**Tufts Institute of the Environment – Environmental Interdisciplinary Research Project**

# Final Report: Campus Biodiversity Assessment, Grafton, Massachusetts, Cummings School of Veterinary Medicine at Tufts University, June - August 2016

***PI's***: Carolyn Talmadge, MS, GIS Specialist, Alison Robbins, MS, DVM
***Student Researchers:***: Irene Galan Lecona, DVM, MS Candidate (Project Director); Alex Shimmel; Adel Molnar, MS Candidate; Matthew Kamm, PhD Candidate
***Co-PI's***: Felicia Nutter, DVM, PhD, Maureen Murray, DVM, David Lee-Parritz DVM, Michael Reed, PhD
***Collaborators***: Jim Phelps (Cummings Farm Manager), Jean Poteete (Senior Campus Planner-Grafton), Ben Sawicki, MS (Conservation Drones Consultant)

Story Map Presentation Link – Click here to view the interactive application.

## Introduction

The loss of biological diversity is a critical concern for our planet, with loss of species through extinction, but also through the steep reduction in population size (over 50% loss) in the last 40 years (World Wildlife Fund, Living Planet Index Report, 2014). As animal and plant populations around the globe are diminished, biologists are increasingly finding effective ways to enhance, restore, and augment populations to halt and reverse biodiversity loss, with many projects conducted at a small local scale. The first step to take to prevent biodiversity loss is to identify species presence in an area of interest, then develop ways to preserve and enhance the species and populations of interest.

The goal of this project was to conduct a biodiversity inventory of the Cummings School large and diverse campus as a baseline for further research and potential conservation initiatives. We conducted an initial inventory of the wildlife and habitats on the Grafton Campus, with emphasis on identifying potentially rare or threatened birds, amphibians, reptile and mammals and their suitable habitats. The inventory was conducted by direct observations, listening for calls, dip net sampling of wetlands habitats, and the use of camera traps to record images of wildlife. The locations of species observations were mapped using GPS field data collection and analyzed. Various maps, videos and images were created to record and report on the campus' ecosystem. Our complete results are displayed using the ESRI Story Map web application and documents land use, results of the avian, herpetological and mammal surveys. The development of the story map was directed by Carolyn Talmadge and reflects the extensive collaboration and dedicated work conducted by faculty, students and staff from both the Grafton and Medford campuses.

The Story Map Presentation is available for viewing through the public link here: http://arcg.is/2avKPNW .

Here is the code for embedding on the TIE website: <iframe width="100%" height="800px" src="https://tuftsgis.maps.arcgis.com/apps/MapJournal/index.html?appid=b1ead12d52774ee08bc6efa408531b11" frameborder="0" scrolling="no"></iframe>.

We plan on making a few additional edits to the site over the next 2 weeks, after which the project will be complete.

In this report we briefly summarize our results.

Methods:

Land Use: Using the GPS coordinates collected from the field surveys, the data was joined and brought into a Geographic Information System (GIS), specifically ESRI ArcGIS 10.3.1. Through the integration and analysis of the data, the team created maps and a preliminary inventory of the biodiversity of the campus that has never before been collected. Additionally, an unmanned aerial vehicle (drone) was used to capture high resolution imagery and video footage of the campus. Finally, to assure high presentation quality, open access, and wide dissemination both in the Tufts community and beyond, the ESRI Story Map web application was chosen as the publication medium.

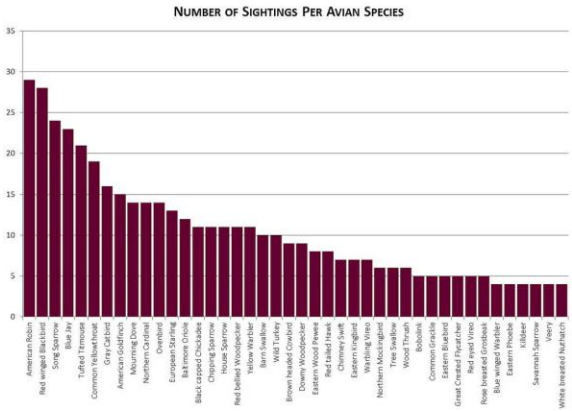
Avian Survey: To determine which areas to target for surveying, habitat extent and spatial distribution of different habitat types were mapped and analyzed beforehand using satellite images and Land Use 2005 (MassGIS). Four avian surveys were conducted from May 2016 to August of 2016. Bird identification was carried out by both sight (direct observation) and sound, by two well-trained and experienced surveyors, Biology PhD student, Matt Kamm and Tufts Professor, Dr. Michael Reed. The minimum sampling effort was established to 10 birds per point and with a distance of at least 100m in diameter from the previous point. Every land use type was surveyed separately to ensure comparability between different assessment sites.

