• Program Report •

Newell Creek Volunteer Monitoring Program

A cooperative project between the John Inskeep Environmental Learning Center at Clackamas Community College, Saturday Academy, the City of Oregon City, Oregon City School District, Park Place Elementary School, and Oregon City High School's Freshman Campus.

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Prepared by Christine Finlayson,
John Inskeep Environmental Learning Center

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Poetry about Newell Creek
by students at Park Place Elementary

BEAUTIFUL CREEK

Tall grass and flowing stream
Splashing feet and rustling leaves
Sweet apples and fresh air
Rough twigs and crawling critters
I think it will do fine

CLEAR CREEK

Wet rocks and turtles crawling
Ducks quacking and birds chirping
Fresh air and green leaves
Brown mud and slimy bugs
I think that Newell Creek will last
a long time

Newell Creek Volunteer Monitoring Program
— At a Glance —

Program Schedule

January 1997	Program planning begins
July-August 97	Teacher training (three days through Saturday Academy's Student Watershed Research Project; one day at the Environmental Learning Center; and one day to plan curriculum)
October 97	Fall sampling
February 98	Winter Sampling
March/April 98	Spring Sampling
April 98	Student Watershed Fair & Saturday in Our Watershed
May/June 1998	Evaluation and reporting

Summary

In September, 1997, the Newell Creek Volunteer Monitoring Program began in earnest. Three elementary school teachers (5th-6th grade) from Park Place Elementary School and three high school teachers (9th grade) from Oregon City High School's Freshman Campus participated in the program. They attended training during the summer and planned how to incorporate their classes into the program.

During the 1997-98 school year, 110 students visited Newell Creek's headwaters at the Environmental Learning Center site several times to test creek water quality, while another 150 students conducted water quality tests in the classroom.

Each school collected on-site data three times during the year: fall, winter, and spring. The elementary school students tested Newell Creek's temperature, dissolved oxygen, content, and pH, as well as made stream observations, mapped stream habitat, and collected and identified macroinvertebrates. These students also created poetry, art, and writing projects based on the monitoring program. Students from the high school tested Newell Creek for temperature, oxygen, pH, nitrate, and phosphate, as well as created a world wide web page for Newell Creek.

On April 14, 1998, the students invited their parents and community members to a *Student Watershed Fair*, where they presented their research on Newell Creek using displays and hands-on demonstrations. Then on April 18, the community was invited to attend *Saturday in Our Watershed* to learn more about the Newell Creek watershed and monitoring program and participate in a service project of their choice: storm drain stenciling, litter pick-up, or invasive plant removal.

When the sampling and special events had been completed, the teachers participated in discussions to evaluate the project and brainstormed ideas for continuing monitoring efforts at their schools.

Teachers at Park Place Elementary continue to be excited about the project and the opportunities it has provided for hands-on learning. In March, the Portland TrailBlazers presented the school with a $1,000 award for their students' study of Newell Creek. They hope to continue creek monitoring, perhaps on a creek closer to the school, next year. They have also encouraged the ELC to pursue water monitoring opportunities with Odgen Middle School, where Park Place's "graduating" 6th graders will go next year.

Teachers at Oregon City High School's Freshman Campus were discouraged by some logistical problems, but have expressed interest in continuing to test creek water quality as part of their physical science curriculum. Opportunities also exist to include biology students from Oregon City High School (10th-11th grade) in the volunteer monitoring program in the future.

With growing support from local teachers, the Environmental Learning Center hopes to be able to expand the Newell Creek Volunteer Monitoring Program to other Oregon City Schools, including other elementary schools, middle schools, and possibly biology classes at Oregon City High School. Our goal is to encourage "ownership" of the program by the teachers and schools, while providing training, equipment loans, and technical assistance.

Section 1

Written Summary of Grant Activities

From the ELC Reflections Newsletter, Fall 1997

Students in the Stream

One hot, humid day last August, staff from the ELC joined six brave teachers to search for possible access points to Newell Creek in the canyon next to Highway 213. We hiked through dense blackberry brambles and traversed steep hillsides, trying in vain to find an easy path to the water's edge. Later, shaking mud off our shorts and tending to our scratched legs, we decided that the creek, for now, was barely accessible for agile adults and inaccessible for kids.

Such was the inauspicious start to a brand-new water monitoring program for Newell Creek. Since our canyon visit, we've revised our plans slightly, and the Newell Creek Volunteer Monitoring Program is now up and running. This October, 115 students visited the ELC to test water quality in the creek as it flows through the site.

Students from OCHS test the temperature of Newell Creek at its headwaters near the ELC

The monitoring program involves three 5th and 6th grade classes from Park Place Elementary, as well as three 9th grade classes from the Freshman Campus of Oregon City High School. Students will sample at least twice a year, testing the creek's water quality at various sites around the ELC. By next spring, we hope to find a good access point to Newell Creek in the canyon so students can compare water quality upstream and downstream.

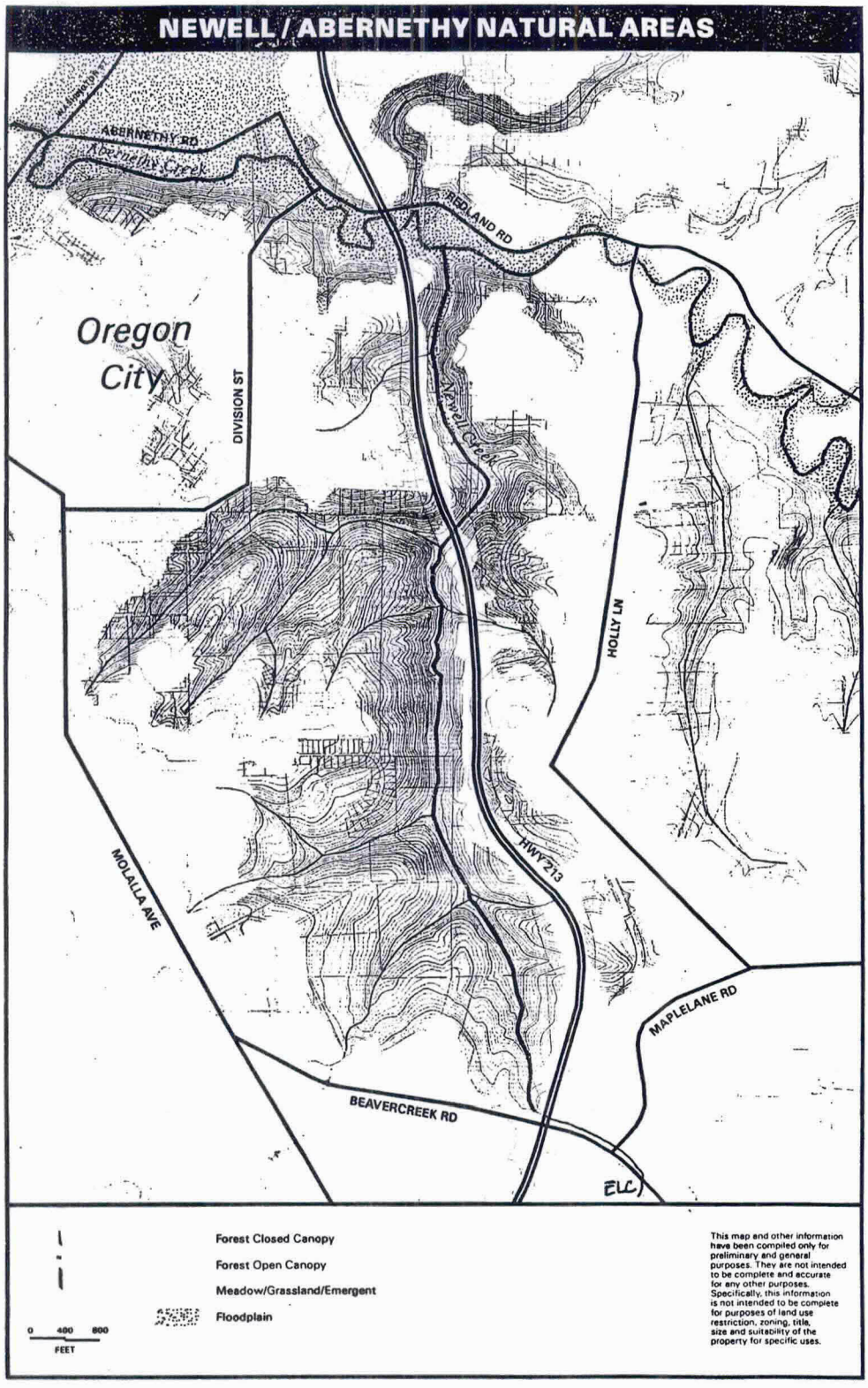
Park Place Elementary students will incorporate the stream monitoring into several subjects, including drawing aquatic insects for art, writing water poems, taking measurements and doing calculations for math, and studying science. Students at the Freshman Campus will focus primarily on physical sciences, using Newell Creek for more advanced water quality testing.

As part of the program, each school will hold a Newell Creek fair this spring to showcase student science projects. Then, in April, the ELC and community partners will host a community-wide event called "Saturday in Our Watershed." Look for announcements this winter!

The first year of the Newell Creek Volunteer Monitoring Program is funded through an environmental education grant from Metro Parks and Greenspaces. After working with participating teachers to evaluate the program, we hope to eventually expand the program to all Oregon City schools, using lessons learned from this pilot year.

by Christine Finlayson
Educational Program Coordinator

Newell Creek flows from its headwaters at the ELC, through the canyon, to its confluence with Abernethy Creek.



Planning the program

Planning for the Newell Creek Volunteer Monitoring Program began in January 1997, with meetings between ELC staff, principals of the two participating schools (Park Place Elementary and Oregon City High School's Freshman Campus), Jane Blair of the Student Watershed Research Project, and Jim Gillen of the Green City Data Project. By the end of the 1996-97 school year, each principal had identified three teachers who were interested in participating in the program and willing to attend a one-week summer training session.

The idea of the grant was to use the Student Watershed Research Project (SWRP) and the Green City Data Project (GCDP) as models to develop a volunteer monitoring program for Newell Creek. We intended to include both water quality monitoring and stream habitat parameters in the program. However, we also needed to develop a monitoring program that would work well within the constraints of Newell Creek. We also needed to find a way to incorporate the program into the existing science curriculum of the Oregon City School District, working with the different requirements of the elementary school (5th-6th grade) and the high school (9th grade) involved.

About Newell Creek

Newell Creek begins as a small stream on the Clackamas Community College campus, flowing through the John Inskeep Environmental Learning Center site. It then flows along the north side of Beavercreek Road (see map), dropping into Newell Creek canyon where Highway 213 and Beavercreek Road intersect.

While the upper watershed is developed and the stream is channelized, the lower watershed in the canyon is much more wild, with tall trees, natural areas, and wildlife. The creek in the canyon is difficult to access, thanks to steep canyon slopes, unstable geology, and a lack of roads or trails.

Newell Creek's flow is highly variable, thanks to large inputs of stormwater from urbanized areas near the headwaters and surrounding the canyon. The creek also receives vast sediment inputs from stormwater, construction sites, and landslides. These characteristics make Newell Creek an interesting creek to study, yet one that is also difficult to access.

