



# RIVEREDGE

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## NATURE CENTER

### **Cedarburg School District** **Inquiry Learning in the School Natural Area**

#### **Riveredge School Naturalists:**

A Riveredge Environmental Educator is designated to work with the teachers and students at each of the three elementary schools throughout the year to support the use of the school natural areas. The Riveredge Educator provides regular and on-call collaboration, resources and programming for teachers in regards to the implementation of inquiry-based learning. The following document is intended to assist teachers in successfully integrating environmental learning activities in the schools' natural areas into the curriculum. In addition, resources such as websites and science based children's books are provided to assist teachers as they continue to find meaningful ways to connect their classroom learning with the outdoors.

#### **Classroom Kits for Outdoor Inquiry:**

*Items marked with (\*) are available in each school's outdoor classroom tool kits purchased and assembled in 2014. Most of the other items can be easily gathered from students. For more information on how to use the tools please refer to 'Using Your School's Scientific Tools for Outdoor Inquiry.'*

- **Bug Collecting**
  - Sweep nets \*
  - Small bug boxes with magnifying lid \*
  - Parmesan cheese containers of various sizes
  - Plastic baby food containers
- **Soil Tools**
  - Soil probe \*
  - Soil thermometer \*
  - Metal spoons (to sample soil)
  - Ziploc bags and plastic baby food containers (to collect soil)
  - Small glass baby food containers (to fill with water and soil, shake, and let settle into soil layers)
- **Guide Books**
  - Soil keys
  - Invertebrate guides (picture guides and booklet with descriptions)
- **Outdoor Research Tools**
  - Hand lenses \*
  - Teacher bag to carry materials \*
  - Student bags for carrying and organizing materials \*
  - Heavy garbage bags cut into squares to create sit-upons
  - Colored pencils for sketching
  - Large crayons for leaf/bark rubbings
  - Clipboards or heavy cardboard cut to clipboard size

## Using Your School's Scientific Tools for Outdoor Inquiry:

### Equipment You Have at Your School:

- Soil probes
- Thermometers
- Hand lenses
- Sweep nets
- Bug boxes
- Teaching bag and several student bags

### Hand Lens

#### Instructions:

- Place the rope of the hand lens over your head. This will prevent the hand lens from getting lost.
- Practice using the hand lens by looking at your hand.
  - With one hand, hold the hand lens a few inches from your eye. The distance varies from person to person, but it should never be touching your eye.
  - Choose which of the 3 lenses to look through. The largest lens has the lowest magnification; the smallest lens has the highest magnification.
  - Move your other hand up slowly towards the lens. Your hand will look blurry and will be out of focus until you have it at just the right distance.

#### Suggested Investigations:

- Use your hand lens to get an up-close view of anything you like: bird feathers, grasshopper eyes, tree bark, leaves, soil, you name it!

### Soil probe

#### Instructions:

- With both hands, hold the handle of the probe and press downwards firmly into the soil.
- Your sample may fill the entire probe or you may only get an inch or so of soil. Both results are fine. Each result tells you something about the soil. What does the amount of soil you collected have to do with soil type, moisture level, and the amount and type of plant roots?
- Do not twist as you press the probe into the soil. This may cause the tip to come loose and become stuck in the ground. If you hit a rock, simply remove and try a different spot. Never sit on the handle as this will cause the soil probe to bend, and it will be harder to take future samples.
- Always remove all of the soil from the soil probe after each use.

#### Suggested investigations:

- **Observe the soil horizon:** Does the color, texture, or soil type change from top to bottom?
- **Determine the moisture level. Roll the soil** between your fingers. Is it moist? Dry? Saturated?
- **What does your soil smell like?** Does it smell like sand, clay, and/or organic matter?
- **Use your hand lens** to look at the particles that make up your soil. Do you find rocks, sand, roots, or leaves?
- **Determine your soil type.** Is it pure sand (like you'd find at the beach), clay (sticky), or silt (slippery)? Most likely, it is a mixture of soil types plus organic matter (loam). If it is loam, does it

seem to be made up mostly of sand (sandy loam); mostly of clay (clay loam), or mostly silt (silty loam)?

- **Make a soil rubbing.** Simply take a pinch of soil and rub it on paper as you would a crayon, shake off the excess, and there you are! If the soil changes from top to bottom, you may want to make 2-3 rubbings from different levels in the soil auger and examine the soil horizon.

### **Air/Soil/Water Thermometer**

#### **Instructions:**

- Before you begin measuring temperature, be sure you understand how the thermometer is calibrated so you can read it immediately and get accurate results.
- Always hold the thermometer at the stem, just below the dial. Holding it by the dial itself will disturb the calibration.
- The tip of the thermometer's stem is the area that measures the temperature. If you hold the thermometer at the tip, your own body temperature will affect the results.
- The thermometer will need a couple of minutes to take an accurate reading. Record the temperature *after* the needle has completely stopped moving on the dial.

#### **Suggested Investigations:**

- **Measure soil temperature at the surface of the soil.** Hold the thermometer just under the dial with the tip touching the surface of the soil (just under the leaf litter).
- **Measure soil temperature 2 inches below the surface.** Keep a firm grip under the dial with one hand. With the thumb and index of your other hand, hold the stem 2 inches above the tip. Gently push the thermometer into the soil until your thumb and index finger touch the ground. Now take your thumb and index finger away so you are only holding the thermometer with the hand placed below the dial so that your hand is not affecting the temperature.
- **Measure the air temperature.** Hold the thermometer just under the dial. Make sure the tip of the stem is touching nothing but air!
- **Measure water temperature at surface and 2 inches below the surface.** Hold the thermometer just under the dial with the tip touching the surface of the water. Record. Keeping a firm grip, lower the thermometer until the tip is 2 inches below the water. Record and compare.

### **Bug Box**

#### **Instructions:**

- Select a bug box and have it ready in your hand. Crouch down close to the ground and gently pull up some leaf litter or carefully roll over a small rock, log, or branch.
- Look for movement and carefully collect the small invertebrates you find, place them in your box, and close the lid.
- Replace the leaf litter, rock, log, or branch.
- Make sure to put your invertebrate back where you found it before returning your bug box!
- Carefully place your clean and empty bug box back in the storage bag. Don't toss it in because it could break against the other bug boxes.

#### **Suggested Investigations:**

- **So everyone has a chance to see all of the invertebrates collected, play "Pass It."** Decide which direction everyone will pass. Make sure everyone knows how to hold the bug box by the top and bottom so it doesn't fall apart. One person is the caller who calls out, "1-2-3 pass." The caller makes

sure there is enough time between passes for everyone to look closely at the invertebrate. When everyone has the invertebrate they started with once again, the game is complete! Share discoveries and questions.

- **Research an invertebrate that interests you** to determine its name and the role it plays in this ecosystem (herbivore, omnivore, carnivore, or decomposer). Find out about its lifecycle, adaptations, survival needs, and habitat. What questions come up for you as you research?
- **Collect, compare, and contrast the different types of invertebrates you find in different areas** of your schoolyard. Do some invertebrates live only in certain areas? Do some invertebrates live in all areas of the schoolyard? What questions come up for you as you investigate?
- **Collect invertebrates in different seasons or at least a few weeks apart.** Do the types and numbers of invertebrates change or do they stay consistent?

### Sweep Net

#### Instructions:

- Work in a group of 4-6 students.
- Take the small sheet out of your sweep net and spread it out on the trail. This is your bug stage! Place some bug boxes around the edges of the bug stage so they are ready for you when the invertebrates are released from the net. The boxes will also keep the bug stage from blowing away!
- Take turns sweeping for insects. Each person should sweep 6-10 times before passing the net to the next person.
- When it is your turn to sweep, one hand grips the pole just beneath the net. The other hand grips the pole further down. Use a gentle sweeping motion to push the net through the grasses. (Gentle sweeps capture more invertebrates!) After each sweep, make sure the net opening is facing upwards so that nothing falls out.
- The last person to sweep carries the net over to the bug stage and turns the net completely inside out over the bug stage. Everyone else kneels around the stage and carefully puts the invertebrates into bug boxes. *Some invertebrates are so delicate that it works best to place a few fingers underneath the bug stage and turn a small portion of the sheet over to drop the invertebrate into the box.*
- Once all of the invertebrates are collected, shake out the bug stage into the grass before placing it back in the net for storage.
- Carry the net with the pole close to your body and the net over your shoulder. To prevent ripping, don't place anything in the net besides the bug stage.

#### Suggested Investigations:

- **Play Pass It.**
- **Compare Mowed to Un-mowed Areas:** Use the sweep net to collect and investigate invertebrates found in an un-mowed area. Record the number and variety found. Now, sweep in a mowed area. Record the number and variety found. Compare and contrast.
- **Think of other comparisons to make** such as uphill areas versus downhill areas, shady spots versus sunny spots, and early fall/spring versus late fall/spring. What questions and further investigations come up for you?

