## THINKING OUTSIDE THE BOX CULVERT II, UPDATE ON SUSTAINABLE FLOOD MANAGEMENT.

### Presenter Information:

Name of Author(s): David Fowler

### Abstract:

Current national policy for floodplain and floodway management policy has two primary objectives, flood loss reduction and the conservation and protection of the natural and beneficial functions of our “natural” riparian resources. While considerable effort has been applied to the first objective, the second objective has had only minor consideration by our floodplain managers. Flood losses in the United States are expected to exceed $20 billion annually, in 2021. Current economic assessments of flood damages, and actions to reduce flood damages, consider a narrow range of costs and benefits. This narrow scope often precludes nature-based flood management projects that counter rising flood damages and are more resilient. Floodplain management, for too long has been focused on mitigating flood damages with little consideration to the cultural, economic, or environmental effects and benefits of a selected “flood control” strategy. Impacts from structural flood control projects have resulted in unforeseen economic and environmental consequences. My presentation will focus on Nature Based Solutions and Green Infrastructure as an alternative for reducing Flood Risk. While structural "Grey" flood management infrastructure is still important in Urban areas to reduce flood risk for valuable economic resources and public infrastructure. The trick is to find a balance using Green Infrastructure, and Nature Based Solutions.

## WAR MEMORIAL CENTER NORTH PARKING LOT SITE DESIGN

### Presenter Information:

Name of Author(s): Cassandra Hoppe

### Abstract:

The War Memorial Center (WMC) north parking lot renovation was part of the Green Print Shoreline Master Plan for green-sustainable improvements along Milwaukee’s lakefront. The project area encompassed lakefront property owned by Milwaukee County and leased to the WMC. The original parking lot improvements were to include mill and overlay of the existing deteriorating parking lots. With Stormwater Solutions Engineering’s (SSE) assistance, the project evolved to relocating one lot away from the lake, as well as the addition of many green infrastructure features to manage runoff from the previously untreated site. SSE was also instrumental in the authoring and submitting of successful grant applications, resulting in the award of $965,000 from MMSD, the FFLM, and the NFWF-SOGL. The goals of the project were to address current infrastructure, improve site access, enhance pedestrian and bicyclist safety and connectivity, and improve water quality, habitat, and aesthetics at the project site. The professional consulting team -- The Sigma Group, Inc., SEH, Inc., and Stormwater Solutions Engineering, LLC (SSE) -- worked together to design a functional parking lot for the recreational lake front while integrating a contemplative experience honoring military veterans. SSE specifically incorporated multi-use porous pathways, bioretention, porous pavement, and native

plantings to manage stormwater runoff and associated pollutants. The green infrastructure provides 190,775 gallons of storage each rainfall event and reduces sediment loading to the Lake by 1500 lbs annually. The plantings were hand selected to provide food and shelter for migratory birds and other shoreline wildlife. Additionally, the project offers opportunities for public education through signage on water management, water quality, and habitat and data monitoring.

## KEEP CALM AND COLLABORATE: COLLABORATIVE NETWORK ENHANCING COASTAL HAZARD RESILIENCE EFFORTS ON WISCONSIN'S LAKE MICHIGAN SHORELINE

### Presenter Information:

Name of Author(s): Lydia Salus

### Abstract:

High lake levels have exacerbated coastal hazards on Wisconsin's Lake Michigan shoreline. Many local and regional efforts have tried to address coastal hazards; however, there is an ongoing need to increase community capacity to address these enduring coastal hazards. To build resilience in Wisconsin's coastal communities, the Collaborative Action for Lake Michigan (CALM) Coastal Resilience network expands coordination efforts among agencies, organizations, local governments, and existing networks and communities of practice. This network serves to add structure to current efforts by allowing groups to continue to collaborate, share information, and work on hazard reduction goals together. Coordination at this scale is integral to unifying coastal hazards policies within the context of long-term resiliency for Lake Michigan's coastal zones. A proven risk communication framework for a regionally specific project in Southeastern Wisconsin was scaled-up to support the development and implementation of CALM. Additionally, stakeholder-driven prioritization is utilized to ensure that the network is directly addressing the needs of the stakeholders. The expected outcomes from this project include increased communication, collaboration, and capacity for communities to address coastal hazards; development, revision, or adoption of local ordinances, plans, and policies; and regional prioritization of hazards to address through collaborative action.