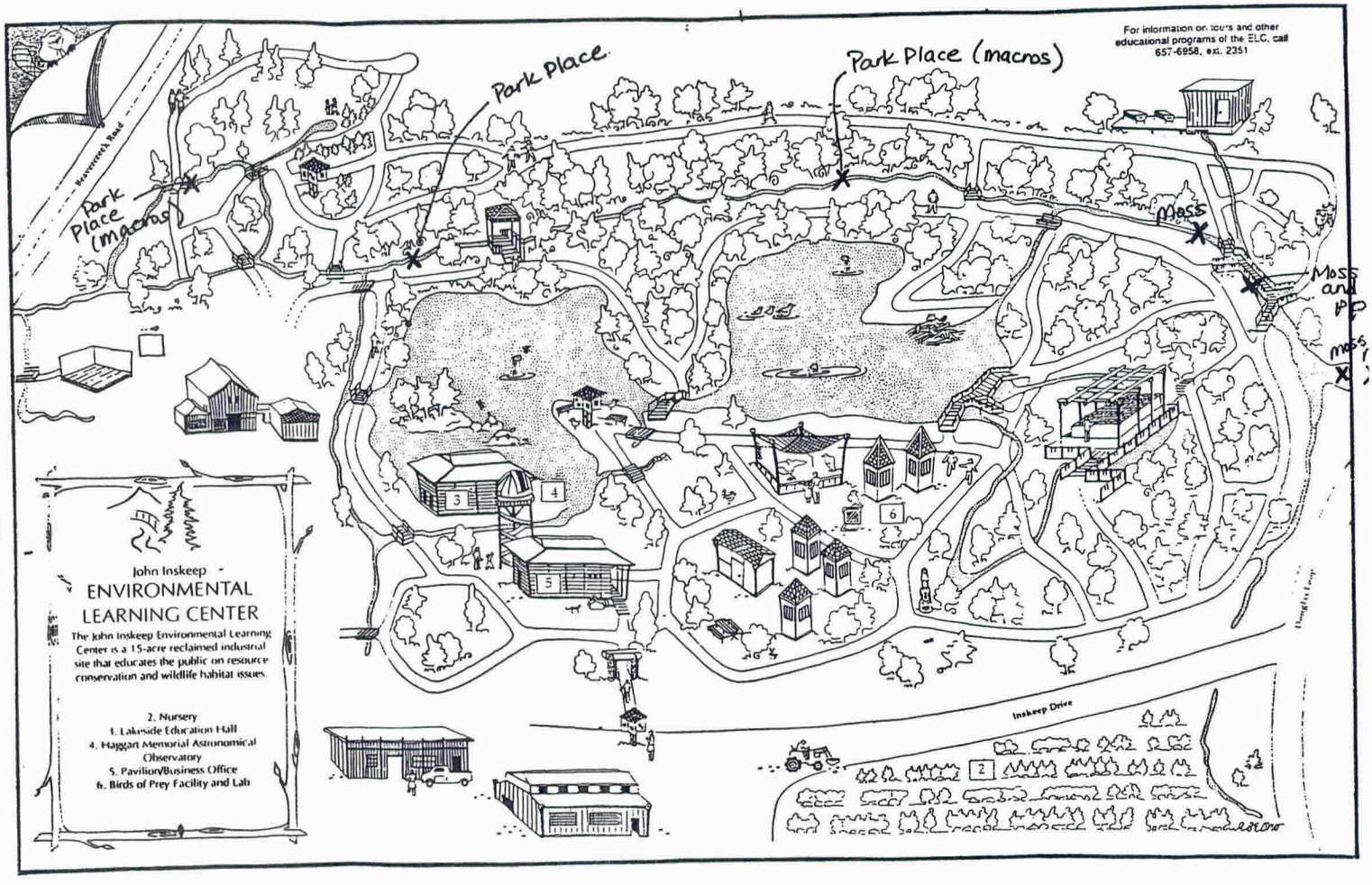
Choosing sampling sites

During winter and spring 1997, staff at the Environmental Learning Center (ELC) joined the City of Oregon City, Metro, Friends of Newell Creek, principals, and teachers to make several forays into Newell Creek Canyon to look for an appropriate sampling site. We had intended to have students sample one site near the creek's headwaters and one in the canyon. By August 1997, it was apparent that access to Newell Creek in the canyon would be difficult, if not unsafe, for students.

We investigated sites from Ogden Middle School (east side), Metro property off Beavercreek Road (south side), and Metro property near the confluence with Abernethy (far north), and Oregon Dept. of Transportation property off Highway 213 (north end). All of these sites were rejected because of difficult access, safety concerns, lack of bus parking, or concerns over damaging the canyon ecosystem from high foot traffic.

As a compromise, we decided to do the first year's sampling at the Environmental Learning Center, near the headwaters of Newell Creek. We identified upstream and downstream sampling sites (see map) for both schools within the ELC property so students could compare data at two locations.

Map of sampling sites at the John Inskeep Environmental Learning Center.



Training Park Place and OCHS teachers

Rather than designing a brand-new training program for the six participating teachers, *[Park Place Elementary: Augusta Shipsey; Terry Ahlgrim; Ali Grimshaw (through March, 1998); Matt Salisbury (March-June, 1998) and Oregon City High School's 9th Grade Campus: Al Denman; Roger Harris; Steven Tebor]* we decided to send the teachers to the first three days of the Student Watershed Research Project workshop (July 28, 29, 30, 1997). We worked with SWRP to design their 5-day workshop to best accommodate our participating teachers during the first three days of training (on these days, the workshop covered the basics of water quality monitoring and habitat studies).

We knew that this training would be an experiment for the Park Place teachers, as SWRP focuses on Grades 7-12. We followed up the SWRP training with one day of discussion and training at the ELC (August 5, 1998) as well as gave teachers one day to meet and plan their curriculum for the year.

Choosing sampling parameters and protocols

For the August 5 meeting, we invited representatives from the City of Oregon City and Friends of Newell Creek to discuss sampling parameters and protocols, and help us evaluate equipment needs for the program. The purpose of this training day was to work with the teachers to adapt the information, skills, and ideas learned at the SWRP workshop to a program specific to Newell Creek.

Parameters

After much discussion, the teachers decided to test for the following parameters:

Park Place	OCHS Freshman Campus
Temperature	Temperature
Dissolved oxygen	Dissolved oxygen
pH	pH
Macroinvertebrates	Nitrates
Mapping and StreamWalk	Phosphates

These parameters were chosen because (a) they represented basic stream conditions and (b) met curriculum needs for each school. Because OCHS's Freshman Campus teaches only physical science (biological sciences are taught in 10th grade at a separate campus), the OCHS teachers could only incorporate physical science parameters (i.e., water quality) into their curriculum. Teacher at Park Place had more flexibility in their curriculum and thus chose to integrate a study of macroinvertebrates, vegetation mapping, and StreamWalk (stream observations) with testing for basic water chemistry.

Protocols and equipment

After attending the SWRP training, the elementary school teachers felt strongly that more simple methods would be appropriate for their classes. They were also concerned about safety issues for their students, particularly the chemicals used in the advanced water quality tests done at the SWRP training. However, the Park Place teachers had enjoyed the training's macroinvertebrate collection and study and thought that their students would enjoy this as

well. They also felt that visual observations such as StreamWalk and simple mapping would be good projects for their classes.

Staff at the ELC recommended the use of ChemEtrics, a color-comparison method for dissolved oxygen, and meters to measure pH because the ELC has had success using these methods with other elementary school classes in our science programs. With the elementary school students using a color comparison method, the high school teachers decided to also use these methods, even though their students would be capable of more advanced chemistry. This would allow the schools to compare their data more readily.

We decided to order equipment to be kept at the schools, rather than establishing a lending library at the ELC. This made it possible for each school to use the equipment in the classroom, even when not visiting the ELC for a sampling visit.

Further adaptations from the SWRP model included using a water quality index from Wisconsin's Water Action Volunteers's Critter Search, which uses macroinvertebrate counts to determine stream water quality (Park Place). We also decided for this pilot year to not follow the stringent quality assurance/quality control procedures followed by SWRP. However, we did have students take replicate samples and record all data.

Preparing to sample

We set the first sampling date for October 2, 1997 (Park Place) and October 9, 1997 (OCHS). Although the initial plan was to have both schools sample on the same day, we didn't want to overwhelm the Environmental Learning Center site and a small section of the creek with too many students. Heavy use of Newell Creek at the ELC site can cause severe streambank erosion, degrading water quality downstream.

Prior to the first student sampling, ELC staff conducted a three-hour "refresher" training session for the elementary school teachers. Several parent chaperones also attended. We provided everyone attending with written instructions for each test, along with a discussion of what the various parameters meant to aquatic life and what factors would cause them to change. At the training, we demonstrated proper use of the equipment and discussed the results of our creek testing.

We also conducted a one-hour training for two of the OCHS teachers prior to their first sampling, because they were collecting different data and using different equipment.

Collecting Data

Each school visited their sampling site at least three times during the 1997-98 year, including a fall, winter, and spring sampling.

	Park Place	**Oregon City High School-Freshman Campus**
Fall	October 2	October 9

Winter	February 3	February 10
Spring	March 30, 31	March 11
	April 1	

Park Place Elementary - Fall Sampling

Park Place Elementary visited the ELC for their fall sampling on October 2, 1997, bringing 100 students through the site in one day. Each class visited for a two-hour time block, and we split each class of 33-35 students into four groups. We used trained ELC staff members as group leaders for this sampling. Each teacher also led a macroinvertebrate station.

After a brief introduction and walk to the creek, students visited two stations: (a) macroinvertebrate collection and identification plus stream observations, either upstream or downstream site; and (b) water quality monitoring (temperature, oxygen, and pH, upstream or downstream site). We were able to accomplish a good amount of work during the students' visit to the ELC. As shown in the curriculum section, the Park Place teachers spent time in the classroom preparing students for the sampling as well as spent class time on following days to analyze the data and summarize the results.

Winter Sampling

On February 3, 1998, another group of Park Place students visited the site for a winter sampling. This time, because the students were preparing for school testing, the teachers decided to allow a small group of honor students to visit the site for sampling, accompanied by the school principal. Twelve students wrote applications about why they wanted to participate in the sampling and all were accepted.

During this visit, the group conducted water quality tests at both the upstream and downstream stations, and collected and identified macroinvertebrates at two sites. After the students decided that the stream's water quality was "okay" for fish based on their sampling, they released silver salmon into Newell Creek. These fish had been raised at the school in cooperation with the Oregon Department of Fish and Wildlife's STEP Program.

Spring Sampling

After the two-hour visits in fall and winter, the teachers expressed an interest in spending a whole day at the ELC, to include an introduction, StreamWalk, water quality monitoring, macroinvertebrate collection and identification, and a discussion of the results.

Consequently, we arranged for the three classes to visit on March 30, 31, and April 1,1998 (30-34 students each day). They arrived at 8:45 a.m. and left at 1:30 p.m. This time, because of the long time period at the site and the three days, we needed to bring in trained ELC volunteers (from our ongoing science programs) to help lead the stations.