## **Ideas for Ongoing School Wide Projects:**

- **School Natural Area Field Guide** – Each grade level contributes to the project. Research and create illustrated information pages about plants, animals, fungi, and even abiotic conditions in the school natural area.
- **Nature Buddies** – Older students pair up with younger students for habitat healing projects (planting trees, pulling invasive species, etc.)
- **Parent “Nature Guides”** – Parents who volunteer to regularly to assist classroom teacher when visiting School Nature Area.

## **Ideas for Outdoor Activities to Support Classroom Learning:**

### **Kindergarten – Grade 2**

#### **The 5 Senses**

- Go on a senses scavenger hunt outside looking for textures, colors, sounds, smells and tastes (can bring along fruit or other garden items if you are unsure of tasting from nature).
- In fall, create a color wheel using fallen leaves.
- Read The Leaf Man and then have the student collect leaves for their own pictures.
- Brainstorm a list of 5 describing words (soft, prickly, hard, and smooth, etc.) Have the students each find one thing from nature that fits on their palm that represents one of those words. Take turns sharing the discovery and guessing which word it represents. Graph the results.
- Take students on an ABC hike. Ask them to find as many things as they can that start with each letter of the alphabet.
- Make a sound map. Sit in one spot as a group or individually and listen. Place an X in the middle of a piece of paper to symbolize where you are sitting. As you hear different sounds, draw them on the paper in the direction they came from.
- Have the students close their eyes. Hold up their fingers counting each different sound they hear. Students share their discoveries.
- Go on a sound hunt. Using a pencil or popsicle stick, have students tap on natural items as they walk to discover interesting ‘music’ in nature. Collect natural items to make wind chime/mobiles.
- Collect leaves in the fall and sort by color, shape, etc. Graph results.

#### **Environmental Science**

- Look for signs of human influence in nature (trails, litter) and create a ‘Nature Helper’ plan. This could include planting, weeding, picking up litter, clearing trails of sticks and debris.
- Ask a Riveredge Naturalist to help identify invasive species growing in the school natural area such as garlic mustard, and then plan a service learning day of pulling invasives.

#### **Earth Science – Day and Night; Weather & Seasons; Land & Water**

- Take temperature throughout the year at various locations (black top vs. grassy area, shade vs. sun, underground, etc.). In winter, compare the air temperature to the temperature in the snow and discuss the idea of snow as an insulator.
- Make an outdoor sundial and mark specific times such as ‘recess ends, line up.’
- On a sunny day, have the students partner to draw chalk outlines of their shadows on the pavement. Return later to compare how their shadow shape has changed. Develop ideas as to what is causing the changes.
- Have students choose a ‘special spot’ in the outdoor classroom. Visit it once a month and have student record in writing or pictures things that change at their spot during the year. Record temperatures and other details in each entry. At end of year use journal pages to create a ‘Special Spot’ book. Encourage students to find their own special spots at home.
- In winter find an untracked area of snow and mark it with a hula hoop, rope or other item. Place a small cache of seed in the center. Visit it the next day to look for tracks and signs of wildlife who

visited during the night. Have students draw pictures or create stories of what they think happened during the night.

- Visit various locations outdoors such as the prairie, grassy lawn, bare soil, pavement, etc. Pour a measured amount of water on the ground and time how long it takes to soak in. Ask students to determine why it takes longer in some areas than others.
- Collect soil samples from various places outdoors. Mix each sample with water in a small bottle, shake the mixture and watch how it settles and separates into layers. Discuss with students why this happens. Ask them to bring soil samples from their backyards and repeat the experiment.
- Have each student choose a 'special spot.' Visit once a month to record seasonal changes.
- Have students sit outside and choose one plant or animal to consider. Write a creative story about what happens to that plant/animal during a significant weather event.
- Record temperature, sunrise & sunset, rainfall, snow and other data. Have students use various types of graphs to record the information. Discuss how different graphs (bar, circle, etc.) are useful to show different things.
- Collect a leaf from a tree in the natural area each day when the leaves begin to change color and record the date. Dry the leaves in a press, laminate them and arrange them on a poster with their dates. Explore pigmentation and find out the reason leaves change color. As a possible extension, record observations about the weather such as daily high and low temperatures, sunrise/sunset time, etc. How does this affect color change?

### **Life Science – Plants and Animals; Living Things; Biomes; Habitats**

- Go on a pollinator hunt. Record types of pollinators, or colors of flowers they are visiting. Graph your findings.
- Assign students or groups certain outdoor classroom animals. Have them search for food, shelter and water for their animal. Have them create a shelter space for their animal. Tour the different shelters and have students present their creation and how it meets the animal's basic needs.
- In fall go on a seed collecting hunt. Categorize the seeds by size, shape or how they move (wind, animal, etc.) Create a chart showing seed diversity in the outdoor classroom.
- Roll play being a caterpillar and turning into a butterfly. Find food for a butterfly.
- Sweep for insects using the sweep net and bug boxes. Watch how they move, categorize them to determine which are insects and which are spiders or other invertebrates. Record findings in a nature journal.
- Sweep for insects using the sweep net and bug boxes. Identify insects in the various stages of their life cycles. Have each student research an insect and create a class insect field guide.
- After observing the growth of a bean seed indoors, take the students outdoors to find examples of nature in the various stages of growth. Have them draw and record their findings in a nature journal.
- Make a list of living things in the outdoor classroom. (plant and animal) Have each student select one of the organisms on the list. Once outside, have them find examples of how their organism finds each of the basic survival needs in its environment.
- Have students investigate a decomposing log. What are all the ways that log provides necessities of life for the organisms around it? Have the students draw or take pictures in the outdoor classroom. Use those pictures to create a tree life cycle story.
- Have students collect seeds from the outdoor classroom in the fall. Investigate the different types of seeds. Classify them based on their physical characteristics and investigate how they travel through experimentation. The seeds could be incorporated into a picture each student creates, illustrating the entire life cycle of the plant. In the picture, include each element the plant needs to survive. Ask the students to identify special adaptations.
- Give students time to explore the forest in the rain. Back in the classroom have them write a story or poem about their experience.
- What are the elements that make up the outdoor classroom biome? Visit and explore, then have students create visual representations of the outdoor classroom identifying all of the elements (weather, organisms, and physical elements).
- Develop a food chain based on observations in the outdoor classroom.

- Record weather data throughout the year. Create graphs and charts. Compare to previous years, or research data from other biomes and compare. What would cause the variations?
- Play Water Cycle Relay (description available from Riveredge). Have the students write creative stories describing the experiences of their water molecule during the game.
- How many different habitats can the students identify in your school yard? Form teams and assign each team a habitat. Have them explore in depth the characteristics of their habitat. Present their findings. Challenge students to find connections between the habitats, showing that ALL habitats are not independent of each other and are interconnected.
- Use the outdoor classroom to explore the concept of ecology as it relates to a grasslands or forest biome. Have students survey and compare the biodiversity in small sections of mowed lawn and long grass prairie. After they have completed their inventory, compare the results and discuss the habitat value of different sites. Charts and/or graphs can be created to illustrate their findings.
- Have students create their own field guides as a classroom project, incorporating vocabulary words and drawings.
- Have students work together to construct a mural of the things they encounter in the outdoor classroom. Have them label everything and/or illustrate interactions they observed. Small samples of living plants, seeds, soil rubbings and other natural materials can be incorporated into the mural to add interest.

### **Physical Science - Force & Motion; Solids, Liquids & Gas**

- Watch how insects move and ask students to record what they observe. What affects how an insect moves and why it needs to move? Have students act out how the insect they observed moved and have others guess which insect it is.
- Look for signs of force and motion in plants. Roots pushing up through soil, spring ephemerals pushing up through fallen leaves and vines pulling upward are all good observations to consider. Observe a soft plant breaking apart asphalt or concrete. Have students consider the force required. Write creative stories from the plant's perspective.
- Make lists of natural forces that can be observed. Divide the list into 'push' forces and 'pull' forces. Have students compare their lists.
- Go on a water scavenger hunt in the winter. Look for all 3 forms of matter.
- Have students explore outside and identify natural matter (10 solids, 5 liquids, 3 gases) If any other teams have the same things listed those are eliminated from the lists. Total the number of original items still on each teams' list to determine a winner.
- Place a plastic baggie over the leaves of a tree or shrub, and close the end with a twist tie. Visit later in the day to observe the condensation forming on the inside of the baggie. Discuss how plants use 'transpiration' and are a major source of moisture in the air.

