A Rain Garden Year

Activity Overview
Students take part in a play that illustrates the seasonal march that happens in a rain garden as native plants bloom and set seed.

Objectives
Students will:

- Use a model to explain an event in the natural world
- Take part in a play to illustrate the sequences of events in natural ecosystems that are repeated each year
- Identify changes in plants at different times of the year
- Increase their understanding of prairie plant adaptations
- Gain an understanding of rain gardens and their purpose

Subjects Covered
Science, Language arts, Music, Movement and Drama

Grades
K through 8

Activity Time 30 minutes

Season
Any

Materials
1 plant phenology card per student (1 set is 20 cards; see masters for making cards or have students create their own set of cards), musical instruments (if available)

State Standards
Language Arts: A.4.1, A.4.4, A.8.1, A.8.4, B.4.1, B.4.2, B.8.1, B.8.2, C.4.1, C.4.2, C.4.3, C.8.1, C.8.2, C.8.3, F.4.1, F.8.1;

Science: A.4.2, A.4.3, A.4.5, A.8.1, A.8.6, B.4.1, C.4.1, C.4.2, C.4.3, C.4.6, C.4.7, C.8.1, C.8.2, C.8.4, C.8.5, C.8.8, E.4.6, E.8.8, F.4.2, F.4.3, F.8.2, F.8.7, F.8.8, F.8.9

Background

Rain gardens are specialized gardens that can reduce polluted runoff. Rain gardens made up of native plants capture water and allow it to soak into the ground instead of running off into storm sewers. Allowing storm water to soak into the ground while the native plants filter out pollutants reduces non-point source pollution going directly into lakes, rivers and other nearby waterways. Storm water is considered non-point pollution because as precipitation falls it collects and picks up pollutants from many surfaces such as roads, parking areas, rooftops, lawns, etc. Non-point source pollution is pollution that does not start from an obvious point, such as an industrial pipe. It is harder to determine where non-point source pollution started.

Rain gardens are often planted with prairie plants that have an ability to live in both wet and dry conditions. Some gardens are planted with woodland plants if the site is shady. In order to avoid intense competition and to adapt to weather cycles, prairie and other native plants have different seasonal periods of growth, flowering, pollination and seed dispersal. As a result, we can experience a changing vista of colors, scents, insects and textures throughout the year. One of the best-known and most dramatic sequences involves plants blooming from April through October; as one blooming plant wanes, another takes center stage. During the growing season, approximately one new plant blooms each day in a natural prairie ecosystem. You can observe this plant blooming cycle on a small scale in your rain garden. "Phenology" is the sequential study of changes that happen in nature over time. Following phenology is exciting because changes in nature are somewhat predictable in different seasons and easily observable. Yet, there is an element of surprise in seeing what's happening in your school's rain garden!

Varied growth patterns are one way native plants have adapted to their environment. For instance, most plants planted in a rain garden are long-lived perennials that are able to slow down their growth rates to share water, light and minerals with crowded neighbors to create a complex and rich mixture of vegetation. Perennials are herbaceous plants that die back to the ground at the end of the growing season but survive underground through their root systems. Staggering growth and flowering times is one way plants adapt to competition for resources. Many native grasses and forbs (i.e., wildflowers) have extensive root systems that allow them to survive fires, harsh winters, droughts and flooding because they have buds at or below the soil surface and more root mass below ground compared to the biomass of the plant aboveground. The root systems of species planted in a rain garden can reach depths of over six feet, and some even extend as deep as twenty feet! By having extensive root systems, plus a variety of blooming times and different stem heights, these plants have adapted to their environment and are able to coexist, filling every niche, or space, available.

The dense root systems underground is why rain gardens are so successful

infiltrating and filtering water. The roots provide millions of channels for the water to soak deep into the ground. Additionally, the roots absorb pollutants and clean the storm water as it moves down into the ground water (or as subsurface flows) to lakes and rivers. With every rain garden built, water quality improves for drinking, swimming, and aquatic wildlife.

In this activity, 20 plants are used to illustrate the seasonal changes that occur in a rain garden: Bee Balm, Black-eyed Susan, Blazing Star, Compass Plant, Cream Baptisia, Fox Sedge, Golden Alexander, Little Bluestem, Marsh Milkweed, New England Aster, Prairie Cord Grass, Prairie Dock, Prairie Dropseed, Prairie Phlox, Prairie Sedge, Shooting Star, Spiderwort, Stiff Goldenrod, Switch Grass, and Yellow Coneflower.

