On the Rocks

A Newsletter of the Michigan Basin Geological Society

2012-2013 Number 3 **www.mbgs.org** **November 2012**

MBGS Membership Meeting, November 7, 2012: The November meeting will be held at Michigan State University, Natural Science building at 7:00 pm in room 204. The speaker is John Esch, Michigan Department of Environmental Quality, presenting "Bedrock Topography, Glacial Drift Thickness, Bedrock Outcrops, and Bedrock Valleys of Michigan". Refer to location information in the newsletter.

- It's that time of year again….the Michigan Basin Geological Society dues are due. Please take a moment to update your information and mail in your 2012-2013 dues. A form is provided in the newsletter. Thanks!

- MBGS has a **core display** available for use that visually demonstrates permeability/porosity. There are posters available for use with the core display. Contact Mark Wollensak at wollensak@voyager.net to reserve this great educational tool.

MBGS Meeting
Wednesday, November 7, 2012

Location: MSU, Natural Science Building
The talk will begin at **7:00 PM in Room 204**
Refreshments will be provided after the talk in the Natural Science Building
No charge for this meeting.

Topic:

" Bedrock Topography, Glacial Drift Thickness, Bedrock Outcrops, and Bedrock Valleys of Michigan"

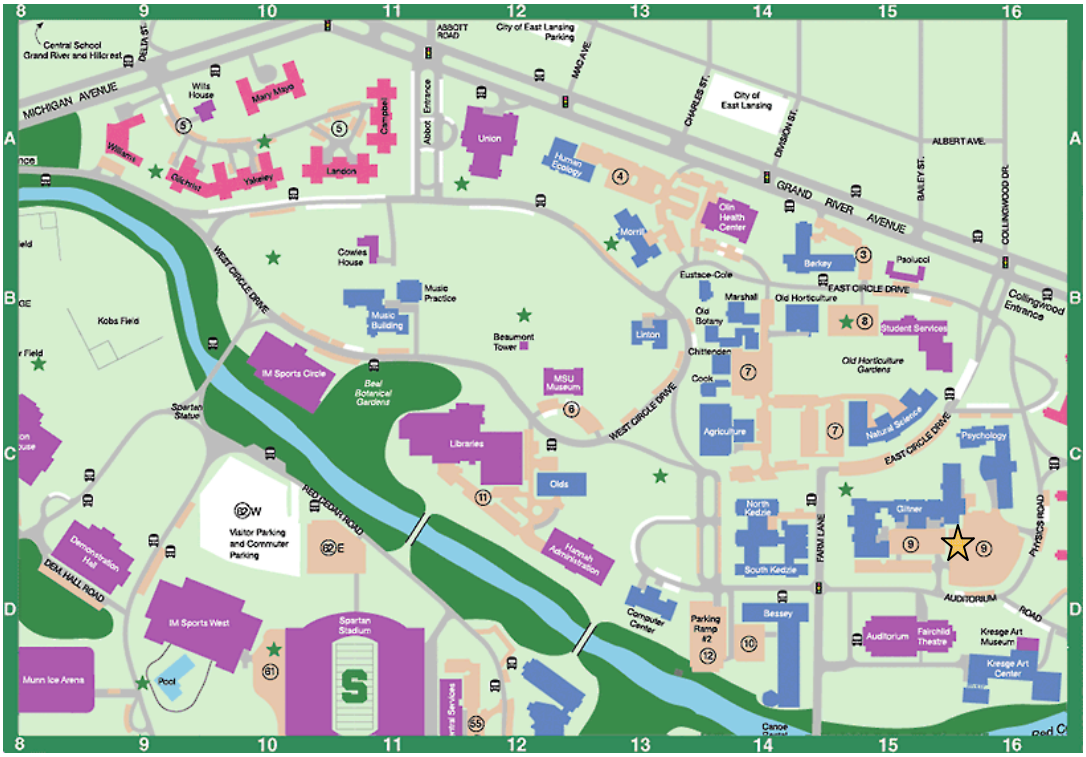
Presenter:

John Esch, Michigan Department of Environmental Quality

Executive Meeting starting at 4:30 PM at Claddagh Irish Pub, Lansing

Please contact Thomas Godbold by if you have any questions
Thomas Godbold E-mail: tgodbold07@gmail.com.

