Michigan**Science**

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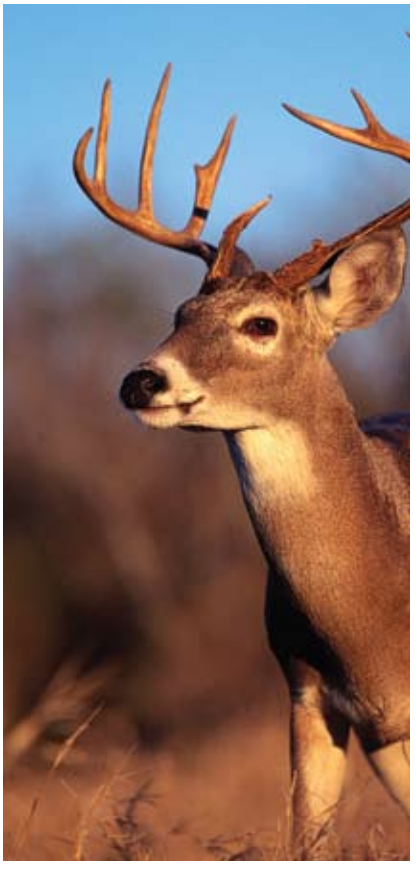


ON THE COVER
The population of Michigan whitetails currently exceeds the state goal by 496,000, but the number of hunters is in decline.

By The Numbers

Beyond propaganda and rhetoric, numbers tell the real story

FOR THE FIRST TIME since record keeping began in 1960, the number of deaths of children under age 5 around the world has fallen below 10 million a year, to 9.7 million, according to a Sept. 13 article in The New York Times. Officials at the United Nations Children's Fund, which compiled the data, say the decline in mortality is due to an increase in the use of vitamins and mosquito nets, campaigns against measles, malaria and bottle-feeding, and economic improvements experienced by much of the world outside Africa, the Times reported. In 1960, about 20 million children died annually, but the drop since then has been steeper than 50 percent because of world population growth, the Times article stated. At 1960 rates, 25 million babies would have died this year.

For more information go to www.nytimes.com/2007/09/13/world/13child.html.

Access to vaccinations after natural disasters, such as in Bangladesh, are lowering childhood deaths. (AP Photo/Rafiq Maqbool)

More than **1.35 MILLION DOCTORATES** were awarded in the United States between 1920 and 1999 — 62 percent in science and engineering and 38 percent in other fields, according to the latest data from the National Science Foundation. The share of doctorates earned by women nearly tripled in the 80-year period, from 15 percent in the early 1920s to 41 percent in the late 1990s. Foreign nationals comprise an increasing portion of doctorate recipients: About one in three Ph.D.s was awarded to a foreign national in the 1990s compared to one in four in the late 1980s. Most foreign students who received doctorates studied science and engineering.

For more information go to www.nsf.gov/statistics/nsf06319/pdf/nsf06319.pdf.

The number of **KIRTLAND'S WARBLERS**, one of the first species listed under the 1967 Endangered Species Act, is on the rise. A new nest was discovered this spring on land owned by Plum Creek Timber Co. in central Wisconsin, while others have been sighted in recent years in Michigan's Upper Peninsula, northern Wisconsin and Ontario, according to the U.S. Fish & Wildlife Service. The songbird's population fell from 432 males in 1951 to 201 males in 1971, but rebounded to 1,486 males in 2006, according to federal officials. The warbler was first described in 1851 after a male was sighted in the outskirts of Cleveland, Ohio. The first nests were discovered in the jack pine forests of Michigan's Oscoda County in 1903 and, for nearly a century after, all nests were found within 60 miles of that site.

For more information go to www.fws.gov/midwest/News/Release07-59.html and www.michigan.gov/dnr/0,1607,7-153-10370_12145_12202-32591--,00.html.

AIR QUALITY CONTINUES TO IMPROVE according to data in the 2007 edition of the Index of Leading Environmental Indicators published by the Pacific Research Institute. Air emissions overall decreased by 53.2 percent between 1970 and 2005. According to the report, "Emissions for all but one pollutant, NOx, are less than half what they were in 1970, despite the substantial increases in population, economic activity, and miles traveled by Americans that have occurred since then."

For more information go to www.aconvenientfiction.com/07EnvIndex.pdf.

SOIL EROSION ON U.S. CROPLAND DIMINISHED by 43 percent nationwide between 1989 and 2003, according to the most recent data from the U.S. Department of Agriculture. The erosion of cropland from water decreased 41.86 percent, and erosion from wind decreased 44.17 percent. In the Great Lakes basin, erosion has declined by nearly 26 percent.

For more information go to www.nrcs.usda.gov/TECHNICAL/land/nri03/SoilErosion-mrb.pdf.

Washington is awash in legislation to mitigate climate change, including proposals for higher taxes on gasoline, caps on carbon emissions and stricter automotive fuel economy standards. Among the most peculiar proposals has been offered by Michigan's own Rep. John Dingell, D-Dearborn, who is intent on eliminating the mortgage interest deduction for houses that exceed 3,000 square feet in size. The Detroit Free Press, among others, praised Dingell for recognizing that "the only sure way to reduce consumption is to increase costs."

Loss of the mortgage interest deduction certainly would increase homeowners' costs. But it wouldn't necessarily reduce energy consumption. In reality, smaller, older homes are far less energy efficient than the "McMansions" targeted for punishment. According to federal government data, a house measuring about 3,400 square feet consumes about 40.2 Btu per square foot. In contrast, a house of 1,200 square feet consumes 55.9 Btu per square foot—a difference of nearly 16 Btu, or 28 percent.

What Mr. Dingell and the Free Press fail to grasp is that larger homes tend to be newer and thus more structurally sound, better insulated and equipped with more energy efficient appliances. According to the U.S. Census Bureau, only 0.05 percent of houses measuring 3,000 to 4,000 square feet have "serious" structural problems, which is about one-tenth the number of smaller homes with such problems.

Residential energy consumption actually has declined during the past 15 years. Between 1993 and 2001, the number of U.S. households increased by 11 percent but annual energy consumption decreased by 1.4 percent — from 10 quadrillion Btu to 9.86 quadrillion Btu. More energy efficient building materials and appliances have made households far more energy efficient.

Ironically, eliminating the mortgage interest deduction could make housing upgrades too costly for many families — and thus increase rather than decrease household energy consumption.

The Detroit Free Press editorial is available at http://ff.org/centers/csspp/library/co2weekly/20070817/20070817_09.html. ■

Field Trips

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

Jelly Belly Presents "Candy Unwrapped"

There's more to candy than what meets the taste buds. Our sweet tooth is stimulated by all of our senses. Through interactive exhibits, Candy Unwrapped explains the historical uses of sugar, and explores the chemistry of candy and its appeal to our palate.

Sept. 28 – Dec. 31, 2007, Cranbrook Institute of Science, 39221 Woodward Ave., Bloomfield Hills, 248-645-3200. Museum is open Saturday through Thursday, 10 a.m.-5 p.m.; Friday, 10 a.m.-10 p.m. Exhibit free with regular admission.

For more information, go to http://science.cranbrook.edu/common/news_detail.asp?newsid=392707&L1=2&L2=4&L3=.

Overnight Adventure

Four different overnight programs are available to schools, scouts and other children's groups: The Science Sampler features activities involving slime, water and static electricity workshops; the Forensics Experience focuses on evidence collection and analysis techniques such as fingerprinting, blood analysis, and toxicology; Astronomy Explorers features telescopes, exploration of light and the Rover challenge; and Dinosaur Adventure offers lessons on fossils and paleontology. Overnights begin at 6:30 p.m. and end at 9 a.m. Adventures without an overnight stay are also available.

Nov. 2007 – May 2008, 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.; workshops are from 10 a.m.-1 p.m.

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

Animal "Grossology"

Animals of all shapes and sizes engage in a variety of gross behavior, but much of it serves a valuable purpose. Learn why dung beetles eat manure, why cows break wind and the utility of slug slime.

Through Jan. 1, 2008, 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, 12 p.m.-6 p.m. Exhibit free with regular admission.

For more information go to http://www.detroitsciencecenter.org/events/AnimalGrossology.htm.

