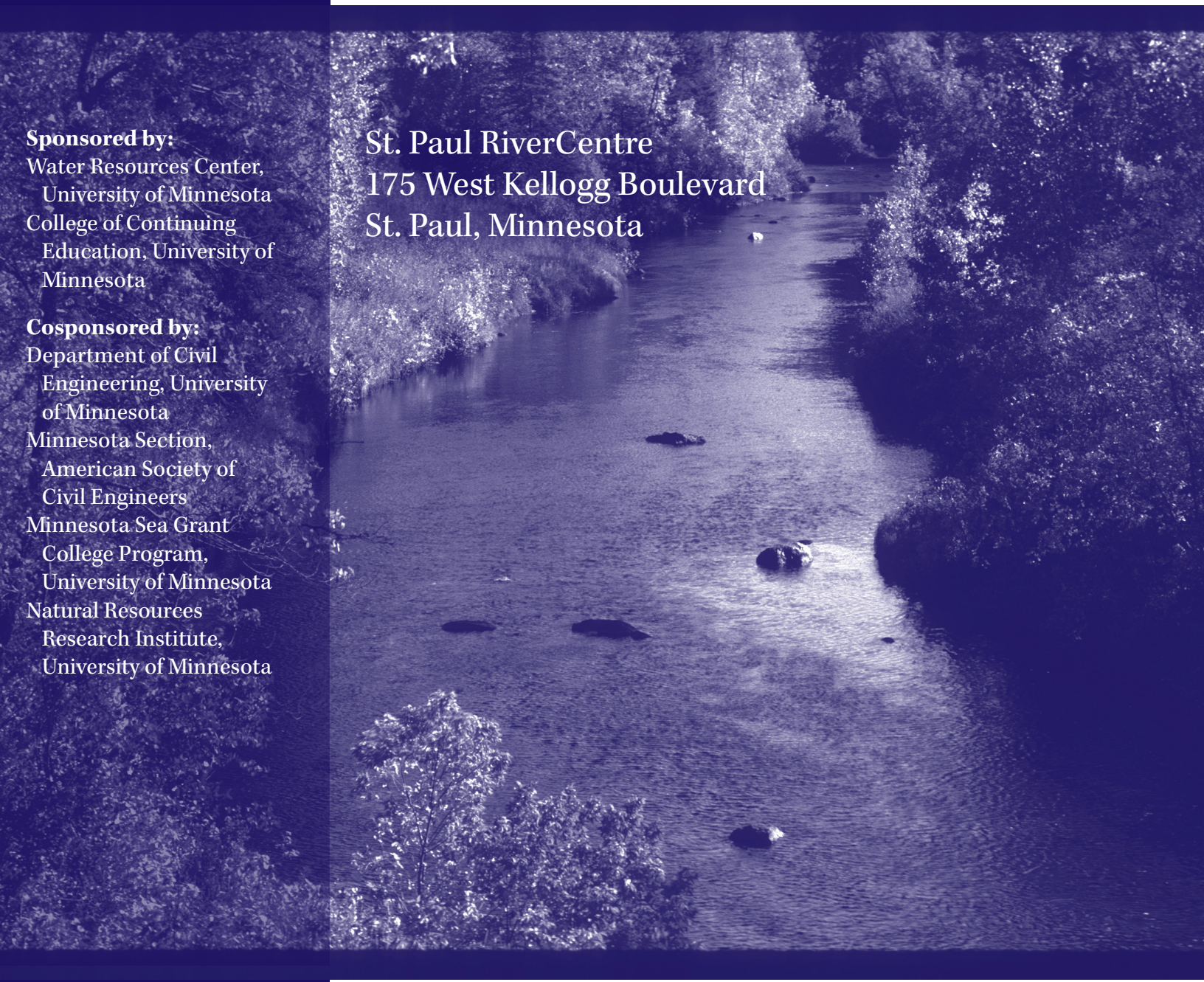
Water Resources Center

University of Minnesota
Driven to Discover℠

Final Program and Book of Abstracts

Minnesota Water Resources Conference

October 18–19, 2011



St. Paul RiverCentre
175 West Kellogg Boulevard
St. Paul, Minnesota

Sponsored by:
Water Resources Center, University of Minnesota
College of Continuing Education, University of Minnesota

Cosponsored by:
Department of Civil Engineering, University of Minnesota
Minnesota Section, American Society of Civil Engineers
Minnesota Sea Grant College Program, University of Minnesota
Natural Resources Research Institute, University of Minnesota

College of Continuing Education
University of Minnesota

www.wrc.umn.edu/waterconf

Minnesota Water Resources Conference

October 18-19, 2011

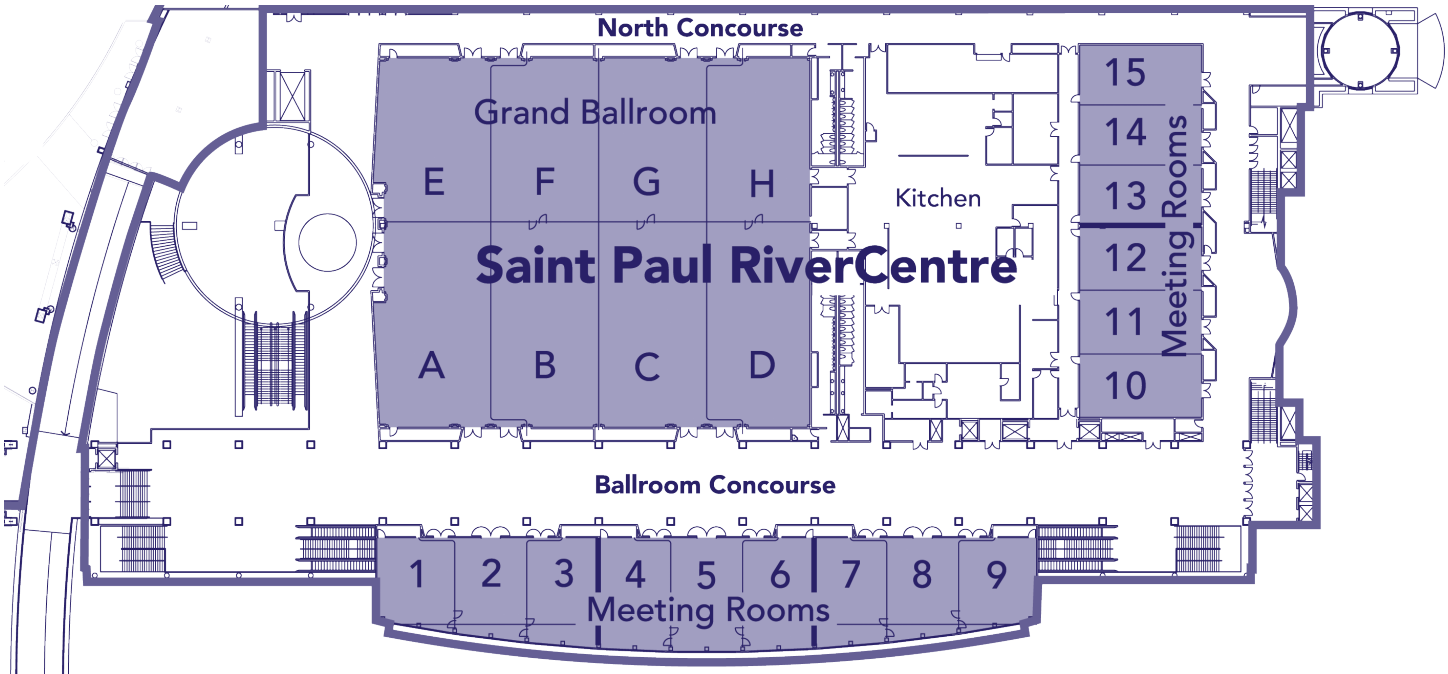
The **Minnesota Water Resources Conference** presents **innovative, practical, and applied water resource engineering solutions, management techniques, and current research about Minnesota's water resources**. The conference provides an opportunity to address: 1) lessons learned from the implementation of engineering projects, 2) best practices discovered in the design and application of water resource management techniques, 3) implications of water policy decisions, and 4) research into current and emerging issues. The conference facilitates interaction among engineers; water resources managers; researchers; and local, state, and federal agency staff.

Continuing Education Units (CEUs); Professional Development Hours (PDHs) Conference attendees will receive .675 CEUs/PDHs for **each** day of the Minnesota Water Resources Conference. Participants who wish to receive full credit must attend all scheduled hours of the event.

2011 Water Resources Planning Committee

John Baker	United States Department of Agriculture and Department of Soil, Water, and Climate, University of Minnesota
Ann Banitt	U.S. Army Corps of Engineers
John Bilotta	Minnesota Sea Grant and University of Minnesota Extension
Judy Boudreau	Department of Natural Resources, Division of Waters
Dan Breneman	Natural Resources Research Institute, University of Minnesota, Duluth
Tina Carstens	Ramsey-Washington Metro Watershed District
Heather Dorr	College of Continuing Education, University of Minnesota
Bill Douglass	Bolton & Menk, Inc.
* *Lisa Goddard*	SRF Consulting Group, Inc.
Lori Graven	College of Continuing Education, University of Minnesota
Lorin K. Hatch	HDR Engineering, Inc.
Andrea Hendrickson	Minnesota Department of Transportation
Kimberly Hill	St. Anthony Falls Laboratory, University of Minnesota
Bruce Holdhusen	ASCE Representative and Minnesota Department of Transportation
Karen Jensen	Metropolitan Council
Heather Johnson	Minnesota Department of Agriculture
Stephanie Johnson	Houston Engineering, Inc.
Ron Leaf	Short Elliott Hendrickson, Inc.
Randy Neprash	Minnesota Cities Stormwater Coalition and Bonestroo, Inc.
Shawn Schottler	St. Croix Watershed Research Station
Wayne Sicora	EVS, Inc.
Faye Sleeper	Water Resources Center, University of Minnesota
Gene Soderbeck	Minnesota Pollution Control Agency
James Stark	U.S. Geological Survey
* *Deborah Swackhamer*	Water Resources Center, University of Minnesota
Stew Thornley	Minnesota Department of Health
Rick Voigt	Voigt Consultants, LLC
Greg Wilson	Barr Engineering Company
Brad Wozney	Minnesota Board of Soil and Water Resources

* Committee Co-Chairs



Program Schedule – Tuesday, October 18, 2011

8:00 – 8:10 **Welcome**
Deborah Swackhamer, Water Resources Center, University of Minnesota

8:10 – 8:20 **Dave Ford Water Resources Award,** *Timothy Scherkenbach, former Deputy Commissioner,* MPCA

8:20 – 9:30 **Plenary Session: The Role of Research-based Education in Protecting Minnesota's Water Resources**
Beverly R. Durgan, Dean, Extension, University of Minnesota

9:30 – 10:00 **Break**

10:00 – 11:30 **Concurrent Sessions I**

TRACK A *ROOMS 1–3*

Lakes-Assessing and Managing Change
Moderator: *James Stark*, U.S. Geological Survey and Department of Soil, Water, and Climate, University of Minnesota
Co-Moderator: *Judy Boudreau*, Department of Natural Resources, Division of Waters

Protecting Cisco Thermal Habitat From Climate Change: Building Resilience in Deep Lakes Using a Landscape Approach
Peter Jacobson, Minnesota Department of Natural Resources

Impacts of Climate and Land Use Change on Nutrient Loading to Coldwater Lakes in Minnesota, Wisconsin, and Michigan
William Herb, University of Minnesota

Assessment of Water Quality Habitat and Conservation Implications for Managed Fish Lakes in Minnesota
Michael Duval, Minnesota Department of Natural Resources

TRACK B *ROOMS 4–6*

Effectiveness of Stormwater Retrofit Strategies
Moderator: *John Bilotta*, Minnesota Sea Grant, University of Minnesota Extension
Co-Moderator: *Greg Wilson*, Barr Engineering Company

Lakeside Stormwater Reduction Project
Chris Kleist, City of Duluth Utility Operations

Punching Holes in a Targeted Neighborhood: Reducing Phosphorus Load to Schwanz Lake, Eagan, Minnesota
Eric Macbeth, City of Eagan, Gun Club Lake Watershed Management

Stormwater Controls on a Golf Course to Restore Impaired Trout Stream
Rusty Schmidt and *Karen Kill,* Washington Conservation District

TRACK C *BALLROOM C*

Lock and Dam #3: The Corps of Engineers First Design-Build in the Saint Paul District
Moderator: *Lorin Hatch*, HDR Engineering, Inc.
Co-Moderator: *Lisa Goddard*, SRF Consulting Group, Inc.

Project Design in a Challenging Environment
Walter Eshenaur, SRF Consulting Group, Inc.

Two-Dimensional Modeling of Mississippi River Flow Patterns
Rick Voigt, Voigt Consultants, LLC

Permitting, Water Quality Sampling, and Construction Challenges
Walter Eshenaur, SRF Consulting Group, Inc.

TRACK D *BALLROOM D*

Drainage Considerations and Design
Moderator: *Heather Johnson*, Minnesota Department of Agriculture
Co-Moderator: *Andrea Hendrickson*, Minnesota Department of Transportation

Assessment of Culverts Designed to Meet Stream Simulation Requirements
Bradley Hansen, University of Minnesota

Multipurpose Drainage: Design Concepts and Practices for Multiple Benefits
Al Kean, Minnesota Board of Water and Soil Resources

Minnesota Drainage Laws Study
Louis Smith, Smith Partners, PLLP

11:30 – 12:15 p.m. **Lunch**

12:15 – 1:00 **Luncheon Presentation: Assessing Risks of Endocrine-disrupting Chemicals: A Scientific Odyssey**
Gerald (Gary) Ankley, United States Environmental Protection Agency, Office of Research and Development, Mid Continent Ecology Division

1:15 – 2:45 Concurrent Sessions II

TRACK A *ROOMS 1–3*

Minnesota Aquatic Systems
Moderator: *Judy Boudreau*, Department of Natural Resources, Division of Waters
Co-Moderator: *Lorin Hatch*, HDR Engineering, Inc.

Air-Water Temperature Relationships in the Trout Streams of Southeastern Minnesota's Carbonate Landscape: Implications for Climate Change and Land Management
Lori Krider, University of Minnesota

Natural Short-Term Declines in Curly-Leaf Pondweed Across a Network of Sentinel Lakes: Potential Impacts of Snowy Winters
Ray Valley, Minnesota Department of Natural Resources Fisheries

Winter Invertebrate Dynamics in Trout Streams of Southeastern Minnesota
Jane Mazack, University of Minnesota

TRACK B *ROOMS 4–6*

Creative Approaches to Stormwater Best Management Practices (BMPs)
Moderator: *Wayne Sicora*, EVS, Inc.
Co-Moderator: *Bruce Holdhusen*, Minnesota Department of Transportation

The Minnesota Filter: A Tool for Capturing Stormwater Dissolved Phosphorus
Ross Bintner, City of Prior Lake

Filtration Observations in the Carver County WMO
Jen Irving, Carver County

Green Infrastructure Practices for the Central Corridor Light Rail Transit Project
Anna Eleria, Capitol Region Watershed District

TRACK C *BALLROOM C*

Engineering Solutions in Modeling
Moderator: *Ann Banitt*, U.S. Army Corps of Engineers
Co-Moderator: *Rick Voigt*, Voigt Consultants, LLC

Development and Application of Ground-Truthed NEXRAD Rainfall Data in HEC-HMS Model Calibration of Red River Basins
Tim Anderson, Barr Engineering Company

Geometric Representation of Flow through the Floodplain and Selection of Hydraulic Coefficients
Brandon Barnes, Barr Engineering Company

Evaluating Best Management Practice Effectiveness and Economics Using a Field Scale Approach
Brian Williams, Minnesota Department of Agriculture

TRACK D *BALLROOM D*

Planning for Effective and Economical Stormwater Practices and Policies
Moderator: *Tina Carstens*, Ramsey-Washington Metro Watershed District
Co-Moderator: *John Bilotta*, Minnesota Sea Grant, University of Minnesota Extension

Make Better Decisions for Stormwater BMPs
Lisa Goddard, SRF Consulting Group, Inc.

Urban Subwatershed Stormwater Retrofit Analysis
Shawn Tracy, Metro Conservation Districts

Environmental and Economic Impacts of Volume Control Policies
Richard Hibbard and *Peter Willenbring*, WSB & Associates, Inc.

2:45 – 3:15 **Break**

3:15 – 4:45 **Concurrent Sessions III**

TRACK A *ROOMS 1–3*

Minnesota Groundwater Systems: The Challenge of Ammonia and Nitrate

Moderator: *Faye Sleeper*, Water Resources Center, University of Minnesota
Co-Moderator: *Stew Thornley*, Minnesota Department of Health

Minnesota Groundwater Ammonia Study: Problem Assessment and Data Collection
Lih-in Rezania, Minnesota Department of Health

Minnesota Groundwater Ammonia Case Studies: Impacts and Management Strategies
David Schultz, Minnesota Department of Health

Nitrate Contamination of Water Resources in Southeastern Minnesota
Paul Wotzka, Hydrologist

TRACK B *ROOMS 4–6*

Retrofitting: Improving Runoff Quality in Urbanized Areas

Moderator: *Lisa Goddard*, SRF Consulting Group, Inc.
Co-Moderator: *Wayne Sicora*, EVS, Inc.

Retrofitting Maplewood Mall for Stormwater Volume Reduction
Cliff Aichinger, Ramsey-Washington Metro Watershed District and *Erin Anderson Wenz*, Barr Engineering Company

Mimicking Native Hydrology on a Corporate Campus: Retrofitting Infiltration Practices and Impervious Surface Reduction at Lockheed Martin, Eagan
Nathan Campeau, Barr Engineering Company

Retrofitting of Low Impact Development Improvements in Residential Neighborhoods–Owatonna, MN
Daniel Edgerton, Bonestroo, Inc. and *Matt Durand,* City of Owatonna

TRACK C *BALLROOM C*

Red River

Moderator: *Gene Soderbeck*, Minnesota Pollution Control Agency
Co-Moderator: *James Stark*, U.S. Geological Survey

Analyzing Impacts Associated With the Proposed Fargo-Moorhead Diversion Project Using Unsteady HEC-RAS
Greg Thompson, Houston Engineering, Inc.

Sediment Transport and Potential Geomorphic Impacts, Fargo-Moorhead Metro Flood Risk Management Project, Feasibility Study
Peter Hinck, Barr Engineering Company

Sediment Concentrations, Loads, and Particle Size Distributions in the Red River of the North and Selected Tributaries Near Fargo, ND, During the 2010 Spring High-Flow Event
Joel Galloway, U.S. Geological Survey – North Dakota

TRACK D *BALLROOM D*

Targeting and Tracking Conservation

Moderator: *Brad Wozney*, Minnesota Board of Soil and Water Resources
Co-Moderator: *Bill Douglass*, Bolton &Menk, Inc.

Conservation Targeting Tools
Julie Westerland, Minnesota Department of Natural Resources

Tracking Minnesota's Clean Water Legacy Effectiveness
Suzanne Hanson, Minnesota Pollution Control Agency and *Andy Holdsworth*, Minnesota Department of Natural Resources

Minnesota Wetland Conservation Act Reporting Data: What It Says and What It Doesn't Say
Ken Powell, Minnesota Board of Water and Soil Resources

4:45 – 5:45 **Reception and Poster Session**

Program Schedule – Wednesday, October 19, 2011

8:00 – 8:10 **Welcome**
Lisa Goddard, SRF Consulting Group

8:10 – 9:30 **Plenary Session: Legislative Update: Agricultural and Water Issues**
Representative Paul Torkelson, Minnesota House of Representatives, District 21B

9:30 – 10:00 **Break**

10:00 – 11:30 **Concurrent Sessions IV**

TRACK A *ROOMS 1–3*

Monitoring Sources

Moderator: *Ann Lewandowski*, Water Resources Center, University of Minnesota
Co-Moderator: *Faye Sleeper,* Water Resources Center, University of Minnesota

Using Remote Sensing to Monitor and Assess Geospatial and Temporal Trends of Water Quality in Minnesota
Leif Olmanson, University of Minnesota

Where's the P: Assessing Sources of Phosphorus in a Lake Watershed
Jessica Wittwer, University of Minnesota

Alternative Methods for Monitoring Surface-Water Runoff from Agricultural Fields
Gretchen Kamps, University of Wisconsin—Platteville

TRACK B *ROOMS 4–6*

Low Impact Design Practices: Monitoring, Evaluation, and Repair

Moderator: *Karen Jensen*, Metropolitan Council
Co-Moderator: *Tina Carstens*, Ramsey-Washington Metro Watershed District

Burnsville Rainwater Garden Efficacy Monitoring and Cost Evaluation: Can We Still Do 90?
Greg Wilson, Barr Engineering Company

A Rain Garden Rehabilitation Case Study
Jeff Schwarz, Metropolitan Council Environmental Services

Porous Pavement Paired Intersection Study Year Two
Ed Matthiesen, Wenck Associates, Inc.

TRACK C *BALLROOM C*

Runoff and Flow in Agricultural Watersheds

Moderator: *Shawn Schottler*, St. Croix Watershed Research Station
Co-Moderator: *Bill Douglass*, Bolton &Menk, Inc.