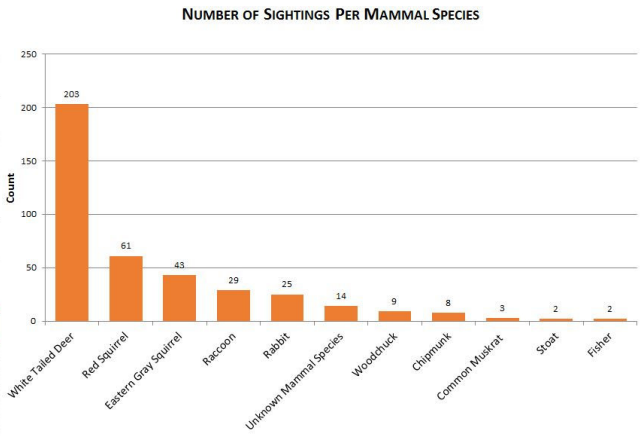
Mammal Survey: For the mammal survey, ESRI ArcGIS 10.3.1 was used to generate a “deployment map” consisting of a deployment grid layer, a land use layer, and Ortho Imagery. The boundary of the campus was divided into 6 independent deployment sites and each independent deployment site into 9 target sites. From May to July 2016, the field crew used the “deployment map” to navigate to each of the target points selected within each grid for the current deployment site. Within each site, five grids were selected based on land use, accessibility and distance to other cameras. Once the crew reached the target point, a place was selected for camera deployment in the immediate vicinity (within a maximum radius of 20m, approximately 65ft). The location was recorded with a GPS unit and written down on a deployment form. Two camera trap brands were used in this inventory (HC500 HyperFire™ Camera (1) and Moultre Trail Cameras (4)) and Reconyx BuckView Advanced™ software was utilized to upload, view and manage the images. From May to July 2016, the five camera traps were deployed and rotated seven times. The data was stored in SD cards and retrieved after a period of 5 – 6 days.

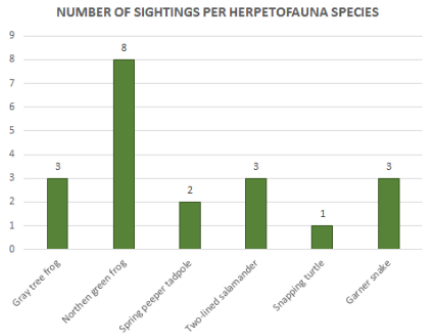
Herpetofauna survey: For the purpose of this survey assessment, a map was created in ArcGIS using a combination of four layers (Potential Vernal Pools, Land Use, Ortho Imagery and Hydrology) to help the survey crew to target the places to be hiked to look for ponds, pools and other available sites for dip netting. For each body of water (stream, pond, pool), one of the team members determined the presence or absence of vertebrate species by dip-netting for larvae and by walking through the basins of the ponds looking for egg masses. The number of dip-net strokes differed between sampling units (e.g., depending on habitat characteristics, individual abundance, etc.) but if possible a minimum of five dip-net strokes were made and the sampling locations were recorded with a GPS unit and after each sample. All larval amphibians were collected from the dip-net (using a teaspoon to minimize the chances of harming larvae). Followed by identification to species level, when possible, data collection and release.

Results: In the summer of 2016, the Grafton Campus Biodiversity Assessment team visited and collected data from 146 sites within the Tufts campus area.

A total of 77 vertebrate species were identified (60 birds, 11 mammals, 2 reptiles and 4 amphibians).




## Conclusion

As animal and plant populations around the globe are diminished, scientists are increasingly finding effective ways to enhance, restore, and augment populations to halt and reverse biodiversity loss. Habitat monitoring and assessment is an essential process to ensure ecosystems remain sustainable and habitable for years to come, in additional to determining key areas for conservation priorities. In the last decade, there has been a dramatic increase in the availability of information available for conservationists, along with the development of applications and tools for managing this large amount of data and resources. The absence of reliable information and, consequently, sound assessments can have the most serious consequences for the understanding of biodiversity and for the development of indicators and indices which allow changes and trends to be monitored and changed over time.

The Cummings School of Veterinary Medicine at Tufts University has remained steadfast in its mission to conserve and protect the numerous habitats and ecosystems throughout the Grafton campus. By implementing a standardized biodiversity assessment, the University is doing its part ensure the campus remains habitable for native species, while maintaining its ability to grow as a veterinary and educational institution. The University will continue to collect data and information on these habitats to ensure a sustainable future for generations to come.

Please see the story map for the complete report and analysis of this research project.