Using Native Plants in the Landscape at Central Carolina Community College
By Chris Bouton
Native Plant Studies Certificate Project, NCBG, Spring 2011

***

Part I

Part II

Part I

Introduction

The purpose of this project is to recommend a list of native plants to complement the landscape and sustainable agriculture practices at the Pittsboro Campus of Central Carolina Community College in Chatham County, NC. The building areas and landscape outside the existing Student Farm will be evaluated for light and water requirements. These will be used to outline of campus-wide zones to assign to each of the recommended native plants. Plant recommendations will also list information for edible and medicinal characteristics, extended-season pollinator value, and potential crops for the cut-flower CSA program. The native plants recommended here will provide a variety of species suited for future landscape installations as part of CCCC's sustainable practices. This list is intended as a baseline for incorporating more native plants into the general campus landscape. It is not comprehensive, so there are many other species that can be considered from the resources and references below. It is my hope that CCCC will use this list to establish a campus policy that integrates native plants with sustainable landscaping and water conservation practices on campus grounds.

CCCC is a 3-county college system that includes Lee, Harnett, and Chatham counties. The campus at Pittsboro is the home of the Sustainable Agriculture, Green Technologies, and Natural Chef Culinary programs. There is a Student Farm on campus that is a focal point on the grounds, opening up to the public several times a year for farm tours and for beekeeping classes. The campus has four buildings and a walking trail that encircles the majority of the grounds. The two most recently constructed buildings were completed in 2010: the new Chatham County Library, the first Silver LEEDS certified government building in the county; and a class Sustainable Technologies building for the Sustainable Agriculture, Green Technologies, and Natural Chef Culinary programs. The 1.3-mile walking trail is very popular with the community in Pittsboro, and now connects to the sidewalk system in town via the new roundabout and sidewalks on Rte. 87. The Student Farm has recently expanded outside the farm perimeter to include more pollinator-friendly native plantings in partnership with the Chatham County Cooperative Extension. In addition, the Student Farm is undergoing the process of organic certification.

New landscape beds were installed with the Library and Sustainable Agriculture buildings. However, plantings in the new beds were not extensive, and landscape beds along the new sidewalk and many parking lot sections are currently filled only sparsely with plantings. The older class buildings and walking trail have not been slated for comprehensive landscape improvements. In discussing the use of native plantings with Student Farm Manager, Hillary Heckler, it is clear that CCCC is interested in creating a fully-integrated landscape to support their programs' missions of sustainability and environmentally sound practices. Using crossover ideas from green building practices and sustainable agriculture, Ms. Heckler hopes to install campus-wide plantings that improve pollinator habitat, including plant specimens that highlight native edible and medicinal plants, as well as possible species for a cut flower CSA (community supported agriculture program).

Benefits of Native Plants in the Landscape

There are various reasons for using native plants in landscape design. Native plants are adapted to the local climate and require minimal maintenance when properly sited. The species that occur here naturally are able to adjust well to local variations in temperature and water availability. This makes it easier to plan landscape beds with lower irrigation and resource needs while improving the architectural interest throughout campus.

Native plants also enhance local pollinator and wildlife habitats by providing food and nesting materials suited to the ecological needs of local species. For example, some native bees only emerge when their host plants are in bloom. One such species is the southeastern blueberry bee (*Habropoda laboriosa*). Their life cycle, like many native solitary bees, is dependent on plant phenology, or timing of cycles such as annual blooming. Adding any number of native blueberry varieties around campus would increase habitat for this pollinator while adding an educational opportunity to the Student Farm and the community. There are a number of native plants that bloom at the far ends of the seasonal ranges in the early spring or late fall. Using plants across a wide variety of bloom times will extend the general seasonal availability for pollinator forage. This will also ensure a broader range of food sources for many native pollinators as well as the honeybees kept on campus. Ultimately, this will benefit the Student Farm, which currently operates a 4-season crop cycle.

Another desirable hosting aspect of many native plants is to attract beneficial predatory insects that feed on agricultural pest insects such as aphids and thrips. Planning borders and hedges of native plants for this purpose is typical of *farmscaping*, a landscape design philosophy that encourages selection of undisturbed, native plantings around agricultural fields for the express purpose to support habitat for beneficial predatory insects and pollinators. This concept is best supported when these designated areas are not disturbed. Expanding the use of native plantings around campus for the benefit of these insect populations will serve to bolster the organic and sustainable practices implemented on the Student Farm. The PDF "Farmscaping to Enhance Biological Control" from ATTRA is provided on the accompanying CD-ROM for reference.

By integrating native plants into future landscape designs for the Pittsboro campus, CCCC will also expand educational opportunities to the surrounding community that uses the campus for recreation. Signage, theme gardens, and self-guided trail tours of plantings are all possible tools that can emphasize the use and value of native plants in the landscape. This will also provide an opportunity to highlight the sustainable practices that are part of the missions for CCCC's programs.

Supporting the Sustainable Agriculture, Green Building, and Natural Chef Programs

Native plants are a major part of the original sustainable community in any locale. That community consists of the natural resources such as soil types, available water, animal and insect habitat, and specialized environmental niches, such as riparian buffers, meadows, savannahs, and rock outcroppings. The programs at CCCC were developed to address the importance of these natural resources in designing sustainable systems of food production and healthy living for a more natural sense of place and well-being. The Sustainable Agriculture A.A.S. and Continuing Education Certificates include courses in Biological Pest Control and Soil Science. The Natural Chef Program emphasizes food from a sustainable perspective. These programs and the Green Building Program focus on resource sustainability in an environmentally sound manner and incorporate the concepts of permaculture and water conservation. In keeping with the missions of these programs, using native plants in the landscape at CCCC will maximize the college's implementation of these goals right on campus. In a short amount of time, CCCC can expand its role as a sustainable education center by using the entire campus as a thriving example of these missions, listed below. The aspects of each mission where native plants can be applied are emphasized in bold italics.

