



Bee Campus USA Annual Report Pollinator Conservation & Education 2019



Tennessee Technological University Cookeville, Tennessee

EDUCATION & OUTREACH



Cookeville Clean Commission / Keep Putnam County
Beautiful organization discusses the importance of protecting pollinator habitats by preventing pollution



Students planted flowers in recycled water bottle containers and painted rocks featuring bees and words of kindness to display around campus during finals week



Student members of the TTU Evergreen Society at the TN Tech Sustainability Day Celebration 2019

- Earth Day Celebration, April 23, 2019
- Plants Rock!, April 25, 2019
- Arbor Day Celebration, April 26, 2019
- Student Orientation: Sprout Pencil Giveaway, June and July, 2019
- Sustainability Day Celebration, October 22, 2019
- Bee Movie movie night with observation hive, October 24, 2019



Students, faculty, and staff receive the Tree Campus USA Certification for 2019 in recognition of campus habitat enhancement efforts



Observation hive available for students to view at the Bee Movie screening in 2019 with live bees

POLLINATOR HEALTH & HABITAT



Tennessee Tech athletes assist with maintaining and enhancing the Algood Middle School Garden



A view of the raised garden beds at the Tech Village Garden



A friendly bee at the Tech Village Garden

1. Community gardening with Student Athletes: The Tennessee Tech Golden Eagles Football Team and the Women's Basketball Team volunteered at Algood Middle School in August of 2019 to help with the enhancement and maintenance of the Algood garden. These students helped to maintain the garden by weeding and also assisted in enhancing it by helping with planting of flowers.

2. Tech Village Garden: Student athletes helped with the maintenance of the TTU Tech Village Garden twice during August of 2019. Additionally, throughout the summer student workers from the Office of Sustainability assisted in weeding as well as planting herbs, vegetables, and flowers. The pollinator-friendly plants grown in this garden not only benefit pollinators, they also provide food to supply the TTU Food Pantry.



A view of the Tennessee Tech Native Plant Garden and insect homes



Engineers Without Borders, a student group, is seen enhancing the wooded habitat of a local sinkhole

3. Native Plant Garden/Biology Greenhouse: Throughout the year of 2019, volunteers assisted in maintaining the student-designed and student-planted garden. The garden includes eight habitat types: prairie, cedar glade/bluff, high elevation acid woods/heath balds, wetlands, rocky outcrops, river/stream, roadside/pasture, mesic woodland, and edible/medicinal plants. All species are native to Tennessee. Furthermore, native plants are also grown and maintained in the TTU Greenhouse. Many plants are first maintained in the Greenhouse by students before being planted in the Native Plant Garden.

4. Grand Challenge River Clean Up: Led by the university's Director of Innovation and Entrepreneurship Michael Aikens, students participated in a River Cleanup in a nearby community. This activity helped to protect the health of pollinator habitat by removing pollution from wetlands with tree snags and stumps.

5. Putnam Proud: The Office of Sustainability at Tennessee Tech covered the entry fee for campus groups, organizations, and groups of friends to participate in the Putnam Proud Countywide Cleanup. This was a week-long event from September 21-28 in which teams helped to rid Putnam County of litter. 7 groups from Tennessee Tech participated and cleaned a wide variety of locations including roadsides, sinkholes, rivers, and local parks. During this county-wide cleanup, volunteers assisted in improving and preserving the health of natural areas such as wooded regions, wetlands, gardens, meadows, and pollinator-friendly lawns.

6. Pollinator Garden: During the summer of 2019, a pollinator garden was started on campus that included native plants. Seeds were planted in the summer months, and the land will only be mowed

once a year in order to enhance pollinator habitat.

7. Tree plantings: Over 270 trees were planted on campus, including native trees, during the 2018 to 2019 school year. These trees serve as important larval hosts for butterflies and moths.

Additional projects that have been started, and will be fully implemented during 2020, include the planting of additional native flower bulbs in the Tennessee Tech pollinator garden and the installation of campus rain gardens that will feature native plants. These projects will further protect and enhance the health of pollinators and their habitats on campus. They will be included in our Bee Campus Certification renewal next year.