Between 5pm & 6pm you can park in Lot 9 behind Giltner Hall and the Psychology Building (former Physics and Astronomy building) for free. Otherwise you can try your luck with the metered slots clustered around the Natural Science Building and the adjacent Student Services Bldg, no charge after 6.



Biography - John is a senior geologist with the Michigan Department of Environmental Quality, Office of Oil, Gas & Minerals, Petroleum and Mining Geology Unit, Lansing, MI eschj@michigan.gov

John grew up in the Grand Ledge Michigan area and received his BS in geology from Central Michigan University in 1984. He started out his career in 1984 as a geologist with Aangstrom Precision Corporation. He led a geophysical survey crew for one year and later worked as a "computer geologist" mapping the structure and isopach maps of every Paleozoic formation in the Lower Peninsula of Michigan. John constructed the first ever comprehensive glacial drift isopach and bedrock topography maps of the Lower Peninsula of Michigan as well as assisting in mapping the major faults in the basin. In 1990, John left the oil patch and took a job with the DNR (later DEQ) conducting hydrogeologic investigations at contamination sites across the state. From 1998-2006 he has been a project geologist (geodog) on 12 Superfund sites here in Michigan. Since 2006 he has been with the Office of Geological Survey/Office of Oil, Gas & Minerals.

John's interests include studying the bedrock surface and structural geology of the Michigan Basin, use of unconventional geophysical techniques, groundwater surface water interactions, and the use of GIS and 3D visualization techniques to help understand subsurface geology. He chairs the DEQ GIS Committee. He is a volunteer with Lifewater International in which he trains people overseas in groundwater exploration, shallow well drilling and hand pump repair.

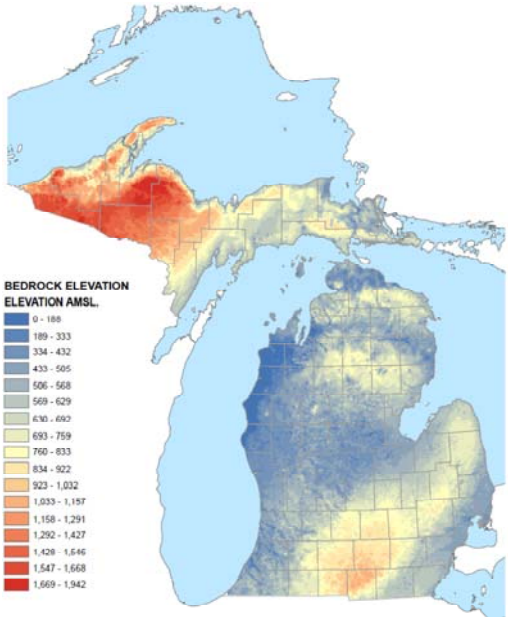
Bedrock Topography, Glacial Drift Thickness, Bedrock Outcrops, and Bedrock Valleys of Michigan

Few studies exist concerning the thickness of the glacial drift, the underlying bedrock surface topography, bedrock valleys or the distribution of outcrops in Michigan. Newly assembled bedrock topography, glacial-drift thickness, bedrock valleys and bedrock outcrop maps were constructed using traditional depth to bedrock data from water, oil and gas, and mineral wells. Due to the sparse well control over much of the Upper Peninsula, nontraditional bedrock elevation sources such as bedrock shorelines and outcrops from bedrock geology maps, SSURGO county soil data, waterfalls, quarries, aerial photos and General Land Office surveyor's plats were also used. The glacial drift thickness map was constructed by subtracting the bedrock surface from a National Elevation Dataset digital elevation model.

The very irregular bedrock surface consists of high relief resistant bedrock highlands and cuestas as well as lowlands, locally smoothed surfaces and deep bedrock valleys. Bedrock valleys in places show well defined drainage networks with tributaries while others show long linear parallel valleys. There may also be local relationships between certain bedrock valleys and scarps with jointing and deeper structural features and resistance variations within individual beds of a bedrock formation. The bedrock surface strongly influenced glacial lobe movement, ice-marginal positions, and interlobate positions. The bedrock surface has been sculpted by numerous paleo-river channels cut into the bedrock during the numerous glacial ice advances over the last 2.5 million years. Others appear to have been cut in preglacial times. Several prominent resistant bedrock cuestas occur, some of which extend into Lake Huron and across southern Ontario Canada.

