Watershed Exchange and Poster Session

Watershed Exchange Tables

The Illinois Height Modernization Program: What Can LiDAR Do for You and How Can You Get It?

Janet Holden and Trisha Rentschler, Illinois Geological Survey

Abstract and bio not available at time of printing.

Where and How to Find USGS Topographic Data

Shelley Silch, U.S. Geological Survey, Illinois Water Science Center

Abstract and bio not available at time of printing.

The Resource Management Mapping Service (RMMS)

Jonathan Rush, University of Illinois Cyberinfrastructure and Geospatial Information Laboratory

The Resource Management Mapping Service is a web-based GIS system for learning about and creating maps of your watershed – the lakes and streams, geology, land use, and social and economic factors. The system provides both standard and customized tools that make it fast and easy to make and share maps of Illinois natural resources. The ability of RMMS to display and summarize a wide range of environmental data enables government agencies and others to develop and implement appropriate resource protection and enhancement measures. RMMS includes data on Clean Water Act projects (section 319), impaired waters (section 303d), water quality reports (section 305b), priority watersheds for non-point pollution or nutrient loss reductions, and more.

Jonathan Rush is the education, outreach, and training coordinator at the CyberGIS Center for Advanced Digital and Spatial Studies, an interdisciplinary research center at the University of Illinois. At the CyberGIS Center, he helps train scholars to use high performance geospatial analysis tools to enable them to answer bigger questions. Jonathan's background is in geography and GIS research and applications in the academic and public sectors. His first fieldwork project was in 2003, measuring the water quality of the Canadian River and its tributaries in Norman, Oklahoma.

Using GIS for Green Infrastructure and Stormwater Management Analysis – Redeveloping Brownsfields in Chicago's Southland

Dennis Latto and Jose Alarcon, South Suburban Mayors and Managers Association

Abstract and bio not available at time of printing.

Poster Session

Sangamon River Regional Sediment Management Program

Heather Bishop, Elizabeth Bruns, and Nicole Manasco, U.S.Army Corps of Engineers, Rock Island District

Abstract and bio not available at time of printing.

Hydrologic and Hydraulic Studies of the Illinois River Basin at ISWS

Yanqing Lian, Elias Getahun, Markus Momcilo, Laura Keefer, and Zhenxing Zhang, Illinois State Water Survey

Abstract and bio not available at time of printing.

Hydrologic and Water Quality Modeling of the Spoon River Watershed for Determining Sediment and Nutrient Critical Source Areas

Arash Zaregarizi, Yazd University, and Elias Getahun, Illinois State Water Survey

In the Midwest, non-point source pollution resulting from agriculturally-dominated watersheds remains one of the major causes of water quality impairments. To address this issue in Illinois, a statewide nutrient loss reduction strategy was recently completed, which sets reduction goals and provides recommendations for conservation measures. The objective of this study is to determine the critical source areas of sediment and nutrients in the Spoon River watershed. Previous Illinois State Water Survey (ISWS) studies showed that the Spoon River generates the largest sediment per unit area among the major tributaries of Illinois River. To accomplish the study objective, a Spoon River watershed model was developed using the Soil and Water Assessment Tool (SWAT), and it was calibrated and validated for monthly streamflow and sediment at USGS 05570000. For both calibration and validation, the streamflow NSE and absolute bias were greater than .80 and less than 5 percent, respectively, and an NSE value of at least .57 and absolute bias of less than 14.5 percent were obtained for sediment simulations. Using the watershed sediment and nutrient outputs at the sub-basin level, three pollution quantifying indices were computed to facilitate the identification and selection of critical source areas for best management practice (BMP) targeting. The impact indices include a concentration impact index, a load per unit area index, and a load impact index. Each index was used to obtain pollutant- specific rankings of the sub-basins in the Spoon River watershed. A total impact index was derived from these indices and was grouped into low, medium, or high classes using the natural breaks method to prioritize the sub-basins with respect to all pollutants. Using this index, the sediment- and nutrient-critical source areas were determined, covering about 9 percent of the Spoon River watershed and accounting for 30, 40, and 36 percent of the overall sediment, nitrate, and total phosphorus loads generated in the watershed, respectively.

Arash Zaregarizi is a visiting research scholar at ISWS and a PhD candidate in the Department of Watershed Management at Yazd University in Iran. Arash's doctoral research focuses on optimizing BMPs for soil and water conservation at the watershed level, and his research interests include water quality assessment and modeling. He has published research articles in both international and Iranian peer-reviewed journals.

