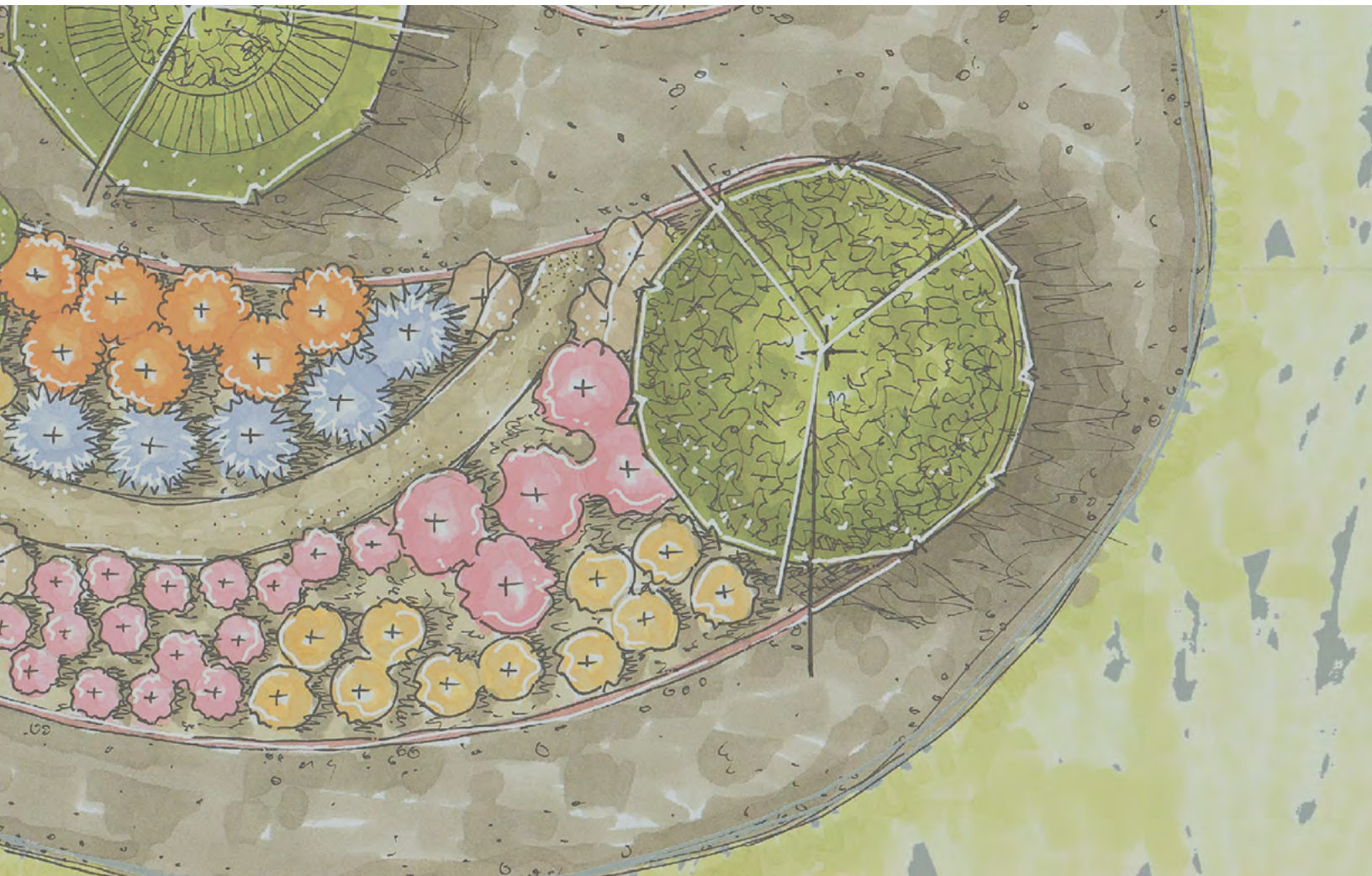
POLLINATOR GARDEN

DESIGN GUIDE

Activities for Youth, Schools, and Beginning Designers



ABOUT THIS GUIDE

This activity guide was developed through a partnership between The Westminster School in Atlanta and the University of Georgia's College of Environment and Design (UGA CED). In the fall of 2022, landscape architecture students from the CED worked with a 5th-grade class at Westminster to design a pollinator garden for the Westminster Lower Schools. Several of the activities presented here were developed and tested through this pilot project.

Westminster and UGA students with models of their garden designs.

Who is this guide for?

Although this guide was originally developed for a school pollinator garden, it can also be used outside the classroom by after-school programs, home schoolers, church or scout groups, and other youth organizations. It can be adapted for different age groups and skill levels. Even adults designing their home gardens will find it useful.

Our project was based in the Piedmont ecoregion of Georgia. Therefore, our examples use plants native to this ecoregion and suitable for the hardiness zones of 7b and 8a. However, the activities can be applied to any region as long as one develops an appropriate plant list.

Why engage youth in designing gardens?

Research has shown that exposure to nature and nature-based learning can have significant positive impact on children's development as well as their mental and physical health.[1]

Additionally, providing opportunities for youth to design their environment can increase their sense of empowerment.[2] By collaboratively working towards a design decision that results in real, physical changes, they start to see that they can, indeed, make a difference in the world.

Bringing garden design into educational settings can also provide a fascinating blend of hands-on STEAM education, design thinking, socio-emotional learning, and collaborative decision-making. Landscape architecture in the classroom can help youth connect scientific knowledge with creative responses to challenging environmental problems, a critical skill set for today's world.

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[1] McGill, Tim. "The Benefits of Children's Engagement with Nature: A Systematic Literature Review." 2014. *Children Youth and Environments* 24 (2): 10–34. doi:10.7721/chilyoutenvi.24.2.0010.

[2] Loebach, Janet, Sarah Little, Adina Cox, and Patsy Eubanks Owens, eds. 2022. *The Routledge Handbook of Designing Public Spaces for Young People: Processes, Practices and Policies for Youth Inclusion.* Routledge.

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What is landscape architecture?

Landscape architects combine an understanding of aesthetics, ecology, and human needs to create attractive and inspiring environments. Landscape architects carefully study a site in order to design creative solutions that improve our environment and engage people with their surroundings. Pollinator gardens are one of many kinds of landscapes that landscape architects can help create. For more information on landscape architecture, visit: https://www.asla.org/aboutlandscapearchitecture.aspx

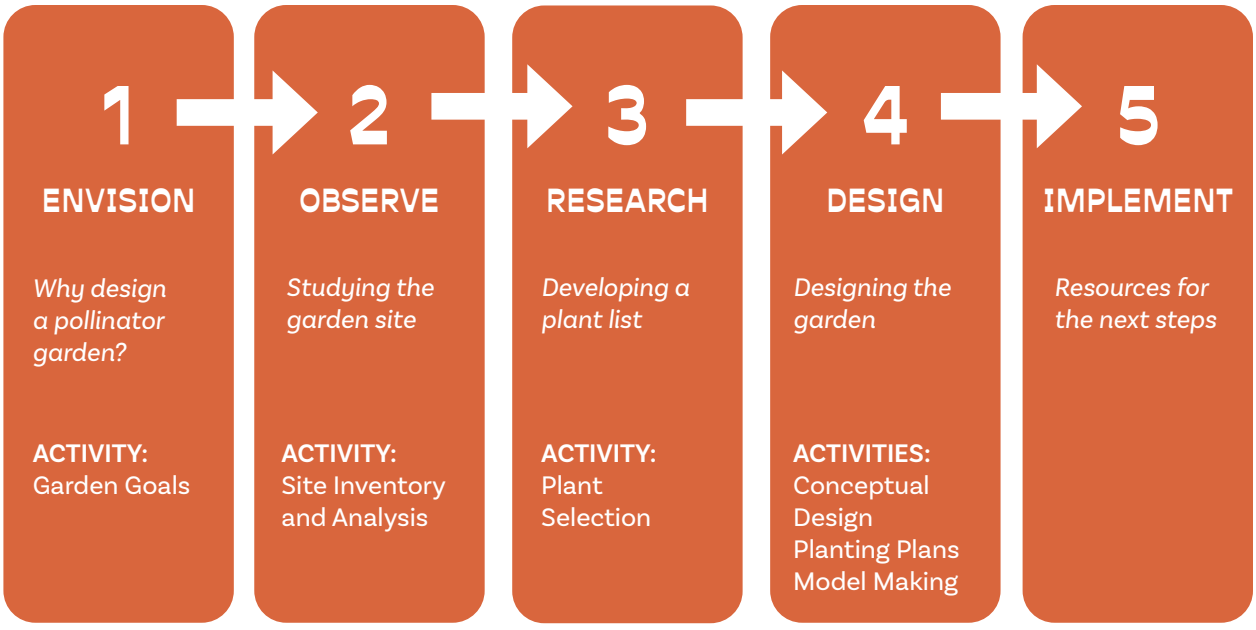
How to use this guide

Designing a garden can seem overwhelming at first. There are so many decisions to make. How does one choose the best plants for the garden? How does one know they will grow well where they are placed? How can the arrangement of plants make the garden more or less attractive?

This guide contains five chapters that explain the purpose of pollinator gardens, the design process, and the basic steps used to develop a planting plan. The first four chapters also include activities to guide educators and students through the design process.

THE DESIGN PROCESS

The Chapters in this guide cover five steps in a design process: envision, observe, research, design, and implement.



Our design steps are similar to the Human-Centered Design process as described by IDEO (https://www.designkit.org). Their website is a useful introduction to design thinking as a problem-solving strategy.

ACKNOWLEDGMENTS

The activities in this guide were developed by The Westminster Schools in collaboration with the University of Georgia's College of Environment and Design under the direction of BDR Partners.

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CHAPTER 1

Pollinator Gardens

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

This chapter explains what pollinators are, why we are concerned about them, how ecological garden design can help, and the steps in a garden design process.

1. AN INTRODUCTION TO POLLINATORS

A **pollinator** is anything, including insects and other animals, that carries pollen from a male part of a flower (stamen) to the female part of a flower (stigma).[1] This movement of pollen, called **pollination**, results in fertilization. **Fertilization** is necessary to produce fruits, seeds, and young plants.

Many insects such as bees, wasps, moths, beetles, and butterflies are pollinators. Other animal pollinators include birds, some reptiles, flies, and bats.

Common pollinators include wasps, bees, moths, and hummingbirds.
Images by (clockwise from top left): Ansel Oommen, Ansel Oommen, Jim Occi/BugPics, Joy Viola/Northeastern University. Image source (all images): Bugwood.org.

[1] https://www.nps.gov/subjects/pollinators/what-is-a-pollinator.htm

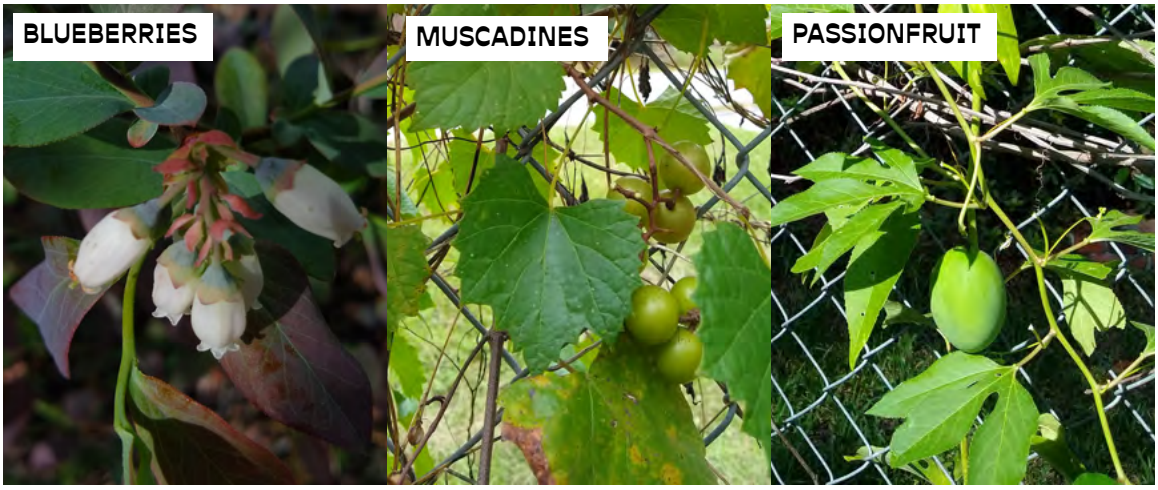
Why are pollinators important?

Pollinators are necessary for plants to reproduce. Since plants are stationary, many of them rely on pollinators to transfer their pollen to another plant. Many of these plants provide us with food. They also help clean our air, water, and soil.

Food

Over 75% of flowering plants rely on pollinators, including many familiar food crops such as berries, chocolate, coffee, melons, and tomatoes. Estimates indicate that 35% of food crops around the world depend on pollination for successful seed and fruit production.[1] That means that 1 out of every 3 bites humans eat is due to these pollinators doing their jobs! Imagine all these foods not being available in grocery stores or restaurants!

Pollinators also contribute to plants that are used to make medicine, biofuels, cloth, and construction materials. Pollinators are also feature as key subjects in many cultures' folklore and artistic works.



Blueberries, muscadine grapes, and passionfruit are all native fruits that depend on pollinators.
Source: Katherine Melcher

Economy

Pollinators are also important to our economy. According to a 2010 study, pollination by honey bees contributed directly to over $16 billion of crop production within the United States, while pollination by other insect pollinators contributed directly to nearly $4 billion of crop production.[2] Through indirectly dependent costs, these pollinators contributed an additional $18 billion to the economy. That's over 28 billion dollars of farm income.

Air, Water, and Soil

Flowering plants help clean the air, filter water, and improve soil quality. Without pollinators these plants would not reproduce; and our air would be dirtier, less oxygen would be produced, and our soil quality would decline.

[1] https://www.usda.gov/peoples-garden/pollinators

[2] https://news.cornell.edu/stories/2012/05/insect-pollinators-contribute-29b-us-farm-income

Pollinator Population Decline

Pollinators populations are declining across the globe. Within North America, wild pollinators have declined in both overall population and diversity of species. Some species, such as the honey bees and the Monarch, appear to be especially threatened. Since 2006, beekeepers have lost about 30% of their colonies each year. From 2020 to 2021, the number of managed honey bee colonies in the United States declined 45.5%.[1]

Source: Katherine Melcher

The iconic Monarch Butterfly is known for its migrations from Mexico and California to summer breeding grounds throughout the United States and Canada.

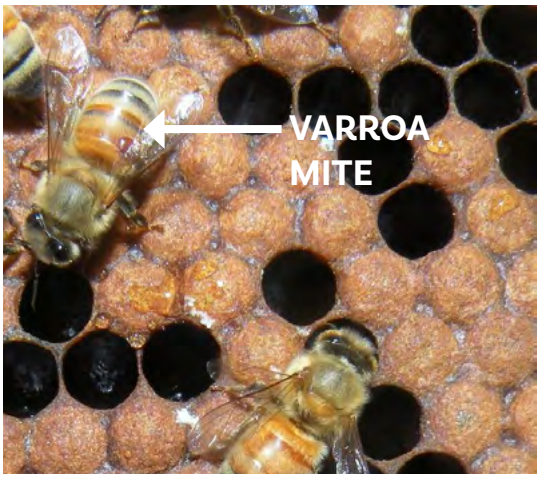
In July 2022, Monarch Butterflies were added to IUCN (International Union for Conservation of Nature) Red List as endangered. Between the 1980s and 2021, their population decreased as much as 90%.

Reasons for Pollinator Decline

Several factors contribute to pollinator decline. Some key factors include an increased spread of disease and parasites, herbicide and pesticide use, and habitat loss and fragmentation.[2]

Parasites and Diseases

Non-native parasites and diseases can infect native species. Key parasites and diseases affecting honey bees include Varroa mites, Hive Beetle, and Colony Collapse Disorder.[2] The increase in average annual temperatures may contribute to insects' susceptibility to disease and parasites.



Honey bees infested with Varroa mites.
Source: Jessica Louque, Smithers Viscient, Bugwood.org.

[1] https://ocm.auburn.edu/newsroom/news_articles/2021/06/241121-honey-bee-annual-loss-survey-results.php

[2] https://www.nps.gov/subjects/pollinators/pollinators-in-trouble.htm

Pesticides

Pesticides are chemicals used to kill weeds, insects, fungi, and other pests. They can be useful tools in agriculture and landscape management. However, when misused, they can harm beneficial insects. Some pesticides kill pollinators directly. Other pesticides remain in the environment for an extended time and contaminate sources of food or water for pollinators.

Neonicotinoids (neonics)[1] are one special type of these insecticides. When applied to plant seeds, neonics may remain in the mature plant as contaminated pollen grains. While pollen contaminated with neonics usually do not kill a pollinator directly; it can weaken the insect and hamper its ability to navigate or forage.[1]

Herbicides are chemicals used to kill unwanted plants in a crop field or garden. While these plants may look like weeds to humans, they might be important forage plants for pollinators. For example, native milkweeds may look like "weeds," but they are essential host plants for the Monarch butterfly.

Before using a pesticide, look for the bee hazard icon on its label (*image left*).

The bee icon is used by the Environmental Protection Agency to indicate that the product can kill bees and other insect pollinators.[2]

Habitat Loss

Pollinators are also declining because they are losing their **habitats**, the places that give them food and shelter! Mining, agriculture, and new housing developments are all removing the plants they depend on to survive.

Pollinators need a reliable food source in the form of nectar and pollen-producing plants. They also need plants on which to lay eggs and to provide protection for larvae. Some pollinators are generalists; they can eat and lay eggs on a variety of plants. Others are specialists; they have formed a relationship with a specific plant or family of plants that they rely on for food and habitat.

Conventional home landscapes often don't meet pollinators' needs for food and shelter. Frequently, home landscapes feature heavily-mowed and herbicide-treated lawns, non-native plants, and a clearing away of litter during the winter; all practices that harm pollinator habitat.

[1] https://ento.psu.edu/research/centers/pollinators/resources-and-outreach/disappearing-pollinators/neonics

[2] https://www.epa.gov/sites/default/files/2013-11/documents/bee-label-info-ltr.pdf

Gardens can provide pollinators with the habitat they need!

Making a pollinator garden is great way to promote pollinator species health and diversity.

Even a small garden can make a difference!

Although the scale of habitat loss might seem overwhelming, even a small garden can make a difference! A 6' x 8' garden (approximately 4 square meters) is large enough to create a rich habitat for pollinators.[3]

The Eastern Tiger Swallowtail Butterfly is the official state butterfly of Georgia. Often seen flying high overhead amongst the Tulip Poplars, it also is a frequent visitor to pollinator gardens. Scientists have found that this butterfly plays a key role in pollinating the Appalachian flame azalea.[2]

Source: Katherine Melcher

[1] Janine Griffiths-Lee et al., Sown mini-meadows increase pollinator diversity in gardens, *Journal of Insect Conservation* (2022). DOI: 10.1007/s10841-022-00387-2

[2] https://news.ncsu.edu/2015/06/epps-butterfly/

2. GARDENS AS ECOLOGICAL SYSTEMS

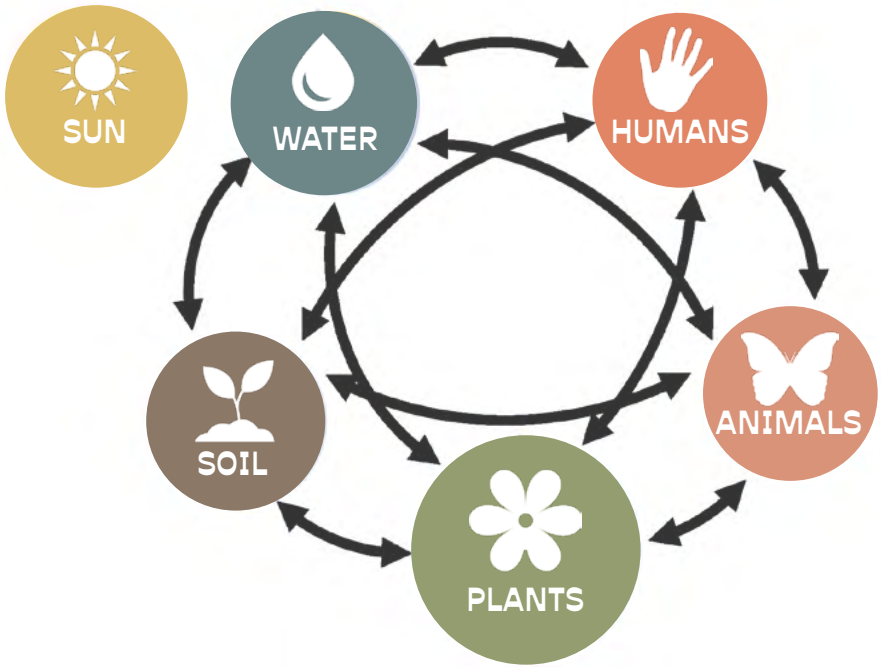
Tersa sphinx moth caterpillar
Source: Katherine Melcher

Ecology is the study of the relationships among living organisms, including humans, and their physical environment.

Ecological landscaping is "a method of designing, building, and maintaining landscapes that considers the ecology of a site and creates gardens that enhance the surrounding environment for the benefit of humans and all other life in the ecosystem."[1]

In an ecological landscape, the sun, water, soil, plants, and animals all support each other's health and growth. Designers can work with these beneficial relationships to conserve natural resources, reduce the need for harmful chemicals, and create healthy environments for pollinators and humans. In an ecological landscape design, plants are selected and arranged to maximize their multiple benefits: food production, soil health, beauty, and pest management.

In an ecological landscape each element supports the others. Can you describe how?



[1] https://www.ecolandscaping.org/10/developing-healthy-landscapes/ecological-landscaping-101/the-basics-of-ecological-landscaping/

There are six key components in an ecological landscape:

CLIMATE AND MICROCLIMATE

*The **climate** is a description of temperature levels, temperature changes throughout the year, and amount of precipitation within one region. It determines what plants will thrive in your garden.*

*The **microclimate** is influenced by patterns of sun/shade, moisture, and wind on a particular site. Plants should be selected and located to fit the existing microclimate. Microclimate is also important to consider for human comfort – for example, is there enough shade and breeze for someone to enjoy spending time in the garden, or would it be too cold and exposed to the wind?*

WATER

Plants and animals both need water to live and grow. The hydrologic cycle of transpiration, evaporation, and precipitation provides water for the garden, but you might also need additional water to support plants when they are first getting established and in times of drought.

SOIL

Soil type influences what kinds of plants will thrive in your garden. Soils contain nutrients, such as nitrogen, phosphorus, and potassium, essential for plant growth. A soil's structure also influences how wet or dry your soil typically is. Some plants prefer well-drained soils, while others are okay with having their roots moist for long periods of time.

Also, you can select certain plants, like cover crops or nitrogen-fixing plants, that can help improve soil fertility. You can also add certain animals, such as earthworms, to help build rich soils.

PLANTS

Plants play a central role in ecological landscapes. Plants can attract beneficial insects, enhance places for human use and enjoyment, provide wildlife habitat, retain and filter water, and build healthy soils.

ANIMALS

Many different kinds of animals can find a home in an ecological landscape. In addition to pollinators, other garden wildlife include birds, small mammals, lizards, and worms. To support wildlife in a garden, provide four basic things: food, water, cover, and places to raise their young.

HUMANS

Humans share the garden with wildlife. When designing, also consider what makes a place comfortable, useful, and pleasurable for humans. The more humans use a garden, the more likely they will take care of the soil, plants, and animals within it.

3. DESIGN: PUTTING IT ALL TOGETHER

What is design?

A **design** is a plan to make something. It frequently has two aims: to make something functional and attractive. For example, we may want a pollinator garden to support native plants and pollinators and also want the garden to be attractive to humans.

Designing is a process that uses both scientific knowledge and creative thinking. Scientific knowledge, such as knowledge about ecology, plants, and pollinators, informs the artistic arrangements of elements in the site. Design is an iterative process. **Iterative** means trying out one idea, and then another, and then another. Each trial leads you to a better solution. Design involves **creative and critical thinking.** Generating multiple new designs is a creative activity, while deciding which design is the best option is a critical activity.

What are the steps in the design process?

A typical design process involves:

Envisioning: identifying the problem or goal.
Observing (research and analysis): learning about the site and also about possible improvements.
Designing: creating multiple design solutions, evaluating them, and selecting the best.
Testing and Refining: imagining the design as implemented and developing the designs in more detail.
Implementing: producing the final product.

ACTIVITY 1

Garden Goals

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

TIME:
1 - 1.5 hours

MATERIALS:
Paper
Pen/pencil

OPTIONAL MATERIALS:
Materials to compile notes from multiple participants:
- Whiteboard
- Poster-sized paper
- Sticky notes

Before designing a garden, it is important to think about who you are designing for and what they need or desire in a garden space. Thinking through who will be in your garden and what you can do to make sure they find the space comfortable and useful will create a useful list of criteria that you will refer to throughout the rest of your design process.

"Who" can include different people who will experience and use the garden, but it could also include wildlife – pollinators and other animals – whom you might want to attract to the garden. You can even expand the "who" to include plants, the soil, and rainwater, too. What would a garden need to have so that its plants, soil, and water are "happy and healthy"?

DESIGN GOAL:

By considering the perspective of multiple potential inhabitants, develop a list of what your garden "must have" and what it would be "nice to have" there.

LEARNING OPPORTUNITIES:

Explore an ecological landscape's key elements (sun, water, soil, plants, and animals)

Discuss what contributes to the health of soil, water, plants, animals, and humans within a garden's setting.

Utilize empathy as a design strategy.

ACTIVITY OUTLINE:

1. Introduction
10 minutes

2. Identifying garden members
10-20 minutes

3. Garden member wish lists
20-30 minutes

4. Prioritizing garden goals
20 minutes

ACTIVITY DESCRIPTION

1. Introduction

10 minutes

Introduce (or review) the different systems in an ecological garden: climate and microclimate, water, soils, plants, and animals (pollinators, wildlife, and humans).

Additional Activities

1. If your class has been learning about water and soil cycles, review those cycles and discuss how they relate to a garden.
2. Draw a diagram that shows these different systems and discuss how they relate to the others.

2. Identifying garden members

10-20 minutes

Brainstorm a list of whom you want your garden to attract. Consider pollinators, people, and other wildlife. This is your list of potential "garden members."

Pollinators:
Research the most common pollinators in your area. You may group them into general categories: for example, wasps, bees, flies and beetles, butterflies, moths, and bats. If you have a specific species in mind, for example the Monarch butterfly, you can include it separately.