How Things Work

Celebrate the Silver Anniversary of the Ann Arbor Hands-On Museum at its recently opened Legacy Gallery. The Gallery's inaugural permanent exhibit is a tribute to Dr. H. Richard Crane, author of the book "How Things Work." Experience 21 interactive exhibits, including gears and pulleys; locks; and generators, motors and electronic switches.

Permanent exhibit, Ann Arbor Hands-On Museum, 220 E. Ann St., Ann Arbor, 734-995-5439. Museum is open Monday through Saturday, 10 a.m.-5 p.m.; Sunday, 12 p.m.-5 p.m.

For more information, go to http://www.aahom.org/exhibits/index.htm.

The Third Degree

Test your reading of this issue of MichiganScience.

Students in grades six through 12 can compete for a $100 gift certificate from Edmund Scientifics®. The winner will be determined by a random drawing from entries with all the correct answers.

1. **How many children under age 5 die annually worldwide?**
   A. 10 million
   B. 8.6 million
   C. 9.7 million
   D. 20 million

2. **True or False? Economic growth reduces rates of infant mortality.**
   A. True
   B. False

3. **Where was the first Kirtland's warbler nest discovered?**
   A. Wayne County
   B. Washtenaw County
   C. Isabella County
   D. Oscoda County

4. **Air emissions decreased by what amount between 1970 and 2005?**
   A. 12 percent
   B. 53.2 percent
   C. 17.9 percent
   D. 37 percent

5. **How much higher were Lake Michigan water levels 14,000 years ago?**
   A. 13 feet
   B. 27 feet
   C. Two feet
   D. Five feet

6. **What is the time period when lake levels declined significantly 4,000 to 4,500 years ago?**
   A. The Nipissing II phase
   B. The Medieval Warming Period
   C. The Mesozoic Era
   D. The Isostatic Rebound Period

7. **In what year did the Tacoma Narrows Bridge collapse?**
   A. 1920
   B. 1930
   C. 1940
   D. 1950

8. **What is the critical wind velocity of the Mackinac Bridge?**
   A. 75 mph
   B. 125 mph
   C. 450 mph
   D. 642 mph

9. **In what year was Michigan's first deer hunting season established?**
   A. 1845
   B. 1859
   C. 1895
   D. 1925

10. **What body mass index is considered obese?**
    A. 15 BMI or above
    B. 20 BMI or above
    C. 25 BMI or above
    D. 30 BMI or above

LAST ISSUE'S WINNER

Zachary Neely, 12, a seventh-grader at St. Ann School in Cadillac, Mich., correctly answered all 10 questions in the summer issue of MichiganScience to win a $100 gift certificate from Edmund Scientifics. Zachary's science teacher is Mrs. Ann Urse.

Mail answers to Bruce Edward Walker, The Mackinac Center for Public Policy, 140 West Main Street, Midland, Mich. 48640, or e-mail answers to walker@mackinac.org. Please include your name, address, grade, school and the name of your science teacher.

Michigan's deer herd flourishes while hunters' numbers decline

By Diane S. Katz

WHITETAIL DEER WILL LIKELY BE PLENTIFUL when Michigan's firearms season opens on Nov. 15, the result of relatively mild back-to-back winters and a proliferation of fawns. Chances of bagging a big buck will also improve because far fewer hunters will be roaming the woodlands. But their decline in number carries consequences for both wildlife management and the state's recreation economy.

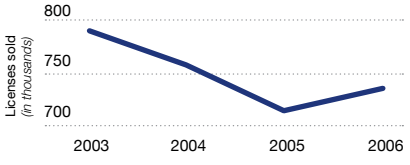
Stalking whitetails has long been Michigan's most popular blood sport. Deer permits comprise 90 percent of all hunting licenses issued annually in the state. Some Upper Peninsula schools close for opening day, while local newscasts feature regular "Big Buck" reports.

Still, the sale of deer hunting permits statewide has declined by 22 percent since 1998, although there was a slight up tick in 2006.[1] Not only has the absolute number of permits dropped, but so, too, has the proportion of Michigan residents who purchase one.[2]

Michigan is not unique in its loss of hunters. Between 1991 and 2001, the number of hunters nationwide declined about 8 percent, from 14.1 million to 13 million.[3]

The number of deer hunters here peaked in 1998, following an increase of 58 percent between 1960 and 1975, and another 10 percent between 1975 and 1998.[4] The recent decline has been accompanied by the aging of license holders, half of whom are now 41 years or older.[5]

Deer Hunting Licenses in Michigan



In response, state officials last year lowered the minimum age to hunt from 14 years to 12 years, and created an "apprentice" license that enables a youth to obtain a hunting license for two years before he or she must successfully complete the safety course otherwise required for a hunting permit. A deer hunt weekend for youth in late September is also scheduled each year.

A proposal to double the cost of a deer license within three years has some within the hunting community worried about further thinning of their ranks. A firearm or archery deer permit now costs $15, a rate last adjusted in 1996. (Seniors pay $6.) House Bill 4624, introduced on April 19th by Rep. Matthew Gillard, D-Alpena, would, if enacted, increase license fees to $18.75 this year; to $22.50 in 2008; to $26.25 in 2009; and to $30 in 2010. The legislation also would authorize a 5 percent "inflationary" increase in license fees for 2012 and 2013.

Currently, the cost of a firearm deer license averages about $20 among the eight Great Lake states.

STATE	LICENSE COST*
Illinois	$15
Indiana	$17
Michigan	$15
Minnesota	$27
New York	$19
Ohio	$24
Pennsylvania	$20
Wisconsin	$24

** Resident, firearm deer.*

License fees are earmarked for the state's Game and Fish Protection Fund, which partly finances the state Department of Natural Resources. Some 76 percent of the agency's budget is derived from such restricted funds. Proceeds from a 10 percent federal excise tax on firearms and ammunition also is channeled to state game and fish agencies. To the extent fewer permits are sold each year, less of the earmarked funds are available to the DNR.

1 Frawley, Brian J. "Demographics, Recruitment, and Retention of Michigan Hunters: 2005 Update," Michigan Dept. of Natural Resources, October 2006.

2 Ibid.

3 Ibid.

4 Ibid.

5 Ibid.

Hunting is an integral part of wildlife management. With few natural predators and suited to a variety of habitats, a deer herd will expand rapidly. Whitetails also possess a robust reproductive capacity. Where food is abundant, fawns may begin breeding at 7 or 8 months old, and twins are common. In September 1962, for example, six bucks and nine does were released on South Fox Island in Lake Michigan; in just eight years, hunters harvested 382 deer there. [6]

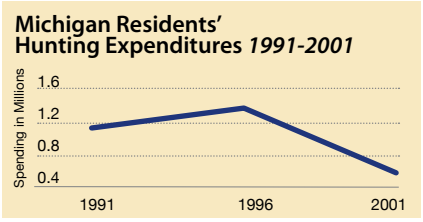
An overabundance of deer can quickly deplete habitat and create hardships for farmers and fruit growers. Herds also become weakened if allowed to increase unabated. Wildlife biologists thus recommend removing at least one-quarter of a herd each year to maintain a healthy and stable population.[7]

Hunting also has played a critical role in controlling the spread of bovine tuberculosis.[8] Researchers have determined that the vast majority of infected deer in Michigan — some 98 percent — have originated from a five-county area. The DNR has instituted extra rifle seasons and unlimited antlerless deer permits to reduce the whitetail populations in Alcona, Alpena, Crawford, Montmorency, Oscoda, Otsego and Presque Isle counties. Subsequently, deer numbers have declined by 51 percent in the areas most affected by the disease.[9]

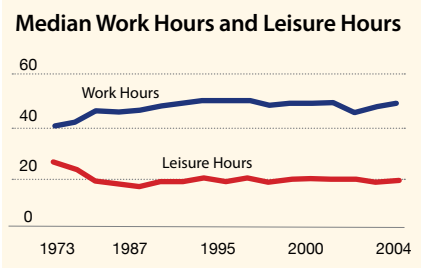
The DNR has set population goals of 1.35 million whitetails statewide: 350,000 for the Upper Peninsula; 500,000 for the northern Lower Peninsula; and 500,000 for the southern Lower Peninsula. Based on estimates of the current population, the herd currently exceeds the population goal by some 496,000, with 359,000 in the Upper Peninsula; 513,000 in the northern Lower Peninsula; and 974,000 in the southern Lower Peninsula.