The Upper Peninsula is characterized by two distinct bedrock surface regions. In the western Upper Peninsula, Precambrian crystalline bedrock forms large, high relief bedrock uplands with bedrock elevations generally greater than 1000 feet above mean sea level (amsl). This contrasts with the eastern

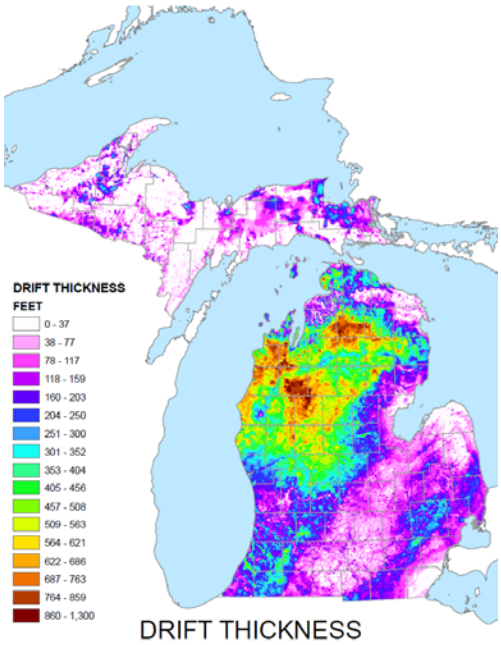
Upper Peninsula where bedrock consists of less resistant Paleozoic sedimentary rocks with elevations generally less than 1000 feet amsl and lower relief. Cuestas and bedrock valleys are the dominant bedrock features in the eastern Upper Peninsula. The Niagaran cuesta and Cambro-Ordovician Sandstone cuestas are especially prominent bedrock features. Locally, the Stonington Formation/Big Hill Dolomite and Black River Formation form lower relief and less extensive cuestas. The Mackinaw Breccia forms localized bedrock highlands north of the Mackinaw Straits. Broad bedrock lowlands generally occur over the Jacobsville Sandstone.



BEDROCK TOPOGRAPHY

In the Lower Peninsula of Michigan, the bedrock surface is dominated by a series of cuestas of which the Marshall Sandstone Cuesta is the most prominent and it is evident as a distinct west sloping bluff at the Marshall Sandstone/Coldwater Shale subcrop contact extending from the northwest corner of Muskegon County in a northeasterly arc to north-central Wexford County. A combined Marshall Sandstone-Coldwater Shale Cuesta is evident as a pronounced bedrock high extending from the western Branch County northeasterly to the tip of the thumb. The Bayport Limestone, Traverse Limestone, Dundee Limestone, Bois Blanc and Bass Islands formations also form cuestas.

Drift thickness in the Upper Peninsula averages 40 feet and ranges from nonexistent at widely scattered bedrock outcrop areas to 450 feet. Drift is locally thicker overlying bedrock valleys, broad bedrock lowlands, along the back cuesta lowlands and over end moraines. This contrasts with the Lower Peninsula where drift averages 270 feet thick and is up to 1,320 feet thick which is the thickest glacial drift on land in North America. Drift is thicker over bedrock valleys and in interlobate areas.



DRIFT THICKNESS

The land surface topography in the Upper Peninsula generally mimics the underlying bedrock topography. In the Lower Peninsula, the land surface topography often is related to the drift thickness. Higher land surface elevations generally correspond to thicker drift, especially in northern Michigan. However, in parts of southern Michigan the opposite is true, especially in Jackson, Hillsdale and Branch Counties where the Marshall Sandstone and Coldwater Shale outcrops and subcrops. In parts of this area higher land surface topography are associated with thinner drift and higher bedrock elevations.

These maps will assist geologists in understanding lobe dynamics, potential glacial aquifers in bedrock valleys, migration pathways, in seismic data processing for oil and gas exploration, bedrock geology mapping, aggregate, mineral and ground-water exploration. In addition the maps may shed some light into the pre-glacial and glacial geologic history of the Great Lakes area.

