

LIVING SCHOOLYARD ACTIVITY GUIDE

CALIFORNIA EDITION | 2016



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This *Activity Guide* was published by Green Schoolyards America in honor of the second celebration of Living Schoolyard Month in California in May 2016. Each year we update its content and add new activity ideas. It is available free of charge on our website at: www.greenschoolyards.org

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GREEN SCHOOLYARDS AMERICA is a national organization that expands and strengthens the green schoolyard movement and empowers Americans to become stewards of their school and neighborhood environments. We believe that school grounds are uniquely positioned to enrich the daily lives of children and their communities, occupying both the geographic and social heart of almost every city across the USA and around the world. We provide resources, training and support for pre-K-12 school districts and partner with nonprofits, businesses, government agencies and utilities to effect change across the country.

We invite like-minded professionals and organizations to join us in this work and collaborate to nurture and grow the international movement to green school grounds. To sign up for our mailing list, please visit our website:

www.greenschoolyards.org



WHAT ARE LIVING SCHOOLYARDS?

“Living schoolyards are richly layered outdoor environments on school grounds that strengthen local ecological systems while providing place-based, hands-on learning resources for children and youth of all ages. They are child-centered places that foster exploration, adventure and a wide range of play and social opportunities, while enhancing health and wellbeing and engaging the community.”

— Sharon Danks, CEO, Green Schoolyards America



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2016 Living Schoolyard Activity Guide California Edition

May 2016 is the second annual celebration of Living Schoolyard Month in California—an event aligned with the annual global celebration of International School Grounds Month (<http://bit.ly/ISGAmay>). We hope the *California Edition* of Green Schoolyards America’s *Living Schoolyard Activity Guide* will encourage schools across the state, and around the world, to take their students outside during the month of May—and throughout the year—to celebrate their grounds and use them to their fullest.

This *Activity Guide* was developed by Green Schoolyards America with written and photographic contributions from our colleagues from 54 other organizations across the state of California, including: school districts, state and national government agencies, non-profit organizations, museums, universities, businesses and utilities.

Our partner organizations contributed a wide range of interdisciplinary ideas that are intended to support learning across the curriculum, promote healthy lifestyles, and encourage play and exploration during children’s free time, before, during and after school. Many of the activities also focus on ways to help children and youth build “place-based understanding,” and connect to their neighborhood’s unique

natural, geographic and cultural context. We hope their ideas will inspire you and help you get started dreaming up outdoor activities for your own local school, wherever you live.

Each page in the *Activity Guide* notes the approximate age range that is suggested for the activity as it is written, but we hope that educators will also adapt the ideas for wider use. This publication was designed with preschool through high school aged students in mind, so we have designated suggested age ranges for each activity, from 3 to 18 years old. Some activities may also be useful for younger and older individuals.

Please visit our website each year to download the most recent version of this *Activity Guide*, which is updated annually. We hope you will also enjoy our two other companion publications, with ideas gathered from our colleagues in the Midwest (USA) and around the world. Together the three publications include a total of 147 activities for children and youth, written by 123 organizations. More information about these additional resources can be found on page 79.

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Celebrate in May!

We hope you will be inspired by the ideas in this *Activity Guide*, and will use your school grounds to their fullest in May, and throughout the year.

After you have participated in Living Schoolyard Month, please share your adventures with us by taking the time to register on our website to tell us what you did! We are very interested in hearing from you. Your participation and reporting of your activities will help us spread the word to other schools, governments and organizations who might be able to help promote and support green schoolyards around the world in the future.



YOUR CELEBRATION

Please tell us about your schoolyard adventures in May by sending us the following information:

- Name of your school
- School location: city, state, country
- A brief description of how you celebrated Living Schoolyard Month (100-400 words)
- Photo(s) showing your activity in progress. (Please confirm you have permission to use these images and to share them with the public in print and online.)
- Contact name and email address
- Age range and number of participating students
- School or project website (if you have one)

Email this to: info@greenschoolyards.org
or submit it via our website: <http://bit.ly/GSAregr1>

Following the event, we will share many of the activity reports we receive by posting them on our website and social networks. We are looking forward to hearing about your work and hope you enjoy the celebration!



green schoolyards america : Living Schoolyard
greenschoolyards.org : Activity Guide – California

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Introduction

When you think about typical school grounds, what image first comes to mind? For many people, school grounds are places covered by paved surfaces and manicured sports fields, adorned with a few, simple shrubs and trees, and one or two ordinary climbing structures. Most school grounds look the same, with very little variation to reflect unique aspects of each school community, the neighborhood's ecological or geographic context, or teachers' preferred curricula.

Children are masters at reading what Wendy Titman calls the "hidden curriculum" of school grounds, and understand the value adults place on them through the level of care given to their surroundings. The messages most traditional schoolyards send children about their place in the world is not reassuring—particularly in our cities where many school sites are paved and are home to very few living things.

Outside of school, spaces children can explore on their own have been shrinking over the last few generations, reducing children's domain from miles of free ranging territory to the limited zone between home and the end of the block. Schoolyards are now one of the only places many children are allowed to play outdoors on a daily basis, and they are increasingly important for fostering children's health and development. With this in mind, schools have a special responsibility to provide the next generation with outdoor

experiences that help them develop their curiosity, their sense of adventure, a healthy lifestyle and a love of nature.

A green or "living" schoolyard movement is gaining momentum around the globe and has the potential to improve the lives of *every child, every day*. Schools are reshaping their conventional yards, designed for 1940s educational methods, and creating beautiful, ecologically diverse landscapes with an eye toward the future. School ground greening creates rich environments that connect nature and environmental sustainability with place-based learning, hands-on curricula, and imaginative play, while also building community.

The movement is growing around the world, and we invite you to join us in this vitally important work.

WHAT ARE LIVING SCHOOLYARDS?

Living schoolyards are richly layered outdoor environments on school grounds that connect nature and local ecological systems with place-based learning, hands-on curricula, and a wide range of play and social opportunities for children and youth of all ages, while engaging the community.



WHY ENRICH SCHOOL GROUNDS?

TEACH PLACE-BASED UNDERSTANDING. Living schoolyards provide opportunities for students to tune in to their surroundings and get hands-on experience with nature while gaining a better understanding of their own neighborhoods. They help children mark the seasons with changes in wildlife migrations, colorful leaves in autumn, and the length of shadows on the ground. They bring watershed education to life, as classes step outside when it rains to watch the rain flow off their school building, through a downspout, and out into the school's rain garden or cistern. Many excellent, low-cost educational resources sit right outside the classroom doors, waiting to be tapped.

PRACTICE STEWARDSHIP. Ecologically-rich schoolyards address important environmental issues in ways that even young children can participate in and understand. Students can identify place-based environmental concerns themselves and become empowered to repair them, enriching their own corner of the world with their ingenuity. While these individual actions may be small, together these projects can fundamentally improve the local environment and profoundly change the way that students understand their place in the world. This is an inspiring and optimistic way to approach the field of environmental education.

FOSTER ADVENTURE, WONDER AND HEALTH. Green school grounds foster children's social, physical and intellectual growth by providing settings for imagination, exploration, adventure and wonder, and serve as dynamic environments in which to run, hop, skip, jump, twirl, eat and play in active, challenging and creative ways. Enriched school grounds provide child-driven, play-based solutions to the obesity epidemic and can promote healthier lifestyles through increased physical activity and nutrition-oriented gardening and cooking programs.

ENGAGE THE COMMUNITY. Living schoolyards teach ecological literacy, invigorate children's bodies, open and inspire young minds, and knit our communities more closely together in the process. Successful green schoolyards are the product of many hands that harness the collaborative potential of their school communities. Like the barn raisings of previous generations, cooperation among community members reinforces interdependence, local self-reliance and a sense of community creating useful, beautiful places at low cost. When parents, teachers and students work together to improve their school and grounds, they foster closer relationships that in turn support student achievement and well-being. This movement shifts the way our society views these important, shared public spaces, and supports school district land management efforts with the energy of community partners.



The transition from a conventional, paved schoolyard to a living schoolyard can be dramatic and opens up a variety of opportunities for children to learn, play and explore.

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MODEL THE FUTURE YOU WOULD LIKE TO SEE

Well-designed green schoolyards model the ecologically-rich cities we would like to inhabit, at a smaller scale, and teach the next generation how to live more lightly on the Earth—shaping places where urbanization and nature coexist and natural systems are prominent and visible, for all to enjoy.

They inspire students and their communities with organic food production, wildlife habitat, energy conservation and production, rainwater collection and management, sustainable design practices and creative artwork. By teaching students to explore their environment with their hands, hearts, and minds—whether they are climbing into a tree house or tackling the challenges of the surrounding world—living schoolyards help us to plant seeds that will blossom as children grow up and help to shape an ecologically literate society.

We are all important participants of the green schoolyard movement. You can help it reach its potential to touch children in every neighborhood—by starting with your own. Get a conversation going with your neighbors, the principal at your local school, and your school district administrators. Dream of the school environment you would like to see for our children, and then help to shape this reality at your local school. The schoolyards of tomorrow will be what you and your community make them.

Environmental planner Sharon Gamson Danks is CEO of Green Schoolyards America, based in Berkeley, California, and a co-founder of the International School Grounds Alliance. Her work transforms school grounds into vibrant public spaces that reflect and enhance local ecology, engage the community, and nurture children as they learn and play.



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² Adapted from an article by Sharon Gamson Danks published by Children & Nature Network in *The New Nature Movement: Guest Columns* blog, Feb 6, 2014. Photographs and text © Sharon Gamson Danks, 2005-2016.





Living Schoolyards for California

The movement to enrich outdoor learning environments on school grounds and connect children with nature took an important leap forward with the adoption of a California state resolution in 2014. The resolution encourages school districts across the state to design and construct schoolyard green spaces and use them to teach academic curricula outdoors. Authored by Assemblymember Phil Ting of San Francisco, the Living Schoolyard Month resolution (ACR-128) adopted on June 16, 2014, also established an annual statewide celebration of school grounds to be held each May.

Support for vibrant outdoor classrooms has been gaining momentum over the last few decades in California, across the USA, and around the world. California has been a national leader in the school garden movement since 1995, when then-Superintendent of Public Instruction Delaine Eastin collaborated with chef Alice Waters to create the Garden in Every School initiative through the California Department of Education. In 1999, the state established the Instructional School Gardens Program (AB 1014) to support garden-based learning. Over the years, tens of thousands of children have enjoyed school gardens inspired by these efforts, and learned firsthand about horticulture, nutrition and a variety of academic disciplines. To promote continued growth of these programs, California passed legislation

in 2006 (AB 1535) that provided a total of \$15 million in school garden grant funds for equipment, supplies, and related professional development for 3,500 school sites.

The 2014 Living Schoolyard Month resolution is an important milestone in California's approach to promoting outdoor green spaces for all children in K-12 public schools and for the state's thriving green schoolyard movement. Building on the success of previous school garden programs, it expands the depth and breadth of outdoor education beyond horticulture and nutrition to connect schoolyard greening to the health of urban ecosystems, child development needs, and the quality of life for students and their school communities.

CONNECTION TO SCHOOLYARDS ABROAD

California's adoption of Living Schoolyard Month holds great promise for children throughout the state and is also significant for the wider, international green schoolyard movement because it highlights the ongoing dialogue between efforts in California and those in other states and countries.

California's resolution was strongly influenced by the *Westerbeke Declaration on School Grounds*, produced by a global nonprofit organization called the International School Grounds Alliance (ISGA). Written collaboratively by leaders





in the school ground field from thirty-one organizations in seven countries, the *Westerbeke Declaration* expresses a vision for using school grounds to improve children's well-being. The adoption of ACR-128 marks the first time the *Westerbeke Declaration* has inspired public policy, and it is hoped that the message it expresses will resonate with institutions in other states and countries in the years to come.

The annual celebration component of California's Living Schoolyard Month is also intentionally aligned with ISGA's annual May festival, International School Grounds Month, so students around the world will celebrate their school grounds simultaneously.



HOW CAN YOU GET INVOLVED?

Public support is very important to the success of green schoolyard programs. Whether or not you live in California, you can:

- Plan a project to enrich your schoolyard or assist a local school by volunteering on a schoolyard work day
- Organize events to celebrate and use your school's existing green space
- Spread the word about Living Schoolyard Month
- Recommend that your city government include schoolyard ecology as a component of their green city plans
- Encourage your school district to support ecological schoolyards and outdoor classrooms that improve children's learning and play environments and enhance neighborhood ecology
- Put the activities in this *Guide* to good use with PreK-12 students at your local school
- Write about your May celebrations of Living Schoolyard Month and share them with us at: info@greenschoolyards.org (See page iv for details.)
- Join California's statewide Living Schoolyard Network by contacting Sharon Danks (CEO, Green Schoolyards America, info@greenschoolyards.org).

With your help to spread the word in California and around the world, celebrations of Living Schoolyard Month and ISGA's International School Grounds Month will bring the benefits of green schoolyards to an increasing number of schools, and thousands more children will go outside to learn, explore and discover the world just outside their classroom door.

⁴ Adapted from an article by Sharon Danks published by Children & Nature Network in *The New Nature Movement: Guest Columns* blog, August 20, 2014. Photographs and text © Sharon Gamson Danks, 2005-2016.





Art

Living schoolyards provide settings and inspiration for creative projects ranging from writing assignments to drawing, painting, mosaic, nature art, sculpture and music.

STUDIO SPACE Students of all ages benefit from art studio spaces that allow creativity to blossom—and that are easy to clean, comfortable, inviting and spacious. Living schoolyards can include formal or informal outdoor art studios that increase teaching space and accommodate messier art forms that are more difficult to practice inside.

CREATIVE EXPRESSION Schools can diversify the recreational offerings they provide to students of all ages during their outdoor free time by including an array of inexpensive, outdoor art materials among their supplies. Unstructured “art time” allows students to get their hands dirty and express themselves creatively in ways that are not always possible during the rest of the school day. Students can also express creativity through music and writing.

OUTDOOR EXHIBITS Outdoor art installations turn ordinary schoolyards into beautiful, memorable places that delight the eye and speak to the heart, while also showing students the school community cares about their environment. Temporary and permanent schoolyard artwork can reflect local culture, highlight regional ecosystems and instill school spirit.

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MAKE A CREATE-WITH-NATURE ZONE

AGES

3-18 years old

CONTRIBUTED BY

**Zach Pine Nature Sculpture and
University of California Blake Garden**
Kensington, California
www.naturesculpture.com
www.laep.ced.berkeley.edu/blakegarden



© ZACH PINE

Make a Create-With-Nature Zone to support creative play and construction using found materials from nature. The Zone can be set up and used for a one-time Create-With-Nature event, or installed permanently in a playground or outdoor classroom to be used during recess with minimal supervision or to support instructional time. Create-With-Nature Zones usually have agreed-upon rules or expectations, sometimes printed on a sign.

MATERIALS

- Collect natural materials from school grounds, such as fallen leaves or twigs, or green waste from a school garden. Ask children to bring additional materials collected in an environmentally sensitive way, from home. Example materials include: leaves, rocks, sticks, flowers, cones, fronds, seeds, pods, wood, shells, evergreen needles, stalks, bark, seaweed, sand, mud and water.
- The size, types and amount of natural materials should be tailored to the age group and to the size of the Zone.
- A slight scarcity of materials can promote creativity, collaboration and sharing. Some materials can be kept in reserve to add in if needed.
- Tree stumps or rounds, to show the boundaries of the Zone and provide work surfaces or seating, can be obtained free-of-charge from tree service companies and public parks and gardens.



DIRECTIONS

- Create the Zone's borders using chalk lines, tree stumps, benches, planters or existing walls and pathways. A cozy Zone promotes sharing, inspiration and collaboration.
- Include a "nature library" along the edge of the Zone to lay out and sort the natural materials. Bins or baskets are helpful to store, transport and collect items for use.
- If the Zone is not on pavement, provide a few flat surfaces such as stepping stones or tree rounds to highlight small objects that are less visible on grass, dirt or mulch.
- Orient students to the Zone. The purpose is to have fun while engaged in the activity, not to make something permanent. You can model this by making a creation, then quickly "recycling" it, making a new one from the same materials, and repeating this process a few times. You may introduce age-tailored vocabulary such as: under / over, symmetrical / asymmetrical, abstract / representational.
- You may want to make a "rule" that materials should be put back in the "nature library" at the end of a session. Make it clear whether foraging from nearby nature is encouraged or not, and what the expectations are for protecting the environment. If the Zone is permanent, post a sign explaining how the Zone should be used.
- The Zone can also be used as an outdoor classroom to achieve curricular goals in all subject areas, using structured activities and assignments.



CREATIVE PAINTING WITH “GARDEN PAINTBRUSHES”

AGES

3-18 years old

CONTRIBUTED BY

Explore Ecology
Santa Barbara, California
www.exploreecology.org



© BIANCA PISANO

Students search the schoolyard garden for two natural items to use as paintbrushes. After finding their own place to sit in the garden, students paint a picture using their “brushes”. Then all students come together, share their artwork, and discuss whether or not their paintbrush worked the way they thought it would and why.

MATERIALS

- Paper
- A variety of natural materials to use as paintbrushes
- Tempera paint
- Clipboards



DIRECTIONS

- Instruct the students to search the garden for two twigs, leaves, fruits or other natural items to use as their paintbrushes (about 5 minutes).
- After each student has found a paintbrush, give each person a clipboard, one or two pieces of paper and one or more cups with paint in them. Students can show each other their brushes while they wait for everyone to get settled.
- Instruct the students to find a place by themselves where they can sit peacefully and undistracted. Once everyone has found a comfortable place, ask them to close their eyes and detect smells or sounds around them. (30 seconds)
- Ask each student to create a painting inspired by their setting, or assign them to create a piece of art with a given natural theme. For example, ask them to draw their favorite place in nature. (10-20 minutes painting time, depending on age)
- If some students finish early, they can sit in their special spot and continue to observe nature around them. When the time is up, ask the students to gather and share their artwork. It is nice to have each student stand up, present their work, and describe what they painted.
- Complete the session with a discussion of the success or problems with the paintbrushes they chose. Explore why each paintbrush worked or didn't work as expected.



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greenschoolyards.org

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PAINTING THE SEASONS

AGES

4-18 years old

CONTRIBUTED BY

Green Schoolyards America
Berkeley, California
www.greenschoolyards.org



© MAIA DANKS

Students select a place in their schoolyard that they will visit once each season to draw or paint the plants and trees as they appear in that month, and then compare them to their drawings of the same place at other times of the year. Materials and techniques used can vary with the students' ages.

MATERIALS

- Watercolor paints and paint brushes, colored pencils, crayons or oil pastels
- Paper suitable for painting or drawing
- One clipboard per student

PREPARATION

- Select a location in your schoolyard to act as a temporary art studio. Find a space large enough to seat the whole class on the ground, near plants with a variety of shapes, sizes and textures. Look for an area that includes deciduous trees or perennial shrubs that lose their leaves in the winter, flower in the spring, leaf out in the summer and/or change color in the fall.



DIRECTIONS

- Bring the class outside to the selected “art studio” and ask each student to find a comfortable place on the ground, near a plant or tree that they find interesting.
- Give each student a clipboard prepared with paper, and their own drawing or painting supplies.
- Ask the students to draw what they see using whatever type of drawing or painting technique is appropriate for their age. Younger students can focus on the basics of drawing from life and capturing the colors of the season. Older students may work on more complex techniques such as detailed scientific illustrations, perspective drawings or refined watercolor techniques.
- Ask each student to create two drawings or paintings: one that focuses on a plant detail, such as a small group of leaves or flowers, and another picture that shows a wider view, with the whole plant or tree in the image. Students can also try to represent the colors they see as accurately as possible.
- Revisit the same site and use the same drawing or painting techniques twice more during the school year, to capture seasonal changes in color and form, as they occur.
- When the third set of drawings and paintings are finished, display the artwork as an exhibit that illustrates the changing seasons on your school grounds.



NATURE'S WATERCOLORS

AGES

5-10 years old

CONTRIBUTED BY

Ayesha Ercelawn

La Scuola, Italian International School

San Francisco, California

www.lascuolasf.org



© AYESHA ERCELAWN

In this art activity, children grind leaves and flowers with mortars and pestles to extract their beautiful colors. They love the physical process of crushing plants and are intrigued to find that the shades of color emerging are not quite what they expected. This can also be a sensory activity if fragrant herbs are used, can connect to the botanical sciences in the classroom, be looked at through the lens of traditional art materials, or be used as an example of biodegradable and sustainable art materials.

MATERIALS

- Mortars and pestles (or small cups and sticks)
- Heavy paper such as construction or watercolor paper
- Paintbrushes
- Water in a small container
- Artist paint palettes
- Leaves and flowers

DIRECTIONS

- Demonstrate how to use a mortar and pestle by grinding four or five leaves with a few teaspoons of water. (Try this beforehand since some leaves work better than others.)
- Let the children gather leaves and flower petals from the schoolyard to try making their own colors. They can experiment with one plant material at a time or see what emerges when they combine different leaves or flowers. Try not to let them dump a lot of water in since the delicate colors will be too diluted.
- Have small pieces of paper available for children to test their colors and see if they like the shade they created or if they want to keep grinding.
- Share all of the students' different colors by pouring a little bit of each child's watercolor into a communal artist's palette for all children to use, together.
- Finally, pass out heavy duty paper and let the students start creating their paintings!

NOTES

- To extend this activity, you can also provide strainers and containers to extract just the liquid color. These colors will keep for a few days in the refrigerator without spoiling, or you can study the process of spoiling (and discuss preservatives, refrigeration, etc.) by keeping them on a shelf to watch how the colors change with age.
- Many soils also make beautiful colors.