The goal of the Associate in Applied Science in Sustainable Agriculture is as follows:
"The Sustainable Agriculture curriculum is designed to provide the entrepreneurial and technical skills necessary to manage a profitable, ***environmentally sound***, community based small farm or agricultural business. Students learn the fundamentals of ***sustainable agriculture***, focusing on ***crop production*** and farm business. Emphasis is placed on entrepreneurial and practical field training. Students will complete a business plan and an agricultural internship in marketing and farming. Graduates are qualified for employment in a variety of positions associated with ***sustainable agriculture***, including ***horticultural*** and livestock operations, wholesale and retail management, ***nursery operations***, and ***environmental and agricultural education***." [http://www.cccc.edu/curriculum/guides/A15410.pdf]

The Natural Chef Program also emphasizes the connection between sustainable farming and culinary professionals. The mission of the Natural Chef Program is as follows:
"Natural Chef Program's mission is to present a curriculum for students to develop expertise and passion for a holistic, nutritional, and ***naturally sustainable lifestyle***. The program prepares graduates for successful careers in the culinary field and is committed to promoting the use of ***whole, organic, and local foods for general wellness and therapeutic applications***. Through partnership with the college's Sustainable Agriculture program, the Natural Chef program supports ***chemical-free, natural foods*** to create ***healthy lifestyles*** throughout the ***local community*** and region for all ages."
[http://www.cccc.edu/green/naturalchef/]

The Green Building Program is described on the website as follows:
"Central Carolina Community College's Continuing Education Department's Green Building and Renewable Energy Program is designed for […] current building industry professionals and new students, homeowners and business owners. The goal is to train a competitive workforce for the ***new green economy*** and to educate community members in ***resource conservation***, alternative energy options, and ***sustainable home design***." [http://www.cccc.edu/green/greenbuilding/]

Evaluation of the CCCC Landscape
In order to establish the list of native plant recommendations, the campus was evaluated for lighting and moisture availability, and then divided into zones. The campus has a wide variety of landscape environments and microclimates. Most of the campus is in full sun with no irrigation. There are two stormwater ponds that retain water for extended periods. One pond is near the entrance at Business Rte. 64, and the other is next to the new parking lot near the Sustainable Technologies building. There are also two new stormwater catchment areas, both of which have new plantings targeted for intermittent inundation. One is near the Library entrance and the other runs along one side of the Sustainable Technologies building.

The west side of the property has an intermittent streambed that starts at the north end of campus and flows into Hill Creek at the southwest corner of campus in a riparian wooded buffer. It flows through several small wooded segments, so the lighting varies from full sun to partial sun along its length. These wooded areas connect via stretches of scrub brush along neighboring properties, running from Rte. 87 on the north to Business Rte. 64 on the south. The tree line can remain murky for extended periods, so there are 2 small wooden bridges for access to an oil seed field and the neighboring Senior Center.

The east side of the campus abuts a mature residential neighborhood with wooded and scrubby fenced areas separating most of the private properties from view. This wooded area continues to the south campus entrance and to the creek on the west. The walking trail encircles the entire campus, passing in part through the wooded areas on the east and south and between the open field and wooded area on the west. The north part of the trail is in open field along Rte. 87. All campus buildings and parking lots are within the walking trail.

Most of the landscape within the walking path is grass turf, with some standard plant beds immediately surrounding the buildings and some mature shade trees in the older parking lots. Plant beds around the older buildings have mature evergreen shrubs and crape myrtles as taller architectural elements, and some standard herbaceous plantings such as cannas, liriope, and pansies. There is no irrigation system for landscape beds around the older buildings.

Lighting
Much of the campus is open and exposed to full sun throughout the year, with parts of the walking trail in partial shade along the wood lines. The majority of the native plant recommendations have lighting requirements of full sun or part-shade. The wooded areas along the trail offer partial shade at different times of day. The eastern portion has more morning shade, and the western portion has some afternoon shade closer to the student farm. The southern portion has more afternoon shade. Within these sections are some very shaded areas in the depressions below the tree canopies off the trail, generally not viewable due to overgrowth of invasive species like Japanese honeysuckle and privet. The wooded area near Hill Creek in the southwest corner is variable part-shade throughout the day with no full sun. Some small segments are very shady depending on the size of the trees and time of year. Around the buildings, some of the north-facing walls also provide shade close to the perimeter. The buildings are not provided with any shade from mature trees.

When making plant selections for sites around buildings, consider the building orientation as well as the height of neighboring plants. These will affect the shading in each site differently across the seasons. The position of the afternoon sun is important, too, because many part-shade plants will thrive when protected from the prolonged heat later in the day. Similarly, more delicate, non-woody species will fare better a few feet away from the brick and cement of buildings and pathways since these materials act as heat sinks, which puts more stress on the plants. In addition, while some plants will grow well enough in the lower end of their lighting requirement spectrum, plants with less than desirable sun exposure might not produce as many blooms or bear fruit as expected; however, they may be more likely to survive during drought situations.

Moisture
The main source of water for general landscaping on campus is rain and runoff. The intermittent streambed on the west and the creek in the southeast corner are shaded enough from the trees to retain moisture along the buffer zones for extended periods. Along the wood line on the east, there are several points along the trail that curve enough to block afternoon sun, so these borders tend to stay moist, as well.

The pond at the entrance on Rte. 64/West Street sustains enough moisture throughout the year to support a small population of native cattails, *Typha* spp. (Note: These have not been keyed out for the exact species). Stormwater drainage runs from the new buildings and parking lots to a new retention pond along the western portion of the walking trail. These areas are great opportunities for showcasing plants that tolerate periods of inundation and ponding with dry periods, such as Bald Cypress, *Taxodium distichum*, and Purple Lovegrass, *Eragrostis spectabilis*.

Moisture will vary depending on a selected planting site's microclimate, as well. For example, some of the planting beds around the new buildings are covered by overhangs, creating some extra shade, so these beds may retain moisture longer than expected. However, there are some new beds along the buildings with high slopes and no retention walls, so these may experience quicker evaporation as well as erosion, which will dry out the roots faster. Irrigation around the buildings can be supplemented with installations that highlight various water conservation practices, such as rain barrels and rain gardens, as well as raised beds and container plantings sited to receive roof runoff directly from gutter pipes. These latter methods are particularly suited for use around the older buildings to highlight how easily a building can be retrofitted to accommodate rainwater retention systems.

Any new plantings around the buildings will have to be evaluated for irrigation needs, especially if the beds will be used for "Edibles" or a Cut Flower CSA (described below). Species flagged as "Drought Tolerant" in the Notes column of the Master List will be more likely to survive periods of drought once the plants are established.

