



# Landscaping for Clean Water *at Your School*

## GUIDE FOR TEACHERS AND STAFF

**Dakota County Soil & Water Conservation District**

---

### Contents

Using This Guide.....	2
Background Information: Understanding Your Garden! .....	2
Watersheds, Runoff, and Water Quality.....	2
Soil Ecology .....	4
Raingardens .....	5
Native Plants .....	6
Pollinators.....	6
Getting Kids Involved: Activities, Lesson Plans, Videos, & More.....	7
STEM: Exploring Water & Runoff.....	7
STEM: Exploring Plants.....	8
STEM: Exploring Pollinators & Other Animals that Use the Garden.....	10
STEM: Exploring Soil.....	11
Garden Arts & Crafts:.....	12
Garden Safety Tips .....	13
Getting Youth Involved in Garden Maintenance .....	14

## Using This Guide

This guide is designed for teachers and staff at schools that already have a raingarden or native planting (including pollinator gardens, shoreline plantings, restored native prairie, and other native gardens) or other green space/natural area on-site.

If you're interested in planting/installing a Landscaping for Clean Water project at your school, we would love to help you! Your first step is to visit the Dakota County Soil & Water Conservation District website ([dakotaswcd.org/cleanwater.html](http://dakotaswcd.org/cleanwater.html)) and sign up for an Introductory Workshop, or contact our staff at [SWCD@co.dakota.mn.us](mailto:SWCD@co.dakota.mn.us).

This guide contains background information on raingardens, native plants, and water quality for teachers; ideas on how to use gardens in curriculum; safety tips; resources for staff on maintaining gardens; and additional links to further useful educational resources. This guide is designed to supplement materials staff may already have from attending workshops.

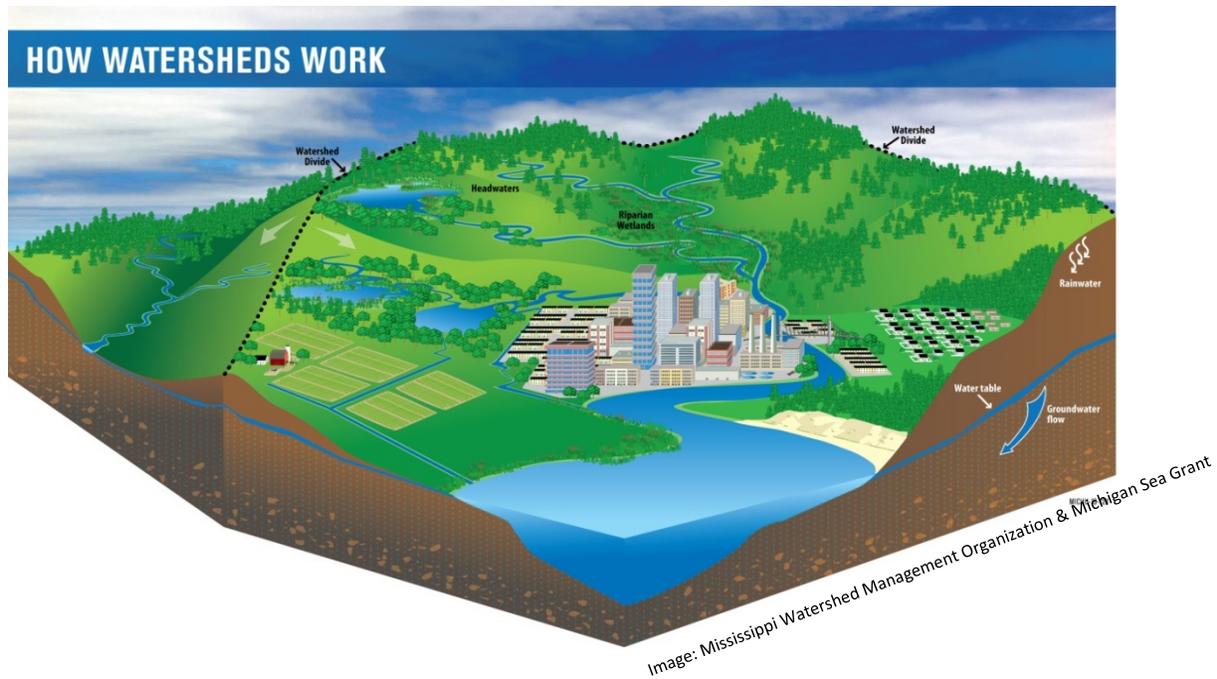
## Background Information: Understanding Your Garden!

