



2017 Strategic Plan

Monica H. Moss Watkins
Janis O'Donnell

Department of Biological Sciences
College of Arts and Sciences
The University of Alabama
Tuscaloosa, AL

THE UNIVERSITY OF ALABAMA®

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Overview

The University of Alabama Arboretum has long occupied a unique position as a resource for research and academics at The University of Alabama, area schools, and Tuscaloosa community recreation and education. Now nearly 60 years old, most of the Arboretum's land was donated by the federal government and has since supported the University's goals of promoting research and providing public education and service. Today the Arboretum is part of a national network that shares plant information with scientists, students, and the public.

The Arboretum maintains plant collections for botanical education and appreciation and features walking trails through native woodlands; wildflower, experimental and children's gardens; and a collection of ornamental plants. Sponsored by the Department of Biological Sciences in the College of Arts and Sciences at The University of Alabama, the Arboretum also is an affiliate of The University of Alabama Museums and cooperates with museum staff on education and outreach programs.

The University of Alabama Arboretum has been one of Alabama's best kept secrets—a natural treasure trove in our own backyard. As the University continues to grow in size, quality and visibility, the Arboretum is poised to become a member of a select group of internationally renowned arboreta in this country. In keeping with The University of Alabama's vision for outstanding research and scholarship, educational excellence, and service to local, national, and international communities, we are embarking on an ambitious plan to enhance the Arboretum's resources and educational missions as we move forward towards international prominence.

Mission

The University of Alabama Arboretum is a scientific institution that engages in teaching, research, and service with primary emphasis on the ecology and biodiversity of Alabama. The Arboretum maintains a plant collection containing native species and their exotic relatives, educational reference specimens, and plants of global conservation concern. The Arboretum's programs promote management, conservation, and sustainable use of natural resources and appreciation of nature through recreational activities and artistic endeavors.

Vision

The Arboretum will serve as a place to engage the local community through programs that promote the Arboretum's mission and highlight contributions of University research to society. The Arboretum will preserve Alabama's natural heritage and become a leading institution in the areas of plant conservation, science education, and natural resource management. This strategic plan will detail a roadmap towards our vision for the Arboretum.

Core Values

Plants are essential to human health and survival. Plant conservation is vital to maintaining the planet's environment upon which we depend. People are happier and healthier if they are able to spend time in a natural environment. Plant and environmental education should be available to everyone. Arboreta and other public gardens are repositories of our botanical heritage and crucial to its preservation.

Goals and Objectives

1. Enhance and expand the teaching, research, and service mission of The University of Alabama Arboretum while keeping the sense of place that has made it special
 - Engage the local community as partners in Arboretum activities and programs
 - Become nationally recognized as a leader in hands-on science education and teacher training by serving a diverse audience through programs for all ages
 - Provide enhanced opportunities for appreciation of nature through the arts and recreation
2. Develop a program for conserving plants native to Alabama and participate in national and international plant conservation efforts
3. Model and teach best practices in natural resource management, conservation, and sustainability
4. Achieve the highest level of accreditation, Level IV, through ArbNet, an international organization of arboreta

History of the Arboretum

The 60-acre property that is now the UA Arboretum was deeded to The University of Alabama in 1956 as part of the transfer of 136 acres of federal land left over after the construction of the Veterans Affairs hospital. The agreement stipulated that a portion of the land would be for an Arboretum, a portion for a golf course in support of recreation and physical education, and a portion shared between the two properties. Faculty in the Department of Biological Sciences created a detailed proposal for the Arboretum as part of the initial application to the federal government. Their proposal outlined the need for an Arboretum in the southeast with emphasis on the biodiversity of local flora and ideal temperate climate that could support specimens from around the world. In 1958, Professor Gibbs Patton, who was instrumental in creating the proposal, was given part-time release of his teaching responsibilities as Director of the Arboretum. Later that year, the pavilion shelter and storerooms were built, nature trails constructed, ornamental plant collections established (magnolias, camellias, hollies), and wildflower garden created.

A distinguished series of directors followed Dr. Patton, with former University Presidents Joab Thomas and E. Roger Sayers serving in the 1960s and Professor Frederick Gabrielson taking over in the 1970s. Mary Jo Modica, who was hired as the Arboretum horticulturalist in 1978, also deserves special recognition, as she ably managed Arboretum operations from the end of Dr. Gabrielson's tenure as director in the 1980s until her retirement in 2012. There followed a period during which the Arboretum lacked a director and was maintained by support staff until the hiring of Monica Watkins, current Arboretum Director, in 2014.

In 1983, the first spring plant sale was held and the 25th anniversary was a catalyst for the creation of the Friends of the Arboretum. The FOA sponsored construction of the Bog Garden in 1986. The daylily collection and Rebecca Welch Meadow Garden were established in 1987. In 1990, the Bishop greenhouse was built and FOA began to fund a greenhouse gardener position. In 1991, the office was moved from the Biology Building to the Arboretum, the pavilion remodeled, and tractor shed built. The FOA held the first fall plant sale in 1992 and the first Garden Celebrations spring garden tour in 1993. In 1994, the Duncan greenhouse was moved to the Arboretum. A 1995 sabbatical tour of public gardens in Europe by Mary Jo Modica inspired development of a formal long-range plan for

the Arboretum. Later that year, a formal Master Plan process was begun with funding from the FOA. In 1997, the Children's Hands-On Museum and the Arboretum were awarded a grant from the Howard Hughes Medical Institute to build a tree platform and develop the Tree Topology curriculum as an outreach to local schools, and the FOA funded a graduate assistantship for an Education Coordinator position.

