



# **A Walk on Campus: How Trees Benefit People and the Environment at Western Carolina University**

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## **Abstract**

The original goal of this study was to map and determine the ecological benefits of the trees on the campus of Western Carolina University including energy conservation, stormwater filtration, air quality improvement, and carbon dioxide storage and removal. Recent studies on the relationship between trees and human health also guided us to establish a way to use trees to provide a space for student recreation to help relieve stress, connect with nature, and improve overall student quality of life on campus. To do this, an inventory of all campus trees was conducted that included information about tree species, height, diameter at breast height, and the location of each campus tree. These data were then uploaded to an OpenTreeMap website to show the ecological benefits of our campus trees. This website was then used to make a walking path connecting some of the native trees, largest trees, and most unique trees on campus for anyone to use for recreation, relaxation, or education. Overall, the study helped us show that the trees on campus provide many cost saving, ecological, aesthetic, and health benefits to the Western Carolina University community.

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# A Walk on Campus: How Trees Benefit People and the Environment at Western Carolina University

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## BACKGROUND

Western Carolina University has received Tree Campus USA Designation. Tree Campus USA is a designation given to colleges and universities through the arbor day foundation that effectively manage their campus trees, develop connectivity with the community beyond campus borders to foster healthy, urban forests, and strive to engage their student population utilizing service learning opportunities centered on campus, and community, forestry efforts. To receive this title the campus must meet 5 standards annually including

- Having a Campus Tree Advisory Committee
  - This committee at WCU includes staff and student representatives from facilities management, biology, and geosciences and natural resources departments
- Campus Tree Care Plan
  - This plan outlines tree care, protection, and preservation standards as well as how to assess tree damage and prohibited practices for the campus
- Campus Tree Program with Dedicated Annual Expenditures
  - WCU has a budget set aside for tree care instillation, fertilization, pruning, maintenance, removal, and arborist training
- Arbor Day Observance
  - Last year, Dr. Kathy Matthews lead a nature walk on campus along the Cullowhee creek corridor where native species were discussed and our WCUTrees app was used to identify trees
- Service Learning Project
  - Student volunteers worked in to preform maintenance on the Edible Campus project the Bardo Arts Center

## INTRODUCTION

The Tree Campus USA aims to show the benefits that campus trees can provide, which include:

- Significantly reducing the amount of energy the campus needs to generate
- Reducing carbon dioxide in the atmosphere
- Giving students, faculty, and the community a setting to relax and unwind

This project focuses on these benefits by creating walking paths through campus that showcase campus trees while providing easily accessible ways to recreate, relax and enjoy the campus. It has been shown that interacting with nature can show improvements in mental health, mood, and general well being. By creating walking paths we are providing opportunities for our students and community members to interact and reap the benefits of nature interaction

## METHODS

Students under the direction of Dr. Diane Styers completed an inventory of all campus trees larger than 2 inches in DBH (Diameter at Breast Height). ArcGIS online was used to create a mapped grid of the campus to designate inventory areas. DBH, height, species, and location, were recorded using, diameter tapes, laser range finders, and the ArcGIS Collector app. This data was then compiled and uploaded to an OpenTreeMap website. This website shows a point location for each campus tree inventoried as well as the overall ecosystem benefits that the trees are providing to the campus including energy conserved, storm water filtered, air quality improved, carbon dioxide removed and stored, along with a total dollar amount saved from benefits. When a point is selected it shows the species, DBH, tree height, a photo of each tree, and the breakdown of ecosystem benefits provided by that tree. This website, along with ArcGIS and Excel, was used to locate trees and map out walking path locations through campus.