SERVICE LEARNING



Student athletes volunteer to weed the Algood Middle School Garden



Members of the Tennessee Tech African Student Union volunteer to remove litter from pollinator-friendly lawns at a local park

1. Community gardening with Student Athletes: Student volunteers from the Tennessee Tech Golden Eagles Women's Basketball Team and the Football Team volunteered during the month of August 2019 in the Algood Middle School Garden. They helped with the overall landscaping of the garden and provided the school with helping hands that they otherwise would not have had. This was a service that required the work of all of the players.

2. Tech Village Garden: Twice during the month of August in 2019, student athletes volunteered to assist with weeding and maintaining the Tech Village Garden. In addition to their service, student workers from the Office of Sustainability also volunteered their time on numerous occasions throughout the summer to support the garden. Their acts of service included maintenance of the garden as well as expanding the garden by planting herbs, vegetables, and flowers. These acts of kindness not only assist pollinators, they also provide food to be donated to the TTU Food Pantry.

3. Native Plant Garden/Biology Greenhouse: Student and community volunteers are essential in maintaining and furthering the Tennessee Tech Native Plant Garden. These volunteers assisted in numerous tasks throughout 2019, such as weeding, planting, and watering the native plants. These

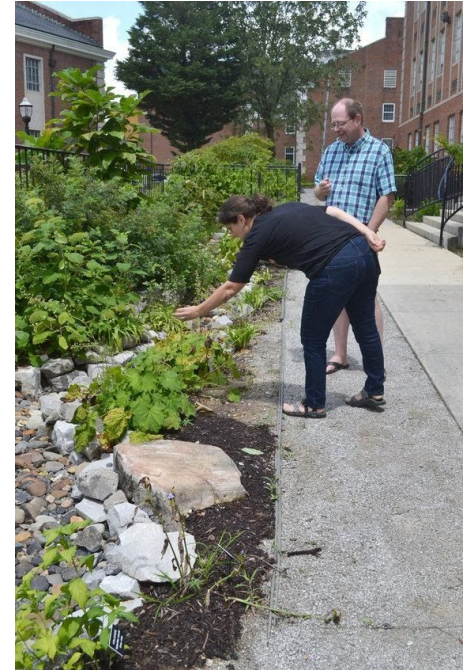
volunteers also assisted in maintaining the plants of the Greenhouse, many of which were eventually transferred to the Native Plant Garden.



Office of Sustainability student worker volunteering to plant vegetables



Office of Sustainability student workers volunteer with weeding



Professor Dr. Shawn Krosnick and the Biology Department Chair Dr. Chris Brown volunteer in the Native Plant Garden

4. Grand Challenge River Clean Up: Volunteers led by Michael Aikens, the university's Director of Innovation and Entrepreneurship, assisted in removing trash from a river in a nearby community. The cleanup site serves as a home to pollinators because of its tree snags and stumps.

5. Putnam Proud: Many community and university groups volunteered their time to participate in the 2019 second annual Putnam Proud Cleanup event. The week-long cleanup occurred from September 21-28 and the Tennessee Tech Office of Sustainability covered the entry fee for participating groups. Seven student groups volunteered during this event. The natural areas they volunteered to clean up included wooded-regions, wetlands, gardens, meadows, and pollinator-friendly lawns. These areas serve as homes for many local pollinators.

CURRICULUM & CONTINUING EDUCATION

The following courses were a part of the for-credit curriculum.

1. AGHT 3030 Integrated Pest Management: Introduction to the aspects of integrated pest management. Identification of plant disease and insect pest problems. Fundamentals of control: biological, cultural, and chemical. Plant disease concepts including etiology, ecology, and physiology.
2. AGHT 3400 Landscape Horticulture: Basic theory and principles of design for landscaping modern homes and businesses. Use of ornamental plants and special features. Installation, maintenance, and discussion of the effect of management on plant growth and health. Topics include pruning, fertilizer application, pest control, etc.



