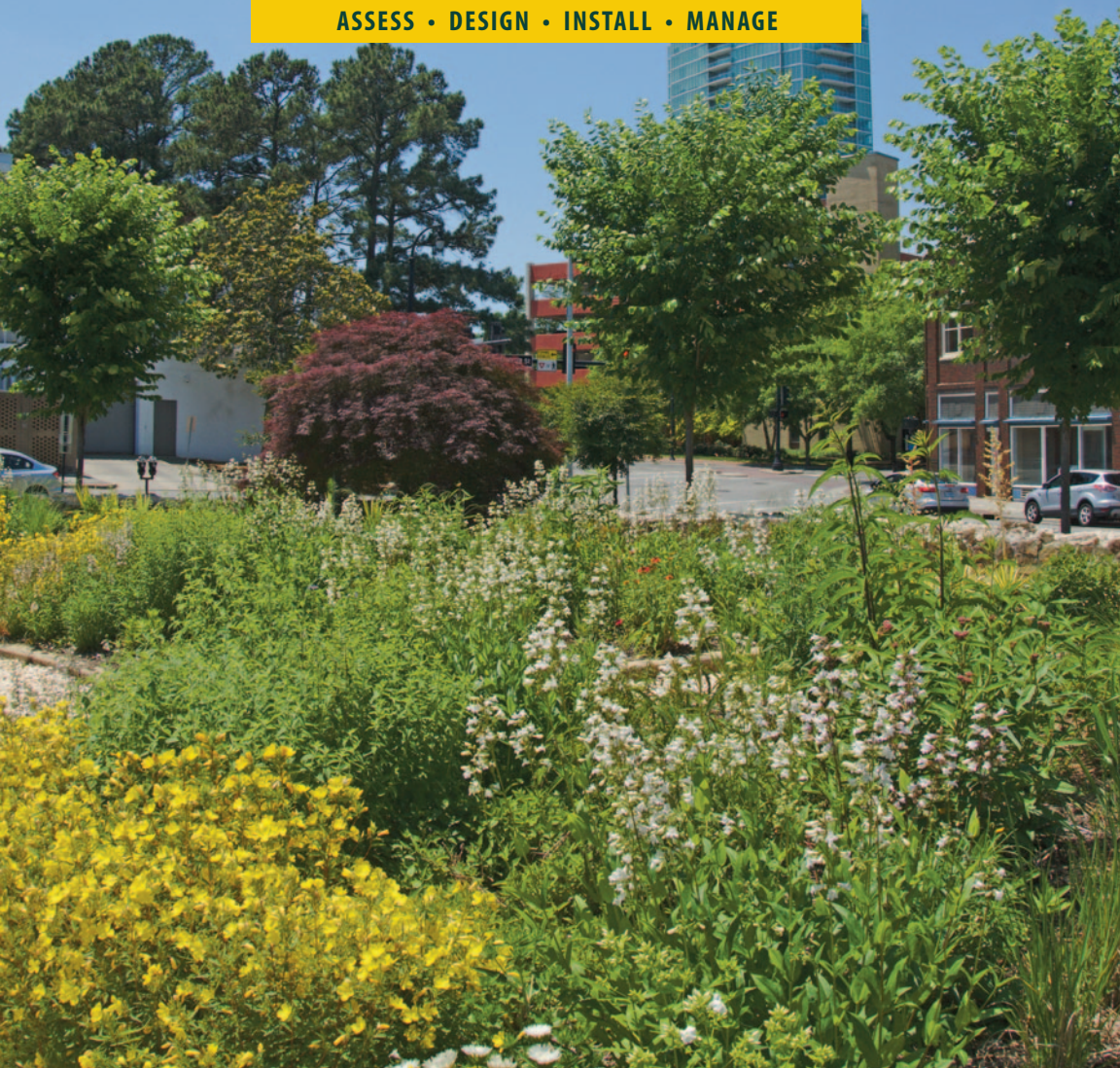


Managing NATIVE PLANT LANDSCAPES

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Over the past few years, demand for native plants has increased at local botanical gardens, plant nurseries and garden shops. Many books and news articles highlight the benefits of creating native landscapes to attract pollinators and birds. The general population is more aware that typical suburban/urban planting of non-native plants does not sustain wildlife. As a result, novice and experienced gardeners seek information and expertise among horticulturalists and landscapers who specialize in native plants.

This manual provides information on managing native plant landscapes and highlights the benefits, challenges, and requirements for sites located in the Piedmont region of NC. It offers a starting point and is not a complete how-to guide. It will be useful for homeowners, homeowner associations (HOAs), public schools, public parks, municipalities, and large commercial sites that have suitable open space for a more environmentally friendly purpose, and contractors who want to broaden their landscape experience.

Also, note that this manual focuses on “management of native plant landscapes” rather than “maintenance.” This word choice is important because it highlights managing the “ever-changing living community so that it is healthy, is aesthetically pleasing, supports a wide range of ecosystem functions, and provides service benefits to the people in the area. Maintenance on the other hand suggests the following of procedures to retain an identical appearance over time. One maintains a lawn – always flat, always straight-edged, always devoid of weeds, always green (or whatever the seasonal color of a particular type of turf).” – Ben Bergmann, City of Durham Horticulturist

These dynamic outdoor spaces go beyond the value of native plants as habitats for insects, birds and other wildlife. Native plant landscapes can reconnect people to biodiverse ecosystems in which all living beings can thrive. Throughout this manual, we have included information from horticultural professionals, researchers and master gardeners to offer many perspectives on the benefits of native plant landscapes. We hope you find it helpful.



Introduction

In the spring, birdsong fills the air along with the sounds of bees collecting pollen and frogs chirping along the stream. This idyllic scenario is supported by a native landscape that could be found in home gardens, school yards, or parks and the benefits go beyond the aesthetic appeal. For those of us who garden, a native plant landscape offers many moments of curiosity about the variety of life we may encounter and more seasonal variety. Before you realize it, you are looking in your garden to find the different types of pollinators visiting the flowers and watching birds eating berries and seeds. In the autumn you notice the beauty of purple asters blooming next to goldenrod and discover that this planting attracts more bees.¹

Native landscapes provide birds and pollinators their required food, water, cover, shelter, and a place to raise their young. Our local vegetation evolved with insects, birds, and other animals to create complex food webs. Wildlife consumes fruits, nuts, and seeds for sustenance, while helping to propagate the regional vegetation. Native plants, especially some tree species like oaks, are also host to a large variety of insects, which in turn are eaten by birds and other animals. Young nestlings, in particular, must consume large numbers of insects in their first weeks of life.²

The migration of certain birds coincides with the blooming of native plants that provide the specific nourishment for them to survive. For example, the ruby-throated hummingbirds spring migration to the piedmont region of NC coincides with the blooming of native plants such as red buckeye, columbine and coral honeysuckle.³

Our local food webs evolved over the millennia, and insects have not had time to adapt to specific chemicals in most non-native plants so non-native plants cannot sustain our insect populations.⁴ Non-native vegetation can provide some fruits, nuts, and seeds, but it does not host the insects that are vital to birds and the web of life.⁵ As their seeds are spread by wildlife, many non-native plants become “invasive” by outcompeting local vegetation and disrupting the local ecology. Non-native invasive plants should be considered a form of plant pollution.

