Experimental Approach to Restoring Native Habitats in Urban Landscapes

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Plant Performance in Curb Cut Rain Gardens:

In the summer and fall of 2015, Plaster Creek Stewards (PCS) began installing "curb cut" rain gardens in the Alger Heights and Oakdale Neighborhoods of Grand Rapids, MI. These gardens receive storm water runoff from the street through a cut in the curb, and are planted with native Michigan plants to increase water absorption and promote biodiversity in an urban setting. To better plan for gardens in the future, research was conducted on native plant species used in the gardens. The goal of the research was to measure the performance and survivorship of the most commonly planted species after one year of growth, as well as assess homeowner preference of the species in their rain gardens.

Maps of the plantings were used to identify plants that were present in at least 4, one-year-old, rain gardens. Plants of interest for the study include *Eurybia macrophylla* (big-leaved aster), *Rudbeckia hirta* (black-eyed susan), *Asclepias tuberosa* (butterfly weed), *Carex rosea*, *Coreopsis lanceolata* (lanceleaf coreopsis), *Penstemon digitalis* (foxglove beardtongue), *Penstemon hirsutus* (hairy beardtongue), *Allium cernuum* (nodding wild onion), *Blephilia ciliata* (Ohio horsemint), *Heuchera richardsonii* (prairie alumroot), *Sporobolus heterolepis* (prairie dropseed), *Echinacea purpurea* (purple coneflower), *Packera obovata* (roundleaf ragwort), *Aquilegia canadensis* (wild columbine), *Lupinus perennis* (wild lupine), and *Fragaria virginiana* (wild strawberry). At all 11 gardens measured in June 2017, the plants of interest were counted and given an overall performance value from 1 to 10. For each species, 5 plants were selected randomly and measured for height and a performance variable (leaf number, stalk number, or clump width).

The results showed that there was no significant difference in plant performance; there was a significant difference in survivorship, however. Lupine had the lowest survivorship, while roundleaf ragwort and strawberry had the greatest survivorship due to their capacity for spreading. Considering effective plant establishment, these results suggest that species with low survivorship should be planted in greater quantity, and that species with the capacity to spread can be used for quick cover but should be used carefully. The results also stressed the need for better counts of planted species: there were large gaps in the data and many plants could not be measured for survivorship.

Savannah Restoration at the CRC Denomination Building:

In the summer of 2016, PCS began a project to restore a one-acre plot of land at the CRC denomination building. The site was seeded in the fall of 2016 to create a tallgrass prairie and oak savannah landscape in an urban setting. We were tasked with researching the question: what is the best way to restore a savannah in this urban novel ecosystem? To study this, a long-term experiment was set up in the summer of 2017. At the site, 48 quadrats were established to test the effectiveness of different treatments in prairie restoration. Each square meter quadrat was assigned to these treatments in random order, including the introduction of native soil (to promote mycorrhizal growth), additional seeding, a combination of native soil and seeding, and a control. Seeds were collected shortly before the study from previous PCS plantings and included *Coreopsis lanceolata, Carex brevior, Carex muehlenbergii,* and *Penstemon hirsutus.*

The whole site was mowed at the end of July 2017 before the treatments were added. For the native soil treatment, nine 3x6 inch holes were dug per quadrat using a soil corer, and then were filled with native soil. The seed mix was added at a density of 0.1 ounce per square meter and included a carrier so that they would not be blown away. These plots will be measured and analyzed by summer researchers for several years to come in order to assess the effects of the treatment groups.

The research this summer has showed us how to be better stewards of God's creation, helped us understand the intricacies of ecological research, and given us opportunities to collaborate with others. In both projects, we learned how to design studies that produce practical data while accounting for the many confounding variables present in field research. It has expanded on the research experiences we had in the classroom and allowed us to contribute to larger scale and longer-lasting projects.