

UNG | UNIVERSITY of NORTH GEORGIA™

LEWIS F. ROGERS INSTITUTE FOR
ENVIRONMENTAL AND SPATIAL ANALYSIS

Environmental Education Workshop 4

UNG – Dahlonega Campus

Pine Valley, Lumpkin County, Georgia

September 14, 2019



Grant # 00D882218

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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. Allison Bailey or 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

Student Workers:

Natalie Crews, Biology Major

Aaron Carney, Environmental Spatial Analysis 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 the University of Georgia Cooperative Extension staff convey research-based information about gardening, horticulture and best practices to the public.



Today's Agenda

<u>Time</u>	<u>Speaker</u>	<u>Topic</u>
9:30	Bailey	Registration & Orientation
9:45	Patterson	Snake Fungal Disease
10:30	James	Predator Beetles
11:15	Kent	Understanding Appalachia
<u>Noon</u>		Lunch
12:30	Williams	Pollinator
13:00	Rogers	The Plight of the American Chestnut
14:00	Mitchem	Climate Conditions & Georgia Ecosystems
15:00	Bailey	Streambank Restoration: Walking Tour along the Etowah
16:00	Bailey	Closing Remarks

Snake Fungal Disease

Searching for snakes with fungal diseases in Smithgall Woods State Park is one of 10 projects awarded mini-grants from the University of North Georgia (UNG) Center for Undergraduate Research and Creative Activities (CURCA). Jessica Patterson, lecturer of biology at UNG, said she and her students will continue to survey snakes and swab them for samples, which will be shipped to a lab in Illinois to determine if they have the fungal disease. The CURCA money will be used for supplies and sample analysis.



Searching for snakes with fungal diseases in Smithgall Woods State Park, investigating the effect cigarette smoke has on bladder cancer, and figuring out if a virus can kill bacteria are a few of the projects awarded mini-grants from the University of North Georgia (UNG) Center for Undergraduate Research and Creative Activities (CURCA).

Ten UNG faculty members received the mini-grant funds in late fall 2018. The grants offer up to \$3,000 to fund supplies,

travel to conduct research, or sometimes even specialized student assistance to faculty beginning or continuing undergraduate research projects in all academic areas. The mini-grants are reviewed and selected internally by a cross-disciplinary and cross-campus group of faculty members.

"By providing additional funding, CURCA mini-grants can help faculty move forward their own research while assisting students in getting more hands-on undergraduate research experience," said Dr. Anastasia Lin, assistant vice president of research and engagement at UNG. "Our grant winners and their students go on to present or publish the research completed with the help of these funds. And we think of these grants as potentially precursors to other larger external grants."

Jessica Patterson, lecturer of biology at UNG, will use the funds to help with her research on fungal diseases in snakes in the northeast Georgia region.

The Snake Fungal Disease causes sores to form on a snake's body, leading it to swell. The snake's immune system is suppressed and creates a 50 percent mortality rate in snakes contracting the disease, she said.

"The disease is caused by a naturally occurring fungal pathogen on the forest floor, but we don't know why it is occurring," Patterson said. "We want to figure out where it is and why it is happening."

To accomplish that, she and her students have been and will continue to survey snakes in Smithgall Woods State Park in Helen, swab them for samples and collect data such as their length and weight. The snakes are then released.

Samples from the snakes are shipped to a lab in Illinois to determine if they have the disease. The money will be used for supplies and sample analysis, Patterson said.

The field work and tests will help determine the location of the disease and hopefully lead to an answer, which is important to all.

"Each animal plays a role in the food chain," Patterson said. "Snakes eat insects and small rodents. If snakes die, then the insects and small mammals will take over. No one wants insects and rats all over."

Patterson is not the only faculty member conducting research related to insects and diseases. Dr. Davison Sangweme and Dr. Evan Lampert will conduct a molecular diagnosis of "Wolbachia" infections in insects.



"We will learn about the prevalence of symbiotic bacteria Wolbachia in local mosquito populations and other insects," said Sangweme, assistant professor of biology at UNG. "Wolbachia may offer insights into how we can help control disease vectors harboring pathogens such as Zika, Dengue, Chikungunya and West Nile viruses."

The unique addition is the UNG faculty and their students will enlist the help of children involved in Super Science Kids (SSK), whose mission is to teach and engage at-risk children and youth in shelters and foster care into the field of science. Angelica Krubeck, a 12-year-old middle school student, founded SSK and spoke in front of the biology faculty this semester.

