from 44 percent in 1968, largely in response to the recovery of the Great Lakes fishery.

Michigan sportfishing organizations provide a close association for anglers with similar interests. Sea Grant Extension reaches members of these groups at their meetings and at sportfishing shows and

exhibits, as well as at special workshops on fish handling and preparation. Publications such as *The Great Lakes Steelheader* (published by the Michigan Steelhead and Salmon Fishing Association) and *Great Lakes Fisherman* also communicate with this audience, which is otherwise widely scattered. An article about salmonid diet research was written by a Sea Grant graduate student for the *Steelheader*, and information about Great Lakes Network salmonid diet studies appeared in the *Great Lakes Fisherman*. Video feature reports about the salmonid diet work and a forecast for Great Lakes fishing reached at least several thousand people.

Sea Grant supported initial research into the economic impacts of sportfishing on local communities. Sea Grant Extension facilitated contacts within the communities, coordinated data collection through local volunteers, and provided additional information to communities as they applied the research findings. Once a resulting model was accepted as an accurate basis upon which to calculate such impacts, other communities expressed interest in analyzing their local situations. Although no longer funded directly by Sea Grant, several of these studies were conducted with assistance from Sea Grant Extension.

Sea Grant Extension is also involved in current Sea Grant research on analyzing the various segments of the sportfishing market. Agents brought the need for this study to the attention of researchers and

expect to make extensive use of the results in their sportfishing development work. Already they have conducted meetings in numerous coastal communities, outlining for local government officials, business leaders and sportfishing groups sportfishing's economic significance. Many of these meetings have also focused on waterfront development and the importance of Great Lakes boating. As a

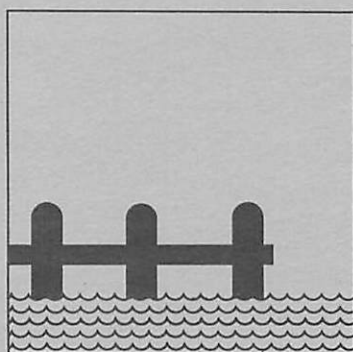
result, at least 12 communities have gained new insights into the economic development potential in their vicinity, and some are actively expanding their efforts. The influence of this information is also evident in the practices of the Michigan Department of Natural Resources, which has adapted its fish stocking plans accordingly.

COASTAL COMMUNITY DEVELOPMENT

Recreation and tourism is big business, especially in the Great Lakes region, and can form the basis for much coastal community economic development. The Great Lakes themselves are important resources. Their coastal zone provides an estimated 200 million person-days of recreation/tourism activity within Michigan and accounts for roughly \$5 billion in direct spending within the state each year. This is about 20 days of coastal recreation for every man, woman and child in the state, and about 5 percent of Michigan's total annual personal income.

The growing body of information from studies of boating, fishing, vacation travel, camping and other activities points to recreation and tourism as the dominant use of the Great Lakes coastal region. Many coastal communities rely economically far more on recreation and tourism than the state of Michigan relies on the automobile industry.

Recreation and tourism encompass a wide variety of activities, with services and facilities along the Great Lakes coastline



provided by a complex mix of public, private and quasi-public organizations. Providing Sea Grant Extension services to coastal communities that are assessing the role of recreation and tourism in their economic development is complex. However, the

foundation provided by Sea Grant research is resulting in significant benefits and accomplishments for these communities. During 1985-86, Sea Grant Extension assisted 18 coastal communities in exploring various options for economic development in bottomland preserves, marinas and recreational boating, waterfront development, planning and promotion.

Bottomland Preserves



The Great Lakes are immense reservoirs containing areas of both geological and historical significance -- unique rock and mineral formations and wrecks of ships and boats that succumbed to powerful lake storms. The state of Michigan, prompted

by Sea Grant research and the initiative of those who believe in preserving the underwater heritage of the Great Lakes, passed a law in 1981 mandating the designation of areas with historically significant concentrations of shipwrecks and geological features as "bottomland preserves." It essentially sets up quite restrictive salvage rights on the shipwrecks within a preserve. This law also allows for public/community petition to designate a preserve but provides no funding or programing to create either shoreside or underwater facilities, nor any management guidelines for focusing activity within a preserve.

Largely through the efforts of several interested communities and the support of Sea Grant Extension and other CES agents, the concept of Great Lakes bottomland preserves has become a reality for the state. One researcher has said that there would be no such legislation or preserves in Michigan were it not for the involvement of Sea Grant Extension.

Michigan is the only Great Lakes state with a bottomland preserve law, and the concept is still new, even to many within the state. Some communities already have active nautical history groups, while others have little or no awareness or appreciation of the unique resources in their vicinity. Therefore, agents have had to educate communities in their districts about the long-term value of the resources and their potential to enhance the region's economic development.