### Watersheds, Runoff, and Water Quality

**Watershed** is a commonly misunderstood term. It's a way to define **the area of land that drains into, and ultimately affects, a certain body of water**. Your school is in a watershed. In fact, depending on the scale at which you define watersheds, it's in many, overlapping watersheds of different sizes.

For example, there might be a small creek at the back of your school. All of the rain or snow melt that runs off your school building, parking lot, and grounds and doesn't soak into the ground eventually makes its way to that little creek – thus, you're in that creek's watershed. If that creek eventually joins the Vermillion River, you're also in the Vermillion River watershed, which would mean you're also in the Mississippi River watershed – one of the largest watersheds in the United States.

Maybe you don't have a body of water on the school property or nearby – but you do have storm drains in the parking lots or nearby street. Those storm drains are connected to a series of underground tunnels (storm sewer pipes) that carry the runoff to a body of water, and dump it there, often untreated. Your school is in that body of water's watershed.



It's also possible (though rare!) that your school sits in multiple different watersheds. A high point, and dividing line between watersheds, could be on school property. In that case, for example, it's possible that the runoff from the front school yard could end up in one river, and the runoff from the back property (up and over a ridge) end up in nearby lake or another river.

Your school is in one or more watersheds, and so are your house and the homes of all of your coworkers and students.

The quality of a body of water (whether a stream, river, pond, lake, or ocean) is dependent on its watershed, the land that ultimately drains into it. Rain and snowmelt never soaks into the ground entirely – especially not if it lands on a hard surface, like a roof or pavement! It runs off over the land until it hits a body of water (this is called, appropriately, **runoff**.) When runoff enters the body of water, whether it gets there directly or through a storm water/storm drain system or ditch, it carries things (like different kinds of pollutants) with it, which it picked up along its journey.

A body of water that sits in a watershed that's primarily forested land will look very different from a body of water whose watershed is primarily farm land, and both will look different from a body of water whose watershed is mostly urban or suburban land.

**Water quality** is how we define the health or condition of a body of water. When we talk about water quality, we're talking about the water's traits or characteristics, including biological, physical, and chemical traits. For example, researchers might measure the water's temperature, clarity, or amount of dissolved oxygen in the water. They might look at the diversity and abundance of plants and animals

living in the waterbody, or the amounts of different nutrients or pollutants. Runoff can affect all of these things.

Some common pollutants that might wind up in the runoff from your school include:

- Chemical or physical pollutants from the roof or pavement, like construction dust or fluids from leaks, from cars or building infrastructure, or from soap used to clean things outdoors
- Grass clippings, leaves, and dirt (these add nutrients like nitrogen and phosphorus to water, which can lead to algae blooms, low dissolved oxygen levels, and other issues)
- Litter/trash
- Salt and/or sand from winter de-icing methods
- Fertilizers or pesticides from grounds maintenance

All of these can negatively impact the body of water that defines your school's watershed. Raingardens and native plantings are a neat solution to help reduce the problem – read more in the sections below!

## Soil Ecology

When people are asked to describe soil, they often think of physical qualities – like soil particle size or density (e.g. is it sandy or more like clay?) Some people might think about chemical properties, like pH or the presence of different elements, like nitrogen or calcium.

These physical and chemical traits are all important for describing soil and understanding how it will affect and interact with plant life, but its biological traits are important too – the presence of different living things (fungi, bacteria, insects, worms) within the soil.

**Soil ecology** is the study of soil and all of the interactions that occur within – between living and non-living aspects, and among the various organisms.

**Healthy soil** is defined in different ways, but is frequently used to mean soil that supports productive plant growth, doesn't suffer from extreme erosion, and sustains its quality year after year. In a farm or garden, healthy soil will likely mean soil that supports high production, with lots of earthworms, few crop parasites, and a soil structure that resists erosion. In a forest, healthy soil will support a diversity of native species, have a thick layer of duff or leaf litter, and be home to a host of native organisms. Healthy soil anywhere often contains micro-organisms (fungi, for example) that enter into mutually beneficial symbiotic relationships with plant roots. Organic matter is crucial in soil – it holds more moisture, improves cohesion, reduces erosion, and adds nutrients.

Soil health can be improved or harmed by actions people take on the land. For example, digging up or tilling the land removes interior structures in the soil and makes erosion more likely or dramatic. Planting species that “fix” nitrogen (turn it into a form usable by other plants) can make the soil a richer, more productive environment for desirable crops. Leaving dead stems and stalks standing in the soil even in the winter and spring can mean less erosion of bare soil during thaw periods.

