WAFSCM 2014 CONFERENCE
ABSTRACTS

SESSION 1

Storm Transposition for Stormwater Ordinance Evaluation

Ken Potter, Nicholas Hayden, David Liebl
University of Wisconsin-Madison

Downscaled climate projections for Wisconsin indicate increases in the magnitude and frequency of extreme rainfall events. But these projections have poor spatial and resolution and vary greatly across models; hence they are not ideal for adapting water management to climate change. Transposition of extreme storms is a potentially useful approach for identifying vulnerabilities to large storm events. By combining NEXRAD and rainfall data it is possible to produce relatively accurate records of the spatial and temporal distribution of extreme events that have occurred recently in a region. We have reconstructed the spatial and temporal distribution of the rainfall associated with the June 2008 extreme events that were centered over the Baraboo River watershed in south-central Wisconsin. We have then used this reconstruction as input to the EPA Stormwater Management Model (SWMM) to determine whether the current Dane County stormwater ordinance adequately prevents increases in flooding in the Yahara Lakes due to watershed urbanization.

New NOAA Precipitation-Frequency Atlas for Wisconsin

Annette Humpal, NOAA and Michael Hahn, SEWRPC

NOAA Atlas 14, "Precipitation-Frequency Atlas of the United States- Volume 8 Midwestern States," was recently released. In Wisconsin, the work on the Atlas was funded by the Wisconsin Departments of Natural Resources and Transportation and the Southeastern Wisconsin Regional Planning Commission (SEWRPC). The Atlas is intended to replace U.S. Weather Bureau Technical Paper No. 40, which was published in 1961, as well as regional precipitation-frequency studies such as SEWRPC's Technical Report No. 40, published in 2000.

The information in Atlas 14 is essential to performing hydrologic analyses using a design storm approach, and has applicability to studies and designs for floodplain mapping and management, stormwater management, green infrastructure, and sustainable development. The Atlas presents information in a web-based format and includes 1) precipitation depths for recurrence intervals of one year through 1,000 years and selected durations from five minutes through 60 days and 2) time distributions of heavy precipitation for 6-hour, 12-hour, 24-hour, and 96-hour durations.

This presentation will focus on application of Atlas 14 in Wisconsin, providing a review of historical precipitation frequency studies; a detailed look at the information developed for the Atlas, including an interactive, web-based demonstration of how the data can be accessed; comparisons of currently-applied precipitation depth-duration amounts with amounts developed for the Atlas; comparison of storm time distributions; and an update on interagency efforts to develop guidelines for multi-purpose use of this information in Wisconsin.

The Corps Water Management System (CWMS): An Overview and Case Studies

Adam Schneider, Senior Engineer, David Ford Consulting Engineers

The US Army Corps of Engineers (USACE) Corps Water Management System (CWMS) is a software tool designed to support operational decision making. CWMS facilitates compiling and viewing real-time data through an intuitive graphical user interface. In addition, CWMS couples real-time data, quantitative precipitation forecasts (QPFs), and simulation models to forecast stages and flows and provide decision support to water managers. These simulation models include the Hydrologic Engineering Center's hydrologic modeling system (HEC-HMS), river analysis system (HEC-RAS), reservoir simulation model (HEC-ResSim), and flood impact analysis (HEC-FIA) software. A common

application consists of 1) CWMS compiling and processing real-time data and QPFs, 2) applying those data and QPFs to an HEC-HMS watershed model to forecast reservoir inflows and local flows, 3) applying the reservoir inflow and local flow forecasts to HEC-ResSim to compute reservoir release forecasts, 4) applying the reservoir release and local flow forecasts to HEC-RAS to compute flow and stage forecasts at points downstream of reservoirs, and 5) using HEC-FIA to analyze the consequences of the forecasted flood event. This presentation will include a detailed overview of CWMS and present case studies for the Red River of the North (St. Paul District) and the Buffalo Bayou (Galveston District) watersheds.

Great Lakes Coastal Flood Hazard Mapping – Applying V-Zone Building Requirements on the Great Lakes
Alan Lulloff - ASFPM

The Federal Emergency Management Agency (FEMA) is revising the Flood Insurance Rate Maps (DFIRMs) for coastal counties along the Great Lakes to include the impact of surge and wave run-up. Areas impacted by waves have special designations on these maps. Building construction in these designated areas is required to be consistent with ASCE 24. A primary requirement of which is that structures be built on piles and/or columns to allow waves to move under a structure to prevent erosion that undermines the foundation. This will be important not only in relation to mapping V Zones but also LimWAs (limit of moderate wave action) since the V Zone building standards apply in these areas as well. This presentation focuses on the implication of designations on FIRMs in coastal communities on the Great Lakes.