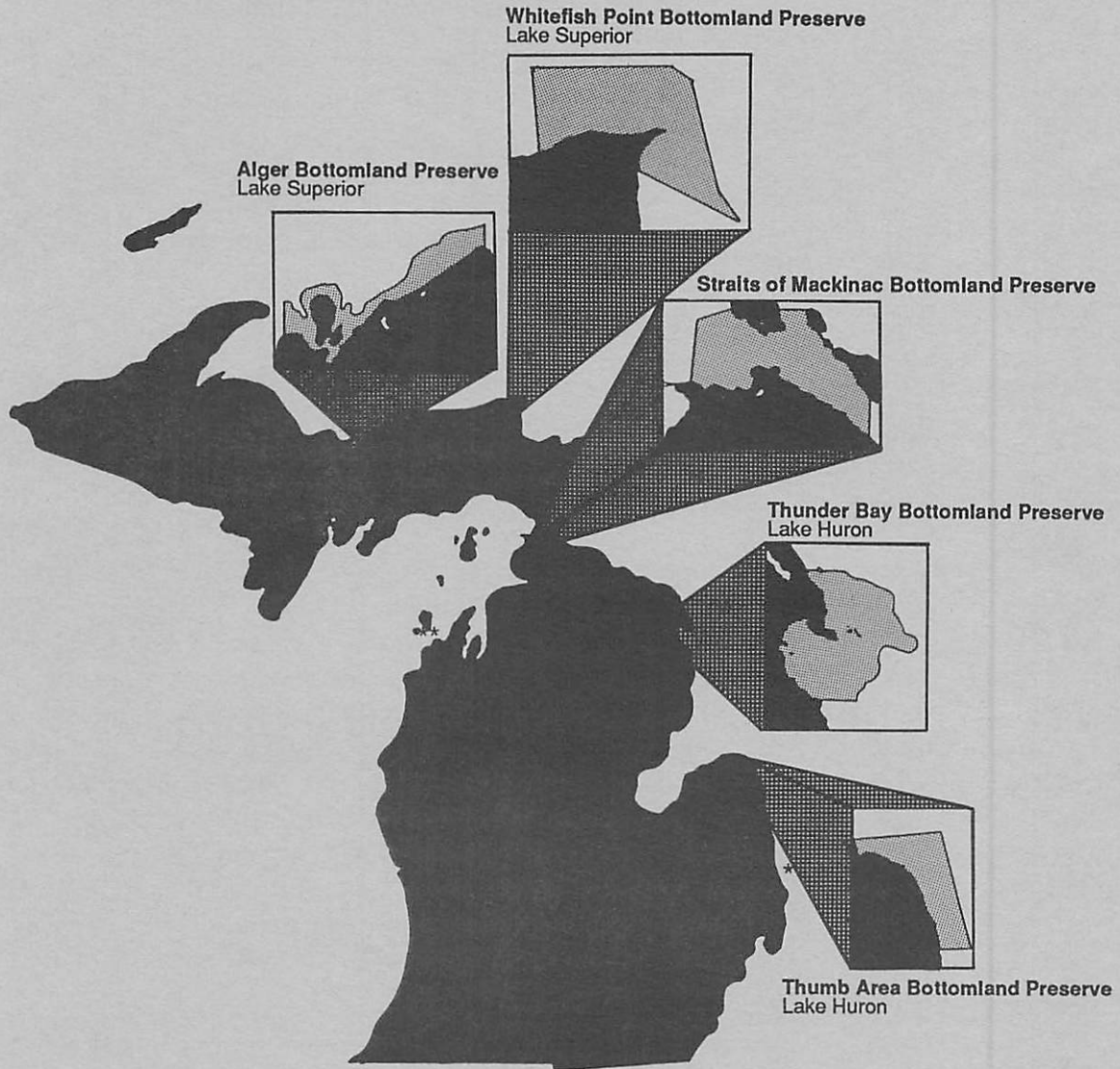
Sea Grant Extension has been involved in various stages of development and management of the preserves, from assisting in proposal drafting, providing leadership training, building a preserve "network" and creating dive accident management strategies, to aiding recreation planning, supporting promotional activities and securing financial resources.

Sea Grant agents have been directly involved with all of the six currently designated preserves and with the proposed seventh one. The Alger and Whitefish Point preserves are in Lake Superior; the Straits Area, Thunder Bay, Thumb Area and Sanilac County preserves are in Lake Huron, and the proposed Manitou preserve is in Lake Michigan.

Sea Grant Extension agents have helped organize citizens' committees to deal with preserve designation and development. These have included more than 1,000 government officials at all levels, business people, community planners, emergency medical and law enforcement personnel, sport divers and dive shop managers, charterboat operators, media representatives, maritime historians, nautical archaeologists and interpretive educators.

With the support of campus specialists and other resource people, the agents have helped local committees learn about and implement appropriate management practices, improve promotion and marketing strategies, enhance identification of shipwreck resources, and

Michigan's Great Lakes State Bottomland Preserves



*Sanilac County Bottomland Preserve
(emergency designation)

**Manitou Bottomland Preserve
(proposed)

develop sport diver safety procedures and dive accident management strategies.

As the communities on Lake Superior and Lake Huron began to demonstrate similar interests and needs in preserves, Sea Grant Extension presented state-level seminars in 1984 and 1985 to begin focusing these local efforts into a more consistent statewide approach to preserve development. The first seminars attracted more than 100 participants from preserve areas, elsewhere in Michigan, other states and Canada.

Sea Grant Extension has also functioned as a communication link among the preserves, helping people in one preserve area contact others and facilitating contact between committees and state officials. In late 1986, Sea Grant Extension coordinated a meeting of more than 20 people representing existing or planned preserves, to discuss issues of common concern and explore potential cooperative efforts. Sea Grant Extension is now assisting in the formation of a state organization of Michigan bottomland preserve representatives by drafting proposed bylaws and providing technical support for marketing efforts.

Because of studies that Sea Grant Extension assisted, the recreation and tourism and associated economic potential of the preserves is now being recognized and valued by many people in the adjacent communities. In 1984, the first documented economic analysis of an existing preserve (Alger) showed annual diver expenditures of \$1.2 million, based

on an estimated 6,000 visiting divers. Non-divers raised this total to \$3.4 million. 1985 results showed similar impacts of \$1.7 million in diver expenditures and total expenditures of \$2.4 million.