People:
Create a list of different groups of people whom you'd like to experience the garden in a variety of ways.
Who do you want to experience the garden when it is built? Who uses the site currently? Who will be in the garden, and who might enjoy it while passing by? Who will take care of the garden?

Wildlife:
In addition to the pollinators listed above, are there other animals you'd like to attract to your garden? Research common backyard wildlife in your area. Consider different types of birds, turtles, lizards, and squirrels or chipmunks.

Other Elements:
You can also expand this exercise to include plants, soil, water, and sunlight as potential garden inhabitants. For each, describe what kind of plant, soil, water, or sunlight you would like to thrive in your garden.

2. Identifying garden members (cont'd.)

Group Organization

This exercise can be done in a large group, or you can divide into 3 or 4 small groups. Each can be assigned a list to develop: for example, one group for humans, one for pollinators, and one for wildlife.

Variations

You can choose to be very general about the types of people, pollinators, and wildlife that will use the garden, or you can delve into the needs of specific people and species. How detailed you decide to get may depend on the age level of participants and how much time you have for conducting research.

Additional Resources

Information on what wildlife need in a habitat: https://www.nwf.org/Eco-Schools-USA/Pathways/Schoolyard-Habitats/schoolyard-habitat-planning-guide

"Define your audience" method from the Design Kit: https://www.designkit.org/methods/define-your-audience.html

Personification and Empathy

Personification means taking human characteristics, emotions, or behaviors - the ways humans experience and think about the world - and applying them to nonhumans. This activity uses personification to consider the garden from a perspective outside our own, in short, to empathize. However, we should also acknowledge that this personification is a fiction. We can imagine - but do not know for certain - what another being thinks or feels.

For more information on Empathy in the design process: https://www.designkit.org/mindsets/4

3. Garden member's wish lists

20-30 minutes

For each garden member, develop a short statement in first person describing what that member would like in the garden.

For each member, come up with a list of what they "must have" to be comfortable in the garden, and a list of what they might like – what they might think would be "nice to have" in the garden.

Use the worksheet at the end of this activity to record your thoughts.

Group organization

Divide the brainstormed list of garden members between the participants. Depending on the age, size of the group, and the length of the list; this activity can be done on their own or in small groups.

People:

To find out what people want in the garden, it is best if you can interview them directly. This might require scheduling additional time outside of the designated activity time.

Ask them:

1. What must the garden have to make it useful to you?
2. What would it be nice to have in the garden?
3. What would you not want in the garden?

For more guidance on how to conduct interviews, see: https://www.designkit.org/methods/interview.html

Other Animals:

For animals and non-human garden members, you will need to conduct research to find out their needs. Remember that animals need: water, food, cover, and places to raise their young. Describe each of these elements for your assigned garden member.

Other Garden Members:

Other garden members can include water bodies such as creeks or ponds, soils, and plants. Of course, you cannot directly interview these garden members, but you can research what they need to function well. Include their needs on your wish list.

4. Prioritizing garden goals

20 minutes Create a summary list of garden goals by compiling and prioritizing the garden wish lists.

Once the individuals or small groups have completed their research, bring everyone together to share their findings and compile a master list of needs for the garden. Create three columns: must-haves, nice to have, and do not include.

Group organization

Create the master list on a large poster-size sheet of paper, on a whiteboard, or on an overhead projector, so that everyone can see what is being added to the list. It is best if each group adds their own findings to the sheet.

Summarize and prioritize

If the list is too long and overwhelming, you may need to group the requirements by themes or start to prioritize them. Here are some useful methods for prioritizing ideas:

1. Download your learnings

   https://www.designkit.org/methods/download-your-learnings.html

2. Bundle your ideas or Find Themes

   https://www.designkit.org/methods/bundle-ideas.html

   https://www.designkit.org/methods/find-themes.html

3. Design Principles or Top Five

   https://www.designkit.org/methods/design-principles.html

   https://www.designkit.org/methods/top-five.html

REFLECTION QUESTIONS

1. *Do our garden members have complementary needs or do some of their needs conflict with others' needs?*
2. *If the needs of one group are in conflict with the needs of another, is there a way to rethink them so that both groups will be satisfied?*
3. *If conflicting needs cannot be resolved, whose needs take priority for our design?*
4. *Can we identify the top five goals we need to keep in mind as we create our design?*

INTERVIEW NOTES:

PEOPLE

ANIMALS

OTHER GARDEN MEMBERS *(soil, water, sun, wind, and plants)*

WORKSHEET 1

Garden Wish List

PEOPLE

I am:_____(their name)

In the future, I would like to use the garden for:_____

_____.

I think the garden should have:_____

_____.

It would be nice if the garden could also have:_____

_____.

Some concerns I have about the garden are:_____

_____.

ANIMALS

I am a: _____ (name of the animal)

I get my water from:_____.

My favorite foods are:_____.

I seek shelter in:_____.

I like to give birth and raise my young in a place that:_____.

Therefore, I need my garden to include: _____

_____.

OTHER GARDEN MEMBERS *(soil, water, sun, wind, and plants)*

I am:_____.

For me to be healthy, I need: _____.

Therefore, I would like my garden to include: _____.

I do not want _____ in the garden.

CHAPTER 2

Studying the Site

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

Once you have determined the goals for your garden, the next step is to analyze the existing conditions on the site. This chapter describes what to look for in each of the six key systems in an ecological garden: microclimate, water, soil, plants, animals, and humans.

1. Site Analysis: An Introduction

The design of a garden begins with site inventory and analysis. A **site inventory** is a recording of what already exists on our site. A **site analysis** adds a value judgment to the inventory, evaluating what is good and bad about a site. A site analysis involves asking: what aspects are good and should be preserved in the design? It also involves asking: what aspects of our site could be improved?

Why conduct a site analysis?

A site analysis has many uses. It can:

- help us identify the best location for a garden within a larger site.
- identify existing problems to be addressed through design. For example, is there an area that collects water after it rains? Maybe it can become a **rain garden**!
- tell us the best location for different uses – for example, a sunny spot might be good for a vegetable garden, while one in the shade with a nice view might be good for a bench.
- guide the placement of plants (based on the plants' sun, shade, soil types, and moisture requirements).

What is a rain garden?

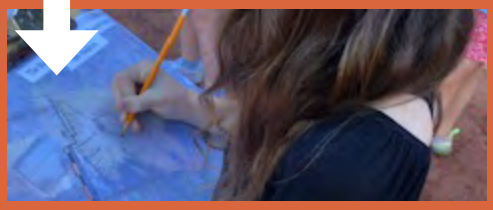
A rain garden is a low-lying area that collects and retains water that is converted into attractive habitat by adding plants that thrive in conditions where the soil is usually moist but also occasionally dry. Rain gardens turn muddy puddles into beautiful, healthy gardens that also filter rainwater.

Source: Katherine Melcher

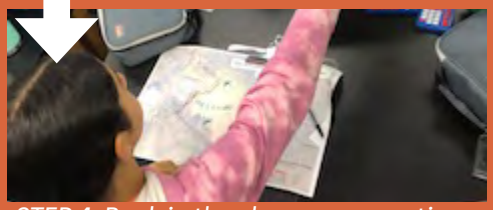
Conducting a site analysis at Westminster Schools

STEP 1: Explaining the purpose of a site analysis.

STEP 2: On the site, reviewing what to look for.



STEP 3: Taking field notes.



STEP 4: Back in the classroom, creating a summary map.

STEP 5: Sharing the summary map with the rest of the class

2. CONDUCTING A SITE ANALYSIS

The site analysis examines each ecological system covered in Chapter 1: microclimate conditions, water flow and drainage, soil quality, existing vegetation, animal presence, and human use.

Here are some of the questions landscape architects ask about each of these systems when they conduct a site analysis:

CLIMATE AND MICROCLIMATE

Why we study it:

Plants, pollinators, and people are all sensitive to a site's microclimate. As different plants evolved within different habitats (woodlands or prairies, for example), each species has specific sun and shade requirements.

Each pollinator species also has different preferences for sunny spaces or shaded spaces. For example, most butterflies prefer to feed on flowers in full sun, but they tend to lay their eggs on host plants in partly-shaded areas.

And, of course, humans also have sun and shade preferences. On a chilly day, we might prefer to be in direct sunlight; but on a hot day in the middle of summer, it's nice to rest in the shade.

What to observe:

Observing the microclimate involves noticing sun and shade patterns, prevailing winds, and patches of moisture. Where sunny or shady areas are on the site depends on the location of the sun. Because the sun's location changes throughout the day and throughout the year, one cannot know the site's sun and shade patterns from just one visit to the site. Try mapping shade patterns at different times of the day. Taking photographs from the same location at different times of the day may help.

A diagram showing how the sun angles change throughout the year.

Source: Laurel Fox, fall 2019, LAND 3430S, UGA CED.

If you have the time to observe the site over the course of a year, notice how the shady areas shift from season to season. If you don't want to wait a year before designing, there are several computer applications that can help you visualize this shift. Here are some to try out:

https://findmyshadow.com/

http://shadowcalculator.eu/#/lat/50.08/lng/19.9

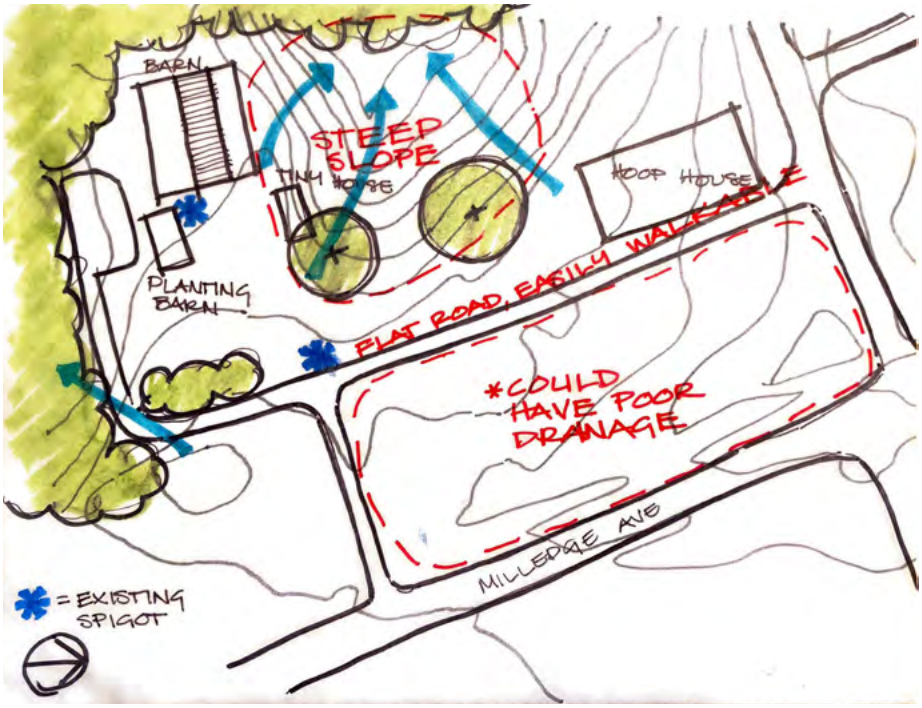
https://shademap.app/@33.9332,-83.3536,15z,1679073965404t,0b,0p,0m

WATER

Why we study it:

Understanding where water flows and collects on your site is important for avoiding problems caused by too much water. Too much water flowing across a site can cause erosion. Water collecting near buildings can weaken its foundation. Water collecting and remaining on site for an extended period of time can also encourage the breeding of mosquitoes. Identifying where water collects and flows on your site will help you design to mitigate these problems.

Observing water flow on the site also helps one place plants in the right location. Plants need water to grow. But some plants need less water (drought tolerant), some plants will die if the soil remains too wet, and some plants prefer moist to wet ground. Noting where soil tends to stay moist and where it is mostly dry will help direct what plants are placed where on the site.



A water analysis showing areas of steep slopes, poor drainage, and the location of the existing water spigot.

Source: Laurel Fox, fall 2019, LAND 3430S, UGA CED.

What to observe

- Try to imagine the path water would take across your site. Where does it come from? A roof? A field? A pond? A pipe?
- Where does it go (remember it flows downhill)?
- Does it flow off the site? Does it collect somewhere? Does it go into a drain or a swale?
- Can you identify any problems areas due to water? Do you see areas of erosion or where water collects?

SOIL

Why we study it:

It is important to observe the soil conditions on the site in order to propose methods of improving the soil and also to select plants appropriate for existing soil characteristics. Although you can improve soil by adding compost, organic matter, or minerals; it is easier to select plants suited for your existing soil quality than try to change your soil. Even poor soils and heavy clay soils have plants that like those conditions.

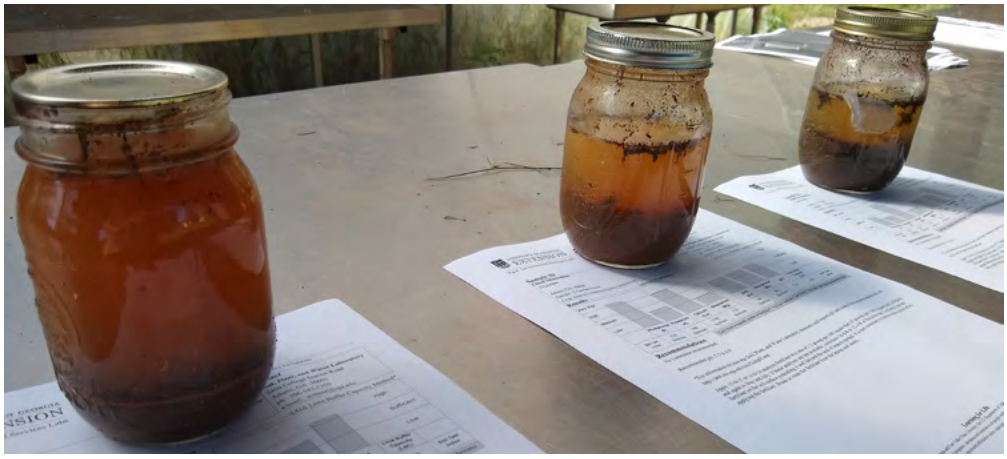
What to observe

There are three aspects of soil one should study: its **structural (physical) qualities**, its **chemistry**, and its **organic (biological) matter.** One can get a good sense of the soil's structure and quality of its organic matter through a visual assessment.[1] Knowing its chemical make-up, however, will require a soil test.

Structural qualities

Physical (Structural) characteristics refer to the soil's texture. Is it gritty, soft, or smooth?

The **soil texture** depends on the size of particles in the soil. The three basic sizes are **sand, silt, and clay**. Tools for assessing the soil structure include soil jars, ribbon tests, and percolation tests.[1]



Soil jars are a simple way to visualize the amount of sand, silt, and clay in a soil.

Source: Katherine Melcher

Why do we care about the size of particles in our soil?

Soil texture determines how well the soil holds water. Sandy soils drain water quickly but they also lose nutrients quickly. Clay soils retain water, sometimes for so long that plant roots rot.

[1] For more information on these tools and soil science activities for youth, see this resource from the Soil Science Society of America: https://www.soils4kids.org/experiments/

Chemical properties

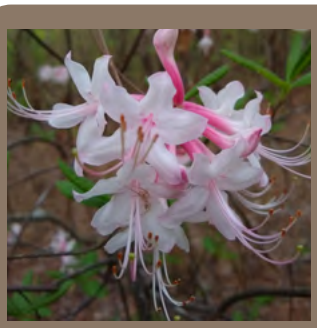
Chemical properties of a soil are the amount of macronutrients and micronutrients exist in the soil, as well as its pH level.

Macronutrients are the nutrients needed in large amounts for plants to be healthy. They include nitrogen, phosphorus, potassium, carbon, hydrogen, oxygen, sulfur, calcium, and magnesium. Most chemical fertilizers add three primary macronutrients to the soil: nitrogen, phosphorus, and potassium.

Micronutrients are other chemicals in the soil that are useful for plant growth in small quantities. Micronutrients include iron, manganese, boron, zinc, and molybdenum.

Soils that are lacking in nutrients do not always need chemical fertilizers. Many native plants grow well in soils with few nutrients. Even if a soil is not rich enough for a vegetable garden, it may still be able to support wildflowers for pollinators.

Soil pH measures the amount of acidity in the soil. It ranges from acidic to basic (alkaline). Soil pH depends on the type of base rock the soils came from.



Some plants prefer acidic soils, while others thrive in alkaline soils. Native plants are often well-adapted to the pH of local soils. For example, many parts of Georgia have acidic soils. And native blueberries, dogwoods, and azaleas thrive in acidic soils, so they are good choices for a Georgia garden.

Native azalea flowers, Source: Katherine Melcher

Organic matter

Healthy soils are alive. They are teaming with organisms and organic matter.

Organisms such as bacteria, fungi, nematodes, arthropods, protozoa, and earthworms are part of the soil food web. All these organisms make up the soil's **biological or organic matter.**

The look, feel, and smell of the soil can tell one a lot about how alive a soil is. If a soil is relatively easy to dig, slightly moist, and dark brown to black in color; it probably has a healthy amount of organic matter. If a soil is hard, dry, and light brown or red; it probably does not have much living in it. The presence of earthworms is a good indication that a soil has a good amount of organic matter.

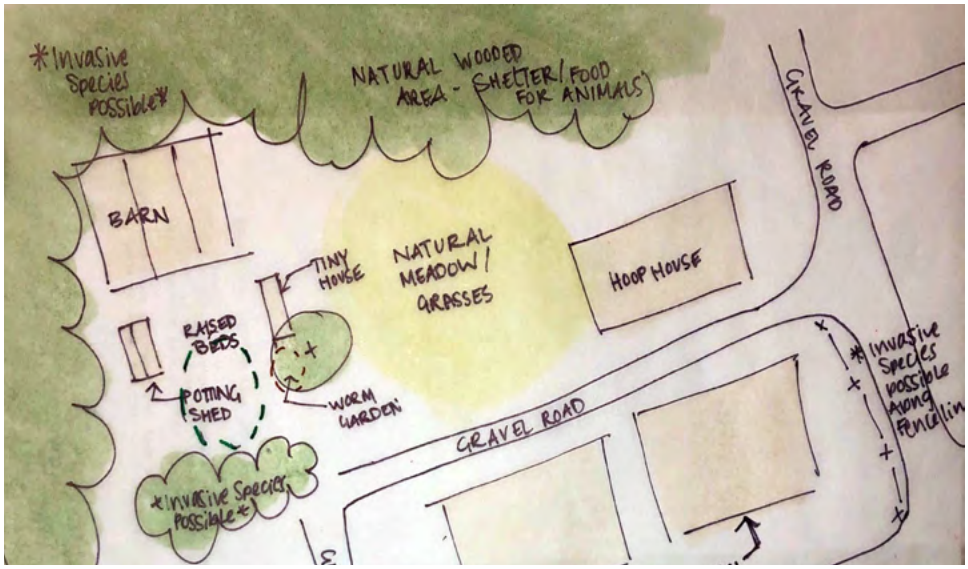
Adding compost and leaf litter will turn poor soil into a better habitat for living organisms.

PLANTS

Why we study them:

Noting the condition of plants already on the site can help you decide if they should be retained or removed in the new design.

Observing the existing vegetation on the site can also give you clues to sun/shade patterns, soil moisture, and soil quality. This is especially true if you know about specific plants and their preferred growing conditions.



A site analysis of vegetation and animal habitat.

Source: Laurel Fox, fall 2019, LAND 3430S, UGA CED.

What to observe:

- Identify the plants on the site. If you are new to plant identification, you could invite a plant expert (landscape architect, horticulturalist, cooperative extension agent, master gardener, or someone who loves plants) to join you.
- Identify invasive plants on the site; these will need to be removed so they do not displace native species and take over the site. Here are some resources to help identify invasive species:

  Top 20 Invasive Plants in Georgia: https://botgarden.uga.edu/wp-content/uploads/2017/01/Invasive-Species-Brochure.pdf

  Invasive Plants in Southern Forests: https://bugwoodcloud.org/resource/files/5863.pdf
- Note plants that you find especially attractive or are attractive to insects and other animals.
- Also, pay attention to plants that appear unhealthy. It could be that they were planted in the wrong place, or they are just at the end of their lifespan. They can be relocated or removed.

ANIMALS

Why we study them:

Animals are attracted to places that provide food, water, protective cover, and places for them to raise their young. Noting existing food sources, water sources, areas of cover, and places to young can ensure that the proposed design does not destroy valuable animal habitat.

What to observe:

Look around your site. Do you observe any wildlife or insects? Where do they tend to be? Can you hypothesize why?

Some items to look for:[1]

- Food: seeds, berries, nectar or pollen, foliage/twigs, fruits, sap, nuts
- Water: birdbath, pond, stream, puddling area
- Cover: wooded area, bramble patch, ground cover, rock pile, roosting box, evergreens, brush pile, meadow, burrow, pond
- Places to raise young: mature trees, meadow, nesting box, wetland, cave, burrows, dead trees, dense shrubs, pond, butterfly host plants

HUMAN USE

Why we study it:

In order to encourage humans to use and take care of the garden, we need to consider what will make it easy, comfortable, and enjoyable to visit the garden. Topics in a site analysis that consider human needs include views, circulation (pathways and vehicular access), comfort, history and character, and existing uses.

What to observe:

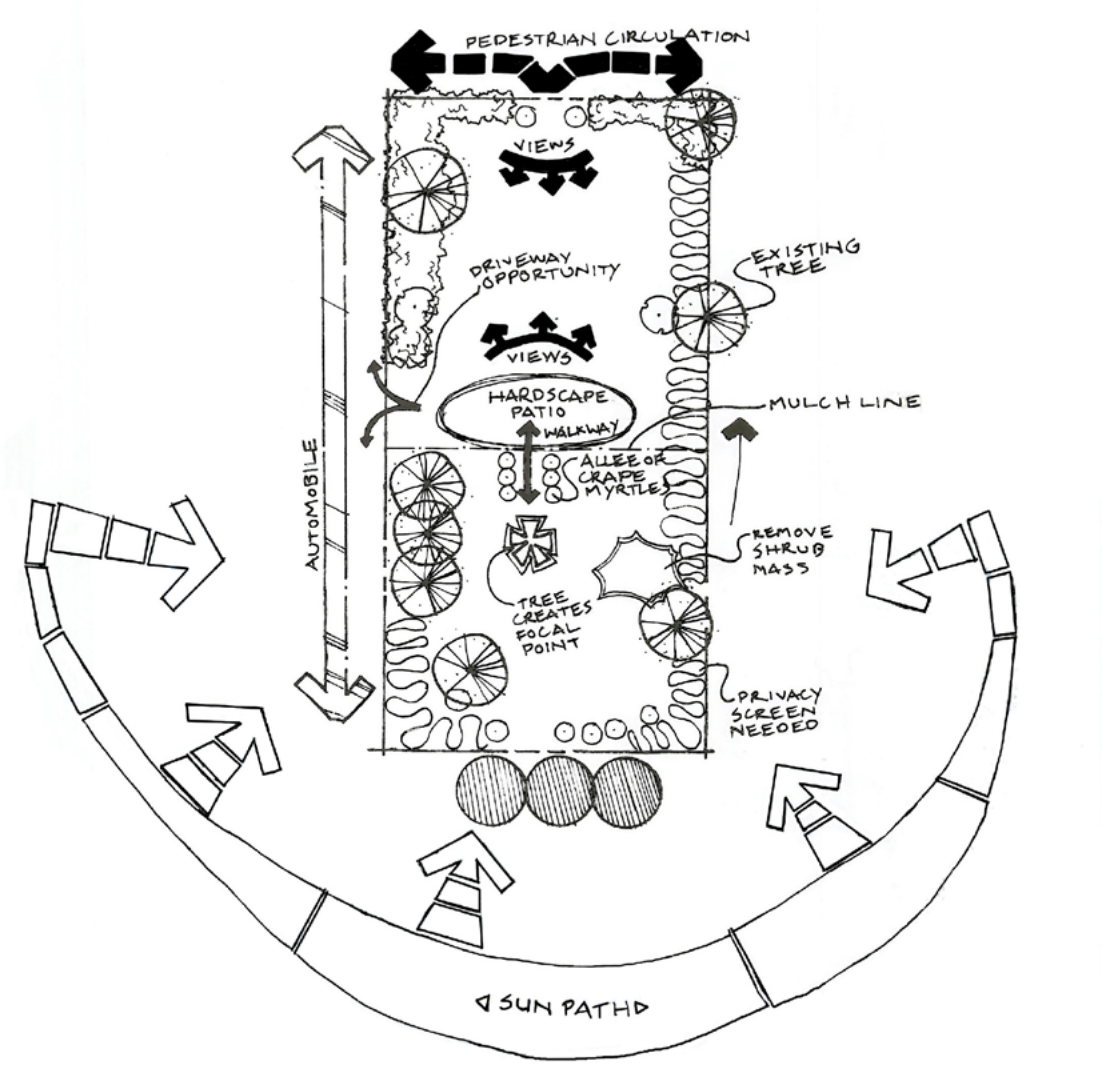
- Consider what makes the site a pleasant place to be. Are there nice views, pleasant sounds, and attractive things to look at? These will be elements to retain in our design.
- Also, think about what makes the site uncomfortable. Are there views that should be screened? Are there places that are too hot or too cold?
- Can you easily walk around the site? Could someone with a wheelchair access the site?
- Are there areas of the site that support specific uses (ball fields, existing garden beds, etc.)?

[1] For more information, see the *Schoolyard Habitats Planning Guide* by the National Wildlife Federation. https://www.nwf.org/Eco-Schools-USA/Pathways/Schoolyard-Habitats/schoolyard-habitat-planning-guide

3. THE SITE ANALYSIS SUMMARY MAP

After gathering information about the different elements in the garden, we can start to make design judgments as to what needs to be improved and what should be protected or enhanced. Often these judgments are summarized in a site analysis map. A **site analysis summary map** is one map that summarizes the most important findings from all the individual site analyses. Often it is called an **opportunities and constraints map** because the findings are presented as opportunities (such as nice views to enhance or turning a drainage way into a water feature) or constraints (such as steep slopes or invasive plants to be removed).

