Preserve the Greenbelt Environmental Education Program
Final Report

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Jerry DiTullio and the Wheat Ridge High School Career Exploration Class.
The dedication of these students, teachers, and parents ensured a successful project.

City of Wheat Ridge Xcel Energy® WELLS FARGO

2. Executive Summary

Detailed in this report is the *Preserve the Greenbelt Elementary Education Program*. The program took place in Wheat Ridge, Colorado in the beautiful Wheat Ridge Greenbelt and in the Wheat Ridge elementary schools Kullerstrand Elementary and Mountain Phoenix Community School. The Tree Project of the Institute for Environmental Solutions (IES), along with the City of Wheat Ridge and other partners, developed the Preserve the Greenbelt Elementary Education Program. IES continued its past successes of planting native trees and shrubs in the Wheat Ridge Greenbelt.

Two Mountain Phoenix students plant a sapling in the Wheat Ridge Greenbelt.

IES and the City of Wheat Ridge first worked together on the IES Wheat Ridge *Revive the Greenbelt!* Project in 2012-2013. *Revive the Greenbelt!* addressed the need for Wheat Ridge Greenbelt restoration due to tree loss and canopy depletion. The intended pilot project was immensely successful and created a replicable model to plant native trees and shrubs in the Wheat Ridge Greenbelt. The project's *Tree Stewards* continue to be a driving force behind this success through their dedication to caring for the new Greenbelt trees. These partnerships were maintained in developing and implementing the *Preserve the Greenbelt Elementary Education Program*.

The *Preserve the Greenbelt Elementary Education Program* was developed to protect and improve the Wheat Ridge Greenbelt by implementing a sustainable volunteer tree stewardship program intended to educate and engage students, educators, and families. IES developed three in-class and hands-on educational workshops that introduced the students to ecosystems, tree science, tree care, and their local urban forests. The planting program was intended to improve the Wheat Ridge Greenbelt through the planting of native trees and shrubs. More than 120 students participated in the workshops and the planting day resulting in over 200 new native trees and shrubs being planted. As of August 2014, almost five months after the planting day, the survival rate of the new saplings is over 95%. This represents another step in improving the Wheat Ridge Greenbelt.

IES will continue to advance the survival of these saplings through the *IES Wheat Ridge Tree Stewards Program*. The volunteers that comprise the new Tree Stewards team are students,

parents, and other community members. These Tree Stewards have been trained and organized by IES to help ensure the health of the saplings planted during *the Preserve the Greenbelt Elementary Education Program*.

This report describes the project's origins, planning, implementation, and outcomes. The report and the attached appendices document the project's organization, goals, objectives, and the stakeholders and contributors. The project's replicable design is explained and can be employed in future ecological education initiatives. The report also contains a thorough project evaluation and recommendations for further action.

IES encourages comments and questions. Please contact IES at solutions@i4es.org or visit the website at www.i4es.org.

Mountain Phoenix students participate in an educational workshop.

3. Introduction and Overview

This Report: *Preserve the Greenbelt Elementary Education Program* Final Report

This report describes the 2013-2014 IES *Preserve the Greenbelt Elementary Education Program* in Wheat Ridge, Colorado. The Institute for Environmental Solutions (IES) created this program as part of The Tree Project: Integrated Urban Environmental Improvement Through Tree Selection and Management.

The IES *Preserve the Greenbelt Elementary Education Program* Final Report documents the program's origins, planning, implementation, and outcomes. This report with the attached Appendices provides complete details about the elementary education and tree-planting program designed to provide the students with the tools they need to understand a tree's role in an ecosystem and to become informed and active members of their local urban forests. IES hopes that the completed project and this report will provide a replicable model for strategic community tree planting and education for use by other schools and communities.

Institute for Environmental Solutions

The Institute for Environmental Solutions is a Denver-based nonprofit organization that engages stakeholders to deliver technically sound solutions to complex environmental and human health problems – without unwanted side effects.

The IES science and stakeholder approach to environmental improvement is objective, practical, and cost-effective. IES confronts multi-faceted environmental issues such as community health, climate change, air pollution, and water pollution that others may find too complicated or difficult to address. By maintaining a commitment to science and collaborating with people of different backgrounds, perspectives, and interests, IES provides lasting solutions for Colorado's most pressing environmental problems. Through innovative and groundbreaking projects to tackle these challenges, IES provides Colorado communities with opportunities to make measurable improvements to the environment.

The IES Tree Project

THE TREE PROJECT
ENERGY • WATER • AIR

The Tree Project, one of IES's major on-going programs, is dedicated to improving the environment of Colorado's urban areas through strategic tree selection and management. The mission of the IES Tree Project is to improve Colorado cities using tree science. Through collaborative, multi-disciplinary partnerships and programs, we restore natural systems and urban green infrastructure; educate children and adults to become environmental stewards; rehabilitate, improve and maintain critical urban natural resources; and improve community health and economy.

The Project facilitates collaboration among communities, businesses and individuals to target and achieve environmental improvement in air and water quality, carbon sequestration, energy conservation, and storm water management with trees. Proper selection, planting, and maintenance of trees improves community health and the local economy. The Tree Project assesses planting practices and vegetation benefits under various scenarios to establish optimal urban tree selection, planting, and maintenance guidelines for practical and cost effective environmental, social, and economic improvement.

In 2010-2011, IES collaborated with Mitchell Elementary School and the City of Golden on the *Trees for Healthy Kids and Community Project* to plant 40 trees to improve the school environment – reduce air pollution and noise from the adjacent highway, control storm water, and mitigate wind. After three years, City of Golden Forester, Dave High, describes the project as "a big success" with the majority of trees thriving. IES partnered with the City and County of Broomfield on the *Trees for a Healthy Community and Economy Project* in 2011-2012, developing and implementing a plan to protect the environment while improving the local economy in Broomfield's emerging civic center.

The Wheat Ridge Greenbelt, a 300-acre woodland open space bordering Clear Creek, is a cherished area to the people of Wheat Ridge and many surrounding communities. In recent years, the Greenbelt has experienced ecological decline due to drought, extreme weather, and limited municipal resources. In 2012-2013, IES, in collaboration with the City of Wheat Ridge, with grant funding from the Urban Waters Federal Partnership and Xcel Energy, planned and implemented a pilot riparian restoration program to start to reverse the decline of Greenbelt trees. This project used scientific research to understand the strengths and concerns in the Wheat Ridge Greenbelt riparian ecosystem, and to develop and test strategies to improve the Greenbelt and improve tree survival. The IES Wheat Ridge *Revive the Greenbelt!* Program removed noxious and invasive species, replaced canopy gaps, implemented strategies to improve the long-term health of the riparian ecosystem, and increased the local community's awareness of urban forestry.

Over 200 volunteers planted more than 200 trees along Clear Creek in April 2013. Thanks to careful planting design (Kevin Lyles, Confluent Design), tree selection, planting, and maintenance, over 75% of these trees are flourishing in the spring 2014 in spite of the September 2013 and May 2014 floods.

Based on this experience, IES has determined that five factors go into successful tree planting and survival.

- Collaboration with the full range of interested stakeholders
- Careful planning of the education and planting program
- Careful selection of the planting sites and plant species to optimize survival
- Good instruction and proper planting with well-organized volunteer participation
- Appropriate maintenance plants and implementation

After the successful 2013 tree planting, two local educators contacted IES about engaging elementary school students in learning about the local ecosystem, and in planting and caring for

trees in the Greenbelt. With grant support from Xcel Energy, IES designed the *Wheat Ridge Preserve the Greenbelt Elementary Program* to teach fourth graders at Kullerstrand Elementary and third graders at Mountain Phoenix Community School how to become Greenbelt Tree Stewards.

The IES Tree Project will continue to build on its successes and work to improve the environment.

