

Living with Highs and Lows

Policies and Adaptive Actions for Great Lakes Water Level Variability

This document provides answers to questions there was not time to answer live during the webinars. Responses were prepared by the presenters and their project team members.

November 10, 2016

Coastal bluff erosion | Milwaukee and Ozaukee Counties, Wisconsin

David Hart, Wisconsin Sea Grant

Q: What is the current status for getting flood insurance for homes along eroding shorelines?

A: I spoke with Alan Luloff at the Association of State Floodplain Managers (<http://www.floods.org/>) for this question. A person can purchase flood insurance if their community participates in the National Flood Insurance Program (<https://www.floodsmart.gov/floodsmart/pages/faqs/how-can-i-get-flood-insurance.jsp>). The question raises the issue of erosion (<https://www.fema.gov/erosion>). As quoted on this site: "Although flood-related erosion is covered by flood insurance, this peril is not covered per se under the National Flood Insurance Program." Determining whether damage was related to a flood event or long-term erosion complicates the matter, as indicated during some claims after Sandy.

Q: How significantly would trimming the extreme high and low levels affect the degree to which adaptive measures would be required - as well as reducing the ultimate costs of those measures?

A: I would need some more context to address this question. I'm not sure how the author of the question envisions trimming water levels. According to historical records since 1918 (<https://www.glerl.noaa.gov/data/dashboard/GLWLD.html>), variability of monthly water level averages on Lakes Michigan-Huron is approximately 6 feet. If the question speculates on the impact of a control structure in the St. Clair River, it is probably better suited for the International Joint Commission or the U.S. Army Corps of Engineers to answer.

Q: Do Wisconsin Department of Natural Resources (WDNR) and/or U.S. Army Corps of Engineers (USACE) seawall and revetment permits cover the entire parcel shoreline frontage or do they end short of the property lines to minimize increased erosion on neighboring parcels?

A: In the study area (and all of Wisconsin) the WDNR takes the lead on reviews and State issuance for seawall and revetment permits. The vast majority of permits are for rock revetments. Typically, the USACE issues their nationwide general permit since revetments and walls seldom encroach upon navigation issues. WDNR permit agents have basic training on general seawall and revetment design Best Management Practices (BMPs) and review permit applications for specific excavation and structure encroachment onto the adjacent lakebed. These are the two major details reviewed since they are in their permitting duty requirements. In addition, they often will look for obvious missing/inadequate typical construction details such as the presence of filter layers or fabric, adequate structure toe protection against wave scour, and construction material. If possible, they may discuss with the applicant the potential detrimental effects to adjacent parcels and question if the structure is high enough to account for any wave overtopping. However, the major review would be focused on the specific area where the structure was to be constructed and may not be the entire parcel if that additional frontage was not included. The ultimate issuance of a permit does NOT insure the structure is adequate for design conditions nor does it accept any responsibility for any future detrimental effects it may cause on adjacent parcels. Those factors remain the responsibility of the permit owner and their consultants/contractors.

Q: Are dredged sediments used in Wisconsin for beach nourishment? If so, are the dredged sediments placed off-shore or on the beach?

A: Beach nourishment using dredged material is allowed in Wisconsin but is rarely used. One major issue is that the dredged material from our major ports is often mixed with significant quantities of fine silts and clay as well as some contaminants. In most cases, the material is well under 95% sand

fraction which would be a typical cutoff value for use as beach nourishment. However, both the port of Green Bay and Superior, WI attempt to sort out the sand fractions and sell it to local construction firms. We have actively promoted the beneficial use of our clean dredged material in Wisconsin and where suitable material is found would accept it for beach nourishment. It has been used in a few locations and is currently being considered for future beach restoration projects. When used as beach nourishment, the material would be placed on the beach when hydraulic dredging is used and in the close nearshore area (well within the littoral zone) if mechanical dredges with shallow scows were used for the dredging. The state of Wisconsin specifically prohibits the offshore “deposit” of dredged material into the open lake beyond the littoral zone.

Q: Do you use LiDAR data to evaluate shoreline erosion rates in Wisconsin?

