Michigan**Science**

A publication of the Mackinac Center for Public Policy

Contributors To This Issue

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Diane S. Katz is director of science, environment and technology policy with the Mackinac Center for Public Policy. She has been published by The Wall Street Journal, National Review, The Weekly Standard magazine, Reason magazine and a variety of Michigan newspapers. Prior to joining the Center, Ms. Katz served for nine years as a member of The Detroit News editorial board, specializing in science, the environment, telecommunications, technology and the auto industry. Her work has won numerous awards, including top honors from the Michigan Press Association in 1994, 1996, 1997 and 1998.

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Bruce Edward Walker is editor of MichiganScience. He has more than 20 years of writing and editing experience in a variety of publishing areas, including reference books, newspapers, magazines, media relations and corporate speeches. Mr. Walker has specialized in water rights, land use, alternative-technology vehicles and other environmental issues.

Henry Payne is the editorial cartoonist for The Detroit News. His work is syndicated to an additional 60 newspapers nationwide via United Feature Syndicate. Mr. Payne has been a runner-up for the Pulitzer Prize. A writer as well as an artist, his articles have appeared in The Wall Street Journal, The Weekly Standard magazine, National Review and Reason magazine.

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ON THE COVER
Michigan forests are thriving, but two tree species are under siege from emerald ash borers and beech scales.

By The Numbers

Beyond propaganda and rhetoric, numbers tell the real story

THE U.S. CENTERS FOR DISEASE CONTROL and Prevention tests blood and urine from thousands of people nationwide to measure the presence of 148 chemicals. According to the latest findings, the percentage of children (aged 1-5 years) with elevated blood levels of lead has declined from 88.2 percent in 1976-1980 to 1.6 percent in 1999-2002. Blood levels of dioxins, furans and PCBs have decreased by more than 80 percent since the 1980s. As the report notes, the mere presence of a chemical in the blood does not portend illness or disease. The toxicity of chemicals, both natural and synthetic, varies dramatically. For more information go to http://www.cdc.gov/exposurereport/report.htm.

THE 2007 BUDGET of the U.S. Agency for International Development includes $20 million for spraying DDT to control malaria in Third World countries. All told, the agency is slated to receive $1.2 billion in U.S. aid for malaria control over the next five years. The World Health Organization in 2006 ended its moratorium on DDT and now advocates use of the insecticide to combat malaria, yellow fever and dengue fever. WHO halted the use of DDT in the 1980s, and turned to other insecticides and bed nets to control malaria-carrying mosquitoes that infect 500 million people annually, and kill 1 million. Spraying DDT on walls twice a year discourages the entry of 90 percent of mosquitoes. The chemical either kills the remaining 10 percent or prevents them from biting. Two years of DDT use in Zambia reduced malaria infections and deaths by 75 percent. South Africa began indoor spraying of DDT in 2001, and has reduced the number of malaria cases by 80 percent (from 60,000 to 5,000) and the number of deaths from 425 to 50. For more information go to http://www.who.int/mediacentre/news/releases/2006/pr50/en/.

CHINA WILL SURPASS THE UNITED STATES in the production of so-called greenhouse gases in 2009 — a decade earlier than previously thought, according to the Sydney Morning Herald. Coal-fired energy plants account for more than 70 percent of the country's energy consumption, according to the paper. China's National Bureau of Statistics reports that the country increased its use of fossil fuels by 9.3 percent in 2006 and, overall, has increased its demand for coal by 18 percent. To keep up with the country's energy demands, China opens a new coal-generated plant every 10 days and plans to open another 2,200 plants by 2030. The U.S. Energy Information Administration Web site projects that China will require an additional 546 gigawatts of coal-fired capacity by 2030 to keep up with current levels of growth. For more information go to http://www.smh.com.au/news/environment/ill-wind-puts-climate-change-on-top-of-agenda/2007/03/09/1173166991682.html# and http://www.eia.doe.gov/oiaf/ieo/coal.html.

*Just the Facts

A Feb. 16 column in The Morning Sun, a Mt. Pleasant newspaper, declared that the scientific debate about global warming "is over." As proof of this assertion, columnist Eric Baerren cited the recently released summary of an upcoming report by the United Nation's Intergovernmental Panel on Climate Change. The only skeptics, according to Baerren, are "raving lunatics."

In fact, surveys of climate scientists have documented sharp disagreements regarding the extent, causes and consequences of global climate change. Moreover, the accuracy of the summary report cited by Baerren is under challenge as misrepresenting the actual content of the U.N. report.

The Morning Sun is not alone in characterizing the climate change debate as settled. Headlines in newspapers big and small have trumpeted similar claims following the release of the summary. However, what many have failed to note is the fact that the summary was a product of political negotiation among various government appointees rather than the conclusions of the scientific community. Nor has it been widely reported that the summary of findings differs significantly from previous reports, indicating considerable uncertainty about the status of climate change.

A pre-publication review of the actual report by the Center for Science and Public Policy notes, for example, that the U.N. panel has cut by half its previous prediction of the rise in sea levels. Likewise, the new report indicates that an earlier assessment of human influence on climate change was dramatically overstated — in excess of 30 percent. Such revisions are a common feature of the "modeling" upon which most climate change theory is based.

The inherent uncertainty of climate models was underscored in a recent Wall Street Journal column by Philip Stott, professor emeritus of biogeography at the University of London. According to Stott, "The inconvenient truth remains that climate is the most complex, coupled, nonlinear, chaotic system known. Models that strive to incorporate everything, from aerosols to vegetation and volcanoes to ocean currents, may look convincing, but the error range associated with each additional factor results in near-total uncertainty."

With respect to the supposed "consensus" about climate change, German environmental scientists Dennis Bray and Hans von Storch found none in their 1996 and 2003 surveys of more than 530 climate scientists from 27 countries. Only 2 percent of the climate scientists surveyed said they "strongly agree" that the models used to predict climate change are accurate, according to a report of the survey by James M. Taylor, editor of Environment & Climate News. A majority of respondents said they do not believe the current state of knowledge is adequate to provide reasonable predictions of climate variability over 100-year time periods, and more respondents "strongly disagree" than "strongly agree" that climate change is caused by humans, Taylor reported.

The Environment & Climate News analysis is available at www.heartland.org/article.cfm?artID=20732.

Doing the math on corn-based ethanol

1. **The energy content of one gallon of ethanol is equal to:**
   A. 1.25 gallons of gasoline.
   B. 0.90 gallons of gasoline.
   C. 0.75 gallons of gasoline.
   D. 0.65 gallons of gasoline.

2. **How much land area is needed to grow one bushel of corn?**
   A. 25 square feet.
   B. 125 square feet.
   C. 250 square feet.
   D. 330 square feet.

3. **How much ethanol can be produced from one bushel of corn?**
   A. 25 gallons.
   B. 15.15 gallons.
   C. 2.66 gallons.
   D. 5.37 gallons.

4. **How much water is needed to produce one gallon of corn-based ethanol?**
   A. 5 to 10 gallons of water.
   B. 15 to 20 gallons of water.
   C. 25 to 30 gallons of water.
   D. 30 to 37 gallons of water.

5. **What was the energy equivalent of gasoline (GGE) required to yield the 1.38 billion gallons of ethanol produced in the United States in 2002?**
   A. 1.44 billion GGE.
   B. 500,000 GGE.
   C. 1.25 million GGE.
   D. 575 million GGE.

Figures from professor Tadeusz W. Patzek, civil and environmental engineering, University of California, Lawrence Berkeley National Laboratory. For more information go to http://pangea.stanford.edu/ESYS/Energy%20seminars/patzek_ethanol.pdf.