### **Grade 3 – Grade 5**

#### **Scientific Inquiry**

- The outdoor classroom is ideal for developing and testing hypothesis. Students can investigate plants or animals found in the playground vs. the natural area; species of plants; rate of spring growth in sun vs. shade; rate of snowfall/melt in forested vs. un-forested areas; temperature in various areas (open field, forest, under leaf litter, in mowed grass, 4 ft. off ground, etc.)
- Look for signs of erosion. Have students find places where erosion is impacting the plants and animals. Have students experiment with various erosion control plans.
- Place a simple rain gauge in multiple areas of the outdoor classroom. (in the open, under tree cover, under brush or dense ground cover) record measurements and make comparisons. Have students design investigations to test their hypotheses on how the different locations influence the plants and animals that live there.

#### **Earth Science: Solar System; Rocks & Minerals, Properties of Matter**

- Have students collect rocks from the Outdoor Classroom. Categorize them. Create a rock field guide. Write a creative story on how that rock got to the Outdoor Classroom.

- Form teams and conduct experiments in winter to melt an ice cube. Students can try placing one on black paper, one on white. Conduct experiments in warmer weather to create a container to insulate an ice cube.
- Place an ice cube in a plastic bottle. On a warm day set it outside. Have students check and report on which state of matter it is in.
- **Life Science: Biomes; Human Body**
- Use the sweep net and bug boxes to collect insects. Have students investigate how their bodies move. Ask students to create a super human with one attribute from an insect they studied. Discuss the term ‘biomimicry’ and how science uses it today.
- Share the current trend of some doctors prescribing ‘Vitamin N’ (nature) to people for depression or tiredness. Have students spend a quiet period of time in a ‘special spot’ outside. Ask them to brainstorm all the ways nature can help humans be more healthy. Use the following journal prompt: “Why do doctors believe vitamin N makes people healthier?”
- Visit the outdoor classroom on a rainy day. It’s raining in the forest, but it’s still not a rainforest! Why? As they hike, have students visualize exploring a rainforest. Compare and contrast what would be found in the rainforest with what they find in this deciduous forest. Many areas of focus can be explored: comparing the niches living things fulfill in each biome; the survival adaptations living things have in each biome; the biodiversity of each biome, the changes in each biome over the course of one year, etc. To represent their findings, students may create a Venn diagram for rainforests and deciduous forests.
- Visit the outdoor classroom and have students locate as many ways as they can that the Outdoor Classroom is connected to a biome somewhere else in the world (i.e. moisture given off from the forest trees may rain in the Great Lakes).

#### **Physical Science: Force & Motion; Electricity & Magnetism**

- Test movement of a dropped ball in a hilly area. Look for signs of how gravity affects plant growth.
- Examine signs of frost heaving; have students develop theories regarding the force needed and how it affects the environment.
- Find examples of how nature’s force is more powerful than humans (roots or grass breaking down asphalt, etc.). Have students develop proposals on ways humans can work WITH nature’s force.
- Have students make hypotheses about what is outdoors that is magnetic. Take magnets outside to test their hypotheses on both manmade and natural materials. (Some sand or dirt may contain iron or magnetite that will be attracted!)
- Create a magnetic scavenger hunt in the outdoor classroom. Hide magnetic materials and have students hunt for and collect them with magnets.

### **Ecology and Nature Websites for Kids and Teachers:**

#### **General Ecology:**

- EEK! Environmental Education for Kids. An educational online magazine brought to you by the Wisconsin Department of Natural Resources. <http://dnr.wi.gov/eeek/>
- Organism Menu. Detailed information on plants, animals, and other living things is provided by Island Creek Elementary School. Includes information on how each species is related to other living things in an ecosystem. [http://www.fcps.edu/islandcreekes/ecology/organism\\_menu.htm](http://www.fcps.edu/islandcreekes/ecology/organism_menu.htm)
- Habitats. Information also provided by Island Creek Elementary School; explores a variety of habitats in depth with photos and ecological information. <http://www.fcps.edu/islandcreekes/ecology/habitat.htm>

- Biokids: Kids' Inquiry of Diverse Species. University of Michigan online field guides created for kids; includes photographs from their specimen collection, wildlife sound recordings, and information on how to identify wildlife based on the signs they leave behind. <http://www.biokids.umich.edu/>
- Biomes of the World. Missouri Botanical Gardens provides in-depth information and photographs for kids on terrestrial biomes and freshwater and marine ecosystems. <http://www.mbgnet.net/index.html>
- Biology of Plants. Missouri Botanical Gardens provides in-depth information for kids on plant growth, pollination, seed dispersal, and adaptations to living in different habitats. <http://www.mbgnet.net/bioplants/>
- EekoWorld (Environmental Education for Kids Online) features an engaging and interactive format that invites children to explore, experiment, and collaborate as they learn about conservation and the environment. <http://pbskids.org/EEKOWORLD/index.html>

#### **Prairies:**

- Bell Museum Prairie Field Guide. An online field guide to the plants and animals of the prairie; written for kids. <http://www.bellmuseum.umn.edu/games/prairie/fieldguide/>

#### **Climate Change:**

- NASA's Climate Kids. Provides background information and scientific data on the issue of climate change and ways kids can be part of the solution. <http://climate.nasa.gov/kids/>
- EPA Global Climate Change: a student's guide to global climate change. Information for kids on climate, weather, climate change, and the greenhouse effect. <http://www.epa.gov/climatestudents/index.html>
- Weather Wiz Kids. Meteorologist Crystal Wicker designed this website especially for kids to allow them to learn more about the fascinating world of weather. It's also a wonderful educational website for teachers and parents to give them the right tools to explain the different types of weather to children. <http://www.weatherwizkids.com/>

#### **Seasonal Changes:**

- Journey North. The kids' section of this website shares real-life information on seasonal changes and animal migration patterns. A variety of photo, video, chart, and written information is available on butterflies and birds.
  - Monarch Butterflies <http://www.learner.org/jnorth/tm/monarch/jr/KidsJourneyNorth.html>
  - Hummingbirds <http://www.learner.org/jnorth/tm/humm/jr/JnKidsOverview.html>
  - American Robin <http://www.learner.org/jnorth/tm/robin/jr/JnKidsOverview.html>
- Spring Wildflowers. Geared towards adults but accessible by kids, this UW-Madison Arboretum webpage shares photographs and basic information on some of the ephemeral wildflowers that can be found in a Wisconsin woods in the spring. <http://uwarboretum.org/photos/album.php?id=16>

#### **Outdoor Teaching Areas and Teaching Tips:**

*Schoolyard Habitat Project Guide: A Planning Guide for Creating Schoolyard Habitat and Outdoor Classroom Projects* by Carolyn Kolstad, Karleen Vollherbst, and Karen Kelly Mullin, is a 132 page how-to guide for transforming school grounds into a special space outdoors where students can look deeper into the world we share. This book provides a step-by-step outline of the habitat creation process.

U.S. Fish & Wildlife Service, 2011, Free when downloaded from <http://www.fws.gov/cno/conservation/schoolyard.cfm>

***No Student Left Indoors: Creating a Field Guide to Your Schoolyard* by Jane Kirkland**

This 178 page reference guide to observing, documenting and sharing your school's natural environment will give you simple strategies and techniques for starting an outdoor exploration program. Filled with activities, resources, and case studies, this guide will take you from novice trip leader to facilitator of citizen scientists. Centered on producing a field guide for your school grounds, the book suggests various levels of equipment, software and even offers book design and production tips for creating either hand-crafted or desk-top published field guides. Suggested activities include bird watching, journaling, and book production. A great tool for project-based learning in elementary grades, *No Student Left Indoors: Creating a Field Guide to Your Schoolyard* can also be used in upper grades, homeschool, and non-formal settings.

Stillwater Publishing, 2011, 978-0-9709754-9-2 (pb), 178 pp., US \$49.95, CAN \$54.95 from Stillwater Publishing, (610) 458-4000, [www.TakeAWalk.com](http://www.TakeAWalk.com)

***Asphalt to Ecosystems: Design Ideas for Schoolyard Transformation* by Sharon Gamson Danks**

*Asphalt to Ecosystems* is an exuberant, yet grounded, resource for educators, parents, and landscapers ready to change the environments in which we teach and learn. In 276 colorful pages, case studies offer diverse solutions for greening schoolyards by including artistic elements, wildlife habitats, and organic gardens. Within the design process, we are guided to address practical issues such as seating, microclimates and protection from the elements. We also learn to use paths and gateways to moderate the pace of exploration and create special spaces for learning and reflection. Areas for active and creative play as well as areas to create and enjoy art and music help us to understand our local region, materials and culture and help us to develop a sense of place. *Asphalt to Ecosystems* is loaded with thoughtful, well-executed ideas that are already in place at learning centers around the world.

New Village Press, 2010, ISBN-13 978-0-9766054-8-5 (pb), 276 pp., US\$39.95 from New Village Press, (510) 420-1361, <[www.newvillagepress.net](http://www.newvillagepress.net)>

***Schoolyard-Enhanced Learning: Using the Outdoors as an Instructional Tool, K-8* by Herbert W. Broda**  
*Schoolyard-Enhanced Learning* shows how the school grounds – regardless of whether your school is in an urban, suburban, or rural setting – can become an enriching extension of the classroom. In this comprehensive handbook, Herb Broda blends theory and practice, providing readers with practical suggestions and teacher-tested activities for using the most powerful audio-visual tool available – the outdoors. Emphasizing the practical, this innovative book offers teachers step-by-step guidance to help ensure success when they take a class outside.