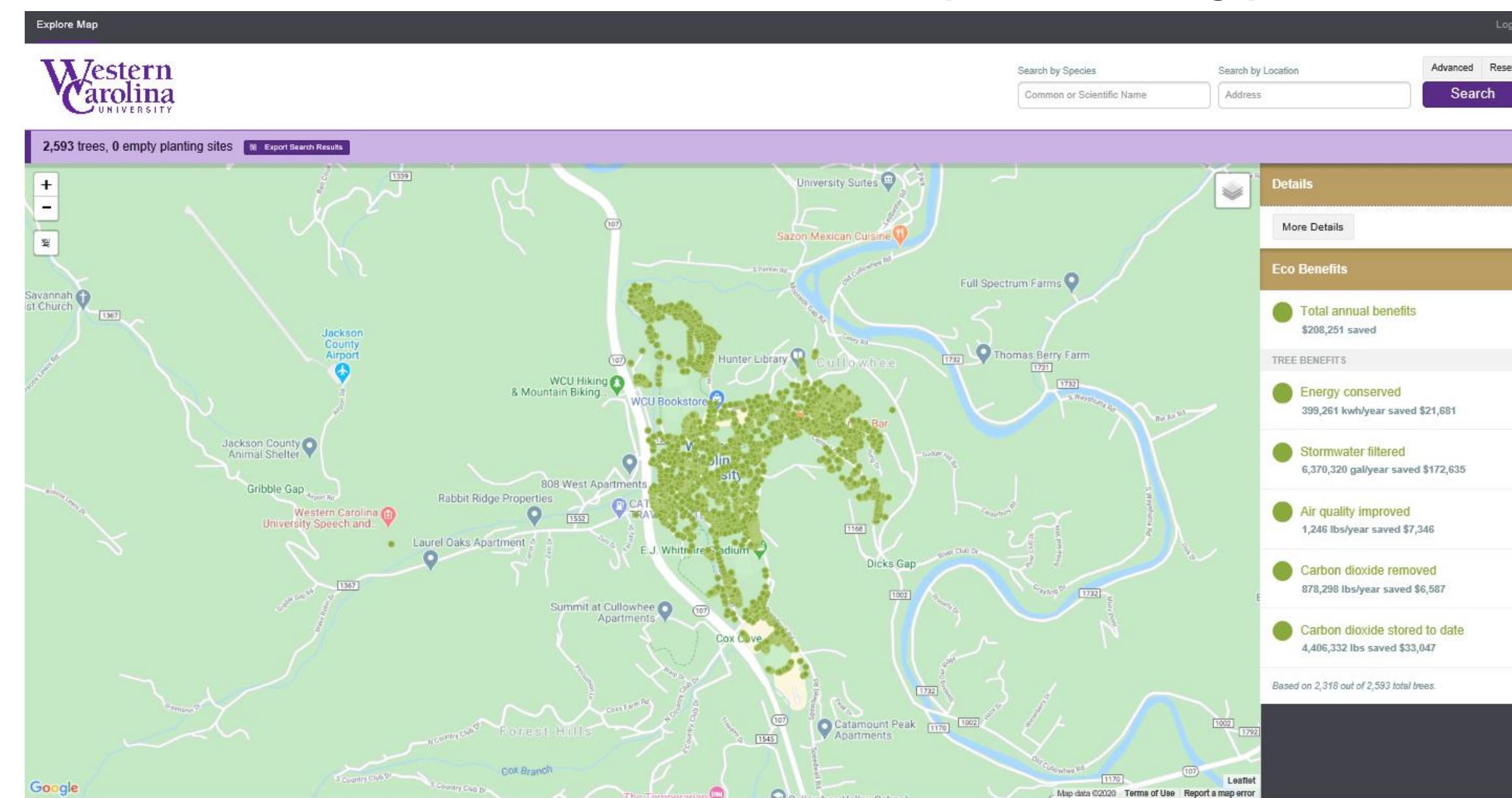


Figure 1- Snapshot of WCU OpenTreeMap website. Each green dot represents a tree. The column to the right shows the ecological benefits along with the current estimated savings as of March 23, 2020

