

THE BIODIVERSITY PROJECT

PROJECT SCOPE ABSTRACT

The Southern Highlands Reserve is located in Western North Carolina at an elevation of 4,500 feet. Divided into two distinct areas under conservation easement, the Core Park and Natural Woodlands, the Reserve plays host to a vast array of naturally occurring native plant communities within a High Elevation Red Oak Forest ecosystem.

The Core Park comprises the research and education center, and the 20-acre highly manicured display gardens planted with native species and their cultivars. It is surrounded by a 100-acre natural woodland that is managed to maintain wildlife habitat, conservation, and ecological connectivity between the two areas.

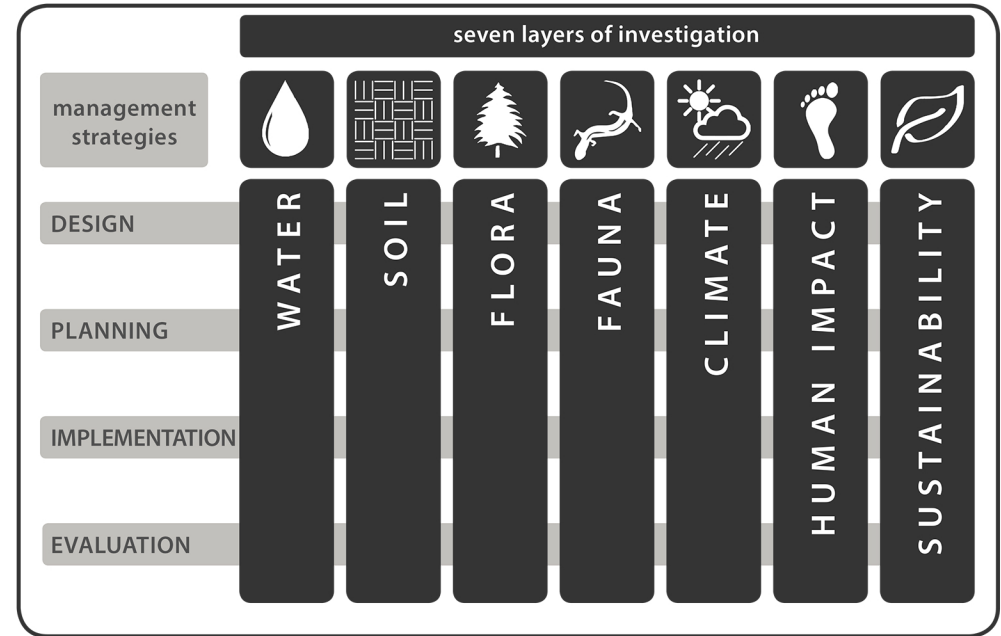
Researchers at the Reserve are developing a long-term study that investigates and measures the contrasts or similarities in biodiversity that may be found between two landscapes that are managed differently, but host to similar goals for conservation. The purpose of this study is to provide evidence that maintaining ecological sensitivity mostly through the use of native plants in landscape design can be beneficial to the environment locally and regionally. The main objective is to measure the possibility that biodiversity can exist within a heavily managed landscape garden area designed to mimic native ecosystems.

The research parameters include seven layers of investigation into the water, soil, flora, fauna, climate, human impact, and overall sustainability measures taken for both the Core Park and Natural Woodland. These investigative layers provide the analytical basis for research projects developed at the Reserve that contribute to this over-arching project.

The main research methods entail field mapping and observation using a combination of Global Positioning Systems, Geographic Information Systems, and sampling to collect, monitor, and maintain data. This information will be analyzed in conjunction with the Reserve's current plant phenology and archived accession records and weather data. Also taken into consideration are the four dimensions of the Reserve's management strategy, which include design, planning, implementation and evaluation.