Zones and Microclimates

The general areas of lighting and moisture described above were assigned a general zone marked on the accompanying map, *CCCC Zones.pdf*. These zones were assigned to the species listed in the Native Plant Master List:

Zone A: Full Sun (Yellow)
Zone B: Part Sun (Dark Blue)
Zone C: Full Sun with High Moisture (Light Blue)

Even within the zones indicated, there will be some variations for each new planting site. The general moisture for Zone A is average to dry, as expected, and mostly dry during the summer months. In Zone B, the moisture is average to dry in some spots, and average to moist in others. The ponds and stormwater swales will have the highest moisture on campus, with the 2 ponds on the west side retaining the most moisture throughout the year. The Hill Creek section in the southeast of campus was not zoned for moisture since it is least accessible area and rather inconvenient for active landscape maintenance. In addition, this section falls within the riparian buffer zone for the Robeson Creek Watershed, so the County or Town Zoning guidelines for this section would need to be consulted before any projects were undertaken.

The microclimate of a selected site should be observed for any unique issues in lighting and moisture throughout the day and across the seasons. This includes intermittent ponding after heavy rain; shade from nearby trees or shrubs; proximity to trail asphalt or concrete walkways, etc. Each new planting bed is an excellent educational opportunity for students to plan according to the characteristics of the target site.

Please note that evaluation of soil types is out of the scope of this project. In addition, the Student Farm will be managing more of the compost and mulch production on campus as they expand, so amendments for the planting beds can be coordinated with the farm manager. If there is any question about soil nutrients or deficiencies, these can be evaluated either by the Student Farm or by sending samples to the Cooperative Extension.

Existing Native Specimens

There are a number of native plant species all around campus. Many wildflowers appear each year along the wood line and walking trail perimeter. Several species of Goldenrods, *Solidago spp*., can be found around the entire trail, even in some part-shade sections. New York Ironweed, *Vernonia noveboracensis*, is another fall wildflower that grows along the trail edge at the north end of campus. There are some very interesting tree and shrub specimens, too, that are mapped out in the attached file *Feature Specimens.pdf*. For example, there are several sites with multiple Black Walnut trees, *Juglans nigra*, which may be a result of the former farm use of the CCCC campus. Hackberry, *Celtis occidentalis*, appears in 2 sections, one site visible from the walking trail, the other near the Paradise Bridge in the southeast part of campus. These are both significant wildlife forage trees. There is also a large specimen of Buttonbush, *Cephalanthus occidentalis*, along

the trail across from the entrance to the bridge that leads to the Senior Center. This spectacular pollinator plant attracts many butterfly species when in bloom. All of these specimens are excellent candidates for educational signage, either as simple nameplates, or as larger signs with historical uses or unique pollinator significance.

Recommended Native Plants

Master List of Native Plants

The plants selected in the Native Plant Master List were taken from a variety of sources, including but not limited to *Flora of the Southern and Mid-Atlantic States* by Alan S. Weakley, University of North Carolina Herbarium; *North Carolina Cooperative Extension Urban Horticulture* web site; and *Planting Guidelines of the North Carolina Division of Parks and Recreation/DENS*. Some were also selected based on the experience and preferences of the author, a fan of low-maintenance native horticulture who happens to live in Pittsboro.

Each plant was considered for its native status in North Carolina and the Southeast, with most species occurring natively in the Piedmont of North Carolina. Species native to outside the immediate region were selected for a unique quality, such as being an edible plant from the general southeast region, as well as the characteristics of low maintenance and water requirements and high survival rate in drought situations.

Most selections are perennials that will self-seed or spread by rhizomes for the added benefit of sustaining formal planting beds and pollinator habitat along the walking trail. This will help to reduce the costs and personnel resources required to restock specimens each year. In addition, this will provide an opportunity for value-added products such as plants and seeds that can be sold as part of fundraising efforts via the Student Farm or even a student landscape club. Furthermore, the use of perennial native plants will help supplement the various sustainable program practices. Allowing the students to plan sections for native landscaping on campus will provide educational opportunities in practical resource-saving applications such as drought-tolerant or xeric design for commercial properties. It will also provide experience in creating habitat for native wildlife, a key concept in sustainable and organic agricultural practices.

Many of these native plant selections have the benefit of attracting a variety of pollinators. While honeybees are the most well-known, other pollinators will benefit from more native plants in the CCCC landscape. For instance, bumblebees are important for some agricultural crops, especially tomatoes, and their natural nesting habitat is in the ground along wooded borders. Many native species of bees, wasps, and syrphid flies are also important for crop pollination.

A number of the recommended plants are also the larval host plant for various butterflies, some of which are listed in the Notes column. My favorite example of a valuable native host species is the Persimmon Tree, *Diospyros virginiana*, larval host to the Luna Moth, *Actias luna*, which has declined in population in recent decades. The tree bears edible fruit and is dioecious, requiring two trees to ensure fruit production. Both features have value-added benefits for agricultural and green building education.

A wide variety of bloom times were considered to extend pollinator activity across the seasons from early spring to late fall. Some plants will bloom even into winter, such as Witch-hazel, *Hamamelis virginiana*, or bloom earlier than expected in prime conditions, such as Golden Ragwort, *Packera aurea*. Since the winters here in the North Carolina Piedmont can be mild, there will be stretches when weather warms up and the insects come out early to scout for food. Planning to extend the season of potential food sources throughout the landscape will help support and possibly increase the variety of native pollinator populations on campus. Another benefit of landscaping with native plants across the seasons is the increased horticultural interest for the public, such as color variety and architectural structure, which will add value to the overall beauty of the campus.

Some of the recommended species may not be readily available at commercial nurseries. In Chatham County, there are several nurseries that carry native plants (see the Resources section for Local Nursery listings). There are also native plant sales at the North Carolina Botanical Garden from spring through late fall as part of NCBG's *Conservation Through Propagation* program. Large commercial chains sometimes list plants as native, but they do not specify the region. It is recommended that the binomial nomenclature (*Genus* and *specific epithet*, e.g. *Lobelia cardinalis*) for all specimen acquisitions are verified and that the native status is confirmed from one of the sources listed in the References section below to ensure that all plants are properly marked when used for educational purposes.

The columns and designations in the Native Plant Master List are listed below.

Common and Botanical Names
The species are listed in alphabetical order according to the botanical name, or binomial nomenclature (*Genus* and *specific epithet*, e.g. *Lobelia cardinalis*). Both common and botanical names are listed in this column.

Light
Light requirements for each species are listed in this column by general categories of *sun*, *part-shade*, and *shade*.

Moisture
Moisture requirements are listed in this column for each species as *dry*, *average*, *moist*, and *wet*.

