

Rain Garden Installation-Native Plants

Objectives

Students will be able to:

- define native plants and diversity.
- Use plant requirements and characteristics to plan the garden landscape.
- identify at least three benefits to planting native species.
- determine the best site to build a garden factoring in the natural constraints.
- understand the steps to build a garden.
- install the plants and mulch to complete the process of building a native garden.
- familiarize students with green gardening methods as an alternative to pesticides and chemicals.

Subject: Environmental Science, Ecology, Biology

TEKS:

6th grade: 2A&E, 12E

7th grade: 2A&E, 10A&B, 13A, 6C,

8th grade: 2A&E, 11A,B&C

Materials

Garden Supplies:

- Mulch
- Plants
- Tools
 - 6 short handled shovels
 - 6 Hand trowels
 - 2 Steel rakes
- 12 Gardening Gloves
- Newspaper
- 6 Watering cans

Activity Supplies:

- Plant markers (1 for each plant)
- Crayons or wax pencils
- Markers
- Pens/pencils
- 6 Clipboards
- 12 *Grow Green Native and Adapted Landscape Plants Guide*
- 12 Copies of the *Plant Selection Worksheet*
- Poster board or oversized map of garden design
- “square foot” pieces of cardboard or 1 foot rulers

Rain Garden Installation-Native Plants

Vocabulary

| | |
|---------------------|--|
| Habitat | The place where an organism lives. |
| Native Plant | Plants endemic (indigenous) or naturalized to a given area. |
| Weed | A plant that is growing where it is not wanted. |
| Biodiversity | The number and variety of organisms found within a specified geographic region. |
| Perennial | Plants that do not die after a season's growth but renew themselves every year from the same root system. |
| Annual | Plants that complete their entire life cycle in one growing season. |
| Deciduous | Trees and plants which shed leaves in the autumn and remain leafless for part of the year. |
| Evergreen | Trees and plants which shed and replace leaves gradually all year round, they are never completely leafless. The leaves of evergreens are often waxy or needlelike to prevent. |
| Mulch | Composed of straw, shredded bark, pine needles or even recycled shredded rubber. Mulch is laid on top of soil to prevent moisture evaporation and the growth of weeds. |

Background

Rain gardens are simply a more natural system of managing storm water, allowing natural functions of infiltration and evaporation that contribute to a natural hydrologic cycle. Rain gardens are constructed shallow depressions designed to collect water primarily from downspouts. Storm water from driveways, streets, and parking areas can also be redirected to rain gardens. The concept is to let plants, bacteria, and soils clean and temporarily hold the water as it infiltrates into the ground close to where the rain falls. Before urban/suburban development, the unique relationship of water, vegetation, and soils resulted in very little runoff on the surface of the land. Today with more built surfaces and less porous ground, most of the precipitation becomes surface runoff. The rain garden keeps water close to where it falls by stopping the water from entering the storm water system as excess surface runoff. The principle for choosing species for a rain garden is to select native plants that infiltrate water into the ground. These species typically have deep root systems with water holding capacity and the ability to direct water through the soil. Instead of runoff, water either transpires through the plant's leaves and stems or seeps into the groundwater to later discharge as clean water into springs, fens, streams, or lakes.

Plant Selection

Growing the right plant species for your rain garden site helps ensure survival of your rain garden plants. A rain garden built on your school grounds collects water after a rain and then dries out. This alternating of wet and dry soils requires that you choose plant species that can tolerate these extreme conditions. Native plants that survive in this environment are usually flood tolerant species, which grow in flood plains, species that grow along rivers (i.e., riparian), and drought/flood tolerant prairie species. Plants suited for a rain garden often have a **bimodal** characteristic, which means they are able to grow well in opposite site conditions such as in wet or dry soils.