Botany students pollinating *Physaria globosa*



Botany students camping at GSMNP for the 2018 Wildflower Pilgrimage

3. AGHT 3410 Plant Propagation: Asexual and sexual propagation of plants by cuttings, layers, division, special structures, grafting, budding, seeds, and tissue culture.

4. AGHT 4420 Greenhouse Management and Crop Production: Principles of greenhouse management and environmental controls; production, timing, harvesting, and marketing of commercial floricultural crops; pest control strategies; and nutrient film technique. Development of commercial production schedule required.

5. AGRN 1100 HON Plant Science: Introduction to the fundamentals of plant science as related to the ecological principles of agronomic and horticultural crops.

6. AGRN 1100 Honors Plant Science: Introduction to the fundamentals of plant science as related to the ecological principles of agronomic and horticultural crops.

7. AGRN 1110 Plant Science Laboratory: Further the discussion of plant science in the laboratory setting.

8. AGRN 3300 Organic Farming: An examination of organic crop production methods including improving the structure of soil and fertility, pest management, irrigation, season extension, vegetable and fruit crop production, harvesting, post-harvest handling and marketing techniques. This class will provide spinach kale, beets, and carrots as part of a collaborative effort to provide smoothies to the athletes on campus.

9. AGRN 4100 Weed Science: Plant and seed identification, and growth habits and dissemination of weeds. Biological, cultural, and chemical methods of control in the integrated pest management (IPM) concept.

10. AGRN 4110 (5110) Forage Crops Production and Management: Botany and classification, soil and climatic requirements, species adaptation, establishment and management of grasses and legumes for

silage, hay, and temporary, permanent, and rotational pastures for ruminants, swine, and horses.



Botany students performing crosses on *Physaria globosa* in the TTU Native Plant Garden

11. ANS 4960 Animal Science Topics in Bee Production: A special topics course only offered during some Spring and Summer semester. Teaches students the details of beekeeping. Only offered during some Spring and Summer semesters.

12. BIOL 2310 General Botany: Introduction to principles of botany.

13. BIOL 3240 Field Botany: Survey of regional flora (herbs, shrubs, & trees) focusing on gymnosperms and angiosperms. Emphasis on nomenclature, structural characteristics, identification of species using a dichotomous key, and characteristics of plant families.

14. BIOL 3330 Entomology: Common harmful and beneficial insects of this region and their control.

15. BIOL 4330 Plant Ecology: Biotic and abiotic factors affecting the distribution and abundance of plant species and the role of plants in ecosystem structure and function.

The Tennessee Tech Office of Sustainability is working closely with the Department of Civil & Environmental Engineering in order to install rain gardens during the year 2020. The rain gardens will include native plant species in order to best protect pollinators. This project will give graduate civil engineering students the opportunity to conduct project-based course work and explore how they, as future engineers, play a critical role in preserving and enhancing pollinator habitat.

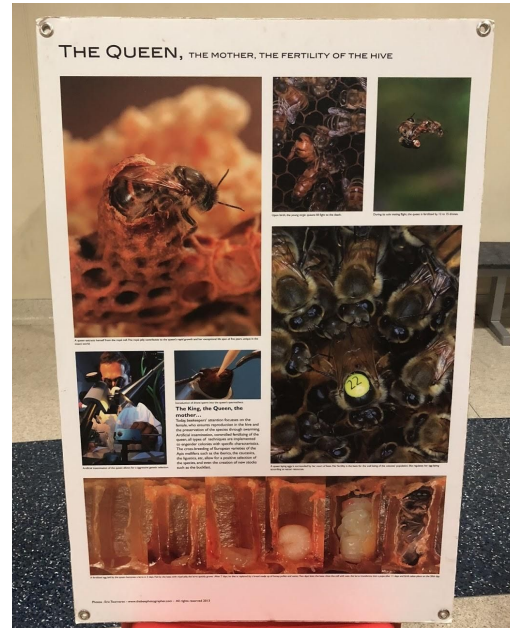
Furthermore, the Biology Department has a teaching and research greenhouse located in the space between Pennebaker and Johnson Hall. The greenhouse has been operational since January 2015, and currently houses approximately 200 plants. The living specimens are used to teach several classes including General Botany 2310, the Introductory Biology sequences, and Field Botany 3240. The greenhouse offers students and faculty an exciting teaching space that highlights the importance and relevance of plants in our everyday lives. Part of the facility is also available for student and faculty research.