Some native plants support more insects than others. In fact, 14% of native plants support 90% of our caterpillars which support our terrestrial food webs.⁶ These native plants are referred to as “Keystone plants” which enable our birds to reproduce, as well as all our specialist native bee species. Most baby birds can only process insects. Caterpillars, in particular, are the best food for them and serve as small packets of easily digestible protein. This means that “Keystone plants” are essential to healthy bird populations. Increasing plant diversity in landscapes and including keystone plants will increase the variety of pollinators and provide vital ecosystem services. The National Wildlife Federation⁷ provides the list of keystone plants across North America by bioregion that host caterpillars and specialist bees. In the piedmont of North Carolina, this includes such common names species of trees (e.g., White oak, Black cherry, River birch, Sugar maple and Virginia pine); shrubs (Northern highbush blueberry); and flowering perennials (e.g., Atlantic goldenrod, Blue wood aster, Maryland golden-aster, Black-eyed Susan, and Coreopsis). The New Hope Audubon Society⁸ compiled a list of keystone plants for piedmont North Carolina based and the work of Doug Tallamy and the list from National Wildlife Federation.



Benefits



Everyone, including wildlife, benefits from a well-designed native landscape with greater variety of plants and seasonal color. The following provides a few highlights.

Supports Biodiversity¹⁰

Biodiversity, the variety of life on earth, promotes resilience in the eco-system and allows life to more easily recover from damage due to storms, diseases, insects and human disturbance. It provides ecosystem¹¹ services such as clean water, healthy soil, and contributes to climate stability¹², to name a few. It is critical to the complex food web for all of life, including humans. For example, many fruits, nuts and vegetables require bees to pollinate them. "One of every 3 bites of food we eat depends on pollination."^{13"}

Increases Interest in Nature

Compared to the typical traditional landscape of turf grass and overly pruned shrubs, a more diverse landscape increases interest in exploring nature. Native plants can provide year-round color and interest due to the variety of plantings. For example, grasses and evergreen shrubs provide color and structure in the winter as well as food and shelter for birds. Winding paths with

native trees, shrubs and flowers can create a haven for birds, bees and butterflies and a myriad of wildlife. This vibrant space invites exploration and can help people reconnect to the reality that they are an integral part of nature and not separate from nature.

Spending at least two hours per week outdoors hiking woodland trails or playing in a park with a diverse landscape improves human well-being.¹⁴ Children playing outdoors can witness bees pollinating flowers which increases curiosity about science and the world around them. Schools with native landscapes provide outdoor learning opportunities.¹⁵

Reduces Inputs

Awareness of climate change and increasing frequency of droughts prompts homeowners, municipalities and regions to find effective methods for reducing water consumption as well as water pollution. Native landscapes reduce watering over the long term. When the soil is properly prepared and plants chosen for the site, native plants require less watering once they're established.

Pollution run-off from chemical inputs such as pesticides and herbicides are accumulating in streams, lakes and rivers. Since local insects coevolved with native plants, they generally have less damage from insects and thus do not require these chemical inputs. For example, a healthy native plant garden will have water sources that attract dragonflies and frogs that eat mosquitoes, birds that eat insects and mulch that helps to control the weeds.

Reduced noise pollution – Native landscape programs such as “Leave the Leaves”¹⁶ encourage homeowners to rake leaves from the lawn to areas that you would usually mulch to encourage habitat for insects. Use rakes instead of gas leaf blowers. Removing leaves has been shown to reduce the insect population because many insects overwinter in leaf litter.¹⁷ Homeowners, HOAs, park visitors, school staff and children will all appreciate the reduction in noise from landscape equipment. The most frequent complaint for HOAs is the sound of leaf blowers. Lawn maintenance equipment can generate unhealthy levels of noise and air pollution, especially the two-stroke gas-powered machines.¹⁸

Cost savings for HOAs and public sites (schools, municipal areas such as Parks and Recreation) – Use perennial native plants that bloom throughout the growing season to reduce cost of planting annuals. Native plants and more sustainable landscape practices can reduce landscape budget costs for mowing, pruning, leaf blowing and leaf removal, water use, pesticides and chemical fertilizers.



Design Process

A successful project includes a planning & design process, installation and good understanding of the long-term maintenance. A sustainable landscape design that supports wildlife includes a plan and plant choices based on the site, proper installation with careful attention to soil preparation, and knowledge about how the plants are best managed.

Define Project Goals

Before beginning any landscape project, it is important to understand the project goals. What does the HOA, school system, corporate, customer group or residents want in their site improvement? For example, is the project's goal a nature play space, community vegetable garden, pollinator garden, outdoor classroom, outdoor gathering space or background? How do they want to incorporate native plants in the project? How will this landscape plan impact any current or future landscape contractors? Will volunteers be involved?

Site Inventory and Analysis

Create a complete checklist of assets and challenges

- > Underground utilities - locate by calling 811.
- > Views to highlight or screen out.
- > Ways to establish or improve circulation.
- > Areas that need more shade.
- > High visibility areas to homeowners that could be a pollinator garden site.
- > Steep slopes, erosion, or low-lying areas with standing water: Determine where water flows on the site. Can the water be used onsite for native plants and creating habitat for birds? Consider rain gardens and other ways of making use of the water flow.¹⁹ Investigate the best approach for stormwater management.^{20 21 22 23}

Evaluate existing areas of sun and shade for plant choices

- > Number of hours in full sunlight to part sun- shade:
- > Shade: 2 hours of sun or less
- > Part shade: 2 to 4 hours
- > Full Sun: 4 plus hours
- > Time of day - morning or afternoon sun

Evaluate the existing soil

- > **Soil test** - Soil structure and organic matter content is important. Soil tests determine the soil pH and the presence of essential nutrients. The results help with the plant selection, soil preparation, and the amount and type of soil amendments. Most soils in North Carolina are acidic, less than a pH of 7.0 which is neutral. Soil pH is influenced by the rock the soil was formed from, current vegetation, soil depth and other factors.²⁴ The pH requirements of plants impact their growth and productivity. For example, soils with a low pH may inhibit plant root intake of nutrients. It's an easy process to obtain the kits from the local county extension offices, and the NC Department of Agriculture will test soil for free or small charge. Note: though soil testing is very helpful, it is not absolutely required. No matter what the site's history, adding organic matter always helps.
- > **Soil amendments** - important in most locations unless existing soils are suitable. Many native plants thrive in poor quality soils. There are 2 types of soil amendments:
 - > **Organic** (such as compost, straw or well-rotted manure) Compost from shredded composted leaves, wood products, food waste are readily available from commercial sites.
 - > **Inorganic**^{25 26} (e.g., sand, lime, perlite, vermiculite) These are not practical on a large landscape site.

Inventory the existing plants on site

- > **Identify all invasive species.** Many require removal by someone with a good knowledge of native and invasive plants. At a minimum, large fruiting invasive shrubs and vines in trees should be removed.
- > **Identify all native plants.** Many high-quality native trees, shrubs and vines can be in these areas that have traditionally been neglected. Good native plants such as trumpet vine are often removed in order to “cleanup” a site. Trumpet vines are an important nectar source for Ruby-throated Hummingbirds.
- > **Pay special attention to existing tree root systems.** Are there large plantings of poorly sited trees and shrubs? Many older developments have very mature established landscapes that are at the end of their expected life span. There can be large pruning costs associated with poorly sited plants that were too big for the intended site. These costs should be evaluated in deciding how much and what to remove.
- > **Many snags, nurse logs, nest cavities can be found that are important habitats.** Avoid excessive cleanup. If a dead tree is not hazardous to people or property, then leave it where possible and top off the large branches that may pose future problems.