A 1985 survey of divers visiting the Thunder Bay preserve showed expenditures of \$168,000 based on 1,065 divers. Local businesses are using the analysis to guide future marketing and promotional efforts for the preserve.

Sea Grant Extension surveyed all divers utilizing Michigan's Great Lakes bottomland preserves in the summer of 1986 and mailed a questionnaire during the following winter to a sample of Michigan divers. The Michigan Travel, Tourism and Recreation Resource Center at MSU assisted in formulating the survey and with analyzing the results, which should yield both individual and aggregate information useful to local preserve committees in their marketing and promotion of the preserves, as well as in the development of preserve facilities. The questionnaire was also used at the proposed Whitefish Point preserve location and by the operator of a newly established dive charter in the Bayfield, Wisconsin, area, who used the results from the 1984 and 1985 Alger Preserve surveys to obtain the loan for his boat.

The agents have also assisted in securing funds for preserve projects: a \$7,600 "Yes Michigan" grant for promotion of the Alger Preserve and a \$14,000 Heritage Preservation grant for the location and documentation of shipwrecks within the Thumb Area Preserve. These grants were

the first either program had made to anything related to underwater resources.

In 1985, Sea Grant Extension coordinated an effort of the National Oceanic and Atmospheric Administration's (NOAA) National Undersea Research Program, Alpena General Hospital and sport diving interests to use a \$26,978 grant to Sea Grant to support the reactivation of the hospital's hyperbaric (recompression) chamber for the treatment of dive accident victims. The grant also provided for educating hospital staff members in the chamber's use. This equipment has already been used to treat several diving accident victims and save several carbon monoxide poisoning victims. (See Dive Accident Management section for other activities, accomplishments and benefits in this program area.)

In 1984, the agents were asked to write the story of Michigan bottomland preserves for *The Michigan Planner*, the journal of the Michigan Society of Planning Officials. That article was revised and published in 1986 as a chapter in *Marine Parks and Conservation: Challenge and Promise*, a two-volume international book on marine parks and underwater preserves published by the National and Provincial Parks Association of Canada. Several newspapers and magazines have also consulted agents in preparing stories about preserves. ANR Information Services television features on the subject have reached statewide audiences.

The contribution of Sea Grant Extension agents is also being felt in other areas of

the Great Lakes and throughout the world. Minnesota, Wisconsin, Oregon, Puerto Rico, Quebec, Belize and Malaysia are already drawing on the experience of this team in developing laws to protect their underwater cultural heritage by establishing preserves or similar entities. For example, in 1986, agent Peterson visited Fathom Five Provincial Park in Tobermory, Ontario, where he shared with the park superintendent much of Sea Grant's experience in developing bottomland preserves; and agent Kinnunen was a resource person for Malaysian officials who manage that country's marine parks.

Marina and Boating Industry



Boating is the best documented recreational activity on the Great Lakes. Michigan has more than 700,000 registered watercraft, approximately one for every five households. Boat registrations have expanded at a rate of about 3 percent per year since 1965. The biggest increases in boating in the past 10 years have been on the Great Lakes. Increases can be attributed to improvements in water quality, fishing, access sites and marina facilities. According to Sea Grant research, the state's registered boaters logged 16.9 million boat-days in 1980, about one-third on the Great Lakes. Boater spending in 1981 was estimated at \$1 billion. Because Great Lakes boating involves larger craft,

about half of all this spending can be attributed to the Great Lakes.

A comprehensive aerial inventory completed in 1983 showed that Michigan has 746 marinas, containing 36,651 slips, serving the Great Lakes. Commercial marinas account for about 70 percent of this total. The Michigan Department of Natural Resources (DNR) Waterways Division has helped develop 67 public marinas, 25 of which serve as harbors-of-refuge for Great Lakes boaters. The number of slips has grown by 20 percent since 1978, yet demand continues to outstrip supply, particularly in southern Michigan.

Of boaters who use only the Great Lakes, 32 percent store their boats at Great Lakes waterfront homes, 39 percent store them at nonwaterfront homes and 21 percent use marinas. Only 3 to 5 percent of registered boaters are from outside Michigan, although a great deal of unmeasured use occurs when out-of-state visitors go boating with friends and relatives. A 1980 general recreation survey estimated that visitors account for as much as 15 percent of boating occasions in Michigan.

Marina and recreational boating businesses once lacked professional organization, and educational opportunities for operators were limited. For many years, the industry was composed largely of family-based operations, many of which were marginally profitable and went out of business. Those that survived are realizing that they need more business management

skills to stay profitable in an increasingly competitive atmosphere. Sea Grant Extension has provided workshops, computer models and other technical assistance to the boating industry, to individual businesses and to communities that are considering new or expanded recreational boating facilities. The agents and the Sea Grant Extension communicator have also informed hundreds of thousands of people about Michigan boating through both published and broadcast reports.

For 10 years, Sea Grant Extension, in partnership with the Michigan Boating Industry Association and the Michigan DNR Waterways Division, has presented an annual educational event for the recreational boating industry.

The 1985 program in Grand Rapids attracted approximately 100 public and private marina operators, marine bankers, insurers, lawyers and other industry-related leaders; the 1986 meeting, 120. Among the topics presented by Sea Grant Extension agents, researchers and external advisory committee members were liability insurance, legal implications of owning and operating a marina, marketing and promoting a marine business, personnel management, Sea Grant boating research and the national boating facilities inventory.

After almost 10 years of leading this educational effort, Sea Grant Extension transferred planning for the program of the 1986 conference to the Michigan Boating

Industries Association and the DNR. Sea Grant researchers, specialists and agents will continue to serve as resource persons and as speakers for the conference.