A: The research team has used the 2012 USACE LiDAR to do bluff profiles along much of the Wisconsin shoreline. They have “re-occupied” these profiles on 2015 LiDAR available in Milwaukee County with very little, if any, change. Ozaukee County LiDAR is not available for 2015, so there is only the 2012.

Q: Do have before and after project photos of “grey infrastructure” failures you could share with us?

A: Our WDNR has many examples of “grey” revetment failures which occurred during the recent high water level period. Many are now being repaired or totally reconstructed, hence the need for a new construction permit. Many have failed due to inadequate construction techniques and/or materials. Others have failed due to inadequate top elevations, allowing for significant wave overtopping and scour. Our project team Coastal Engineer also has many pictures of failed grey infrastructure examples; however, since both our Wisconsin WDNR and our project team Coastal Engineer are typically called after a failure, we seldom have “before” or “as built” photographs

Q: Other webinar attendees have mentioned an interest in images of shoreline structures. Did you know additional images are available at <http://coastal.ohiodnr.gov/shorestructures>?

A: Thanks for sharing the website. Ohio Coastal Management does a wonderful job of providing information about coastal hazards.

Q: My experience with revetments installed during the last Lake Michigan high water period is that they are now having negative effects on adjacent property owners and many revetments now stick out into the lake and prohibit shoreline walking. Is that true in your study area too? I'm from Michigan.

A: Yes, there are some revetments in our study area which were constructed during high water levels and now still reach out into the lake due to a lack of significant beach material returning. Since Wisconsin law indicates that a property owner’s land use extends to the waterline, if there is no beach present, the public is advised to “keep their feet wet” when walking past such a structure. They would have to stay lakeward of the revetment toe to traverse the “shoreline”.

Q: Are you working in the results of effectiveness studies of the various treatment types being considered? Or, have there even been any studies attempting to assess treatment effectiveness?

A: The wide variety of shore protection “treatment types” presented to our project audience where those in which our project team specialists identified as being “possible” solutions dependent upon the specific parcel involved. We specially attempted to include every possible solution from completely “green” nature-based solutions to completely “grey” conventional solutions. The audience participants were given general descriptions of each treatment option as well as where it typically would be appropriate and where it would not function satisfactorily. We also discussed cost ranges of each. However, we have not specifically worked with each property owner to recommend the appropriate solution or solution options. In this case, we were looking for their perceptions of whether they would approve of these options, if applicable to their specific situation. We would like to explore where each option would be applicable and certainly would support demonstration studies of various structural solutions, especially the “green” nature-based options. To date, we have no examples of “nature-based” options in place along our project study area.

Q: There are dunes and bluffs in Ozaukee County. Does the increase in shore protection include both shoreline types or only bluff areas?

A: Actually, much of the Ozaukee County shoreline where there is no bluff is already protected with revetment or at least rocks along the top of the beach. See map at: <http://floodatlas.org/wcmp/obliqueviewer/>. There is relatively little shore protection along the bluff shoreline.

Q: Is there a method of shore protection that permits longshore transport of sediment to continue? Was longshore transport a concern of this project?

A: Beach and nearshore sediment supply appear to be closely linked to how much sediment enters the system from the bluff and from nearshore downcutting. All shore protection methods have a negative effect on longshore sediment supply as far as I know.

Q: How can we access the various methods of bluff stabilization you examined? Is there a report that highlights the most successful techniques?

A: The Phase 2 report for our Great Lakes Water Levels Integrated Assessment project lays out 29 possible response options. You can access this report, as well as the other project reports, through the website at <http://seagrant.wisc.edu/glwlia>. We are working to refine these options as the integrated assessment continues. We also send monthly reports about the project through Constant Contact. Please send your email to Deidre Peroff (dmpferoff@aqu.wisc.edu) to be included.

November 17, 2016

Extreme water levels | Huron County, Ontario

Lynne Peterson, Local Government and Integrated Policy

Matthew Hoy, Lake Huron Centre for Coastal Conservation

Q: Is there any periodicity to the polar vortex that caused record ice cover on the Great Lakes a few years ago?