BUBBLE POETRY

AGES

6-18 years old

CONTRIBUTED BY

Sarah Amador
Evergreen Elementary School
Rohnert Park, California
crpusd.schoolwires.net/evergreen



© SARAH AMADOR

The joy of blowing bubbles is timeless, felt immediately by people of all ages. The experience borders on the magical and whimsical. This English Language Arts activity allows students of all ages to access the power of metaphor and imagery by comparing their bubble to experiences, feelings and the world around them.

MATERIALS

- Bubble solution
- Bubble makers (or wire hangers, anything that can make a closed shape)
- Bubble containers
- Journals
- Pencils

DIRECTIONS

- What is metaphor? What is imagery? These are questions English teachers ask students every year. This Bubble Poetry lesson provides an easy, inexpensive and engaging way for students to apply these concepts to poetry.



- I like to ask, “What does the bubble compare to? Is it the earth? A ball?” One of my first grade students is in love with monster trucks, so of course he imagines his bubble to be a monster truck wheel rolling across the sky. It’s delightful to see students using their imaginations and being creative, not only with words but also with their bodies. Recently, my first grade students used their hands to make giant bubbles, quite successfully!
- Invite four or five students to blow bubbles. Encourage the remaining students to run and pop as many bubbles as possible. That’s the physical part of this lesson. If available, visit an adjoining park or run around a field. The more contact with nature, the better! Rotate the students who wish to blow bubbles, so that everyone gets a turn.
- Direct students to write poetry about their bubble using metaphor, imagery and adjectives. Encourage them to sit under a tree or find a quiet spot. A sentence frame for the first line might look like this, “My bubble is a [noun].”
- I’ve taught this lesson to all ages, from seniors in high school to first graders. All of them find themselves able to access the power of metaphor and imagery, by simply comparing the bubble to experiences, feelings and the physical world around them. Older students get to reconnect with their inner child, and witness the joyful laughter that bubbles spontaneously from the younger students.



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BIRDHOUSE BUILDING

AGES

8-18 years old

CONTRIBUTED BY

Waldorf School of the Peninsula
Los Altos, California
www.waldorfpenninsula.org



© WALDORF SCHOOL OF THE PENINSULA

Building a birdhouse (or bat house) is a great project. At Waldorf School of the Peninsula, students build a birdhouse in Grade 4 during the winter months. This activity helps develop coordination and introduces bird ecology.

MATERIALS

- Redwood fence boards, 1"×6", 6'-8' long (4.5 linear feet required per bird house), that are green and lightweight (not heartwood) with few knots and blemishes. It is best to use a wood that does not require treatment, including stains and oil.
- Small scrap wood to protect the birdhouse from clamps
- Nails: "5 Penny d" nails
- Hand-turned drills (two or three for the class), with bits for making the birdhouse hole and bits for the latch nail. The larger drills for making the birdhouse holes are more durable and the drill bits are larger and stronger.
- One per student: metal T-square rulers, small wood handled saw (type that cuts on the push and pull stroke), lightweight hammer, metal clamp, pencil
- Sawhorses, one per three or four students
- Safety goggles, one per student

DIRECTIONS

- Each type of bird requires a different type of house, with specific dimensions. Begin by researching what kind of birds you are hoping to house in order to select a species that lives in your area and to understand its needs.
- At our school, students are given one full class day to practice measuring, sawing and hammering on scrap wood before they begin. An alternative is to bring several adults for assistance.

- There are many good plans for birdhouses. Here is a link to the plans we use: <http://bit.ly/1Ntow2X>. At our school, the teacher learns to build the birdhouse and uses the plans for reference. We do not provide the students with copies of the directions but instead show them a finished birdhouse and ask them to deconstruct it in their minds. When helping a student with the next step, other students watch and see if they can then accomplish the task on their own.
- In the plans, you are directed to cut some of the boards down to 4 inches wide. Experienced students can cut the boards themselves if boards are first cut to the proper lengths.
- On nailing and finish work: Instruct the students to pull out any nails that are not true. Nails must be "flush" with the boards and the boards must be "flush" with each other, not showing large air gaps and mistakes. Cuts that are not straight must be fixed. Birdhouses are rasped, sanded and holes are patched with wood putty. Cracks are fixed with wood glue. Our goal is to make them beautiful as well as functional.
- Our students take the birdhouses home when everyone is finished, which encourages the students to support each other in finishing their work. If students finish early, they team up to build another one for the school garden.

Adapted from Carolyn Brown and Anastasia Sinclair, "Bird House Building: Grade 3-4+," Waldorf School Gardens of the Bay Area and Beyond.
www.waldorfschoolgardens.com/lesson-plans/bird-house-building





Recreation

Living schoolyards encourage exploration, imagination, relaxation and free choice among a variety of recreational options, from ball games and climbing equipment to informal play in bushes, trees and flowers. They include space for traditional sports and games with rules created by adults, as well as places for children to dream up their own games without adult involvement.

Rich, interesting, well-designed green schoolyard spaces invite children to climb and run and swing and balance, to dig and pretend and create. They lend themselves well to creative play with art materials, musical instruments and performing arts. Their planted areas invite kids to engage in open-ended “nature play,” find the little creatures that live in the soil, and unwind and explore “far away lands” with their best friend from the comfort of a cozy corner of the schoolyard.

School grounds can also become shared community resources after hours, providing multi-use, public open space within walking distance of every neighborhood. They are often the sites of annual school and community festivals and can be used creatively outside of school hours and on the weekends.¹

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SCHOOLYARD NATURE *LOTERÍA*

AGES

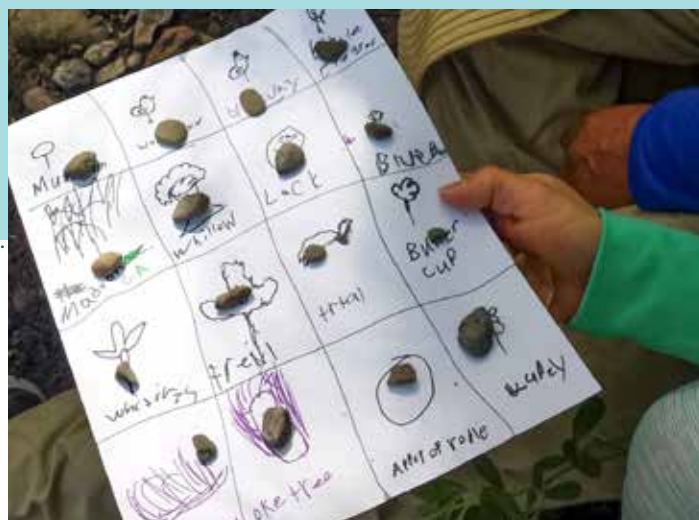
6-17 years old

CONTRIBUTED BY

Latino Outdoors

Capitola, California

www.latinoooutdoors.org



© LATINO OUTDOORS

Lotería is a traditional game played in many Spanish speaking countries that is somewhat similar to bingo. Kids can make their own nature-themed *lotería* cards and *tablas* (game boards) using their schoolyard or backyard for inspiration. Teachers can help students to make a collaborative class set and/or personalized, nature-themed *lotería* games to take home.

MATERIALS

- To make one *lotería* set for the class, you will need at least two blank index cards per child, of any size. You will also need one full sheet of cardstock (8½" x 11") per child, to use for the *tablas*.
- Drawing and coloring materials and glue for each child
- A class set of counting chips, for use while playing the game. This can be anything from bottle caps to beans or a favorite type of dried seed found in your schoolyard.

DIRECTIONS

- First, bring the class out into the schoolyard to explore, play and identify what they see! Ask the children: What kinds of trees grow at your school? Which animals visit or live there? Which insects? What type of plants do you see? Do you see birds, a lizard or a cat walking by? Ask students to make a list of everything they see, from the grass they can touch to the birds that fly away.
- Second, ask the children to draw what they observed, and make colorful pictures of the plants and animals in your schoolyard. They can pick other favorite objects, too. Give each student two cards. Ask them to draw one animal, plant or object per card and label each card with a descriptive name. If they know how to translate their label into Spanish, their cards can have both the English and Spanish words for the plant, animal or object they drew (e.g.: *El Gato*, The Cat). Ask Spanish-speaking parents or students to help with the translations. Visit the schoolyard as many times as needed to draw a full set of 54 cards (or more) with the class.

- To create the *tablas* (game boards), make photo copies of the hand drawn cards at a reduced scale (2" x 2.5"), and ask children to paste the small versions of the drawings onto their 8½" x 11" paper to create a grid of pictures, in random order, with four rows and four columns. (See photo) Each child will need sixteen small images for their *tabla*.
- Next, play *lotería* in the classroom or outside in the schoolyard. To begin, the leader holds the deck of cards and picks one card at random from the stack. He or she calls out the name of the card (as written) and shows everyone the picture. Children playing the game place a counting chip on the matching space on their *tabla* if their *tabla* has that image. The first child to cover four squares on their *tabla* in a horizontal, vertical or diagonal row (or fill four corners or a small square group of four) is the winner of the game and shouts "¡Lotería!" (Lottery!)
- Students can also work in small groups to make their own full set of place-specific *lotería* cards and *tablas* and use them to play with their parents and other members of the community, reinforcing the identification of nature in the schoolyard while spending time together in an enjoyable social activity that connects generations.

FOR MORE ABOUT *LOTERÍA* SEE:

Wikipedia – *Lotería* – <http://bit.ly/1PSeyYH>



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"EVERYBODY'S IT" TAG

AGES

4-10 years old

CONTRIBUTED BY

Playworks

Oakland, California

www.playworks.org



© PLAYWORKS

This twist on a classic game of tag will get kids moving and help develop their hand-eye coordination and spatial awareness. This activity is best for a large group of kids (ten or more).



© LISA HOWARD



MATERIALS

- No materials are necessary for this activity, but adult leaders should establish boundaries in a relatively small, safe area so that constant motion is encouraged.

PREPARATION

- Demonstrate safe tagging: light touch, like a butterfly's wings, on the shoulder
- Explain and avoid unsafe tagging: hard contact that might cause the person being tagged to fall
- Review the boundaries and the consequences for going outside them. Students who go out of bounds will have their count started over from zero and will need to perform ten jumping jacks to get back into the game.

DIRECTIONS

- The object is for players to tag other players and keep a running count of everyone they touch in three minutes.
- No one person is "it" and no one stops playing or "freezes" when tagged.
- Variations:
 - Adjusting the length of the game and the location of the boundaries, between rounds, can add fun and variety.
 - If someone is tagged, they must subtract one from their running tag count.



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JUMP THE RIVER

AGES

4-7 years old

CONTRIBUTED BY

Playworks

Oakland, California

www.playworks.org



This fun jumping game brings play into the classroom. Teachers can integrate this game into lessons about rivers or ways people travel. During the activity, children learn and practice different jumping skills. The game can also be adapted for indoor use.

MATERIALS

- Jump ropes and chalk
- Optional: hula hoops, small logs or “found objects”

PREPARATION

- Arrange “obstacles” like sticks or small logs on the ground, or use jump ropes arranged in two lines, to create “terrain” for players to jump over. Obstacles can also be represented by chalked lines on the pavement. If you have an actual stream in the area you are using, that works well, too!



DIRECTIONS

- Explain to the children that they are taking a walk in the woods and may need to cross a stream or river. Ask the children to walk throughout the prepared space and when they come to a “river” (the objects or chalk lines on the ground) they need to jump over it without getting their feet wet. Children should work independently.
- When landing, children should land on two feet spreading their feet about shoulder width apart so they have a wide base of support when they land. After landing, children should proceed to and jump over the next river. Emphasis should be placed on landing on both feet at the same time without falling over.
- Indoor version: Ask children to draw or paint their own rivers on large sheets of paper. Securely tape children’s drawings to the floor and pretend that the class is going on a trip. When children reach the different rivers scattered throughout the room they must swing their arms and jump over the river, landing on the other side without falling over.



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STEAL THE NATIVE PLANT

AGES

8-18 years old

CONTRIBUTED BY

Center for Land-Based Learning
Winters, California
www.LandBasedLearning.org



© MATT LECHMAIER

This game is modeled loosely after “steal the bacon”. Teams of students learn to identify native plants and then compete with other teams to be the first to tag the correct plant when called. This game promotes team building, helps students hone their plant identification skills, and encourages students to run.

MATERIALS

- Three to seven different native plants (either growing in pots, or cuttings you’ve taken from mature plants)
- Plant identification cards or field guides with information about the native plants (one set for each team)
- A large, flat area, safe for running

DIRECTIONS

- Create two to six teams with equal numbers of players, up to six in each team. Give each team time to learn all the plants by looking carefully at each one, describing its unique characteristics using the field guides.
- Assign each person in each team a number from one to six, depending on the size of the teams. If you do not have the same number of people in each team, you can give one person two numbers. (For example, if you have three teams of six and one team of five, you can give one of the people in the team of five two numbers to be responsible for.) Each team should have a #1 person, a #2 person, etc.
- Arrange all of the players into two lines, opposite each other, and declare these to be the starting lines. Place one plant of each species on the center line, between the players.
- Call out the name of a plant and then a number. If you called out Toyon #2, for example, the #2s from each team would run to the centerline and try to be the first

student to touch the Toyon. Calling the name of the plant first, before calling out the number of who will go touch the plant, makes all the students think about which plant that is, instead of just the students whose number you called. The person who touches the plant first, wins a point for their team. You can play until a team reaches a specified number of points, or until all the plants and numbers have been called.

- Remind players that they must be aware not to harm the plants or each other. Be aware that students will be running toward each other from multiple directions and possibly looking down at a plant instead of up at each other.
- You can choose to place multiple plants of the same species in the center to allow multiple students to find the correct plant. You can also call out a unique characteristic of a plant instead of the plant’s name.



© EMILY JAMES



PHOTOSYNTHESIS TAG

AGES

9-13 years old

CONTRIBUTED BY

Los Angeles Unified School District
Office of Outdoor and Environmental Education
Los Angeles, California
www.outdooreducation.org



© SHARON DANKS

In this activity, students learn about the components and process of photosynthesis while practicing cooperative learning skills and playing a game of tag. The game explains the ingredients necessary for plant survival. The object is for the “trees” to get everything they need in order to make glucose (earn a sweet treat) and survive.

MATERIALS

- Green, yellow, blue, brown and red string
- Bag of small, sweet, edible treats

DIRECTIONS

- Explain the concept of photosynthesis and the process by which leaves create energy for plants.
- Show the students the collection of string and explain what each color stands for: yellow for the sun, blue for water, red for carbon dioxide (CO₂) and brown for nutrients. These are the components needed for a tree to survive.
- Choose a few students to be the “trees” in this game of tag, so approximately one person in six is a “tree”. Give each “tree” a green string to tie on their wrist in a manner that is easily released. The “trees” will be the only ones who can try to snatch the other students’ strings.
- Once the “trees” have been selected, have the other students choose which photosynthesis components they would like to be. Note: allow the students to choose whichever component they would like to be, even if all of them choose the same color. This can be discussed at the end of the game.
- Ask the “components” to tuck their strings into their back pockets or the back waistband of their pants. They should not tie the string on their body in any way. The hanging strings will look like a tail. The object is for the “trees” to get everything they need in order to make glucose.
- To play the game, the “trees” chase the “components” and try to snatch their “tails”. Once a “tree” has everything needed to make glucose they take their catch to the leader and explain what they have collected. The students cannot just hand the strings to the leader. They must explain what each color represents. Once the student (“tree”) has answered correctly, give them one treat. Round one should last about five minutes.
- When the first round is over ask the students to sit down and discuss what happened in the game. Did one or more “trees” survive? Why or why not? (In order to survive, they must have had a least one treat.) If most students chose “water”, discuss what happens during floods. Explain that if there is too much of something, like water, the trees cannot survive. Trees get uprooted, nutrients get diluted or washed away.
- Play a second round. Choose different students to be the “trees”. During the second round, if a string gets taken, the student can get another string of any color and keep playing. As “trees” turn in their components, add another “tree”. Do not tell the students at the beginning of the round that more trees will be added, they will begin to see what happens as “trees” turn in their components. This can be discussed during the wrap-up. This round should also only last five minutes.
- At the end of round two discuss the results. What happened when there was an unlimited amount of components? How many trees survived? What would happen if the game continued?





Health

Green schoolyards foster children’s mental and physical health and well-being by providing settings for curiosity, imagination, exploration, wonder and adventure.

IMPROVED WELL-BEING Studies have shown that many types of green spaces have therapeutic properties that lower blood pressure, help people relax and provide other benefits that improve the well-being of children, teachers, school administrators and visitors.

SENSORY EXPERIENCES Living schoolyards stimulate the five senses and provide opportunities to engage the whole body to develop children’s sense of balance and coordination.

PHYSICAL ACTIVITY Living schoolyard environments offer child-driven, play-based solutions to obesity problems. They also provide places for students to be physically active during physical education classes and while participating in sports and other organized fitness games.

HEALTHIER LIFESTYLES Green schoolyards can promote healthier lifestyles through nutrition-oriented gardening and cooking programs. They are also places to learn new skills that foster lifelong health, from water safety to tool use.

ACTIVITIES IN THIS CHAPTER

- **Modular Obstacle Course** **20**
Sensory integration / child-directed play (2-12 years old)
- **Multisensory Garden Tour** **21**
Sensory exploration (4-8 years old)
- **Herb Bundles** **22**
Sensory exploration (5-12 years old)
- **Why Eat Colorful Rainbow Food?** **23**
Nutrition / sharing food (4-9 years old)
- **Jump Rope Activities** **24**
Active game / fitness (5-18 years old)
- **Plant Part Relay Race** **25**
Active game / plant anatomy (8-10 years old)

OTHER RELATED ACTIVITIES

- **“Everybody’s It” Tag** **15**
Active game / coordination (4-10 years old)



MODULAR OBSTACLE COURSE

AGES

2-12 years old

CONTRIBUTED BY

Golestan Colab
Berkeley, California
www.golestankids.com/colab



© GOLESTAN COLAB

In this activity students create their own modular obstacle course with a versatile set of materials. This activity is completely child-directed, never teacher-directed. By creating an obstacle course out of heavy movable parts, students develop core strength, agility and balance, while also learning to collaborate and create as a team. This further helps them develop executive functioning, social emotional, and problem solving skills. The obstacle course particularly helps students that are disregulated or struggle with sensory integration issues by providing a lot of opportunities for proprioceptive input from moving heavy things and participating in the course when it's completed.

MATERIALS

- Any combination of: tires, straw bales, used large wire spools, ropes, cardboard boxes, hula hoops, trampoline, large wood slices, long 2x4 wood pieces, and/or tree stumps

DIRECTIONS

- Set materials out in the schoolyard. The larger, heavier to move items can be piled in a corner. Other items like the ropes and wood pieces can have a designated bin to which they will be returned after the activity.
- Explain to the students that they are going to be creating an obstacle course with the materials provided. Show them the materials they can use and allow them to examine

them. Students can be encouraged to play around with the materials before they start making the obstacle course.

- Older students can plan the obstacle course collectively, maybe even map it out on paper. Good questions to ask to help guide the process are: What are the skills they want to test: Height? Balance? Speed? Coordination? Who are they designing the course for? How long is the course?
- After the kids have become familiar with the materials, they can create their own obstacle course. The role of the teacher is to give gentle guidance when needed. The teachers should not tell kids what to do or share ideas with them, rather help them to explore and find solutions.
- There is no “right” way to use any of the materials—the more creative and unconventional, the better. You can lend a helping hand when asked, but do not move heavy items for the students. This is a time to encourage teamwork and problem solving. For example, if a child is having a hard time moving a straw bale, you can suggest that s/he solicit the help of other children. If they still have a hard time moving it, you can initiate finding a solution by asking questions that will enable the children to problem-solve such as: “What can we use to move it?”
- Once the obstacle course is complete, the students can test it out and play in it. This is a good time for teachers to encourage trial and error to see how they can improve their obstacle course.



MULTISENSORY GARDEN TOUR

AGES

4-8 years old

CONTRIBUTED BY

Chino Basin Water Conservation District
Montclair, California
www.cbwcd.org



© GISELA LOPEZ

No matter our age, gardens innately awaken our senses. They provide the perfect setting to engage students' senses and subsequently build a sense of place, mindfulness, and connection to the outdoors. This loosely structured sensory activity allows students to use their power of observation to explore and play in their schoolyard garden. In the Multisensory Garden Tour, children will actively engage with their schoolyards as scientists, stopping at predetermined areas to record and discuss observations using each of their senses.

MATERIALS

- One per student: Clipboard, pencil, worksheet with five sections (one section for each sense)

DIRECTIONS

- Review or teach the five senses to students, emphasizing that scientists use all senses when developing an understanding of the world around them. Instruct children not to pick anything from the garden without asking, especially not for eating.
- **SIGHT:** Ask students guiding questions such as, What is the furthest thing you can see? What's the closest thing you can see? What might the garden look like from the eyes of squirrel, a butterfly, an ant...? Provide time for students to write or draw observations of the garden. Challenge them to draw what the garden may have looked like 500 years ago or 500 years in the future.
- **LISTENING:** Instruct students to sit silently for 10-20 seconds with both arms in the air, listening carefully to the sounds of garden. Ask them to count each garden sound they hear by raising a finger. When they open their eyes, ask them to compare and share their observations with their neighbor. What sounds were distracting? Which were caused by wind? Water? Animals?
- **TASTE:** Remind students not to taste anything unless it's a good choice for your class. Provide an opportunity

for students to explore the schoolyard and list, draw, or discuss which plants they think may be tasty or edible. Introduce guiding questions such as: How is taste a helpful sense? Challenge students to find evidence of foraging or grazing and hypothesize what the consumer might have been.