Hunters harvested nearly 456,000 deer in 2006, according to state data.[10]

The recreation economy has been hard-hit by the decline in hunting. As the graph below indicates, fewer hunters mean fewer hotel and cabin bookings; fewer restaurant orders; and fewer equipment purchases.



A variety of factors contribute to the trend — among them, a more sedentary lifestyle. A 2003 Harris Poll, for example, found that recreation requiring physical activity has declined in popularity. When asked to name their favorite leisure-time activities, the largest numbers of adults mentioned reading (35 percent) and watching TV (21 percent).[11] Moreover, the median number of work hours has increased while leisure time has remained flat, as the chart below indicates.[12]



For a generation accustomed to immediate gratification, hunting may simply require too much time and patience, said Rodney Clute, big-game specialist for the DNR. "It requires planning," he said. "You have to select your sites and receive permission to hunt on certain lands. After all this, you may or may not bag a deer."

Indeed, only 46 percent of hunters statewide harvested a deer in 2006.[13]

There's no shortage of land on which to hunt, but some sportsmen complain about crowded conditions and poor habitat on state-managed properties. About 87 percent of the animals harvested in 2006 were taken on private lands.[14]

The DNR for years has leased private lands for hunting, but now has only about 10 percent of the acreage it once provided under the Hunter Access Program. Many landowners now prefer to manage the leasing on their own, the better to control who gains access to their property.

"For many farmers, they can receive the same economic gains with a smaller group of hunters with less headaches," said Mark Sargent, the coordinator of the Hunter Access Program.

For some hunters, the last straw was the conservation officers who, seemingly intent on generating state revenue, issue tickets for minor infractions. "Conservation Officers often issue tickets for minor infractions when a warning would suffice," said one commenter on AbsoluteMichigan.com, a Web site featuring news and information about the state. "In the last five years, I have noticed a marked increase in CO presence in the field and a marked decrease in their demeanor. I'm sure that the DNR themselves have driven many folks out of hunting and fishing."[15]

The state instituted hunting regulations in 1859, with the establishment of a seven-month season to preserve deer populations in the southern Lower Peninsula. Prior to settlement, abundant herds

6 Sargent, M.S and Carter, K.S., ed. 1999, "Managing Michigan Wildlife: A Landowners Guide." Michigan United Conservation Clubs, East Lansing, MI.

7 Ibid.

8 Michigan Dept. of Natural Resources. See http://www.michigan.gov/emergingdiseases/0,1607,7-186-25804_25811-75930--,00.html.

9 Michigan Dept. of Natural Resources. See http://www.michigan.gov/emergingdiseases/0,1607,7-186-25804_25811-75930--,00.html.

10 Frawley, Brian J., "Michigan Deer Harvest Survey Report 2006 Season," Michigan Dept. of Natural Resources, June 2007. See http://www.michigan.gov/documents/dnr/deer_06harvest_198710_7.pdf.

11 The Harris Poll, "Different Leisure Activities' Popularity Rise and Fall, But Reading, TV Watching and Family Time Still Top the List of Favorites," Dec. 8, 2004. http://www.harrisinteractive.com/harris_poll/index.asp?PID=526.

12 Ibid.

13 Frawley, Brian J., "Michigan Deer Harvest Survey Report 2006 Season," Michigan Dept. of Natural Resources, June 2007. See http://www.michigan.gov/documents/dnr/deer_06harvest_198710_7.pdf.

14 Ibid.

15 http://www.absolutemichigan.com/dig/michigan/should-the-dnr-raise-hunting-license-fees/.

of deer roamed the southern regions of the state, where the mix of hardwood forest and wetlands was ideal for whitetails. The mature forests to the north, however, were less conducive to deer, and were mostly inhabited by elk and moose. But as settlement spread, and in the absence of property rights over wildlife, hunting dramatically reduced the number of deer in southern Michigan. Meanwhile, as timber cutting began in earnest in the northern portions of the state, the herds there quickly flourished.

Large-scale commercial hunting prompted the state in 1881 to prohibit the sale of venison beyond Michigan's borders. Market hunting and commercial sale of venison were banned outright in 1901.

Deer populations fluctuate depending upon weather and other natural factors. Contrary to conventional wisdom, the return of wolves to the Upper Peninsula has not depleted whitetail herds, according to DNR officials. A population of 500 adult wolves could consume 15,000 to 25,000 deer annually.[16] But greater population declines have occurred in the UP due to a shortage of winter feeding areas brought on by an overabundance of animals, according to Clute.

Suburbanization in southeast Michigan actually has increased deer populations; large lots and parks offer grassy areas in which deer like to browse free from predators.

It remains to be seen whether the slight increase last year in the number of hunting permits portends a trend after years of decline. Continued losses would undermine wildlife management and Michigan's recreation economy. ■

16 Michigan Department of Natural Resources, "The Impacts of Wolves on Deer in the Upper Peninsula," Aug. 29, 2006.

"Hon, have you noticed an increase in the deer population lately?"

WHAT GOES UP...

By Douglas A. Wilcox, Todd A. Thompson, Robert K. Booth and J.R. Nicholas

GREAT LAKES LEVELS IN CONSTANT FLUX[1]

THE RECENT DECLINE OF WATER LEVELS across the Great Lakes has generated considerable media coverage and alarming pronouncements about climate change. But a new report by researchers with the U.S. Geological Survey documents a natural variation in Great Lakes levels throughout millenniums. Moreover, the fluctuations of the past century have been far less dramatic than previous ones. The geologic record also reveals thousands of years of significant climate variability in the Great Lakes region, according to the report, which is excerpted below.

LAKE-LEVEL VARIABILITY

Water levels in the lakes vary naturally on timescales that range from hours to thousands of years. Short-term changes are triggered by storms and seiches[2]; seasonal changes are driven by differences in snowmelt, precipitation and evaporation; annual to millennial changes are driven by subtle to major climatic changes affecting both precipitation (and resulting stream flow) and evaporation. Rebounding of the Earth's surface in response to loss of the weight of melted glaciers has also affected water levels.

RECORDED WATER-LEVEL HISTORY

Dredging, control structures,[3] locks, dams, hydroelectric facilities, canals and diversions[4] have altered the hydrology of the Great Lakes/St. Lawrence River System. Dredging and control structures have had the largest impacts. For instance, dredging of the St. Clair River from 1880 to 1965 permanently lowered Lake Michigan/Huron by about 16 inches. Control structures at the outlets of Lake Superior and Lake Ontario keep the levels of these lakes regulated within a range that is smaller than the range of levels that would occur under natural outflow conditions.

Recorded lake-level histories for each lake show some similarities. Periods of higher lake levels generally occurred in the late-1800s, the late-1920s, the mid-1950s, and from the early-1970s to mid-1980s. Pronounced low lake levels occurred in the mid-1920s, the mid-1930s and the mid-1960s, and returned again in 1999. Because Lake Superior water levels have been regulated since about 1914

1 Excerpted from the U.S. Department of the Interior U.S. Geological Survey Circular 1311 "Lake-Level Variability and Water Availability in the Great Lakes"; available online at http://pubs.usgs.gov/circ/2007/1311/.

2 Stationary waves usually caused by strong winds and/or changes in barometric pressure. Seiches are found in lakes, semi-enclosed bodies of water and areas of the open ocean.