During this visit, we also added a stream mapping component where the students observed the creek channel and 20 feet on either side of the creek, drawing trees, shrubs, structures, etc. Prior to doing this mapping exercise on-site, the teachers took their classes to the natural area behind their school and had the students practice drawing aerial views.

After the final spring sampling, the Park Place Elementary teachers spent considerable time with their classes compiling data from the three visits and creating displays for the Student Watershed Fair. Each group of students created a display; the best were selected for use at the fair.

OCHS-Freshman Campus

The teachers from OCHS's 9th grade campus took a different approach to setting up their monitoring, because of logistical problems at their school. At the high school level, the three physical science teachers each had 4-5 classes, or roughly 100-150 students. Each class had short time periods, too short to allow all students to walk over to the ELC (20 minutes each way) and test water quality in Newell Creek. It was also difficult for the teachers because no substitute time was available for the participating teachers.

As a result, the teachers decided to start the fall sampling with a small group of TAG (talented and gifted) students, then look for ways to involve their classes in the program in some way. After making a presentation to the TAG program, the teachers asked for interested students to participate in an after-school program. Eleven students indicated interest and got the necessary permission forms. Unfortunately, this group of students was not in any class together, so all meetings had to take place after school.

Students from the OCHS Freshman Campus first visited the ELC on October 9, 1997 for their fall sampling. They tested the creek's waters for temperature, oxygen, pH, nitrates, and phosphates at two locations: (a) at the headwaters of Newell Creek and (b) downstream of where water from their school's heating/cooling system enters the creek. One of the teachers also ventured down to Newell Creek in the canyon the evening before and brought back a far-downstream water sample for testing and comparison.

A group of 10 students returned on February 10, 1998 and March 11, 1998 to take winter and spring water tests. During each visit, ELC staff and the teachers arranged discussion time for students to analyze the sampling results and plan their research project.

In February 1998, one teacher, Roger Harris, developed a nitrates laboratory to do with all his classes (see example in "Curriculum and Student Data Section"). He collected water from Newell Creek (at the school's sampling sites) as well as invited students to bring in water from their local creeks and tap water to test. All 150 of his students participated in this laboratory exercise, testing water samples in groups.

Prior to doing the testing, Roger Harris led a discussion about nitrates, sources of nitrates, and how they reach the water. The class also discussed acceptable nitrate levels for humans and for different types of organisms. After the students completed their testing, they were asked to decide whether the water would be safe to drink based on its nitrate level and whether they knew enough to say that it was safe to drink.

Hosting a Newell Creek Student Watershed Fair

A Newell Creek Student Watershed Fair was held on April 14, 1998 from 6:00 to 8:00 pm at the Environmental Learning Center. Nearly 100 parents, students, and community members attended.

For the event, students at Park Place created displays for each of nine topics: Stream Walk, mapping, stream shape, dissolved oxygen, pH, temperature, macroinvertebrates, poetry, and publicity). Each display described or included the equipment used in sampling, and presented photos, data, and conclusions (see photos of the event and displays in Section 3).

Students also designed hands-on demonstrations to accompany each display. For example, the stream shape table had a "Stream Erosion Model" that used sand and a watering can to show how flowing water shapes a streambed. The pH station gave visitors a chance to use a pH meter to test creek water, tap water, soda pop, and lemon juice. The macroinvertebrates station showed the types of equipment used and had actual "bug" samples and microscopes for visitors. Park Place students staffed each of the demonstrations, with two shifts, 6-7 p.m. and 7-8 p.m.

Students also had the opportunity to show their parents and siblings the Newell Creek sampling sites.

Park Place Elementary followed up the event at ELC with a Mini Watershed Fair at their school on April 15, 1998, so other students could learn more about the project. Several Park Place students, and two teachers also returned to the ELC on the evening of April 16, 1998 to make a brief presentation about their project to the community.

Students from OCHS's Freshman Campus prepared displays that showed Newell Creek history, and created graphs and displays illustrating the results from their temperature, oxygen, pH, phosphate, and nitrate testing. They also created a Web page for the Internet that showcases Newell Creek and has pictures of them sampling the creek. At the watershed fair, students from OCHS led visitors through their web site and shared what they had learned with the elementary school students.

Hosting Saturday in Our Watershed

A special community event, Saturday in Our Watershed, was held on April 18, 1998 from 9 a.m. to 1 p.m. We had picked this date during Fall 1997 and publicized it, only to discover that it was the designated clean-up day for Oregon City's "First City Clean-Up and Enhancement," sponsored partly by SOLV. When we learned that we were sponsoring potentially competing events on the same day, we decided to coordinate with the city's clean-up and designated a representative to work with the planning committee.

In the end, we offered a five-hour event, beginning with activities to learn about the Newell Creek Watershed, then tying in with watershed enhancement activities in the afternoon. About 15 volunteers attended the event. We set up the Lakeside Education Hall at the

Environmental Learning Center with the students' displays and hands-on exhibits, including water quality monitoring. We also offered a presentation and slide show about Newell Creek and the canyon, led by James Dalton, photographer. Then the entire group toured the ELC site, learning about the creek's headwaters and watershed issues and touring the student's sampling sites.

After the introduction to watersheds, participants could choose between three enhancement activities: litter pick-up, invasive plant removal (at a Metro site near Newell Creek canyon), or storm drain stenciling on the Clackamas Community College campus (where many of the drains enter Newell Creek). Despite the cold and windy weather, volunteers stenciled 19 storm drains. Several bags of litter were collected, and six volunteers visited the Metro site to help remove Scot's broom.

Developing a Curriculum Framework

One goal of the project was to adapt existing curricular materials and the SWRP model to fit the Newell Creek watershed and community issues and needs. The two schools involved in this program had different needs, so they approached this quite differently.

Park Place Elementary

The Park Place teachers used materials from SWRP, the Water Action Volunteers program (Wisconsin), Glencoe Science, Project WILD, and the "Hands On Save Our Streams: Science Project Guide for Students" from the Izaak Walton League as a background for developing classroom and sampling activities. Their monitoring curriculum is described in detail in the section called "Curriculum and Student Data."

These teachers were also able to incorporate the Newell Creek Volunteer Monitoring Program into several parts of their curriculum, including using it as a basis for poetry, creative writing, artwork, and math (see Cross-curriculum Coordination). One related project was that the school has been raising salmon and steelhead, in conjunction with Oregon Department of Fish and Wildlife. Although they began this project prior to the Newell Monitoring Program, this year they were able to directly tie in their water monitoring efforts with the fish raising, using water quality equipment to monitor tank conditions and sampling the creek's waters for fish suitability before deciding to release salmon fry there. Also, in late May, the 5th and 6th grade classes visited Outdoor School, where the teachers used their water monitoring equipment to test different waters for comparison.

Looking ahead to next year, the teachers hope to continue the Volunteer Monitoring Program, assuming they can gain money for equipment needs and bus travel. They have discussed (a) sampling a creek or runoff stream within walking distance of their school, to eliminate the need for buses and (b) sampling Newell Creek or another creek in an area that is less human-influenced, so the students can see a creek in its more "natural" state.

Oregon City High School

Fitting the Newell Creek Volunteer Monitoring Program into the Oregon City High School's Freshman Campus curriculum was a little more difficult. One concession that we made early

on was to have the 9th grade students focus only on physical science, because the high school doesn't teach biology until 10th grade, at a separate campus.

The teachers also identified that not all students would be able to visit the ELC to test Newell Creek and developed a core group of TAG students to work on the program. These students gained the experience of participating in a scientific research project and learned investigation and reporting skills that they can apply to Certificate of Advanced Mastery (CAM) requirements.

Roger Harris, one of the teachers, also developed a nitrates laboratory exercise that became part of his chemistry curriculum, involving another 150 students in water testing. This lab exercise is included in the *Curriculum and Student Data* section.

To incorporate volunteer monitoring program further into the OCHS Freshman Campus's physical science curriculum would be difficult, without a new approach and active support by the school administration. Future work may involve biology students at the 10th-12th grade campus (see the Section 3, Evaluation, for more discussion).

Park Place Elementary

Curriculum, Student Data, Projects

Newell Creek/Park Place Water Monitoring Project 1997-1998

Before visiting the ELC to measure pH, DO, water temp., and macro invertebrates, we taught our classes how to measure and record data for these areas through simulations.

pH

Class time : 1 hour Prep. Time : 1 hour

To teach pH, we showed the students a chart showing acidity and its measure, on a scale. We told them that pH is the measure of the acidity of (in this case) a liquid. We also showed them a scale showing what pH different fish and plant life need for survival.

To sample pH in the classroom, the students were given indicator strips, and containers of tap water, window cleaner, desk cleaner, shampoo, hand soap, and "pine needle tea" (a mixture of needles, soaked in water for a few days). Students used the indicator strips and accompanying charts to determine the pH of the different items. The reason we included "pine needle tea" was to show that changes in pH can occur in nature. Class discussions also involved pH of soils, and different vegetables they may grow in their own gardens that will affect the pH.

DO

Class Time: 15 minutes. Prep Time: minimal (S.W.R.P. info)

Class discussion on oxygen in the air, and oxygen in the water, and how oxygen gets in the water, and why it is needed for fish survival. This discussion was quite enlightening, as you could see students who had not really thought about how fish could get oxygen when they are always underwater. We discussed the colorimeter, but did not use it until we were at the creek.

Temperature

Class Time: 1 hour Prep. Time: 15 minutes

Students were taught how to read thermometers using either degrees Fahrenheit or degrees Celsius, and how important it was to record the temperature in the right format, Celsius, or Fahrenheit. They were shown how to submerge the thermometer without touching the bottom of the container, and read the thermometer without touching the end. Students measured hot and cold tap water, and predicted what the temperature would be for lukewarm water. Then they measured the lukewarm water. Students also completed worksheets that asked them to estimate approximate C and F temperatures for different things such as body temperature, cold drinks, hot chocolate, so they would have some understanding of what types of numbers they should get for temperatures.

Macro invertebrates
Class time: 2-3 hours Prep. Time: 1 hour

Students were given the attached water monitoring forms, with complete instructions on how to conduct a macro invertebrate study. The form that has all of the critters identified and categorized as sensitive, semi-sensitive, and tolerant was reproduced, and the critters were cut out and mixed up. Each group of students was given a "macro invertebrate sample" that they needed to identify, categorize, and mathematically follow the water quality formula to determine the simulated water quality. This exercise was repeated a few days later with a different sample to see if the students could identify the macros and determine the water quality. This exercise proved very valuable when we went to the creek, because the students knew what to look for, and could find macros that would have gone unnoticed without this training.

Data
Class time: 1 hour Prep. Time: 1/2 hour

For each of the above categories, we stressed the fact that all information found was data, and it needed to be written down in a way that could be communicated to others. Students were especially enlightened about the data sheets we had from S.W.R.P. that had scales to indicate what could survive in the water, based on the data we recorded. They seemed intrigued that scientists had a way to look things up, they didn't all work on a brand new discovery, but used old discoveries to help understand every day situations and measurements. Students recorded the data they had recorded from our in-class simulations.

Following our 1st visit to the E.L. C....

