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# Exploring Our Urban Forests: Teachers and Students Choosing Lessons in Nature

*Final Completion Report*

From the San Diego Children and Nature Collaborative  
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June 12, 2014

**Grade 4**  
**Taking a Closer Look**

Trees have common features that differ in structure and scale.

**Teacher Background Reading**

The trunks can be identified by looking at several of their features: leaves, buds, bark, flowers, fruit, and seeds. Once the features of a tree are observed, the tree can be identified in a way a dictionary way. The word "taxonomy" means to divide organisms into the groups by comparing their features. Generally, trees are on a division scale, present in the group and absent in the other. Identification looks at a series of questions, and use the process to narrow down the tree's name, genus and species of the tree.

Leaves are the food factories of a tree, as they capture energy from the sun and convert it to sugar and other tree products. The main part of a tree is the trunk. The trunk has bark, and the bark provides support for the tree to grow tall and strong. The trunk is the support that allows water to the tree, so they receive water and nutrients from soil.

Because of the structural strength of solid wood and wood fibers, we get wood used for many products for trees. Most trees and other are produced on trees. Trees also produce many chemicals for use in other products, like for our daily lives.

These trees have trunks and other wood products show, where you can find them in the air and in water, they can be used in many ways. In the air, they can be used in many ways, such as in the air, they can be used in many ways, such as in the air, they can be used in many ways, such as in the air.

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**Goldspotted Oak Borer (GSOB)**

**Teacher Background Reading**

Locally, oak trees have been killed by an insect called the goldspotted oak borer. Foresters and other professionals call it "GSOB" for short. The goldspotted oak borer is a "pest borer," with very strong front wings. The oak borer attacks large diameter or mature oaks in the oak, canyon oak, and black oak, all common in California. One way to stop the spread of this insect is to dry oak branches for two years before moving it.

These oak borers are most relevant to students who live in oak woodlands or in areas with oak mortality, and the activities focus on local observations. The student reading covers the life cycle of this insect, tree structure and function, and the insect's method of damage. This reading also describes the insect's introduction and invasive spread, and what can be done to reduce oak tree losses. Before using this lesson, students should complete the tree lessons about internal structure of trees and oak communities (Grade 4, Lesson 2 and Grade 5, Lesson 2). In addition, the "Planting Action" lesson provides for students to take action to replace oak trees that have died.

Grade 4, Lesson 2 is named "Transportation Inside Trees" and focuses on internal structure and function of trees. The learning outcomes are that students will understand that tree trunks have specialized cells that transport water, nutrients, and food and provide strength for the tree. The activities observations and student reading focus on the role of xylem and phloem in transporting water, nutrients, and food within the tree. Students are introduced to the cross-sections of a tree and the annual production of wood within tree rings.

Grade 5, Lesson 2 is named "Food Webs" and features the oak community ecosystem and says that plants and animals are connected to each other. The learning outcomes are that students will understand that ecosystems are made up of interdependent organisms and the physical environment, and that students will describe relationships in their ecosystem and its role in communities by describing food chains and webs. The lesson has a single Student Reading "Life in an Oak Community." Students are asked to identify food chains from the reading, then link them into an oak community food web.

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## Project Abstract

Nature-based urban forestry lessons were developed, offered, and evaluated for teachers and students in seven elementary schools in San Diego County. Students in grades K-5 were engaged in science lessons in their schoolyard that provided progressive and integrated lessons about urban trees and met science and language arts standards. Lessons featured observation skills, leaves and tree identification, seeds, soil, tree products, oak communities, food webs, goldspotted oak borer, planting acorns, and entering data from local trees in the San Diego Tree Map. Nature educators were recruited, trained and coordinated to provide professional development, grade-level meetings, guidance on the lessons, and ongoing support for the teachers. Comparing pre- and post-lesson evaluations, teachers indicated they were more comfortable using hands-on methods to teach lessons, using items from the outdoors to teach a lesson, and going outside to teach a lesson. Three short videos documented the teacher and student experiences in three schools. Project funding was provided by the California Department of Forestry and Fire Protection (CalFire), with the San Diego Audubon Society serving as fiscal sponsor and San Diego State University contributing faculty and student research time.

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# Urban Forestry Education: Teachers and Students Choosing Lessons in Nature

San Diego Children and Nature Collaborative and San Diego Audubon Society  
For the California Department of Forestry and Fire Protection  
June 12, 2014

## Executive Summary

Nature-based urban forestry lessons were developed, offered, and evaluated for teachers and students in seven elementary schools in San Diego County. Students in grades K-5 were engaged in science lessons in their schoolyard that provided progressive and integrated lessons about urban trees and met science and language arts standards.

The lessons were adapted from Project Learning Tree and other curricula relating to trees, and written to require limited materials, preparation and science background knowledge. They were designed to be taught primarily outdoors; and created to meet Next Generation Science Standards. Lessons featured observation skills, "schoolyard safari," leaves and tree identification, seeds, soil, tree products, oak communities, and food webs. Lessons were also developed for understanding oaks and how they are threatened by the goldspotted oak borer, planting acorns, and entering data from local trees in the San Diego Tree Map. Lesson packets were revised based on feedback from teachers and nature educators, and are available online.

These lessons provided schoolchildren with awareness of the trees and other nature on their school campus, using hands-on activities and learning by observing, touching, listening, smelling, telling and doing. Schoolyard-based lessons allowed teachers to easily and frequently bring students outdoors to spend time in and learn about local nature every day for lessons that are aligned with curriculum standards.

Starting with personal connections with teachers and administrators, schools were identified in three school districts. Nature educators and experienced naturalists were recruited, trained and coordinated to provide professional development (PD), grade-level meetings, guidance on the lessons, and ongoing support for the teachers in spring and fall 2013.

Teachers completed pre- and post-lesson surveys. Teachers responded that they had used all or most of the lessons, and felt the lessons met the identified standards and the learning objectives. Teachers perceived that students engaged in and learned something new from the lessons, and appeared very interested. Teachers became more comfortable using hands-on methods to teach lessons, using items from the outdoors to teach a lesson, and going outside to teach a lesson. Teachers felt that a nature coordinator was helpful available to them, by observing, sharing, and getting feedback on the lessons. Three short videos documented the teacher and student experiences in three schools.

Project funding was provided by the California Department of Forestry and Fire Protection (CalFire), with the San Diego Audubon Society serving as fiscal sponsor. Cooperators included urban forestry professionals, students in science teacher training and Faculty-Student Mentor Research classes at San Diego State University (SDSU), and local nature educators.



## I. Introduction

The goals of this project are to develop, offer, and evaluate local nature-based urban forestry lessons. Students will be engaged in reading about trees, then in science lessons in their schoolyard and neighborhood, and then in tree inventory, citizen science, or oak restoration projects. They'll discover that "trees are cool!" Project funding was provided by the California Department of Forestry and Fire Protection (CalFire), with the San Diego Audubon Society serving as fiscal sponsor, and various professionals and students contributing time.

The project was developed to enhance learning about urban forestry, based on issues that teachers and students identify as relevant to their school campus and/or neighborhood. Starting with personal connections with teachers and administrators in selected school districts, the project was intended to provide urban forestry lessons that meet core curriculum, and offer activity choices based on the interests of teachers and students.

Project objectives were to:

1. Expand capacity for educators to teach urban forestry-based lessons, and evaluate factors affecting their choice of these lessons
2. Based on students' and teachers' interests, provide "nature champions" and other resources to teach hands-on lessons about schoolyard and neighborhood trees
3. Develop curriculum for students to learn about oaks and threats of the gold-spotted oak borer
4. Organize stewardship projects to collect and enter data about trees or plant acorns for oak restoration

Project deliverables were: progressive and integrated lessons about urban trees for grades K to 6 that meet science and language arts standards; new curriculum package for oak health and gold-spotted oak borer; and final report with evaluation of factors influencing teachers' choices and their feedback on the urban forestry lessons.

## II. Background and Brief Literature Review

Nature is an outdoor classroom where children experience science, math, language and group learning by observing, touching, listening, smelling, telling and doing. When children explore nature, they develop their curiosity and creativity, get a sense of place, and learn that they are part of something bigger than themselves. Through their experiences in nature, they become more passionate stewards of the natural world in San Diego and beyond.

Many schoolchildren are unaware of trees in their neighborhood and school campus, or the role of trees in their daily lives. They are overwhelmed by the "devastating" environmental problems of the world, but only rarely experience the wonder and joy of nature in days their school and lives. Many teachers and administrators are reluctant to "open the door" to add science, nature, or community-based learning to their busy school days.

Schoolyard gardens and native habitats offer well-documented teaching and learning opportunities in all subjects, and provide places for teachers to easily and frequently bring students outdoors for lessons that are aligned with curriculum standards. Students can observe, get hands on experiences, learn about, and appreciate local nature every day, if it is



part of the school campus. Schoolyard nature can be part of after-school nature learning and outdoor play, and it can provide space for tutorials, counseling, and cooperative learning.

Natural elements can be found in every schoolyard, though some have much more surfaces covered by buildings and pavement than other schoolyards. These natural elements include food-producing gardens, fruit trees, potted containers, butterfly-attracting and other themed gardens, native plants, shade trees, ornamental landscaping plants, and grass. Learning in the schoolyard-based nature compliments bus trips to the coast, shrublands, mountains, desert, nature centers, and sixth-grade outdoor school.

The body of research on nature-based learning is limited. Some studies have focused on students in dedicated nature-based schools or classrooms, and the nature immersion is unlike the traditional classroom setting that may have occasional or even regular schoolyard habitat or nature field trips. Other studies have attempted to evaluate the effects of field trips or garden experiences for a limited time frame, and it is difficult to correlate that with sustained learning in science or other subjects. The Children & Nature Network (2010)<sup>1</sup> has an annotated bibliography of studies and reports on educational aspects of children's experiences in nature.

## Learning in Schoolyard Settings

Blair<sup>2</sup> summarized qualitative studies that have documented a wider scope of desirable outcomes for school garden programs, including an array of positive social and environmental behaviors. Gardening enthusiasm varies among teachers, depending on support and horticultural confidence. Blair based this on a literature review of children's gardening outcomes, taking into account potential effects, school gardening outcomes, teacher evaluations of gardens as learning tools, and methodological issues with the studies. The following excerpts from her literature review related directly to this project (but her references are not cited in this project report):

**Exposure to Nature and Gardening in Childhood Shapes Adult Attitudes and Environmental Values.** Many authors and researchers believe that today's children lack the exposure to the natural world that shapes environmental values and puts science in context (Bundschu-Mooney, 2003; Finch, 2004; Kahn, 2002; Kellert, 2002; Orr, 2002). Chawla's (1998) review of the qualitative and survey literature found that adults who had significant and positive exposure to nature as children—experiences, often with significant adults, that socialize them to view nature in positive and meaningful ways—were more likely to be environmentally sensitive, concerned, and active.

