

**FOREST PRESERVE ADVISORY BOARD
REPORT TO COUNCIL**

Report # 2020-01

SUBJECT: Recommendation that the City of Greenbelt create a science fund or studying the Forest Preserve

DATE: January 28, 2020

BACKGROUND: In the Forest Preserve Advisory Board's Report to Council from May 24, 2018 (Report # 2018-02), FPAB requested that future City budgets contain a Science Fund to be used to fund ecological or historical research in the Forest Preserve to improve understanding of the ecology and history of Greenbelt's forests. Council included the requested funding in the following year's budget for FPAB to disperse through the Public Works Department. In late 2018 and early 2019 FPAB discussed and subsequently created a research program to disperse the Science Fund, and advertised this program in summer 2019 at the University of Maryland, other academic institutions, and local conservation organizations (Attachments 1 & 2). In September 2020 FPAB received one application for the grant program: Green Mechanics, a Benefit LLC, proposes to perform a deer exclusion forest regeneration study (Attachment 3).

DISCUSSION: Green Mechanics proposes a three-year project to assess the effects of deer browse on forest vegetation and tree regeneration. They propose to establish and monitor three paired plots (each 4m x 15m) in various locations in the North Woods and Hamilton Woods Tracts. Each location would have a temporary fenced enclosure plot and an unfenced control plot. The enclosures plots would be made from mesh plastic fencing and 4"x4"x12' posts. All holes for the fence posts and installation of the fencing will be done by hand. Each enclosed plot would be paired to an adjacent unfenced control plot. The fencing would prevent access by deer but not by other wildlife. The plots will be sited with scientific consideration to plant community, slope, aspect, elevation, and other factors, and will be sites to minimize visibility to Preserve visitors. Green Mechanics will choose the specific locations for the enclosures with input from FPAB and City staff. Green Mechanics will survey vegetation in each paired plot in spring and late summer over the course of the three year study and report their results annually. Dr. Peter May, co-founder of Green Mechanics, used similar enclosures in research of wetland restoration on the Anacostia River for his Ph.D. dissertation.

RECOMMENDATION: FPAB supports funding this project. We believe the study will give us valuable insight about forest regeneration, which will be meaningful for the future of our Preserve. FPAB believes that the enclosures that Green Mechanics proposes do not constitute structures and are therefore permitted by City Code Section 12-156. Holes for the posts will be dug by hand, and no concrete will be poured. The enclosures would be removed when the project completes, leaving no trace. The Forest Preserve has consulted with City staff and attorney about this project.

Attachments:

- 1) Science Fund flier
- 2) Science Fund application
- 3) Green Mechanics proposal

Attachment 1: Science Fund flier

Small funds available for studying the ecology, history, and use of the Greenbelt Forest Preserve



The Greenbelt Forest Preserve is a 255-acre preserve owned by the City of Greenbelt, Maryland. As established by City Code in 2003, the land is “preserved in a natural state for the use and enjoyment of present and future generations.” The City Council has established a fund to encourage research about the ecosystem and history of the Preserve, and improve stewardship of the Preserve. The fund will be dispersed as reimbursable grants to researchers for certain types of expenses. Anyone can apply. Preference will be given to projects with outputs that enhance the ability of the city to manage the Preserve. Up to \$2000 is available in 2019.

Projects might include:

- Studying the forest over time to document change;
- Surveying vegetation, invertebrate, or vertebrate animal populations;
- Mapping invasive species;
- Surveying stream aquatic life, water quality or pollution;
- Reviewing documents to trace the history of land use within the Preserve;
- Surveying attitudes about the Preserve from citizens/users;
- Studying the impact of adjacent land uses and land management practices on the Preserve;
- or
- Other ecological, social, or historical research.

See Sec. 12-159: City Code: <https://www.greenbeltmd.gov/Home/ShowDocument?id=7734>

Request application from forestpreserve@greenbeltmd.gov

Attachment 2: Science Fund Application

Greenbelt Forest Preserve Ecology Fund Application

The Greenbelt Forest Preserve is a 255-acre preserve owned by the City of Greenbelt, Maryland. As established by City Code in 2003, the land is “preserved in a natural state for the use and enjoyment of present and future generations.” The City Council has established a fund of \$2,000 for 2019/2020 to encourage research about the ecosystem and history of the Preserve, and improve stewardship of the Preserve. The Forest Preserve Advisory Board will review applications for this fund. The fund will be dispersed as grants to researchers for certain types of expenses. All funds must be expended by June 15, 2020. Anyone can apply. Preference will be given to projects with results that enhance the ability of the city to manage the Preserve. Awardees must submit a written report and present their research in a public talk and/or poster at the end of the grant period.