3 Levees and breakwalls, for example.

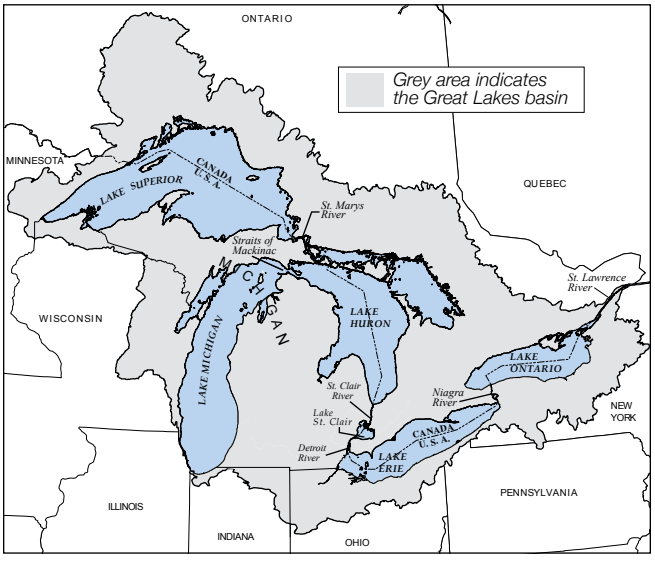
4 A transfer of water from the Great Lakes Basin into another watershed, or from the watershed of one of the Great Lakes into that of another.

and levels of Lake Ontario have been regulated since about 1960, lake-level patterns on those lakes since regulation began do not reflect all the natural variability that would have occurred without regulation. For example, unregulated Lakes Michigan/Huron and Erie had extremely high water-level peaks in 1929, 1952, 1973, 1986 and 1997, as well as extreme lows bottoming out in 1926, 1934, 1964 and 2003. Some of those extreme levels, especially the lows, were muted in Lakes Superior and Ontario after regulation began.

RECONSTRUCTED WATER-LEVEL HISTORY

The Great Lakes are rimmed by coastal features[5] and associated sedimentary deposits, some as old as 14,000 years and some that are developing today. Many of these features are formed by and respond to changes in lake level.[6] … Because many … coastal deposits formed in response to either short-term or long-term fluctuations in lake level, they can be used to reconstruct lake-level changes that preceded instrument measurement of water levels that began in the mid-1800s … .

For the Lake Michigan Basin, data from five strandplains[7] were combined to produce a hydrograph[8] of lake-level change over the past 4,700 years.[9] … [Several] periodic lake-level fluctuations were active in the past and are probably still active in the lake basin today. … [The] lake level was roughly 13 feet higher 4,500 years ago. This high phase is called the Nipissing II phase[10] of ancestral Lake Michigan, and it is represented around the lakes by high, dune-capped ridges, mainland-attached beaches, barrier beaches and spits. This shoreline commonly was instrumental in isolating small lakes from the larger lake basins. The Nipissing II phase was followed by more than 500 years of lake-level decline during which lake levels dropped to elevations similar to historical



Covering approximately 295,000 miles[11] between eight states and one Canadian province, the Great Lakes-St. Lawrence River system includes Lakes Superior, Michigan, Huron[12], Erie and Ontario; their connecting channels; the St. Marys and St. Clair rivers; Lake St. Clair; the Detroit River, the Niagara River and the St. Lawrence River. The system also includes several man-made canals and dams. *Graphic courtesy of the U.S. Department of the Interior.*

averages. Three high phases from 2,300 to 3,300, 1,100 to 2,000, and zero to 800 years ago followed this rapid decline. Pervasive in the hydrograph is a quasi-periodic[13] rise-and-fall pattern of about 160 ± 40 years in duration. This fluctuation can be extended into the historical record, and it appears that the entire historical dataset (mid-1800s to present) may be one such 160-year quasi-periodic fluctuation. Superimposed on this 160-year fluctuation is a short-term fluctuation of 32 ± 6 years in duration. This lake-level rise-and-fall pattern produced the individual beach ridges in most embayments[14] and is also expressed in the historical data, most easily seen in the low levels in the 1930s and 1960s and again starting in the late 1990s.

RELATION TO CLIMATE

… The importance of climate variability in controlling Great Lakes water levels during the past 5,000 years has been assessed by comparing

5 Any geological feature along the coast, from dunes, beaches and swamps to cliffs and rock outcroppings.

6 Thompson, T.A., Baedke, S.J., and Johnston, J.W., 2004, Geomorphic expression of late Holocene lake levels and paleowinds in the upper Great Lakes, in Hansen, E.C., ed., The geology and geomorophology of Lake Michigan's coast: Michigan Academician, v. 35,p. 355-371.

7 Shore-parallel ridges of sand commonly occurring in embayments along the lakes, forming a washboard pattern inland from the shore.

8 A graph showing water level, flow rate, or some other property of water with respect to time.

9 Baedke, S.J., and Thompson, T.A., 2000, A 4,700-year record of lake level and isostasy for Lake Michigan: Journal of Great Lakes Research, v. 26, p. 416-426.

10 Nipissing phases are one or more high levels of the Great Lakes between 6,000 and 4,000 years ago. Nipissing lake levels were slightly more than 4 meters (13 feet) higher than historical levels.

11 Neff, B.P., and Nicholas, J.R., 2005, Uncertainty in the Great Lakes water balance: U.S. Geological Survey Scientific Investigations Report 2004-5100, 42 pp.

12 Lakes Huron and Michigan are usually considered as one lake because of their wide connection at the Straits of Mackinac.

13 A repetitive behavior that is not uniform in period or amplitude.

14 A hyrdrogeological formation that either resembles or is actually a bay.

independent proxy records[15] of past climate variability with the reconstructed water-level history of Lake Michigan inferred from sediments. The development of high-resolution and well-dated paleoclimate[16] records, such as those from inland bogs and lake sediments, has revealed significant climatic variability in the Great Lakes region at decadal to millennial timescales during the past several thousand years. One unsettling pattern in these records is that, despite being a relatively humid region, severe droughts larger than any observed in the past century occurred several times in the last few thousand years and had large and long-lasting ecological effects. For example, between about 1,000 and 700 years ago, a time interval broadly consistent with the Medieval Warm Period,[17] a series of large-magnitude moisture fluctuations occurred over the western Great Lakes region, the Great Plains and the western United States.[18] Lake Michigan water levels were greatly affected by these fluctuations, particularly a large drought about 1,050 years ago. This large drought dramatically altered forest composition in southeastern Michigan[19] and may have extended well into eastern North America.

Another major drought in the region, which was probably even larger than the Medieval Warm Period droughts, was associated with the large drop in Lake Michigan water levels between 4,500 and 4,000 years ago. At that time, water levels in Lake Michigan dropped at a rate at least five times the rate of isostatic rebound.[20] Although non-climatic factors may have been involved in this rapid drop, the timing corresponds to a well-documented and widespread centennial-scale drought that affected much of the North American mid-continent — activating dune systems, causing widespread fires and leading

15 A reconstructed history of environmental changes based on the contents of a natural archive (for example, sediments, ice cores), typically using an indicator, measurement, or suite of measurements that are highly correlated with a particular environmental variable (for example, temperature).

16 The climate of a given period of time in the past.

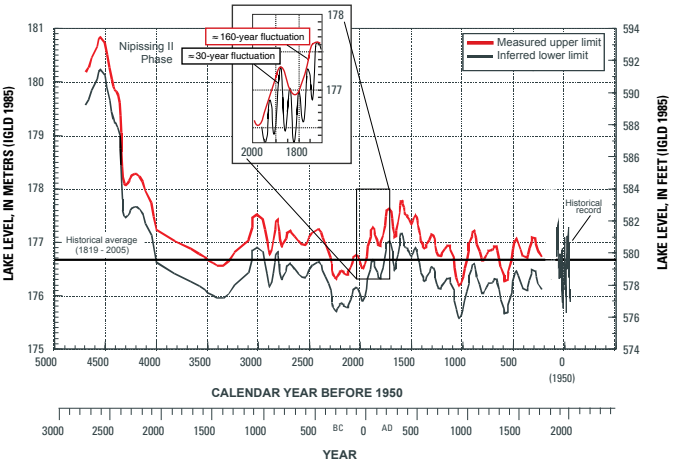
17 A warm interval lasting several centuries, beginning around 1,000 years ago and particularly well documented in Europe.

18 Booth, R.K., Notaro, M., Jackson, S.T., and Kutzbach, J.E., 2006, Widespread drought episodes in the western Great Lakes region during the past 2000 years—Geographic extent and potential mechanisms: Earth and Planetary Science Letters, v. 242, issues 3-4, p. 415-427.