**School Gardening: A Broader Effect Than Experiential Education?** The style of learning that happens in school gardens, using direct contact with natural phenomena, is considered experiential, inquiry-based learning grounded in concrete experience

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<sup>1</sup> Children & Nature Network. 2010. Children's contact with the outdoors and nature: A focus on educators and the educational setting. 23p. Available at <http://www.childrenandnature.org/downloads/EducationsynthesisMarch2010FINAL.pdf>.

<sup>2</sup> Blair, D. 2009. The child in the garden: An evaluative review of the benefits of school gardens. *Journal of Environmental Education* 40(2):15-36. Available at <http://www.csupomona.edu/~smemerson/business318/articles101/childrens%20gardens.pdf>. Accessed 9/26/13



(Corson, 2003; Kellert, 2002; Mabie & Baker, 1996; Rahm, 2002). Kellert argued that because nature changes rapidly, it attracts and stimulates a child's attention. Naming and categorizing objects found in the particularly information-rich and potentially fascinating natural world facilitates children's capacity to retain information and ideas, a first step in cognitive development, as Bloom's taxonomy of cognition outlined (Bloom, Engelhart, Furst, Hill, and Krathwohl, 1956). The experience of nature's detail, whether direct or vicarious, provokes children's need to comprehend and make sense of what they have experienced.

**Studies of Principals' and Teachers' Evaluations of the Effectiveness of School Gardens.** Another approach to evaluating school-garden effectiveness is for researchers to measure (a) principals' and teachers' enthusiasm for gardening as a learning tool, (b) how teachers find gardens useful, and (c) what barriers they perceive in the integration of gardens into the curriculum. Studies of principals or teachers have involved... sending questionnaires to schools or teachers whom researchers identified as garden users... DeMarco, Relf, and McDaniel (1999) sent a national school-gardening survey to 322 elementary school recipients of a National Gardening Association Youth Gardening Grant. Less than 5% of respondents felt that school gardening was unsuccessful at enhancing student learning, and 61% felt that it was very successful at enhancing student learning. Goals for school gardening were academic (92%), social development (83%), recreational (63%), and therapeutic (52%).

**Teachers' Need for Support and Training.** The teacher and principal are major variables in school-garden success. In particular, more needs to be known about the principal's effect. Major teacher issues are lack of personal interest and limited capabilities, knowledge, and time. Samples of gardening teachers and teachers with adequate gardening support (Graham et al., 2004) were more enthusiastic about the potential of school gardens than were mixed samples of gardening and non-gardening teachers (Graham and Zidenberg-Cherr, 2005). Support may come in the form of (a) enthusiastic principals, (b) effective and credible lead teachers who promote school gardening through contagious student excitement rather than through personal power (Vesilind and Jones, 1998), or (c) the semiretirement-lead gardener programs for teachers, such as at the Davis, California, schools (Graham et al.).

LaForce and Bancroft<sup>3</sup> evaluated the Science in the Schoolyard program undertaken by the Boston Schoolyard Initiative, which has implemented outdoor classrooms in 32 schools and created curriculum support materials and programs. The feedback from 97 teachers and 966 students (grades 3 to 5, in seven schools) confirmed the benefits from outdoor nature-based science experiences.

- Teachers who completed the training took students outdoors for science significantly more often and reported higher levels of commitment to outdoor instruction and confidence in their ability to teach outdoors.
- Students who reported that they participated in outdoor science lessons reported engaging in more observations and investigations, indicated higher interest in and self-efficacy for science

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<sup>3</sup> Laforce, M. and L Bancroft. 2012. Science in the schoolyard: Evaluation for Boston Schoolyard Initiative. University of Chicago: Center for Elementary Mathematics and Education. 51 p. Available at [http://d30clwvkkpijx.cloudfront.net/bsi/final\\_report.pdf](http://d30clwvkkpijx.cloudfront.net/bsi/final_report.pdf)





Rickinson et al<sup>4</sup> and Dillon et al<sup>5</sup> reviewed research on outdoor learning in schoolgrounds, reporting positive impacts on science process skills, greater confidence and motivation toward learning, and more positive relationships among students, teachers and the community. Coyle<sup>6</sup> summarized studies on the role of outdoor learning programs and outdoor play time in furthering children's overall education, improving their lifelong learning skills, prospects for career success and school test scores. He reported on a survey by the National Wildlife Federation of nearly 2000 educators, with more than 75% strongly agreeing that children who spent sometimes outdoors were more creative and better able to problem solve inside the classroom.

Ferreira et al<sup>7</sup> reported on a partnership formed between a local university, a school district, and a community organization in order to develop and implement outdoor classrooms and curriculum in seven local elementary schools. Teacher surveys showed a shift in their perceptions about the value of the outdoors for instructional purposes, a greater number of learning experiences for students, and greater sense of community.

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<sup>4</sup> Rickinson, M., J. Dillon, K. Teamey, M. Morris, M.Y. Choi, D. Sanders and P. Benefield. 2004. Review of research on outdoor learning. National Foundation for Educational Research and King's College London. Available at [http://www.field-studies-council.org/documents/general/NFER/A\\_review\\_of\\_research\\_on\\_outdoor\\_learning.pdf](http://www.field-studies-council.org/documents/general/NFER/A_review_of_research_on_outdoor_learning.pdf).

<sup>5</sup> Dillon, J., M. Rickinson, K. Teamey, M. Morris, M. M. Y. Choi, D. Sanders, and P. Benefield, 2006. The value of outdoor learning: evidence from research in the UK and elsewhere. *School Science Review*, 87, 107–111.

<sup>6</sup>Coyle, K. J. 2010. Back to school: Back outside! How outdoor education and outdoor school time create high performance students. National Wildlife Foundation. Available at <http://www.nwf.org/pdf/Be%20Out%20There/Back%20to%20School%20full%20report.pdf>.

<sup>7</sup> Ferreira, M., D. Grueberg, and S. Yarema. 2012. A community partnership to facilitate urban elementary students' access to the outdoors *School Community Journal* 22(1): 49-64. Available at [http://www.adi.org/journal/2012ss/2012\\_SS\\_SCJ.pdf](http://www.adi.org/journal/2012ss/2012_SS_SCJ.pdf)



### III. Curriculum Development for Nature-based Learning

This project had two tasks for curriculum development, as written in the grant agreement:

Task 1: Develop an integrated and progressive packet of lessons about urban trees. Lessons will begin with student readings at all grade levels to infuse urban forestry content into core language arts lessons that are the focus of many school hours. Classes will choose follow-up lessons about trees and urban forest ecosystems, to be done in the schoolyard or neighborhood. They will be adapted from such sources as Project Learning Tree (PLT), Investigating the Oak Community, and California's Education and the Environment Initiative (EEI); and will meet life science and literacy standards at elementary grades (such as trees in K, similarities and differences in grade 1, life cycles in grade 2, adaptations in grade 3, habitats in grade 4, structure and function in grade 5, and literacy in all grades).

Task 2: Develop lessons about oak health and the gold-spotted oak borer. Work with GSOB team to develop, pilot test, revise, and publish curriculum for students in grades 4 and 6 to observe and learn about oaks, the gold-spotted oak borer, potential long-term losses of native oaks, actions to reduce those losses, acorn collection and planting, long-term care of oak seedlings, and scientific processes.

The lessons were adapted from existing curricula relating to trees, written by curriculum consultants, finalized by the project team, taught in spring 2013 by teachers, revised based on feedback from teachers and nature coordinators, and taught in revised form in fall 2013. For each grade, three lessons were written (two for grade five).

Each lesson was developed to meet the following criteria:

- Lessons taught outdoors on school campus or adjacent (such as a park)
- Limited materials and preparation for teachers
- Limited science background for lesson content and methods
- Suitable for schoolyards with minimal nature (trees, lawn, ornamental plantings)
- Meet Next Generation Science Standards

Lessons were drawn from the following sources, and adapted for schoolyard conditions in southern California:

- Project Learning Tree<sup>8</sup>
- Oak Foundation<sup>9</sup>
- Talk about Trees<sup>10</sup>
- Emerald Ash Borer<sup>11</sup>

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<sup>8</sup> Project Learning Tree. Available at <http://www.plt.org/>.

<sup>9</sup> Antunez, K. 2000. Investigating the oak community. Oakland, CA: California Oak Foundation. 110 p. Available at [http://www.californiaoaks.org/ExtAssets/investigating\\_the\\_oak\\_community.pdf](http://www.californiaoaks.org/ExtAssets/investigating_the_oak_community.pdf)

<sup>10</sup> Talk about Trees. Lessons available at <http://www.talkabouttrees.org/index.html>

<sup>11</sup> Emerald ash borer education packet, 26 p. Available at <http://www.emeraldashborer.info/files/edpacket.pdf>



## Curriculum Standards

Lessons were developed to meet Next Generation Science Standards identified for each grade in the lesson packets, as outlined in Table 1. The most-relevant Disciplinary Core Ideas (DCIs) are identified for each grade, along with the themes and titles. In addition, the lessons were cross-referenced to Common Core standards<sup>12</sup> and current California Science Standards.<sup>13</sup>

## Input from Urban Foresters

The San Diego Regional Urban Forests Council (SDRUF) was invited at their August 1, 2012 meeting to provide input on concepts to include in the curriculum, in a discussion facilitated by the project manager, as described in Appendix A. The urban foresters were asked to complete a one-page form to gather this input; including their name, home and work communities, and how they are interested in participating. In addition, the SDRUF Executive Committee agreed to review lessons, help with teacher workshops, assist with tree inventory and stewardship projects.

Fifteen attendees at the Southern California Committee of the California Forest Pest Council meeting on October 24, 2012 contributed information about lessons relating to oaks and the gold-spotted oak borer (GSOB), as described in Appendix B. These foresters and entomologists identified the most important concepts as the life cycles of oaks, field identification of oaks and of insect-related symptoms on trees, ecological and social values of oaks, native and non-native trees and insects, introduced pests, and acorn planting.