Zone
Planting zones in this column are shown in the map *CCCC Zones.pdf* with color and letter designations, described above in the section "Zones and Microclimates". Note that these are general recommendations. The site of each landscape bed or trail segment should be evaluated further for available lighting and moisture before planting. Experimenting with various species in each site is encouraged to enhance the overall diversity of the landscape.

Characteristics
Plant height, form, deciduous status, perennial status, and growth habit are listed in this column.

Bloom Times and Colors
Annual bloom times and flower colors are listed in this column. Note that bloom times can be delayed if a plant is sited in lower lighting conditions than indicated for the species, or if the plant is trimmed early in the season to prevent 'legginess' for aesthetic reasons.

Notes
This column contains items of interest for each species, as well as indications such as Edibles, Value-added potential, Extends Pollinator Season, Drought-Resistant, and Traditional Medicinal, described below

Edible Plants
The native plants listed as "Edible" in the Notes column of the Master List are highlighted in orange. Each of these species has a flower, fruit, leaf, root, seed, shoot, or stem that may be used as a food item. These selections also appear in the document *Edible Native Plants.doc*, which includes additional notes describing useful plant parts and value-added possibilities, such as jams, juices, flour, spices, or teas, which can be useful as seasonal ingredients in the restaurant menus for Natural Chef Culinary Program. Please note that some of these plants are not recognized as commercial food items but have traditional uses in recipes. Some species with important ethnobotanical uses have been determined to contain poisonous parts, such as Common Elderberry, *Sambucus canadensis*, the unripe fruits of which have low toxicity but unwanted reactions when ingested. All food uses have been listed for informational purposes only. All species are perfectly suitable for general horticultural use in the campus landscape. However, CCCC should evaluate the potential uses for each of these "Edible" plants in the Natural Chef Culinary Program or the Student Farm CSA. Two valuable web site resources for this information are listed below:

> North Carolina Cooperative Extension: *Poisonous Plants of North Carolina*
> http://www.ces.ncsu.edu/depts/hort/consumer/poison/poison.htm
>
> Memorial Sloan-Kettering Cancer Center, Integrated Medicine: *Information About Herbs, Botanicals, and Other Products*
> http://www.mskcc.org/mskcc/html/11570.cfm

Traditional Medicinal Plants
Plants listed with a designation of "***Traditional Medicinal" in the Notes column have historic ethnobotanical uses. This label is for information purposes only. Some of these listings are known to have poisonous or carcinogenic

compounds but may have current popular uses due to ethnobotanical traditions. One example of this is Sassafras, *Sassafras albidum*, which was used as a traditional tea. It is still used in various Cajun recipes and for homemade root beer by hardcore brewing enthusiasts. Other listings are available commercially for home medicinal purposes, such as Witch Hazel, *Hamamelis virginiana*, Purple Passionflower, *Passiflora incarnata*, and Eastern Purple Coneflower, *Echinacea purpurea*. As stated in the previous section, CCCC should evaluate the potential uses for each of these plants in the Natural Chef Culinary Program or the Student Farm CSA; however, all species are perfectly suitable for general horticultural use in the campus landscape.

Value-added Plants

Plants listed as "*V*" for Value-added in the Notes column have alternative uses to general horticultural interest. As noted in the previous sections, a plant's value as an "Edible" can be integrated as a featured seasonal ingredient in the Natural Chef classes and restaurant menus. Some plants have value as dye sources. For instance, Yellowroot, *Xanthorhiza simplicissima*, was traditionally used by the Cherokee to make a yellow dye for fibers. This and other plants with dyeing properties, such as Sumac, *Rhus spp.*, have the added value of income potential due to the number of local fiber artists and the popular weaving programs at the Arts Incubator in downtown Siler City. Plants that have good potential as crops for a Cut Flower CSA are also tagged as *V*, and then checked in the Cut Flower column.

Cut Flower Plants

The Cut Flower column identifies plants with the separate value-added potential for a Cut Flower CSA program. Species were identified based on feedback and information from horticultural web sites and local nursery resources. Other species on the list may be candidates for this use, as well. Experimentation for cutting is highly encouraged. The issue of deer damage should be evaluated when considering the planting sites for beds that will be targeted for Cut Flower crops outside the protection of the Student Farm. However, it is highly encouraged to experiment with different native plants throughout the campus, anyway, to get an idea of where various species will thrive and produce optimal crop blooms.

Deer Resistant Plants

The column for the Deer Resistant designation is, of course, only a suggestion of which plants have less potential to suffer damage by deer browsing. Unfortunately, many of the plants we consider horticulturally pleasing are very pleasing to deer as food. Experimenting with plants in different sites for deer-resistance is encouraged. One possible educational project for students is to plan several test landscape beds of native plants with a proactive application routine for deer repellants. There are also many possibilities for deer-safe landscape designs with creative fencing, pergolas, and espaliers, so these plants can be worked into useful projects in the future. More information on deer-resistant species can be found at the NCBG web site or through the Cooperative Extension (see References).

Part II

Implementation

The best way to ensure a consistent implementation of landscaping with native plants is to create a policy on campus. This way, as landscape projects are planned, all parties involved will have the same information, e.g. Operations, Administration, Instructors, Student volunteers, etc. The Native Plant Master List is a useful tool to incorporate into any campus-wide policy for landscaping. Even with no general landscape policy, it is highly encouraged to use this Native Plant Master List and start targeting sections for improvement each semester by using resources from the Green Technologies and Sustainable Agriculture programs. This is a great opportunity to showcase the concepts featured in these programs by inviting students to help plan small projects on campus using innovations from their courses of study. Giving ownership to the students as part of a regular program or extracurricular component will ensure that landscape beds are maintained. This is also an opportunity to incorporate project plans into courses.

Since CCCC grounds keeping operations are limited to mowing about twice a month, it is best not to put in a new landscape bed unless there is someone assigned to maintain it. The regular maintenance crew does not maintain the landscaping aesthetics, so the garden beds will have to be maintained by students. Installing more landscape beds hinges on student enrollment and interest. Consider devising a work plan between the programs, and then looking at class schedule offerings to pair project areas to class projects. This is a big campus, so landscaping needs to broken out into small, manageable projects.

The department in charge of funding development at CCCC should be contacted to assist in scheduling fundraising efforts to support plant acquisitions, described below. Storage areas should also be confirmed for specimens acquired through plant swaps or donations. Follow consistent labeling practices with common and botanical names to ensure proper plant identification.