Data
Class time: 3-4 hours Prep. time: 1/2 hour

Students brought their data back to class, analyzed that data as a class and within their groups to write up summaries about what could survive in the water, based on their data and the S.W.R.P. data sheets they had. This project was written up following this model: QUESTION, HYPOTHESIS, EXPERIMENT, DATA, CONCLUSION, FUTURE RECOMMENDATIONS.Student samples are attached. At the 5th/6th grade level, this appeared difficult, and we did it has a whole class, with contributions from the students written on the overhead. Students wrote down similar information because it was a joint effort. This was time-consuming, but the students were very proud of their finished products. These 1st writeups were saved for comparison with our 2nd visit to the E.L.C. in the spring.

Additional instruction on watershed-related topics...

Watershed/Erosion

Class time: 2 hours Prep. time: 1 hour

Using a stream table, students predicted, then created different stream patterns by changing the slant of the stream table, the obstacles in the way of the water, and the amount of water poured. Students diagramed and recorded their data on the attached forms from Glencoe Science. Students also created mixtures of sand, gravel, soil, salt, and water, to see which things would dissolve, float, or sink to the bottom of water. See attached forms from Glencoe Science.

Stream Patterns

Class time: 2 hours Prep. time: 1 hour

Using the attached lab from Glencoe Science, students drew stream patterns and made deductions about streams and rivers. They discovered that streams and rivers will not cross, and will start to get wider and straighter as they join other streams. Students then looked for the stream pattern on the Newell Creek watershed map. The area is heavily wooded, making the stream difficult to see, but the students were still intrigued by the large area that it covers, and they could identify what interfering factors there are in the Newell Creek Watershed.

Plant Identification

Class time: 4-5 hours (for a small group) Prep. time: 1 hour

The class went out to "Nature's Place," a small field and wooded area beside our school, to gather leaf and seed samples from plants. Using the Plants of the Northwest book, the samples were identified and glued into an herbarium, following instructions from the S.W.R.P. training.

Preparing for our 2nd trip to the E.L.C....

Class time: 2 hours Prep. time: 1/2 hour

Students reviewed pH, DO, temperature, and macro invertebrates, and remembered quickly what we had done, and how to do it again. The new research question posed was, "How had the pH, DO, Temperature, and macro invertebrate count changed from Fall, 1997? Students also prepared to do some stream mapping. Linear measurement and scale drawings were reviewed. The stream mapping was difficult, and by the time the third class visited the E.L. C., it was simplified and modified, so that drawings were general, not specific.

Follow-Up for 2nd E.L.C. Trip

Data

Class time: 4 hours Prep. time: 1/2 hour

Students analyzed their new data, comparing it to the S.W.R.P. charts, then comparing it to the fall data. They wrote up their data following the same format as in the fall, with QUESTION, HYPOTHESIS, EXPERIMENT, DATA, CONCLUSION, AND FUTURE PLANS. Students still needed to work together to do this, but more of the steps were done independently, so their recorded information has more variety than the fall writeups.

Presentation

Class time: 5 hours Prep. time: 2 hours

Students worked in small groups to prepare presentations that would explain their research project and results to others. Some students went back to the E.L.C. on their own time to create a video and excellent photographs to document their stream walk data. All students prepared a presentation. The best were chosen to be on display at the E.L.C. for the Student Watershed Fair. Others were on display in the school. These presentations were high quality, and showed a lot of pride on the part of the students. Students helped set up and participated in the Watershed Fair at the E.L.C. on the evening of April 14th. Students also did a "Mini Watershed Fair" at school for the other students. They had Newell Creek water to test in addition to their displays.

Suggestions for the future...

1. Create a pretest, post-test for students.
2. Test other water using the same sampling techniques, for example, creek water near Park Place School, since the other end of Newell Creek has such difficult access.
3. Have students meet with DEQ scientists, or OR F & W members who can show how this data actually gets used.
4. Continue teaching students how to monitor water, and make efforts to keep watersheds clean.

CROSS CURRICULUM COORDINATION

SCIENCE

SCIENCE: The three classes helped the Oregon Deartment of Fish and Wildlife by participating in a salmon raising project. There were three batches that were raised at the school for release in the wild. The middle batch was released at the Newell Creek site in hopes that when they return, the creek will be a viable habitat for the salmon. The students monitor the water quality in the aquarium at school and keep daily records or their results. They recorded the water temperature, the pH reading, and the ammonia levels in the tank. They also kept records of the mortality rate of the eggs and fry. This program helped complete the cycle of the importance of water quality to all forms of life and gave the students a look at the "future" of the stream.

SCIENCE AND ART The students also briefly looked at the adaptation of fish to their environment. They studied the size, shape, coloration, feeding habits, habitat and other factors of their survival. They then had the assignment of creating their own fish and identifying its environment. This clearly showed that they realized the complexity of these creatures and their needs for a specific environment.

In hopes of enforcing the concept of the entire ecosystem being interrelated, we studied the water cycle. The students were able to see that, even though we could see the beginning of Newell Creek, it involved more than what we saw on the site to provide that water for the stream. The students drew their own interpretation of the water cycle. They learned the difference between scientific or technical drawing and imaginative drawing.

CREATIVE WRITING

POETRY:There were several different writing assignments given in connection with the water study. Beside the knowledge gained in technical writing by using a set format for their field study reports, the students also did creative writing in a poetry form after their visits to the sites. They used a "senses" poem to record an emotional reaction to the site and what they had felt and observed. These poems were written both after the fall and spring visits. They were asked to pay close attention to details and presentation, as well word choice, in these assignments which were skills the teachers found important in connection with this project.

CREATIVE WRITING AND ART: This project was a creative assignment combining their art and writing skills. The students used tempera paint and soap bubbles to print on paper. After sharing stories of water creature folk lore from around the world, they then observed their art work to "find" water monsters in the bubbles. Using this creative project, they created stories about these found creatures. Their creative efforts were mounted and shared both orally and visually with their classmates during the Halloween season.

PHYSICAL EDUCATION

The students played the game Hooks and Ladders during their P.E. class. The purpose was to recognize that some fish migrate and to identify the stages of the life cycle . They also learned the limiting factors affecting Pacific salmon in particular as they complete their life cycle.

MATHEMATICS

The students used math skills in computing the viability factors of the macroinvertebrates. There were also some calculation sheets they did in their brief study of salmon.

OTHER: The teachers used many resources, but, in particular, the *AQUATIC* project wild, both the 1988 and 1992 editions, were extremely helpful in augmenting our cross curricular coordination.

DATA

October, 1997

Question: What is the quality of the water in Newell Creek at the E.L.C.?

Hypothesis: I think the Water Quality of Newell Creek is poor.

Experiment: Visit Newell Creek and measure the temperature, pH, Dissolved Oxygen and macro invertebrates.

Conclusion: Newell Creek in the E.L.C. has a pH that can support trout, mayfly, stone fly, and caddis fly larva. The D.O. is 7. This could support salmon and trout. The temperature is middle range. Some plant life, fish diseases,s most bass, crappie, bluegill, carp, catfish,and caddis fly can survive in this temperature range.

The macro invertebrates indicate a water quality index of 26. This is excellent water quality.

Further Questions:If we went again, would we find more critters because we had experience?

What would the water of Newell Creek be like at other parts of the creek?

Further Plans: Go back to the E.L.C. at a different time of the year and test a different part of Newell Creek.

Data: October 3,1997

April, 1998

Question: What changes have occurred in the quality of Newell Creek at the head waters in the E.L.C. since October 3, 1997?

Hypothesis: I think the pH is going to be lower than in October. I think the temperature is going to be higher since October. The macro invertebrates only live in clean water so I think we might catch more macros then we did in October.I think the DO will be lower.

Experiment: Use the same tools and sites to measure the pH,DO,temperature,and macros of Newell Creek.

Conclusion:The pH level has gone down between October and April. It went from 7.0 to 6.5. The DO went higher between October and April. It went from 5.5 to 7.0. The temperature went higher between October and April.It went from 42.8 f to 52.7 F. The water quality went up between October and April. It went from 26 to 33.

Table of Contents

Science
10-3-917

The temperature is in the middle range. Some plant life, Some fish diseases Salmon, Trout, Stone fly, Mayfly, Caddisfly, and water beetles can live here. The macroinertebrates indicate a Water Quality index of 5. This is poor water quality.

FURTHER QUESTION: Would the water quality be different at a different time of year? Would we find more critters because we've had experience? Would the water quality of Newell Creek be different at the other parts of the creek?

FUTURE PLANES: Go back to the ELC at a different time of the year. Test a different part of Newell Creek.

4 where we

Hands On Save Our Streams

Stream Walk Survey

Student's Name: [illegible]

Date of Stream Walk: 10-2-97 Name of Stream: Newell Creek

Does the stream flow in a straight line or does it curve? curve

Using the following guide, describe what the stream bed is made of. Check all that apply.

- ☐ Bedrock (large area of rock covering streambed, cannot be moved)
- ☑ Boulders (watermelon-size and larger)
- ☐ Cobbles (orange-size)
- ☑ Gravel (grape-size)
- ☑ Sand (smaller than grapes and feels gritty)
- ☑ Silt (smaller than sand and feels silky)

What color is the water?

☑ Clear ☐ Tea-colored ☐ Oily ☐ Milky ☐ Muddy ☐ Black ☐ Grey
☐ Other: _____

Is there foam on the surface of the water? No

Is the stream the same color or does the color change? ?

Do you see trash in or around the stream? Describe the kinds of trash you see. No

Do you smell any unusual smells such as oil, sewage or rotten eggs? ☐ Yes ☑ No
Describe the smells. _____

What do you see on the streambanks? ☐ Concrete ☑ Soil ☑ Rock ☑ Vegetation/roots

If there is vegetation growing on the streambanks, what types do you see?

☑ Trees (woody plants 6 feet tall or taller) ☑ Shrubs (woody plants shorter than 6 feet)
☑ Grasses and Vines

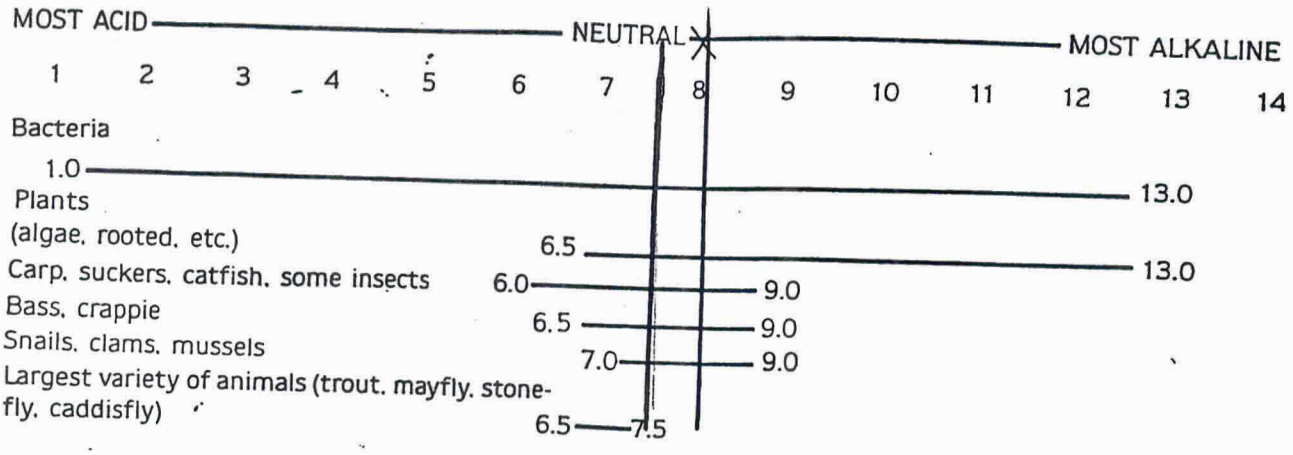
Is the land along the stream:

☐ Paved ☐ Lawn ☐ Trees ☑ Other path

4

4

pH Ranges That Support Aquatic Life



Temperature Ranges (Approximate) Required for Certain Organisms

Temperature	
Greater than 68° F. (20° C)- warm water	Much plant life, many fish diseases Most bass, crappie, bluegill, carp, catfish, caddisfly
Middle range: 55° - 68° F (12.8 - 20° C)	Some plant life, some fish diseases Salmon, trout, stonefly, mayfly, caddisfly, water beetles
Low range: Less than 55° F (12.8° C) - cold	Trout, caddisfly, stonefly, mayfly

Dissolved Oxygen Requirements for Native Fish and Other Aquatic Life

D.O. in parts per million

(below 68° F.)	(above 68° F.)
Cold-water organisms, including salmon and trout	Warm-water organisms (including fish such as bass, crappie, catfish and carp)
6 ppm	5 ppm

From "A Lesson Plan for Some Water Investigations." *Investigating Your Environment Series*. U.S. Forest Service, Revised 1977. Printed with permission.