Fourteen attendees at the August 1 and six at the October 24 meetings listed the top three concepts they would like children to know about trees, and the following list displays their collective responses, as outlined in Appendix C:

- Right tree, right place (3)
- Proper way to plant trees, care for trees, protect root zones of trees (3)
- Trees provide shade, reduce heat, save energy, protect from wind and weather (9)
- Ecosystem values: air quality, stormwater retention, carbon sink (9)
- Trees as habitat for wildlife (native trees, birds, mammals, insects) (5)
- Tree biology, life cycles, differences among trees, forest ecosystems (9)
- Commerce and trees (timber, food, herbs, fabric) (2)
- How do trees benefit me? (physical and mental health, beauty) (4)
- Other: Sustainability, Why arbor days are important, How to be a tree advocate, Future job opportunities in arboriculture and urban forestry, Natural open space preservation

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<sup>12</sup> Further information about Common Core standards in California at <http://www.cde.ca.gov/re/cc/>

<sup>13</sup> Science standards 1998 available at <http://www.cde.ca.gov/be/st/ss/documents/sciencestnd.pdf>



**Table 1. Cross-reference to Next Generation Science Standards**

Grade	Next Generation Science Standards (NGSS)	Unit Title	Unit Theme	Lesson Titles
Kinder- garten	K-LS1-a. Collect, analyze, and use data to describe patterns of what plants and animals (including humans) need to survive.  K-ESS3-a. Obtain information to describe the relationship between the needs of different plants and animals (including humans) and where they live on the land or in the water.	Exploring our Urban Forest	Exploring relationships of living organisms.	Getting a Sense of Nature Soil Stories Leaf Sorting
Grade 1	1-LS1-a. Use diagrams and physical models to support the explanation of how the external parts of animals and plants help them survive, grow, and meet their needs.	Growing Trees	A tree is composed of structures that function together to assist in growth and survival.	Examine our Urban Forest Have Seeds will Travel How Do Your Plants Grow?
Grade 2	2-LS4-a. Make observations about the variety of plants and animals living in an area and identify the specific places they live in order to make comparisons between different areas.	Where We Live	Ecosystems are composed of interrelated systems.	Schoolyard Safari Schoolyard Bird Safari In the Microhabitat of Miss I.M. Ant
Grade 3	3-LS1-a. Construct explanations from evidence that life cycles of plants and animals have similar features and predictable patterns.  3-LS4-d. Analyze and interpret data about changes in the environment of different areas and describe how the changes may affect the organisms that live in the areas.	How Trees Work	A tree is composed of structures that function together and with the environment in which they live.	My Tree The Life of a Tree Got Trees?
Grade 4	4-LS1-a. Use simple models to describe that plants and animals have major internal and external structures, including organs that support survival, growth, behavior, and reproduction.	Taking a Closer Look	Trees have common features that differ in structure and scale and work together for survival and growth.	Our Class Tree Taking a Closer Look at Leaves Name That Tree



Grade	Next Generation Science Standards (NGSS)	Unit Title	Unit Theme	Lesson Titles
Grade 5	5-LS2-a. Construct and use models of food webs to describe the transfer of matter among plants, animals, decomposers, and the environment and discuss limitations of these models.	Relationships	Oak Tree communities include many organisms that are a part of food webs.	Relationships Food Webs
Grades 4-5	4-LS1-1a. Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.  5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.	Goldspotted Oak Borer	Life	Understanding a Local Pest Collecting Data as a Citizen Scientist
Grades 4-5	Refer to Grade 5/Lesson 2	Acorn Planting		
Grades 4-5	Refer to Grade 4/Lesson 2	Tree Mapping		



## Involvement of Teacher Certification Students

Lessons from Project Learning Tree were first outlined by teacher certification students in a science methods class taught by Associate Professor of Science Education Meredith Houle Vaughn at SDSU. This was an opportunity to involve 28 students in real-life curriculum development. Students first attended a four-hour Project Learning Tree training on September 14, 2012, given by Maureen Lewis and Kathy Halvert at Kellogg Elementary School in Chula Vista, where Dr. Vaughn's class met.

Vaughn provided the lesson plan format to the science education students, and they worked in pairs to draft and pilot test 14 lessons, two lessons for each grade level (K-6). Each lesson was 60 minutes with a component to be taught outdoors. The students taught parts of each lesson to their classmates in one class session, then revised the lessons. These lessons were the starting point for the lessons developed by the curriculum consultants.

## Curriculum Development and Revision

Two curriculum consultants drafted the initial lessons in fall 2012, and those were finalized by the project team, printed, and given to the teachers in the PD and grade-level meetings in spring 2013. Based on feedback from teachers, nature coordinators and the project team, the lessons were revised in summer 2013 and the revised lessons printed and taught in fall 2013. Those lessons are posted on the webpage, <http://sdchildrenandnature.org/wp/education/resources-for-teachers/>.

The lessons followed the BSCS 5E Instructional Model for lesson plan structure, in a sequence of Engage, Explore, Explain, Elaborate, and Evaluate.<sup>14</sup> The lesson packets were intended to be easy to read, attractive for teachers, and easily copied in black/white. Graphic artist Maggie Holloway set up the lesson template and formatted the lessons. Sketches were included for visual content, and drawn by local naturalist Liz Paegel.

**Goldspotted Oak Borer (GSOB).** Although there are excellent public information brochures and website, no lessons about the GSOB had been developed for schoolchildren. Task 2 focused on developing lessons about oak health and the gold-spotted oak borer. These lessons are most relevant to students who live in oak woodlands or in areas with oak mortality, and the activities focus on local observations. The student reading covers the life cycle of this insect, tree structure and function, the insect's method of damage, introduction and invasive spread, and what can be done to reduce oak tree losses. Before doing these lessons, students would complete the two lessons about internal structure of trees and on oak communities (Grade 4, lesson 2 and Grade 5, lesson 2). In addition, "Planting Acorns" lesson provides for students to take action to replace oak trees that have died.

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<sup>14</sup> Bybee, R.W., J.A. Taylor, A.Gardner, P.Van Scotter, J.C. Powell, A. Westbrook and N. Landes. 2006. The BSCS 5E instructional model: Origins and effectiveness. Colorado Springs, CO: BSCS. 65 p. Available at [http://bscs.org/sites/default/files/legacy/BSCS\\_5E\\_Instructional\\_Model-Full\\_Report.pdf](http://bscs.org/sites/default/files/legacy/BSCS_5E_Instructional_Model-Full_Report.pdf).



**Table 2. Themes and Titles of Lessons, Grades K to 5**

Draft Lessons, Spring 2013	Final Lessons, Fall 2013
<p>Grade K: Exploring our Urban Forest Theme: Exploring relationships among living organisms.</p> <ol style="list-style-type: none"> <li>1. Getting a Sense of Nature</li> <li>2. Soil Stories</li> <li>3. Leaf Sorting</li> </ol>	<p>Grade K: Exploring our Urban Forest Theme: Learning to Explore Nature</p> <ol style="list-style-type: none"> <li>1. Getting a Sense of Nature</li> <li>2. Soil Stories</li> <li>3. Leaf Sorting</li> </ol>
<p>Grade 1: Growing Trees Theme: The structure of plants and trees are related to their functions. A plant's specific parts enable it to function as a healthy organism.</p> <ol style="list-style-type: none"> <li>1. Examine our Urban Forest</li> <li>2. Have Seeds will Travel</li> <li>3. How Do Your Plants Grow?</li> </ol>	<p>Grade 1: Growing Trees Theme: An urban forest includes all plants and organisms in the schoolyard.</p> <ol style="list-style-type: none"> <li>1. Examining Schoolyard Trees</li> <li>2. Schoolyard Bird Safari</li> <li>3. In the Microhabitat of Miss I.M. Ant</li> </ol>
<p>Grade 2: Where We Live Theme: Ecosystems are composed of interrelated systems.</p> <ol style="list-style-type: none"> <li>1. Schoolyard Safari</li> <li>2. Schoolyard Bird Safari</li> <li>3. In the Microhabitat of Miss I.M. Ant</li> </ol>	<p>Grade 2: Noticing Differences Theme: Trees are important for animal habitats, and animals help trees and plants disperse their seeds.</p> <ol style="list-style-type: none"> <li>1. Schoolyard Safari</li> <li>2. Have Seeds will Travel</li> <li>3. How Do Your Seeds Grow?</li> </ol>
<p>Grade 3: How Trees Work Theme: A tree is composed of structures that function together and with the environment in which they live.</p> <ol style="list-style-type: none"> <li>1. My Tree</li> <li>2. The Life of a Tree</li> <li>3. Got Trees?</li> </ol>	<p>Grade 3: How Trees Work Theme: A tree is composed of structures that function together with the environment in which they live.</p> <ol style="list-style-type: none"> <li>1. My Tree—Part 1</li> <li>2. My Tree—Part 2</li> <li>3. Taking a Closer Look at Leaves</li> </ol>
<p>Grade 4: Taking a Closer Look Theme: Trees have common features that differ in structure and scale and work together for survival and growth.</p> <ol style="list-style-type: none"> <li>1. Our Class Tree</li> <li>2. Taking a Closer Look at Leaves</li> <li>3. Name That Tree</li> </ol>	<p>Grade 4: Taking a Closer Look Theme: Trees have common features that differ in structure and scale.</p> <ol style="list-style-type: none"> <li>1. Name That Tree</li> <li>2. Transportation Inside Trees</li> <li>3. From a Tree to Me</li> </ol>
<p>Grade 5: Relationships Theme: Oak Tree communities include many organisms that are a part of food webs.</p> <ol style="list-style-type: none"> <li>1. Relationships</li> <li>2. Food Webs</li> </ol>	<p>Grade 5: Relationships Theme: Oak Tree communities include many organisms that are a part of food webs.</p> <ol style="list-style-type: none"> <li>1. Relationships</li> <li>2. Food Webs</li> </ol>



There are two lessons for the goldspotted oak borer:

Lesson 1, Understanding a Local Pest. Learning outcomes are that students will understand the biology of an insect pest and its relationship to local oak trees.

Lesson 2, Collecting Data as a Citizen Scientist. Learning outcomes are that students will collect scientific data, learn about the life cycle of the goldspotted oak borer (GSOB), and observe the consequences of human behaviors (moving firewood). This lesson is taught at the Cuyamaca Outdoor School, operated by the San Diego County Office of Education for students and teachers in the sixth grade. Students participate in a “citizen science” project, collecting data that will help scientists and land managers learn more about the distribution of GSOB and its effects on oak trees.

These lessons are posted on the websites that provide public information on goldspotted oak borer ([www.gsob.org](http://www.gsob.org)) and the state-wide campaign to stop moving firewood (<http://www.firewood.ca.gov/>).

Two lessons were written to support the stewardship projects (Task 4):

**Acorn Planting.** Learning outcomes are that students will learn how to plant a tree seed (acorn) and what resources a tree needs to grow. The lesson guides teachers in deciding whether they will plant acorns on public lands, plant acorns on their school site or nearby nature area, or participate in an oak planting event. The seven steps for planting acorns are included, with instructions for two of the steps (testing and storing acorns), and information about the other five steps in the Bulletin of the California Oak Foundation, “How to collect, store and plant acorns,” included with the lesson. The reasons for planting acorns, instead of seedlings grown from acorns, are provided.