Strategic Planning Process

Monica Watkins, Arboretum Director since 2014, has worked closely with the College of Arts and Sciences administration, faculty, and other University units and sought input from members of the community to develop the vision articulated above for the Arboretum's future. This strategic plan describes current initiatives of high priority, as well as goals for the next five to ten years. However, this plan will not be a static document. Rather, it is a roadmap towards our vision for the Arboretum, placing this wonderful facility on the path to realizing its full potential.

Themes

Three major themes are integrated into this plan: *Technology*, *Experiential Learning*, and *Environmental Sustainability*.

Technology: Current technological tools and applications are a necessity for the teaching, research, and service programs of all arboreta. From the Arboretum website to social media, citizen science websites and applications and digitizing historical documents, current activities and plans for the future are essential for the growth of Arboretum programs.

Experiential learning: Hands-on nature experiences enhance learning for all ages. At the undergraduate level, creation of outdoor laboratory experiences and an internship program will provide unique learning opportunities. Citizen science, through which schoolchildren and other visitors can contribute scientific data to research programs, will provide opportunities to participate in the scientific research process. These activities will enhance communication between university researchers and the public and contribute to

the broader impacts of research, such as being better informed to make decisions about important environmental issues.

Environmental sustainability: The Arboretum is positioned to educate the public on sustainability practices and to be a significant contributor to improved sustainability practices by the University. This effort will be accomplished by hosting programs such as the sustainable community garden and campus composting program, and by mentoring student-led sustainability projects.

Part II

Proposed Improvements

Advisory Board and Fundraising

A new Arboretum Board Governors will be organized to advise the Arboretum Director on administration of the Arboretum. Its duties will include assisting the Director and staff in developing policies, priorities, and strategic and long-range plans. Its membership will be composed of faculty, staff, and community representatives with expertise related to the Arboretum's mission. Members will be appointed by the Dean of the College of Arts and Sciences based on recommendation by the Arboretum Director and Chair of the Department of Biological Sciences. Members may include representatives from the Department of Biological Sciences, New College, Department of Art, Natural Resources Management minor, Department of Geography, Department of Geology, College of Education, College of Engineering, Community Based Partnerships, Center for Economic Development, Tuscaloosa Tourism and Sports Commission, University Forester, University Landscape Architect, College Development staff and other positions deemed necessary. The board shall serve in an advisory capacity only and all activities will require approval of the Arboretum Director, Chair of the Department of Biological Sciences, and Dean of the College of Arts and Sciences.

In addition, the Friends of the Arboretum membership group will exist to collect donations, support Arboretum fundraising activities, promote Arboretum programs, and enlist support for the Arboretum. Volunteers may be granted membership based on their hours of service rather than financial contributions. It will be administered jointly by

development staff from the College of Arts and Sciences and Arboretum staff. In coordination with the Arboretum Director and with the assistance of a marketing firm, the Friends will identify and develop the resources required to achieve the goals of this plan. These will include grants, community partners, and potential fundraising activities. A high priority step towards resource development will be the creation of a spring festival that will include the return of the long-popular sale of plants and add nature-themed and sustainable arts and crafts, food, and music offered by vendors and invited musicians. We anticipate that this expanded event will draw more diverse participants from the University and the Tuscaloosa community as it highlights the resources and mission of the Arboretum.

Charges for special events, fees for educational programs, and sales of compost and firewood are other sources of income to sustain the upkeep and improvement of the Arboretum grounds and structures. An important longer term goal is the addition of a visitor center with a gift shop and that will educate and provide an income source.

Master Plan

In consultation with the university planner and landscape architect, we will select a landscape architecture firm with experience in designing public gardens and nature



centers to create a new master plan for the property. This process will identify peer and aspirational institutions and translate our vision into a physical design. The Arboretum's master plan then will be reviewed annually and revised every five to ten years.

Logo and signage

A new logo has been designed that reflects this new phase in the Arboretum's history and meets current University design standards. An oak tree was selected to represent Alabama's tree biodiversity, and to highlight Tuscaloosa County's distinction as the center of oak diversity in the state and the city of Tuscaloosa's nickname "Druid City." Additional signage throughout the property will better inform visitors of University policies, of expected behavior, and to release the University from liability in the event that

rules are not followed. Additional signage will indicate operating hours, emergency contact information, and assist visitors with navigation around the property through maps and trail markers.

Buildings and Structures

The College of Arts and Sciences has provided resources for the highest priority improvements of buildings and structures and security features:

- Roofs of the office, shop, and pavilion have been replaced.
- Security alarms and cameras have been added.
- Lighting fixtures and furniture in offices and pavilions have been replaced.
- Structures have been painted.
- A new sign, automatic gate, and landscaping have been installed at the main entrance.
- Step railings have been installed.
- A new bridge has been constructed on a trail near the tree platform.
- A deteriorated dock has been removed from the Arboretum pond, replaced by a stonework patio.

Further renovations, replacements, and added features include:

- Replacement of other bridges on trails
- Addition of benches throughout the Arboretum
- Addition of a storage shed for garden implements
- Repair of the tree platform
- Addition of garbage and recycling cans that meet university design standards

Larger scale projects:

Classroom: A portable classroom near the sustainable garden was designed to run on a solar electric power system. However, the original system was incompatible with the roof and caused roof leaks. Planned improvements to this structure include an adjacent movable solar panel array, a wood burning heater, and LED lights.

