

Session C4: Assessing Urban Waters

Room A107-109

3:30 – 5:00 pm

0210

C4-1

Modeling the Health of Wadeable Streams in Connecticut Using Biomonitoring Information and Watershed Characteristics

Christopher Bellucci¹, Mary Becker¹, Mike Beauchene¹ and Lee Dunbar²

¹*Connecticut Dept. of Energy and Environmental Protection, Hartford, Conn., USA,* ²*retired, Hartford, Conn., USA*

Bioassessments have formed the foundation of many water quality monitoring programs throughout the United States. Like many state water quality programs, Connecticut has developed a long term database containing information about species richness, species composition, relative abundance, and feeding relationships among organisms present in stream and river systems. Geographic Information Systems (GIS) can provide estimates of landscape condition and watershed characteristics and when combined with measurements of stream biology, provide a useful visual display of information that is useful in a management context.

The objective of our study was to develop and evaluate best fitting models to predict stream health for all wadeable river and stream segments in Connecticut using previously collected macroinvertebrate data and watershed characteristics derived using GIS. A secondary objective was to identify potential uses of the model for water managers tasked with implementing resource management programs to achieve goals established in the Federal Clean Water Act. We developed and evaluated models using an information theoretic approach to predict stream health as measured by macroinvertebrate multimetric index (MMI). We identified a three variable model, including percent impervious land cover, a wetlands metric, and catchment slope that best fit the MMI scores (adj- $R^2 = 0.56$, SE = 11.73). We then provide examples of how modeling can augment existing programs to support water management policies.

0554

C4-2

Geospatial Techniques for Site Selection and Estimated Benefit of Watershed-Scale Implementation of Low Impact Development

Kristen Cayce¹, Jamie Kass¹ and Jennifer Walker²

¹*San Francisco Estuary Institute, Oakland, Calif., USA,* ²*Watearth, Inc., Oakland, Calif., USA*

In the Bay Area, low impact development (LID) practices are becoming a frequently accessed tool for stormwater management. In general, LID is the practice of mimicking nature to manage stormwater runoff by slowing, filtering, and storing surface water, thus providing benefits including contaminant reduction, leveling of the hydrograph, water storage, and flood reduction. Traditional stormwater best management practices (BMPs) can accomplish similar goals, but LID has additional benefits not provided by conventional BMPs including wildlife habitat, aesthetics, increase in property value, and reduction of long-term costs. Due to the multi-benefit nature of LID treatments, stormwater managers have begun to include these practices in capital plans and demonstration projects. Although LID is being more widely adopted in the Bay Area, most implementation to date has been done in an opportunistic and pragmatic fashion. However, as the larger resource management community begins to undertake more holistic planning at the watershed scale, it is reasonable to want to assess the cumulative benefits of multiple LID projects on a watershed's hydrograph. This first requires an understanding of the areas within the watershed that are suitable for LID treatments. This project has built a Bay Area site suitability model of five LID treatments (stormwater wetlands, bioretention, bioswales, permeable pavement, and wet ponds) based on seven landscape characteristics; slope, depth to ground water, land use, soils, minimum footprint, and proximity to aquatic resources. The model output categorizes the region into areas that are ideal, suitable, adequate, not suitable, and not recommended for each of the five treatments which can be viewed with geospatial tools. This tool combined with simulated hydrology models helps managers identify strategic placement of LID treatments to meet management and regulatory goals. This project estimated the cumulative effect of various LID treatment location, type, and quantity scenarios on runoff in a sub-watershed of Sonoma Creek watershed using EPA's SWIM model. This approach to LID implementation provides a watershed view of potential cumulative reduction in stormwater runoff and therefore another important tool in the stormwater management toolbox.

