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## Clean Rivers Education Program

Environmental Services offers free, classroom and field study science education programs for K – college students within the City of Portland. Students learn about watershed health, urban ecology, the causes and effects of water pollution and what they can do to protect rivers and streams.

Clean Rivers Education programs address local water quality, environmental design and habitat issues. The program offers hands-on classroom lessons designed to complement teachers' curricula. Classroom programs often serve as a prelude or follow-up to a field trip.

During field experiences, students spend time outdoors observing, interpreting, exploring and connecting to local natural areas. Students apply the skills they learn through watershed investigations and stewardship/community action projects. Clean Rivers Educators work with teachers to develop a unit of study to best meet learning objectives.

### The Clean Rivers Educators

**Lynn Vanderkamp** serves schools in southeast and southwest Portland  
*lynn.vanderkamp@portlandoregon.gov*



**Megan Hanson** serves schools in north, northeast and northwest Portland  
*megan.hanson@portlandoregon.gov*

## At a Glance

	Student Contacts*
Classroom lessons	8,916
Field science programs	5,533
Community events	1,672
<b>TOTAL</b>	<b>16,121</b>

\*Using *contacts* takes into consideration that some students receive multiple programs

**Number of classes taught** (classroom and field): **570**

Classroom programs are typically 1-1.5 hrs.  
Field programs are typically 2-2.5 hrs.

**Schools and Organizations** **82**

**Volunteers** (includes parent chaperones) **563**

**Volunteer-hours** **1,113**

## Classroom Lessons

(60-90 minutes depending on lesson and age group)

### Environmental Storytelling

598 students

Grades K - 3

Educators use a Japanese storytelling box to tell students an illustrated story about water. After the story, students draw pictures about what they learned and present their artwork to the class.

### Riparian Habitats

361 students

Grades 1-3

Students learn about the five elements of a habitat that all animals need to survive: food, water, shelter, space, and oxygen. They play a Habitat Bingo game to learn about Pacific Northwest animals that live in and near rivers and streams. Students then explore pelts and skulls of local animals.

### Water Cycle

316 students

Grades 2-5

Students follow the path of a water molecule in Project Wet's *Incredible Journey* lesson. They track its journey and create a visual map with pipe cleaners and beads. An optional writing extension is offered.

### Watershed Awareness

760 students

Grades 2-5

A watershed is an area of land that drains into a specific body of water, like a stream, river or slough. Students analyze current and historical maps to identify changes in local watersheds. Using an EnviroScape® watershed model, students demonstrate stormwater pollution impacts and brainstorm better pollution solution practices.



**Riparian Plants**  
**870 students**

Grades 3 - 9

A riparian zone is the land next to a water body. Students learn the value of native plants in enhancing water quality and wildlife habitat, and the negative effects of invasive plants in a riparian zone. Students learn basic botany terminology and gain beginning plant identification skills.

**Water Chemistry Lab**  
**845 students**

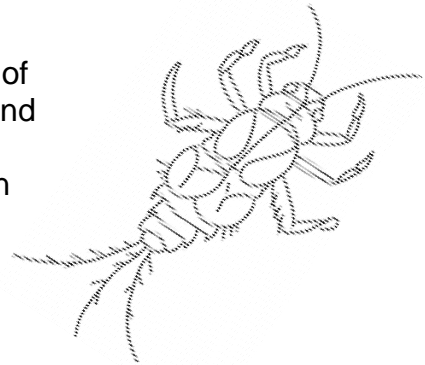
Grades 4 - 12

Students practice using the scientific method while measuring the health of a water body. Students observe, create hypotheses and interpret data as they measure water quality parameters such as temperature, dissolved oxygen, pH, and turbidity.

**Aquatic Macroinvertebrates (Water Bugs)**  
**1,996 students**

Grades 4 – 12\*

Macroinvertebrates (water bugs) are excellent indicators of water quality. Students explore life cycles, adaptations, and pollution tolerances of water bugs. Using images, field guides and preserved specimens, they learn identification skills and create scientific drawings. *\*This lesson is adapted for 1st/2nd grade water insect studies.*



**Salmon Survival**  
**289 students**

Grades 2 - 8

Students learn about Portland's threatened coho, steelhead and Chinook salmon. They explore salmon life cycles with preserved specimens and learn salmon-specific vocabulary. An interactive board game packed with science content helps students explore the journey of salmon and threats to their survival.