Stenhouse Publishers, 2007, ISBN 978-1-57110-729-9, 182 pp., from Stenhouse Publishers, [www.stenhouse.com](http://www.stenhouse.com)

**Boston Schoolyard Initiative** [www.schoolyards.org](http://www.schoolyards.org)

**Placed-Based Education Evaluation Collaborative** [www.peecworks.org](http://www.peecworks.org)

**Children and Nature Network** [www.childrenandnature.org](http://www.childrenandnature.org)

**Center for Ecoliteracy** [www.ecoliteracy.org](http://www.ecoliteracy.org)

**Green Teacher Magazine** [www.greenteacher.com](http://www.greenteacher.com)

## Book List

### Kindergarten

- *Box Turtle at Long Pond* by William T. George
- *Come Out, Muskrats* by Jim Arnosky
- *If You Were a Wild Duck Where Would You Go?* by George Mendoza
- *Wonderful Worms* by Linda Glaser
- *The Snail's Spell* by Joanne Ryder
- *A Seed is Sleepy* by Dianna Hutts Aston
- *How Many Seeds in a Pumpkin?* by Margaret McNam
- *Discover the Seasons* by Diane Iverson
- *Animals in Winter* by Henrietta Bancroft
- *The Animals' Winter Sleep* by Lynda Graham-Barber
- *In the Snow: Who's Been Here?* by Lindsay Barrett-George
- *Time to Sleep* by Denise Fleming
- *Jump, Frog, Jump* by Byron Barton
- *Sneaky Salamanders* by Suzanne Paul Dell'Oro
- *From Tadpole to Frog* by Wendy Pfeffer
- *Are You a Snail?* by Judy Allen
- *Hey Diddle Diddle: A Food Chain Tale* by Pam Kapchinske
- *Why Frogs Are Wet* by Judy Hawes
- *Toad* by Ruth Brown

### Grade 1 & 2

- *Letting Swift River Go* by Jane Yolen
- *River Song* by Steve Van Zandt
- *Diary of a Worm* by Harry Bliss and Doreen Cronin
- *A Handful of Dirt* by Raymond Bial
- *Dirt: The Scoop on Soil* by Natalie M. Rosinsky
- *Flip, Float, Fly Seeds on the Move* by JoAnn Early Macken
- *The Dandelion Seed* by Joseph Anthony
- *In a Nutshell* by Joseph Anthony
- *A Seed is Sleepy* by Diana Hutts Aston
- *The Tiny Seed* by Eric Carle
- *Flowers-Fruits-Seeds* by Jerome Wexler
- *Johnny Appleseed* by Rosemary and Stephen Vincent Benet
- *Johnny Appleseed: A Tall Tale* by Stephen Kellog
- *Johnny Appleseed: A Poem* by Reeve Lindbergh
- *When Winter Comes* by Nancy Van Laan
- *Animals in Winter* by Henrietta Bancroft
- *Hibernation* by Margaret Hall
- *How and Why Animals Prepare for Winter* by Elaine Pascoe
- *Time to Sleep* by Denise Flemming
- *Do Polar Bears Snooze in Hollow Trees? A Book about Animal Hibernation* by Laurie Purdie Salas
- *Stranger in the Woods* by Carl R., Sams, II, and Jean Stoick
- *Whose Tracks Are These?* by Jim Nail
- *In The Snow* by Huy Voun Lee
- *In the Snow: Who's Been Here?* by Lindsay George Barrett
- *Under the Snow* by Melissa Stewart

- *Over and Under the Snow* by Kate Messner
- *Not a Stick* by Antoinette Portis
- *Who Lives Here* by Maggie Silver
- *Animal Homes* by Angela Wilkes
- *Amazing Amphibians*
- *Frog Sing Songs* by Yvonne Winer
- *From Tadpole to Frog* by Wendy Pfeffer
- *How to Hide a Meadow Frog* by Ruth Heller
- *Pond Year* by Kathryn Laskey
- *Marsh Music* by Marianne Collins Berkes
- *The Salamander Room* by Anne Mazer
- *The Life Cycle of a Frog* by Ruth Thomson
- *Lizards, Frogs and Polliwogs* by Douglas Florian
- *The Young Scientist Investigates: Pond Life* by Terry Jennings
- *Big Night for Salamanders* by Sarah Lamstein
- *Follow That Map!: A First Book of Mapping Skills* by Scot Ritchie
- *Me on the Map* by Joan Sweeney
- *Secret Place* by Eve Bunting
- *Crinkleroot's Guide to Walking in Wild Places* by Jim Arnosky

### Grade 3 & 4

- *A River Ran Wild* by Lynne Cherry
- *Where the River Begins* by Thomas Locker
- *Water Insects* (Lerner Natural Science Book) by Sylvia A. Johnson and Modoki Masuda
- *One well: The Story of Water on Earth* by Rochelle Strauss
- *Minn of the Mississippi* by Clancy Holling
- *There's a Hair in my Dirt: A Worm's Story* by Gary Larson
- *Soil* by Richard Spilsbury
- *Rocks and Soil* by Steven Hoffman
- *Minibeasts in the Soil* by Sarah Ridley
- *How Seeds Travel* by Cynthia Overbeck
- *Johnny Appleseed* by Eva Moore
- *Seeds: Pop-Stick-Glide* by Patricia Lauber
- *Where They Go in Winter* by Margaret Waring Buck
- *Fang, the Story of a Fox in Winter* by Tessa Potter
- *Animals in Winter* by Martha Rustad
- *Crawdad Creek* by Scott Sanders
- *Salmon Creek* by Annette Lebox
- *Amphibians* by Robert Snedden
- *Frog Girl* by Paul Owen Lewis
- *Frogs* by Alyse Sweeney
- *Your are the Earth: from Dinosaur Breath to Pizza from Dirt* by David Suzuki
- *When a Butterfly Sneezes: A Guide for Helping Kids Explore Interconnections in our World Through Favorite Stories* by Linda Booth Sweeney

### Grade 5

- *Pond & River – Eyewitness Books* by Parker, S., Alfred A. Knopf Inc. New York. 1988
- *The Water Naturalist* by Angel, H. and Wolseley, P., Facts on File, Inc., New York, 1982.
- *Fresh Water Life* by Klots, B., G.P. Putnam's Sons, 1966.

- Parker, S., “Pond & River – Eyewitness Books” by Alfred A. Knopf Inc. New York. 1988
- *A Guide to Common Freshwater Invertebrates of North America* by Reese Voshell, J. Jr. McDonald & Woodward Publishing. Blacksburg, Virginia. 2002
- *The Frog* by Margaret Lane
- *What is a Frog?* by Gene Darby
- *Frogs, Toads, Lizards, and Salamanders* by Nancy Winslow Parker
- *Amphibian* by Eyewitness Books
- *Spring Peepers Are Calling* by Charlene Billings
- *Frog Heaven: Ecology of a Vernal Pool* by Doug Wechsler
- *Salamander Rain: A Lake and Pond Journal* by Kristin Joy Pratt-Serafini
- *Earth Science For Every Kid*. VanCleave, Janice. Wiley, New York City, NY. 1995. Eco-Inquiry. Hogan, Kathleen. Institute of Ecosystem Studies, New York. 1994.
- *Everybody Needs a Rock*. Baylor, Byrd. Scribners, New York. 1974.
- *Life In A Bucket of Soil*. Silverstein, Alvin. Dover, New York. 2000.
- *Nature In A Nutshell For Kids*. Potter, Jean. Wiley, New York City, NY. 1996.
- *Soil Science Simplified*. Harpsted, M. I. and Hole, F. D. Iowa State University Press, Ames IA. 1988.
- *Soil -We Can't Grow Without It -Educator's Guide*. National Wildlife Federation, Washington, D.C., March, 1985.
- *The Worm Book*. Nancarrow, Loren and Hogan Taylor, Janet. Ten Speed Press, Berkeley, CA. 1998.
- *Worms Eat Our Garbage: Classroom Activities for a Better Environment*. Appelhof, Mary, Mary Frances Fenton and Barbara Loss Harris. Flower Press, Kalamazoo, MI. 1993.
- *How Seeds Travel* by Cynthia Overbeck
- *Track Finder* by Miller, Dorcas. Nature Study Guild. Rochester, N.Y. 1981..
- *Tracking & the Art of Seeing* by Rezendes, Paul. Camden House Publishing, Inc. Charlotte, Vermont. 1995.
- *A Guide to Animal Tracking and Behavior* by Stokes, Donald. Little, Brown and Company.