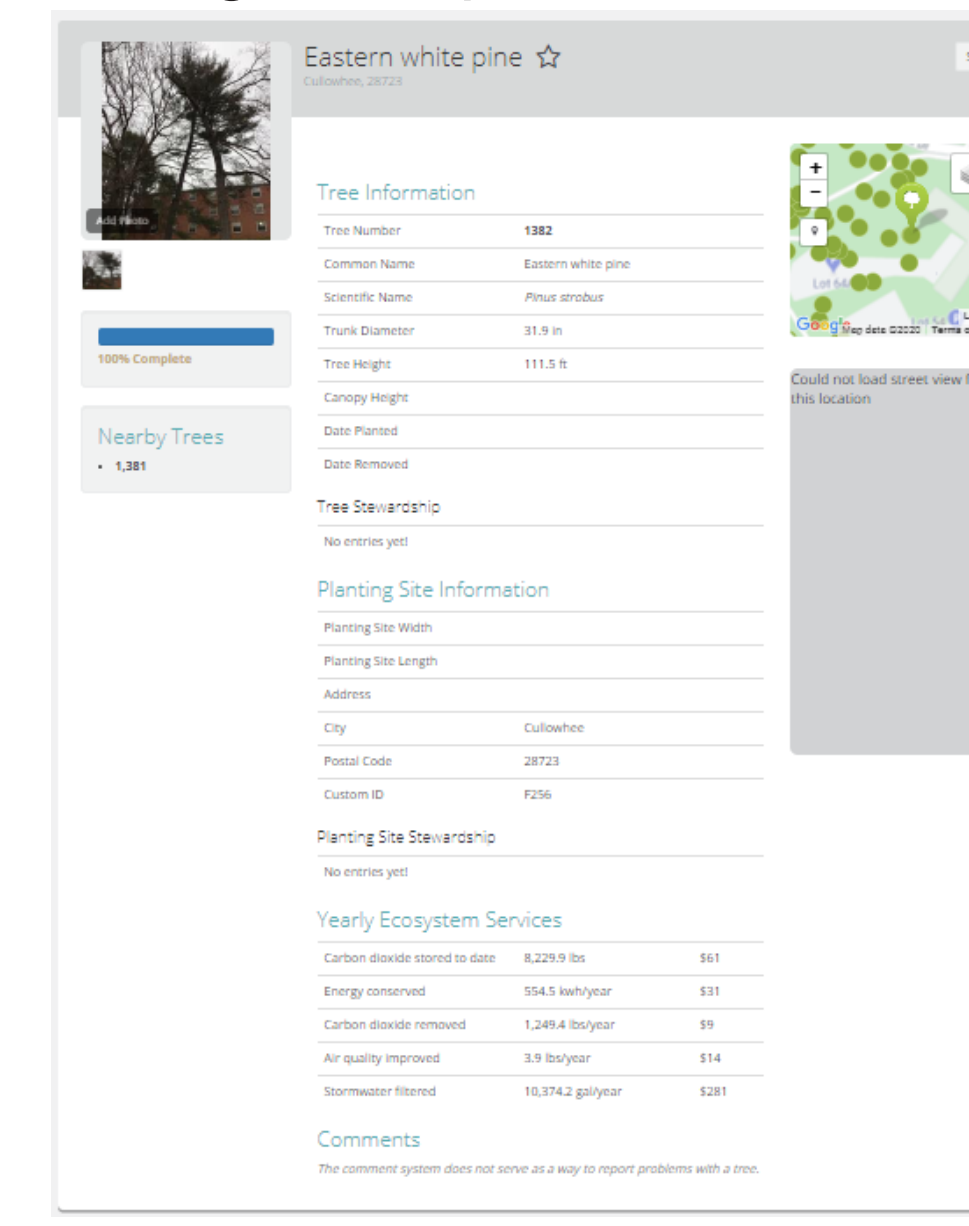


Figure 2- Snapshot of individual tree information from WCU OpenTreeMap website

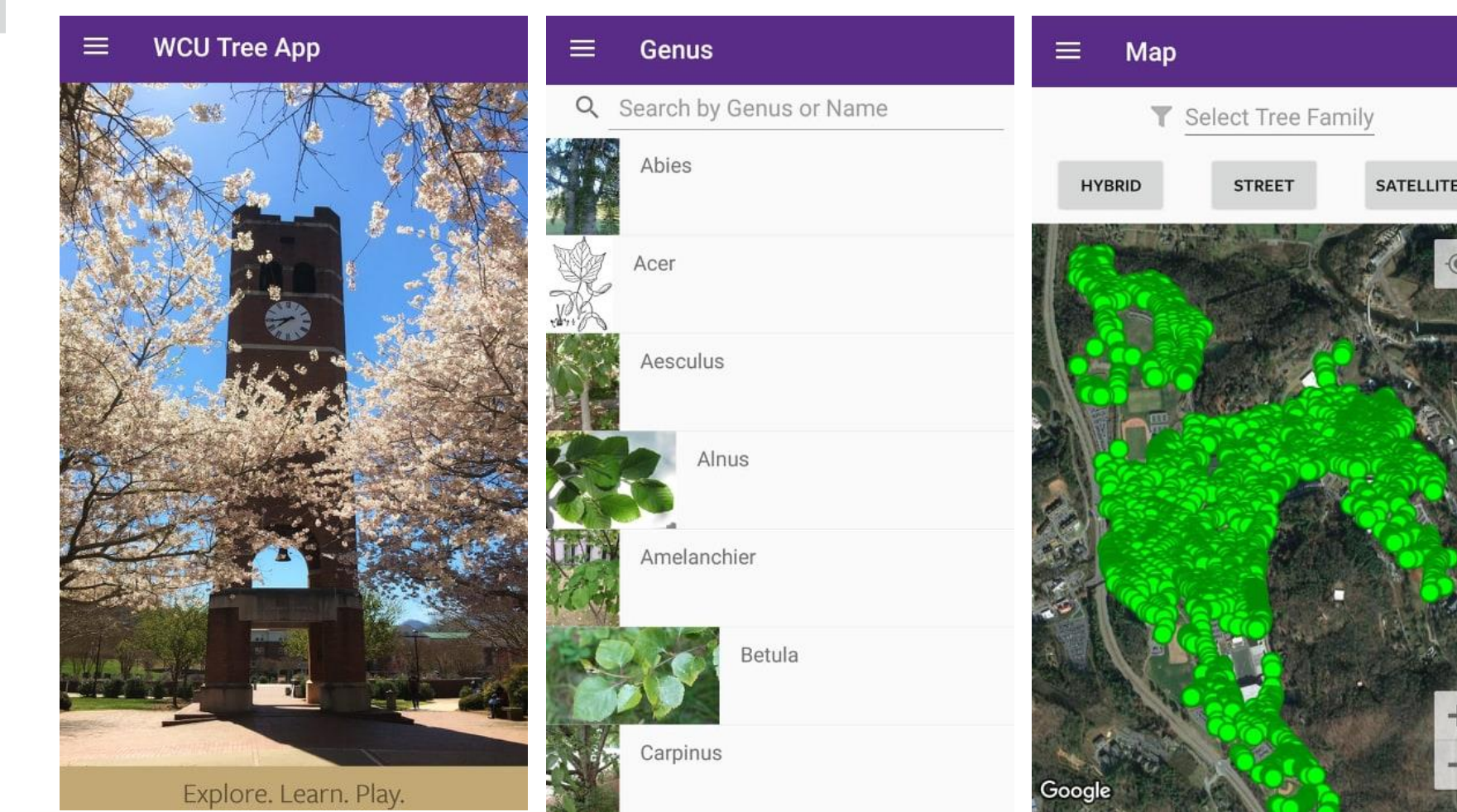


Figure 3, 4, & 5- Screenshots of WCU Tree App. Figure 3 shows the home screen of the App. Figure 4 shows the tree search feature. Figure 5 shows the map of campus trees

## RESULTS

Walking paths were created in the main campus and old campus areas of WCU. These paths feature a variety of trees, focusing on species native to North Carolina, as well as highlighting some of the tallest and largest trees on campus. The path in the old campus location consists of an inner and outer loop totaling about 0.7 miles all together. The main campus area features a main outer loop with 3 cut throughs, and a lower loop around the football field, all together totaling about 3 miles.

