

UNG | UNIVERSITY of NORTH GEORGIA™

LEWIS F. ROGERS INSTITUTE FOR
ENVIRONMENTAL AND SPATIAL ANALYSIS

Environmental Education Workshop 8

UNG - Dahlonega Campus

Pine Valley, Lumpkin County, Georgia

April 17, 2021



Grant #
00D882218

Welcome to the Environmental Education Workshop.

We are thrilled that you have decided to attend this workshop! At the workshop, our goal is that you learn more about north Georgia's forests, soils, water, and environment. With this information we hope that our communities will become responsible stewards of the air, water, and soils in north Georgia. We hope the workshop is both enjoyable and educational. Finally, we encourage you to share the information learned today with your friends, family, and neighbors to have the largest positive impact on our communities to keep our air, soils, and water clean and safe. If you have any questions, please contact Dr. Jamie Mitchem. Enjoy the workshop!



Environmental Education Project

The project objectives focus on comprehensive knowledge, application, technology, and environmental science skills on the environmental issues of invasive insect species, vegetation management, impairment of waterways due to sediment, soil and water quality issues affecting native forest ecosystems in urban, suburban, or rural communities, as all of these community types have native forest ecosystems in Georgia. One of the major issues in vegetation management is how to control invasive plant species without the excessive use of pesticides. Most citizens cannot identify native species in the Foothills landscape, nor proper methods for treatment; and therefore, are unable to act as good stewards of native forests/trees in Georgia rural, suburban, or urban landscapes. Learning activities on native/invasive plant identification and best treatment practices will mitigate this lack of knowledge.

About the Grant Team



Dr. Allison Bailey (Left) & Dr. Jamie Mitchem (Right)

Dr. Allison J. Bailey

Associate Professor of Geography & Environmental Sustainability Studies, IESA

Dr. Bailey's teaching emphasizes environmental communication, human interaction with nature, and conducts research on forest health, tree canopy, wildlife habitat, and public green spaces.

Dr. Jamie Mitchem

Professor of Geography/GIS, IESA

Dr. Mitchem's teaching and research have been in the areas of hazards geography, Geographic Information Science (GIS), meteorology, storm chasing (tornadoes), climatology, climate change, social vulnerability, and emergency management.

Jacob Lougee, Student GIS Technician and Project Manager

Jennifer McCollum, Student GIS Technician

Student Workers:

Natalie Crews, Biology Major
 Aaron Carney, Environmental Spatial Analysis Major
 Michelle Ortiz, Journalism Major
 Keshav Kumar, Business Major
 Waminja Cleaveland, Film Major
 Jose Patricio Patino-Cruz, Business Major

Collaborating Partners

Sustaining Georgia's green legacy by partnering with individuals, organizations, and communities in raising awareness toward improving and maintaining Georgia's community forests.



Promote sustainable management that leads to naturally diverse and healthy forests and watersheds within the more than 867,510 acres of national forest lands in Georgia; to engage and educate the public to join in this effort; and to promote preservation of this legacy for future generations.

The Georgia Forestry Commission (GFC) is a dynamic state agency responsible for providing leadership, service and education in the protection and conservation of Georgia's forest resources



GEORGIA FORESTRY COMMISSION *protecting and conserving Georgia's forests*



Chattahoochee Riverkeeper is an environmental advocacy organization dedicated solely to protecting and restoring the Chattahoochee River Basin.

Keeping Watch Over Our Waters Since 1994

The Georgia Master Gardener Association, Inc. (GMGA) has as its primary purpose the support of and advocacy for master gardeners and master gardener organizations throughout the state. We work collaboratively with the University of Georgia (UGA) Extension to provide unbiased, research-based horticultural information to the public through our master gardener extension volunteers.



Lumpkin Coalition is a diverse group of wonderful folks -- young and not-so-young, working and retired, Georgia natives and transplants from all over the country -- united by a common commitment to preserving and enhancing the special quality of life here in north Georgia.