"Angelica and our undergraduate students will assemble kits and train the SSK children on how to collect insects," said Lampert, associate professor of biology at UNG. "We will have pictures and illustrations on what insects to collect and ones to avoid. The collected insects will be preserved in the provided vials. "We hope to capture the SSK children's interest by sharing with them how widespread and common Wolbachia infections can be.""

Both faculty members acknowledge this community-based project will reveal if participation in research improves children's understanding of and their interest in science.

"We wish to capture and fire up interest in science at the earliest opportunity," Sangweme said.

Help Save the Snakes!

Whether hiking on trails or working in your yard, you can help us identify species found in Georgia and locate snakes that may be sick. Snake Fungal Disease (SFD) is a naturally occurring fungus in the dirt that causes many snakes to become sick and die. We are trying to learn more about it to contribute to conservation efforts. Thank you for helping us save the snakes!

Scan the QR code, or type in the URL, and fill out the survey to help us:



<https://arcg.is/jqGPf>



Raising Beetles to Protect Hemlocks

The Ecological Protection Lab (aka Predatory Beetle Lab) is the yellow building just below the Health and Natural Sciences building. It is in this building that species of predatory beetles are bred and released into the nearby National Forest to deal with the **woolly adelgid infestation** of hemlock trees across North Georgia counties. The Hemlock Woolly Adelgid is an invasive, aphid-like insect that has been transported from Asia to the United States, where it has few to no natural predators, and now infects hemlocks from Maine to Northern Alabama. These microscopic insects are threatening the hemlocks with extinction and without treatment, the trees cannot survive.

Hemlock trees are a keystone species, which means that the health of their ecosystem depends on these trees. They are important for wildlife, local economy, soil health, erosion control, water quality, and air quality. The extinction of the Eastern Hemlock species will result in many negative consequences.

Want to get involved or learn more about what UNG students are doing to control Hemlock Woolly Adelgid populations?

You can add us on Facebook:

<https://www.facebook.com/ungbeetlelab/>

To keep up with future events to create awareness of this issue. Call us at 706-867-4596 or e-mail at Stacie.James@ung.edu

We also suggest you follow:

The Lumpkin Coalition (hosts of Hemlock Fest)

<http://www.lumpkincoalition.org/>

<http://hemlockfest.org>

Save Georgia's Hemlocks

<http://www.savegeorgiashemlocks.org/>



Hemlock Woolly Adelgid wool can be found on the undersides of infected hemlock needles.



Adelgids feed by sucking sap at the base of needles.



Laricobius nigrinus is one species of predatory beetles being reared to predate the Hemlock Woolly Adelgid.

Sweet Home Appalachia



The southern and central Appalachians is the most significant biodiversity hotspot east of the Rocky Mountains and the most agrobiodiversity in the U.S. and northern Mexico. But what exactly do we mean by the word Appalachia? Where is it and why does it matter? This session will examine is an overview of the natural treasures that are all around us.

Rosann Kent is the director of Appalachian Studies Center at the University of North Georgia, the state's official center for the study of the region. Her expertise is in heirloom seed saving, particularly their associated ethnocultural memories and community kinship patterns.

Appalachian Teaching Project

Building a Sustainable Future for Appalachian Communities

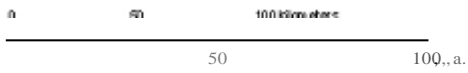
In this regional collaboration, 16 Appalachian Studies Centers in 11 states work together in service for the region. ATP seeks to support and encourage student research and interaction among those campuses and constituent communities.

Students propose solutions to community-defined problems and explore ways to meet the needs of these individual communities.