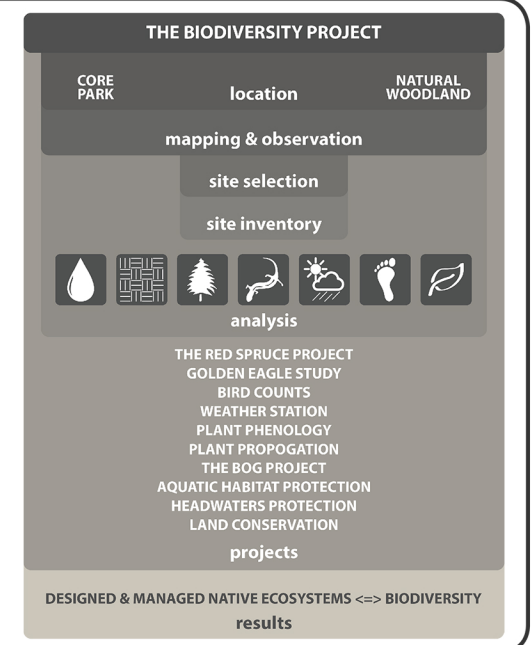
This study is still in its early stages, and the purpose of this poster is to garner feedback from other researchers about the study proposal. The expected outcome over the course of this study is that biodiversity in the Core Park will be sustained and heightened through a combination of ecologically-minded management strategies with the use of design intended to emulate regional ecosystems. The data collected through the course of this study will be used to inform local landscape management decisions and add to regional studies for landscape ecology.

RESEARCH PARAMETERS



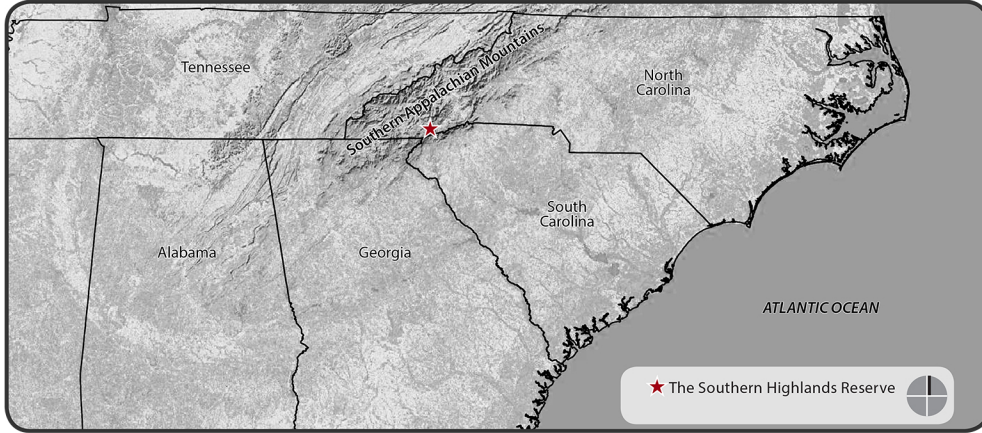
METHODOLOGY

- Two Locations
- Mapping & Observation
- Specific Study Site Selection
- Site inventory
- Seven layers of investigation for analysis and comparison
- Project Development & Implementation
- Determine Results