# RIVEREDGE

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## NATURE CENTER

### **Cedarburg School District Inquiry Learning in the School Natural Area**

#### **Riveredge School Naturalists:**

A Riveredge Environmental Educator is designated to work with the teachers and students at each of the three elementary schools throughout the year to support the use of the school natural areas. The Riveredge Educator provides regular and on-call collaboration, resources and programming for teachers in regards to the implementation of inquiry-based learning. The following document is intended to assist teachers in successfully integrating environmental learning activities in the schools' natural areas into the curriculum. In addition, resources such as websites and science based children's books are provided to assist teachers as they continue to find meaningful ways to connect their classroom learning with the outdoors.

#### **Classroom Kits for Outdoor Inquiry:**

*Items marked with (\*) are available in each school's outdoor classroom tool kits purchased and assembled in 2014. Most of the other items can be easily gathered from students. For more information on how to use the tools please refer to 'Using Your School's Scientific Tools for Outdoor Inquiry.'*

- **Bug Collecting**
  - Sweep nets \*
  - Small bug boxes with magnifying lid \*
  - Parmesan cheese containers of various sizes
  - Plastic baby food containers
- **Soil Tools**
  - Soil probe \*
  - Soil thermometer \*
  - Metal spoons (to sample soil)
  - Ziploc bags and plastic baby food containers (to collect soil)
  - Small glass baby food containers (to fill with water and soil, shake, and let settle into soil layers)
- **Guide Books**
  - Soil keys
  - Invertebrate guides (picture guides and booklet with descriptions)
- **Outdoor Research Tools**
  - Hand lenses \*
  - Teacher bag to carry materials \*
  - Student bags for carrying and organizing materials \*
  - Heavy garbage bags cut into squares to create sit-upons
  - Colored pencils for sketching
  - Large crayons for leaf/bark rubbings
  - Clipboards or heavy cardboard cut to clipboard size

## Using Your School's Scientific Tools for Outdoor Inquiry:

### Equipment You Have at Your School:

- Soil probes
- Thermometers
- Hand lenses
- Sweep nets
- Bug boxes
- Teaching bag and several student bags

### Hand Lens

#### Instructions:

- Place the rope of the hand lens over your head. This will prevent the hand lens from getting lost.
- Practice using the hand lens by looking at your hand.
  - With one hand, hold the hand lens a few inches from your eye. The distance varies from person to person, but it should never be touching your eye.
  - Choose which of the 3 lenses to look through. The largest lens has the lowest magnification; the smallest lens has the highest magnification.
  - Move your other hand up slowly towards the lens. Your hand will look blurry and will be out of focus until you have it at just the right distance.

#### Suggested Investigations:

- Use your hand lens to get an up-close view of anything you like: bird feathers, grasshopper eyes, tree bark, leaves, soil, you name it!

### Soil probe

#### Instructions:

- With both hands, hold the handle of the probe and press downwards firmly into the soil.
- Your sample may fill the entire probe or you may only get an inch or so of soil. Both results are fine. Each result tells you something about the soil. What does the amount of soil you collected have to do with soil type, moisture level, and the amount and type of plant roots?
- Do not twist as you press the probe into the soil. This may cause the tip to come loose and become stuck in the ground. If you hit a rock, simply remove and try a different spot. Never sit on the handle as this will cause the soil probe to bend, and it will be harder to take future samples.
- Always remove all of the soil from the soil probe after each use.

#### Suggested investigations:

- **Observe the soil horizon:** Does the color, texture, or soil type change from top to bottom?
- **Determine the moisture level. Roll the soil** between your fingers. Is it moist? Dry? Saturated?
- **What does your soil smell like?** Does it smell like sand, clay, and/or organic matter?
- **Use your hand lens** to look at the particles that make up your soil. Do you find rocks, sand, roots, or leaves?
- **Determine your soil type.** Is it pure sand (like you'd find at the beach), clay (sticky), or silt (slippery)? Most likely, it is a mixture of soil types plus organic matter (loam). If it is loam, does it

seem to be made up mostly of sand (sandy loam); mostly of clay (clay loam), or mostly silt (silty loam)?

- **Make a soil rubbing.** Simply take a pinch of soil and rub it on paper as you would a crayon, shake off the excess, and there you are! If the soil changes from top to bottom, you may want to make 2-3 rubbings from different levels in the soil auger and examine the soil horizon.

### **Air/Soil/Water Thermometer**

#### **Instructions:**

- Before you begin measuring temperature, be sure you understand how the thermometer is calibrated so you can read it immediately and get accurate results.
- Always hold the thermometer at the stem, just below the dial. Holding it by the dial itself will disturb the calibration.
- The tip of the thermometer's stem is the area that measures the temperature. If you hold the thermometer at the tip, your own body temperature will affect the results.
- The thermometer will need a couple of minutes to take an accurate reading. Record the temperature *after* the needle has completely stopped moving on the dial.

#### **Suggested Investigations:**

- **Measure soil temperature at the surface of the soil.** Hold the thermometer just under the dial with the tip touching the surface of the soil (just under the leaf litter).
- **Measure soil temperature 2 inches below the surface.** Keep a firm grip under the dial with one hand. With the thumb and index of your other hand, hold the stem 2 inches above the tip. Gently push the thermometer into the soil until your thumb and index finger touch the ground. Now take your thumb and index finger away so you are only holding the thermometer with the hand placed below the dial so that your hand is not affecting the temperature.
- **Measure the air temperature.** Hold the thermometer just under the dial. Make sure the tip of the stem is touching nothing but air!
- **Measure water temperature at surface and 2 inches below the surface.** Hold the thermometer just under the dial with the tip touching the surface of the water. Record. Keeping a firm grip, lower the thermometer until the tip is 2 inches below the water. Record and compare.

### **Bug Box**

#### **Instructions:**

- Select a bug box and have it ready in your hand. Crouch down close to the ground and gently pull up some leaf litter or carefully roll over a small rock, log, or branch.
- Look for movement and carefully collect the small invertebrates you find, place them in your box, and close the lid.
- Replace the leaf litter, rock, log, or branch.
- Make sure to put your invertebrate back where you found it before returning your bug box!
- Carefully place your clean and empty bug box back in the storage bag. Don't toss it in because it could break against the other bug boxes.

#### **Suggested Investigations:**

- **So everyone has a chance to see all of the invertebrates collected, play "Pass It."** Decide which direction everyone will pass. Make sure everyone knows how to hold the bug box by the top and bottom so it doesn't fall apart. One person is the caller who calls out, "1-2-3 pass." The caller makes

sure there is enough time between passes for everyone to look closely at the invertebrate. When everyone has the invertebrate they started with once again, the game is complete! Share discoveries and questions.

- **Research an invertebrate that interests you** to determine its name and the role it plays in this ecosystem (herbivore, omnivore, carnivore, or decomposer). Find out about its lifecycle, adaptations, survival needs, and habitat. What questions come up for you as you research?
- **Collect, compare, and contrast the different types of invertebrates you find in different areas** of your schoolyard. Do some invertebrates live only in certain areas? Do some invertebrates live in all areas of the schoolyard? What questions come up for you as you investigate?
- **Collect invertebrates in different seasons or at least a few weeks apart.** Do the types and numbers of invertebrates change or do they stay consistent?

### Sweep Net

#### Instructions:

- Work in a group of 4-6 students.
- Take the small sheet out of your sweep net and spread it out on the trail. This is your bug stage! Place some bug boxes around the edges of the bug stage so they are ready for you when the invertebrates are released from the net. The boxes will also keep the bug stage from blowing away!
- Take turns sweeping for insects. Each person should sweep 6-10 times before passing the net to the next person.
- When it is your turn to sweep, one hand grips the pole just beneath the net. The other hand grips the pole further down. Use a gentle sweeping motion to push the net through the grasses. (Gentle sweeps capture more invertebrates!) After each sweep, make sure the net opening is facing upwards so that nothing falls out.
- The last person to sweep carries the net over to the bug stage and turns the net completely inside out over the bug stage. Everyone else kneels around the stage and carefully puts the invertebrates into bug boxes. *Some invertebrates are so delicate that it works best to place a few fingers underneath the bug stage and turn a small portion of the sheet over to drop the invertebrate into the box.*
- Once all of the invertebrates are collected, shake out the bug stage into the grass before placing it back in the net for storage.
- Carry the net with the pole close to your body and the net over your shoulder. To prevent ripping, don't place anything in the net besides the bug stage.

#### Suggested Investigations:

- **Play Pass It.**
- **Compare Mowed to Un-mowed Areas:** Use the sweep net to collect and investigate invertebrates found in an un-mowed area. Record the number and variety found. Now, sweep in a mowed area. Record the number and variety found. Compare and contrast.
- **Think of other comparisons to make** such as uphill areas versus downhill areas, shady spots versus sunny spots, and early fall/spring versus late fall/spring. What questions and further investigations come up for you?