Design

Incorporate design elements

Consider traditional landscape design elements such as balance, focal points, simplicity, repetition, proportion in size, unity in repetition of materials and enclosure of the space. Also, well-defined edges provide transitional boundaries connecting different areas of the landscape. The internet offers several sources such as the basic principles of landscape design²⁷ or concepts on sustainable native landscape design.^{28,29} Remember that birds live at different layers in our ecosystems – high in the canopy, in the mid-level and on the ground level. Plan for having as many layers as possible. Examples of basic landscaping methods include:

- > Native canopy trees are critical for hosting butterflies and moths which produce the caterpillars and provide food. Consider existing trees, determine locations where canopy trees may be added and plan for succession of older trees.
- > Incorporate tall shrubs in the back with coarse texture and smaller plants with fine texture in the front.
- > Include at least 10 different species in each landscape to promote biodiversity and attract a variety of wildlife.
- > Use perennials in mass to make them more visible to the person managing the site. Cluster the same species together in drifts in each area to create interesting patterns. Planting the perennials of the same species together is also helpful for the pollinators as they move from one plant to the other and for caterpillars.

- > Be sure to include a variety of native evergreen and deciduous shrubs, perennials and grasses for seasonal interest color and a food source throughout the year. For example, in winter evergreens with berries provide food for birds as well as color to the landscape.
- > Once design is complete, it is critical to ensure final plant placement allows mature spread that does not cover walks and entry ways which can create unnecessary future pruning needs.

Reduce lawn size where feasible

Consider how much lawn is actually needed for recreation and open space. Currently, American lawns cover as much acreage as all the national parks. In the U.S., the financial and environmental cost of turf grass is high. It is estimated that in 2020, \$105 billion was spent in lawn maintenance.³⁰ This does not include the number of natural resources used to install and maintain lawns or the pollution created from gasoline powered equipment. Furthermore, the estimated 40 million³¹ acres of lawns do not provide habitat for birds and pollinators or other environmental services. If only half of the area dedicated to turf were transformed to native plant landscapes, it would represent the largest national park in the United States.³²

Ways to reduce lawn size include enlarging non-mowed areas under tree root systems to connect trees and shrubs where possible, enlarge existing plant beds by adding native plants, and wooded natural areas on the edges. Lawns that are left should be in the most visible and useful locations where grass gets the best growing conditions. This also creates “cues of care” for people concerned about any messy looks. Eliminate poor lawn areas that are eroding under trees or sites too steep to get turf established. Another way to reduce mowing lawns is to plant more trees.³³

For large lawns, another option is to consider meadows³⁴ for better bird habitat that gets mowed once a year. Meadows created in previously mowed areas can be made attractive with mowed paths, curving shapes for interest, benches, and gathering areas. The increased plant diversity and lower maintenance costs are a benefit. These sites are a new concept and will require expertise to be successful with careful planning, site preparation (weed suppression, etc.), installation and yearly maintenance such as monitoring for invasive plants. The Xerces Society for the Conservation of Invertebrates offers an excellent manual on meadows.³⁵ [Click to learn more.](#)

In North Carolina, a number of commercial sites have installed meadows on their property in order to reduce mowing and provide additional habitat. For example, the Environmental Protection Agency (EPA) Research Triangle Park campus has replaced 20 acres of mowed grass with either meadows or native grasses that only require mowing once a year. This has led to cost savings from reduced mowing, and they intend to add more acres that require little management over time.

Plant Selection

There are many reference guides on plants native to the region such as “Native Plants of the Southeast” or “Native Trees of the Southeast.”³⁷ Consider the purpose of the plant as well as site conditions. For example, does the site require shade trees? If the site can accommodate large shade trees, which types of trees provide the greatest benefit? A white oak promotes biodiversity by providing food and shelter for the largest number of pollinators and wildlife.³⁸ The New Hope Audubon Society Native Plant list for the Piedmont can be found [here](#).

A good tool for multi-criteria searches for plants that grow in NC, including native, can be found in the NC Extension Gardener Plant Toolbox. [Click to learn more](#). For example, the search could show a NC native plant that prefers sun and tolerates occasional flooding.

Many plant species native to the NC Piedmont are tolerant of difficult soil conditions. For example, some species withstand very dry conditions after they are established, (e.g., *Panicum virgatum* (Switchgrass), *Schizachyrium scoparium* (Little Bluestem), *Juniperus virginiana* (Eastern Red Cedar), and *Myrica cerifera* (Wax myrtle). Other plants are suited to wet sites in sun such as *Cephalanthus occidentalis* (Buttonbush) or *Aronia arbutifolia* (Red chokeberry), while others tolerate wet soil in shade like *Ilex opaca* (American holly). Some sites have low-lying areas with soils frequently wet or flooded sites and can be developed into a stormwater management area if plants are selected that tolerate periodic flooding (e.g., *Ceanothus americanus* (New Jersey tea) or *Clethra alnifolia* (Sweet pepper bush)).

It is important to define the parameters of what is considered a native plant for the project. These could be plants that are indigenous to a specific county, contiguous counties, or to a state or region. The [USDA Plant Database](#) is a reliable resource to determine the geographic range of native plants based on political boundaries. However, ecoregions³⁹ are zones over which there are similar soils, moisture and temperature patterns. These ecoregions can be broken down into relatively small land areas such as the Piedmont.

[Click to learn more](#).

“Another important consideration when choosing native plants for a site is to determine availability. This could be extended to include using named cultivars within native species since that is what is often available. When planting several individuals of the same species, using the straight species offers the benefit of within-species genetic diversity. However, if only a clonal cultivar (no inter-plant genetic diversity) is available, then it is still preferable to an exotic species. Care must be taken when hybrids are used since they are inter-specific, often with one of the plant 'parents' being non-native.” – Ben Bergmann, City of Durham Horticulturist



Straight species vs Cultivars

Straight species native plants have grown in a particular area or ecoregion for hundreds or even thousands of years, are open-pollinated, and grow true to seed. These are preferred if available because they continue to support plant diversity and insects evolved with them. Cultivars are primarily plants that are the result of selective breeding by humans, although there are instances where plants mutate and create a cultivar. Hybrids are the result of a genetic cross between two different species. A plant label will give the genera and species in italics, followed by another descriptive name in single quotes. This last name indicates that the plant is a cultivar.⁴⁰ An example of a naturally occurring cultivar is the coral honeysuckle *Lonicera sempervirens* 'Major Wheeler'.

Cultivars have been developed for attractive characteristics such as flower color, plant height, winter hardiness etc. Studies have shown that the more manipulated the cultivars become, the less attractive they are to pollinators.⁴¹ In particular, it is best to avoid cultivars with double-flowers and sterility. Work on woody plant cultivars has shown that insects are deterred from eating cultivars where green leaves have been modified to red, purple or blue. Tallamy explains, "Red leaves remove chlorophyll from the leaf and load it with anthocyanins, which just happen to be feeding deterrents."⁴² Cultivars that differ significantly in color and morphology from the native species should be used cautiously.

Installation of the Sustainable Landscape

Soil Preparation

The soil profile at right shows the different layers of soil. Note the thin, dark layer of organic matter that holds nutrients and moisture. Leaves and other types of organic mulch help to protect these top layers.