- **TOUCH:** Ask the students to find two contrasting plants that are distinctive to the touch. A soft lamb's ear compared to a succulent provides excellent contrast and offers an opportunity to discuss plant adaptations. Compare and contrast how the plants feel and why certain plants have different textures.
- **SMELL:** Prompt the students to find their favorite fragrance in the garden. Then have the students pair up, show, and discuss their favorite scented plant. Provide guiding questions about why different scents may help a plant.

EXTENSION

- Ask students to draw a picture or write a creative story about their schoolyard garden from the sensory



HERB BUNDLES

AGES

5-12 years old

CONTRIBUTED BY

San Francisco Botanical Garden

San Francisco, California

www.sanfranciscobotanicalgarden.org



© SHARON DANKS

Children explore using their senses and create a scented herb bundle to remember their discoveries.

MATERIALS

- For each child: provide a piece of fabric cut into 4 to 5 inch squares and a rubber band
- Activity requires an area containing plants with fragrant leaves which children can collect



© ANNETTE HUDDLE

DIRECTIONS

- Review the five senses. Explain to the children that they will explore the leaves in the area using their senses.
- Discuss: How might we explore this space with our senses? Which sense might we not use today? The sense of taste, unless an adult says we can.
- Take a moment to observe leaf shapes and colors and to notice sounds in the area. Then demonstrate how children can carefully touch the leaves to feel the leaves' textures and then smell their hands to experience each plant's scent.
- Allow children to explore the area for a few minutes, then ask them each to find one plant whose scent they like and stand next to it. Help each child carefully collect two to three leaves from the plant, using one hand to support the stem while carefully pinching off the leaf with the other.
- Gather the children in a circle and distribute the fabric. Have children place their leaves in the center of their square and then wrap the fabric around the leaves, pressing the leaves into the center. Distribute the rubber bands and help children wrap the rubber band to close the bundle.
- Ask the children to offer one word to describe the scent of their bundle. If there is a good variety of plants, have children trade with a partner, smell the bundle and then try to find the plant whose leaves are inside. Remind them that gently squeezing the bundle will help release the scent of the plant even after the leaves have dried.



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WHY EAT COLORFUL RAINBOW FOOD?

AGES

4-9 years old

CONTRIBUTED BY

Trinity Gardens

Santa Barbara, California

www.trinitygardenssb.org



© JUDY SIMS

Children learn about the nutritional benefits and tastes of colorful, fresh produce snack food through this activity. Together they build a food rainbow from fresh produce. They then taste a prepared rainbow food snack at a community table. The group may also be involved in planning, planting and harvesting from a rainbow shaped children's garden.

MATERIALS

- Large basket of colorful, whole produce; one per child
- Additional fresh produce, cut up for each child's finger food rainbow snack (Optional: hummus for dipping)
- Laminated food rainbow color word cards, in English and other languages, as desired
- California Dept. of Education's laminated food cards (or assorted seed packets, magazine or calendar pictures)
- Compostable paper plates, cups and napkins
- Hand washing station
- Painter's canvas tarp or old sheet, with colored bands each 10-12 inches wide, to create a "food rainbow"

DIRECTIONS

PART I. Rainbow Mat Activities (about 20 minutes)

- Ask students to sit around three sides of a rainbow painted floor mat; position teacher on the fourth side
- Discuss: "Why eat a FOOD rainbow?" Use charts, books and/or a song to introduce and reinforce that each food color helps our bodies grow in special ways.
- Students echo: "Red helps my heart," "Orange helps my vision," "Yellow helps my skin," "White supports my good health (immune system)," "Green gives me stronger bones and teeth." "Blue and purple help my brain to remember (memory)." (Note: see additional information online about the health benefits of vegetables and fruits.)

- Distribute whole produce to each student. Invite those holding red vegetables or fruits to place them on the rainbow mat near the matching color word. Help students identify each type of produce and discuss how each color helps our bodies. Repeat for each color.
- Review and summarize: "What have we learned about the importance of eating different colors of fresh food?"

PART II. Eating the Food Rainbow (20-30 minutes)

- Ask students to wash their hands, set the table and sit down to have a snack using the cut produce.
- As they try each type of food, review healthy food concepts and discuss flavors. Encourage students to try foods for the first time. The teacher models by eating each item.
- Compost leftover food and paper. Write in journals about food tasting experiences.
- Contact Trinity Gardens for free seeds to plant a rainbow garden as a follow up project.

OPTIONAL RESOURCES

Books (ages 4-8): *I Can Eat a Rainbow* (Annabel Karmel); *Growing Colors* (Bruce McMillan); *Eating the Alphabet* (Lois Ehlert)

Books (ages 8-12): *Blue Potatoes, Orange Tomatoes* (Rosalind Creasy), *The Vegetables We Eat* (Gail Gibbons)



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JUMP ROPE ACTIVITIES

AGES

5-18 years old

CONTRIBUTED BY

American Heart Association
Los Angeles, California
www.heart.org



The American Heart Association is working to help kids, families and communities live heart-healthy lives. Use this physical activity information to help students get active and stay active, for life.

MATERIALS

- Jump ropes
- Jump rope skill cards from *Jump Rope for Heart* (See: <http://bit.ly/1QYWrSx>)



BACKGROUND

- For both children and adults, increased physical activity is associated with an increased life expectancy and decreased risk of cardiovascular disease. Physical activity produces overall physical, psychological and social benefits.
- Inactive children are likely to become inactive adults. Physical activity helps with controlling weight, reducing blood pressure, raising HDL (“good”) cholesterol, reducing the risk of diabetes and some kinds of cancer, and improved psychological well-being, including gaining more self-confidence and higher self-esteem. Physical activity should be increased by reducing sedentary time. It should be fun for children and adolescents. Parents should try to be role models for active lifestyles and provide children with opportunities for increased physical activity.

DIRECTIONS

- Included (left) are two jump rope activities for school children sourced from the American Heart Association’s *Jump Rope For Heart*. Follow the directions on the cards to teach children a variety of jump roping patterns and games. This is a time when children can establish the foundation for movement skills. These are also the years when positive experiences can establish a positive attitude and appreciation for participating in daily physical activity for life.
- *Jump Rope for Heart* promotes the value of physical activity to elementary school children while showing them they can contribute to their community’s welfare.



PLANT PART RELAY RACE

AGES

8-10 years old

CONTRIBUTED BY

Community Alliance with Family Farmers
Davis, California
www.caff.org



© ERIN DERDEN-LITTLE

In this activity, students connect the foods they eat to the six parts of a plant while being physically active. It requires an open space with even ground for kids to run and can be adapted for a 15-25 minute time slot.

MATERIALS

- At least 50 cards printed with different types of produce
- One sign for each plant part: root, stem, leaf, flower, fruit, seed
- Six containers
- Diagram showing all six parts of a plant

BACKGROUND

- Plants have six primary plant parts: roots, stems, leaves, flowers, fruits and seeds. The produce items we eat can be classified by plant part. For example, carrots are roots, spinach is a leaf, zucchini is a fruit and a broccoli crown is made up of flower buds.

DIRECTIONS

- The class will be divided into two to three teams, depending on the number of students. To set up the race, divide the cards evenly among the teams and place them at each team's starting line. Attach each plant part sign to a container and set them a good distance from the starting line.
- Ask students to sit in a circle so they can all see the teacher. Display a diagram of a plant showing the six plant parts. Ask students to explain what each plant part does or why it is important. The discussion should include the following ideas:
- **ROOTS** bring in water and nutrients from the soil and hold the plant firmly in the ground.
- **STEMS** act as an elevator for the nutrients/water and bring them to the rest of the plant (like our veins). Provide structure for the plant (like our skeleton).

- **LEAVES** gather sunlight for photosynthesis in order to create food for the plant.
- **FLOWERS** contain the reproductive parts of the plant. Fruits and seeds are produced after flowers are fertilized through pollination. Some flowers rely on insects, animals, wind or water for pollination. Bees are the pollinating insects we hear about the most. We wouldn't have many of the fruits we eat without the help of bees!
- **FRUITS** develop from fertilized flowers. Fruits are the outer covering that protect the seeds. They are sometimes fleshy, (apples, tomatoes) sometimes dry or hard (walnut shell).
- **SEEDS** contain the embryo for a new plant and a food supply that the embryo uses to sprout.
- Explain that the students' job is to think about which plant part we are eating when we eat a particular type of produce. For the relay race, they will sort cards displaying things we eat into the correct plant part category. Show the group a few examples to practice.
- Divide the students into teams. Line them up and review the rules. The first person picks up a card and works with his/her team to decide which plant part it is. The person with the card skips or hops to the corresponding container, puts the card in the container, then skips or hops back to tag the next person in line. Keep playing until the cards run out.
- Encourage the children to work with their teammates! Once finished, ask the students which cards were the hardest to sort. While they watch, go through a few cards in each container and discuss whether each item fits or whether it should be placed under a different plant part category.





Social and Emotional Well-Being

Enriched school grounds are ideal places to foster positive, healthy relationships among children, between children and adults, and between people and the environment. Research tells us that nature has a therapeutic influence on our mental and physical health, so an environment filled with trees, shrubs, flowers and wildlife is a helpful starting point to set the stage for social and emotional learning that build empathy and collaboration.

EMPATHY Living schoolyards help schools foster an atmosphere that emphasizes care for one another, care for all living things, and care for the Earth. They provide settings that teachers can use for lessons that range from understanding one another's feelings to valuing the great diversity of life that shares our world.

COLLABORATION Nurturing an enriched school ground environment—and our community—is best accomplished through collaboration, built on strong, positive relationships. Living schoolyard environments provide opportunities to practice and hone communication, teamwork and stewardship skills, while providing balance for other aspects of school life that are more competitive.³

ACTIVITIES IN THIS CHAPTER

- **The Tree is Like Me!** 27
Empathy / trees / physiology (5-10 years old)
- **Exploring Our Relationship to Place** 28
Collaboration / relationships / empathy (5-18 years old)
- **Lighthouse** 29
Communication and cooperation game (9-12 years old)

OTHER RELATED ACTIVITIES

- **Modular Obstacle Course** 20
Collaboration / child-directed design / play (2-12 years old)
- **Finding Your Place in the World** 31
Empathy / nature / observation skills (3-18 years old)



THE TREE IS LIKE ME!

AGES

5-10 years old

CONTRIBUTED BY

TreePeople

Beverly Hills, California

www.treepeople.org



© SHARON DANKS

Comparing ourselves to trees might appear silly but, if we take a look we find that we are quite similar. Bodies correlate to trunks, blood to sap, arms to branches; we begin to see a resemblance. What about our needs? Water to drink, air to breathe, food to eat; recognizing these similarities help us tune in to the natural world in a unique way. We will be able to see that “the tree is like me!”

MATERIALS

- Butcher paper or other mural size paper
- Crayons or markers
- Fallen tree leaves



© TREEPEOPLE

DIRECTIONS

- Take students out to see a tree and ask, “What would it be like to be a tree?”
- While laying underneath the tree, instruct the students to close their eyes. Lead them through a visualization that has them imagining their toes reaching down into the warm soil to become roots... their arms reaching up toward the sun to become branches... their hair and finger tips sprouting leaves... and their body strong and straight and covered with bark. Continue the visualization to imagine water soaking up through their roots; carbon dioxide coming into their leaves and releasing oxygen; birds landing on their branches; spreading their branches to create shade; and more.
- Ask students to open their eyes and share experiences.
- Next, have students lie down on a sheet of mural paper in the classroom or outside. Trace around their bodies, creating individual life-size images. Ask students to add their face to the drawing and then to make the rest of their body look like a tree: body=trunk, hands/arms=branches, skin=bark, hair/fingers=leaves, feet/toes=roots.
- Invite students to draw animals on their Tree/Me image and glue fallen leaves on their branches.
- Ask students, “What are the similarities between our bodies and the structure of a tree?” “What else do you think people have in common with trees?” (e.g. blood is like sap; similar needs for food, water, air, etc.)



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EXPLORING OUR RELATIONSHIP TO PLACE

AGES

9 years old and up

CONTRIBUTED BY

Occidental Arts and Ecology Center
Occidental, California
www.oaec.org



© SASHWA BURROUS

This activity examines our relationships with place, people, all living beings and the “things” we interact with each day, building and re-learning ecological literacy. “Eco” comes from the Greek word *oikos* which means home. Ecology is the study of home. Economy is the management of home. Ecosystems are the web of connections at home. This place-making activity sets the stage for long term observations of the ways in which we are in a relationship with home.

DIRECTIONS

- Stand in a circle in the schoolyard. The facilitator supports participants in establishing the cardinal directions by instructing, “on the count of three, point to where the sun rose this morning.” Ask participants to hold their pointing arms still while they look around at the varied responses. Ask two or three people to provide an explanation of why they are pointing in the direction they chose, highlighting observation, memory and gut feeling as common responses.
- Without revealing the answer, use the participants’ co-created knowledge to establish the cardinal directions. Once group has established N/S/E/W, “create” (or imagine) an oriented, flat map on the ground with clear boundaries, an equator and a center point. You may draw a line in the dirt (or use chalk on asphalt) or use reference points to establish boundaries.
- Participants will soon physically place themselves on the map according to their personal responses to the facilitator’s prompts. Acknowledge that scale will vary depending on the question. After each prompt is (silently) responded to through physical motion, ask three to five participants to tell the group where they are. Set the pattern by asking students to introduce themselves and share their response with a brief story, if appropriate. The student sharing their response then calls on the next student. The facilitator monitors the discussion and prompts with the additional questions.
- Sample prompts for this mapping activity include:
Place yourself on the map where you call “home.” Place yourself on the map where—to the best of your knowledge—your mother’s ancestors are from. Place yourself on the map where—to the best of your knowledge—your father’s ancestors are from. Place yourself on the map where you first felt a connection to the natural world. Place yourself on the map where some of the materials in your cell phone were extracted. Place yourself on the map where your shirt was made. (Ask a partner for some help in reading the tag.) Place yourself on the map where your favorite food is from. Place yourself on the map where you would like to travel one day. Design your own prompts in order to meet the needs of your community.
- To debrief, stand in a circle. Raise your hand if you: liked that exercise; were ever confused during that exercise; learned something about yourself/the group during that exercise; had to travel during that exercise; felt heard during that exercise; have more stories to share.
- Discussion prompts: What came up for you? What did you learn about your community? Surprises? Similarities? Differences? How are we all connected? To each other? To land? To food? To water? What networks did you observe? What systems connect us?
- Summary: This activity is about building community amongst participants (unexpected commonalities and differences) and rooting our personal experiences in deeper relationship with place in order to better understand home. We are global citizens.



LIGHTHOUSE

AGES

8-12 years old

CONTRIBUTED BY

Life Lab

Santa Cruz, California

www.lifelab.org



© JOHN FISHER

This activity asks one student (the lighthouse) to verbally lead another blindfolded student (the boat) through a maze of people. This pairs well with class discussions around communication and cooperation skills.

MATERIALS

- Blindfold

DIRECTIONS

- Ask a student who feels that he or she can communicate clearly to be the lighthouse.
- Ask another student who considers himself or herself to be a good listener to be the boat. Blindfold this student.
- The remaining students will become obstacles in a bay. They can be bridges, logs and so on. It is important that they are quiet and do not move during the activity.
- Situate the lighthouse at one end of the playing area.
- Place the boat at the other end.
- The remaining students can take their places between the boat and the lighthouse as obstacles in the bay.
- The task of the lighthouse is to verbally lead the blindfolded boat through the obstacles. The lighthouse should remain stationary. The lighthouse should give the boat explicit directions so that it will avoid the obstacles. It may help to have the boat keep a hand raised to assist in determining left from right.
- The task is completed when the boat safely arrives at the lighthouse. If the boat hits an obstacle and sinks, choose another student to be blindfolded, rearrange the obstacles and begin again. The obstacles should remain still and silent.
- Possible discussion topics after this activity:
 - How did it feel to be the boat?
 - What did the boat have to do to stay afloat and reach the lighthouse?
 - How did it feel to be the lighthouse?
 - What did the lighthouse have to do to bring the boat in safely?
 - What does “concentration” mean?
 - What does “communication” mean?



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Place-Based Understanding

Living schoolyards, built with local, natural materials and native plants, are each unique, reflecting the geography, ecology and culture of their community and building a sense of place for children and adults who spend time in them.

NATURAL CONTEXT Green schoolyards can showcase local ecosystems in their region, helping children to connect on a daily basis to the living systems that surround them.

GEOGRAPHIC CONTEXT Large painted or three dimensional maps of many types can be added to schoolyards to illustrate the school's location in the world, the country, the state, the city, the neighborhood or even their watershed.

CULTURAL CONTEXT California's school communities have incredibly rich cultural diversity which can be celebrated in living schoolyards with art, events and activities that reflect the school's population and context.

HISTORICAL CONTEXT Every school site and surrounding neighborhood has its own history, whether it is newly built or has stood for hundreds of years. Curricula about local history can be connected to the unique patch of ground managed by your school, and the results may be displayed creatively outdoors, for everyone to enjoy.

ACTIVITIES IN THIS CHAPTER

- **Finding Your Place in the World** 31
Natural context / observation (3-18 years old)
- **Schoolyard Investigations Using Tools** 32
Natural context / science field work (4-8 years old)
- **Six of One, Half Dozen of the Other** 33
Natural context / classification systems (5-18 years old)
- **"Sense-sational" Tree Tour** 34
Natural context / trees / observation (5-8 years old)
- **Reflection Writing in Your Green Schoolyard** 35
Natural context / observation (7-18 years old)
- **Create a Schoolyard Site Survey Map** 36
Geographic context / mapping (5-18 years old)

OTHER RELATED ACTIVITIES

- **Painting the Seasons** 9
Natural context / seasonal change / art (4-18 years old)
- **Schoolyard Nature Lotería** 14
Cultural and natural context / game (6-17 years old)
- **Exploring Our Relationship to Place** 28
Cultural context / observation (5-18 years old)
- **Documenting Biodiversity in Your Schoolyard** 39
Science lesson / place-based study (9-18 years old)



FINDING YOUR PLACE IN THE WORLD

AGES

3-18 years old

CONTRIBUTED BY

The Presidio Trust
San Francisco, California
www.presidio.gov



© THE PRESIDIO TRUST

This “activity” is remarkably simple yet potentially profound, and gets more valuable if it can become a regular part of a weekly or monthly routine. The power of observation relies on the conditions of settling the mind, tuning the senses and sparking curiosity. By giving each student their own space (or “place in the world”) and singular task to simply notice what is happening, students develop a practice they can bring with them anywhere they go outdoors.

MATERIALS

- No materials are necessary for this activity, however it lends itself to on-going field journaling practice (drawing and writing observations, questions, musings, etc.)

DIRECTIONS

- Identify an outdoor area that is large enough for students to have a personal sitting space at least 10 feet from other students. This can be an area that is new to them or one that they are already familiar with. (If the latter, this can be presented as a challenge for them to notice something new that they had been previously unaware of.) Ideally students will be invited to find their own sitting spot, with the understanding that this is not a talking activity.



- The initial length of time for their observations can be as short as 3-5 minutes. If this activity becomes a regular part of a weekly routine its duration can be increased in response to students’ capacities and interests. There is value in returning to the same sitting spot over time so that phenological changes can be noticed (changes in natural phenomena, e.g. the changing growth phases of a plant). Afterwards, invite students to share their insights and surprises. This discussion with an interested adult adds a vital component to their connection with the natural world.
- There are many activities teachers can do with their students to extend this activity such as:
 - Make a sound map of the area around each student
 - Engage a “See-Think-Wonder” inquiry: Focus on one thing that interests students. Encourage them to write about it and pose related questions.
 - Write a poem (haiku or cinquain)
 - Ask students to write a letter to themselves from the perspective of a plant or animal in their space
 - For older students, ask the following questions related to values in decision-making about human impacts on a place: What has happened here? What is happening here? What should happen here?
- If journaling, invite students to “dialogue journal” with a partner to share questions and observations. Alternatively, invite students to bring their journal home so their parents can engage in the dialogue with their own questions.



SCHOOLYARD INVESTIGATIONS USING TOOLS

AGES

4-8 years old

CONTRIBUTED BY

Monterey Bay Aquarium

Monterey, California

www.montereybayaquarium.org



© JOEY LEHNHARD

Young children can use observation and measurement to find out more about an environment using simple tools that extend human senses and make the data collected more precise and scientific. In this activity, students take a closer look at a small part of their schoolyard and use scientific tools to observe and explore what they see!

MATERIALS

- Magnifier, thermometer, 1m-long piece of string
- Science notebook, pencil, clear tape

DIRECTIONS

- Select an area of your schoolyard that has both sunny and shady areas. Explain to students that today they are going to do what scientists do—collect data—about their schoolyard. Show them the place in their science notebooks where they will record their findings.
- Tell students to:
 - Make a string circle, lay it on the ground and observe what you find inside of it.
 - Collect a soil sample from your circle and tape it into your notebook.
 - Use the thermometer to take the surface temperature inside your circle.
 - Count the number of insects you find in your circle.