Select the above plants you have in your rain garden and/or add additional plants. The goal is to have at least one or two plants blooming in each month.

Activity Description

Everyone receives a card with a plant "in flower" illustrated on one side and "in seed" illustrated on the other side. If musical instruments are available, have each student choose an instrument to represent their plant in bloom. To start the play, everyone should be in a group and crouching down. Read the play narrative. Students stand up and hold their card above their heads when they hear their plant is blooming. If using instruments, students also play their instruments. When their plant sets seed, they lower and turn their cards and remain standing. When winter comes again and the above ground portion of their plant dies, they crouch down into the winter dormant state.

Sample Play Narrative:
It is a cold winter season. The days are cold and short. Nights are long. To most humans, the rain garden looks lifeless. All aboveground portions of the plants are brown and brittle. But underneath, the roots are quite alive. *(All students should be in a group and crouched down. They are the roots of their plant.)*

You are our rain garden. You are the living roots of your plants with a blanket of snow over your heads. The covering of snow keeps the soil and roots protected. At the same time, the dry plant parts above ground provide winter cover to small animals.

As the days start to get warmer and longer, the snow melts, and the soil warms. Spring rains begin, and plants start to grow—leaves start to emerge from the ground. The growing plants in the rain garden absorb the snowmelt and spring rains, filtering out pollutants along the way. (*Students start to sit up a bit. As their plant blooms, they stand up and hold their card up*.)

"Now it is (insert month) and the (insert plants in bloom) begin to bloom while the (insert names of plants) stop blooming and begin to set seed." [*Continue through the months listed below*]

Now it is May…

A Rain Garden Year (cont.)

	BLOOMS	STOP BLOOMING, SET SEED
May	Shooting Star Prairie Phlox Golden Alexander Fox Sedge	
June	Spiderwort Cream Baptisia Black-eyed Susan Marsh Milkweed Prairie Sedge	Shooting Star Prairie Phlox Fox Sedge
July	Yellow Coneflower Compass Plant Bee Balm Blazing Star Prairie Sedge Prairie Dock	Spiderwort Cream Baptisia Golden Alexander Marsh Milkweed
August	Cord Grass Stiff Goldenrod Switch Grass Prairie Dropseed	Blazing Star Prairie Sedge Compass Plant Bee Balm Black-eyed Susan
September	New England Aster	Prairie Sedge Yellow Coneflower Prairie Dock Cord Grass Switch Grass
October		Stiff Goldenrod New England Aster Prairie Dropseed

Now the temperatures are getting colder and the days shorter and the nights longer. The aboveground portion of the plants die and only the roots are alive.
(The students crouch back down)
The winter is back, and our school's rain garden once again looks lifeless. But it is not lifeless; it is alive and waiting—waiting for another year.

Discussion

Discuss how adaptations such as extensive root systems and different blooming times enable native plants to survive in their environments. What are some threats to these plants' survival? Emphasize that there is a wide variety of ways plants and animals adapt to their environment.

Talk about how plant adaptations support the functioning of a rain garden to reduce polluted runoff and to improve water quality. (Topics to consider include deep root systems, different growing times, and the ability to withstand both droughty and wet conditions.)

Extensions

- Create your own cards. Draw the flowering plant form on one side and the seed form on the other. Use a field guide or other reference to draw and color the picture accordingly.
- Visit the library to research other plant and animal adaptations. Expand on this play to include different plant and animal adaptations throughout the year.
- Write a story that describes a plant and its seasonal adaptations.
- Keep a phenology journal and record plant changes during different times of year.
- Create other phenological sequences from either observations or research projects (see Earth Partnership for Schools activities, "Observations from a Single Spot" and "Ecosystem Observation Cards").
- Write and direct a phenological play with younger students.
- Create a Phenology Book or Calendar that describes observations throughout the year.
- Create a computer database to record seasonal observations in your school's rain garden.