Answers: 1. D (0.65 gallons of gasoline); 2. D (330 square feet); 3. C. (2.66 gallons); 4. D (30 to 37 gallons of water); 5. A. (1.44 billion gallons GGE).

Field Trips

Area science museums host special programs of interest to budding scientists and their families

Dinosaurs: Giants of Patagonia

Paleontologist Rodolfo Coria hosts this IMAX film on two of South America's largest dinosaurs: the plant-eating Argentinosaur and the bipedal carnivore Giganotosaur. Computer-generated cinematography brings both creatures to life in a film that also offers theories about how these enormous creatures became extinct.

Opens spring 2007, The New Detroit Science Center, 5020 John R St., Detroit, 313-577-8400; Center is open Monday through Friday 9 a.m.–3 p.m.; Saturday 10:30 a.m.–6 p.m.; and Sunday noon–6 p.m.

For more information go to http://www.detroitsciencecenter.org/theaters/IMAX.htm.

Eighth Annual Science of BIG Machines

Heavy equipment used in the construction industry — backhoes, loaders, cranes and dump trucks — and the simple machines used to operate them are featured indoors and outdoors at COSI Toledo and Festival Park. Operators of the big machines will provide hands-on experience.

June 10-17, COSI Toledo, 1 Discovery Way, Toledo, Ohio, 419-244-2674. Museum is open Tuesday through Saturday 10 a.m.–5 p.m., and Sundays noon–5 p.m. Cost: $9 adults (fathers free on Father's Day); $8 seniors; $7 kids; free for children aged 2 and under.

For more information go to http://www.cositoledo.org/calendar/index.htm.

On the Air!

The history and future of radio and television broadcasting are part of Impression 5 Science Center's new permanent exhibit. In addition to a timeline of radio technology, the exhibit features a radio booth where visitors can participate in a live broadcast within the museum; perform their own weather report with maps and a green screen; and view high-definition NASA images in the HDTV surround-sound theater.

Impression 5 Museum, 200 Museum Drive, Lansing, 517-485-8116. Museum is open Monday through Saturday 10 a.m.–5 p.m.; Sunday 1 p.m.–5 p.m.

For more information go to http://www.impression5.org.

ESSAY CONTEST!
$500
for 500 words

Star Trek, Star Wars

and most every other deep space odyssey feature rocket engines that roar in space.*

*SCIENTIFIC OR NOT?

References to science — both accurate and otherwise — permeate popular culture.

Show us what you know! MichiganScience will award a scholarship prize of $500 to the student (in grades six through 12) whose 500-word essay best explores a scientific fact or exposes a scientific fallacy in a book, movie, song or other pop culture medium. Runners-up will receive gift cards good for a selection of thousands of products from Edmund Scientific, a premier supplier of science kits and other educational materials.

Deadlines: The deadline for entries is June 1, 2007. The entry may be submitted in an email or a Word document to walker@mackinac.org no later than Friday, June 1, 2007. Hard copies may be mailed to 140 W. Main St., P.O. Box 568 Midland, MI 48640. Winners will be announced Aug. 1, 2007. The winning essay will be published in the Fall 2007 issue of MichiganScience. Submission grants to MichiganScience the right to reprint the essay, the name and the photograph of winners.

Requirements: All essays must be original, legible and no more than 500 words in length. Each entry must include the following information:

Name _____

Street address _____

State _____ Zip _____

Phone _____

School _____ Grade _____

Age _____

I heard about this contest from _____

MichiganScience respects your privacy. All contact information will be used solely to notify winners and verify entry status.

Sponsored by MichiganScience and Edmund Scientific / MichiganScienceOnline.org

AGAINST THE GRAIN:

TREE ROGUES STRIKE AMID VAST FOREST GROWTH

By Donald I. Dickman

Over the past 50 years, Michigan forests have rebounded from unrestrained logging, massive forest fires and clearing for agriculture. Between 1978 and 1997, the state gained 538,000 acres of forest due to tree growth on open fields and former cropland.[1] Timber volumes have tripled since the 1950s. Despite this remarkable revival, the state's tree stock isn't quite out of the woods, so to speak. A variety of pests and diseases continues to threaten several of Michigan's most distinct tree species. »

1 Michigan Department of Natural Resources.

Not only has Michigan gained forest acreage, but the variety of trees growing in the state has expanded. An inventory by the Michigan Department of Natural Resources found 75 tree species and a substantial number of subspecies.

Insects and diseases evolve with forests, and some may even be beneficial for some species of trees. Pests cull weak and old trees, serving as nature's cleanup crew. Outbreaks of destructive pests such as the forest tent caterpillar and jack pine budworm do occur, but they typically subside due to natural controls such as birds and other predators. Non-native pests (also known as "exotics") are different. They have not evolved with native forest species, so natural controls may not exist. Consequently, they can threaten entire species of trees.

The proliferation of trade has dramatically increased the volume of international shipping — and the numbers of hitchhiking pests. The U.S. Department of Agriculture inspects less than 5 percent of containers brought to American shores.

Dutch elm disease, an Asian fungus, was transported to America in 1930 via wooden crates from Europe. Spread by the European elm bark beetle, Dutch elm disease hit Michigan from the east in about 1950. Virtually every large elm in the state succumbed. Streets that once were shaded by grand arches of foliage were laid bare by the epidemic. Elm trees still exist, but only because they typically grow to reproductive age before they die.

The dreaded gypsy moth first reared its ugly head in Michigan during the mid-1950s, although it was originally loosed in Massachusetts in the 1800s. The moth was brought to North America by professor L. Trouvelot, who wanted to breed a hardy silkworm. Some of the moths escaped after a specimen jar fell from the professor's open window, and they multiplied in a vacant lot adjacent to his home in Medford, Mass. Trouvelot notified townspeople about the accident, but no action was taken.[2]

The hairy, leaf-eating caterpillars, which are native to Europe, Asia and North Africa, descend on fruit and shade trees — oak is their favorite — and defoliate every limb in a matter of days. The worst outbreaks in Michigan occurred in the 1980s and 1990s. In recent years, a variety of birds, mice and insects has added gypsy moths to their diets, helping to manage its numbers.

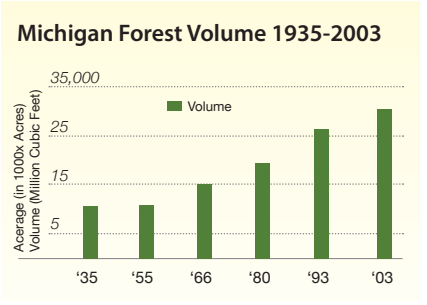
The newest forest rogues are the emerald ash borer and beech bark disease,[3] which are proving to be just as deadly as their predecessors. Millions of trees in Michigan have died in the past seven years, and the end of the epidemic is nowhere in sight.

The emerald ash borer, an Asian beetle, has killed some 15 million ash trees in Michigan. Hardest hit has been southeastern Michigan, where the "Green Menace" was discovered in 2002. The emerald ash borer is so named for its green color and because the larvae bore into the bark of the ash tree. They feed on the soft inner wood and the phloem, the tissue that transports sugar to the roots. So starved, the roots fail to produce nutrients to feed the tree, which eventually dies. The beetle attacks all species of ash, but other hardwood trees are immune.

2 Wisconsin Department of Natural Resources.

3 For more information on these and other pests, go to (http://web2.msue.msu.edu/bulletins/intro.cfm). A number of bulletins are listed that can be purchased or downloaded to a computer as pdf files. Emerald Ash Borer in Michigan, (http://www.emeraldashborer.info/michiganinfo.cfm) is another informative Web site.