4. IES Wheat Ridge Preserve the Greenbelt Elementary Education Program

After successful collaboration with the City of Wheat Ridge in the 2012-2013 *IES Wheat Ridge Revive the Greenbelt! Project*, the IES Tree Project continued its work improving the Greenbelt. Educators from two local Jefferson County Public Schools in Wheat Ridge, Kullerstrand Elementary and Mountain Phoenix Community School, expressed interest in participating in improvement projects in the Greenbelt. Ms. Esther Valdez, Principal at Kullerstrand, participated in the *Revive the Greenbelt! Project* with her family. She met with IES team members and described Kullerstrand Elementary School, which borders the Greenbelt, and how its students could benefit from hands-on participation in environmental education. Mr. Eric Ebert, a teacher at Mountain Phoenix Community School, contacted IES about engaging third grade students in Greenbelt activities. From these existing partnerships, the *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* project was born.

The Kullerstrand planting site on planting day.

Mountain Phoenix Community School, located near Kipling Street and I-70, is a K-6 Waldorf charter school in Jefferson County that emphasizes "an artistic approach to education". Third grade students from Mountain Phoenix had visited the Wheat Ridge Greenbelt prior to the *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* many times as part of their interactive curriculum. The Mountain Phoenix student profile is generally middle class. Kullerstrand Elementary School, located near 38th Avenue and Youngfield Street, is a K-6 public school. Kullerstrand's student profile consists of a larger percentage of economically disadvantaged students where more than 77% of students qualify for free and reduced price lunch. Most of the fourth graders at Kullerstrand Elementary had never visited the Wheat Ridge Greenbelt prior to the program. These two schools required unique approaches and offered diverse perspectives to the program.

To plan and implement the project, IES worked in collaboration with the City of Wheat Ridge and the two schools located near the Greenbelt. IES received a major grant from Xcel Energy and additional funding from the Wells Fargo Community Assistance Fund in 2013 to implement the *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* with the City of Wheat Ridge, Kullerstrand Elementary, and Mountain Phoenix Community School. IES designed a unique education curriculum to engage young users of the Wheat Ridge Greenbelt in a tactile way. The students were engaged in the natural world immediately surrounding them through planting, nature walks, and hands on workshops. The hands on workshops emphasized a

science based understanding of a tree's place in its ecosystem, responsible tree planting, and stewardship. The students were provided context to their science curriculum and were expected to increase their understanding of ecosystems during the workshops and planting day. This method of teaching encouraged growth in awareness, knowledge, attitude, and skills, while fostering participation with their community and its valuable resources.

Project Goals

The goals of the *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* were to develop a science based educational and sustainable volunteer program that would maintain newly planted trees in the Wheat Ridge Greenbelt, increase the rate of tree survival, and engage students and their families in protecting the environmental and community benefits of the Greenbelt. Students would learn about ecosystems and the ways they can positively impact their local urban forests.

Students from Mountain Phoenix learn about the web of life with visual aids during a workshop activity.

Project Objectives

The project objectives were:

1. Restore and revitalize two areas in the Wheat Ridge Greenbelt.
2. Improve air and water quality of the Wheat Ridge Greenbelt.

The first and second objectives were designed to achieve IES`s mission of environmental and human health benefits.

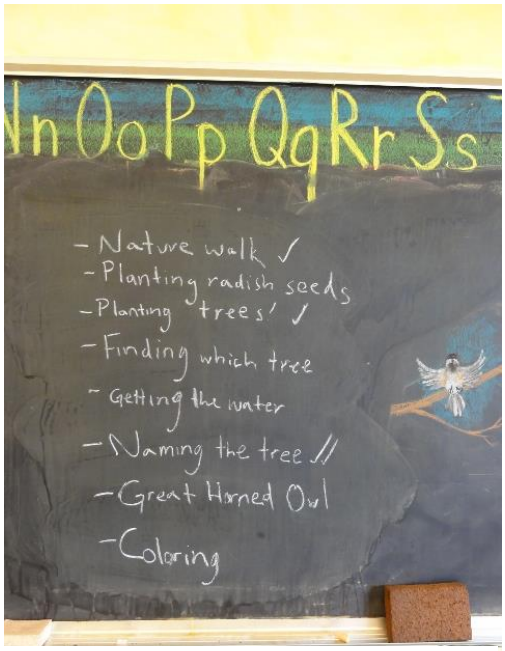
3. Develop an education plan which will engage local elementary school students in their local community and environment.
4. Teach elementary students how to properly plant and maintain trees.
5. Plan and host a planting event with community schools.
6. Educate students on the benefits of the Wheat Ridge Greenbelt and urban forestry.

The third through sixth objectives emphasized the critical education component of the program. IES`s commitment to educating and engaging local communities is highlighted by these objectives. By educating young users of the Wheat Ridge Greenbelt, some of whom had never visited their Wheat Ridge Greenbelt "backyard", IES was able to instill the value of stewardship

and excite the interest of elementary school students.

7. Conduct an environmental analysis of the planting site.
8. Design a strategic landscape plan.
9. Implement the Tree Stewards program in new areas along the Wheat Ridge Greenbelt.
10. Document the project to ensure that can be replicated.

The seventh through tenth objectives sought to give the community and the students the tools and abilities to continue and expand on the efforts of the program. Empowering communities to take action and address their environmental needs is something that IES seeks to provide with all projects.

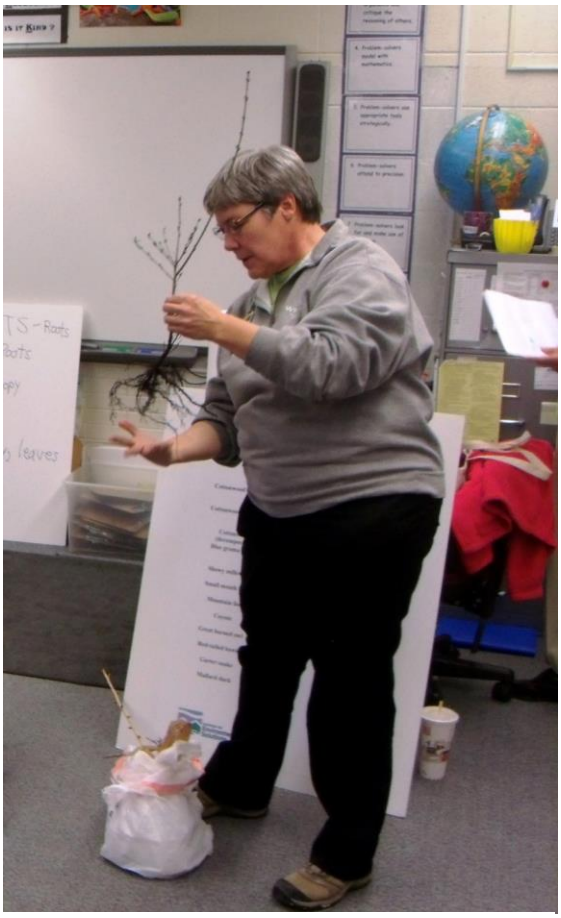


Students were asked to name their favorite aspect of planting day during the final workshop.

The Jefferson County Schools elementary science curriculum emphasizes learning that relates to the real world. The fourth grade curriculum focuses on living systems, living things, organisms and ecosystems. By connecting the ecological web of life in the Wheat Ridge Greenbelt to the planting of and care for trees – a critical backbone of the ecosystem – science and the environment came alive. The majority of fourth graders at Kullerstrand Elementary had never visited the Greenbelt, although their school borders the open space. Now each of them has a personal investment and motivation to visit, learn about, and care for the resource. Based on the positive and enthusiastic feedback from students, teachers, administrators, and parents, IES has decided to work on developing an ongoing Greenbelt-based environmental education program for Kullerstrand fourth graders.