A: Dr. Agnes Richards, Environment Canada and Climate Change scientist suggests that you refer to: Veretenenko SV, Ogurtsov MG. 2012. The Polar Vortex Evolution as a Possible Reason for the Temporal Variability of Solar Activity Effects on the Lower Atmosphere Circulation. Proceedings of the 9th Intl Conf. "Problems of Geocosmos"; St. Petersburg, Russia. [\[PDF\]](#)

Q: Is LiDAR being used to update the erosion rates & shoreline erosion hazard maps?

A: Alec Scott, Water and Planning Manager from the Ausable Bayfield Conservation Authority replies: "To date we have not used LiDAR to update the erosion rates. In our part of Ontario, there is a recent program called Southwestern Ontario Orthophotography Project (SWOOP) where the shoreline gets flown along with inland areas approximately every 5 years. The resolution of the 2010 and 2015 ortho-images is 20 cm and the raw images, model files, and 3D point clouds were part of the deliverables and suitable for use in a 3D environment using photogrammetry software. In 2007 the shoreline was flown at a ground sample distance of 6 cm to produce a 10 cm ortho-imagery, and 1 m true and ½ m interpolated contours. Flights occur in leaf off conditions and we have found this to be acceptable to determine the toe of slope and top of bank."

December 1, 2016

Climate change, lake levels, tribal fisheries & culturally important sites | Northwest Lower Michigan

Frank Marsik, University of Michigan, Climate and Space Sciences and Engineering
Richard Rood, University of Michigan, Climate and Space Sciences and Engineering

Q: Does irrigation from farming affect lake levels?

A: According to the Great Lakes Commission Annual Report on Great Lakes Regional Water Use (2012), in 2012 approximately 44.3 billion gallons a water per day are withdrawn from the Great Lakes watershed for a variety of uses. Of this, approximately 662 million gallons of water per day are withdrawn for the irrigation of agricultural crops. In contrast, Lenters et al. (2013) estimate that evaporation results in the loss of approximately 820 billion gallons of surface water from the Great Lakes waters each day. Given that the Michigan DEQ estimated in 2006 that less than only 2.5% of water withdrawn from the basin by Michigan agricultural uses was taken from the surface waters of the Great Lakes, combined, these studies would suggest that evaporative losses from the surface waters of the Great Lakes far exceed those drawn for agricultural irrigation.

December 8, 2016

Developing land-use regulation and infrastructure policy | Southwest Michigan

Richard Norton, University of Michigan, Urban and Regional Planning Program
Zachary Rable, University of Michigan, Urban and Regional Planning Program
Katie Sieb, LIAA

Q: We all understand the pitfalls of hard armoring on the shoreline, but in the absence of land use solutions landowners want to protect their shore, is there benefit to give them a pros cons list of options to protect the shoreline. (e.g. underwater breakwaters that may not impact lake processes?)

A: In consultation with Guy Meadows (Michigan Technical University), we conclude that there really are no benefits or pros to constructing hardened shoreline structures--even underwater breakwaters--in terms of protecting the shore. Such structures are designed to protect nearshore built structures by preventing the movement of sediment--particularly the loss of sediment through erosion or avulsion. But in doing so, they also necessarily interrupt the natural movement of sediment needed to maintain the natural and stable (albeit dynamic) structure of the shoreline itself. The result ultimately is the loss of the sandy beach on the property "protected," and likely the loss of shoreline along neighboring properties. In addition, absent ongoing maintenance, these structures ultimately fail as lake processes scour them away. If the goal is to protect the natural functioning of the shoreline, then the better approach is to establish "soft" shoreline protection measures like natural vegetation where and when appropriate to control erosion as much as possible, and to plan for the movement of structures when necessary as the shoreline naturally moves over time. If the decision is made to construct hardened armoring because the built structures on the shore are deemed too valuable to be lost, then that decision should be made with the full understanding that lake will scour away the natural beach lakeward of that armoring at some point, and may detrimentally affect neighboring shoreline, at least for extended periods when standing lake water levels are high.



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