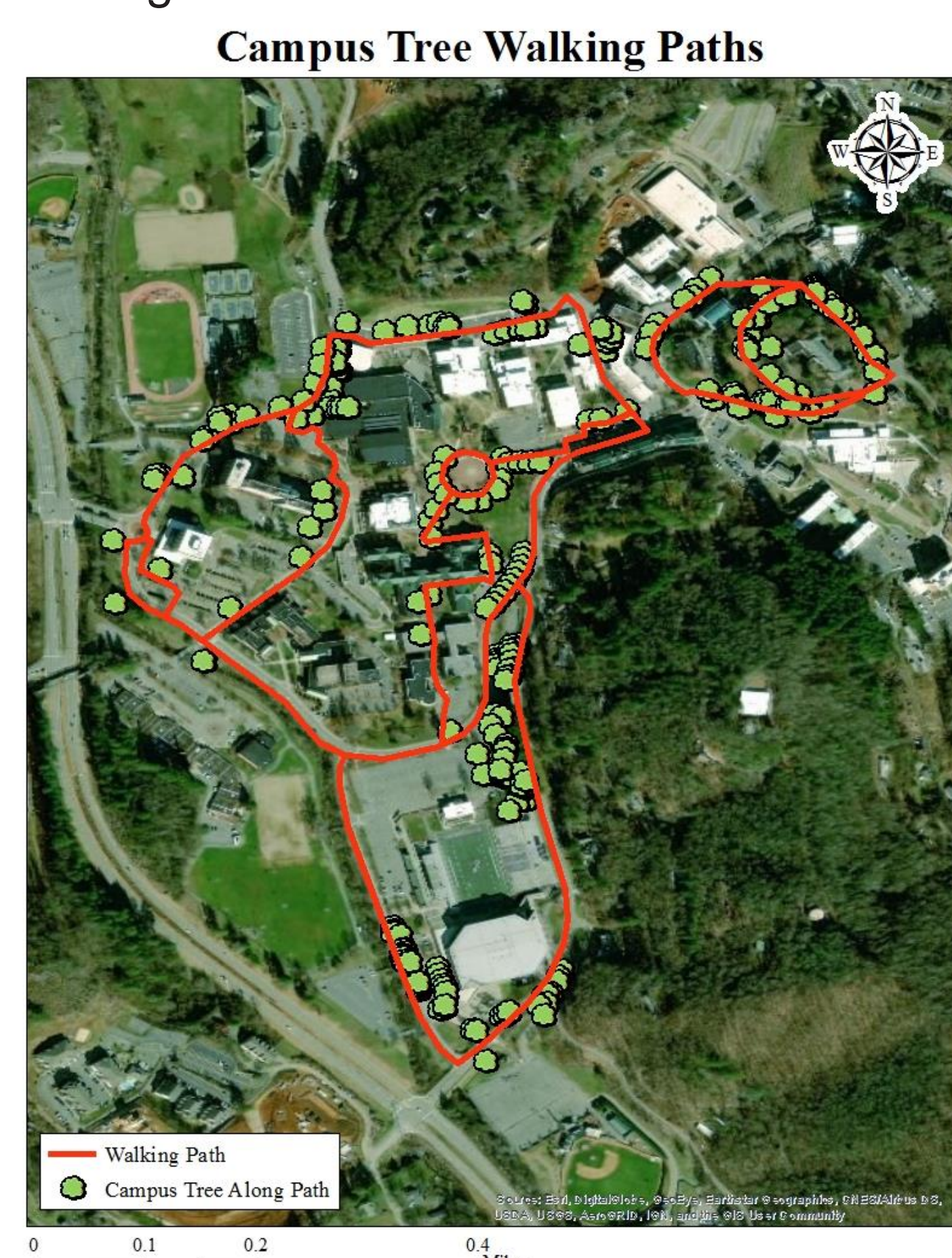


Figure 6- Proposed Walking Paths

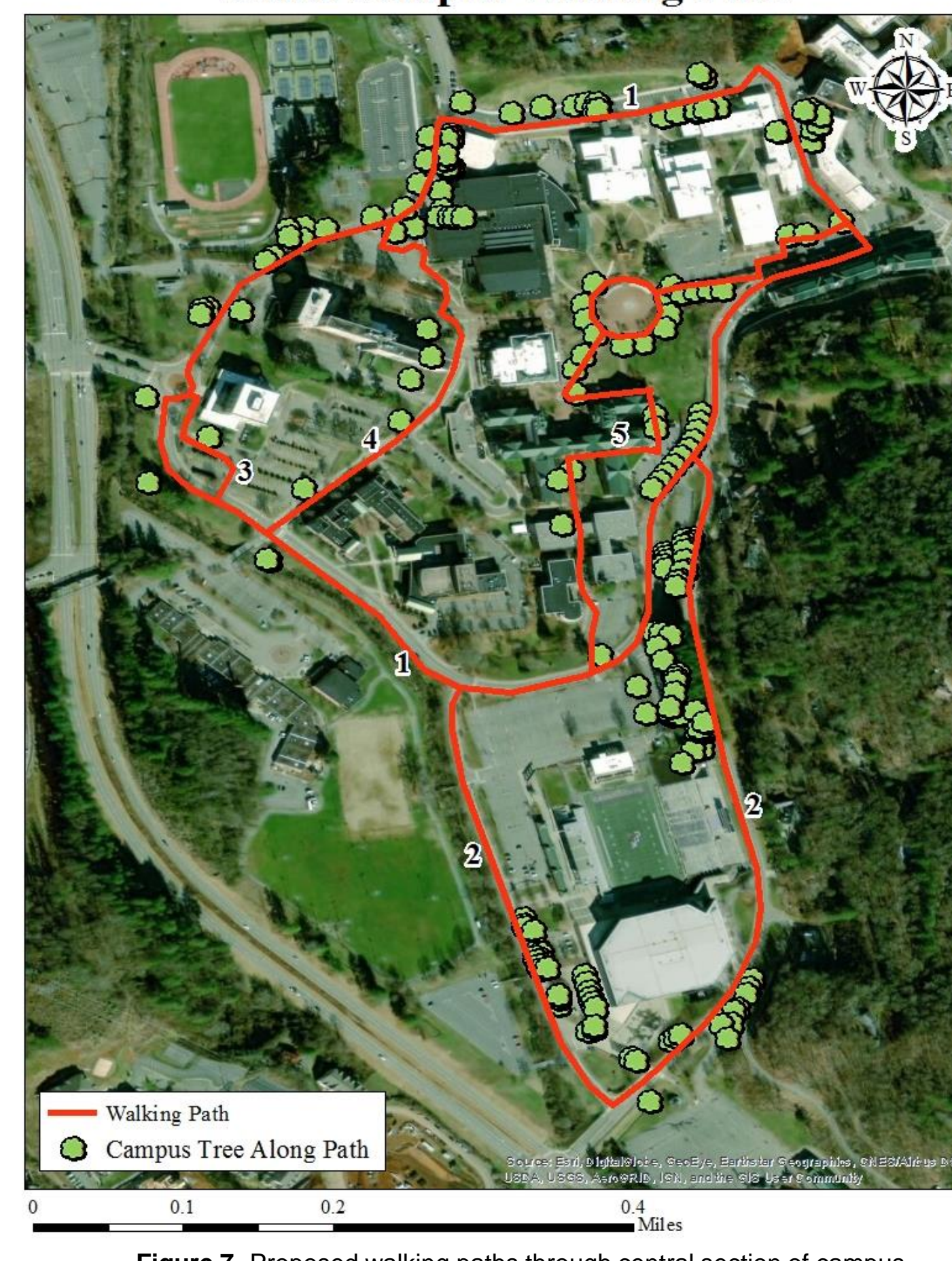


Figure 7- Proposed walking paths through central section of campus

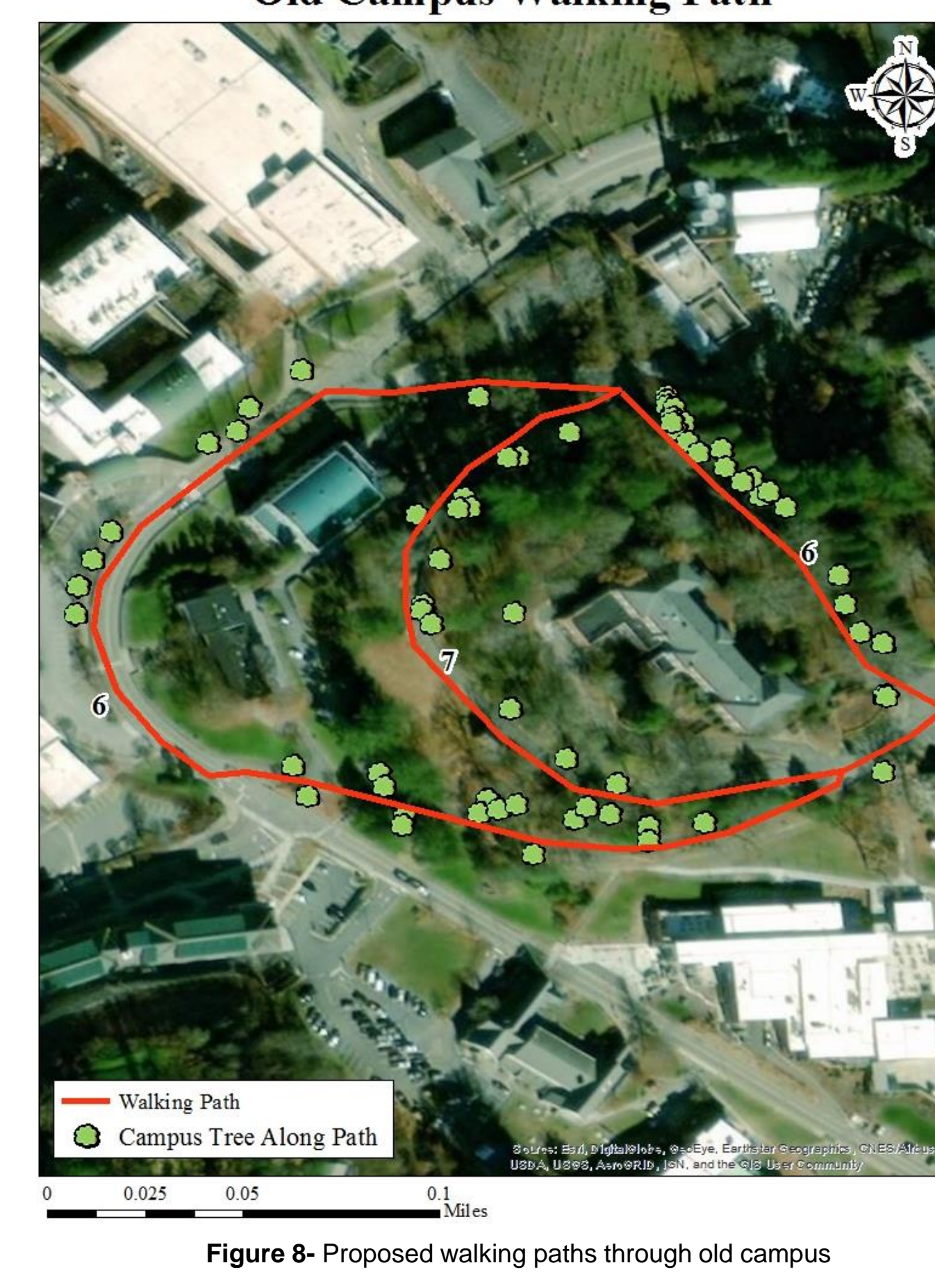


Figure 8- Proposed walking paths through old campus

Path Number	Total # of Trees	Tallest Tree (Feet)	Largest Tree (DBH in Inches)
<b>Main Campus</b>			
1	83	101	24.5
2	87	106.6	39.8
3	1	27	8
4	5	98	44.3
5	24	100	46.3
<b>Old Campus</b>			
6	46	109.2	46.8
7	19	130.9	41.2

Path Number	Distance (Miles)
<b>Main Campus</b>	
1	1.3
2	0.8
3	0.1
4	0.3
5	0.6
<b>Main Campus Total</b>	<b>3.0</b>
<b>Old Campus</b>	
6	0.5
7	0.2
<b>Old Campus Total</b>	<b>0.7</b>
<b>Grand Total</b>	<b>3.7</b>

Table 3- Species found on Walking Paths

Species Featured on Paths