19 Booth, R.K., and Jackson, S.T., 2003, A high-resolution record of late-Holocene moisture variability from a Michigan raised bog, USA: Holocene, v. 13, p. 863-876.

20 Rebounding of the Earth's surface in response to loss of the weight of melted glaciers.

Lake fluctuations remain steady over time



The hydrograph above depicts water levels for Lake Michigan-Huron over the past 5,000 years, from 3,000 BC to the present. The upper *x*-axis refers to the entire 5,000-year cycle measured, while the lower *x*-axis refers to actual calendar years. The *y*-axis at left measures water levels in meters, and in feet at right. *Graphic courtesy of the U.S. Department of the Interior.*

to long-lasting changes in forest composition.[21] Abrupt climate changes at that time are well documented on most continents, suggesting potential global-scale linkages.

Times of prolonged high water levels in the Great Lakes (highstands) have also been linked to climate variability. For example, bog surface-moisture reconstructions and inland lake records from throughout the Great Lakes region indicate wetter conditions during highstands.[22] Pollen records indicate that populations of trees favoring moist conditions also expanded at these times.[23] Although some climate changes associated with lake-level fluctuations were widespread, others were probably more spatially variable, with different areas of the Great Lakes Basin receiving more or less moisture. The water-level history of the Great Lakes integrates these spatial patterns. Comparison of localized records of climate variability from throughout the Great Lakes Basin (for example, records from small lakes, bogs and

21 Booth, R.K., Jackson, S.T., Forman, S.L., Kutzbach, J.E., Bettis, E.A., Kreig, J., and Wright, D.K., 2005, A severe centennial-age drought in continental North America 4200 years ago and apparent global linkages: Holocene, v. 15, p. 321-328.

22 The uppermost topographic position or elevation reached by lake level during a specific period in time. For example, Booth and Jackson, 2003; Booth and others, 2004.

23 Booth, R.K., Jackson, S.T., and Thompson, T.A., 2002, Paleoecology of a northern Michigan lake and the relationship among climate, vegetation, and Great Lakes water levels: Quaternary Research, v. 57, p. 120-130.

This "strandplain" near Manistique, Mich., illustrates the variability of water levels. The series of ridges that comprise the strandplain were produced by the deposit of sand by waves. Higher lake levels deposited sand farther inland.

tree rings) with the regionally integrated record of Great Lakes water-level history will … help develop hypotheses regarding the atmospheric-circulation patterns associated with Great Lakes water-level fluctuations at scales of decades to millennia.

Clearly, the water balance of the Great Lakes region has varied considerably, and the overall variability for the past 14,000 years far surpasses that of the last 100 years in magnitude and ecological effect. Mechanisms behind climatic variability at these long timescales are poorly understood; however, many severe moisture fluctuations of the past century have been linked to dynamics of the ocean-atmosphere system, particularly variability in sea-surface temperatures and the associated changes in atmospheric circulation. For example, sea-surface temperature variability in both the Pacific and the Atlantic has been linked to changes in atmospheric circulation that influence the water balance of the mid-continent, including the Great Lakes region.[24] Interactions between land surface and atmosphere, particularly with regard to soil moisture, often extend and amplify a large drought.[25] The extreme fluctuations in water balance evident in the Great Lakes water-level history and other paleoclimatic records may represent interactions and amplifications of this kind, as well as responses of the ocean-atmosphere system to variability in external influences such as solar radiation and volcanic activity.[26]…

RELATION TO COASTAL ECOSYSTEMS

Water-level fluctuations in the Great Lakes are of great ecological importance in the coastal zone because even small changes in lake level can shift large areas from being flooded to being exposed and vice versa. The vegetation of shallow-water areas in the Great Lakes is the one biotic resource most directly affected by natural or regulated changes in water level. Individual plant species and communities of species have affinities and physiological adaptations for certain water-depth ranges, and their life forms may show adaptations for different water-depth environments. Changes in water level add a dynamic aspect to the species-depth relation and result in shifting mosaics of wetland vegetation types. In general, high water levels kill trees, shrubs, and other emergent[27] vegetation, and low water levels following these highs result in seed germination and growth of a multitude of species. Some species are particularly well suited to recolonizing exposed areas during low-water phases, and several emergents may coexist there because of their diverse responses to natural disturbance.

In the first year after a reduction in water levels, the distribution of new seedlings is due to the distribution of seeds in the sediments. In ensuing years, the distribution of full-grown plants is due to survival of seedlings as they compete for growing area. If one species is favored in early colonization, its density may be great enough

24 McCabe, G.J., Palecki, M.A., and Betancourt, J.L., 2004, Pacific and Atlantic Ocean influences on multidecadal drought frequency in the United States: Proceedings of the National Academy of Science, v. 101, p. 4136-4141, 2004; Schubert, S.D., Suarez, M.J., Pegion, P.J., Koster, R.D., and Bacmeister, J.T., 2004, On the cause of the 1930s dust bowl: Science, v. 303, p. 1855–1859; Booth, R.K., Notaro, M., Jackson, S.T., and Kutzbach, J.E., 2006, Widespread drought episodes in the western Great Lakes region during the past 2000 years—Geographic extent and potential mechanisms: Earth and Planetary Science Letters, v. 242, issues 3–4, p. 415–427.

25 For example, Delworth, T.L., and Manabe, S., 1988, The influence of potential evaporation on the variabilities of simulated soil wetness and climate: Journal of Climate, v. 1, p. 523–547; Manabe, S., Wetherald, R.T., Milly, P.C.D., Delworth, T.L., and Stouffer, R.J., 2004, Century-scale change in water availability—CO2-quadrupling experiment: Climatic Change, v. 64, p. 59–76; Schubert, S.D., Suarez, M.J., Pegion, P.J., Koster, R.D., and Bacmeister, J.T., 2004, On the cause of the 1930s dust bowl: Science, v. 303, p. 1855–1859.

26 For example, Adams, J.B., Mann, M.E., and Ammann, C.M., 2003, Proxy evidence for an El Niño-like response to volcanic forcing: Nature, v. 426, p. 274; Meehl, G.A., Washington, W.M., Wigley, T.M.L., Arblaster, J.M., and Dai, A., 2003, Solar and greenhouse forcing and climatic response in the twentieth century: Journal of Climate, v. 16, p. 426–444; Rind, D., Shindell, D., Perlwitz, J., Lerner, J., Lonergan, P., Lean, J., and McLinden, C., 2004, The relative importance of solar and anthropogenic forcing of climate change between the Maunder Minimum and the present: Journal of Climate, v. 17, p. 906–929.

27 Refers to vegetation with roots in water and parts that grow above the water surface.

that it can maintain dominance of an area. In most cases, early colonizing species or communities are later lost through competitive displacement, but the opportunity to go through a life cycle allows them to replenish the seed bank in the sediments. Occasional low water levels are also needed to restrict growth of plants that require wet conditions, such as cattails, at higher elevations in wetlands that are typically colonized by sedges and grasses.

The magnitude of lake-level fluctuations is of obvious importance to bordering wetland vegetation because it directly results in different water-depth environments.[28] The different plant communities that develop in a Great Lakes wetland shift from one location to another in response to changes in water depth. The water-depth history largely determines the species composition of a particular site at a given point in time…

The effect of water-level changes on shorelines varies with the morphology, composition and dominant processes of the coast. Variability in lake levels causes erosional and depositional processes to take place at different elevations over time. The most dramatic effect is the impact of an elevated storm surge during high lake levels, flooding low-lying areas and eroding mobile substrates. These storms can liberate sediment from upland areas, feeding the littoral[29] system, and can ultimately nourish downdrift shorelines. The effects of this nourishment may not be seen until times of low water levels when exposed sand bars, widened beaches and dune growth are evident.

Water-level fluctuations in the Great Lakes also play a major role in development and stabilization of coastal dunes. Studies of buried soils within dunes along the southeastern shore of Lake Superior and eastern shore of Lake Michigan show that dune building occurred during the high lake-level periods that have recurred about every 160 years. High lake levels destabilize coastal bluffs and make sand available to leeward perched dunes.[30] Intervening periods of lower lake levels and relative sand starvation permit forestation and soil development on the dunes.[31]

Shorelines quickly adapt to the rise and fall of water levels, as the photos above illustrate. Photo 1 (upper left) shows a patch of wetland along the Pigeon River near Sheldon, Mich., when water levels dropped more than 1.5 feet from the previous year. Photo 2 (upper right) shows the same patch one year later, when annual emergent plants grew from the seed bank. Photo 3 (lower left), from 2001, displays the perennial emergent plants that displaced annuals along the shore. Photo 4 (lower right), from 2003, shows the shift to a different perennial plant community.

