Progress Report – 8 July 2009
Redesigning the American Neighborhood Project
Rubenstein School of Environment and Natural Resources
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This report covers progress on the remaining, currently-active project objectives for the Redesigning the American Neighborhood (RAN) project. These objectives include stormwater pollutant source and transport research in the Butler Farms and Oak Creek Village neighborhoods, a collaborative detention pond performance assessment with USGS in Englesby Brook watershed, and investigation of citizen attitudes towards stormwater across different neighborhood types. Data collection on all three objectives is currently underway and will conclude in calendar year 2009. However, data analysis, publication, and graduate student defenses are not likely to be completed until the second half of 2010. For these reasons we will request a no-cost extension to allow us to conclude these final activities with the remaining funds. We alerted the EPA Program Manager, Eric Perkins, to the need for this no-cost extension nearly one year ago, as part of a strategic plan to conclude this research initiative productively and efficiently.

Butler Farms / Oak Creek Village Storm Sampling

In stream sampling was initiated in Potash Brook Tributary 7, within the Butler Farms and Oak Creek Village neighborhoods in 2004 (see past project work plans). These data were to inform and complement the process of stormwater best management practice (BMP) implementation within the neighborhoods. Our efforts with neighborhood residents, local regulatory and government officials, and technical experts has led to the development of an LID inspired stormwater management plan for the neighborhood consisting of decentralized and small scale interventions. While these design plans have been generally well received, they are only now being partially implemented in the 2009-2010 construction years. Other components will not be decided on until the broader watershed permit program is defined and the regulatory framework is finalized, possibly in 2010. These developments are beyond the influence of the RAN project.

In recognition of the slow pace of the BMP decision process and implementation Joel Nipper (PhD student) has been pursuing relevant, supporting research objectives within the Butler Farms and Oak Creek Village neighborhoods that build on the objectives identified in the original RAN work plan. An expanded sampling program has added discrete sampling of storm drained sections of the neighborhoods in addition to the two in-stream sampling stations established in 2004. Together these data allow us to apportion total watershed loads between impervious surface washoff, upstream sources, and the aggregate effect of the stream channel on pollutant load delivery. In addition to serving these expanded research objectives, these data will provide a more detailed record of pre-BMP conditions upon which later performance assessments can be based in the future.

This sampling is currently in the last planned field season of data collection under the RAN program. The process of source apportionment will rely on simulation modeling to supplement the collected data sets. Preliminary work in this area has included development of initial structural parameterizations of the watershed sub-catchments using EPA-SWMM, and the programming of an evolutionary algorithm parameter sampling module within MATLAB for iterative SWMM simulations. At the conclusion of field sampling this year the collected datasets will be divided into calibration and validation sets and the analysis will proceed. It is anticipated these efforts will conclude in mid 2010.

Detention Pond Performance Assessment Collaborative with USGS

In 2007 we began a collaborative sampling program with the USGS to assess the performance of a large stormwater pond in the Englesby Brook watershed. This objective was a directly relevant tangent to the original RAN objectives and was approved by the EPA Project Manager, Eric Perkins. Sampling

equipment at the inlet and outlet of the pond allow for continuous measures of flow, turbidity, conductivity and temperature. Water quality samplers at the inlet and outlet enable us to collect flow weighted storm samples, which are analyzed for total nitrogen and total phosphorus. An additional set of inlet and outlet samplers have been used to collect suspended sediment concentration samples, which will be corresponding turbidity record to estimate sediment loads into and out of the pond.

Thirty eight sets of storm event samples have been collected at the inlet and outlet of the pond, from which the pond's nutrient performance can be assessed. Periodic base flow samples have also been collected to allow for an assessment of pond dynamics between storm events. Sampling at the pond is expected to continue into the fall of 2009, contingent upon continuing collaborative funding from the USGS.

Once sampling has concluded at the end of this year Joel Nipper will analyze the data as part of his PhD research efforts. In addition to basic characterization of the runoff data he will combine the pond data with other data that has been collected in the watershed (e.g. flow and water quality data collected at the watershed outlet). Together, these data will be used with statistical and/or simulation modeling to examine pond performance within the broader watershed context along with an assessment of the performance of the pond to treat the runoff from the contributing sub-catchments. These data analysis activities are expected to extend through the spring of 2010.

Stormwater Survey

In 2007 Walt Kuentzel (Associate Professor in the Rubenstein School of Environment and Natural Resources) joined our team to provide survey research expertise. In 2007, we conducted a follow-up survey to the original 2004 survey in the BFOC neighborhood. The follow-up questionnaire replicated a number of the 2004 items to see if our outreach efforts had changed neighborhood knowledge and interest in stormwater management issues. We also began to explore issues of neighborhood activism and public participation. The limitations of a single neighborhood case study, however, led us to expand the scope of the social science part of the study by designing a comparative study of different types of neighborhoods throughout the Northeast. Do the stormwater attitudes, preference, and behaviors of people who chose to live in an exurban housing estate like BFOC differ from people who chose to live in other types of neighborhoods? The applied goal is to understand how the dynamics of contemporary residential choice can be combined with neighborhood design to create sustainable living environments.

One of the biggest challenges has been neighborhood sampling, which has involved getting a handle on the theory and empirical evidence behind neighborhood typologies. Is an exurban neighborhood like BFOC a distinctly contemporary type of neighborhood, or is it simply an incremental evolution of earlier suburban forms of development? To do this, we brought an additional graduate student into the project: Andrea Kofstad. Andrea spent the Fall of 2008 getting up to speed on issues of stormwater management, eco-design, the public participation literature, and environment and behavior literature. During spring 2009 she completed a literature review on neighborhoods and neighborhood typologies and then developed a typology that is theoretically grounded and empirically useful for our intended purposes. During May and June 2009 we selected specific neighborhoods in the Northeastern U.S. based on 4 sample categories: "Retreat" neighborhoods (predominantly seasonal neighborhoods), "residential partnerships" (suburban housing estates), small town neighborhoods, and "co-housing" neighborhoods. Two to four neighborhoods in each category have been chosen, along with half a dozen smaller, "eco-village" co-housing communities.

Having decided on a sample, we are presently gathering resident names and addresses from the tax role lists in city offices. During the remainder of July and August 2009, we will write, format, and print the questionnaire. Since response rates are usually not as good during the summer months, we have decided delay sending out the questionnaire until the beginning of September. We will use a 4-contact protocol: 1) an introductory letter, followed 3-5 days later by 2) a questionnaire and cover letter explaining the survey, 3) a reminder postcard 7-10 days later, and 4) a second questionnaire a cover letter 7-10 days later mailed to non-respondents. If response rates are low, we will conduct a fifth contact:

follow-up phone calls to non-respondents urging them to complete the survey. Once the bulk of the surveys are returned by December, Andrea Kofstad will analyze the data and write her thesis on the results, which will be ready for review by March 2010.

All results from the remaining, active objectives will be reported in full in the final report for this project that will be submitted at the end of the anticipated no-cost extension date for 30 September 2010.