The Hall County Master Gardener Extension volunteers help University of Georgia Cooperative Extension staff convey research-based information about gardening, horticulture and best practices to the public.



**UNIVERSITY OF GEORGIA
EXTENSION**

Today's Agenda

<u>Time</u>	<u>Speaker</u>	<u>Topic</u>	<u>Location</u>
9:30		Registration	Health and Natural Sciences Building, Room 147
10:00	Mitchem	Welcome and IESA info	Room 147
10:15	Lougee	Tree identification app	Room 147
10:45	Mitchem	Trees, Weather, & Climate	Room 147
11:00	James	Hemlocks, Woolly Adelgids, and Predator Beetles and Environmental Leadership Center	Ecological Protection Lab
Noon	Kent	Heirloom seeds, community gardens, pollinators, and trees	Vickery House
13:00		Lunch	
14:00	Student Guide	Campus walk and tree identification	Outside
15:00		End of Workshop	

Practice Citizen Science on your own device



1. Download Survey123 app from the Apple Store or Google Play.
2. Scan the QR code with your camera or QR reader.
3. Open in app and then you can access the survey now and later.
4. Have fun collecting data.

For more information about GIS classes at UNG, visit us at

www.ung.edu/iesa

Tree ID App



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Weather and Climate



Trees affect our climate, and therefore our weather, in three primary ways: they lower temperatures, reduce energy usage and reduce or remove air pollutants. Each part of the tree contributes to climate control, from leaves to roots. The outdoor air conditioning provided by trees reduces the energy used inside your home or office. Shade provided by strategically planted

deciduous trees cools buildings during the warm months, allows the sun's warming rays to shine through its branches in the winter and also protects buildings from cold winds. With some planning, urban trees can help minimize the heat island effect that saddles many cities.

UNG has data collecting weather stations at each of the five campuses. The study of weather provides an excellent foundation for science, technology, engineering and math (STEM) education. The system provides an array of public safety features including lightning alerts, severe weather alerts, temperature forecasts, environmental cameras and agricultural monitoring. It also archives past weather and gives weather forecasts for the coming days. The data can be used to teach about atmospheric pressure, wind speed and direction, and cloud types. The system creates cloud movies, 24-hour time-lapse videos that show the sky conditions for an entire day, in less than a minute. The videos are linked with graphs of temperature, pressure, and dew point.



The UNG WeatherSTEM Station

Soil Condition and Sampling of Hemlocks

Similar to the blight that killed over 3 billion American Chestnut trees throughout eastern North America in the 1930's, another pest, the Hemlock woolly Adelgid (HWA), has been destroying our Hemlock forests since the 1950's. In Georgia, HWA infestations have reached Rabun, Habersham, Stephens, Towns, White, Union, Fannin, Gilmer, Pickens, Lumpkin, and Dawson Counties and are traveling fast. It is predicted that 90 % of our Hemlocks may die in the next few years. Brought into forests and neighborhoods by birds, squirrels, deer, wind, humans,



Woolly Adelgid infesting a Hemlock tree's needles

and the planting of infested trees from other areas, the HWA, an aphid-like insect about 1/32 inch long, attaches itself to the base of the Hemlock's tiny green leaves and sinks its mouthpart into the tree's tissue, sucking out the sap and injecting a toxic saliva. Unless treated, the Hemlock sickens and dies, sometimes within only 2-4 years in the south. The fight is for the very survival of the Hemlock species.

Unless stopped or significantly slowed, the spread of the Hemlock woolly Adelgid in Georgia will have enormous and lasting consequences:

- For fish and other wildlife –loss of the protection, habitat, and cooling effect of Hemlock canopy; permanently altered ecology or forest floor and hydrology of streams and rivers; decreased numbers of trout in particular as water temperatures rise.
- For native plant species – loss of a tremendous number of native plant species that depend on the deep shade and forest floor ecology maintained by hemlocks; resultant loss of food sources for wildlife; rampant increase of invasive, weedy plant species.
- For homeowners -- loss of aesthetics in their landscaping and possible decrease in property value.
- For hunters, fishermen, and other outdoorsmen – loss of recreational environment.
- For tourism and related industries that depend directly or indirectly on the Hemlock tree – huge loss of revenue that could reach into the millions of dollars as it already has in North Carolina.