Soil Moisture and Rainfall Intensity Thresholds for Runoff Generation in Southwestern Wisconsin Agricultural Basins
Timothy Radatz, Discovery Farms Minnesota

Evaluation of Factors Contributing to Changes in Runoff Ratio in 21 Tributaries to Lake Pepin
Jason Ulrich, University of Minnesota

Channel Erosion and Floodplain Deposition Investigations in the Minnesota River Basin
Christian Lenhart, University of Minnesota

TRACK D *BALLROOM D*

Lakes/Shores

Moderator: *Stephanie Johnson*, Houston Engineering, Inc.
Co-Moderator: *Brad Wozney*, Minnesota Board of Soil and Water Resources

Restoration of Lake Rebecca—Hennepin County, Minnesota
Rich Brasch, Three Rivers Park District

Shoreline Restoration: Big Island, Lake Minnetonka
Jeff Lee, Barr Engineering Company

Adapting Minnesota Shoreland BMPs for Climate Change
Barbara Liukkonen, University of Minnesota

11:30 – 12:15 p.m. **Lunch**

12:15 – 1:00 **Luncheon Presentation: Agricultural Water Management: What Can Farmers Do to Maintain Good Water Quality, and Still Do Agricultural Water Management?**
Don Baloun, Minnesota State Conservationist, Natural Resources Conservation Service, United States Department of Agriculture

1:15 – 2:45 **Concurrent Sessions V**

TRACK A *ROOMS 1–3*

Contaminants of Concern

Moderator: *Stew Thornley*, Minnesota Department of Health
Co-Moderator: *Ron Leaf*, Short Elliott Hendrickson, Inc.

Evaluating Exposure and Toxicity Potential for Contaminants of Emerging Concern
Michele Ross, Minnesota Department of Health

Polycyclic Aromatic Hydrocarbon Concentrations and Sources in Five Minneapolis, Minnesota Lakes
Sarah Elliott, U.S. Geological Survey

Characterizing the Relationship Between Sulfate Reduction and Mercury Methylation in St. Louis River Sediment
Nathan Johnson, University of Minnesota, Duluth

TRACK B *ROOMS 4–6*

Managing Highway Stormwater

Moderator: *Andrea Hendrickson*, Minnesota Department of Transportation
Co-Moderator: *Bruce Holdhusen*, Minnesota Department of Transportation

Stormwater Management for a MegaProject: The Reconstruction of the I-35W/TH 62 Crosstown Commons
David Filipiak, SRF Consulting Group, Inc.

Automated Turbidity Monitoring of Minnehaha Creek During I-35W Reconstruction and BMP Assessment
Dwayne Stenlund, Minnesota Department of Transportation

Performance of Swale in Infiltrating Stormwater Runoff
Farazana Ahmed, University of Minnesota

TRACK C *BALLROOM C*

Evolution and Changes to Sediment Production

Moderator: *Gene Soderbeck*, Minnesota Pollution Control Agency
Co-Moderator: *Shawn Schottler*, St. Croix Watershed Research Station

Sediment Loading in the Le Sueur River Watershed, from Post-glacial Times to Modern
Karen Gran, University of Minnesota, Duluth

An Integrated Sediment Budget for the Le Sueur Watershed
Patrick Belmont, Utah State University

Minnesota River Basin Sediment Research: Implications for TMDL Implementation Strategies
Peter Wilcock, Johns Hopkins University

TRACK D *BALLROOM D*

Groundwater

Moderator: *James Stark*, U.S. Geological Survey
Co-Moderator: *Heather Johnson*, Minnesota Department of Agriculture

Hydrologic Trends in Groundwater-Surface Water Interaction
Andrew Streitz, Minnesota Pollution Control Agency

Energy and Water Quality Benefits of Managing Marginally Productive Land for Prairie Biomass Production
Jared Trost, U.S. Geological Survey

2:45 – 3:00 **Break**

3:00 – 4:30 **Concurrent Sessions VI**

TRACK A *ROOMS 1–3*

Case Studies for Water Quality Standards, Categorization, and Total Maximum Daily Load (TMDL) Development

Moderator: *Greg Wilson*, Barr Engineering Company
Co-Moderator: *Randy Neprash*, Minnesota Cities Stormwater Coalition; Bonestroo, Inc.

River, Pool and Lake Pepin Eutrophication Standards
Steven Heiskary, Minnesota Pollution Control Agency

Colby Lake: A Case for a TMDL Alternative
Stephanie Johnson, Houston Engineering, Inc.

Using Flow Regime and Imperviousness to Establish a Biotic TMDL and Protection Strategies
Jennifer Olson, Tetra Tech

TRACK B *ROOMS 4–6*

Best Management Practice Effectiveness and Pollutant Tracking

Moderator: *Karen Jensen*, Metropolitan Council
Co-Moderator: *Kimberly Hill*, St. Anthony Falls Laboratory

Fate of Petroleum Hydrocarbons in Stormwater Bioretention Areas
Gregory LeFevre, University of Minnesota

BMP Effectiveness Monitoring in the Whitewater River Watershed
Greg Johnson, Minnesota Pollution Control Agency

The Nutrient Tracking Tool (NTT): Evaluation of Agricultural Environmental Management
Brooke Hacker, Greater Blue Earth River Basin Alliance

TRACK C *BALLROOM C*

Flood Mapping

Moderator: *Rick Voigt*, Voigt Consultants, LLC
Co-Moderator: *Judy Boudreau*, Department of Natural Resources, Division of Waters

Accuracy May Be Lost in DFIRMs Developed With Limited Funding: A Lake Crystal, Minnesota, Case Study
William Douglass and *Tim Olson*, Bolton & Menk, Inc.

Floods of September 2010 in Southern Minnesota
Christopher Ellison, U.S. Geological Survey

Flood Response Mapping: Incorporating Flood Forecasts and LiDAR Data
Mike Lawrence, Houston Engineering, Inc.

TRACK D *BALLROOM D*

Invasive Fish

Moderator: *Gene Soderbeck*, Minnesota Pollution Control Agency
Co-Moderator: *Shawn Schottler*, St. Croix Watershed Research Station

Effects of Common Carp on Wild Rice Survival and Growth
James Johnson, Freshwater Scientific Services, LLC

Coon Rapids Dam vs. Asian Carp
Martin Weber, Stanley Consultants, Inc. and *Brian Nerbonne*, Minnesota Department of Natural Resources

4:30 **Adjourn**

Twin Cities Metropolitan-Area Chloride Monitoring
Brooke Asleson, Minnesota Pollution Control Agency; *Racheal Crabb*, Minneapolis Park & Recreation Board; *Kent Johnson*, Metropolitan Council Environmental Services; *Matt Loyas*, Capitol Region Watershed District

Image Analysis Techniques to Evaluate Effects of Nearshore Lake Development on Aquatic Macrophytes
Marcus Beck, University of Minnesota; *Lorin Hatch*, HDR Engineering, Inc.; *Bruce Vondracek*, U.S. Geological Survey

Restoring an "Oasis" in the City: The Challenges of Pond Dredging
Greg Bowles, Houston Engineering, Inc.

Restoration of a Drained Lake for Wetland Banking: A Model for Future County Ditch System Repairs
Chuck Brandel, I&S Group, Inc.

Coming to a Farm Near You: Part I
Jeffrey S. Broberg, McGhie & Betts Environmental Services, Inc.

Upstream-Downstream Friendship Tours Serve as a New Model of Civic Engagement
Susan Carlin, Minnesota River Board; *Warren Formo*, Minnesota Agricultural Water Resources Coalition; *Patrick Moore*, Clean Up the River Environment; *Bruce Tiffany*, farmer

A Case Study of Local Governance and Watershed Management in Minnesota: Opportunities and Constraints
Mae Davenport, *Paula Guetter*, *Amit Pradhananga*, and *Amanda Sames*, University of Minnesota

MnDOT Bridge Tales of the 2011 Flood
Petra DeWall, Minnesota Department of Transportation

Automation Innovations in Stormwater Modeling: Hydraulic Design Case Studies
William Douglass, Bolton & Menk, Inc.

Memory Lane Pond Floodplain Re-Evaluation
Phillip Elkin, Bonestroo

Accuracy and Precision of Agricultural Laboratory Tests for Nutrients in Manure: Lessons Learned From the Manure Analysis Proficiency (MAP) Program
Jerry Floren, Minnesota Department of Agriculture; *Robert Miller*, Colorado State University

Winter Diets and Dynamics of Brown Trout in Groundwater Dominated Streams
William French, *Jennifer Biederman*, *Leonard Ferrington*, *Lori Krider*, *Jane Mazack*, *Jim Perry*, P*atrick Sherman*, and *Bruce Vondracek*, University of Minnesota

Can River Bank Sediment Be a Carrier and Then Source of Available P in Lake Pepin?
Ashley Grundtner and *Satish Gupta*, Department of Soil, Water, and Climate, University of Minnesota

Water-Based Infiltration for Middle Spunk Lake
Stan Hanson, Bonestroo, Inc.; *Greg Berg*, Stearns County Soil and Water Conservation District

Effectiveness of Buffers Installed at Targeted Critical Drainage Areas in Minnesota
John Hanzas, Stone Environmental, Inc.

Infiltration BMPs Beyond Project Close-Out: An Overview of the Rice Creek Watershed District's BMP Maintenance Inspection Program
Elizabeth Hosch, Rice Creek Watershed District

Iron-Enhanced Sand Filter Pond Retrofit
Forrest Kelley, Capitol Region Watershed District

Using Education to Eliminate Sediment Runoff from Construction Sites
Shannon Kelley, McGough Construction

Water Quality in the Southern Basin of Lake of the Woods: 2010
Richard Kiesling and *Sarah Elliott*, U.S. Geological Survey

Connecting the Public to the Minnesota River Through Ideas
Scott Kudelka, *Richard Moore*, and *Kimberly Musser*, Water Resources Center, Minnesota State University, Mankato

Root River Field to Stream Partnership: An Overview
Kevin Kuehner, *Adam Birr*, and *David Tollefson*, Minnesota Department of Agriculture

2D Modeling: Flooding and Frustration
Jonathon Kusa, HR Green, Inc.

Cumulative Impacts of Residential Lakeshore Development on Littoral Habitat
Jessie Lepore, University of Minnesota

Red River Watershed Recovery Potential Indicators Project
Molly MacGregor, Minnesota Pollution Control Agency

Developing Watershed Protection and Restoration Strategies
Bob Finley, Minnesota Pollution Control Agency and *Steve Woods*, Minnesota Board of Water and Soil Resources

Lambert Creek Stream Restoration Using Only Hand Labor
Ed Matthiesen, Wenck Associates, Inc.

Collaborative BMP Retrofit Subwatershed Assessment Study and Implementation
Ed Matthiesen, Wenck Associates, Inc.

Effects of Trash and Vegetation on Sumps Equipped With a SAFL Baffle
Kurtis McIntire, *John Gulliver*, and *Omid Mohseni*, St. Anthony Falls Laboratory, University of Minnesota

Partially Grouted Riprap for Bridge Abutment Scour Protection
Patrick McLarnon, TKDA; *David Berkowitz* and *Jason Law*, City of Andover

Minnesota Water Resources Modeling Group: Advancing the Management of Minnesota Water Resources Through Science of Modeling
Shahram Missaghi, University of Minnesota Extension

Working Together for the Minnesota River
Kimberly Musser, Water Resources Center, Minnesota State University, Mankato; *Jon Carlson* and *John Hickman*, Epic Media; *Scott Kudelka* and *Rick Moore*, Water Resources Center, Minnesota State University, Mankato

Impact of Hydrologic Alteration on Riverine Turtle Nesting in Eastern Minnesota Rivers
Jason Naber, Emmons & Olivier Resources, Inc.; *Christian Lenhart* and *John Nieber*, University of Minnesota

Hydrologic Watershed Response to Land-Cover and Climate Changes Across the Upper Midwest
Kenneth Brooks, *Christian Lenhart*, *John Neiber*, *Mikhail Titov*, and *Lucas Vold*, University of Minnesota

Rain Gauge Network Data Online
Nancy Read, *Sandy Brogren*, and *Janet Jarnefeld*, Metropolitan Mosquito Control District

Measurement of Nutrient Movement in Continuous No-Till Production Landscapes
George Rehm, *Warren Formo*, and *Tim Radatz*, Minnesota Agricultural Resources Coalition

We Have a Plan, Now What? Ongoing Water Supply Planning in the Twin Cities Metropolitan Area
Lanya Ross, Metropolitan Council

Flood Risk Reduction for Breckenridge, Minnesota, and Wahpeton, North Dakota
Andrew Sander, U.S. Army Corps of Engineers

City of Mounds View Stormwater Infiltration Program (SIP)
Brad Schleeter, Bonestroo, Inc.

Watershed Partnerships
Louis Smith, Smith Partners, PLLP; *Kevin Bigalke*, Nine Mile Creek Watershed District; *Eric Evenson*, Minnehaha Creek Watershed District

Habitat Enhancement Projects in an Urban Setting: Pheasant Branch Creek
Aaron Steber, Cardno JFNew

Cedar River Basin TMDL Development Project
Bill Thompson, Minnesota Pollution Control Agency

Modifying Bioretention Cell Design to Achieve Regulatory Water Quality Benefits
Joel Thrash and *Mark Pranckus*, Cardno JFNew

Cleary Lake Drawdown: Shifting from an Algal-Dominated to a Plant-Dominated Ecosystem
Brian Vlach, Three Rivers Park District

205th Street Channel Stabilization
Jeff Weiss, Barr Engineering Company; *Mac Cafferty*, City of Lakeville; *Jim Davidson*, Dakota County Soil and Water Conservation District

Effectively Managing Shoreline and Creek Bank Erosion
Peter Willenbring, WSB & Associates, Inc.

The Benefits of Implementing Stormwater BMPs Over a 12-Year Period in the City of Hugo: A Case Study
Peter Willenbring, WSB & Associates, Inc.; *Bryan Bear*, City of Hugo; *Phil Belfiori*, Rice Creek Watershed District

Evaluating Watershed Outreach Interventions: Informing Future Outreach Through an Integrative Model
Christine Yaeger, *Mae A. Davenport* and *Karlyn Eckman*, University of Minnesota; *Erin Seekamp*, Southern Illinois University

Dinner Program, Sponsored by American Society of Civil Engineers (ASCE) Minnesota Section

Tuesday, October 18, 2011
5:30 p.m. Social Hour, 6:30 p.m. Dinner, 7:30 p.m. Program

Location: Joseph's Grill, 140 South Wabasha Street, Saint Paul
(located just across the bridge from downtown Saint Paul, about 1 mile from the River Centre; free off-street parking is provided.)

Cost: $30 ASCE members, $35 non-members, $15 students (not included in conference registration fee)

This dinner program is open to all who are interested.

St. Croix River Crossing Project Stakeholder Involvement Process and Water Resources Issues: A Panel Discussion

MnDOT Perspective: Project Need, Environment, Stakeholder Process, and Preferred Alternative
Todd Clarkowski, MnDOT Metro District, team leader, St. Croix River Crossing Project

National Park Service: The St. Croix Wild and Scenic Riverway
Christopher Stein, National Park Service, superintendent, St. Croix National Scenic Riverway

Wisconsin DOT Perspective
Paul Conlin, project development supervisor, WisDOT NW Region,

The St. Croix River Crossing Project concerns the replacement of the Stillwater Lift Bridge. Constructed in 1931, the Stillwater Lift Bridge crosses the St. Croix River between Minnesota and Wisconsin. The project's current proposal would construct a new four-lane bridge at a nearby location, connecting four-lane expressways existing on both sides of the St. Croix River. The proposal would preserve the historic Stillwater Lift Bridge as a portion of a bicycle and pedestrian trail. Following an executive order by President Bush in 2002, a stakeholder-driven, public involvement process addressed the transportation needs while balancing any environmental, social, and economic impacts, leading to the current St. Croix River Crossing proposal.

In 1972, the United States Congress designated the St. Croix River, over which the Stillwater Lift Bridge crosses, as a National Wild and Scenic River for its unique scenic, recreational, and geologic values. The project area also includes a number of protected natural resources, such as threatened or endangered plant and animal species (osprey, bald eagle, peregrine falcon, mussels) and wetlands. The importance of maintaining water quality of the St. Croix River is of great significance for this project. A preliminary drainage design has been developed to address the concerns of the St. Croix River Basin Team and a number of other water quality management organizations to ensure water quality and quantity standards are being met.

For questions or additional information, contact John F. Blackstone, PE, chair, ASCE EE/WR Technical Committee, jblackstone@comcast.net, 651-263-4357; or Bruce Holdhusen, PE, holdhusen@infionline.net, 651-261-2325.

Minnesota Water Resources Conference

October 18–19, 2011
Saint Paul RiverCentre

175 West Kellogg Boulevard
Saint Paul, Minnesota

Book of Abstracts

Arranged by session in order of presentation

Index of first authors on page 66

Plenary Session 1 8:20 a.m. – 9:30 a.m.

The Role of Research-based Education in Protecting Minnesota's Water Resources

Beverly R. Durgan, Dean, Extension, University of Minnesota

University of Minnesota Extension has a 100-year history of conducting research-based information educational programs that help Minnesota make informed decisions about water quality. Today Extension's commitment to providing research-based information is making a difference in suburban lots, shoreline homes, highway roadsides, agricultural fields and forests.

Biographical Information

Beverly Durgan has dedicated her career to connecting Extension and research with the citizens of the state. She knows firsthand the important contributions University of Minnesota Extension makes and is committed to ensuring that Extension continues to deliver practical and useful research-based education and information to Minnesotans.

Prior to being appointed as the dean and director of Extension in September 2005, Durgan held several administrative positions at the University, including chief fiscal officer and associate dean for the then-College of Agricultural, Food and Environmental Sciences. As associate dean, she oversaw the research and outreach programs of eleven academic departments and six research and outreach centers. In her role as chief financial officer, she provided oversight and strategic management of the research, resident instruction, Extension and outreach budgets of the college.

Concurrent Sessions I 10:00 a.m. – 11:30 a.m.

Track A: Lakes-Assessing and Managing Change

Protecting Cisco Thermal Habitat From Climate Change: Building Resilience in Deep Lakes Using a Landscape Approach

Peter Jacobson (peter.jacobson@state.mn.us), Minnesota Department of Natural Resources

Cisco Coregonus artedi are coldwater fish that are sensitive to ecological stressors such as climate warming and eutrophication. However, deep lakes with high concentrations of hypolimnetic oxygen, may provide a refuge for coldwater fish such as cisco. We identified potential refuge lakes in Minnesota using a process-oriented, dynamic, one-dimensional year-round lake water quality model (MINLAKE2010) by projecting oxythermal habitat under future climate change using a third generation Coupled Global Climate Model - CGCM 3.1. Protection of water quality in these refuge lakes will be critical for maintaining suitable coldwater habitat and maintaining the resilience necessary to sustain cisco in at least some Minnesota lakes after climate warming. Building on the climate change modeling, we also developed a landscape approach that identifies important catchments critical for water quality protection in these systems.

Impacts of Climate and Land Use Change on Nutrient Loading to Coldwater Lakes in Minnesota, Wisconsin, and Michigan

William Herb (herb0003@umn.edu), University of Minnesota

As part of a national fish habitat study funded by the USGS, the goal of the glacial lakes regional study described here is to predict the impacts of climate and land use change on coldwater fish habitat in Minnesota, Wisconsin, and Michigan. As one study component, we developed a regional regression model for nutrient loading to lakes based on land use, population, and climate. For a set of 124 coldwater lakes in Minnesota, the regression model predicts in-lake total phosphorus (TP) concentration with R2=0.65. The regression model will be used to project future changes in TP concentration based on projected changes in land use and climate. These results will then be used to project changes in oxythermal habitat for coldwater fish, using models previously developed by the Minnesota DNR, St. Anthony Falls Lab, and Auburn University to study climate change impacts on cisco lakes in Minnesota.

Assessment of Water Quality Habitat and Conservation Implications for Managed Fish Lakes in Minnesota

Michael Duval (Michael.duval@state.mn.us), Minnesota Department of Natural Resources

Fisheries managers recognize two fundamental components of fish habitat: physical habitat represented by vegetation, wood, and bottom substrates; and water quality habitat represented by dissolved oxygen, nutrients, and phytoplankton and epiphytic algae. As part of a DNR strategic planning process, we sought to identify fish habitat conservation needs and opportunities for Minnesota's managed fish lakes. To assess current status of water quality habitat in lakes, we developed a watershed disturbance variable (all urban, agriculture, and mining land uses) using the NLCD 2001 land use GIS data set. We then calculated the amount of protected land (publicly owned or protected by conservation easement) for each watershed using 2008 Minnesota DNR GAP Ownership data. Plotting values of each of these two components on separate axes allows for the categorization of lakes into a protection vs. restoration framework. We present a number of watershed management options and opportunities that arise from this framework.

Concurrent Sessions I 10:00 a.m. – 11:30 a.m.