Soil health affects water quality because healthy soil is more likely to stay in place, rather than eroding in runoff and ending up in nearby waterbodies, carrying overloads of nutrients with it. Soil is a crucial piece of any garden, for the success of the garden itself and the surrounding environment.

## Raingardens

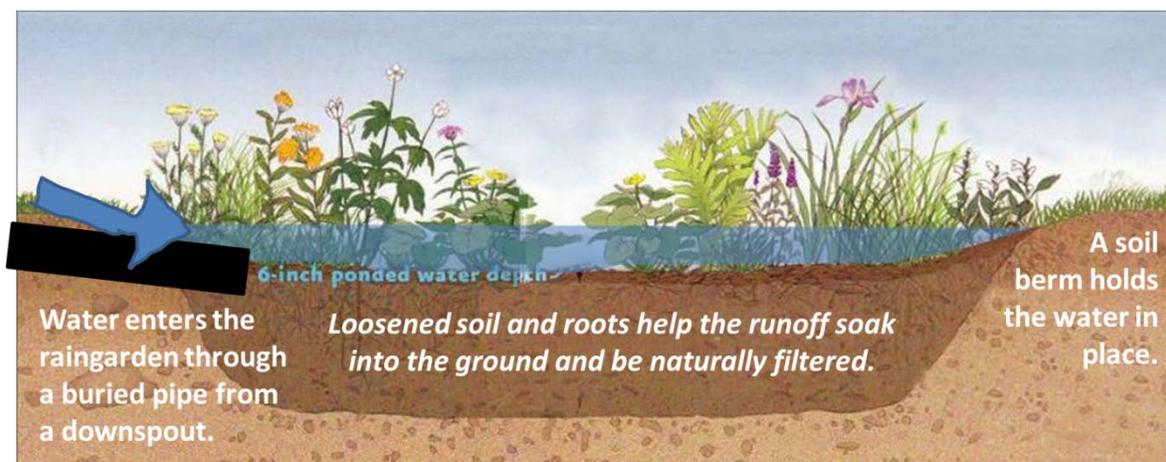
Polluted runoff is leaving developed areas and entering our bodies of water. Raingardens are an elegant solution to that problem.

Raingardens are a simple concept: they are shallow, flat bottomed, planted basins, designed and located in such a way that they collect and hold runoff in the planted area. This allows the runoff to slowly soak into the soil, where it's naturally treated and filtered, and can then recharge underground aquifers (an important source of drinking water in Dakota County.) Someone walking by likely wouldn't notice anything unusual about the garden, but they're carefully planned.

A raingarden is located at least slightly downhill from a source of runoff (a downspout or parking lot, for example) and is shaped like a very shallow basin, or pool (if full, the basin might be four or five inches deep, at its deepest point.) Runoff can be directed into the raingarden using a buried pipe or an above-ground dry creek bed if the runoff wouldn't naturally flow to that spot. The soil in the basin is loosened, and sometimes mixed with sand to help water infiltrate more quickly. A soil berm or wall holds the water in the basin while it slowly sinks into the ground.

Raingardens are designed to hold water for no longer than 48 hours, so that they don't become a breeding ground for mosquitos. Because they're specifically designed to capture significant amounts of rainwater runoff, they often don't require any watering after they're established, making them a low-maintenance option.

Raingardens can be planted with any species, but deep-rooted native species will help the water soak in even faster (cultivated or non-native varieties of flowers often have shallower root systems.)



## Native Plants

**Native plants** were here before Europeans settled Minnesota. They've evolved here for thousands of years, and are perfectly adapted to the local climate, soil, pests, and other herbivores. They're in balance with one another. They also have very deep roots, which help water infiltrate into the soil, and because they co-evolved with native pollinators, they have exactly what local pollinators need to survive. There is an enormous diversity of native flowering plants and grasses, in all sizes, shapes, and colors.

**Invasive, exotic, or introduced plants** were brought here by people from elsewhere, sometimes directly and purposefully, sometimes by accident. Some introduced/exotic plants don't cause much of a problem, although they might not provide the same benefits as native species. Some introduced plants, however, reproduce and get out of control – these are usually the ones we use the term “invasive” for. This might be because they have an advantage over the native species (like leafing out earlier in the season) that allows them to quickly take over a landscape, creating a monoculture. Often the advantage is that because they didn't co-evolve here with the other species found here, they don't have any local pests – nothing here eats them! They can quickly push out native species, becoming out of control weeds.