Ecological Protection Lab

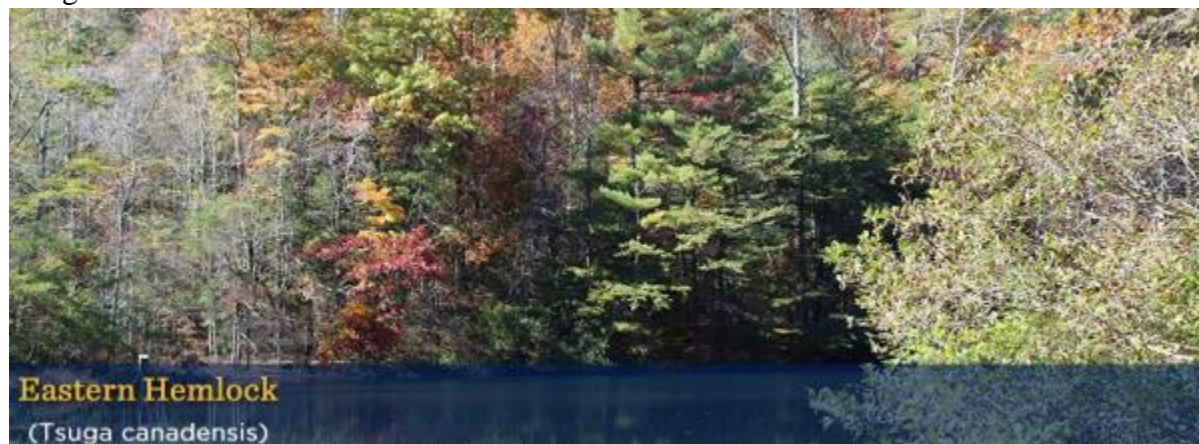
The UNG Ecological Protection Lab (formerly the Beetle Lab) has led in regional efforts to protect the Eastern Hemlock from the invasive Woolly Adelgid by initiating biological control efforts through the rearing and release of predatory beetles to reduce adelgid numbers and impacts.

During a field botany class a few years ago, a seed was planted in Dr. Robert Fuller's head (professor and Environmental Leadership Center director). The instructor of the class, Mark Warren, owner of the Medicine Bow outdoor school, was expressing the value of hemlock trees to the entire ecosystem and the grave risk they face from the hemlock woolly adelgid (HWA). The seed started germinating as he learned about the efforts to control this noxious pest locally by working with Young Harris College, Clemson University, and the University of Georgia (UGA).

These labs have been working with imported beetles that prey on the HWA. Dr. Fuller felt that it was time for the University of North Georgia (UNG) to help fight in this battle too. Fortunately, this notion was allowed to sprout. Two people stepped in to help nurture Dr. Fuller's idea. First, Dr. Mike Bodri, Dean of the School of Science and Health Professions, offered his support and bountiful expertise.

Secondly, Representative Amos Amerson was able to obtain ample funding to hire a full-time lab coordinator and support the lab in terms of materials and supplies to get the lab up and running. Soon members of the community stepped up and provided their support by volunteering and providing funding and donations. Three local nonprofit organizations, The Lumpkin Coalition, Upper Chattahoochee Riverkeepers, and Georgia Trout Unlimited, bestowed upon us the necessary monetary donations. Local residents even donated refrigerators, 5-gallon buckets, and their time to help support the cause.