## DAYLIGHTING DUBUQUE'S BEE BRANCH CREEK - A FLOOD MITIGATION SUCCESS STORY

### Presenter Information:

Name of Author(s): Mark Shubak, P.E., CFM

### Abstract:

The historic Bee Branch Creek in Dubuque, Iowa, was enclosed within a large limestone arch trunk line storm sewer in the early 1900s to accommodate rapid urbanization. This watershed includes the City's most developed areas where more than 50 percent of Dubuque residents either live or work. Inadequate capacity of this trunk line storm sewer resulted in severe flooding of more than 1,100 residential and commercial properties within the city and six presidential disaster declarations since 1999. The daylighting of Bee Branch Creek project restored the

enclosed stream to an urban waterway and today is touted by the City as a "fiscally responsible investment to mitigate flooding, improve water quality, stimulate investment, and enhance the quality of life within the Bee Branch Watershed."

The creativity of this project demonstrates how a variety of stormwater management techniques can be implemented on a flood mitigation project while also providing community and environmental benefits. The project is an excellent case study for other communities and agencies challenged with flooding and seeking to address other community needs.

## BENEFITTING COMMUNITIES THROUGH SOLELY GRANT SOURCED GREEN INFRASTRUCTURE ON MILWAUKEE PUBLIC SCHOOL (MPS) SCHOOLYARDS.

### Presenter Information:

Name of Author(s): Kara Koch

### Abstract:

Milwaukee Public Schools and their Green Teams have visions of holistic redevelopments for their schools to improve the environmental health and social-emotional wellbeing of their students and community. The redevelopments of these schoolyards offer access to green and inspiring outdoor learning environments. Commonly schoolyards are covered in crumbling asphalt, requiring costly repairs for MPS, and detrimentally impacting the environment and health of the students, staff, and the community. Access to green space in communities and schoolyards can result in better academic outcomes, increased engagement, improved social-emotional skills, and decreased childhood obesity. Additionally, the conversion of pavement to green space provides stormwater management, urban biodiversity, and meaningful STEM curricular connections.

The redevelopment design for the schoolyards includes green infrastructure, recreational improvements, outdoor educational improvements, and other functional features. The projects are funded through different grant sources and fundraising groups that contribute to various elements of the project: stormwater management, education, design alternatives, etc. As designers, we have to craft a design that would fit within each of the schools' vision of a redevelopment that also fits their allocated budgets. Five schools are chosen each year to go through the process, and each school is unique and has their own challenges.

## LARGE SCALE GREEN INFRASTRUCTURE FOR UPSTREAM FLOOD MITIGATION IN URBAN ENVIRONMENTS

### Presenter Information:

Name of Author(s): Kara Koch & Adrienne Cizek

### Abstract:

Stormwater Solutions Engineering, LLC was part of a group project with Milwaukee Metropolitan Sewerage District (MMSD) and Corvias Infrastructure Solutions, LLC (Corvias) who entered into

a public/private partnership to create 8.45 million gallons of stormwater in the next three years (2020-2023) using green infrastructure (GI) toward meeting MMSD's 2050 goal of zero combined sewer overflows, reduced localized flooding, and improved water quality. SSE pursued New Testament Church (NTC) as a client and potential partner to construct a constructed stormwater wetland (CSW) in the City of Milwaukee. The 4.7-acre constructed stormwater wetland (CSW) located at NTC in Milwaukee is designed to capture, treat, and store 1.86 million gallons of stormwater and creek flood waters prior to its discharge into the Little Menomonee River tributary.

In 1992, the City of Milwaukee (City) installed a 36-inch storm capturing drainage from W Bradley Rd and directing it to the drainageway on the adjacent southern property. Working with multiple agencies, SSE received approval from the City to intercept and divert drainage from this storm sewer into the proposed CSW. The City of Milwaukee can receive credit for pollutant removal achieved by the proposed CSW towards TMDL requirements in their MS4 permit.