Comparison of Sediment Budgets of Nearshore Environment for Two High Coastal Bluffs on Lake Michigan

Chin H. Wu, UW Department of Civil and Environmental Engineering, University of Wisconsin–Madison, Madison, WI, *chinwu@engr.wisc.edu*

Sediment budget is critical to the dynamic evolution of coastal bluff and nearshore environments. In this talk, we report sediment budget at two high-bluff (30-45 m) sites. Historical aerial photos and topographic surveys of bluffs and beaches were conducted to obtain the recession rate of bluff crest and toe, shoreline position, and beach width. Successive nearshore substrate surveys were performed. Longshore sediment transport driven by waves and currents were measured to characterize littoral transport of cohesive bluffs. At Port Washington, WI, the bluff crest recession ranged from 0.05 to 0.6 m/yr. In contrast, the bluff toe experienced a net deposition up to 1.1 m/yr. Field observations of beach width and sediment availability agreed with calculated trends of sediment accretion. At the Wisconsin Concordia University site, no beaches existed in front of the newly-built coastal structures, suggesting that natural sediment pathways may be disrupted. Distinct spatial variation of bluff slumping occurred, which was most severe on the south bluffs, average on the north bluffs, and nonexistant within the structured area. Comparison of sediment budgets for the two sites aids in understanding the impacts of shore protection structures on the nearshore environment, leading to better regional integrated bluff management (IBM) for coastal bluffs in the Great Lakes.

LUNCHEON SPEAKER

The Calumet County Legacy of the Waste Swamp Land Act (1850)
Matthew Marmor, Calumet County Emergency Management

This presentation will examine local Calumet County's colorful history in the Manitowoc Watershed Basin following Wisconsin's implementation of the Federal Swamp Land Act of 1850. The Act transferred ownership of waste and swamp lands in Wisconsin from federal to state jurisdiction, and eventually legislated on to private parties who could reclaim the land by draining it. Besides swamp fever was a public health hazard and settling the land made it more valuable.

As the land use changed so did the flood hazards. Documented heavy precipitation events in the mid 1900s through current times have made flooding a reoccurring thorn, and increasingly a potential economic risk to the area. Today the area is in the midst of plotting out a community led vision to address flooding issues. The historical perspective is foundational to forming flood hazard mitigation strategies, both for local land use and the role of wetlands in the watershed. What about the original drained swamp lands? Well, come and find out what became of them.

SESSION 2

How Non-Regulatory Products Can Benefit Your Community
Erik Binnie, WDNR Floodplain LOMR GIS Specialist

Starting this year, the Wisconsin DNR has begun offering a suite of spatial products to communities in select watersheds known as the Non-Regulatory Flood Risk Products. Behind the dull name are exciting datasets, developed to FEMA specifications, which are designed to better engage and inform local communities about their different flood risks. This presentation will detail the unique processes the Wisconsin DNR went through to create these products and how the non-regulatory products can benefit your community. During a flooding event, a stream can run down Main Street and a shoreline can be at your doorstep. With the assistance of the Non-Regulatory Flood Risk Products, communities will be able to more effectively plan for such events.

Wisconsin DNR ePermitting System
Lu-Venus Mayas, WDNR ePermitting Outreach Specialist

The ePermitting system was designed, to get application permits dealing with these specific topics submitted to the DNR. The presentation uses the Internet (if available) or a PowerPoint presentation to show people who to want to submit a Water permit application electronically to the Wisconsin Department of Natural Resources for review and approval.

The on-line permit system has a number of different parts that are being phased in over the next year. Right now, applicants will find 72 of the nearly 100 water-related permit applications on the same web page for the first time, and applicants for three of the most popular permit types can now fill out their applications on-line, pay any fees on-line, and track the progress of their application on-line. The three permit types available for on-line processing at this time are individual permits for wetland and waterway projects; permit applications for wastewater pit trench de-watering, and permit applications for aquatic plant management on private ponds. Coming soon are Stormwater permit applications. This new system will provide better overall protection of natural resources where projects are proposed, will provide more consistent decisions across DNR regions and water-related programs, and will help eliminate duplication of effort by staff.

Case Studies of ISIS-FAST Rapid 2-Dimensional Flood Inundation Modeling
Mark Mittag, Paul Robinson, Colin Moore, CH2M HILL

The ISIS-suite of hydrologic and hydraulic modeling software has over 10,000 users world-wide, but has been little-known in the U.S. Recently, it has been gaining in popularity in the U.S. from it's ability to provide rapid 2-dimensional flood inundation modeling using the ISIS-FAST solver. The solver's simplified 2-dimensional modeling approach uses LIDAR or other raster Digital Elevation Model (DEM) data to quickly analyze overland flow paths and estimate flood inundation depths. Applications have included quickly mapping floodplains for entire counties to identifying flooding problem areas at the start of small watershed studies.