SUMMARY

… Independent investigations of past climate change in the basin over the long-term period of record confirm that most of these changes in lake level were responses to climatically driven changes in water balance, including lake-level highstands commonly associated with cooler climatic conditions and lows with warm climate periods. The mechanisms underlying these large hydroclimatic anomalies are not clear, but they may be related to internal dynamics of the ocean-atmosphere system or dynamical responses of the ocean-atmosphere system to variability in solar radiation or volcanic activity. …

The extreme high and low lake levels measured in recorded lake-level history have altered storage by as much as 31 cubic miles in Lake Michigan-Huron and as little as 9 cubic miles in Lake Ontario. Diversions of water into and out of the lakes are very small compared to the total volume of water stored in the lakes.

CONCLUSION

A variety of factors influence lake levels that may shift hourly, daily and seasonally, or even over centuries and millennium. Some of the causes are easily understood, including the levels of snowmelt, precipitation and drought. Other possible causes are not fully understood, including the impacts of solar and volcanic activity and the interaction between Earth's atmosphere and oceans. But the latest research by the U.S. Geological Survey documents that current conditions are well within the natural variability of long-term cyclical change. ■

28 Environment Canada [Wilcox, D.A., Patterson, N., Thompson, T.A., Albert, D., Weeber, R., McCracken, J., Whillans, T., and Gannon, J., contributors], 2002, Where land meets water—Understanding wetlands of the Great Lakes: Toronto, Ontario, 72 pp.

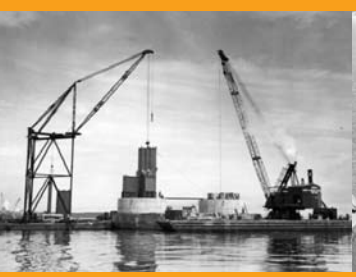
29 Pertaining to the area of the coast affected by near-shore waves and currents.

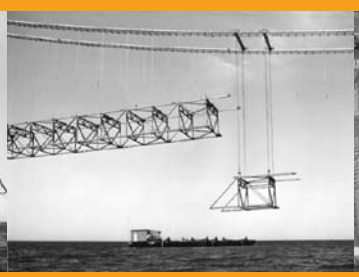
30 Dunes that sit on a plateau high above the shore; they consist of sand as well as other loose material, and dramatically changing lake levels help to create them.

31 Anderton, J.B., and Loope, W.L., 1995, Buried soils in a perched dunefield as indicators of late Holocene lake level change in the Lake Superior basin: Quaternary Research, v. 44, p. 190–199; Loope, W.L., and McEachern, A.K., 1998, Habitat change in a perched dune system, in Mac, M.J., Opler, P.A., Puckett, C.E., Haecker, and Doran, P.D., eds., Status and trends of the Nation's biological resources, volume 1: U.S. Geological Survey, p. 227–230; Loope, W.L., and Arbogast, A.F., 2000, Dominance of a ~150-year cycle of sand-supply change in late Holocene dune-building along the eastern shore of Lake Michigan: Quaternary Research, v. 54, p. 414–422.

THE MIGHTY MAC
50 YEARS STRONG

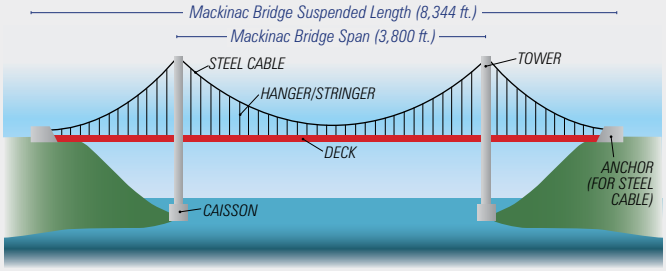
This year marks the 50th anniversary of the Mackinac Bridge, a marvel of engineering and construction spanning the Straits of Mackinac to link Michigan's two peninsulas. Many of the innovations introduced by Chief Engineer David B. Steinman remain the standards in bridge building today. »




By Henry Fleischer, P.E., CMfgE

Black and white photos courtesy of the Mackinac Bridge Authority.



The Mighty Mac measures 26,372 feet, from Mackinaw City in the Lower Peninsula to St. Ignace in the Upper Peninsula. The roadway of the bridge is suspended from steel cables strung between two concrete-and-steel towers, and anchored at both ends in 170,000-ton concrete blocks that descend to bedrock 100 feet below the water and rise 119 feet above the surface. Each of the two cables is composed of 37 strands of 340 wires that each measure 0.196 inches in diameter, for a total diameter of 24.25 inches.

The piers securing the bridge remain the deepest structures ever sunk in suspension-bridge construction. Nearly 750,000 tons of concrete and steel are submerged in places to a depth of 230 feet.

According to Pat Zacharias, a Detroit News librarian, the young Steinman was a newsboy in the Brooklyn Bridge neighborhood who boasted to his friends that he was "going to build bridges like the famous structure that towers above us. They laughed at me." By the age of 63, Steinman had designed 400 bridges around the world before he tackled the Mackinac.

The span between the two towers measures 3,800 feet. Currently, this central suspended span is the third longest in the United States, behind New York City's Verrazano-Narrows Bridge (4,260 feet) and San Francisco's Golden Gate Bridge (4,200 feet).

The total suspended length of the bridge is 8,344 feet — longer than any other in the Western Hemisphere. Worldwide, it is only surpassed by the Akashi-Kaikyo Bridge (12,831 feet) that connects the Japanese cities of Honshu and Shikoku. When taking into account the approaches leading to the suspended span, the Mackinac Bridge is considerably longer, at 5 miles, than the 2.4-mile Akashi-Kaikyo.

Bridge workers toiled without safety harnesses or nets, according to Ms. Zacharias. The dangers claimed five lives during the 42-month construction, between May 7, 1954 and Nov. 1, 1957.

The Mackinac Bridge was the world's first to incorporate Steinman's principles of aerodynamic stability. He developed this set of principles several years before the spectacular collapse of the Tacoma Narrows Bridge in 1940 — a failure Steinman predicted after its builders ignored his advice.

Designing a bridge to cross the Mackinac Straits posed three significant challenges: high winds, deep water and the extreme pressures of ice accumulations. To deal with the wind, Steinman utilized open stiffening trusses in place of solid sheets beneath the roadway to increase stability, thus improving the critical wind velocity from 40 mph to 632 mph. Steinman further improved bridge stability by using an open grid road surface to further increase the critical wind velocity to what he described as an "unprecedented level of essentially infinity." His formulae and treatise on aerodynamic stability remain the world's standard.