## **Ideas for Ongoing School Wide Projects:**

- **School Natural Area Field Guide** – Each grade level contributes to the project. Research and create illustrated information pages about plants, animals, fungi, and even abiotic conditions in the school natural area.
- **Nature Buddies** – Older students pair up with younger students for habitat healing projects (planting trees, pulling invasive species, etc.)
- **Parent “Nature Guides”** – Parents who volunteer to regularly to assist classroom teacher when visiting School Nature Area.

## **Ideas for Outdoor Activities to Support Classroom Learning:**

### **Kindergarten – Grade 2**

#### **The 5 Senses**

- Go on a senses scavenger hunt outside looking for textures, colors, sounds, smells and tastes (can bring along fruit or other garden items if you are unsure of tasting from nature).
- In fall, create a color wheel using fallen leaves.
- Read The Leaf Man and then have the student collect leaves for their own pictures.
- Brainstorm a list of 5 describing words (soft, prickly, hard, and smooth, etc.) Have the students each find one thing from nature that fits on their palm that represents one of those words. Take turns sharing the discovery and guessing which word it represents. Graph the results.
- Take students on an ABC hike. Ask them to find as many things as they can that start with each letter of the alphabet.
- Make a sound map. Sit in one spot as a group or individually and listen. Place an X in the middle of a piece of paper to symbolize where you are sitting. As you hear different sounds, draw them on the paper in the direction they came from.
- Have the students close their eyes. Hold up their fingers counting each different sound they hear. Students share their discoveries.
- Go on a sound hunt. Using a pencil or popsicle stick, have students tap on natural items as they walk to discover interesting ‘music’ in nature. Collect natural items to make wind chime/mobiles.
- Collect leaves in the fall and sort by color, shape, etc. Graph results.

#### **Environmental Science**

- Look for signs of human influence in nature (trails, litter) and create a ‘Nature Helper’ plan. This could include planting, weeding, picking up litter, clearing trails of sticks and debris.
- Ask a Riveredge Naturalist to help identify invasive species growing in the school natural area such as garlic mustard, and then plan a service learning day of pulling invasives.

#### **Earth Science – Day and Night; Weather & Seasons; Land & Water**

- Take temperature throughout the year at various locations (black top vs. grassy area, shade vs. sun, underground, etc.). In winter, compare the air temperature to the temperature in the snow and discuss the idea of snow as an insulator.
- Make an outdoor sundial and mark specific times such as ‘recess ends, line up.’
- On a sunny day, have the students partner to draw chalk outlines of their shadows on the pavement. Return later to compare how their shadow shape has changed. Develop ideas as to what is causing the changes.
- Have students choose a ‘special spot’ in the outdoor classroom. Visit it once a month and have student record in writing or pictures things that change at their spot during the year. Record temperatures and other details in each entry. At end of year use journal pages to create a ‘Special Spot’ book. Encourage students to find their own special spots at home.
- In winter find an untracked area of snow and mark it with a hula hoop, rope or other item. Place a small cache of seed in the center. Visit it the next day to look for tracks and signs of wildlife who

visited during the night. Have students draw pictures or create stories of what they think happened during the night.

- Visit various locations outdoors such as the prairie, grassy lawn, bare soil, pavement, etc. Pour a measured amount of water on the ground and time how long it takes to soak in. Ask students to determine why it takes longer in some areas than others.
- Collect soil samples from various places outdoors. Mix each sample with water in a small bottle, shake the mixture and watch how it settles and separates into layers. Discuss with students why this happens. Ask them to bring soil samples from their backyards and repeat the experiment.
- Have each student choose a 'special spot.' Visit once a month to record seasonal changes.
- Have students sit outside and choose one plant or animal to consider. Write a creative story about what happens to that plant/animal during a significant weather event.
- Record temperature, sunrise & sunset, rainfall, snow and other data. Have students use various types of graphs to record the information. Discuss how different graphs (bar, circle, etc.) are useful to show different things.
- Collect a leaf from a tree in the natural area each day when the leaves begin to change color and record the date. Dry the leaves in a press, laminate them and arrange them on a poster with their dates. Explore pigmentation and find out the reason leaves change color. As a possible extension, record observations about the weather such as daily high and low temperatures, sunrise/sunset time, etc. How does this affect color change?

### **Life Science – Plants and Animals; Living Things; Biomes; Habitats**

- Go on a pollinator hunt. Record types of pollinators, or colors of flowers they are visiting. Graph your findings.
- Assign students or groups certain outdoor classroom animals. Have them search for food, shelter and water for their animal. Have them create a shelter space for their animal. Tour the different shelters and have students present their creation and how it meets the animal's basic needs.
- In fall go on a seed collecting hunt. Categorize the seeds by size, shape or how they move (wind, animal, etc.) Create a chart showing seed diversity in the outdoor classroom.
- Roll play being a caterpillar and turning into a butterfly. Find food for a butterfly.
- Sweep for insects using the sweep net and bug boxes. Watch how they move, categorize them to determine which are insects and which are spiders or other invertebrates. Record findings in a nature journal.
- Sweep for insects using the sweep net and bug boxes. Identify insects in the various stages of their life cycles. Have each student research an insect and create a class insect field guide.
- After observing the growth of a bean seed indoors, take the students outdoors to find examples of nature in the various stages of growth. Have them draw and record their findings in a nature journal.
- Make a list of living things in the outdoor classroom. (plant and animal) Have each student select one of the organisms on the list. Once outside, have them find examples of how their organism finds each of the basic survival needs in its environment.
- Have students investigate a decomposing log. What are all the ways that log provides necessities of life for the organisms around it? Have the students draw or take pictures in the outdoor classroom. Use those pictures to create a tree life cycle story.
- Have students collect seeds from the outdoor classroom in the fall. Investigate the different types of seeds. Classify them based on their physical characteristics and investigate how they travel through experimentation. The seeds could be incorporated into a picture each student creates, illustrating the entire life cycle of the plant. In the picture, include each element the plant needs to survive. Ask the students to identify special adaptations.
- Give students time to explore the forest in the rain. Back in the classroom have them write a story or poem about their experience.
- What are the elements that make up the outdoor classroom biome? Visit and explore, then have students create visual representations of the outdoor classroom identifying all of the elements (weather, organisms, and physical elements).
- Develop a food chain based on observations in the outdoor classroom.

- Record weather data throughout the year. Create graphs and charts. Compare to previous years, or research data from other biomes and compare. What would cause the variations?
- Play Water Cycle Relay (description available from Riveredge). Have the students write creative stories describing the experiences of their water molecule during the game.
- How many different habitats can the students identify in your school yard? Form teams and assign each team a habitat. Have them explore in depth the characteristics of their habitat. Present their findings. Challenge students to find connections between the habitats, showing that ALL habitats are not independent of each other and are interconnected.
- Use the outdoor classroom to explore the concept of ecology as it relates to a grasslands or forest biome. Have students survey and compare the biodiversity in small sections of mowed lawn and long grass prairie. After they have completed their inventory, compare the results and discuss the habitat value of different sites. Charts and/or graphs can be created to illustrate their findings.
- Have students create their own field guides as a classroom project, incorporating vocabulary words and drawings.
- Have students work together to construct a mural of the things they encounter in the outdoor classroom. Have them label everything and/or illustrate interactions they observed. Small samples of living plants, seeds, soil rubbings and other natural materials can be incorporated into the mural to add interest.

### **Physical Science - Force & Motion; Solids, Liquids & Gas**

- Watch how insects move and ask students to record what they observe. What affects how an insect moves and why it needs to move? Have students act out how the insect they observed moved and have others guess which insect it is.
- Look for signs of force and motion in plants. Roots pushing up through soil, spring ephemerals pushing up through fallen leaves and vines pulling upward are all good observations to consider. Observe a soft plant breaking apart asphalt or concrete. Have students consider the force required. Write creative stories from the plant's perspective.
- Make lists of natural forces that can be observed. Divide the list into 'push' forces and 'pull' forces. Have students compare their lists.
- Go on a water scavenger hunt in the winter. Look for all 3 forms of matter.
- Have students explore outside and identify natural matter (10 solids, 5 liquids, 3 gases) If any other teams have the same things listed those are eliminated from the lists. Total the number of original items still on each teams' list to determine a winner.
- Place a plastic baggie over the leaves of a tree or shrub, and close the end with a twist tie. Visit later in the day to observe the condensation forming on the inside of the baggie. Discuss how plants use 'transpiration' and are a major source of moisture in the air.