The West Michigan Marine Association received Sea Grant Extension support to develop an intensive one-day workshop in April 1985 on marketing and promoting of a marine enterprise. The 40 participants gained insights from a Sea Grant researcher into the development of marine business marketing strategies and are now better able to spend their limited promotional dollars on the most effective forms of advertising available to them.

Though Sea Grant Extension efforts, marina managers have used three computer models that look at operational feasibility questions: investment, pricing and cash flow. More than a dozen potential marina developments have been analyzed, and marina managers continue to verify the validity of the Sea Grant Extension models.

Coastal communities and businesses have increased their understanding of the economic impact of boating facilities by studying results of Sea Grant boating research that demonstrated that a single 100-boat marina generates as much as a half million dollars in spending in its market area. Communities often need this kind of information to support the development of such facilities or, in the case of municipalities, to supply the necessary local match for grant projects.

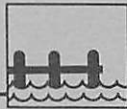
Using a computer spreadsheet model based on that research, agents have generated information about the local economic impact of boaters who would use a proposed launch or marina facility. In 1985, proposed boating projects in 12 communities were analyzed by the spreadsheet analysis method. It was instrumental in the funding and future development of five new boating facilities, including sites at Benton Harbor, Elk Rapids and Algonac. Escanaba, in the Upper Peninsula, has invested approximately \$88,000 to date, and Pentwater has spent approximately \$160,000 to add 30 slips and should realize approximately \$180,000 annually in economic returns. The DNR Waterways Division also requests a site analysis for each of its proposed projects.

Another half-dozen communities and 10 marinas have used a second model to determine the spending impacts of additional boaters. The method most often used to attract boaters has been providing additional access sites and launch ramps. Each 100 additional boaters generate annual spending of \$178,698. Based on this information, two additional access sites are being developed.

For example, anglers in Grand Haven sought Sea Grant assistance in establishing their need for improvements at the municipal boat launch. They used a computer model to calculate their contribution to the economy. The city council agreed to solicit plans for developing the island where the boat

launch is located, including upgrading the road and launch. A major MSU effort to revitalize the economy of the Benton Harbor-St. Joseph area credited Sea Grant Extension for assistance in obtaining state financial support for a new joint marina.

Waterfront Development



Successful urban waterfront developments attract tourists and are a source of community pride. Through such projects in Boston and Baltimore have received more widespread attention, many communities along the Great Lakes are achieving similar success. Others are seeking assistance to improve both economically and environmentally through waterfront developments emphasizing recreation and tourism. Using past Sea Grant research on the economic impact of boating and fishing and case studies from other communities, Sea Grant Extension agents have educated leaders from 16 coastal communities about capitalizing on the economic potential of their waterfronts. As a result, three communities have incorporated waterfront revitalization into planning documents, and two of them have received funding for reconstruction projects.

During the 1985 Agriculture and Natural Resources Week at MSU, a Sea Grant Extension seminar about waterfront development featured Sea Grant researchers and representatives from

coastal communities that have successfully revitalized their waterfronts. Sea Grant experience with coastal waterfront development is being transferred to other communities and to agents from the other Great Lakes Sea Grant programs through professional conferences, mediation of potential conflicts and visitations. Swedish officials touring western Michigan in 1986 received copies of the charterboat marketing study, which they expect to use in assessing their water-related recreational development potential.

Agent Pistis took part in a ceremony honoring Grand Haven as one of Michigan's Communities of Excellence. His participation reflected his role in its now widely recognized waterfront development. He had provided information about economic impacts of sportfishing, educated local leaders about various financing options, and facilitated cooperation between the local charter captains and government officials.

In Traverse City, the Maritime Heritage Alliance (with leadership and assistance from Sea Grant Extension) has worked for four years to preserve and promote the area's maritime history through a number of projects and activities. The local waterfront museum has started collecting and displaying artifacts and other materials relevant to the settlement of the area and its water-based economy. The Maritime Heritage Alliance has also been building replicas of historic vessels that once plied Great Lakes waters, one of which, the

Gracie L, is already completed, and another, the Madeline (which has received a \$5,000 Sesquicentennial grant), is under construction. The museum, the completed vessel and the construction activity on the second vessel have all become tourist attractions and will continue to be a centerpiece of the community's waterfront redevelopment effort. The organization has received inquiries about possible usage of a vessel at such events as the Detroit River Festival. The project's value is now estimated at \$250,000, with roughly half that amount invested to date.

Tourism Planning, Development and Promotion



Developing coastal tourism involves selling the local endowment of natural resources and services to gain income from visitors. Increasing tourism may mean reducing the quality or availability of scarce resources to local residents. This sometimes generates major conflicts in coastal areas between those advocating development and those wishing to retain and enjoy the environment. Some local residents benefit from tourism development; others may suffer from increased congestion, inflated prices, trespass, noise and other less desirable consequences.

Though Great Lakes coastal communities may enjoy a big comparative advantage in attracting tourists, not all of them are in a

good position to develop a tourism-based economy. There is a history of overselling the potential benefits of tourism to economically depressed regions. The market is not unlimited -- it is very competitive and seasonal. It is also very sensitive to weather, the economy, airfares, currency exchange rates, the price of gasoline, local social conditions, etc. Many of these factors are outside local control, making tourism a risky business.

Although there are risks involved in developing the recreation and tourist economy, the Great Lakes states have only begun to realize their potential. More people travel from the region to destinations elsewhere than are attracted to it from other areas. The rest of the country knows little about Great Lakes tourism opportunities. Many think Lake Erie is dead. The region has the image of a depressed industrial area rather than a land of clean, fresh water, beautiful beaches, 30-pound salmon, shipwrecks, fall color, winter sports and historical sites.