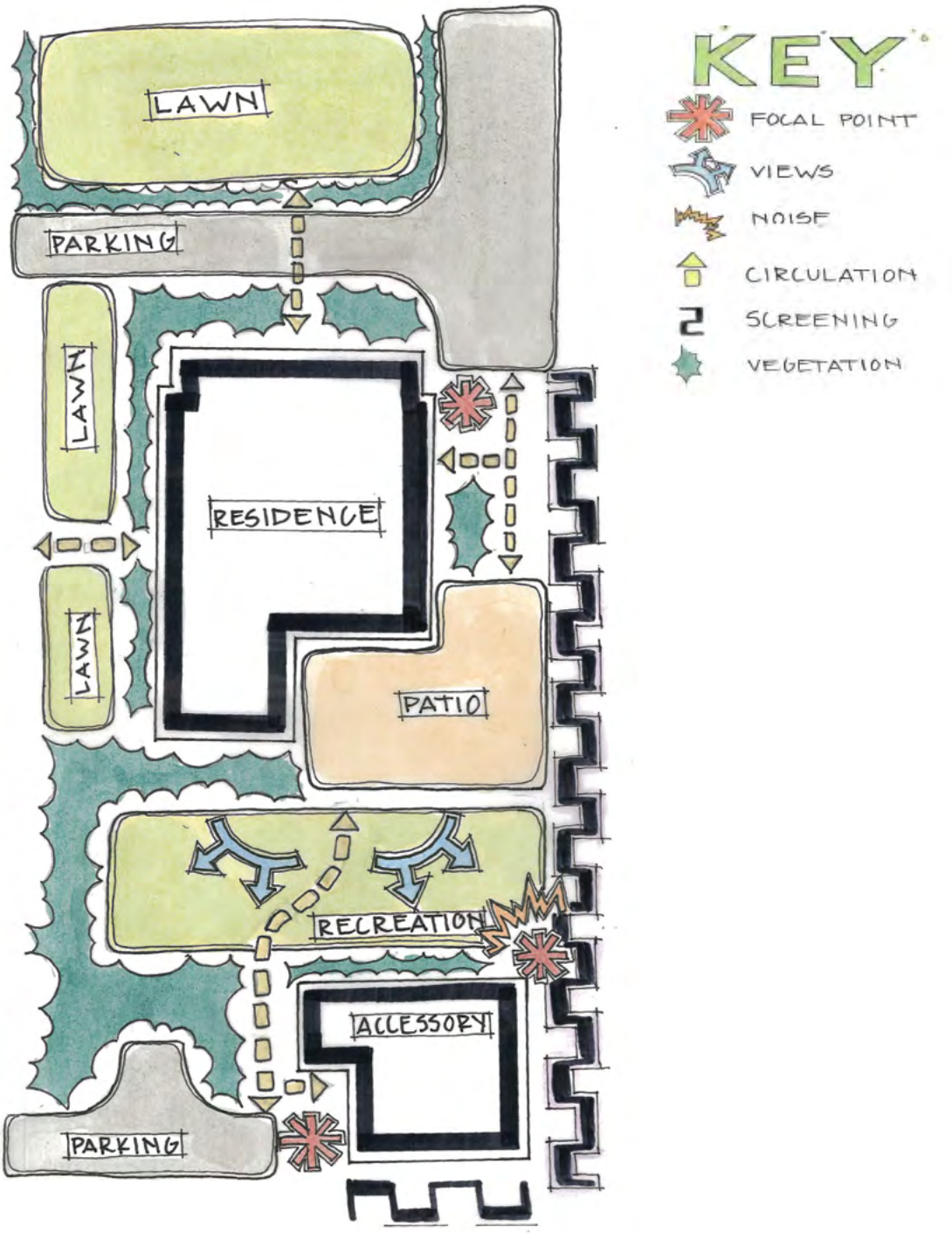
The site analysis summary map is important for the next phase of the design. On the site analysis map, one can see all the opportunities and constraints at one time and place design elements in response to these findings.



A site analysis summary map for a residential landscape.

Source: Sarah Franklin, spring 2017, LAND 3040, UGA CED.

Another example of a site analysis summary map for a residential landscape.



Source: Anneka Pace, spring 2020, LAND 3040, UGA CED.

ACTIVITY 2

Site Inventory & Analysis

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

TIME:
1 - 1.5 hours

MATERIALS:
Printed base maps of site
Clipboards
Pens, markers, or colored pencils
Shovel (for soil observations)

OPTIONAL MATERIALS:
Large print out of base map (for a summary map)

Now that you have some goals for your garden design, you need to learn more about your site. The design of a landscape begins with a site inventory and analysis. In a site analysis, landscape architects walk the site and document existing conditions such as sun and shade patterns, water drainage, topography (slopes of the land), and soil quality.

A site analysis helps designers make decisions on the placement of plants and materials. By taking each of the elements of analysis (microclimate, water, soil, plants, animals, and humans) into account, we can place plants and materials in the most suitable location.

DESIGN GOAL:

To observe, document, and evaluate the existing conditions of the site in order to guide the placement of plants and materials in the design.

LEARNING OPPORTUNITIES:

Observe how each of the ecological systems (microclimate, water, soil, plants, and animals) in a garden that exist within a specific site.

Learn how to evaluate the health of each of these ecological systems.

Develop mapping skills: reading maps, understanding scale, and how to notate field observations on maps.

ACTIVITY OUTLINE:

1. Introduction
10 minutes

2. Site observations and field notes
30 - 60 minutes

3. Summary map
20 minutes

ACTIVITY DESCRIPTION

Preparation

Create a base map

Prepare and print base maps of the site.

In some cases, the landowner might have an existing survey that you can use for a base map. If not, you can develop a base map from satellite imagery available on Google Earth or Google Maps.

Developing a base map can be an additional youth activity, if you have the time.

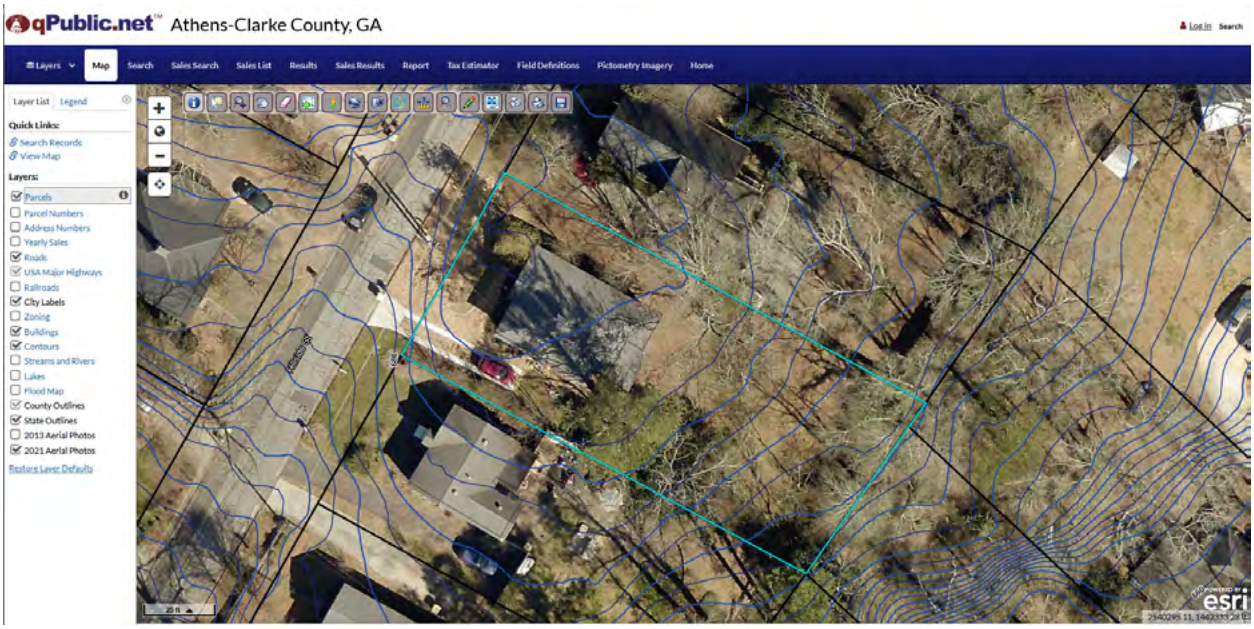
Here are some resources on how to develop a base map:

University of Georgia Extension, "Drawing a Landscape Plan, The Base Map": https://extension.uga.edu/publications/detail.html?number=C1032-3&title=drawing-a-landscape-plan-the-base-map

National Wildlife Federation "Schoolyard Habitats Planning Guide", Appendix A: Mapping Skills (pages 70-71): https://www.nwf.org/Garden-for-Wildlife/Create/Schoolyards

Utah State Extension, "Building a Base Map": https://extension.usu.edu/laep/design4everyone/building_a_basemap

North Carolina State Extension, "How to Make Wildlife Friendly Landscapes, Step Two - Map Existing Site and Vegetation": https://extension.usu.edu/laep/design4everyone/building_a_basemap



You can make a good base map from property maps on qpublic.net. Search by your state and county. Not all counties have maps available, though.

1. Introduction

10 minutes

Introduce students to site inventory and analysis and discuss why it is one of the first steps in garden design.

Questions to discuss

1. What is a site inventory?

   A site inventory is a mapping of what already exists on our site.

2. What is a site analysis?

   A site analysis adds a value judgment to the inventory – what aspects of the site are good and should be preserved or enhanced? What aspects of our site could be improved?

3. Why do we conduct a site inventory and analysis as one of the first steps in design?

   - To help us identify the best location for a garden within a larger site.
   - To identify existing problems to be addressed through design.
   - To tell us the best location for different uses – for example, a sunny spot might be good for a vegetable garden, while one in the shade with a nice view might be good for a bench.
   - To guide the placement of plants (based on the plants' sun, shade, soil types, and moisture requirements).

2. Site observations and field notes

5 - 10 minutes for each topic, 30-60 minutes total

1. Start by looking at the base map.

   Can students identify their location on the map?

   Can they turn the map so it has the same orientation as the actual site?

   Can they point out key landmarks on the map?

2. For each topic below (microclimate, water, soil, plants, animals, and humans), explain what one is looking for and why it is important for the garden design. Review the key concepts and terms from Chapter 2.

3. Walk the site with the base map, discussing the questions below and marking on the map the observations that the group makes. Do one topic at a time and use a separate base map for the different topics.

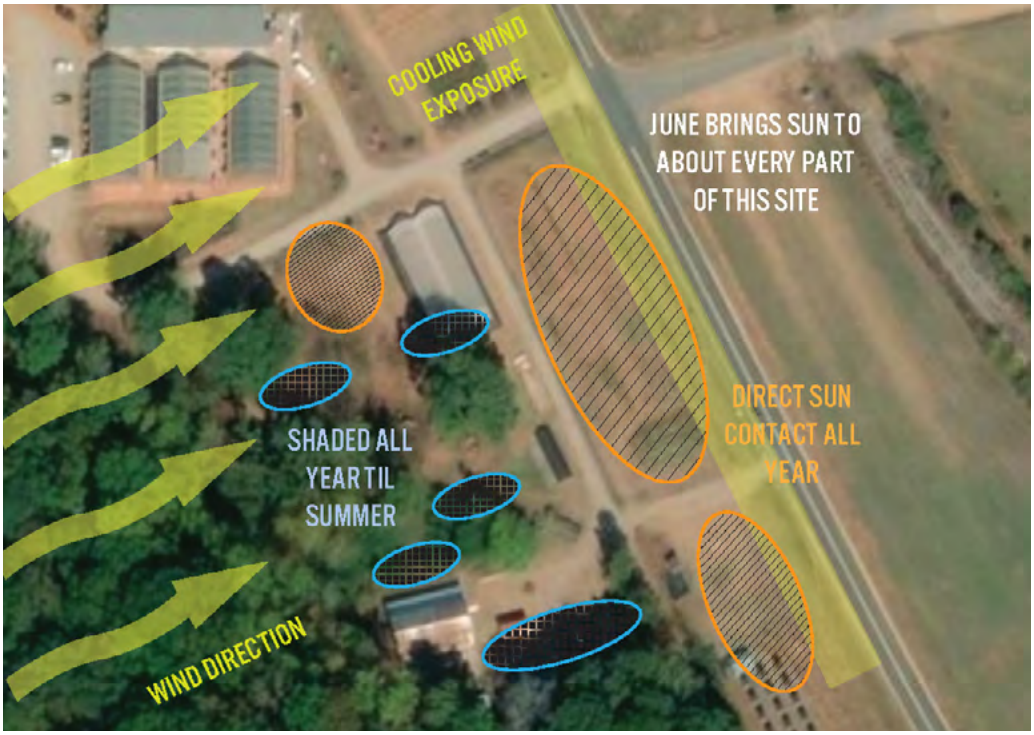
Group Organization

If you have a small group, you can work through all six categories together. If you have a larger group, you can divide into smaller groups, each assigned 1-3 categories to analyze. When dividing into smaller groups, reserve some time to share findings with the larger group at the end of the activity.

Microclimate analysis

Sun/shade patterns

1. Can you locate the sun's path from morning to evening (east to west)? How would you draw that on your map?
2. Where are areas of sun and shade currently? Mark those on your map.
3. Thinking about the sun,'s path how do you think those areas of sun and shade might shift throughout the day? Add any additional areas of shade to your map.
4. To conclude, divide your site into four categories: sunny, mostly sunny (with a little shade), mostly shady (with a little sun), and full shade. Label these on your map.

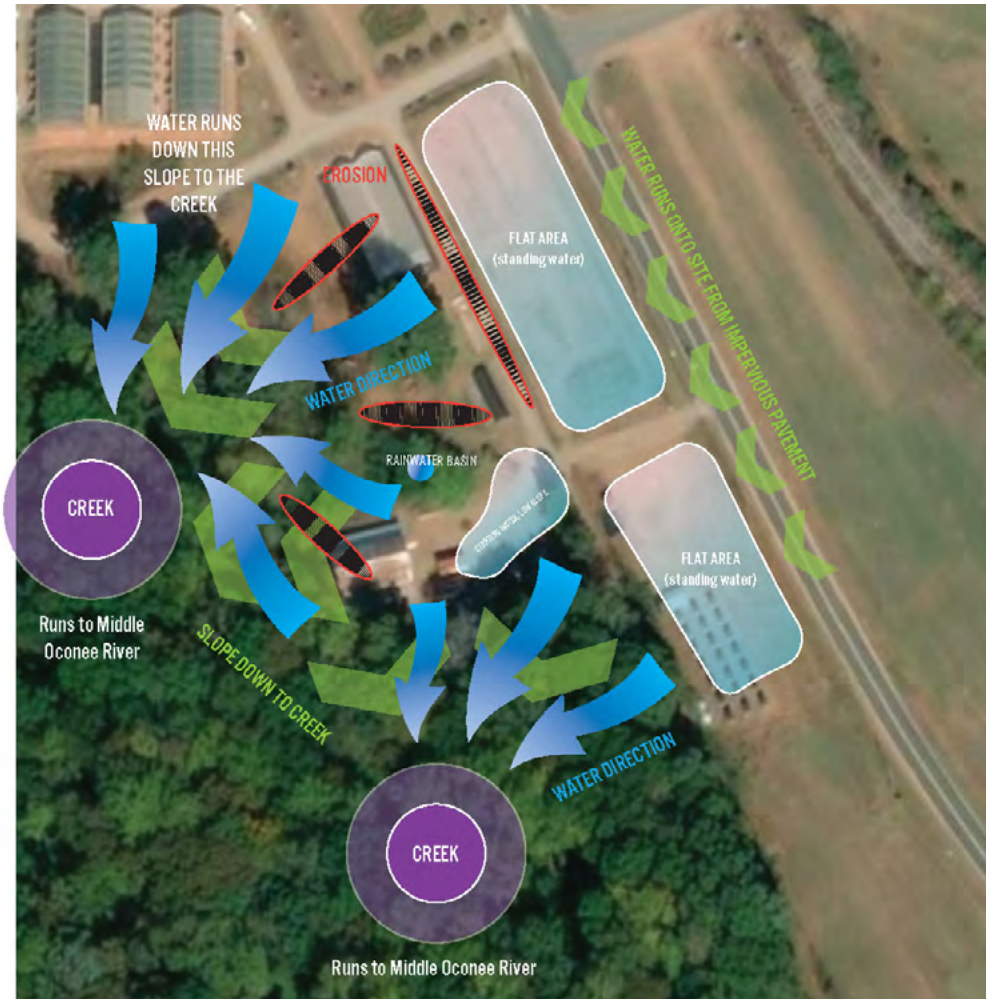


An example of a microclimate site analysis.

Source: Henry Smith fall 2019, LAND 3430S, UGA CED.

Water and slopes analysis

1. Where is the highest point of the site? The lowest?
2. Mark any streams, ponds, or other water features on the map.
3. Imagine you are a drop of water falling on the site, where would you flow?
   Draw arrows in that direction.
4. Are there areas of the site that do not drain water quickly? How can you tell?
   Mark these on the map.
5. Are there areas of erosion where it looks like water has washed away the soil?
   Circle and label these areas on the map.
6. Is there a source of water, if you need to water the garden?
   Locate it on the map and mark it.



An example of a water and slopes site analysis.

Source: Henry Smith fall 2019, LAND 3430S, UGA CED.

Soil analysis

Identify three locations on the site with different types of vegetation (open lawn area versus a forested area, for example) or obviously different levels of sun and moisture.

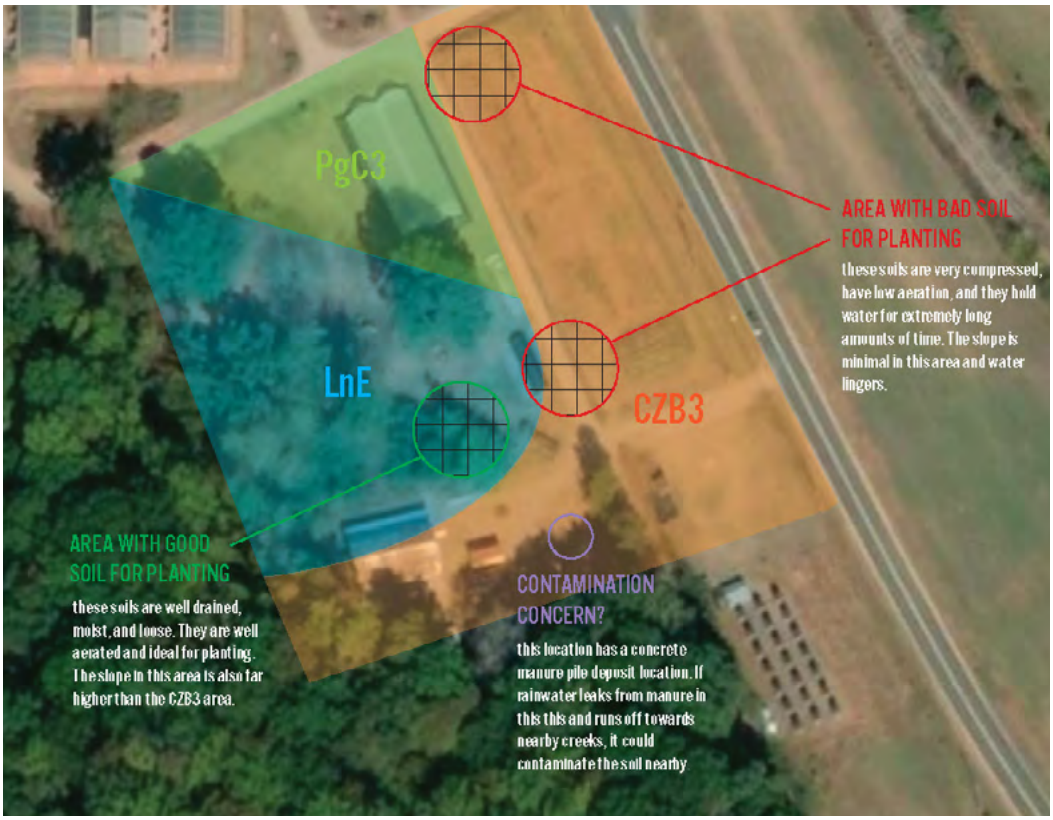
Note these locations on the base map.

In each of these three locations, dig one shovelful of soil. Place the soil on a sheet of cardboard, so you can observe it better.

1. How easy was the soil to dig?
2. What color is the soil? White, red, or grey; light brown; or dark brown?
3. Feel its texture. Would you describe it as mostly clay (smooth), loam, or sand (gritty)?
4. Do you see any evidence of earthworms or other animal life? How much organic matter (leaf debris, hummus, etc.) is visible in the soil?

Based on your observations, summarize the soil based on the following characteristics:

1. Would water drain quickly if poured in the hole that you dug? If you have time, do a percolation test: https://www.caryinstitute.org/eco-inquiry/teaching-materials/schoolyard-ecology/schoolyard-inquiries/percolation-protocol
2. How much moisture is in the soil? Do you think you will need plants that require moist soils or those that prefer dry conditions?
3. Will you need plants that tolerate heavy clay soils?



An example of a soil site analysis map.

Source: Henry Smith fall 2019, LAND 3430S, UGA CED.

Vegetation analysis

1. Walk around the site and think about how you would divide the site based on different kinds of vegetation that you observe.

   For example, do you see: a vegetable garden, naturalistic areas, a grassy meadow, an open field, an area of shrubs or trees, or an ornamental garden?

2. Draw these existing plant groupings on your map. Give them a descriptive label.

3. Identify any invasive plants that you know. Here are some resources to help:

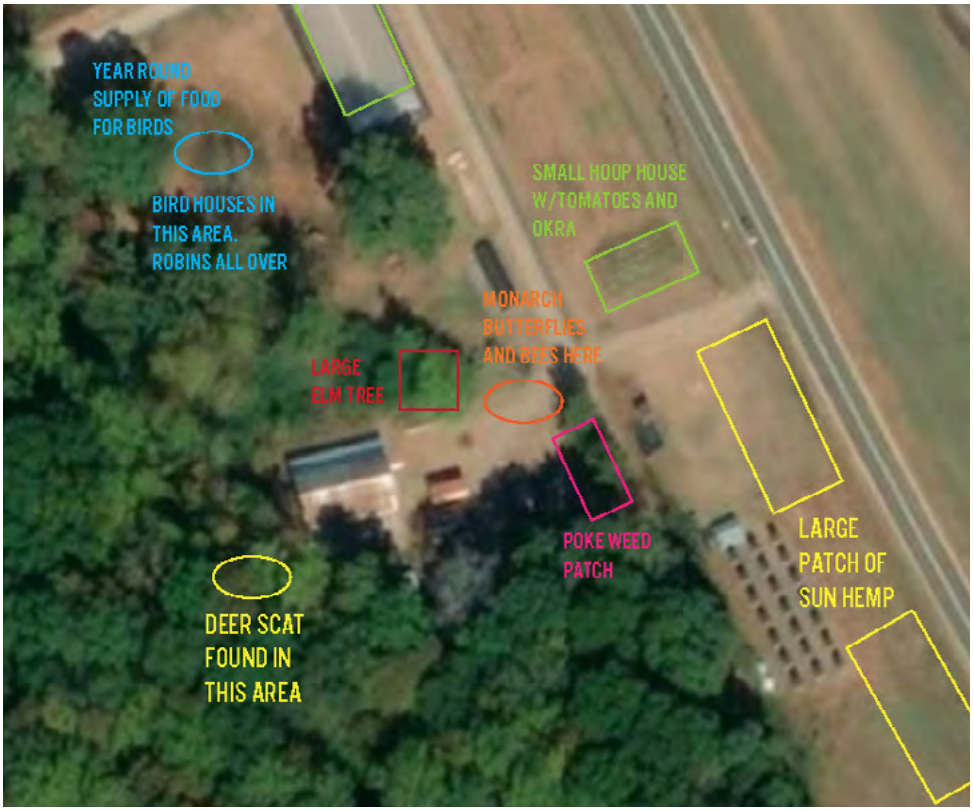
   Top 20 Invasive Plants in Georgia: https://botgarden.uga.edu/wp-content/uploads/2017/01/Invasive-Species-Brochure.pdf

   Invasive Plants in Southern Forests: https://bugwoodcloud.org/resource/files/5863.pdf

   Option: Invite an expert to help.

4. Identify any special plants. For example, a large tree that everyone likes or a plant that is providing food for people.

5. Add a recommendation for each plant grouping: keep, move, or remove.



An example of a combined vegetation and animal habitat site analysis.

Source: Henry Smith fall 2019, LAND 3430S, UGA CED.

Animal habitat inventory

Walk around the site, looking for insects and wildlife and any evidence that they have been on the site recently.

1. Where are they? Mark their location on the map.

2. Do you observe any evidence that wildlife or insects have been on the site recently?

   For example,holes in a tree trunk might indicate a woodpecker was there; bird droppings suggest that birds have been roosting overhead. Mark these locations on the map.

3. Do you see any potential food sources such as seeds, berries, nectar or pollen, foliage/twigs, fruits, sap, or nuts?

4. Are there potential water sources such as birdbaths, ponds, streams, or puddling areas?

5. Are there areas of cover such as wooded areas, bramble patches, ground covers, rock piles, roosting boxes, evergreens, brush piles, meadows, burrows, or ponds?

6. Do you see places where animals might raise their young such as mature trees, meadow, nesting boxes, wetlands, burrows, dead trees, dense shrubs, ponds, or butterfly host plants?

Note all of these locations on your map.

Based on these observations, highlight areas of high wildlife value that should not be disturbed.