### **Grade 3 – Grade 5**

#### **Scientific Inquiry**

- The outdoor classroom is ideal for developing and testing hypothesis. Students can investigate plants or animals found in the playground vs. the natural area; species of plants; rate of spring growth in sun vs. shade; rate of snowfall/melt in forested vs. un-forested areas; temperature in various areas (open field, forest, under leaf litter, in mowed grass, 4 ft. off ground, etc.)
- Look for signs of erosion. Have students find places where erosion is impacting the plants and animals. Have students experiment with various erosion control plans.
- Place a simple rain gauge in multiple areas of the outdoor classroom. (in the open, under tree cover, under brush or dense ground cover) record measurements and make comparisons. Have students design investigations to test their hypotheses on how the different locations influence the plants and animals that live there.

#### **Earth Science: Solar System; Rocks & Minerals, Properties of Matter**

- Have students collect rocks from the Outdoor Classroom. Categorize them. Create a rock field guide. Write a creative story on how that rock got to the Outdoor Classroom.

- Form teams and conduct experiments in winter to melt an ice cube. Students can try placing one on black paper, one on white. Conduct experiments in warmer weather to create a container to insulate an ice cube.
- Place an ice cube in a plastic bottle. On a warm day set it outside. Have students check and report on which state of matter it is in.
- **Life Science: Biomes; Human Body**
- Use the sweep net and bug boxes to collect insects. Have students investigate how their bodies move. Ask students to create a super human with one attribute from an insect they studied. Discuss the term ‘biomimicry’ and how science uses it today.
- Share the current trend of some doctors prescribing ‘Vitamin N’ (nature) to people for depression or tiredness. Have students spend a quiet period of time in a ‘special spot’ outside. Ask them to brainstorm all the ways nature can help humans be more healthy. Use the following journal prompt: “Why do doctors believe vitamin N makes people healthier?”
- Visit the outdoor classroom on a rainy day. It’s raining in the forest, but it’s still not a rainforest! Why? As they hike, have students visualize exploring a rainforest. Compare and contrast what would be found in the rainforest with what they find in this deciduous forest. Many areas of focus can be explored: comparing the niches living things fulfill in each biome; the survival adaptations living things have in each biome; the biodiversity of each biome, the changes in each biome over the course of one year, etc. To represent their findings, students may create a Venn diagram for rainforests and deciduous forests.
- Visit the outdoor classroom and have students locate as many ways as they can that the Outdoor Classroom is connected to a biome somewhere else in the world (i.e. moisture given off from the forest trees may rain in the Great Lakes).

#### **Physical Science: Force & Motion; Electricity & Magnetism**

- Test movement of a dropped ball in a hilly area. Look for signs of how gravity affects plant growth.
- Examine signs of frost heaving; have students develop theories regarding the force needed and how it affects the environment.
- Find examples of how nature’s force is more powerful than humans (roots or grass breaking down asphalt, etc.). Have students develop proposals on ways humans can work WITH nature’s force.
- Have students make hypotheses about what is outdoors that is magnetic. Take magnets outside to test their hypotheses on both manmade and natural materials. (Some sand or dirt may contain iron or magnetite that will be attracted!)
- Create a magnetic scavenger hunt in the outdoor classroom. Hide magnetic materials and have students hunt for and collect them with magnets.

### **Ecology and Nature Websites for Kids and Teachers:**

#### **General Ecology:**

- EEK! Environmental Education for Kids. An educational online magazine brought to you by the Wisconsin Department of Natural Resources. <http://dnr.wi.gov/eeek/>
- Organism Menu. Detailed information on plants, animals, and other living things is provided by Island Creek Elementary School. Includes information on how each species is related to other living things in an ecosystem. [http://www.fcps.edu/islandcreekes/ecology/organism\\_menu.htm](http://www.fcps.edu/islandcreekes/ecology/organism_menu.htm)
- Habitats. Information also provided by Island Creek Elementary School; explores a variety of habitats in depth with photos and ecological information. <http://www.fcps.edu/islandcreekes/ecology/habitat.htm>

- Biokids: Kids' Inquiry of Diverse Species. University of Michigan online field guides created for kids; includes photographs from their specimen collection, wildlife sound recordings, and information on how to identify wildlife based on the signs they leave behind. <http://www.biokids.umich.edu/>
- Biomes of the World. Missouri Botanical Gardens provides in-depth information and photographs for kids on terrestrial biomes and freshwater and marine ecosystems. <http://www.mbgnet.net/index.html>
- Biology of Plants. Missouri Botanical Gardens provides in-depth information for kids on plant growth, pollination, seed dispersal, and adaptations to living in different habitats. <http://www.mbgnet.net/bioplants/>
- EekoWorld (Environmental Education for Kids Online) features an engaging and interactive format that invites children to explore, experiment, and collaborate as they learn about conservation and the environment. <http://pbskids.org/eeeworld/index.html>

#### **Prairies:**

- Bell Museum Prairie Field Guide. An online field guide to the plants and animals of the prairie; written for kids. <http://www.bellmuseum.umn.edu/games/prairie/fieldguide/>

#### **Climate Change:**

- NASA's Climate Kids. Provides background information and scientific data on the issue of climate change and ways kids can be part of the solution. <http://climate.nasa.gov/kids/>
- EPA Global Climate Change: a student's guide to global climate change. Information for kids on climate, weather, climate change, and the greenhouse effect. <http://www.epa.gov/climatestudents/index.html>
- Weather Wiz Kids. Meteorologist Crystal Wicker designed this website especially for kids to allow them to learn more about the fascinating world of weather. It's also a wonderful educational website for teachers and parents to give them the right tools to explain the different types of weather to children. <http://www.weatherwizkids.com/>

#### **Seasonal Changes:**

- Journey North. The kids' section of this website shares real-life information on seasonal changes and animal migration patterns. A variety of photo, video, chart, and written information is available on butterflies and birds.
  - Monarch Butterflies <http://www.learner.org/jnorth/tm/monarch/jr/KidsJourneyNorth.html>
  - Hummingbirds <http://www.learner.org/jnorth/tm/humm/jr/JnKidsOverview.html>
  - American Robin <http://www.learner.org/jnorth/tm/robin/jr/JnKidsOverview.html>
- Spring Wildflowers. Geared towards adults but accessible by kids, this UW-Madison Arboretum webpage shares photographs and basic information on some of the ephemeral wildflowers that can be found in a Wisconsin woods in the spring. <http://uwarboretum.org/photos/album.php?id=16>

#### **Outdoor Teaching Areas and Teaching Tips:**

*Schoolyard Habitat Project Guide: A Planning Guide for Creating Schoolyard Habitat and Outdoor Classroom Projects* by Carolyn Kolstad, Karleen Vollherbst, and Karen Kelly Mullin, is a 132 page how-to guide for transforming school grounds into a special space outdoors where students can look deeper into the world we share. This book provides a step-by-step outline of the habitat creation process.

U.S. Fish & Wildlife Service, 2011, Free when downloaded from <http://www.fws.gov/cno/conservation/schoolyard.cfm>

***No Student Left Indoors: Creating a Field Guide to Your Schoolyard* by Jane Kirkland**

This 178 page reference guide to observing, documenting and sharing your school's natural environment will give you simple strategies and techniques for starting an outdoor exploration program. Filled with activities, resources, and case studies, this guide will take you from novice trip leader to facilitator of citizen scientists. Centered on producing a field guide for your school grounds, the book suggests various levels of equipment, software and even offers book design and production tips for creating either hand-crafted or desk-top published field guides. Suggested activities include bird watching, journaling, and book production. A great tool for project-based learning in elementary grades, *No Student Left Indoors: Creating a Field Guide to Your Schoolyard* can also be used in upper grades, homeschool, and non-formal settings.

Stillwater Publishing, 2011, 978-0-9709754-9-2 (pb), 178 pp., US \$49.95, CAN \$54.95 from Stillwater Publishing, (610) 458-4000, [www.TakeAWalk.com](http://www.TakeAWalk.com)

***Asphalt to Ecosystems: Design Ideas for Schoolyard Transformation* by Sharon Gamson Danks**

*Asphalt to Ecosystems* is an exuberant, yet grounded, resource for educators, parents, and landscapers ready to change the environments in which we teach and learn. In 276 colorful pages, case studies offer diverse solutions for greening schoolyards by including artistic elements, wildlife habitats, and organic gardens. Within the design process, we are guided to address practical issues such as seating, microclimates and protection from the elements. We also learn to use paths and gateways to moderate the pace of exploration and create special spaces for learning and reflection. Areas for active and creative play as well as areas to create and enjoy art and music help us to understand our local region, materials and culture and help us to develop a sense of place. *Asphalt to Ecosystems* is loaded with thoughtful, well-executed ideas that are already in place at learning centers around the world.

New Village Press, 2010, ISBN-13 978-0-9766054-8-5 (pb), 276 pp., US\$39.95 from New Village Press, (510) 420-1361, <[www.newvillagepress.net](http://www.newvillagepress.net)>

***Schoolyard-Enhanced Learning: Using the Outdoors as an Instructional Tool, K-8* by Herbert W. Broda**  
*Schoolyard-Enhanced Learning* shows how the school grounds – regardless of whether your school is in an urban, suburban, or rural setting – can become an enriching extension of the classroom. In this comprehensive handbook, Herb Broda blends theory and practice, providing readers with practical suggestions and teacher-tested activities for using the most powerful audio-visual tool available – the outdoors. Emphasizing the practical, this innovative book offers teachers step-by-step guidance to help ensure success when they take a class outside.