Mountain Phoenix Community School students are more familiar with the Greenbelt, and all have visited the area on school outings. Planting trees to restore damaged areas added a significant new dimension to the students' experience. As with the Kullerstrand students, Mountain Phoenix students will now have a personal connection, making the Greenbelt an important part of their world.

5. Project Organization



Margaret Paget speaks to Kullerstrand Elementary Students about proper planting techniques.

Community and Stakeholder Involvement

To ensure stakeholder involvement, IES established a monthly meeting schedule to meet with Kullerstrand, Mountain Phoenix, and City of Wheat Ridge participants to gain their input in project planning and implementation. To establish this group, IES assessed the major organizations involved with the project and invited a member from each to join the planning group. This group provided the means for interested stakeholders to address their ideas, interests, and concerns throughout the planning process. The purpose of these meetings was to get advice on all aspects relating to elementary education and planting project design.

The members of this group were instrumental in helping with the planning and implementation of the project. They included IES project staff members and:
Jennifer Dalton, *fourth grade teacher, Kullerstrand Elementary School*
Eric Ebert, *third grade teacher, Mountain Phoenix Community School*
Margaret Paget, *Forestry and Open Space Supervisor, City of Wheat Ridge*

Having regular meetings kept the planning process on schedule and ensured that IES Wheat Ridge *Preserve the Greenbelt Elementary Education Program* objectives supported the curriculum requirements of the teachers, schools, and classes involved. IES scheduled the meetings to occur monthly, though the schedules of the members meant two meetings would occur each month – one with IES, Margaret Paget and Jennifer Dalton, and one with IES staff and Eric Ebert. Each meeting group was kept informed of the comments of the other. These meeting agendas are in Appendix A.

IES drew from the expertise of the IES Tree Project Steering Committee during project planning and implementation. The Steering Committee consists of professionals in related fields and meets every three months. IES staff members took advantage of these meetings to describe the vision for the project and receive feedback, ideas, and concerns in turn. Agendas for Steering Committee meetings that occurred during the *Preserve the Greenbelt Elementary Education Program* are in Appendix B.

Collaborative Funding Model

Xcel Energy provided a major grant to IES to support this project in response to IES's application submitted in April 2013. Wells Fargo provided a small cash grant in response to IES's June 2013 application.

IES staff members, graduate interns, and Institute associates contributed hundreds of unpaid volunteer hours to project planning, implementation, research, evaluation, public relations, project promotion, and volunteer recruitment leading up to and on each of the six classroom workshops and three planting events.

The City of Wheat Ridge, through the terrific cooperation of Margaret Paget, Forestry and Open Space Supervisor, Parks and Recreation Department, provided extensive in-kind contributions to support the project. Wheat Ridge contributions included significant staff time for project planning, public relations, project promotion, and implementation leading up to and on planting days in addition to the classroom workshops. The City of Wheat Ridge provided support for the classroom workshops by printing and laminating educational papers and posters. Wheat Ridge also provided art supplies, mulch, shovels, beaver cages, and trees and shrubs for the planting days. Ms. Paget spoke about trees and tree planting at the workshops at both schools, and led the three nature walks during each planting day.

Sponsors were acknowledged in the IES welcome speech on planting days, in the IES quarterly e-newsletter, IES Facebook and LinkedIn pages, the Wheat Ridge Connections newsletter, and the local newspapers.

Project Timeline

The *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* Timeline, provided in Appendix C, presents each component of the project from the planning stages to the third series of classroom workshops. The project timeline was based on past successful projects administered by IES. The project had eight major components:

- Project organization and scheduling
- Research and landscape plan
- Educational program
- Plan long-term maintenance
- Community tree planting event organization
- Outreach
- Public Relations Communications
- Project documentation and evaluation

The initial timeline was used throughout the project. When planning for a project of this size, it was important to be realistic with the time and resources available for each task. The timeline in the Appendix C was specifically tailored for IES and this project.

6. Community Collaboration

Many community members and organizations worked with IES to facilitate a successful project. IES Tree Stewards from past projects donated their time and knowledge to the project. Kullerstrand Elementary School, Mountain Phoenix Community School, and Wheat Ridge High School participated in project planning, educational workshops, and planting events. The City of Wheat Ridge Parks and Recreation Department supported the project generously with a variety of resources. The Colorado State Forest Service and Keith Wood provided tree-related learning materials for the workshops and planting day. IES contacted Ms. Jill Fellman, member of the Jefferson County School Board, and met with her in August 2013 to brief her on the collaboration with two schools. She provided valuable advice for working with public schools, and for communicating with the School Board. The collaborating groups provided valuable knowledge, experience, time, and effort.

Public Relations

To promote the project and create better awareness of the benefits of urban forestry, IES developed and implemented a public relations plan that employed various media and platforms. The range of diffused project information was both local and regional. The goal was to inform and update the public, involve local businesses, recruit Tree Stewards, and increase awareness of IES and its efforts.

IES Institute Associate Loren Klick and a Mountain Phoenix student on planting day.

Project information was provided on the City of Wheat Ridge's website, in IES newsletters, social media sites Facebook and LinkedIn, and the IES website. The provided information included event schedules, event photographs, project developments, and project planning events. Video footage of classroom workshops and planting days was recorded for a project video by a professional videographer, described below.

IES custom designed project t-shirts and had them produced by Idea Company, Golden. IES created different t-shirts specific to the two elementary schools, and distributed shirts to every student and teacher the day before planting. Additional t-shirts were distributed to volunteers on the planting day. The shirts displayed the school logo on the front with the title "Tree Steward" and sponsor logos on the back. The shirts served as a special 'thank you' to participants, acknowledgement of sponsors and partner organizations, and a keepsake to commemorate the planting day. Participants were encouraged to proudly display their Tree Steward affiliation when caring for Greenbelt trees. Images of the shirts are in Appendices H and I.

The Kullerstrand Elementary planting day was covered by Austin Briggs of the Denver Post. This coverage was displayed online at the Denver Post's website and printed in the Denver Post's local YourHub section in the Wheat Ridge area. The article included interviews with project volunteers, information about the progress of the project, and photographs documenting participation. The article is in Appendix D.

Video

IES commissioned local videographer, Jesse Johnson IOTK Media, to record the workshops and planting day events. Volunteers and participants were interviewed about the program, workshops, planting day, and the project's future influence and effects. Those interviewed included Xcel Energy Area Manager, Community and Local Government Affairs, Preston Gibson; Kullerstrand Elementary fourth grade teacher Jennifer Dalton, Mountain Phoenix Community School third grade teachers Noa Wotton and Eric Ebert, IES Executive Director Carol Lyons, IES Associate Loren Klick, and IES Associate Brian Kelly. The interviews and footage of planting day activities are combined in the video. The video is available on the IES website and YouTube channel.

Wheat Ridge High School Career Exploration Class

The Wheat Ridge High School Career Exploration Class, taught by Wheat Ridge City Councilmember Jerry DiTullio, participated in an education and tree planting event on April 17, 2014. Through the event, students were introduced to an assortment of careers including landscape architecture, urban forestry, and forestry and open space management.

A Wheat Ridge High School student assembles a beaver protection cage.

The enthusiastic group of students and volunteers assisted in a variety of tasks. The students planted saplings, assembled protection cages to prevent damage from beavers and other grazing animals, staged the planting location for the Mountain Phoenix Community School's planting day, cleaned up litter around the planting site, and distributed mulch and soil.

The Career Exploration Class improved the Wheat Ridge Greenbelt through their planting efforts and assistance in preparation for future planting events. The interaction proved to be beneficial while supporting the project's goals. This special education class includes students with a wide range of special physical, mental, and emotional needs. The class was accompanied by several parents and special assistants, including a sign language interpreter and a guide for the blind. The tasks assigned to the class were planned to take into account the various special students needs and were all completed with total success.