The bark of trees infected with beech scales, which transmit beech bark disease, take on a whitewashed look.



Source: State of Michigan

The number of trees in Michigan has increased nearly three-fold in 70 years.

Virtually all ashes are gone in some communities, including Farmington Hills, Auburn Hills and Ann Arbor. The economic costs of the infestation exceed tens of millions of dollars, and could go much higher. Michigan State University researchers and Genesee County Parks and Recreation Commission staff announced plans in April of this year to treat 70 ash borer infested trees in Richfield Township's Wolverine Campground this summer. Scientists will test neonicotinoids (pesticides commonly used for controlling lawn grubs) on ash borers by injecting the chemical into tree trunks and soil surrounding the infested trees. It is hoped that further research conducted in Genesee County this summer will reveal information on the ash borer's reproduction cycle.

Beech bark disease is caused by the beech scale, a sucking insect introduced into eastern Canada in 1890. The beech scales feed on tree sap and spread pathogenic fungi (Nectria) that destroy the bark and leave the tree susceptible to invasion by other insects and fungi. "Beech snap" occurs when the weakened trunks are broken by a strong wind. The tiny scale covers itself with a white wax as protection from predators, leaving the trunk and branches of infected trees looking white-washed.

Thus far, serious beech bark infestations have occurred in the Michigan counties of Emmet, Grand Traverse, Leelanau, Mason, Manistee, Oceana and Wexford in the northwestern Lower Peninsula; and in Alger, Chippewa, Luce, Mackinac and Schoolcraft counties in the eastern Upper Peninsula. Old, large beech trees in these areas are dying at an alarming rate. There are so many dead beeches being cut in the U.P. that sawmills no longer accept them. The ecological consequences of the tree loss are yet unknown, but clearly the more than 40 species of birds and mammals that feed on beech nuts are experiencing lean times.

At present, containment of the beech scale and ash borer is the primary means of control. Dead or dying trees must be quickly felled and, if possible, sawn into lumber, chipped or burned. Transport of beech or ash logs and firewood beyond infested areas is prohibited, as is the transport of ash nursery stock out of quarantined areas. While some insecticide treatments against the ash borer are registered, the cost of widespread applications is prohibitive. The beech scale is particularly difficult to control with chemicals because their waxy outer layer serves as a protective barrier.[4]

Few beech or ash trees show a natural resistance to either pest; out of millions of trees, a handful may be resistant. The challenge is to determine whether they are biologically resistant or simply escaped infestation. Seeds and cuttings can be collected for testing and, if resistance is confirmed, replanting.

Michigan's forests are a tremendous natural resource, providing habitats for a wide variety of tree and animal species and scenic vistas for hiking and other recreational activities. Despite the expansion of tree species in Michigan's forests — and the growth of forest acreage — over the past several decades, a continued vigilance against insects and diseases afflicting our forests will be an ongoing concern. ■

The skeleton of a dead beech tree towers above young maple undergrowth in a UP forest, an all too common sight.

4 See MSU Extension Bulletin E-2955, Homeowner Guide to Emerald Ash Borer Treatments (2006) and MSU Extension Bulletin E-2746, Biology and Management of Beech Bark Disease (2005).

Compiled by Heidi Ray

Let's Go (Science) Camping

Michigan's budding scientists are well-served by a wide-range of summer science camps. The state's science museums offer camps that accommodate kindergarteners to high school seniors, with an array of subject matter, including astronomy, forensics, climatology, entomology, chemistry and physics. Many science camps also accommodate working parents by offering before- and aftercare.

Grade* or Age	Camp	Dates	Hours**	Member Fee	Non-member Fee
Ann Arbor Hands-On Museum, 220 E. Ann St., Ann Arbor, Mich. 48104 734.995.5439, http://www.aahom.org/programs/ss_camp.htm					
Gr. 1-2	Astronomy	June 25-29	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 1-2	Wild 'n' Crazy Weather	July 9-13	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 1-2	Trees 'n' Bugs	July 23-27	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 1-2	Dino-Mite Dinosaurs	July 30-Aug. 3	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 1-2	Up in the Air: Things That Fly!	Aug. 6-10	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 1-2	Playing With Your Food	Aug. 13-17	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 1-2	Good Vibrations: Sound and Music	Aug. 20-24	9 a.m.-11:30 a.m. or 1:30 p.m. -4 p.m.	$90	$100
Gr. 2-4	Science and Drama: It Matters!	June 18-22	9:30 a.m.-3:30 p.m.	$300	N/A
Cranbrook Institute of Science, 39221 Woodward Ave., PO Box 801, Bloomfield Hills, Mich. 48303 248-645-3210, http://science.cranbrook.edu/educational/scouts					
Ages 3-4	Little Explorer	June 14-15; June 21-22; July 12-13; July 26-27	9:30 a.m.-12 p.m.	$75	$60
Gr. K-1	Beginner Explorer I	June 11-13 or July 9-11 or Aug. 6-8	10 a.m.-3 p.m.	$130	$150
Gr. K-1	Beginner Explorer II	June 18-20 or July 23-25 or Aug. 13-15	10 a.m.-3 p.m.	$130	$150
Gr. 1-2	Science Explorer I	June 11-15 or Aug. 6-10	9:30 a.m.-4 p.m.	$270	$295
Gr. 1-2	Science Explorer II	June 18-22	9:30 a.m.-4 p.m.	$270	$295
Gr. 1-2	Science Explorer III	Aug. 13-17	9:30 a.m.-4 p.m.	$270	$295
Gr. 2-3	Science Explorer I	June 25-29 or July 16-20	9:30 a.m.-4 p.m.	$270	$295
Gr. 2-3	Science Explorer II	July 9-13	9:30 a.m.-4 p.m.	$270	$295
Gr. 3-4	Science Explorer I	July 30-Aug. 3	9:30 a.m.-4 p.m.	$270	$295
Gr. 3-4	Science Explorer II	July 23-27	9:30 a.m.-4 p.m.	$270	$295
Gr. 3-4	Ecology Explorer	July 16-20	9:30 a.m.-4 p.m.	$270	$295
Gr. 4-5	Astronomy Explorer	July 16-20	9:30 a.m.-4 p.m.	$270	$295
Gr. 4-5	Outdoor Explorer	July 9-13	9:30 a.m.-4 p.m. (This camp ends 8 a.m. Friday after Thursday overnight.)	$270	$295
Gr. 5-6	Physics Explorer	June 25-29	9:30 a.m.-4 p.m.	$270	$295
Gr. 6-8	Crime Scene Explorer	July 30-Aug. 3	9:30 a.m.-4 p.m.	$295	$325
Gr. 6-8	Advanced Outdoor Explorer	July 23-27	9:30 a.m.-4 p.m. (This camp ends 9 a.m. Friday after Thursday overnight.)	$270	$295
Gr. 8-9	Expert Explorer Days Geology (July 30); Archaeology (July 31); Paleontology (Aug. 1); Astronomy (Aug. 2); Anthropology (Aug. 3)	July 30-Aug. 3	9:30 a.m.-4 p.m.	$100/day; $400/wk	$125/day; $500/wk
Detroit Science Center, 5020 John R St., Detroit, Mich. 48202 313-577-8400, option 5 , http://www.detroitsciencecenter.org/camp/SummerCamp2006.htm					
Gr. 1-3	Science Spectacular	June 18-22 or July 23-27	9 a.m. - 4 p.m.	$175	$190
Gr. 1-3	Construction Junction	June 25-29 or July 30-Aug. 3	9 a.m. - 4 p.m.	$175	$190
Gr. 1-3	Surfing the Solar System	July 9-13 or Aug. 6-10	9 a.m. - 4 p.m.	$175	$190
Gr. 1-3	Larger than Life: Explore Your World!	July 16-20	9 a.m. - 4 p.m.	$175	$190
Gr. 4-6	Science Spectacular	June 18-22 or July 23-27	9 a.m. - 4 p.m.	$175	$190
Gr. 4-6	Inventor Invasion	June 25-29 or July 30-Aug. 3	9 a.m. - 4 p.m.	$175	$190
Gr. 4-6	Missing Maple Mystery	July 9-13 or Aug. 6-10	9 a.m. - 4 p.m.	$175	$190
Gr. 4-6	Doctor Discovery	July 16-20	9 a.m. - 4 p.m.	$175	$190

*Students should be entering the grades listed. **Many camps offer extended hours for an additional fee. Call the host organization for details.