EDUCATIONAL & INTERPRETIVE SIGNAGE



Dr. Bruce Green explaining honey bees next to his observation hive and honey bee signage.

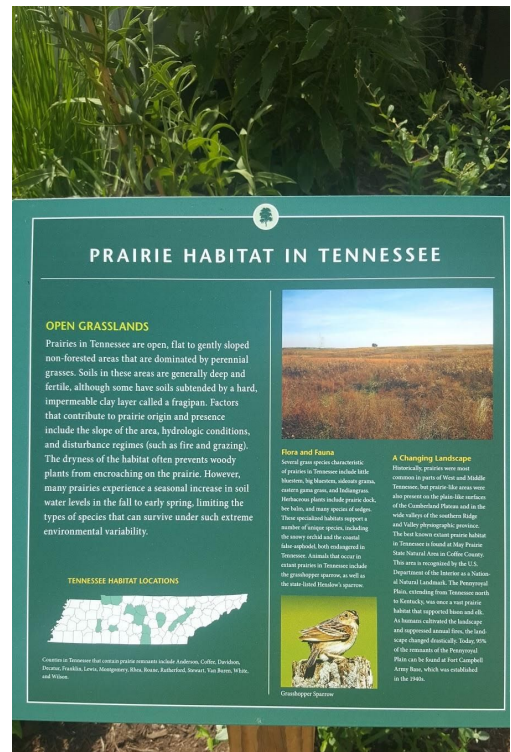
Dr. Bruce Green temporarily installed four informative signs to discuss honey bees at the film screening of Bee Movie.



A close-up photo on signage related to the role of the Queen in a honey bee hive.

There are six signs detailing the different habitats present at the Native Plant Garden. These signs inform students of different native plants that help pollinators. Additionally, educational signs were installed at the TTU Native Plant Garden that inform students of the native flora and fauna of Tennessee. Signs were purchased and will be permanently installed in the summer of 2020 that identify many campus trees, including native trees that are important larval hosts for butterflies and moths.

Furthermore, Tennessee Tech's recognition as a 2019 Bee Campus USA was publicized in the university's electronic newspaper as well as the social media platforms of the Office of Sustainability. By doing this, the university shared information about Bee Campus USA in a digital and environmentally friendly way.



The Prairie signage at the Native Plant Garden informs students of the flora and fauna of Tennessee prairies. It also explains how these regions play an essential role in maintaining habitat for local pollinating birds.

POLICIES & PRACTICES

The Tennessee Tech Grounds Department has embraced IPM practices. It aims to amend the soils, which should cut the university's pesticide use in half in two years. Last year it planted over 40,000 sq ft in pollinator habitat. Organic fertilizers are also used. Reducing pesticide use remains a major goal of the Grounds Department. Pesticide use has decreased 50 percent in the last five years, and continues to decrease every year.

The Office of Sustainability's Bee Campus USA website page features an interactive map that displays all regional suppliers of native plants within a 100 mile radius of the campus.

<https://www.tntech.edu/sustainability/bee-campus-usa.php>

It also provides a link to mail-order native Tennessean plants.

<https://tynnativeplants.wordpress.com/buying-native-plants/>

Recommended Locally Native Plant Species List — <https://plants.usda.gov/java/stateSearch>

Regional Native Plant Supplier List — <https://www.tntech.edu/sustainability/bee-campus-usa.php>

Pollinator Friendly Integrated Pest Management Plan —

<https://www.tntech.edu/sustainability/pdf/Tennessee-Tech-IPM-Plan-2019.pdf>

CONTACT US!

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Website — <https://www.tntech.edu/sustainability/bee-campus-usa.php>

Social Media — <https://www.facebook.com/TTUSustainableCampusCommittee/>