Additional Resources

- Bates, J. (1997). *A northwoods companion: spring and summer.* Mercer, WI: Manitowish River Press.
- Bauer, C. & M. Smith Fry. (2000). *My nature journal: Explorations of the natural world using phenology.* Madison, WI: University of Wisconsin-Arboretum.
- Curtis, J.T. (1959). *Vegetation of Wisconsin*. Madison, WI: University of Wisconsin Press.
- Leopold, A. (1949). *A sand county almanac.* New York: Oxford University Press.
- Levine, Carol. (1995). *A guide to wildflowers in winter*. New Haven: Yale University Press.
- Locker, T. (1995). *Sky tree*. Harper Collins Publishers, USA.
- Nichols, N., Entine, L., & E. Howell. (1996). *Prairie primer.* Madison, WI: University of Wisconsin-Extension.
- Stokes, D.W. (1976). *A guide to nature in winter*. Boston: Little, Brown & Co.
- Weber, L. (1996). *Backyard almanac.* Duluth, MN: Pfeifer-Hamilton Publishers.

Web sites

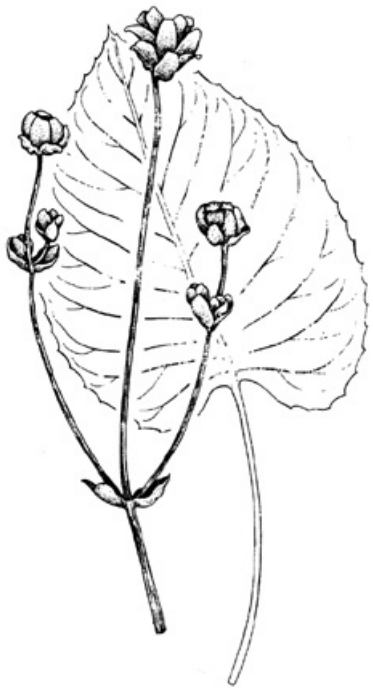
- Earth Alive: http://www.naturenet.com/earthalive/nnhome.asp
- Rain Garden Plant List http://dnr.wi.gov/org/water/wm/nps/rg/plants/PlantListing.htm
- Rain Garden Resources http://www.danewaters.com/private/raingarden.aspx

Assessments

- Describe how rain gardens help reduce the amount of pollution going into local waterways.
- List and explain at least 2 ways plants have adapted to their environment.
- Describe how adaptations enable plants to live in their environment.
- Write a short story describing a rain garden plant's adaptations and seasonal changes.
- Create a mobile with drawings illustrating the blooming and setting seed versions of different rain garden plants and the time of year these changes occur.
- Research a native plant found in your school's rain garden; describe its characteristics, its seasonal adaptations, and its life history. Make an oral report to the class, and conduct peer reviews of these reports.
- Develop a web page on a specific plant(s) using photos, drawings, and life history information.
- Create a phenology journal or calendar, and record observations of the rain garden for a specific period of time.

EPS 2005 Institute participants experiencing "A Rain Garden Year" at the Urban Ecology Center, Milwaukee, WI. Photo: Libby McCann.

Spiderwort

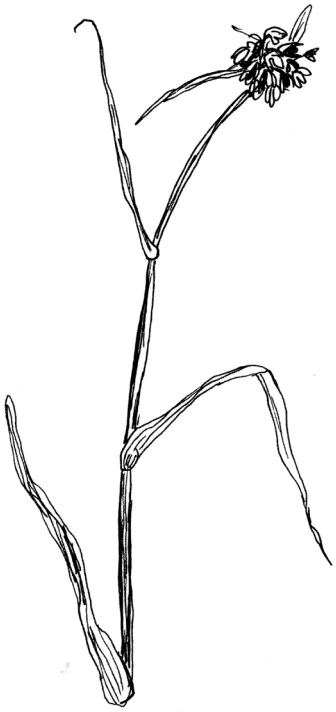


Prairie Dock

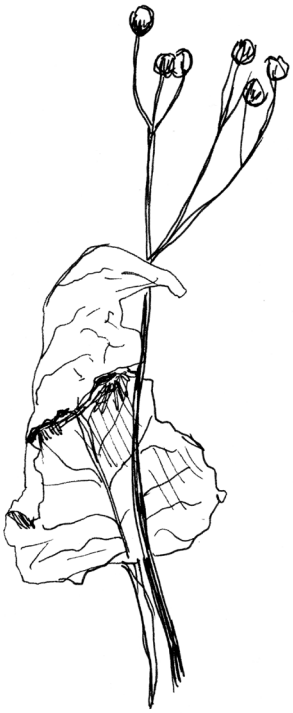
Black-eyed Susan

Cord Grass

Sample Rain Garden Year Cards with plants in flower.



Spiderwort



Prairie Dock

Black-eyed Susan

Cord Grass

Sample Rain Garden Year Cards with plants in seed.

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