## A GREEN INFRASTRUCTURE PLAN FOR THE BLACK EARTH CREEK WATERSHED TO REDUCE FLOODING AND CREATE MULTIPLE BENEFITS

### Presenter Information:

Name of Author(s): Steve Gaffield (EOR), Mike Rupiper (CARPC)

### Abstract:

Black Earth Creek is a prized trout stream in in southern Wisconsin, but it also presents a flood hazard underscored by the extreme August 2018 flood. This plan identifies opportunities to provide a quantifiable level of flood protection, plus water quality, recreational, economic, and ecological benefits using green infrastructure, a nature-based approach using soil and vegetation to retain and infiltrate water. A steering committee of 14 local communities, agencies and non-profit organizations guided plan development, and 7 stakeholder events and a project website gathered input. Aggressive implementation of green infrastructure throughout the Black Earth Creek watershed could reduce the peak flood discharge by 5 – 10%, reducing the flood impacts to structures and saving millions of dollars. Agricultural conservation practices have the highest potential watershed-wide benefits due to the large fraction of the watershed covered by cropland. Urban green infrastructure can reduce local flooding, water quality, and habitat impacts, through retrofitting green infrastructure in areas with high impervious cover. Wetland and stream restoration in valley bottoms can provide multiple benefits potentially worth millions of dollars. Implementing these strategies will require partnerships between local government, private landowners, non-governmental organizations, and other stakeholders, taking advantage of federal, state, and local funding sources.

## BUILDING FLOOD RESILIENCE IN THE EAST RIVER WATERSHED IN NORTHEAST WI

### Presenter Information:

Name of Author(s): Kayla Wandsnider

### Abstract:

The East River Watershed, located in Northeast Wisconsin in Brown County, drains, indirectly, to Lake Michigan. This rapidly changing area constantly battles increasing flood risk due to population growth, climate trends, and fluctuating lake levels. Brown County is in the top five fastest growing counties in Wisconsin causing a surge in development. Annual precipitation in Wisconsin has increased by 15% and temperatures have risen 2° F on average since the beginning of the 20th century. Further complicating matters are the fluctuating water levels on Lake Michigan which impacts water flow in the East River and from its tributaries.

All these factors and more have led to severe flooding in the East River Watershed and growing distress over future flood impacts. Planning for community resiliency has become crucial. In 2020, the East River Collaborative was formed as a network of municipal, state, federal, university and non-profit organizations to collaborate on these issues at a watershed scale. Subsequently, this galvanization of community has led to the start of several projects with more lined up for the future: watershed flood modeling, stakeholder interviews, community resilience assessments, a watershed priority framework, surveys, and nature-based solution projects. Success will include resiliency across the watershed in social capacity, ecological sustainability, economic stability. This is a critical point in time to focus people's energy for systemic watershed level intervention to flooding.

## GREAT LAKES COASTAL RESILIENCE IN A CHANGING CLIMATE

### Presenter Information:

Name of Author(s): Adam Bechle

### Abstract:

Climate change threatens to intensify the hazards facing Wisconsin's Great Lakes coastal communities, leading to a need to build resilience to more severe and frequent erosion, flooding, bluff collapse and navigation impairment. These anticipated impacts to coastal community resilience were assessed as part of the Wisconsin Initiative on Climate Change Impacts (WICCI) recent report Wisconsin's Changing Climate. Great Lakes coastal hazards are largely dependent on the water levels of the lakes, as illustrated by Lake Michigan's recent six-foot swing from record low water levels in 2013 to record high water levels in 2020. Under a changing climate, both high and low water level extremes are anticipated to continue in the future. This could include potentially higher highs and lower lows than seen in the historical record. Climate change is also expected to increase the wave energy reaching Great Lakes coasts due to a reduction in ice cover in a warmer climate. Increasing precipitation in a changing climate will also reduce stability of coastal bluffs. Great Lakes coastal communities are building resilience to these intensifying coastal hazards with adaptation strategies that

include a vulnerability assessments, improved zoning and land-use policies, traditional gray infrastructure, and nature-based shorelines.

## FLOOD MANAGEMENT PROPERTY ACQUISITION: REALIZING MORE COMMUNITY BENEFITS THAN JUST REDUCED FLOOD RISK

### Presenter Information:

Name of Author(s): Mark Mittag, P.E.