**Cultivars** aren't considered native plants either, but they're in a slightly different category. *Cultivar* stands for “cultivated variety.” They are plants that have been bred (similar to domestication in animals) by people, with certain traits selected for, like large flowers, unusual colors, or a loss of thorns. These cultivars or hybrid plants have traits that many people want in their gardens, but typically have lost traits that are desirable for the environment. Often they no longer have a fragrance, so pollinators can't find them, or no longer produce nectar for pollinators. They usually have much shallower roots, so they don't help as much with infiltration. And they often require more maintenance or inputs than native plants - like fertilizers, herbicides, or more watering.

## Pollinators

**Pollinators** are animals that carry pollen from flower to flower, allowing those plants to reproduce and produce fruits and seeds. Pollinators can be butterflies, bees, other insects, birds, or bats. (There have even been recorded instances of other vertebrates, like monkeys and lizards, pollinating plants!) In Minnesota, bees, butterflies, and hummingbirds are common pollinators.

Pollination is an example of **mutualism**, a mutually beneficial symbiotic relationship. The plants are able to reproduce, cross-pollinate with other plants, and produce seeds for a new generation. The pollinators, in turn, receive a “gift” from the plant – nectar or another food source (like some but not all of the pollen or seeds from the plant.) Humans also benefit greatly from the relationship. Researchers estimate that about a third of all of the food we eat on any given day wouldn't exist without the work of animal pollinators.

Unfortunately, many pollinator species, especially native bee species, have been declining drastically around the world. These populations are affected by pesticides, climate change, disease, invasive species, and landscape change.

The latter is one we can all easily fight against. Vast swaths of turf grass or parking lots don't provide a food source for pollinators; what was once a comfortable home for pollinators might now be a food desert. Adding patches of flowering native species provides important feeding and habitat grounds for pollinators, including migrating ones on their travels. Planting native flowers in clumps is important, because one or two plants on their own might not have the noticeable color or fragrance that alerts pollinators to their presence.

## Getting Kids Involved: Activities, Lesson Plans, Videos, & More

This is a collection of links to great resources and lesson plans that exist online. Incorporate these activities and ideas into your curriculum as fits your schedule! Words in bright blue text are hyperlinks.

### STEM: Exploring Water & Runoff

**Crumple a Watershed Activity:** A fun, effective activity to introduce the concept of watersheds. Can be adapted for 2<sup>nd</sup>-7<sup>th</sup> grade students.

[http://fergusonfoundation.org/teacher\\_resources/crumpled\\_paper.pdf](http://fergusonfoundation.org/teacher_resources/crumpled_paper.pdf)

**Where Does All the Runoff Go Activity:** A fun, slightly messy activity to explore how water runs off over different surfaces. Can be adapted for any age level. <https://www.soils.org/files/sssaiys/run-off-volume-activity.pdf>

**Discovering the Watershed Lesson Plan:** A great packet of activities, vocabulary cards, and other resources for teaching on watersheds, from Purdue University. Can be adapted for 4<sup>th</sup>-6<sup>th</sup> grade students. <https://www.extension.purdue.edu/extmedia/FNR/FNR-476-W%20Discovering%20the%20Watershed%2013.pdf>

**National Geographic: In Your Watershed Lesson Plan:** An introductory lesson plan that includes photos and a worksheet. Best for 6<sup>th</sup>-8<sup>th</sup> grade students. <https://www.nationalgeographic.org/activity/in-your-watershed/>

**Urban Runoff Mapping Activity & Lesson Plan:** A great resource for higher-level discussion and mapping of the school yard and factors that affect runoff. Best for 9<sup>th</sup>-12<sup>th</sup> grade students. [https://www.natureworkseverywhere.org/asset/resources/Lesson\\_Plan\\_Urban\\_Runoff\\_v1\\_9\\_8\\_2016.pdf](https://www.natureworkseverywhere.org/asset/resources/Lesson_Plan_Urban_Runoff_v1_9_8_2016.pdf)

**Some great videos to help explain watersheds and urban runoff:**

- Watersheds! From CoCoRaHS HQ: <https://www.youtube.com/watch?v=2pwW2rlGla8&t=125s>
- What is a watershed? From the North Texas Municipal District: <https://www.youtube.com/watch?v=QoqgzJf6LQ>
- Fifteen to the River: Explaining Stormwater Runoff: <https://www.youtube.com/watch?v=GrBEEijxaY>