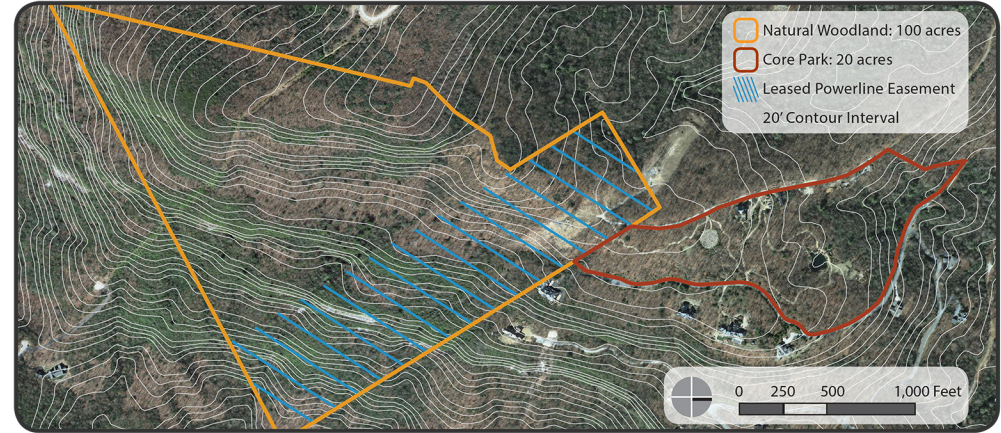


DETERMINING THE BENEFITS FOR USING NATIVE PLANTS & ECOLOGICAL DESIGN AT THE SOUTHERN HIGHLANDS RESERVE

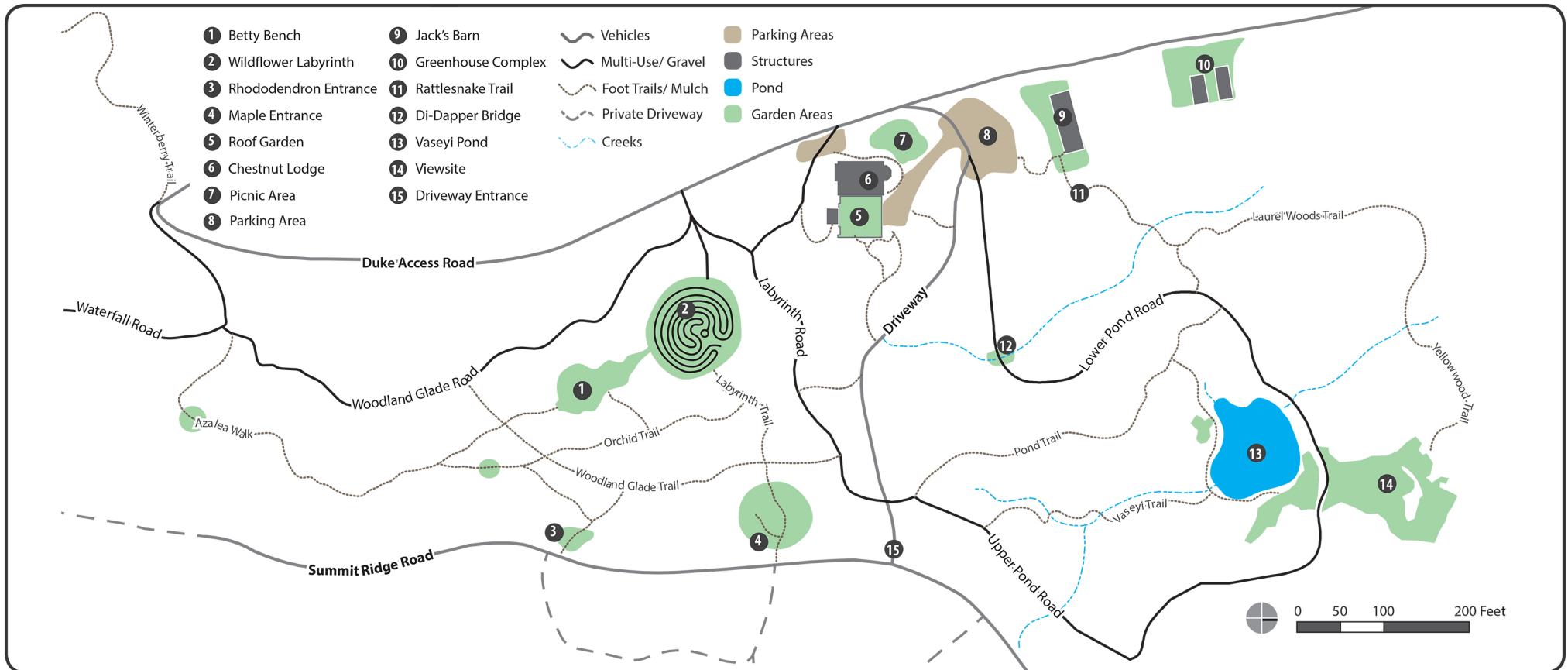
LOCATION WESTERN NORTH CAROLINA BLUE RIDGE ESCARPMENT



THE SOUTHERN HIGHLANDS RESERVE AREAS



CORE PARK



DEFINITION BIODIVERSITY

BIODIVERSITY:

“Biological diversity, or biodiversity, describes the variety and abundance of all like forms in a given place—plants, animals, and other living organisms such as fungi, lichens, and mosses. Biological diversity also describes the processes, functions, and structures that sustain that variety and allow it to adapt to changing circumstances. Moreover, it encompasses the complexity of gene pools, species, communities, and ecosystems at spatial scales from local to regional to global.”¹



SALAMANDER: SIGN OF A HEALTHY ECOSYSTEM



MOSSES & LICHENS



WILD FLOWER LABYRINTH



EVALUATION

ECOSYSTEM COMMUNITIES HIGH ELEVATION RED OAK FOREST & SPRAY CLIFFS

HIGH ELEVATION RED OAK FOREST:

This community can be found on dry to moderately moist slopes and ridge-tops at mid to high elevations (around 3,500- 5,500 feet).² Common plants include ferns, Yellow Birch, Azaleas, Rhododendrons, and Trilliums.