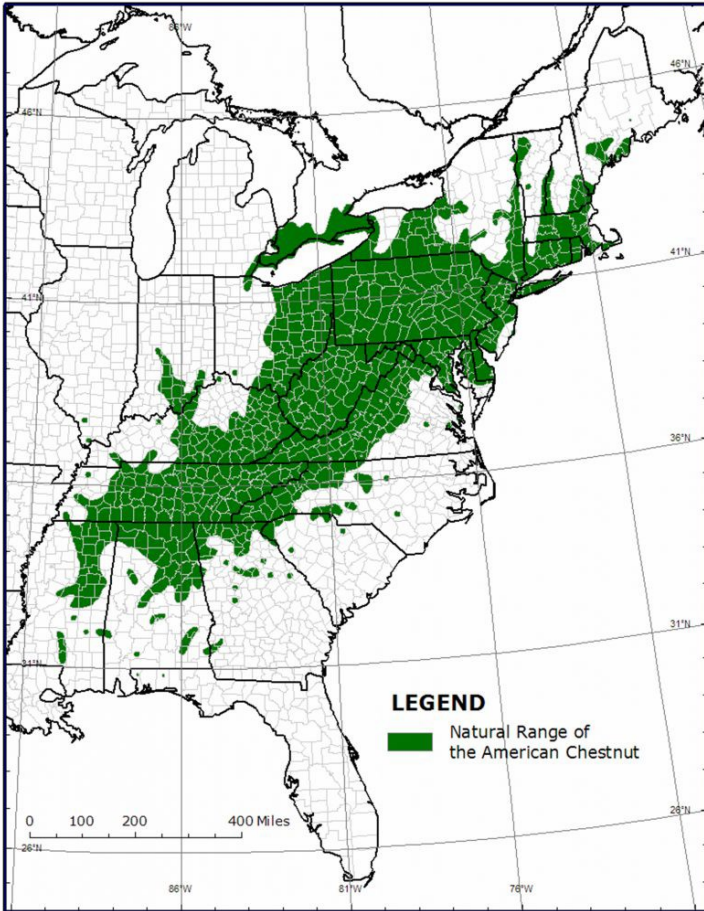
A travel grant from the [Appalachian Regional Commission \(ARC\)](#), a regional economic development agency, provides funding for students to present their project at three-day event in Washington, DC. Students deliver their research through a group presentation and a poster, discuss community issues and learn to network.



GEORGIA



Plight of the American Chestnut



The American chestnut tree reigned over 200 million acres of eastern woodlands from Maine to Florida, and from the Piedmont plateau in the Carolinas west to the Ohio Valley, until succumbing to a lethal fungus infestation, known as the chestnut blight, during the first half of the 20th century. An estimated 4 billion American chestnuts, up to 1/4 of the hardwood tree population, grew within this range.

<https://www.acf.org/the-american-chestnut/native-range-map/>



The Family of James and Caroline Shelton pose by a large dead Chestnut Tree in the Great Smoky Mountains National Park circa 1920. <https://www.ourstate.com/american-chestnut/>

More than a century ago, nearly 4 billion American chestnut trees were growing in the eastern U.S. They were among the largest, tallest, and fastest-growing trees. The wood was rot-resistant, straight-grained, and suitable for furniture, fencing, and building. The nuts fed billions of birds and animals. It was almost a perfect tree, that is, until a blight fungus killed it more than a century ago. The chestnut blight has been called the greatest ecological disaster to strike the world's forests in all of history

<https://www.acf.org/the-american-chestnut/history-american-chestnut/>

American Chestnut - *Castanea dentata*

Bloom/Cone



Leaf/Needle



Bark



Mature Tree





TopView

American Leaf (left):

Leaf is long in relation to its width

Large, prominent teeth on edge; bristle at the end of each tooth curves inward

Base of leaf blade tapers sharply

Leaf is very thin and papery

Chinese Leaf (right):

Leaf is oval-shaped

Teeth are smaller

Base of leaf blade is rounded

Leaf is thick and waxy-feeling



Bottom, View

American Leaf (left):

Elongated leaf

Large, prominent teeth on edge; bristle on teeth curves inward

Blade tapers sharply to meet stem at base of leaf blade

Light green underside on leaves exposed to the sun

Chinese Leaf (right):