Michigan has increased its promotional budget from \$3 million to more than \$9 million annually to begin improving the state's image, and other Great Lakes jurisdictions have launched similar programs. Michigan tourism is expected to generate \$14 billion in revenues in 1987.

As the significance of travel and tourism in Michigan's economy is recognized, more communities need guidance in determining what part of their future lies in tourism. Sea Grant Extension agents are assisting

them in planning, development and promotion by educating leaders, developing organizations and providing technical assistance.

Sea Grant agents have developed leadership in coastal communities by assisting in the formation of county and regional tourism councils. These councils have been mechanisms for local efforts to promote tourism and have filled the planning gap that larger state efforts cannot satisfy. More importantly, these councils have created linkages and facilitated networking between marine businesses and other coastal entities and with inland tourist enterprises.

For example, in Ottawa County, Sea Grant Extension and other CES staff members helped form the Ottawa County Tourist Council, a citizens' advisory group appointed by the county board of commissioners. Half the council members represent either marine businesses or coastal communities. This group is the first known attempt by Michigan county government to promote and plan for tourism on a coordinated, countywide basis. Sea Grant Extension helped develop the council's budget and presented it to the commissioners, who allocated more than \$8,000 to the group in 1985.

The council's accomplishments to date include completing a \$5500 countywide traveler survey that was supervised by a Sea Grant Extension agent and an MSU researcher. Findings of the survey indicate that one of the primary attractions of Ottawa County is its proximity to Lake

Michigan and its water-related recreation. This study also generated tourism economic impact information that is being used by the local Chamber of Commerce, the council and individual businesses to plan and promote tourism in the area. Other communities are requesting similar studies.

Ottawa County retailers are shifting to methods other than billboards to advertise their services. Using Sea Grant research that emphasized the cultivation of informal tourism information networks as part of areawide promotion, the tourism council developed a folder containing brochures that list and describe 160 county businesses, attractions, sites and facilities of interest to tourists, as well as shopping, fishing and boating, parks, agricultural recreation and accommodations information.

Participating businesses distributed 50,000 copies of the folder during the 1986 travel season and used it themselves to answer questions, give directions, refer travelers to other businesses and promote the area. About 10 percent of the businesses reported that tourists had frequented their establishments after reading the folder, and 34 of them indicated interest in purchasing space in the 1987 edition.

Tourism councils have also formed in Allegan and Oceana counties, where the Sea Grant Extension agent and specialist provided needed information and support. In cooperation with tourism associations and CES staff members, agents have co-sponsored three regional tourism

seminars in other coastal counties. These educational programs had different focuses but generally were designed to provide businesses, leaders and planners with

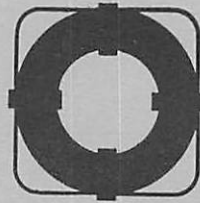
information to assist them in capturing a larger share of the tourism market. More than 200 persons participated in these events.

WATER SAFETY

Water safety is important to Michigan. In the state with the longest Great Lakes coast and half its territory under water, both livelihoods and recreation/tourism depend heavily on people's functioning near, on or in the water. The state leads the nation in the number of registered recreational boats (734,075). The Detroit

River is the busiest commercial waterway in the country. Michigan's population is lake oriented in many ways, with 100,000 second homes located on the Great Lakes coast, and water-related recreational facilities attracting both tourists and residents to the shore.

Another factor that makes water safety a concern for the state is the low water temperature of its Great Lakes and many inland lakes and streams. This year-round condition creates a constant threat of hypothermia, the lowering of the body's temperature significantly below its norm. Being in cold water accelerates this process. Water robs the body of its heat 25 times faster than air of the same temperature. The threat to boaters and others on or about the water is significant, especially in the spring and fall, when people may assume that the water is as



warm as the daytime air. After a decade of declining deaths due to boating and drowning, the trend turned upward in 1985-86 and more than 155 people died in Michigan water accidents.

Cold Water Near-Drowning, Hypothermia



Sea Grant's water safety work has consisted of both research and innovative and intensive Extension efforts aimed at overcoming some of the major water safety challenges posed by the Great Lakes. The program's support of Dr. Martin Nemiroff's research in cold water near-drowning has resulted in the realization that apparent drowning victims can sometimes survive extended submersions in cold water with no permanent ill effects. Sea Grant Extension has educated thousands of emergency professionals about these findings and has helped them develop and implement appropriate cold water accident rescue and

treatment plans. This has resulted in a revolution in the treatment of cold water near-drowning victims nationally and internationally, as well as within the state.

Sea Grant Extension has also educated the boating public about the threat of hypothermia. Through Sea Grant Extension efforts since 1977, more than 6,000 boaters, boating instructors and emergency professionals have learned about the hazards of hypothermia and how to avoid and treat it most effectively. Many have changed their approach to treating such incidents, and they have often succeeded in rescuing victims, citing Sea Grant as the provider of the vital information necessary to achieve positive results.

At least three counties have established cold water accident emergency action plans. In 1985-86, one agent conducted 14 workshops on cold water near-drowning for emergency medical technicians, who received continuing medical education credits through the Michigan Department of Public Health. In 1986, agents also conducted water safety and hypothermia workshops for various other groups, including approximately 500 teens and adults. Local people educated by Sea Grant Extension are continuing the programs initiated several years ago. This information has also reached the general public through mass media and other channels. During 1985-86, several short television features about hypothermia and cold water near-drowning were produced by Sea Grant Extension/ANR Information

Services and broadcast statewide. The most significant outcome of these efforts is the number of lives saved that might well have been lost otherwise.