- After students spend time collecting data, return to the classroom and graph and analyze or discuss what they found. Record students' questions on a chart or Question Wall for further investigation. Help them think about their data by asking the following questions:
 - Look at your soil samples. What do you see? Now look again with the magnifier. How are the two samples the same? How are they different? Could you find some soil that looks different from your samples? Where would you look?
 - Which area was warmer, sun or shade? Do you think we could find the very WARMEST place in our schoolyard? Where would you look? Do you think the temperature stays the same in those areas all day? How can we find out?
 - How many insects did you find? Where could you look for more? Do you think you would find the same number if you went back another day? How can we find out? Can you find a place with more insects in the schoolyard? Where might you find more insects, in the sun or in the shade?
 - What did you find in the sun that you didn't find in the shade? What did you find in the shade that you didn't find in the sun?
 - What interesting thing did you find? Was it in the sun or shade? What makes it interesting to you? Can you describe it?
- Scientists must look more than once at their study areas to begin to answer questions. Ideally, take the children out again to answer these and other questions.



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SIX OF ONE, HALF DOZEN OF THE OTHER

AGES

7 years old and up

CONTRIBUTED BY

Life Lab

Santa Cruz, California

www.lifelab.org



© JOHN FISHER

In this activity, groups of students will search for objects in the garden that have a specific quality and those that have the opposite quality. Students use multiple senses to find and classify contrasting objects in the natural environment.

MATERIALS

- One egg carton per group of three students

PREPARATION

- On the bottom of each egg carton write two words. One should be a likely quality of a garden object, such as “wet”. The other should be its opposite (“dry”). Use words that will encourage students to use their senses, such as dark/light, rough/smooth, dull/colorful, scented/unscented, scratchy/soft, etc. Label each carton with different opposites. To discourage unsupervised tasting, avoid opposites that refer to taste.

DIRECTIONS

- Divide the class into groups of three. Tell the class that each group will get a special collecting container in which to collect 12 items. They shouldn’t let any other group see the secret information on the bottom of the carton.
- Distribute the cartons and demonstrate to each group how the opposites should be placed, with six of each category in a long row. On the bottom of the carton are secret words that tell what category of objects to collect. Every group will be collecting different opposites.
- Remind students to handle everything gently and to take only small specimens. Allow enough time for students to explore the site and gather the items they need.
- When the groups are finished, have them each exchange cartons and try to determine which opposite categories the other group collected, without looking on the bottom of their carton.
- Discuss strategies that the groups used for identifying the other group’s classifications.



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"SENSE-SATIONAL" TREE TOUR

AGES

5-8 years old

CONTRIBUTED BY

Canopy
Palo Alto, California
www.canopy.org



© CANOPY

Engaging and fun, this fresh-air tour of schoolyard trees engages students through their senses to observe trees up close and view trees in new ways. Students then use their observations to describe the similarities and differences among the trees at their school.

MATERIALS

- Bags for students to collect tree items
- Paper and clipboard
- Colored crayons or pencils
- Fruit from trees, to share with the class (optional)

PREPARATION

- Select and identify four or five trees at your school that satisfy the five senses. For example, trees with leaves of interesting shapes or colors, leaves that are fragrant, textured tree bark, or fruit trees.
- Gather samples from trees such as leaves, fruits or seeds.
- Find out a few facts about each tree to share with students.

DIRECTIONS

- Review the five senses with students.
- Ask students what they have noticed about the trees at their school.
- Let students know that they will visit some of the trees at school and will observe them using their senses.
- Review instructions for how to observe a tree gently. If students will collect samples, remind them to only pick up items from the ground.
- Go outside on the school grounds with the class. At the first tree, review the main tree parts and why each of these parts is important.

- At each tree, ask the students to explore and experience the tree with the appropriate sense(s):
 - **SIGHT:** Students stand around the tree and look up and down. What colors and shapes do they see?
 - **TOUCH:** Invite students to gently touch the tree bark and leaves. How do they feel?
 - **SMELL:** Pass around leaf samples for students to smell. How does it smell? (If there are no fragrant trees on campus, teachers can bring in samples from other trees. For example: bay, camphor, citrus.)
 - **HEARING:** Ask students to listen to the tree. What do they hear? Ask students what sounds they might hear from animals living in or around trees. If students hear human activity, talk about how people live among trees and that we are part of nature. Ask students why they think humans need trees.
 - **TASTE:** Engage students in a discussion about which foods come from trees. Bring in fruit from trees, to share, or distribute the school's fruit snack.
- After the tour, students may share the similarities and differences among the trees they observed and discuss which tree(s) is their favorite and why.
- Ask students to draw one of the trees they observed, label the tree's parts, and write a paragraph describing the tree and what they appreciate about the tree. Or, if students collected samples, they can create an art piece with the tree parts they collected.



REFLECTION WRITING IN YOUR GREEN SCHOOLYARD

AGES

7-18 years old

CONTRIBUTED BY

Nature's Voices, Green Schools Initiative
Berkeley, California
www.naturesvoices.org



© NATURE'S VOICES

This activity links to the Language Arts Common Core Standards by asking students to reflect upon why green schoolyards are important to their school. Students choose their favorite spot in the schoolyard, then use a prompt to write about the benefits of green schoolyards for themselves and their school. These essays can be published on the Nature's Voices website and on other community platforms to showcase student stories about green schoolyards.

MATERIALS

- Pen, paper and clipboard for each student
- Computer access to publish the stories on the Nature's Voices website, listed above.

DIRECTIONS

- Tell the class that May is Living Schoolyard Month and that they will be brainstorming, writing about and then publishing stories about the many reasons why their green schoolyard is so important to them.
- Begin by taking students on a tour of the schoolyard, stopping at all of the students' favorite spots and reflecting on why these places are special. The teacher can designate a note-taker to record comments during the walk.
- Gather the class and lead a discussion to reflect on the site tour. The discussion might include questions like this:
 - Name some of your favorite places on the school grounds and tell us why they are so special to you?
 - What are some of the benefits of green schoolyards? Students might say: nature calms them down; they love that their school is protecting the environment; or they have fun playing in nature at school.
 - How does the green schoolyard help the community? Ideas might include that the school is saving water, growing food or planting trees.
- Should other schools have green schoolyards like the one at your school? If so, why?
- Are there other elements that students would like their schoolyard to include, to make it even greener?
- Teachers continue the lesson by giving each student a clipboard to write an essay that summarizes what they were thinking about during the discussion. Students choose their favorite place in the schoolyard, sit down there and write for 15-20 minutes. The general writing prompt might be: "Why I love my green schoolyard" or "What my green schoolyard means to me."
- After students have completed the first draft of their essays outside, the teacher can later use them to teach or practice the writing process by creating edited revisions. Students may also illustrate their writing with photographs or drawings.
- With their teachers' assistance, students can publish their completed stories and images on the Nature's Voices website. This website, listed above, is a storybank of written work, photographs and videos from and about youth, who share their thoughts related to their environmental and outdoor experiences.
- Students and teachers can also brainstorm other ways to share their stories, from publishing their essays in the school or community newspaper to sharing them on the school's website.



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CREATE A SCHOOLYARD SITE SURVEY MAP

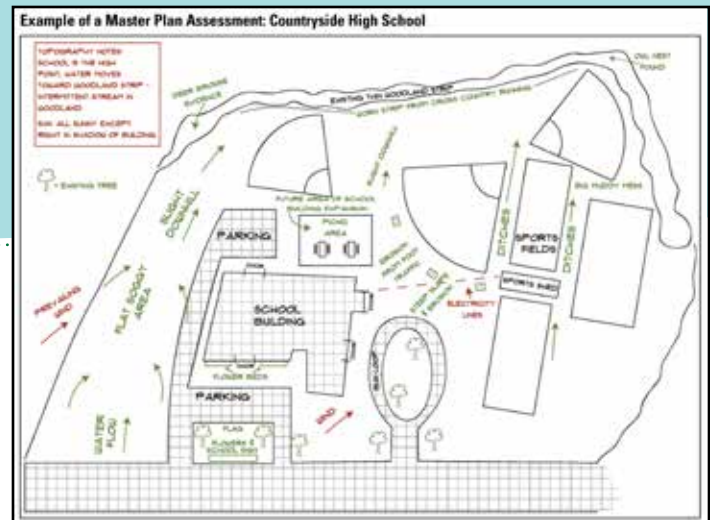
AGES

5-18 years old

CONTRIBUTED BY

U.S. Fish & Wildlife Service
Sacramento, California

www.fws.gov/cno/conservation/schoolyard.cfm



A schoolyard site survey takes students on a journey around the campus to identify areas used by people, both formally and informally, physical features of the campus, and human-related and biological characteristics of the site.

MATERIALS

- U.S. Fish & Wildlife Service's *Schoolyard Habitat Project Guide*, see: <http://1.usa.gov/1RZLep0>
- All available maps and images of the school
- Camera
- Measuring tape
- Field guides
- Binoculars
- Pencils, markers and graph paper

DIRECTIONS

- Draw an outline of the school property, school buildings and parking lots. This is your base map.
- Walk the entire schoolyard.
- Sketch on your base map all of the important physical, human related and biological characteristics listed below. Create a legend and designate symbols to mark important characteristics.
- Create a collective schoolyard site survey that includes observations from the whole class about the following features:
 - **TOPOGRAPHY:** Identify high and low spots. Locate steep slopes.
 - **PREVAILING WIND:** Indicate prevailing wind direction.
 - **SUNNY AND SHADY AREAS:** Distinguish between areas that receive full sun, partial shade and full shade.
 - **WATER:** Designate any areas that are obvious drainage or waterways. Indicate direction of water runoff. Locate any areas where erosion is occurring. Locate spots that seem especially wet or dry.
 - **STRUCTURES:** Identify structures where students play or gather such as playground equipment, bike racks, signs, benches, picnic tables and fences.
 - **FIELDS:** Identify the athletic fields and areas that are used for informal play either by the school or other members of the community. Identify where students gather for fire drills.
 - **ACCESSIBILITY:** Identify areas that are accessible during a class period. Indicate formal and informal pathways. Identify spaces used by the public.
 - **UTILITY FEATURES:** Locate obvious utility lines above or below ground. Locate existing water or irrigation lines and accessible spigots.
 - **PLANTS:** Locate and identify trees, shrubs and plants that provide food and cover for wildlife, both on and adjacent to the school grounds.
 - **WILDLIFE:** Locate and identify signs of wildlife on the school grounds.
 - **GROUNDCOVER:** Indicate different groundcovers such as grass, bare earth, pavement, woodland groundcovers, native plantings or garden areas.
- Discuss your observations and completed schoolyard map with the class and with the rest of the school.





Wildlife and Habitat

Schoolyard wildlife and native habitat zones are important and engaging places that help students of all ages connect to the natural world. They illustrate that “the environment” is not just a far away place—it is something that surrounds us all in our local neighborhoods. Wildlife sanctuaries and schoolyard ecosystems, large or small, enrich school curricula while providing refuges for a variety of species. They allow students to see that wildlife can exist in urban and suburban areas and even thrive with a little help. Wildlife areas and native plantings can be connected to the curriculum in countless ways, including nature observation in science classes, sketching practice in art classes, and population estimates/counts for math classes.

The strongest projects provide well-rounded habitats that fulfill the basic needs of local wildlife—consistent food sources, clean water, shelter and areas where they can rear their offspring. Successful schoolyard wildlife sanctuaries also provide places for students to observe birds, animals and insects while leaving the creatures relatively undisturbed. They are peaceful havens for quiet reflection where flora and fauna are nurtured, changes happen slowly following ecological cycles and planting schemes highlight seasonal change and mimic natural patterns.¹

ACTIVITIES IN THIS CHAPTER

- **Schoolyard Habitat Survey** **38**
Science lesson / grounds improvement (5-10 years old)
- **Documenting Biodiversity in Your Schoolyard** **39**
Science lesson / place-based study (9-18 years old)
- **Garden-Based Learning: Interdependence** **40**
Science lesson / habitat / adaptations (7-10 years old)
- **Object Match Challenge** **41**
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- **Butterfly Habitat Hunt** **42**
Insects / schoolyard ecology (5-12 years old)
- **Plant a Native Hedgerow** **43**
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- **What Makes a Bird a Bird** **44**
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- **Sierra Nevada Animal Olympics** **45**
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- **California Desert Animal Olympics** **46**
Desert habitat / active game (8-11 years old)
- **Blue Whale: An Animal of Unusual Size** **47**
Ocean habitat / math lesson (10-18 years old)



SCHOOLYARD HABITAT SURVEY

AGES

5-10 years old

CONTRIBUTED BY

CalRecycle

Sacramento, California

www.CaliforniaEEI.org



© SHARON DANKS

Students conduct a survey of their schoolyard to determine in what ways it is a habitat for plants and animals. They work in small groups to discuss and sketch their ideas on how to improve their schoolyard for plants and animals.



MATERIALS

- Piece of paper (and clipboards if feasible) for students to record their findings (written words or drawings) while they are outside studying schoolyard habitats.

DIRECTIONS

- Put students in pairs. Assign each pair an adult helper/older student buddy, if available.
- Explain to students that they are going out to the schoolyard to see which plants and animals they can find. They will use their paper to draw and write about some of the plants and animals they see and will note where they found them.
- Lead them outside, talk about appropriate physical boundaries and the importance of not disturbing what they see (nests, flowers, etc.). Give them 15 minutes to walk around the schoolyard recording what they find.
- Return to the classroom for a group discussion about the findings. Teachers may help the class organize and summarize their findings in columns, e.g. “What We Found” (animal or plant) and “Where We Found Them”.
- Finish the activity by having students write and draw about how people can help plants and animals survive in their habitats. Doing so will help teachers assess students’ understanding. (e.g. We can plant trees to make a habitat for birds.)

Adapted from California Education and the Environment Initiative,
“Surviving and Thriving.” <http://bit.ly/20Jt5hh>



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DOCUMENTING BIODIVERSITY IN YOUR SCHOOLYARD

AGES

9-18 years old

CONTRIBUTED BY

California Academy of Sciences
San Francisco, California
www.calacademy.org/educators



© KAIT SHORROCK

Using simple tools and technology, develop and carry out an original scientific investigation about biodiversity on your school campus. Use iNaturalist to conduct a biological survey, get help with species identification and connect with a global network of naturalists. Then, analyze your data, draw conclusions and share your findings to inspire environmental stewardship in your community.

MATERIALS

- Mobile device with iNaturalist app downloaded, one per group of two to five students
- Science notebook, one per student

PREPARATION

- Review the iNaturalist mobile app, website and Teacher's Guide: <http://bit.ly/1W5dxDG>
- Setup login: <http://bit.ly/1RZMRmB>
- Select your schoolyard study site as your "place"

DIRECTIONS

- Lead a short discussion accessing prior knowledge about schoolyard biodiversity. Ask the students: Which species (large or small) have you seen on your school grounds?
- Show students the iNaturalist website and app and, if applicable, show any data that already exist near your schoolyard. Ask students: Which of these species are unfamiliar to you? Who collected these data?
- Explain that today students will be collecting data using iNaturalist to document the species they can find in their schoolyard.
- Ask students to log onto iNaturalist on the mobile devices. Model how to take a photo of an individual organism and sync to iNaturalist. Give students time to practice.
- Ask students to create a preliminary inventory by using a mobile device to take photos of individual organisms.

Divide responsibilities so that everyone has a chance to take photos, sync to iNaturalist, identify species and complete online entries. (Use the online tutorials to practice this process before teaching the students.)

- Facilitate a discussion about what the students observed. Ask: What kinds of organisms did you observe? What did you see that you didn't expect?
- After students have a sense of local biodiversity, have them work in small groups to examine the data, compare their schoolyard to a nature preserve and discuss.
- Then ask students to answer questions in their science notebooks: What kinds of organisms are abundant near your school? What is rare? Why do you think that is? How did the organisms near your school get to be there? What do they need to survive? Does anything seem strange, confusing or interesting to you about what lives in your environment? Record all questions in science notebooks.

RECOMMENDED EXTENSION

- Continue students' background research on local environmental issues by investigating local news and interviewing community members. Ask students to develop their own research questions, gather more data on the schoolyard, analyze results and share them with their community.
- More information is available from: <http://bit.ly/1Tag0dA>



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CALIFORNIA
ACADEMY OF
SCIENCES

GARDEN-BASED LEARNING LESSON: INTERDEPENDENCE

AGES

7-10 years old

CONTRIBUTED BY

Berkeley Public School Gardening & Cooking Program
Berkeley, California
www.berkeleyschools.net/cgp



© BERKELEY PUBLIC SCHOOL GARDEN-
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& COOKING PROGRAM

Students explore different environments within the school garden to identify various ways flora and fauna adapt to natural and non-natural environments. After this lesson, students will understand how plants and animals survive in their habitats and will have an emerging understanding of biodiversity and its importance in gardens of all types.

MATERIALS

- Garden journals and pencils
- Assorted garden tools
- Scavenger hunt cards that picture flora and fauna found in your school garden (make these ahead of time with your class)



DIRECTIONS

- Bring the class outside into your school garden.
- Distribute garden journals and scavenger hunt cards to teams of two. Discuss how plants have particular features that enable them to conserve water and absorb sunlight.
- Instruct students to find a plant to describe that: has tiny leaves, a spine, uses stems to climb, is covered in tiny hairs or has giant leaves. Have them find an animal or insect that: burrows under ground, sunbathes, eats garbage or walks on two feet. Students document these findings in pairs as they explore the garden using their scavenger hunt cards.
- Regroup students and discuss adaptation behaviors and physical features that help living things survive in their habitat. Students then share their observations and discuss how these characteristics could have adapted over time to fit their environment.
- Ask students to discuss with their partner their knowledge of what plants and animals need to survive (nutrients, sunlight, water, shelter). Next, encourage the partner pairs to share their discussion with the group. Students can describe what they found during the scavenger hunt and share something about how it has adapted to its environment.
- To provide ceremony to the closing of the lesson, offer students a seasonal snack or invite them to forage and taste something in the garden on their way out. Ask students to think about how that piece of fruit or vegetable has adapted to survive in its environment.



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OBJECT MATCH CHALLENGE

AGES

9-18 years old

CONTRIBUTED BY

California Native Plant Society
Sacramento, California
www.cnps.org



© SAN FRANCISCO UNIFIED SCHOOL DISTRICT

This is a great, hands-on, introductory activity for biology classes that can be done with students in a schoolyard. The goal of this exercise is to help students learn to provide sustained, focused attention on the details of a plant (or object) they choose, and to learn to describe and record what they see, in detail. This activity is a natural fit for lessons about herbivore predation, adaptations, photosynthesis, diversity, cells, respiration and other biological topics.

MATERIALS

- Hard writing surface for each student (e.g. clipboard)
- Piece of paper and a pencil (or colored pencils) for each student
- Plant materials and other natural objects found in the schoolyard or local neighborhood. Fallen leaves work best, but a single leaf taken from a plant is also a good subject for study.

DIRECTIONS

- Set the challenge for the students. Give them a few minutes to find a natural object in the schoolyard to study during this exercise (a biological focus). Once they find their object, they will draw it using the entire sheet of paper. Their drawings should be:

A = Accurate
B = Big
C = Clear
D = Detailed
E = Explained

These standards will set the tone for the students and allow their work to be compared to others in the class during a “match up” challenge at the end of the lesson.

- Ask students to take their time and capture as much detail from their objects as possible.

- As the students are working, the teacher should review their progress and encourage them to add more detail, explanations, colors, dimensions and other subtleties of their object. This will help them to meet the “Explained” portion of the standard.
- When the students have finished their drawings in an allotted amount of time (20-30 minutes), gather the group back together in a central location.
- Ask the students place their papers in a circle on the ground, or on the perimeter of a table. Ask them to put their objects in the middle of the circle, but not near their own drawing.
- Once all of the students have added their papers and objects to the circle, ask the entire class to work together to match each object with the corresponding drawing.
- Debrief the class about which objects were the easiest to identify and match, and which ones were more difficult. What clues helped the students match their objects?
- Use the drawing standard to guide the discussion. Ask broad questions to bring out their curiosity about the focus topic. The discussion may also continue in the classroom.

Adapted by San Francisco Unified School District from: California Native Plant Society, *Opening the World Through Nature Journaling*, Version 2.1, John Muir Laws. Used with permission. <http://bit.ly/22BgVq3>



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BUTTERFLY HABITAT HUNT

AGES

5-12 years old

CONTRIBUTED BY

National Wildlife Federation, Schoolyard Habitats®
Midpines, California
www.nwfcalfornia.org



© ELIZABETH SOPER

Students will explore what butterflies need in order to survive and will investigate their own school grounds for butterfly habitat.

MATERIALS

- Pictures of local butterflies
- Research/articles on butterfly habitat and host plants for your geographic area
- Magnifying glasses
- Nature journals

DIRECTIONS

- Explore the concept of wildlife habitat with your students. Ask them what they think wildlife need in order to survive.
- In order for an animal to survive, it must be able to find adequate habitat that provides food, water, cover and a safe place to raise young. The amount and quality of these needs varies a great deal from species to species.
- Now have students think specifically about butterflies. Where do they tend to see butterflies? What do they think butterflies eat? Where do they think butterflies find cover and raise their young?



- Many butterflies require specific plants in order to survive. These plants are called “Host Plants.” For example, Monarch butterflies require milkweed in order to survive. Ask students to research which butterflies are present in their local community and which habitat and host plants they may require.
- Next, take your students outside to your own schoolyard and have them explore the grounds for butterflies and plants. Younger students can draw what they see in their journals or you can also cut out squares of construction paper of different colors. Hand out one or more (depending on level of students) squares of several different colors and have them look for butterflies or flowers that include that color. Ask students to observe these animals/plants carefully and draw them in their journals. For older students, take them outside for a butterfly/plant hunt. As a group, search for the butterflies and plants they identified in their research.
- Alternatively, divide students into groups and ask each group to look for one specific type of butterfly or plant. Depending on the time of year, students can also look for butterflies and draw what they see in a nature journal or on a sheet of paper.
- When you return to the classroom, examine your results. Make a list (or simple sketches) of the plants and/or butterflies you found. Could you add any plants to make the schoolyard a better place for butterflies?