0497
C4-3

Design of and Initial Results from an Integrated, Probabilistic Stream Monitoring Survey in Portland, OR

Jason Law and Chris Prescott

City of Portland, Portland, Oreg., USA

The City of Portland, Oregon recently implemented a stream monitoring program based on a generalized random- tessellation stratified (GRTS) probability survey design. The sample frame is based on a new high resolution LiDAR based stream layer created by Metro, the Portland, OR regional government and recently incorporated into the National Hydrography Dataset. The survey design incorporated Oregon master sample sites selected from the Oregon 1:100,000 NHD stream layer by transferring the master sample sites to the new frame and using a custom GRTS selection process to sample new sites while preserving the existing master sample sites. This combination of choosing new sites while preserving existing master sample sites maximized the potential to share data but incorporated frame improvements that allowed for better coverage of the stream network.

The sample design is a stratified, partially augmented serially alternating design. Sample sites were stratified by stream duration with a further stratum for intermittent sites determined by the boundaries of the City of Portland's Forest Park. The park contains many intact small watersheds that would otherwise dominate intermittent site sampling. Twenty perennial sites and 12 intermittent sites are sampled each year with four rotating panels. The design is partially augmented with a single revisit of a site randomly selected from the previous year's panel.

The first year of monitoring was completed in June 2011. The response design included habitat assessments using the National Rivers and Streams Assessment protocol, macroinvertebrate sampling, fish sampling, quarterly dry weather water quality sampling, one wet weather water quality sample, and continuous temperature monitoring. The collocation of this large indicator set is in contrast to previous city monitoring when data collection efforts between water quality, biological and habitat parameters were not coordinated. Initial results showed that the condition of macroinvertebrate communities, stream habitat, and water quality varied widely across the City. We discuss significant findings including the relationships between biological condition and water quality, habitat, and flow. The program will be used to monitor trends and to evaluate the watershed wide impact of City actions including sustainable stormwater management and instream restoration activities.

0396
C4-4

The Response of Benthic Macroinvertebrates to Urbanization in the Los Angeles and San Gabriel Rivers Watersheds, California

Kristy Morris¹, Scott Johnson² and Raphael Mazor³

¹*Council for Watershed Health, Los Angeles, Calif., USA,* ²*Aquatic Bioassay & Consulting Laboratories, Ventura, Calif., USA,*
³*Southern California Coastal Water Research Project, Costa Mesa, Calif., USA*

The effect of urbanization on benthic macroinvertebrates and water quality, toxicity, and physical habitat conditions was investigated in two highly urbanized watersheds in the greater Los Angeles Region. The San Gabriel River Regional Monitoring Program (SGRRMP) and the Los Angeles River Watershed-wide Monitoring Program (LARWMP) assess the condition of streams in the region with probabilistic and targeted sampling using the aforementioned indicators.

Monitoring commenced in 2005 and 2008 for the SGRRMP and LARWMP, respectively. The results from these monitoring programs have already provided valuable information on the variability of stream conditions at both the regional and sub-watershed scales. In particular, benthic macroinvertebrate (BMI) communities respond strongly to urbanization as shown by the difference in SoCal IBI (Index of Biological Integrity unique to southern California) scores in relation to the surrounding land use. 71% of the sites sampled during the monitoring period had IBI scores that were below the reference condition for perennial streams in the region.

Across the neighboring watersheds, the condition of invertebrate communities was strongly correlated with environmental variables related to varying degrees of urbanization. These include the condition of the riparian habitat such as vegetative canopy cover and buffer zone, and the relative quantity of complex stream habitat, such as cobble (riffles) and woody debris. Invertebrate communities were degraded in streams with moderate to high levels of channel alteration and impervious cover, indicating that there was little evidence for a resistance to urbanization.

This presentation shows relationships of BMIs along a gradient in highly-urbanized watersheds in the Los Angeles region. The

patterns of urbanization and the response of BMIs to urbanization and environmental changes will be discussed as well as a comparison to the other metropolitan areas within the United States. These results will assist scientists and managers to understand the implications of using BMI's as indicators of the extent of anthropogenic disturbances.