**Tree Mapping.** Learning outcomes are that students will learn how to identify trees, measure the height and diameter of the trees in their schoolyard, and enter the data into the San Diego Tree Mapping Project database. Teachers are expected to complete Grade 4/Lesson 1: Name That Tree first, as that provides instructions for measuring and identifying trees. Then instructions are provided for students to enter data online for the San Diego Tree Mapping Project, <http://sandiegotreemap.org/map/>. They are referred to two online sites for identification of trees in California, <http://www.urbantreekey.org/> for urban trees and <http://selectree.calpoly.edu/> for native trees.





## IV. Teacher Support for Nature-based Learning

This project had two tasks for teacher professional support, as written in the grant agreement:

Task 3: Enhance resources for teaching nature-based urban forestry lessons. “Nature Champions” (trained naturalist guides) will work with two schools in each of four school districts (8 schools), to facilitate teaching these lessons in nature. Based on student interests, nature champions will help provide resources to teach two follow-on lessons in the schoolyard, neighborhood, or nearby natural areas. Schools using these nature-based lessons will be recognized in a “green ribbon schools” initiative within the Collaborative.

Task 4: Involve students in tree inventory, citizen science, or acorn planting projects (stewardship projects). Nature champions will work with at least two classes at each school on a class stewardship project, based on their campus, community, and interests of the students and teachers. These projects will be developed to teach simple tree inventory methods and organize data collection and input for trees on their school campus and/or neighborhood; collect and enter data as a Citizen Science project, for example, the Project BudBurst or the National Phenology Network; or organize classrooms and community groups to plant acorns, and then monitor and care for seedlings during the project.

These tasks involved selecting schools, recruiting and working with nature coordinators, and providing PD and support to teachers. These steps are summarized in this report, and further documentation is provided in the separate report, Project Documentation for Nature Coordinators’ Support to Schools.

### Selection of Schools and Administrators’ Approval

Schools were sought, that had the interest and commitment of the principal for teaching the schoolyard-based lessons. This was a long process, first consulting with colleagues who work locally in science and nature education. They suggested specific schools, based on:

- Master Gardeners’ familiarity with schools, some have well-developed schoolyard habitat and dynamic teacher and garden coordinator
- Nature educators (Collaborating Partners of SDCaN) who lead field trips for specific teachers and schools
- City arborists in some cities, that were interested in and could assist with the project (Chris Guenther in Escondido and Annette Saul in Santee)
- Nature providers and educators participating in the Escondido Nature Educators’ Group
- Science-based schools

Project manager Crystal De Soto made contacts with schools and their principals in 2012, sending invitation and confirmation letters. In 2013, Leanne Teiper Jacobson worked with and confirmed the final participating schools. Because of the process of obtaining Institutional Review Board (IRB) review of human subjects’ research (for teacher evaluation), the objective was to identify and get approval in three school systems, with willing principals. They were generally referred by others and then visited by De Soto or Teiper Jacobson in 2012.



Three school systems were selected, for the following reasons:

- Santee Unified School System, based on previous interest from district curriculum staff and Master Gardeners' work in several schools
- Escondido Union School District, to support the coordinated approach initiated by the informal Escondido Nature Educators Group
- San Diego Unified School Systems, based on contacts at individual schools, diverse populations of students, and evaluator's familiarity with IRB approval process

## **Recruitment and Selection of Part-time Nature Coordinators**

Announcement of these part-time positions was made in email messages to the SDCaN contact list and the list for San Diego Naturalist Guides. The text included principal tasks and responsibilities, school locations, and qualifications. Nature coordinators were asked to be self-motivated, energetic and flexible in duties and interactions with teachers and students; focused on working as a team; effective communicators with teachers, students, parents/guardians, co-workers, cooperators, and supervisors; and mindful of the care and safety of students participating in the program.

Resumes were received from 16 naturalists and educators, and eight were interviewed by Crystal De Soto, Leta Bender, and Anne Fege on December 18 and 19, 2012. Four were selected. One resigned due to family commitments, and the position was offered to another naturalist. Later, another resigned due to other work assignments, and the schools were assigned to the other three nature coordinators. In fall 2013, naturalist Judie Lincer provided support to all of the elementary schools.

Three meetings were held in January 2013 for orientation with the nature coordinators and other project team members. The focus was on objectives and outcomes, schedule, reporting, and communications, and preparation for the PDs.

## **Roles and Management of Nature Coordinators**

The final scope of work for each nature coordinator was to:

1. Contribute to successful implementation of the Urban Forestry Project to facilitate teaching the tree-focused lessons in the schoolyard, for assigned schools.
2. Schedule and teach part of a 45- to 60-minute teacher workshop at each school.
3. Meet with teachers and other school staff regularly, in grade level groups or individually.
4. Facilitate teachers doing the nature-based lessons by providing materials, modeling outdoor lessons, encouraging teachers, and considering the safety of students participating in the program.
5. Identify at least two teachers willing to do a class stewardship project (grades 4-5).
6. Communicate with project manager to provide updates, identify issues, and ask for assistance.
7. Work with the other nature coordinators to share materials and experiences.
8. Work with evaluation team to communicate observations of selected lessons and facilitate surveys of teachers.



9. Record and submit information bi-weekly on contacts with teachers and their implementation of the lessons, using data table developed by the team.
10. Be self-motivated, energetic and flexible in working with teachers and students.

After the spring 2013 work with the teachers, project manager Heather Gastil provided the following reflections and recommendations about the nature coordinators:

Leading a group of naturalists to conduct PD trainings for an entire school and then grade-level trainings was not as effective as having one experienced person with that experience lead the trainings. The general PD for the schools should have been conducted by the person who has experience with running PDs rather than spending time to train new people. Grade-level trainings should have also been conducted by the person with PD experience with support by the nature coordinators.

Communication of both the project manager and the coordinator with the principal is helpful and supportive for the nature coordinator. Designating the coordinator as the main support and only communicator with the teachers is very important for clarity and follow through. Additional effort was needed in communicating with and recruiting teachers. There were many weeks that went by due to lack of follow through and timid approaches. Recruitment requires persistent communication and follow through.

Coordination of the project was completed through a variety of online documents, meetings in person, mentoring at the school sites, and phone contacts. One thing that worked well was having weekly check-ins over the phone. I called each coordinator weekly to follow up and provide support.

The time spent training and supporting the coordinators for the PDs could have supported more teachers in completing the curriculum. Devoting more hours to the support of the teachers and less to curriculum development will increase impacts of the program.

The roles that I would hire for next time are project manager, with project management and PD experience; project coordinators with experience in the classroom and with project planning; and one nature coordinator to provide site-specific information about incorporating nature into the curriculum. Better definition of these roles will provide more efficient teacher support and use of project hours. If I were to do this project again, I would seek coordinators that had experience with project or event planning and logistics, and experience in the classroom for adapting lessons and providing necessary support.



## Professional Development and Support for Teachers

A checklist was set up but was not followed consistently by nature coordinators. The recorded information is provided in Table 3. In some schools, most teachers taught some lessons, and in other schools, few taught the lessons. Substantially more lessons were taught in two schools (SD Community Charter and Whitman) in spring 2014, attributed to the additional communication with and support from the nature coordinator.

**Table 3. Professional Development and Lessons Taught, by School**

	Escondido- Bernardo	Escondido- Juniper	SD Unified- SD Community Charter	SD Unified- Hawthorne	SD Unified- Whitman	Santee-Chet Harrit	Santee-Rio Seco
Number of teachers in school	18	24	12	15	16	17	24
Completing pre-survey	10	12	4	2	14	12	12
Completing post-survey	5	N/A	N/A	N/A	N/A	N/A	N/A
School-wide professional development	Y	Y	N	Y	y	y	y
Grade-level meetings							
Grade K	N	y	Y	Y	Y	Y	Y
Grade 1	Y	Y	Y	N	Y	Y	Y
Grade 2	Y	Y	N	N	Y	N	N
Grade 3	Y	Y	N	N	Y	N	N
Grade 4	N	N	N	N	Y	N	Y
Grade 5	Y	N	Y	N	Y	N	N
Taught at least one lesson in spring 2013							
Grade K	0	4	0	2	2	3	0
Grade 1	0	2	0	0	0	2	0
Grade 2	2	2	0	0	0	4	0
Grade 3	3	4	0	0	0	1	0
Grade 4	0	0	0	0	0	0	0
Grade 5	4	0	2	0	2	2	0
Taught at least one lesson in 2013-2014							
Grade K	0	2	6	6	6	10	6
Grade 1	0	3	2	0	3	6	0
Grade 2	0	3	2	0	3	0	0
Grade 3	0	0	0	0	4	6	0
Grade 4	0	0	0	0	4	3	0
Grade 5	0	0	4	0	4	2	0



## Reports from Nature Coordinators

Nature coordinators provided narrative descriptions of their experiences at the schools in two schools in Escondido Union School District, two schools in Santee Unified School District, and three schools in San Diego Unified School District. Those are provided in the separate report, Project Documentation for Nature Coordinators' Support to Schools.

In February 2014, nature coordinator Judie Lincer provided the following observations about her work with teachers in spring 2013 and fall 2014:

What I have discovered as the Nature Coordinator and Program Manager for *Exploring our Urban Forests* is that using the schoolyard for science lessons and exploration is a natural fit and a great opportunity to use hands-on and engaging, inquiry-based learning for science and across curriculum. Teachers love it, students love it and all benefit and learn with more depth, interest, excitement and fun. I like to call it a "Breath of Fresh Air" for both students and teachers alike! Most importantly, this style of learning is the way that students remember best what they have learned.

These lessons also completely mesh with Common Core and Next Generation Science Standards which are research-based and proven ways for best teaching practices and have recently been adopted by California. Getting our students (and teachers) outdoors to do 'schoolyard science' is clearly going to be an easy, accessible, inexpensive, efficient way for teachers to implement life science and earth science in elementary school and also allows for lessons in math (measurement, patterns) language arts (peer discussions, discourse, writing and reading of expository text) and can also incorporate technical drawing, science journaling, art, etc.

In the past, many teachers have not had the opportunity or encouragement to use their schoolyard for science lessons. Since it is a paradigm shift for teachers, it is of tremendous importance to be able to provide not only lessons but supports to teachers as well, if we want teachers to follow through with implementation. Our structure for implementing *Exploring Our Urban Forest* allowed for this by having a Nature Coordinator take teachers out into their schoolyards and model lessons with their classes.

One of the most important supports we can give teachers, to move the lessons from the teacher's desk to implementation, is offering to model lessons for each teacher. It was so clear that this was extremely valuable and tremendously appreciated by teachers so they could get familiar with their schoolyards, see how to execute a lesson and get comfortable with the concept. When teachers see how engaged and excited students are, teachers become much more comfortable doing something that is a little 'outside of the box' from their usual teaching routine.