Cob house: This small structure was designed and built out of local natural materials (straw and clay) by students in 2006. Located near the portable classroom, it was intended to serve as an outhouse with a composting toilet and to demonstrate sustainable building practices. A green roof was added later by Arboretum staff, however, the intended plaster finish coat was never applied. Fortuitously, in its present state, it is an ideal habitat for native solitary masonry bees. These bees pose no threats to the public, and provide an interesting demonstration of how human structures can sometimes benefit the natural environment. Repair and completion of the cob house for its intended purpose requires the installation of a door and window along with a composting toilet, replanting of the green roof, and application of a plaster finish coat. To preserve the bee habitat, a new wall for the bees will be built nearby. The plaster finish coat would be applied to the cob house after the bees have relocated.

Maintenance shop: The current maintenance shop houses supplies and equipment, and contains a small work area for carpentry and equipment maintenance. At approximately 1000 square feet, it is undersized and some equipment and supplies are necessarily stored outside the shop. Additionally, the shop is poorly located. A drainage channel flows directly behind the shop and must be kept clean to prevent flooding during heavy rains. The shop is prominently located on the edge of the tree specimen garden adjacent to existing greenhouses, office, and pavilion. For aesthetic and functional reasons, it must be replaced with a larger, more secure building in a less noticeable, more accessible location that is not subject to flooding. The existing concrete pad will be an ideal spot for a new gazebo, rain shelter, or other garden feature.

Greenhouses: The current greenhouses are in a state of disrepair and require either extensive renovation or replacement. Cleaning and minor repairs necessary to minimally maintain the plant collection and reduce expenses for heating in winter are in progress. The high cost of a renovation to restore full functionality indicate that a more cost-effective strategy will be to replace them with a working greenhouse space for plant propagation, research, and teaching at another site on the property and to add a conservatory in a visitor center.

Visitor, learning, and conference center: A new visitor center with attached conservatory is proposed. This facility will meet or exceed current Leadership in Energy

and Environmental Design (LEED) building standards and demonstrate the University's sustainability efforts to the public. This building will include a multipurpose room for events and group visits, classroom laboratory, research laboratory, offices, kitchen, exhibit and gallery space, and an adjoining plant conservatory with public display areas and additional space for plant propagation. The plant conservatory will serve as main exhibit space for the Arboretum's greenhouse plants, providing room for large plants that cannot be housed in the current facility and additional plants. We envisage room to house insects (bees, butterflies), reptiles, and amphibians in habitat exhibits and a basement rhizotron, or soil window, to view tree roots and other underground life. This exhibit will be a unique complement to the existing tree platform that focuses on canopy ecology. The rhizotron will be used to interpret belowground ecology and communicate current scientific research in soil ecology to the public. To our knowledge, no other public garden has a full size rhizotron available to visitors. Together, the tree platform and rhizotron will give Arboretum visitors a hands-on and unique experience in both aboveground and belowground ecology. A nature playground will be constructed next to the new visitor center. It will be constructed of natural materials and designed to interpret nature education concepts.

Roads and Parking

Vehicle accessibility and parking is key to improving the Arboretum visitor's experience. Roads and parking, therefore, are necessary considerations of the proposed building projects and essential to the design of the Arboretum's revised master plan. The Arboretum is currently accessed via a gravel road, Arboretum Way. This road, which begins at the paved parking lot at the Harry Pritchett running park/former golf course and ends at Pelham Heights Road, is one way with several pullover and turn around areas. It is a safety concern, particularly during peak hours. Moreover, Arboretum Way requires regular maintenance because rainwater runoff creates muddy puddles and potholes and erodes the roadbed and roadside. The improvements outlined below will ease access, improve safety, and lead to increased visitor numbers.

Arboretum Way will be widened and resurfaced with gravel, and vegetation will be cleared from its edges to improve sight lines and accessibility to the Arboretum. The two

parking lots also require resurfacing with gravel. New parking lots will be needed for the new visitor center and maintenance shop, and roadside erosion control measures will be implemented. Paving these areas with a *sustainable*, permeable surface should be considered a priority; these areas can then double as a demonstration for educational purposes.

Safety and Security

The Arboretum requires upgrades to facilities, policies, and training to bring safety and security up to current standards. Our first priority is the safety of our visitors and staff, followed by the security of University facilities including the plant collection. Signs, as discussed above, are being installed to inform visitors of applicable laws, university policies, and Arboretum rules. These signs will be placed at our entrances and address issues such as liability release, off-leash dogs, and protection of the plant collection. Off-leash dogs have become a serious problem since the closing of the former University golf course adjacent to the Arboretum.

The UA Department of Environmental Health and Safety inspects Arboretum facilities and is available to assist with any issues. Old asbestos greenhouse tabletops were disposed of by EHS staff in 2015. Fire extinguishers are checked monthly.

Staff training needs include self-defense, active-shooter, First Aid, and CPR training. Additional training such as Safe Zone may be appropriate. A safety management plan is being drafted for staff reference. Staff read equipment manuals and go through safety training prior to using equipment such as the mower, tractor, and chainsaw. Volunteers go through training and sign a liability waiver prior to volunteering.

Currently there is no storm shelter; in the event of severe weather, the Arboretum must be closed. Events, including field trips, must be cancelled and staff sent home or to another place to shelter. The proposed new visitor center would resolve this issue by providing exhibit space in the basement that doubles as a storm shelter.

Several years ago, after a greenhouse heater failed, cold-sensitive specimens were lost. A temperature alarm installed in the upper greenhouse sends an alert when temperatures fall below a set level. As part of recent office renovations described above, the existing system was enhanced by the installation of a second temperature alarm in the

lower greenhouse and door alarms on the office. New locks and security cameras were also installed. Game cameras, designed to photograph wildlife, were installed in 2016 at strategic locations to monitor wildlife as well as provide images of remote locations that are inaccessible to hardwired security cameras. Plans are being made to extend the security system to the shop, which was broken into in 2011 and cost over \$5000 to replace stolen tools. Installation of security cameras in the wildflower garden will protect rare plants in the collection, as a number of these plants have been stolen over the past decades.