Elias Getahun is a research hydrologist with ISWS at the Prairie Research Institute. Elias has extensive experience in watershed modeling, the development of decision support systems for non-point source pollution control, and water resources systems analysis. He has published his research work in peer-reviewed journals, technical reports, and conference proceedings.

Use of Magnetic Fly Ash to Assess Upper Sangamon Basin Post-Settlement Sedimentation Rates

Jia Wang, University of Illinois

Sedimentation rates have been one of the most important factors that impact the landscapes and livelihoods of residents in Midwestern states. The occupation of the landscape by Europeans started in the mid-1800s, when the use of coal for heating houses and then later for railroads and power plants liberated humans' ability of production. This study focuses on the measurement of magnetic spherules, a byproduct of coal combustion called fly ash, as the marker of the beginning of coal burning in the upper Sangamon basin valley alluvium. Alluvium are river deposits left behind by the flowing of water. Samples were collected and analyzed from seven sites in 10 cm intervals up to 1.5 m beneath the ground throughout different parts of the Sangamon River valley and its tributary valleys. Fly ash were extracted and purified from the samples and examined under the microscope to try to provide a basis for identifying post-settlement alluvium from pre-settlement alluvium. The extracted magnetic fraction was also examined under a scanning electron microscope to confirm fly ash in alluvium. The data were combined with previous data collected from soil samples in the other locations in the area and analysis showing interesting relationships between fly ash percentage and depth beneath the surface. Alluvium from the tributaries shows that the highest fly ash percentage, about 15-20 percent, is at the 10-20 cm interval, while the main valleys in Allerton Park, Champaign County peaks around 35-40 cm beneath the surface with a 40-45 percent fly ash content. The data shows an increasing trend from the bottom of the soil core that peaks and then decreases. This result can suggest a correlation with the effects of the Clean Air Act implemented in

the 1970s. Particle size analysis shows increases and decreases throughout the soil sample core. Sedimentation rate can be further examined through the data collected and analyzed to find any observable trends post European settlement. This study can provide valuable insight for scientists to understand the effects of modern agriculture and the impact to soils that industrialization and urbanization has brought upon this landscape. This project was originally part of the Critical Zone Observatory project, funded by NSF and later by the National Great Rivers Research and Education Center, to better understand human impacts on landscapes.

Jia Wang is currently an undergraduate student at the University of Illinois at Urbana-Champaign. She is majoring in environmental geology and earth, society, and environmental sustainability. She began working on this project in November 2014 under the guidance of David A. Grimley, a geologist at the Illinois State Geological Survey, and Alison Anders, a professor at the University of Illinois at Urbana-Champaign.

Additional contributors: David Grimley, Illinois State Geological Survey, and Alison Anders, University of Illinois

Regional Water Supply Planning Studies in Illinois

Zhenxing Zhang, Illinois State Water Survey

It is vital for Illinois to provide citizens and industries sustainable and affordable clean water in the present and for the future. As a state, it is important to understand future water demand, water supply, costs associated with providing and conveying water, and the costs and impacts of wastewater effluent. Well-designed state and regional water supply planning is a valuable tool to ensure sustainable water sources in the future for the entire state. Executive Order 2006-01, signed by Governor Rod Blagojevich in January 2006, authorized the Illinois Department of Natural Resources (IDNR) to lead state and regional water supply planning activities. Since 2006, the Illinois State Water Survey (ISWS) has been working closely with IDNR to conduct technique analysis of water demand and water availability in Illinois. The entire state is divided into 10 water supply planning regions, with northeastern Illinois and east central Illinois prioritized. ISWS has completed water supply planning studies in northern Illinois, east central Illinois, and the Kaskaskia River basin. ISWS is currently working on the middle Illinois and northwest Illinois regions. The Kankakee River watershed was identified in the northeastern Illinois water supply planning report as needing additional study due to significant expected development in the watershed. The watershed is currently being studied as a sub-region. For water supply planning studies in each region, groundwater models are developed to assess the impact of the past and future withdrawal on groundwater levels and determine the sustainable withdrawal rate. Groundwater monitoring is conducted to evaluate the impact of past groundwater withdrawals. The Illinois Streamflow Accounting Modelling was developed to analyze surface water availability under various climate conditions and the impact of surface water withdrawals and wastewater effluents. Water demand is analyzed and projected based on available population, water use, socioeconomic, and climatic data. Three different scenarios are developed to represent uncertainty.

Zhenxing (Jason) Zhang is a water supply hydrologist with ISWS focusing on surface water supply, water availability, hydrologic modelling, and stochastic hydrology. He holds a PhD in water resources engineering from the State University of New York College of Environmental Science and Forestry. Zhenxing is a licensed professional engineer and professional hydrologist. He has extensive experience in water supply, water resources planning and management, and hydrologic modeling with years of experience working for the Susquehanna River Basin Commission and Pennsylvania State University before he joined ISWS.