We now have solid feedback that this type of support made a difference and has given teachers the confidence and competence to take their students outdoors. Teachers that have implemented our lessons have responded very positively to the concept of schoolyard science, and it has become apparent how much more their students remember and how interesting and enriching the experiences can be. Students ask for



SD CHILDREN & NATURE

more and more opportunities to go outside for lessons and they are buzzing with wonder, questions and insights as they explore.

One of the challenges was the timing of introducing *Exploring Our Urban Forest*, at the same time schools were implementing Common Core State Standards (CCSS), which drew a great deal of attention and focus of many teachers in all three districts. I believe that with more exposure to the NGSS and Common Core, teachers will realize and appreciate the incredible value of these lessons since they put into practice many of the most important concepts of both. This type of teaching is the wave of the future and we have the opportunity to make it easier for teachers to use these hands-on practices while getting more familiar with plants, animals, ecosystems, nearby nature spaces and teaching students (and teachers) to embrace the benefits of using nature in everyday learning.

Lincer invited a wildlife biologist to visit Chet Harritt ES and provide an inventory of the wildlife observed, signs of wildlife, native plants, other plants, and habitats. That inventory is provided in the separate report, Project Documentation for Nature Coordinators' Support to Schools.

## Stewardship Projects

As the teacher communication and support developed, it became apparent that the expectations for stewardship projects had been set too high. For most teachers, the completion of three lessons was a substantial accomplishment. Nature coordinators encouraged teachers in grades 3 to 5 to map some trees or plant acorns, and several urban forestry professionals offered to assist with schools in the areas they work. No stewardship projects were completed. Annette Saul, Arborist for the City of Santee, led fourth grade students and their teacher on a field trip to Santee Lakes.



## V. Evaluation

A formative evaluation was designed to assess the new curriculum as well as the approach of using nature coordinators to support teachers. The evaluation plan centered on the effectiveness of the curriculum, teacher comfort in implementing lessons utilizing the outdoors, and support offered by the nature coordinator/educator.

To address the evaluation questions, teachers were asked to complete a survey prior to implementing the lessons with the nature coordinator. This survey, referred to as the pre-lesson survey, asked teachers such questions as length of time teaching, grade taught, comfort with using hands-on lessons, knowledge of and prior use of the outdoors for teaching, as well as experience working with a nature coordinator. All teachers, who stated that they planned to implement the lessons, were invited to complete the survey. In order to assess changes in teachers' comfort levels, teachers were given the option to give their name. It was explained to teachers that their responses would be kept confidential and only the evaluator would have access to their individual responses. Moreover, all data would be maintained on the evaluator's personal computer in locked files.

Upon completion of the lessons, teachers were asked to complete a second survey, referred to as the post-lesson survey. Questions in the post-lesson survey included lessons implemented, quality of lessons, student impact, and perspectives on using a nature coordinator. For those teachers that shared their name, their pre-lesson survey and post-lesson survey responses were matched to gain insight into whether teacher comfort level increased after implementing the lessons. Lesson implementation and survey completion were all voluntary. Teachers were given the option to implement the lessons without having to complete a survey.

Teachers were located in three school districts in San Diego County: Escondido, Santee and San Diego Unified school districts. Prior to asking teachers to complete pre and post-surveys, district approval was gained through each district's Institutional Review Board. In all, 72 teachers completed the pre-lesson survey while 57 teachers completed the post-lesson survey. Matched data was available for 32 teachers.

In the first year of the project, students at SDSU produced a draft evaluation approach, survey questions, and observation structure. This was completed within a two-semester course (one credit each semester) for Faculty-Student Research Methods, led by Associate Professor Meredith Vaughn. These initial approaches and questions were discussed by the project team, and used as the starting point for the evaluation plan. These methodologies are provided in the project files.

Students first reviewed literature on science curriculum evaluation, and developed a draft pre- and post-lesson survey for teachers. The survey included teachers' beliefs about using nature in the classroom and about teaching science, prior use of nature in their teaching environment, and knowledge of local ecological systems. After the lessons, the SDSU students' drafted questions focused on logistics, student reactions, experience with the naturalist, and experience teaching lessons in nature.

Students also developed an observation methodology and recording sheet, with the intent of



observing students doing the lessons. Scheduling and transportation complexities did not allow for any of the observations. They planned to make observations in 15-minute increments, with codes for:

- Lesson observation notes about lesson events, instructor inside, instructor outside, explanation, modeling, demonstration, directions, use of instructional aides, summarizing, assessing understanding, and discipline.
- Student observations: student volunteers, hands-on activity, student activity – verbal, student activity – physical, stations, and student disengagement.
- Physical description of learning environment: indoor classroom, outdoor space (approximate size, significant features, proximity to classroom)

## Curriculum Effectiveness

The first evaluation questions related to the lessons. First, teachers were asked the number of lessons they implemented.

- 55% implemented all of the lessons (three per grades K-4, two for fifth grade)
- 33% implemented most of the lessons
- 12% implemented half or less of the lessons

Next, teachers were asked about the curriculum itself as well as specific aspects of the curriculum. Teacher were asked, "Were the suggested materials sufficient to each the lessons, with the following responses:

- 70% felt that the suggested materials were very to extremely sufficient;
- 24% felt they were somewhat sufficient
- 6% felt they were a little or not sufficient

Although the sample was too small to conduct grade level analyses that would yield reliable findings, a review of the responses grouped by grade level did not suggest differences by grade level. That is, there were teachers in each grade level that felt that the suggested materials were sufficient, and some teachers at each grade level that thought the suggested materials were only *somewhat* sufficient.

Next, teachers were asked whether the lessons met the upcoming standards soon to be put into place throughout the majority of school districts nationally. Teachers were asked to rate their level of agreement with whether the lessons met the standards they were written for (NGSS, Common Core standards in literacy or in math), which were provided for each grade level in the lesson packets.

Table 4 shows the most common responses for each of these questions was that the curriculum aligns with the standards. Specifically, three-quarters of teachers expressed that the lessons were closely aligned to the Next Generation Science Standards and the Common Core standards in literacy (75% and 74%, respectively). The lessons were not written to meet with Common Core standards in math, and fewer teachers felt they were aligned to those standards.





**Table 4. Percent of Teacher Agreement about Curriculum Alignment to Standards**

	Disagree	Both Agree/Disagree	Agree
Next Generation Science Standards	6%	18%	76%
Common Core – Literacy	10%	16%	74%
Common Core – Math	16%	33%	51%

Further review of the data suggests that grade level lessons were rated somewhat differently. Specifically, kindergarten, third to fifth grade lessons were generally rated by teachers as more aligned with the Common Core standards in literacy, as shown in Table 5. Kindergarten and second grade lessons teacher rated as less aligned with Common Core standards in literacy. Lessons were not developed to align with Common Core standards in math, and teachers generally related their alignment low.

**Table 5. Teacher Responses about Alignment to Common Core Standards in Literacy**

	Disagree	Both Agree/Disagree	Agree
Kindergarten	0%	8%	25%
1 <sup>st</sup> grade	0%	40%	60%
2 <sup>nd</sup> grade	30%	40%	30%
3 <sup>rd</sup> grade	0%	0%	100%
4 <sup>th</sup> grade	0%	0%	100%
5 <sup>th</sup> grade	20%	10%	70%

The curriculum, as a whole, was assessed by asking teachers whether they would use the curriculum again and whether they would recommend the curriculum to other teachers.

- Would you teach these lessons again? Their responses were 94% yes and 6% no.
- Would you recommend these lessons to your colleagues? Their responses were 92% yes and 8% no.

In summary, teachers completing the post-survey had used all or most of the lessons. The majority of teachers felt that the lessons met the Next Generation Science Standards and the Common Core standards for literacy. Teachers generally agreed that the curriculum aligned with the Common Core standards for literacy, particularly for grades 3 to 5. Teachers also, overall, felt that the suggested materials were sufficient for the standards identified for the lessons.

## Student Impact

Next, student impact was evaluated, with three questions in the teacher post-lesson survey:

- How engaged did the students appear during the lessons?
- Do you feel your students learned something new from the lessons?



- Was the learning outcome for these lessons fully met?

Based on teacher responses, students were generally engaged in the lessons and learned something new from the lessons. On a scale of 1-5 with five being the highest, on average, teachers rated students' engagement as a 4.07 and whether they believed that students learned something new from the lesson as a 4.13. Both scores between *very* and *extremely* high.

Teachers were asked how much they agreed or disagreed with the statement "The learning outcome for these lessons was fully met," and responded:

- 86% of the teachers agreed with this statement
- 12% of the teachers both agreed and disagreed
- 2% of the teachers disagreed with the statement

To gauge further understanding of the impact of the lessons on students, teachers were asked two additional questions:

- During the lesson was there a time period when the students appeared VERY INTERESTED? Their responses were 96% yes and 4% no.
- During the lessons was there a time period when the students appeared UNINTERESTED? Their responses were 29% yes and 71% no.

Teachers were asked to first respond with either a yes or no response followed by the option to explain their response. Responses to these questions again supports that teachers felt that the students were impacted by the curriculum. A few responses suggest that moments of disengagement occurred.

Analysis of the teachers' comments to these two questions, as well as the comment shared by teachers about how their students learned something new, revealed that being outdoors and having hands-on activities make activities most engaging. In contrast, teacher-directed instruction alone and completion of tasks (indoors or outdoors) were the times when students appeared uninterested during the lessons.

## Effectiveness of Nature Educators

To assess the impact of having both the new curriculum and the access to a nature coordinator, teacher comfort level was assessed before and after lesson implementation. As Figure 1 shows, in all instances teachers' comfort level significantly increased after implementing the lessons. Specifically, teachers became even more comfortable using hands-on methods to teach lessons, using something from the outdoors to teach a lesson, and going outside to teach a lesson.

Teachers were also asked about whether it was helpful to have a nature coordinator available to teach the lessons. On average, teachers felt that it was between *somewhat* to *very* helpful to have a nature coordinator available to teach the lesson (mean = 3.53).

