Fall 2021 ENVS 401A Project Statements

Shifting baselines on a changing planet: a collaborative past and future ecology of Vermont

Context

Conservation actions are anchored by baselines. Traditionally, conservation decision-making has prioritized attainment of historical conditions deemed "natural", often with a pre-European vision of landscapes in mind. But scientific data are increasingly revealing that there is no such thing as a place untouched by humans, dovetailing with environmental justice concerns that a human-free "wilderness" can be exclusionary.

On a rapidly changing planet, returning to a single version of the past is quite honestly impossible. But *whose* past have we been trying to return to? The past is in fact plural: it is not a single static baseline, but a moving picture witnessed by many observers and recorded in many archives. Data from the past lie waiting for us to uncover – below ground, but also stored in museums, attics, and memories. Our task is to recognize these archives and make them more broadly accessible, telling a wider range of stories about the past and providing a menu of future conservation scenarios for a more diverse group of stakeholders to choose from. We will engage with natural history and archaeological legacy collections, historical surveys, and the landscapes themselves, and creatively broaden participation in aggregating and interpreting these datasets through specimen digitization and utilization of community ("citizen") science methods. Together, we will explore Vermont's past using records that span millennia to decades and provide both scientifically rigorous datasets and new narratives of change that challenge Vermonters to think differently about future ecosystems and how they may participate in documenting them.

Project #1: Botany Alive: developing a wildflowerbased record of past and present climate change from museums



Community partner: Fairbanks Museum and Planetarium

Anna Rubin, Director of External Relations & Allison Gulka-Millard, Director of Programs

Introduction

Understanding the past impacts of climate change is central to developing an accurate contemporary assessment of how our natural world is evolving, as evidenced by changes documented in natural history observations – whether in museum collections or a digital app. The mission of the Fairbanks Museum & Planetarium's Botany Alive project seeks to build on more than 100 years of dedicated practice by extending the interpretation of a living botanical exhibit – the Wildflower Table – to reveal changes in botanical life, representing a unique phenological dataset (phenology = timing of biological events) that can tell the story of Vermont's past climate as "seen" by plants.

The Wildflower Table is a living display that features local flora collected by volunteers to showcase the variety and beauty of native species. Individual flowers are labeled and displayed, grouped loosely by genus. This exhibit was established by Frances Clapp Fairbanks, the wife of Museum founder Franklin Fairbanks, and has been a fixture in the Fairbanks Museum since its earliest days – meaning there are decades of data points to analyze. Additionally, weather records kept at the Fairbanks Museum since 1894 represent the longest continuous record of weather at the same location in Vermont. These data include daily maximum and minimum temperatures, precipitation amounts, relative humidity, wind direction and speed, barometric pressure and general character of the day.

The primary responsibilities of this team will be to digitize historic botanical data, establish citizen science guidelines, integrate plant and climate data into a phenological assessment, and contribute to the development of a new Botany Alive exhibit. The resulting museum exhibit and connected curriculum guides will integrate data-informed interpretations of first bloom dates with this Victorian-era arrangement to deepen the Museum's relevance in a wider discussion of the effects of climate change.

Project Needs

- Review existing data (includes note cards, legers, and excel files) and Standardize digital presentation to include Genus, Species, common name, first bloom date, collection location, and other relevant information in alignment with iNaturalist and the Vermont Atlas of Life
- Standardize collection protocols, including recommended tools for gathering and recording specimens in the service of greater public access
- Contribute to communications about citizen science opportunities
- Present data to partners, including the Vermont Center for Ecostudies, Dartmouth College, Northern Vermont University, and the University of Vermont
- Contribute content for interpretive panels and audio tour content

Project #2: The Vermont Atlas of Life: connecting historic and citizen science observations of small mammals



Community partner: Vermont Center for Ecostudies

Kent McFarland, Conservation Biologist

Introduction

As human activity profoundly alters the map of life, our response requires knowledge of plant and animal distributions across vast landscapes and over long periods of time. Vermonters cannot respond effectively to climate change, natural disasters, invasive species, and other environmental and economic threats without a new understanding of the state's living resources. What lives here? What's at risk of being lost? The answers lie scattered among books, reports, computers, museums, and even in the journals of Vermonters now living or long passed.

The Vermont Atlas of Life (VAL) is a growing library of knowledge on Vermont's animals, plants, fungi and microorganisms - an online, real-time resource with maps, photographs, and data open for anyone to use. Data sharing has become an important issue in modern biodiversity research to address large scale questions and conserve species. Despite the steadily growing scientific and conservation demand, data are not always easily accessed. The initial Vermont Small Mammal Atlas was completed from 2008 to 2011 with the goal of learning more about the distribution and habitat requirements of terrestrial small mammals in Vermont.¹ Data were obtained from field surveys conducted at 47 sites across the state from 2008 to 2010, incidental small mammal data collected in 1998 during herptile surveys, records from the Zadock Thomson Natural History Collection and other museums, and a literature review (including unpublished sources). The field surveys contributed more than 3,000 records representing 20 species. The Vermont distributions of 21 species of small mammals were mapped based on field surveys and historical records, and expanded descriptions of the habitats of each of the species were provided. With your help, the VCE hopes to advance the state of our knowledge of Vermont small mammals and their conservation by mobilizing primary occurrence data and making key information accessible for a wide range of audiences through an interactive, open-access VAL.

