

**Title:** Monitoring Invasive Plant Species and Interpreting Their Origins Along the Northern Half of the Appalachian Trail

**Faculty Member:** Dr. Diane Husic, Professor of Biological Sciences

**Student Researcher:** David Mest

**Project Start Date:** May 18, 2015

**Project Duration:** 10 weeks<sup>1</sup>

**Project Summary and Goals:** We hope to identify key areas along the northern portion of the Appalachian Trail (Pennsylvania – Maine) that are susceptible to habitat degradation due to an influx of specific invasive plant species<sup>2</sup>. This study aims to understand and identify the threats that several invasive plant species pose to the Appalachian Trail (AT). Through collecting and analyzing population data on these species, we hope to achieve the following:

- Establish population size, location, and range for several invasive plant species.
- Interpret location attributes (i.e. proximity to shelters, access paths, and/or road crossings) to determine
  - **at-risk areas** along the AT and
  - **the role of human activity** in the introduction of invasive plant species to the AT from surrounding habitats.
- Document habitat disturbance in areas with extensive foreign plant species invasion along the AT through digital photography.
- Share data and analysis with conservation groups.

**Background:** The Appalachian Trail (AT) is quite possibly the most iconic footpath in the world, stretching roughly 2,200 miles from Georgia to Maine along the world's oldest mountain range. The AT runs along an important conservation landscape, and serves as a beacon for environmentalists and outdoor enthusiasts alike who wish to connect with nature. The Appalachian Trail Conservancy (ATC) estimates that 2-3 million people per year hike portions of the trail, ranging from day hikes to all out "thru-hikes"<sup>3</sup>. It is imperative then, to fully understand any threats to the ecological well-being of the trail. Always changing, the trail has withstood countless threats to its integrity since its original completion in 1937. Destructive hurricanes, infrastructure development, and climate change have all impacted the trail in various ways. Some of the fragmentations caused by these occurrences may be enabling non-native species to enter and thrive. A large portion of this study will focus on invasive species presence around those fragmented areas.

Monitoring population ranges is especially important in the case of invasive species, due to the nature of their rapid growth and their ability to transform ecosystems entirely by choking out native flora and fauna. A successful outcome of this study would be one that concludes with clearly defined population ranges and location characteristics for specific invasive plant species that have not yet been continuously studied along a transect of this magnitude. By establishing this baseline of species information along the AT, including habitat preference, it will be possible to track changes in their populations (e.g. spread) in the future. Establishing population data will allow us to understand whether these species have spread to the trail on their own, or if human activity on the trail is at least in part to

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<sup>1</sup> The work for this project will begin before the official SOAR start date and continue through early August

<sup>2</sup> Species being generally considered are; Garlic Mustard, Burdock, Non-native Thistles, Japanese Barberry, Oriental Bittersweet, Autumn and Russian Olives, Winged Burning Bush, Non-native Honeysuckles, Japanese Stiltgrass, Wine Raspberry, Norway Maple, and Tree of Heaven.

<sup>3</sup> Statistical data via the Appalachian Trail Conservancy

blame. Further analysis of this data will allow us to identify other areas along the trail that may be vulnerable to similar infestation.

Information about how and where individual species originate on the trail is useful to conservation groups seeking to protect the AT's biodiversity. This kind of information is key to developing and enacting policies or practices that seek to limit the introduction of these non-native, invasive species. For example, if a particular species is commonly found around access paths, a reasonable conclusion could be made that hikers are transporting seeds on their persons onto the trail. This information could then be used to raise awareness and promote preventative actions.

**Project Significance:** Kudzu (*Pueraria montana*) serves as a prime example of the importance of monitoring invasive species populations. Overlooked during its introduction to the southern U.S., Kudzu can now be seen sporadically along the AT from the southern terminus in Georgia well into northern Virginia. The Kudzu vine grows rapidly and has demonstrated the ability to cover entire landscapes. Although a wealth of information now exists on the Kudzu vine, the species continues to spread. To date, Kudzu has been reported as far north as Bucks County, PA. This study aims to research several other invasive plant species that we feel pose comparable threats to northern stretches of the AT if left unstudied.