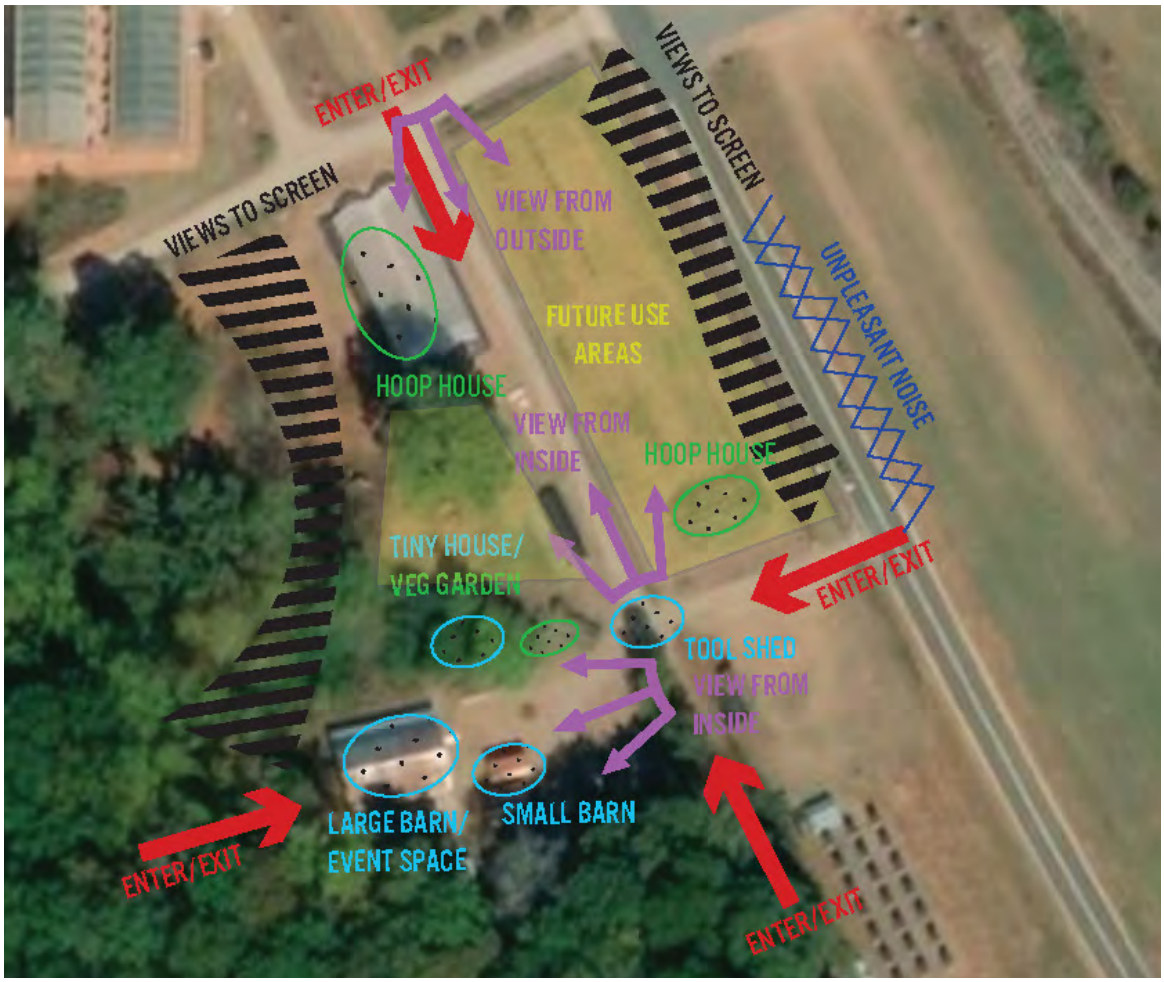
A native bee house and pond edge are two animal habitats one might have on a site.

Source: Katherine Melcher

Human use analysis

As you walk the site, note on the map:

1. Nice views that you'd like to emphasize
2. Bad views that you'd like to screen
3. Access points and pathways (for pedestrians and vehicles)
4. Existing human uses
5. Places that are pleasant and comfortable. Explain why.
6. Places that are unpleasant and uncomfortable. Explain why.



An example of a human use analysis.

Source: Henry Smith fall 2019, LAND 3430S, UGA CED.

3. Summary analysis

20 minutes

1. If you divided into smaller groups for the site analysis, come back together as a larger group.
2. Ask each group to share their site analysis by drawing them on a large site analysis map.
3. After reviewing the information from all groups and categories, ask students to identify the top three things they would like to change about the site and the top three things they want to preserve. Depending on the size of the group, this can be done in small groups or as individuals.
4. Create an opportunities and constraints map by marking everyone's top three changes and top three "keepers" on a blank base map.

Map by Laurel Fox, fall 2019, LAND 3430S, UGA CED.

REFLECTION QUESTIONS

1. *For each of these categories, explain why we analyze it before designing a garden:*

   - *microclimate*
   - *water and slopes*
   - *soil quality*
   - *existing vegetation*
   - *animal habitat*
   - *human use*

2. *What did you learn about your site from the site analysis and inventory? List your top three most important things.*

3. *How do you think this information helps us design a pollinator garden?*

CHAPTER 3

Plant Selection

This chapter describes criteria to consider when selecting plants. It also explains what to research about the plants when creating a plant list.

Once a good understanding of site conditions has been developed through a site analysis, the next step in the design process is to create a list of plants suitable for the garden.

A **plant list** is a selection of plants that would be appropriate to use on the garden site. A plant list includes plants suited to the local climate and the specific microclimates (sun, shade, moisture, and soil qualities) of the site. It also should include plants that provide food for local pollinators and other wildlife. One plant list can be used for multiple projects in the same geographic region.

1. CONSIDERATIONS FOR PLANT SELECTION

Selecting plants for a pollinator garden involves identifying plants that are well-suited to the growing conditions of the site. Additionally, one should select several plants that provide the pollen and nectar that pollinators feed upon. Keep the following considerations in mind while researching potential plants for the garden.

1. Native plants

The best way to ensure that plants are well-suited for the climate, soils, and wildlife of your area is to use plants that are native to your ecoregion.

An **ecoregion** is an area that has similar geology, landforms, soils, vegetation, climate, land use, wildlife, and hydrology.

To find your ecoregion, visit https://www.epa.gov/eco-research/ecoregions

The American groundnut (Apios americana) is a host plant for the Silver-spotted Skipper (Epargyreus clarus).

Source: Katherine Melcher

Reasons for selecting native plants:

- Native plants are well-adapted to the local climate and soil types.
- Many native insects and other wildlife have evolved alongside native plants. Many insects are specialized; they only lay their eggs on a few native species.
- Hybrids and cultivars (such as blueberries, strawberries, and blackberries) developed from native plants are more suited to our climate and often less susceptible to disease.

Reasons for avoiding non-native plants:

Non-native plants may attract pollinators away from native species that have co-evolved with the insects and are better adapted to the region. Some non-native plants are **invasive,** meaning that they quickly take over a space where native plants used to grow. For more information on invasive species, see the resources listed in Chapter 2, page 25.

USDA Plant Hardiness Zones

The USDA classifies the United States into 13 zones based on the average annual extreme minimum winter temperature .

Find your zone at: https://planthardiness.ars.usda.gov/

If you select plants suited for your zone, it is likely they will survive the winter temperatures on your site.

2. Sun, soil, & water requirements

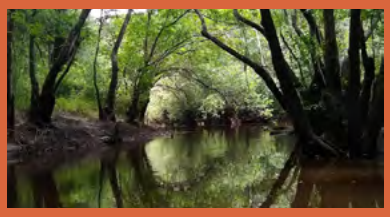
In addition to selecting plants based on hardiness zone and ecoregion, it is important to select plants appropriate to specific conditions on your site. You can simplify these conditions into four basic categories: **wet soil in sun, wet soil in shade, dry soil in sun, and dry soil in shade.**[1]

Special qualities for special conditions

Some sites are especially challenging and need plants suited to their conditions. For example, many plants do not like heavy clay soils. If your site has heavy clay, look for plants that can tolerate both wet and dry soils.

Selecting Plants Based on Their Natural Habitat

One method for selecting plants based on their sun and water needs is to find a native plant list that is based on the natural communities in your ecoregion. For example:



For a rain garden, select plants that naturally grow in flatlands, wetlands, floodplains, and riparian zones.

For a sunny slope or meadow, select plants that naturally grow in prairies, glades, barrens, and rock outcrops.

For the north side of a building (shady site), select plants that naturally grow in forests and woodlands.

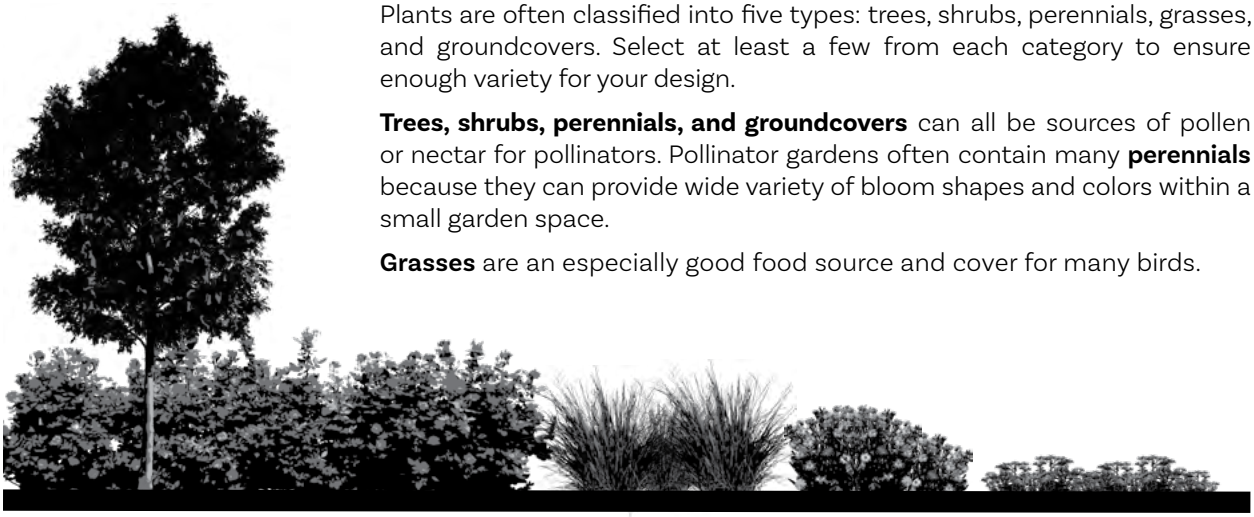
Source (all images): Katherine Melcher

[1] These categories are adopted from "Plants for Special Situations and Purposes" in *Native Plants of the Southeast* by Larry Mellinchamp.

3. Plants that support pollinators

To provide habitat and food for pollinators, you should select plants with these characteristics:

1. A mixture of types and heights



Plants are often classified into five types: trees, shrubs, perennials, grasses, and groundcovers. Select at least a few from each category to ensure enough variety for your design.

Trees, shrubs, perennials, and groundcovers can all be sources of pollen or nectar for pollinators. Pollinator gardens often contain many **perennials** because they can provide wide variety of bloom shapes and colors within a small garden space.

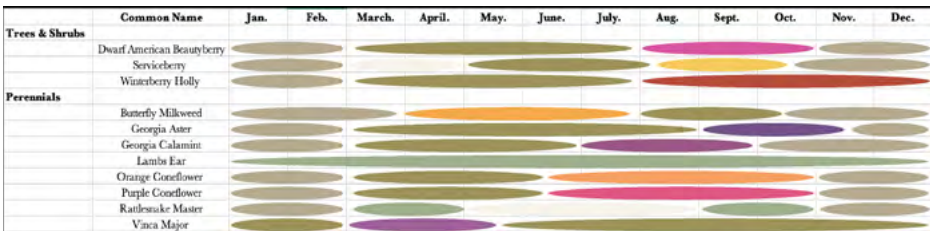
Grasses are an especially good food source and cover for many birds.

TREES	*SHRUBS*	*GRASSES*	*PERENNIALS*	*GROUNDCOVER*
Trees are woody plants that typically have a single trunk growing to a large height.	A shrub is a plant that is smaller than a tree and has several main stems coming up from the ground.	Grasses are typically shorter plants with long, narrow leaves, growing wild or on lawns and pasture.	A perennial is an herbaceous (non-woody) plant that lives more than two years. Many wildflowers are perennial.	Groundcovers are low-growing, spreading plants. Many of them are perennials, too.

2. A mixture of bloom times, colors, and forms

To attract and support pollinators, gardens must provide food, habitat, and water year-round. Pollinators feed on the pollen and nectar from flowering plants. Therefore, a variety of flowering plants that bloom at different times (from spring through the fall) can provide these important food sources. In winter, mulch, fallen leaves and hollow stems provide shelter for overwintering insects.

Having a variety of flower forms (shapes) and colors will attracted a wider variety of pollinators. Different flower colors and shape attract different pollinators. For example, butterflies and beetles prefer flat, open blooms. Hummingbirds like red, tubular flowers. Bees cannot see red; instead they prefer yellow, purple, or blue flowers. Pollinators active at nighttime, such as moths and bats, are drawn to white flowers.



A seasonal plant chart shows the bloom time and color throughout the year.
Source: Westminster Pollinator Garden Design, LAND 7050, fall 2022, UGA CED.

3. Host plants

Native butterflies have specific host plants. **Host plants** are the plants on which butterflies lay their eggs. Their leaves provide food for the larvae.

One particular species of butterfly will only lay eggs on a few specific species of plants. Pollinator gardens often include butterfly host plants selected to attract specific species of butterflies.

A Monarch butterfly larva eating milkweed leaves.

Source: Katherine Melcher

BUTTERFLIES & THEIR HOST PLANTS

Monarch	**Milkweed** *(Ascelpias incarnata, Asclepias tuberosa)*
Gulf Fritillary Zebra Longwing	**Passionflower** *(Passiflora incarnata, Passiflora lutea)*
Black Swallowtail	**Golden Alexander** *(Zizia aurea)*
Spicebush Swallowtail	**Spicebush** *(Lindera benzoin)*
Zebra Swallowtail	**Pawpaw** *(Asimina triloba)*
Eastern Tiger Swallowtail	**Tulip Tree** *(Liriodendron tulipifera)* **Wild Black Cherry** *(Prunus serotina)*
Spring Azure	**Dogwood** *(Cornus florida)*

For more butterflies and host plants, see the Georgia Butterflies brochure at https://georgiawildlife.com/sites/default/files/wrd/pdf/Georgia%20Butterflies%20Brochure.pdf

4. Evergreen plants or interesting winter form

In the winter, most perennial flowers die back from the cold and look like they are dead. But they will regrow in the spring.

To make sure the garden looks attractive to humans in the winter, it is good to include some evergreen plants that keep their leaves throughout the winter. Also, grasses and deciduous trees that have interesting forms and textures can add visual interest in the winter.

In this planting design, grasses and deciduous trees are framed by a background of evergreen shrubs and trees.

Source: Katherine Melcher

2. THE PLANT LIST

A pollinator visiting a purple passionflower (Passiflora incarnata).
Source: Katherine Melcher

What is a plant list?

A plant list is a selection of the most suitable plants for a garden site. The list contains information about each plant, such as its height, width, sun requirements, and bloom time, that will help the designer place it in an appropriate place on the planting plan.

A plant list should include the following information:

Common name: The name people most commonly use for the plant.

Scientific name: The scientific name is a Latin name for the genus and species of the plant. We include it because not everyone uses the same common name for the same plant.

Plant type: tree, shrub, perennial, grass, ground cover, or vine

Light requirements: Full sun, part sun, part shade, full shade

Soil moisture requirements: Dry, moist, or wet (or low, medium, or high water needs)

Height and width at maturity

Bloom time, color and form: When does the plant bloom? What color and shape are its flowers?

Seasonal interest: When does it have berries or fruit?

Evergreen, deciduous, or perennial:

An evergreen plant stays green through the winter

A deciduous plant is a woody plant (shrub or tree) that loses its leaves in the winter

A perennial is a grass or wildflower that dies back to the ground in the winter, but sprouts and grows again in the spring.

Wildlife use: Is the plant a host plant for butterflies? Does it provide other food or shelter to desired wildlife?

Where to find information about plants:

Many states have native plant societies or university extension services that can provide lists of native plants appropriate to your region.

National plant databases:

Lady Bird Johnson Wildflower Center (https://www.wildflower.org/)

The Audubon Society (https://www.audubon.org/native-plants)

The Xerces society (https://xerces.org/pollinator-resource-center)

3. CERTIFIED HABITATS

After creating a plant list, double check to see if it will be a good pollinator habitat by using the criteria from garden certification programs.

Monarchs Across Georgia will certify your garden as a **Certified Pollinator Habitat,** if it provides flowering plants during spring, summer, and falls and includes native Milkweeds, the Monarch's host plant. https://www.eealliance.org/pollinator-habitat-certification.html

Connect-to-Protect certifies native plant gardens within the state of Georgia. https://botgarden.uga.edu/conservation-science/connect-to-protect/

Nationally, **Monarch Watch** registers gardens as **Monarch Waystations,** if they provide nectar plants and native milkweed plants. https://monarchwatch.org/waystations/

The Rosalynn Carter Butterfly Trail adds certified gardens to their butterfly trail map. https://rosalynncarterbutterflytrail.org/join-the-rosalynn-carter-butterfly-trail/

The National Wildlife Federation certifies gardens as **Certified Wildlife Habitats,** if they provide food, water, and shelter for animals. https://www.nwf.org/Garden-For-Wildlife/Certify

A pollinator habitat with black-eyed Susan, Joe Pye weed, and yarrow.

Source: Katherine Melcher

ACTIVITY 3

Creating a Plant List

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

TIME:
1 - 1.5 hours

MATERIALS:
Site analysis maps from Activity 2
Worksheet 3
Internet access

OPTIONAL MATERIALS:
Books that list garden plants suitable for your region

Materials for plant cards:
Plant catalog or printer (to print images of plants)
Index cards
Scissors
Paper glue

A planting design starts with a plant list from which you can select your plants. A good plant list includes a variety of plant types (trees, shrubs, perennials, grasses, and groundcovers) as well as a good number of native flowering plants and pollinator host plants. On the practical side, you need to select plants with the appropriate sun and water requirements for your garden. On the more creative side, plant height, texture, and color can influence, inform, and define how garden spaces look and feel.

If you have already found a good native plant list suitable for your region (appropriate for your ecozone and hardiness zone), then you can skip this activity. You might be able to find a suitable plant list through a local native plant society, wildlife organization, or state university extension services.

DESIGN GOAL:

To create a master list of plants suitable for your garden. Your plant list can be used for multiple projects within the same region.

LEARNING OPPORTUNITIES:

- Botany and horticulture: discover the habitat requirements and wildlife benefits of specific native plants.
- Ecology: apply pollinator plant knowledge by selecting appropriate plants for the garden.
- Art and communication (optional): share plant knowledge by making plant identification cards.

ACTIVITY OUTLINE:

1. Review plant selection criteria and site conditions
10 minutes

2. Research native plants and create plant lists
30-45 minutes

3. Combine the plant lists
10 minutes

ACTIVITY DESCRIPTION

1. Review plant selection criteria and site conditions

10 minutes

Review the plant selection criteria presented in Chapter 3.

Review your site analysis to understand the sun/shade and moisture requirements for your garden.

Questions to discuss:

1. What is the USDA Hardiness Zone for your location?
   https://www.fs.usda.gov/wildflowers/Native_Plant_Materials/Native_Gardening/hardinesszones.shtml
2. If you had to divide your garden site into areas that share the same climatic conditions (sunny and dry, sunny and wet, shady and dry, shady and wet), how many areas would you have?

   Circle these on a copy of the base map and label their conditions.

   Note the range of sun to shade you have on the site and the range of wet to dry your soils are. You will need to select plants that fit these ranges.

2. Research native plants and create plant lists

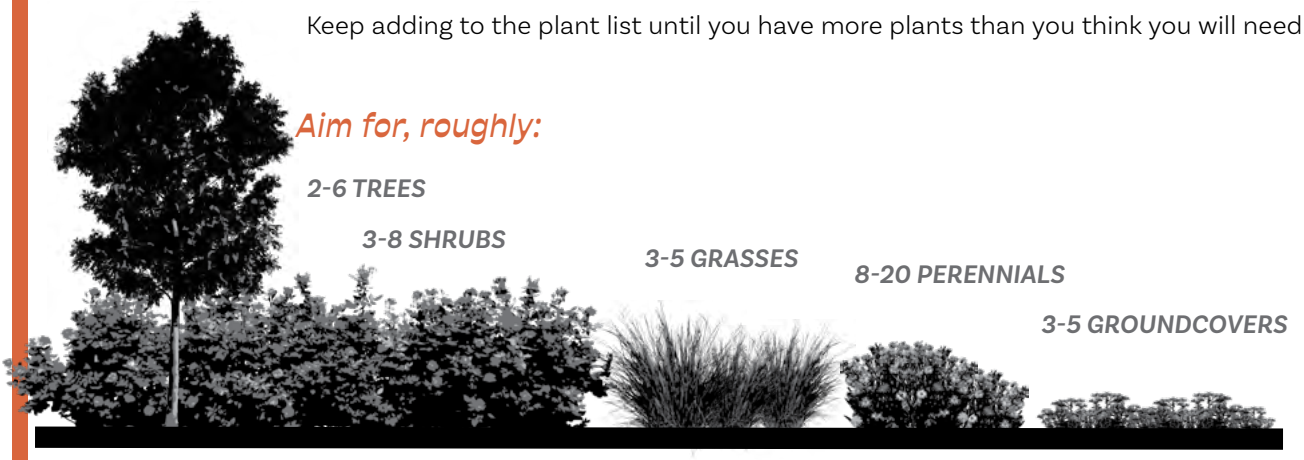
30-45 minutes

Find and select plants native to your ecoregion and that grow in your USDA hardiness zone. Compile your favorite plants into a plant list using the tables provided in Worksheet 3.

At a minimum, include in the table: scientific name, common name, plant type, light requirements, moisture requirements, height and width, bloom time, winter interest, evergreen or not, host plant or other wildlife uses. See Appendix 1 for a sample plant list for a pollinator garden in the Piedmont ecoregion of Georgia.

It is also useful to collect images of the plants, especially if you are new to plant identification.

Keep adding to the plant list until you have more plants than you think you will need.



Group Organization

If you are working in a large group, you can split up into teams. Each team can look for one specific plant type (trees, shrubs, perennials, grasses, or ground covers) or create a full plant list for different conditions (for example: one group for the rain garden, and another for the hot, dry slopes in the garden).

Ask each person to contribute at least one plant that will attract their favorite pollinator animal.

Plant Research Resources

Websites

Native Plants of North America from the Lady Bird Johnson Wildflower Center: https://www.wildflower.org/plants-main

Native Plant Finder from the National Wildlife Foundation: https://www.nwf.org/nativeplantfinder/plants

Native Plants Database from the Audubon Society: https://www.audubon.org/native-plants

Native Plants Finder from Homegrown National Park: https://homegrownnationalpark.org/native-plants-finder/

Within your state or region, also search for:

Native Plant Societies | Native Plant Nurseries | Land Grant University Extension publications and websites

Recommended plant books for the Southeastern United States:

Daniels, Jaret C. 2021. *Native Plant Gardening for Birds, Bees, & Butterflies: Southeast.* Adventure Publications.

Davis, Brad E., and David Nichols. 2021. *Plants in Design: A Guide to Designing with Southern Landscape Plants.* University of Georgia Press

Mellichamp, Larry, and Will Stuart. 2014. *Native Plants of the Southeast: A Comprehensive Guide to the Best 460 Species for the Garden.* 1st ed. Timber Press.

Mellichamp, Larry, and Will Stuart. 2020. *The Southeast Native Plant Primer: 225 Plants for an Earth-Friendly Garden.* Timber Press.

Wasowski, Sally and Andy Wasowski. 2020. *Gardening with Native Plants of the South.* Lyons Press.

Plant Lists for Georgia:

Georgia Native Plant Society – Native Plant search: https://gnps.org/georgias-native-plants/search-native-plants/

State Botanical Garden: Thirty Perennials for Pollinators: https://botgarden.uga.edu/wp-content/uploads/2017/01/Binder1_Redacted.pdf

3. Compile the plant lists

10 minutes

If you divided into small groups for the research, come back together and merge all the lists in order to create one plant list.

Review your collective plant list and ask:

1. Do we have plants that will grow well in each of our site's conditions (shade and sun, wet and dry)
2. Do we have a good variety of plant types (trees, shrubs, grasses, perennials, and ground covers)?
3. Do we have some plants that are flowering in each season: spring, summer, and fall?
4. Are there some evergreen plants included? Do we need to find more?

VARIATIONS:

1. **Plant cards:** Turn your plant list into a deck of plant cards. Assign each student a certain number of plants. Ask students write the plant information on an index card and glue an image of the plant to the other side of the card. As a class, you will have a whole deck to shift through!

   See Appendix 2 for plant cards that were developed for the Westminster Schools Pollinator Garden.

2. **Plant wiki:** create a wiki website where students can add the plant information that they research. It can grow from year to year as more plants are added.

3. **Garden certification:** Once the plant list is compiled, as students to fill out the application to make the garden a certified pollinator or wildlife habitat. Do you have the right plants to fulfill the criteria?

An example of a "plant card" that summarizes important information about a plant.

Source: Westminster Pollinator Garden, fall 2022, LAND 7050, UGA CED.

Plant List for Pollinator Garden

*Location:*_____ *Ecoregion:*_____ *USDA Zone:*_____

TREES

Scientific Name	*Common Name*	*Sun/ Shade*	*Water Use*	*H x W*	*Bloom Time, Color, Form*	*Winter interest*	*Wildlife Benefits*

VINES

Scientific Name	*Common Name*	*Sun/ Shade*	*Water Use*	*H x W*	*Bloom Time, Color, Form*	*Winter interest*	*Wildlife Benefits*

SHRUBS

Scientific Name	Common Name	Sun/ Shade	Water Use	H x W	Bloom Time, Color, Form	Winter interest	Wildlife Benefits

PERENNIALS

Scientific Name	Common Name	Sun/ Shade	Water Use	H x W	Bloom Time, Color, Form	Winter interest	Wildlife Benefits

GRASSES & SEDGES

Scientific Name	Common Name	Sun/ Shade	Water Use	H x W	Bloom Time, Color, Form	Winter interest	Wildlife Benefits

GROUNDCOVERS

Scientific Name	Common Name	Sun/ Shade	Water Use	H x W	Bloom Time, Color, Form	Winter interest	Wildlife Benefits

PERENNIALS

Scientific Name	Common Name	Sun/ Shade	Water Use	H x W	Bloom Time, Color, Form	Winter interest	Wildlife Benefits

CHAPTER 4

Garden Design

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

Once you have determined your garden goals, conducted a site analysis, and researched plants, you can start designing!

*A garden design starts with a **conceptual design** which is also called a preliminary design or schematic design. This conceptual design then gets refined into a **planting plan.***

1. CONCEPTUAL DESIGN

A **conceptual design** is a preliminary design because it includes your first design ideas. Since they are your first ideas, they can be rough, loose, or schematic in character. A **schematic design** illustrates the location of elements within a design, but it does not get into detail about exact sizes or shapes of each element.

We call this a conceptual design because it is a translation of your ideas (or concepts) on to a site map. Before building the design, the conceptual design needs to be refined into a more exact drawing of what will be in the garden. In this phase, you don't have to think about specific plants just yet. You will add those details in the next phase of developing a planting plan.

What is the goal of conceptual design?

The goal of the conceptual design phase is to create a plan view diagram that illustrates:

- the location of the proposed uses and new garden features
- the location of new pathways, gathering spaces, and planting areas
- the preferred shape (or form) of the planting beds and pathways

How does one create a conceptual design?

This process breaks the conceptual design into three steps:

1. Programming
2. Conceptual diagrams
3. Garden forms

1. Programming

Programming involves creating a list of what you want to add to the garden site. What kinds of uses will need to be accommodated within the garden? Will it be an educational garden? If so, you might want to include an outdoor classroom or educational signage. Will it be a meditative space? Then you could consider including a labyrinth or meandering path.