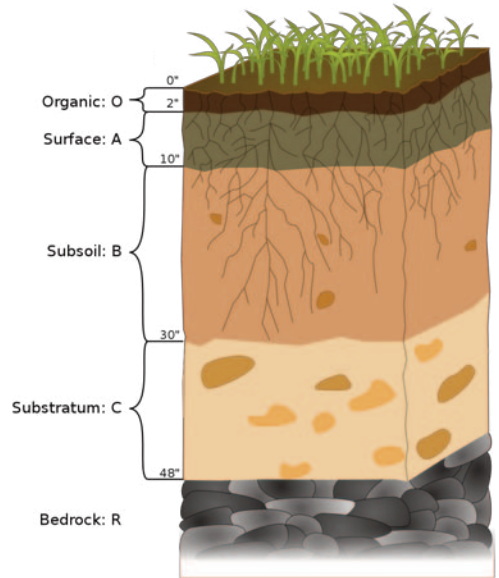
Soil preparation is based on existing soil conditions. Is the soil texture sand, sandy loam, clay loam or clay?⁴³ Does water filter through quickly or does it drain slowly? Correct soil preparation provides nutrients and improves structure. Site analysis of soils will help in choosing plants that fit the budget in terms of soil renovation. Most plants benefit from soil modification and good planting methods, though some plants require less soil prep than others. The good news is that native plants have adapted to the local soils.

Large construction sites require extensive site grading, and any existing topsoil can be lost or nonexistent to begin with. Clay soils can be compacted which challenges soil improvement situations. Amending clay soils requires using the right methods such as adding organic matter to avoid compacting the soil further.⁴⁴ This means don't work in wet clay soil and avoid walking on the soil and using heavy machinery in the area.

Planting Methods

Herbaceous Perennials

Once the soil is prepared, dig a hole a few inches wider than the container and no deeper than the crown of the plant. Roll the container on the ground to loosen the plant. Remove the plant from the container by turning it over with your other hand loosely holding the plant to prevent damage. Brush off the top layer (1/2 to 1 inch) of soil to remove potential weed seeds. If rootbound then loosen the roots or cut off the bottom inch of the plant. You want to make sure the roots are loose and will grow outward. See photos next page.



TIP: Tight plant spacing will reduce weed opportunities and the need for lots of mulch around plants.



Gently shake out of pot



Loosen or cut matted roots



Loosen roots on side



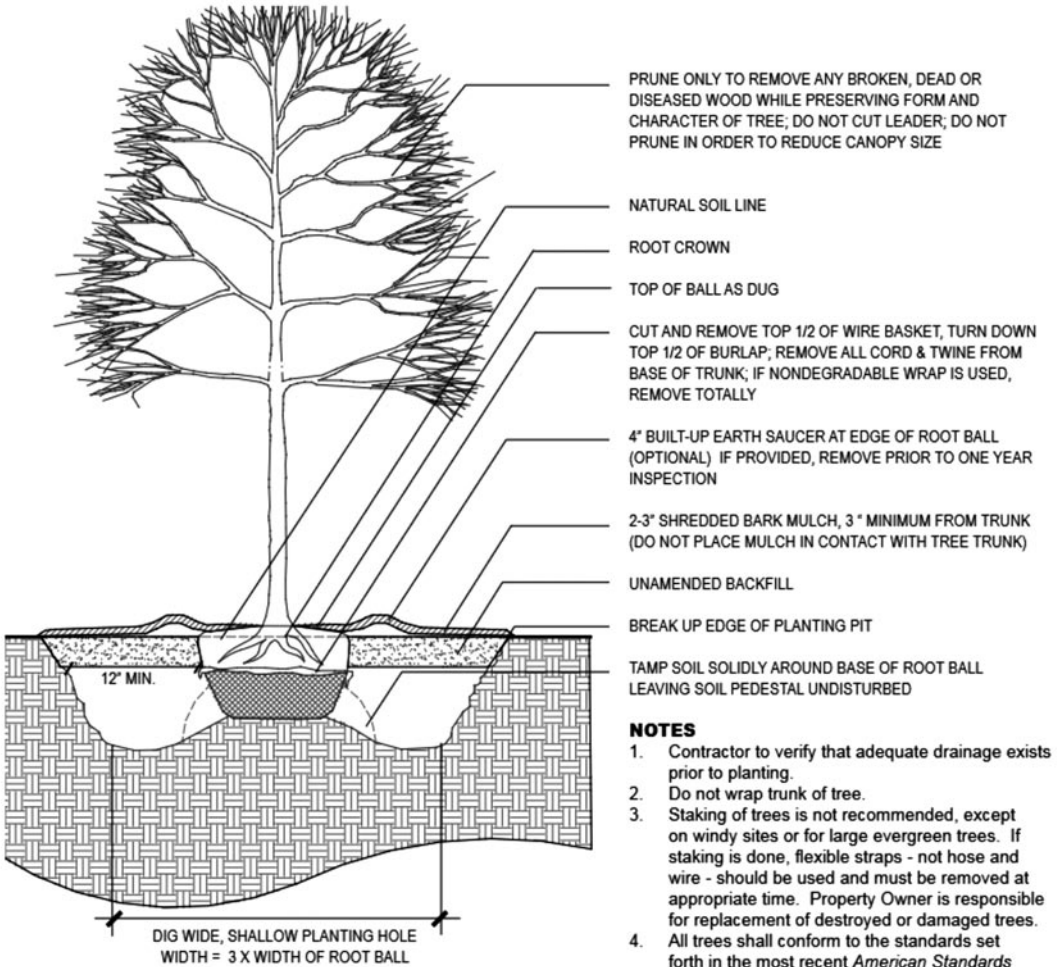
Ready to plant

Place the plant in the hole making sure the crown of the plant is level with the surface for most plants. Fill the dirt in loosely around the plant and then lightly press down on the soil around the plant. Be careful not to mound up soil around the trunk - this will cause rot. Water the plant thoroughly.

Trees and Shrubs

First dig a large enough hole (2 ½ - 3 times the size of the root ball) and incorporate organic matter with the surrounding soil. The drawings illustrate how to plant trees and shrubs.

Correct method for tree planting



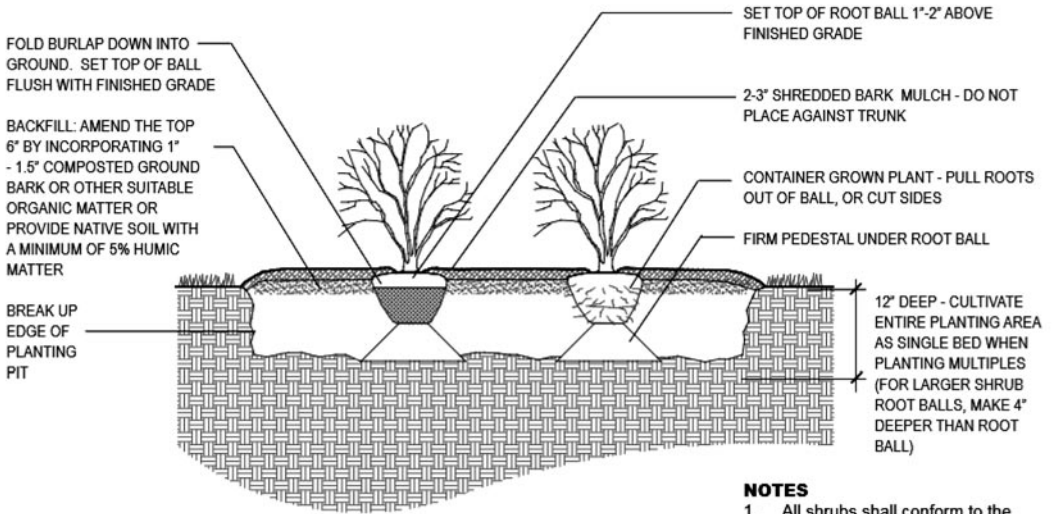
NOTES

1. Contractor to verify that adequate drainage exists prior to planting.
2. Do not wrap trunk of tree.
3. Staking of trees is not recommended, except on windy sites or for large evergreen trees. If staking is done, flexible straps - not hose and wire - should be used and must be removed at appropriate time. Property Owner is responsible for replacement of destroyed or damaged trees.
4. All trees shall conform to the standards set forth in the most recent *American Standards for Nursery Stock* published by the American Association of Nurserymen (A.A.N.).
5. Trees with root flare covered by more than 1.5" of soil will be rejected prior to installation.