The Wheat Ridge High School Career Exploration class with chaperones and teacher

7. Project Design

Background

IES entered the project with a partnership with two schools in Wheat Ridge, Colorado, Kullerstrand Elementary School and Mountain Phoenix School. Both are located close to the Wheat Ridge Greenbelt. Mountain Phoenix Community School students walk to and visit the Greenbelt as part of their curriculum. It takes 10 to 15 minutes to walk from Mountain Phoenix to the Greenbelt. The north fence of the Kullerstrand Elementary School playing field borders the Greenbelt. However, there is no direct connection from Kullerstrand to the Greenbelt, as the Greenbelt property in that area includes steep drop-offs and marshes. For planting day, Kullerstrand students reached the west end of the Greenbelt trail access by a 5-minute bus ride.

The Greenbelt is located in the heart of Wheat Ridge. Image Google Earth.

IES pinpointed planting sites in the Wheat Ridge Greenbelt that were located near each school's campus and easily accessible. The Mountain Phoenix planting site is located south of the intersection of Moore Street and West 43rd Avenue in Wheat Ridge. This quiet corner is an entry point to the Greenbelt and has a small gravel pull-off for parking. The Kullerstrand planting site is located off of Youngfield Street in Wheat Ridge. This site is accessible by trail from either the Open Space parking lot near Clear Creek and West Lake, or by a trail behind a business center located at Youngfield Street and West 40th Avenue.

Both of these sites are connected by the Clear Creek trail system in the Wheat Ridge Greenbelt, though they are roughly two miles apart. The Greenbelt at these sites is a popular recreation area for community members. It is connected to the larger, paved trail system that leads to Prospect Park and other sites in Wheat Ridge and surrounding communities. The sites were chosen for several reasons:

- The Greenbelt is surrounded by residential development and suffers from the resultant edge effects.
- Historic grazing, haying, and gravel mining have resulted in considerable disturbance and alteration of the natural flora and topography of the floodplain and creek.
- Artificial lakes from gravel quarrying dominate the western portion of the floodplain. The creek has been significantly incised and is now largely isolated from its floodplain.
- The Greenbelt was severely impacted by a hailstorm in 2009, resulting in significant canopy loss.
- The Colorado Department of Transportation uses a portion of the Greenbelt near the Kullerstrand planting site to control runoff from Interstate 70 and keeps it devoid of trees.
- Animals such as beavers have cleared many trees from the area before moving on.

Site analysis and an assessment of the current conditions were necessary for determining factors that would influence the overall project design. Without understanding the existing riparian system's limitations, the design could fall short in meeting restorative goals. IES approached the Wheat Ridge Greenbelt with the hope of improving ecological and hydrologic processes in locally degraded sections in the greater South Platte River watershed system. Implementation of the project design was planned to replace lost, damaged, or compromised elements of the natural system.

Clear Creek high flow through the Wheat Ridge Greenbelt in June 2014.

The Wheat Ridge Greenbelt has seen limited success in previous efforts to establish new trees due to the disconnection between the stream and the historical floodplain. A lack of maintenance support for new plantings has also been a challenge for the area. A combination of these factors has caused a high mortality rate, estimated at 75% in the first year, among newly planted trees in the Greenbelt.

IES conducted research to assess the riparian condition of each of the proposed planting sites. Two external documents produced for state and local constituents and one IES document informed design decisions for the site:

- Colorado Natural Heritage Program's (CNHP) Biological Inventory of the site identifies several key factors affecting the area.
- City of Wheat Ridge's Open Space Management Plan (OSMP) identifies the Greenbelt as the jewel in the community and proposed management plans to improve its value for wildlife, social, and economic importance.

- IES's 2013 Riparian Conditions Assessment (RCA) following Natural Resources Conservation Service (NRCS) guidelines to provide more recent data at a micro-area scale. This can be found in Appendices J and K.

The CNHP, in the Department of Fish, Wildlife, and Conservation Biology, a sponsored program of the Warner College of Natural Resources at Colorado State University, delineated the Prospect Park section of the Wheat Ridge Greenbelt as a Conservation Area based on its biological inventory. Both proposed planting sites are located in this area. CNHP's biological survey focused on capturing the ecological processes that are necessary to support the continued existence of a particular element that is of natural heritage significance. It identified that the Prospect Park Conservation Area (PPCA) supports the globally rare Ute ladies'-tresses orchid (*Spiranthes diluvialis*) and contains the only known occurrence worldwide of a newly discovered species of earthstar (genus *Mycenastrum*) a type of fungus. There are occurrences of two significant woodland communities:

- Plains Cottonwood / Western Snowberry Riparian Woodland community is ranked as "globally/state imperiled".
- Plains Cottonwood / Chokecherry Riparian Woodland community is ranked as globally/state critically imperiled".

Mile High Conservation Corps members remove non-native and invasive species in preparation for the planting day of IES's Revive the Greenbelt! Project.

The CNHP report indicates that these are both worthy of restoration efforts. In addition to these important species in the Greenbelt, the report identifies that the area needs management action to maintain the existing plant communities in the PPCA. The CNHP recommends the encouragement and proliferation of native plants and animals and the development of an ecosystem with more natural ecological attributes.

The Wheat Ridge OSMP shares the overall goals of the CNHP report for its vegetation in passive recreation areas. The Wheat Ridge OSMP requires the Greenbelt to maintain, improve, and encourage the composition, structure, and distribution of vegetation types that naturally occur in the area. Specific efforts from Wheat Ridge have been to remove non-native and invasive species to provide benefits to bird, mammal, and rare plant habitat. Russian Olive (*Elaeagnus angustifolia*), targeted for removal, has been the dominant forest tree in many areas and is the single greatest barrier to establishing a native forest canopy. Other species targeted for eradication are the common teasel (*Dipsacus fullonum*), cutleaf teasel (*D. laciniatus*), leafy spurge (*Euphorbia esula*), and yellow toadflax (*Linaria vulgaris*). The areas with a significant proportion of non-native species have been gradually

treated over several years to allow native species to assert dominance after the removal of the non-natives, including at the site of IES's 2012-2013 *Revive the Greenbelt!* Project.

Natural regeneration of the Greenbelt can benefit from and be dependent on the effects of inundation and scouring of the floodplain in the distribution of seeds. Therefore, periodic flooding of the floodplains or manual disturbance and planting can help regeneration over time. A stronger connection between Clear Creek and the larger floodplain is described in the OSMP as desirable and recommended.

IES performed an RCA using NRCS guidelines that identified and confirmed the specific deficiencies throughout both sections of the Greenbelt in November 2013. This assessment gave IES a more exact look into the specific conditions at both project areas with guidance from the broader background of the previous two studies, in addition to IES's own RCA from its *Revive the Greenbelt! Project*. In doing so, IES noted several factors that affected the riparian area's health.

Both proposed planting areas are located near Clear Creek and areas of standing water for much of the year. Since the sites have different characteristics, they will be described separately for clarity.

Kullerstrand Site

Kullerstrand planting site, June 2013.

The Kullerstrand Planting Site is located near the west edge of the Greenbelt. According to the RCA provided by IES Associate and Landscape Designer Brian Kelly, the banks [near the site] are well vegetated and minimal erosion was present. However, canopy loss in the area was high and there were invasive and noxious species. The area lacked mid-age trees. More information is present in the RCA in Appendix J.

Mountain Phoenix Site

The Mountain Phoenix planting site was a more diverse section of land. The soil in various areas was primarily gravel, sand in others and, near a dated channel, the soil was loose and nutrient rich. The area was affected by beaver and hail damage. According to the RCA, the Mountain Phoenix planting site also lacked mid-age trees. More information is in the RCA in Appendix K.