Proposed uses (**the program**) are used to generate a list of **program elements** (items to include in your garden). Program elements could be a couple benches and some stepping stones, or it could include water fountains and artwork. Collecting images from gardens you admire is a good way to generate some ideas of what to include.

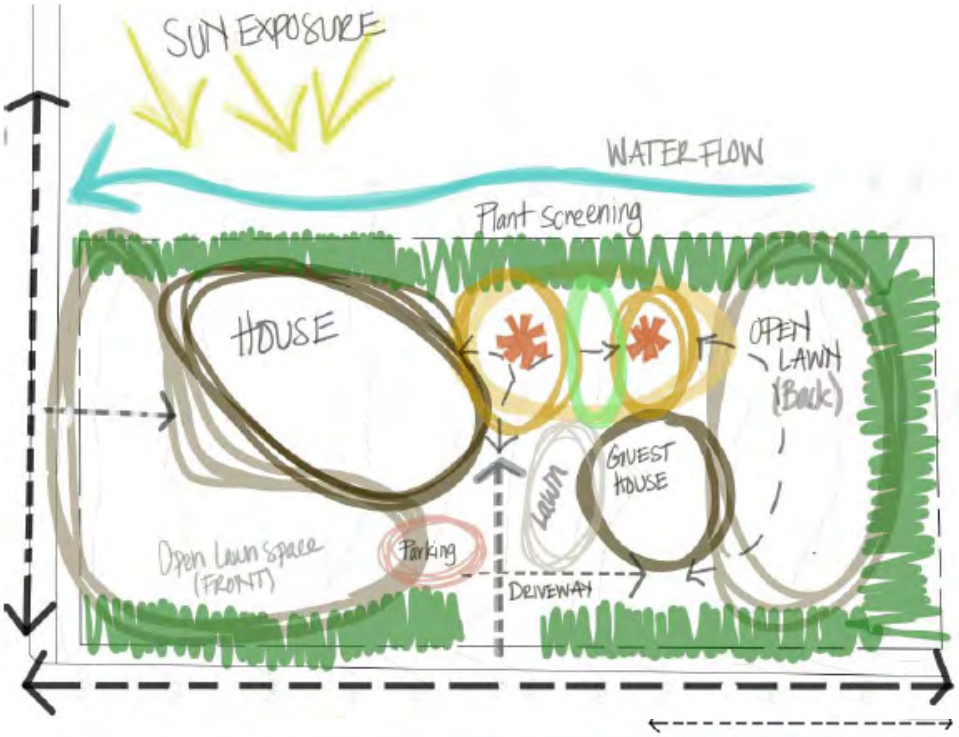
EXAMPLE PROGRAM LIST: what to add to the garden

CLIMATE	WATER	SOIL
What can you do to improve the microclimate on the site?	*What can you add to address water concerns on site?*	*What can you add to support healthy soils?*
Shade structure Trees for shade Windbreak	Rain barrels Dry creek bed (rocky swale) Rain garden Retention pond	Compost bins Worm hotel Potting table Cover crops

PLANTS	ANIMALS	HUMANS
What can you add to support plant growth?	*What can you add to attract animals?*	*What can you add to encourage human use of the site?*
Raised bed Trellises or fences for vines Edible garden Woodland or shade garden Flower meadow	Bee houses Bird houses Bird feeders Butterfly stones Bird bath	Benches Outdoor classroom Tool shed Educational signs Artwork Directional signs

2. Conceptual Diagrams

Conceptual diagrams, or bubble diagrams, are loose drawings of circles (bubbles) and lines, indicating primary use areas and circulation. Diagramming involves placing the program ideas in ideal locations on the site map, using the information from the site analysis to guide the placement.



An example of a conceptual diagram (bubble diagram) showing locations of program elements such as lawn areas, plant screens, and focal points.

The conceptual diagram translates into a more precise design of garden forms.

Source: Alma Basave. spring 2020, LAND 3040, UGA CED.

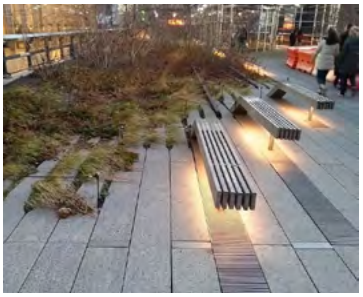
There is not just one way to arrange the program on the site. It is a process of exploration – trying out many different alternatives – before deciding which one is best.

Your first marks on the page do not have to be the best solution. They might not even be a good solution (there is no ONE right solution in design).

Try to keep creating new diagrams until you cannot think of any new ways to arrange the elements on your site. The trick is to generate as many ideas as possible, so you can look through them later and evaluate them.

3. Garden Forms

Once you have selected your best conceptual diagram, you can think about what form (or shape) you want your garden to have. Some gardens, such as those from the European Renaissance, are highly geometric and symmetrical. Others, like the English estate garden, aim to create a more naturalistic effect. English cottage gardens have a riot of flowering perennials, while Japanese gardens tend to be more restrained with a focus on evergreen plants.


A variety of geometric shapes can be used in garden forms.

Source (all images): Katherine Melcher

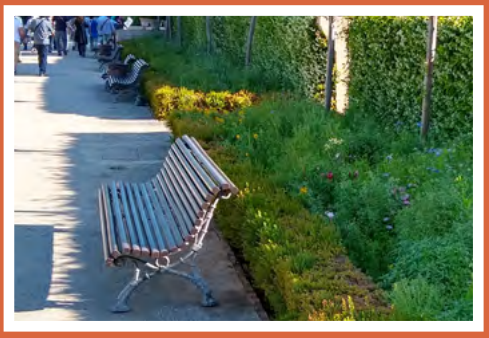
Gardens come in many different forms, so let your creativity loose! Try several different shapes or styles. Maybe the form relates to the form of a nearby building. Maybe the form is inspired by your favorite native plant or favorite pollinator. Maybe the form is an abstraction of a mountain range or the clouds in the sky.

AESTHETICS

Aesthetics is the study of what makes something, like a garden, attractive to humans. We all have different opinions on what makes a place attractive. But attractiveness often motivates our decisions to buy a plant or to create a garden in the first place. What do humans find attractive? How can that help guide us in selecting plants and arranging them?

Although people's preferences vary, here are three landscape design theories we can use in planting design:

COHERENCE AND COMPLEXITY[1]:
In general, we seem to prefer a balance between coherence and complexity, mystery and legibility. Simply put, we like enough things going on to keep our eyes and mind occupied, but at the same time, have enough order that we feel we understand the place and do not feel overwhelmed or threated.



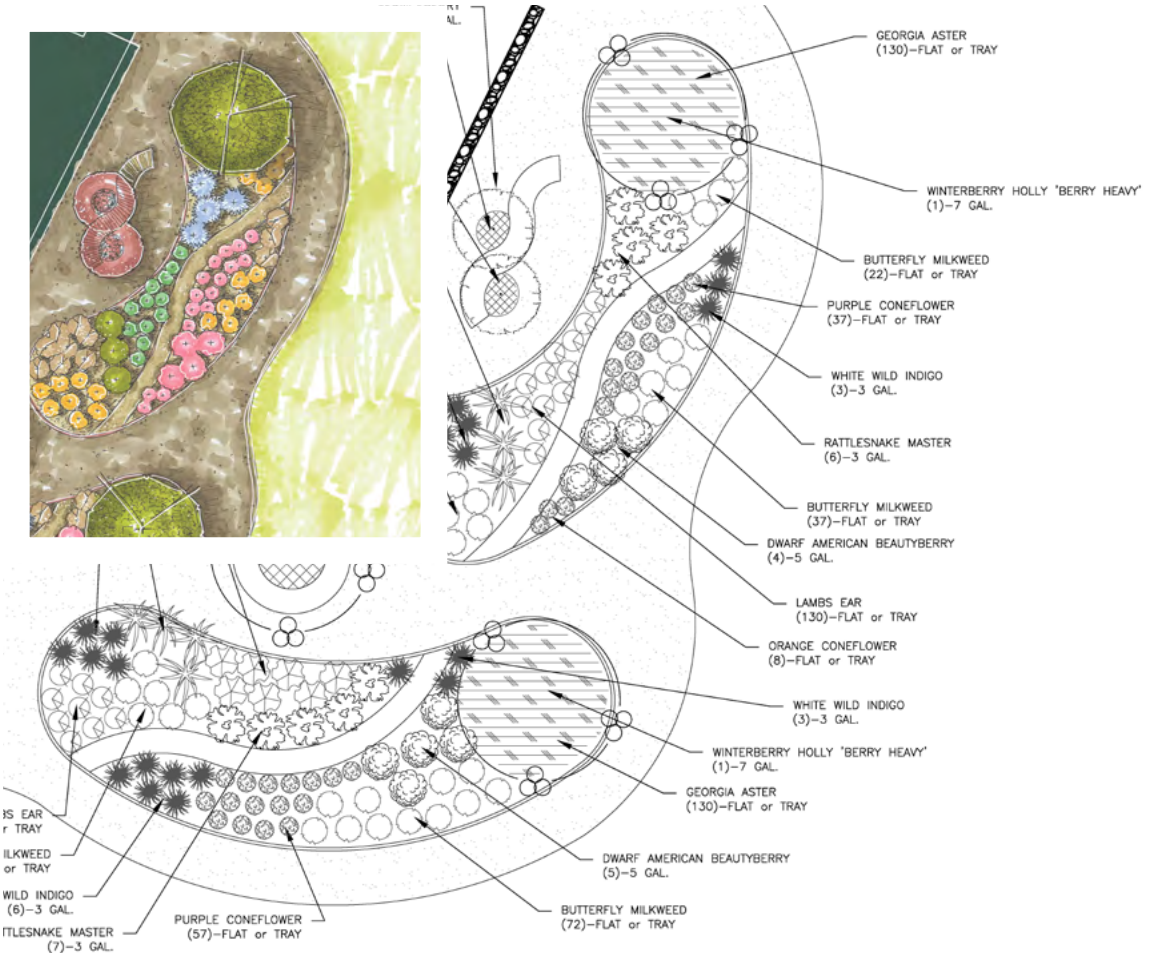
PROSPECT – REFUGE[2]:
Humans like open views. We feel more comfortable when we can see most of what is around us. Prospect-refuge theory suggests that we like to have our backs protected (by a wall, a bench, or shrubs, for example) and have an open view (prospect) out in front of us.

CUES TO CARE & ORDERLY FRAMES[3]:
Finally, humans look for "cues to care". We like our landscapes to appear natural yet also cared for. Creating "orderly frames," such as a concrete edge around a wildflower border, a strip of moved lawn along a grass meadow, or terraces, all indicate that the place is being taken care of.

Source (all images): Katherine Melcher

1. Kaplan, R., Ryan, R. L., & Kaplan, S. (1998). *With people in mind : design and management of everyday nature*. Washington, D.C.: Island Press.
2. Jelić, M., Šeruga, M., & Mikloušić, I. (2013). Application of prospect-refuge theory to the example of urban parks. / Provjera teorije vidikzaklonna primjeru gradskih parkova. *Socijalna Ekologija*, 22(3), 183-200.
3. Nassauer, J. (1995). Messy ecosystems, orderly frames. *Landscape Journal*, 14(2), 161-170.

2. THE PLANTING PLAN



An illustrative planting plan for the Westminster Schools pollinator garden (upper left) and a detailed planting plan with the plants labeled (lower right).

Source: UGA CED Westminster design team, fall 2022, LAND 7050S.

Once you have a list of plants suited for the different areas on your site and a conceptual design, you can start to think about how best to place specific plants within your design. In addition to basic plant requirements such as the amount of sun and moisture available, also consider what will be attractive to pollinators and to people. Luckily, what pollinators and people find attractive are very similar!

A planting plan indicates where specific plants will be placed in your garden. It shows the position, type, and number of plants. It will help us count the total number of plants that we will need to purchase (or grow) and how those plants should be arranged on the site.

Planting plans also help you visualize how your garden will look in different seasons – a colorful garden in spring, summer, and fall will attract both pollinators and people!

Considerations for Arranging Plants

1. Height

Select plants that provide at least three levels of height: a ground layer, middle layer, and background or canopy layer. Having these three levels of plants provides a good variety of habitat for wildlife.

Layering the plants so that the lowest level (ground level) is closest to the pathways, the highest level (background or canopy layer) is furthest away from the path, and the middle layer fills in-between creates a sense of order and openness that is attractive for humans, too.

Plants of varied heights line this pathway.

Source: Katherine Melcher

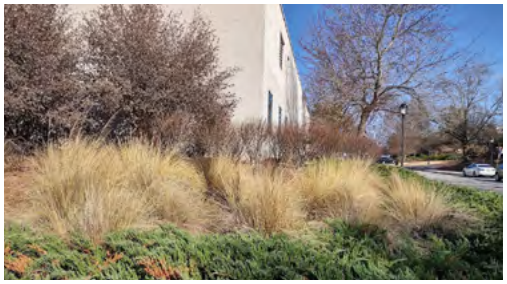
2. Massing - and focal points

Massing, or grouping a large number of the same plant together, creates a landscape that is attractive to pollinators and people. Grouping the same flowering plant together in large masses gives pollinators a lot of food without having to travel very far. These large grouping also make the planting design look coherent to humans.

Plants are arranged in masses, while the tree creates a focal point.

Source: UGA CED Westminster design team, fall 2022, LAND 7050S.

3. Evergreens or winter interest



Including at least one, but preferably two, evergreen plants in the design makes it more attractive during winter months. Think of evergreen plants as frames or backdrops for the seasonal changes provided by the other plants.

Grasses and an evergreen ground cover provide winter interest.

Source: Katherine Melcher

4. Use plants to make rooms by defining the edges of a space

The trees and shrubs create "walls" to this "outdoor room".

Instead of thinking about plants as individual objects to arrange within a space, think of them as creating walls to an outdoor room. Align them in groups around the edges of a lawn area, the foundation of a building, or a vegetable garden.

5. Create orderly frames

The sidewalk and fountain create an orderly border that frames the flowers.

Designate some areas for annual vegetables, perennial herbs, or native wildflowers.

Give these areas strong edges with a small, evergreen hedge or an edging material so they look neat even when they are not well-maintained.

6. Design forms

Plants can be arranged and trimmed to create many different forms.

As explained in the conceptual design phase, designs can be curvilinear and loose or use straight lines and exact geometries. Although the informal style will be easier to maintain, both will work. Have fun and be creative!

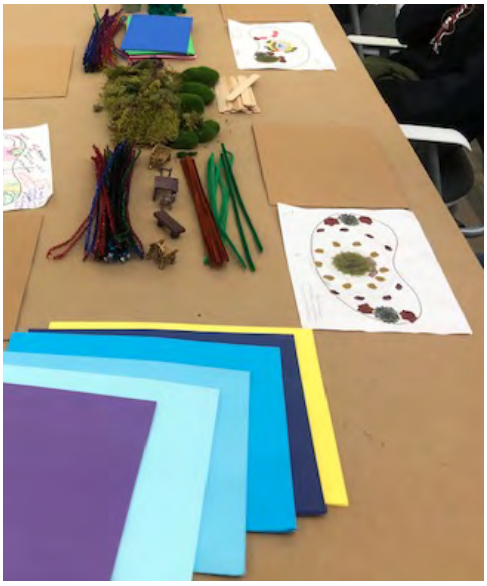
7. Coherence and complexity

Provide enough variety in plant color and texture so that the plants don't all blend together.

Source (all images on this page): Katherine Melcher

Try many different arrangements of plants, pathways, and seating areas.

Source: Westminster Schools Pollinator Garden student designs, fall 2022.



Try to visualize what your garden will look like in three dimensions.

You can do this by drawing your plants on a photograph of the garden, creating models, or purchasing the plants and arranging them on the site.

Remember to have fun and try many options!

ACTIVITY 4A

Conceptual Design

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

TIME:
1 - 1.5 hours

MATERIALS:
- Design goals from Activity 1
- Site analysis maps from Activity 2
- Base maps (multiple copies or trace paper to draw on top of the base map)
- Crayons, markers, or colored pencils

OPTIONAL MATERIALS:
- Whiteboard, large sheets of paper, and/or post-it notes to gather notes from multiple participants

A conceptual design integrates your vision for the site (Activity 1) with your understanding of site conditions (Activity 2). It provides the framework for your planting design (Activity 4B).

In our process, we break the conceptual design into three steps:

1. Programming: creating a list of what elements the garden should contain.
2. Conceptual diagrams: diagramming where those elements would be best located on the site.
3. Garden forms: trying out different shapes and styles for the layout of garden elements.

DESIGN GOAL:

In your conceptual design, you will create a preliminary design that includes the arrangement of key features of your garden, such as planting beds, pathways, and seating areas. If you already have pathways and planting beds in your garden area, and you do not want to change them, you can skip the conceptual design and go directly to the planting design activity (Activity 4B).

LEARNING OPPORTUNITIES:

- Develop ideation skills as a part of the design thinking approach to problem solving.
- Integrate ecological site knowledge into a creative design project, as a STEAM (science, technology, engineering, art, and math) project.
- Explore geometric forms and composition principles from art and design.

ACTIVITY OUTLINE:

1. Program lists
10-20 minutes

2. Conceptual diagrams
20-30 minutes

3. Garden forms
20 minutes

4. Evaluating and synthesizing design options
20 minutes

ACTIVITY DESCRIPTION

Preparation

- Create a preliminary list of program elements (desired "things" to have in the garden) based on the Garden Goals from Activity 1.
- Have many copies of base maps for the conceptual diagramming and garden forms activities.

Group organization

- The program exercise can be completed as a large group or in small groups.
- The conceptual diagrams and garden form studies are best completed as individuals or in small groups of 2-4 students.

1. Program Lists

10-20 minutes

Explain what a program list is (see Chapter 4) and present a preliminary list developed from Activity 1: Garden Goals.

Ask them, as individuals or in small groups, to brainstorm additions to the program list.

- Explain brainstorming rules: https://www.designkit.org/methods/brainstorm-rules.

- Review the six ecological systems from Chapter 1 to assist with brainstorming. What can be added to help the climate, improve water quality, fertilize the soil, support plants, attract animals, or encourage human use?

- Use Worksheet 4 at the end of this activity to record the brainstorm.

Come back together as a group and add the new ideas to the program list.

If there are too many ideas, consider using the Design Kit's Top Five method (https://www.designkit.org/methods/top-five.html) to narrow down the list.

Additional Activity: Collage

Research new program ideas by visiting other gardens or looking up gardens online. Use the six categories and your site analysis conclusions to help focus your research. Which of these six categories might need more interventions on your site?

Create a collage or collect images on a vision board: https://www.designkit.org/methods/collage

2. Conceptual diagrams

20-30 minutes

Give each individual or small group at least 5 copies of the site analysis summary map (or just one if you have tracing paper) and colored markers or pencils.

Review the key findings from the site analysis (Activity 2).

Ask them to:

- Draw preferred locations of the elements in the program list based on the site analysis information. Use circles to designate key areas and arrows to designate pathways and other connections.
- Consider relationships between uses and site conditions.
- Develop at least three different arrangements.

Then ask them to choose their favorite arrangement to use in the next exercise. To make the selection, ask them to discuss the pros and cons of each option with others.

Things to consider while creating a concept diagram:

SITE ZONES

- Divide the site into climate zones: sunny and hot, partially sunny and comfortable, cool, or windy.
- Draw the zones as "bubbles" on your plan.
- Describe these different zones.
- Think about what would be the best uses in each of these zones.
- Consider the climate, what would go best in a sunny area, for example?
- Think about what uses go well together, what should be next to what? For example, it would be convenient to place the tool shed near to where the tools are being used.

PATHWAYS AND CONNECTIONS

- Then, think about how you might move around the garden – where would you come from, where would you want to go? Draw these pathways in as lines.

PROGRAM ELEMENTS

- Return to your program list. Is there a place for everything in your garden? What is missing? Think about the best location for each of these elements. Draw those missing elements into the plan in the best location.

3. Garden forms

20-30 minutes

Share with the class different garden design styles and discuss the geometric forms and shapes involved in each.

As individuals or in small groups, transform the conceptual diagram into a garden design by adding a form/shape to it.

- Either on trace paper or on a copy of the conceptual diagram, draw the planting areas, pathways, and other program elements with that form in mind. Think about how all the elements fit together into one coherent pattern.
- Create at least three different garden designs with three different styles.

Present the three designs to another group. Ask their opinions on which is the better design. Discuss why it is considered better than the others. Make a final decision on which design to move forward with.

Additional Activities:

Conduct research into specific gardens from history and explain what kind of geometry inspired their forms.

Create a collage of favorite garden styles.

4. Evaluating and synthesizing design options

20 minutes

At this point, you can move forward with multiple designs or synthesize the design ideas into one design. We recommend three methods for synthesizing the design ideas:

OPTION 1 (moderate involvement): Have the designers or design teams present their top concept diagrams. If designers or design teams have very similar concept diagrams, merge them into one larger group and ask them to synthesize their designs.

OPTION 2 (most involved): As a large group, use the Top Five method (https://www.designkit.org/methods/top-five.html) to select top ideas from all the designs. Then ask the groups to create a new conceptual diagram that includes the top ideas from all designs.

OPTION 3 (easiest and least amount of time): Ask a professional landscape architect or designer to review the diagrams and create a synthesis of the best ideas.

Reflection questions

1. *Does your conceptual design support the goals from Activity 1? How?*
2. *How does your conceptual design incorporate what was learned from the site analysis (Activity 2)?*
3. *What criteria did you use to evaluate which garden form you preferred?*

WORKSHEET 4

Program List

BRAINSTORM what you would like to include in your garden design.

Use the six ecological systems to assist your brainstorm. What can you add to help the climate, improve water quality, fertilize the soil, support plants, attract animals, or encourage human use?

CLIMATE	WATER	SOIL	PLANTS	ANIMALS	HUMANS
What can you do to improve the microclimate on the site?	*What can you add to address water concerns on site?*	*What can you add to support healthy soils?*	*What can you add to support plant growth?*	*What can you add to attract animals?*	*What can you add to encourage human use of the site?*

MORE SPACE FOR PROGRAM IDEAS...

Sketch what some of the program elements would look like.

CLIMATE	WATER	SOIL	PLANTS	ANIMALS	HUMANS
What can you do to improve the microclimate on the site?	*What can you add to address water concerns on site?*	*What can you add to support healthy soils?*	*What can you add to support plant growth?*	*What can you add to attract animals?*	*What can you add to encourage human use of the site?*

ACTIVITY 4B

Planting Plans

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

TIME:
1 - 1.5 hours

MATERIALS:
Plant list from Activity 3
Copies of conceptual design from Activity 4A or base map
Crayons, markers, or colored pencils
Plant palette template*
Scissors
Glue sticks

OPTIONAL MATERIALS:
Plant cards (from Activity 3 or Appendix 2) or images of the plants

The planting plan shows the locations of specific plants in your garden area. Creating planting plans can help us visualize what the final garden might look like, while working through alternatives. Once you have a planting plan, you can then count how many plants you need and place them in your garden.

On the practical side, you need to select plants with the appropriate sun and water requirements for your garden. On the more creative side, plant height, texture, and color can influence, inform, and define how garden spaces look and feel.

DESIGN GOAL:

To develop a pleasing and functional arrangement of plants within the garden site.

LEARNING OPPORTUNITIES:

- Botany: Deepen knowledge of native plants, their characteristics and ecology.
- Art: Take into consideration aesthetic considerations such as color, texture, form, and compositions in selecting and arranging plants.
- Math and graphics: use a scaled map to develop your design.

ACTIVITY OUTLINE:

1. Introduction
10 minutes

2. Planting design activity
20-30 minutes

3. Present and discuss
20 minutes

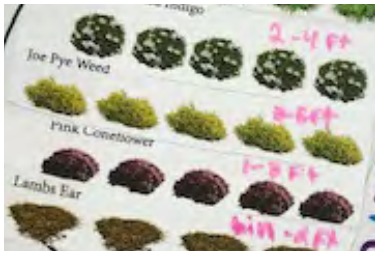
**Plant palette templates are papers with plan view circles or images of each plant in the palette for students to cut out and move around their plan. Circles should be the correct width of the plant based on the scale of the garden bed base map. See Appendix 3 for blank templates scaled at 1" = 10'.*

ACTIVITY DESCRIPTION

Preparation

Create plant templates* based on the plant list. There should be a different symbol for each species. They should be at the same scale as the garden design base used for the site analysis and conceptual design. The template in Appendix 3 has symbols that you can label with your selected plants.

Print enough plant templates and base maps/concept designs for all groups to use.



**Plant palette templates are papers with plan view circles or images of each plant in the palette for students to cut out and move around their plan. Circles should be the correct width of the plant based on the scale of the garden bed base. See Appendix 3 for blank templates scaled at 1" = 10'.*

1. Introduction

5-10 minutes

Review your plant list from Activity 3.

Review the considerations for plant arrangement (see Chapter 4 for more details).

PLANTING DESIGN CONSIDERATIONS:

1. *Arrange multiple heights together, with tallest plants furthest away from pathways.*
2. *Create masses of the same plant. Trees or taller plants can serve as focal points.*
3. *Think about where to place evergreens, so that the garden looks attractive in winter.*
4. *Use the plants to define the edges of a space and create outdoor "rooms".*
5. *Create orderly frames using evergreen plants, pathways, or small walls.*
6. *Have fun with the design forms – Are the plants drifting across the site? Are they arranged in an orderly pattern?*
7. *Think about color and texture – what would these plants look like in combination together?*

2. Planting design

20-30 minutes

1. Provide groups with the base map, plant templates, and scissors. Make sure they have images of the plants to reference.
2. Ask students to cut out the individual plants and arrange them in their design, keeping in mind the ideas reviewed in the introduction.
3. Encourage them to develop at least three alternative arrangements. Let them try out a few arrangements before passing out the glue.
4. Allow students to add other elements (benches, arbors, etc.) to the design with markers.
5. Ask them to glue down their favorite arrangement.

Planting designs created from plant templates, Westminster Schools pollinator garden design project.

3. Present, discuss and reflect

20 minutes

Ask students to present their planting designs to the rest of the class, giving at least one explanation why they arranged the plants in the manner that they did.

Reflection questions

1. Why do we make planting plans?
2. What are the different things we take into consideration when arranging plants in a planting design?
3. What did you learn about design from creating a planting plan?

ACTIVITY 4C

Model Making

ENVISION
OBSERVE
RESEARCH
DESIGN
IMPLEMENT

Understanding the various elements of plants in design – form, texture, height, color, seasonality – is a critical component of designing a successful garden. Being able to visualize how plants work in a specific garden design is difficult. Thus, creating three dimensional models can help us understand our designs prior to construction.

