American Water Resources Association
2009 SPRING SPECIALTY CONFERENCE
Managing Water Resources Development in a Changing Climate
May 4-6, 2009
Anchorage, AK

Tuesday, May 5
10:30 AM – 12:00 Noon
Session 16: Urban Hydrology

1. How Climate Change Impacts Urban Runoff and Water Quality Design - John Hayes, Clemson University, Clemson, SC (co-authors: C. V. Privette, III, S. J. Klaine)

The presentation describes how various climate change scenarios can impact design of urban runoff and water quality management practices based on simulations by the IDEAL model and field data. The IDEAL model was developed to provide an organized system for evaluating the effectiveness of either a single management practice or a treatment train for reducing loadings from a watershed on an annual basis. Combinations of low impact development and traditional management practices can be evaluated quickly to determine whether practices are providing the desired benefits. IDEAL helps address questions about the benefit of small structures scattered around a development as compared to larger structures located near the outlet point. IDEAL will be used to simulate effectiveness of various treatment trains in order to consider how drier, average, or wetter conditions produced by climate change would impact BMP size and efficiency as used for post construction water quality. A major driver for the model is rainfall probabilities and depths. These values will be modified based on potential climate change so that impacts on size and effectiveness resulting from specific rainfall patterns can be demonstrated. While this presentation is focused on Greenville County, SC where the model has been used extensively, the process is applicable to many other areas. Local soils information is also used in the IDEAL predictions. This analysis is particularly relevant at this time because Greenville County is currently in extreme drought conditions having received the lowest annual runoff on record in 2007 and expected to break that record in 2008. The presentation will show various suites of treatment trains, as well as conditions having no BMPs, evaluated as “What if…?” scenarios. Comparisons of runoff, sediment, nutrient and indicator bacteria loadings can be made for developments based on either their planned condition or actual development conditions. BMPs modeled by IDEAL include ponds, cisterns, bioretention cells, bioswales, sand filters, permeable pavement, and vegetated filters. The model allows the user to quickly compare whether a development with a specified combination of BMPs is likely to meet water quality goals using a specified set of practices.

2. Managing Water Supplies and Quality in a Highly Urbanized Basin - Bruce Lytle, Lytle Water Solutions, LLC, Highlands Ranch, CO (co-authors: Frank P. Jaeger)

Cherry Creek is a very small, but complex, basin in the Denver, Colorado metropolitan area that has intense competition for limited supplies of water. To complicate matters further, Cherry Creek Reservoir is located at the downstream end of this suburban reach and has both high recreation and environmental values that are protected by a total maximum annual load (TMAL) regulation controlling the incoming water quality to the reservoir. These water quality restrictions produce additional constraints on an already limited water supply. There are eight water suppliers upstream of the reservoir that will serve over 350,000 people, and each of these entities depends on Cherry Creek water supplies to varying degrees. Because of this, basin water is heavily used, and reused, which also affects downstream water quality. Therefore, the water supply entities have had to find ways to balance maximizing use with maintaining water quality. To manage available supplies, a surface/ground water numerical model was developed to optimize the use of available water resources without regard for the current jurisdictional boundaries among the water supply entities. A new, off-stream reservoir was utilized to help manage the available water supplies. Through re-use and re-timing of available flows with reservoir storage, water management was optimized for all water supply jurisdictions. To simultaneously manage water quality in the basin, a watershed model and a reservoir model were developed to understand the effects of (a) surface and ground water withdrawals, (b) point and non-point discharges, and (c) water quality in the reservoir so that a TMAL could be developed for the reservoir. These models simulated how future conditions would affect Cherry Creek flows so that appropriate water quality standards could be set for the reservoir. Through re-use, water storage, strict controls on point discharges, and non-point discharge water retention and detention projects, entities in the Cherry Creek basin have

been able to achieve a balance between limited water supplies and protecting water quality to optimize the use of available water resources while maintaining aesthetic values associated with the reservoir.