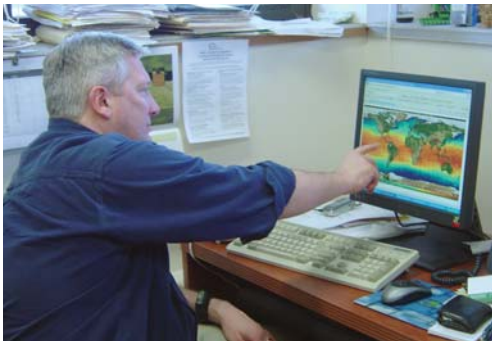
Grade* or Age	Camp	Dates	Hours**	Member Fee	Non-member Fee
Exhibit Museum of Natural History , University of Michigan, 1109 Geddes Ave., Ann Arbor, Mich. 48109 Sarah Thompson, Camp Explorations Director, 734-647-6421, camp_explorations@umich.edu **• http://www.lsa.umich.edu/exhibitmuseum/publicprogrms/special_programs/summer_camp/**					
Ages 6-11	Camp Explorations: Space Adventure	June 25-July 6 (no camp July 4)	1 p.m.-4:30 p.m.	$275/2 wks; $165/1 wk	N/A
Ages 6-11	Camp Explorations: Ecology Adventure	July 9-20	1 p.m.-4:30 p.m.	$295/2 wks; $165/1 wk	N/A
Ages 6-11	Camp Explorations: Paleo Adventure	July 23-Aug. 3	1 p.m.-4:30 p.m.	$295/2 wks; $165/1 wk	N/A
Ages 6-11	Camp Explorations: Science Sampler	Aug. 6-10	1 p.m.-4:30 p.m.	$150	N/A
Ages 8-12	Camp Explorations Morning	June 25-July 6 (no camp July 4)	8:30 a.m. -12 p.m.	$225/2 wks; $165/1 wk	N/A
Ages 8-12	Camp Explorations Morning	July 9-20	8:30 a.m. -12 p.m.	$245/2 wks; $165/1 wk	N/A
Ages 8-12	Camp Explorations Morning	July 23-Aug. 3	8:30 a.m. -12 p.m.	$245/2 wks; $165/1 wk	N/A
Ages 8-12	Camp Explorations Morning	Aug. 6-10	8:30 a.m. -12 p.m.	$125	N/A
Impression 5 Science Center, 200 Museum Dr., Lansing, Mich. 48933 517-485-8116, ext. 32, http://www.impression5.org/mos/view/Group_Visits/Group_Visits/LABS_Science_Camps					
Gr. K-2	Microscope World	June 11	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Trash-It! Paper	June 12	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Bugs! Bugs! Bugs!	June 13	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Solar Blast	June 14	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Sensory Street	June 15	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Combo: Microscope, Trash, Bugs, Solar, Sensory	June 11-15	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Fizz Wiz Kidz	June 18-22	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Zaptastic Kids	June 25-29	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Tye-Dye Fun	July 2-3	9 a.m. - 4 p.m.	$90	$110
Gr. K-2	Fairytale Science	July 5-6	9 a.m. - 4 p.m.	$90	$100
Gr. K-2	Combo: Tye-Dye, Fairy Tale	July 2-3 and July 5-6	9 a.m. - 4 p.m.	$170	$200
Gr. K-2	Moon Walkers	July 9-13	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Blood & Guts	July 16-20	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Fizz Wiz Kidz	July 23-27	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	DinoMania	July 30-Aug. 6	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Nature Explorer	Aug. 6-10	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Science of Art	Aug. 13-17	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Kitchen Chemistry	Aug. 20-24	9 a.m. - 4 p.m.	$180	$220
Gr. K-2	Ultimate Slime Bash	Aug. 27	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Splash Science	Aug. 28	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Rock Hound	Aug. 29	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Blasting Sound	Aug. 30	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Bubble Bash	Aug. 31	9 a.m. - 4 p.m.	$45	$55
Gr. K-2	Combo: Slime, Splash, Rock, Blasting, Bubble	Aug. 27-31	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Microscope World	June 11	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Trash-It! Paper	June 12	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Bugs! Bugs! Bugs!	June 13	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Solar Blast	June 14	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Grossology	June 15	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Combo: Microscope, Trash, Bugs, Solar, Grossology	June 11-15	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Forensics	June 18-22	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Techno City	June 25-29	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Tye-Dye Fun	July 2-3	9 a.m. - 4 p.m.	$90	$110
Gr. 3-5	Rocket Builders	July 5-6	9 a.m. - 4 p.m.	$90	$100
Gr. 3-5	Combo: Tye-Dye, Rocket	July 2-3 and July 5-6	9 a.m. - 4 p.m.	$170	$200
Gr. 3-5	Comet Kidz	July 9-13	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Green Thumbs	July 16-20	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Treasure Hunter	July 23-27	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Krazy Chemist	July 30-Aug. 6	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Forensics	Aug. 6-10	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Movie Science	Aug. 13-17	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Mythbuster Science	Aug. 20-24	9 a.m. - 4 p.m.	$180	$220
Gr. 3-5	Ultimate Slime Bash	Aug. 27	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Trebuchet Challenge	Aug. 28	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Rock Hound	Aug. 29	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Science Behind Magic	Aug. 30	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Medieval Science	Aug. 31	9 a.m. - 4 p.m.	$45	$55
Gr. 3-5	Combo: Slime, Trebuchet, Rock, Magic, Medieval	Aug. 27-31	9 a.m. - 4 p.m.	$180	$220
Gr. 6-8	Robotics	June 25-29	9 a.m. - 4 p.m.	$180	$220
Gr. 6-8	Advanced Techno City	July 9-13	9 a.m. - 4 p.m.	$180	$220
Gr. 6-8	Advanced Forensics	July 30-Aug. 6	9 a.m. - 4 p.m.	$180	$220

TAKING MICHIGAN'S TEMPERATURE

AN INTERVIEW WITH MICHIGAN'S OFFICIAL CLIMATOLOGIST

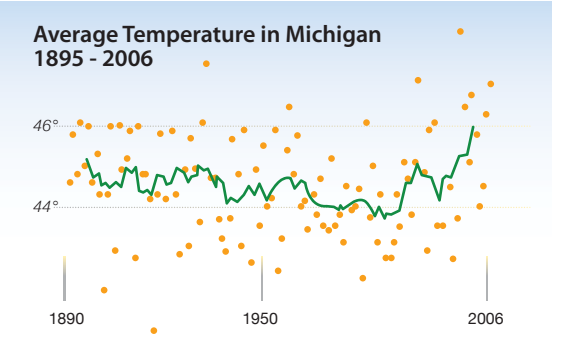
In the face of a public debate that's generating more heat than light, MichiganScience sat down with **Jeffrey A. Andresen** to discuss Michigan's climate history

By Bruce Edward Walker


JEFFREY ANDRESEN HAS BEEN THE OFFICIAL state climatologist since 2001. Operating from within Michigan State University's Department of Geography, the state climatologist conducts research, disseminates weather and climate information to the public, and administers the Michigan Automated Weather Network, which records weather data from 48 monitors statewide.