Mountain Phoenix planting site, January 2014.

Tree and Shrub Selection

Trees and shrubs for planting were selected by Brian Kelly and Margaret Paget. The City of Wheat Ridge purchased the plants and Margaret Paget facilitated the order and distribution. The native species were specifically selected and designated to each site. The species were selected for their ability to thrive in the area and provide new native canopy to replace canopy loss. The list of trees for the two sites is provided below and in Appendix H1.

Kullerstrand

Hybrid Cottonwood	15
Lanceleaf Cottonwood	10
Peachleaf Willow	10
Sumac	10
Thinleaf Alder	5
Wax Currant	5

Mountain Phoenix

Hybrid Cottonwood	15
Lanceleaf Cottonwood	10
Peachleaf Willow	35
Chokecherry	15
Thinleaf Alder	15
Red Osier Dogwood	10

Planting day supplies provided by the City of Wheat Ridge

8. Classroom Workshop Design and Events

IES staff members designed and implemented three classroom workshops for all the elementary students in the program. This plan came out of discussions of what students should understand about the ecology of the Wheat Ridge Greenbelt. The first two workshops occurred before the planting event, and the third happened shortly after the planting days. At Mountain Phoenix, IES associates met with one third grade class (30 students) for 45 minutes, then move to the next third grade class (30 students) for the same amount of time. At Kullerstrand, the two fourth grade classes joined together for hour-long workshops.

Please refer to Appendices L, S and U for a timeline and calendar of classroom workshops.

Workshop 1 Design

Based on discussions with Third and Fourth teachers from the two elementary schools, IES understood that most of the Mountain Phoenix third grade students in the program had been to the Wheat Ridge Greenbelt, while almost none of the Kullerstrand fourth graders had. To close the gap in experience among the students IES focused this workshop on the plants and animals of the Greenbelt and the way they interact in the local ecosystem. In doing so, students would be able to understand the importance of trees in the Greenbelt.

Students study organism cards during Workshop 1. The cards displayed images of various Greenbelt organisms.

Project Learning Tree's Environmental Education Activity Guide (www.plt.org/environmental-education-activity-guide) was used as a reference for planning the first workshop. The workshop activity was titled 'The Wheat Ridge Greenbelt and the Web of Life.' It was divided into several sections: program introduction, defining and explaining some terms, the activity itself, wrap up, and distribution of an activity sheet for students to complete before the next workshop. Please refer to the Appendices L through V for the workshop content and activities.

The activity was inspired by a lesson in the Project Learning Tree guide, but adapted to fit the Wheat Ridge Greenbelt and the needs of IES. Students were given 8 1/2" by 11" laminated sheets depicting parts of a tree (canopy, trunk, and roots), plants, or animals found in the Greenbelt. The potential organisms and corresponding images were developed by Liz Wickard and Margaret Paget of City of Wheat Ridge. IES staff members created 'organism cards' to be used by students. Please see Appendix M for an example of an organism card. Cards were

laminated by Liz Wickard, then hole-punched and mounted with string to allow students to wear over their heads. Students effectively 'became' the depicted organisms.

Students participate in Workshop 1 at Mountain Phoenix Community School.

IES associates developed content for several posters, printed by Liz Wickard to aid students in thinking of ways organisms might be interconnected. These included sharing habitat and being in a predator or prey relationship, among others. The poster was accompanied by a large list of all the organism cards. Refer to Appendices O and P for these posters.

Students were asked to form a circle while wearing their organism card. One student was given the end of a roll of string, asked to point out another card that the original organism was interdependent with, and explain why. The string was then rolled out to connect the two students. This continued until all students were interconnected in a stringed web showing the relationships of organisms in the Wheat Ridge Greenbelt. Students were instructed to tug on their string once to see if other plants or animals were connected to them in ways they did not expect.

At the end of the activity, students with tree cards were asked to drop their part of the string. Students were asked to describe the impact the loss of trees had on their particular cards and what it might means for other impacted organisms.

IES Associate Loren Klick describes the organisms present in the Greenbelt during Workshop 1 at Mountain Phoenix Community School.

To close the workshops, students were asked to reflect on the activity and look for webs of life in other places. IES asked students to describe or draw their own web of life of plants and animals seen around the school, home, or additional places on a take home worksheet. They were also encouraged to think about how these organisms might interact and how trees were connected. Please see Appendix R for a completed student activity sheet asking these questions.

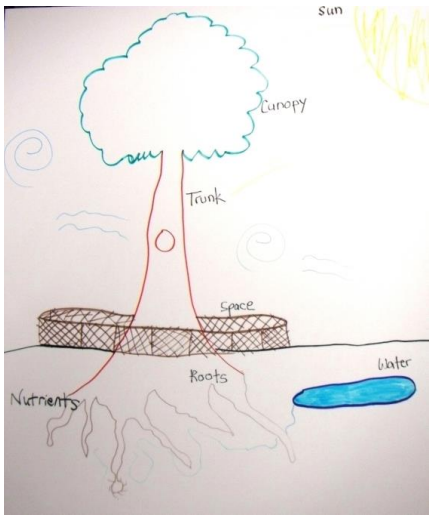
Workshop 1 Events

Mountain Phoenix Community School's workshop occurred on March 19, 2014. IES began with Eric Ebert's third grade class. Emphasized in this workshop were various birds seen in the Greenbelt, since this class frequently visited the Greenbelt to view animals and expressed special interest in birds. Following the workshop, IES moved next door to Noa Wotton's third grade class. The same workshop content was presented.

The workshop at Kullerstrand Elementary School occurred the following day, March 20, with Ryan Deal and Jennifer Dalton's fourth grade classes. IES used the same content in this workshop, but emphasized the cause and effect nature of organisms leaving the web of life. This was done because the fourth graders were, at that time, discussing ecosystem cause and effect relationships.

Students responded well in each classroom, becoming attached to their particular organism card and articulating well the reasons they were interdependent on other organism. Some students asked to keep their cards, but they would be needed again in later workshops.

Workshop 2 Design



Students identify what a tree needs to survive during workshop 2.

For workshop 2, IES drew students' attention to trees specifically, particularly what trees need to be healthy and how they take in these 'needs.' The main activity in the workshop was adapted from the LEAF Wisconsin K-12 Forestry Lesson Guides (www.uwsp.edu/cnr-ap/leaf/Pages/K-12-Forestry-Lesson-Guides.aspx) 'To Be a Tree' activity to fit the Greenbelt.

The workshop was split into sections consisting of reviewing the previous workshop's take-home worksheet, explaining the different sections of trees and their needs, the main tree needs activity, and then preparing the students for the upcoming planting event. Students were given another worksheet to complete at home. Please refer to Appendix S for the content of Workshop 2.

To explain the needs and sections of a tree, students were asked questions about what they thought trees would need to survive, and the different sections as described by organism cards in Workshop 1. Once a student answered correctly, they were invited to draw on a blank poster board and depict the tree section or need discussed. After everything was discussed, the class had drawn a tree getting needs such as sunlight and water. Each classroom kept its completed poster.

In the main activity, students were given laminated 8 ½" by 11" cards. Some cards depicted the three main sections of a tree: roots, trunk, and canopy, and these could be worn as a necklace similar to the cards first workshop. In addition, students were given tree 'needs' cards consisting of things trees need to grow and thrive: air, water, sunlight, and nutrients. Students with tree cards met up with others of the same species and formed a circle facing outwards, separated by IES associates to depict the fifth need of proper spacing. Students holding needs cards would slowly walk around the circle and be collected by the corresponding part of a tree. For example, the student holding the canopy card would collect the sunlight, while the student with roots would collect the water. Tree sections would trade cards through the trunk to distribute the needs. Once a tree collected all its needs, it would grow. This was depicted by handing the 'trunk' an umbrella to show the new growth.