Dive Accident Management



With the expansion of recreational sport diving in Michigan, particularly in Great Lakes bottomland preserves, concern about the ability to deal with diving accidents increased. Generally, these concerns focused on the lack of: responders' knowledge about dive accident treatment, well-defined strategies for responding to accident situations, and fully equipped recompression facilities in Michigan to treat accident victims. Finally, the diffuse nature of the diving industry and low awareness by the medical community meant that no organization in the state was equipped to address these concerns.

Sea Grant Extension agents and UM campus staff members identified these issues, recognized the need to address them and became involved before the 1985 diving season. Innovation and networking were important in this new arena of programing. Information, financial and human resources from campus and field staffs, government agencies, medical experts and citizen volunteers were identified and linked. Sport diving in Michigan is now a safer experience, and

this should translate into continued tourism and economic benefits for Michigan.

Sea Grant Extension coordinated the dive accident management program on two levels. First, agents planned and held a series of seminars at locations where diving activity is concentrated. These seminars focused on improving the dive accident response skills of charterboat operators, marine rescue personnel, EMTs and ambulance staffs, and hospital emergency staffs. Each seminar was tailored to the region, and local people were involved in planning and giving presentations. The four programs drew 260 participants who learned basic treatment and response skills and applied them, with field demonstrations, where possible. EMTs who attended received continuing education credits from the Michigan Department of Public Health.

The second level of effort was statewide. The most serious diving accidents involve decompression sickness or an air gas embolism. In both cases, the only effective treatment is hyperbaric therapy in a recompression chamber. As of 1984, Michigan had no operational multi-place chamber, so Sea Grant Extension mobilized the resources to put one in place and to train hospital staff members in its operation. The National Oceanic and Atmospheric Administration and Alpena General Hospital were coordinated so that a \$26,968 grant from NOAA's National Undersea Research Program to Sea Grant could be used to reinstall Alpena General's hyperbaric chamber and train support staff

members in its use. This was the first time these federal agencies had been involved in such a project in the Great Lakes. Sport diving interests were also mobilized and generated \$2,000 for the project.

Lives have already been saved by this effort. At least five dive accident victims, as well as many other nondiving patients (hyperbaric oxygen is also the treatment of choice for many nondiving illnesses), had been treated as of December 1986. One of them was transported from Paradise on Lake Superior via ambulance and helicopter to Alpena by a participant in the 1985 dive accident management seminars.

At the end of 1986, Alpena General Hospital was the only staff (seven physicians, 10 technicians) and facility of its kind in Michigan. It is applying the new resources in its own educational outreach programs, thus multiplying the Sea Grant Extension effort. The hospital's resident expert is conducting training in hospitals around the state with former Sea Grant researcher Dr. Martin Nemiroff.

People at all responder levels have enhanced skills as a result of knowledge of dive accident management concepts. Four local and state/regional networks for responding to accidents are established, and Sea Grant Extension's initial effort has been multiplied by those who participated. Local ambulance groups and EMTs have incorporated dive accident response equipment and training into their programs, and education on this subject is also now more commonly incorporated into sport diver training classes. Many

local, state and federal organizations and agencies have been linked with CES and Sea Grant efforts.

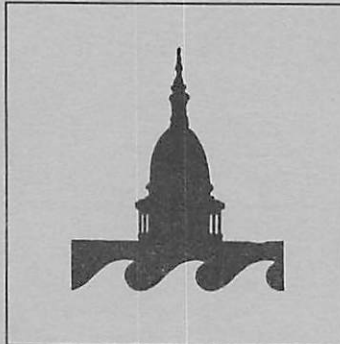
The Sea Grant Extension diving specialist at UM has initiated a diver education series, a series of booklets about a wide variety of diving topics. Fourteen titles were published in 1986 by the UM communications office. The series is in great demand by individual divers, diving instructors, federal and state parks and agencies, aquariums and research

institutions around the Great Lakes and the nation. The following organizations are also using some or all of the booklets in their training programs: the Michigan State Police, the U.S. Secret Service, the British Sub-aqua National Diving Committee, West Point Military Academy, Disney World's Living Seas Pavilion, the National Oceanic and Atmospheric Administration Diving Office in Seattle, and dive rescue teams of several sheriff's departments throughout the United States.

GREAT LAKES MANAGEMENT

The Great Lakes Basin ecosystem is so large and complex that managing its resources requires a coordinated approach to making decisions about the various policy issues and to developing and implementing practical problem-solving strategies.

Water quality is perhaps the overriding issue in the Great Lakes. It is considered so important by the governments of the United States and Canada that they have signed two major international agreements to maintain and improve it. Public and private sectors have invested several billion dollars in water quality improvement and pollution control programs. Although certain types of pollutants are under better control than they were 20 years ago, the pervasive presence of toxic and hazardous substances at many locations in the basin has so far defied a comprehensive solution. Through the U.S. - Canada Great Lakes Water Quality Agreement of 1978 and the Toxic Substances Control Agreement among the Great Lakes states and the province of Ontario, as well as other public and private efforts, some progress has been achieved. However, Michigan citizens are still concerned about the discovery of



contaminated water supplies, fisheries and public access at "areas of concern" in 10 coastal communities.

Although the Great Lakes seem inexhaustible and, indeed, supply water for drinking, manufacturing, agricultural and recreational purposes for the basin's 50

million residents, water quantity has also become a highly visible issue. Governors of the Great Lakes states and prime ministers of two Canadian provinces have signed a Charter of Principles for Great Lakes Management in an attempt to address public concern about the possibility of diversions that would take water from the Great Lakes for use outside the basin.