Stream 1

WAV 's STREAM QUALITY DATA CHART

Sensitive		Semi-sensitive		Tolerant	
Dobsonfly larva		Dragonfly nymph	1	Black fly larva	1
Caddisfly larva		Damselfly nymph	1	Midge larva	1
Stonefly nymph		Crayfish		Aquatic worms	1
Mayfly nymph	1	Beetle larva	1	Leeches	1
Water penny		Cranefly larva	1	Snails (left foot)	1
Snails (right foot)	1	Scud	1		
		Aquatic sowbug	1		
		Clams			
Total number of ✓ in this column	13	Total number of ✓ in this column	5	Total number of ✓ in this column	3
Sensitive group total (total number of ✓ above x 3)	39	Semi-sensitive group total (total number of ✓ above x 2)	10	Tolerant group total (total number of ✓ above x 1)	3

Add the three group totals:

Sensitive group total = 39

Semi-sensitive group total = 10

Tolerant group total = 13

GRAND TOTAL 62

Stream Quality Assessment

23+	Excellent water quality
17-22	Good water quality
11-16	Fair water quality
1-10	Poor water quality

Make a list of other animals and invertebrates you saw during this activity:

Rory [illegible]
Elc visit
10-2-97

Today we went to the ELC. It was pretty fun.

First we mesured the temperatur of Newell creek and the pH. Then we messured the pH in deit coke. After that we messured deit coke with backing soad a in in it.

The we went to another part of the creek and we tryed to catch litle critters. At firts we wen't very sucsful, but then we started catching quite easally because we figuered out the trick to catchin them. I had a lot more fun than I thought I would. :)

Newell Creek

4-1-98
science

Question: What changes have occurred in the quality of Newell creek at the head waters in the EIC since October, 1997?

Guess: pH - Greater, DO - Greater, Tempeature - caller, Macro inverlabrates more.

Experiment: USe the same tools and sites to mesure the pH, DO, temperatures and macroinvertebrates of Newell Creek.

Data:

pH	DO	Temperature	Macro
8.1	8	12°C	T=3 SS=4 S=9 WQ

Fishand other organisms can survive at this level.

The macroinvertebrate counts should probably not be compared because in April we had more time. However, many more sensitive macroinvertebrates were visable, suggesting that the water might be better quality.

Newell Creek (your observations)
35 Sentence log

Future Plans
People should clean up the pond. Students should continue to study the water Quality- Macro invertebrates should be found in a specific size area.

Circle the land uses you see while walking along the stream:

roads	houses	apartments	schools
shopping malls	crop fields	golf courses	pastures
parks	mining	sewer manholes	landfill
forest	discharge pipes	construction sites	cut trees

Are there any other land uses not listed above? _____

Indicate the location and describe each land use on the stream map.

Do you see any animal tracks? ✓ Yes ☐ No
Draw pictures of the animal tracks.

Do you see animal houses, such as beaver dams or bird nests? ✓ Yes ☐ No

If yes, describe: spider web

Describe the animals, birds and other wildlife you see. birds, ducks

Do you see fish? ☐ Yes ☐ No How large are the fish? ___ inches How many fish do you see? _____

Do you see or hear insects? ✓ Yes ☐ No

What kinds of insects do you see? water skiper

What other observations can you make about your stream? Describe them. _____

Save Our Streams Science Project Guide for Students
Izaak Walton League of America
Save Our Streams Program
707 Conservation Lane, Gaithersburg, Md. 20878-2983
(800) BUG-IWLA

MACROINVERTEBRATES - CRITTER SEARCH

List the critters you find, and how many.

CRITTER	HOW MANY?	TOLERANT, SENSITIVE, OR SEMI-SENSITIVE?
scud	IIII	semi
aquatic worm	1	tolerant
right footed snail	IIIII	sensitive
Midge larve	II	tolerant
Mayfly Nymph	I	sensitive

BACK IN CLASS WE WILL DO THE CALCULATIONS TO FIGURE STREAM QUALITY

T=3 = 39
S=8
S=27

Mapping Vegetation

1. Measure a space 100 feet long, and no less than 10 feet wide.

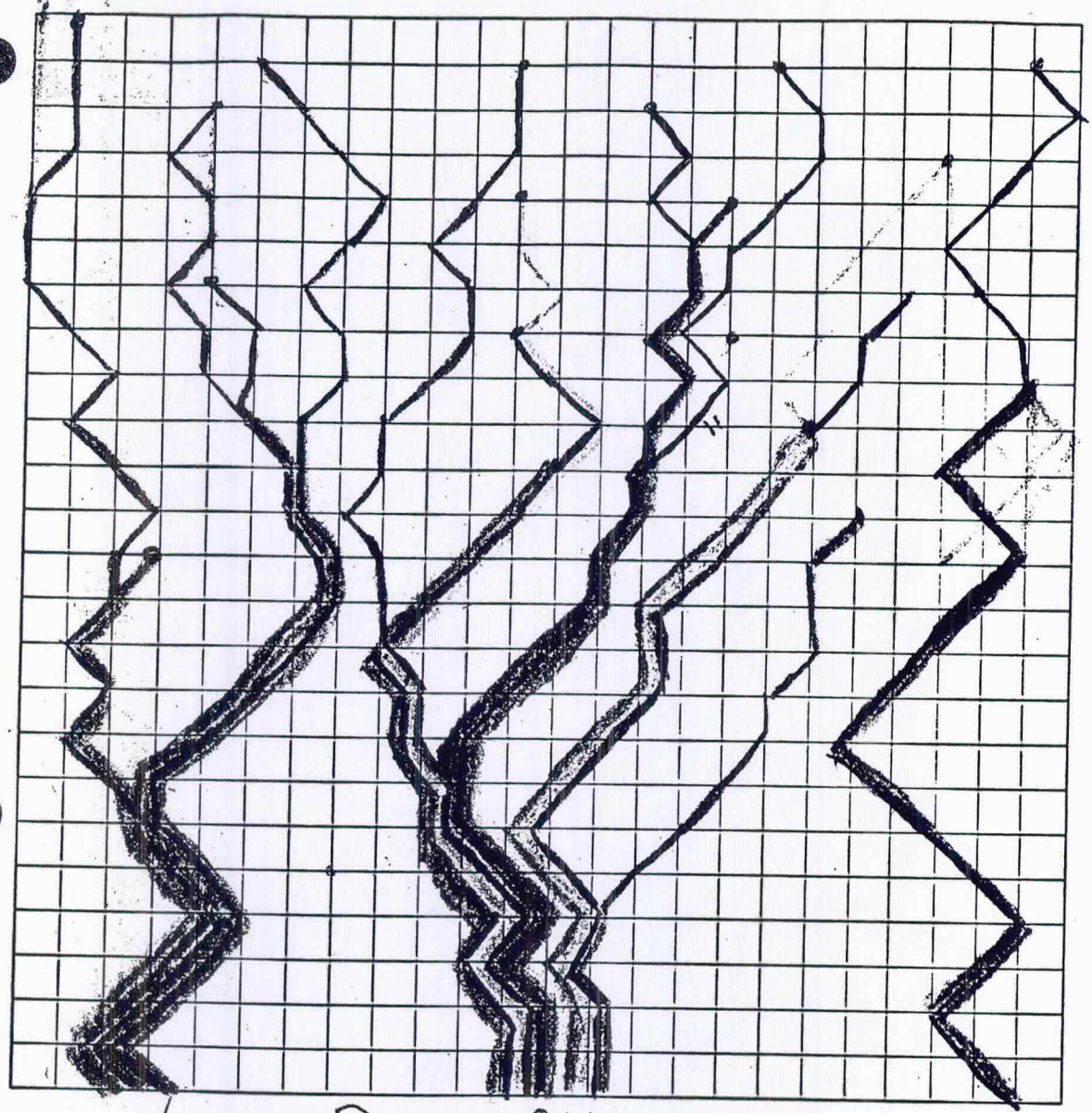
2. Map three layers of vegetation.*
    1. Ground cover and bare ground. (Include all small plants without woody stems.)
    2. Shrub layer. (Include all plants with multiple woody stems, significantly shorter than trees in the area.)
    3. Tree layer. (Include the tallest layer, generally plants with single, woody trunks that will grow to 25 feet or taller.)
3. Each square on your graph paper represents one square foot. Use your measuring tapes for reference. You do not need to identify the species of vegetation, just the general categories - bare ground, ground cover, shrubs, trees.

*In an area with lots of vegetation, you may need to make three separate maps. In areas with light vegetation you may make one map, including all three areas.

4. Map any man-made structures that may affect the stream. (Include storm drains, pavement, concrete, buildings, roads, etc.)

DATA AND OBSERVATIONS

FIGURE 28-1



ANALYSIS

What do your stream patterns look like? My stream patterns look like they have alot of curves + connections.

CONCLUSIONS

1. Why did the streams in the game not flow toward the top of the paper? The stream doesnot flow upwards because water can only flow down. If it flowed up, it literaly would not move.

NAME ____ DATE ____ CLASS ____

2. Why does a real stream often change direction even when running down a steep hill?

Because obsticals will push water and force it to make its way around the obstical, creating sort of a tiny island.

3. Look at a picture of an actual drainage system, such as the Mississippi River drainage system. How is your stream pattern similar to the real one? My stream has a lot of things like the Mississippi River like my stream starts out small and flows in to more streams to create a larger stream.

4. Compare your stream pattern to the stream patterns of other students. Are they similar? What can you infer from this? Yes + no. The streams are Simular because the start small + end large. The mainly have a lot of run ins also

GOING FURTHER

Draw objects such as rocks and trees on a piece of graph paper. Then place 20 dots at random locations on the paper. Do steps 5–9 of the Procedure. When you get to a rock or a tree you must go either right or left until you are able to continue down. Do these objects change the pattern? How is the pattern changed?