Consider planting or starting a butterfly garden as part of a Schoolyard Habitats® site. Visit our website for more information: <http://bit.ly/1ScGx7H>



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PLANT A NATIVE HEDGEROW

AGES

8-18 years old

CONTRIBUTED BY

Collaborative for High Performance Schools (CHPS)
Sacramento, California
www.chps.net



© SHARON DANKS

A hedgerow is a linear arrangement of closely spaced shrubs and trees designed to create a fence-like border, serve as a barrier or mark a boundary. In a schoolyard context, a hedgerow can also act as a windbreak, create shade and promote habitat for beneficial insects and birds. Plants in hedgerows can be chosen for a variety of services that support a nearby school garden, such as: masking crop plants from pests, deterring pests with their scent, enticing pests away from crops, and serving as nurse plants and food sources for beneficial insects that assist in the management of organic gardens.

MATERIALS

- Mixture of native hedge plants (mostly perennial shrubs)
- Well-rotted manure or peat-free compost
- Cardboard
- Shovels, trowels, spades and/or forks
- Gloves
- Bark, mulch, straw or grass clippings
- Pruning shears
- Stakes or bamboo sticks

DIRECTIONS

- Decide where the hedge is to be planted. Consider linear spaces around the perimeter of a school garden or other school ground boundary between adjacent uses.
- Source native hedgerow plants from your local nursery.
- Mark planting locations 12 inches apart in the designated row using stakes or bamboo sticks. Double rows may be needed, or even triple rows, if your site is very exposed to the wind or if you would like to create a dense boundary. If you are planting more than one row, stagger the plants as in this diagram:

```

X X X X X X X X X X X X X X X
X X X X X X X X X X X X X X X
  
```

- Dig holes approximately the same depth as the height of your plants' root balls, or as directed by your local nursery. Add a trowel full of compost or manure to each

hole and mix with the native soil. Loosen the root ball of each plant slightly (so roots will not continue to grow in a circle in the ground) and place one plant into each hole. Fill the remainder of each hole with native soil and firm the soil around the plant to remove any air spaces. Water the new plants. Add a 1-foot wide strip of cardboard to the soil's surface around the plants to deter weeds. Cover the cardboard with a thick layer of bark, mulch, grass clippings or straw.

- Clip plants to 12 inches high to encourage root development and new growth but leave a plant unclipped roughly every 10-12 feet to become a standard.

VERSATILE CALIFORNIA PLANT FAMILIES

Sages (*Salvia* spp.)

California lilac (*Ceanothus* spp.)

Manzanita (*Arctostaphylos* spp.)

CALIFORNIA NATIVE PLANT RESOURCES

CA Native Plant Society - <http://bit.ly/1p5U3Sz>

CA native plant lists by region - <http://bit.ly/1Vr8cHW>

Hedgerow species to consider - <http://bit.ly/1MyUss4>

Reference: Kourik, Robert. *Designing and Maintaining your Edible Landscape Naturally*. Vermont: Chelsea Green Publishing, 1986.



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WHAT MAKES A BIRD A BIRD?

AGES

4-8 years old

CONTRIBUTED BY

Central Valley Joint Venture
Sacramento, California
www.centralvalleyjointventure.org



© CHRIS NICOLAI

Through observations of birds, bird stories, images and teacher-led discussions, students will learn about the features, adaptation and traits of birds. Students will then draw pictures and text to create a booklet that helps them answer the question: What makes a bird a bird?

MATERIALS

- Children's story about birds. Some suggested books include: *That Chickadee Feeling* by Frank Glew, *What Makes a Bird a Bird?* by May Garelick, or *It Could Still be a Bird* by Allan Fowler
- White paper (tabloid or legal size preferred)
- Clipboard
- Crayons or colored pencils

OPTIONAL MATERIALS

- Ability to observe wild birds; binoculars for older children would be useful
- Printed images of birds, including pictures of key concepts / vocabulary listed below
- Stuffed life-like toy birds or puppets
- Bird feathers (clean feathers, obtained at a craft store)
- Hard boiled chicken egg
- Any other props useful to describe the concepts and vocabulary outlined below

DIRECTIONS

- In an outdoor environment, the teacher will read aloud an introductory children's story about birds. The teacher will then lead a brief discussion to find out what the students know about birds. Following the discussion, the teacher will use some of the available learning aides to discuss the key characteristics of birds. Students should be given the opportunity to observe wild birds if possible.

- Concepts / vocabulary to introduce includes:
 - **BEAK / BILL:** All birds have a beak or bill, but so do some mammals like the duck-billed platypus.
 - **WINGS:** All birds have wings but some mammals do as well like bats.
 - **FLIGHT:** Most birds fly but not all birds fly, for example penguins. Some mammals, such as bats can fly, too.
 - **EGG:** All birds lay eggs, but so do some other animals including reptiles.
 - **NEST:** Most birds build nests but so do some other animals including insects (wasps) and some reptiles (turtles).
 - **FEATHERS:** Only birds have *feathers*! This along with the features above makes a bird a bird!
- Students will then create a booklet of their own by folding one or more pieces of paper in half depending on how many pages are desired. On each page the students should use colored pencils or crayons to draw and describe some of the things that they learned that make a bird a bird. The clipboard is used to support the paper while the students are drawing and writing.



SIERRA NEVADA ANIMAL OLYMPICS

AGES

8-11 years old

CONTRIBUTED BY

Yosemite National Park Education Office
Wawona, California
www.nps.gov/yose/learn/education



© KIRA LUCIER

Animals in Yosemite have some amazing adaptations to help them survive. This activity helps students learn about some of these unique characteristics by imitating them and competing with their friends. Students will collect data to determine if humans have the same abilities as black bears, mountain lions, frogs, owls, or bighorn sheep! Teachers can emphasize concepts including adaptations and variation, the scientific method, data collection and analysis.

MATERIALS

- Masking tape
- Measuring tapes
- Stopwatches
- White boards and markers or pencils and notebooks for recording data/creating simple graphs.

PREPARATION

- Prepare each Adaptation Station with a leader and supplies. Students will rotate between the stations in small groups. Ask a leader at each station to introduce each animal adaptation and record the data.

DIRECTIONS

- Ask each small group to pick an Adaptation Station.
- Learn about an animal's amazing ability and then try it!
- Measure and record the results for each student.
- Compare with the results within the group.
- Rotate to a new station and repeat the steps above.
- Debrief students at each station and at the end of the activity. Questions can include:
 - **VARIATION WITHIN SPECIES:** Did you have the same results as your friends for each task?
 - **ADAPTATIONS:** Why does each animal have its special ability? What was the most amazing ability you learned about? What adaptations do people have to make us special?

ADAPTATION STATIONS

- *American black bears* can run at a speed of 35 miles per hour (or about 100 feet in two seconds). With masking tape mark off a distance of 100 feet. Use a stopwatch to measure each student's time running 100 feet.
- *Mountain lions* can jump 25 feet in one leap from a standstill. Hold up a measuring tape perpendicular to the ground, and ask each student to stand next to the measuring tape one at a time and give their best jump.
- The *great gray owl* is the largest species of owl. They can be up to 33 inches tall with a wingspan of 60 inches! Ask students to stretch their arms out side to side, and then measure their "wingspans" fingertip to fingertip.
- *Sierra Nevada bighorn sheep* are an endangered species that live high on the rocky peaks of Yosemite's mountain ranges. Make a "tightrope" made of masking tape with periodic distance markers, and see how far each student can tiptoe on this "narrow ledge".
- The highly endangered *Sierra Nevada yellow-legged frog* breathes not just through their mouths but also through their skin, allowing them to stay underwater for minutes or even months when hibernating. Use a stopwatch to measure how long each student can hold their breath like an underwater frog!



CALIFORNIA DESERT ANIMAL OLYMPICS

AGES

8-11 years old

CONTRIBUTED BY

Death Valley National Park

Death Valley, California

www.nps.gov/deva



© SARAH CARTER

The Mojave Desert might not seem like an inviting home, but some animals have adaptations that help them thrive in the hot dry climate. This activity helps students learn about these unique characteristics by imitating them and competing with their friends. Students will determine if humans have the same abilities as mountain lions, kangaroo rats, roadrunners and ravens. This can be a “jumping off point” for studies of adaptation, variation, the scientific method, data collection and analysis.

MATERIALS

- Masking tape
- Measuring tapes
- Stopwatches
- White boards and markers or pencils and notebooks for recording data/creating simple graphs.

PREPARATION

- Prepare each Adaptation Station with a leader and supplies. Students will rotate between the stations in small groups. Ask a leader at each station to introduce each animal adaptation and record the data.

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- Rotate to a new station and repeat the steps above.
- Debrief students at each station and at the end of the activity. Questions can include:
 - **VARIATION WITHIN SPECIES:** Did you have the same results as your friends for each task?
 - **ADAPTATIONS:** Why does each animal have its special ability? What was the most amazing ability you learned about? What adaptations do people have to make us special?

ADAPTATION STATIONS

- *Mountain lions* can live in the desert mountains, as well as the Sierra Nevada. They have the amazing ability to move quietly and quickly. Divide students into pairs. Ask one student to close their eyes as the other student tries to slowly and silently sneak up and tap them on the shoulder.
- People need water every day, but the *kangaroo rat* never has to drink. They are named for their giant kangaroo-like feet. They are about 4.5 inches long and can jump up to 9 feet! That’s about 24 times the length of their body. Set a measuring tape on the ground, and ask each student to stand next to the measuring tape and give their best jump. Ask: If you were a kangaroo rat, how far could you jump?
- The *roadrunner* can run 20 miles per hour (or about 100 feet in 3.5 seconds) With masking tape, mark a distance of 100 ft on the ground. Use a stopwatch to measure each student’s time running 100 ft.
- *Ravens* can live almost anywhere, from the hottest deserts to the coldest mountains. They can also imitate other animals or even people. Ask students to listen to the sounds around them for 30 seconds and pick one to imitate.



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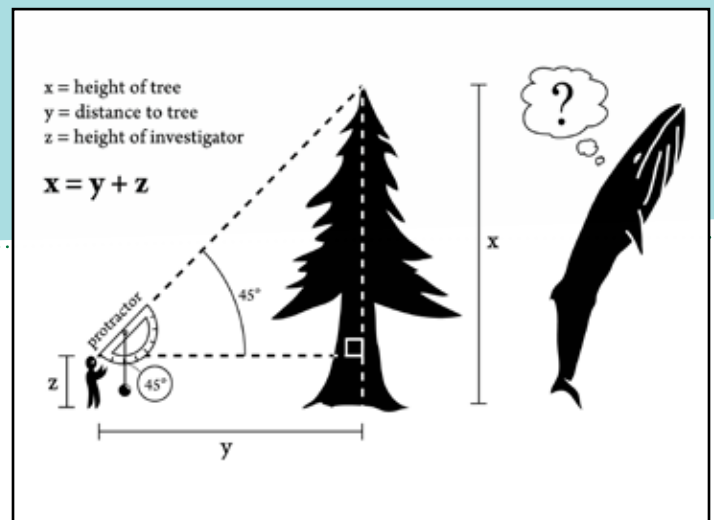
BLUE WHALE: AN ANIMAL OF UNUSUAL SIZE

AGES

10-18 years old

CONTRIBUTED BY

California Coastal Commission
San Francisco, California
www.coastforyou.org



© CALIFORNIA COASTAL COMMISSION

Blue whales are the largest animals known to have lived on earth, and they can be seen right off the coast of California! Could a blue whale fit in your schoolyard? Compare the height of a tree in your schoolyard to the length of a blue whale.

MATERIALS

- A yard stick and a 100 foot rope or measuring tape
- Clinometer made with a protractor, a straw, string, paper clip or metal washer

DIRECTIONS

- How can you tell if a blue whale could fit in your schoolyard? Start by asking students what they know about blue whales. There are many options for learning about these whales, and you can have students do research ahead of time or share information from the resource links included at the end of this activity.
- Come prepared with a piece of rope that has been pre-measured to 100 feet (or 30 meters), or a long measuring tape. Have two students each take one end of the rope and walk slowly apart until the rope is taut, then place it on the ground. Explain that a blue whale can grow to this size. Have students line up along the rope with their arms outstretched, fingertips just touching. Are they as big as the whale? Have students close their eyes and imagine an animal as big as a blue whale, swimming next to them. What do they think it is like to be a creature that size?
- Older students can compare the length of a blue whale to the height of the tallest tree on their school grounds (or to a flag pole, their school building, or other tall feature). How tall do the students think the tree is? One method to calculate the height is to compare shadows on a sunny day. Use measuring tape to measure the shadow cast by the tree. Next measure a shadow cast by a yard stick (or meter stick) held perpendicular to the ground. The shadows will be proportional to the original objects.

USE RATIOS TO CALCULATE TREE HEIGHT

(Shadow of measuring stick) / (Shadow tree) =
(Length of measuring stick) / (Height of tree)

→

Height of tree =

(Length of measuring stick) * (Shadow of tree) / (Shadow of stick)

- Another method to calculate height is to use a clinometer. Tape a straw or a small roll of paper to the flat side of a protractor. Thread some string through the hole in the protractor (near the center of the straw), and tie a weight (a paperclip or a washer) to the string so it stretches past the bottom of the protractor and swings freely. Have one student look through the straw to see the top of the tree. Have the student move farther from or closer to the tree until a partner tells them that the string is hanging down at a 45 degree angle on the protractor. The student has now formed an isosceles right triangle with the tree (see diagram above). The distance from the student to the tree, plus the student's height, equals the height of the tree. Is the tree taller than a blue whale is long? Imagine a blue whale next to the tree. How many trees would it take to equal the length of the blue whale? Why might it be useful to measure a tree this way?

ADDITIONAL RESOURCES

Making a clinometer: <http://bit.ly/1r1eEco>

Blue whales: <http://bit.ly/1W5JGep>



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Watershed Stewardship

Clean, fresh water is a precious resource. It comes to our schools and communities in the form of rainfall and through municipal plumbing systems and natural waterways. It leaves school grounds through man-made storm drains and sewer networks, and by flowing over the landscape, percolating into the soil, and running through local creeks. In most cases, water from these sources is relatively clean when it arrives on school grounds and dirtier when it leaves. School communities have the power to improve their local water systems and to use them as educational resources at the same time by incorporating water planning into the design and use of school grounds.¹

STORMWATER MANAGEMENT Schoolyards designed to manage stormwater can be beautiful and educational while holding and utilizing rainwater, and purifying urban runoff.

WATER CONSERVATION Living schoolyards can conserve water by finding and fixing leaks, incorporating drought tolerant plant species, building gardens with efficient irrigation systems, and deeply mulching planted areas.

GREYWATER REUSE Schools can capture lightly used water from the building, purify it and then use it to water trees onsite, reducing the amount of fresh water they need from the municipal system.

ACTIVITIES IN THIS CHAPTER

- **Follow the Water: Make a Stormwater Map** 49
Stormwater management / place-based study (7-10 years old)
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OTHER RELATED ACTIVITIES

- **Create a Schoolyard Site Survey Map** 36
Mapping / place-based study (5-18 years old)



FOLLOW THE WATER: MAKE A STORMWATER MAP

AGES

7-10 years old

CONTRIBUTED BY

The Trust for Public Land
San Francisco, California
www.TPL.org



© JEANINE STRICKLAND

In this activity, you will map where rainwater flows around your schoolyard, observing where it collects and moves faster and where it slows down and soaks into the ground. You will also learn about where stormwater goes after leaving the school.

MATERIALS

- Schoolyard plan (map) or aerial photo
- Map of your neighborhood
- Pens and/or pencils

DIRECTIONS

- If you were outside during a rainstorm recently, did you notice water flowing across the pavement? You may be familiar with the term “watershed”; it is the land area from which surface runoff drains into a stream, channel, lake, reservoir or other water body. The next time it rains, watch the stormwater’s behavior as it hits the ground at your school and flows downhill. How does it flow over different types of materials? Where does the water go? What else do you observe? Make a schoolyard stormwater map with your class to find out.
- Landscaped areas with plants, grass, sand, gravel or mulch hold water like a sponge. These are “pervious” or “permeable” materials. Mark them on your map.
- Hard surfaces such as paving and buildings do not absorb water. During your rainy day observations, you may see large amounts of water collect in the gutters, pour from the downspouts and flow toward the storm drains. Mark these “impervious” surfaces on your schoolyard map.
- Roofs drain to gutters which collect water that then flows into downspouts (often at corners of buildings) and onto the school grounds. When it is raining, you may see water gushing out of each downspout. Mark the school building’s “downspouts” with an “X” on the map.
- Follow the streams of water flowing during a storm to find the storm drains and catch basins and mark them on your schoolyard map with a square. These drains lead to a broader network of city storm drains, which may flow directly to a creek, river, lake or other water body.
- Check your neighborhood map to see if you can identify where the water goes after leaving your school site. If that water flows to a stream, can you trace the stream downhill to see which larger water body it joins?
- Mark the puddles and soggy spots on your schoolyard map. Where are the biggest or deepest ones? Which ones evaporate and disappear first? Can you find any “swales” (ditches)? If so, observe how planted swales slow the rainwater and allow it to be filtered and partially absorbed before the remainder flows to the storm drain.
- Can you identify any opportunities at your school to protect water quality by reducing stormwater runoff and/or preventing stormwater pollution? Stormwater pollution occurs when rain or snowmelt flows over streets or paving and picks up trash, oil, dirt and other materials as it travels. These pollutants are then carried to the storm drains and then to local creeks and streams.
- Ask your city if they have a water quality “stenciling” program to mark your local storm drains with an educational message that will help to improve water quality and habitat downstream.

See the East Bay Municipal Utility District’s website for free outdoor classroom materials: <http://bit.ly/1STWDWI>



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THE TRUST FOR PUBLIC LAND
LAND FOR PEOPLE

CALCULATING RAINWATER RUNOFF

AGES

10-18 years old

CONTRIBUTED BY

Education Outside with
San Francisco Public Utilities Commission
San Francisco, California
www.educationoutside.org with www.sfwater.org



© EDUCATION OUTSIDE

In this activity, students in dry climates determine how many gallons of rainwater fall on a roof linked to their cistern. They also estimate how much water their school uses to irrigate a drought tolerant garden and determine how many cisterns they would need to meet this demand. Students will learn that a lot of water can be captured from roofs for irrigation.

MATERIALS

- Length of string or rope for measuring (50 or 100 ft)
- Measuring tape
- Rainfall chart for your area

BACKGROUND

- The average annual rainfall in California's San Francisco Bay Area is about 20 inches (1.7 feet). This means that if it rains on a hard, impermeable surface like a roof or pavement, and there are no drains to remove the water, there would be 1.7 feet of water covering that area over the course of the rainy season. In many cities, rainwater flows from storm drains to the sewer system and is treated before it is released into the ocean. In non-urban areas, where much of the ground is permeable, rainwater is absorbed, recharges groundwater aquifers or flows into rivers that empty into the ocean.
- Rainwater can be captured and used to irrigate school gardens or to flush toilets at school. Cisterns are large containers that can hold rainwater that flows off a school's roof. Cisterns come in many sizes and may be able to collect enough water to irrigate a school garden during dry periods, reducing tap water use.

DIRECTIONS

- Begin by visiting a cistern in your schoolyard or envisioning where you would like to put one in the future.
- To determine the area of the roof that drains to the cistern, roughly measure the building's length and width (on the ground) using pre-measured lengths of string or using a very long tape measure. Then multiply the length and width to estimate the roof area. $\text{Area} = \text{Length} \times \text{Width}$

- Example: If your building measures 100 ft long by 30 ft wide, then: $100 \text{ ft} \times 30 \text{ ft} = 3,000 \text{ ft}^2$
- Calculate the volume of runoff generated by rainfall in one year by multiplying the roof area by the annual rainfall.
 - $\text{Area of Roof (ft}^2\text{)} \times \text{Depth of Annual Rainfall (ft.)} = \text{Volume of Water (ft}^3\text{)}$
- Once you have estimated the annual volume of water that falls on the roof, convert cubic feet into gallons by multiplying the volume of water (ft³) by 7.5.
 - $\text{Cubic feet} \times 7.5 = \text{Gallons}$
- Discuss: How many gallons of rainwater fall on your roof annually? Can your cistern hold it all? Where does overflow go? How can you use the water you capture? How many gallons of rainwater does the school garden need? How many cisterns do you need to meet this demand?
 - Determine the area of garden space that needs irrigation
 - Determine the size/capacity of your current cistern
- Gardens planted with natives and drought tolerant plants use less water than most other gardens. To calculate the annual water need, assume a native plant garden needs 1,000 gallons of water per 100 ft² and use this formula:
 - $(\text{Area of Garden} / 100 \text{ ft}^2) \times 1,000 \text{ Gallons} = \text{Gallons Needed Annually for Irrigation}$
- To find out how many cisterns you need to store this much water, divide your school's water need (calculated in the previous step) by the capacity of your cistern.
 - Example: $200,000 \text{ Gallons (annual need)} / 1000 \text{ Gallon Cistern} = 200 \text{ cisterns!}$
 - Does this surprise you?

Reference: Techbridge. SFPUC. Adapted by Education Outside, 2009.