Real-time weather information from the network is available online at www.agweather.geo.msu.edu/.



MichiganScience: What can you tell us about the history of climate events in Michigan?

Dr. Andresen: In terms of the climate in the geological time frame — thousands to millions of years before present — there is relatively little known other than that the climate has varied dramatically here. Michigan has experienced periods of glaciations, sheets of ice, as recently as 15,000 years ago, and there have also been periods of relatively warm, tropical-type climate.

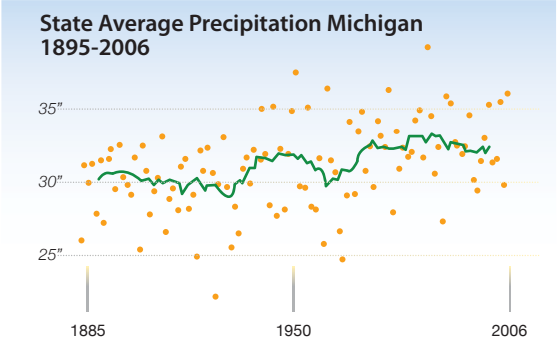
MichiganScience: What do you use to determine climate patterns?

Dr. Andresen: Prior to the initial use of weather instruments about 200 years ago, one must use so-called paleoclimate records, such as ice cores, sediment cores, pollen counts and tree ring patterns. For many of these records, you need a reference series that you believe in so that you can calibrate what you see in a tree ring or in concentrations of pollen. I have colleagues who work with sand dunes and sediment cores from ponds and lakes. They've been able to piece together some idea of past climate in the state, but it's very, very sketchy other than knowing that there have been periods of relative difference. The only thing we know with a lot of confidence is that there have been wide swings from one extreme to another and everything in between.

Our state stone, the Petoskey, is fossilized coral. It doesn't seem right for coral to be present in Michigan because coral requires a warm, saltwater-type environment. The Petoskey dates from the Devonian Period of the Paleozoic Era approximately 100 to 400 million years ago. The theory is that there was a very large and shallow, very warm and salty water body in the general vicinity that supported this kind of life. So, the conclusion is that the climate has been very, very different.

MichiganScience: How wide has the fluctuation been between warm and cold over the past 15,000 years?

Dr. Andresen: That's difficult to say. Between the end of the last glaciation and the present, one has to believe climate has warmed several degrees Celsius. But that's a guess. I don't think I've ever seen anyone put specific numbers or have estimates on the temperatures, but it is safe to assume that the climate was significantly colder than it is now.



MichiganScience: What about the period of relative warming during the Middle Ages? Is there any data to suggest that had any impact on Michigan's climate?

Dr. Andresen: We have relatively little data from this period.

There are some stories relative to the Vikings in the North Atlantic and the colonization of Greenland. The Vikings colonized many areas of the North Atlantic region beginning in the 7th and 8th centuries, which was a relatively warm period in at least this part of the world. As it warmed up, their agriculture-based food production system worked even in more severe Northern climates. They spread out to the British Isles, Iceland, Greenland and even to North America. There's a lot of good evidence on the extensive colonies they built in Greenland. Greenland, at that point in time, between 1100 and 1300, was warmer — certainly more than it has been since. It allowed them to take some of their agricultural system, including sheep, goats and dairy cattle from Scandinavia and other parts of Europe. Then the climate began to cool down again. The Norse were agrarians, while the Inuit natives fished and hunted. When the Norse could not produce fodder for their animals, they essentially just disappeared from those parts of the world. The records that were kept by the Norse just basically stopped.

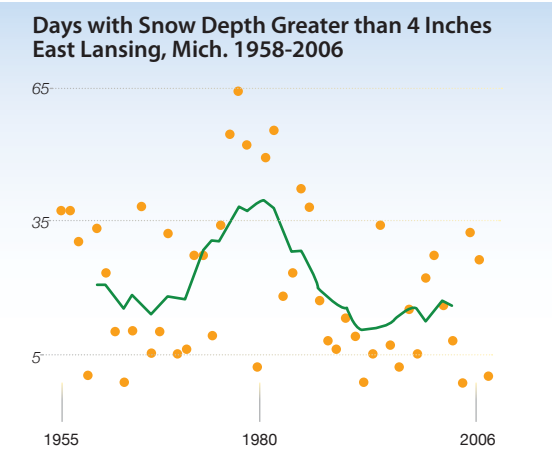
MichiganScience: Would it be safe to surmise that the same warming period in Greenland also impacted North America?
Dr. Andresen: Perhaps. Sometimes climate in different regions behaves independently. But, at least in the North Atlantic, it's fairly widely thought, at least in that part of the world between 900 and 1200, that those were relatively warm centuries. After all, the Norse called Labrador "the garden of paradise for the world." Given the evidence we do have, I'd say there've been some very significant swings. In the last 1,000 years, there's much more confidence.

MichiganScience: How sudden was this cooling following the warmer temperatures after the 1300s?
Dr. Andresen: Probably between 100 and 150 years.

MichiganScience: That seems pretty rapid for such a significant change.
Dr. Andresen: It is. One of the ironic aspects of the recent warm up and melting of glacial ice in this part of the world is the realization that the remnants of a lot of these settlements and areas that were colonized are visible again for the first time in centuries. There were several thousand Europeans living on the southwest and southeast coasts of Greenland at the beginning of the last millenium.

MichiganScience: Isn't the period following the warming in the Middle Ages called the "Little Ice Age"?
Dr. Andresen: Yes, and the beginning of that was what doomed the Norse colonies in Greenland. Europe was very cold for a long time, up until the 1870s, which was the end of the Little Ice Age.