Source: Town of Cary, NC Landscape Appearance Manual

[Click to learn more.](#)

Correct method for shrub planting



Source: Town of Cary, NC Landscape Appearance Manual

NOTES

1. All shrubs shall conform to the standards set forth in the most recent *American Standards for Nursery Stock* published by the American Association of Nurserymen (A.A.N.).
2. Soil analysis shall be obtained prior to planting. Soil shall be amended as recommended.
3. Sheet preparation of beds is highly preferred to individually dug holes.

Mulching

Mulching is important for weed control, retaining soil moisture and building organic matter. This step is critical for success and is required during initial installation as well as on-going management of the native plant landscape. Avoid too much mulch around plants as it can smother native plants. Also avoid too much mulch around tree trunks (mulch volcanoes) as it will damage the tree. Use mulch from local sources and without dyes when possible. Hardwood mulch used on native perennial beds will break down and provide nutrients for the plants. Composted leaves are an excellent option.



Management

Landscapes that have native plants require many of the same management practices as any landscape – mulching, planting, weeding, and watering. However, the methods and approach are different. A native plant landscape has more plant diversity, but the transition toward native plants can initially involve replacing non-natives with natives. For example, plant Dwarf Yaupon Holly as a foundation plant instead of using a non-native holly which could get too large for the site. Another example would be planting native herbaceous perennials instead of annuals in a display. This approach increases herbaceous perennials and thus reduces the cost of constantly planting and digging up annual plantings. The increased variety in plants can promote interest among the landscape crew. When considering contractors, choose one with experience with native plants and request references and examples of their previous work. Also, bring in a native plant landscaping consultant if the current contractor has less than five years of experience planning, installing, and managing a native landscape.

Annual Management Schedule

The following is a general description for native plant management in Piedmont, NC. Changing weather patterns will require adaptation.

JANUARY - FEBRUARY

- > Winter annual weed control by hand weed or cultivate.
- > Mulch & prune trees and shrubs.
- > Only cut back perennials and grasses if required by client. Good to leave some for-winter interest as needed.

MARCH - APRIL

- > Early spring – cut back last year's woody stems to 1 ½ - 2 feet for stem nesting bees. It is best to wait until temperatures are consistently in the 50s for bees that are emerging.
- > Early spring planting

MAY - JUNE

- > Summer weed control
- > Water new plantings as needed

JULY - AUGUST

- > Water new plantings as needed

SEPTEMBER - NOVEMBER

- > Fall planting & mulching

NOVEMBER - DECEMBER

- > Winter weed control

Watering

Group plants with similar water requirements together. Consider the landscape carefully when creating a plant list and installing plants. For example, use drought-tolerant plants in hot, sunny areas (e.g., near parking lots). For newly planted areas, water deep and slow for the first season when the soil is dry. Trees and shrubs take longer to establish their root system and will need regular watering initially, especially during times of drought. The best time to water is in the early morning, and use a slower, longer, lower to the ground method. Use drip irrigation or high-quality water bags or even slow drip buckets placed while performing seasonal weeding tasks. Otherwise, with proper installation of native landscapes and regularly mulching, the need for watering will diminish except during droughts.

Other ways to reduce watering is:

- > Limit turf to only those areas dedicated to recreation and pets. Also, consider using a type of turf that requires less water (e.g., Zoysia).
- > Use organic soil amendments (e.g., compost, etc.) to promote water retention.
- > Mulch planting beds.
- > Use rain gardens and other methods to reduce water runoff.
- > Avoid spray irrigation.

Due to climate change and the cost of providing water to municipalities, many towns and cities have standards and fees to strongly discourage the use of irrigation systems (permanent piping systems to regularly provide water to landscapes). On the state level, NC has water efficiency standards for in-ground irrigation systems.⁴⁵

Controlling Weeds

Most important – Crew leader and crew should be knowledgeable about the landscape goals of the site, and identification and care of all plants including native, nonnative and invasive plants. For this reason, it is important to have a design that uses perennials and grasses in groups that are easily visible to those unfamiliar with native plants.

Newly planted areas, where the soil has been disturbed, require weeding on a regular basis until the plants grow to fill the area. As native plants fill the site, there is less room for weeds to become established. Crews will need to shift from spray treatment of weeds to hand removal. The use of herbicides to kill weeds and unwanted plants can negatively impact pollinator populations. The best way to remove a weed is to cut the weed at the base and use a gardening knife to remove it. This approach leaves the soil undisturbed.

- > **Early control of weeds is critical.** Prioritize removing weeds that are flowering or going to seed first to prevent them from spreading.

- > **When removing existing turf or weedy areas** to create new plant site consider sod cutting, or smothering the turf if time allows, or consider using an organic spray that may be effective on cool season turf but more difficult to kill warm season turf.
- > **Integrated pest management** - reduce/ eliminate⁴⁶ herbicide use for bird friendly habitat. Broad spraying herbicides have been shown to reduce the number and diversity of bird species.⁴⁷
- > **Use of mulch to supplement hand weeding to control weeds.** Hardwood mulch breaks down and adds to the soil. Over time, native plant landscaping can create a “living mulch”⁴⁸ where plants fill in the spaces which reduces maintenance time.

Tidying the Garden

Traditionally people have wanted to remove all dried vegetative matter and leaves from their gardens to make them “tidy”. We now better understand the ecological importance to our pollinators and birds of leaving the leaves and not tidying up until late spring. Avoid cutting back and removing dried flower stalks until late March or April when temperatures are consistently in the 50s(Fahrenheit). Many birds rely on the seeds from dried flower stalks, so leaving them for the birds is beneficial. Likewise, our native bees nest in the ground or in woody plant stems. Leaving the dried stalks 1 ½ - 2 feet provide them places for their larvae. You can provide ground nesting space also with loose gravel or sand in sunny locations.



Leave the Leaves^{49 50} in flower beds and under shrubs or trees provides several benefits including saving money as no wood mulch is needed. Leaves provide nutrients for the trees they came from and shelter for many insects. It may surprise you to know that 94% of our butterflies and moths overwinter in the leaves in the form of eggs, caterpillars, or chrysalis.⁵¹ Luna moths and swallowtail butterflies disguise their cocoons and chrysalis as dried leaves which wait in the litter until spring to emerge. Our birds know this is a good place to look for food and can be seen kicking and picking through the leaves for bugs to eat. So many insects live in the leaves: spiders, snails, worms, beetles, millipedes and more – and they support chipmunks, turtles and amphibians which rely on insects for food. Leaving the leaves not only helps the trees, improves soil health, and it helps with biodiversity.

Pruning: Less Is More

Change pruning practices and allow plants to have their natural form whenever possible. Restrict pruning to cases of practical importance such as visibility or safety or to promote plant health. Pruning trees and large shrubs when they are young for long-term health includes removal of dead, dying, diseased, and damaged wood and cutting back branches partially or entirely to promote a strong leader (for species that have them) and sound architecture (e.g., no crossed branches, well-spaced main branches and wide branch angles). Also, hedges that provide an important screen in a small space may require pruning. Many of the bird friendly shrubs and trees produce berries or nuts for the birds. Severe pruning removes these berries and makes the plantings less effective.