DISCOVER

Look up more information about rivers and stream patterns in an encyclopedia. Develop a model showing other types of stream patterns or make a poster showing two actual examples of the patterns. Share your model or poster with the class.

The stream pattern didn't really change but If my streams were to hit a rock, tree or dirt pile they would flow around the obsticle to creat another connection. like this!

(5) good!

NAME _____ DATE 9-23-97 CLASS _____

LAB 30

Chapter 15

Rivers

Rivers are important contributors to erosion because rivers affect large areas of land. Most landscapes, even desert areas, are affected by running water. The work of running water includes weathering rock, transporting sediments, and depositing sediments. All of these processes go on at the same time in all stream channels.

OBJECTIVES

In this experiment, you will

- show how a delta forms and
- observe how rivers cause erosion.

EQUIPMENT

- 2 blocks (wood)
- pail
- pebbles (coarse, blue)
- pinch clamp
- rock (flat, about 6 cm high)
- sand (fine)
- sprinkler can
- stream table
- water

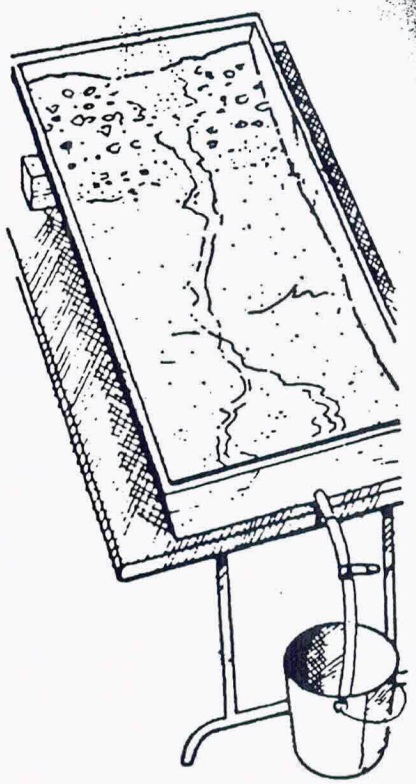


FIGURE 30-1

PROCEDURE

1. Set up the stream table as shown in Figure 30-1. Be sure the pinch clamp is tight so no water can escape.
2. Mix the blue pebbles and the fine sand and place them at the upper level of the stream table.
3. Form a "lake" at the lower end of the stream table. With your finger, make a small trench about 1 cm deep from the upper end of the stream table to the lake.
4. *Gently* pour the water over the upper level of the table (the upper end of the river). Observe what happens. Diagram what occurs in Diagram A in the Data and Observations section.
5. Now, alternately use more and then less water and note how this affects the structure formed.
6. Re-form the river, adding two or three sweeping curves. Bury the rock along the outside of one of the curves. Mark on Diagram B where you bury the rock.
7. Let the water run slowly through the river. Observe what happens. Diagram what occurs in Diagram B in the Data and Observations section.

NAME _____ DATE 9-22 CLASS 5/6 Ahlgrim

LAB 31

Transporting Soil Materials by Runoff

Chapter 15

If the water from rain and melted snow doesn't evaporate or soak into the soil, it flows into rivers and streams. This water is called *runoff*. Some minerals in the soil are dissolved and carried away as a solution by runoff. Other materials are picked up or pushed along the ground surface by runoff. Eventually, all of these materials are deposited.

OBJECTIVES

In this experiment, you will

- observe which of the soil components goes into solution, and
- determine which surface materials are carried a long distance and which are deposited nearby.

EQUIPMENT

- clay or mud (60 mL)
- 5 glasses (clear plastic)
- gravel (60 mL)
- salt (60 mL)
- sand (60 mL)
- spoon
- water

PROCEDURE

1. Put 30 mL of clay into the first glass, 30 mL of gravel into the second glass, 30 mL of salt into the third glass, and 30 mL of sand into the fourth glass.
2. Take the leftover 30 mL of each material and put it into the fifth glass.
3. Add water to each glass and stir well. Record your observation in Table 31-1 of the Data and Observations section.
4. Observe the glasses three times during the next 30 minutes. Record your observations in Table 31-1.

DATA AND OBSERVATIONS

TABLE 31-1

	Beginning	1	2	3
Clay	It looks like coffie but not all the way mixed	Same	Same	In the middle it's more clear
Sand	It looks like under water in a river.	Same	Same	same
Salt	It looks like water and milk mixed.	more at bottom.	all at the bottom	Same
Gravel	It the Clackamas but more clear.	same	Same	same
Mixture	a polluted river	same	Same	Same

Newell Creek

Ducks swimming and waters flowing
Wind blowing and birds chirping
Fresh air and fragarant flowers
Spring leaves and slimmy bugs

I feel that Newell Creek is a healthy Creek

Newell Creek

Rushing water and green malards.
Birds singing and gravel crunching
under my feet.
The sweet smells of nature
and fresh green leaves.
The brown moist soil and
the feathery green grass.
I think nature is beutafull

Wonderful Stream

Wobling ducks and swimming turtles

Birds chirping and leaves rustling

Sweet flowers and fresh air

Gushy mud and wet water

I think Newell Creek is wonderful.

SEA MONSTER

Have you ever seen a sea monster? Well if you haven't your going to scared when you see mine!

It's really big, over 980 feet long and over 35 tons in weight. It also has three sets of gills (and two sets of nostrils for out of water experiences), spikes all down its back, wings about 420 feet long for out of water flying, and two heads. On both of the heads it has long horns over 112 feet long. For really deep swimming (from one of its ancestors) it has a light that hangs from the top of its head.

My water monster likes to eat large boats, killer whales, blue whales and great white sharks. But for appetizers it will eat anything.

It lives inside caves in the deep waters of the Pacific Ocean. It has no swimming limits. It can swim from the surface to the deepest, darkest crevices in the bottom of the ocean.

Well, if you haven't heard enough to picture my sea monster then just look at the illustration and then you will see.

By:

Oregon City High School
Freshman Campus

Laboratory, Student Work

Newell Creek - Testing for Nitrates

First & Last Name _____

Lab Period ___ Date Due _____(ATBOC)

Research Associates _____

Background - Nitrogen makes up about 80% of the air we breathe. It is present in all proteins, found in all living things, and is an essential part of all ecosystems. Nitrogen can be divided into two forms: organic and inorganic. Organic nitrogen is found in materials that either are or were once alive. Inorganic nitrogen may be found as a gas, nitrites, nitrates, or ammonia.

NITRATES

Nitrates are an essential nutrient for plant growth and are a main ingredient in fertilizers. Rain can wash nitrates from farm fields, lawns, and golf courses into streams. In nature, nitrates are formed by bacteria breaking down ammonia and other compounds that contain nitrogen.

Too much nitrate can cause problems such as excessive algal and plant growth. Ecologists generally agree that a lake should not have more than 0.30 ug/g of total nitrogen in it. Amounts greater than this can cause algal blooms if other nutrients are also present.

Nitrates in drinking water can also be a health hazard. Most experts agree that safe drinking water should have less than 10 mg/l of nitrate. Concentrations of greater than 90 mg/l can be directly harmful to many aquatic animals. Some, especially those such as salmon, that prefer cold water have lower tolerances.

AMMONIA (NH_3)

Ammonia (NH_3) typically comes from the decay of organic material such as dead plants or animals, or excrement from feedlots or sewage. We expect to find ammonia in ponds and marsh water and perhaps slow-moving steams since there is often decaying matter present as bottom ooze. However, we would not expect to find ammonia in a fast-moving stream. If we find ammonia there, we should suspect sewage input, farm runoff or heavy fertilizer use in the area. Circle the boldface ammonia header just above this paragraph.

In Feedlots, cattle produce large quantities of urine and fecal matter and this can create serious nitrogen pollution problems for nearby streams. Some crops, such as corn, require large quantities of nitrogen to grow. Fertilizers containing nitrogen are washed off the land into rivers during heavy rains. Ammonia is broken down by bacteria to form nitrates.

NITRITES

Nitrites are a short-lived form of nitrogen that is quickly converted to nitrate by bacteria. In the human body, nitrites can cause serious blood disorders that can lead to illness, or in the case of infants, death. This is the reason that nitrate levels in drinking water are of concern.

Water Quality Summary: Nitrogen

Problem: In some waters, where phosphorus does not limit algal growth, nitrogen may be the limiting factor. Excessive nitrogen can support algal growth. High ammonia leads to loss of dissolved oxygen through nitrification. Nitrate, while an important indiator of external sources of nutrients, is not in itself particularly harmful.

Causes:

- Nitrogen can come from manure sources, such as treatment lagoons and overfertilized fields.

- In comercial inorganic fertilizers, nitrogen is used in the greatest quantities of any nutrient. Runoff from agriculture, forestry, golf courses, and lawns is high in N, expecially if runoff occurs shortly after fertilizer applications.
- Ammonia comes from decomposition of organic matter, expecially in the absence of oxygen.
- Municipal and industrial wastewaters can contain eitherammonia or nitrate.
- Contaimated groundwater seeping into streams may be a source of nitrogen.

Today's Investigation - Please use complete sentences.

1. Where did your water sample come from?

Auxiliary Scoring Guide -
Not on task during lab -
Safety voliation -
Paper not neat -