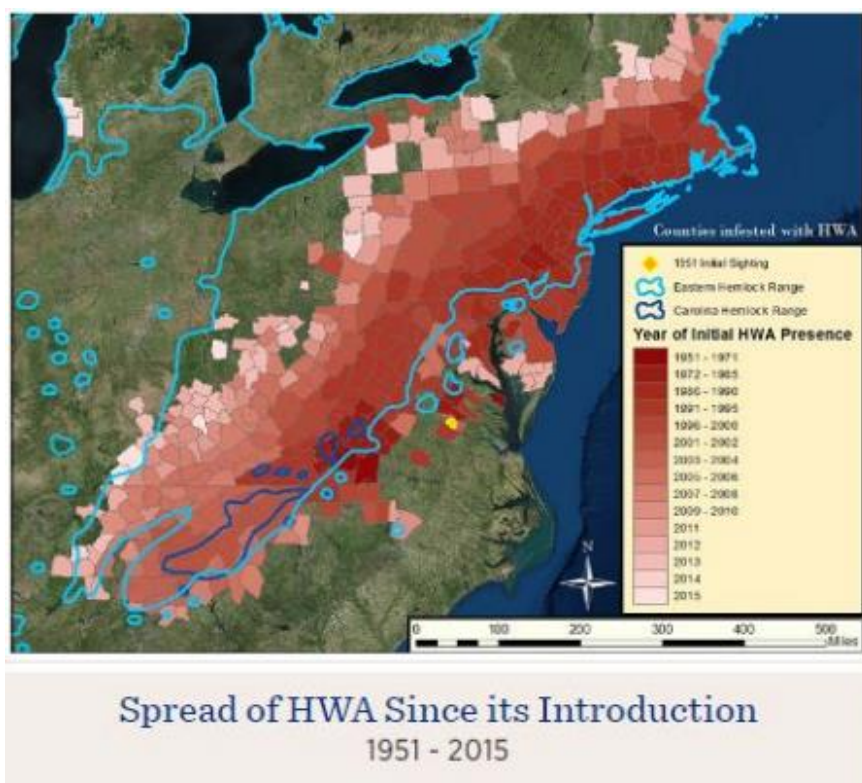
The creation of this lab, the efforts from its workers and volunteers, and the increase of knowledge throughout the community will all aid in this battle against the hemlock woolly adelgid.



The Woolly Adelgid and Predator Beetles

The Hemlock Woolly Adelgid (HWA) is an aphid-like insect that feeds mainly upon Hemlock tree species and was introduced into the eastern United States from Japan in 1951 by import of nursery stock. Since its introduction, HWA have spread to 17 states from Georgia to Maine where they cause large scale mortality of Native Eastern and Carolina hemlocks. This tiny parasite spreads across the forest by hitch-hiking on birds.

HWA use sucking mouthparts to pierce through the base of the hemlock needles into the parenchyma cells (nutrient transport cells). Large infestations can quickly deplete trees of their vital nutrients. Early impact to trees infested with HWA include loss of needles and stunts the growth of new needles and branches. If left untreated, HWA infestations can result in hemlock tree death within 3-5 years of infestation.



In their home environment of Japan, HWA experiences heavy predation, mostly from beetles, that they evolved an impressive bi-annual reproduction cycle. It is precisely these reproductive traits that allow HWA to have such rapid effects on hemlock trees in the U.S. where they have no natural predators. During most of the summer they aestivate on the needles (basically a long sleep), once temperatures get colder they develop a white woolly egg mass. This generation is fully developed in the winter, will begin feeding, and reproduce in the spring. The second generation feeds and produces a new generation that will crawl to a needle to aestivate for the next summer, thus repeating the lifecycle. In the U.S. all HWA reproduction is asexual, a sexual generation does occur in its native range but targets a different tree species that is not present in the U.S.

When the U.S. realized how important it was to control HWA, several exploratory missions were sent to hemlock forest in Japan and the Pacific North West to identify natural predators of HWA. A handful of predatory beetles that coevolved specialized feeding on HWA were chosen as biological control agents. The UNG Ecological Protection Lab primarily breeds two species of beetles: *Lacricobius nigrinus* (Ln) and *Sasajiscymnus tsugae* (St). Our lab, along with UGA and Young Harris, obtain a small amount of beetles each winter which we breed in the lab. These lab reared predators are then released into selected Hemlock Conservation Areas around North Georgia.