Other important considerations for selecting species for successful plant survival include light availability and soil type. Plant height, attracting wildlife, and aesthetics such as flower color, leaf textures and fruits can also play a role in plant selection. See "Criteria for Selecting Rain Garden Species" below for more details. **Native plants** are species that were present in the local landscape at the time of European settlement. Over thousands of years, these plants have adapted to the climate, soil and water conditions of the area. Since they are well adapted to their region, native plants tend to need less water and fertilizers, and therefore less maintenance, than do other plants. Local wildlife have similarly adapted to their surroundings, so native plants best meet their food and

Rain Garden Installation-Native Plants

cover needs, and provide good places for them to raise their young. In general, native plants will not out-compete other plants in a natural area or more broadly in an ecosystem but instead generally enhance biological diversity.

To begin the process of species selection, identify your rain garden site features (sun shade, soil type, etc). Then determine what plant characteristics will fit your site and needs. Review the following criteria and identify the criteria that fit your site characteristics and goals for your project.

Criteria for Selecting Rain Garden Species

Necessary criteria for every rain garden:

1. **Sunlight availability:** The amount of sunlight an area receives determines the types of plants that will survive those light conditions so that they will flower and set seed. Plants that need full sun need at least 6 to 8 hours of direct sun during the growing season; plants that require shade cannot tolerate more than 3 hours of direct sun. The hours and angle of sunlight change with the seasons, too. Some areas shaded most of the day at one time of the year may be in full sun other times of the year, or areas sunny in the spring may be shady in summer.

Common guides for choosing plants based on the amount of sun or shade available are:

Sun – Areas receive a minimum of 6 to 8 hours of sun per day during the growing season. Prairie and wetland species including sedge meadow species grow well under these conditions.

Partial shade – Partially shaded areas receive 3 to 6 hours of sun per day.

Shade – Areas of shade receive less than 3 hours of direct sun.

Most species lists will identify a plant's sun/shade requirements.

2. **Grass/sedge to forb (wildflower) ratio:** The proportion of species for a reasonable mix of grass/sedge and forb species that mimics the natural structure and character of a native prairie rain garden can be anywhere between 30% and 60% grass. Aesthetically, grass species, including sedges and other grass-like species, define the visual character or essence of the prairie. Ecologically, grasses provide structural support for forbs, hold the soil with their fibrous root systems, and provide food and cover for wildlife. Forbs provide visual interest, food for wildlife on a continual basis, and enhance diversity. The ratio of grass/sedge to wildflowers in a woodland tends towards less grass-like species and more wildflowers with some ferns.

3. **Phenology:** One of the best known and most dramatic sequences in a rain garden involves flowers blooming from mid-April through October. During the growing season approximately one new plant blooms each week. This sequential or phenological change is striking and attractive to pollinating insects such as butterflies. In shady areas, blooming peaks in the spring with a few species blooming during summer and fall. When choosing species, particularly in sunny areas, select plants for a continuous bloom.

4. **Height:** When selecting species, be aware of each plant's ultimate height and spread at maturity. Plant height should be in proportion with the size of your planting. Typically, small rain gardens are planted with short species. Large plants in a small area tend to overwhelm the site and appear unkempt. Large areas can be planted with a mix of short and tall prairie species. Short species are less than four feet; tall species are greater than four feet.

Additional Criteria:

1. **Color:** Flower color is an aesthetic consideration. Look for color combinations and contrasts within each blooming interval. Pairing complimentary colors (yellow/purple, red/green, orange/blue) tends to intensify the colors.
2. **Species that attract specific insects, birds, and other wildlife:** Planting a diversity of native wildflowers and grasses, along with shrubs and trees nearby (or in the garden), provides maximum habitat and opportunity to

Rain Garden Installation-Native Plants

attract a variety of butterflies and birds. Wildlife in the schoolyard adds life, beauty, discovery, and educational opportunities. Planning and proper plant selection will increase the number and variety of butterflies and birds attracted to a planting. A diversity of flying and crawling insects are attracted to flowers. Grazing insects such as grasshoppers, leafhoppers, and butterfly larvae feed primarily on the leaves of grasses and forbs. These insects form the base of the food web, especially for birds. Birds also feed on highly nutritious seeds produced by native plants. Tall and short grasses and trees and shrubs provide cover and nesting. Woody plants provide wind protection for butterflies and hummingbirds that seek nectar on prairie flowers.