Track B: Effectiveness of Stormwater Retrofit Strategies

Lakeside Stormwater Reduction Project

Chris Kleist (ckleist@duluthmn.gov), City of Duluth Utility Operations

Polluted stormwater is a principal contributor to water quality impairments of water bodies nationwide. Managing stormwater in Duluth is an even greater challenge due to an elevation change of 883 feet and sixteen designated trout streams within Duluth's City limits. The City of Duluth's stormwater utility owns and maintains hundreds of large Best Managements Practices (BMPs) which accept flow from a large catchment areas and function to reduce peak flow, velocity, and sediment load flowing to streams within the City. The Lakeside Stormwater Reduction Project sought to understand the effectiveness of small "homeowner" BMPs and quantify the reduction of both volume and suspended solids in the receiving storm sewer system.

The Lakeside Stormwater Reduction Project is a three-year, $334,000 project funded by a Minnesota Pollution Control Agency (MPCA) Section 319 grant and completed using a scientific approach with a treatment neighborhood and a control neighborhood. The two neighborhoods were selected for the study based on relatively similar stormwater producing criteria such as road surface, number of homes, total impervious surface, and storm sewer volume. Both neighborhoods were also geographically very close to one another to ensure that they received the same rainfall because the elevation change in Duluth often causes precipitation rates to fluctuate significantly between cross-town neighborhoods.

Methodology:

The project began in 2008 with the installation of flow monitoring equipment in both of the neighborhood's storm sewers. The first year was a monitoring year and flow monitoring crews used Isco area velocity meters and Hydrolab sondes to collect baseline flow data from each neighborhood. Measurement parameters included volume, rate, temperature, conductivity, and turbidity. During calendar year 2009 we installed the Best Management Practices such as rain gardens, grassy swales, and rain barrels at many of the properties in the treatment neighborhood with professional assistance from the Minnesota Conservation Corps. Trees and shrubs were also planted at many of the treatment neighborhood homes for their long-term stormwater benefit. Monitoring continued throughout 2009. Calendar year 2010 is the evaluation and monitoring year and we are currently in the process of completing analysis of the flow data.

Punching Holes in a Targeted Neighborhood: Reducing Phosphorus Load to Schwanz Lake, Eagan, Minnesota

Eric Macbeth (emacbeth@cityofeagan.com), City of Eagan, Gun Club Lake Watershed Management

A 2010 study of total maximum daily load (TMDL) indicates a 28-acre, single-family neighborhood contributes 24 percent of the phosphorus to 11.5-acre Schwanz Lake in southeast Eagan. Stormwater modeling estimates 5,100 square feet of retrofitted rain garden/bioretention area would reduce this phosphorus load by 72 percent. Developed before City of Eagan (City) water-quality requirements, the neighborhood drains stormwater directly to the lake through one pipe. The City first identified optimal retrofit locations within street rights-of-way to filter and absorb the most stormwater, then engaged residents to host and maintain the rain gardens voluntarily. With support from a $90,000 Clean Water Legacy Fund grant to the Gun Club Lake Watershed Management Organization, the City constructed 27 rain gardens in 2009-2011. Flow-meter data from the drainage pipe to the lake indicate reduced runoff and phosphorus load from the project.

Concurrents Session I 10:00 a.m. – 11:30 a.m.

Track B: Effectiveness of Stormwater Retrofit Strategies, *continued*

Stormwater Controls on a Golf Course to Restore Impaired Trout Stream

Rusty Schmidt (rusty.Schmidt@mnwcd.org) and Karen Kill (karen.kill@mnwcd.org), Washington Conservation District

Stillwater Country Club (SCC) has 65 acres of significantly altered hydrology, using a series of drain tiles to quickly move untreated stormwater from areas within play and directly to Brown's Creek, a designated trout stream listed as impaired for lack of biota due to high temperatures and TSS. A 74% TSS reduction is needed to meet TMDL goals. SCC, Browns Creek Watershed District and Washington Conservation District used funds from the 2010 Clean Water Legacy Fund to improve water quality.

Raingardens, check dams, native plantings and 650 Enviro-lok Bags where installed in 12 project areas on the course to allow infiltration and stabilize soils, resulting in a 7% reduction in TSS loading to Brown's Creek. The SCC is very pleased with project results aesthetically and with course playability keeping greens free of water without increased drain tile.

Concurrent Sessions I 10:00 a.m. – 11:30 a.m.

Track C: Lock and Dam #3: The Corps of Engineers First Design-Build in the Saint Paul District

Project Design in a Challenging Environment

Walter Eshenaur (weshenaur@srfconsulting.com), SRF Consulting Group, Inc.

Lock and Dam #3 is located on the Mississippi River approximately six miles upstream from Red Wing, Minnesota. Its position on a bend in the river makes downstream bound navigation difficult because of an outdraft current that pushes towboats and barges away from the lock toward the gated part of the dam. Accidents related to the outdraft include 11 incidents since 1968 when tows have collided with the gated part of the dam. Failure of the dam or of the embankment system due to a towboat accident could cause a catastrophic drawdown of Pool 3 with significant economic and environmental consequences.

After many years of analysis, modeling, and many design iterations, the solution currently under construction involves an 832 ft extension of the existing guidewall that allows tows to dock and de-couple barges for passage through the lock. The extended guidewall , together with a river bottom geometry alteration that will shift the thalweg towards the center of the river, is expected to diminish the outdraft so that tows are no longer in danger of being swept into the dam.

In addition to the outdraft issues, upstream and downstream dam embankments associated with LD#3 that provide for flow around the dam during flood events have deteriorated with time. In order to refortify the associated dam embankments while minimizing environmental impacts, several innovative reconstruction solutions have been designed and are currently being implemented.

This first presentation of three provides a brief history of Lock and Dam #3 and the issues that are being addressed, presents an overview of the first design-build project implemented by the St. Paul District Corps of Engineers, and outlines the goals, designs, and constraints of this challenging project.

Two-Dimensional Modeling of Mississippi River Flow Patterns

Rick Voigt (rickvoigt@voigtconsultants.com), Voigt Consultants, LLC

The lock chamber of Lock and Dam #3 is located on the outside of a river bend. Hydraulic conditions at Lock and Dam #3 are further complicated by significant interaction between in-channel and overbank flows for discharges above approximately 42,000 cfs. Therefore, a single river bed geomorphic model from approximately 2.7 miles upstream to 2.1 miles downstream of the lock and dam was developed. One of the unusual characteristics of the river reach is that, due to the complex nature and variety of structures, the critical river flow condition varies significantly for flows between 42,000 cfs and the 500-yr flood (252,500 cfs) depending on location.

This presentation will describe how the two-dimensional model was developed using the USACE ADapative Hydraulic Modeling System (ADH). The presentation will highlight how the model aided the design process by 1) assessing different design concepts, 2) evaluating flow patterns and velocities over and near the lower embankment and the complex, sinuous spillways within the embankment, 3) using model output as input for riprap design, and 4) evaluating sediment transport upstream of the lock and dam to verify design stability.

Concurrent Sessions I 10:00 a.m. – 11:30 a.m.

Track C: Lock and Dam #3: The Corps of Engineers First Design-Build in the Saint Paul District, *continued*

Permitting, Water Quality Sampling, and Construction Challenges

Walter Eshenaur (weshenaur@srfconsulting.com), SRF Consulting Group, Inc.

This project is one of only a few that place fill in the River. Most projects focus on dredging material from the river and then disposing of it on land. However, because of the need to create a fill section near the guidewall in order to redirect the thalweg, emphasis was placed by the Minnesota and Wisconsin regulatory agencies for additional efforts to manage sediment through the application of in-water Best Management Practices (BMPs). In addition, the effectiveness of these BMPs and the construction process in general was to be evaluated through periodic water quality (TSS and turbidity) sampling. Prior to commencing construction, a great deal of activity occurred to coordinate permits between Wisconsin and Minnesota, proactively plan for how permit requirements will be met, and to establish a protocol for ensuring effective BMP implementation and evaluation methods.

This presentation addresses permitting coordination, discusses the stringent permit conditions, and provides insights into development of an evaluative sampling protocol, in-water BMP selection, sampling results, and challenges faced during the first year of construction.

Concurrent Sessions I 10:00 a.m. – 11:30 a.m.

Track D: Drainage Considerations and Design

Assessment of Culverts Designed to Meet Stream Simulation Requirements

Bradley Hansen (hanse038@umn.edu), University of Minnesota

The stream simulation approach to culvert design requires that a culvert not substantially change the functioning of the stream. This means that a culvert is required to perform similarly to the natural stream in passing sediment, woody debris, maintaining channel form and profile, and facilitating the migration of fish and macroinvertebrates. In this study 19 culverts originally designed to meet some or all stream simulation requirements were surveyed to assess how well they met the requirements. The main criterion used to evaluate this was the presence or absence of adequate sediment in the culvert. Of the 19 culverts surveyed, nine did not meet this criterion. A likely reason that these culverts lack sediment was improper sizing relative to bankfull channel width. Other possible reasons were also identified and will be presented along with recommendations for improving culvert design to meet stream simulation requirements.

Multipurpose Drainage: Design Concepts and Practices for Multiple Benefits

Al Kean (al.kean@state.mn.us), Minnesota Board of Water and Soil Resources

Agricultural and urban lands in Minnesota involve drainage and drainage infrastructure, both natural and artificial, as well as public and private. Management of runoff is key to various goals for agricultural productivity, flood damage reduction, water quality, and fish and wildlife habitat. Because public and private drainage infrastructure is extensive throughout much of Minnesota, multipurpose drainage is critical for achieving multiple goals of runoff management. Old and new drainage management practices, including "conservation drainage" practices, can be implemented at the lot, field, or watershed scales. The goals of this presentation are to present design concepts, conservation practices and associated terminology for multipurpose drainage, and to help promote consensus of understanding that supports implementation.

Minnesota Drainage Laws Study

Louis Smith (smith@smithpartners.com), Smith Partners, PLLP

The LCCMR commissioned Smith Partners to conduct a legal analysis of Minnesota drainage laws to determine the economic costs and benefits and environmental impacts of the laws and consider alternative strategies that would best serve the collective needs of public waters and property owners alike. Based on a broad review of Minnesota's water resource laws and strong stakeholder engagement, the study developed demonstration scenarios set in the Minnesota River valley, Red River valley, and urbanizing fringe of the metro area. With lessons learned from these scenarios, the project crafted policy recommendations to integrate drainage and conservation planning, establish new funding tools, and remove regulatory barriers to projects that achieve both drainage and conservation benefits.

Luncheon Presentation 12:15 p.m. – 1:00 p.m.

Assessing Risks of Endocrine-Disrupting Chemicals: A Scientific Odyssey

Gerald (Gary) Ankley, United States Environmental Protection Agency, Office of Research and Development, Mid Continent Ecology Division

Biographical Information

Gary Ankley is a toxicologist with the USEPA/ORD Mid-Continent Ecology Division in Duluth, Minnesota. He received his BS from the Department of Fisheries and Wildlife at Michigan State University, and M. S. and Ph. D. from the School of Forest Resources at the University of Georgia. He has worked at the Duluth EPA lab for about 23 years in several areas, including the development of test methods for effluents and sediments, assessment of the effects of endocrine-disrupting chemicals on wildlife and application of genomic and computational toxicology tools to ecological risk assessments. He is the author of more than 300 research papers and book chapters on these and related topics, and has been formally recognized as one of the most highly cited scientists in the world in the environmental sciences. Dr. Ankley consults for a number of national and international organizations involved in chemical regulation/risk assessment, including the World Health Organization and Organization for Economic Cooperation and Development. In 2008, he received the prestigious Founders Award from the Society of Environmental Toxicology and Chemistry in recognition of an outstanding career in the environmental sciences.

Concurrent Sessions II 1:15 p.m. – 2:45 p.m.

Track A: Minnesota Aquatic Systems

Air-Water Temperature Relationships in the Trout Streams of Southeastern Minnesota's Carbonate Landscape: Implications for Climate Change and Land Management

Lori Krider, University of Minnesota

Carbonate geology in Southeastern Minnesota creates a unique landscape of springs, seeps and sinkholes that feed groundwater into streams, creating coldwater habitat for cold and ultra-cold stenotherms, including trout (Salmo sp.). Intuitively, groundwater-fed systems would appear to be relatively resistant to climate change due to their stable temperature and moderating influence. Air temperatures have been shown to be effective predictors of water temperatures in surface-water dominated streams. However, no published work investigates the relationship between air and water temperatures in groundwater-fed stream systems in carbonate systems across watersheds. We used simple linear regression to examine weekly air-water temperature relationships for 40 groundwater-fed streams in Southeastern Minnesota. A lumped linear regression model (i.e., all 40 streams combined) had an R2 value of 0.83, a slope of 0.38 and an intercept of 6.63 (SD = 4.80, SE = 1.99). These relationships are dramatically different in slope and intercept than ones reported for surface water dominated streams because they demonstrate the winter warm, summer cool thermal regime indicative of groundwater-fed streams. The high R2 values demonstrate that air-water temperature regression models for many groundwater-fed streams may be useful in predicting the thermal regimes of groundwater-dominated streams under future climate scenarios. A regression model of slope vs. intercept can be used to identify streams that are more meteorologically controlled, and thus more vulnerable to climate change. Such relationships can be used to guide restorative versus protective management strategies for trout streams. Although groundwater input is a seasonally dampening influence, many of these systems are still very responsive to atmospheric temperatures. Climate change is expected to alter the thermal regime of groundwater-fed systems, but will do so at a slower pace than surface water dominated systems. The negative effects of global climate change can be reduced by wise land management decisions or exacerbated by poor ones.

Natural Short-Term Declines in Curly-Leaf Pondweed Across a Network of Sentinel Lakes: Potential Impacts of Snowy Winters

Ray Valley (ray.valley@state.mn.us), Minnesota Department of Natural Resources Fisheries

Curly-leaf pondweed (Potamogeton crispus; CLP) is a widespread invasive aquatic plant that has been present in the state since the early 1900's. Where it grows abundantly, the plant has the potential to influence phosphorus loading and algal blooms when it senesces. Due to its potential to influence lake dynamics, CLP frequency has been monitored annually in 11 sentinel lakes as part of a cooperative long-term monitoring program since 2008. Curly-leaf pondweed declined by 37% across the 11 lakes since 2008. In two southern Minnesota lakes: St. Olaf and St. James, CLP declined by 80% and 95% respectively. Declines appear to be related to heavier than normal early-winter snowfall. Curly-leaf pondweed's winter growth form is not dormant like other native plants and requires some minimal degree of light to persist through winter. These findings have many implications; especially as they relate to climate change adaptation strategies.

Concurrent Sessions II 1:15 p.m. – 2:45 p.m.

Track A: Minnesota Aquatic Systems, *continued*

Winter Invertebrate Dynamics in Trout Streams of Southeastern Minnesota

Jane Mazack (louws002@umn.edu), University of Minnesota

Groundwater-fed streams, which remain cold in summer but ice-free in winter, provide ideal habitat for ultra-cold stenotherm insects and brown trout. Previous studies on these insects have focused on their thermal tolerance limits; however, their role within the broader ecosystem context is not well-established. Thus, the goals of our study were to document invertebrate emergence and community composition, while investigating their relationships to thermal regime and trout growth. We assessed 12 trout streams in southeastern Minnesota on three occasions throughout the winter using invertebrate bioassessment protocols. Invertebrate sampling dates were paired with trout diet analyses to determine invertebrate influence on trout diet and growth. Surface-floating pupal exuviae collection and Hess samples were used to study the emergence patterns of cold-adapted insects in relationship to water temperature and evaluate winter invertebrate populations. Both community composition and winter emergence patterns varied among streams with different thermal regimes and geospatial characteristics.

Concurrent Sessions II 1:15 p.m. – 2:45 p.m.

Track B: Creative Approaches to Stormwater Best Management Practices (BMPs)

The Minnesota Filter: A Tool for Capturing Stormwater Dissolved Phosphorus

Ross Bintner (rbintner@cityofpriorlake.com), City of Prior Lake

A recent study of nationwide municipal monitoring data reports that the fraction of total phosphorus that is dissolved (phosphates) is approximately 44% (median values) and detailed monitoring studies have shown that this fraction can range from 0 to 100% for some rainfall events. Very few stormwater treatment practices can consistently capture dissolved phosphorus over the life-cycle of a treatment practice, and therefore a large portion of the phosphorus load is entering our impaired water bodies. The "Minnesota Filter" is a new treatment system that can capture 80-90% of the dissolved phosphorus fraction and can be used in many applications including sand filters, wet detention basins, permeable weirs, ditch check blocks, and rain gardens, among others. This presentation will provide performance and design information from recent and on-going field studies of field installations of the Minnesota Filter.

Filtration Observations in the Carver County WMO

Jen Irving (jirving@co.carver.mn.us), Carver County

In 2002 the Carver County WMO adopted Water Rules that specify stormwater treatment requirements for new development sites. The soils in the County require that filtration rather than infiltration be used to treat stormwater. More than 100 filtration BMPs including raingardens, shelves, basins and treatment train combinations have been installed. In 2004, the County began monitoring select BMPs to determine their effectiveness at removing pollutants. Grab samples from the inlets and outlets were collected as close to the start of a rain event as possible. The samples were analyzed for total suspended solids (TSS), total phosphorus (TP), and ortho-phosphorus (OP) and the pollutant removal efficiency was calculated for each rain event. After the 2010 sampling season, average removal efficiencies across all sites was 87% for TSS, 58 % for TP, and 51% for OP. This presentation will present details and data for each BMP and new data from 2011.

Concurrent Sessions II 1:15 p.m. – 2:45 p.m.

Track B: Creative Approaches to Stormwater Best Management Practices (BMPs), *continued*

Green Infrastructure Practices for the Central Corridor Light Rail Transit Project

Anna Eleria (anna@capitolregionwd.org), Capitol Region Watershed District

In 2010, construction commenced for the Central Corridor Light Rail Transit (CCLRT), an 11-mile, two-way commuter rail system that will link the downtowns of Minneapolis and Saint Paul in Minnesota. Requiring full reconstruction of heavily traveled streets, the CCLRT presents a unique opportunity to improve the quality of stormwater runoff, aesthetics, and sustainability of this highly urbanized corridor that will not likely be seen again for decades. Seven miles of the CCLRT falls within the jurisdiction of Capitol Region Watershed District (CRWD). Starting in spring 2011, the Metropolitan Council, CRWD and the City of Saint Paul will construct green infrastructure practices within the Corridor to achieve significant and measurable water quality improvements as well as provide more greenspace, enhance aesthetics, and improve air quality.

Four categories of green infrastructure practices have been selected to achieve the runoff reduction and water quality goals of the project:

- integrated tree trench system;
- stormwater planters;
- rain gardens; and
- infiltration trenches.

The integrated tree trench system will be constructed on both sidewalks along 5.2 miles of the Corridor where feasible. The system will receive runoff from the streets via catch basins that will direct runoff to infiltration trenches and from sidewalks via pervious pavers that will direct runoff to structural soils. The structural soils will support vigorous growth of trees that provide evapotranspiration, infiltration, and nutrient uptake. Approximately eleven additional green infrastructure practices, including rain gardens, stormwater planters and infiltration trenches, will be constructed on adjacent connecting streets to the Corridor.

Concurrent Sessions II 1:15 p.m. – 2:45 p.m.

Track C: Engineering Solutions in Modeling

Development and Application of Ground-Truthed NEXRAD Rainfall Data in HEC-HMS Model Calibration of Red River Basins

Tim Anderson (tanderson@barr.com), Barr Engineering Company

A detailed set of hydrologic models for subbasins tributary above the Red River of the North at Halstad, MN were developed as part of the flood control efforts in the Red River Valley. This work is part of an effort to achieve a combined set of hydrologic/hydraulic models that can be used in the basin to evaluate different flood mitigation projects or programs. Nine subbasins, ranging from 300 to over 2,200 square miles were modeled using the HEC-HMS hydrologic model. Accurate rainfall distributions (both spatially and temporally) were important for the calibration of the modeling due to the variability of precipitation throughout the large study area. NEXRAD rainfall data adjusted using approximately 1,600 rain gauges in and near the basins were used to develop hourly hyetographs for five calibration storm events at nearly 12,000 locations within the 18,000 square mile study area.

Geometric Representation of Flow Through the Floodplain and Selection of Hydraulic Coefficients

Brandon Barnes (bbarnes@barr.com), Barr Engineering Company

HEC-RAS provides a number of options to define the geometric representation of the floodplain and also to characterize how flow is conveyed downstream. Geometric representations may include using cross sections, storage areas, or a combination of the two to capture the physical characteristics of the area. Selection of appropriate geometric and hydraulic parameters is important for accurate simulation of the dynamic routing of the hydrograph as well as the water surface profile of the river channel and overbank areas. Selection of appropriate model coefficients must consider the efficiency of irregular shaped lateral structures and the resulting overland flow element required to convey overflows through subsequent storage areas. Parameter choices may appear to deviate from typical or published values for typical weir geometries.

The emphasis of this presentation will focus on how different geometric representations of the floodplain in a HEC-RAS unsteady flow model alter model results, and how this can lead to selection of hydraulic coefficients that differ from published values for standard weir geometries in order to replicate observed values during actual flood events. Results from the corresponding analysis conducted using the HEC-RAS unsteady flow model developed for the feasibility study of the Red River Diversion, Fargo-Moorhead Metropolitan Flood Risk Management Project will be presented.