Students at Mountain Phoenix hold up umbrellas indicating that their tree cards were able to obtain everything a tree needs to thrive during Workshop 2.

Students at Mountain Phoenix participate in Workshop 2.

IES purposely distributed too many or too few needs cards to go around. There may have been more sunlight cards or not enough water cards, for example. The classes were asked what the lack of a certain need would mean for the tree, and if there was a way to help the tree. The goal of the activity was to show the students the threats trees face in times of drought and other problems, and how caring for trees could help newly planted ones survive even in harsh times.

Margaret Paget joined IES for this workshop, as all stakeholders wanted students to be prepared for the upcoming planting in terms of expectations for behavior and safety. Ms. Paget brought examples of trees to be planted so students could understand the scope of the upcoming activity.

The workshop closed with a student worksheet, asking students to think about what their tree would look like in five years or in fifty years if it received all its needs. Having seen the saplings,

students could begin to picture the tree growing. The activity was designed to get students excited for the planting and get them interested in further care. Please see Appendix T for an example of the second workshop's student worksheet.

Workshop 2 Event

IES met with the Mountain Phoenix third graders on April 9, moving from Eric Ebert's class to Noa Wotton's. The worksheets from the previous workshop were collected at the start. One class became very excited at the activities and was not trusted with open umbrellas; the other class was calmer and could use them to indicate growth in the activity.

With all three presentations, Margaret Paget hosted a question and answer session after her presentation so students knew what to expect and what was expected of them at the upcoming planting.

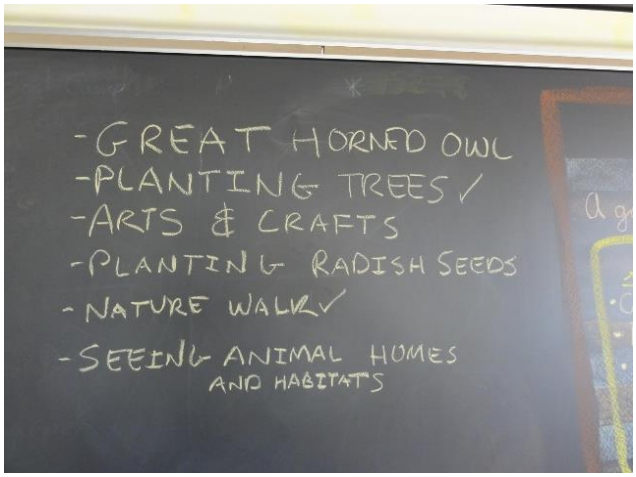
Workshop 3 Design

Students at Kullerstrand participate in Workshop 3. The board game provided examples of proper and improper tree care.

The final classroom workshop occurred after the planting event. In the early stages of the program, this workshop was tentative but, as the program went on, IES felt it was important to follow up with the classes on the importance of proper tree care, especially since Mountain Phoenix classes had agreed to steward the trees for the important first three years.

The workshop was divided into a few sections. Students were asked to describe their experiences at the planting event. IES defined the concept of tree stewardship as it related to the trees recently planted at the Greenbelt. Students played a board game depicting common events that could help or harm urban trees. Following the game, IES distributed tree stewardship manuals to the teachers of each class with detailed tree care guidelines for the recently planted trees. The workshop series closed with IES reiterating the topics of the previous meetings and thanking the students for their participation. Please refer to Appendix U for the Workshop 3 content.

The board game activity was drawn from a portion of LEAF Wisconsin K-12 Forestry Lesson Guide, edited to fit the ecosystem of the Wheat Ridge Greenbelt. Please refer to Appendix V for the LEAF's original game board and cards. To prepare for the workshop, IES associates played the game with people outside of the organization to anticipate unforeseen issues or questions.



Students identified their favorite aspects of planting day during Workshop 3.

These play-throughs aided in IES's preparations to introduce the game to the students and in understanding the time involved with playing the game.

Workshop 3 Event

The Mountain Phoenix workshops occurred on April 30, with the Kullerstrand workshop occurring the following day, May 1. All of the classes enjoyed the game, and some groups of students had the time to play multiple games. Following the game students were encouraged to ask questions as IES associates described caring for the recently planted trees in detail.

At the close of the workshops, students and teachers were given evaluation forms, which will be described in a subsequent section titled 'Program Feedback.' As IES associates left the class, students and teachers thanked them for the workshops and opportunity to preserve the Greenbelt.

Students from Kullerstrand participate in the board game during Workshop 3.

9. Planting

Planting Design

The design for both planting areas was similar, and focused on sections of the sites that were lacking part of or the entire canopy. The goal was to place trees in areas that would provide greater survival rates and mitigate declining ecosystems in the area. Tree species were strategically selected and planted to optimize environmental benefits and to minimize potential negative impacts. The trees selected are native to the local Wheat Ridge Greenbelt ecosystem.

The planting sites were developed through a combination of tree canopy analysis with the use of aerial imagery and on the ground observation. There are several topographic features, such as benches, shelves, and depressions at each site that have potential for holding water and providing moisture. These areas were targeted in the planting plan.

Staging

Leading up to the planting day on April 18 for Mountain Phoenix Community School, IES worked with the Wheat Ridge Parks and Recreation Department staff members to coordinate equipment, logistics, and material staging. Trees were delivered to the Wheat Ridge office before staging and were assessed to ensure quality, species, and amount.

Students in the Wheat Ridge HS Career Exploration class prepare for planting.

IES and Wheat Ridge Parks and Recreation staff members marked the planting locations at the site with landscaping flags. The flags had a species name written to ensure the proper species would be planted at each designated location. Each flag also had one of three differently colored landscapes flagging to differentiate student planting groups. On planting day, Wheat Ridge supplied mulch, beaver cages, and shovels. The city also supplied watering buckets, a hand pump to draw water from Clear Creek, and the trees. The Wheat Ridge High School Career Exploration class planted some trees and cut protective beaver cages for the Mountain Phoenix site the day before planting day.

IES delivered event t-shirts to the classrooms in the project a day before each planting event so students could arrive wearing them.

Planting Days

The planting event involving the Mountain Phoenix third graders occurred on Friday, April 18, 2014. The Kullerstrand fourth graders planted on the following Friday, April 25. Eric Ebert and Noa Wotton, third grade teachers at Mountain Phoenix Community School, and five parent chaperones brought the students to the planting site on the Mountain Phoenix Planting day. IES and Wheat Ridge had seven staff members and three IES-related volunteers in attendance. All volunteers were guided by IES and Wheat Ridge staff members.

Margaret Paget, Carol Lyons, and Preston Gibson welcome students to the Greenbelt.

When the classes and chaperones arrived, the adults checked in at a tent canopy-covered registration table. Chaperones were given a chaperone instruction sheet which described the event, ways in which their help would be needed, and an event schedule. This sheet is in Appendix Y. Chaperones were offered nametags and t-shirts. One of the important aspects of working with stakeholder volunteers is to show appreciation for their efforts. As such, IES designed and produced commemorative t-shirts for volunteers to wear during the planting event and then keep. The t-shirts connected participants to the event and encouraged a sense of camaraderie. A schedule for this event and the Kullerstrand planting are Appendix Z.

IES Associate Brian Kelly instructs students on proper tree planting technique.

To start the event, Xcel Energy's Preston Gibson thanked the students for participating and thanked IES for planning and implementing the project in collaboration with Wheat Ridge. IES Executive Director, Carol Lyons, spoke regarding the event and the best time to plant a tree (today). The ceremony showed participating students and their parents the importance of the planting and the gratitude of the community.

Student participants were divided into three groups of 20 students. This was done by assigning one of three

different colored bits of landscape flagging. Students attached the flagging to their nametag. Chaperones were allowed to join whichever group they preferred, though IES staff ensured they were equally divided among the student groups.