The Arboretum has two primary entrances with gates located at the east and west ends of Arboretum Way. The east entrance on Pelham Heights Road is used as a staff entrance and kept locked when not in use. The west entrance is accessed through a gate at the intersection of Loop Road and Veterans Memorial Parkway. This shared gate serves as the main visitor entrance to both the Harry Pritchett Running Park and the Arboretum. Arboretum staff open this gate in the morning and UAPD is responsible for closing it at night. A second gate has recently been installed at the Arboretum access road where it meets the paved parking lot in the running park. Security at this entrance has been improved by the addition of landscaping and a gate with a timer that can be opened and closed automatically, thus preventing entry when the Arboretum is closed.

The Arboretum does not currently have continuous perimeter fencing. Barbed wire fencing is present along some property lines, but is in poor condition. In other areas, such as along Pelham Heights Road, trees and other vegetation create a screen but not a barrier. There is no fencing separating the Arboretum from the former University golf course. The former golf course is partially surrounded by a fence, but it, too, needs repairs in multiple areas. We propose to repair, replace, or install fencing along the entire perimeter of the University property. In some areas, this means creating a living hedge fence to provide wildlife corridors and to create buffer zones with adjacent properties. In some areas, this will require coordination of efforts with Intercollegiate Athletics, Facilities and Grounds, and Land Management.

Freshwater Management

An intermittent creek runs across the Arboretum property. The source of this stream is buried beneath the former golf course property. Large pipes lead to a five-acre

manmade lake that drains to the Arboretum. In addition, runoff from the former golf course area sheets down slopes, wears gullies in walking trails, and overflows streams and drains. Management of water flow will require cleaning and repair of existing culverts and drains, followed by placement of larger diameter pipes and storm water culverts both at the Arboretum itself and underneath the adjacent railroad track with the capacity required to handle upstream runoff from the former golf course property. We recommend partnering with storm water management engineers and leverage the expertise that has addressed similar issues at the Moundville site to develop a strong plan for improved drainage, erosion control, and trail maintenance.

Aquatic ecology, a strength of the faculty of the Department of Biological Sciences, is an important focus in the state of Alabama, which harbors the highest level of stream and wetland biodiversity in the nation. The existing small pond is not sufficient for highlighting and educating the public about the important feature of Alabama's natural resources. With access to the ponds on the cross country/golf course property, the staff of the Arboretum and faculty of The University of Alabama could reclaim and restore these freshwater resources, while creating enhanced opportunities for education in aquatic ecology and fisheries. Permanent access to this area, either as part of the Arboretum or as part of an agreement, could then make possible the addition of a pier and boats and storage shed feasible. We propose a comprehensive watershed restoration plan, encompassing the old golf course lake, stream, and Arboretum pond that will lead to the creation of a functional freshwater ecosystem.

Forest Management

About two thirds of the Arboretum property is forested and requires management using modern forestry practices. Two areas are designated as specific forest types; one is a mixed pine and hardwood stand and the other is an oak-hickory hardwood stand. Additional forested areas along the road are unmanaged and contain a large number of invasive species. Other forested areas categorized as part of the botanical collection are discussed in the Gardens section that follows.

Of highest priority will be removal of invasive species within these forested areas and trail repair. Invasive plants, primarily Chinese privet, English ivy, and bamboo, line the

creek and much of the forested area adjacent to the Children's Garden and road. Wisteria, kudzu, honeysuckle, Japanese climbing fern, and *Nandina* also have invaded forested areas. *Microstegium*, an annual grass, has most recently invaded along roads, walkways, and trails. It is likely to encroach further in natural areas during the spring and summer months. These will be removed using a combination of manual labor and mechanical and herbicide methods.

A network of trails connects forested areas to the rest of the facility; all require repair followed by regular maintenance. Trails have not been properly maintained and erosion is severe in some places. This is exacerbated by the excess runoff directed to the Arboretum from the former golf course land as discussed in the Freshwater Management section. Many of the original trails were properly designed to meander up hills. However, visitor-created folk trails used as shortcuts have become established and run straight up the slopes, causing severe erosion and closure of some trails. Additional trails will have to be closed for the same reason. Bridges that are in poor condition are being replaced and traction coating will be applied to all bridges. Reconfiguring the trail network is an option that will be addressed during the master planning process.

Over the next three years, a forest assessment and management plan will be developed. Faculty in Biological Sciences and Geography and the University forester have volunteered to assist in this effort. This assessment will include an inventory of vegetation and a wildlife survey, with the assessment used as an opportunity for education and outreach to students and the community. A planned annual Bio Blitz---an event where experts and amateur biologists team up to identify as many species as possible over a single day or week---will be an exciting way to gather information quickly and an opportunity to publicize the Arboretum and faculty expertise. The inaugural Bio Blitz is scheduled to take place in 2018 in partnership with the UA Museums. As the management plan begins to take shape, particular recommendations for forest restoration and wildlife habitat improvement can begin to be implemented immediately. Possible management techniques include mechanical mulching, regular herbicide application to control invasive species, prescribed fire, and thinning.

The last Master Plan included a proposal for establishing a display of longleaf pine as part of the curated gardens. Since that time, knowledge of longleaf pine restoration

techniques has advanced significantly. The feasibility of establishing a stand of longleaf pine in the forested areas will be considered as part of the new master plan. This project could be completed slowly over time and would add to the Arboretum's botanical collection and benefit the Arboretum's education outreach program. Potential collaborations with the United States Forest Service and county and state extension services could teach natural resource management students, local landowners, and the broader community about Alabama's upland longleaf pine stands.

