View results

Respondent

4 Brenda Wilson

46:28
Time to complete

Final Project Report

1. Date of this final project report submission *

February 28, 2026 (needed to resubmit on March 2, 2026)

2. Name of project exactly as it was listed in your award letter *

Climate Change in Your Neighborhood

3. Date (or semester/year) of original award letter *

Spring/2024

4. Expiration date of award as listed on original award letter or approved scope change letter - whichever is more recent *

02/28/2026

5. Enter the amount of the award, including any budget increases as a result of a previous scope change. *

$9,704.00

6. What is your project's 6 digit fund account number created for this project and to which the SSC allocation was transferred?

Please ask your project's financial contact for this information if unknown.

SCEF (303692)

7. How much (in dollars) of your award (including previous approved budget increases) is remaining? *

$0

8. Briefly describe the goals of your project. *

Climate change and biodiversity loss resulting in heat waves, flooding, and worsening air quality impact human and planetary health. Literature reviews have found that increasing urban green spaces with native and other beneficial vegetation are nature-based solutions (NBS) that communities can use to reduce the impacts of climate change and improve biodiversity. This project aims to examine the difference between spaces with native/not native vegetation and conventional urban spaces that tend to contain nonfunctional turf grass or are continuously mowed. This study will look at metrics such as temperature, air quality (VOCs, PM1, PM2.5, PM 10), biodiversity index above and below the ground, and soil quality in terms of water retention capacity. Our study hypothesizes that NBS with increased vegetation will be beneficial in terms of less heat, flooding, and better air quality, which will lead to improved human and planetary health outcomes, protect infrastructure, and build resilience in our communities. This pilot study and the results obtained can be used for further investigation in different disciplines concerned about climate change mitigation through increased green spaces. There is applicability in fields such as urban planning and medicine in connecting climate change, human and planetary health impacts, and mitigation strategies. This project hopes to educate community members on this issue so that they can participate in diminishing the effects of climate change as much as possible.

9. Did you complete your project as it was outlined in the original award letter or in a subsequent approved scope change? *

- (●) Yes, the project was completed as originally outlined.
- ( ) No, the project was not completed as originally outlined.

10. On what date did you consider the project finished or that you stopped working on it? *

02/28/2026

11. Describe, in detail, the challenges / obstacles your project faced. *

Soil Sampling Trial Runs. We were unable to conduct trial runs early in the season due to lengthy delays in establishing MOU agreements and sampling permit approvals between the University and Robeson Meadows, setting up purchasing accounts and ordering from vendors, and then waiting for delivery of equipment and supplies, which in some instances took nearly a month. In addition, one of our initially selected sites had to be moved due to a high density of stones in the soil that interfered with soil and insect collection. Future efforts should prioritize early testing of site suitability for all field methods and should commence during the winter for collection throughout the summer period.
Pitfall Trap Durability. The rain covers used on pitfall traps degraded over the course of the summer. Replacing brittle plastic covers with more flexible, durable materials would improve trap longevity and reduce replacement needs.
Air Quality Data Recovery. The Atmotube Pro devices posed logistical challenges. Each sensor had to be paired with a unique phone, and if the corresponding phone was not present at the time of data collection, the data could be lost. This resulted in multiple site-weeks of missing data. Future trials should consider investing in research-grade sensors with automated cloud uploads or centralized data recovery options.
Infiltration Data Quality. Infiltration testing yielded unreliable data due to two main issues:
1. Manual stabilization – Due to uneven or sloped ground at several sites, particularly those in the swale, the infiltrometer could not stand on its own and had to be held in place by hand. This manual stabilization introduced movement that likely disrupted the seal between the infiltrometer's stainless steel disk and the soil, leading to inconsistent contact and poor data quality, including negative infiltration rates. For future trials, we recommend using a clamp, tripod, or frame to stabilize the device. Selecting flatter ground or modifying uneven surfaces would also help ensure reliable contact throughout the measurement period.
2. Insufficient water volume – In some trials, less than 10 ml of water infiltrated over the 5-minute test period. At least 15–20 ml is required for reliable hydraulic conductivity calculations [5]. Extending the test duration or lowering the suction rate may be necessary to achieve this threshold, although the latter should only be done by individuals familiar with the theory and operation of the instrument.

12. Describe, in detail, the successes your project experienced. *

The results of this study provide evidence that native vegetation areas support significantly greater insect biodiversity compared to regularly mowed turf grass areas in Robeson Meadows neighborhood. Light trap collections showed consistent significant differences in order diversity and total abundance between vegetation types. In street mediations, native vegetation (Site 1) had significantly higher order diversity ($p = 0.01788$) and insect abundance ($p = 0.03283$) compared to mowed areas (Site 2). Swale locations showed a similar pattern with native vegetation (Site 3) often having significantly higher insect abundance than mowed areas (Site 4, $p = 0.01593$). These findings align with the initial hypothesis that vegetated areas provide more diverse plant communities and habitats.
Several findings in this study were close to achieving statistical significance but fell short which may be due to limited statistical power. For example, order diversity in swale light traps ($p = 0.05447$) and street median insect abundance ($p = 0.05191$) were marginally statistically significant. This study was likely underpowered, as data collection was conducted weekly over a five-month period across four sites. The sample size may have been insufficient to fully capture the effects of vegetation, particularly given that technical difficulties intermittently disrupted the data collection process.
To improve statistical power and ecological insight in future studies, we recommend increasing sampling intensity by extending the study duration, increasing sampling frequency, or adding more replicate sites. Incorporating additional insect sampling methods (e.g., malaise traps, pan traps) could also help capture a broader spectrum of biodiversity. Moreover, expanding taxonomic resolution beyond order-level identification—ideally to species—would offer a deeper understanding of which insect groups are most responsive to different vegetation types. Year-round monitoring may also reveal seasonal dynamics that were missed in this summer-focused study.
In addition to biodiversity findings, this study explored the potential for native vegetation to improve air quality. Across all pollutant types measured (VOC, PM1, PM2.5, PM10), native vegetation was associated with lower average pollutant concentrations. Although these reductions were not statistically significant at the 0.05 level (see Table 1), all treatment effects were negative and directionally consistent, suggesting a potential air quality benefit. For instance, VOC levels were approximately 15% lower at vegetated sites, and PM1 concentrations were reduced by nearly 5%. These results should be interpreted cautiously, as the sample size was limited and the monitoring period relatively short. Nonetheless, they point to a promising direction for future research on the air quality benefits of native landscaping.
Finally, soil microbiome sequencing has been completed, and data analysis is currently ongoing. Results from this component will provide insight into how vegetation type influences belowground microbial communities—another key dimension of ecosystem health and function. These results will be included in future versions of this report as the analysis progresses.