The new buildings are still receiving some plant materials from the original construction plans, and it is unclear what the target species are for plantings. Native plants in the Master List should be considered for these areas if no further purchase orders are in place for these buildings. Otherwise, the focus of implementation can start with the older buildings, as follows:

Years 1-2:

-Target existing beds around Buildings 1 and 2 for landscape upgrades, including low retaining walls and/or landscape borders such as stone or brick to make for easy maintenance of the surrounding lawns by Operations personnel.
-Incorporate organic landscape practices as policy on the general campus area to support the organic certification of the Student Farm by removing the possibility of drift to the crop areas.
-Hold an annual Spring/Fall Plant Swap with the community for native plant acquisitions.
-Launch a fundraising campaign to encourage community involvement and use naming rights for garden beds as a possible development tool.
-If budget resources are not available, contact local nurseries and landscape companies to donate specimens or labor.
-Start with the beds and immediate sidewalk areas in the front and back entrances of each building. Then upgrade the side beds and connecting walkways.
-Install irrigation as needed, using resources from the Green Technologies program.
-Estimate mulching needs and communicate with the Student Farm for designing a composting schedule.
-Co-ordinate with the Natural Chef Program, Sustainable Agriculture Program, Green Technologies Program, and campus Operations to organize the collection, storage, and composting of kitchen waste, cardboard, and other recyclable materials.
-Co-ordinate with the Student Farm for possible plant propagation facilities.
-Consider implementing solar-powered irrigations timers for drip/soaker hoses in garden beds.
-Start a Student Landscape/Horticulture Club to offer a creative outlet for students from all programs.
-Expand dedicated/named/themed areas to the walking trail, including more benches. Start with walkway intersections and trailhead entrance areas.
-Consider a Work Study program for Sustainable Landscape/Farmscape Practices for students in the Green Technologies and Sustainable Agriculture programs.

Years 3-4:
-Start Cut Flower CSA
-Add improvements to the water retention ponds and surrounding buffer areas.
-Increase the number of landscape beds for dedicated/named/themed gardens around all buildings.
-Develop educational signage for beds, e.g. plant names (Scientific epithet/Common name) and the Sustainable practices exhibited.
-Expand landscaping to segments along the entire walking trail; implement mechanical removal of invasive weeds.
-Evaluate landscape beds for any changes needed in perennial flower species.
-Hold an annual Spring/Fall Plant Swap with the community for native plant acquisitions.
-Implement final plans with Student Farm for compost/mulch production.
-Continue expanding landscape beds around and between Buildings 1 and 2.
-Continue incorporating organic landscape practices on campus.
-Expand landscape beds to include walkways between Buildings 1 and 2 with Library and Sustainable Technologies building.

Years 5+:
-Continue mechanical removal of invasive weeds.
-Finish installing and upgrading landscape beds around all buildings.
-Increase number of named/dedicated benches along walking trail and walkways between buildings.
-Finish installing plant nametags and educational signs around campus.
-Hold an annual Spring/Fall Plant Swap with the community for native plant acquisitions.
-Continue incorporating organic landscape practices on campus.
-Begin organic certification process for entire campus.
-Enjoy the mature landscape beds you worked so hard to install!

Recommended Maintenance Practices: Organic Practices
Since the Student Farm is working toward organic certification, it would make sense to use organic practices in the landscaped areas and lawns around campus. Ideally, a policy should be implemented to use only approved organic substances such as herbicides and pesticides. Since the impact of non-organic chemicals can affect the Student Farm by chemical drift and impact campus-wide habitat for pollinators and beneficial predatory insects, it would make sense to create a programmed maintenance schedule to support the efforts of the Student Farm. That would mean adopting a policy of no substances prohibited by the National Organic Program allowed on campus. In the future, if the college wanted to go for organic certification of the complete campus site, then the practices will already be in place when that certification process is started.

Some practices used on the Student Farm include the use of horticultural vinegar and fire apparatus for weed control. Horticultural vinegar can be safe to use around other plants with proper practices. A 5% solution is used currently in some parts of campus. Siting is critical for specimen and tree protection since vinegar translocates through roots and drastically changes pH levels in surrounding soil. This is ideal for weeds in parking areas and along sidewalks, but not near trees. Painting horticultural vinegar onto cut stems will minimize the amount that gets into the soil, unlike spraying, which spreads the vinegar aerosol to neighboring plants.

The use of fire apparatus for weed management does not involve actually burning plants. Instead, a wand projects a directed flame with a switch for controlled application of flame to selected plants only. The flame is held to plant material for only about 3-5 seconds. This ruptures the plant material without igniting the plant, maintaining a safe fire application. This is best implemented on days with soft rain or drizzle. The North Carolina Botanical Gardens use this type of weed application as part of their regular landscape maintenance practices. The Student Farm currently has one device like this, as well. Training of students can be conducted as part of the Sustainable Agriculture and Green Technologies programs for use on campus in landscape beds.

Permaculture is a sustainable land use design practice that integrates natural ecological concepts into landscape, building, and agriculture plans. Permaculture is currently taught as part of the design process in Sustainable Agriculture, and it will be incorporated into the ground-level planning and design classes in the Green Building program. Pairing native plants to

existing microclimates on campus would be a good project for students to learn to apply permaculture concepts. Planning beds designated for pollinator habitats around campus is another possibility.

Mulch will be needed in any formal landscape beds, and this is best reapplied annually or as needed. Mulch production will need to be built into project budgets. This can include a chipper/shredder as own entity or attachment existing farm equipment. This way, bulk scraps and trimmings from trail can be shredded (with long-term composting for invasive seeds). All kitchen waste from the Natural Chef program can be planned for composting. The college can also keep some lawn pasture set aside for mulch as hay, with a scheduled cut before it goes to seed. This is best applied as dried hay for weed-free mulch. It can also be composted to reduce the high nitrogen levels, if necessary. Cardboard from shipping boxes from the entire campus can also be composted or used as the first application of mulch at the bottom of a landscape bed before soils and plantings are installed. Another permaculture concept that would be useful here is the design of campus purchasing guidelines to require that packaging of bulk purchases be compostable.