Plant Collection

The Arboretum's plant collection records require review, and a comprehensive inventory must be completed. Up-to-date accession records of the plant collection are required for accreditation. The greenhouses, gardens, and forested areas must be systematically surveyed to catalog all species represented in the botanical collection. Plants in the greenhouses, woody specimen areas, and along some trails are labeled with common and scientific names. Existing labels will be cleaned, repaired, or replaced, and new labels will be created for specific plants that are not currently labeled. The review of records, inventory, and maintenance of existing plant labels must be completed within the next year and will be accomplished with assistance from students and volunteers under the supervision of the Arboretum Director. Faculty can contribute assistance through the participation of their students in botany, dendrology, and natural resources courses with a field identification component.

Over the next 2-3 years, accession records will be cataloged using standardized software designed for botanical institutions. This software maps the location of specimens using GPS coordinates and records information such as accession date, accession location, and other important information such as bud and bloom time. An updated map will be created and distributed to visitors and connected to the website and app using this software. Making our records accessible through technology will not only reach more members of the public but also assist in sharing with other public gardens and arboreta and help accomplish the goal of making a significant contribution to plant conservation.

These projects will be initiated by the Arboretum Director with assistance from students and staff. However, to properly manage the collection in the future, a dedicated

curator should be hired. The curator would have primary responsibility for the plant collection, with special emphasis on maintaining accession records and conservation. This position is discussed in more detail in the Personnel Section. An added benefit of this position is that it would satisfy accreditation requirements for a curator or other scientific staff.

Future goals for the collection include planting of additional woody specimens. Burr oak, American chestnut, and Osage orange were added to the Arboretum's collection in 2015. Five hundred woody species are required for Level III & IV accreditation of Arboreta. Additional aquatic specimens could be added under the proposed watershed restoration plan outlined above.

Gardens

The Arboretum currently contains wildflower, rhododendron, bog, children's, and sustainable community gardens, as well as a Black Belt prairie exhibit. Addressing deferred maintenance of these areas has begun and will continue over the next 2-3 years. Current attention is on basic maintenance such as weeding, pruning, and replanting in the children's, wildflower, and sustainable community gardens. Repair of existing and installation of new edging and irrigation will reduce future labor needs and improve function of these gardens.

The George Wood Chapter of the Alabama Wildflower Society is assisting with improvements of the Arboretum gardens. In particular, the chapter is helping to restore and maintain native plants in the wildflower garden, rhododendron garden, prairie exhibit, and the pollinator area of the children's garden.

Sustainable agriculture: The Arboretum is home to the University's composting program. The compost piles have been relocated to the back gate to provide a location closer to the community garden. UA Grounds staff provide carbon-rich leaf deliveries in the fall, which are combined with nitrogen-rich fruit and vegetable scraps from Dining. Future plans include partnering with Grounds, Bama Dining, and Athletics to create a post-consumer program for food scraps and compostable serveware and napkins. We will purchase an aerator attachment for the tractor to quickly create a finished compost product. Our goal is a full-circle program producing high-quality compost to showcase in

prominent areas around campus, especially partner areas (Bama Dining, Grounds, and Athletics). Compost not used on campus can be sold to members of the community to generate earned income for the Arboretum. We will employ best practices to create finished compost, which will result in an opportunity for community education as well as becoming a revenue-generating activity.

The sustainable community garden has recently been reestablished in coordination with the Center for Service and Learning (CSL) and student volunteers. CSL coordinates student volunteers while the Arboretum provides expertise in gardening and space for the garden. Produce is then donated to the West Alabama Food Bank. The garden was awarded funding in FY 2015-2016 through the Financial Affairs Sustainability Grant. In the near future, the Arboretum would expand this project with additional partners from campus and the Tuscaloosa community. The field area west of the present community garden is an ideal space for expansion of sustainable agriculture, including more crops and an orchard area.

The Arboretum Master Plan will include creating new gardens to enhance the plant collection and available educational experiences. A dedicated pollinator garden adjacent to the children's and community gardens will provide habitat for bees, butterflies, and other pollinators that would also pollinate garden crops. European and Asian gardens, inspired by Tuscaloosa sister cities, will give an international perspective to the plant collection. A sculpture trail will provide exhibition space for students, faculty, and professionals and draw in new visitors. These gardens could be sponsored by donations from individuals and businesses as well as be eligible for grant funding.

Education and Outreach

Education and outreach are core components of the Arboretum's mission. Immediate plans, include continued support of field experiences for science and non-science courses, such as botany, forest ecology, drawing, and creative writing. The Arboretum has provided K-12 field trips for West Alabama schoolchildren and scouts for decades. Individuals, families, and groups enjoy recreation and public programs. Recent programs have included an open house with lectures and music through a daylong event and a lecture cosponsored by the Alabama Wildflower Society on plants for pollinators.

We will reinstitute K-12 field trips, scouting, and public tours with assistance from student interns and volunteers. Education and outreach materials will be revised with guidance from the Arboretum Director and staff. Students will design lesson plans in line with current standards that place increased emphasis on environmental education and early childhood education: the Alabama College and Career Ready Standards (CCRS) that integrate Common Core State Standards, the federal Every Student Succeeds Act (ESSA) that replaces No Child Left Behind, and new state environmental literacy guidelines designed in consultation with the Environmental Education Association of Alabama. Funding will be sought to cover supplies and student transportation (school bus fees).

In tandem with the new field trip lessons, forest research plots will be established. These plots---one in the mixed-pine area and the second in the hardwood area---will be used to develop programming for hands-on, research-based, citizen science forest research. Restoration of the local watershed, encompassing the old golf course lake, stream, and Arboretum pond will provide opportunities for education and outreach in aquatic ecology and fisheries management.