Oval-shaped leaf

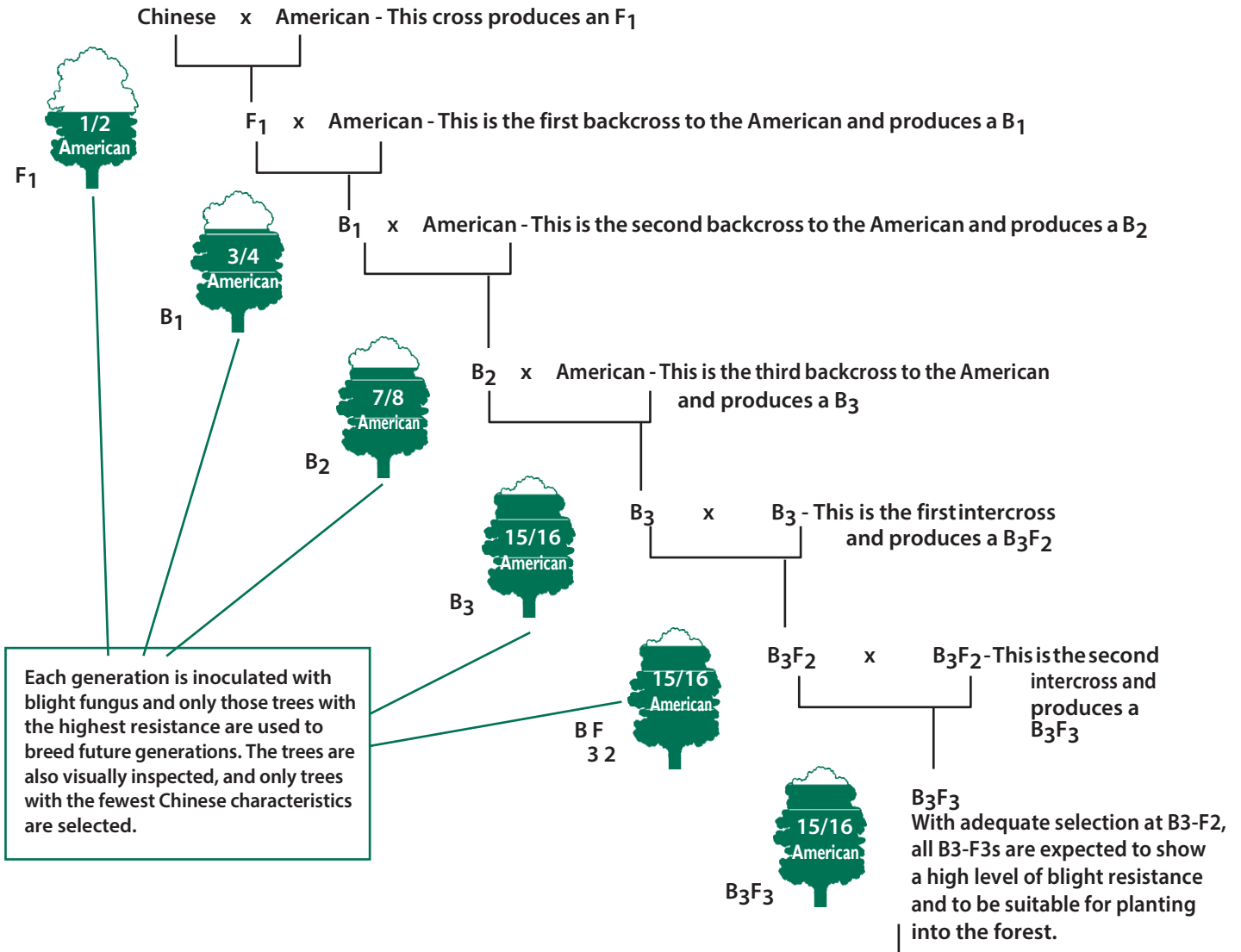
Small teeth on edge

Base of leaf blade rounded

Underside of sun leaves look whitish because of many hairs

THE AMERICAN CHESTNUT FOUNDATION'S BACKCROSS BREEDING PROGRAM

TACF's backcross breeding program begins by crossing an American chestnut and a Chinese chestnut. This is followed by three successive generations of crossing back to American chestnut trees to restore American characteristics. In between each breeding step, the trees are inoculated with blight fungus (*Cryphonectria parasitica*) and only those trees showing strong blight resistance and American characteristics are chosen to breed additional generations. For the final two generations, trees with proven blight resistance are intercrossed with each other to eliminate genes for susceptibility to blight introduced from the American parents.



www.acf.org



Breeding, testing and evaluation continues. TACF's breeding program will continue to integrate additional sources of blight resistance into the breeding populations. For more information on TACF's breeding and restoration programs call 1-(828)-281-0047 or visit our website at www.acf.org.

Gardening and Pollinators

Pollinators play important roles in biodiversity, crop production, and even the economy. A 2014 economic impact study by University of Georgia experts determined that the annual value of pollination to Georgia is over \$360 million. Even better? The services pollinators provide is totally free.

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. Pollinators are also key to the survival of wild plant species, they help to control pests that destroy agricultural crops and they help in decomposition, which is extremely important in crop production because the process aerates the soil.

Although wasps, ants, and bees don't yield warm and fuzzy feelings for most people, that doesn't mean they should be ignored. Pollinator populations are decreasing. Not only in population, but also in diversity. Research from UGA is helping to identify not only the reasons behind the decline, but also what homeowners can do to help them. To help pollinators like bees and butterflies do their jobs of moving pollen, home gardeners can provide a habitat that provides water and shelter.



A pollinator-friendly garden can be created in the shade. For homeowners surrounded by shade, pollinator-friendly landscapes can seem unattainable, but they don't have to be. Landscapes graced with trees and an abundance of shade can be great resources for pollinators, too.