**Other simple activities to explore your school's watershed and how it produces runoff:**

- **Early Childhood and Elementary:** Go outside and have students pour buckets of water or run a hose on different kinds of surfaces (pavement, lawn grass, a garden), observing what happens to the water. Areas around trees and larger plants will suck up water faster than areas of turfgrass, and of course no water can soak into pavement.
- **Service project:** Have students clean leaves, sticks, and other debris from around any storm drains or surface drains on school property. Be very cautious and wear bright colors if you work in or near a street. All of these materials will otherwise flow directly to the nearest body of water, causing algae blooms or polluted waterways.
- **Understanding Maps:** Request a PDF digital map of your school yard with contour lines from our office at the Dakota SWCD. Have students look at the different elevations (899 feet is higher elevation than 898 feet, for example, and water always travels downhill) to decide how water flows over the landscape when it rains, and which path it will take away from the school yard.
- **Math:** Take some rough measurements to determine the volume of your school's raingarden, if you have one. Determine how much runoff it can trap on land, to be naturally filtered. You can also calculate the area of hard surface that is being directed to the runoff, then multiple that by the depth of rainfall in inches, to calculate how much runoff is being sent to the raingarden every time it rains.

## STEM: Exploring Plants

**Let's Plant Curriculum Unit:** A great unit plan introducing plant anatomy, growth, and care for early elementary learners from Scholastic. Includes multiple activities and lesson plans. Designed for 1<sup>st</sup> and 2<sup>nd</sup> grade students. <https://www.scholastic.com/teachers/unit-plans/teaching-content/lets-plant-unit-about-plant-anatomy-growth-and-care/>

**School Gardens: A Guide to Gardening and Plant Science:** A fantastic set of 31 K-12 lesson plans from Minnesota Agriculture in the Classroom. Focus is on growing edible plants, but many of the lessons will be relevant for raingardens or native gardens as well. Also includes lesson plans on soil type and health. <https://minnesota.agclassroom.org/educator/garden/guide.pdf>

**Native Plant Activities for Kids:** A link to a webpage with several activities and lesson plans for teaching kids about and engaging kids with native plants. Works best for 3<sup>rd</sup>-6<sup>th</sup> grade students. <https://www.cnps.org/education/students/parents-teachers>

**Plant Cycles: Photosynthesis and Transpiration Activities:** Make predictions and record observations on plant photosynthesis and transpiration! Works best for 3<sup>rd</sup> to 6<sup>th</sup> graders.

[https://www.teachengineering.org/activities/view/cub\\_bio\\_lesson04\\_activity1](https://www.teachengineering.org/activities/view/cub_bio_lesson04_activity1)

**Some great videos to introduce the concepts of native and invasive plants:**

- The Beauty of Native Plants, a TedX Talk (based in Midwest):  
<https://www.youtube.com/watch?v=b5eDBUFCav8>
- The threat of invasive species, a Ted-Ed video:  
[https://www.youtube.com/watch?v=spTWwqVP\\_2s](https://www.youtube.com/watch?v=spTWwqVP_2s)
- Wonder Plant Woman vs the Invasive Plant Monster (with kid actors!):  
[https://www.youtube.com/watch?v=uh2i97-s\\_bs](https://www.youtube.com/watch?v=uh2i97-s_bs)
- Why cities should plant more trees: <https://www.youtube.com/watch?v=aKyvGHycngM>
- Landscaping for Clean Water Introduction Workshop from the Dakota SWCD (45 min):  
<https://www.youtube.com/watch?v=GBG9xxbOHR4&t=2s>

**Other simple activities to explore the native plants outside in your garden:**

- **Citizen Science:** Students can use different apps or websites to collect and submit data on biodiversity (number and types of species) and on phenology (timing of seasonal events, like when plants leaf out or produce flowers or seeds) of the plants in the garden. Check out:
  - [Nature's Notebook](#)
  - [BudBurst](#)
  - [iNaturalist](#)
  - [Seek by iNaturalist](#)
- **Observation & Identification:** Students can use online and paper resources to ID as many plant species in the garden as possible. Some great resources that could be used with K-12 students include:
  - Online: [Minnesota Wildflowers](#)
  - Online: [Minnesota DNR: Restore Your Shore Plant Guide](#)
  - Books: *Berries, Nuts, and Seeds Take-Along Guide* and *Wildflowers, Blooms, and Blossoms Take-Along Guide*, both by Diane L Burns
  - The Fandex Wildflower Field Guide
  - Book: *The Peterson First Guide to Wildflowers* by Roger Tory Peterson
- **Using Microscopes:** View plant leaves, roots, flowers, seeds, and more under the microscope (or using hand lenses)! What textures and parts do you notice? Can you see the tiny root hairs and the rigid plant cells? What role do the different structures play?
- **Five Senses Exploration:** Explore the garden using all five senses. Older students can then write about their experiences. What does the garden look like? What colors do they notice? What do they smell? (Have them crush leaves or roots to get a better smell, and get up close to flowers.) What different textures are present? Are their leaves that feel different than expected? If you sit in the garden silently for a minute, what sounds do you notice? Students can even taste the leaves and flowers of most plants – *make sure you pick a plant whose identity you know, and double check its potential toxicity online before having students try anything.* There are very few