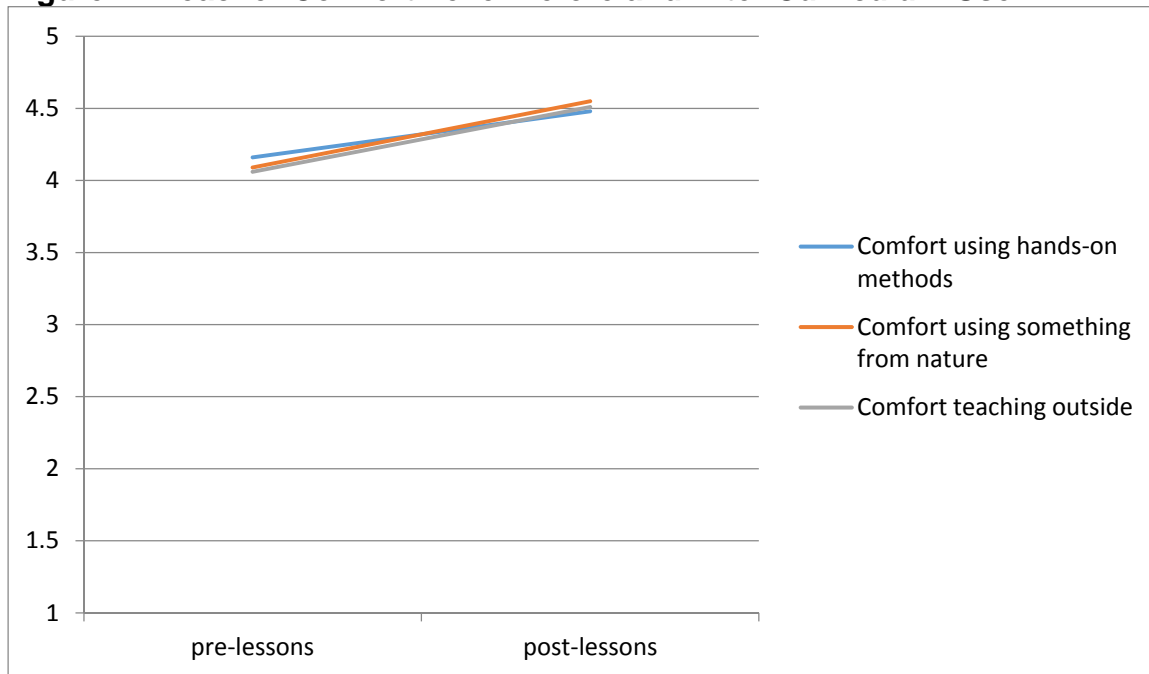
Teachers were asked to identify how they used the nature coordinators, and their responses show that they interacted with them in different ways:



- Observed the nature coordinator teaching the lesson (n=9)
- Shared teaching the lessons with the nature coordinator (n= 14)
- Had the nature coordinator observe the lesson implementation (n=7)
- Asked the nature coordinator questions prior to lesson implementation (n=28)

Although there is not enough data to assess whether using a nature coordinator in one way compared to others is most effective, the the responses suggest that the support was utilized. Moreover, when asked whether there were any other ways they would like to use the nature coordinator, the vast majority (92%) stated there were no other ways they would have liked to use that support system.

**Figure 1. Teacher Comfort Level Before and After Curriculum Use**



1 = Not at all, 2 = A little, 3 = Somewhat, 4 = Very, and 5 = Extremely

Questions asked:

- Now, that you have taught these lessons, how comfortable are you using hands-on methods to teach any lesson?  $r(28) = .43, p < .05$
- Now that you have taught these lessons, how comfortable are you using something from the outdoors to teach any lesson?  $r(28) = .40, p < .05$
- Now that you have taught these lessons, how comfortable are you going outdoors to teach any lesson?  $r(28) = .45, p < .05$

## Comments from Teachers

As they completed the post-lesson surveys, teachers provided comments, some of them listed in Figure 2.

Principal Andrew Johnson, Chet Harritt ES, wrote a letter on March 17, 2014 with the following compliments to the program and staff:



The San Diego Children in Nature Collaborative has been a supportive and helpful community partner as we engage our students with outdoor, "hands-on" science lessons at Chet F. Harritt School. Their support and expertise has been appreciated by students, staff members and community members. We are fortunate to be located at the east base of Cowles Mountain, a part of the Mission Trails Park System. We reside where numerous hiking trails intersect with a small tributary of the San Diego River. Our faculty and students use our outdoor laboratory to investigate and explore the local ecosystem.

The expertise and content knowledge that Ms. Judie Lincer has provided through the "Exploring our Urban Forests" program has helped to focus and support many of the Science lessons that we deliver in this environment. Ms. Lincer has visited frequently with faculty members, attended grade level planning meetings and helped to design and deliver outstanding science and nature content. Our students are always engaged when given hands on opportunities in nature. They love to learn about nature and the world around them. We very much appreciate the time and effort that the Collaborative has given to support this learning and hope that our partnership can continue for years to come.

## Video Documentation

Three videos were produced by Jim Karnik, videographer and owner of Field Notes. The film production narrative worksheet is provided in **Error! Reference source not found.** The videos are posted on the SDCaN website, and the Field Notes website:

- Kindergarten, Juniper ES, Escondido Union School District, [http://fieldnotes.com/sdcan-wf3\\_Juniper.html](http://fieldnotes.com/sdcan-wf3_Juniper.html)
- Second grade, Chet Harritt ES (in cooperation with seventh graders), Santee School District, <http://fieldnotes.com/sdcan-wf1.html>
- Fifth grade, Whitman ES, San Diego Unified School District, [http://fieldnotes.com/sdcan-wf2\\_Whitman.html](http://fieldnotes.com/sdcan-wf2_Whitman.html)



## Figure 2. Comments from Teachers, Provided in Post-lesson Surveys

### Outdoor lessons

- A few of the students were very interested but for the students with a hearing loss (six students in all) the outdoor activities were difficult for them due to the noise. These students are also learning how to hear and how to filter background noise.
- My kids are just a little scattered and so they had a hard time focusing in when we went outside.
- The students were highly motivated to learn the routine inside the classroom before heading out of doors for the exploration
- The students were most uninterested when listening to the instructions about what we were going to do. They wanted this part to be over so they could get outside to look for things.
- For the students that finished early, they were a little hard to keep entertained while the other students were finishing up. Since we were outside, I didn't have any of my usual time fillers.

### Outdoor experiences

- I have an outdoorsy group that likes nature. This added a lot to their own knowledge of the canyon.
- Kids really enjoyed being outside - a novelty. Because of this, they came away with a better appreciation of what the outdoors has to offer.
- Kindergarten kids are interested in anything new and nature! They really got into looking and listening to nature. It was evident even at recess and other times.
- This was probably one of the first times my students actually got down and close to see what Mother Nature has to offer. They loved it!
- Students were especially attentive while outside observing and discussing items/concepts in nature.
- When the instruction is largely teacher-directed, they lose interest. Ideal to have more hands-on activities that let them explore on their own.
- When the students were outside (drawing their tree, the map of where it was), they were very much engaged and interested!
- They enjoyed being outside and realizing how many different science related objects they could find just on our playground. They enjoyed sharing their drawings and writing.

### Lesson fit

- I taught the 5th grade lessons to my 4th graders. It was a better fit to the curriculum.
- I taught these lessons along with other lessons on plants and plant life cycles students.
- I am partnering with the local Parks and Recreation staff representative in April (on Arbor Day) to complete Lessons 2 and 3
- Our group came up with a new lesson with our nature expert to better go with what our kids had been learning about.
- We mixed all the lesson around and did rotations at the park with four teachers. One teacher concentrated on leaves, one on life cycle, one on bark, and one on things from/not from trees.



**Figure 2. Comments from teachers provided in post-lesson surveys, continued**

Science and other standards

- I think our school is unique in that we are allowed a lot of freedom to take students outside to explore and "play." We are a project-based school so we spend more time on science than other schools are allowed. I can see where a naturalist would be helpful to schools who don't normally teach lessons like these.
- I think these lessons are very engaging and provide a great opportunity for the kids to really look at and appreciate trees. I also think these lessons work well with Common Core and NGSS,
- I thought the lessons were too easy for my first graders, especially at the end of the year. Instead of just drawing the tree (before and after), I had them write about the trees using adjectives and lots of details. They could express what they really knew much better with words than crayons.
- I loved having the students apply scientific concepts and inquiry to their own school grounds and the habitat found within our city. Learning is much more meaningful to them when real life connections can be made.

Naturalist support

- Instead of having the naturalist teach the lessons, I invited the naturalist to guide us on a canyon hike to reinforce what was learned in the lessons. I found this very effective.
- My student teacher and I taught the lessons but Judie showed us how we would teach the lessons and gave me ideas I could use when teaching.
- We only had a naturalist to explain the lessons to us. I think the students would have learned more if the naturalist taught the lessons.
- I did not realize that there was someone available to help me teach the lessons. However, Debby Knight, the Rose Canyon docent leader, was flexible and willing to cater her focus to what I was teaching in the classroom.
- I didn't have a naturalist teach the lessons. Judie taught me and I taught the lesson. While it's awesome to have another voice to teach the lessons, I felt prepared to teach them based on the lesson plans and her walk-through.

Already doing this

- I already feel like these were lessons I do with my class every year. Many of us at my school use our creek area to teach science. Yes, I will continue to teach the lessons.
- Lesson 1 was a stretch of the science standards for 2nd grade. In our habitat dig, we found a worm and a few other bugs. We go out to the Big Rock Creek Outdoor Lab each week with our 7th grade Science Buddies and cover much more complex, in-depth ideas. Not getting my "bang for the buck" from the lessons, not worth the time spent.

Overwhelmed

- I feel discouraged that I wasn't able to teach any of the lessons yet, but I would like to teach them this coming year. My reasons for not teaching them yet have everything to do with timing. Please do into think I do not appreciate the lessons or the time you have all put into this amazing program. I find these lessons exciting and I am certain my kids will love them and learn a lot from them.
- I taught fewer lessons than I would have preferred due, to the required life science lessons and experiments I had to complete prior to the benchmark assessments.



## VI. Project Management

This project had one task for project management and evaluation, as written in the application and grant agreement:

Task 5: Evaluate and coordinate the project. Evaluation will focus on factors influencing teachers' willingness to teach lessons in nature (first reading lesson and subsequent science lessons), teacher experiences with the lessons, support from the nature champions, and students' learning of the concepts (such as an essay or project report). Assistance will be provided by student interns from San Diego State University interested in science education. Coordination includes overseeing draft lesson development with local experts; working with curriculum consultants, naturalists, and teachers; developing final packet of lessons; scheduling stewardship projects with agencies; submitting reports to CalFire; and completing other grant requirements.