UPCOMING EVENTS

- **November 1, 2012:** Michigan Section AIPGat the Kellogg Center in East Lansing. The topic is on amendments to Part 201 Section 324.20120(e) regarding venting groundwater. RSVP to Dawn Prell. dprell@nthconsultants.com

- **November 2, 2012:** Wayne State University Planetarium, "**A New Step in Spatial Exploration - The MSL and Curiosity Rover Mission",** Professor Claude Pruneau, Physicist and Director of the WSU Planetarium. No charge but an **RSVP is required** Visit event webpage at: http://planetarium.wayne.edu/science-under-dome/index.php.

- **November 8, 2012** –SPE Meeting, Wonderful World of Coiled Tubing by Subhash Shah, http://connect.spe.org/Michigan/Home/

- **November 29, 2012:** Michigan Section AIPG Annual Meeting, Cleary College, Howell. "Offshore Coring Feasibility Studies – Geotechnical Investigations to Support a Potential Large Water Intake" by Joyce Dunkin.

- **April 15, 2013** – SPE Meeting, Understanding Liquid Loading Will Improve Well Performance by Robert Sutton

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2012-2013 MBGS Officers

The Executive Committee meeting minutes are available on our website at www.mbgs.org

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- The Stratigraphy of Manitoulin Island, Ontario, Canada, June 19-20, 1954
- The Devonian and Silurian Rocks of Parts of Ontario, Canada and Western New York, June 22-23, 1951
- The Traverse Group of the Northern Part of the Southern Peninsula of Michigan, June 16-17, 1949
- The Devonian Strata of the London-Sarnia Area, Southwestern Ontario, Compiled by Erwin C. Stumm, Lewis B. Kellum and Jean Davies Wright, June 9-10, 1956
- The Ordovician Rocks of the Escanaba-Stonington Area, Led by R. C. Hussey , June 2-3, 1950
- The Niagara Escarpment of Peninsular Ontario, Canada, June 18-19, 1955
- Lower Paleozoic and Pleistocene Stratigraphy Across Central Wisconsin, Compiled by C. E. Prouty, Led by L. M. Cline, J. L. Hough and R. F. Black, 1960
- Classic Silurian Reefs of the Chicago Area, by Donald G. Mikulic and Joanne Kluessendorf , June 27, 1998
- Geology of Central Ontario, Canada, 1965

Historical CD #2: Four out-of-print publications from 1947, 1959, 1983 and 1991, 2001, $15

- Copper Country Field Trip, Michigan, June 20-22, 1947
- Geology of Mackinac Island and Lower and Middle Devonian, South of the Straits of Mackinac, June 12-14, 1959
- Tectonics, Structure and Karst in Northern Lower Michigan, August 1983
- Geology of the Pictured Rocks, Upper Peninsula, Michigan, July 11-13, 1991

Historical CD #3: Six out-of-print publications from 1948, 1952, 1990 - 1995, 2001, $15

- Pleistocene and Early Paleozoic of the Eastern Part of the Northern Peninsula of Michigan, June 18-21, 1948
- Stratigraphy and Structure of the Devonian Rocks in Southeastern MI and Northwestern OH, June 20-21, 1952
- Lower Ordovician and Upper Cambrian of Wisconsin , May 10-12, 1990
- Guidebook to the Precambrian Geology and Metallogeny of the Central Upper Peninsula of Michigan September 12-13, 1991

Historical CD #4: Six out-of-print publications from 1957, 1958, 1961, 1967, 1968 and 1970, 2004, $15

- Silurian Rocks of the Northern Peninsula of Michigan , 1957
- Cambrian Geology of Parts of Dickinson and Iron Counties, Michigan, June 1958
- Geologic Features of Parts of Houghton, Keweenaw, Baraga and Ontonagon Counties, Michigan, May 19-21, 1961
- Correlation Problems of the Cambrian and Ordovician Outcrops Areas, Northern Peninsula of Michigan 1967
- The Geology of Manitoulin Island, June 1968
- Devonian Strata of Alpena and Presque Isle Counties, Michigan 1970