<http://extension.uga.edu/topic-areas/timely-topics/pollinators.html>

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 Weather STEM Station

If you need this document in another format, please contact Dr. Allison Bailey at allison.bailey@ung.edu

Stream Bank Restoration

River, stream, creek, brook, tributary, or branch these words all mean different things to different people. Throughout this publication, the word “stream” means any continuous or intermittent flowing water regardless of the channel size. It is the nature of a stream to change its course, constantly shift, and meander. Erosion of streambanks is a natural part of this process by which the stream adjusts to changing conditions within the channel and its watershed. If you try to interfere with this process, you will be in a long-term battle against the natural tendency of the stream to move and change. However, because of man’s development, especially in urban areas, this process may be accelerated. The shape of the stream channel is a result of the flow of the water, the sediment carried, and the composition of the streambed and streambank materials. A stream channel must simultaneously accommodate the flow and carry its sediment load within the streambanks. The stream forms a continuous system of pools, riffles, bars, and curves to absorb the energy of the flow.



Streams are rarely perfectly straight. What appears to be a “straight” stream is in reality made up of small curves not easily recognized. Flowing water has a natural tendency to meander from one side to the other of a channel, and soil, sand, and gravel are washed away from the areas where the current is fastest and deposited where the water moves more slowly.

Changes in streamflow, sediment load, and erosion or deposition on the streambanks will cause the stream to seek a new balance. Increasing paved areas or removing vegetative ground cover in the watershed will reduce the infiltration of rainfall and cause more runoff from the land. This leads to higher stream flows with an increased capacity to scour streambeds and undercut streambanks. Soil erosion from adjacent lands will cause increased sediment build up if the stream flow is insufficient to carry the load of soil (sediment) along the stream.



For those of you who live in urban or suburban areas, it is likely that your stream channel has or is in the process of adjusting to increased runoff by eroding deeper and/or wider. Many urban streams which have eroded their banks so that the channel can carry greater flows will have

lost the streamside vegetation that helps control bank erosion.

Streambank erosion is a natural process that occurs when the forces of flowing water exceed the ability of the soil and vegetation to hold the banks in place. Natural rates of streambank erosion vary with stream size, the amount of vegetative cover, and the type of soil in the streambank. Under well-vegetated conditions, the smallest streams (those without any tributaries) may show little evidence of erosion over periods of several decades unless subjected to extreme flood events. Large streams, on the other hand, often show evidence of noticeable erosion, especially on outside bends. The forces that cause erosion increase during flood events,

and most erosion occurs at these times. Human disturbances to watersheds that increase frequency and magnitude of runoff events also increase streambank erosion. Human disturbances include logging, mining, agriculture, and urbanization. Typical urban or suburban developments which may impact a stream include houses, garages, parking lots, and walkways, including areas cleared of forest and replaced by tailored lawns.

TABLE 1
EROSION TYPES AND CAUSES

Type of Erosion	Causes
General bank scour	Increased discharge resulting from watershed changes; increased flow velocities caused by reduction in channel roughness or increased gradients; removal or loss of bank vegetation.
Toe erosion and upper bank especially along outside bends.	Removal of unconsolidated or loose lower bank materials, failure associated with bed lowering
Local streambank and streambed scour	Scour of local lenses or deposits of unconsolidated material; erosion by secondary currents caused by flow obstructions and channel irregularities; loss of bank vegetation. Local bed scour may be caused by channel constrictions and flow obstructions. Some bed scour generally occurs below culverts.
Overbank runoff	Failure to provide adequate means of directing concentrated flows from overbank areas into the channel.

Adapted from Nelson R. Nunnally

Loss of streambank and streamside vegetation reduces the resisting forces and makes streambanks more susceptible to erosion. This is often the single greatest contributing factor to harmful or accelerated erosion on small and medium-size streams. Streambank vegetation may be removed intentionally for various reasons, or its loss may be inadvertent due to trampling by animals or humans.

TABLE 3
GENERAL GUIDANCE
FOR ESTABLISHING SEVERITY OF EROSION

Degree of Erosion	Characteristics
Stable to Mild	Little or no evidence of erosion; if eroding banks are present, they are small in extent (linear extent less than average bank height) and rates are modest (less than ½ foot per year); greater erosion may be tolerated at bends if it causes no associated problems.
Moderate	Extent of problem or rate of erosion exceeds criteria for stable class, but is less than severe.
Severe	Erosion covers large area of bank (linear extent greater than three times average bank height) and is occurring at a rate in excess of one foot per year or a rate that is unacceptable for safety, environmental, or economic reasons.

From Robbin B. Sotir & Associates

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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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