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SHEET MULCHING: TURNING LAWNS INTO NATIVE GARDENS

AGES

9-18 years old

CONTRIBUTED BY

StopWaste

Alameda County, California

www.stopwaste.org



Many San Francisco Bay Area native plant species are adapted to extended periods of time with little rainfall, due to California's dry summer climate. These drought tolerant plants contrast greatly with the thirsty, non-native lawns that make up much of our built environment, including school grounds. Sheet mulching is an easy, hands-on approach to converting a lawn into a healthy layer of soil ready for planting California native species and creating a diverse schoolyard ecosystem.

MATERIALS

- Biodegradable “sheet” material, such as cardboard
- Mature compost
- Coarse mulch materials (wood chips or tree trimmings)
- One bucket per student; access to water
- Gardening gloves and sunglasses to protect hands and eyes from splinters and dust
- 4 inch starts of California native plants, as desired (If you live outside California, use plants that are native to your own region.)

BACKGROUND

- Sheet mulching uses cardboard to block the sun, enabling grass and weeds to decompose and adds nutrients to the soil, accelerated by the water. A layer of compost creates

a welcoming environment for plants to go directly on top of the cardboard. A top dressing of mulch protects the soil and helps retain moisture, reducing the need for water.

DIRECTIONS

- Identify and measure the space (lawn or bare soil) you want to sheet mulch and make sure you have enough material to create one layer of cardboard, a 1 inch layer of compost and a 2 inch layer of mulch. A handy sheet mulching calculator can be found at: <http://bit.ly/1Vwi7g2>
- If the space is surrounded by a sidewalk, work with students to dig shallow trenches (8 inches wide x 6 inches deep) along the hardscape perimeter to prevent sheet mulching materials from overflowing onto the sidewalk.
- Sheet mulching is accomplished one step at a time:
 - Lay cardboard directly on top of the lawn (or bare soil), overlapping different pieces by at least 8 inches.
 - Wet the cardboard until it is completely saturated.
 - Add a 1 inch layer of compost on top of wet cardboard.
 - Add a 2 inch layer of mulch on top of compost.
 - Pull back the layer of mulch to plant 4 inch starts directly into the compost, as desired. Carefully place the mulch back around the starts.
 - Protect the new sheet mulched, planted zone from foot traffic until the plants are well established.
 - Enjoy the garden!



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STOPWASTE
at home • at work • at school

SCHOOL OUTDOOR WATER USE AUDIT

AGES

9-18 years old

CONTRIBUTED BY

Sacramento City Unified School District
Sacramento, California
www.scusd.edu/project-green-programs



© SHARON DANKS

Water plays a critical role in our school operations every day. In order to reduce our water usage a complete understanding of a school's water use is needed to identify potential water efficiency opportunities. This outdoor water use audit will allow students to explore some the many areas of water use outside the classroom and guide discussion toward water saving actions and opportunities at their school.

MATERIALS

- Notebook or paper
- Pencil
- Camera (optional)

PREPARATION

- Coordinate with the necessary building staff to have someone available who can turn on your school's sprinkler system and locate your water meter so your students can view it and make observations.

DIRECTIONS

- Begin by locating your school's water meter(s). Discuss how the water meter measures the amount of water being supplied to your school.
- Ask the students to draw a picture of the meter or take a photo and record the number on the meter and the time. Pay special attention to the units that the meter uses—gallons, cubic feet, and hundred cubic feet are common units for water meters
- Next, locate the irrigation controls for your school and turn on the sprinklers for all areas.
- Discuss with your students how the irrigation system is controlled and how often the sprinklers are used and why.
- Locate each of the different irrigated areas on your school property and assign a group of students to each area. (e.g. athletic fields, schoolyard, garden, ornamental landscape, etc.)
- Ask the students to make the following observations of their assigned area:
 - Describe your area in detail, including types of plants: e.g. grass, bushes, native plants, garden. What hard surfaces surround your area or are a part of this zone?
 - How does the water flow after it hits the surface? Does it run off or is it absorbed into the ground? Do you see any puddles or standing water resulting from irrigation runoff? If yes, describe the location and what you see. Take photographs or make a sketch of the area.
 - Do you see any of the sprinkler heads broken, leaking and/or gushing water? If yes, describe the location and what you see. Take photographs or make a sketch of the area.
 - Do you see any sprinklers that are over-spraying onto sidewalks, concrete and/or asphalt? If yes, describe the location and what you see. Take photographs or make a sketch of the area.
- Once finished with observations, visit the water meter again and record the number on the meter and the time.
- Return to the classroom to discuss each group's findings including their water meter recordings on the amount of water that was used during the time it took to complete this activity.
- Follow up discussion topics can include: drought, water efficiency, surface runoff, permeability and evaporation.





Schoolyard Agriculture and Food

In our increasingly urban society, people of all ages have become disconnected from the natural and agricultural environments that sustain us. Starting a school garden is one way to reconnect students and school communities with local agricultural and ecological systems and to create new, vibrant, hands-on learning environments at the same time.

HORTICULTURE SKILLS Culinary gardens are cost-effective, hands-on learning spaces for studying natural science, botany and horticultural techniques. Gardens are commonly used to teach lessons on topics such as soil, weather, plant growth, insect life cycles and decomposition.

CURRICULUM CONNECTIONS School gardens can also be springboards for topics in many disciplines. They help bring social studies and history lessons to life, and provide engaging settings for teaching arithmetic and geometry, health and nutrition, art and music, reading and foreign languages.

SHARING FOOD Edible gardens give students of all ages insight into where their food comes from, what it takes to produce it and the art of bringing it to the table in an enjoyable manner. Preparing and sharing food in the schoolyard is easier to do if schools build informal outdoor kitchen spaces with ovens or barbecues, sinks and picnic tables.¹

ACTIVITIES IN THIS CHAPTER

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Soil science (14-18 years old)
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THE SCIENCE OF SOIL TESTING

AGES

14-18 years old

CONTRIBUTED BY

**The Huntington Library, Art Collections
and Botanical Gardens**

San Marino, California

www.huntington.org



© THE HUNTINGTON

Healthy soil is the key to a healthy garden. But how do you know what kind of soil is in your garden, and which plants will thrive in that soil? These “layers” of activities guide students in testing the soil make-up for a fuller perspective, and they are adapted from our on-site program, “Farm to Plate: Connecting with Our Food at the Ranch.”

MATERIALS

- Soil from the school garden
- Magnifying glass
- Cups
- pH strips with reference scale
- Shovel
- Hose or watering can
- Ruler
- Mason jar with lid
- Soil texture triangle: <http://1.usa.gov/22Bpb9s>

DIRECTIONS

- Begin by encouraging students to observe a soil sample from the garden. Ask them to use their senses to describe what the soil looks like, feels like and smells like.

PART I – Soil pH

- Ask students to fill cups with small soil samples from different parts of the garden. If it is dry, add enough water to moisten. For each sample, have students put the pH strip in the soil for a few seconds and then identify the pH color on the strip. Discuss if the results are uniform or if there is variation on your site. Knowing the pH of the soil is the first clue to what kinds of plants might be well-suited to that garden.

PART II – Soil Drainage

- Ask a student to dig a small hole in the garden, approximately one foot wide and one foot deep. Have another student fill the hole with water, and then stand the ruler in the hole. Time how long it takes for the measured water to drain into the soil. Discuss what conclusions can be drawn from the results. Knowing the drainage tendencies of the soil is the second clue to what kinds of plants might be well-suited to that garden.

PART III – Soil Texture

- Ask a student to fill the mason jar two-thirds with water and then add garden soil until the jar is almost full. Put the lid on the jar and shake until the soil has broken into particles, then set it to rest. After a few minutes, a layer of sand will form; after about an hour, a layer of silt; and after about a day, a layer of clay.
- Ask students to estimate the percentage of each of the three soil layers, and then have them locate that percentage balance on the soil texture triangle. The result will indicate the type of soil that is in their garden, and it will offer them more insight regarding the soil pH and drainage results. Then ask students to deduce what kind of plants might be successful or unsuccessful in the garden.



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THE HUNTINGTON
Library, Art Collections, and Botanical Gardens

ROOTS AND SHOOTS

AGES

8-13 years old

CONTRIBUTED BY

Full Option Science System (FOSS)
Lawrence Hall of Science, Univ. of Calif., Berkeley
Berkeley, California
www.fossweb.com and www.outdoorbiology.com



© KAREN MENDELM NELSON

There's more to a plant than meets the eye! Use a trowel to dig up and investigate the root structures of numerous schoolyard plants—weeds! Uncover these varied below-ground structures (roots) and find out how they support the shoots, the visible parts of the plants.

MATERIALS

- For each group of four students: one trowel and hand lens
- For the class: four marking flags, basin of water, plant with fibrous roots, plant with taproot, two opaque bags, marker, string

PREPARATION

- Find one weed (grass) with a fibrous root system. Wash roots and enclose the plant in an opaque bag so that only the roots are visible; label the bag "1". Do the same for a plant with a taproot; label it "2".
- Flag four different weeds growing in the schoolyard.



should try to find a plant that matches one of the flagged plants, dig it up and rinse the roots in a basin of water.

- Following root extraction, call students to the sharing circle and display the collected roots and shoots. Ask questions about the roots they dug up.
 - Are some roots harder to get out of the ground?
 - Were you able to get all the roots out?
 - Why is it hard to get the roots out?
 - Was anything attached to the roots?
- Focus the discussion on root types.

Does anyone have a plant with roots like plant "1"?

Discuss similarities and then identify them as fibrous roots. Introduce mystery plant "2". Ask for some descriptions of this root. Give students time to look at their roots to see if any are similar. Identify this as a taproot. Ask:

- What do roots do?
 - Which roots hold the most soil after they are out of the ground?
 - Do roots "branch" like shoots?
 - Shoots have stems, leaves, flowers and bark. Do roots have structures like these?
- Ask students to guess what the mystery plants will look like. Unveil the hidden plants. Compost the weeds and drain the dirty water onto a few plants.

Modified from the FOSS Next Generation Edition, Structures of Life Module, (Investigation 2, Growing Further, Part 3: Roots and Shoots) developed at the Lawrence Hall of Science, copyrighted by the Regents of the University of California, 2015, and distributed by Delta Education.



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**THE LAWRENCE
HALL OF SCIENCE**
UNIVERSITY OF CALIFORNIA, BERKELEY

PLANT ROOT EXPLORATIONS

AGES

6-10 years old

CONTRIBUTED BY

Hidden Villa

Los Altos Hills, California

www.hiddenvilla.org



© SHARON DANKS

In this two-part activity, students will study roots in the schoolyard and make a viewing box to study roots over time. Plant roots absorb water and nutrients and anchor the plant in the ground. Roots are typically found below the ground, but sometimes grow above ground to absorb water and nutrients from the air. There are many different types of roots including taproots, fibrous roots, cauline roots and tubercular roots. A taproot is a long central root that stores energy while firmly anchoring the plant. Fibrous root systems usually grow less deep but can extend a great distance to allow plants to find water and nutrients in a wider area. Cauline roots spread easily and help a plant cover a wide area (e.g. ivy). Tubercular roots, found on plants such as the sweet potato, grow out of the stem, branch, leaves or old woody root.

PART 1: EXPLORE ROOTS IN THE SCHOOLYARD

MATERIALS

- Garden trowels and gardening gloves (optional)
- 1 milk container (school lunch size) for each student

DIRECTIONS

- A great way to encourage students to explore different kinds of roots is to have them weed a portion of the schoolyard such as a garden pathway or other weedy playground space. Select a large, well-defined area to work on that does not contain any plants you want to keep. Clearly mark the boundaries of this selected area before you begin.
- Bring students outside and explain the activity. Demonstrate how to pull the weed by the stem base, as close to the ground as possible, so that the roots come up cleanly and remain intact. Use trowels as needed to loosen the soil.
- After students remove the plants from the ground, they should gently shake off the extra dirt and observe the roots they have in hand. Designate a space for students to put the weeds they find. Discuss the range of root types the class discovered.

PART 2: CREATE ROOT VIEWING BOXES

MATERIALS

- 1 clear plastic square (1.5" x 1.5") for each student, cut from transparency sheets or similar sturdy, clear plastic
- Scissors, tape, drawing paper, pencils
- Soil, seeds (e.g. sugar snap peas or radish), water

DIRECTIONS

- Preparation: Wash the milk cartons and open the flaps. Mark a 1" x 1" square on each container to show students where to cut.
- Ask students to cut a 1" x 1" square in the side of their carton, following the marked outlines, and then tape a 1.5"x1.5" piece of plastic across the hole. (Tape the plastic on both sides, inside & outside the container.)
- Fill each milk carton with soil and plant a radish or pea seed. Be sure students place their seeds near the side with the viewing square. (If planted too far back, students will not see the roots growing.) Place near a classroom window or outside in a protected area.
- Water the plants regularly and observe them weekly after the seeds sprout. Have students discuss and record their observations once a week for four weeks.

References: Jenny Strehle and Jessica Zuckerman, "The Root Show," Hidden Villa Garden Curriculum 2008, Hidden Villa. Adapted excerpt used with permission.



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SEED SAVING WITH CHILDREN

AGES

4-18 years old

CONTRIBUTED BY

Grow Your Lunch, LLC
San Francisco, California
www.growyourlunch.com



© BENJAMIN EICHORN

Saving seeds preserves genetic diversity for generations to come and completes the life cycle of school garden plants. Keep in mind that not all plants in the garden will produce viable seeds, as many are hybrids whose offspring will not exhibit the same traits as the parent plant. The basic principle to successfully saving seeds is to let the seeds dry completely (or “senesce”) on the plant before trying to save them. If the seeds are not completely dry, they will be prone to rot once stored. If you want to learn more about seed saving, read Suzanne Ashworth’s book *Seed to Seed*.

MATERIALS

- A screened drying rack or stainless steel cookie sheet
- Stainless steel bowls
- Mason jars with holes punched in the tops
- Sticky labels



EASY SEEDS TO SAVE

Herbs: parsley, dill, fennel, cilantro/coriander

Lettuce

Legumes: beans, peas

Grains: wheat, barley, oats, quinoa, amaranth

Annual flowers: sunflowers, poppies, hollyhocks

DIRECTIONS

- Before you begin, identify the plants in the garden that are ready to have their seeds saved. The seeds will be dry and ready to fall to the ground. Select plants that have not cross-pollinated with others, unless you are trying to save hybridized seeds. Refer to *Seed to Seed* for more detailed seed saving guidelines.
- Pick the pod, seed head or other part of the plant that contains dry seeds and place them in stainless steel bowls.
- Find a comfortable place to sit and “thresh” the seeds. (Rub the seeds out of the other plant material, or “chaff.”) Remove any remaining plant material by blowing over the seeds. (This is called “winnowing.”)
- If the seeds are completely dry, place them in the mason jar and label it with the date the seeds were saved, the name of the crop and the variety. Store in a cool, dark, dry place.
- If the seeds are not completely dry, spread them out on the drying rack and place it in a well-ventilated area, out of the sunlight, where it will be safe from animals until the seeds are ready for storage.



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GROWING HEIRLOOM WHEAT: SEED TO FEED

AGES

4-12 years old

CONTRIBUTED BY

**Trinity Gardens and
Center for Regenerative Agriculture**

Santa Barbara and Ojai, California

www.trinitygardenssb.org and www.ojaicra.org

While learning where their food comes from, students use simple approaches to grow, harvest, thresh, winnow and grind wheat into flour. This can be used to make bread, tortillas, muffins or pancakes. Ideally, fresh produce grown in the school or community garden accompanies this activity for a well-rounded meal. Young children are introduced to the curriculum through the classic story, *The Little Red Hen*. Kids also plant seeds for the next wheat crop.

MATERIALS

- Hand grain mill (suggestion: Victorio Deluxe Grain Mill)
- *The Little Red Hen* – any version that suits the student group
- Wheat seed (suggestion: heirloom White Sonoran wheat from Native Seeds)
- Small, dark paper or plastic plates, one per child
- Recipe, ingredients and equipment for cooking with flour
- *Bread Comes to Life*, by George Levenson, optional
- Red Hen puppet, *Folkmanis*, optional
- Smooth pebble for each child, about 2.5 inches, optional

DIRECTIONS

- Arrange a schoolyard growing space. Use *The Little Red Hen* book to introduce the “Seed to Feed” wheat growing project if you are working with young children.



© TIMOTHY TEAGUE PHOTOGRAPHY

Young children become excited when asked, “Would you like to help the Little Red Hen with her wheat?”

- Older students can learn about grain by doing research, to gain historical perspective and scientific knowledge. Examples of grain varieties may be obtained from a local garden or farm, and grain seeds can be found in bulk bins at a health food store or acquired at a local seed bank, seed swap or nursery.
- Plant wheat seeds in a weed-free, prepared garden space and cover with approximately 1/3 inch soil in rows about 6 inches apart, with 2-3 inch spacing. After growing into 6 inch tall clumps of grass, thin the plants to about 6 inch spacing. Students delight when discovering the first seed heads, and then observe the maturing plants changing to a lighter green, then golden brown. Hand water the wheat, or use drip irrigation. Stop watering when the wheat begins to turn light brown.
- Thresh the wheat when it is fully mature. First, dry the seed heads, cut them off with scissors, and place them into harvest baskets. The seeds can then be separated from the seed heads in several ways: 1) stomp on a pillowcase full of seed heads; 2) smash an individual seed head with a smooth rock; 3) winnow the seeds by hand. To winnow seeds, students blow the chaff away from a plate containing smashed seed heads. This leaves just the seeds which can then be poured into the mill. After the wheat is milled, it becomes flour and can be used in a cooking project. Set some seeds aside for planting the next wheat crop.



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HOW MANY HONEY BEES?

AGES

5-13 years old

CONTRIBUTED BY

Slide Ranch

Muir Beach, California

www.slideranch.org



© DANA BIEDERMAN

Do people need bees? Do bees need people? How many honey bees do you think live in a hive? The average number of bees in a medium sized colony is 42,000. By acting out the process of gathering nectar, students gain a larger understanding and appreciation for bees, the process of making honey, and how bees impact the food we eat.

MATERIALS

- Jars (one large, several small)
- Spoons
- Water
- Optional: yellow food coloring for water (to make it look more like nectar), markers and paper.



DIRECTIONS

- Spread out jars filled with water in an outdoor area.
- If possible, position jars near actual flowering plants, or ask students to draw flowers and then instruct the students to place the drawings under the jars. The jars can be far apart or close together depending on the space available.
- Give each student a spoon and explain that they are going to use the spoon like a bee uses its “proboscis” (straw-like tongue) to collect the nectar from the jars.
- Students will deposit the “nectar” they collected into one centrally located jar representing the hive.
- After five minutes, look to see how much “honey” is in the “hive.”
- Debrief: A bee typically makes 40 trips from the hive to flowers and back in a day. In its whole life a honey bee makes about $\frac{1}{2}$ teaspoon of honey.
- Ask: How many honey bees do you think work together to make one jar of honey? How about one gallon of honey? What about all of the honey in the supermarket? How did it feel to be a bee?



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CIVILIZATIONS OF THE AMERICAS: AZTEC ALEGRÍA RECIPE

AGES

5-11 years old

CONTRIBUTED BY

The Edible Schoolyard
Berkeley, California
www.edibleschoolyard.org



© SHARON DANKS

At the Edible Schoolyard in Berkeley, our students study ancient civilizations of the Americas, combining social studies lessons with related hands-on cooking and gardening projects. The activity below is a cooking project using a grain called amaranth, which was a staple food of the Aztec Empire and was considered sacred. In addition to growing amaranth, the Aztecs followed many of the Mayan agricultural traditions like growing cacao, harvesting honey and growing food on terraced hills. In later years, the Incas further developed terraces using stone walls and rigid geometric patterns. In our curriculum, we explore those agricultural practices and ideas by trying many of them with the students.

BACKGROUND

- Amaranth has been a cultivated grain for thousands of years. The bright flowers can also be used for dyeing cloth and making pigment. When the Spanish conquered the Aztecs and saw how important the grain was for their culture, they banned it.
- Mayans discovered chocolate before the Aztec civilization came about. Chocolate is made from cacao beans. The beans we eat are the seeds within the cacao pod, which grow on trees in the tropics. The cacao plant is native to Mexico. There is bountiful evidence that the Mayan civilization used cacao in their everyday life and valued it highly. We show our students images of Mayan hieroglyphic writing and explain that from writings such as the *Popol Vuh*, we know that the Maya had two main uses of cacao: as currency and as a special drink. The Maya believed the cacao bean had magical and divine properties and they prepared it in the form of a frothy drink that only nobility could consume.
- The Maya were among the world's first beekeepers. They cultivated honey from a native stingless bee that resides within living trees in the tropical forests of Central America. Honey was harvested as part of a religious ceremony twice a year. Honey was used as a sweetener, an antibiotic and as an ingredient in the Mayan version of mead, a fermented drink.

INGREDIENTS FOR AZTEC ALEGRÍA

- 1/3 cup brown rice syrup (or maple syrup or honey)
- 1/2 cup sunflower seeds
- 1 teaspoon ground cinnamon
- 1 cup amaranth, from the school garden or purchased
- 1 tablespoon honey

DIRECTIONS

- Line a sheet pan with parchment paper. Place the jar of brown rice syrup into a pot of hot water. In a deep pan, pop the amaranth in small batches, setting the popped amaranth aside in a mixing bowl.
- Lightly toast the sunflower seeds in a deep pan. Add the toasted sunflower seeds and cinnamon to the popped amaranth.
- Slowly stir in the warmed brown rice syrup and honey. Mix well and pour alegría onto the sheet pan. Spread the *alegría* mixture evenly over the sheet pan and let it cool. Cut into two inch squares or store it in an airtight container.
- Eat together in the school garden.