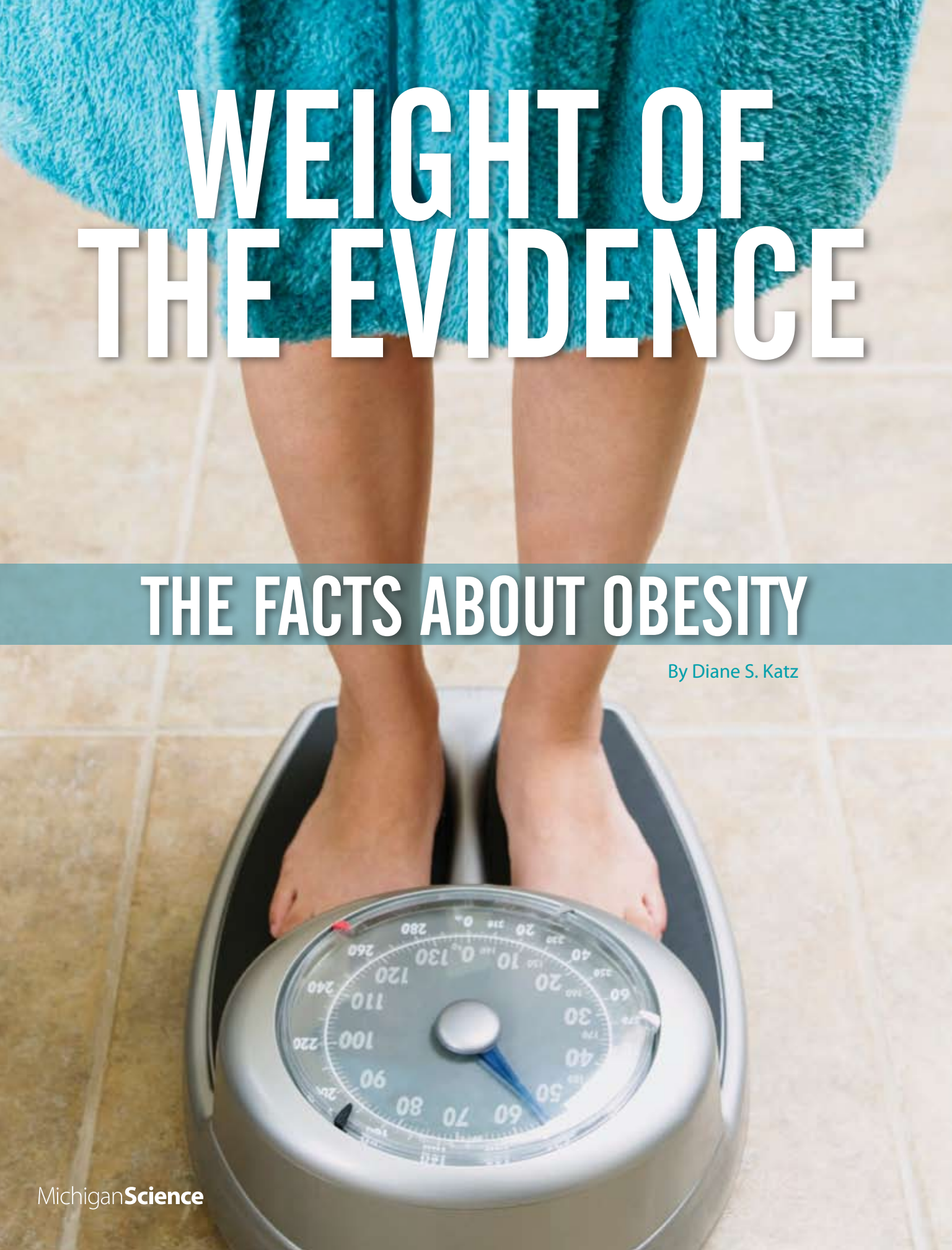
To protect against ice pressure, Steinman designed the towers' concrete piers using a most-secure safety factor of 20 (20 times the maximum ice pressure achieved under laboratory-controlled conditions). The pressure of ice buildup can render a bridge structurally unsound — if not cause it to collapse. The maximum ice pressure ever encountered by bridge engineers is 21,000 pounds per lineal foot of pier width. In the laboratory, the greatest ice pressure achieved was 23,000 pounds per lineal foot. Steinman arrived at his safety factor of 20 by multiplying the maximum possible ice pressure of 23,000 pounds by five and dividing the safe foundation pressure by four. For further safety, each of the concrete piers was sheathed in armor plate above and below areas of potential ice contact.

The Detroit Science Center, with assistance from the American Bridge Division of U.S. Steel, has assembled an 80-foot-long replica of the Mackinac Bridge to commemorate its golden anniversary. The Mini Mac is the largest single exhibit ever assembled and displayed at the science center. It connects two sections of the museum with a four-foot-wide walkway.

To sink the concrete piers in bedrock at depths of more than 200 feet, engineers on site designed and built an ingenious pile driver they nicknamed "The Gismo." The project also involved some of the deepest "cofferdams" — submerged air-filled work areas — ever constructed.

Steinman also introduced "Prepakt" concrete pourings to unequaled depths. Developed in the 1950s, Prepakt was better suited for work underwater, where conventional concrete is difficult to use. The use of Prepakt in construction of the Mackinac Bridge established a world record for the underwater consolidation of concrete placement, which was set in May 1955 when 200,000 tons of concrete was poured into the bridge's foundations.

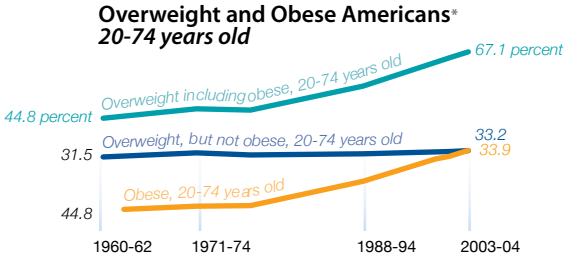
The innovative design and construction techniques devised for the Mackinac Bridge have been emulated many times since 1957, when the Mighty Mac was completed. Fifty years later, the bridge still stands as an engineering marvel and an emblem of our state. ■



WEIGHT OF THE EVIDENCE

THE FACTS ABOUT OBESITY

By Diane S. Katz



More than 25 percent of Michigan residents — and 135 million Americans overall — are overweight, according to the U.S. Centers for Disease Control.[1] Even our dogs and cats are fat.[2] Blame is commonly placed on fast food restaurants, trans fatty acids, TV commercials and high fructose corn syrup. But there's more hype than science in these and other standard excuses.

Obesity is commonly ranked second to smoking as a "modifiable risk factor"[3] for ailments such as Type 2 diabetes, heart disease, arthritis, gallstones, high blood pressure and some cancers. At one time, the CDC claimed that obesity kills 400,000 Americans annually. But the agency, in 2005, adjusted the estimate downward by 94 percent, to 26,000 deaths annually.[4]

America is hardly alone in having a plump population; the World Health Organization reports that nearly 530 million European adults are overweight or obese.[5] Even the world's capitol of haute cuisine has a *big* problem: Some 42 percent of French adults are now considered "gros."[6]

A variety of lifestyle factors contribute to our growing girth. But some of the increase can also be attributed to the broader definition of "overweight" adopted in 1998 by the National Institutes of Health. In one day, the combined number of overweight Americans ballooned 29 percent, from 68 million to 96 million.[7]

What defines obesity in medical terms is the body mass index, a calculation of the ratio between a person's height and weight.[8] Various classifications, ranging from "underweight" to "extreme obesity" were established according to the level of disease risk.

CLASS	BMI
Underweight	Less than 18.5
Normal	18.5 to 24.9
Overweight	25 to 29.9
Obesity (Class 1)	30 to 34.9
Obesity (Class 2)	35 to 39.9
Extreme Obesity	Above 40

The body mass index is a relatively simple (and inexpensive) screening measure, but it does lack precision in some applications. For example, it cannot account for whether weight is fat or muscle. Thus, a 6-foot-tall athlete weighing 250 pounds would be classified obese. Nor does it distinguish between frame sizes, i.e., a person with a larger frame will have greater mass overall, but a smaller ratio of lean mass to fat mass.[9] Therefore, the BMI is most accurate when applied to sedentary populations.

It is also important to note that BMI does not measure the *distribution* of body fat, which can influence disease risk. Excess weight in the central abdomen — the so-called "apple" shape — is correlated with a higher risk of some

1 http://www.cdc.gov/nccdphp/dnpa/obesity/trend/maps/index.htm.

2 The American Society for the Prevention of Cruelty to Animals characterizes pet obesity as "extremely common." See http://www.aspca.org/site/PageServer?pagename=pets_petnutritionoverweight

3 A "modifiable risk factor" is a behavior that individuals can alter, such as exercise and food intake. Non-modifiable risk factors are characteristics such as age and genetics that cannot be changed.

4 "New JAMA Study Challenges CDC's 400,000 Obesity Deaths Figure," PR Newswire. See http://www.prnewswire.com/cgi-bin/stories.pl?ACCT=109&STORY=/www/story/04-19-2005/0003436025&EDATE=.

5 "The challenge of obesity in the WHO European Region," World Health Organization Fact Sheet, Sept. 12, 2005. See http://www.euro.who.int/document/mediacentre/fs1305e.pdf.