Shoreline management, particularly in the current high water situation, has also become a significant issue. Michigan's Coastal Zone Management Program, aid from the Corps of Engineers and local zoning/building regulations, as well as tax assessment on shoreline property, have direct impacts on coastal property owners and implications for coastal management.

Great Lakes issues can, and often do, cross traditional community

communication lines. Sea Grant Extension has, on numerous occasions, brought together those that have a common interest in these issues but who may not have communicated with each other previously.

For example, Sea Grant Extension participated with the Cooperative Extension Service's Public Affairs Leadership (PAL) group in organizing a statewide conference about water. The PAL group consists of citizens recruited by Extension home economists to develop their skills in dealing with government and public affairs. Although the PAL program has officially ended, the group held a reunion in May 1986 at Cheboygan at which it offered other citizens information about Michigan's water issues and some practical techniques for dealing with them.

Sea Grant Extension agents helped plan the event, recruited speakers, provided materials and gave presentations. One hundred fifty attendees gained a greater understanding of their relationship to the Great Lakes and its management system and learned practices that they can use at home to improve water quality and quantity management. Sea Grant Extension agents Kinnunen, McKinney and Peterson and others who planned the conference were recognized by the Epsilon Sigma Phi (Cooperative Extension Service) fraternity with a state-level team award.

Michigan legislators and their aides have come to rely upon Sea Grant Extension as

a credible source of information about Great Lakes management issues. A state senator appointed by the governor to the Great Lakes Commission sought a briefing from Sea Grant staff members in her district about the issues she might encounter. She continues to seek Sea Grant Extension input on concerns in her district, praising Sea Grant Extension's objective information as essential to her effective decision making. Federal legislative staff members have likewise consulted with agents on a regular basis about Great Lakes issues. Agents have organized tours to acquaint both elected officials and their staffs with these matters, and several have provided technical input on Great Lakes issues to the Great Lakes and Water Resources Planning Commission.

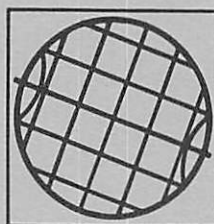
Because of their expertise and informed perspective, agents have spoken to many community organizations, service clubs and special interest groups in their districts, as well as at meetings of state-level organizations, about Sea Grant and Great Lakes issues.

Two Sea Grant Extension agents attended the second World Conference on Large Lakes in May 1986 on Mackinac Island. This event focused on the problem of toxic contamination of the world's major water resources, including the Great Lakes. The Sea Grant Extension communicator videotaped interviews with numerous participants for a 30-minute documentary program about the subject.

INTERNATIONAL OUTREACH

The world is shrinking, figuratively, because of communication technology and corresponding information and educational exchange. Students travel great distances to take advantage of such opportunities in other countries, and teachers go abroad to share their knowledge with societies eager to benefit from expertise developed in major educational centers. MSU has for many years promoted these exchanges, and the Cooperative Extension Service has trained agents and campus specialists to share their knowledge with international audiences.

Many of the concepts that Sea Grant Extension has developed and promoted are suitable for such outreach. In June 1985, two Sea Grant agents visited Auburn University's International Center for Aquaculture, where they met with various staff scientists and others interested in fisheries, including the Alabama-Mississippi Sea Grant staff. The agents' travel was part of the MSU Title



XII International Program's effort to expand understanding of aquaculture and agricultural programs for developing countries. Auburn's philosophy about farming systems based on pond culture has applications in Michigan as well as in many developing areas.

Ronald Kinnunen was part of a five-member team of scientists that traveled to Indonesia in early 1986 to work on a fisheries research planning project. The team developed a detailed five-year plan for staff research for the Faculty of Fisheries at Institut Pertanian Bogor on Bogor, West Java, the leading unit for fisheries education in the university system of the Republic of Indonesia. Kinnunen was the U.S. counterpart in fisheries Extension and developed a plan for transferring research results to the public and private sectors.

Kinnunen drafted a paper on procedures and equipment needs for a fish disease diagnostic laboratory that the Faculty of Fisheries is establishing. He also planned pesticide analysis comparisons of various fish stocks used in the Collaborative Research Support Program to see what effect, if any, the water conditioning system has on reducing pesticides in the water.

Kinnunen also wrote a script describing the Aquaculture Collaborative Research Support Program and worked with Republic of Indonesia Television personnel to produce two nationally televised documentaries on this project, one in Bahasa Indonesian and the other in

English. Several news segments, which focused on MSU and Institut Pertanian Bogor cooperation in aquaculture research, were also shown throughout the country.

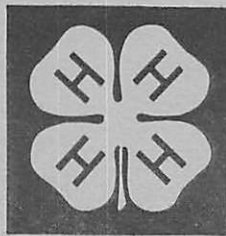
In 1986, The Fish Boat published an article by John McKinney about his 1984 Extension externship in Montserrat. In responding to a request for information from a New York commercial fisherman who had read the article, McKinney learned that several of the objectives of his externship are now being implemented. These include gearing up for an expanded fishery, acquiring better equipment for fish preservation, simplifying procedures for landing catches and improving existing dockage to accommodate larger vessels.

4-H YOUTH EDUCATION

Knowledge of the environment -- how it affects people and how people affect it -- is an essential part of overall life understanding. It is important that all Michigan citizens recognize the role the Great Lakes play in their lives. Sea Grant Extension attempts to bring this information to as many people as possible, with special efforts to reach young people as they are developing their perspectives.

Sea Grant Extension has concentrated its efforts to educate and inform future citizens and decision makers about the Great Lakes by building on the extensive 4-H youth program within the state. A half-time Sea Grant/4-H district Extension agent began work in 1985 and has prepared educational materials, conducted events and served as a leader in the 4-H Great Lakes Natural Resources Camp.