### Project Schedule and Deliverables

Project commenced on July 1, 2012 and was completed on March 31, 2014. Activities followed this schedule:

#### Summer 2012

- Organizing meetings
- Input from urban foresters

#### Fall 2012

- SDSU students draft and pilot lessons
- Curriculum consultants selected and draft lessons
- Recruit and select four naturalists
- SDSU students develop evaluation plan

#### Spring 2013

- Conduct orientation with naturalists and workshops with teachers
- Grade-level training
- Lessons taught in schools, w/ support of naturalists
- Survey approved by Institutional Review Boards and administered

#### Fall 2013

- Return to schools to encourage teachers
- Collect and analyze evaluation data

#### Spring 2014

- Analyze feedback and complete evaluation report
- Write draft and final report

These project deliverables were identified in the application, and were completed:

- Progressive and integrated lessons about urban trees for grades K to 6 that meet science and language arts standards
- New curriculum package for oak health and gold-spotted oak borer



- Final report with evaluation of factors influencing teachers' choices and their feedback on the urban forestry lessons

Lessons were produced in .pdf format and posted on the following webpages:

- <http://sdchildrenandnature.org/wp/education/resources-for-teachers/>, Nature Lessons for Schoolyards (grades K-5)
- Four lessons about the Goldspotted Oak Borer (posted on three sites)
  - [GSOB\\_4Lessons\\_SDCaN-CalFire\\_16p\\_rev22apr14](#)
  - <http://ucanr.edu/sites/gsobinfo/files/189531.pdf>
  - [http://firewood.ca.gov/docs/activities/SDCaN\\_UrbanForests\\_Curric\\_GSOB\\_30p\\_dec13.pdf](http://firewood.ca.gov/docs/activities/SDCaN_UrbanForests_Curric_GSOB_30p_dec13.pdf)
- Guidance on Planting Acorns, [SDCaN\\_UrbanForests\\_Curric\\_AcornPlanting\\_dec13](#)
- Instructions for entering Tree Mapping Data for San Diego region, [SDCaN\\_UrbanForests\\_Curric\\_TreeMapping\\_10p\\_dec13](#)

Videos are available at:

- Kindergarten, Juniper ES, Escondido Union School District, [http://fieldnotes.com/sdcan-wf3\\_Juniper.html](http://fieldnotes.com/sdcan-wf3_Juniper.html)
- Second grade, Chet Harritt ES (in cooperation with seventh graders), Santee School District, <http://fieldnotes.com/sdcan-wf1.html>
- Fifth grade, Whitman ES, San Diego Unified School District, [http://fieldnotes.com/sdcan-wf2\\_Whitman.html](http://fieldnotes.com/sdcan-wf2_Whitman.html)

## Project funding

The San Diego Audubon Society served as the fiscal sponsor for SDCaN. The project budget was \$82,566; invoices were submitted monthly to CalFire. Matching contributions were \$32,656, for a total project budget of \$115,222.

Table 6 displays the matching hours contributed by local cooperators, notably from San Diego State University (SDSU), urban foresters active in the San Diego Regional Urban Forestry Council, and gold-spotted oak borer experts.

**Table 6. Matching Hours Contributed to Project**

Contributors	Hours	\$ Value
Anne Fege, Program Leader	342	\$13,680
Meredith Vaughn, Associate Professor, San Diego State University (SDSU)	147	\$5,880
Leta Bender, SDCaN	48	\$1,920
Urban Foresters	48	\$1,288
Teacher certification students (SDSU)	112	\$2,688
Students in faculty-student research mentor class (SDSU)	300	\$7,200
	997	\$32,656





A request for shifting some funds was made and approved. Teacher stipends were planned for a small number of teachers upon completion of all the lessons for that grade. After initial discussions with school administrators, the stipends were determined to create unachievable long-term expectations for teaching lessons in nature, and the PD time was during the school day. Many teachers were interested in learning and teaching the lessons, even though other demands limited most to one or two lessons.

Student interns participated in the project for college credit, and labor costs for interns were not expended as student contributions were made in two other ways. SDSU students and professor in a Faculty-Student Research Methods class helped to develop the evaluation instruments. Students in a science education methods class prepared the first lessons, based on the Project Learning Tree materials.

Additional hours were invested in curriculum revision and project management. Considerable time was required to revise the curriculum to incorporate feedback from teachers who used the lessons this spring, suggestions from the naturalists who worked with the teachers, understanding of NGSS, and reformatting of revised lessons. Project management efforts were greater than expected, for contact and continuing communication with the school administrators, providing oversight and feedback to naturalists, and scheduling and implementing PDs at all schools. There were increased project management efforts for coordinating survey distribution and collection, managing video scheduling and production, and writing the project report.

## **Project staff**

Throughout the project, Anne Fege served as the program leader. Crystal De Soto served as project leader through 2012, and Heather Gastil served as project leader from January to August, 2013. Judie Lincer worked as a nature coordinator from January 2013 to the project's completion, and Kathleen Beck and Tina Rysedorph worked as nature coordinators from January to June, 2013.

**Anne S. Fege, Ph.D., M.B.A.**, Program Leader. Anne is Chair of the San Diego's Children and Nature Collaborative, Adjunct Professor at San Diego State University, former Botany Research Associate at the San Diego Natural History Museum, retired Forest Supervisor of the Cleveland National Forest, and an active Girl Scout volunteer. Anne's thirty years of accomplishments in natural resources management encompass biodiversity and habitat conservation, nature education, urban forestry, wildland fire ecology and education, wilderness management, research, and technology transfer.

**Meredith Houle, Ph.D.** Dr. Houle Vaughn is Associate Professor in the School of Teacher Education and a member of the Center for Research in Mathematics and Science Education at (SDSU). She holds a doctorate in Curriculum and Instruction with a focus on science and technology education and has experience in curriculum design, professional development, and educational research. This builds on her previous work with supporting youth in urban ecology investigations in the out of school time.

**Heather Gastil, M.A.**, Project Manager. Heather is an education and curriculum design consultant and has been working in the field of environmental education for over 13 years. She



has taught high school biology and environmental education in both informal and formal settings, and ran a teacher training program for science teachers. Heather is currently managing the project, "Exploring Our Urban Forests," to support elementary school teachers in getting their students out of the classroom in ways that meet curriculum standards.

**Leanne Jacobson Teiper, M.A.**, Project Evaluator. Leanne has managed applied research studies for over 15 years, and has seven years of experience working with at-risk populations including abused children, juvenile delinquents, homeless youth, impoverished families, schools, and communities, and mentally ill adults, Leanne uses her doctoral training in developmental psychology to optimize programs through evaluation methods as well as to provide research practices consultation and applied research management. Leanne recently worked on three Department of Education grants as an evaluation consultant.

**Crystal De Soto**, Project Manager. Crystal DeSoto, M.A., NAI Certified interpretive Trainer, Crystal is Co-Chair of Youth Programs and Education Committees for the San Diego's Children and Nature Collaborative. Crystal has spent the last 15 years pursuing her passion of inspiring personal connections with nature. Crystal has worked with youth of all ages through positions with San Diego Canyonlands, Earth Discovery Institute, San Diego Natural History Museum, Birch Aquarium at Scripps, Wyland Foundation, Monterey Bay Aquarium, High Tech High International, SEA Camp San Diego, Ocean Discovery Institute, San Diego Audubon Society, and the Girl Scouts. Currently Crystal is founder of Local Point of View Tours where she offers interpretive training, nature-based educational consulting, and local naturalist services.

**Judie Lincer, M.A.**, Nature Coordinator. Judie has taught at the preschool to high school levels for over 20 years, and is currently a Naturalist Educator. She provides professional development and coaches teachers in using the outdoors to engage children in science, enhance their scientific- inquiry skills and develop an appreciation of local environments. Judie leads fourth grade curriculum-based hikes at the Silverwood Wildlife Sanctuary and hikes for the after-school program, Outdoor Explore! She is trained as a docent at the San Natural History Museum and teaches children about the habitats in San Diego in school outreach programs and museum visits.

**Kathleen Beck**, Nature Coordinator. Kathleen works as a nature educator for Cuyamaca Outdoor School (since 1993), Julian School District, and San Diego Audubon Society's OutdoorExplore! after-school program. She provides training for interns and volunteers, and is Education Coordinator for the Volcan Mountain Foundation. Kathleen has a Masters in Education.

**Kristina Rysedorph**, Nature Coordinator. Kristina is a nature educator, with experience at Tecolote Nature Center and the Water Conservation Garden. She taught in elementary schools in San Diego Unified School District from 1990 to 1997 and substituted from 2008 to 2012. Kristina has a Masters in Education.

## Organizations

Funding was provided by the California Department of Forestry and Fire Protection, under the Urban Forest Education Program, funded by Proposition \_\_\_. The grant was awarded to the San Diego Audubon Society, serving as the fiscal sponsor for the recently-established San Diego Children and Nature Collaborative.



SD CHILDREN & NATURE

**San Diego Audubon Society (SDAS)** has a vision of shaping “a culture in San Diego where nature is a common interest of all – where people learn to appreciate, understand, and actively protect the natural world. As we inspire others to join us in strengthening this culture of conservation, our region’s irreplaceable biodiversity will be more highly valued and vigorously protected.” The first of five strategies is to “engage new and diverse audiences, including a special focus on families and youth.” Special emphasis will be placed on targeting and engaging young people (K-12) and families in this transition to a more environmentally-aware and civically-engaged society, and engaging communities that represent the San Diego region’s socio-economic diversity.

The **San Diego Children and Nature Collaborative** was organized in January 2009 and is dedicated to providing families and schoolchildren greater access to nature experiences; informing community-based organizations about the health, developmental, and emotional benefits of outdoor experiences in nature; and strengthening learning opportunities and resource sharing among Collaborative participants. It brings the national Children & Nature Network (CN&N) movement to San Diego, inspired by “native son” columnist and author Richard Louv with his 2005 book *Last Child in the Woods: Saving Our Children from Nature-Deficit Disorder*, and building on successful programs in more than 60 cities, states, and countries. In the first two years, the Collaborative has held bi-monthly meetings with participants from more than 50 organizations; drafted the mission, strategic goals, and current structure; established a Board and Committees; and obtained grants for localized curriculum and field trips, family nature groups, and communication projects.



## Appendices

### Appendix A: Input from San Diego Regional Urban Forests Council



San Diego Regional Urban  
Forests Council  
August 1, 2012

CalFire Grant # 8CA11910  
Urban Forestry Education:  
Teachers and Students Choosing  
Lessons in Nature



Fourteen attendees at the San Diego Regional Urban Forests Council meeting on August 1, 2012 contributed information about concepts they consider essential for schoolchildren to learn.