Adapted from Edible Schoolyard's, "Civilizations of the Americas" lesson by the Edible Schoolyard staff. The complete lesson can be found at: <http://bit.ly/1qNkoWl>



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SCIENCE COMES TO TEA

AGES

7-10 years old

CONTRIBUTED BY

Ayesha Ercelawn

La Scuola, Italian International School

San Francisco, California

www.lascuolasf.org



© AYESHA ERCELAWN

A garden tea party, fun for everyone, can also be an excellent format for including some science. Our garden class incorporated tea making into the third grade classroom's unit on States of Matter. Evaporation and condensation, changes in temperature, thermometer reading and recording skills, conducting, and insulating—these ideas can all be pulled into making a lovely pot of tea!

MATERIALS

- Two to four teapots (clear glass teapots are great visuals)
- Fresh herbs from the garden or purchased
- Hot water thermos or kettle
- Honey
- Spoons, one per teapot
- Cooking thermometers, one per teapot
- Clear glass or plastic cups, one per teapot
- Baskets for gathering herbs

DIRECTIONS

- Children gather herbs, such as mint, from the school garden. Small teams harvest and prepare the herbs, remove the stems, tear leaves in half and place them in empty teapots. Plan to steep the tea for at least 10 minutes.
- Review or introduce thermometer use and observe the current air temperature.



- Place a thermometer into each teapot, and slowly start to pour hot water. Once temperature stabilizes, a student from each group records the temperature. As tea steeps, students periodically record the change in temperature.
- Discuss what will happen when you take off the teapot's lid, as part of a conversation about evaporation, water vapor, and the gas phase of water. Show clear cups and ask children how they could capture some of that water vapor. Give each team a cup to place on or above the teapot and watch steam condensing.
- Show honey and discuss whether students think it is a solid or liquid. Each team stirs honey into their tea and observe the process of dissolving/mixing. Pour and drink!

EXTENSIONS

- **SCIENCE EXTENSION:** After a discussion of recorded temperatures and the cooling observed, make a plan for insulation vs. conduction experiments. What materials could we try using to keep the tea as hot as possible?
- **CULTURAL EXTENSION:** Invite students' families to share a favorite tea or tea drinking customs, including medicinal values for these herbs.
- **BOTANY EXTENSION:** Make teas out of different plant parts. For example, chamomile flowers, licorice roots, mint leaves, rooibos twigs or cinnamon bark.
- **MATH EXTENSION:** After tasting different teas, children record their preferences and analyze these data.



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LA SCUOLA

PROCESSING ACORNS

AGES

8-10 years old and up

CONTRIBUTED BY

Living Classroom

Los Altos, California

www.living-classroom.org



© VICKI MOORE

This lesson is intended to coincide with the 4th grade Social Studies topic of California Indians. Students will learn about various plants that the Indians used for housing, baskets, food, medicine and tools. Students learn how plants were crucial to the survival of Native California Indians and can find many of the plants in their school's own native plant garden. Students will gain hands-on experience with the plant material during this activity.

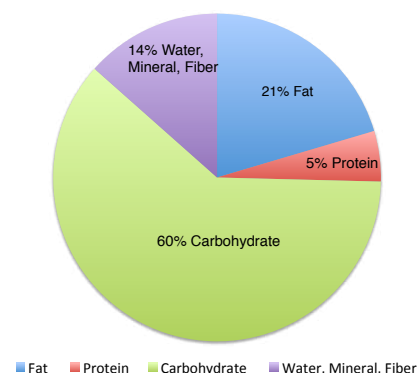
MATERIALS

- Bag of dried acorns (or gather with students)
- Tarp or terry cloths, mortar and pestle, bowls to collect shells and kernels, twenty pounding rocks

DIRECTIONS

- Quickly introduce the importance of acorns: One of the mainstays of the diet for California Indians was the acorn which was used in soup, porridge and bread from sixteen different species of oak trees. Because of the nutrition provided by acorns, the Native American people in California did not need agriculture. Acorns contributed to the fact that California peoples did not experience annual famine months. It is estimated that among one tribe, the Yokut, a typical family consumed 1,000 to 2,000 pounds of acorns each year. Acorn meal is 21% fat, 5% protein, 62% carbohydrate, and 14% water, mineral, and fiber. Show photos of acorn meal, acorn mush and acorn pancakes if you have them.
- If there are acorns on campus, go with students to collect them. Otherwise include acorns in your activity kit.
- Bring the acorns to the tarp and spread them out. Place the small terry cloth material on the tarp, one per student.
- Show the students how to crack the acorns. Place one acorn on a rock and then use the other rock to smash the acorn between the two rocks. Once smashed, ask students to peel off the outer layer and put the acorn meat in one bowl and the shell in another.

- After enough acorn meat is obtained, allow students to take turns with the mortar and pestle to pound the acorn meat into acorn meal. (30 seconds per student, so it goes quickly.)
- While the kids work, provide more information. In the fall, Indians would travel to special groves of oak trees that produced abundant crops to collect acorns. Acorns were a staple crop—something they ate on most days and it supplied a large portion of the calories in their diets.
- Acorns take time to process. It is best done over the course of a semester or several weeks.
- How to process acorns:
 - Gather them, dry them and remove the shells
 - Grind them with a mortar and pestle, then leach this flour with water to remove tannic acid (very bitter).
 - Cook the acorn meal in a basket to make mush or toast it on hot stones to make pancakes.



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LIVING CLASSROOM



Energy and Climate

School facilities use a substantial amount of energy for heat, light and power, and many school community members use fossil fuels to commute to school. Schools can engage students in reducing their facility’s energy footprint (and saving money), while teaching real-world lessons about where energy comes from and what it takes to produce and transmit power. Students can also be encouraged to walk and bike to school to reduce fossil fuel use.¹

RENEWABLE ENERGY School grounds can host renewable energy demonstration systems that power decorative fountains—or the entire school—teaching children and their communities about clean and sustainable sources of energy.

CLIMATE IMPROVEMENT School ground design can address climate change and make the site more comfortable by removing pavement, which heats up in the sun, and by planting trees and shrubs to provide shade for students and school buildings.³

CURRICULUM CONNECTIONS Living schoolyards with energy and climate features that are accessible to students provide hands-on learning resources for science and other curricula. Art activities can also be tied to an understanding of the sun’s power to provide heat and light.

ACTIVITIES IN THIS CHAPTER

- **Introduction to Renewable Energy** 64
Renewable energy / science lesson (9-11 years old)
- **How Cool is Your Schoolyard?** 65
Climate improvement / place-based study (8-18 years old)
- **Make a Solar Etching** 66
Art project / sunlight (8-18 years old)

OTHER RELATED ACTIVITIES

- **Photosynthesis Tag** 18
Sunlight / energy / science game (9-13 years old)



INTRODUCTION TO RENEWABLE ENERGY

AGES

9-11 years old

CONTRIBUTED BY

Education Outside
San Francisco, California
www.educationoutside.org



© EDUCATION OUTSIDE

In this lesson, students learn about renewable energy and explore solar, wind and hydroelectric energy using hands-on models. Before using this activity, students should have already explored the concept of “energy” and its sources.

MATERIALS

- Whiteboard and markers
- Science notebooks
- Pinwheel supplies: unused pencils, pushpins, pinwheel template: <http://1.usa.gov/1NuyZes>
- Model windmill generator
- Model solar panel or garden solar feature
- Model waterwheel: <http://bit.ly/267w338>
- Posters or other information about renewable energy sources (solar, wind and hydro)
- Resources can be found at: <http://bit.ly/EOpath>

PREPARATION

- Write the word “renewable” on the white board. Set up three renewable energy stations with supplies, models and information about different energy sources.

DIRECTIONS

- Begin by asking students a few questions: What does the word renewable mean (able to be replaced by nature)? What are some examples of sources of energy that are non-renewable (burning oil, natural gas or coal)?
- Ask students to discuss forms of energy that are renewable with a partner, and list examples of naturally occurring energy in “nature” (waves, wind, sun, etc.). Take suggestions from volunteers to share with the class.
- Tell students that they are going to learn about three sources of renewable energy today: solar, wind and hydropower. Using informational posters for help,

discuss each form of renewable energy: What forms of renewable energy have the students seen before? (A local dam? a wind farm? solar panels?) How do they work? Where does the energy come from and go?

- Divide students into three groups and ask each group to start at one of the stations. Give students 5-8 minutes at each station, depending on the available time.
- **WIND POWER GROUP:** At this station, students will make pinwheels to demonstrate how a wind turbine works. They can also play with a model windmill generator.
- **SOLAR POWER GROUP:** At this station students experiment with a solar powered fan or another schoolyard solar feature such as a solar powered pond pump, observing what happens when the panel is partially blocked.
- **HYDROPOWER GROUP:** At this station students will use water from a hose or watering can (or a water feature, if the school garden is equipped with one) to rotate a waterwheel.
- After each group has had a chance to rotate through each station, reconvene the students and ask them to share one thing they learned about renewable energy with a partner. Ask one volunteer from each group to share their comment with the entire class.
- End the lesson by asking students to recap the lesson’s objectives in their science notebooks. Ask: What is the difference between renewable and non-renewable energy? What are three forms of renewable energy?



HOW COOL IS YOUR SCHOOLYARD?

AGES

8-18 years old

CONTRIBUTED BY

Green Schoolyards America
Berkeley, California
www.greenschoolyards.org



© SHARON DANKS

Why are cities often hotter than the surrounding countryside? In this activity, students study the microclimates on their schoolyard and explore the influence of the built environment on surface and air temperatures. They will use infrared and standard outdoor thermometers to measure and compare the temperatures of the air, pavement and natural areas.

MATERIALS

- One handheld infrared thermometer for measuring surface temperatures (e.g.: <http://bit.ly/Fluke62>)
- One standard outdoor thermometer, for measuring air temperature, attached to the top of a meter stick. (Use this to measure air temperature at a consistent distance from the ground, approx. the height of a young child.)
- Notebook(s) and writing materials to record findings

BACKGROUND

- Man-made surfaces, such as buildings, asphalt, concrete, rubber and metal often trap and store more heat from the sun than vegetation and other natural materials such as trees, grass, wood and soil.
- We can cool the temperature of our schoolyards—and cities—through our choice of materials; for example, by replacing pavement with plants and adding trees for shade. (See: <http://bit.ly/EPAtemp>) This is important to understand as the effects of climate change increase.

DIRECTIONS

- Lead a brief discussion about microclimates, factors that influence them, and why this matters. Ask: “How do different materials in our schoolyard influence local temperature?” Walk outside onto the school grounds with a class on a warm, sunny day. Observe and discuss the wide range of materials used onsite. Ask students to hypothesize which areas of the yard are the warmest, coldest, and why?
- Identify five or six areas within the yard that the class believes have different microclimates, to be your “study

areas”. You might consider including: a patch of asphalt in full sun and one in full shade; a concrete sidewalk; a shady tree grove; a soil-covered garden bed; a metal slide; rubber safety mats; a natural lawn; artificial turf; etc.

- Establish set intervals for measuring temperatures in the study areas and decide on the length of your study. E.g., plan to take measurements once per hour (with different classes), from 9:00 am - 4:00 pm, for a week. Create a data table for the class(es) to share to record their measurements.
- Model how to use both types of thermometers, following all of the directions for use of your infrared thermometer. (Some infrared thermometers require a different setting for each material to properly measure surface temperatures; others only have one setting.)
- Divide students into teams and distribute responsibilities for taking measurements of the surface temperature and the air temperature at the appropriate times and in each of the specified locations. Ask students to record their findings on the shared data table.
- When the data have been collected for the entire study period, analyze the results with the class(es). What patterns did you notice? Which areas of the school grounds were the warmest and coldest? Do any of the areas on the grounds get dangerously hot? (>111°F can cause pain; >140°F can cause burns) After drawing out patterns, ask students to develop explanations for how and why these patterns might exist. Then have students apply their working hypotheses to generate ideas about how to cool the hottest temperatures onsite.



MAKE A SOLAR ETCHING

AGES

8-18 years old

CONTRIBUTED BY

Rahus Institute - Solar Schoolhouse
Sebastopol, California
www.solarschoolhouse.org



© TOR ALLEN

Many years ago, people would start their family's cooking fire using mirrors or glass to focus sunlight into a high temperature beam. The power of sunlight can also be used to make artistic creations with the aid of a magnifying glass. Solar Schoolhouse learned of this technique from Solar B, a Santa Barbara artist who "solar carves" amazing artwork using only sunshine. You too can be a Solar Artist!

MATERIALS

- Magnifying glass (2x or 3x magnification, 4" diameter)
- Protective eyewear for each student (welding goggles, Shade #5, 50mm)
- One or more clean pieces of wood per student
- Pencils



DIRECTIONS

- Ask students to choose a piece of wood, and then draw or write something on the wood with a pencil.
- Students should sit outside in a comfortable, sunny place, with the sun shining over the shoulder that matches the hand they use for writing (either to the right or left).
- Ensure that each student puts on protective eyewear before they begin to etch.
- Students should hold the magnifying glass with the lens perpendicular to the sun, above the wood.
- Slowly move the lens closer to the wood, making sure the light beam is a perfect circle, and focusing it until it gets as small as possible. It should start burning at this point. If the lens gets too close to the wood, the beam will start to enlarge and it will stop burning.
- To etch the design, move the beam in the direction of the pencil line, traveling slowly back and forth, and going further forward with each pass.
- As you can see in the picture, the lens bends the heat essence of the sun and concentrates it. On a clear day, the temperature of a totally focused beam can reach over 800 degrees Fahrenheit!! Do not allow this hot point of light to come in contact with students' skin or flammable clothing. *Always be safe* and have fun!





Thoughtful Use of Materials

Everything a school chooses to include in its environment says something about its values. Over the last few decades, as the green building movement has grown, many schools have started to question conventional playground materials—asphalt, concrete, stainless steel, plastic and rubber—that are widely used. Schoolyard landscape features designed using sustainable, natural and recycled building materials demonstrate green building practices to the school community and can reduce the school district's costs and impact on landfills and other urban infrastructure.¹

NATURAL MATERIALS Living plants, wood, bamboo, straw, stone, sand, clay, adobe, snow and other natural materials are teaching tools for lessons about environmental stewardship and time-tested building techniques that are still relevant today. They lend themselves well to artistic expression and cultural connections, and to community participation in schoolyard construction and stewardship.

RECLAIMED AND RECYCLED MATERIALS Using salvaged building materials on school grounds diverts bulky waste from landfills and recaptures the remaining value of the materials for further use. It reduces the need to mine, harvest, process and transport new materials, which in turn, saves additional energy and effort, and preserves environments at the extraction source.

ACTIVITIES IN THIS CHAPTER

- **The Nature Swap** 68
Natural materials / imaginative play (2-8 years old)
- **Compost Gourmet** 69
Natural materials / decomposition / soil health (5-10 years old)
- **Traditional Uses of California Native Plants** 70
Plants / ethnobotany / cultural studies (8-18 years old)
- **Think Before You Throw: 4Rs Recycling Race** 71
Salvaged materials / recycling game (4-18 years old)

OTHER RELATED ACTIVITIES

- **Make a Create with Nature Zone** 7
Natural materials / art / creative play (3-18 years old)
- **Nature's Watercolors** 10
Natural materials / art / creative play (5-10 years old)
- **Sheet Mulching: Turn Lawns into Native Gardens to Save Water** 51
Natural materials / water conservation / grounds improvement (9-18 years old)
- **Nature Elements in the Landscape** 74
Natural playscape / grounds improvement (3-18 years old)



THE NATURE SWAP

AGES

2-8 years old

CONTRIBUTED BY

Nature Kids Institute
Orangeville, California
www.naturekidsinstitute.org



© NATURE KIDS INSTITUTE

Transform your plastic and unimaginative playthings into unbridled creativity by replacing play accessories with nature's loose parts!



MATERIALS

- Leaves, sticks, pine cones, rocks, acorns, pine needles, seashells, flowers, seed pods and other natural materials.

DIRECTIONS

- This activity restores a child's right to imagine and create their own fun! Does your play space for young children contain a play kitchen with plastic food? How about a toy barn full of animals, a doll house with dolls, or even a painting easel with brushes? If so, it's time to let nature shake things up!
- Leave the play kitchen but remove the food, leave the barn but remove the animals, leave the doll house but remove the dolls, and (our absolute favorite) leave the painting easel but remove the paintbrushes.
- Challenge children to find their own "food," "animals," "dolls" and "paintbrushes" using natural elements found around the school or natural materials that you provide.
- You will be amazed by how creative children can be when they are not limited by the manufactured toys we offer them. Suddenly, little chefs are able to cook up anything they want, unheard of animals move into the barn, dolls become free to embody the full range of human diversity and behavior, and painting becomes a much more complex and tactile experience. In this play scenario, the creative decisions come from within the child instead of from without.



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COMPOST GOURMET

AGES

5-10 years old

CONTRIBUTED BY

TreePeople

Beverly Hills, California

www.treepeople.org



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A forest, in order to thrive, needs nutrient-rich mulch (fallen leaves and branches) to be converted to healthy humus—exactly what trees and plants need to grow! Composting is our attempt to promote the process of decomposition by recycling our yard clippings, food scraps and other organic matter. Using compost to feed the soil, we can divert our organic matter from landfills and convert it into soil for our school and community gardens.

MATERIALS

- Mixing bowl, spoon and apron
- Baking pan filled with organic compost
- Container of water
- Separate bowls of dried leaves, branches, food scraps and grass clippings
- Compost bin (or picture)

DIRECTIONS

- Explain to the students that they will observe a demonstration by the Compost Gourmet who specializes in turning trash into treasure!
- Ask the students, “What do you think is natural trash?”
- Set up a demonstration separating the bowls of items by “greens” (high in nitrogen—food scraps and grass) and “browns” (high in carbon—dried leaves and branches, including the mixing bowl, spoon and water).
- Wearing your apron, proceed as the “Compost Gourmet”. (Silly voice is optional.)

- Use the following script, modifying it as you choose: “I am going to show you how to turn what some people think is trash, into treasure! Look at these ingredients! What do we usually do with them?” (Throw them away.) “Not in my kitchen! All of these can be turned into compost. Compost is rich soil that is used to grow food and plants. Using a special recipe, I will mix these together to make compost. The perfect recipe calls for an equal blend of nitrogen and carbon. These are important elements for making soil. For our recipe we’ll call nitrogen-rich ingredients “greens”. Green ingredients are moist, like grass clippings, food scraps and garden weeds.” (Display some samples.) “The carbon-rich ingredients we’ll call “browns”. Brown ingredients are dry like bark, branches and dry leaves.” (Display some samples.)
- Invite students to come up and add equal parts of green and brown ingredients to the mixing bowl, stirring it and adding water.
- Demonstrate that the last step is to put it in the oven. “Do you think I should put it in a regular oven?” Share that the ingredients for compost go into a compost bin (show the bin or a picture), and that it acts like an oven. All the micro-organisms work so hard to process this material, that the compost bin actually gets hot inside. In about 3 months we have our finished product—compost.
- Pull out a sample showing the baking pan filled with organic compost. Allow students to smell it, feel it and add handfuls of it below a tree.



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TRADITIONAL USES OF CALIFORNIA NATIVE PLANTS

AGES

8-18 years old

CONTRIBUTED BY

Living Classroom

Los Altos, California

www.living-classroom.org



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This lesson is intended to coincide with the 4th grade Social Studies topic of California Indians. Students will learn about various plants that the Indians used for housing, baskets, food, medicine and tools. Students learn how plants were crucial to the survival of Native California Indians and can find many of the plants in their school's own native plant garden. Students will also gain hands-on experience with the plant material.

MATERIALS

- Laminated pictures of tule houses and tarweed gatherers
- 2 arrows, bow, arrowhead, cutting tool, dipping gourd, elderberry flute, or soap root brush (the more variety to demonstrate, the better)
- Tule basket or deer grass mat / basket
- Ethnobotany story hand outs (<http://bit.ly/NAplants>)

DIRECTIONS

- Instructor: "How many stores did the California Indians have?" Answer: They had to find or make everything.
- "Today we'll learn about plants they used and relied on for their survival. This is called ethnobotany (ethno=people and botany=plants), how plants are useful to people. How did they make their houses?" With poles and thatch from plants (show picture).
- "What did they use for medicines?" Plants. "Today we still use plants for medicine like aspirin whose natural form is found in willow tree bark."
- Some medicinal examples:
 - Teas—from mint, sage, elderberry, rose petal—to drink for stomach aches, headaches, fevers, etc.
 - Poultices made by grinding up plants—like yarrow, sage, lichen, buckeye—mixed with water or oil and applied to skin to heal wounds, bug bites, etc.
 - Scattered plants as bug repellent in houses—like bay leaves to repel fleas.
- "What did they eat?" Some meat, some fish and clams, but lots of plants; much more variety than we eat today, including all kinds of berries, seeds and roots.
- "Their main winter food was acorns. Why?" They were abundant and could be stored.
- Lastly, show the bow made from elderberry, the arrows with an obsidian tip and a glass tip, the skirt (Ohlone), elderberry flute and soap root brush, elderberry game of staves. (Soap root was used for soap, food, glue, medicine, poison and more, all from a hairy, fist sized underground bulb.)
- Now, transition the students by telling them they are going to walk through the garden and look for the plants that they would use to complete their ethnobotany story. Assign pairs and hand out the ethnobotany story. Tell students that they are to read the story and look for the plant that would serve the needs described in the story. Ask them to include the name of the plant in their story. They should also read the plant sign (if the instructor has labeled it) for more information about the plant.
- After this exploration in the garden, ask the students: "Are you ready to gather and live off native plants like the Native Americans did? How does California Indians' knowledge of plants compare with your own knowledge of plants?"