This presentation will provide two U.S. ISIS-FAST case studies. In Florida, ISIS-FAST results at the beginning of a county-wide urban flooding study identified problem flooding areas allowing detailed data gathering investments to focus upon those locations. In Chicago, ISIS-FAST modeling combined

with local storm sewer model results provided quick estimates of the storm sewer level of service under the proposed urban flood reduction alternative. In addition to the case studies, participants will learn how to download a free copy of the ISIS-suite of modeling software.

The CRS Basics
Scott Cofoid, ISO, Inc.

The Community Rating System (CRS) is a Federal Emergency Management Agency (FEMA) program, administered by the Insurance Services Office (ISO, Inc.) that recognizes communities for their floodplain management activities that go above and beyond the minimum NFIP standards. The CRS assigns credit points for each floodplain management activity a community performs and then correlates those points to classes and flood insurance premium discounts for homeowners in that community. This session will discuss what the CRS Program is, how it works, the many benefits of it, how to apply to the CRS and what activities a community can earn credit for doing. This session will also look at state laws and common practices that communities can take advantage of under the Program.

Adaptive Management Program - FEPS Update
Matthew Clark, W.F. Baird & Associates Ltd.

The Flood and Erosion Prediction System (FEPS) was developed for the US Army Corps of Engineers in the early 2000s. It is a deterministic modeling tool that links GIS technology, engineering models, automated mapping tools, and custom visualization in a modular system. FEPS has been used to estimate future bluff and dune position for more than over 3,000 miles of shoreline on the Great Lakes. With the addition of economic data and attribute information for property parcels, such as tax assessment value and distance of buildings from the erosion reference feature, the FEPS capabilities include the calculation of economic damages due to shoreline recession, flooding, and failure of shore protection structures. Within the last twelve months, the FEPS has been modernized. This work includes updates to the databases (shoreline structures, demographics data, etc.), shore protection damage algorithm, and GIS tools to run on the Windows 7 platform, as well as improved linkages between FEPS and MS Excel. The erosion, flooding, and shore protection Performance Indicator documentation has also been brought up-to-date, and a comprehensive manual has been developed. The presentation will present the history of the FEPS development and provide useful examples of applications.

Development of Geo-Indicators for Assessment of Coastal Bluff Ecosystems along Lake Michigan for Regional Integrated Bluff Management (IBM)

Nick Jordan, Geological Engineering and Geology, University of Wisconsin–Madison, Madison, WI, *nbjordan@wisc.edu*

Coastal bluffs along the Great Lakes are a sensitive landscape feature, often containing both vital shoreline habitat at the bluff face and toe and urbanized development at the crest. Sediments are the major component in the coastal bluff environment (CBE). Due to a periodic bluff failure and recession, changes in beach width, and the nature of the nearshore environment, movements of sediment are constantly altered by natural climate factors and anthropogenic coastal development. As a result the nature of coastal bluff ecosystem is in a state of constant change. Proper management of coastal bluffs requires sound science-based knowledge of the factors influencing bluff recession. Three sets of geo-indicators are being used to parameterize the CBE, quantify coastal processes with a regional sediment budget, and characterize the health or function services of the CBE. We present geo-indictors derived from data collected and compiled at both developed (e.g., Oak Creek, North Port Washington) and undeveloped (e.g., Manitowoc County, Lion's Den County Park) sites. These geo-indicators will help coastal managers effectively assess the health of the coastal bluff ecosystem for regional integrated bluff management (IBM) along Lake Michigan.

SESSION 3

Municipal Stormwater Permit Guidance for Implementing TMDLs
Kevin Kirsch and Eric Rortvedt, WDNR

DNR will present proposed guidance for implementing TMDL requirements in municipal stormwater discharge permits. DNR will explain why a percent reduction approach is proposed for implementing MS4 mass allocations. Municipal stormwater benchmarks of compliance will be discussed as a way to show progress in complying with TMDL requirements.

The Milwaukee River Basin Total Maximum Daily Loads
Daniel G. Bounds, CDM Smith
Kimberly O. Siemens, CDM Smith

Under Great Lakes Restoration Initiative funding, the Milwaukee Metropolitan Sewerage District (MMSD) commissioned a study to develop total maximum daily loads (TMDLs) for phosphorus, sediment, and fecal coliform bacteria in the 880-square-mile Milwaukee River Basin, which contains the Menomonee River, Kinnickinnic River, and Milwaukee River watersheds, and the Milwaukee Harbor estuary. A TMDL is the maximum amount (expressed in load per day) of a pollutant a water body can receive from both point and non-point sources and still meet water quality standards or targets. The purpose of the TMDL study was to allocate loads of total phosphorus, sediment (Total Suspended Solids), and fecal coliform bacteria in a manner that will result in attainment of applicable designated uses throughout the Basin. As part of the effort, an implementation plan is also under development to lay out actions aimed at achieving the loading allocations identified by the TMDL calculations.