2. What dangerous metal do the A-6900 foil packs contain?

3. How do you dispose of your test sample when you have completed your testing?

4. What was the level of Nitrates in your sample?

5. What are three possible sources of nitrates that could be found in a body of water?

-
-
-

6. What is considered a safe level of nitrate for drinking water?

7. What concentration of nitrate-nitrogen is considered directly harmful to many aquatic animals?

8. What is a feedlot?

9. What do bacteria have to do with nitrates?

10. What percent of our air is nitrogen gas?

11. What are common causes of ammonia in water?

12. How would you judge the water quality of your water sample concerning nitrogen levels?

Monitoring Results and Interpretation

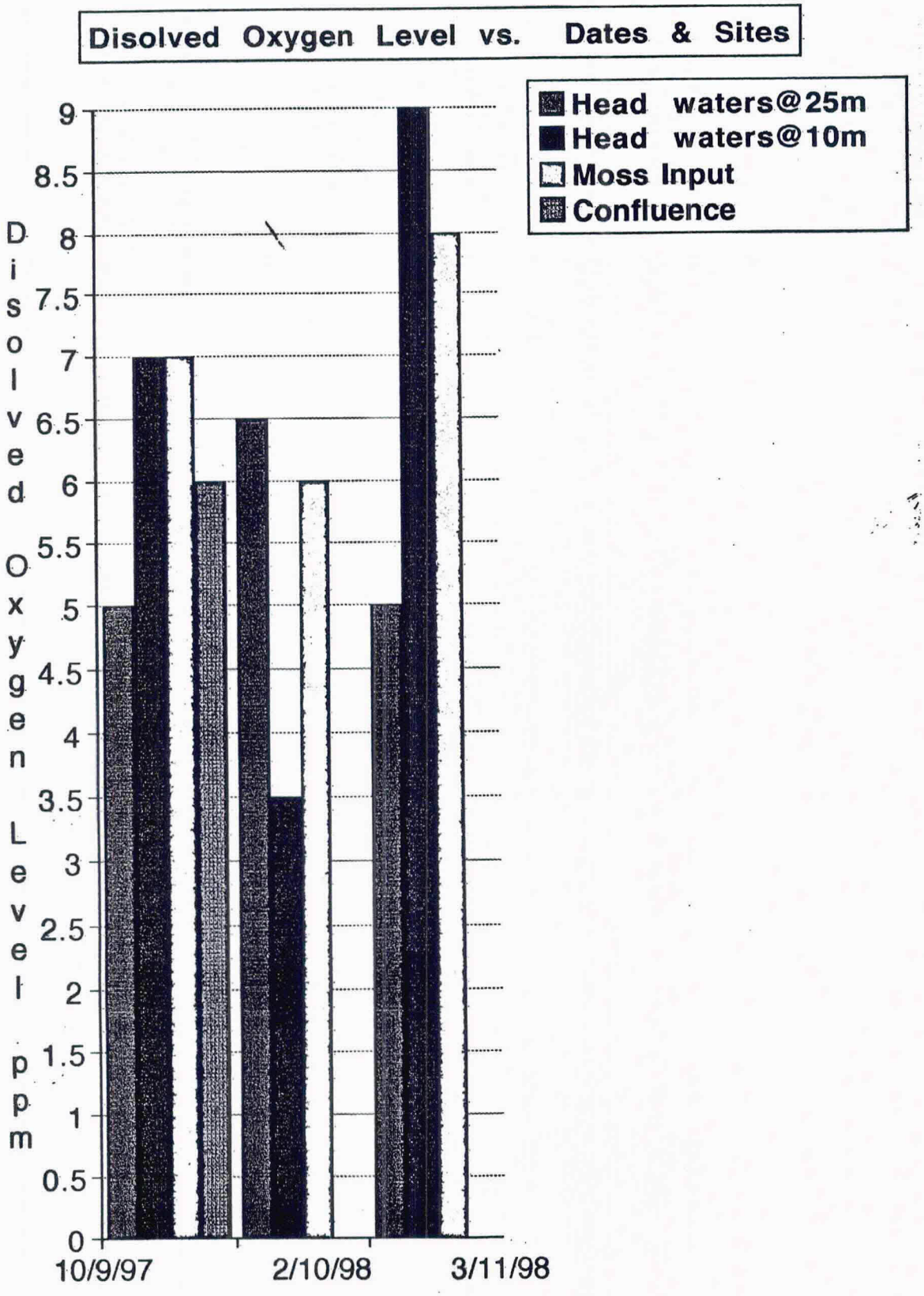
* does not include tests in March (shown in graphs)

Newell Creek Water Quality Test Results

	A		B	C	D	E	F
1	Site		Temp.(F)	pH	Nitrogen(ppm)	Phosphorus(ppm)	DO(ppm)
2							
3	Headwaters@10m	10/9	52	6.85	0.1	0.175	5
4		2/10	44.5	6.7	0.5	0.1	6.5
5	Headwaters@25m	10/9	54	8.2	0.1	0	7
6		2/10	42	6.7	0.2	0.05	3.5
7	Moss Input	10/9	59.5	7.8	0.3	0.6	7
8			60	8.2	0.8	0.4	7
9		2/10	52	6.85	0.8	0	6
10	Confluence 10/8		58	7.5	0.5	0.25	6
11							
12							

Newell Creek tested for orthophosphate, in other words reactive phosphate. Most of the areas tested had 10 - 60 times the amount of phosphate than was needed to have a significant impact on plant growth. In fact some of the levels of reactive phosphorus were higher than the highest amounts of total phosphorous levels allowed for other creeks in the area. Our average phosphorous level was 0.196875 which is twenty times more than the needed amount. The high phosphorous concentrations in the surface waters may indicate fertilizer runoff, domestic waste discharge, or the presence of industrial effluents or detergents.

Example graphs from student displays
Newell Creek Student Watershed Fair in April, 1998



Section 2

Written evaluation and comments

PROGRAM EVALUATION

Informal evaluation of the Newell Creek Volunteer Monitoring Program continued throughout the 1997-98 school year. Staff from the Environmental Learning Center met with participating teachers after the initial fall sampling, as well as used ongoing "check-ins" via phone, to debrief, troubleshoot any problems, and plan changes for the next sampling. For example, after the Fall 1997 sampling for Park Place, it was clear that we needed to expand the amount of time that the students were on-site. In the spring, we arranged a 5-hour sampling visit.

We also held final evaluation meetings with all six teachers during May, 1998. A meeting on May 9, 1998 involved Park Place teachers Augusta Shipsey, Terry Ahlgrim, Matt Salisbury (a substitute teacher who took over Ali Grimshaw's class after she went on maternity leave). A meeting on May 27, 1998 involved OCHS teachers Al Denman, Roger Harris, and Steven Tebor.

SUMMARY OF LESSONS LEARNED

The following section summizes lessons learned from the first year of the volunteer monitoring program. Detailed evaluation comments from teachers and ELC staff are also included later in this section.

Suggestions from Park Place Teachers

- Develop a pre-test and post-test for participating students. This would enable us to track actual knowledge and skills gained by students in the program, instead of relying on anecdotal evidence. It would also help us gear the program to meet certain CIM benchmarks.

- Test other creeks or runoff water using the same sampling techniques. For example, test water near Park Place School since the other end of Newell Creek has such difficult access. Sample another part of Newell Creek (a site that is less human-managed) or another creek nearer to the school to allow for comparisons.

- Have students meet with experts from the Oregon Department of Environmental Quality and the Oregon Department of Fish and Wildlife, who can show them how the data is used to make decisions. This would help ensure that students get the big picture of why they're doing the monitoring.

Suggestions from ELC Staff

- Consider designing a water monitoring training program for participating teachers, to be held at the ELC. This program would be geared to local streams, curriculum needs and constraints, and the types of equipment used. It would also put participants in touch with local resource people.

- Establish a lending library for sampling equipment. Schools can check out some equipment for long-term use at the school, while the bulk of equipment could stay at the ELC for use by a variety of schools. This approach allows us to work with more schools and to have enough equipment to separate large classes into small groups for sampling.

- Concentrate on recruiting "graduating" 6th grade students who are moving on to Ogden Middle School as mentors for the younger Park Place students.

Suggestions from OCHS

- Instead of relying on building adminstrators to recruit participating teachers, meet directly with teachers to introduce the idea of the project and explain the expectations or grant requirements. This would help ensure that the teachers who agree to participate in the project can make the necessary time commitment.

- Continue using the ChemEtrics method for elementary school but investigate using more advanced chemistry tests for high school classes. Students experienced problems with color-tinted water in the nitrate and phosphate tests, which made it difficult to read the low values. These students could use SWRP protocols or Hach kits directly.

- Look for opportunities to continue the project with Talented and Gifted (TAG) students, or with biology classes at the high school. Also, consider working with the curriculum director for the high school to establish an environmental science class that could include water monitoring.

EVALUATION COMMENTS

ON USING SWRP TRAINING FOR THIS PROGRAM

The teachers had mixed feelings about using the Student Watershed Research Project (SWRP) training to prepare them for the program. All six teachers thought the SWRP training had some merit, especially for providing background information, networking with other teachers, and seeing a variety of sampling sites. The teachers also liked having the monitoring manual to refer to during the year.

Park Place Elementary: Although the Park Place teachers said that the SWRP training was fun and they couldn't have done the project without training, they did have some concerns with the focus on middle school and high school. As Terry Ahlgrim said, "The SWRP people were scientists and not educators. They were way over our heads most of the time... It was aimed for older students than what we were going to be doing, so we had to constantly - as we we were trying to listen - think 'How are we going to make this applicable to 5th and 6th graders?'"

And, Augusta Shipsey added, "There was a lot of technical data. They were using micrometers and we were using yard sticks... They had a lot of technology that was beyond

the scope of what we wanted our students to receive from this project."

However, they did feel that the broad background presented at the training was necessary knowledge. As Augusta said, "One thing that is helpful to me as a teacher is to have background broader than what I'm going to be using on the project so if a student is ready to run with some concept or they have questions that aren't in the "text," then I'm able to guide them. I don't have all the answers, ever... If I'm only trained to do what I'm going to do, then I can't enable the kids who are more sophisticated to continue."

The teachers also referred to the SWRP manuals throughout the project, both for background information and to adapt activities to the elementary school level. "When we wanted to do mapping, we could refer back to the SWRP manual and find something that we could modify for our use," Terry said. They also used Project WILD, Water Action Volunteers, and "Hands On Save Our Streams: Science Project Guide for Students" from the Izaak Walton League.

At the evaluation meeting, ELC staff and the elementary school teachers discussed the pros and cons of having the ELC offer its own training for participating teachers in future years. We agreed that the idea should be explored further. Augusta suggested that this would be "optimum." Terry thought that this would help in translating the training to the elementary school level. As she said, "After finishing at SWRP and feeling overwhelmed at SWRP with all the stuff we got, when we got back and worked with you.. it was your "Critter Search" form that brought it all together, made us think 'This will really work well for kids.'"

OCHS: Overall, the high school teachers thought that the SWRP training was very helpful. However, both Roger Harris and Al Denman thought that it would have been more helpful to have been trained on the exact methods that they would be using, rather than going through the training, then choosing a different method. Roger added that a local training "might have been more appropriate to our location," especially because the training showed them an "ideal" creek for sampling with kids, not one like Newell Creek that has difficult access. Steve Tebor, however, thought that the SWRP program was well-taught and that they had all benefitted by having different kinds of rivers and streams to look at during the training. Roger agreed that the training was "very professional."

ELC: From the ELC perspective, it was nice not to have to plan an entire training session ourselves. By sending the teachers to an existing training, the teachers could benefit from the expertise of the SWRP scientists and a solid scientific program. However, there were two major drawbacks to this approach: (a) the training offered was less appropriate given the elementary school teachers and the different sampling protocols chosen; and (b) by sending teachers to the SWRP training, then meeting with them for the first time afterwards, it took longer to build communication and trust as a program team than if we'd been working with the teachers to plan the training together.

ON COORDINATION WITH SWRP/GREEN CITY DATA

Although the six teachers attended the SWRP training, the overall monitoring program did not involve as much coordination with SWRP as we had expected. Partly this was because the schools were using different sampling protocols than those outlined in SWRP, and partly because the elementary school teachers felt that they needed to develop a curriculum that would be more appropriate for their younger students.

For the Newell monitoring program, we also chose not to emphasize the stringent quality assurance/quality control (QA/QC) procedures followed by SWRP participants. We did have students take replicate samples and record all results. Also, several students "read" each color comparator, as these comparisons can vary from eye to eye. In the classroom and while analyzing the data, the teachers helped the students identify data that didn't seem to make sense. In future years, we would like to work more QA/QC into data collection so we can better identify sampling errors and natural variability in creek conditions.

None of the teachers chose to participate in the Green City Data Project training offered in January 1998. The high school teachers were reluctant to incorporate mapping into their curriculum, believing that it was biological science rather than their role of teaching physical science. Teachers from Park Place did adapt SWRP's mapping exercise for use with their classes, including practicing mapping in a natural area behind their school, then drawing an aerial view of the stream, with trees, shrubs, and structures.