**After the Flush - The Wastewater Story**  
**586 students**

Grades 4 - 8

After the flush, it doesn't just go away. Students create simulated wastewater and then clean it up following steps taken at Portland's Columbia Boulevard Wastewater Treatment Plant. Students gain an appreciation for the city's sewer infrastructure that helps protect public health, water quality, and the environment. This lesson is often followed with a field trip to the treatment plant.

**It's an Overflow!**  
**358 students**

Grades 5 - 12



Are combined sewers still overflowing into the Willamette River? Students discover the sewer history of Portland and experience a combined sewer overflow (CSO) in the classroom. They learn about the City of Portland's 20-year program to control combined sewer overflows and the CSO project that is the largest capital project in Portland's history. Students learn what the city will do in the future to protect rivers and streams.

**Soak It Up- Sustainable Stormwater Solutions**  
**1, 339 students**

Grades 5 - college

Stormwater runoff from streets, sidewalks and roofs can carry pollution to streams and rivers. Working with aerial maps of a model neighborhood, teams of students calculate area, percentage of pervious and impervious cover, and determine runoff. Students then redesign their neighborhoods with sustainable stormwater facilities such as bioswales, ecoroofs, green streets and stormwater planters. This lesson integrates math and science topics.



**Movin' On Up: Biomagnification and Bioaccumulation**  
**335 students**

Grades 5 - 12

Students explore the hydrophobic properties of some pollutants in a river system. They discover how pollutants can build up in the fatty tissues of organisms, how pollutants move through a food chain/food web, and how we can reduce health risks from these pollutants. Students calculate percentages and averages as they track pollution through a river food chain.

## Field Trips

(1.5-2.5 hours)

### Investigating Your Urban Stream, Pond or Wetland 3,048 student contacts

Grades 1 - college

Students apply concepts and new skills gained in the classroom to a field study. Students meet at a local stream, pond or wetland to investigate water and the nearby habitat. Field study activities may include: testing water quality, sampling for aquatic macroinvertebrates (water bugs) as biological indicators, exploring wildlife, and identifying native and non-native plants. Activities depend on the season, site features, and curriculum emphasis. Monitoring activities, research, and scientific inquiry goals may be included.



### Natural Area Restoration Projects 1,767 student contacts

Grades 4- 12

Students help restore a local natural area while also learning about field investigation techniques such as water quality testing, plant identification, wetlands, and wildlife study. They participate in stewardship activities such as invasive plant removal, planting, and maintenance. This is a special option involving partnerships with local agencies and organizations



### Canoe the Slough Tours 300 students

Grades 4-12



Students who have studied extensively about the Columbia Slough Watershed and who have completed a stewardship project are invited on a canoe tour of the Columbia Slough. This program is in partnership with the Columbia Slough Watershed Council Slough School and Northwest Discoveries. Tours take place at Whitaker Ponds Environmental Learning Center and Kelley Point Park.

**Sustainable Stormwater Tours**  
**275 students**

Grades 5 - college

Students visit bioswales, ecoroofs, stormwater planters, green streets, rain gardens and creative downspout disconnections. They learn how these solutions allow stormwater to soak into the ground to reduce volume, while plants and soil filter pollutants and improve water quality. Educators work with teachers to develop an itinerary based on transportation and location.



**Storm Drain Curb Marking: A Community Action Project**  
**127 students and community members**

Grades 3 -adult

Much of the stormwater in Portland goes directly into streams and rivers carrying oil, dirt, fertilizers, pesticides and other pollutants from our yards and streets. Students install permanent curb markers with the message “Dump No Waste” to remind people that storm drains are for rainwater only.



**Resources for Checkout**  
**8 teachers, 432 students**

Teachers check out equipment and materials to extend learning units. Examples include the EnviroScape® Watershed Model, chemistry equipment, and the Stormwater Obstacle Course.