Each area should be evaluated for pruning needs to reduce expenses. Correct plant placement will reduce or eliminate the need for pruning. Many landscapes have plants for a quick filling of the site and at maturity these plants grow too big for the site. This leads to long-term pruning costs.

Some solutions in pruning renovation:

- Switch out plants for smaller cultivars that may seem undersized but at maturity require little to no pruning (e.g. DwarfYaupon).
- Some large plants can be cut back severely to reduce size then allowed to grow back to a natural form.

Care of Existing Canopy Trees

Native canopy trees are the most productive habitat for wildlife and have numerous benefits. They provide food and shelter for a diverse range of species as well as shade. Other important benefits include carbon sequestration, water uptake and moderation of soil temperatures.

Protecting tree root systems is a very important part of long-term tree health. Roots convey water and nutrients from the soil through the tree as well as stabilize the tree's structure. A tree's root zone includes the area within its "drip line" (the diameter of the tree canopy) and often extends beyond that. The fragile feeder roots found in the upper organic layer are critical for tree health. Building organic matter to retain rainwater and create a functional forest soil is critical. Create larger mulched areas under trees using mulch initially but leaves from the site as the long-term goal. This will create habitat for many overwintering insects which includes the majority of our pollinators. Avoid compacting tree roots.⁵² Construction around the tree, lawn maintenance activities, parking vehicles, and even regular foot traffic can cause tree root compaction. Stop trying to grow grass under trees. Extend mulched areas under trees to the drip line to reduce mowing and benefit the tree's growth. For more information on benefit of trees and how to protect them, [click here](#).

Working with HOAs and Contractors

A big challenge to implementing native landscapes is changing old habits. Sustainable native landscapes are more like home gardens than typical commercial sites. The following is an example of a specific situation to illustrate the general steps toward creating a native plant landscape for an organization with a board of directors. This example is of an HOA with board members interested in establishing a landscape comprised of native plants. However, the general process would be similar for corporate campuses and public sites such as schools and parks. Only the decision makers and the supervisors change. The second and third steps in the process are also relevant for individual landowners.

First, the enthusiastic native plant landscape board member must convince the rest of the board and then other homeowners in the community to make changes to improve habitat for birds and pollinators. This will create a different aesthetic, a whole new look and feel that will engage people. Emphasize the benefits listed above highlighting the reduced energy use, decreased pollution from small engines and quieter neighborhoods for homeowners. Find out if local town ordinances support and promote native landscapes. Sustainable solutions for HOAs provide an opportunity to improve landscapes for residents and have a positive impact.^{53,54} For any change in how commercial landscapes have traditionally been maintained there needs to be a long-term commitment from the Homeowners Association (HOA) board or school system. Once one enthusiastic person is off the board the site may lose its focus on a more environmentally friendly landscape that uses native plants unless other homeowners have been involved in the project.

Second, find a contractor experienced in native landscapes or educate the one you have. Most commercial landscape companies have a specific skill set and may not have any experience with these new ideas. Native plant choices need to be durable, easily recognized in the landscape by the crew, available at larger nurseries and deer resistant. The HOA or another third party with experience in native plants may need to monitor and communicate goals and methods to the landscape crew supervisor. There can be many levels of supervision between you and the person on the ground deciding what plants need to be removed. It may be easier to teach crews and volunteers a handful of native plants to keep than which numerous weeds to remove. If plugs or larger plants are installed initially this will help those managing the garden with what the plants look like as seedlings. Decisions will need to be made about management of certain species and their populations. For example, relatively few plants may be installed at a site for which the goal is to have the whole area fill in with vegetation. Thus, seedlings or self-seeding plants could be left in some area but pulled in others. Likewise, the suckering masses that are created by many native shrubs and small trees could be considered desirable or those extra plant materials might be used in other locations. The landscape manager must be aware of landscape goals and knowledgeable about plant growth habits.



Lack of understanding in long-term management can cause natives and sustainable landscapes to fail. There are a number of resources available on sustainable landscape design and construction.⁵⁵ The HOA may want to consider hiring a smaller native plant contractor to design, install and manage some high-profile areas such as separating out pollinator gardens or management of all trees and shrubs. This could be useful if the main contractor is not aware of the finer garden tasks of plant care. If tasks are clearly defined this can allow each contractor to focus on what they do best.

Third, the native plant contractor could start with an initial small planting to build homeowner's support. Choose a high-profile area that homeowners can see and enjoy. This can be at a pool, mailboxes or other highly visible common spaces. Consider adding a seating area to encourage appreciation for the new planting areas. It is important to include a convenient water source for easy access to ensure plants are watered. A group of volunteers interested in native plants will make it more successful. They can learn plant names and basic care while helping with tasks like watering if the contractor is unable to water.

Landscape Contracts

The following sources provide a sample contract and may serve as a guide for points to consider when drafting a contract for native plant landscapes. Each situation is different because landscape uses vary among sites, and needs and interests vary among HOAs, municipal parks and recreation facilities, or schools.

- > <https://www.plantnovanatives.org/sample-maintenance-contract>
- > http://www.chicagowilderness.org/resource/resmgr/publications/Native_Landscaping_Guide.pdf See pages 5-8 for information on contractors.

Local Case Studies

A number of local landscape experts have installed native plant gardens in public areas. The following summarizes five local native plant installations and tips from the experts:

> UNC-Chapel Hill

Example of stormwater management

One campus area with turf over a large stormwater pipe was converted to an oasis for wildlife. The pipe in that section was removed and the stream was restored and the edges planted with native plants. Now birds and other wildlife inhabit this space. People passing by now choose to meander along the paths rather than the sidewalk along the street to enjoy the beauty of this little oasis.

For more information, [click here](#).



> Duke Gardens

Pocket Prairie Project by Bloomquist Garden of Native Plants

Native Plants (8 acres) & Pocket Prairie Project by Blomquist Garden of Native Plants at Duke Gardens: A demonstration garden of Southeastern native prairie plants located in an urban parking lot on Duke Campus near Duke Gardens. This garden shows that native prairie plants can be beautiful and low maintenance. Prairie wildflowers and grasses evolved in sunny, dry conditions with poor soil. They make great alternatives to turf and provide for birds and pollinators. To learn more and find a list of plants used in this project, [click here](#).



> City of Durham

The Piedmont Prairie Garden at Rotary Plaza

The City of Durham's Landscape Services Division created a complex pollinator habitat in a downtown Durham civic plaza next to City Hall (Rotary Plaza is at 400 North Mangum Street, Durham NC).

- > **Preparation – Year 1:** Cover crops planted (first crimson clover and winter rye during winter-spring, then pearl millet during summer-fall).
- > **Overall reduction of inputs:**
 - > No herbicide used. Cover crops outcompeted most of the weeds.
 - > No mulching material was imported to the site as cut pearl millet served the purpose.
 - > No fertilizer was imported to the site (crimson clover provided nitrogen, all cover crops provided organic matter). The site was solarized between cover crops as another means to avoid application of synthetic pesticides.
- > **Planting:** Installed 1,580 herbaceous perennials and woody ornamental shrubs native to the Durham County area, including 14 keystone pollinator species. This design features native plants that are aesthetically pleasing and suited for the dry site. The inclusion of many different plant species increases the garden's biodiversity which improves the ecosystem's sustainability and resilience.
- > **Maintenance** through hand-weeding and cutting plants back once per year.
- > **Benefits:** A dramatic reduction in chemical, water, and mechanical inputs compared to a standard urban landscape. These more sustainable landscapes allow City of Durham's Landscape Services to avoid use of pesticides in city sites that have pollinator habitat, implement non-chemical pest prevention and management methods on city grounds, eliminate pesticides used solely to maintain aesthetics on city grounds; reduce the area of city-managed lands to which pesticides are applied; and adopt a no-neonicotinoid insecticides practice.