13. Describe, in detail, how your implemented project addressed sustainability. *

This study presents preliminary evidence that urban green spaces dominated by native vegetation may improve air quality and significantly enhance insect biodiversity relative to conventionally managed turf grass. Thes findings provide crucial support for transitioning away from the ecological limitations of mowed turf grass toward more functional native vegetation in urban landscapes.
Together, these findings highlight the compelling case for incorporating native vegetation into urban design while moving away from the resource-intensive, ecologically barren practice of maintaining turf grass monocultures. The evidence supports native vegetation's role in improving heat island effects, enhancing stormwater management, supporting biodiversity, and providing the foundation for soil quality improvements and carbon sequestration which are all benefits that could drive green infrastructure policy, urban planning decisions, and community-scale climate resilience.
The transformation happening in places like Robeson Meadows demonstrates that environmental solutions don't always require massive infrastructure projects or government mandates. Sometimes the most powerful changes begin with individual residents making different choices about the plants outside their front doors. When those choices are informed by solid research showing clear ecological benefits, they become the foundation for broader community resilience. The data from this study provides the scientific backing that residents, planners, and policymakers need to feel confident that small-scale vegetation changes can add up to neighborhood-wide improvements in air quality, biodiversity, and climate adaptability.
This research proves that the path forward is clear: communities that embrace native vegetation over conventional turf grass are investing in their own ecological and economic future, creating landscapes that work with nature rather than against it.
In addition, we have taken steps to continue this project as experiential learning experiences for undergraduate students in 2 ways: (1) The soil samples have been shared with the undergraduate teaching laboratories for students to extract genomic DNA and perform PCR and 16S rRNA gene sequencing analysis to determine microbial content in the soil sample. Result from those students' experiments will be incorporated into our dataset for enrichment of the analysis. (2) The protocol methods and workflow conditions used in this pilot study will be used to develop a newly proposed environmental microbiology laboratory experience for undergraduate students to learn about biodiversity and changes on the soil microbiome and ecosystem caused by environmental conditions and climate change.

14. Describe, in detail, how your project integrated student involvement and community outreach. *

Two undergraduate students (Nicolas Ramkumar and Keya Patel) initiated the project, recruited faculty mentor Professor Brenda Wilson, and wrote and submitted the proposal to secure SSC funding to support the pilot studies. Three undergraduate students (Nicolas Ramkumar, Keya Patel, and Martin Hernandez) collected and stored the samples and processed the environmental and biota data and wrote up that part of the reports. One master's graduate student (Chaehee Lim) and one undergraduate student (Alexander Kim), under the guidance of senior scientist (Dr. Mengfei Ho) and Professor Wilson, processed the soil samples to extract genomic DNA and submitted them for sequencing analysis. Alexander Kim and Dr. Ho are currently analyzing the sequencing data. Professor Wilson has setup an experimental protocol based on the methods used for this pilot study for the MCB 301 Microbiology Laboratory course that will allow undergraduate students to learn how to process soil samples for microbiome sequencing and analysis.

15. Describe how the project engaged individuals from underrepresented groups and/or how it promoted diversity, equity, and inclusion. *

Martin Hernandez (URM undergraduate student) worked during the Summer of 2024 with Nicholas Ramkumar to learn how to collect and process the samples.

16. What key takeaways should the campus community know about your project? *

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17. Describe the marketing material developed for promotion of your project, including but not limited to advertising (including digital) and/or signage related to this project. All marketing must include SSC's logo and/or a statement of which fee funded the project. Projects must coordinate with SSC to ensure the promotion appropriately highlights the SSC's contributions to the project. *

We have generated a summary report of the study and results that are in non-technical language to share with the Robeson Meadows Homeowners Association, in which the SSC's support is acknowledged.

18. Upload project marketing and/or media not previously submitted in semester progress reports. *

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19. Complete and upload the semester financial documentation for your project. You should reflect all expenditures since your last semester project report. **We strongly suggest that you also upload supporting financial transaction reports from Banner for your award's CFOP. Talk to your project's financial advisor for more information on generating this report.** https://studentengagement.illinois.edu/sites/default/files/2024-09/SSC-Budget-Timeline-SEMESTER-PROGRESS-REPORT-template.xlsx *

NOTE: Any unused project funds remain the property of SSC and will be transferred back to SSC when the project has finished or when the award expires, whichever comes first.

SSC-Budget-Timeline-FINAL-PROJECT-REPORT_0228_Brenda Wilson.xlsx