toxic plants you might possibly encounter – most plants you'd have in your garden, even if not recommended for eating, would be fine to have a small taste of.

## STEM: Exploring Pollinators & Other Animals that Use the Garden

**Pollinator Garden Curriculum and Activities**: A fabulous collection of lesson plans and activities for use in and around a pollinator garden. There are activities for K-12 audiences.

<https://www.pollinator.org/pollinator.org/assets/generalFiles/Gardens-Curriculum-2010-one-doc.pdf>

**Bugs Can Teach Science! Recorded Webinar and Resources**: A 1.5 hour webinar for teachers on using pollinators to teach standards-based science. Techniques are directed at grades 3+.

[https://learningcenter.nsta.org/products/symposia\\_seminars/PollinatorLive/webseminar2.aspx](https://learningcenter.nsta.org/products/symposia_seminars/PollinatorLive/webseminar2.aspx)

**PollinatorLIVE: Distance Learning Webcasts**: Webcasts to share with students or to watch as teachers, all about plants and pollinators. <https://pollinatorlive.pwnet.org/webcasts/index.php>

**Winter Bird Observation Lesson Plan**: Background information to help plan a winter bird observation and bird feeder activity with your students, near the garden. Can be adapted for any age group, best for 1<sup>st</sup>-8<sup>th</sup> grade. <https://kidsgardening.org/lesson-plans-winter-bird-observation/>

**Teacher Resources from the National Wildlife Federation**: A huge list of wildlife-related lesson plans and webinars, including several focused on pollinators for different age groups and soil and watershed related activities. There are lesson plans for K-12 grade. <https://www.nwf.org/Educational-Resources/Educator-Tools/Lesson-Plans-and-Webinars>

### Some great short videos to introduce pollination:

- Parts of a flower and Pollination from the Dr. Binocs Show: [https://www.youtube.com/watch?v=djPVgjp\\_bdU](https://www.youtube.com/watch?v=djPVgjp_bdU)
- What happens if the bees all die? <https://www.youtube.com/watch?v=JiYBvRfILa>
- Unraveling the Monarch Butterfly Migration Mystery: <https://www.youtube.com/watch?v=fBakLuH6kDY>

### Other simple activities to explore pollinators, birds, and other wildlife in your garden:

- **Citizen Science**: Students can use different apps or websites to collect and submit data on biodiversity (number and types of species) and abundance of animals in the garden. Check out:
  - [iNaturalist](#)
  - [Seek by iNaturalist](#)
  - [Great Lakes Worm Watch](#) (try pouring mustard water on the ground and measuring how many earthworms come wriggling up!)
  - [MN Bee Atlas](#)
  - [Journey North](#)

- **Observation & Identification:** Students can use online and paper resources to find and ID as many animal species in the garden as possible. Birds and mammals can usually be identified to the species level; invertebrates may just be identified to order or family level. Some great resources that could be used with K-12 students include:
  - Online: [Insect Identification Key](#)
  - Books: *Peterson First Guide to Insects*; *Peterson First Guide to Butterflies and Moths*; *Peterson First Guide to Caterpillars*; *Peterson First Guide to Urban Wildlife*; *Peterson First Guide to Birds of North America*
  - Foldout guide: *Butterflies & Moths Pocket Naturalist Guide*
  - Book: *Caterpillars, Bugs, and Butterflies Take-Along Guide* and *Birds, Nests, and Eggs Take-Along Guide* by Mel Boring
  - Book: *National Audubon Society Field Guide to Birds of the Eastern Region*
- **Motion Trap Cameras:** You can purchase motion trap or trail cameras for about \$100 online. If you have the budget for this kind of technology, you can set one up near the garden or around the school yard, put bait (nut butter works the best) in front of it, and see what animals are around at night and when people aren't around! Students can make predictions about which animals they'll see and graph the diversity and abundance results. They can look at numbers of animals seen at different times of day or depending on the weather. They can also do comparison studies, experimenting with different variables, like type of bait (or presence of bait) or different locations in the school yard.
- **Engineering and Building:** Make bee houses! <https://www.nwf.org/Garden-for-Wildlife/Young/Build-a-Bee-House> Or make bird houses or bird baths.
- **Plant milkweed and look for monarch caterpillars at the end of the school year!**
- **Raise butterflies in the classroom:** You can explore the life cycle of butterflies by raising a few in the classroom from caterpillars, then releasing the adult butterflies into your native garden...But read this first!  
[https://monarchjointventure.org/images/uploads/documents/Monarch\\_Rearing\\_Instructions.pdf](https://monarchjointventure.org/images/uploads/documents/Monarch_Rearing_Instructions.pdf)