Students pull water from Clear Creek with the help of a Parent Volunteer.

At this time, students were called to their group by the various IES staff members and volunteers. The three groups would plant trees, take a nature walk, and participate in arts and crafts activities. After each activity finished, students would gather at the registration table to meet their new group leader. The groups rotated twice after one hour, so each student participated in all of the three activities.

Tree Planting

An IES staff member led a presentation on proper tree planting techniques. The training included how to properly identify and carry the tree from the holding containers, how to dig the hole, and how to place and plant the sapling at the proper depth. The presentation also demonstrated backfilling, mulching, and watering. Please refer to the Tree Planting Instruction sheet in Appendix A1 for an example of what was given to chaperones.

Students were instructed to plant the root collar even with the adjacent grade in a hole that was at least three times the width of the root ball. The hole was then backfilled using the same soil and, if necessary, additional soil was available. Planters were instructed to build a ringed berm of soil around the tree, and then cover this berm with 3-4" of mulch, allowing for approximately 3" of space between the trunk(s) and mulch.

IES and Wheat Ridge staff members walked among the students and chaperones, ensuring trees were being planted properly. At the Mountain Phoenix site, another team transported buckets of water from Clear Creek to locations near trees ready for watering. At the Kullerstrand site, Wheat Ridge provided watering containers near the planting sites so a specific team was not needed to distribute water.

Students from Kullerstrand participate in the nature walk.

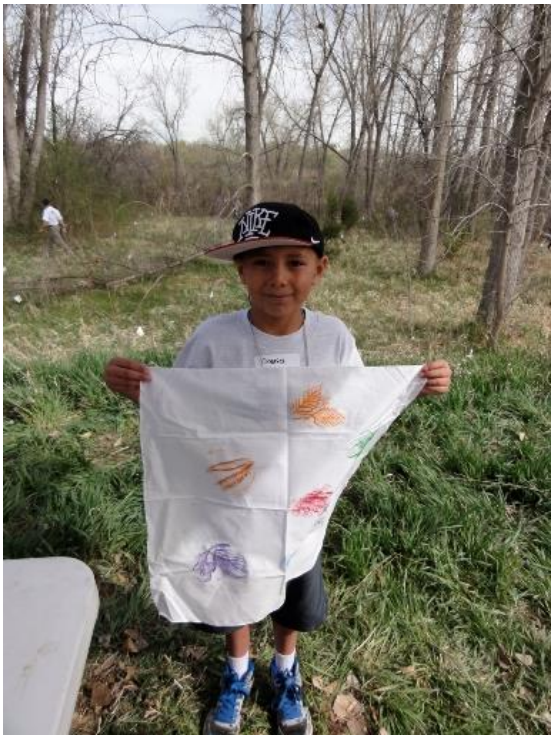
Nature Walk

Margaret Paget led an age-appropriate nature walk to give the children a chance to see the trees, plants, and animals that they had learned about in the first classroom workshop. At the Mountain Phoenix site, students began the walk at the registration table, taking time to quietly observe a

nesting great horned owl. The students' route took them away from Clear Creek and towards quieter locations so students could view animals without additional disturbance. At the Kullerstrand site, the students traveled east before making a loop near West Lake and Clear Creek. Both nature walks took roughly 45 minutes. Ms. Paget pointed out a wide variety of plants, noting interesting characteristics such as texture and smell. She skillfully drew connections among plants and animals, reinforcing the lesson of interdependence of the various organisms. Students were able to observe a variety of birds and were encouraged to listen to characteristic sounds.

Arts and Crafts

The registration table doubled as the location for arts and crafts. There were a variety of activities, with materials provided by Wheat Ridge and IES. Wheat Ridge provided supplies to make a small vial terrarium for a radish seed that could be worn around the neck, and stamps of leaves from native trees and blank bandanas to decorate. IES provided general supplies such as paper, crayons, colored markers, scissors, and glue.



A Kullerstrand student displays his leaf rubbings.

IES designed a coloring sheet depicting a blank Greenbelt, and students were asked to fill in the sheet with plants and animals discussed in the classroom presentation or seen on the nature walk. The reverse side included a list of the trees, other plants, and animals discussed in the classroom workshops.

Sierra Club volunteer Betty Jo Page led the activity, and was joined by fellow volunteers and Wheat Ridge Parks and Recreation staff members for assistance. At the Mountain Phoenix site, Wheat Ridge staff members set up a binocular station so students could view the nesting great horned owls.

Event Closing

Once each student group had completed all activities, IES and Wheat Ridge staff members thanked the students, teachers, and chaperones at the registration table.

Program Feedback

IES asked for feedback throughout the elementary education program. At the close of the program IES distributed evaluation forms to students and teachers.

The Kullerstrand fourth graders after a successful planting day.

Evaluation during the classroom workshops consisted of asking students about their worksheets and reiterating lessons from previous workshops. At the third workshop, IES wrote down students' comments about their experiences at the planting day. Evaluation forms at the end of the third workshop were more formal than these conversations.

The teacher evaluation consisted of an 'agree or disagree' section, then three open-ended questions on the planting and workshop programs. Please see Appendix D1 for this evaluation form.

The student evaluation sheet focused more on educational aspects. Students were asked what they liked about the workshops, then about the purpose of the workshops. Questions asked about the importance of planting trees and how the students helped the Wheat Ridge Greenbelt. Please see Appendix B1 for a student evaluation form. The evaluation results will be described in more detail in the Evaluation section below.

Commemorative Posters

IES created posters to commemorate the planting days and to recognize the students, teachers, volunteers, and funders. These posters were placed in Greenbelt kiosks near trailheads for all to see. The posters list the project partners and sponsors, provide images of the planting days, and summarize the planting day. The posters are in Appendices E, F and G.

10. Preserve the Greenbelt Elementary Education Project Evaluation

Project Outcomes

The *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* was hugely successful. IES was able to meet all its goals and objectives as determined in the planning stages of the project. The chief goals were to develop a science based educational and sustainable volunteer program that will maintain newly planted trees in the Wheat Ridge Greenbelt, increase the rate of tree survival, and engage students and their families in protecting the environmental and community benefits of the Greenbelt.

A Kullerstrand student examines a Greenbelt tree during the nature walk.

IES's first objective was to evaluate current Greenbelt conditions and determine the areas of greatest need. These areas were determined by a combination of viewing satellite imagery, on-the-ground inspections, and recommendations by the City of Wheat Ridge. As described earlier, IES developed the project's planting plan through these methods. The fruit of these efforts can be viewed in the RCA which describes the state of the Greenbelt and areas of concern. This report contains the findings, discussions, and agreements that informed the project and is in Appendices J and K.

The next objective was the engagement and organization of volunteer student tree stewards. Early on, IES determined the best way to engage students was to give them background knowledge of the Wheat Ridge Greenbelt in the form of classroom presentations. In this way, students would understand aspects of the Greenbelt ecosystem in ways a shorter program would not be able to impart. The three classroom workshops, two before the planting event and one following, were ideal to draw students into the Greenbelt and provide a variety of lessons showing the importance of trees in the Greenbelt and how to care for them.

The third objective was to provide formal training that focused on supplemental watering and monitoring. In the final classroom workshop, IES provided each teacher with a bound manual describing tree hazards, maintenance, and care for their recently planted trees.

This process will need to be improved for future programs. The Mountain Phoenix teachers were initially engaged and committed to maintaining the saplings through the first three years of their lives. There was, however, a two-month period where the Mountain Phoenix site was unmaintained by Mountain Phoenix community members in late spring and early summer. The site has since been visited and maintained by Mountain Phoenix community members.