Anne Fege outlined the project, and Project coordinator Crystal De Soto described her roles in the project. Each attendee took time to write the following information, on a one-page form, and their responses will be collated:

- List the top three concepts that you would like San Diego's children/students to know about trees.
- Describe two hands-on activities you've done with students, relating to trees.
- Identify two local resources, programs, or people that could assist with this project
- Outline how you would like to participate in this project.
- I live in this community/city/school system:
- I work in this city/school system:
- I'd like to participate in this way:
- Other suggestions for this project:
- Name, email, and phone

Crystal asked the arborists and urban foresters to state three key concepts, and the following were offered:

Values of trees:

- How do trees benefit me? Physical, mental health
- Trees in the urban forest and what does that mean
- Commercial applications from trees, food, fabric trees
- Shading and cooling
- Trees help save \$ on electricity bill
- Trees are habitats for wildlife
- Natural open space preservation, native species
- Carbon sequestration and air quality



SD CHILDREN & NATURE

- Trees help keep the oceans clean

Tree planting and care:

- Right tree, right place
- Proper way to plant trees
- How to care for trees
- Protecting root zones of trees
- What's that tree? (identification)

Tree biology and ecology:

- Role of pollinators w/ trees
- Trees from other biomes in San Diego Zoo

Other:

- Future job opportunities in arboriculture
- Legends and mythology
- Tree jokes (How did tree get on internet? He logged on. What did tree wear to swim party? Trunks)
- Why arbor days are important
- Linking disabled and veteran groups w/ trees

Hands-on activities that attendees have taught, about trees:

- What's that tree, what's that seed/fruit? Collect trees from various seeds, look up seeds to identify trees
- Proper tree planting (Sam and others)
- SDG&E arbor day events w/ school (1-2 schools each year), rewarding to see the kids excited about planting trees
- Donna Trotter, City of Encinitas gave a program for pre-schoolers ages 4-5. She got stumps for children to sit on, created sense of tree canopy with children holding rulers with leaves on them, and simulated powerlines simulated. Children waved the rulers (tree trunks), then the leaves got tangled in the tape, just like trees get tangled in powerlines
- In lobby, displayed table w/ seeds-fruits of trees, things made out of wood
- Urban Corps offers schools/programs, 1000 schools in past 3 years, 17 presentations per month teaching benefits of trees, tree placement to conserve energy (TreeSmart)
- Reading/circle time w/ stumps under trees

Other resources for lessons:

TreeSmart program. Lessons on three topics (from webpage

[http://www.urbancorpssd.org/tree\\_smart.html/](http://www.urbancorpssd.org/tree_smart.html/) Contact is Katheryn Ramirez, 619-235-6884, [kramirez@urbancorps.org](mailto:kramirez@urbancorps.org)

NatureExplore from Arbor Tree Foundation, [www.natureexplore.org](http://www.natureexplore.org). There are two boxes with materials and lessons, in library that Robin assembled at CCSE.

Talk about Trees classroom presentations. Excerpts from website

<http://www.talkabouttrees.org/index.html>): Contact is Anne Spindel, [annespindel@gmail.com](mailto:annespindel@gmail.com),

[Notes prepared by Anne Fege on August 1, 2012]



## Appendix B. Input from California Forest Pest Council



California Forest Pest Council,  
Southern California Committee

October 24, 2012  
CalFire Grant # 8CA11910  
Urban Forestry Education:  
Teachers and Students Choosing  
Lessons in Nature



About fifteen attendees at the Southern California Committee of the California Forest Pest Council meeting on October 24, 2012 contributed information about lessons relating to oaks and the gold-spotted oak borer (GSOB).

Anne Fege outlined the project, answered questions, and recorded suggestions from the group about concepts to consider they consider essential for schoolchildren to learn, relating to oaks and GSOB. The following were offered:

- Interdependence of trees, birds, habitat
- Life cycles of oaks, they're dynamic, don't "live forever"
- Deciduous and non-deciduous strategies
  
- Morphology, especially leaves (black oaks, live oaks)
- Species identification, including oaks, pines
- Field identification of insect-related symptoms on trees (leaf fall, insect-related holes)
  
- Values of trees, including social, ecological
- Native and non-native trees and insects
- Introduced pests such as GSOB, firewood as vector
- Native American use of acorns and oaks
  
- Acorn anatomy and development, energy source, root growth and patterns
- Collect, store, sort and plant acorns (use Investigating our Oak Community curriculum), and handout, <http://ucanr.org/sites/gsobinfo/files/76820.pdf>
- For oak restoration projects, plant acorns instead of seedlings
- Calculate planting density with probabilities (viability of acorns, emergence as seedlings, growth to sapling, final density desired, thinning)
- Set out a bucket of acorns in an area with scrub jays, and observe them taking the acorns!
- See Maureen Anderson's presentation in Webinar on 8/30/12, <http://ucanr.org/sites/gsobinfo/files/76820.pdf>

Contact for Southern California Committee of the California Forest Pest Council is Kim Camilli, Forest Pest Specialist, California Department of Forestry and Fire Protection, [kim.camilli@fire.ca.gov](mailto:kim.camilli@fire.ca.gov), phone 805-543-4244.

Notes prepared by Anne Fege on 10/25/2012.



## **Appendix C: Collected Input from Urban Foresters**

Fourteen attendees at the San Diego Regional Urban Forestry Council meeting on August 1, 2012 and six at the meeting on October 23, 2012 contributed information about concepts they consider essential for schoolchildren to learn. This is a summary of the information.

### **List the top three concepts that you would like San Diego's children/students to know about trees (grouped)**

- Right tree, right place (3)
- Proper way to plant trees, care for trees, protect root zones of trees (3)
  
- Trees provide shade, reduce heat, save energy, protect from wind and weather (9)
- Ecosystem values: air quality, stormwater retention, carbon sink (9)
- Trees as habitat for wildlife (native trees, birds, mammals, insects) (5)
- Tree biology, life cycles, differences among trees, forest ecosystems (9)
  
- Commerce and trees (timber, food, herbs, fabric) (2)
- How do trees benefit me? (physical and mental health, beauty) (4)
- Future job opportunities in arboriculture and urban forestry
  
- Other: Sustainability, Why arbor days are important, How to be a tree advocate, Natural open space preservation

### **Identify local resources, programs, or people that could assist with this education project**

- San Diego Regional Urban Forests Council, both executive Board and general members
- San Diego Unified School District and other school districts
- Master Gardeners and Rare Fruit Growers
- Arboriculture/Horticulture programs at community colleges
- San Diego tree map
- Local nurseries (2)
- Libraries
- Professional Tree Care Association
- Urban Corps (3)
- Alpha Project
- San Diego River Park Foundation
- Encinitas Environmental Committee
- Patty Berg, The Wishing Tree Company
- Link disable/veterans with tree planting
- Conservation Days and Forestry Institute for Teachers (N. Calif. Society of American Foresters)



## Appendix D. Outline for Video Production



### WEB FILM SEGMENT PLANNER

Date: 4/3/2013  
Organization: Children and Nature  
Contact: Heather Gastil  
Phone: 619-787-4115 E-mail: hgastil@gmail.com

WEB:

**Series Title:**

Series Code:

**Segment Title:**

Segment Code:

**Main Topic:**

**Production Date:**

**Time:**

**Location: Chet Harritt – Santee School District**

#### **Segment Description:**

*(In one short paragraph describe what this film is all about and what the overall objective of the film is. This is important for developing a story line and will be used to promote your film online.)*

This film will showcase nature/school yard based curriculum at Chet Harritt Elementary School in Santee. Teachers are working with nature coordinators to implement hands-on, nature-based curriculum using the nature in their very own school yard. This program is funded by CalFire, San Diego Children and Nature and San Diego Audubon and will provide teachers with the tools to continue this method of nature based teaching well beyond the grant funding. (Let's add to this after we hear what the teacher says about nature lessons at their school.)

**Key Search Words:** nature, lessons, school yard, science, curriculum, curricula, elementary, standards, trees, urban forest, natural, environment

*(These Meta Tags will be used on YouTube, Vimeo and fieldnotes.com.)*

### **FILM OUTLINE**

**Background Activity:** *(Filming an activity or event provides a background story for you to convey your message. This also creates more entertainment value and increase viewership.)*

Film teacher (maybe 7<sup>th</sup> grade or 2<sup>nd</sup> grade teacher?) implementing lessons in the school yard. Also include shots of a teacher and maybe students working the in the creek area by the school. School nature area consists of: Creek/Riparian area next to the school yard. The creeks is running now, not sure if it has water year round. Lots of signs of native wildlife and habitats in this area. 2nd graders are paired up with 7th graders to do science projects and lessons there.

**Introduction:** (Where we are, what the activity is about and why we are doing it.) (Anne or Heather will talk about this)





The San Diego Children and Nature Collaborative has created the Exploring Our Urban Forests program in an effort to provide “nature coordinators” and other resources to teach hands-on lessons about schoolyard and neighborhood trees, and to develop curriculum for students to learn about their urban forests (their schoolyard and backyard!) while being aligned to the current science, Common Core, and Next Generation Science Standards.

Chet Haritt Elementary School in Santee is one of the sites we are working with for this program, and as you can see behind us they have an amazing creek and outdoor nature space with lots of wildlife and native vegetation! The lessons in our program are designed to utilize any nature areas at the school, expand on what some teachers are already doing with nature such as Chet Haritt’s amazing mentor program between the 7<sup>th</sup> and 2<sup>nd</sup> grade science teachers, and get the tools and means needed for the teachers that aren’t utilizing these areas. (again, we can add to this when we know more about what other nature they are already doing)

**Main Topic:** *(explore in detail how you plan to present the main topic of your film. What is your main message and how does it tie in to the activity/event)*

Get a shot the creek area and the teacher introducing the lesson to the students.

- Ask 7<sup>th</sup> grade teacher: “What an amazing nature space to do science! Tell me about the 7<sup>th</sup>/2<sup>nd</sup> grade mentoring program and the kinds of activities you do using this area.”
- Ask same teacher: “How has this collaboration made a difference with science education at Chet Harritt?”

Get a shot the nature area in the school and a different teacher (not the 7<sup>th</sup> or 2<sup>nd</sup> grade) introducing the lesson to the students.

- Ask teacher: “How has the Urban Forest Program made it easier for you to incorporate lessons involving this nature area into your curriculum?”
- Ask teacher: “What have you noticed about student engagement and learning when using nature-based lessons and do you think they have changed the learning dynamic in the classroom?”
- Ask student: “Do you like learning about science using the trees and creek?”
- Ask student: “What do you like about learning outside or learning about nature?”
- Ask nature coordinator: “Why is this project important and what differences have you seen in working with the teachers and the students at Chet Harritt?”
- Ask nature coordinator: “How do you feel this program will have an impact here at Chet Harritt?”

**Closing/Call to action:** (What do you want viewers to do after watching this film – donate, volunteer, enjoy and appreciate nature? Thank them for watching and invite them to participate, explore and contact your organization.)

- Ask teacher: “Will you continue to do these lessons in the future?” If not, what components will they continue to use?
- Ask teacher: “How much effort would it take for teachers at other schools to do lessons like these at their schools?”
- Ask teacher or coordinator: “Should ever school be using nature and school yard based curriculum throughout the grade levels?” Why?