Not only will students have the opportunity to build three dimensional models of their own planting plans, but they will also be able to reflect on each of their designs post-building and identify areas for improvement and revision.

TIME:

1 hour

Why we make models:

- To visualize designs in three dimensions
- To evaluate planting designs prior to construction
- To identify areas for improvement

MATERIALS:

Cardboard base (8.5" x 11")
Glue guns with cool glue
Copies of their conceptual design or planting design

Model materials:
Tissue paper
Colored paper
Pipe-cleaners
Moss
Seed pods
Various sized sticks and twigs
Anything else you can find - be creative!

DESIGN GOAL:

Create three-dimensional models of the planting in order to better visualize the arrangement of plants. The models can be created using cardboard as a base. Moss, seed pods, and small twigs can represent plants. Other craft supplies can be used as well!

LEARNING OPPORTUNITIES:

- Art: Take into consideration aesthetic considerations such as color, texture, form, and compositions in selecting and arranging plants.
- Math and graphics: translate a 2-dimension plan into 3-dimensions.

ACTIVITY OUTLINE:

1. Introduction
10 minutes

2. Model making
30-40 minutes

3. Present, discuss, and reflect
10 minutes

ACTIVITY DESCRIPTION

Preparation

Decide if students will work individually or in small groups. If working in groups, use their previous designs (Activity 4A or 4B) to group students with similar designs together.

Print copies of their previous designs for reference.

Collect materials for the models. Nature-based materials such as moss, seed pods, small branches, and sticks can be used to represent different plants. But you can also use standard craft supplies like pipe cleaners, pom poms, and colored paper.

1. Introduction

5 minutes

Review their planting plans created in Activity 4A and define the purpose and goals of model-making activity.

2. Model Making

30-40 minutes

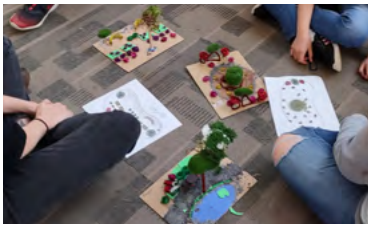
Provide students with an overview of the materials

Ask students to build a model of their planting design, keeping in mind height, texture, color, and seasonal changes. Refer to Chapter 4 for a full list of considerations.



3. Present, discuss, and reflect

10 minutes



Ask students to present their models to the group.

Ask them to explain the reasons behind their design choices.

Reflection questions

1. Did any new ideas come out of this exercise that you want to add to our garden design?
2. What makes model-making helpful when creating planting plans?
3. What did you learn about your design from your model?
4. How can model-making help us improve our designs?

Creating garden design models with Westminster Schools

CHAPTER 5

School Garden Resources

Designing a garden is only the beginning of the fun!

Seeing the garden come to life through community efforts is equally rewarding. There are many existing resources on how to plan, build, and maintain community and school gardens.

To help you move from design to reality, we list some of our favorites here.

GARDEN PLANNING AND IMPLEMENTATION

Now that you have developed a garden design and planting plan for your area, you can start planning for its implementation! Implementation has three basic steps:

1. **Planning:** creating a budget, raising funds, sourcing tools and materials, recruiting volunteers and professionals, and organizing work days.
2. **Implementation:** building the garden and planting the plants.
3. **Care:** maintaining the garden and integrating it into educational programs.

Community volunteer day at a pollinator garden in Tifton, GA.

Source: Katherine Melcher

Planning and Implementation Resources:

The Learning Grounds Guide for Schools:

https://dnr.maryland.gov/wildlife/Documents/Learning-Grounds-Guide-for-Schools.pdf

A School Ground Greening: A Policy and Planning Guidebook:

https://www.evergreen.ca/tools-publications/school-ground-greening-a-policy-and-planning-guidebook/

All Hands in the Dirt: A Guide to Designing and Creating Natural School Grounds: https://www.evergreen.ca/downloads/html/all-hands/

National Wildlife Foundation Schoolyard Habitat Project Guidebook: https://www.nwf.org/-/media/Documents/PDFs/Eco-Schools/SYH-Planning--Guide-Web_-FINAL_042021.ashx?la=en&hash=4E20AC721C15A5BC8A2D5C9782BE0FFFC9D8D525

Creating Community Gardens for People of All Ages, AARP Livable Communities: https://www.aarp.org/livable-communities/tool-kits-resources/info-2023/creating-community-gardens-worksheets.html

https://www.aarp.org/livable-communities/tool-kits-resources/info-2023/creating-community-gardens.html

School Garden Resources:

National Organizations:

School Garden Support Organization, Promising Practices: https://www.sgsonetwork.org/promising-practices/

Green Schoolyards America: https://www.greenschoolyards.org/

Georgia-based Garden Organizations:

Connect to Protect Garden Guide, State Botanic Garden of Georgia: https://botgarden.uga.edu/wp-content/uploads/2022/03/c2pguide.pdf

School Garden Resources, University of Georgia Extension: https://extension.uga.edu/programs-services/school-garden-resources.html

Curricula and Education Resources:

Growing a Wild NYC Curriculum:
https://www.nwf.org/-/media/Documents/PDFs/Eco-Schools/Growing-a-Wild-NYC-Curriculum-FINAL-lo

Edible Schoolyard Project: https://edibleschoolyard.org/

Tree ID for Kids, Woodland Trust:
https://www.woodlandtrust.org.uk/blog/2020/03/tree-id-kids/

UGA Extension's Resources for Fourth Grade: https://extension.uga.edu/programs-services/school-garden-resources/curriculum/fourth-grade.html

Pollinator Partnership Guidebook for Southeast:
https://www.pollinator.org/pollinator.org/assets/generalFiles/SoutheastMixedForestrx5FINAL_171017_090748.pdf

Comprehensive Pollinator Curriculum, Grades 3-6, North American Pollinator Protection Campaign:
https://www.pollinator.org/pollinator.org/assets/generalFiles/curriculum.pdf

Community volunteer day at a schoolyard garden in Oakland, CA.

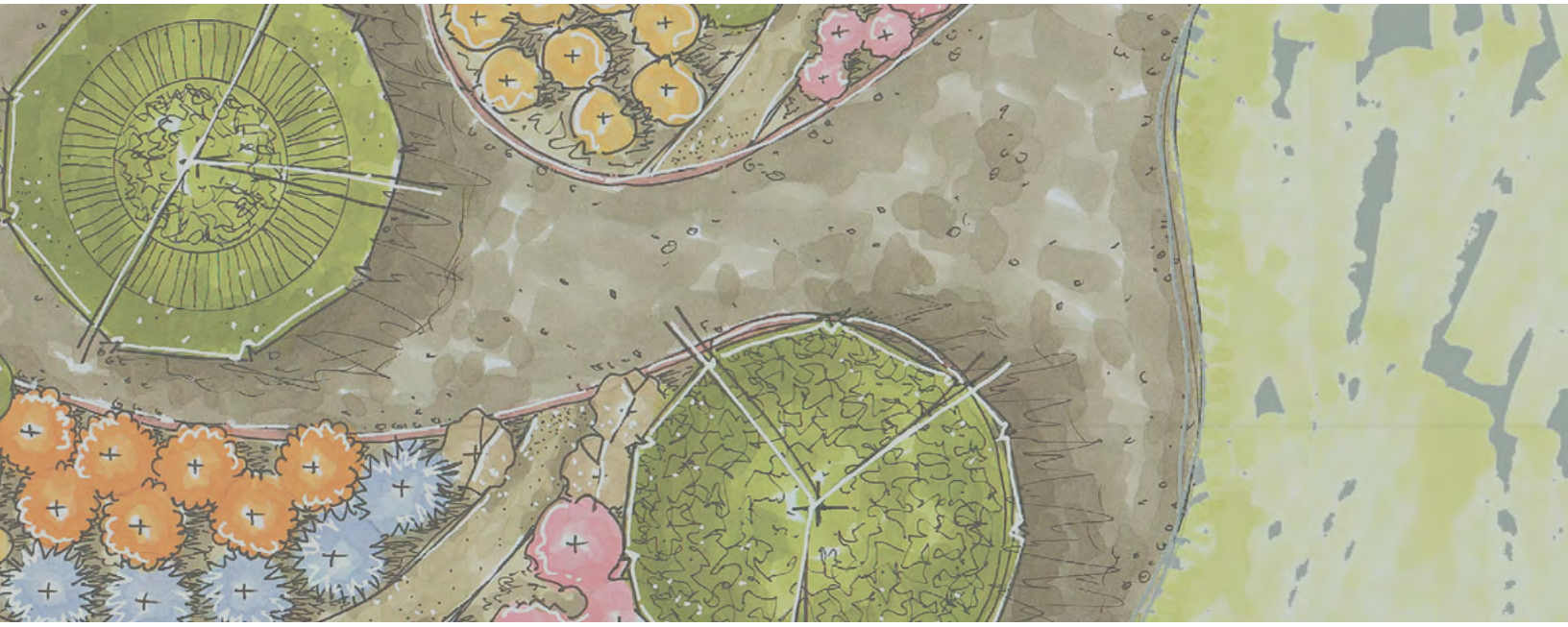
Source: Katherine Melcher

Final thoughts...

Don't hesitate to ask for help. Landscape architects, university extension agents, school garden programs, and other service agencies have many resources to support school and community gardens.

Study and share your success:

- Participate in the **Great Southeast Pollinator Census**, a citizen science project created by the University of Georgia. Every August, citizens across the southeast document pollinator numbers. For more information: https://GSePC.org/
- Document your pollinator patch via **Journey North**, a national citizen science project: https://journeynorth.org/pollinatorpatches
- Add your garden to the **Homegrown National Park** map, an effort to create new ecological networks across the United States: https://homegrownnationalpark.org/



POLLINATOR GARDEN DESIGN GUIDE

APPENDICES

Appendix 1: Plant List for Georgia's Piedmont Ecoregion

TREES

Scientific Name	*Common Name*	*Sun*	*Water Use*	*H x W*	*Bloom Time, Shape, Color*	*Seasonality*	*Wildlife*
Asminia triloba	Pawpaw	Part shade-shade	Medium	15' x 15'	Apr-May Bowl Red-purple	Deciduous	Host plant for Zebra Swallowtail
Cercis canadensis	Eastern Redbud	Part shade-part sun	Low	20' x 25'	Mar-Apr Lipped Pink	Deciduous	Bees, edible flowers
Cornus florida	Dogwood	Part shade-part sun	Low	20' x 20'	Mar-May Flat White	Deciduous	Host plant for the Spring Azure
Diospyros virginiana	American persimmon	Part shade-sun	Low	35' x 25'	May-June Bowl Yellow	Deciduous	Bees, mammals
Hamaelis virginiana	American witchhazel	Shade-sun	Medium	20' x 15'	Oct-Dec Composite Yellow	Deciduous	Bees, butterflies
Ilex vomitoria	Yaupon	Shade-sun	Low	12' x 8'	Apr-May Clusters, flat White	Evergreen	Birds, butterflies
Liriodendron tulipifera	Tulip tree	Shade-sun	Medium	80' x 50'	Apr-May Bowl Yellow, green	Deciduous	Host plant for Eastern Tiger Swallowtail
Magnolia virginiana	Sweet bay magnolia	Part shade	Medium-High	25' x 25'	Apr-July Bowl White	Evergreen	Moths, beetles, birds
Prunus serotina	Black cherry	Shade-sun	Medium	60' x 40'	Mar-May Flat, clusters White	Deciduous	Bees
Ptelea trifoliata	Hoptree	Shade-sun	Low-High	15' x 10'	Mar-June Composite White	Deciduous	Host plant for Eastern Tiger Swallowtail and Giant Swallowtail
Zanthoxylum clava-herculis	Hercules club	Sun	Medium	20' x 12'	Apr-May Clusters White	Deciduous	Host plant for Giant Swallowtail

SHRUBS

Scientific Name	Common Name	Sun	Water Use	H x W	Bloom Time, Shape, Color	Seasonality	Wildlife
Aesculus parviflora	Bottlebrush buckeye	Part shade	Medium-High	12' x 12'	June-July Clusters Red	Deciduous	Hummingbirds, butterflies
Callicarpa americana	American beautyberry	Part shade	Low	5' x 5'	May-July Clusters White, pink	Deciduous	Birds, butterflies
Cephalanthus occidentalis	Buttonbush	Part shade-shade	High	8' x 8'	June-Sept Composite White	Deciduous	Great nectar source for insects
Clethra alnifolia	Sweet pepperbush	Shade-sun	High	4' x 4'	July-Aug Trumpet White	Deciduous	Bees, butterflies, hummingbirds, mammals
Clinopodium georgiana	Georgia calamint	Part shade-sun	Low	2' x 2'	July-Oct Lipped Purple	Evergreen	Bees
Conradina canescens	False rosemary	Part shade-sun	Low	2' x 3'	July-Oct Lipped Purple	Evergreen	Bees
Illicium floridanum	Florida anisetree	Part shade	High	8' x 8'	Mar-June Composite Red-purple	Evergreen	Nectar for insects
Ilex verticillata	Winterberry	Shade-sun	High	10' x 6'	Apr-June Flat, clusters White	Deciduous	Honey bees
Ilex vomitoria var. nana	Dwarf yaupon	Shade-sun	Low	4' x 4'	Apr-May Flat, clusters White	Evergreen	Birds, butterflies
Itea virginica	Virginia sweetspire	Part shade	High	5' x 5'	Mar-June Composite White	Deciduous	Nectar for insects
Lindera benzoin	Spicebush	Shade-sun	Medium	12' x 8'	Mar-May Composite Yellow	Deciduous	Host plant for Eastern Tiger Swallowtail, Spicebush Swallowtail
Morella cerifera	Wax myrtle	Part shade-sun	High	8' x 8'	Feb-May Clusters, bowl White	Evergreen	Birds, Host plant for Red-Banded Hairstreak
Vaccinium darrowii	Darrow's blueberry	Part shade	High	2' x 2'	Jan-Apr Bell White	Evergreen	Bees, birds
Vaccinium myrsinites	Shiny blueberry	Part shade-sun	Medium	2' x 2'	Jan-Apr Bell White	Evergreen	Bees, birds
Vaccinium virgatum	Rabbiteye blueberry	Part shade-sun	Medium	8' x 6'	Jan-Apr Bell White	Deciduous	Bees, butterflies, birds, mammals

Appendix 1
Plant List for Georgia's Piedmont Ecoregion

PERENNIALS

Scientific Name	Common Name	Sun	Water Use	H x W	Bloom Time, Shape, Color	Seasonality	Wildlife
Asclepias incarnata	Swamp milkweed	Part shade-sun	Medium-High	5' x 3'	July-Sept Clusters Pink	Deciduous perennial	Host plant for monarch
Asclepias tuberosa	Butterfly milkweed	Sun	Low-Medium	2' x 2'	June-Aug Clusters Orange	Deciduous perennial	Host plant for monarch
Baptisia alba	White wild indigo	Part sun-sun	Low-Medium	3' x 3'	Mar-May Lipped, closed White	Deciduous perennial	Nectar for butterflies and bees
Coreopsis lanceolata	Lanceleaf coreposis	Sun	Low	2' x 2'	Apr-July Flat, composite Orange	Deciduous perennial	Nectar for butterflies and bees
Echinacea purpurea	Purple coneflower	Sun	Low	3' x 3'	Apr-Sept Flat, composite Purple, yellow	Deciduous perennial	Nectar for butterflies and bees
Eryngium yuccifolium	Rattlesnake master	Sun	Low-Medium	4' x 3'	May-Sept Round, clusters White	Deciduous perennial	Bees, butterflies
Eutrochium purpureum	Joe-pye weed	Part sun-sun	Low	6' x 3'	July-Sept Clusters Pink	Deciduous perennial	Birds, butterflies
Helianthus angustifolius	Swamp sunflower	Part sun-sun	Medium-High	6' x 4'	Aug-Nov Flat, composite Yellow	Deciduous perennial	Birds, butterflies
Hibiscus coccineus	Scarlet rosemallow	Part sun-sun	High	5' x 3'	July-Sept Bowl Red	Deciduous perennial	Hummingbirds, moths, butterflies
Liatris spiacata	Gayfeather	Sun	Medium	3' x 5'	July-Sept Tubular, clusters Purple	Deciduous perennial	Hummingbirds, bees, butterflies
Monarda fistulosa	Wild bergamot	Part sun-sun	Low-Medium	3' x 3'	May-Sept Tubular, lipped Pink-purple	Deciduous perennial	Bees, hummingbirds, butterflies
Monarda punctata	Spotted bee balm	Sun	Low	3' x 3'	May-Sept Tubular, lipped Pink, green, white	Deciduous perennial	Bees, butterflies, hummingbirds

PERENNIALS (cont'd.)

Scientific Name	Common Name	Sun	Water Use	H x W	Bloom Time, Shape, Color	Seasonality	Wildlife
Pycanthemum tenuifolium	Narrowleaf mountain mint	Part sun-sun	Low-Medium	3' x 3'	June-Aug Clusters White	Deciduous perennial	Bees, birds, butterflies
Rudbeckia hirta	Black-eyed Susan	Sun	Low-Medium	3' x 2'	June-Sept Flat, composite Yellow	Deciduous perennial	Bees, birds butterflies
Soldago rugosa	Wrinkle-leaf goldenrod	Sun	Medium-High	4' x 4'	Aug-Oct Clusters Yellow	Deciduous perennial	Bees, birds, butterflies
Symphotrichum georgianum	Georgia aster	Part shade-sun	Low-Medium	3' x 3'	Oct-Nov Flat, composite Purple, yellow	Deciduous perennial	Bees, birds, butterflies
Zizia aurea	Golden alexander	Part sun-sun	Medium	2' x 2'	May-June Clusters Yellow	Deciduous perennial	Host plant for Black Swallowtail

GRASSES & SEDGES

Scientific Name	Common Name	Sun	Water Use	H x W	Bloom Time	Seasonality	Wildlife
Andropogon ternarius	Splitbeard bluestem	Part sun-sun	Low	4' x 2'	Fall	Perennial	Seed for birds and mammals
Carex pensylvanica	Pennsylvania sedge	Part shade-part sun	Low-Medium	1' x 2'	Spring-Fall	Perennial	Nesting cover for birds and frogs
Chasmanthium latifolium	Inland sea oats	Part shade-shade	Low	3' x 3'	Fall	Perennial	Seeds for birds
Eragrostis spectabilis	Purple lovegrass	Sun	Low	2' x 2'	Aug-Oct	Perennial	Host plant for paradoxical grass moth, nesting cover for birds
Muhlenbergia rigens	Pink muhly grass	Sun	Low-Medium	3' x 3'	Fall	Perennial	Nesting cover for birds
Panicum virgatum	Switchgrass	Sun	Medium-High	4' x 3'	Fall	Perennial	Birds

Appendix 1
Plant List for Georgia's Piedmont Ecoregion

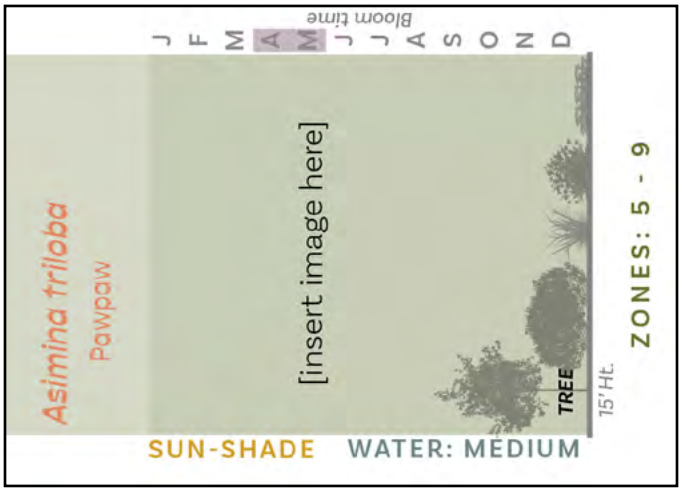
GROUNDCOVERS

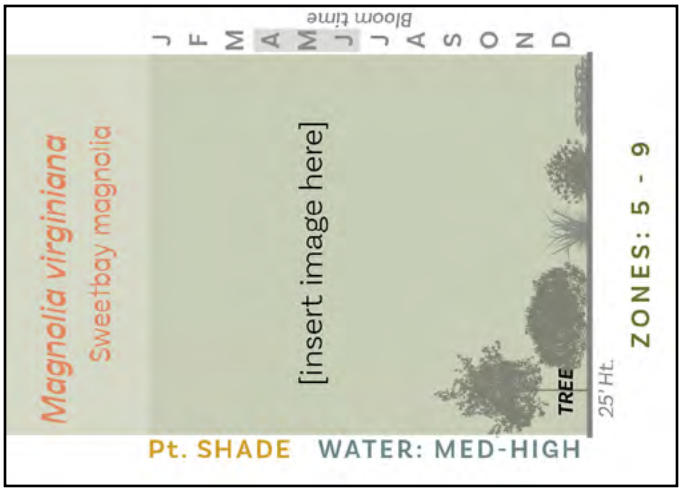
Scientific Name	Common Name	Sun	Water Use	H x W	Bloom Time, Shape, Color	Seasonality	Wildlife
Achillea millefolium	Yarrow	Part sun-sun	Low	1' x 1'	May-July Clusters White	Evergreen	Nectar for insects
Chrysogonum virginianum	Green and gold	Part sun-part shade	Low-Medium	1' x 1'	Apr-May, Sept-Oct Flat Yellow	Perennial	Bees, butterflies, birds
Fragaria virginiana	Wild strawberry	Part shade-sun	Low	1' x 1'	Apr-July Flat White	Evergreen (in some areas)	Host plant for gray hairstreak
Mitchella repens	Partridgeberry	Part shade-shade	Low-Medium	1' x 1'	May-Oct Tubular White	Evergreen	Birds and mammals
Phlox divaricata	Eastern blue phlox	Part shade-shade	Medium	1' x 1'	Apr-June Flat Blue	Perennial	Bees, butterflies, hummingbirds
Salvia lyrata	Lyre-leaf sage	Shade-sun	Low	1' x 1'	March-May Lipped Purple	Evergreen (in some areas)	Bees, butterflies, hummingbirds
Sisyrinchium angustifolium	Blue-eyed grass	Sun	Medium-High	1' x 1'	March-May Flat Blue	Evergreen	Bees

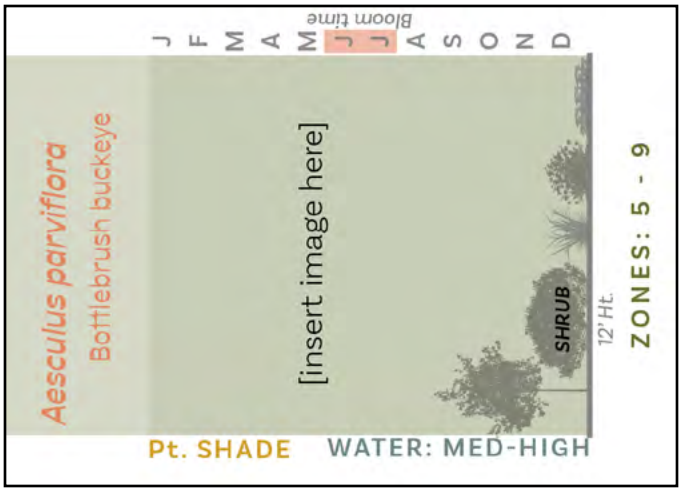
VINES

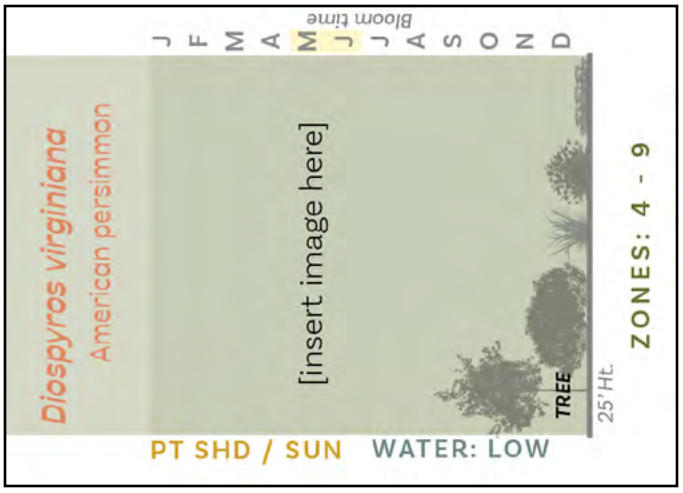
Scientific Name	Common Name	Sun	Water Use	H x W	Bloom Time, Shape, Color	Seasonality	Wildlife
Aristolochia tomentosa	Wooly Dutchman's pipevine	Part shade-sun	Medium-High	20-30'L	Trumpet Yellow, white, purple	Deciduous	Host plant for Pipevine Swallowtail
Lonicera sempervirens	Coral honeysuckle	Part shade-sun	Medium	3-20'L	March-June Tubular Red	Deciduous	Nectar for insects, hummingbirds
Passiflora incarnata	Purple passionflower, maypop	Part shade-sun	Low-Medium	25'L	May-Sept Flat Purple, white	Deciduous	Host plant for Gulf Fritillary and Zebra Longwing
Passiflora lutea	Yellow passionflower	Shade-part shade	Low	15'L	May-Sept Flat Yellow	Deciduous	Host plant for Gulf Fritillary