Evaluating Best Management Practice Effectiveness and Economics Using a Field Scale Approach

Brian Williams (brian.c.williams@state.mn.us), Minnesota Department of Agriculture

The Minnesota Department of Agriculture partnered with Minnesota State University-Mankato, and a host of agricultural professionals to successfully establish the Hwy 90 Drainage Demonstration Site in 2006. Side-by-side nutrient rate and timing comparisons enable evaluation of nutrient losses and BMP effectiveness on a field scale setting. Drainage water is continuously monitored evaluating flows, weather patterns, along with nitrate, phosphorous, and pesticide concentrations from 4 individual sub-watersheds within the study field.

The goals and objectives of the Hwy 90 Drainage Demonstration project include: 1) Evaluate nutrient and pesticide management strategies and practices aimed at reducing nonpoint source pollution while protecting farm profitability; 2) Increase the understanding of agro-ecosystems influences on the environment; 3) Increase the understanding of agricultural impacts on soil and water, and work toward reducing adverse impacts with farmers, crop consultants, water quality personnel, and other technical advisers targeted for educational outreach activities.

Concurrent Sessions II 1:15 p.m. – 2:45 p.m.

Track D: Planning for Effective and Economical Stormwater Practices and Policies

Make Better Decisions for Stormwater BMPs

Lisa Goddard (lgoddard@srfconsulting.com), SRF Consulting Group, Inc.

Increasingly stringent requirements for stormwater management have resulted in an expanding set of potential treatment practices. However, not all best management practices (BMPs) perform the same treatment function or provide the same removal efficiencies. Furthermore, the frequency and intensity of maintenance can vary greatly between BMP types. The Minnesota Local Road Research Board (LRRB) recently developed a planning-level tool to assist practitioners in selecting appropriate BMPs. The tool includes information on the BMPs that are most commonly used in Minnesota. Users are walked through a step-by-step decision-making process that narrows BMP choices according to physical constraints, regulatory environment, capital costs, and other factors. This resource was developed to work alongside LRRB's Stormwater Maintenance BMP Resource Guide and the Minnesota Stormwater Manual. We will describe the various steps in the tool and the BMPs it includes.

Urban Subwatershed Stormwater Retrofit Analysis

Shawn Tracy (Shawn.tracy@metrocd.org), Metro Conservation Districts

The 11-county metro area Soil and Water Conservation Districts have modified and applied the Center for Watershed Protection's Urban Subwatershed Restoration Manual series within the Twin Cities region of Minnesota over the past 2 years. The urban stormwater retrofit analysis identifies the highest value stormwater treatment retrofit options within subwatersheds. The process identifies which subwatersheds to work in first, which catchments within those subwatersheds and, finally, which individual locations to install specific BMPs. Each catchment is investigated for areas conducive to retrofitting and then considered for treatment by at least one of seven BMP family types. Data from field-assessed sites are used to model various treatment options within each catchment and a scaled cost-benefit analysis is reported identifying 1st priority areas, specific BMP choices and their site-specific design considerations. This process provides assurance and direction to LGU's interested in meeting their local water quality goals in the most cost-effective manner.

Environmental and Economic Impacts of Volume Control Policies

Richard Hibbard (rhibbard@wsbeng.com) and Peter Willenbring (pwillenbring@wsbeng.com), WSB & Associates, Inc.

Stormwater management policies for development and redevelopment projects in Minnesota typically require varying levels of stormwater volume reduction/infiltration. This presentation compares the environmental benefits and financial impacts of a range of currently in place volume reduction standards. The information presented will be useful to those developing/justifying policies governing the extent to which infiltration should be provided on a typical site. The analysis quantified the annual runoff volume and pollutant load generated from medium density residential, commercial, and 100 percent impervious sites without BMP's. The annual reduction in runoff volume and pollutant load was estimated based on infiltrating the runoff volume for rainfall events of 0.5", 1.0", 1.25", 1.35", 2.0", and 2.8". The cost to construct systems to infiltrate for these rainfall events is presented with the cost to remove a pound of phosphorus or an acre foot of runoff volume.

Concurrent Sessions III 3:15 p.m. – 4:45 p.m.

Track A: Minnesota Groundwater Systems: The Challenge of Ammonia and Nitrate

Minnesota Groundwater Ammonia Study: Problem Assessment and Data Collection

Lih-in Rezania (lih-in.rezania@state.mn.us), Minnesota Department of Health

Ammonia level as high as 7mg/L has been detected in public water supply wells. A number of public water supply wells have been found to contain high TOC and Ammonia levels that are not expected in groundwater drinking water sources. Since ammonia and TOC are not regulated contaminates under the Safe Drinking Water Act (SDWA), MDH has limited historical data to speculate the adverse impacts and challenges on treatment, disinfection, and SDWA compliance they bring to Public Water Systems.

The presence of free Ammonia is known to cause water distribution system nitrification problems such as high HPC, biofilm growth, loss of chlorine residuals, taste and odor, low pH, and corrosions. To understand the extent of the problem, a two-phased study on ammonia was conducted. Phase 1 focused on statewide data collection and problem assessment, and phase 2 case studies on impacts and management strategies.

Phase 1 involved forty municipal water systems across Minnesota with a comprehensive data collection effort. One hundred twelve (112) municipal wells were selected for the investigation. More than 5000 filed and lab analysis on ammonia, nitrite, nitrates, pH, TOC, ORP, temp, HPC, ammonia, nitrate, and nitrite were performed on samples collected from each well source, entry point, and distribution system. The study found ammonia level of the 112 tested wells ranged from 0 to 7.2 mg/L and averaged 0.86 mg/L, with 54% of the wells having levels above 0.5 mg/L. TOC levels were found to range from 0 to 11 mg/L with an average of 2.58 mg/L and 56% of the wells tested above 2.0 mg/L. Nitrification/de-nitrification activities were confirmed in 46% of the water distribution systems, all with elevated HPC and "0" or "near 0" total chlorine residuals.

The study made clear that Minnesota's groundwater systems are faced with a big challenge in ammonia management and nitrification control. Failure to successfully manage excess ammonia will affect water systems' ability to achieve simultaneous compliance of the SDWA regulations, including the Lead and Copper Rule, Total Coliform Rule, and the Disinfectants/Disinfection By-Product Rule.

Concurrent Sessions III 3:15 p.m. – 4:45 p.m.

Track A: Minnesota Groundwater Systems: The Challenge of Ammonia and Nitrate, *continued*

Minnesota Groundwater Ammonia Case Studies: Impacts and Management Strategies

David Schultz (david.schultz@state.mn.us), Minnesota Department of Health

In Phase 2 Ammonia Study, eight Municipal Water Systems were closely examined. More than 3000 lab analysis were conducted on source, treated, and distribution system water samples. Filter influents and effluents, and storage tank effluents were also investigated to further understand how and where nitrification occurs. These case studies demonstrate the intricate relationships among TOC, ammonia, and treatment processes such as iron oxidation, filtration, and disinfection (i.e., Chlorination vs. Chloramination). They also demonstrate the role ammonia has in causing nitrification and water quality complaints, corrosion, and compliance problems. It is to be noted that in one of the case studies where treated water contains TOC of 10 mg/L and Ammonia of 7 mg/L, MDH did not find any signs of nitrification nor problems with disinfection by products. That case demonstrate the important role of dissolved oxygen (D.O.) in initiating and aggregating nitrification; it also links Minnesota copper corrosion problems to nitrification by a common denominator, high D.O. in water, introduced by aeration for iron oxidation and gravity filtration for iron removal.

The study concludes that to effectively manage excessive ammonia in treated water or control nitrification, water systems must know the concentrations of ammonia in their well sources (to determine a management strategy that best suit the system) and closely monitor disinfectant residual concentrations, including free chlorine, total chlorine, and monochloramine, and ammonium ions, to prevent free ammonia from entering into the water distribution systems. Ammonia management strategies including a) source blending to within range feasible for chloramination; b) practice breakpoint chlorination to burn off ammonia preventing it from entering into treatment train and/or distribution systems; c) convert existing iron filters to bioactive-ammonia-removal-filters; d) for sources with higher levels of ammonia, avoid treatment processes that introduce oxygen/D.O. to minimize copper corrosion and nitrification, and e) apply chemical such as Sodium Chlorite or Chlorine Dioxide that inhibits microbial growth and minimize nitrification.

Nitrate Contamination of Water Resources in Southeastern Minnesota

Paul Wotzka (pjwotzka@aol.com)

The ground and surface water resources of Southeast Minnesota are highly valued as sources of drinking water and for recreation. Region wide, however, 1 out of every 8 private wells used for drinking water are currently contaminated above the nitrate drinking water standard of 10 [mg/L]. In some counties the number of contaminated wells is nearly 1 in 3. In 2010, over 86 miles of trout streams in Southeast Minnesota were proposed to be listed as impaired for nitrate contamination for exceeding standards. High levels of nitrates in trout streams occur during base flow conditions when groundwater inputs to streams dominate. Despite the 1989 Groundwater Protection Act statutory goal "that ground water be maintained in its natural condition, free from any degradation caused by human activities" long term groundwater monitoring indicates increasing nitrate contamination. Long term nitrate monitoring data from DNR fish hatchery springs show that nitrate concentrations have double over the 20 year implementation history of the Groundwater Protection Act. A major factor leading to these results is land use trends over the last 30 years which indicate the dominance of acreage in row crop agriculture – corn and soybeans - at the expense of more diverse crop rotations that historically have included hay and small grains.

Concurrent Sessions III 3:15 p.m. – 4:45 p.m.

Track B: Retrofitting: Improving Runoff Quality in Urbanized Areas

Retrofitting Maplewood Mall for Stormwater Volume Reduction

Cliff Aichinger (cliff@rwmwd.org), Ramsey-Washington Metro Watershed District and Erin Anderson Wenz, Barr Engineering

The Kohlman Lake TMDL calls for the reduction of nutrients from watershed and from in-lake loading. A major source of Phosphorus loading is from the impervious areas in the District (roads, interstates, and parking lots). In the analysis of the Kohlman Lake watershed, the 200 acres of impervious cover in and around Maplewood Mall is an obvious feature on the landscape. The District identified that retrofitting the Mall parking areas to infiltrate at least one inch of runoff would result in a large reduction in phosphorus to Kohlman Creek and the lake.

The District began discussions with the owners of Maplewood Mall in 2008 to implement a four phase project in the Maplewood Mall parking lot. Phase I constructed rain gardens at the mall entrances and was completed in 2010 with District funds. Phases II and III address stormwater infiltration in the northeast and northwest quadrants of the Mall and will be completed in the fall of 2011. Phase IV will address the south half of the Mall property, but is not planned for completion until 2012 or 2013. The District has received a Clean Water Fund grant for Phase II ($500,000) and a MPCA 319 grant ($500,000) for Phase III. The total Phase II and III project cost is estimated at $2.4 million.

The goal for all phases of this project is to infiltrate or filter at least one inch of runoff from the mall parking lot. The proposed project will reduce sediment loading and particulate and dissolved phosphorus laoding to Kohlman Lake. The primary BMP to be used in the project will be infiltration tree trenches. Other BMPs will include infiltration rain gardens and planter areas, porous pavement, and a cistern.

This presentation will review the lessons learned while trying to design and construct a project on property owned by the largest retail property owner in the county. We will also discuss the process of identifying the types of BMPs to include in the project and some of the design issues.

Mimicking Native Hydrology on a Corporate Campus: Retrofitting Infiltration Practices and Impervious Surface Reduction at Lockheed Martin, Eagan

Nathan Campeau (ncampeau@barr.com), Barr Engineering Company

In 2008 the Lockheed Martin Eagan campus, with assistance from Barr Engineering, completed a Sustainable Campus Master Plan to reduce their environmental footprint. A key component of the Master Plan was stormwater volume reduction. Concepts were developed to reduce stormwater runoff by 93 percent in a one inch rain event through impervious surface reduction, alternative plantings and infiltration basins across the entire 51-acre campus.

Extensive monitoring of 42 of the 51 acres was conducted in 2008 and 2009 (pre-construction) to develop a calibrated XP-SWMM model of the pre-project conditions on Lockheed's campus. Phase 1 of the project, completed in 2009, included the reconstruction of a 1.2 acre watershed with parking lot using porous asphalt and a rainwater garden designed to capture the first inch of runoff. Monitoring of this watershed compared with the calibrated pre-project conditions demonstrated an 89 percent reduction in runoff. The monitored period of seven months recorded 30.2 inches of rainfall, the wettest summer on record.

Concurrent Sessions III 3:15 p.m. – 4:45 p.m.

Track B: Retrofitting: Improving Runoff Quality in Urbanized Areas, *continued*

Retrofitting of Low Impact Development Improvements in Residential Neighborhoods – Owatonna, MN

Daniel Edgerton (dan.edgerton@bonestroo.com), Bonestroo, Inc. and Matt Durand (matt.durand@ci.owatonna.mn.us), City of Owatonna

The City of Owatonna secured a $450,000 MPCA grant to implement LID improvements. A design team from Bonestroo worked with the City to design the following projects:

Reconstruction of two alleys using porous concrete and porous bituminous pavement.

Construction of bioswales and three large raingardens in the rear and side yards of floodprone Owatonna neighborhoods. The bioswales and raingardens are designed to provide enhanced conveyance for stormwater during large storm events, safely routing water away from homes and to the streets.

Biofiltration improvements that divert stormwater through a water quality structure and into a two-celled biofiltration pond. The water quality structure consists of a salvaged $500 septic tank that was modified into a multi-chamber pretreatment structure. The City reports that the modified structure has been very effective collecting debris and sediment. The biofiltration cells include a porous planting media, native deep rooted plantings, and a draintile network.

Concurrent Sessions III 3:15 p.m. – 4:45 p.m.

Track C: Red River

Analyzing Impacts Associated With the Proposed Fargo-Moorhead Diversion Project Using Unsteady HEC-RAS

Greg Thompson (gthompson@houstoneng.com), Houston Engineering, Inc.

Eight of the top ten recorded floods in the Red River Valley have occurred since 1979. Following the flood fight of 2009, the St. Paul District of the U.S. Army Corps of Engineers accelerated the Fargo-Moorhead Metropolitan Flood Risk Management Project (FM Metro Diversion). Houston Engineering was contracted to develop a detailed unsteady HEC-RAS model to evaluate potential impacts associated with various alternatives of the project. The model covers 750 miles of river, including over 2,900 cross sections and nearly 900 storage areas.

This presentation will detail the use of the large-scale unsteady HEC-RAS model to evaluate impacts associated with the diversion alternatives. The impacts were primarily related to lost floodplain storage and changes to timing of discharge hydrographs. The unsteady HEC-RAS model became a key component in the project design, which ultimately included a diversion channel, upstream staging, and off-channel storage.

Sediment Transport and Potential Geomorphic Impacts, Fargo-Moorhead Metro Flood Risk Management Project, Feasibility Study

Peter Hinck (phinck@barr.com), Barr Engineering Company

Large-scale flood control projects have the potential to impact the sediment transport and geomorphologic characteristics of the affected riverine systems. The evaluation of potential project impacts from such large-scale projects must include an understanding of the watershed-scale geologic and geomorphic setting as well as site-specific sediment transport and channel morphology characteristics.

This presentation will focus on the feasibility analysis of potential impacts from the proposed diversion of the Red River of the North and some North Dakota tributaries as part of the Fargo-Moorhead Metro Flood Risk Management Project. The study features the analysis of multiple sediment transport and geomorphologic datasets, including an intensive campaign to measure bedload and sediment transport rates and sediment gradations during the spring flood of 2010. The study also takes advantage of observations from an existing diversion project on the Sheyenne River, one of the rivers affected by the proposed project.

Sediment Concentrations, Loads, and Particle Size Distributions in the Red River of the North and Selected Tributaries Near Fargo, ND, During the 2010 Spring High-Flow Event

Joel Galloway, U.S. Geological Survey – North Dakota

In 2008, the U.S. Army Corps of Engineers proposed that a $1.3 billion diversion channel be constructed around the Fargo-Moorhead Metropolitan area to mitigate recurring flood damages, which are estimated to be more than $187 million annually. To better understand fluvial sediment dynamics, which have important implications for the construction and function of the proposed diversion, the U.S. Geological Survey studied sediment concentrations, loads, and particle size distributions for the 2010 spring high-flow event on the Red River of the North and selected tributaries near Fargo, North Dakota. During the high-flow period, suspended sediments comprised 99 percent of total loads, and bedload contributed less than 1 percent. Generally, tributary streams contained higher concentrations of suspended-sediment concentrations but had smaller bedload particle sizes than the Red River of the North. Additionally, the timing of the peak of suspended-sediment concentrations varied among sites, occurring before, simultaneously with, or after the hydrograph peak.

Concurrent Sessions III 3:15 p.m. – 4:45 p.m.

Track D: Targeting and Tracking Conservation

Conservation Targeting Tools

Julie Westerlund (Julie.Westerlund@state.mn.us), Minnesota Department of Natural Resources

Part of the work underway with Clean Water Fund dollars, conservation targeting tools currently being developed have excellent potential to help decision-makers as they practice conservation on the landscape. The presentation will highlight new tools that are being developed and will demonstrate the potential there is to assist decision-makers and land managers.

Tracking Minnesota's Clean Water Legacy Effectiveness

Suzanne Hanson (Suzanne.Hanson@state.mn.us), Minnesota Pollution Control Agency and Andy Holdsworth (Andy.Holdsworth@state.mn.us), Minnesota Department of Natural Resources

Minnesotans want to know if our water is getting cleaner and how Clean Water Funds are being spent. These questions and many others are being addressed by representatives from the interagency Measures and Outcomes team in the Clean Water Legacy Effectiveness Tracking Project. The project goal is to develop a multi-agency clean water effectiveness tracking framework that will help clarify the connections between funds invested, actions taken and clean water outcomes achieved. The heart of the framework is a suite of quantifiable performance measures that tell a cohesive, meaningful story about the pressures on Minnesota's water bodies, the state of Minnesota's watershed health, and the response of agencies and partners working to restore and protect Minnesota's waters.

Minnesota Wetland Conservation Act Reporting Data: What It Says and What It Doesn't Say

Ken Powell (Ken.powell@state.mn.us), Minnesota Board of Water and Soil Resources

The Minnesota Board of Water and Soil Resources will be issuing the 2004-09 Wetland Report in 2011.This report includes data from Local Government Units regarding regulatory wetland losses and gains. This presentation will dispel myths about what this data actually means, review past data collection efforts, discuss recent attempts to get better data, highlight interesting trends/observations of recent data (including 2010 data), and clarify the role of the Wetland Conservation Act regulatory program in Minnesota's wetland conservation efforts.

Poster Session 4:45 p.m. – 5:45 p.m.

1. Twin Cities Metropolitan-Area Chloride Monitoring

Brook Asleson (brooke.asleson@state.mn.us), Minnesota Pollution Control Agency; Rachael Crabb (RCrabb@minneapolisparks.org), Minneapolis Park & Recreation Board; Kent Johnson (kent.johnson@metc.state.mn.us), Metropolitan Council Environmental Services; Matt Loyas (matt@capitolregionwd.org), Capitol Region Watershed District

Recent studies show that chloride concentrations are increasing in Twin Cities Metropolitan Area (TCMA) lakes and streams. The Minnesota Pollution Control Agency (MPC A) has initiated the TCMA Chloride Management Plan project to address this issue. From the fall of 2010 through 2013, the MPCA and local partners are collaboratively sampling 74 lakes, 27 streams, and 8 storm sewers for chloride and related parameters. This monitoring effort has three objectives: to assist the MPCA in developing new monitoring guidance specifically for chloride; to improve the chloride database for the TCMA; and to inform the TCMA Chloride Management Plan. The data will be analyzed to characterize chloride levels and patterns throughout the TCMA, and to elucidate possible causative relationships through correlation and regression with road density and application rate data. This study will help us to better manage TCMA water resources with respect to chloride while balancing our need for road safety.

2. Image Analysis Techniques to Evaluate Effects of Nearshore Lake Development on Aquatic Macrophytes

Marcus Beck (beckx266@umn.edu), Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota; Lorin Hatch (lorin.hatch@hdrinc.com), HDR Engineering, Inc.; Bruce Vondracek (bvondrac@umn.edu), U.S. Geological Survey

Development of biological indices for lakes has improved the ability to detect impacts of stressors on aquatic organisms. However, quantitative techniques to understand mechanisms of biological response and stressors are challenges that have not been adequately addressed. Moreover, continued nearshore lake development in Minnesota is expected to impact biological integrity. Image analysis techniques with remotely sensed data could be used to quantify nearshore stressors. We are developing automated techniques to identify stressors in nearshore areas using aerial photos. Behavior of a macrophyte-based index for lakes with aquatic plant surveys will be modeled relative to identified stressors. We are also quantifying the amount and spatial extent of docks for 4,300 lakes managed by the Minnesota Department of Natural Resources. Preliminary analysis indicates these techniques can efficiently and accurately extract nearshore land use data at ecologically relevant spatial scales. These techniques will facilitate remediation of biological impairments of surface waters in Minnesota.

3. Restoring an "Oasis" in the City: The Challenges of Pond Dredging

Greg Bowles (gbowles@houstoneng.com), Houston Engineering, Inc.