## STEM: Exploring Soil

**[Kids Gardening: Soils and Environment Lesson Plans](#):** This website includes many great gardening lesson plans for all grade levels, but their several plans on soil are especially great. They have lesson plans and activities on soil microbial life, raingardens, soil texturing, the relationship between soils and plants, and more. Check out "Soil is Alive!" for an overview of the fauna that lives in soil.  
<https://kidsgardening.org/lesson-plans/>

**[Soils for Teachers Resource Guide](#):** This website collects resources for teaching about soil from across the internet, including background and vocabulary, lesson plans, twelve short videos, soil booklets for each state, and more. Lesson plans available for K-12 grade. <https://www.soils4teachers.org/lessons-and-activities>

**The Sponge Model of Soil Activity:** This modeling activity explains how to use a sponge to demonstrate the ability of different soils to soak up water. Can be adapted for any grade level.

<https://www.doctordirt.org/teachingresources/sponge>

**Creating a Soil Profile Activity:** Layers of soil are called soil horizons. Students can create a colorful soil profile for the soil from a pit dug in the school yard or at the edge of the garden.

[https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2\\_054308](https://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/edu/?cid=nrcs142p2_054308)

**Soil Health Theater Videos:** A selection of excellent, short (1-5 minute) videos about soil health, including microbial activity, soil life, the strength and structure of healthy soils (and their ability to withstand erosion), and more. Many of the activities demonstrated in the videos can then be replicated with chunks of soil from your own garden – how well, for example, does your garden’s soil hold together when immersed in water? What kind of a structure does it have?

<https://www.nrcs.usda.gov/wps/portal/nrcs/detailfull/national/soils/health/?cid=stelprdb1048858>

#### **Additional videos exploring the world of soil health:**

- Introduction to Soil, Part 1 (how soils are formed and why soil is important):  
<https://www.youtube.com/watch?v=p166fVxwyuY>
- Microscopic Video of the Life in Soil: [https://www.youtube.com/watch?v=Nzvf0\\_GCiag](https://www.youtube.com/watch?v=Nzvf0_GCiag)
- Soils are living! <https://www.youtube.com/watch?v=Qas9tPQKd8w>

#### **Other simple activities to explore the soils in your garden:**

- There are many ways you can start to observe and describe the soils in your garden:
  - Students can dig small holes and feel the texture of the soil. Does it have large chunks or feel gritty? Is it sticky or smooth? Does it hold together in shapes, like clay? Compare soil texture across different parts of the garden or school yard.
  - What does the soil smell like? (The smell of soil comes from a chemical called *geosmin*, which humans and other animals are extremely sensitive and receptive to:  
<https://microbiologysociety.org/publication/past-issues/soil/article/the-smell-of-the-soil.html>)
  - What different colors are present in the soil? Do the colors change as you dig a deeper hole? Students can mix soil with water and use it to paint.
  - Look at small samples of soil under a microscope. Is anything moving? What tiny microfauna are visible?
- Rapid decomposition is a great sign that there is a lot of microbial activity in your soils, meaning your soil is very healthy. Have students bury a piece of 100% cotton fabric in the soil in the garden, then check on it once every week or so. How quickly does it decompose? They could bury fabric in the garden and elsewhere in the school yard, and compare decomposition rates.