IES did not engage and recruit an adequate number of Tree Stewards to care for the Kullerstrand site. Given the small number of Kullerstrand Tree Stewards, the site was not provided optimal attention. In the future more Tree Stewards are necessary and the commitments must be sufficiently established in advance.

The fourth objective of the *Preserve the Greenbelt Elementary Education Program* was to establish environmental criteria for environmental and educational benefit. These metrics included the following aspects as determined by the grant application:

1. 75% of students will show an increase in environmental awareness and increased conservation values on pre- and post-tests.
2. 6 environmental educators will complete training
3. 150 students to be taught by these educators
4. 6 acres of habitat to be restored
5. 50 volunteers to be engaged in environmental stewardship
6. 600 volunteer hours to be contributed to the stewardship projects
7. 60 people will learn about natural resource conservation
8. 35% increased tree survival rate

Kullerstrand fourth grade teacher Ryan Deal helps a student during arts and crafts.

Metric 1 was evaluated using worksheets distributed after each workshop and informal questions to the classes involved in the program. These worksheets were filled out by the students then collected and evaluated by IES. Based on the worksheets, IES determined that roughly 95% students showed an increase in environmental awareness and increased conservation values.

Metric 2 was met by including six educators in the program: Two teachers from Mountain Phoenix Community School; three from Kullerstrand Elementary School (two teachers and a teacher's aide; and Jerry DiTullio, instructor of the Wheat Ridge High School Career Exploration class.

Metric 3 was not met as a total of 120 students participated in the program. Mountain Phoenix had 60 students in its third grade, Kullerstrand 30 in its fourth grade, and Wheat Ridge High School contributed 30 from the Career Exploration class. IES considers this a success. We expected the Kullerstrand classes to be larger than they were.

Metric 4 was met as the total planted areas amounted to 6 acres.

Metric 5 was met as120 students were engaged, their six instructors and a dozen additional volunteers.

Margaret Paget teaches Kullerstrand students about the Greenbelt ecosystem during the nature walk.

Metric 6 has been met and continues to increase in terms of volunteer hours. Over 100 students participated, in addition to 20 more adult volunteers outside of IES Associates. The 3.5-hour planting events means volunteers logged 520 hours in these events alone. Stakeholders volunteered their time for advisory meetings and classroom workshops as part of the program. Student, parent, and teacher volunteers continue to visit the Wheat Ridge Greenbelt to care for the trees increased the hourly total.

Metric 7 was a success as 120 students were involved.

Metric 8 will be evaluated over the next three years. Previous survival rates for new trees in the Greenbelt were estimated at 25% after one year. We expect the survival of the student-planted saplings to exceed 60%. After three months of monitoring, IES has determined that roughly 85% of the saplings have survived.

Problems and Challenges

The largest challenge of the project was to engage different grades and different schools, while using much of the same educational material due to time and material constraints. Each class was different, and IES had to manage students differently in each separate workshop.

As part of this challenge, IES discovered each educator had varying experience with the Greenbelt and the content of the classroom workshops. Some educators were more involved than others. A way to manage these inconsistencies would be to forward

A Mountain Phoenix student gathers water for her sapling on planting day.

exact content to the instructors involved, or at the least condensed content outlines. In this way, educators would know what to expect for educational objectives.

Student discipline was a challenge. IES team members visited each classroom before the workshop program began to get a feeling for the class behavior and level of participation. However, we were surprised by the noise level allowed and lack of student attention, both in the classroom and in the Greenbelt. For future programs, IES will meet with each teacher before the first workshop, and agree on standards for student behavior and what IES expects for student management.

Another challenge centered on the number of students involved in the program. IES staff is limited, as were the physical size of areas designated as planting locations. To resolve this issue, IES divided the student groups into thirds, so that a maximum twenty students would be participating in a given activity at a time. This meant more material and volunteers were needed on planting days, but the result was fewer disturbances to the Greenbelt and additional opportunities to teach students. We found that the smaller Kullerstrand class groups were more effective in providing adequate supervision and attention for each student.

An excited group of Tree Stewards at the Kullerstrand planting event.

Mountain Phoenix teachers failed to collect the final student evaluation forms after the third workshop. We had emphasized throughout the program planning process that program evaluation was of top importance and that receiving feedback from the students was critical. In the future, we should establish a timetable with specific dates showing each participant's responsibilities, to reduce misunderstanding.

Recommendations for Next Steps

The IES *Preserve the Greenbelt Elementary Education Program* is an important step in supporting long-term tree survival rates and improving the ecological health of the Wheat Ridge Greenbelt. IES assessments of the Greenbelt, in discussions and the RCA, indicated that simply planting trees would not be enough. While the planting plan was designed so trees would have as much access to natural water as possible, supplemental watering and care is essential. For this reason, IES decided to use the Tree Steward model as developed in its most recent project, *Revive the Greenbelt!*

IES and the City of Wheat Ridge are continuing to work with tree stewards to improve the site and program. IES regularly engages the Tree Stewards, gathers feedback, and provides assistance. IES needs to continue working with its volunteers to ensure record collection and adherence to the suggested best practices of care.

IES has developed commemorative posters to be displayed near each planting site; these posters simultaneously display the successful planting day and ask for new tree stewards to join the current team. IES will need to continue to recruit tree stewards.

Two-Month Evaluation

IES Tree Project members and Wheat Ridge Forestry and Open Space Supervisor Margaret Paget compiled an evaluation after visiting the site two months after the planting days. Photos were taken and success rates were identified. In the first two months after planting in April, over 90% of the saplings are leafing out and thriving. This indicates that the students did a proper job of planting, and the species and sites selected were appropriate. IES Wheat Ridge Tree Stewards, staff members, and parent volunteers continue to care for the new plants. IES made a special arrangement to permit use of Clear Creek water, and the City of Wheat Ridge delivers the water supply for volunteers.

Saplings two months after planting.

Saplings two months after planting.

Conclusion

The *IES Wheat Ridge Preserve the Greenbelt Elementary Education Program* was a success. The project was made possible because of the generous funding provided by Xcel Energy. The close collaboration between IES, the City of Wheat Ridge, and each school involved contributed to the success. Each stakeholder was both informed and part of the agenda setting, which helped keep the project focused and on track. Margaret Paget and her staff were resourceful and very helpful for the duration of the project, volunteering time and materials for every event. The results of the project will continue to be seen as students and volunteers care for the trees. These students, protecting the Greenbelt in their own urban backyard, will continue to make this project a success.

The students' participation and enthusiasm was contagious in the classroom and in the Wheat Ridge Greenbelt. The students demonstrated an understanding of the introduced tree-based

curriculum and then successfully planted over 200 trees. Subsequent visits to the planting sites show that the trees are being cared for and were planted correctly. IES is proud that these young Tree Stewards are prepared to positively impact their local urban forests.

The mission of the IES Tree Project is to improve Colorado cities using tree science. Through collaborative, multi-disciplinary partnerships and programs, we restore natural systems and use urban green infrastructure, educate children and adults to become environmental stewards, rehabilitate, improve and maintain critical urban natural resources, and improve community health and economy.

Based on this experience, IES confirmed that five critical factors go into successful tree planting and survival.

- Collaboration with the full range of interested stakeholders
- Careful planning of the education and planting program
- Careful selection of the planting sites and plant species to optimize survival
- Good instruction and proper planting with well-organized volunteer participation
- Appropriate maintenance plants and implementation

We look forward to building on this experience, and continuing to train the next generation of tree stewards. IES welcomes comments, questions, and volunteers. Please contact us at Solutions@i4es.org or www.i4es.org.

Plans for Printing, Binding, and Distribution this Report

This report will be available electronically via the IES website, www.i4es.org. A limited number of printed and bound copies will be distributed to project stakeholders.

An IES Tree Steward helps a Kullerstrand fourth grader plant her sapling.