3. Species desired for lessons, activities and research: A rain garden offers many hands-on learning activities and inquiry-based opportunities. You may select plants Native Americans used for food and medicinal uses or plants that illustrate plant adaptations. Consider species that have a variety of seed types to learn about seed dispersal mechanisms or to test seed germination methods. Also pick plants that awaken your senses and curiosity with fragrances, textures, shapes and sounds. Additionally, a rain garden provides a context to learn about storm water impacts and solutions in the local watershed.
4. Species blooming during the school year: Many species bloom during the summer months when students are on vacation. To make sure students experience plants in bloom during the school year, increase the number of species that bloom in the spring and fall months.
5. Species that are aggressive: Some plants can be overly aggressive either through vegetative reproduction or seed. These species, such as sunflowers, switch grass, common goldenrod, and cupplant often form large masses. Species with this type of growth habit are appropriate for large sites but may become too overpowering in smaller plantings.

Gardening for Water Quality

Building gardens and managing them organically greatly improves water quality and ecosystems in local creeks and rivers. Plants act as natural filters of pollutants such as oil, chemicals, and dog waste. Grass lawns have very shallow root systems and do not soak in/filter pollutants as well as native, rain, or vegetable gardens.

Gardening without chemical fertilizers or pesticides is called organic or green gardening. Chemical fertilizers or herbicides such as Miracle Grow and Roundup get washed down stormdrains during rainfall and end up in creeks. Pesticides and herbicides can kill or deform aquatic wildlife, and fertilizers result in algae blooms that remove oxygen from the water causing fish kills and dead zones.

Activity Outline:

Students will identify plants and implement simple strategies in creating their gardens. Split class into two groups to rotate through Activity 1 and Activity 2.

1. Activity 1: Plant Adoption and Mapping– become experts on an adopted plant
2. Activity 2: Planting, Mulching, and Garden Care

Activity 1: Plant Adoption and Mapping

Plant Adoption

1. Split students into pairs or small groups. Depending on the amount of classes, vary the group size according to the number of classes, the size of the garden, and the number of plants available.
2. Each group receives 1 plant from the rain garden plant list which they identify using the *Grow Green Native and Adapted Landscape Plants Guide* (omit large and small trees pgs. 3-9). This is their adopted plant. Direct students to the index and explain how some plants are indexed by the second name on the plant tag, ex. Texas Sage is indexed under S for Sage.

Rain Garden Installation-Native Plants

3. Students record their findings and complete the *Plant Selection Worksheet* noting plant name; sun, soil, and space requirements; if it attracts wildlife and if so what kind. Encourage students to record any additional information or special characteristics about their plant.
4. Have pairs/groups present the plants they selected to the group.

Garden Mapping

1. When the *Plant Selection Worksheet* is complete have students draw in the placement and/or a drawing and name of their plant onto the garden map.
2. Upon completion each class will have a customized map of the garden to hang in their classroom.

Activity 2: Planting and Garden Care

Review plant needs. Read each plant's information and answer the following questions:

- Is your bed in the sun, shade, or partial shade?
- How much space does each plant or seed need to grow to maturity? Make sure to space your plant properly from the others.

Plant Spacing- Use square foot cardboard pieces or rulers to measure space between holes for plants. Ideally, each plant should have at least one square foot of space around it.

Planting - Students will work in pairs (may need to be adjusted for smaller or larger garden projects) to plant one 4-inch native plant. Go over "How to Plant" banner.