Even before mulching can be considered, site preparation will have to be done first. Sites around the buildings will be rather easy to prepare. However, the perimeter of the walking trail will be rather time consuming since there are many overgrown invasive species in the scrub. Some notable invasives that occur throughout the wood line and scrub around campus are Japanese Honeysuckle, *Lonicera japonica*; Autumn Olive, *Elaeagnus umbellate*; Russian Olive, *Elaeagnus angustifolia*; Princess Tree, *Pawlonia tomentosa*; Tree of Heaven, *Ailanthus altissima*; Japanese Privet, *Ligustrum japonicum*; and Chinese Privet, *Ligustrum sinense*. In some spots along the walking trail, these are the only specimens visible once plants leaf out in the spring. Controlling these weeds is time-consuming, especially since many of these plants are entangled with native specimens of trees and shrubs. However, these weeds can be managed as part of a proactive maintenance plan, most notable through mechanical removal. Obviously, labor provided by students is an option, especially when integrated into a sustainable program course, or even a student club, like Horticulture, Ecology, or similar clubs. The use of livestock for mechanical removal, such as goats, is also a possibility. Several local farms use goats to clear out desired field space, using moveable fencing and sketching out a timed rotation. They are very efficient and quick at clearing all vegetation in a given area, indeed. Goats also have the added benefit of not being allergic to Poison Ivy, *Toxicodendron radicans* (which, incidentally, is a native vine). Ms. Heckler has expressed an interest in considering this option for mechanical weed mitigation.

Mixing Native Specimens and Non-Native Herbs

Many common culinary herbs are attractive in landscape beds, but most are not native to the southeastern United States. Using culinary herbs in the landscape with native flowering plants would offer more visual illustrations of how easy it is to garden with natives. The planting beds around the Sustainable Technologies Building are ideal for this since it houses the Natural Chef program.

Since many culinary herbs are not palatable to deer because of their strong scents, working these in with native flowering plants may help deter deer from browsing landscape beds that are not fenced. For example, rosemary and lavender are non-native species that are popular culinary garden herbs, but deer dislike the strong scent of their leaves and flowers. Salvias also have a strong scent that discourages deer, and they have a very high pollinator value. Common garden Sage, *Salvia officinalis*, is an important culinary Salvia and an interesting landscape specimen. Planting a buffer of these useful culinary herbs around native plants such as *Rudbeckia* (Black-eyed Susans) or *Echinacea* (Coneflowers) could discourage deer from wiping out sections landscape beds. At the same time, this would add educational value for highlighting sustainable agriculture concepts by featuring native and non-native species that thrive well in the same growing conditions. Finding bulletproof "deer resistant" plants is impossible, but plenty of species in the Native Plant Master List can be incorporated into landscape designs that will suffer minimal deer damage.

Potential Funding and Plant Acquisition Sources

Robeson Creek Watershed Council

The stream on the Pittsboro campus, Hill Creek, is a direct feed stream into Robeson Creek, which is the main waterway in the Robeson Creek Watershed in Pittsboro. Karen Hall is the facilitator at NC State University for the Robeson Creek Watershed Council. It is highly recommended to consult with RCWC for any planting projects that involve the riparian buffer near Hill Creek in the southwest section of campus both for funding potential and for information on any possible

limitations due to watershed regulations. There may also be grants or other funding opportunities for incorporating native plants into the stream buffer and pond buffer segments on campus, especially when a BMP (Best Management Practices plan) is established. RCWC will be able to assist with these plans to maximize grant potential and sustainable resource conservation.

Fundraising for Garden Development

Newly cultivated garden beds anywhere on campus can be a potential funding source by designating each section as a dedicated, donor-named area. These garden beds can be used in fund-raising efforts to provide standard naming opportunities for private and corporate donors. Themed beds or larger garden sections that showcase specific educational concepts can be offered to encourage donations according to the donor's wishes. Some garden theme possibilities are listed below:

Edible Natives	**Medicinal Natives**	**Native Xeric Garden**
Native Pollinator Garden	**Native Shade Garden**	**Raised Bed/Accessible Garden**
Therapeutic/Sensory Garden	**Native Herb Garden**	**Square-Foot Garden**

Borders and paths in larger beds or in raised bed containers can also be designed with local brick, stone, and cement materials. These can then be incorporated into planned fundraising campaigns to Buy-a-Brick or Buy-a-Block in smaller donation increments. The same concept can be applied to memorial plaques on larger architectural stones for design interest and the intentional construction of microclimates within planting beds. Therapeutic/Sensory Gardens would require more planning with raised bed walls and ADA accessible paths to allow access for those in wheelchairs.

New Specimen Acquisitions

Landscape budgeting can be reduced by inviting local garden groups, Master Gardener programs, and horticulture/landscape professionals to make donations of plants. New specimen acquisitions can be invited during a Plant Swap event, requesting that only known specimens from the recommended list are brought to the event and that these are properly tagged. An emphasis should be placed on acquiring specimens of local genotypes, that is, plants known to have originated from the Piedmont in North Carolina. Since there are many native plant enthusiasts among local professionals and gardeners, there is a high probability that specimens with clear provenance will appear at such an event. To ensure proper plant identification, the services of local horticulture professionals, Master Gardeners, and Cooperative Extension agents can be invited to assist with validating plant donations during these events. This would also be a good opportunity to promote local businesses and agencies related to the Sustainable Agriculture and Green Building programs.

This type of event can also be promoted as a larger community effort. For example, CCCC could collaborate with Habitat for Humanity, requesting that Plant Swap donors bring one specimen for CCCC and one for Habitat. Habitat For Humanity typically does not have a landscape budget for new homes. Since most garden enthusiasts will have more than one plant "volunteer" to offer, this could be a very successful, high-profile "Sustainable Community" event.

Planting specimen acquisitions can also be promoted as a community event by holding a variation of the Crop Mob concept: volunteers come in for a day and assist in the physical labor of getting the specimens into the planting beds. This concept of community volunteering has become popular among new small farm operations in the Sustainable Agriculture movement. Given the local enthusiasm for CCCC's sustainable programming, the student body and local community may be very interested to participate in this type of event.

Plant and Seed Sales

Most of the recommended native plants are perennial, producing volunteers by rhizomes or seeds. Both seedlings and seeds have value for generating income for landscape plans and the Student Farm. Mature seeds can be harvested and packaged before they disperse into the landscape, reducing the need for manual work hours to thin out garden beds. Volunteer seedlings can be harvested directly from the landscape on a regular schedule and potted for seasonal plant sales through the Student Farm or a student landscape club. Scheduling annual or semi-annual native plant sales in the fall or early spring would be best for most recommended native perennials. Depending on the species sited in each landscape zone, there should be plenty of opportunities to offer a variety of plants and seeds as value-added products. This would be

a good complement to the sustainable programming concepts on campus and provide consumer education opportunities, as well.