The Arboretum's long-term goal is to be a hub for teacher training in hands-on science education with a focus on environmental education and natural resources. The Arboretum will host teacher training workshops for programs such as Project Learning Tree and Global Learning and Observations to Benefit the Environment (GLOBE). In coordination with the College of Education and local school districts, the Arboretum can offer training to pre-service (students) and in-service teachers. The Arboretum can also provide opportunities to expose science majors to career opportunities in STEM teaching through workshops, internships, and trail guide volunteer programs. The Arboretum can expand its role in natural resources education by providing internship and expanded field experiences and labs for students in the Natural Resources Management minor. Programs for the general public and landowners, hosted by the Arboretum and taught by local professionals from Alabama County Extension Services (ACES), the U.S. Forest Service, and other agencies and organizations will provide practical information about natural resources.

In the long term, education and outreach programs at the Arboretum have the potential to be highly competitive for private and federal grants. The forest research

citizen science project can be designed to reach PreK-12 students, undergraduates, the general public, lifelong learners, and families. Reference forest plots at the Department of Biological Sciences Tanglewood Field Station and in the Talledega National Forest can be used to compare data and provide opportunities for collaboration and student field trips. Preschool field trips and family programs will provide a pilot study that can be developed into a nature preschool program with collaborative research opportunities with faculty in the College of Human Environmental Sciences and the College of Community Health Sciences.

Technology

The Arboretum's technology has not been kept up to date in recent decades, and technology enhancements essential for Arboreta education, outreach, and management have begun and will continue to be a priority. Improvements have been made for high-speed internet access, the Arboretum website (<https://arboretum.ua.edu>) is being updated, and a Facebook page now publicizes Arboretum events and features photos of recent activities. The Arboretum has partnered with the UA Museum of Natural History and Moundville Archaeological Park to gather nature observations from citizen scientists through an online social network for nature lovers at iNaturalist.org. UA students and faculty along with Arboretum staff, interns, and visitors are working on adding observations at the UA Arboretum Biodiversity Survey via iNaturalist.

The Arboretum's website requires a redesign to fit current university design standards, add online reservation and donation pages, and an online store where supporters can purchase Arboretum souvenirs and selected publications. To enhance the visitor experience, an Arboretum app will be created. It will include a map and virtual tour of the Arboretum with links to information about plants in the collection. Historical documents related to the Arboretum will be digitized and made available through the Arboretum website.

Longer term improvements include a greenhouse wireless control system for monitoring environmental conditions and irrigation. Citizen science forest research plots will be outfitted with wireless monitoring equipment with real-time sensors and broadcast

data and video on the Arboretum's website. With support from eTech, OIT, and interested faculty, the Arboretum will continue to maintain and upgrade with new technology.

Personnel

In the 1950s and 1960s, the Arboretum staff consisted of a regular faculty member with a partial appointment as Director of the Arboretum, a part-time caretaker, and work study students. In the 1970s, a horticulturalist was hired who eventually took over day-to-day management and the role of director was left unfilled. In the 1990s and 2000s, various part-time temporary and student employees assisted with education and horticulture. In the late 2000s, the caretaker role was made a permanent, full-time position.

In 2014, the horticulturalist position was transformed into a permanent, full-time, staff director position. In 2016, a new, permanent full-time assistant position was created to support the Arboretum's mission in the office and on the grounds. A part-time student worker position was created to cover custodial duties and free up full-time staff to devote time to projects. This student worker is also available to assist the caretaker with watering, gardening, and other routine tasks.

The Arboretum's open hours have been and remain 8 a.m. to sunset, 7 days a week, closing only for Thanksgiving, Christmas, and New Year's Day. Due to increased visitor numbers, Arboretum staff began regularly working weekends in 2015. Visitors require interaction from staff and supervision to ensure that policies are being followed. New signage will inform visitors of University policies. Our peak visitor hours occur at times that the university is usually closed (weekends, holidays, early evenings in the spring and summer).

Volunteers contribute a significant number of hours to the Arboretum's work effort. While some groups and individuals come once or twice for special project days, others make a commitment to regularly assist Arboretum staff. There is an opportunity to formalize these regular, weekly volunteers into a program that better meets their needs as well as the Arboretum's goals. We are working with guidance from the Provost's office Quality Enhancement Program to develop a student internship program as a certified experiential learning opportunity. Students would choose one of three areas---horticulture, natural resources, or environmental education---for a semester or yearlong

internship. They would train alongside Arboretum staff, assist with daily tasks and then research and implement a project that benefits the Arboretum's facilities or programs. Our goal would be to provide stipends for up to 10 students per semester.

Future staff needs include the addition of an education coordinator and a curator. The education coordinator would be responsible for daily management of the education program and would assist the director with program development, grant writing, and education research. A curator will have primary responsibility for management of the Arboretum's plant collection. An added benefit of this position is that it would satisfy accreditation requirements for a curator or other scientific staff and be tasked with maintaining the required accession records. Current Arboretum staff are expected to grow into positions of increased responsibility, with promotion to new positions as appropriate, and may be asked to assist with or manage improvements at the Department of Biological Sciences' Tanglewood Field Station or the College of Arts and Sciences Strode Property. In addition to regular merit salary increases, retention of experienced permanent employees in positions of increasing responsibility will require salary increases.