For more information regarding the use of native plants in municipal landscapes [click here](#).⁵⁶

➤ **New Hope Audubon Society and Accesso, Research Triangle Park, NC**

As New Hope Audubon's first corporate bird friendly partner, Accesso improved bird friendly habitat at the 120-acre Meridian Corporate Center near Research Triangle Park, NC. The corporate campus of Meridian now includes native plant landscaping. Based on the feedback from a champion of the project, they "reduced our overall costs 12% to 17% in just under two years by using perennial plantings wherever possible and xeriscaping⁵⁷ areas without irrigation." – Catherine Winder, Senior Property Manager, Accesso Services

➤ **United Church of Chapel Hill (UCCH)**

The congregation at UCCH chose to incorporate native plants in the landscaping plans of their new church site to align with their Earth Ministry goals. UCCH landscaping has minimal turf for a few open spaces for people to gather outside. Otherwise, it is densely planted with native perennials and shrubs. This includes a large, more formal garden area at the entryway using native plants and small borders with trees along the driveway with natural areas. Maintenance requires some weeding and editing some of the native plants that seed in. These gardens attract pollinators and birds which the congregation enjoys.



"The gardens at United Church of Chapel Hill are among our greatest assets to welcome our neighbors. Few churches seem to have gardens like ours that are cultivated with such careful attention to the passing of the seasons, the use of native plants, and pollinators to bring energy into our outdoor spaces. They are alive with buzzing and humming and movement. In this way they are symbolic of the dynamic life of our community. There is always something new to discover in our gardens, so it's common to see even our most regular attendees strolling slowly along the pathway or stopping to appreciate new growth. The gardens have become a resource for the whole neighborhood, attracting people who live nearby to walk through or sit for quiet reflection. We believe that the gardens give expression to the values of the church itself - the goodness of creation, the abundance of diversity and differences, the importance of attentive caretaking and stewardship of our gifts." – minister, United Church of Chapel Hill



Summary

This manual is about promoting change. Start small, plan and achieve the first steps (low-hanging fruit). When working with landscape contractors who haven't specialized in native plants, focus on areas of agreement as described in the HOA scenario. Learn more about the challenges that these changes may pose to contractors and work together to address them. Make changes in the most visible locations to get buy-in and highlight the benefits. Replace plants with natives to increase plant diversity over time. You and your communities' efforts will have the greatest chance of success when following recommendations on design, installation and management.

Creating a sustainable native landscape offers many benefits to each of us and the ecosystem we depend on for life on this beautiful planet. It simply requires each of us to try something new. Incorporate native plants in your landscape no matter how big or small. Each of us can help restore ecosystems that support the bees, birds and butterflies we enjoy watching by being a champion of native plant landscapes in our backyards, schools, and communities. Every native tree, shrub and wildflower helps protect the biodiversity and food sources for the people living here. Every small oasis, whether a backyard or large park, adds up to a potential corridor that bridges natural areas and benefits everyone.



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Additional Local Resources

North Carolina Botanical Garden: The North Carolina Botanical Garden is a conservation garden. Our guiding mission is to inspire understanding, appreciation, and conservation of plants and to advance a sustainable relationship between people and nature. Located at 100 Old Mason Farm Road, Chapel Hill, NC 27517 <https://ncbg.unc.edu/>.

Sarah P Duke Gardens: H.L. Blomquist Gardens of Native Plants features gardens of native plants from across the state including prairie gardens and is open year round at 418 Anderson Street, Durham, NC 27708 <https://gardens.duke.edu/>.

Pollinator Paradise Gardens at Chatham Mills - A demonstration garden created by Agriculture Agent Debbie Roos of the Chatham County Center of North Carolina Cooperative Extension. The garden features over 225 species of perennials, trees, shrubs, vines, and grasses, and 85% of them are native to North Carolina. The garden is at the Chatham Mills complex in Pittsboro and is open 7 days a week. Address: 480 Hillsboro St. Pittsboro, NC 27312. Read more [here](#).

References

- 1 Kimmerer, R.W. 2013. Braiding Sweetgrass. Minneapolis: Milkweed Editions.p.46.
- 2 New Hope Audubon Society. 2022. "Bird Friendly Habitat" brochure. <https://www.newhopeaudubon.org/>
- 3 Winter, K. "Ruby-throated hummingbird. U.S. Forest Service. https://www.fs.fed.us/wildflowers/pollinators/pollinator-of-the-month/ruby-throated_hummingbird.shtml (accessed June 2022)
- 4 Tallamy, Douglas W. 20007. Bringing Nature Home. Portland, Oregon: Timber Press.
- 5 New Hope Audubon Society. 2022. "Bird Friendly Habitat" brochure. <https://www.newhopeaudubon.org/>
- 6 Narango, D.L., Tallamy, D.W. & Shropshire, K.J. Few keystone plant genera support the majority of Lepidoptera species. *Nat Commun* 11, 5751 (2020). <https://doi.org/10.1038/s41467-020-19565-4>
- 7 Natural Wildlife Federation. "Garden for Wildlife – Keystone Native Plants – Eastern Temperate Forests". <https://www.nwf.org/Garden-for-Wildlife/About/Native-Plants/keystone-plants-by-ecoregion> (Accessed June 2022)
- 8 New Hope Audubon Society. 2022. "Keystone plants for North Carolina Piedmont" https://www.newhopeaudubon.org/wp-content/themes/nhas/library/docs/NHAS_Recommended_keystone_plants.pdf (Accessed June 2022).
- 9 NC State University Extension. (Accessed September 2022). "Landscaping for wildlife with native plants. <https://content.ces.ncsu.edu/landscaping-for-wildlife-with-native-plants>
- 10 Tribot, A.S., Deter, J. and Mouquet, N., 2018. Integrating the aesthetic value of landscapes and biological diversity. *Proceedings of the Royal Society B: Biological Sciences*, 285(1886), p.0971. <https://royalsocietypublishing.org/doi/full/10.1098/rspb.2018.0971>
- 11 National Geographic Society. Resource Library accessed April 2022. <https://www.nationalgeographic.org/encyclopedia/ecosystem/>
- 12 Shah A. 2014. Why is biodiversity important? *Global Issues*. <https://www.globalissues.org/article/170/why-is-biodiversity-important-who-cares>
- 13 Xerces Society - Pollinator Conservation. 2022. <https://www.xerces.org/pollinator-conservation/whats-at-stake>
- 14 Robbins J. 2020. Ecopsychology – how immersion in nature benefits your health. *Yale Environment* 360. <https://e360.yale.edu/features/ecopsychology-how-immersion-in-nature-benefits-your-health>
- 15 Finch K and Loza AM. 2015. We Conserve PA. https://conservationtools.org/library_items/1360-Nature-Play-Nurturing-Children-and-Strengthening-Conservation-through-Connections-to-the-Land
- 16 Black S.H. November 2020. Leave the Leaves to benefit wildlife. Xerces Society. <https://xerces.org/blog/leave-leaves-to-benefit-wildlife>
- 17 BBC News. November 2019. Leaf blowers fatal to declining insects, Germans warned. <https://www.bbc.com/news/world-europe-50431827>
- 18 Banks, J. and Walker, E., 2018, November. Gas-Powered Landscape Maintenance Equipment: Noise and Health. In *APHA's 2018 Annual Meeting & Expo* (Nov. 10-Nov. 14). APHA.
- 19 University of Florida. Bioretention basins/rain gardens. 2008. https://buildgreen.ifas.ufl.edu/Fact_sheet_Bioretention_Basins_Rain_Gardens.pdf.
- 20 Town of Chapel Hill, NC - Stormwater Management. May 2022. <https://www.townofchapelhill.org/government/departments-services/public-works/stormwater-management>
- 21 Natural Water Retention Measures (accessed May 2022). <http://nwrmeu.com/measure/retention-ponds>
- 22 Green Home Guide. (Accessed May 2022). <https://greenhomeguide.com/know-how/article/how-to-manage-your-stormwater-sustainably>
- 23 Kraus, H. & Spafford, A. 2009. Rain Gardening in the South: Ecologically Designed Gardens for Drought, Deluge, and Everything in Between. Hillsborough, NC. Eno Publishers.
- 24 NC State Extension. A Gardener's Guide to Soil Testing. <https://content.ces.ncsu.edu/a-gardeners-guide-to-soil-testing> . (accessed September 2022)