Resources

Support Documents

The support documents provided on the disc for this project are for reference only. These consist of different publication types from the various internet resources used for researching the native plant list, including USDA Plant Guides, Cooperative Extension PDFs, ATTRA Sustainable Ag publications, etc. It contains information on many, but not all, of the species included in the list, their uses, propagation, habitat, requirements, and other useful information.

Local Nurseries for Native Plants

This list is not comprehensive:

Cure Nursery. Wholesale by appointment; specializing in wetland trees & shrubs.
www.curenursery.com
880 Buteo Ridge Rd., Pittsboro, NC 27312; Phone: 919-542-6186

JC Raulston Arboretum at NC State University. Annual Spring and Fall plant sales are held by the National Horticulture Honor Society Phi Alpha Xi - Iota Chapter, and the arboretum began annual plant sales in 2010 from specimens donated by NC nurseries. Native and non-native specimens.
http://www.ncsu.edu/jcraulstonarboretum/index.php
Department of Horticultural Science, NC State University, Campus Box 7522, Raleigh, NC 27695-7522; (919) 515-3132.

Mellow Marsh Farm, Inc. Wholesale native plants as bare root stock, live stakes, and seed. [NOTE: Wetland plants for mitigation are their specialty, but their catalog has many plants in the Master List.]
http://www.mellowmarshfarm.com/
1312 Woody Store Road, Siler City, NC 27344, Phone: 919-742-1200, Fax: 919-742-1280

Niche Gardens, LLC. Retail nursery with large selection of native plants. Excellent web site for searching Native, Cut Flower, and Deer-Resistant species. [NOTE: "Native" status for plants on their site may not indicate that these are native to North Carolina or the Southeast.]
http://nichegardens.com/
1111 Dawson Road, Chapel Hill, NC 27516, Phone: 919-967-0078, Fax: 919-967-4026

North Carolina Botanical Gardens - Plant Propagation Program. The Plant Sales at NCBG run from early spring through the fall each year. The plant sale is open during regular visiting hours and is located behind the Totten Center. All sales support the Garden's public outreach and conservation programs. For more information, please visit http://ncbg.unc.edu/pages/47/.
100 Old Mason Farm Road, Chapel Hill, NC 27517; *USPS Only:* North Carolina Botanical Garden,
The University of North Carolina, CB 3375, Chapel Hill, NC 27599; Phone: 919-962-0522.

References

Alternative Pollinators: Native Bees (publication), ATTRA—National Sustainable Agriculture Information Service: http://attra.ncat.org/attra-pub/PDF/nativebee.pdf

Farmscaping to Enhance Biological Control (publication), ATTRA, December 2000.

Flora of the Southern and Mid-Atlantic States, Working Draft of 8 March 2010, Alan S. Weakley, University of North Carolina Herbarium (NCU), North Carolina Botanical Garden, University of North Carolina at Chapel Hill, Campus Box 3280, Chapel Hill NC 27599-3280

Memorial Sloan-Kettering Cancer Center, Integrated Medicine "Information About Herbs, Botanicals, and Other Products" web site:
http://www.mskcc.org/mskcc/html/11570.cfm

National Biological Information Infrastructure (NBII) web site:
http://www.nbii.gov/portal/server.pt/community/pollinator_species/852

Native American Ethnobotany, Moerman, Daniel. Timber Press, Inc. 1998, Portland, Oregon.

Native Plant Information Network (NPIN) web site, from The Lady Bird Johnson Wildflower Center at the University of Texas at Austin:
http://www.wildflower.org/explore/

The North Carolina Botanical Garden, Native Plant recommendations web site:
http://ncbg.unc.edu/plants-and-gardening/

North Carolina Cooperative Extension, "Muscadine Grapes in NC" web site:
http://www.ces.ncsu.edu/muscadines/index.html

North Carolina Cooperative Extension, "Poisonous Plants of North Carolina" web site:
http://www.ces.ncsu.edu/depts/hort/consumer/poison/poison.htm

North Carolina Cooperative Extension Urban Horticulture web site:
http://www.ces.ncsu.edu/depts/hort/consumer/

Planting Guidelines of the North Carolina Division of Parks and Recreation/DENS (publication):
http://www.ncparks.gov/About/docs/plant_guide.pdf

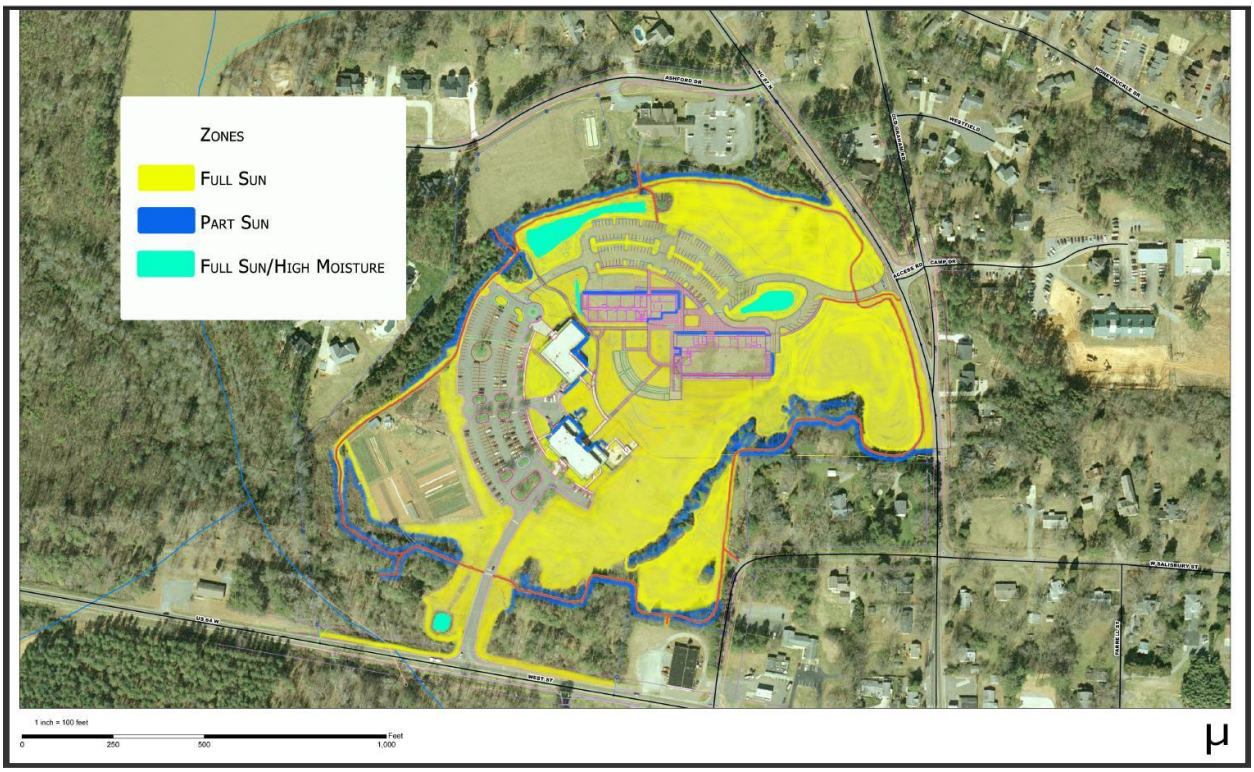
Pollinator Partnership web site:
http://www.pollinator.org