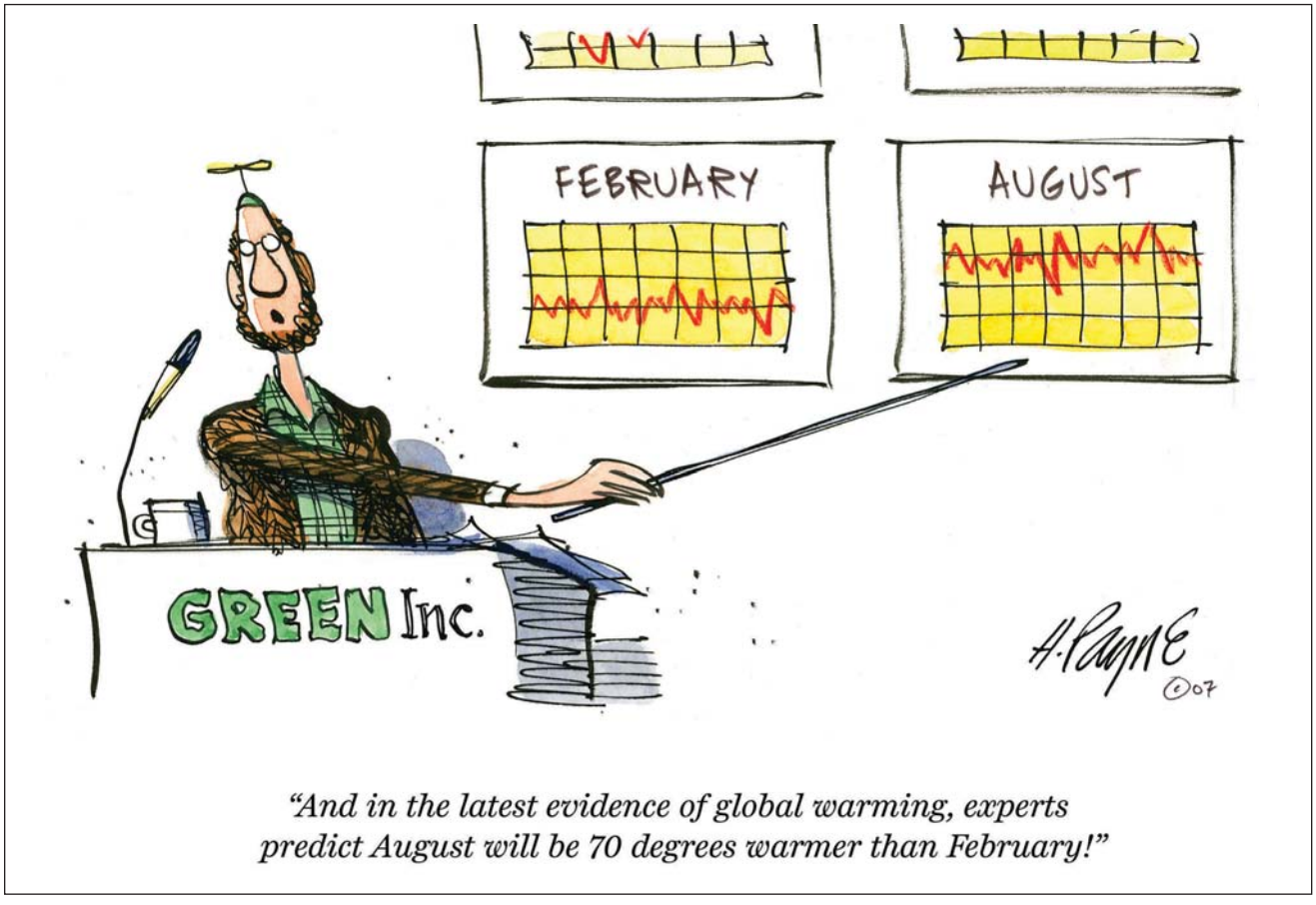
MichiganScience: What caused the climate shift?
Dr. Andresen: It's difficult to say. Climatologists look at the global ocean conveyor belt — sometimes referred to as the thermohaline — and the movement of the Gulf Stream. That's a key to climate in the North Atlantic. The Gulf Stream is one of the major ways the atmosphere and ocean move excess heat from the lower latitudes up into the Arctic and the Northern Hemisphere. Given that heat transport, Northern and Western Europe are much warmer climatologically than they would be otherwise. We know for a fact that at different times in Earth's history, the Gulf Stream — instead of moving



northeast from tropical sections of the Western Atlantic up into the Arctic — veered more directly east toward Iberia and northwest Africa. And when that happens, it cuts off heat to the North Atlantic and it can trigger the onset of glaciations in areas such as Greenland, Northeastern North America and Scandinavia.

MichiganScience: What other factors caused these climate shifts?
Dr. Andresen: There are three minor but still important imperfections of the Earth's elliptical orbit. A mathematician by the name of Milutan Milankovich postulated that each of these factors had cycles that lasted from 22,000 to 400,000 years. Occasionally, all three — changes in tilt, the wobble rate and changes in the elliptical orbit around the sun — caused the Earth to be either closer, more directly in the sun's rays, or the opposite. That likely is a major piece of the onsets and ends of glaciations and other climate changes. There have also been meteor impacts, which is what many scientists believe brought about the demise of the dinosaurs and the end of the Cretaceous Period due to the rapid cooling of the Earth under a shroud of dust in the atmosphere. For similar physical reasons, major volcanic eruptions are also thought to have led to at least temporary changes in climate in the Earth's past. Following the eruption of Mount Pinatubo in the Philippines in 1991, for example, global mean temperatures dropped on average almost 2 degrees Fahrenheit.

If you go back farther in time than that, you also have to consider continental drift, which could be another factor. We have plates on the Earth's surface, on the semi-molten crust below the mantle, that have been drifting



"And in the latest evidence of global warming, experts predict August will be 70 degrees warmer than February!"

and crunching together. That, in turn, has an impact on the atmosphere above it. So, depending on where the continents are situated on the globe, there's another significant impact on the climate.

MichiganScience: When did weather records for Michigan originate?

Dr. Andresen: We have some records that go back to the middle of the 19th century here, but these are very, very few in number and sketchy in detail. What little we do have, though, is interesting. The instruments suggest that many of the extreme minimum temperatures in our observational climate record that were reported were set in the 1880s and 1870s. It's not really a fair comparison, though, because the exposure of those instruments was different than it is now. One could infer that it was possibly even colder than that because the instruments used to record the temperatures were on the tops of roofs, which is typically a warmer setting.

MichiganScience: Tell us about the 1930s, when there was a significant increase in temperature.

Dr. Andresen: The '30s, in our region, was especially significant because it was the driest decade since the beginning of the instrumental record. The 1930s, though, was a very demanding decade weather- and climate-wise. Especially 1934 and 1936, which were two of the worst droughts in the Midwest on record. Those are two benchmark years. Ironically, the 1936 drought followed one of the most severe winters, causing horrible, horrible conditions, with documented incidents of snowdrifts covering houses. Many of the record maximum temperatures in Michigan were set in either 1934 or 1936. The all-time state record of 112 degrees Fahrenheit was set in 1934 and still stands after 70 years. If you look around the Midwest, a lot of extreme record temperatures were set in one of those two years.

MichiganScience: How does that jibe with claims that the highest recorded temperatures have occurred within the last 10 years?

Dr. Andresen: It's the difference between weather and climate. Climate is the long-

term average of weather conditions over extended periods such as decades. Weather describes environmental conditions over shorter time periods, including such events as storms, hurricanes, droughts. The rule about what is classified weather and what is classified climate, according to international convention, is that a 30-year time period marks a climate period.

While many of those extremes occured in the 1930s, when you average over longer periods in time, the years in the most recent decade come out looking warmer — mainly because the minimum temperatures in the cold season have increased — and those temperatures have taken the annual averages up. So, the numbers you're hearing about recently are the mean average temperatures for the entire year.

When we look at weather extremes, such as heavy rain events and hail storms, in Michigan, I have not seen any evidence of a change in the frequency of extremes. There isn't much of a real trend. There's a little more of a tendency for heavy rain events, but it's small. In terms of extreme maximum temperatures, I don't see much of a change. The overall averages of those temperatures have increased during nighttime hours and during the winter months.

One probably would make the argument that those extremes are what really matter because of the impact they have on humans, society and ecosystems. We should be concerned about any trends, especially the occurrence of extremes. Right now, I don't see a big change or trend in extreme events. We're going to be running an update of an earlier study soon that investigates trends of extremes and will be checking carefully for any recent changes.

MichiganScience: February was blisteringly cold this year, wasn't it?

Dr. Andresen: Average temperatures in the state generally ranged from 4 and 8 degrees Fahrenheit below average for February. That was the largest negative departure we've seen in some time.

MichiganScience: What do you attribute that to?