The presentation is relevant to this year's WAFSCM conference theme because it will not only touch on the regulatory motivation behind the study and provide an overview of the TMDL development process, but will also outline the approaches used to calculate allowable loads for the varied pollutant sources throughout the Milwaukee River Basin.

Mitigation Round Table
Roxanne Gray, Mitigation Section Supervisor with Wisconsin Emergency Management
Gray Heinrichs, State Floodplain Manager with the Department of Natural Resources
Donna Haugom, Jefferson County Emergency Management Director

This panel will focus on the topic of mitigation including an introduction on what is mitigation and examples; how to identify and prioritize mitigation opportunities, and how it all ties in with planning at the local level. The second portion of the panel discussion will focus on moving past the response phase in flood events, and how state agencies coordinate to assist communities during recovery through mitigation. It will discuss how mitigation can work in conjunction with floodplain regulations. The final portion of the panel discussion will provide the local perspective in implementing a long-term mitigation program at the county level. Presenters will be Roxanne Gray, Mitigation Section Supervisor with Wisconsin Emergency Management; Gray Heinrichs, State Floodplain Manager with the Department of Natural Resources; and Donna Haugom, Jefferson County Emergency Management Director.

An Innovative Flood Warning Tool: Integrated Nowcast and Forecast Operation System (INFOS) for the Yahara River Chain of Lakes (RCL)

John R. Reimer, Graduate Student, Department of Civil and Environmental Engineering, University of Wisconsin–Madison, Madison, WI, *jrreimer@wisc.edu*

Historic flood events in the Yahara River Chain of Lakes (RCL) have resulted in millions of dollars of damages. Flooding events would be more frequent and severe due to the projected

increasing extreme rainfalls caused by climate change. As a result, there is a great desire to issue timely warnings for the public and lake level managers. In this talk, we will show an innovative tool, Integrated Nowcast Forecast Operation System (INFOS), for providing flood warnings for the Yahara RCL, Wisconsin. Specifically hourly real-time rainfall map, obtained from over 60 weather stations and forecasted precipitation from the National Weather Service, are shown. The rainfall information would be used in a series of watershed hydrologic, river hydraulic, and lake hydrodynamic models to delineate flood inundations for the Yahara RCL. Lake water levels and river discharges would be projected for the purpose of providing timely and future flood outlooks and warnings. INFOS is a valuable tool for flood warnings. Furthermore INFOS can also yield outcome of flood scenarios, which can be used for flood adaptation and mitigation.

Developing and Interpreting Coastal Floodplains along the Great Lakes
Matthew Rembold, P.E., CFM and Nathan Catania, GISP, CFM, CDM Smith

Workmaps depicting coastal hazard areas along the Wisconsin shoreline are scheduled to start being released by the end of 2014. The engineering and mapping procedures have been developed for the coastal analyses along the Great Lakes, but are not widely published. Additionally, coastal mapping that accounts for waves and water levels is new to most of Region V and may be unfamiliar to those that have to interpret the FIRMs. This presentation will provide a background on both the engineering and mapping portions of the coastal analyses. It will also provide insight into how the engineering results are translated into the mapping features found on the FIRM. Several examples will be presented showing how coastal zones, BFEs, and gutters were determined and placed on the map.

CLOSING PLENARY

Geology of Dunes and Sandy Bay Barriers along Lake Michigan's Door Peninsula: The Importance of Increased Sediment Supply Following High Lake Level Phases
Dr J Elmo Rawling 3rd, UW-Extention, Wisconsin Geological and Natural History Survey

Understanding how shorelines of the Great Lakes have responded to past lake-level fluctuations can help inform future management decisions. This study focuses on the geologic formation of dunes and sandy barrier beaches in Wisconsin's Door Peninsula to document sedimentary responses to natural lake-level fluctuations. Dunes are not very common along the Lake Michigan shoreline in Wisconsin, but the three bay barriers studied were buried by wind-blown sand including dunes that have relief of up to ~60 feet. The purpose of this study was to document when the barriers formed and when the subsequent dune activity occurred. The chronology presented here for barrier emplacement and dune development is based on 65 optical ages that were collected from littoral sediment in the barriers (n = 17) and the overlying wind-blown sand (n = 48). The barriers initially formed during the Nipissing high lake phase (~6.0-4.5 thousand years ago), and were modified during the subsequent Algoma high (~3.4-2.3 thousand years ago). The majority of the dune ages fall into two primary groups that overlap with or are slightly younger than the ages acquired from the barriers. Dune development occurred rapidly when the sand supply increased as lake levels receded.

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