Oasis Pond is a public waters wetland located in the City of Roseville. This wetland receives stormwater runoff from hundreds of acres of urbanized landscape. To protect the water quality of downstream recreational lakes, in 1986 the City constructed a sedimentation basin within Oasis Pond.

Periodic maintenance of this sedimentation basin is required to ensure sediment capacity is maintained. In 2010, the Rice Creek Watershed District (RCWD) undertook a pond dredging project to restore the water quality treatment function in the basin.

The presentation will provide an overview of the project challenges encountered during the Oasis Pond Dredging project including: dredging within a public waters wetland, sediment disposal, dewatering of dredge material and permitting.

Poster Session 4:45 p.m. – 5:45 p.m.

4. Restoration of a Drained Lake for Wetland Banking: A Model for Future County Ditch System Repairs

Chuck Brandel (chuck.brandel@is-grp.com), I&S Group, Inc.

The Drummer Wetland Bank is a restoration of a small lake in Blue Earth County within the Le Sueur River Watershed. The project area was originally a shallow lake that was tiled in the early 1900's. Blue Earth County Ditch No. 25 was extended into this area with a 14" tile that lowered water levels by approximately 12 feet. The project was then farmed and an open ditch was constructed through the center of the lake bottom in the 1990's to better drain the area. A portion of the project was put into CRP in 1986 and was planted in reed canary grass. I&S Group prepared a plan to restore the area to a 30 acre 8 foot deep lake. Construction was completed in late 2010, and the wet fall and large amount of snow filled the basin with 174 acre-feet of water. The presentation will discuss the unique challenges and anticipated benefits associated with this type of project, and how this can be a model for future repairs to County Ditch systems.

5. Coming to a Farm Near You: Part I

Jeffrey S. Broberg (jsbroberg@mcghiebetts.com), McGhie & Betts Environmental Services, Inc.

In 1986 we moved back to Minnesota and purchased a 167 acre farm in the Whitewater Watershed of Winona County in the Driftless Area of the Paleozoic Plateau. When we bought the farm the uncased, 400-foot deep, multi-aquifer well measured 8 mg/L nitrates. In 2010 the well tested to have over 19 mg/L nitrate-nitrogen, nearly twice the health risk limit for nitrate-nitrogen and we found that one-third of our neighbors also have nitrate contaminated water Even as a professional geologist and environmental consultant until fairly recently I was largely unaware of the impact crop farming was having to my groundwater. In my technical analysis of the soils, rocks and water on my farm I have developed models for infiltration rates and the sensitivity of water resources in the karst of SE MN. I have also found that local farmers and ag-experts are largely unaware, or are in denial, about the fate of their chemical inputs that are impairing the sustainability of our groundwater.

6. Upstream-Downstream Friendship Tours Serve as a New Model of Civic Engagement

Susan Carlin (susan.carlin@mnsu.edu), Minnesota River Board; Warren Formo (warren@mawrc.org), Minnesota Agricultural Water Resources Coalition; Patrick Moore (Patrick@cureriver.org), Clean Up the River Environment; Bruce Tiffany, farmer

The Upstream-Downstream Friendship Tour Network is a boundary-spanning team of citizens who care about clean water and believe in the importance of building respectful, trusting, collaborative relationships to achieve water quality goals. This new venture started in the fall of 2010, when citizens (farmers from the upper Minnesota River Basin and urban residents and business owners from the Lake Pepin area) were invited to participate in the first friendship exchange. The initial meetings were structured so that participants could learn about one another's geographic, environmental, financial, and social values/challenges in a personal, non-confrontational manner. Through Bush Foundation funding, the organizers are now offering workshops so that watershed professionals and volunteers can learn to use the Friendship Tour model, social media, and open space meeting technology. These skills can be applied locally in an effort to foster cultural support for the restoration and protection of water quality.

Poster Session 4:45 p.m. – 5:45 p.m.

7. A Case Study of Local Governance and Watershed Management in Minnesota: Opportunities and Constraints

Mae Davenport (mdaven@umn.edu), Paula Guetter (guett006@umn.edu), Amit Pradhananga (prad0047@umn.edu), and Amanda Sames (same0057@umn.edu), Department of Forest Resources, University of Minnesota

In Minnesota, local governments have land use planning authority, making these institutions important players in how land is used, developed and protected. While local governments can shape land use, individual landowners play a central role in land use outcomes. Thus, individual and cumulative "governance" decisions have profound implications for the health of hydrologic systems. As environmental conditions change, many communities are ill-equipped to respond to problems effectively. We conducted a community assessment investigating the critical capacities and constraints of local governance that influence management of two Minnesota watersheds. Data were gathered through (1) in-depth interviews with diverse water resource professionals, government representatives, and community residents and (2) a survey of riparian landowners. Primary capacities participants perceived were related to the financial and technical assistance provided by Soil and Water Conservation Districts and Watershed Management Organizations. Perceived incapacities were linked to local governments' limited water management expertise, transboundary coordination problems, and lack of broad landowner commitment to conservation practices. Implications for sustainable watershed management and local governance will be discussed.

8. MnDOT Bridge Tales of the 2011 Flood

Petra DeWall (Petra.dewall@state.mn.us), Minnesota Department of Transportation

March 11th, 2011- Recent Flood Predictions are showing a potential of record flooding in downtown St. Paul and Major Flooding across the state. We will share our experiences during the floods and what happened. This is more a placeholder abstract as the flood is yet to occur. One area that will be discussed is actions taken at the Hastings Bridge. Construction has started on the new bridge and the cofferdams are not far away from a critical pier. We will discuss what actions we took pre flood and what resulted.

9. Automation Innovations in Stormwater Modeling: Hydraulic Design Case Studies

William Douglass (billdo@bolton-menk.com), Bolton & Menk, Inc.

Recent automation innovations in water resource engineering software allows civil engineers to more efficiently and economically complete stormwater analysis and hydraulic design. This presentation highlights the scope, principal findings, and conclusions of two large scale stormwater management studies conducted by Bolton & Menk, Inc. including the Water Resources Management Plan for the City of Ramsey, MN, and the Citywide Stormwater Utility Inventory for the City of Osseo, MN. These studies utilized hydrologic modeling software from Autodesk called Storm and Sanitary Analysis (SSA) where the seamless integration with Computer Aided Drafting (CAD) and Geographic Information System (GIS) software allowed the projects to be completed effectively and efficiently under aggressive deadlines. The overall scope of these projects was to combine research, mapping, land use analysis/planning and hydraulic design to create a detailed design tool that each City could use for growth planning, infrastructure replacement, and flood mitigation.

Poster Session 4:45 p.m. – 5:45 p.m.

10. Memory Lane Pond Floodplain Re-Evaluation

Phillip Elkin (phillip.elkin@bonestroo.com), Bonestroo

The City of Crystal is home to a chain of landlocked ponds to which a FEMA flood elevation was assigned in 1976. This regulated elevation identifying 42 properties to be within the 100yr floodplain, including the City Public Works Garage. While the city recognized certain areas were susceptible to flooding, there were other areas included in the floodplain which did not seem to be at risk. This presentation will incorporate a history of flood mapping, discussions of defining a 100yr event, how much flood protection is enough and the FEMA map amending process.

11. Accuracy and Precision of Agricultural Laboratory Tests for Nutrients in Manure: Lessons Learned From the Manure Analysis Proficiency (MAP) Program

Jerry Floren (jerry.floren@state.mn.us), Minnesota Department of Agriculture; Robert Miller (rmiller@lamar.colostate.edu), Colorado State University

Researchers rely on manure nutrient testing by laboratories when designing experiments to make manure application recommendations for maximum crop productivity with minimal environmental risk. Farmers rely on the researcher's recommendations along with laboratory tests for nutrients in their on-farm manure resources to determine application rates and methods when applying manure to their land. The Minnesota Department of Agriculture (MDA) developed a manure proficiency program. MDA certifies laboratories in the United States and Canada for manure testing based on laboratory performance in the proficiency-testing program, and several states require the use of certified labs for cost sharing or permit requirements. Approximately 60 laboratories analyzed 63 different manure samples. Based on results from this program, it is possible to estimate the variability in results obtained from different laboratories and different manure sources. For many tests, variability increases at low nutrient concentrations, and this variability may influence both research and nutrient management planning.

Poster Session 4:45 p.m. – 5:45 p.m.

12. Winter Diets and Dynamics of Brown Trout in Groundwater Dominated Streams

William French (fren0104@umn.edu), Department of Entomology, University of Minnesota; Jennifer Biederman (coch0088@umn.edu), Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota; Leonard Ferrington (ferri016@umn.edu), Department of Entomology, University of Minnesota; Lori Krider (krid0006@umn.edu), Department of Bioproducts and Biosystems Engineering, University of Minnesota; Jane Mazack (louws002@umn.edu), Department of Entomology, University of Minnesota; Jim Perry (Jperry@umn.edu), Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota; Patrick Sherman (psherman@umn.edu), University of Minnesota; Bruce Vondracek (bvondrac@umn.edu), Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota

Trout streams in the Driftless Ecoregion of southeast Minnesota provide valuable economic, recreational, and esthetic benefits. Growth rates and abundances of brown trout vary widely among streams in the Driftless Ecoregion and previous research has suggested prey availability and composition in diet as a possible mechanism. Although trout diets during the summer season have been studied in the past, the composition and importance of winter diets are relatively unknown. Additionally, prey items are rarely identified beyond order or family, which can mask the contributions of particular species to brown trout. The goal of our study was to document the composition of brown trout diets throughout the winter, and investigate possible implications for trout dynamics (i.e. growth, abundance, and survival) across a range of stream conditions in southeast Minnesota. We collected diet samples from trout in 12 different streams on three occasions during the winter (December-March) of 2010-2011. Aquatic invertebrates were identified to genus or species to identify the relative importance of various taxa to brown trout. Growth was measured directly from marked and recaptured fish, or back calculated length at age and incremental growth measurements from scale samples collected simultaneously with diets. Standardized sampling of aquatic invertebrates was also conducted to estimate prey availability in each of the 12 streams. We performed bioenergetic modeling with our diet data to examine the energetic consequences of varying diets for brown trout. Trout diets varied both seasonally and between streams, with different invertebrate taxa dominating diets at various times and locations. Growth rates, abundances and survival of brown trout varied among streams, and empty stomachs were extremely rare.

13. Can River Bank Sediment Be a Carrier and Then Source of Available P in Lake Pepin?

Ashley Grundtner (grun0128@umn.edu) and Satish Gupta (sgupta@umn.edu), Department of Soil, Water, and Climate, University of Minnesota

Sediments are a major carrier of P to rivers and lakes. Although only a small fraction of sediment bound P (particulate P) is available at any time, sediments in lakes and river bottoms can act as a continuous source of available P over a long period of time. One such case is Lake Pepin, a large floodplain lake on the upper Mississippi River about 80km south of St. Paul, where severe eutrophication has been known to occur during dry years. Even though it is well accepted that a majority of sediments in Lake Pepin are coming from river banks, there is a perception that P is coming from agricultural lands. This research is geared to answer a question: Do the bank sediments have ability to adsorb soluble P from river waters during transport and then release it after being deposited at the bottom of Lake Pepin? For this study, we collected a series of river bank materials representing various parent materials and analyzed them for equilibrium phosphorus concentration (EPC0) as well as their potential to adsorb and desorb soluble phosphorus. In addition, we ran adsorption experiments of these materials with water samples collected both from treatment plants and various river reaches. Results show that these bank materials have a low EPC0 (0.155 mg/L) value, a high P adsorption potential but minimal desorption capacity. We conclude that these bank materials can adsorb soluble P from the river waters and then hold onto it until settled.

Poster Session 4:45 p.m. – 5:45 p.m.

14. Water-Based Infiltration for Middle Spunk Lake

Stan Hanson (Stan.hanson@bonestroo.com), Bonestroo; Greg Berg (Greg.Berg@mn.nacdnet.net), Stearns County Soil and Water Conservation District

The Middle Spunk Lake project, funded in part through the Clean Water Legacy Amendment, is a partnership between local residents, Avon Area Lakes Association, city of Avon, Initiative Foundation and Stearns County Soil and Water Conservation District (SWCD) to improve the waters of Middle Spunk Lake by implementing individual landowner water improvement efforts or best management practices (BMPs) on individual lots. What makes this project unique is that the water improvement benefits of a single individual effort is magnified by numbers; several residents working together to make an even bigger difference in the health of Middle Spunk Lake. With the technical assistance from Bonestroo Engineer, approximately 41 raingardens will be installed in the Statford Addition this spring to decrease the amount of Stormwater runoff directly entering Middle Spunk Lake.

15. Effectiveness of Buffers Installed at Targeted Critical Drainage Areas in Minnesota

John Hanzas (jhanzas@stone-env.com), Stone Environmental, Inc.

A paired watershed study is being conducted in Minnesota to assess the effectiveness of semi-circular 30-foot grass buffers, installed around critical drainage points from corn and soybean fields, in reducing herbicide residues, sediment and nutrients in runoff water. These buffers are a voluntary Best Management Practice (BMP) recommended by the Minnesota Department of Agriculture (MDA). Previous research conducted by the University of Minnesota for the MDA using digital terrain analysis and SWAT modeling indicated that critical surface drainage points could be identified and pollution reduction per land area placed in BMPs can be maximized. The study includes a single, yearly pre-emergent application of herbicide at a reduced rate (another Minnesota BMP) and measurement of rainfall, runoff flow, herbicide residue, sediment and nutrients. Runoff events in 2010 yielded a strong statistical calibration between study watersheds. During the 2011 and 2012 field seasons, data will be collected to determine the effectiveness of this BMP.

16. Infiltration BMPs Beyond Project Close-Out: An Overview of the Rice Creek Watershed District's BMP Maintenance Inspection Program

Elizabeth Hosch (ehosch@ricecreek.org), Rice Creek Watershed District

The Rice Creek Watershed District has addressed the growing concern of stormwater facility maintenance by requiring signed and recorded Operation and Maintenance Agreements as part of the routine permitting process. Currently, 300+ projects have such maintenance agreements, yet less than 10 submit annual inspection reports as required in the agreement. To assess and correct this disconnect between the construction and maintenance phases of these projects, RCWD began a BMP maintenance inspection program in 2008. As part of this program, routine inspections of maintenance activity are performed, including inspection of soil infiltration capabilities, appropriate vegetation, effective hydrology, erosion concerns, and overall function of the feature. Initial inspection is done to assess the feature, results are communicated with maintenance personnel, and follow up inspection is done to confirm corrections. Inspection over the last three summers has dramatically increased rates of compliance and overall responsiveness from maintenance personnel.

Poster Session 4:45 p.m. – 5:45 p.m.

17. Iron-Enhanced Sand Filter Pond Retrofit

Forrest Kelley (forrest@capitolregionwd.org), Capitol Region Watershed District

CRWD completed a study of the Lake McCarrons subwatershed in 2009 to identify opportunities to improve water quality. A stormwater pond maintained by the City of Roseville was identified as a possible location to retrofit the existing drainage system. Viable options were determined after assessing site conditions such as contaminated sediment, wetland regulations, and erosion issues. Partnering with the Ramsey Conservation District and the City of Roseville, plans were drafted to install a SAFL Baffle pre-treatment manhole, dredge the pond to restore design capacity, and retrofit the outlet structure with an iron-enhanced sand filtration bench. Construction began in February 2011 and is expected to be complete by July 2011. The District will monitor the pond to determine the effectiveness of the system to reduce the Total Phosphorus load to Lake McCarrons. Preliminary data should be available by late summer 2011.

18. Using Education to Eliminate Sediment Runoff from Construction Sites

Shannon Kelley (skelley@mcgough.com), McGough Construction

According to the EPA, stormwater drainage from a construction site carries sediment and other pollutants – often as much as 150 tons of silt per acre!—that end up in Minnesota's surface waters, reducing clarity, lowering dissolved oxygen, and smothering aquatic habitat.

In 2008, McGough Construction initiated an in-house education program and has trained over 125 staff to conduct NPDES/MPCA SWPPP required inspections using customized forms and procedures. The training covers permit requirements, concrete washout protocol, and Best Management Practices.

By educating the people directly responsible for managing jobsites, McGough is committed to preventing run-off and pollution from every construction site to help ensure clean lakes, rivers and streams for future generations.

19. Water Quality in the Southern Basin of Lake of the Woods: 2010

Richard Kiesling (kiesling@usgs.gov) and Sarah Elliott (selliott@usgs.gov), U.S. Geological Survey

The Minnesota Pollution Control Agency (MPCA) included the Lake of the Woods (LOW) on its 2010 draft list of impaired waters because of nutrients, eutrophication, and biological indicator impairments. During 2010, the US Geological Survey in cooperation with the MPCA conducted a water quality study in the LOW southern basin to support TMDL model development. Data were collected biweekly from 5 open water sites, 2 inflow sites, and 5 outflow channel sites during the ice-free season. Silica, orthophosphate, and chloride concentrations were significantly different among open water sites. Within the lake, phosphorus and silica decreased along a south to north gradient but nitrate and ammonia were higher in the northernmost bay and outflow channels. Algal biomass increased July through September, reaching 45 micrograms per liter chlorophyll-a. Pigment analysis indicated that bluegreen algae dominated the biomass peaks. Data are being used to develop a BATHTUB model of the southern LOW basin.

Poster Session 4:45 p.m. – 5:45 p.m.

20. Connecting the Public to the Minnesota River Through Ideas

Scott Kudelka (scott.kudelka@mnsu.edu), Richard Moore (richard.moore@mnsu.edu), and Kimberly Musser (kimberly.musser@mnsu.edu), Water Resources Center, Minnesota State University, Mankato

The Water Resources Center at Minnesota State University Mankato received a Legislative-Citizen Commission on Minnesota Resources (LCCMR) grant to develop the "Minnesota River Experts: An Educational Field Trip Online." The broad goal of this project is to use new media techniques to share the latest research and increase public awareness about the condition of the Minnesota River.

The "Minnesota River Experts: An Educational Field Trip Online" is an interactive web site featuring video clips of scientific experts working in the field answering key questions about the river's health. Housed at the revised and expanded Minnesota River Basin Data Center web site, other interactive features, such as Google-Earth flybys, panoramic images, and animations, will accompany the videos to give web site users an immersive experience to better understand the context of these complex river issues. Some videos segments will be coupled with educational materials that can be used in classrooms across the basin.

21. Root River Field to Stream Partnership: An Overview

Kevin Kuehner (Kevin.Kuehner@state.mn.us), Adam Birr (Adam.Birr@state.mn.us), and David Tollefson (David.Tollefson@state.mn.us), Minnesota Department of Agriculture

The Root River Field to Stream Partnership is designed to help Southeast Minnesota farmers, researchers, and policy-makers better understand the relationship between agricultural practices and water quality. The partnership is conducting evaluations of water quality and land management practices at multiple scales using the latest in tools and technology. Three subwatersheds (<5000 acres) representative of the major geomorphic regions within the Root River Watershed have been selected for this effort. Monitoring has occurred since 2010 at differing scales within each of the subwatersheds including in-stream and edge-of-field locations. Stream channel assessments, agronomic diagnostic tests, farm practice surveys, and digital terrain analysis are also being conducted to complement and inform the water monitoring data. An overview of the approach used in this study will be presented as well as results for selected activities.

22. 2D Modeling: Flooding and Frustration

Jonathon Kusa (jkusa@hrgreen.com), HR Green, Inc.

The recent increase in available topographic data for project sites and improvement in computing speed have allowed designers to model complex water resource projects using 2D software. HR Green will present our experience using XPSWMM 2D modeling software to assess three separate projects – a residential flooding planning evaluation, a district-wide flooding planning study, and a stream realignment/restoration final design project. The presenter will utilize the three projects to focus on the pros and cons of the modeling approach through an explanation of the model development, analysis, and output. The benefits and limitations of the software relative to the three applications will be discussed.

Poster Session 4:45 p.m. – 5:45 p.m.

23. Cumulative Impacts of Residential Lakeshore Development on Littoral Habitat

Jessie Lepore (lepor012@umn.edu), Department of Fisheries, Wildlife, and Conservation Biology, University of Minnesota

The littoral zone contains the majority of vegetation within the lake ecosystem and is critical to the physical and biological integrity of lentic water bodies. Aquatic macrophytes stabilize the shoreline and support macroinvertebrate and fish communities by providing spawning substrate, foraging area, and refuge. In-water structures such as docks, piers, and other alterations associated with shoreline residential development have been shown to impact aquatic vegetation and fish assemblages. We used a multi-scale approach to assess the cumulative effects of residential lakeshore development on littoral habitat in north temperate Minnesota lakes. We measured habitat variables such as natural and man-made shoreline structures and complexity of littoral macrophyte cover along a gradient of lakeshore development. These habitat data are compiled with fish IBIs and plant surveys to enhance understanding of the relationship between lakeshore anthropogenic disturbance and near-shore habitat quality.