Weaknesses exist in the population studies and other forms of ecological monitoring that have been carried out on wild flora and fauna along the AT. Disconnects exist between research organizations in focus, methodology, and location. It is very uncommon for organizations to carry out large-scale research projects, especially ones that traverse state boundaries. Instead, individual groups usually focus on small portions of the trail each year, and piece them together over time. Rarely is this regional information communicated amongst different conservation groups and thus, landscape scale data is missing. A study done across roughly 1,000 miles between Boiling Springs, PA and Mt. Katahdin, ME (northern terminus) will allow us to see larger trends of species invasion. Additionally, the results of this study will be distributed to outside research organizations interested in the AT or in monitoring invasive plant species, such as the ATC and, locally, the Kittatinny Coalition<sup>4</sup>.

A separate shortcoming of previous studies has been the underutilization of citizen scientists who spend countless hours traversing these regions. Citizen scientists in the form of hikers are intensely focused on the immediate vicinity of long stretches of the trail. Thus, the trail becomes a long survey transect and data collected by hikers using detailed guidebooks can be fairly specific even in the absence of GPS technology. This study will use this shortcoming as a blueprint for its methodology.

**Methodology:** Research will begin near the southern border of Pennsylvania, along the AT in Boiling Springs. From there, the presence of invasive species will be recorded as the trail heads northward. Upon discovery, recordings will be made through digital photography and through a voice-recording device, explaining what was observed. Each night, the information collected that day will be transcribed into spreadsheet software on an iPad. These spreadsheets will contain location attribute data, as well as pertinent details provided in the AWOL Appalachian Trail guidebook including proximity to towns or water sources, elevation data, and distance from access paths. The iPad will also serve as a line of

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<sup>4</sup> Monitoring invasive species is one of the goals of the Kittatinny Coalition. The Kittatinny Ridge is a portion of the Appalachian Mountain Range that runs through Pennsylvania. Dr. Husic and the Dept. of Biological Sciences are members of the Kittatinny Coalition.

communication between Dr. Husic and I throughout the study, as a substitute for in person meetings. This will allow data to be shared fairly frequently, and will ensure that trends are detected as early as possible. Characteristics, as well as sample photographs for each species, will also be loaded onto the iPad for cross-referencing.

Areas with a high invasive species presence that have unique physical attributes will be documented accordingly on a case-by-case basis. The purpose of taking special note to these features is to answer questions such as the following:

- Is the species present due to a man-made disturbance (i.e. clear-cut land at road crossings or utility lanes)?
- Is the species present due to characteristics of the geography (i.e. open clearings with high sunlight, close proximity to water, roads, or agricultural or industrial sites)?
- Are shelters or access paths allowing species to spread due to hikers spreading seeds?

Documenting the presence of these species on a continuous trek north will allow for uniform research, filling key information gaps between studies conducted by other organizations. This information can then be extrapolated upon return to campus to provide a broader picture of the threat that certain species may pose to the ecological well-being of the trail.

**Roles:** Collaboration between Dr. Husic and myself has led to a list of invasive species to consider for the monitoring. Marian Orlousky of the ATC and member of the Kittatinny Coalition has also provided some suggestions<sup>5</sup>, and will serve as our contact with the ATC during our planning period and upon completion of the project. All of the species being considered are eligible due to documentation of their presence in the northeastern U.S. (but not necessarily along the AT).

Dr. Husic will provide direction in selecting the species to be monitored and how to identify them. I will become well versed in the unique traits of each species before the start date. During the study, twice weekly communication with Dr. Husic will allow for collaboration and adjustments in focus if necessary<sup>6</sup>. Upon return, a collaborative final analysis of all data will be done with respect to the projects' summary goals.

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<sup>5</sup> Presence is suspected north of Massachusetts for the following but systematic monitoring has not yet been done in that region; Pale Swallow-wort, Black Swallow-wort, Dodder, Wavy Leaf Basket Grass, and *Salvia glutinosa*.

<sup>6</sup> The study plan is to focus on 3-5 species, but this can be adjusted on the fly if a particular species is not present for extended stretches.

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**Budget:**

Student stipend: \$3000

Faculty stipend: \$1000

Supplies: \$500

- Handheld voice recorder
- iPad
- Protective case
- Spreadsheet and geographic location apps

Permits: \$0

- We have checked with the ATC, and no permits or special permission will be required since no samples will be taken during the study.

The Department of Biological Sciences will provide funding for any expenses not covered by the SOAR program.