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LIVING CLASSROOM

THINK BEFORE YOU THROW: 4RS RECYCLING RACE

AGES

4-18 years old

CONTRIBUTED BY

Green Schools Initiative
Berkeley, California
www.greenschools.net



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In this activity, children learn about what everyday products are made of and what happens when items come to the end of their useful lives. This includes learning about the 4Rs and how to sort their waste properly as compost, recycling and landfill trash to reduce their environmental impact on the Earth. Students practice sorting and have fun with a Recycling Relay Race.

MATERIALS

- A large bag with examples of waste students encounter at school, including at least one example of each type of waste (items to be composted, recycled and landfilled) per team. For example: used classroom paper, empty milk cartons, empty yogurt containers, paper napkins or towels, chip bags, paper plates, plastic bottles, aluminum cans, plastic forks and non-messy food waste (e.g. banana peels)
- Each team of students needs: one trash bin labeled “Landfill” (with a black bin or black sign), one recycling bin labeled “Recycling” (with a blue bin or sign), one compost bin labeled “Compost” (with a green bin or sign)

DIRECTIONS

- Before you begin the activity with students, attach waste station signs to the bins and bring them outdoors. In the schoolyard, 5-10 yards from the bins, arrange one pile of mixed waste per team, to be sorted by students during the race. Each pile should have the same number of items and the same examples of waste to sort.
- Gather students outside near the prepared materials and tell them about the 4Rs. Ask if they’d like to be an Earth Protector (or other eco-hero). Tell them that everything we use is made with resources that come from the Earth—our clothes, houses, food, books, cars, computers, toys and iPhones (modify for age). When we are done using our things we often throw them “away”. Ask students: “Where do things go when we throw them away?” Answer: There is no such place

THE 4RS

REDUCE – Use fewer things, so less is wasted

REUSE – Use durable goods, not disposable ones

RECYCLE – Turn old materials into new ones

ROT – Compost organic matter to create rich soil

as “away” because we only have one Earth. It all goes somewhere—to the landfill, or a recycling plant or a compost pile. The less we use, and the less we bring to the landfill, the more we save resources, replenish soils and protect our Earth.

- **WASTE SORTING:** Show an example of each item when you explain the activity. Ask what each item is made of and whether it can be recycled or composted (rotted) or whether it is landfill trash. Demonstrate where each item can be disposed of properly (in matching bin). Plastic items go to the landfill. Paper, bottles and cans can be recycled. Food-soiled paper, milk cartons and food waste can be composted. Tell students that it is important for them to “Think Before You Throw” and to practice the 4Rs. Ask the students if they understand the 4Rs.
- **RECYCLING RELAY RACE:** Divide students into teams and ask them to line up behind each waste pile. Each student will pick one item, race to their waste bins, and put the item in the proper bin (landfill, recycling, compost). When they return to their pile, the next student takes a turn. The team that completes the race first and gets the most items in the correct bins wins.





Community Engagement

School grounds are unique public open spaces. They are community resources that are fully occupied during the school day—but may also be used when school is not in session to enhance the well-being of residents in the local neighborhood and the surrounding community.

FAMILY ENGAGEMENT Green schoolyards can be venues for school-related public events that draw parents and family members further into their child's education and invite the community to participate in life at school.

JOINT USE Some living schoolyards become part of their city's public park system after hours, providing access to green space and recreation for students and other members of the local community when school is not in session.

COMMUNITY STEWARDSHIP The process of building and sustaining green schoolyards connects communities to place, and helps to engage students, teachers, staff, parents, neighbors, businesses, nonprofits, public agencies and others in collaborations to care for and improve their school grounds. This cooperation reinforces interdependence and local self-reliance, and builds a “sense of community” while creating useful, beautiful school environments at affordable prices.²

ACTIVITIES IN THIS CHAPTER

- **Family Camp Out in the Schoolyard** 73
Family engagement / event (6-18 years old)
- **Nature Elements in the Landscape** 74
Community stewardship / grounds improvement (3-18 years old)
- **Building a Wildflower Hugel Mound** 75
Community stewardship / grounds improvement (5-18 years old)

OTHER RELATED ACTIVITIES

- **Plant a Native Hedgerow** 43
Insects / habitat improvement (8-18 years old)
- **Sheet Mulching: Turn Lawns into Native Gardens to Save Water** 51
Water conservation / grounds improvement (9-18 years old)
- **School Outdoor Water Use Audit** 52
Water conservation / community stewardship (9-18 years old)



FAMILY CAMPOUT IN THE SCHOOLYARD

AGES

6-18 years old

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Outdoors Empowered Network
San Francisco, California
www.outdoorsempowered.org



© BAY AREA WILDERNESS TRAINING

This activity can be a terrific team builder for families whose children share a class or a grade level, or for an entire school community. Enjoy the sights and sounds of nighttime in your neighborhood and use this activity as a spring board for school camping trips to regional parks in your area!

MATERIALS

- Tents, sleeping bags, sleeping pads and flashlights are the most essential items. Some families might be able to provide their own gear. Others may not have tents, sleeping bags or other equipment. Camping gear can be borrowed from gear libraries in a small but growing number of cities (see: <http://bit.ly/OENetwork>) and many outdoor gear shops have rental programs.
- It's very helpful to have somewhere to cook outside in the schoolyard, and if possible, a place to gather around a camp fire. If you have an existing outdoor oven or fire pit on school grounds, that's a wonderful place to cook and share a meal. If not, other options include a portable steel "fire pit," portable camping stoves or BBQ grills (which encourage parents to get involved). Be sure to obtain proper permission from your school district to cook outside during your campout. Invite the local fire department to join you if you need help setting up and managing a temporary fire pit.
- Food to share for dinner and breakfast (e.g. potluck)

DIRECTIONS

- Pick a date: fall or spring is best. You may want to start with a spring event and move it to the fall once you've built a tradition people are looking forward to!
- Obtain permission from the school district for staff, students and their families to be onsite overnight. Because your campout is at school, you probably won't need the same "field trip" form that you use to leave the site.

- Advertise your event. Notify families about the campout as far in advance as possible to build excitement. Send multiple announcements and encourage attendance by announcing a BBQ dinner and s'mores.
- Ask for RSVPs that include whether families have their own gear. Arrange to borrow and pick up the camping equipment for families in your school community that don't have tents, sleeping bags, etc. If you live in a city that has an Outdoors Empowered Network member organization, inquire about the camping training sessions they offer and gear library access, since their gear can be borrowed for FREE. Some local outdoor specialty stores may also be willing to rent/loan gear. <http://bit.ly/GearCommons> also loans tents through a peer-to-peer gear sharing program.
- Recruit volunteers who can arrive early on the day of the event to help set up the camp site and assist families with their tents. Serve dinner after the group is settled. After dinner, roast marshmallows and make s'mores if you can, since this is an activity that is guaranteed to be popular. Let the kids play with their flashlights and get their teeth brushed, then make time for storytelling around the fire, as this is a great way to settle the kids down. Stargazing might be possible, and is a terrific tie-in to science curriculum. After kids are off to bed, parents can spend more time getting to know one another in an informal setting.
- In the morning, serve breakfast and include everyone in clean up activities. Be sure to leave time for taking down the tents. Wet tents will need to dry before they are stored.



NATURE ELEMENTS IN THE LANDSCAPE

AGES

3-18 years old

CONTRIBUTED BY

Bay Tree Design, inc.
Berkeley, California
www.baytreedesign.com



© LISA HOWARD

Students greatly benefit from having natural elements in their schoolyard landscape that they can explore and use—depending on their age—to enhance their imaginative play, develop gross motor skills, incorporate into their academic studies, or enhance informal relaxation spaces. This project places boulders, tree rounds or logs in the schoolyard landscape. It is intended to be undertaken during a community workday or by school district facilities staff or a hired contractor.

MATERIALS

- Tree rounds or logs from long-lasting hardwoods like cedar or redwood; minimum 18" diameter x 18" long
- Boulders, a minimum of 18" in diameter
- Open-graded aggregate base rock, to place under the logs
- Winch, tripod, digging bar and other appropriate tools
- Work gloves, safety glasses and any other safety equipment deemed necessary for the activity
- Adults to supervise children, if they are involved, and to keep children's participation safe and age appropriate
- Insurance for volunteers, via the school, district or PTA
- Camera

CONSIDERATIONS

- Select a location in a soft, landscaped area and decide if you will use boulders and/or tree rounds or logs. When placing these natural elements onsite, consider: the ground surface, nearby traffic and use patterns, drainage and desired uses. If these elements are intended for play they should follow the CPSC and ASTM guidelines for safety. All materials should be onsite before work begins.



© SHARON DANKS

DIRECTIONS

- Recruit adult volunteers from the school community to assist with construction and lend tools to the project.
- To place tree rounds:
 - Mark the ground to indicate where you wish to place the elements. Explain this layout to the assembled volunteers. Dig holes in the soil that are a few inches wider than each tree round you will be using, following your plan. The holes should be deep enough to accommodate a 6" bed of compacted base rock plus half the height of the tree rounds.
 - Fill the holes with 6" of base rock; compact it firmly. Place the tree rounds in the ground, with at least half the height below the finished grade and the other half above ground. Fill the hole around each piece of wood with additional base rock up to 3" below finished grade, and compact firmly. Add wood chip mulch to the top of the holes to match the surrounding landscape.
- To place boulders:
 - Place boulders in the ground on compacted native soil, at least 1/3 below the finished grade with the other 2/3 exposed above the finished grade. Fill the holes with native soil and top with mulch, as desired.



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Living Schoolyard
Activity Guide – California

BAY TREE DESIGN

BUILDING A WILDFLOWER HUGEL MOUND

AGES

5-18 years old

CONTRIBUTED BY

New Horizon School

Pasadena, California

newhorizonschool.org/school_life/peace_garden



© IESHA SILER

A hugelkultur mound is a no-irrigation raised-bed system created by stacking logs and mounding soil over them. The activity of building a hugel mound will provide a way to teach and learn about water harvesting and the process of building healthy soil. This building project should be accompanied by a lesson on the importance of infiltrating rain water on site, building soil fertility and capturing moisture. This activity works well as part of a community work day, where parents, students and community members come together to build this drought tolerant garden.

MATERIALS

- Twenty bags of steer manure or compost (often free or available inexpensively from a local farm or ranch) and some top soil
- Wood chips or straw to use as mulch
- Local wildflower seeds such as: California poppies, white yarrow, collared annual lupine and purple needlegrass, or seeds appropriate for your own area. (Ask your local botanical garden for ideas.)
- Collect: fallen logs (2-3 foot long segments are manageable for two students), branches, twigs, fallen leaves, compostable food wastes
- Fill the spaces between the logs and branches with leaf litter and organic materials such as food scraps. Top off the mound with 1-2 inches of soil and a 3 inch layer of mulch. Sprinkle with native wildflower seeds.
- Water generously upon completion and then water lightly once a week until the plants are established. (Plants usually take one month to become established.)

DIRECTIONS

- Identify an area in your school that would be appropriate for local wildflowers and has good sun exposure. Try to place the garden beds in an area where the school community passes or congregates often, so that the blooms can be enjoyed by everyone. Select a location that is already unpaved (bare soil, grass, etc.) Consider the wind direction, too, as this will capture moisture from the air.
- Lay the logs down as the first layer of the hugelkultur bed. Place the largest logs on the bottom, and smaller logs above them. Next, add a layer of branches and then a layer of small sticks and twigs. Water these materials until they are soaked.



© IESHA SILER

References: Leigh Adams, artist and sustainable agriculture consultant at the Los Angeles County Arboretum, taught this passive water harvesting technique at New Horizon's free community workshop series. The poster above was created by Zainab Eltaib, 8th grader at New Horizon.



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greenschoolyards.org

Living Schoolyard
Activity Guide – California



Contributing Organizations

The *Living Schoolyard Activity Guide - California Edition* is the result of a fruitful collaboration between Green Schoolyards America and 54 other organizations across the state of California, who each contributed a schoolyard activity that reflects their own organization's mission and programs. The diversity of ideas they shared will now enrich school ground programs across California and beyond. We greatly appreciate everyone's participation and extend our sincere and heartfelt thanks.

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Center for Land-Based Learning
 Winters, California
www.LandBasedLearning.org



American Heart Association
 Los Angeles, California
www.heart.org



Center for Regenerative Agriculture
 Ojai, California
www.ojaicra.org

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Bay Tree Design, inc.
 Berkeley, California
www.baytreedesign.com



Central Valley Joint Venture
 Sacramento, California
www.centralvalleyjointventure.org



Berkeley Public School
Gardening & Cooking Program
 Berkeley, California
www.berkeleyschools.net/gcp



Chino Basin Water Conservation District
 Montclair, California
www.cbwcd.org



CalRecycle
 Sacramento, California
www.CaliforniaEEI.org



Collaborative for High Performance Schools
 Sacramento, California
www.chps.net



California Academy of Sciences
 San Francisco, California
www.calacademy.org/educators



Community Alliance with Family Farmers
 Davis, California
www.caff.org



California Coastal Commission
 San Francisco, California
www.coastforyou.org



Death Valley National Park
 Death Valley, California
www.nps.gov/deva



California Native Plant Society
 Sacramento, California
www.cnps.org



The Edible Schoolyard
 Berkeley, California
www.edibleschoolyard.org



Canopy
 Palo Alto, California
www.canopy.org



Education Outside
 San Francisco, California
www.educationoutside.org



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Explore Ecology
Santa Barbara, California
www.exploreecology.org



Living Classroom
Los Altos, California
www.living-classroom.org



Full Option Science System (FOSS)
Berkeley, California
www.fossweb.com



**Los Angeles Unified School District
Office of Outdoor and Env. Education**
Los Angeles, California
www.outdooreducation.org



Green Schools Initiative
Berkeley, California
www.greenschools.net



Monterey Bay Aquarium
Monterey, California
www.montereybayaquarium.org



Green Schoolyards America
Berkeley, California
www.greenschoolyards.org



**National Wildlife Federation,
Schoolyard Habitats®**
Midpines, California
www.nwfcalfornia.org



Grow Your Lunch, LLC
San Francisco, California
www.growyourlunch.com



Nature Kids Institute
Orangeville, California
www.naturekidsinstitute.org



Hidden Villa
Los Altos Hills, California
www.hiddenvilla.org



Nature's Voices
Berkeley, California
www.naturesvoices.org



**The Huntington Library, Art
Collections and Botanical Gardens**
San Marino, California
www.huntington.org



New Horizon School
Pasadena, California
www.newhorizonschool.org



La Scuola International School
San Francisco, California
www.lascuolasf.org



Occidental Arts and Ecology Center
Occidental, California
www.oaec.org



Latino Outdoors
Capitola, California
www.latinooutdoors.org



Outdoors Empowered Network
San Francisco, California
www.outdoorsempowered.org



Lawrence Hall of Science, UC Berkeley
Berkeley, California
www.outdoorbiology.com



Playworks
Oakland, California
www.playworks.org



Life Lab
Santa Cruz, California
www.lifelab.org



The Presidio Trust
San Francisco, California
www.presidio.gov





Rahus Institute - Solar Schoolhouse
 Sebastopol, California
www.solarschoolhouse.org



Trinity Gardens
 Santa Barbara, California
www.trinitygardenssb.org



Sacramento City Unified School District
 Sacramento, California
www.scusd.edu/project-green-programs



The Trust for Public Land
 San Francisco, California
www.TPL.org



San Francisco Botanical Garden
 San Francisco, California
www.sanfranciscobotanicalgarden.org

BLAKE GARDEN

University of California Blake Garden
 Kensington, California
www.laep.ced.berkeley.edu/blakegarden



San Francisco Public Utilities Commission
 San Francisco, California
www.sfwater.org



U.S. Fish & Wildlife Service
 Sacramento, California
fws.gov/cno/conservation/schoolyard.cfm



San Francisco Unified School District
 San Francisco, California
sfusdschoolscience.org/environmental-science-center



Waldorf School of the Peninsula
 Los Altos, California
www.waldorfpenninsula.org



Slide Ranch
 Muir Beach, California
www.slideranch.org



Yosemite National Park Education Office
 Wawona, California
www.nps.gov/yose/learn/education



StopWaste
 Alameda County, California
www.stopwaste.org

Zach Pine Nature Sculpture

Zach Pine Nature Sculpture
 Kensington, California
www.naturesculpture.com

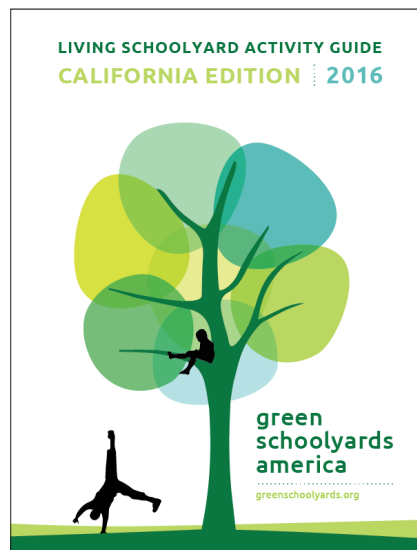
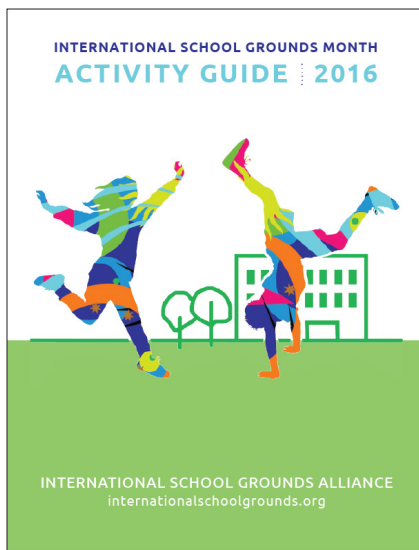


TreePeople
 Beverly Hills, California
www.treepeople.org





Companion Publications



We hope you enjoyed this publication! We also invite you to download a free copy of two companion *Activity Guides* we produced as a set in the same format, with additional school ground activities from other geographic areas.

Green Schoolyards America's *Midwest Edition* includes 38 year-round, outdoor ideas written with Midwestern climates in mind, by 33 organizations working in the central USA.

The *2016 International School Grounds Month Activity Guide* includes 50 ideas for outdoor activities in May, written by 37 organizations in 17 countries. It is published by the International School Grounds Alliance (<http://bit.ly/ISGAorg>) and was produced and edited by Green Schoolyards America in collaboration with our ISGA colleagues.

We hope the variety of geographic and cultural contexts in this collection of *Activity Guides* will support your work anywhere in the world—during the month of May and year-round.

GREEN SCHOOLYARDS AMERICA

- 2016 Living Schoolyard Activity Guide California Edition — <http://bit.ly/GSAGuides>
- 2016 Living Schoolyard Activity Guide Midwest Edition — <http://bit.ly/GSAGuides>

INTERNATIONALSCHOOLGROUNDSALLIANCE

- 2016 International School Grounds Month Activity Guide — <http://bit.ly/ISGAmay>

COMBINED TABLE OF CONTENTS

- 2016 Combined Table of Contents for the School Ground Activity Guide Set — <http://bit.ly/ISGAmay>
- Total of 147 activities from 123 organizations!





Green Schoolyards America

OUR MISSION is to inspire and enable communities across the United States to enrich their school grounds and use them to improve children's well-being, learning and play while contributing to the ecological health and resilience of cities.

WE FACILITATE public dialogue about innovative research, design, education and policy and foster partnerships between professionals and organizations across the USA and around the globe. Our programs promote the green schoolyard movement, build relationships that help it succeed and work to embed this paradigm shift in our existing institutions and national policy and regulatory frameworks.

WE VALUE the uniqueness of each school and celebrate local sense of place while promoting learning, environmental sustainability, lifelong health, recreation and community engagement. We believe strongly in the value of student and community participation in schoolyard design, construction and stewardship.

WE PROVIDE resources, training and support for school districts and partner with nonprofits, businesses, public agencies and utilities to effect change across the USA.

WE COLLABORATE with educational institutions to develop comprehensive, district-wide green schoolyard programs with strong connections to local sustainable-city planning efforts, regional ecosystems, educational standards and health. -

WE INVITE like-minded professionals and organizations to collaborate to nurture and grow the movement to green school grounds.

Green Schoolyards America is fiscally sponsored by Architects/Designers/Planners for Social Responsibility, a 501(c)(3) corporation.

Green Schoolyards America is a national organization that expands and strengthens the green schoolyard movement and empowers Americans to become stewards of their school and neighborhood environments. We believe that school grounds are uniquely positioned to enrich the daily lives of children and their communities, occupying both the geographic and social heart of almost every city across the USA and around the world.

GREEN YOUR SCHOOLYARD

- Visit our website's resource page for helpful articles to support your efforts: <http://bit.ly/GSAresources>
- Subscribe to our newsletter: <http://bit.ly/GSAnews>
- Read *Asphalt to Ecosystems*, written by our CEO, Sharon Danks, to learn what's happening in schoolyards around the world. Available from your local library or our nonprofit publisher, New Village Press: <http://bit.ly/DanksA2E>
- Visit our Facebook page (<http://bit.ly/GSAFBk1>) and LinkedIn page (<http://bit.ly/GSALI>) to keep up with current research and events in this field.
- Encourage your city government and school district to adopt a Living Schoolyard resolution: <http://bit.ly/CaACR128>
- Please contact us at info@greenschoolyards.org if you'd like to bring living schoolyards to your school district or region. We also welcome new contributors to next year's schoolyard *Activity Guides*.