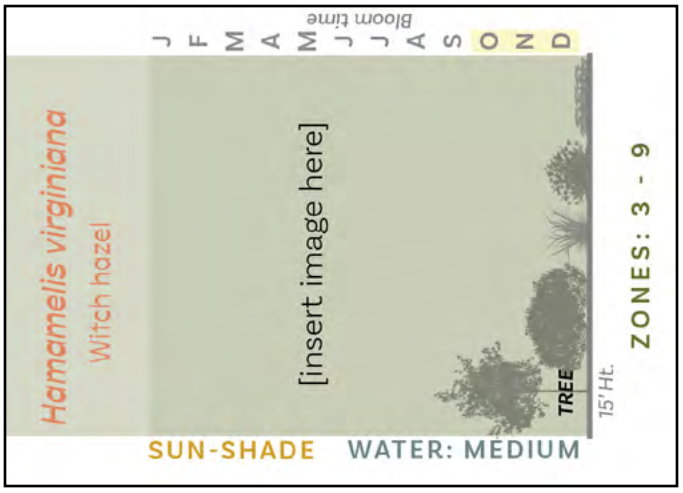
Appendix 2: Plant Identification Cards



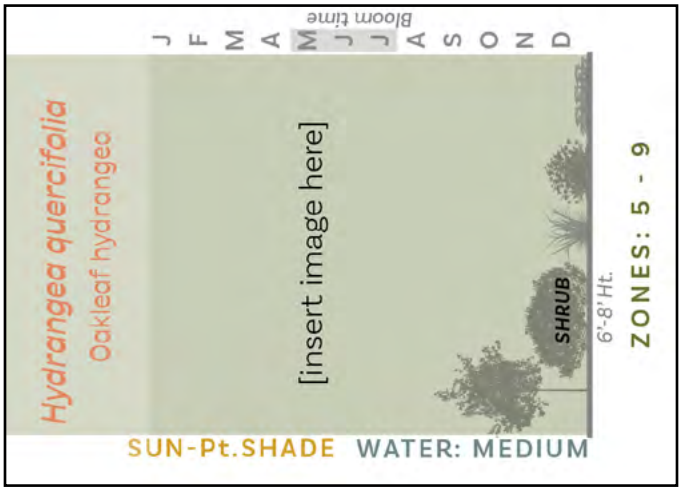


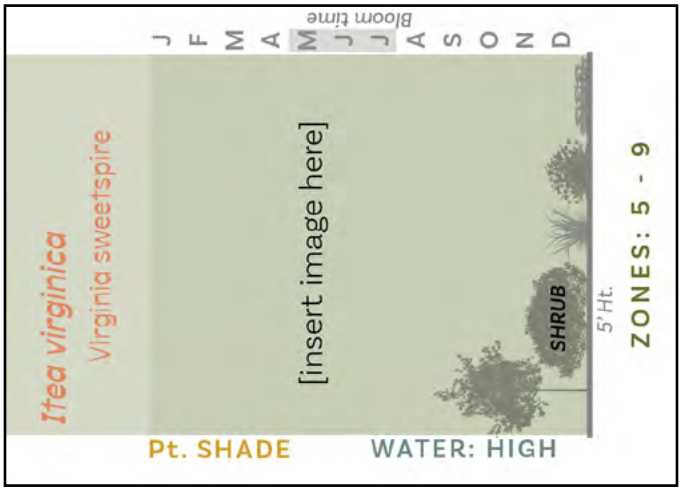


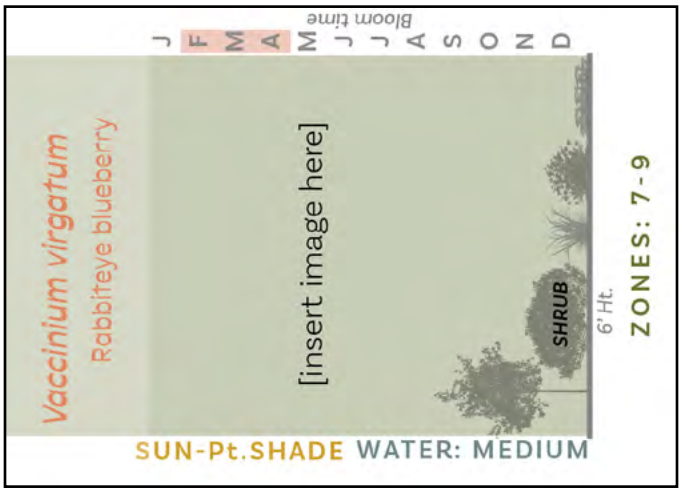


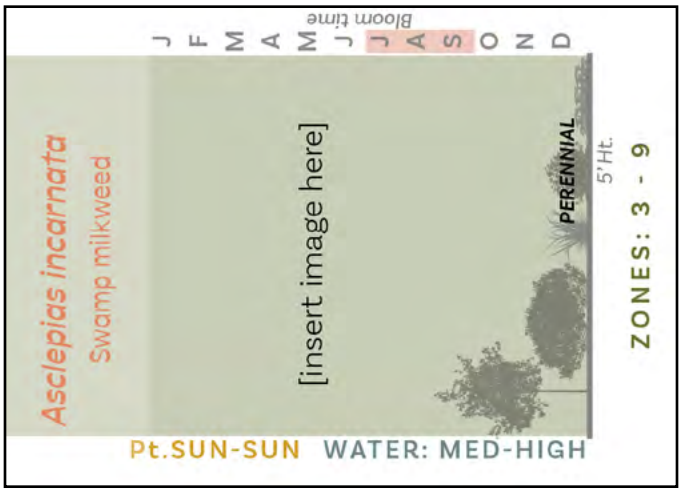


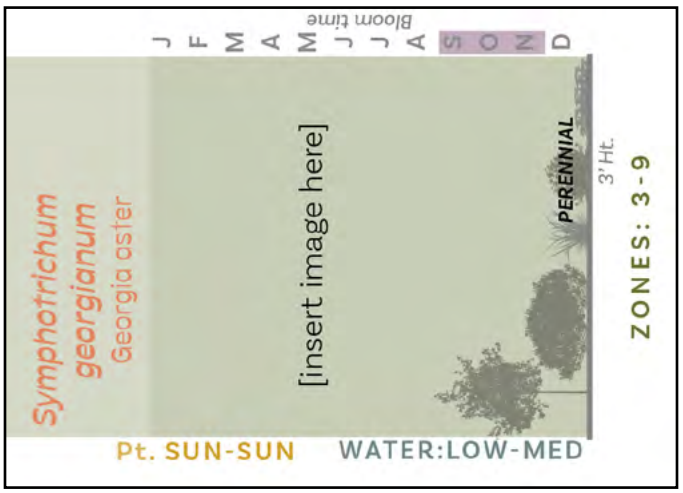
Appendix 2
Plant Identification Cards

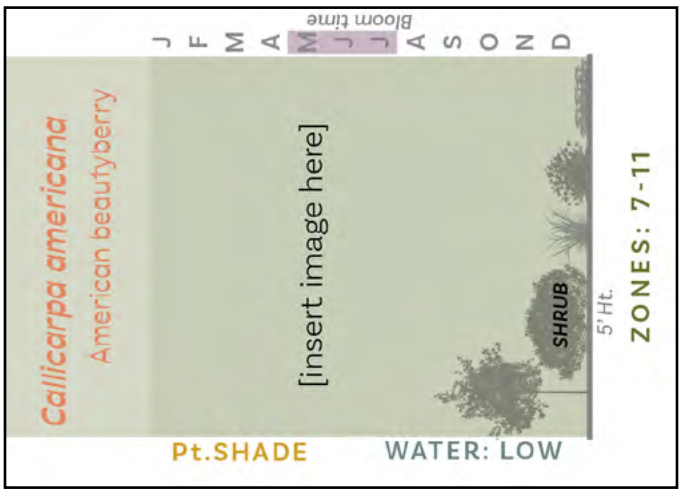


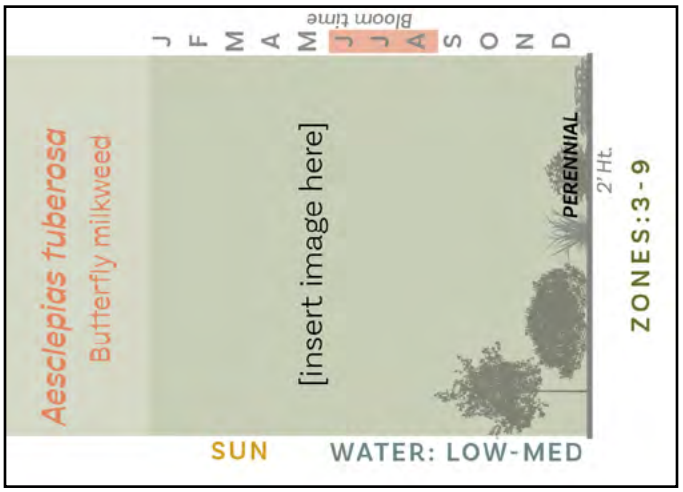


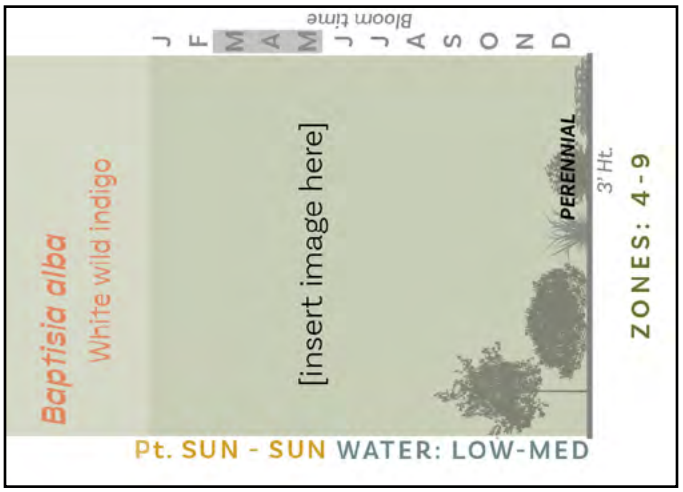


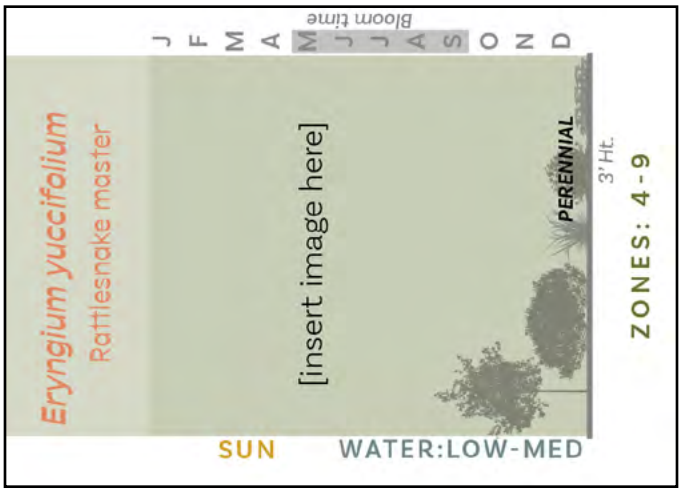


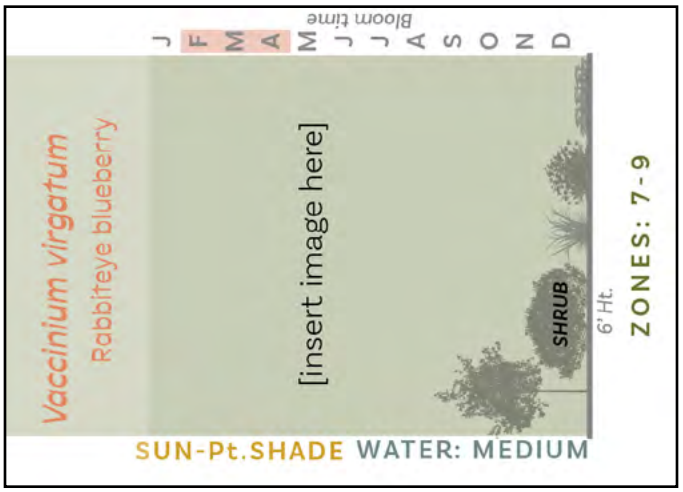

Symphotrichum georgianum
Georgia aster
[insert image here]
Bloom time
J F M A M J J A S O N D
PERENNIAL
3' Ht.
ZONES: 3-9
Pt. SUN-SUN
WATER:LOW-MED


Callicarpa americana
American beautyberry
[insert image here]
Bloom time
J F M A M J J A S O N D
SHRUB
5' Ht.
ZONES: 7-11
Pt.SHADE
WATER: LOW

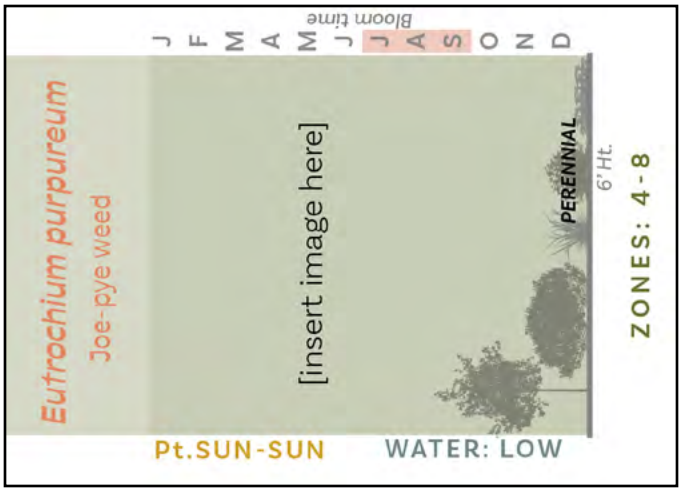

Asclepias tuberosa
Butterfly milkweed
[insert image here]
Bloom time
J F M A M J J A S O N D
PERENNIAL
2' Ht.
ZONES:3-9
SUN
WATER: LOW-MED

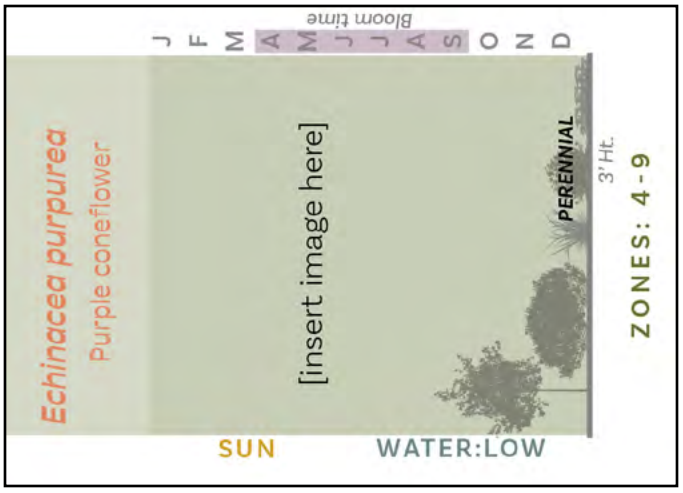

Baptisia alba
White wild indigo
[insert image here]
Bloom time
J F M A M J J A S O N D
PERENNIAL
3' Ht.
ZONES: 4-9
Pt. SUN - SUN WATER: LOW-MED

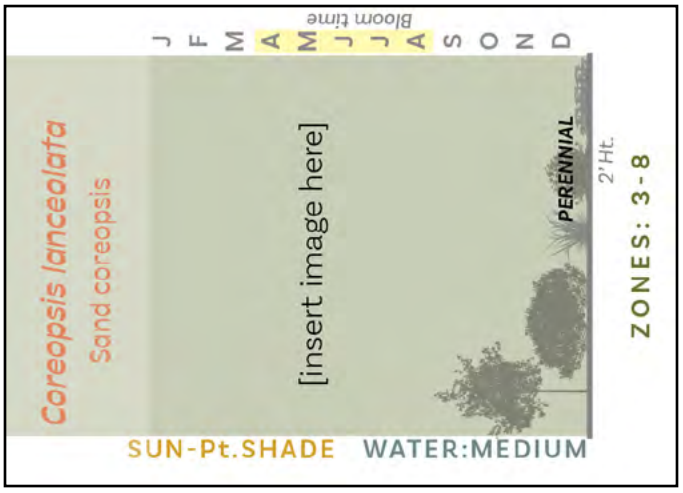

Eryngium yuccifolium
Rattlesnake master
[insert image here]
Bloom time
J F M A M J J A S O N D
PERENNIAL
3' Ht.
ZONES: 4-9
SUN
WATER:LOW-MED

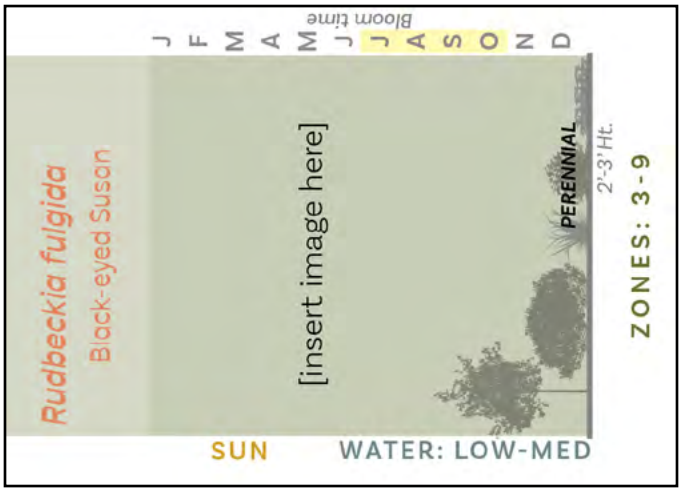

Vaccinium virgatum
Rabbiteye blueberry
[insert image here]
Bloom time
J F M A M J J A S O N D
SHRUB
6' Ht.
ZONES: 7-9
SUN-Pt.SHADE WATER: MEDIUM

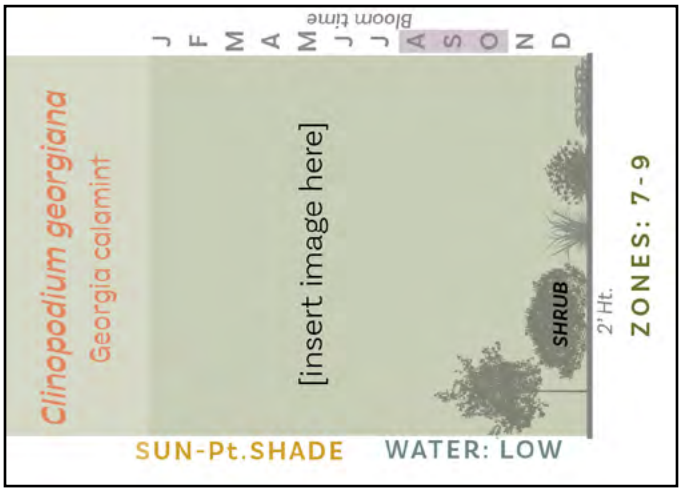
Appendix 2
Plant Identification Cards









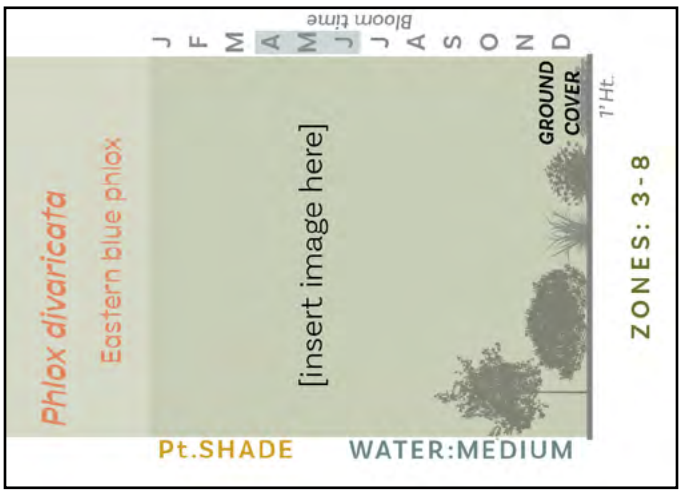



Passiflora incarnata
Purple passionflower
Maypop
[insert image here]
Bloom time
J F M A M J J A S O N D
VINE
ZONES: 5-9
SUN-Pt.SUN WATER:LOW-MED


Monarda fistulosa
Wild bergamot
Bee balm
[insert image here]
Bloom time
J F M A M J J A S O N D
PERENNIAL
3' Ht.
ZONES: 4-9
SUN-Pt.SUN WATER:LOW-MED

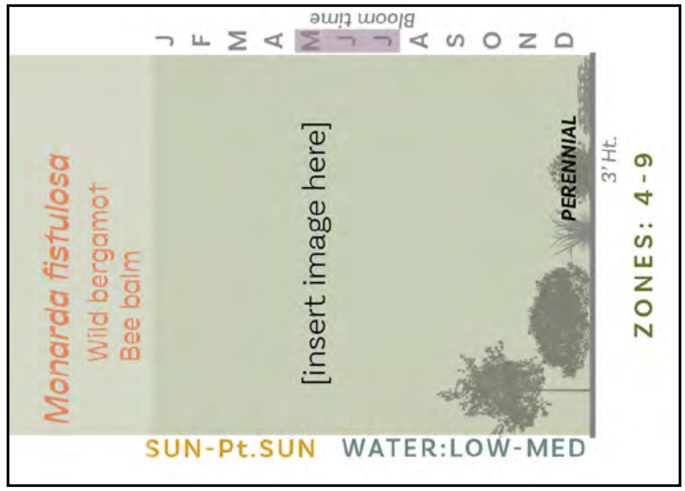

Pycanthemum tenuifolim
Narrowleaf mountain mint
[insert image here]
Bloom time
J F M A M J J A S O N D
PERENNIAL
3' Ht.
ZONES: 4-8
SUN-Pt.SUN WATER:LOW-MED


Achillea millefolium
Yarrow
[insert image here]
Bloom time
J F M A M J J A S O N D
GROUND COVER
1' Ht.
ZONES: 3-9
SUN-Pt.SUN WATER:LOW

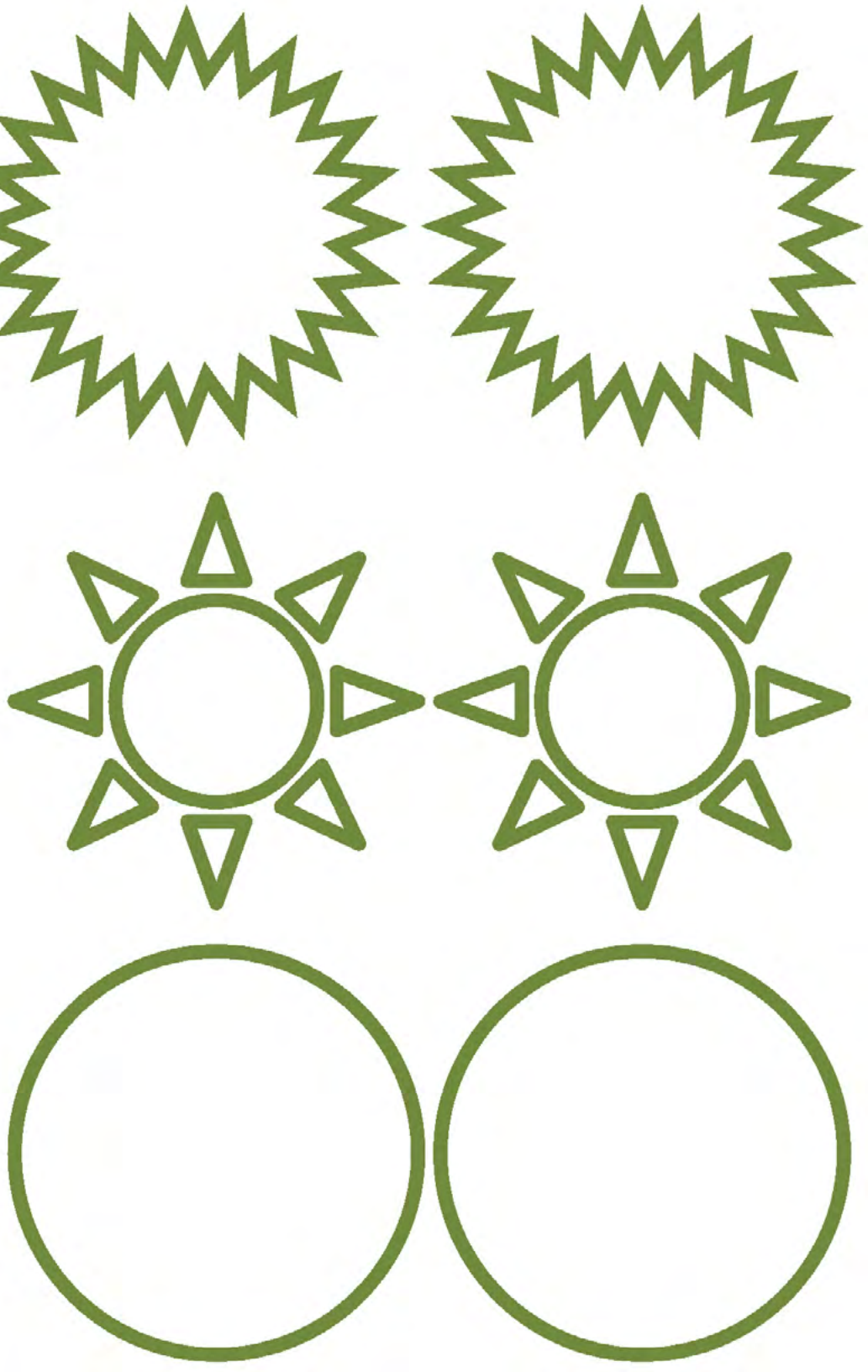

Phlox divaricata
Eastern blue phlox
[insert image here]
Bloom time
J F M A M J J A S O N D
GROUND COVER
1' Ht.
ZONES: 3-8
Pt.SHADE WATER:MEDIUM


Lonicera sempervirens
Coral honeysuckle
[insert image here]
Bloom time
J F M A M J J A S O N D
VINE
ZONES: 4-9
SUN-Pt.SUN WATER:MEDIUM

Appendix 2
Plant Identification Cards



25’ W
Plant Symbols



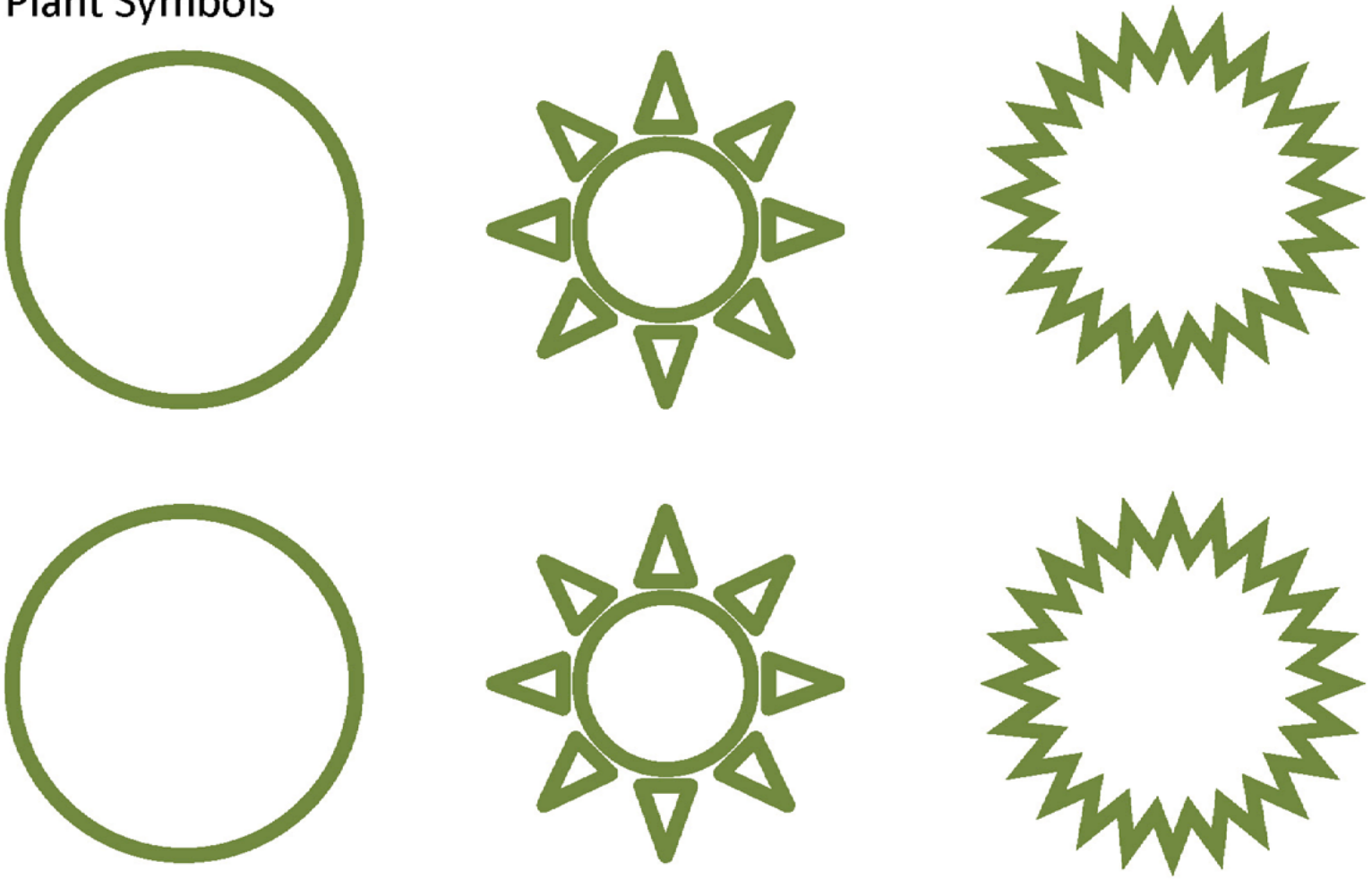
SCALE: 1” = 10’

Use a different symbol for each plant species. Add color, patterns, or letters to these shapes to create additional plant symbols.