## Career Education

2011 marks the third year of the *Futures Working for Clean Rivers* career education program. This program brings together Environmental Services staff and select school groups to promote environmental career development. The idea was conceived by Environmental Services' Diversity Committee. Clean Rivers Education develops and coordinates *Futures Working for Clean Rivers* activities.

The goals of this program are to communicate, affect and empower the lives of young women by introducing them to possible careers in science, serve as role models by demonstrating educational opportunities, and to develop future employees in the environmental field.

**Schools** Harriet Tubman Leadership Academy for Young Women  
Linus Pauling Academy - Marshall High School

### Environmental Career Game Show: What's My Line? 35 students Grades 6-8



Students were the audience of an interactive game show to learn about a variety of careers at Portland's Bureau of Environmental Services. Students engaged with panelists to learn about the job duties, skills needed, and career paths of various staff, then tried to match each panelist with her job. Afterwards, staff set up tables with photos, maps and equipment pertaining to their work. Students worked on a scavenger hunt as they mingled with staff to learn more about their jobs.

### After the Flush Field Trip 16 students Grades 9-12

Students toured the Columbia Boulevard Wastewater Treatment Plant to learn how the city is able to treat up to 450 million gallons of wastewater a day and the roles of treatment plant employees. After the tour, students attended demonstrations by staff on topics such as pipe cutting and brazing, pipe bending, thermal imaging, process controllers, and microbiology.



## Partnerships

The Clean Rivers Education Program values the power of partnerships to maximize resources and extend learning opportunities for Portland students. This year, Clean Rivers Education partnered with the following organizations:

- Columbia Slough Watershed Council Slough School
- East Multnomah Soil and Water Conservation District
- Johnson Creek Watershed Council
- Lower Columbia River Estuary Partnership
- Multnomah Youth Cooperative
- Native American Youth and Family Center
- Northwest Discoveries
- Northwest Service Academy
- Portland area school districts
- Portland Parks and Recreation / City Nature
- Reed College
- Surfrider
- Zenger Farm
- Verde
- Wolftree

## Supporting Environmental Services Programs and Projects

Many Environmental Services divisions depend on Clean Rivers Education to get the word out about their programs and projects. Educators work closely with the following internal partners:

- Combined Sewer Overflow Program
- Community Watershed Stewardship Program
- Portland Harbor Superfund Program
- Communications Division / Public Involvement
- Science Fish and Wildlife Program
- Sustainable Stormwater Program
- Tabor to the River
- Watershed Services Group
- Wastewater Group
- Pollution Prevention Group

## Highlights

*Example projects from the more than 80 schools and organizations that participated in Clean Rivers Education this year.*

### Sustainable Stormwater Gets Personal

Partners:

- Clean Rivers Education
- Environmental Services Sustainable Stormwater Program
- Chapman Elementary
- Archbishop Howard School

Watersheds: Willamette River, Columbia Slough

One of Clean Rivers Education's most popular lessons is *Soak it Up*. In this lesson, students learn about bioswales, green streets, ecoroofs and disconnected downspouts, and then redesign a model neighborhood using green stormwater facilities. This year, students focused on stormwater at their own school properties.

Students at Archbishop Howard School used their own school's parking lot during *Soak it Up*. They measured pervious and impervious surfaces, calculated runoff, and then redesigned their parking lot using aerial maps and architectural drawings.



As part of a six-week unit on watersheds and stormwater, students at Chapman School conducted an investigation at a newly constructed green street facility adjacent to their school. Teams of students measured and mapped the green street, estimated, then calculated the percent of each plant species in the green street, and developed concepts for an informational sign.

## Second Grade Science and Literacy

Partners:

- Clean Rivers Education
- Maplewood Elementary; parents

Watershed: Fanno Creek

Second graders at Maplewood Elementary combined literacy and science in a custom Clean Rivers program. Students heard tales from our Storytelling program like *Why Crowdad Has Eyes on Stalks* and *Land of Bog*.

Then they made connections between those stories and the benefits of native plants. Afterwards, parents joined students and headed outside to their school's nature-scape "Wildwood" outdoor classroom. There, students worked with parent volunteers to identify native plants using plant identification books. The program ended with students proudly sharing the name and key characteristics of some of the native plants at their school.