Allegheny Serviceberry
American basswood
American holly
American sycamore
Black cherry
Black locust
Black Oak
Black walnut
Carolina Hemlock
Chestnut Oak
Downy Serviceberry
Eastern hemlock
Eastern red cedar
Eastern Redbud
Eastern white pine
Flowering dogwood
Green ash
Hawthorn
Mockernut Hickory
Northern red oak
Pin oak
Red maple
River birch
Scarlet oak
Sourwood
Southern magnolia
Southern Red Oak
Spicebush
Sweetgum
White oak
Willow Oak
Witch-hazel
Yellow Birch
Yellow Buckeye
Yellow Poplar

## CONCLUSION

These walking paths can be used by students, faculty, and community members who want to enjoy time outside and see what our campus has to offer. These paths offer easy recreation to experience nature and the associated health benefits in an accessible way. They could be utilized by the university in many ways such as guided educational walks that could be led along the routes of the paths. The paths of these loops could be added into the OneTreeMap website and the WCUTrees app so they could be easily accessible and all the information about the trees along the route could be explored by those utilizing them. These paths could also be used as future research opportunities to study the connection between campus trees and green spaces to student mental and physical health, overall happiness and attitude on campus, and overall student performance, as most current research focuses generally on nature and health, not specifically on a university setting.



Figure 9- Tree Campus USA sign featured at WCU

## References

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