Dr. Andresen: Physically, it's because of the pattern of the jet stream — where it goes and how it flows around the hemisphere. From mid-November through the middle of January, we had a jet stream pattern across North America — with relatively cold conditions to the north and warm conditions to the south — that was further North than it normally is. This also kept the main storm track to our north in Canada, and most of the air masses moving into Michigan were of relatively mild Pacific origin, leading to many 50 degree days. Then in mid-January, there was a big change. We saw a big ridge develop over western North America, with a big trough over the East. Then, one after another, air masses from the Arctic and even Siberia came across the Pole, and the jet stream literally steered those frigid air masses down into the lower 48 states. This gave us our cold outbreak, and it was really pretty serious and significantly cold. Eight degrees below or above normal temperatures is a pretty big departure.

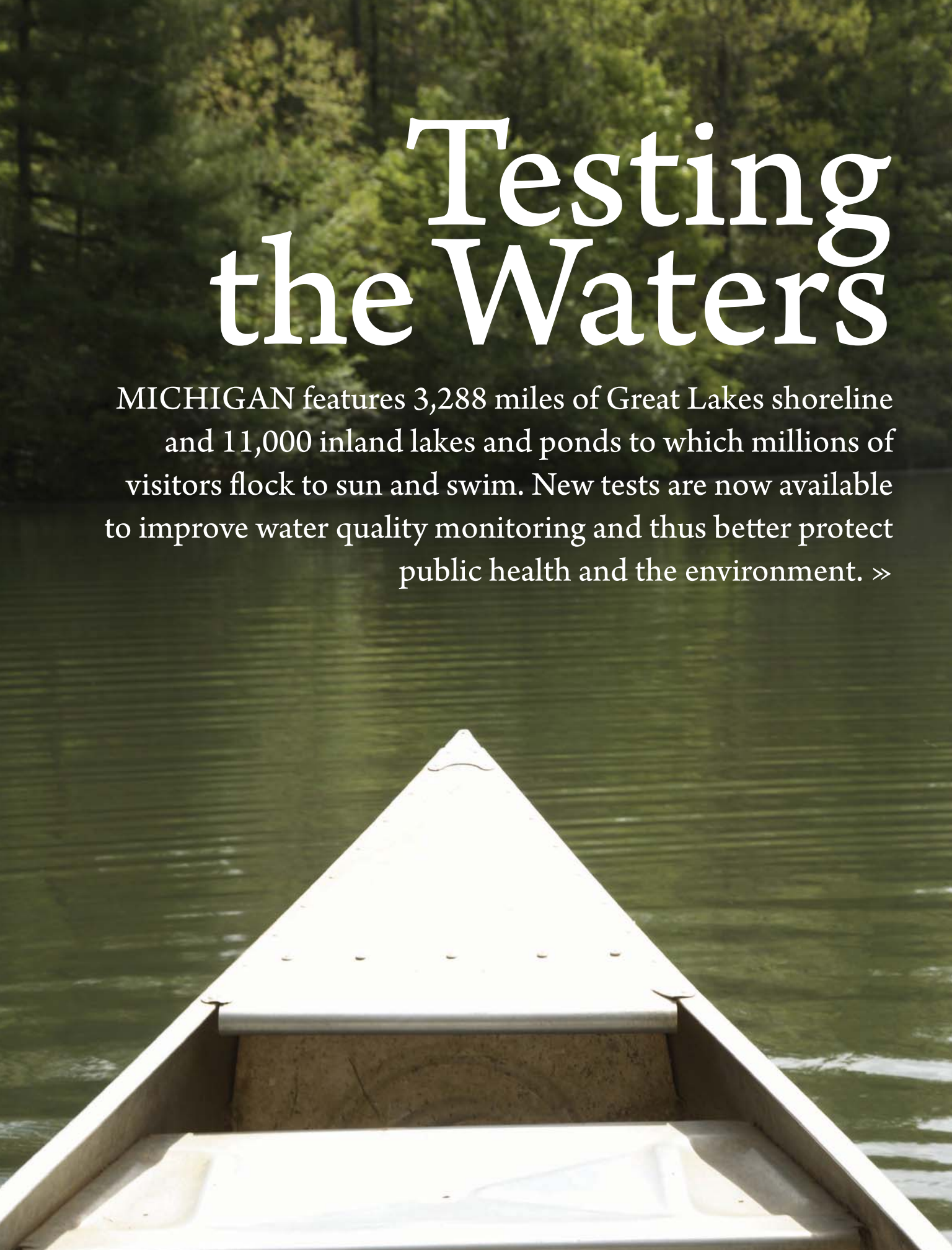
One of the more interesting aspects of the climate system is that we typically don't see one jet stream pattern persist more than several weeks. That would most likely either be in the middle of the winter or the summer, which are the most stable seasons. During spring and fall, with a seasonal transition going on, you almost never see anything last this long. The worst, coldest winters are when we're stuck in a cold pattern for a long time. Or, we see extended warm periods. This winter, we've seen both with incredibly mild conditions early and followed by very cold weather. All the warm water from the Pacific dissipated. It's been replaced with cold water that rises with anomalously strong trade winds to create La Niña, which we haven't seen in some time.

It probably is part of the natural variability of the system. We probably can't attribute it to one particular cause. There's a lot of variability, which is why it's difficult to discern what's natural and what's not.

MichiganScience: What does the future hold for Michigan's climate?

Dr. Andresen: Michigan has become warmer over the last three decades, but the temperatures now are still within the range of the natural variability that we've observed over the last 100 or 120 years. They are currently at the high-end of that range. Much of that warming has occurred in the winter and the spring seasons — and a good deal of that has occurred at nighttime, which is partially related to increases in cloudiness. Changes in summer have not been nearly as evident. At the same time, it's also become somewhat wetter. The benchmark dry decade in Michigan was the 1930s, and it's been wetter ever since. There is some indication in the last 10 years that the increasing trend in precipitation may have leveled off somewhat. That may be temporary, but then again it may not.

Future projections of climate in our region during the next century from most recent global climate simulations suggest conditions generally warmer and wetter than those of recent decades. Whether or not the general agreement of these projections with observations during the past few decades is coincidental is not clear — only time will tell. ■



Testing the Waters

MICHIGAN features 3,288 miles of Great Lakes shoreline and 11,000 inland lakes and ponds to which millions of visitors flock to sun and swim. New tests are now available to improve water quality monitoring and thus better protect public health and the environment. »

New monitoring tests can increase our understanding of Michigan's water quality

By Joan B. Rose, Ph.D.

County health departments are authorized under state law to monitor water quality at public beaches. A total of 53 of Michigan's 83 counties conducted beach monitoring in 2004, the latest year for which figures are available. This represents a dramatic increase in testing compared to 1999, when only 20 counties tested water quality at public beaches.

Michigan Counties Conducting Beach Monitoring

Proper testing requires a minimum of three water samples taken from one foot below the surface, in water that reaches a depth of between three feet and six feet. According to the Michigan Department of Environmental Quality, no less than five "sampling events" (three samples per event) must be taken within 30 days to reliably evaluate water quality. For the purpose of determining if swimming is safe, Michigan tests for E. coli, the presence of which indicates fecal contamination.

E. coli and other coliforms are considered to be "indicator organisms" because they grow in the digestive tracts of both animals and humans, and thus they indicate the presence of other more harmful pathogens. Testing for indicator organisms is less costly and time-consuming than testing for a variety of specific bacteria or other pathogens.

At elevated levels, E. coli and other coliforms may "indicate" the possible presence of pathogens in the water (such as E. coli 0157:H7), which can cause illness such as gastroenteritis, an inflammation of the stomach and intestines. Symptoms include crippling cramps, severe diarrhea, kidney failure and even death in young children and the elderly.