This person is developing Great Lakes material for 4-H and school programs in rural areas of the state and has prepared original curriculum units on sand dune formation, ponds and the effects of the Great Lakes on Michigan's weather. In response to ignorance about the Great Lakes demonstrated by seventh graders on a field trip, the agent is creating a very



simple introduction to the Great Lakes watershed concept, titling it "The Great Lakes Connection."

The agent has also adapted Ohio Sea Grant materials on changing lake levels, knowing ropes and knots, shipping on the Great Lakes, an oil spill simulation

exercise and the Great Lakes Triangle, incorporating a Great Lakes and/or Michigan perspective. She is editing the draft water quality curriculum developed by UM Sea Grant researchers several years ago and is distributing copies of the Fisheries in Transition curriculum produced by Sea Grant.

4-H clubs and public school classrooms in Muskegon, Ottawa and Allegan counties are using the materials. Through these lessons, a high school shop teacher has even helped students building all-terrain vehicles become more sensitive to the fragile nature of sand dunes. The agent also developed a Marine Careers Forum for the Whitehall High School in 1986, in which several hundred students participated. She has also led several wetlands field trips, including the wetlands option at the 1986 4-H Exploration Days at

MSU, a three-day statewide campus event for teens and leaders.

Since 1983, the 4-H Great Lakes Natural Resources Camp at Beaver Island, Michigan, has attracted young people to its unique natural environment and learning experiences. The camp is primarily designed for youths ages 13 - 15, and the objectives of the program are:

- To provide a special incentive for 4-H'ers to become involved and excel in natural resources projects.
- To provide an exemplary experience for selected youths on how to enjoy, teach about and provide leadership in natural resources, especially the aquatic environment and the Great Lakes.
- To promote increased involvement of 4-H'ers in the natural resources and environmental education (NREE) programs at the county level.
- To strengthen Sea Grant and 4-H programs at the county level.
- To increase the participants' awareness, appreciation and understanding of natural resources ecology and management.

The weeklong camp has involved approximately 50 young people each year. Participating teens have demonstrated an interest in natural resources, either within their 4-H clubs or through school work and projects, and have shown leadership ability. Professional and support staffs, including Sea Grant Extension agents and specialists, bring the total to nearly 75 persons. Instruction has included the

following topics: wetlands, wildlife, plants, entomology and Great Lakes ecology-- measuring water clarity, observing littoral drift, calculating wave horsepower, reading beach sand movement, predicting weather and collecting biota samples from the lake.

Pre-camp and post-camp evaluations of campers' resource-related knowledge and attitudes showed overall gains in both areas. Campers showed an 11 percent increase in knowledge and a 14 percent increase in favorable attitudes toward Michigan's natural resources. 1985 participants gave the camp an overall rating of 4.0 (5 = excellent, 1 = poor). Campers are expected to share what they have learned with their local 4-H clubs, and many have asked the Sea Grant Extension/4-H agent how the Great Lakes activities can be used "back home". Several have used information from the camp to carry out fair projects, too.

Volunteer 4-H leaders expressed interest in having an experience similar to that provided by the teen camp, and in 1986, Sea Grant Extension and the 4-H Natural Resources and Environmental Education Developmental Committee initiated a condensed version. Leaders participated in the same instructional sessions as the campers and observed and practiced NREE teaching techniques. Shorter sessions emphasized using Sea Grant and other resource materials and organizing community resources to initiate or expand programs.

With assistance from campers and leaders, the Sea Grant Extension/4-H agent developed a newsletter that is distributed to participants in both the camper and leader training events to maintain their interest and support. Other communication activities publicizing the Great Lakes Natural Resources Camp have included articles in Sea Grant's newsletter, Upwellings, the CES Communicator, and Extension Review (the national magazine of the CES), and a television feature report.

Sea Grant Extension helped establish a memorial fund in John Judd's honor through the Michigan 4-H Foundation. This will finance scholarships (named for him) for participants in the Great Lakes Natural Resources Camp and leader training, both of which he supported.

Several Sea Grant Extension district agents have worked with both 4-H and other youth groups to develop their

understanding of and appreciation for Great Lakes resources and to guide their decision-making processes. One agent has cooperated with the Soil Conservation Service's field days in Leelanau and Antrim counties, where several hundred sixth graders are exposed to a variety of natural resources experiences, including Great Lakes activities. He also provides Great Lakes input to Charlevoix County's 4-H camp. One hundred fifty South Haven high school students participated in a Lake Michigan Day workshop about contaminants in fish presented by another agent. Still others have led sessions on aquatic entomology, wetlands and general water resources topics. In 1986, a Sea Grant Extension agent arranged for the photo exhibit on NOAA's Lake Superior Submersible Research Program to visit various locations in the Upper Peninsula, where programs about the research attracted hundreds of young people and adults.

CONCLUSION

At the end of Sea Grant Extension's first decade, it is possible to see the program developing a maturity that will be essential as it faces new demands of the Great Lakes. It is difficult to predict precisely what Great Lakes challenges and opportunities will confront Michigan in the next decade. Perhaps by 1996, fluctuating water levels will seem insignificant compared with the need for adequate disposal facilities for contaminated sediments. Perhaps the Great Lakes cruise industry will need increased docking

facilities, or the "super" salmon currently being researched will require a greatly enhanced forage base of the once-maligned alewife. Whatever the challenge, Sea Grant Extension agents and other staff members have the expertise, well-honed educational and technical skills, established contacts, knowledge of human and financial resources, and imagination required to continue helping Michigan residents put Great Lakes knowledge to work.