Part III

Summary and Assessment

An annual report will be prepared each year to document progress towards the following benchmarks that have been set to measure the vision set out at the beginning of this document:

1. Increase diversity and numbers of University students, faculty, and teachers.
 - Engage 5,000 PreK-12 students per year through public programs and field trips. Pre- and post-test used to measure gain in knowledge and understanding of science and environmental studies.
 - Engage 1,000 visitors per year through public programs and events. Conduct an annual survey to assess the quality of the visitor experience.
 - Train 300 pre-service and in-service teachers in hands-on science education
 - Reach an additional 1,000 undergraduate students through expanded participation in field courses and training exercises in biology and natural resources management

- Be awarded grant funds for science education research, publications in nationally recognized journals
 - Increase volunteer participation through work days, internships, and coordination with the Center for Service Learning and off-campus groups
2. Plant conservation
- Publish an updated species list on the Arboretum website
 - Participate in 5 projects of significance to plants native to Alabama
 - Participate in 3 projects of national or international significance
 - Be awarded grant funding for self-supporting plant conservation research projects
 - Share information about plants of concern with the public
3. Natural resources and sustainability
- Increase the amount of composted waste by 50%
 - Decrease the amount of waste produced by the Arboretum
4. Achieve initial Arboretum accreditation at Level II. Maintain and progress to higher levels as the collection, education, and research programs grow towards national and then international prominence.

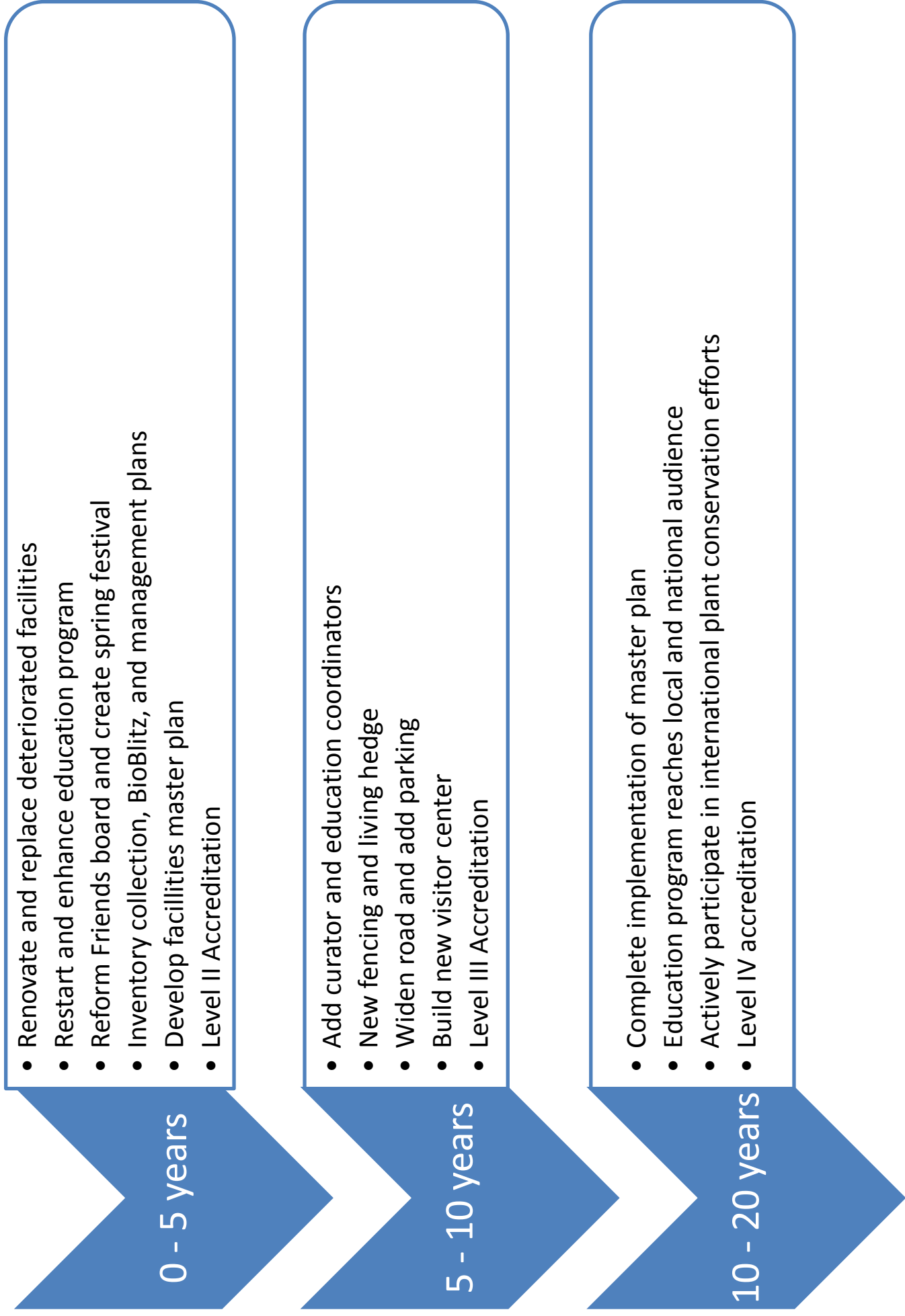


Figure 1. Timeline.

