Examining Restoration Success after Ten-years of the Green Seattle Partnership: Implementation and Results of the Phase 4 Verification

Bulletin TB-2016-3

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Summary

Declining forests and an urge from Seattle's mayor in 2005 led to the Green Seattle Partnership (GSP), a twenty-year restoration plan for 2,500 acres (10.11 km^2) in urban forests. After five to seven years in active restoration, portions of the forest would be evaluated, and if considered "successful," they would transition from active restoration sites into a maintenance phase, called Phase 4. In 2015, half way through the twenty-year plan, a team of four people—two Plant Ecologists from the City of Seattle Parks and Recreation Department, a Strategic Advisor, and myself—began to assess the restoration sites for ecological success. We used data on diversity, vegetation structure, and ecological processes to help us determine success, as well as qualitative observations and gut-feelings. I reported data for 79 management zones that received a Phase 4 Verification. We moved 50 of these zones into Phase 4, of which there was a strong correlation to meeting ecological thresholds based on reference sites. We recorded the weakest ecological features in Seattle's natural areas to be invasive species, low future canopy, social trails, and edge effects. A logistic regression showed that the latest monitoring data on invasive cover and understory cover were significantly correlated to Phase 4 status, while five other monitoring categories were not significantly correlated.

What is the issue?

Before European-descended settlers arrived in the 1850s, current-day Seattle was primarily coniferous forest. By the 1990s, after logging and urban development, Seattle's forest were isolated patches of primarily deciduous species. Invasive species, especially English ivy, degraded the forests and hindered tree regeneration. Restoration began in 2005 under the GSP, and by 2015 over 1200 acres had received restoration work. For funding and management purposes for Seattle Parks and Recreation, restoration projects need to move from capital projects to maintenance projects once their restoration trajectory is deemed adequate.

Deciding when restoration is ecologically successful is a difficult decision. Often, restoration sites are often given a target for final species assemblage, based on reference site data and altered for site constraints, like being located in an urban matrix. Monitoring data is used to determine if restoration sites are on trajectories towards reaching desired states. Seattle Parks and Recreation decided that restoration sites were considered to be on a desired trajectory if they met 66% of the desired state amount 3-8 years following restoration work.

How was the project conducted?

We used seven ecological characteristics to help us evaluate restoration success: regeneration density, regeneration richness, understory cover, understory richness, invasive cover, invasive regeneration, and canopy composition. We conducted 79 Phase 4 Verifications during leaf on from May to September 2015. Phase 4 Verification consisted of walking through and assessing > 85% of the zone. We cross-checked the seven ecological characteristics with previous monitoring data, selected weakest and 2nd weakest ecological characteristics, and decided if the zone was Phase 4 or not. The Phase 4 decision was subjective and reached through consensus, but differing opinions were captured through a confidence rating of the decision. To analyze the data, I used a logistic linear regression with multiple predictor variables to analyze which ecological characteristics captured in the monitoring data were most related to the binary dependent variable of Phase 4 status. I used data from the monitoring data, and not from the monitoring-checks, because the monitoring data had more precise and more continuous data.

What are the major elements of this project?

Since 2015 was the first year of Phase 4 Verifications for any city within the Green Cities network, this project acted as a pilot study. The selection of Phase 4 candidates, the creation of a data sheet, the analysis of the data, and future improvements are all elements that will be helpful for future Phase 4 Verifications. By creating the verification process, this project will serve as a template for future verifications. This will be useful information for the City of Seattle, but also for the other Green Cities in the Puget Sound region, which have yet to implement a Phase 4 Verification.

Another major element was the logistic regression that related Phase 4 status to the monitoring data. This will help prioritize Phase 4 Verifications in future years. Sites with high invasive cover and low understory cover should be done last, since sites with these characteristics had high correlation with not passing Phase 4. As more data is incorporated into the logistic regression in future years, it's possible that a model could eventually replace Phase 4 Verifications, which would reduce the need for expert opinion for every acre moved into Phase 4. The pros and cons of relying on a model are discussed.