Historical CD #5: Five out-of-print publications from 1971, 1989, 2001, and **Oil & Gas Fields Vol. 1 & 2, 1969 & 1992**, 2006, $50

- Oil & Gas Fields Symposium, Volume 1**,** April 1969**,** 200 pp., maps, illus., second printing with updates
- Oil & Gas Fields Manual of the Michigan Basin, Volume 2**,** 1992**,** 520 pp., maps, illus.
- Glacial Geology of Southwestern Michigan**,** 1989**,** 53 pp. by A. Kehew, L. J. Schmaltz, and W. T. Straw
- Geology of the Lake Erie Islands and Adjacent Shores**,** 1971**,** 65pp., maps, illus. by Jane L. Forsyth
- Glacial Geology of Southwestern Michigan, Landforms of the Lake Michigan Lobe, Southwestern Michigan, 2001, AAPG Eastern Section Meeting Field Trip, 32 pp., maps, illus. by A Kehew and A. Kozlowski

Historical CD #6: Six out-of-print
publications from 1946, 1953, 1963, 1966, 1978 & 1987 plus the Richfield Challenge, 1952 & Tom Knapp's MS Thesis, 2007 $15.

- Guidebook for Ordovician Stratigraphy of the Cincinnati, Ohio and Richmond, Indiana Areas, June 12, 13, 1953 by W. H. Shideler and B. T. Sandefur
- Guidebook for Ontario Geological Excursion to Kettle Point – Owen Sound- Waubaushene, June 21, 22, 23 1946 by W. A. Roliff, C.S. Evans and J.F. Caley
- Guidebook for the Stratigraphy of the Silurian Rocks in Western Ohio, May 31-June 2, 1963 by C. H. Summerson, Jane L. Forsyth, Karl V. Hoover and J. R. Ulteig
- Guidebook for Cambrian Stratigraphy in Western Wisconsin, May 21, 22, 1966 by Merideth E. Ostrom
- Geology of the Manitoulin Area, Special Papers #3, September 29, 30 and October 1, 1978 by J. T. Sanford
- and R. E. Mosher
- Middle Devonian Cratonic Carbonates and Shales in Southwestern Ontario, November 14, 1987 by Bruce Wilkinson
- The Richfield Challenge, A Review of the Richfield Developments in Michigan, 1952 by Gordon H. Hautan
- A Theory of Rogers City and Dundee Relationships in Central Michigan, Masters Thesis, 1947 by Tom Knapp

(NEW) Historical CD #7: Six out-of-print
Field Guidebooks from 1962, 1969, 1977, 1980, 1985 & 1988, $15

- Silurian Rocks of the Southern Lake Michigan Area, 1962, James H. Fisher, Chairman, MBGS Annual Field Conference
- Studies of the Precambrian of the Michigan Basin, by Harold B. Stonehouse, 1969
- The Geology of the Marquette District: a Field Guide By F. W. Cambray, 1977
- Ordovician and Silurian Geology of the N. Peninsula of Michigan, 1980, R.B. Votaw, 40 pp., illus., maps
- Special Paper #4: Ordovician and Silurian Rocks of the Michigan Basin and its Margins, 1985 K.R. Cercone and J.M. Budai (eds.), 96 pp., illus.
- Upper Keweenawan Rift-Fill Sequence, Mid-Continent Rift System, Michigan, 1988, P.A. Daniels and R.D. Elmore, M.S. Wollensak, ed., 150 pp., illus., maps

OTHER SPECIAL OFFERS

- **Historical CD Set - # 1 – 7 (detailed above) for a special purchase price of $95**

- **NE Lower Peninsula Geological Field Conf.,** 2004, T. Black, M. Wollensak, On CD $10

- **Stratigraphic Lexicon for Michigan,** 2001, prepared by MBGS and published by DEQ, $4

- **Robert E. Mosher Geological Studies** A lifetime of geological research on Silurian Rocks with John T. Sanford. The disks are organized chronologically and include field work in North America and Europe. 2007, 2 CDs $35.

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Please fill out this form when paying your dues for 2012-2013. Dues are $25.00 for active member and $10.00 for students.

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