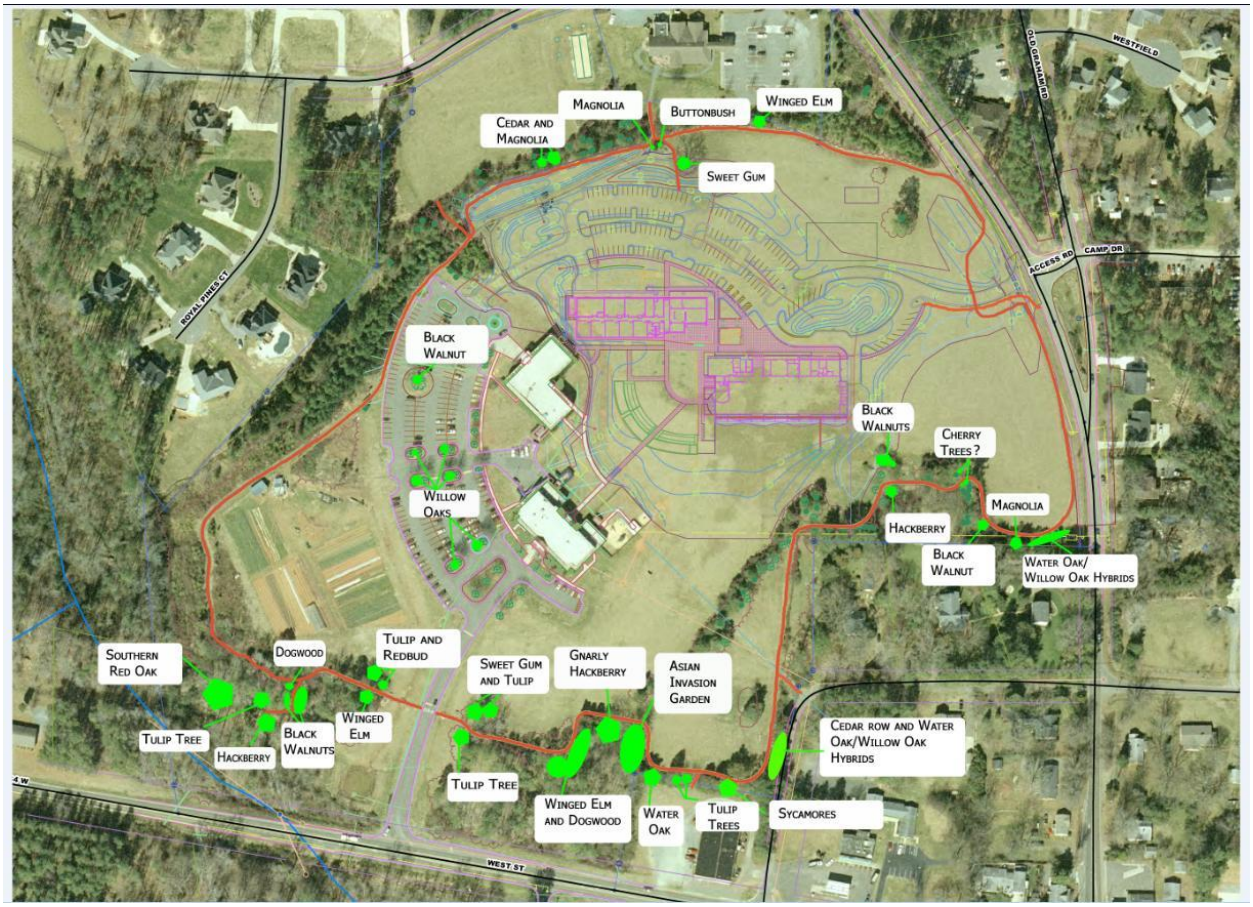
USDA, NRCS. 2010. The PLANTS Database (http://plants.usda.gov, 6 July 2010). National Plant Data Center, Baton Rouge, LA 70874-4490 USA.

Appendix

The maps are located here and in the accompanying disc as separate files. The Native Plant Master List and Edible Native Plants list are located on the accompanying disc as separate files.

Zones (*CCCC Zones.pdf)*
Feature Specimens (*Feature Specimens.pdf)*
Native Plant Master List (*Native Plant Master List.doc*)
Edible Native Plants (*Edible Native Plants.doc*)


Zones
Full Sun
Part Sun
Full Sun/High Moisture
1 inch = 100 feet
0
250
500
1,000
Feet


Magnolia
Buttonbush
Winged Elm
Cedar and Magnolia
Sweet Gum
Black Walnut
Black Walnuts
Cherry Trees?
Willow Oaks
Magnolia
Hackberry
Black Walnut
Water Oak/ Willow Oak Hybrids
Southern Red Oak
Dogwood
Tulip and Redbud
Sweet Gum and Tulip
Gnarly Hackberry
Asian Invasion Garden
Tulip Tree
Hackberry
Black Walnuts
Winged Elm
Cedar row and Water Oak/Willow Oak Hybrids
Tulip Tree
Winged Elm and Dogwood
Water Oak
Tulip Trees
Sycamores
Royal Pines Ct
Old Graham Rd
Westfield
Access Rd
Camp Dr
West St