Georgia has released nearly 1.4 million predatory beetles since 2004.

[The Problem: Hemlock Woolly Adelgid](#) [The Solution: Predator Beetles](#)



HWA is never going to be fully eliminated from the area, but the goal is to establish the predators to keep HWA populations at levels that no longer cause hemlock mortality. This is a complex process that involves understanding the lifecycle and environmental variables that influence both HWA and the predator beetles. The optimum time, locations, and species of beetles being released is a major area of future research. Lots of this research relies on conducting field surveys of predatory beetle establishment and hemlock health in order to learn what management techniques are working the best.

Heirloom seeds, Community gardens, Pollinators, and Trees



Visit the headquarters of the Appalachian Studies Center at the Historic Vickery House and see its garden, seasonal high tunnel, and food pantry. Learn how to start seeds and receive a free seed starting kit.

<https://ung.edu/appalachian-studies-center/index.php>

Saving Appalachian Gardens and Stories

Our signature project is Saving Appalachian Gardens and Stories (SAGAS) an annual demonstration garden for heirloom seeds and oral history collection. This joint effort of the Department of Biology and the Center began in 2006 as we collected heirloom seeds from the mountain region. Two years later, biology professors, students and community volunteers started an annual demonstration garden at the historic Vickery House, the Center's headquarters. Biology Professor Karrie Ann Fadroski maintains the center's seed bank and oversees the garden. Rosann Kent oversees the story collection.

The garden

The organic garden is designed to minimize water loss, replenish our seed bank and share seeds with our neighbors.

Pollinators

Pollinators play important roles in biodiversity, the survival of wild plant species, crop production, and even the economy. Pollination is key to seed production, and without pollinators like hummingbirds, bees, ants, butterflies, wasps, and many others, our favorite fruits and vegetables would never make it to our tables.

The stories

SAGAS also preserves cultural history by interviewing seed donors about gardening traditions and foodways of Southern Appalachia. Such memories are as important as the genetic diversity of the seeds.

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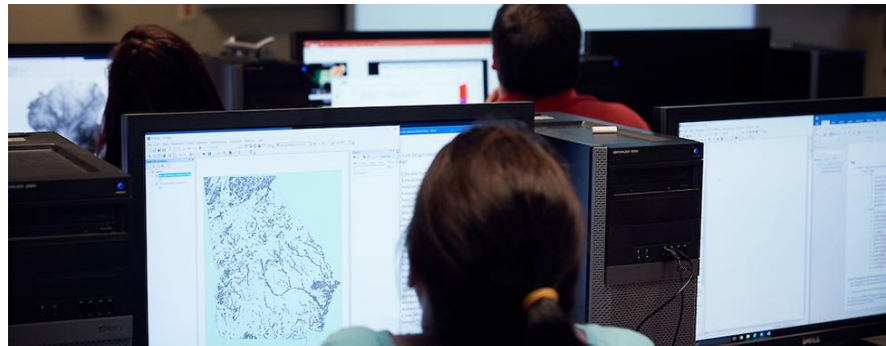
LEWIS F. ROGERS INSTITUTE FOR ENVIRONMENTAL AND SPATIAL ANALYSIS

Established in 2001, the Lewis F. Rogers Institute for Environmental and Spatial Analysis (IESA) on UNG's Gainesville Campus promotes environmental education through the use of advanced technology, interdisciplinary instruction, collaborative learning, and community service. Graduates from our degree and certificate programs have found employment at impressive rates and many go on to reputable graduate schools throughout the United States. Our students follow a curriculum built around a solid core of geospatial science and technology and related courses in areas of their interest, such as environmental science, environmental studies, engineering, education, urban planning and community development, environmental health, and the geosciences. Students find the flexibility to follow their passions, while earning valuable, work-ready training in applied geospatial techniques.

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Notes