Additional contributors: H. Vernon Knapp, Walton Kelly, Scott Meyer; George Roadcap, Daniel Abrams, Devin Mannix, and Daniel Hadley, Illinois State Water Survey

Insights from Long-Term Monitoring: Asian Carp and Fish Communities within the Illinois River

Rich Bendleton, Illinois Natural History Survey, Illinois River Biological Station

Long-term monitoring can provide novel information regarding ecological patterns and processes. While long-term monitoring efforts have gained greater recognition in their importance in understanding ecological patterns, few have documented the influence of invasive species on ecosystem properties and processes throughout the course of an invasion (introduction, establishment, and spread). The Long Term Resource Monitoring Program, an element of the Upper Mississippi River Restoration - Environmental Management

Program, has been monitoring ecological patterns and aquatic resources throughout the upper Mississippi River system for over 20 years and provides a unique opportunity to understand the influence of invasive species on the existing fish community. With the arrival and establishment of Asian carp in Illinois waterways, long-term monitoring has revealed that significant changes have occurred within the fish community of the La Grange reach of the Illinois River. In general, several sport fishes (e.g. largemouth bass, crappie, white bass, bluegill) and catastomids (i.e. suckers) have declined in terms of relative abundance since the establishment of Asian carp, whereas several non-sport fishes such as gar, grass carp, and emerald shiners have increased in abundance. Changes observed in fish community structure may have potentially altered other aspects of ecosystem functioning (e.g. primary/secondary production, decomposition), and continued research and long-term monitoring will be necessary to further our understanding of existing impacts of invasive species while continuing to study and monitor future invasions occurring within our ecosystems.

Rich Pendleton is a large river ecologist with the Illinois Natural History Survey based out of the Illinois River Biological Station located in Havana, Illinois. Specifically he works as a fish component specialist for the Long Term Resource Monitoring Program. His research includes natural and anthropogenic disturbances to large rivers, invasion dynamics, and the life history and dynamic rate functions of fishes.

Additional contributors: Levi Solomon, Brian Ickes, and Andrew Casper, Illinois Natural History Survey

Trends in Illinois River Sport and Commercial Fisheries from the Last 50 Years

Dan Gibson-Reinemer, Illinois Natural History Survey, Illinois River Biological Station

Abstract not available at time of printing.

Dan Gibson-Reinemer is a large river ecologist with the Illinois Natural History Survey based out of the Illinois River Biological Station located in Havana, Illinois. Specifically he works as a fish component specialist for the Long Term Resource Monitoring Program. His research includes natural and anthropogenic disturbances to large rivers, invasion dynamics, and the life history and dynamic rate functions of fishes.

Additional contributors: Jason DeBoel; Mark Fritts, and Andrew Casper, Illinois Natural History Survey, Illinois River Biological Station

Prediction of Potential Nursery Habitat for Asian Carp Larvae in the Illinois River below Starved Rock Lock and Dam Using the FluEgg Model

Tatiana Garcia and James J. Duncker, U.S. Geological Survey, Illinois Water Science Center

An Asian carp spawning event was observed in June 2015 in the Illinois River below Starved Rock Lock and Dam near Utica, Illinois. High densities of Asian carp were observed spawning in turbulent water for several miles below the lock and dam. Although the location of this spawning event was well-defined, both the fate and transport of the eggs and larvae and the location of potential nursery habitat are not well known. The Fluvial Egg Drift Simulator (FluEgg) model was used to simulate the transport and dispersal of silver (Hypophthalmicthys molitrix) and bighead (Hypophthalmicthys nobilis) carp eggs and larvae after this spawning event. In the model simulation, eggs drifted from the spawning site until hatching and eggs in suspension were allowed to hatch. After hatching, larvae were allowed to develop until reaching the gas bladder inflation stage at which larvae start leaving the current looking for nursery habitats. The input data for FluEgg was generated using hydraulic and water quality data collected over a more than 40 mi reach of the Illinois River during the spawning event. The hydraulic data consisted of a combination of acoustic Doppler current profiler data and estimated hydraulic parameters based upon gaging station data. The water quality data consisted of near surface water temperature data collected during the event. Herein, we present preliminary results of these simulations, including the longitudinal distribution of both eggs at hatching time and larvae at gas bladder inflation. The location of the trailing edge of the larvae at gas bladder inflation was used to identify river reaches with potential nursery habitat for Asian carp larvae. This information is useful for the application of potential control strategies to target the early life stages of Asian carp.