### **Garden Arts & Crafts:**

There is an infinite number of arts-based, garden-inspired activities your students can do outside, in or around your garden. This list represents just a small sample to get you started:

- **Leaf rubbings:** Gain a new appreciation of the textures and veins in leaves by doing leaf rubbings using paper and wax crayons.
- **Solar prints:** Use Sun Print Paper to make long-timeframe “photos” of arranged leaves and flowers from the garden.
- **Nature mandalas:** Have students collect small items from the garden and surrounding area (rocks, leaves, petals, twigs) to create temporary, symmetrical art installations outside, by lying the items in patterns on the ground. This activity forces students to pay close attention to the natural materials around them, as they look for items for their art piece. Remind them to consider “Leave No Trace” principles – don’t pick blooming flowers (leave them for the pollinators!) and don’t collect more than 2-3 leaves from the same plant.
- **Be the Camera – Partner Activity:** Split the students up into pairs. One student will be the “camera,” the other will be the “photographer.” The Camera should close their eyes, with the Photographer standing behind them, hands lightly on their shoulders. The Photographer will gently guide the Camera around the perimeter of the garden, with the Camera’s eyes still closed. They can ask the Camera to tilt their head, squat down, etc, as the Photographer lines up “the shot” they want. Then, when the Photographer is ready, they’ll give a gentle squeeze to the Camera’s shoulders – “taking a photo.” The Camera will open their eyes, without moving their head or body, for two seconds, then close them again, preserving the mental image in their mind. You can ask the Photographer to capture specific images (“something that represents life to you,” “something that shows struggle or overcoming challenge,” “something with purple or blue in it”) or just whatever they’re interested. After the Photographer takes two or three images, have the pair swap roles. Then, gather in a large circle and discuss what it was like to be a Camera and a Photographer. Have each person choose one “image” to briefly describe to the group. How did this activity help them notice their ecosystem in new ways?

## Garden Safety Tips

Exploring outside in your garden and schoolyard is a pretty safe activity! With that said, remember to:

- Stay hydrated on hot days and encourage students to bring water bottles out with them
- Avoid physical activities outdoors at the hottest part of the day, on very hot and humid days; heat exhaustion and dehydration can happen very quickly, especially with children
- Wear brightly colored clothing or safety vests and station a lookout for vehicles whenever students are working near a street or parking lot with vehicle traffic
- Teach the students how to identify ticks and encourage them to do a tick check after working outside, especially mid-May through the end of the school year, and late September and October <https://www.dnr.state.mn.us/insects/deerticks/index.html>
- Know how to identify and avoid poison ivy, wild parsnip, and stinging nettles
  - [https://www.canr.msu.edu/news/identifying\\_poison\\_ivy\\_isnt\\_always\\_easy\\_to\\_do](https://www.canr.msu.edu/news/identifying_poison_ivy_isnt_always_easy_to_do)
  - <http://eekwi.org/veg/plants/wildparsnip.htm>
  - <https://www.minnesotawildflowers.info/flower/stinging-nettle>

## Getting Youth Involved in Garden Maintenance

This section should not be intended as a complete guide to garden maintenance – if you or your school's grounds staff have questions about seasonal maintenance, pests, weeds, raingarden infiltration, they can contact our office with questions or to request a maintenance pamphlet!

This is a list of ways that students can get hands-on experience caring for the garden. Having the students spend a little time working in the garden will give them both a sense of ownership and stewardship.

### Start of School Year: Early Fall

- Weeding! Have students pull weeds, attempting to get the seeds/fruits before they drop.
- Seed collection! Once seeds of desired plants are ripe, students can collect them and store them in labeled paper envelopes. They can take them home, store them somewhere cool and dry, and plant them wherever they want next year! (Some seeds need to be in the cold in order to germinate. Google seed collecting and planting recommendations for the specific plant.)
- Mark plants for division! Have students look for plants that are ready to be divided – flopping outward from the center, dying in the center, run out of space to expand. Put a wooden stake or other marker by the plant. It can be split and divided next spring.
- Bouquets! Students can collect and dry flowers and grasses for dried flower bouquets.
- *Leave grasses, stems, and other vegetation standing until soils have warmed to 50 degrees or above next spring.*

### Winter:

- This is a great time for bird watching. Starting in February or March, they can also start monitoring the garden for the first signs of leaves and buds.

### End of School Year/Spring:

- Weeding! Students should wait until seedlings are large enough to identify, to be sure they aren't pulling the desirable plants.
- Mulching! Once every couple years or so, when the garden is still new, you'll need to add 1-2 inches of shredded mulch around the plants. Students can help spread it.
- Cleaning debris! Remove sticks, old dead leaves, etc from any raingarden inlets. Wear gardening gloves.