24. Red River Watershed Recovery Potential Indicators Project

Molly MacGregor (Molly.Macgregor@state.mn.us), Minnesota Pollution Control Agency

Watershed Recovery Potential Indicators method developed by Norton and others* was applied to watersheds of Northwest Minnesota participating in watershed approach planning cycle. Data was collected and reported at the 12-HUC subwatershed for four to five indicators of ecological conditions, stressors and socio-economic capacity, and then reviewed with agency staff and landowners. Indicators assess readiness for planning, suggest goals, and identify resource needs. Monitoring indicators over time measures effectiveness. Poster will display indicators as applied to three major watersheds, results of stakeholder review, incorporation into planning, and assembling and displaying the indicators in GIS.

25. Developing Watershed Protection and Restoration Strategies

Bob Finley (Robert.Finley@state.mn.us), Minnesota Pollution Control Agency and Steve Woods (Steve.Woods@state.mn.us), Minnesota Board of Water and Soil Resources

Part of the work underway with Clean Water Fund dollars, the interagency protection and restoration strategy development team is working to ensure TMDL requirements are met by: setting targets and goals, using data from stressor identification and developing models and using local studies that identify priority management zones. Learn how local governments and state agencies are working together to protect and restore the state's waters.

26. Lambert Creek Stream Restoration Using Only Hand Labor

Ed Matthiesen (ematthiesen@wenck.com), Wenck Associates, Inc.

The Vadnais Lakes Area Watershed Management Organization (VLAWMO) took a unique approach to stabilize a degrading stream in Vadnais Heights, Minnesota by using only Minnesota Conservation Corps supplied hand labor. Original plans used traditional construction methods, but the estimated cost to stabilize 1,660 linear feet was over $200,000. Redesign focused on using tree material found on site to provide bank toe stabilization and grade control. Hydraulic information showed shear stress and velocities were within a range that brush bundles and grade control structures would work while live stakes took root and became the primary structural reinforcement. An educational component was included by the design engineer explaining the purpose and design behind toe protection and grade control structures. Additionally, a water resources graduate student conducted pre and post project macroinvertebrate assessments to measure changes in species diversity and abundance as a result of adding coarse woody debris to the channel.

Poster Session 4:45 p.m. – 5:45 p.m.

27. Collaborative BMP Retrofit Subwatershed Assessment Study and Implementation

Ed Matthiesen (ematthiesen@wenck.com), Wenck Associates, Inc.

In a first of its kind effort, the Coon Creek Watershed District and the Anoka Conservation District partnered to perform a BMP retrofit assessment on Sand Creek. The project goals are to improve stormwater quality and reduce runoff volume from older neighborhoods that were built prior to storm water quality and quantity rules. CCWD has implemented three of the four most cost-effective stormwater projects in the last year in collaboration with Coon Rapids, Anoka-Hennepin ISD#11 school, and ACD. The projects were based on recommendations in the 2009 Sand Creek Subwatershed Retrofit Assessment. Results are estimated to give: 31% reduction in TSS, 91% reduction in TP, and 142% volume reduction. A fourth project will be installed in 2012. This was a pilot project in Anoka County and is now being used by every county in the metro area.

28. Effects of Trash and Vegetation on Sumps Equipped With a SAFL Baffle

Kurtis McIntire (mcint130@umn.edu), John Gulliver (gulli003@umn.edu), and Omid Mohseni (omohseni@umn.edu), St. Anthony Falls Laboratory, University of Minnesota

On April 12, 2011 the first SAFL Baffle was installed. This porous screen was bolted into a 6 ft diameter, 6 ft deep manhole sump in St. Paul. Though we know the SAFL Baffle improves the ability of manholes to capture sediments and hold on to them during intense storm events, little was known about the effects of stormwater debris like trash and vegetation on the system's performance. The goal of this study at St. Anthony Falls Laboratory (SAFL) was to better understand how stormwater debris affects these devices. A series of laboratory tests were completed with various types of simulated debris, on different sump sizes, and with variations of the SAFL Baffle. We quantified BMP performance, while inundated with debris, by using two metrics: the device's ability to capture pollutants at low flow rates, and its ability to retain the captured materials during high flow rate events.

29. Partially Grouted Riprap for Bridge Abutment Scour Protection

Patrick McLarnon (patrick.larnon@tkda.com), TKDA; David Berkowitz (D.Berkowitz@Andovermn.gov) and Jason Law (J.Law@Andovermn.gov), City of Andover

Faced with deteriorating and vandalized riprap at two bridges built in the late 1970s, the City of Andover turned to a proven scour countermeasure technique used in Europe, partially grouted riprap (PGR). Unlike traditional, fully grouted riprap, PGR involves only partially filling the void spaces in the riprap with grout, to maintain 50 to 65 percent of the void space. The result is a larger mass of interlocking riprap that is flexible and allows for equalization of hydraulic pressures. Design and construction considerations included riprap gradation and material; grout specifications; specialized grout testing equipment from Europe (tamping table and modified slump cone); a test section of PGR for quality control; and documentation of lessons learned in the field. According to the Minnesota Department of Transportation (Mn/DOT), this is the first use of PGR in the state. The Minnesota Local Road Research Board and Mn/DOT are jointly studying the use of PGR for spill-through abutments, with results expected in late 2012.

Poster Session 4:45 p.m. – 5:45 p.m.

30. Minnesota Water Resources Modeling Group: Advancing the Management of Minnesota Water Resources Through Science of Modeling

Shahram Missaghi (miss0035@umn.edu), University of Minnesota Extension

Computer models extend the understanding of our environment and are valuable tools for water resources managers. Scientists and researchers have steadily increased their reliance on models to be better suited to address emerging environmental challenges such as climate change. But local government water resource managers have not readily adopted these models and therefore have not gained the skills in using these effective management tools. That has created a modeling literacy gap between the two groups. The gap is widening by lack of understanding of the role of models, a basic knowledge base, access to necessary data and the models themselves. A new users group, Minnesota Water Resources Modeling Group, has been created to overcome these obstacles by providing an online community to participate in forums, have access to basic data set, and to learn about the latest training opportunities. The poster promotes the advancement of Minnesota water resources through science of modeling.

31. Working Together for the Minnesota River

Kimberly Musser (kimberly.musser@mnsu.edu), Water Resources Center, Minnesota State University, Mankato; Jon Carlson and John Hickman, Epic Media; Scott Kudelka (scott.kudelka@mnsu.edu) and Rick Moore (richard.moore@mnsu.edu), Water Resources Center, Minnesota State University, Mankato

A one-hour documentary focusing on the effort to improve water quality in the Minnesota River Basin is being produced by Ron Schara Productions and the Water Resources Center at Minnesota State University Mankato to air this spring on KARE 11. The "Working Together for the Minnesota River" documentary will brings attention to the river and highlights actions required to restore this important state treasure. In conjunction with the documentary, the Minnesota River Basin Data Center web site is being expanded and updated to serve as a clearinghouse for information related to research and restoration efforts in the basin.

Highlights of the documentary will be shown to provide a broad context of the story being told about how people are making a difference restoring and protecting the Minnesota River and its tributaries. The presenters will talk about the inspiration behind this project along with the rewards and challenges of producing this documentary. An overview will also be given on the newly revised and expanded Minnesota River Basin Data Center web site and how it is being used to increase public awareness and participation in the effort to improve water quality in the Minnesota River Basin.

32. Impact of Hydrologic Alteration on Riverine Turtle Nesting in Eastern Minnesota Rivers

Jason Naber (jnaber@eorinc.com), Emmons & Olivier Resources, Inc.; Christian Lenhart (lenh0010@umn.edu) and John Nieber (nieber@umn.edu), Department of Bioproducts and Biosystems Engineering, University of MInnesota

Riverine turtles in Minnesota are dependant upon near stream sandbars for nesting. This research project evaluated the alteration of hydrologic regime of several Minnesota rivers using the Indicators of Hydrologic Alteration (IHA) software along with field geomorphology surveys and historic aerial photos analysis. Using USGS stream gauge data and aerial photos, a river stage-sandbar area relationship was developed to determine the effect of prolonged high flow duration on available nesting habitat. Findings of the study suggest periods with suitable water levels during the nesting period from 1940 to 2009 have declined in southern Minnesota meaning that turtle hatchlings are likely delayed and/or have lower survival rates. There was no significant change in the streamflow and sandbar nesting habitat for the northern rivers. Our findings suggest that there is likely reduced reproductive success of certain turtle species in southern Minnesota rivers due to increased summer flows.

Poster Session 4:45 p.m. – 5:45 p.m.

33. Hydrologic Watershed Response to Land-Cover and Climate Changes Across the Upper Midwest

John Neiber (nieber@umn.edu), Department of Bioproducts and Biosystems Engineering, University of Minnesota; Kenneth Brooks (brook007@umn.edu), Department of Forest Resources, University of Minnesota; Christian Lenhart (lenh0010@umn.edu) and Mikhail Titov (tito0003@umn.edu), Department of Bioproducts and Biosystems Engineering, University of Minnesota; Lucas Vold (voldx033@umn.edu), University of Minnesota

To quantify watershed response to land cover and climate change we analyzed streamflow data and applied a water balance modeling approach. For streamflow analysis we used the indicators of hydrologic alteration (IHA) program and calculated discharge to precipitation (Q:P) ratios to quantify watershed response to land cover and precipitation change. Results indicated that streamflow and Q:P ratios increased in agricultural watersheds, but decreased or remained constant in forested watersheds. Response to land cover class superseded effects of possible climate change. Supporting evidence for these results was provided by the SWAP (Soil, Water, Atmosphere and Plant) model, a field-scale water balance model, which indicated greater recharge under conventional row crops compared to perennial grass cover, implying that higher streamflow would result from areas dominated by conventional row crops. Overall results indicate that water management actions are needed in agricultural watersheds to reduce negative effects of increased streamflow to meet TMDL requirements.

34. Rain Gauge Network Data Online

Nancy Read (nancread@mmcd.org), Sandy Brogren (sandybrogren@mmcd.org), and Janet Jarnefeld (janjarne@mmcd.org), Metropolitan Mosquito Control District

For over 50 years the Metropolitan Mosquito Control District has been monitoring rainfall in the 7-county metro area using a network of up to 80 standard 4" cylinder rain gauges. This data set has been made available for public use primarily through the State Climatology Office (DNR). In 2011 MMCD staff evaluated and revised our rainfall network to take advantage of other's data and to make our own data publicly available on a daily basis. MMCD rain gauge information is now entered as part of CoCoRahs, the Community Collaborative Rain, Hail & Snow network and available immediately through their web access at www.cocorahs.org. Archived data continues to be available through State Climatology as well as through CoCoRahs. This poster describes current precipitation data access and visualization and how this data is used by MMCD for estimating wetland water depth changes and directing and evaluating mosquito control operations. Information is also presented on other cooperative precipitation monitoring efforts.

35. Measurement of Nutrient Movement in Continuous No-Till Production Landscapes

George Rehm (Rehmx001@umn.edu), Warren Formo (warren@mawrc.org), and Tim Radatz (Radatz@mawrc.org), Minnesota Agricultural Resources Coalition

Movement of both phosphorus (P) and nitrogen (N) across the varied production landscapes is a serious concern that pertains to the quality of our waters. Mechanisms of movement are quite different with the majority of P attached to soil particles. Therefore, it is essential to minimize soil movement and no-till production is one management practice that can be used to achieve this goal. No-till production systems can also be diverse.

The Discovery Farms initiative in both Wisconsin and Minnesota provides an excellent opportunity to compare and contrast movement of sediment, N, and P in two contrasting no-till production systems. In one system, beef manure provides the majority of the major nutrients needed for crop production. In the Minnesota situation, essential nutrients, as need, are supplied from commercial fertilizers. Data collected and summarized for this presentation will be used to compare the two production situations recognizing that soils and production environments are not the same for both farming enterprises.

Poster Session 4:45 p.m. – 5:45 p.m.

36. We Have a Plan, Now What? Ongoing Water Supply Planning in the Twin Cities Metropolitan Area

Lanya Ross (lanya.ross@metc.state.mn.us), Metropolitan Council

The Metropolitan Council (Council) is implementing the Twin Cities Metropolitan Area Master Water Supply Plan, which was completed in March 2010. The plan guides long-term water supply planning and considers the cumulative impacts of urban growth on local and regional supplies.

The plan identifies water resource issues that communities will need to address as they develop their water supplies. It also provides guidance and information to help tackle those issues. Local suppliers, technical professionals, and regulators all benefit from the information provided in the plan. It guides water resource assessment activities and supports water appropriation permits and resource protection plans.

This presentation highlights the plan's adaptive management approach to sustainable development. Several current efforts illustrate the Council's ongoing process of data collection, analysis, and the update of tools and resources.

37. Flood Risk Reduction for Breckenridge, Minnesota, and Wahpeton, North Dakota

Andrew Sander (Andrew.R.Sander@usace.army.mil), U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers and the communities of Breckenridge and Wahpeton are completing construction of flood control projects that are expected to cost a combined $22,000,000. The projects include levees along the Red and Ottertail Rivers, a diversion of the Ottertail River, maintenance of breakout flows from the Bois de Sioux River, and pump stations and outlets. The projects were designed to optimize economic benefits and to minimize environmental impacts. The project design analysis was complicated by the impact of ice jams, the confluence of two rivers with variable timing and flood magnitude, the breakout flow from the Bois de Sioux River and two upstream reservoirs. The diversion channel and has been in place for several flood events and the sheet pile and riprap inlet structure has experienced significant erosion.

Poster Session 4:45 p.m. – 5:45 p.m.

38. City of Mounds View Stormwater Infiltration Program (SIP)

Brad Schleeter (brad.schleeter@bonestroo.com), Bonestroo

The City of Mounds View developed the Stormwater Infiltration Program (SIP) in 2008 as a companion to the City's Street and Utility Improvement Program that will reconstruct approximately 75% of the City's streets over a 9-year period. The intent of the SIP is to standardize the design of infiltration features, define the public input process, and streamline the watershed permitting effort for all of the City's reconstruction projects.

Mounds View recognized that incorporating infiltration features into their reconstruction projects would be necessary to address the requirements of the Rice Creek Watershed District. The City developed the SIP as a comprehensive program to direct how infiltration features would be incorporated into City reconstruction projects in a cost effective manner that shared the maintenance responsibilities between the City and adjacent property owners.

The SIP establishes that all proposed infiltration features will be located in City right-of-way or other City owned property to keep project costs down and eliminate the time consuming process of purchasing easements or acquiring property to locate BMPs. Locating the features on City property also allows greater flexibility to site features throughout the project area where they have the least impact to adjacent properties. The SIP also includes a property owner appeal process that identifies the specific conditions by which property owners adjacent to a proposed infiltration features can appeal the feature location to the City Council.

The SIP also offers flexibility to adjacent property owners as to how the infiltration features are restored. The City standard option includes turf grass restoration, which minimizes the maintenance responsibility of adjacent property owner. However, at the request of the adjacent property owner, the SIP allows property owners to restore the infiltration features with rain garden plantings, provided that they purchase and maintain these plantings.

39. Watershed Partnerships

Louis Smith (smith@smithpartners.com), Smith Partners, PLLP; Kevin Bigalke (kbigalke@ninemilecreek.org), Nine Mile Creek Watershed District; Eric Evenson (eevenson@minnehahacreek.org), Minnehaha Creek Watershed District

Minnehaha Creek, Nine Mile Creek, and the Vermillion River have many challenges in common. Each of these streams is impaired, has land use – watershed conflicts, and is the focus of some kind of recreational interest. There are also governance issues: how does a watershed authority effectively plan and collaborate with local units of government and their land use planning and development vision? How can diverse funding sources be combined successfully to create multiple layers of conservation, economic, and community benefits? Is there a way to engage businesses and the private sector in the cause of conservation along these stream corridors?

The Minnehaha Creek Watershed District, Nine Mile Creek Watershed District, and Dakota County joined with Allina and Target to commission Smith Partners to answer these questions. The project integrates the best learning about watersheds, greenways, and public private partnerships to recommend a new model of partnership to pursue water quality, habitat and land conservation, and recreational initiatives in a way that is connected to the local economy.

Poster Session 4:45 p.m. – 5:45 p.m.

40. Habitat Enhancement Projects in an Urban Setting: Pheasant Branch Creek

Aaron Steber (ASteber@JFNew.com), Cardno JFNew

Severe streambank erosion is common in Pheasant Branch Creek, an urban stream in the City of Middleton, WI. In 2009, JFNew designed and built nearly 1,500 linear feet of bank stabilization and habitat enhancement projects on Pheasant Branch Creek funded by the City of Middleton and grants from the Wisconsin DNR's Clean Water Fund Program & the American Recovery and Reinvestment Act (ARRA). This was a complicated site with annual flows averaging approximately 10 cfs, yet three flood events in the previous 10 years were recorded above 800 cfs at this site. Stabilization projects focused on the worst areas of erosion within the corridor, specifically those areas where existing infrastructure was threatened by erosion. Severe erosion throughout the reach caused the loss of many trees which were utilized to stabilize streambanks through the use of rootwad composites; increasing habitat complexity within the stream as small spaces found within the rootwads can provide cover for small fish, as well as reptiles, and small mammals found in the riparian habitat. Flow deflection techniques, such as stream barbs, were also used to move the thalweg away from eroding banks toward the center of the channel; creating variable flows across the channel cross section. Stream barbs can create areas of slow-moving backwater that induce near-bank depositional features and accelerate mid-channel flows that promote scour pool development providing beneficial habitat for fish, amphibians, reptiles, and aquatic insects. All disturbed areas were seeded with native species endemic to southern Wisconsin with deep extensive rooting systems. Once established, the dense roots of these native grasses and forbs will trap and hold bank material in place, further reducing erosion of bank sediments while increasing the biotic diversity of the riparian corridor.

41. Cedar River Basin TMDL Development Project

Bill Thompson (Bill.thompson@state.mn.us), Minnesota Pollution Control Agency

The Cedar River Basin in Minnesota includes the Cedar River Watershed (586 square miles) and the Shell Rock River Watershed (254 square miles). The important regional cities of Austin and Albert Lea are located in each of these respective watersheds. A turbidity and excessive nutrients TMDL was initiated in 2008, to address both stream and lake impairments. The three watershed districts (Shell Rock, Turtle Creek, and Cedar River), SWCDs, counties, MDNR, private consultants and MPCA have cooperated for the project. Water monitoring and watershed/stream channel assessment activities occurred from June 2008- December 2010. This presentation will provide background information, organizational structure, water and land data, watershed modeling, overall results to-date, public outreach and communication, lessons learned, costs, and future direction. The focus will be on an overview/critique of methods employed to construct a broader and sustainable watershed and water quality improvement effort.

42. Modifying Bioretention Cell Design to Achieve Regulatory Water Quality Benefits

Joel Thrash (jthrash@jfnew.com) and Mark Pranckus (mpranckus@jfnew.com), Cardno JFNew

Regulatory drivers and economic incentives have made bioretention a popular stormwater solution in the Midwest. Impending NPDES post-construction regulations, pollutant removal goals and monitoring requirements requires proper BMP design and performance. Bioretention cells with an Internal Water Storage (IWS) layer may provide a solution to meet expectations. The IWS layer provides water storage, principally releasing it through exfiltration. This volume, ignored by traditional bioretention design, has the ability to assimilate 'first flush' stormwater runoff and detain and release 2-yr, 24-hr storm events. This presentation will discuss bioretention with IWS design including the relationship to soil conditions, climatic variables, and land use. Amended soil layering, media depths , specifications, ponding depths , cell sizing, underdrains; overflow mechanisms, and exfiltration will be discussed along with native plant selection and installation tips. Case studies demonstrating post-construction performance on water quality, lifecycle costs and maintenance concerns will be presented.

Poster Session 4:45 p.m. – 5:45 p.m.

43. Cleary Lake Drawdown: Shifting From an Algal-Dominated to a Plant-Dominated Ecosystem

Brian Vlach (BVlach@ThreeRiversParkDistrict.org), Three Rivers Park District

Cleary Lake is a shallow lake located in Scott County that has had nuisance growth of curlyleaf pondweed. The lake is impaired for excessive nutrients (119≤TP≤208 µg/L) and had severe algal blooms (35≤Chl-a≤74 µg/L) that persisted throughout the summer following curlyleaf pondweed senescence. A lake drawdown in the fall of 2003 and 2004 was implemented as a long-term management approach to control curlyleaf pondweed, improve the native plant community, and improve water quality conditions. The drawdown was successful in controlling curlyleaf pondweed. Since the drawdown, the lake has transitioned from an algal dominated to a plant dominated system. Water quality changes included a decrease in phosphorus (79≤TP≤96 µg/L) and chlorophyll-a (14≤Chl-a≤31 µg/L) concentration. The percent frequency of curlyleaf pondweed has been increasing the past several years, but the establishment of a native plant community has been critical for maintaining long-term control of curlyleaf pondweed and improving water quality conditions.

44. 205th Street Channel Stabilization

Jeff Weiss (jweiss@barr.com), Barr Engineering Company; Mac Cafferty (mcafferty@ci.lakeville.mn.us), City of Lakeville; Jim Davidson (jim.davidson@co.dakota.mn.us), Dakota County Soil and Water Conservation District

The 205th Street Channel was a severely incised and eroded reach between 205th Street and Lake Marion in Lakeville, MN. In 2008-2009, approximately 600 feet of the reach was stabilized by raising the stream bed and installing bioengineering techniques, including constructed riffles, cross vanes, vegetated reinforced soil slopes (VRSS), biolog, and live stakes. The design was completed so that there would be no damage during a 10-year flood event and minimal damage in a 100-year flood event. The project was funded by the City of Lakeville and the Vermillion River Watershed Joint Powers Organization. Barr Engineering completed the design and Dakota County SWCD provided additional technical assistance.