## Afterschool Rain Garden Club Inspires Next Steps

Partners:

- Clean Rivers Education
- Bridger Elementary
- Community Watershed Stewardship Program

Watersheds: Willamette River, Johnson Creek

Clean Rivers Education teamed up with Bridger Elementary's after school Rain Garden Club this year. Students participated in a riparian restoration lesson and took a field trip to visit a large restoration project in the Johnson Creek watershed. They made connections between natural area restoration projects and a stormwater project in progress at their school. Excitement generated from the afterschool program helped inspire the garden club leader to successfully apply for a Community Watershed Stewardship Grant. The grant will allow Bridger to begin phase two of the school's raingarden project, including disconnecting the school's downspouts to the raingarden and adding more native plants. Next school year, every class at Bridger will participate in a Clean Rivers Education classroom and/or field trip.

## A New Approach to Field Trips

Partners:

- Clean Rivers Education
- Rosa Parks School
- Columbia Slough Watershed Council Slough School

Watershed: Columbia Slough

Clean Rivers Education and the Columbia Slough Watershed Council's Slough School teamed up at Rosa Parks School to offer a new approach to field trips. After classroom presentations by both Clean Rivers Education and Slough School, 4th grade students walked from their school to the Columbia Boulevard Wastewater Treatment Plant Natural Area—about a mile through their neighborhood. Along the way, students investigated green streets and rain gardens, located bird nests, and predicted how many steps it would take to walk a block. Once at the natural area, students tested the water quality of the Columbia Slough, learned about the wastewater treatment plant, identified native plants, and searched for clues about the area's wildlife. Another goal of the walking field trip was to show students how to access natural areas near their neighborhood. Several students commented that they wanted to bring their families back to visit the natural area.



## Science Inquiry Summit

Partners:

- Clean Rivers Education
- Cleveland High School parents
- Environmental Services' Johnson Creek Watershed and Science Fish and Wildlife teams

Watersheds: Willamette and Johnson Creek

Watershed investigation at Cleveland High School did not stop at the end of the school day. Ninth grade students at Cleveland High School had the option of working on a year-long afterschool inquiry project. Students first participated in Clean Rivers Education watershed investigation and monitoring field trips in the Johnson Creek watershed. Then, with mentoring help from biology teacher Scott Burns and parents, they developed research questions and conducted watershed investigations on their own time. At the end of the school year, students presented their research to Environmental Services staff at the second annual Science Inquiry Summit.

## Year of the River

### Partners

- Sunnyside Environmental School
- US Geological Survey
- Portland Parks City Nature
- Johnson Creek Watershed Council

Watersheds: Willamette and Johnson Creek

Sunnyside Environmental School uses the environment as a context for learning across subjects. 2011 was the *Year of the River* at Sunnyside, and Clean Rivers Education was an integral part of the curriculum. Seven middle school and two 5th grade teachers took advantage of Clean Rivers Education resources. In the classroom students studied CSOs, wastewater treatment, macroinvertebrates, salmon issues, and biomagnification. They also learned about Johnson Creek hydrology from staff at the US Geological Survey. Students toured the Columbia Boulevard Wastewater Treatment Plant and participated in multiple field trips with Clean Rivers Education and Portland Parks City Nature to work on restoration projects and field investigations at natural areas in the Johnson Creek watershed.

## Confluence Connection

### Partners:

- Clean Rivers Education
- Ockley Green School
- Portland Parks—City Nature
- Columbia Slough Watershed Council—  
Slough School



Ockley Green 6th graders developed a connection with the Columbia Slough Confluence and Kelley Point Park this year. In the fall, students learned about the Columbia Slough Watershed in the classroom with a presentation by Slough School. In the winter, they learned about water chemistry and tested water quality at the Columbia Slough confluence with Clean Rivers Education. They also planted native trees and shrubs with Portland Parks City Nature. In the spring they returned to paddle the slough in canoes provided by the Columbia Slough Watershed Council and led by Clean Rivers Education and Slough School staff. On the slough, students spotted great blue heron and kingfishers, floated over a beaver dam, and learned about the Columbia Slough Confluence Habitat Enhancement Project.