Name of the person or group submitting the proposal _____

Affiliation _____

Contact Information

Name and Address _____

Telephone _____ Email _____

Date of submission: _____

Descriptive Title of Project _____

Attach separate sheet/s with the following:

Project Summary/Abstract

Project Narrative

Please indicate any time specifications: Is there a particular season in which this research will be done? Will sampling occur monthly, quarterly or yearly? When do you expect to complete your project?

Simple project budget and budget narrative

Resources or equipment to be used

Expected Output/Results

Bibliography and References cited.

Please submit documents by September 30, 2019 to forestpreserve@greenbeltmd.gov or to Jason Martin, Greenbelt Public Works Department, 555 Crescent Rd, Greenbelt, cell: (240) 462 3758

Attachment 3: Green Mechanics proposal



Deer Exclosure Forest Research Grant Proposal for the Greenbelt Forest Preserve

Green Mechanics Benefit LLC is locally based Ecological Engineering, Research & Design startup based in Greenbelt and comprised of University of Maryland Alumni. We aim to provide innovative approaches for ecosystem restoration, environmental assessment and research, TMDL crediting for municipalities and quantifying our social, economic and ecological impacts within our community through our projects.

BLLCs (Benefit Limited Liability Corporations) are an official State of Maryland corporate type that places an equal importance of public goods on social, economic and environmental factors as well as business benefits within the operations of the corporation.

Team Members

Larry X. Davis (Co-Founder & Lead)

Justan Randolph (Co-Founder) Peter

I. May, Ph.D. (Co-Founder) Kelly

Fleming (Co-Founder) Michael

Carmichael (Co-Founder)

Project Summary

This research project will focus on determining the effect of deer browsing/herbivory on forest regeneration within the Greenbelt Forest Preserve by utilizing methods of experimental enclosure ecology (DeStefano et al 2010, McKenna et al 2013). The effect of deer herbivory on future forest structure and health is well documented (Stromayer and Warren 1997, Nishizawa et al 2016). Dr. Peter May, a member of the Green Mechanics team, has conducted PhD level research focusing on determining the effect of non-migratory goose herbivory on tidewater Anacostia River marsh restoration using the enclosure methodology (May 2007). The establishment of deer enclosure fencing within three (3) defined blocks in the forest preserve will allow the research team to track the emergence and establishment of herbaceous and woody plants, shrubs and trees over time in the absence of the often unseen effects of large herbivores, mainly deer. Spring and late summer documentation through visual empirical surveys of the emergent plants within the enclosures will document the presence and persistence of natural plant regeneration. Native seed banks often do not have a chance to establish due to grazing effects after germination and early growth. This effort will reveal the potential for utilizing planned enclosures to foster natural forest regeneration. It is anticipated that if the research shows a positive effect, strategically placed enclosures positioned within the forest could provide a low energy but high impact tool for the community to foster natural forest regeneration over time, leaving enclosure fencing up only long enough for trees and shrubs to establish and persist without the enclosure fencing in the presence of deer herbivory. At Green Mechanics, we call this approach Time Ecologies.

Site Location

Potential enclosure research sites will be chosen after field surveys with planned and organized stakeholder participation and agreement. At least one enclosure within each of the North and South Tracts of the Greenbelt Forest Preserve will be determined in the field after consultation. Attempts will be made to include multiple factors for site decision such as forest community type/structure, slope, solar aspect, soils, proximity to the Beltsville Agricultural Research Center and existing paths. The siting of the three enclosures can be normalized for these factors to be similar, or can be chosen to represent different forest types and contexts in the landscape. Determinization of site location is ultimately contingent on the Forest Preserve Committee and City Management recommendations.

Project Methods

Construction of enclosures will be undertaken without heavy equipment and will be done by hand. Three (3) enclosures will be constructed with 3 corresponding unfenced control plots, designed at (4m x 15m) with standard heavy duty deer fencing. The enclosure height and narrow rectangular design is an effective approach to reduce the potential of deer hopping over the fence and into the enclosures. Wooden fence posts will be anchored in 2 foot holes dug manually with post hole diggers. Wide meshed heavy duty plastic deer fencing will be affixed to 4'x4'x12' fence posts with monoline supports between the posts to support the mesh and metal stakes to pin the mesh to the ground. Control plots without fencing will be adjacent to enclosure plots marked with corner stakes.