45. Effectively Managing Shoreline and Creek Bank Erosion

Peter Willenbring (pwillenbring@wsbeng.com), WSB & Associates, Inc.

Erosion is routinely occurring along shorelines and stream banks throughout the State of Minnesota. This erosion is degrading water quality, impacting habitat, and threatening structures adjacent to these areas. The first half of the presentation provides an overview of the impact of the problem, discusses typical design options that can be used to correct the problem in a selected area, and reviews regulatory approaches and requirements that are being implemented that encourage specific design practices. The second half of the presentation provides a case study with photos showing how well projects previously constructed have turned out and review lessons learned.

Poster Session 4:45 p.m. – 5:45 p.m.

46. The Benefits of Implementing Stormwater BMPs Over a 12-Year Period in the City of Hugo: A Case Study

Peter Willenbring (pwillenbring@wsbeng.com), WSB & Associates, Inc.; Bryan Bear (bbear@ci.hugo.mn.us), City of Hugo; Phil Belfiori (pbelfiori@ricecreek.org), Rice Creek Watershed District

Over the past 12 years, the City of Hugo has experienced more development than most communities in the Twin Cities Metropolitan area. With this development, much of the land has been converted from farmland with limited if any BMP's, to residential and commercial land uses that have integrated retention and treatment ponds, infiltration, and other BMP's into the design. As part of a recent update to the Cites storm water and water quality model, it was observed that over 150 new storm water ponds had been constructed as part of this development.

This presentation discusses the runoff rates, volumes, elevations, and pollutant loads observed prior to this development; reviews the storm water management practices that were implemented as part of development; and compares the past rates and loads to those today with the BMP's. The presentation will also provide findings, observations and lessons learned over this period.

47. Evaluating Watershed Outreach Interventions: Informing Future Outreach Through an Integrative Model

Christine Yaeger (yaeg0019@umn.edu), University of Minnesota; Mae A. Davenport (mdaven@umn.edu) and Karlyn Eckman (eckma001@umn.edu), Department of Forest Resources, University of Minnesota; Erin Seekamp (eseekamp@siu.edu), Southern Illinois University

Watershed science outreach is one way to promote cross-scale awareness of watershed problems among citizens. Outreach aimed at integrating scientific and civic knowledge at the watershed scale can raise understanding of individual behaviors and collective actions that influence watershed health. What outreach interventions are most appropriate for integrating and transferring knowledge to diverse local stakeholders? This presentation will describe an integrated evaluation model for watershed science outreach and will apply this model to evaluate five outreach interventions conducted in the Watershed Health Integrated Research (WHIR) project completed in southwestern Illinois' Lower Kaskaskia River watershed. The model, based on program evaluation theory, includes an analysis of effort for each intervention and an assessment of intervention objectives against criteria to appraise strengths and weaknesses. Key lessons learned and recommendations for future watershed science research will be presented.

Plenary Session II 8:10 a.m. – 9:30 a.m.

Legislative Update: Agricultural and Water Issues

Representative Paul Torkelson, Minnesota House of Representatives, District 21B

Biographical Information

Paul Torkelson is a member of the Minnesota House of Representatives, representing District 21B, which includes all or portions of Brown, Redwood and Watonwan counties in the southwestern part of the state. He is a member of the House Health Care and Human Services Policy and Oversight Committee. He also serves on the Finance subcommittees for the Agriculture, Rural Economies and Veterans Affairs Finance Division, the Cultural and Outdoor Resources Finance Division, the Environment and Natural Resources Finance Division, and the Transportation and Transit Policy and Oversight Division.

In 2006, Governor Tim Pawlenty appointed Torkelson to the Minnesota Governor's Clean Water Council, a position he held until his election to the House. He is a member of the Minnesota's Deer Hunters Association, a former vice president of the Minnesota Farm Bureau, and a former chair of St. James Health Services.

Concurrent Sessions IV 10:00 a.m. – 11:30 a.m.

Track A: Monitoring Sources

Using Remote Sensing to Monitor and Assess Geospatial and Temporal Trends of Water Quality in Minnesota

Leif Olmanson (olman002@umn.edu), University of Minnesota

The use of remote sensing is a cost-effective way to gather information on water and land resources needed for effective water planning and management. We have recently completed a 33-year (1975 – 2008) comprehensive water clarity database for over 10,000 Minnesota lakes using Landsat imagery. We have also investigated MODIS and MERIS data as alternative systems for regional assessments. These systems have higher temporal resolution that can allow for near real time monitoring of algal blooms and the higher spectral resolution of MERIS could be used for assessment of more variables such as chlorophyll, colored dissolved organic matter (CDOM) and cyanobacteria to help detect and characterize algal blooms. Development of the database and temporal and geospatial trends in relation to land cover and lake morphometric characteristics will be discussed, along with examples of using the different imagery for water quality assessment of Minnesota lakes. Our water clarity data can be accessed at water.umn.edu.

Where's the P: Assessing Sources of Phosphorus in a Lake Watershed

Jessica Wittwer (wittw001@umn.edu), University of Minnesota

This project sampled soils along landscape gradients to determine potential movement of phosphorus from source areas to off-site locations (e.g. lakes and wetlands). A phosphorus index had been completed for this watershed and provided the major land-use sources P to Stocking Lake including row-crop agriculture, managed timber land, and shoreland residential. Phosphorus movement occurs as either sediment-derived P that is attached to soil particles and moves via soil erosion or soluble forms of P that can move as water moves through the soils and landscapes. Our sampling techniques are able to capture both forms of P in landscapes surrounding Stocking Lake Watershed in Central Minnesota. Our results show differences in P levels among land-use types and highlight management concerns for many of the surrounding land-uses.

Alternative Methods for Monitoring Surface-Water Runoff From Agricultural Fields

Gretchen Kamps, kampsg@uwplatt.edu University of Wisconsin – Platteville

One of the challenges in choosing a surface-water monitoring protocol is that the trade-off between accuracy and cost is not well defined. Therefore, it is difficult to decide what monitoring strategy is most appropriate and cost effective. For this reason, we are evaluating the following four alternative surface-water monitoring systems:

- automated time-based composite sampling with real-time remote site operation,
- automated flow-weight composite sampling,
- passive siphon sampling with stage recorder, and
- passive stand-pipe flow splitter sampling.

Evaluations of the alternative sampling protocols will be based on relative error and precision of load and discharge estimates as well as equipment and operational costs. Results presented will include analysis of 2010 water-year field runoff events at Pioneer Farm for alternatives 1, 2, and 3 (above) and the results of laboratory investigations of the passive stand-pipe flow splitter.

Concurrent Sessions IV 10:00 a.m. – 11:30 a.m.

Track B: Low Impact Design Practices: Monitoring, Evaluation, and Repair

Burnsville Rainwater Garden Efficacy Monitoring and Cost Evaluation: Can We Still Do 90?

Greg Wilson (gwilson@barr.com), Barr Engineering Company

Before the Burnsville Stormwater Retrofit Study (Barr, 2006) indicated that stormwater runoff volumes could be reduced by 90 percent, a paired watershed approach had not been used to monitor the treatment effectiveness of rainwater gardens and very few stormwater retrofits included rainwater gardens. Prior to completion of the current study, no paired watershed monitoring studies had been completed on the efficacy and cost-effectiveness of rainwater gardens and questions remain about the long-term performance. This project includes an evaluation of the long-term efficacy and cost-effectiveness of rainwater gardens, based on supplementary monitoring to the original paired watershed study. The results evaluate whether properly designed and maintained rainwater gardens provide long-term treatment capacity and represent a cost-effective BMP for new and retrofitted residential development, based on comparison to literature for the life-cycle cost-effectiveness of other BMPs. Study methodology, monitoring results, cost-benefit comparisons and recommendations for design and maintenance of rainwater gardens will be presented.

A Rain Garden Rehabilitation Case Study

Jeff Schwarz (jeffrey.schwarz@metc.state.mn.us), Metropolitan Council Environmental Services

A rain garden constructed jointly in 2009 by Independent School District (ISD) 287 and MCES in Richfield, MN did not drain properly. Standing water remained in the basin for longer than the MPCA-recommended performance criteria of 48 hours. Stormwater infiltration tests and a soil boring program were conducted to better characterize soil and groundwater beneath the basin. The tests indicated that a localized silt/clay confining layer beneath the rain garden was not allowing stormwater to infiltrate. Installation of a vertical gravel drain breaching the confining layer corrected the problem.

This presentation will cover the steps taken to successfully rehabilitate the basin and will include the following lessons learned:

- Collect site specific geotechnical data from beneath the actual rain garden basin to the groundwater table. Do not assume a soil borings collected outside the basin will represent conditions beneath the basin.
- Conduct infiltration tests after the basin is constructed so localized corrections can be made, if necessary, before landscaping materials are placed.

Porous Pavement Paired Intersection Study Year Two

Ed Matthiesen (ematthiesen@wenck.com), Wenck Associates, Inc.

The Shingle Creek Watershed Commission and the City of Robbinsdale are conducting an EPA funded study to investigate whether a porous asphalt residential street can be used as a physical substitute for salt as an ice prevention method. The first phase of the project was installed on a sand subgrade and has been in operation for two years. The second phase of the project was installed on a clay subgrade in and has been monitored for one winter. The project monitors pavement temperature, ice accumulation, subgrade water level and water quality and pavement durability. Results of the 2009-10 monitoring on the porous pavement section on the sand subgrade indicated that porous asphalt has comparable bare pavement to a traditional road salted section. The second year of the study will provide further data on the sand subgrade section and the first winter results of porous asphalt on a clay subgrade.

Concurrent Sessions IV 10:00 a.m. – 11:30 a.m.

Track C: Runoff and Flow in Agricultural Watersheds

Soil Moisture and Rainfall Intensity Thresholds for Runoff Generation in Southwestern Wisconsin Agricultural Basins

Timothy Radatz (radatz@mawrc.org), Discovery Farms Minnesota

Identifying time periods when land application of manure is likely to contribute to surface runoff contamination is important for making proper management decisions and reducing the risk of surface water contamination. The goal of this study was to improve our understanding of the factors that influence runoff generation in agricultural watersheds during non-frozen ground periods. Six small basins (ranging from 6 to 17 ha) within two southwestern Wisconsin farm sites were instrumented and surface runoff continuously monitored from 2004 to 2007 by the University of Wisconsin Discovery Farms Program (DFP) and the University of Wisconsin – Platteville Pioneer Farm (PF). The soils in all basins were silt loam. A direct-plant management strategy and corn-soybean crop rotation were utilized within basins at the first farm site (DFP). The second farm site (PF) utilized a conventional tillage system (chisel plow in the fall followed by soil finisher in the spring) and a corn-oat-alfalfa crop rotation within the basins. Tillage differences between the farm sites influenced the amount of surface runoff generated during the non-frozen ground period. At PF, the amount of precipitation leaving the landscape as surface runoff (2%) was approximately two times greater compared to DFP (0.9%), indicating that the direct-plant management system was better at retaining precipitation than the chisel plow/soil finisher system. An antecedent soil moisture (ASM) threshold of 0.39 cm3cm-3 for runoff generation was determined for all six basins. Below this threshold, runoff coefficients (runoff depth divided by precipitation depth) were near zero. Above this threshold, runoff coefficients increased with ASM. Maximum 30 minute rainfall intensity (I30) thresholds for runoff generation increased as ASM decreased and as crop cover increased. Avoiding manure application during time periods when soil moisture is near or above a critical soil moisture threshold would decrease the risk of surface water contamination.

Evaluation of Factors Contributing to Changes in Runoff Ratio in 21 Tributaries to Lake Pepin

Jason Ulrich (ulri0010@umn.edu), University of Minnesota

Recent study of 21 tributaries in the Minnesota and Mississippi river watersheds has showed that runoff ratio (flow/ precipitation) has increased significantly in many agricultural watersheds during the period May-June, 1940-2009. This study evaluated possible factors in these increases by investigating temporal changes in artificial drainage and crop type as well as total precipitation volume, precipitation intensity and indicators of antecedent soil moisture over the same period. Mann-Whitney median and Kendall-tau tests were used to evaluate trends. Results show that watersheds with the greatest increases in runoff ratio are those that have been substantially altered by artificial drainage and increased soybean agriculture. Evapotranspiration was shown to decrease significantly in watersheds where soybean agriculture has increased. Conversely, total precipitation volume and intensity, and antecedent soil moisture showed no significant increase over the same period. Results suggest that increases in artificial drainage and decreased ET due to soybean agriculture are the primary factors in the runoff ratio increases. Efforts to quantify the relative effect of both factors are currently in progress.

Concurrent Sessions IV 10:00 a.m. – 11:30 a.m.

Track C: Runoff and Flow in Agricultural Watersheds, *continued*

Channel Erosion and Floodplain Deposition Investigations in the Minnesota River Basin

Christian Lenhart (Lenh0010@umn.edu), Department of Bioproducts and Biosystems Engineering, University of Minnesota

Streambank erosion and floodplain deposition processes are key parts of the Minnesota River sediment issue. Historic investigations, field monitoring and modeling of channel evolution processes were conducted to quantify these processes, focusing on the lower Minnesota River. Most streambanks consisted of highly erodible sand and silt. Long-term rates of bank migration ranged from 0.01 m/yr to 3m/year from 1938-2009 with the Minnesota River having the highest rates and tributaries in the steep drop zone next. Channel evolutionary trends varied by watershed position but channel widening has been occurring on the main channel. Sediment loads are mitigated by a large rate of floodplain deposition with the greatest rates near the channel margin and least in backwater swamps. However, connectivity has been reduced by human structures. Interactions between vegetation, geomorphology and hydrology were also examined for their effect on sediment load. Findings from this study will assist in prioritizing restoration actions.

Concurrent Sessions IV 10:00 a.m. – 11:30 a.m.

Track D: Lakes/Shores

Restoration of Lake Rebecca – Hennepin County, Minnesota

Rich Brasch (RBrasch@threeriversparkdistrict.org), Three Rivers Park District

Lake Rebecca is a 256-acre degraded, deep lake located in Lake Rebecca Park Reserve, Hennepin County. Water quality in the lake has historically been poor, with June-September mean values over the last ten years of approximately 98 ug/l for total phosphorus, 58.5 ug/l for chlorophyll a, and 1.1 meters for water clarity. The lake is also infested with nuisance-level growths of curlyleaf pondweed and Eurasian water milfoil. In 2007, the Park District undertook an aggressive effort to improve water quality and enhance the growth of native rooted macrophytes in the lake. This effort involved reducing watershed TSS and TP loads entering the lake, early season low dose endothal treatments over multiple years to combat curly leaf pond weed, and an alum treatment to reduce internal loading driven by releases from enriched sediments. The project has been a carried out on accelerated schedule to achieve significant, long-lasting improvements over a relatively short period of time.

Shoreline Restoration: Big Island, Lake Minnetonka

Jeff Lee (jefflee@barr.com), Barr Engineering Company

Problem: Approximately one third of the shoreline within Big Island Park consists of tall, steep banks up to 60 feet high. Wave action from long fetches around the island cause significant erosion of the shoreline toe, leading to bank failure and water quality impairment in Lake Minnetonka and loss of shoreline habitat.

Solutions: The shoreline restoration was completed in two stages: riprap toe protection and bioengineering of the banks. First, additional toe protection was added to the shoreline in the form of field stone riprap. When the riprap was installed in areas with extremely steep or near vertical banks, it was placed some distance away from the shore and backfill was placed between the riprap and the bank, creating a shore bench slightly above normal water levels. The second stage was to install bioengineering techniques within these areas of backfill and along other banks that are less steep. The bioengineering in backfill areas stabilize the bank and provide fresh patches of native vegetation while preventing the need to grade out the banks to a stable slope. Because of the distance between the existing bank and the new edge of the riprap, additional natural bank failure can continue at a smaller scale without posing a significant threat to water quality.

Coordination: Addressing the problems within Big Island Park required coordination between the City of Orono, who owns and manages the park, the State of Minnesota, Minnehaha Creek Watershed District, and local residents.

Adapting Minnesota Shoreland BMPs for Climate Change

Barbara Liukkonen (liukk001@umn.edu), University of Minnesota

In the past decade many BMPs have been implemented to protect water quality. However, development of most BMPs has been based on historical climate patterns without incorporating the potential effects of climate change. Future precipitation patterns are likely to include heavy downpours that can quickly raise water levels and inundate shorelines, followed by extended periods of drought. We investigated the effects four water regimes on eight native aquatic and wet meadow plants commonly used in shoreland restorations.

In summer 2010, four study basins at the U of MN St. Anthony Falls Lab were planted. Water levels in the basins were adjusted during the growing season to mimic historic and predicted climate change water levels. The climate change levels were determined using XPSWMM and a three-dimensional lake hydrodynamic and ecological software (ELCOM-CAEDYM). We investigated the effects of fluctuating water levels on shoreland plant establishment, survival, and vigor; water chemistry; and sediment flux.

Funding for this project was provided through a 319 grant from the EPA via MPCA.

Luncheon Presentation 12:15 p.m. – 1:00 p.m.

Agricultural Water Management: What Can Farmers Do to Maintain Good Water Quality, and Still Do Agricultural Water Management?

Don Baloun, Minnesota State Conservationist, Natural Resources Conservation Service, United States Department of Agriculture

Biographical Information

Don Baloun has been Minnesota's state conservationist since April 2010, managing USDA-NRCS operations statewide. USDA-NRCS helps Minnesota farmers and landowners protect natural resources through technical and financial assistance. Baloun joined the agency in 1979. During his career, he has held numerous staff and managerial positions in Iowa and Wisconsin including soil scientist, district conservationist, area resource conservationist and DNR/NRCS Liaison.

Baloun traveled six times to NRCS national headquarters (NHQ) to assist on special projects including serving as Environmental Quality Incentives Program (EQIP) Policy Team leader, EQIP Manual Re-write, Wetlands Reserve Program (WRP)-NHQ Program Manager Assistance, acting WRP Program Manager, Regional Assistant Chief's Office-management Analyst and Cooperative Conservation Partnership Initiative Policy Matrix Development.

Concurrent Sessions V 1:15 p.m. – 2:45 p.m.

Track A: Contaminants of Concern

Evaluating Exposure and Toxicity Potential for Contaminants of Emerging Concern

Michele Ross (michele.ross@state.mn.us), Minnesota Department of Health

In a new program at the Minnesota Department of Health (MDH), toxicologists and environmental scientists are identifying patterns of use, reporting the potential for exposure, and developing human health-based drinking water guidance for chemicals considered to be "contaminants of emerging concern" (CECs). This new program is funded through the Clean Water, Land, and Legacy Amendment to the Minnesota Constitution, approved by voters in 2008. Candidate chemicals include pharmaceuticals, personal care product ingredients, industrial chemicals, pesticides, and other chemicals for which MDH drinking water guidance currently does not exist or needs to be updated to reflect new toxicity or occurrence information. Chemicals are identified by MDH staff or nominated by stakeholders and the public. MDH staff, in consultation with an advisory group of technical experts, have developed a tiered process for evaluating identified and nominated CECs. The process includes a preliminary assessment of available exposure and toxicity related information for each identified and nominated chemical. The data gathered in the preliminary assessment are used to categorize chemicals based on potential health risk (a function of exposure and toxicity), and to identify chemicals of greater concern from among all chemicals currently under review. These chemicals are then evaluated under the final tier of the process, developing human health based guidance, which requires a rigorous toxicological assessment.

Polycyclic Aromatic Hydrocarbon Concentrations and Sources in Five Minneapolis, Minnesota, Lakes

Sarah Elliott (selliott@usgs.gov), U.S. Geological Survey

In 2009, the U.S. Geological Survey in cooperation with the Minneapolis Park and Recreation Board, investigated contaminants of emerging concern in five Minneapolis, Minnesota lakes as part of a statewide study. Sediment samples collected from the top 5 centimeters of lake bottom were collected from five lakes and analyzed for trace organics and contaminants of emerging concern, including a subset of polycyclic aromatic hydrocarbon compounds (PAH). Sources of PAHs are diverse and can include tire debris, gasoline, oil, asphalt, and coal-tar sealcoat. Ratios of selected PAHs to the sum of PAHs exhibited similar patterns among the five lakes; however, among the five, Wirth Lake contained the highest concentrations of most PAHs. Phenanthrene, fluoranthene, and pyrene dominated the total PAH composition. A comparison of PAH ratios at each lake to ratios found in potential sources provides an indication of sources that are important contributors of the PAH load to Minneapolis lakes.