Stenhouse Publishers, 2007, ISBN 978-1-57110-729-9, 182 pp., from Stenhouse Publishers, [www.stenhouse.com](http://www.stenhouse.com)

**Boston Schoolyard Initiative** [www.schoolyards.org](http://www.schoolyards.org)

**Placed-Based Education Evaluation Collaborative** [www.peecworks.org](http://www.peecworks.org)

**Children and Nature Network** [www.childrenandnature.org](http://www.childrenandnature.org)

**Center for Ecoliteracy** [www.ecoliteracy.org](http://www.ecoliteracy.org)

**Green Teacher Magazine** [www.greenteacher.com](http://www.greenteacher.com)

## Book List

### Kindergarten

- *Box Turtle at Long Pond* by William T. George
- *Come Out, Muskrats* by Jim Arnosky
- *If You Were a Wild Duck Where Would You Go?* by George Mendoza
- *Wonderful Worms* by Linda Glaser
- *The Snail's Spell* by Joanne Ryder
- *A Seed is Sleepy* by Dianna Hutts Aston
- *How Many Seeds in a Pumpkin?* by Margaret McNam
- *Discover the Seasons* by Diane Iverson
- *Animals in Winter* by Henrietta Bancroft
- *The Animals' Winter Sleep* by Lynda Graham-Barber
- *In the Snow: Who's Been Here?* by Lindsay Barrett-George
- *Time to Sleep* by Denise Fleming
- *Jump, Frog, Jump* by Byron Barton
- *Sneaky Salamanders* by Suzanne Paul Dell'Oro
- *From Tadpole to Frog* by Wendy Pfeffer
- *Are You a Snail?* by Judy Allen
- *Hey Diddle Diddle: A Food Chain Tale* by Pam Kapchinske
- *Why Frogs Are Wet* by Judy Hawes
- *Toad* by Ruth Brown

### Grade 1 & 2

- *Letting Swift River Go* by Jane Yolen
- *River Song* by Steve Van Zandt
- *Diary of a Worm* by Harry Bliss and Doreen Cronin
- *A Handful of Dirt* by Raymond Bial
- *Dirt: The Scoop on Soil* by Natalie M. Rosinsky
- *Flip, Float, Fly Seeds on the Move* by JoAnn Early Macken
- *The Dandelion Seed* by Joseph Anthony
- *In a Nutshell* by Joseph Anthony
- *A Seed is Sleepy* by Diana Hutts Aston
- *The Tiny Seed* by Eric Carle
- *Flowers-Fruits-Seeds* by Jerome Wexler
- *Johnny Appleseed* by Rosemary and Stephen Vincent Benet
- *Johnny Appleseed: A Tall Tale* by Stephen Kellog
- *Johnny Appleseed: A Poem* by Reeve Lindbergh
- *When Winter Comes* by Nancy Van Laan
- *Animals in Winter* by Henrietta Bancroft
- *Hibernation* by Margaret Hall
- *How and Why Animals Prepare for Winter* by Elaine Pascoe
- *Time to Sleep* by Denise Flemming
- *Do Polar Bears Snooze in Hollow Trees? A Book about Animal Hibernation* by Laurie Purdie Salas
- *Stranger in the Woods* by Carl R., Sams, II, and Jean Stoick
- *Whose Tracks Are These?* by Jim Nail
- *In The Snow* by Huy Voun Lee
- *In the Snow: Who's Been Here?* by Lindsay George Barrett
- *Under the Snow* by Melissa Stewart

- *Over and Under the Snow* by Kate Messner
- *Not a Stick* by Antoinette Portis
- *Who Lives Here* by Maggie Silver
- *Animal Homes* by Angela Wilkes
- *Amazing Amphibians*
- *Frog Sing Songs* by Yvonne Winer
- *From Tadpole to Frog* by Wendy Pfeffer
- *How to Hide a Meadow Frog* by Ruth Heller
- *Pond Year* by Kathryn Laskey
- *Marsh Music* by Marianne Collins Berkes
- *The Salamander Room* by Anne Mazer
- *The Life Cycle of a Frog* by Ruth Thomson
- *Lizards, Frogs and Polliwogs* by Douglas Florian
- *The Young Scientist Investigates: Pond Life* by Terry Jennings
- *Big Night for Salamanders* by Sarah Lamstein
- *Follow That Map!: A First Book of Mapping Skills* by Scot Ritchie
- *Me on the Map* by Joan Sweeney
- *Secret Place* by Eve Bunting
- *Crinkleroot's Guide to Walking in Wild Places* by Jim Arnosky

### Grade 3 & 4

- *A River Ran Wild* by Lynne Cherry
- *Where the River Begins* by Thomas Locker
- *Water Insects* (Lerner Natural Science Book) by Sylvia A. Johnson and Modoki Masuda
- *One well: The Story of Water on Earth* by Rochelle Strauss
- *Minn of the Mississippi* by Clancy Holling
- *There's a Hair in my Dirt: A Worm's Story* by Gary Larson
- *Soil* by Richard Spilsbury
- *Rocks and Soil* by Steven Hoffman
- *Minibeasts in the Soil* by Sarah Ridley
- *How Seeds Travel* by Cynthia Overbeck
- *Johnny Appleseed* by Eva Moore
- *Seeds: Pop-Stick-Glide* by Patricia Lauber
- *Where They Go in Winter* by Margaret Waring Buck
- *Fang, the Story of a Fox in Winter* by Tessa Potter
- *Animals in Winter* by Martha Rustad
- *Crawdad Creek* by Scott Sanders
- *Salmon Creek* by Annette Lebox
- *Amphibians* by Robert Snedden
- *Frog Girl* by Paul Owen Lewis
- *Frogs* by Alyse Sweeney
- *Your are the Earth: from Dinosaur Breath to Pizza from Dirt* by David Suzuki
- *When a Butterfly Sneezes: A Guide for Helping Kids Explore Interconnections in our World Through Favorite Stories* by Linda Booth Sweeney

### Grade 5

- *Pond & River – Eyewitness Books* by Parker, S., Alfred A. Knopf Inc. New York. 1988
- *The Water Naturalist* by Angel, H. and Wolseley, P., Facts on File, Inc., New York, 1982.
- *Fresh Water Life* by Klots, B., G.P. Putnam's Sons, 1966.

- Parker, S., “Pond & River – Eyewitness Books” by Alfred A. Knopf Inc. New York. 1988
- *A Guide to Common Freshwater Invertebrates of North America* by Reese Voshell, J. Jr. McDonald & Woodward Publishing. Blacksburg, Virginia. 2002
- *The Frog* by Margaret Lane
- *What is a Frog?* by Gene Darby
- *Frogs, Toads, Lizards, and Salamanders* by Nancy Winslow Parker
- *Amphibian* by Eyewitness Books
- *Spring Peepers Are Calling* by Charlene Billings
- *Frog Heaven: Ecology of a Vernal Pool* by Doug Wechsler
- *Salamander Rain: A Lake and Pond Journal* by Kristin Joy Pratt-Serafini
- *Earth Science For Every Kid*. VanCleave, Janice. Wiley, New York City, NY. 1995. Eco-Inquiry. Hogan, Kathleen. Institute of Ecosystem Studies, New York. 1994.
- *Everybody Needs a Rock*. Baylor, Byrd. Scribners, New York. 1974.
- *Life In A Bucket of Soil*. Silverstein, Alvin. Dover, New York. 2000.
- *Nature In A Nutshell For Kids*. Potter, Jean. Wiley, New York City, NY. 1996.
- *Soil Science Simplified*. Harpsted, M. I. and Hole, F. D. Iowa State University Press, Ames IA. 1988.
- *Soil -We Can't Grow Without It -Educator's Guide*. National Wildlife Federation, Washington, D.C., March, 1985.
- *The Worm Book*. Nancarrow, Loren and Hogan Taylor, Janet. Ten Speed Press, Berkeley, CA. 1998.
- *Worms Eat Our Garbage: Classroom Activities for a Better Environment*. Appelhof, Mary, Mary Frances Fenton and Barbara Loss Harris. Flower Press, Kalamazoo, MI. 1993.
- *How Seeds Travel* by Cynthia Overbeck
- *Track Finder* by Miller, Dorcas. Nature Study Guild. Rochester, N.Y. 1981..
- *Tracking & the Art of Seeing* by Rezendes, Paul. Camden House Publishing, Inc. Charlotte, Vermont. 1995.
- *A Guide to Animal Tracking and Behavior* by Stokes, Donald. Little, Brown and Company.