The enclosures will be regularly visited and maintained with surveys annually each spring and late summer to capture seasonal emergence of herbaceous macrophytes as well as woody shrub and tree emergence. Surveys will be completed by creating a visual square meter grid with germinated plants identified to species, photographed and mapped within each enclosure and control plot. Emergence and survivorship of

woody species will be tracked annually by height and, in the future if the experiment continues longer, by DBH (diameter at breast height). This effort is expected to take place annually over a minimum of 3 years of funding for this project. An annual report of the findings of each years survey will be developed and submitted before the end of each year.

Expected Output/Results

We hypothesize that within exclosures prohibiting herbivory there will be a significant increase in the total numbers of germinating herbaceous and woody plants over time when compared to adjacent unfenced control plots. It is also expected that there may be a discernible increase in plant species and functional diversity within the 3 exclosures in comparison to the control non exclosure groups. A report on each year’s findings integrating the Spring and late Summer survey results and comparison to previous years data in the second and third years observations will be provided at the end of the year.

It is expected that the exclosure plots could (and should) be maintained beyond the 3 year project life to allow for a greater degree of time for natural, self-organized forest regeneration to take place and be observed. For example, the interannual variation in oak acorn mast generation operates on non-regular time scales and could be captured by a longer exclosure observational period.

From a forest management perspective, data from this experiment could provide information and impetus on strategies for using exclosures over time to assist in natural forest regeneration. While herbaceous species may disappear once exclosures are removed, once woody species have reached a stage of growth beyond deer browse impacts (i.e. meristem heights above deer reach, bark development beyond buck scrape) those species will be on their way toward providing the next generation of forest. While annual active deer management is occurring in the adjacent Beltsville Agricultural Research Center, the Greenbelt Forest Preserve may act as a refugia for deer as it is clear from personal observations that deer herbivory is impacting groundcover, shrub and midstory forest structure as well as the future canopy cover trees. This research may provide a valuable passive tool for Greenbelt Forest Preserve regeneration.

Materials and Labor Costs

Table 1. Total Sum of expenses for project implementation, Green Mechanics Service charge of \$20/hr

Materials	\$958
Green Mechanics Implementation and Reporting	\$880
2% Contingency	\$37
Total	\$1,806

Resources and Equipment

Table 2. Necessary items for the installation of the exclosures. All of the quantities sum up to the material value in Table 1.

Materials	Quantity
4'' x 4'' x 12 Pressure Treated Wood	30
7.5' x 330' Standard Deer Fencing	1
Post Hole Diggers	2
Monoline and Metal Stakes	1 spool and 1 box
Laminated Exclosure Descriptive Signage /Contact Information /QSR Code	3

Timeline of Project Implementation

Table 3. Projected timeline of project implementation and monitoring.

Greenbelt Forest Preserve Projected Project Timeline	Year 1	Year 2	Year 3
Order Supplies	Feb 2020		
Construction of Exclosure 1	Feb 2020		
Construction of Exclosure 2	Feb 2020		
Construction of Exclosure 3	Feb 2020		
Plant ID Assessment #1	Apr/May 2020	Apr/May 2021	Apr/May 2022
Plant ID Assessment #2	July 2020	July 2021	July 2022
Plant ID Assessment #3	Sep 2020	Sep 2021	Sep 2022
Final First Year Reporting	Oct 2020	Oct 2021	Oct 2022

References Consulted

DeStefano, S., Faison, E., Compton, J., & Wattles, D. 2010. Forest Enclosures: An Experimental Approach To Understanding Browsing By Moose And Deer. *MassWildlife*, pp 14-23.
https://harvardforest.fas.harvard.edu/sites/harvardforest.fas.harvard.edu/files/publications/pdfs/DeStefano_MassWildlife_2010.pdf

May, P I. 2007. Alternate State Theory and Tidal Freshwater Mudflat Experimental Ecology on Anacostia River. Doctoral Dissertation, *University of Maryland*, pp 19-76.

McKenna, J., Beheler, B., Carlson, D., & Farlee, L. 2013. How to Build a Plastic Mesh Deer Exclusion Fence. *Purdue University Forestry And Natural Resources*.

Nishizawa, K., Tatsumi, S., Kitagawa, R., & Mori, A. S. 2016. Deer herbivory affects the functional diversity of forest floor plants via changes in competition-mediated assembly rules. *The Ecological Society Society of Japan*, pp 569-578.

Stromayer, K.A.K., and R.J. Warren. 1997. Are Overabundant Deer Herds in the Eastern United States Creating Alternate Stable States in Forest Plant Communities? *Wildlife Society Bulletin* 25(2):227-234.