Project Needs

- Gather all primary occurrence data and metadata from the Vermont Small Mammal Atlas, <u>VAL iNaturalist data</u> (see <u>mammal data</u>), Middlebury Natural History Collections, and possibly other sources, into <u>Darwin Core</u> format and metadata and publishing these data on the <u>VAL IPT server</u> for the <u>Global Biodiversity Information Infrastructure</u>
- Compile natural history and ecological information for all species
- Create an interactive web site within the Vermont Atlas of Life. VAL atlases are built using WordPress as well as data pipelines through APIs, Javascript leaflet maps, and other technologies. The site will include: introduction, species accounts and maps, overall results to date, access to primary data, how to contribute, and more

¹ Kilpatrick, C. William and Jason Benoit (2011). Small Mammal Project: Final Report. University of Vermont and NorthWoods Stewardship Center. Unpublished.

Project #3: Changes in the land: telling the story of change of the Bridgewater Hollow Bramhall Wilderness

Community partner: Northeast Wilderness Trust

Shelby Perry, Wildlands Ecology Director & Hannah Epstein, Stewardship Coordinator

Introduction

The Northeast Wilderness Trust is a regional land trust unique in its exclusive focus on preserving wilderness areas. This focus on wilderness is informed by

the Trust's belief that wilderness has intrinsic value and the right to exist for its own sake; offers experiential benefits to hikers, hunters, paddlers, and wildlife watchers; and affords multiple societal benefits including the provision of wildlife habitat, climate regulation, clean air and water, and a scientific benchmark against which progress toward sustainable use of the managed landscape can be measured.²

In 2020 the Wilderness Trust purchased its first preserve in Vermont, the 355-acre Bridgewater Hollow Bramhall Wilderness Preserve. Protecting a property is not the end of its story though, we still have many decisions to make about how to care for the property in the long term. Those decisions can be based on a wide variety of factors, including the context of the property, its history, and the processes playing out on the property now. Given that NEWT is a wilderness trust, most of the management decisions that they make on a property are based around embracing the natural changes occurring on a property, and planning things like public access in a manner that will be least impactful to those processes. Telling the story of change on the property will allow NEWT to better understand the forces that created what is seen on the ground today, and to better predict what might change over time. It also allows them to better tell the story of the property to their wider audience, garnering support for future conservation work that may be pursued in the area.

Project Needs

- Research the paleoecological and archeological history of the property and surrounding region using whatever tools may be available to you (creativity is key) including: searching open-access databases, digitization of relevant sediment cores and other datasets from the primary literature, engagement with cultural resource management, compilation of historic information such as photographs and logging/bounty records...
- Explore the property today: describe some of the processes at work on this system today and develop potential protocols for baseline assessments (e.g., BioBlitz)
- Make recommendations of what areas are appropriate for more intensive use (trails, targeted public access) and what areas might be best left untouched
- Tell the story of change on the property through creative media content, connecting the historical processes of the property with the current processes occurring there and present it in a compelling way that NEWT can share on their website

NORTHEAST



WILDERNESS TRUST

² <u>http://www.newildernesstrust.org/mission-and-history/about-wilderness/</u>

Project #4: Leveraging legacy collections: reconstructing human-environment interactions in Vermont

Community partner: Vermont Division for Historic Preservation

Jess Robinson, PhD, State Archaeologist

Introduction



Ideas of Vermont's past continue to evolve in the present. Documenting the long history of human activity in Vermont can inform conservation decision-making both through providing empirical data, but also by challenging how we consider places as "natural" or "wild" with a criterion of human absence. The Vermont Division for Historic Preservation is "dedicated to identifying, preserving, and interpreting historic resources on behalf of the citizens of the state and promoting them as significant components of our communities.³" Archaeological investigations undertaken to comply with federal and/or state regulations have taken place in Vermont regularly since the passage of the National Historic Preservation Act (1966) and Vermont's historic preservation law (1975)⁴. Decades of archaeological site data were mapped and reported in an "analog" manner, using drafted maps with reference to durable benchmarks such as houses, topographic contours, etc. These maps are largely confined to singular final reports or other regulatory documents. There is no way view the site excavations or sampled areas the maps represent holistically, which would in turn enable data synthesis to generate site densities, develop predictive models, avoid areas where previous testing has taken place, etc.

You will utilize your GIS skills to georeference (or accurately overlay in real space) a selection of maps from archaeological site investigations from the 1970s-2000s and digitally map the excavation units, site limits, and other important spatial data the maps depict. This work will provide a critical service to the Vermont State Archaeologist and the Vermont Division for Historic Preservation as they work to both interpret the past through the materials people left behind and provide an efficient and cost-effective regulatory process. Close analysis of these archaeological deposits relative to specific locales, landforms, ecozones, etc. can be used to test hypotheses about the reciprocal relationships between humans and their environments – including how past land-use practices prior to European arrival may be shaping present day ecological interactions. Further, as these archaeological collections span periods of recent climate change, they represent archives of faunal and botanical data broadly relevant to developing management scenarios under future climate change.

Project Needs

- Use GIS to georeference archaeological sites (localities, units) from across the state and appropriately categorize and interpret associated metadata such as artifacts, radiocarbon dates, hearth or lithic presence, zooarchaeological assemblages, phytoliths, etc.
- Develop 'time slice' maps of archaeological site density to trace potential changes in human population size and resource use through time on centennial or millennial scales
- Compare archaeological data with paleoenvironmental proxies to better understand how humans shaped and were shaped by local environments
- Summarize your results and consider how to make them broadly accessible in ways that can inform discussions of wilderness and socio-ecological systems in Vermont

³ <u>https://accd.vermont.gov/historic-preservation</u>

⁴ <u>https://accd.vermont.gov/historic-preservation/resources-rules/laws-regulations</u>