### Abstract:

Flood management techniques such as levees, larger flood conveyance channels, flood storage, or structure mitigation that removes structures and creates permanent open space often require property acquisition. Property acquisition for flood management can not only reduce flood risk in a community, but also provide an opportunity to repurpose flood prone property for broader community benefits.

For over 20 years MMSD has partnered with local municipalities in property acquisition for flood management. This presentation will focus upon property acquisition examples that have brought additional benefits to neighborhoods beyond flood management, such as through welcomed open space, expanded parkland, neighborhood-led recreational opportunities, habitat benefits, and others.

## P, N, & $H_2O$ - UNDERSTANDING NATURAL CYCLES AND DEVELOPMENT IMPACTS

### Presenter Information:

Name of Author(s): Phillip Taylor

### Abstract:

We talk a lot about pollutants and the affect they have on the environment. We talk a lot about devices to capture and treat stormwater runoff. We talk a lot about modelling and performance and a lot of other stuff, but we should also step back and understand why we are doing all this. What is the natural framework surrounding everything! This presentation takes a good look at the nature of the Water Cycle, Phosphorus Cycle, and Nitrogen Cycle. Did you know that phosphorus is a rare element in the universe, but without it life would not exist? Did you know the thunderstorms are an essential part of the nitrogen cycle? Did you know that the Phosphorus Cycle is one of the longest cycles on Earth, measured in hundreds of millions of years? This presentation is a back-to-basics old school fun learning presentation, we need to understand what we are dealing with so we can make better decisions going forward.

# IMPACT OF LAKE MICHIGAN WATER LEVELS ON DISTRICT ASSETS

## Presenter Information:

Name of Author(s): Susan K Coyle
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Lead Presenter Phone #: (414) 225-2086
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Title of Proposed Presentation: Impact of Lake Michigan Water Levels on District Assets

## Abstract:

In January 2020, the Jones Island Water Reclamation Facility (JIWRF), owned by the Milwaukee Metropolitan Sewerage District (MMSD, District), experienced flooding from Lake Michigan that impacted operations, both at a personnel and process level. Currently, a project is working on mitigating flood risk to electrical and other facilities impacted by the storm surge. Another project was created to evaluate the impacts of extreme high and low Lake Michigan water levels on JIWRF and South Shore Water Reclamation Facility (SSWRF), as well as the conveyance system and the boat dock at MMSD Headquarters. This larger planning-level project consists of contracts with two engineering consulting firms, who are using a variety of methodologies to quantify the risks to District assets. The aim of this effort is to improve the District's resiliency to predicted climate change in the Great Lakes Basin.

# USING DELFT3D TO MODEL COMPLEX COASTAL ENVIRONMENTS IN THE GREAT LAKES

## Presenter Information:

Name of Author(s): Jacob Sturzl

## Abstract:

The use of coastal modeling software for design and analysis of projects in the Great Lakes is becoming more and more prevalent. Delft3D is a 3D suite of modeling software with a wide range of capabilities including:

- River, delta, and open coast hydrodynamics
- Wave generation and transformation
- Sediment transport including coastal morphology
- Water Quality and Contaminant transport

The authors have used Delft3D in support of myriad coastal projects including off-shore breakwaters, revetments, coastal morphology, and contaminant transport investigations. This presentation will include a summary of Delft3D's capabilities and examples of how the authors have put the software to use in the Great Lakes.

# ADVANCING GREEN INFRASTRUCTURE AT GREAT LAKES MARINAS

## Presenter Information:

Name of Author(s): Julia Noordyk

## Abstract:

Marinas offer a “last chance” opportunity to treat and manage stormwater runoff before it enters the Great Lakes. Clean Marina programs are perfectly positioned to help coordinate and connect marinas with the resources and technical assistance needed to implement impactful stormwater improvements at their facilities. Starting in 2019, a team from the Wisconsin, Michigan and Ohio Clean Marinas programs embarked on a three-year public-private partnership to help Great Lakes marinas make their facilities more environmentally sustainable by harnessing the power of green infrastructure. Come hear about the successes and challenges in implementing stormwater improvement projects at marinas along the Great Lakes of Superior, Michigan and Erie. You will also be introduced to the Clean Marina Stormwater Toolkit, an online resource for learning about, visualizing and building green infrastructure at marinas.