The most common test for E. coli involves filtering water samples and culturing the captured bacteria. The bacteria colonies that result are visible and can be counted. Samples may also be mixed with a liquid media and, when the bacteria grow, the change of water color indicates the presence of coliforms or E. coli in the water. (This method does not reveal the volume of bacteria or E. coli.)

Michigan's water quality standards are set under the state's Natural Resources and Environmental Protection Act. To be considered safe for swimming, the value of a daily single sample of E. coli must not exceed 300 colonies per 100 milliliters of water. Each 30-day period, a "geometric mean" is also calculated using all of the samples collected within that time. Under this analysis, the water is considered safe for swimming if the E. coli does not exceed 130 colonies per 100 milliliters of water.

At present, the method of testing is determined by the category of water use, as the chart below indicates.

Water Use	Indicator Testing and Standard
Wastewater treatment discharges to surface water	Fecal coliforms (less than 200 bacteria colonies per 100 ml)
Drinking water after treatment	Total coliforms, including E. coli (zero allowed per 100 ml)
Swimming	E. coli (less than 300 bacteria colonies per 100 ml)

There are many disease-causing pathogens, viruses and parasites that contaminate water when, for example, rainfall washes animal waste into lakes and streams, septic tanks leak or sanitary sewers overflow. Useful as fecal indicator tests can be, they do not always capture the full range of pathogens present or the

Water sampling by Michigan State University researchers requires preliminary field tests and comprehensive laboratory analysis.

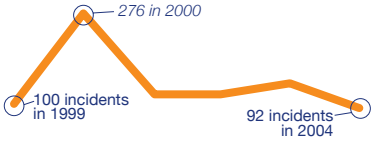
precise levels of contamination that may pose health risks to swimmers.

Recent research has demonstrated that some indicator bacteria may survive and even multiply under conditions that would otherwise destroy the pathogen that the indicators are designed to measure. Also, the concentration of indicators in the water may change depending upon where and when the contamination occurs, and where and when the water samples are taken. Therefore, the ratio of indicators to actual pathogens can fluctuate depending on a variety of factors, rendering the test results less than precise. Consequently, more precise measurements of water quality would require alternative methods of testing, such as "microbial source tracking" and "pathogen monitoring."

One of the gravest illustrations of the potential inadequacy of single-indicator testing occurred in Milwaukee in 1993. Although indicator tests showed the city's drinking water to be in compliance with regulatory standards, an outbreak of Cryptosporidium sickened more than 400,000 residents and was blamed for more than 100 deaths (principally among the elderly and immune-compromised individuals). The parasite that caused the outbreak could have been detected by pathogen monitoring.

Water quality standards in Michigan are based on "14 beneficial uses" of water. The Michigan Department of Environmental Quality in 2004 identified 580 water "segments of impairment" in the state[1]. A total of 90 impairments (16 percent) were the result of pathogens, the majority of which were related to the release of untreated waste sewage, according to the agency. The balance of 84 percent resulted from the run-off of nutrients such as fertilizers.

Michigan Beach Advisories and/or Closings —1999-2004



Source: Michigan Department of Environmental Quality

As previously noted, the single-indicator method of testing does not identify the full extent of pathogen contamination or all its sources. In a recent study, Michigan State University researchers screened key waters in Michigan using alternative indicators and actual pathogen monitoring, and the results demonstrate the range of information that can be obtained through alternative testing methods.

For example, samples from the St. Marys River in Sault Ste. Marie were collected both upstream and downstream of Michigan and Ontario sewage treatment plants. The samples were tested for indicators and parasite pathogens. Key findings include:

- Water quality at the Canadian site where sewage is discharged to the river was inferior compared to the U.S. discharge site, indicating the need for better treatment. This has since been undertaken.
- The pathogen Giardia was detected in samples from the Canadian site as well as downstream.
- The levels of coliphage (a new fecal indicator) at the U.S. site suggest that more investigation may be warranted to understand and improve sewage treatment.
- Downstream samples of floating solids had very high concentrations of indicators and the pathogen Giardia compared to the discharge sites. The levels suggest an unidentified sewage source is discharging solids into the waterway.
- The shoreline water was found to be of good quality as long as the solids did not reach the shore.

Silver Lake, in Mears, Mich., is a popular destination for boating, fishing and swimming. The results of testing with both standard and alternative fecal indicators found that water quality generally failed the standard for safe recreational uses as defined by state law. Leakage from septic tanks and, to a lesser extent, perhaps, birds or other animals are likely contributing to the fecal contamination. Bacteria may also persist by attaching to beach sand and lake foams.

Finally, our testing of 11 other surface water sites near large-scale livestock facilities[2] found Cryptosporidium in all. Giardia was detected at eight sites, and high levels of E.coli were also found.

As our research reveals, the use of alternative indicators and pathogen monitoring can provide important information to communities facing decisions about water quality. Advanced testing equipment and techniques are now available to improve monitoring and, as a result, the water quality in the Great Lakes State. ■

1 U.S. E.P.A. 1999. Total maximum load (TMDL) program, EPA 841-F-99003A.

2 Commonly referred to as Confined Animal Feeding Operations (CAFO).

Looking Ahead

The following environmental issues likely will be the subject of legislative debate in the coming months:

By Russ Harding

ENVIRONMENTAL FEES

The Michigan Department of Environmental Quality is seeking to increase regulatory fees by a total of nearly $19.6 million, including the costs of permits for air emissions, wetlands, dam safety, floodplains, inland lakes and streams; and groundwater discharge. The agency also wants to impose higher fees for pollution prevention, hazardous waste users, solid waste, on-site sewage and mineral wells. The existing fees generate $22.6 million annually. If approved, the new fees would amount to nearly $42.2 million — an increase of 187 percent. The agency claims higher fees are necessary to make up for less federal and state funding of its regulatory programs. However, the regulated community will likely resist the higher fees given the economic challenges facing Michigan businesses. For more information search Senate Bill 406 at Michigan Votes, www.michiganvotes.org.

CLEANUP REGULATIONS

For the past few years, business groups and the Michigan Department of Environmental Quality have been negotiating revisions to regulations governing the cleanup of contaminated property. The lack of progress prompted the agency to hire the firm Public Sector Consultants to mediate the process. PSC is expected to finish its work this spring, even though a number of unresolved issues remain. The business community is advocating for rules that provide certainty and finality, while the DEQ generally favors more regulatory latitude.

GREAT LAKES WATER QUALITY AGREEMENT

State Sen. Patricia Birkholz (R-24th District) has introduced legislation that would implement the Great Lakes Water Quality Agreement in Michigan. In order for the agreement to be binding, all Great Lakes states must pass implementing legislation. To date, only Minnesota has passed such a statue. The agreement requires, in part, state regulation of new or increased water withdrawals within five years of ratification. The agreement prohibits out-of-basin withdrawals, but exempts communities that are partly in and partly out of the basin, providing a process for those to use Great Lakes water. For more information search House Bill 4336, House Bill 4343 and Senate Bill 212 at Michigan Votes, www.michiganvotes.org.

BALLAST WATER TREATMENT

The standoff between the shipping industry and the Michigan Department of Environmental Quality over ballast water treatments has intensified, with the FedNave shipping company suing DEQ over its requirements that shippers must obtain a permit before they can use ports in Michigan. FedNave has threatened to boycott Michigan ports. Michigan is the only Great Lakes state to require ballest water treatment insisting that the treatment is necessary to prevent the introduction of non-native species. ■

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