1. Remove potted plants from their containers:
2. Gently hold the base of a plant and turn the container upside down.
3. Roll the edge of the container against a hard surface to allow the root ball to slip out.
4. Handle all plants by their root ball, not by lifting on the stem, to prevent root injury.
5. Dig holes for the plants at least three times wider than the root ball with sides that slope inward.
6. Set the root ball in the hole.
7. Pack soil around the sides of the root ball. Bottom of stem should be level with soil.

Mulching - Each pair will spread newspaper over the soil and around their plant (and added weed barrier for areas with lots of grass), and then mulch around their plant.

1. Gently cover the exposed soil with 2 inches of mulch.
2. Make sure to leave a ridge around the planting hole.
3. The mulch should come close to, but not touch, the base of the plants.
4. Do not place mulch over planted seeds.
5. Create a mulch border (approximately 6" wide and 2" deep) around your raised bed to cover exposed cardboard and prevent weed growth.

Garden Care – Discuss proper garden care/green gardening.

1. With watering cans, each group will water their plant gently until the water takes 30 seconds to soak into the ground.
2. Use compost; not chemical fertilizer.
3. Hand pull weeds or use barrier; not herbicide.
4. Select and grow native plants which require less water.

Additional Resources

LBJ Wildflower Center www.wildflower.org

National Wildlife Federation www.nwf.org/gardenforwildlife/

Grow Green www.growgreen.org

Earth Partnership for Schools

http://uwarboretum.org/eps/research_act_classroom/rain_garden_curriculum.php

RAIN GARDEN PLANT LIST

| Species | Category |
|----------------------|-------------|
| Big Muhly | Grass/Sedge |
| Inland Sea Oats | Grass/Sedge |
| Meadow Sedge | Grass/Sedge |
| Frogfruit | Groundcover |
| Fall Aster | Perennial |
| Lantana | Perennial |
| Mistflower | Perennial |
| Red Yucca | Perennial |
| Turk's Cap | Perennial |
| Twistleaf Yucca | Perennial |
| American Beautyberry | Shrub |
| Yaupon Holly | Shrub |
| Bamboo Muhly | Grass/Sedge |
| Blue Grama | Grass/Sedge |
| Cherokee Sedge | Grass/Sedge |
| Cherry Sage | Grass/Sedge |
| Deer Muhly | Grass/Sedge |
| Gulf Coast Muhly | Grass/Sedge |
| Lawn Sedge | Grass/Sedge |
| Liriope | Grass/Sedge |
| Pine Muhly | Grass/Sedge |
| Texas Sedge | Grass/Sedge |
| Horseherb | Groundcover |
| Chile Pequin | Perennial |
| Copper Canyon Daisy | Perennial |
| Coreopsis | Perennial |
| Engelmann Daisy | Perennial |
| Flame Acanthus | Perennial |
| Gulf Coast Penstemon | Perennial |
| Hymenoxys | Perennial |
| Mealy Blue Sage | Perennial |
| Mexican Honeysuckle | Perennial |
| Mexican Oregano | Perennial |
| Obedient Plant | Perennial |
| Pigeonberry | Perennial |
| River Fern | Perennial |
| Rock Rose | Perennial |
| Spiderwort | Perennial |
| Texas Betony | Perennial |
| Tropical Sage | Perennial |
| Winecup | Perennial |
| Zexmenia | Perennial |
| Dwarf Yaupon | Shrub |
| Mexican Bush Sage | Shrub |

Rain Garden Installation-Native Plants

Plant Selection Chart

Using the Grow Green Native and Adapted Landscape Plants Guide fill in the details about your adopted plant.

| | |
|--------------------------------------|--------------------|
| | Plant Name: |
| Spread – Diameter and Spacing | |
| Height of Mature Plant | |
| Water Needs | |
| Sun Light Needs | |
| Soil Needs | |
| Evergreen or Deciduous | |
| Seasonal interest | |
| Color | |
| Attracts Wildlife? | |