6 Sciolino, Elaine, "France Battles a Problem That Grows and Grows: Fat," New York Times, Jan. 25, 2006. See http://www.nytimes.com/2006/01/25/international/europe/25obese.html?_r=1&oref=slogin.

7 See http://www.obesityfocused.com/articles/about-obesity/definition-of-obesity.php.

8 The BMI is determined by dividing a person's weight (in kilograms) by the square of their height (in meters).

9 See http://www.obesityfocused.com/articles/about-obesity/definition-of-obesity.php.

*Sources: Center for Disease Control and Prevention, National Center for Health Statistics, *Health, United States, 2006,* Figure 13. Data from the National Health and Nutrition Examination Survey.

health problems compared to excess weight in the hips and thighs — the so-called "pear" shape. Nor is the index diagnostic; the measurement of body mass cannot determine whether one has, or will have, high cholesterol or Type 2 diabetes. Such determinations would require further testing.

Obesity was officially declared a disease in 2004 by then-Secretary of Health and Human Services Tommy Thompson. Large sums of federal research dollars are now dedicated to understanding the dynamics of weight gain.

Researchers at the University of Texas Southwestern Medical Center, for example, are investigating how genes regulate appetite and metabolism. In experiments involving the "adipose" genes in fruit flies, C. elegans worms and mice, researchers have observed that the gene stimulates the accumulation of fat when food supplies are limited.[10] When food is plentiful but the threat of predators is high, the adipose gene "turns off" to improve the animals' evasive abilities. The researchers hypothesize that this trait may also apply to humans, i.e., populations grow heavier where food is plentiful and living conditions are safe.

"It could explain why so many people struggle to lose weight and suggests an entirely new direction for developing medical treatments that address the current epidemic of diabetes and obesity," said Dr. Jonathan Graff, who led the UT research team.

"People who want to fit in their jeans might someday be able to overcome their genes," he quipped.

The pharmaceutical industry is working on drug therapies. So far, two have been approved by the U.S. Food and Drug Administration — one that acts on the central nervous system to decrease appetite and another that blocks fat absorption in the digestive tract. However, the operative word is "assistive." These drugs may help to increase weight loss, but they will not reverse obesity without changes in diet and exercise. Bariatric surgery, which reduces stomach size or allows food to bypass portions of intestinal tract, can be effective in substantial weight loss for the extremely obese.

Still, there's no getting around the fact that body fat accumulates when caloric intake exceeds caloric output. It may be popular these days to advocate a ban on trans fatty acids, but weight gain is tied to the number of chips eaten, not the type of fat in which they are fried.[11] Trans fatty acids carry the same number of calories per gram as other fats.

Similarly, our collective weight gain also has been blamed on the use of high fructose corn syrup in a variety of prepared foods. But there's no difference between HFCS and other sugars either in the number of calories per gram or how they are digested. According to a recent review of the literature by researchers at the University of Maryland, "The evidence that HFCS consumption uniquely increases the risk of weight gain is very weak."[12]

Changes in lifestyle have played a role in reshaping our bodies, researchers say. For example, Inas Rashad and Michael Grossman of the City University of New York cite increased rates of labor force participation by women and a decrease in smoking.

Whereas women once had afternoons free to cook everything from soup to nuts, there's less time today for anyone in the family to prepare dinner. Thus, families eat out far more often now than in decades past, and restaurants have proliferated as a result. There were 694,310 food service establishments nationwide as of 2002 — an increase of nearly 30 percent in the previous 10 years alone, according to the U.S. Census Bureau.[13]

Researchers also have documented an inverse relationship between smoking and obesity, i.e., nonsmokers weigh more than smokers, on average, and smokers who quit gain weight.[14] With the proportion of U.S. smokers down by half today compared to 1965,[15] it is hardly surprising that so many waistlines are bulging.

The past few decades have also seen an explosion of labor-saving devices, all of which reduce the number of calories we expend on a daily basis. A lot more people are also spending a lot more time staring at computers and TV screens, and engaged in other sedentary pursuits. There was no such thing as a "couch potato" in the 1960s. Now, 66 percent of U.S. households have three or more television sets, which the average American watches for more than four hours per day, according to the A.C. Nielsen Co.[16] But while blame is often laid on TV advertisers for tempting our children with caloric-rich treats, the real problem is the fact that they — and we — are glued to the set rather than to a bicycle seat. ■

10 "'Skinny gene' does exist, researchers find," Southwestern Medical Center, Sept. 4, 2007. See http://www.utsouthwestern.edu/utsw/cda/dept353744/files/409858.html.

11 Trans fatty acids, like saturated fatty acids, have been linked to increased risk of coronary heart disease.

12 Forshee, Richard A., et al., "A Critical Examination of the Evidence Relating High Fructose Corn Syrup and Weight Gain," Critical Reviews in Food Science and Nutrition, August 2007. See http://www.hfcsfacts.com/HFCSexpertReview.html.

13 U.S. Census Bureau, "Industry Statistics Sampler, NAICS 722, Food services and drinking places." See http://www.census.gov/econ/census02/data/industry/E722.HTM.

14 Grunberg, Neil E., "Nicotine, Cigarette Smoking, and Body Weight," British Journal of Addiction," 80; 1985. See http://www.blackwell-synergy.com/doi/pdf/10.1111/j.1360-0443.1985.tb03008.x?cookieSet=1.

15 Centers for Disease Control and Prevention. See http://www.cdc.gov/tobacco/data_statistics/tables/adult/table_2.htm.

16 See http://www.csun.edu/science/health/docs/tv&health.html.

Looking Ahead

By Jack McHugh

Lawmakers' focus on budget issues this session has resulted in little action on technology and environmental issues. However, that is likely to change now that the Legislature has finalized the 2008 budget. Several bills are awaiting debate, including the following:

LAWMAKERS SEEK TO PROTECT PRIVACY

Citing concerns about civil liberties, Rep. Tom Pearce, R-Rockford, has proposed legislation that would prohibit the implantation of an ID microchip without a person's consent. The Food and Drug Administration has approved implantation of a radio frequency microchip in humans to allow hospital personnel to locate medical records quickly. Such ID microchips can also be used as "electronic keys" for security purposes. Rep. Pearce has patterned his proposal after Wisconsin's Public Act 482, which prohibits requiring anyone to undergo a microchip implantation.

In a related matter, Rep. Paul Opsommer, R-DeWitt, has introduced House Bill 5061, which would prohibit the use of radio frequency microchips in a Michigan driver's license. Under the Real ID Act approved by Congress in 2005, states must issue federally approved driver's licenses and ID cards by May 2008. The act requires the use of "machine-readable technology," i.e., a microchip, which could include "biometric identifiers" such as fingerprints or a retinal scan.

For more information go to www.legis.state.wi.us/lrb/pubs/Lb/06Lb13.pdf; www.michiganvotes.org/2007-HB-4133; www.michiganvotes.org/2007-HB-5061.

STIFFER GROUNDWATER REGULATIONS PROPOSED

A legislative package introduced by House Democrats would greatly expand the restrictions on groundwater use enacted last year. House Bills 5065-5073 would impose extensive permitting requirements on commercial and industrial firms. The Michigan Department of Environmental Quality would be granted unchecked new powers to regulate water use, conservation and mitigation requirements.

For more information go to www.michiganvotes.org/2005-SB-850.

STEM CELL RESEARCH

Gov. Jennifer Granholm has urged the repeal of Michigan's ban on embryonic stem cell research. House Bill 4416, introduced by Rep. Andy Meisner, D-Ferndale, would repeal the use of stem cells taken from human embryos created for purposes of in vitro fertilization in a fertility clinic. The use of human embryonic stem cells in medical research remains controversial. Some say that embryonic stem cells hold greater promise for treating a variety of debilitating diseases, including certain types of cancers. But concerns have been raised about the ethical implications of using stem cells from human embryos, as opposed to stem cells from other sources.

The Legislature last year authorized the Department of Community Health to create a statewide network of umbilical cord blood stem cell banks, to be funded by $5 million from the 21st Century Jobs Fund, the state's economic development subsidy program.

For more information go to www.michiganvotes.org/2006-HB-6291.

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