Label the plant name on the planting plan with a callout (arrows) or a legend.

For plants smaller than 2’ spacing, draw an area bubble and list the desired plant.

20' W
Plant Symbols



SCALE: 1" = 10'

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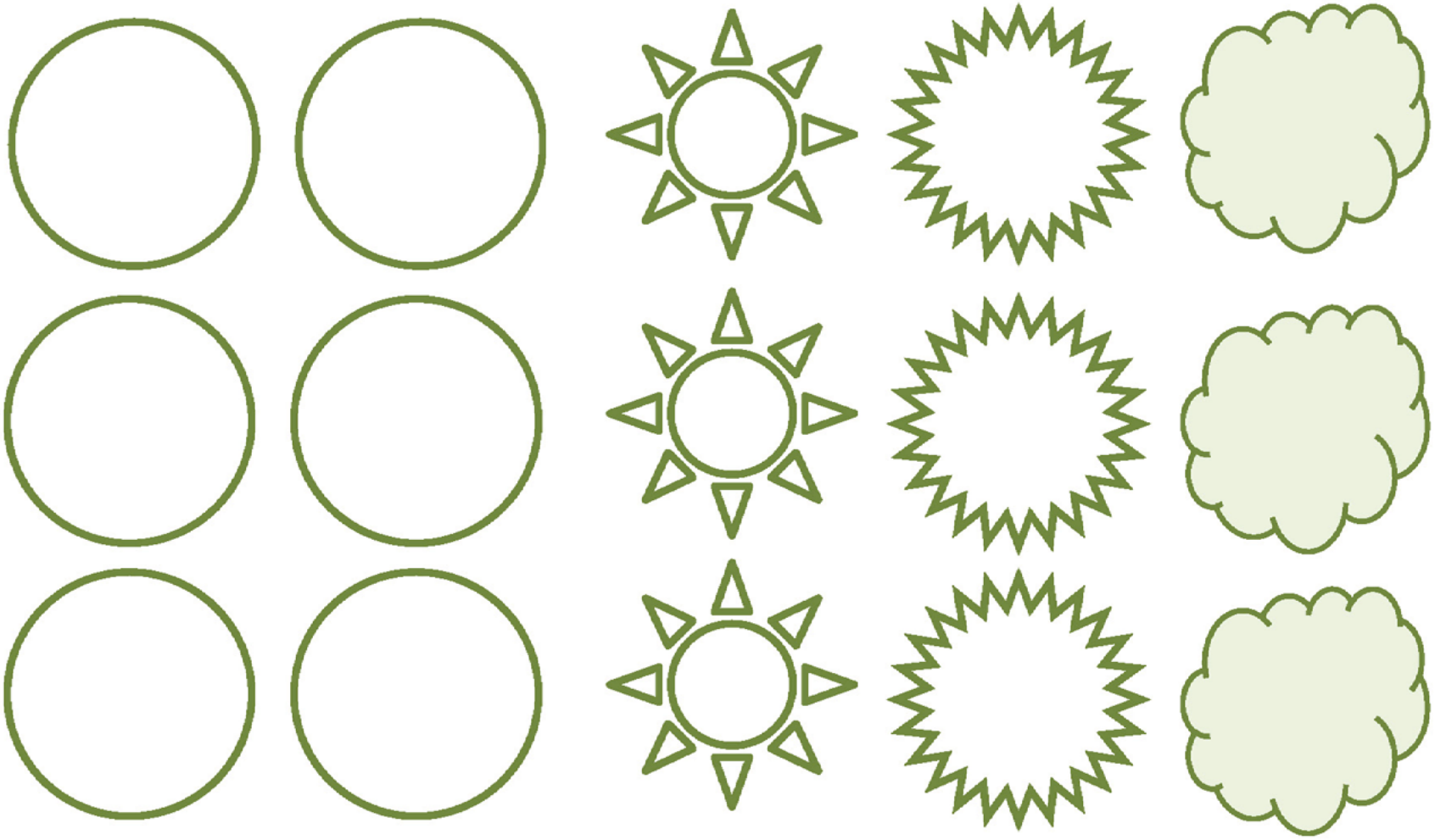
For plants smaller than 2' spacing, draw an area bubble and list the desired plant.

15’ W

Plant Symbols



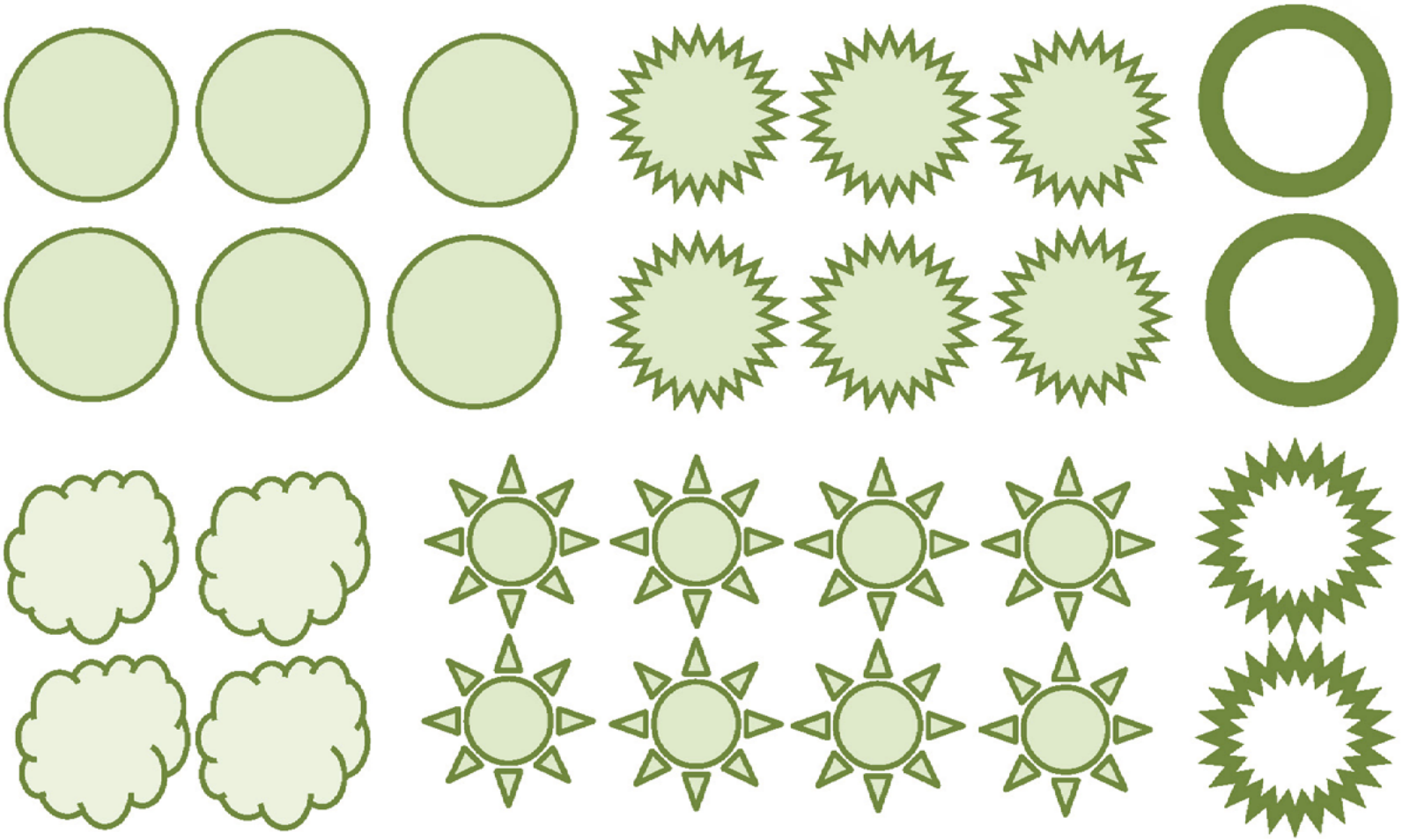
SCALE: 1” = 10’

Use a different symbol for each plant species. Add color, patterns, or letters to these shapes to create additional plant symbols.

Label the plant name on the planting plan with a callout (arrows) or a legend.

For plants smaller than 2’ spacing, draw an area bubble and list the desired plant.

10’ W
Plant Symbols



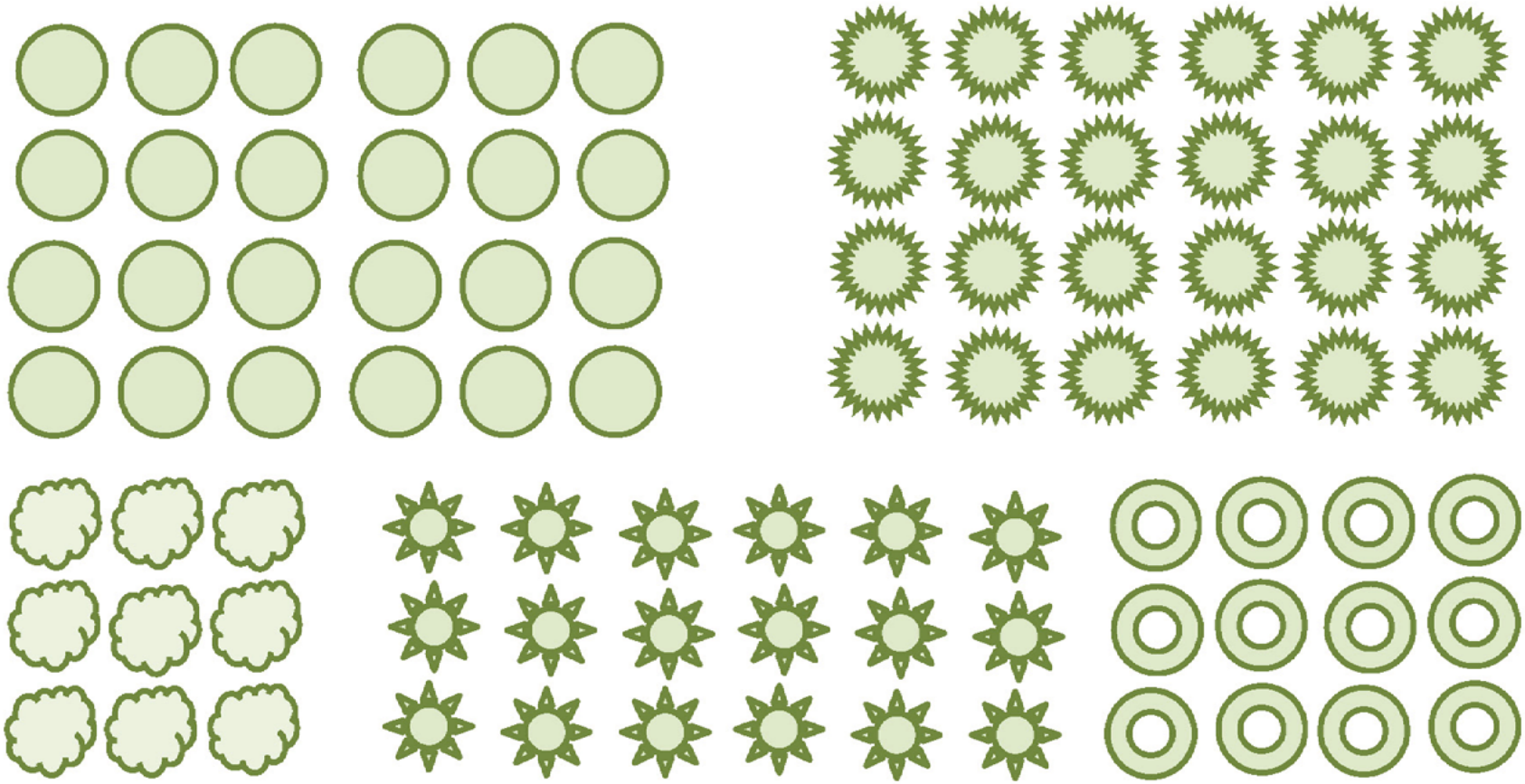
SCALE: 1” = 10’

Use a different symbol for each plant species. Add color, patterns, or letters to these shapes to create additional plant symbols.

Label the plant name on the planting plan with a callout (arrows) or a legend.

For plants smaller than 2’ spacing, draw an area bubble and list the desired plant.

5’ W
Plant Symbols



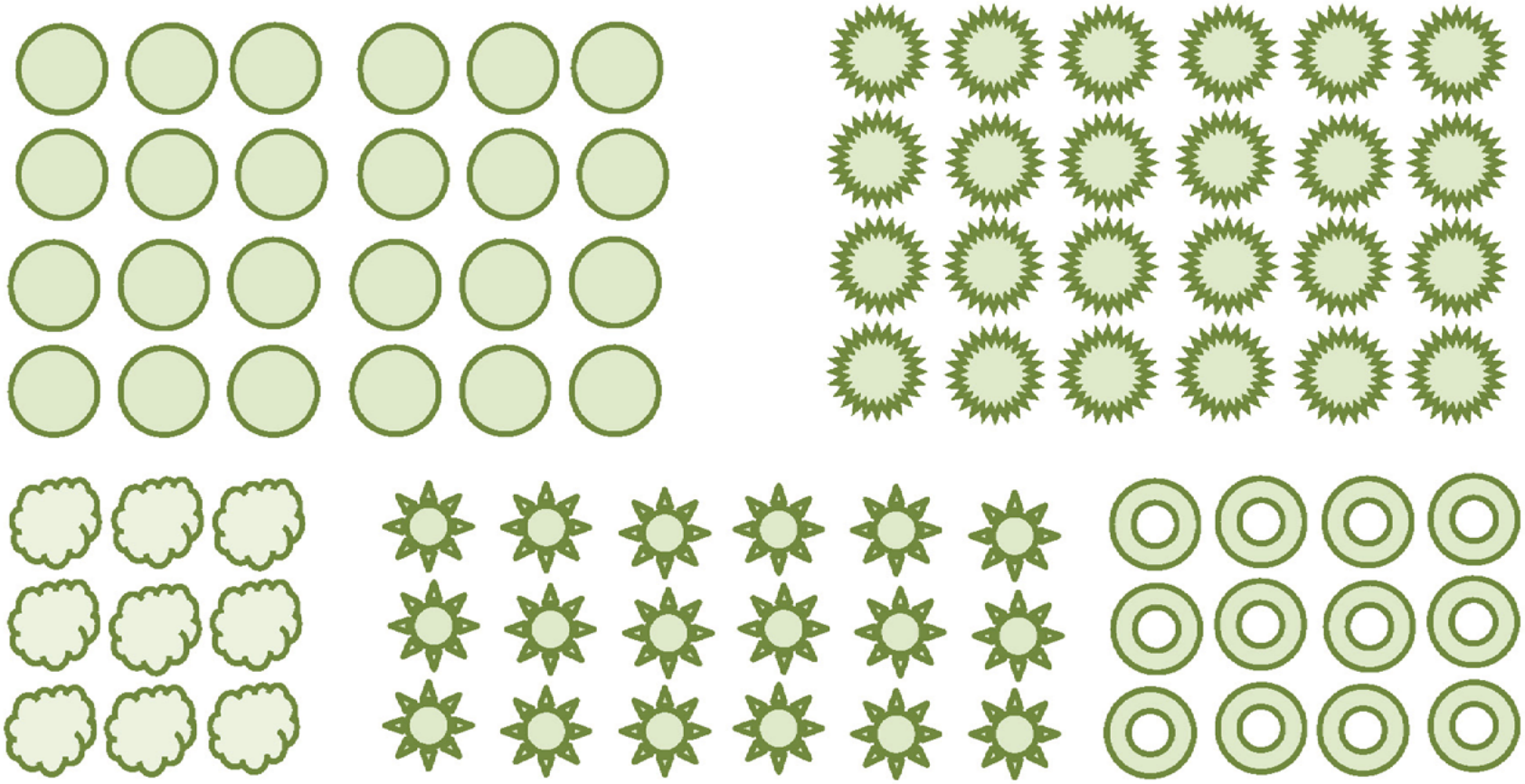
SCALE: 1” = 10’

Use a different symbol for each plant species. Add color, patterns, or letters to these shapes to create additional plant symbols.

Label the plant name on the planting plan with a callout (arrows) or a legend.

For plants smaller than 2’ spacing, draw an area bubble and list the desired plant.

5’ W
Plant Symbols



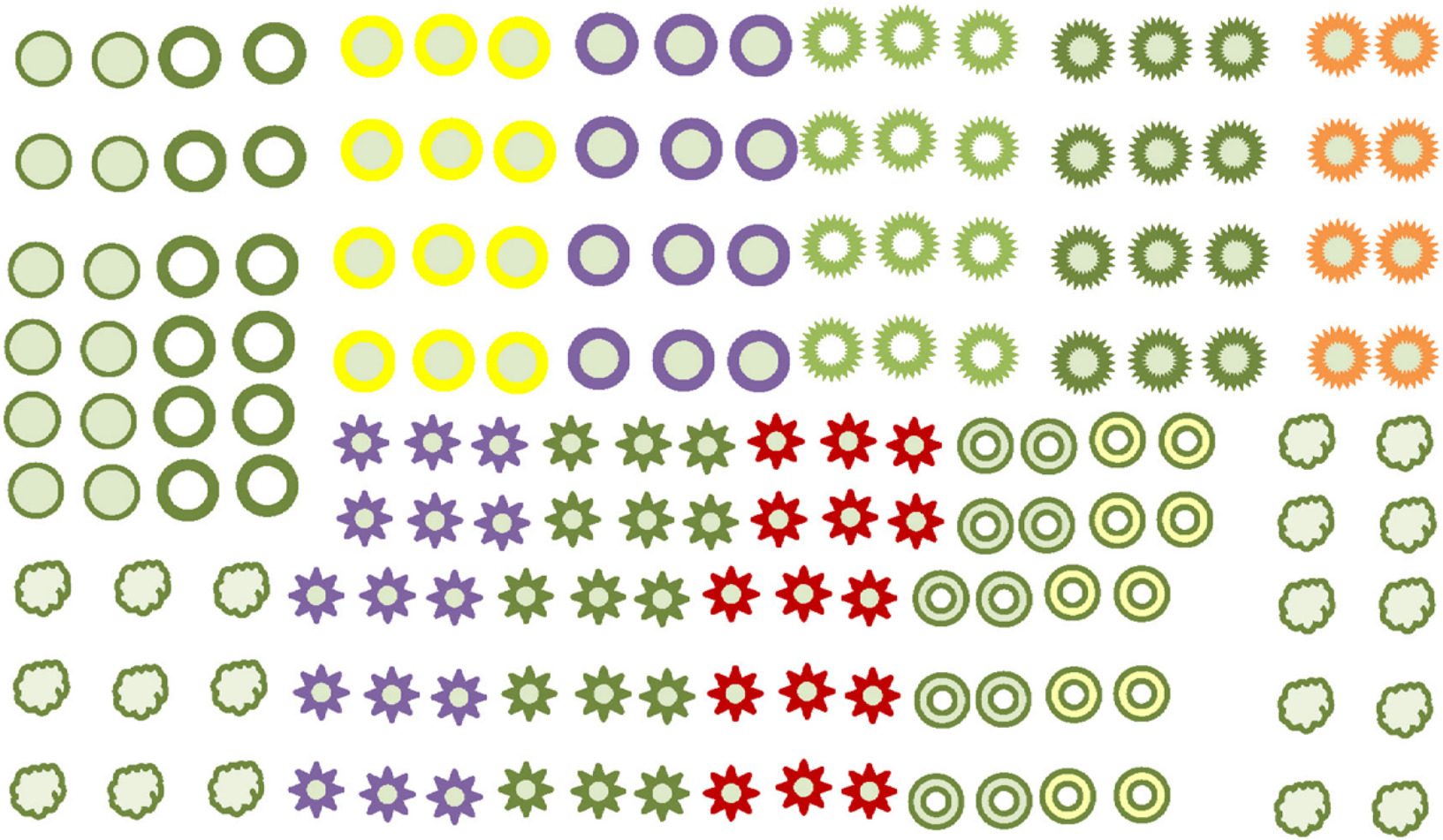
SCALE: 1” = 10’

Use a different symbol for each plant species. Add color, patterns, or letters to these shapes to create additional plant symbols.

Label the plant name on the planting plan with a callout (arrows) or a legend.

For plants smaller than 2’ spacing, draw an area bubble and list the desired plant.

3’ W
Plant Symbols



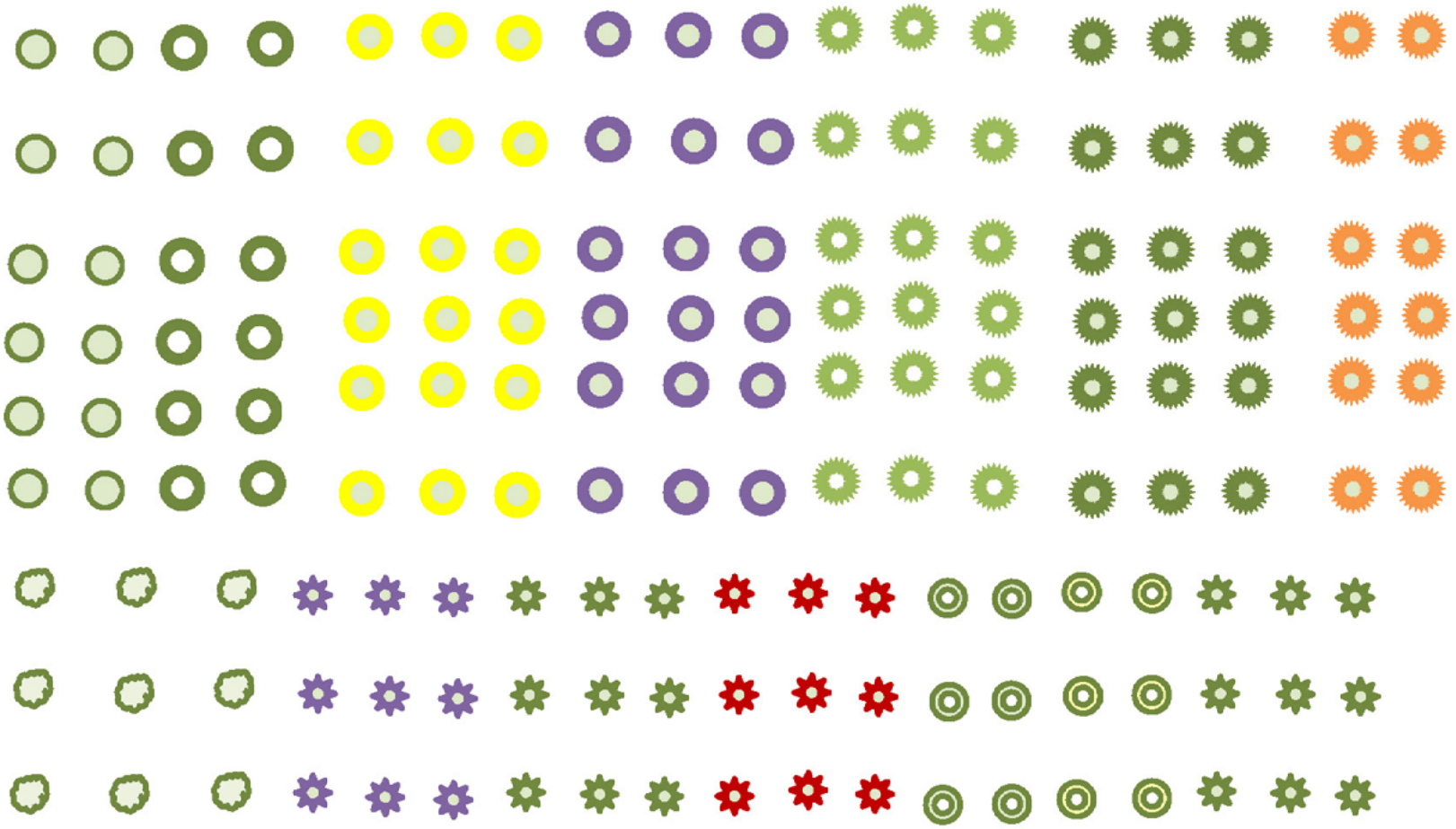
SCALE: 1” = 10’

Use a different symbol for each plant species. Add color, patterns, or letters to these shapes to create additional plant symbols.

Label the plant name on the planting plan with a callout (arrows) or a legend.

For plants smaller than 2’ spacing, draw an area bubble and list the desired plant.

2’ W
Plant Symbols



SCALE: 1” = 10’

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