Characterizing the Relationship Between Sulfate Reduction and Mercury Methylation in St. Louis River Sediment

Nathan Johnson (nwjohnso@d.umn.edu), University of Minnesota, Duluth

Biotic transformation of inorganic mercury to methylmercury represents a public health concern due to its bioaccumulative properties in fish and neurotoxicity in humans. Prevailing wisdom indicates that efficient mercury methylation may be confined to a narrow range of organic carbon and sulfate concentrations in sediment environments, which could limit methylmercury sources in the St. Louis River Estuary spatially. The objective of this study was to measure mercury speciation and associated porewater redox conditions (iron, sulfur, and manganese) and organic carbon from four different Habitat Zones, which represent a majority of the St. Louis River Estuary. Sediment from the different habitat zones exhibited a wide range of chemical and physical characteristics that allowed comparisons of different dynamics which lead to mercury methylation. Results provide evidence that production of methylmercury by microbes in sediment is possible in a wider range of sediment conditions than was previously thought.

Concurrent Sessions V 1:15 p.m. – 2:45 p.m.

Track B: Managing Highway Stormwater

Stormwater Management for a MegaProject: The Reconstruction of the I-35W/TH62 Crosstown Commons

David Filipiak (dfilipiak@srfconsulting.com), SRF Consulting Group, Inc.

Reconstruction of the Crosstown Commons has been recognized by the Minnesota Society of Professional Engineers as their 2011 Project of the Year and was also selected for an ACEC Grand Award. The largest project in Mn/DOT's history, this four-year construction project transformed the face of transportation in the south metro, including reconstruction of four miles of I-35W, two miles of TH 62, nine interchanges, 26 bridges, 10 miles of retaining walls, eight miles of noise walls, nearly 17 miles of storm sewer, and 14 water quality/detention BMPs in a very constrained corridor.

SRF Consulting Group has been involved with planning, environmental documentation, design, and construction administration for the I-35W corridor since the early 1990s. This presentation will provide a brief overview of the water resource planning and agency coordination that translated into design and construction opportunities and challenges. More importantly, the presentation will focus on at few examples of how the process unfolded for a few water resource components that involved improving water quality and flood protection for both the corridor and the surrounding area.

Automated Turbidity Monitoring of Minnehaha Creek During I-35W Reconstruction and BMP Assessment

Dwayne Stenlund (Dwayne.stenlund@state.mn.us), Minnesota Department of Transportation

Prior to demolition and construction of the I35W bridges over Minnehaha Creek, automated data logging turbidity (ntu) probes were installed up and downstream to assess the best management practices for nuisance discharge prevention during all phases and stages of construction. This presentation will address observed turbidity installations in North Carolina and Nevada on linear projects and the project goals for Minnesota. A subset of 3 years of data collection will be presented, and photos of concurrent construction practices that demonstrate proper product performance (perimeter control, inlet controls, and temporary stabilization) and contractor operations (good housekeeping, demolition dust control, concrete management, and dewatering). In addition, equipment installation, prevention of theft, maintenance, data retrieval and winter issues related to automated turbidity sampling will be discussed.

Performance of Swale in Infiltrating Stormwater Runoff

Farazana Ahmed (ahmed262@umn.edu), University of Minnesota

Properly designed swales (drainage ditches) can be effective LID pollution prevention devices. The water that swales can infiltrate has been observed in this study by taking multiple infiltration measurement in a number of swales in Minnesota. Much of the water infiltrates through the sides of the swales as the water runs towards the swale bottom. This presentation will show the spatial variation of the infiltration rate of few vegetative swales located in the Twin Cities metro area. Case studies will be presented showing the amount of stormwater runoff that can be infiltrated by swales for various rainfall events and infiltration rates.

Concurrent Sessions V 1:15 p.m. – 2:45 p.m.

Track C: Evolution and Changes to Sediment Production

Sediment Loading in the Le Sueur River Watershed, From Post-glacial Times to Modern

Karen Gran (kgran@d.umn.edu), University of Minnesota, Duluth

The greater Blue Earth River watershed supplies a disproportionate supply of suspended sediment to the Minnesota River. Multiple studies agree most sediment is currently sourced in bluffs. This research focuses on understanding pre-settlement bluff erosion rates using the valley incision record left behind in terraces coupled with 1D kinematic modeling to determine incision history and 2D numerical modeling to translate valley incision into erosional volumes through time. Results show bluff erosion has fluctuated around a steady mean giving pre-settlement erosion rates of 50,000 Mg/yr of silt and clay. Modern bluff erosion determined by air photo and ground-based lidar analyses are 150,000 – 225,000 Mg/yr, meaning modern valley erosion rates are 3 to 4 times higher than pre-settlement rates. Management of bluff erosion requires mitigation of changing hydrology in the upper watershed, reducing peak flows that enhance bluff erosion, coupled with site-specific bluff stabilizations.

An Integrated Sediment Budget for the Le Sueur Watershed

Patrick Belmont (Patrick.belmont@usu.edu), Utah State University

We developed a sediment budget for the Le Sueur watershed for 2000-2010. Sediment sources include bluffs, banks, ravines, and agricultural uplands, each of which was constrained by multiple, independent measurements. We find that near-channel sources, bluffs and banks, account for nearly 70% of sediment loading and appear to be highly sensitive to hydrology. Uplands account for one quarter of sediment loading and ravines account for the small remainder. Floodplain deposition is small, but non-negligible. Geochemical fingerprinting in Lake Pepin corroborates the Le Sueur sediment budget, indicating a pulse of upland erosion in the mid-20th century and recent shift back to near-channel sources even though total sediment supply to Lake Pepin remains high. Our key finding is that both the sources and drivers of erosion are changing in time. Therefore, an effective sediment reduction plan must depend on multiple lines of corroborating evidence and directly address physical dynamics of the system.

Minnesota River Basin Sediment Research: Implications for TMDL Implementation Strategies

Peter Wilcock (wilcock@jhu.edu), Johns Hopkins University

Research on sediment sources, fluxes, and sinks in the Minnesota River Basin and Lake Pepin provides a clear narrative on causes of elevated sediment loads and context for developing an implementation plan to address water quality impairments. Sediment loads remain very large relative to background, even as the primary source of sediment is shifting from field to near-channel. Near channel sources respond to river discharge, whose peak values are increasing. To get at both source and symptom, management actions must address both erosion hotspots and increased runoff. Although the broad trends are clear, implementation will require difficult, local decisions based on imperfect information. Effective collaboration among stakeholders will require a decision analysis framework that is robust, transparent, and accessible, incorporating the best available scientific information and accounting for uncertainty. We will present a suitable model framework for estimating sediment loads and evaluating sediment reduction implementation strategies.

Concurrent Sessions V 1:15 p.m. – 2:45 p.m.

Track D: Groundwater

Hydrologic Trends in Groundwater-Surface Water Interaction

Andrew Streitz (Andrew.Streitz@state.mn.us), Minnesota Pollution Control Agency

Trends discovered in local hydrologic datasets during the development of a groundwater model in Benton County were found to match trends in comparable state-wide datasets. The model, part of the Minnesota Pollution Control Agency's Little Rock Creek watershed study, determined a cause and effect relationship existed between increasing groundwater withdrawals for irrigation use and corresponding declines in groundwater levels and creek discharge in summer months. Analyses of high capacity water withdrawals across the state show statistically significant increasing trends over the last 20 years. Statistically significant decreasing trends were found in a majority of summer month stream discharges derived from state-wide stream gaging stations randomly selected for this study. Rivers with significant summer month declines were commonly located downriver and downgradient from a large number of nearby high capacity wells, while gages without trends were not. These trends appear to be related to changing agricultural practices.

Energy and Water Quality Benefits of Managing Marginally Productive Land for Prairie Biomass Production

Jared Trost (jtrost@usgs.gov), U.S. Geological Survey

Detailed accounting of energy inputs and energy yields of diverse prairies and corn grain shows that the net energy produced from prairies is similar to that of corn. However, corn produces more gross bioenergy per hectare than prairie. Corn production also contributes nitrogen to surface water and groundwater. Practices that minimally effect water quality and improve the energy production of prairie are therefore of great interest. The bioenergy production and nitrate leaching below the rooting zone was measured in prairie plots amended with nitrogen fertilizer and water. Irrigated prairies fertilized with 70 kg N/hectare yielded 126% more bioenergy and leached no more nitrate than non-amended control plots. Doubling the fertilization rate did not significantly increase bioenergy yields but did increase nitrate leaching. This project demonstrates that bioenergy yields of diverse prairies established on marginal, coarse-textured soils can be improved with moderate fertilization and irrigation while minimally impacting groundwater quality.

Concurrent Sessions VI 3:00 p.m. – 4:30 p.m.

Track A: Case Studies for Water Quality Standards, Categorization, and Total Maximum Daily Load (TMDL) Development

River, Pool and Lake Pepin Eutrophication Standards

Steven Heiskary (steven.heiskary@pca.state.mn.us), Minnesota Pollution Control Agency

Excess nutrients are an important focus for USEPA and states have been charged with developing nutrient (eutrophication) standards as a part of their state water quality standards. In 2008, Minnesota promulgated lake eutrophication standards as a part of this national effort.

The Minnesota Pollution Control Agency (MPCA) has developed draft river eutrophication standards as a part of its current revision of Minnesota Rule Chapter 7050 standards rulemaking. Along with the regionally based river eutrophication standards, MPCA has proposed site-specific standards for the Mississippi River navigational pools and Lake Pepin. Proposed standards and associated technical support documents are out for public review and comment. This presentation will:

- Provide an overview of the technical basis for the standards;
- Demonstrate linkages with Wisconsin nutrient standards and expectations in USEPA guidance; and
- Discuss implementation and assessment issues related to the proposed standards.

Colby Lake: A Case for a TMDL Alternative

Stephanie Johnson (sjohnson@houstoneng.com), Houston Engineering, Inc.

Every two years the Minnesota Pollution Control Agency (MPCA) performs an assessment of the State's water quality and submits a report to the U.S. Environmental Protection Agency (USEPA). Historically, all waters that were not meeting water quality standards in the State where reported under Category 5 – i.e., impaired and in need of a Total Maximum Daily Load (TMDL) study. In February of this year, the MPCA issued new guidance for third parties to request that impaired waters be listed under Category 4b as an alternative to Category 5. While still considered impaired, waters in Category 4b do not require a TMDL study due to the existence of other pollution control requirements and/or efforts that will result in the water body achieving the water quality standard.

The South Washington Watershed District (SWWD) intends to file the first Category 4b request (under the new MPCA guidance) in the State. The request will be for Colby Lake, which is currently listed (in Category 5) as impaired for contact recreation due to excessive nutrients. In this presentation we will discuss the details of the Category 4b listing requirements and summarize the case for re-classifying Colby Lake as a Category 4b water. Specific information on the SWWD programs that support this filing will be discussed.

Concurrent Sessions VI 3:00 p.m. – 4:30 p.m.

Track A: Case Studies for Water Quality Standards, Categorization, and Total Maximum Daily Load (TMDL) Development, *continued*

Using Flow Regime and Imperviousness to Establish a Biotic TMDL and Protection Strategies

Jennifer Olson (Jennifer.olson@tetratech.com), Tetra Tech

The Grand River watershed, located east of Cleveland, Ohio, has numerous aquatic life use (biotic) impairments. Much of the watershed is developed; imperviousness and altered flow regime have been identified as the primary stressors on aquatic life in this watershed. The U.S. EPA has funded a pilot flow-based TMDL for this watershed, based on work completed in US EPA Region 1 (northeast US), which will potentially open the door for other flow-based TMDLs in the Region. A flow regime TMDL was developed using a reference, or attainment, stream approach. The threshold for aquatic life use impairments in the watershed lies between 3 and 6 percent effective imperviousness.

The watershed contains many small cold water streams which are critically important to ensuring the health of the Grand River, a Wild and Scenic River. Protection strategies were developed for these streams that included impervious cover and riparian area targets. These targets will be used by local decision makers in land use planning decisions and ordinance development.

The SUSTAIN model was also piloted in this watershed in two subwatersheds. SUSTAIN was used to determine the most cost-effective BMPs that could be implemented in order to meet the flow-based requirements of the TMDL.

This talk will present the derivation and results of the TMDL, protection strategies, and SUSTAIN modeling; discuss the overarching policy implications; and describe the challenges associated with establishing a flow-based TMDL.

Concurrent Sessions VI 3:00 p.m. – 4:30 p.m.

Track B: Best Management Practice Effectiveness and Pollutant Tracking

Fate of Petroleum Hydrocarbons in Stormwater Bioretention Areas

Gregory LeFevre (lefev024@umn.edu), University of Minnesota

Despite interest in attenuating stormwater pollutants through bioretention, little fundamental knowledge exists regarding the fate of pollutants or removal mechanisms in these systems. Through an investigation of bioretention field sites in the Twin Cities, we discovered total petroleum hydrocarbon residual concentrations in bioretention soils were substantially lower than expected, warranting investigation into their ultimate fate. Using laboratory column reactors simulating bioretention cells and a 14C radiolabel hydrocarbon tracer, the ultimate fate was determined for three planting regimes (unplanted, grass, clover). Sorption to soil, vegetative uptake, and biodegradation were major loss mechanisms, but volatilization and leaching were minor. Concentrations of bacterial biodegradation genes correlated with hydrocarbon concentration in the column. Batch tests revealed that bioretention soils were capable of biodegradation, and that previous pollutant exposure and presence of vegetation decreased biodegradation lag time. This research suggests that bioretention is an effective means of attenuating petroleum hydrocarbon pollution from stormwater.

BMP Effectiveness Monitoring in the Whitewater River Watershed

Greg Johnson (Gregory.johnson@state.mn.us), Minnesota Pollution Control Agency

A best management practice (BMP) effectiveness monitoring project was conducted in the Whitewater River watershed between 1995 and 2005. The project was developed following the guidelines of the USEPA Section 319 National Monitoring Program. Paired-watershed designs were used for flow and chemistry monitoring in five small watersheds and biological monitoring in the main branches of the Whitewater River and adjacent streams. No significant change in flow and water quality was observed in the small paired-watershed study, but BMP implementation problems and hydrology differences hampered the success of the study. A significant difference in coldwater fish index of biotic integrity (IBI) scores was detected in one of 12 paired-watershed site scenarios suggesting that BMP implementation resulted in improved biotic conditions in the river; however, the potential effects of other variables in the much larger watersheds made drawing a definitive conclusion difficult.

The Nutrient Tracking Tool (NTT): Evaluation of Agricultural Environmental Management

Brooke Hacker (brooke.hacker@mnsu.edu), Greater Blue Earth River Basin Alliance

A new national model, the Nutrient Tracking Tool (NTT), is being tested in Minnesota. NTT is being evaluated for its capability to improve accuracy and ease-of-use regarding Best Management Practice (BMP) site assessments. NTT estimates BMP outcomes regarding changes in nitrogen, phosphorous, sediment loss and the BMP's impact on crop yield. The United States Department of Agriculture (USDA) and Texas Institute for Applied Environment Research are developing NTT. An EPA 319 grant to Conservation Marketplace of Minnesota (CMM) provides the funding for this evaluation. CMM is a team of public and private conservation professionals who are collaborating to provide an ecosystem services market that draws expertise from locally-led professionals. CMM uses standardized tools to provide simple, repeatable and scientifically sound methods that connect agricultural producers to private market funding for BMPs.

Concurrent Sessions VI 3:00 p.m. – 4:30 p.m.

Track C: Flood Mapping

Accuracy May Be Lost in DFIRMs Developed With Limited Funding: A Lake Crystal, Minnesota, Case Study

William Douglass (billdo@bolton-menk.com) and Tim Olson (timol@bolton-menk.com), Bolton & Menk, Inc.

In Minnesota, the Flood Insurance Rate Maps (FIRM) are being converted to digital maps (DFIRM) on a county-wide basis. In some areas, the available funding does not match the level of effort needed to create reliable DFIRMs. This has led to hydraulic modeling using only LiDAR surface contour data without additional bridge or culvert data. This was the case in Lake Crystal, Minnesota where the proposed DFIRM included a significant increase in the designated 1% event floodplain through the City. Bolton &

Menk, Inc. revised the floodplain modeling by augmenting the LiDAR data with accurate bridge and culvert surveys that could better predict the impacts of the 1% event. The resulting model significantly reduced the 1% floodplain and removed many of the residences from the proposed floodplain. This presentation discusses the original FIS and the proposed hydraulic modeling, and shows comparative cross sections associated with each model. It also shows comparative floodplain delineations including the geographical differences of each.

Floods of September 2010 in Southern Minnesota

Christopher Ellison (cellison@usgs.gov), U.S. Geological Survey

During September 2010, heavy rainfall resulted in severe flooding across southern Minnesota, causing more than $64 million in damages and 21 counties to be declared Federal disaster areas. The U.S. Geological Survey, in cooperation with the Minnesota Department of Natural Resources and the Federal Emergency Management Agency, documented the meteorological and hydrological conditions leading up to the flooding. On September 22–24, several National Weather Service precipitation stations recorded rainfall that exceeded the 72-hour 100-year recurrence interval. Twelve active streamgages measured record flood-peaks and seven streamgages had annual exceedance probabilities less than 0.2 percent (greater than 500-year recurrence interval). After waters receded, high-water marks were mapped in the four most severely affected communities so that flood-peak inundation maps could be constructed to show the extent and height of flooding. These inundation maps then can be used for future flood response and recovery efforts by local, county, State, and Federal agencies.

Flood Response Mapping: Incorporating Flood Forecasts and LiDAR Data

Mike Lawrence (mlawrence@houstoneng.com), Houston Engineering, Inc.

In recent years, above average rainfall and snowfall amounts have raised widespread concerns about the risk of flooding, especially during the spring snowmelt period. Local emergency managers, with an understanding of anticipated flooding extents, are better prepared to plan and react to major flooding events. These managers' reactions can greatly reduce the potential for flood damages. Houston Engineering, Inc. (HEI) has provided innovative flood inundation mapping services for several projects in North Dakota, including the Red River Valley. Using the same National Weather Service forecasts that are used by emergency managers and the public, combined with high resolution LiDAR topographic data, these services give users a detailed understanding of the potential impact of the forecasts through a web-based tool. These tools have proven indispensable in planning and responding to recent flooding events.

In this presentation we will present information on the concepts behind HEI's flood inundation mapping tools and the information that is used to create them. Examples of the various applications developed will also be shared, focusing on projects in the Souris River, Apple Creek and the Fargo-Moorhead area.

Concurrent Sessions VI 3:00 p.m. – 4:30 p.m.

Track D: Invasive Fish

Effects of Common Carp on Wild Rice Survival and Growth

James Johnson (james@freshwatersci.com), Freshwater Scientific Services, LLC

In 2010, St. Croix Tribal Environmental Services initiated a study in collaboration with Freshwater Scientific Services, LLC to assess the impact of common carp (Cyprinus carpio) on the survival and growth of northern wild rice (Zizania palustris) in Upper Clam Lake (Burnett County, WI; 1200 acres, mean depth = 1.5 m). Prior to 2005, the lake supported 250 to 300 acres of rice, but between 2005 and 2009, these rice beds shrank from 290 acres of moderate to dense growth to less than 90 acres of very sparse growth confined to one bay. Furthermore, wild rice seed enumeration studies conducted in 2009 and early 2010 showed that very few seeds remained in lake sediments (0 seeds/m2 in top 10 cm, 11 ± 6 (1SE) seeds/m2 in 10-30 cm stratum; N=50). This decrease in rice coincided with the appearance of a strong year-class of carp in 2005. In a 2009 fish survey, individuals from this year-class ranged from 50 to 65 cm in length and represented over 40% of the captured carp from all year classes. To assess the impact of these carp on wild rice survival and growth, we established two fenced plots (carp excluded) and two open plots in each of three near-shore locations of Upper Clam Lake. At each location, one fenced plot and one open plot were heavily seeded in early 2010 with wild rice harvested from neighboring lakes late in 2009. Results clearly indicated that carp dramatically reduced the establishment and growth of wild rice and other aquatic plants.

Coon Rapids Dam vs. Asian Carp

Martin Weber (webermartin@stanleygroup.com), Stanley Consultants, Inc. and Brian Nerbonne, Minnesota Department of Natural Resources

Asian carp were intentionally introduced into the south-central United States in the 1970's for the purposed of controlling vegetation in catfish farm ponds. During flood events the species escaped the ponds and made their way to the Mississippi River. Since then Asian carp have steadily advanced up the Mississippi valley and are well established in Iowa and Illinois. Due to their astounding eating and reproductive habits Asian carp the potential to cause extensive and irreversible changes to aquatic environments. If established in Minnesota the invasive species could endanger Minnesota's native fishery and the State's $2 billion per year tourism industry.

Three Rivers Park District owns and operates the Coon Rapids Dam, located on the Mississippi River in the northern Twin Cities metropolitan area. Coon Rapids Dam represents the southernmost non-navigable dam on the Mississippi and has been identified as a potential barrier to the upstream migration of Asian carp. If established upstream of Coon Rapids Dam the species has an unobstructed path to the upper Mississippi Valley and sport-fishing lake including Mille Lacs.

In cooperation with Three Rivers Park District the Minnesota Department of Natural Resources commissioned an evaluation of the Dam for its effectiveness as an invasive fish barrier and preliminary design of improvements necessary to improve its barrier effectiveness and extend its life 50 years. The presentation will discuss the threat posed by Asian carp, the evaluation of alternative barrier systems, analyses performed to determine barrier effectiveness and preliminary designs and cost estimates to implement the improvements. An update to State legislation to fund the improvements will also be presented.

Index of First Authors

Index of First Authors

Index of First Authors

Index of First Authors