- 25 Davis, J.G. & Whiting, D. February 2013. CSU Extension. <https://extension.colostate.edu/topic-areas/yard-garden/choosing-a-soil-amendment/>
- 26 Myers, M. May 2020. NCSU – Extension Gardner. <https://extensiongardener.ces.ncsu.edu/2020/05/soil-testing-and-choices-of-amendments/>
- 27 Steiner, R. Landscape Design 2022. <https://www.gardendesign.com/landscape-design/rules.html>
- 28 County of Santa Clara. 2022. Sustainable Land Management. <https://slm.sccgov.org/learn-landscaping/explore/bayfriendly-principles-sustainability/seven-principles-design>
- 29 Carley, D.S. & Spafford, A.M. 2021. Pollinator Gardening for the South. Chapel Hill, NC: UNC Press.
- 30 Root, T. June 30, 2021. Ditching Grass could help your backyard thrive. The Washington Post. <https://www.washingtonpost.com/climate-solutions/2021/06/30/climate-friendly-backyard/>
- 31 Son J. 2021. Princeton Student Climate Initiative - Princeton University. <https://psci.princeton.edu/tips/2020/5/11/law-maintenance-and-climate-change>
- 32 Adler, J. April 2020. Meet the ecologist who wants you to unleash the wild in your backyard. Smithsonian Magazine. <https://www.smithsonianmag.com/science-nature/meet-ecologist-who-wants-unleash-wild-backyard-180974372/> (accessed June 2022).
- 33 Leaf and Limb. (Accessed May 2022). <https://www.leaflimb.com/6-reasons-why-planting-native-trees-benefits-the-environment-and-our-local-ecosystem/>
- 34 We Conserve PA. 2017. From Lawn to Meadow. <https://conservationtools.org/guides/151-from-lawn-to-meadow>
- 35 Sturm, A., Frischie, S. 2020. Mid-Atlantic Native Meadows: Guidelines for Planning, Preparation, Design, Installation, and Maintenance. Portland, OR.: The Xerces Society for Invertebrate Conservation.
- 36 Mellichamp L. 2014. Native Plants of the Southeast. Portland, Oregon: Timber Press, Inc.
- 37 Kirkman LK, Brown CL, Leopold DJ. 2007. Native Trees of the Southeast. Portland, Oregon: Timber Press, Inc.
- 38 Roach, M. March 2021. Why you should plant oaks. New York Times. <https://www.nytimes.com/2021/03/31/realestate/oak-trees-why-you-should-plant.html>
- 39 Environmental Protection Agency. Ecoregions of North Carolina. https://gaftp.epa.gov/EPADDataCommons/ORD/Ecoregions/nc/nc_eco.pdf (accessed September 2022)
- 40 Martin, Susan, July 2020-Vol 6 No. 7, Native Species or Cultivars of Native Plants – Does it Matter? <https://piedmontmastergardeners.org/article/native-species-or-cultivars-of-native-plants-does-it-matter/>
- 41 White, A.S. 3/1/2016. From Nursery to Nature: Are native cultivars as valuable to pollinators as native species? <https://pollinatorgardens.org/2013/02/08/my-research/>
- 42 Eierman, K. 2015. Eco Blog: The Nativar Conundrum: New Research on Natives vs. Native Cultivars with Dr. Doug Tallamy. EcoBeneficial.com <https://www.ecobeneficial.com/2015/10/the-nativar-conundrum-new-research-on-natives-vs-native-cultivars-with-dr-doug-tallamy/>
- 43 Kraus, H., Spafford, A. 2009. Rain Gardening in the South. Hillsborough, NC: Eno Publishers.
- 44 Toscano, A. Amending Clay Soils. Fine Gardening. <https://www.finegardening.com/project-guides/gardening-basics/amending-clay-soil-in-the-southern-plains> (accessed 5-1-2022)
- 45 NC Department of Environment and Natural Resources. 2009. <https://deq.nc.gov/media/21239/download>
- 46 Craves J. October 2018. Why lawn chemicals really are harmful to birds. Bird Watching. <https://www.birdwatchingdaily.com/beginners/birding-faq/lawn-chemicals-really-harmful-birds/>
- 47 Quinn, J., 2021. Ecology of Farmland Birds: What is the effect of spraying stubble fields on winter farmland bird diversity and abundance? <https://www.thebrideproject.ie/wp-content/uploads/2022/03/Ecology-of-Farmland-Birds-Cian-Kelly.pdf>

- 48 Sandoval, D. Good Natured Landscapes. <https://goodnaturedlandscapes.com/living-mulch/> (accessed 6/2022)
- 49 Black, SH. Leave the leaves to benefit wildlife. Xerces Society. <https://xerces.org/blog/leave-leaves-to-benefit-wildlife>.
- 50 Driscoll, B. Leave the leaves. New Hope Audubon Society. <https://www.newhopeaudubon.org/blog/leave-the-leaves/>. (accessed 6/2022)
- 51 Jordan, SF. 2020. Moving beyond flowers: Natural nesting habitat for bees and other insects. Xerces Society. <https://xerces.org/blog/moving-beyond-flowers-natural-nesting-habitat-for-bees-and-other-insects>
- 52 Peterson G. Michigan State University Extension. Protect tree roots from soil compaction. https://www.canr.msu.edu/news/protect_tree_roots_from_soil_compaction
- 53 Cubie, D. Greening your HOA. The National Wildlife Federation. February 2022. <https://www.nwf.org/Home/Magazines/National-Wildlife/2022/Feb-Mar/Gardening/HOAs>
- 54 Nemo, L. Cookie-Cutter Suburbs could help spread sustainable yards. Scientific American. December 2019. <https://www.scientificamerican.com/article/cookie-cutter-suburbs-could-help-spread-sustainable-yards/>
- 55 Cook, TW & Vanderzanden, MA. 2011. Sustainable Landscape Management. Hoboken, NJ: Wiley & Son. <https://landscaper.ir/wp-content/uploads/2016/01/Sustainab-Architecture-Management.pdf>
- 56 Durham City-County Planning Department. 2021 <https://www.durhamnc.gov/DocumentCenter/View/1034/Landscape-Manual-for-Durham-NC-PDF?bidId>
- 57 Note: Xeriscaping is a method of landscaping that reduces the need for water after installation. For more information see: https://plants.ces.ncsu.edu/garden_detail/xeriscape-dry-sun-garden/

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