OUR VISION

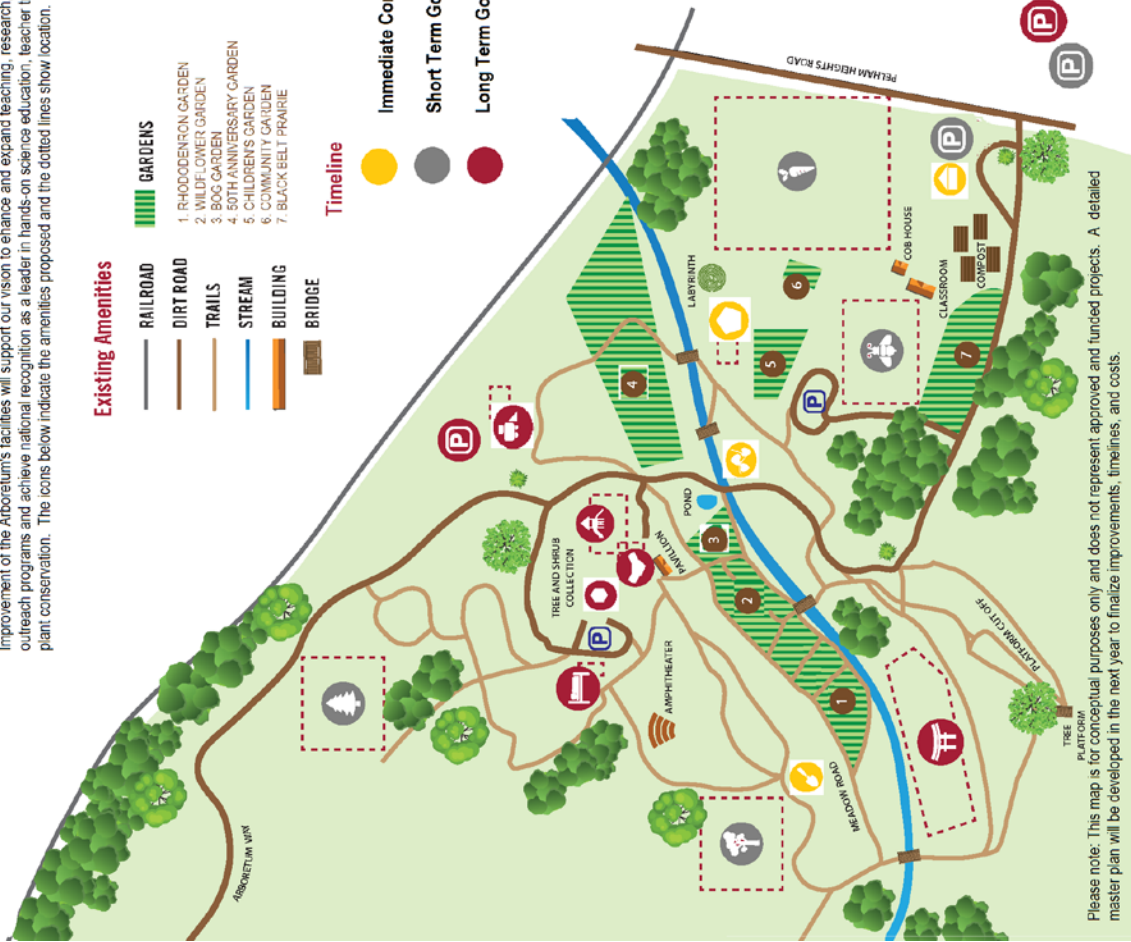
Improvement of the Arboretum's facilities will support our vision to enhance and expand teaching, research, and outreach programs and achieve national recognition as a leader in hands-on science education, teacher training, and plant conservation. The icons below indicate the amenities proposed and the dotted lines show location.

Existing Amenities

- GARDENS
- RAILROAD
- DIRT ROAD
- TRAILS
- STREAM
- BUILDING
- BRIDGE

Timeline

- Immediate Concerns
- Short Term Goals
- Long Term Goals



- Invasive Species Removal
An experienced contractor will bring native species to a level that can be maintained by Arboretum staff with assistance from students and volunteers.
- Garden Shed
A new, larger garden shed is required to store tools used by students and volunteers to maintain the children's and community gardens.
- Pollinator Garden
The Arboretum will participate in University efforts to establish habitat for bees and butterflies by planting native wildflowers.
- Sustainable Garden Partnership
As the sustainable community garden outgrows its current space, this area will be available to continue efforts with additional partners from campus and the Tuscaloosa
- Visitor Center and Conservatory
To support growth in our programs, the Arboretum requires an indoor space with exhibits, a large meeting labs, larger restrooms, and offices. An attached conservatory will house plants on public display.
- European Garden
This new themed garden inspired by Tuscaloosa's connection to will attract additional visitors and provide a unique experience.
- Bunkhouse
Students will have a place to spend the night when conducting evening field studies. Visiting scholars will enjoy the tranquility of the Arboretum and the convenience of being in town.
- Trail Erosion Control
Arboretum staff and University Facilities will develop a plan to repair and maintain the Arboretum's trails with the assistance of an experienced contractor, students, and volunteers.
- New Greenhouse
A modern climate controlled greenhouse will replace the existing worn and outdated greenhouses to better support research and conservation efforts.
- Pine Forest Citizen Science Research Plot
A research plot will be established in the existing pine forest. Students and members of the public will learn about the environment by collecting and comparing ecological data.
- Hardwood Forest Citizen Science Research Plot
A research plot will be established in the existing hardwood forest. Students and members of the public will learn about the environment by collecting and comparing ecological data.
- Tractor Shed
The current storage shed does not meet the expected needs for additional equipment necessary for our expanded programs. Relocation of this shed will improve visitor access to and aesthetics of the
- Playhouse and Gazebos
A playhouse for children inspired by and immersed in nature built for crawling, jumping, climbing, and splashing. The former shop foundation will be reused for a gazebo looking out on the
- Asian Garden and Sculpture Trail
Inspired by gardens of Japan, this area will feature native Southeastern and exotic Asian "sister" species of plants. Concrete footings for exhibition of student and professional sculpture.

Figure 2. Map of the Arboretum and proposed improvements.