SPRAY CLIFFS:

Spray cliffs and waterfalls are home to many rare and endemic flora and fauna. These communities occur where small streams have cut into the bedrock. Plants include Round-leaf Sundew, Grass of Parnassus and Appalachian Shoestring Fern.³



NATURALLY OCCURRING VASEYI AZALEAS (*RHODODENDRON VASEYI*) ARE RARE



RED OAK (*QUERCUS RUBRA*) LEAVES EMERGING



SPRAY CLIFFS IN THE NATURAL WOODLAND



EVALUATION

PROJECT THE RED SPRUCE PROJECT

RED SPRUCE (*PICEA RUBENS*):

For a decade, the Reserve has been growing Red Spruce. In 2009, we collaborated with the NC Wildlife Resources Commission to grow Red Spruce for restoring the endangered Spruce-Fir high altitude forests of Western North Carolina. The Reserve's micro-climates, location, and altitude provide the perfect opportunity to propagate Red Spruce for this and other restoration efforts, including the Southern Appalachian Spruce Restoration Initiative (SASRI). In turn, restoring the spruce will support connected endangered animal communities such as the Carolina Northern Flying Squirrel.



ONE-YEAR OLD SPRUCE SEEDLINGS IN THE NURSERY



VOLUNTEER POTTING DAY



OVER 1,000 SPRUCE READY FOR PLANTING DAY



PLANNING IMPLEMENTATION EVALUATION

EDUCATION AQUATIC HABITAT PROTECTION

EDUCATION:

Education is an important aspect of the Reserve's mission. Part of developing increased awareness for the importance of our water resources is educating the younger generations. Students have the opportunity to visit the Reserve and learn about aquatic habitats at the Vaseyi Pond, a unique outdoor classroom constructed to emulate wilder places.

The Reserve is also part of a Mountain Bog learning network to contribute knowledge, learn about protecting this endangered habitat, and ultimately design one on site.



HIGH-SCHOOL STUDENT SEARCHING FOR INSECTS



MAN-MADE WATERFALL COMMUNITY AT THE VASEYI POND



BOG PROJECT AREA: WORK IN PROGRESS

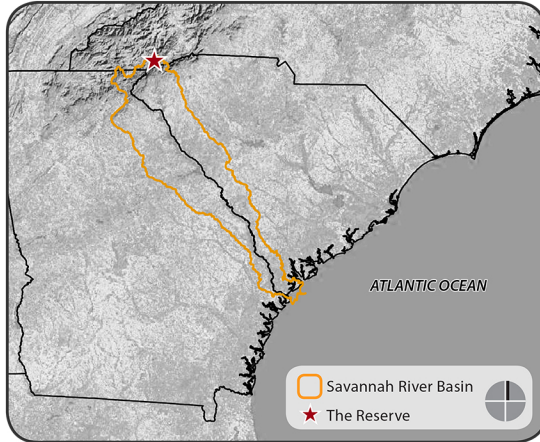


DESIGN PLANNING IMPLEMENTATION EVALUATION

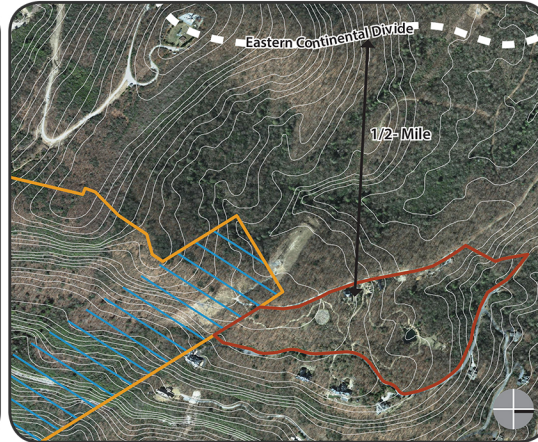
ELEMENTS WATER

WATER:

Located just a half-mile from the Eastern Continental Divide, the Reserve is at the southern edge of the Blue Ridge Escarpment in the Southern Appalachian Mountains, and is the headwaters for the Savannah River Basin. Special care is taken at the Reserve to treat the water resources wisely. One of the first areas constructed was a pond for irrigation that has become an important aquatic habitat for endemic amphibians as well as a research area.



SAVANNAH RIVER BASIN HEADWATERS



ONE HALF-MILE PROXIMITY TO EASTERN CONTINENTAL DIVIDE



VASEYI POND: HABITAT & IRRIGATION



DESIGN PLANNING

EVALUATION

ELEMENTS CLIMATE & WEATHER

CLIMATE:

This area of Western North Carolina is defined as a "temperate rain forest". The mountain peaks create many micro-climates to which ecosystems have adapted over time.

The Reserve actively monitors weather using a *Davis Vantage Pro* station. Design measures taken to mitigate the human footprint in the area while adapting to the climate include an intensive green roof and pervious pavement parking area.



THE WEATHER STATION AT 4,365 FEET



INTENSIVE GREEN ROOF

2012

Median Temperature: 53.4°

High Temperature: 93.8° June

Low Temperature: 5.4° February

Rainfall: 80 inches

2013 JANUARY- APRIL

Median Temperature: 39.4°

High Temperature: 74.8° April

Low Temperature: 10.1° February

Rainfall: 40 inches

RECENT CUMULATIVE WEATHER DATA



DESIGN PLANNING

EVALUATION

PROJECT PLANT RECORDS

PHENOLOGY:

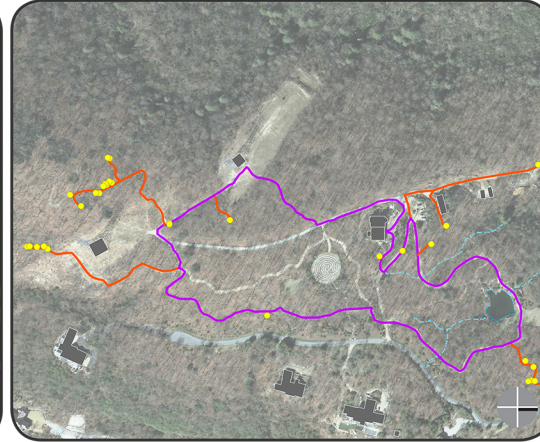
The weekly phenology walk is an important aspect to the Reserve's on-going observation and data collection. This regime monitors thirty-two plants occurring naturally at the Reserve for comparison to sister plants that have been cultivated on site.

PLANT ACCESSION:

Every plant and seed cultivated at the Reserve has a record that tells its history since arrival on site. These records are integral to the development of an educational and valuable database for research and perpetual knowledge.



ACCESSION TAG IN THE CORE PARK



PHENOLOGY TRAIL MAP: MONITORING PLANTS IN BOTH AREAS OF THE RESERVE



SQUAWROOT (*CONOPHOLIS AMERICANA*): A RARE, NON-PHOTOSYNTHESIZING PERENNIAL PLANT THAT IS MONITORED



PLANNING

EVALUATION

SYNOPSIS DESIGN, MANAGE & PLAN FOR BIODIVERSITY

SYNOPSIS & CONCLUSION:

The purpose of this poster is to garner feedback from peers and colleagues about The Biodiversity Project for The Southern Highlands Reserve. This project seeks to demonstrate that biodiversity can exist within a designed and planned landscape managed to mimic native ecosystems and create continuity with the surrounding mountain communities. This is demonstrated through projects and education opportunities developed by researchers using the four management strategies with the seven layers of investigation.

The two large sections on this poster provide the project abstract and research parameters, as well as the location and site map for the Reserve. Seven sections on this poster define elements unique to the Reserve, along with highlights of the projects and educational activities housed within The Biodiversity Project.

This is only the beginning of what is intended to be a long-term investigation. The results will provide hard data and insight into the significance that designing landscapes to emulate native ecosystems is important to sustaining our precious natural environments, and can be done aesthetically without detracting from biodiversity. Data from this study will be used to inform future management decisions at the Reserve, as well as provide important information for on-going research in the region.



THE SOUTHERN HIGHLANDS RESERVE MISSION

The Southern Highlands Reserve, a private nonprofit woodland garden, is dedicated to supporting, and sustaining the natural ecosystems of the Blue Ridge Mountains through the preservation, cultivation and display of plants native to the region and by advocating for their value through education, restoration and research.

KELLY HOLDBROOKS
Director of Programs
kholdbrooks@southernhighlandsreserve.org

TAYLOR LADD
Director of Research & Education
tladd@southernhighlandsreserve.org

The Southern Highlands Reserve
558 Summit Ridge Road
Lake Toxaway, North Carolina 28712
828.885.2050
www.southernhighlandsreserve.org

¹The Western North Carolina Vitality Index. 2012. Natural Ecosystems. Biodiversity. www.wncvitalityindex.org. [accessed May 2013]
²-----2012. Natural Ecosystems. Classifying Communities. www.wncvitalityindex.org. [accessed May 2013]
³The Southern Highlands Reserve. n.d. About the Reserve. Gardens. Waterfall and Cliff Communities. www.southernhighlandsreserve.org. [accessed May 2013].

CONTACT & SOURCES



The Southern Highlands Reserve
NATIVE PLANT ARBORETUM RESEARCH CENTER