ON TEACHER PARTICIPATION AND COORDINATION

The teachers' participation in the monitoring program varied, depending on their enthusiasm for the program, school support, and ability to work the project into their curriculum.

Park Place: The elementary school teachers were quite enthusiastic about the program and managed to work it into their curriculum in many ways. Each of them had 33-35 students each for the entire day, and flexibility with cross-curriculum work, including using the project as the basis for poetry, artwork, creative writing, and math studies. The Park Place principal also offered extensive support to the program, including attending planning meetings and investigating Newell Creek canyon for possible sampling sites, paying for buses, allowing the teachers to adapt their schedule and curriculum to fit the project, and attending sampling days himself as a chaperone.

OCHS-Freshman Campus: In contrast, the high school teachers tried to participate in the program as much as they could, but it was a difficult fit. They faced greater constraints from (a) more focused curriculum requirements from teaching only physical science; (b) limited support from the school adminstration for paid substitute time or release time; and (c) short class periods with 5-6 classes rotating through one teachers' room. This meant that each teacher had roughly 150 students to involve in the program and would have needed to walk his class to the ELC, study the creek, and return to school during a single period. These teachers adapted the monitoring program into an after-school activity for TAG students, with one teacher developing an in-class water testing laboratory for all of his classes.

When looking at the difference in participation for the two schools, it's important to note that the high school teachers needed substitute time to bring a small group of students (or even one class) out to the ELC, while the elementary teachers could bring their entire class without needing to cover other classes. The Oregon City High Teachers expressed a strong frustration that they could not get "release time" from their classes.

When asked why they didn't participate more, the high school teachers list off several reasons. Says Al Denman, "It's really hard to organize and teach kids that you don't see," meaning that the students he worked with on after school sampling weren't necessarily in his classes. Steve says that he didn't feel comfortable bringing three of his classes over to the ELC because of behavior problems. They all mention large class sizes, lack of transportation, and the lack of release time.

Although the ELC had worked closely with the principals at both schools and asked them to identify interested teachers, we did not meet with all of the teachers until after they had completed their training. At this point, the expectations of time and accomplishments had already been written into the grant. Some of the teachers felt that participation in the grant took a "top down" approach.

The high school teachers said that they felt overwhelmed by the expectations and confused about priorities as the school district was implementing new curriculum requirements that same school year. By doing the water monitoring with all of his classes, Roger Harris, said, "We finished the year without doing the electricity or sound units."

Despite these issues, Roger calls it a "neat project" and Al says, "The project deserves to continue. It could be incorporated into other classes." They have both encouraged the ELC to continue looking for ways to fit the project into the high school curriculum, either by working directly with TAG students or by working with 10th and 11th grade classes at the high school. Roger plans to continue a water quality monitoring unit with his laboratory classes.

All of them suggest that perhaps the project would have been more appropriate for a biology class, taught in 10th grade at a separate campus. Says Al Denman, "I think the grant would have worked better for a biology class as opposed to our physical science. We picked some topics that we could work with, but I think there's a lot of interesting things that could have been done." They point out that the older students can drive themselves, which makes transportation much easier.

ON USING STUDENT MENTORS

We had hoped to use interested high school students as student mentors for the elementary school classes, but ran into difficulties. Because the participating OCHS students were making an after-school commitment to participate in the project, they were not willing to miss class to work with elementary school students during the work day. As Al Denman explained, these students were already very busy with music, sports, and other activities and were concerned about missing more class time to participate in the project. Also, they would need

a teacher to accompany them during school hours, but the high school teachers weren't able to leave their other classes.

As mentors and group leaders during Park Place visits, we used ELC volunteers instead. For future years, we may have better success recruiting Ogden Middle School students who "graduated" from Park Place program to serve as mentors for the younger students.

ON SAMPLING METHODS AND EQUIPMENT

Park Place: The Park Place teachers liked having most of their equipment available at school, so they could practice tests with students in the classroom and in the natural area behind the school. They also used the pH meter to monitor the school's fish tanks for raising coho and steelhead. The Park Place teachers were happy with the monitoring methods and equipment and thought that they were appropriate for their age group.

OCHS: At OCHS, Al Denman noted the difficulty in using color comparison sampling methods when the water contained dissolved solids or had tinted colors. He also wondered whether the students understood the chemistry. "I'm not sure kids can take a vial and get water samples and really picture what's happening. Maybe they do, but it seems kind of abstract to go from putting water in a vial and knowing what that means." Roger Harris thought the color comparison methods worked well for his classes. Steve Tebor said that he would have preferred digital readouts, like those used as SWRP.

ELC: Although both schools had one set of equipment at their schools, they also relied on existing ELC equipment. By using several sets of equipment, we were able to have classes separated into small groups and work along the stream at different sites simultaneously. However, this also meant that ELC equipment was in heavy use; as the year went on, some of this equipment became damaged or depleted and needed to be replaced. For the future, this approach of having some equipment stored at the schools for their use, combined with a "lending library" at the ELC seems to be a good option.

ON SATURDAY IN OUR WATERSHED

Attendance for this event was lower than we had expected. Several factors probably played a role. Because we combined the event with the SOLV clean-up (FirstCity Clean-Up and Enhancement sponsored by SOLV and Oregon City), we ended up "competing" for local volunteers. Also, by combining our event with the SOLV clean-up, we decided to offer several clean-up and enhancement activities as part of our event. Although these gave people "hands-on" opportunities to help the Newell Creek watershed, it also meant that our event was loosely focused and we may have tried to accomplish too much in a single event. However, cooperating with SOLV also meant that we were able to get county-wide publicity for the event and the volunteer monitoring program, which helps in building awareness about the Newell Creek watershed.

SUCCESSES

Park Place Elementary: Overall, the Newell Creek Volunteer Monitoring Program was a success, especially for the elementary school classes. Both teachers and students at Park Place are enthusiastic and look forward to continuing water quality monitoring in the future, with some modifications to make the program fit better with their curriculum needs.

All three elementary school teachers thought that their students learned valuable lessons by participating in the program. Augusta Shipsey commented on the sense of accomplishment that her students felt after learning new information. "They throw the words 'pH' and 'DO' around like these are everyday terms. They know these words now... because of the hands-on nature of the project, the vocabulary is sticking." Augusta notes that her students felt pride in their individual progress and developed a respect for Newell Creek, two things that will be transferable knowledge.

Terry Ahlgrim agrees that her students learned important concepts. "They got to see that scientists don't just go out in the field and know everything...You don't have everything memorized." Her students had to learn that they needed to take their data and compare it to something before it would mean anything. "For them to know that that's what scientists do with data was valuable for my kids to see. The ELC project was a lot of work for them. My kids' write-ups are really long. It took so long and they would ask 'Why can't we just go do it?' (They learned that) it doesn't mean anything until you record it for posterity, for other people to learn from what you've done and to communicate it to other people."

(Note: After one of the participating Park Place teachers left suddenly for maternity leave, Matt Salisbury, her substitute stepped in on his second day of work, bringing his entire class on a spring sampling visit to the ELC. He led the macroinvertebrate station and continued to work with students afterwards, helping them analyze their data and prepare for the Student Watershed Fair.)

A few weeks later, Matt Salisbury said that he felt the program was a positive experience. "I saw some kids that normally may think 'this is ridiculous' or 'why am I doing this' that were literally in the mud - they were playing in it and they'd share 'look what I found, look what I found' and I could see their eyes just lit up. They were having the best of time there. I was just sad that we had to go so soon, for the kids."

The Park Place teachers were also honored for their students' work in March by the Portland TrailBlazers, which gave them 30 tickets to a Blazer game and a check for $1,000.

OCHS - Freshman Campus: Al Denman says that one success was that the monitoring program offered the TAG students a program in science that was different than what they could get at school. He added that the participating students learned the "process of doing a scientific investigation." After taking field notes they had to decide what to do with the measurements taken. And when they discovered different nitrate levels between two spots, they had to decide what might affect those levels, what were the influences. Steve Tebor says

that he "saw a lot of excitement" among the students who participated, and that they learned about water quality terminology, testing, and taking field notes.

Roger Harris thought that one of the most interesting thing his students learned was about watersheds and how development and agriculture can affect a creek. He put up the large aerial photo of Newell Creek watershed a few days before doing his nitrate testing lab and said that "the kids loved it. They tried to find their houses relative to Newell Creek and the watershed and put marks on the wall if their house wasn't on the map." It gave the class an opportunity to talk about why the canyon was undeveloped, how building in Oregon City affects the watershed, and how nitrates in fertilizers can affect the headwaters of a creek.

Another success was the in-class water testing that Roger Harris did with his 150 students. He said, "It was the one spot where I could get all the kids involved in what was going on. I took samples from various places here (Newell Creek) and saw that each one of them got tested. I also invited students to bring their own samples from other places so that we could compare waters. I got a good response. A lot of kids brought in different ones and they labelled it as to where they got it and what time they got it and what the conditions were. When we did the testing, the students did a good job. I doubled up so that no matter what water samples were tested in my five classes, somehow each sample got tested at least twice. Then I could show the students the next day "here's what your group got and here's what another group got doing the same thing. Their results were amazingly close. I was impressed."

He says the students learned two important lessons: (a) that you couldn't determine water quality by looking at the water and (b) that low nitrate levels were only one part of clean drinking water. "We had some samples that were very clear and others that looked polluted. But that wasn't necessarily an indication of their nitrate levels. It was important for the kids to learn that you can't tell what chemicals are in the water just by the color and the appearance of the water. You have to do specific chemical tests on it."

He said, "I think the neat thing about those tests is that there were quite specific instructions there. You had to agitate it for exactly three minutes. You had to let it sit for this long and so on. They were real conscientious about that. They enjoyed doing it, especially since it was kind of a generalized thing for the masses. All the kids got involved and got to do it. They did it in groups of half a dozen kids and each one of them had different jobs that they were supposed to do. I did 150 students in one day."

ELC: The students's excitement and enthusiasm for the program was catching. As the year went on, we saw their knowledge grow. In October when the students first visited the site, most of the students had never investigated a creek before, never tested water quality, and didn't know that macroinvertebrates lived in creeks. They were excited about getting to borrow rubber boots and science equipment. By the spring and the Student Watershed Fair, they were sharing their findings with parents and describing what the results of water testing meant to aquatic life.

It was also gratifying to see community support for this project grow and have the participating teachers want to spend *more* time on the site with their students, and encourage

us to continuing working with other schools, such as the "graduating" sixth graders moving on to Ogden Middle School and the 10th biology grade classes at Oregon City High School.

PLANS FOR CONTINUING THE PROGRAM

We would like to continue and expand the Volunteer Monitoring Program, assuming that we can find funding to do so. In the future, we'd like to continue working with the younger grades, involving other local elementary schools. We see the Environmental Learning Center's role as more of a facilitator, providing technical support and equipment loans, but having teachers select appropriate sampling sites and choose how to work the program into their curriculum. This would be the new "Volunteer Monitoring Program" and could involve work on Newell Creek as well as other local waters.

By starting with the younger grades, we can continue working with students as they move through the school system, expanding the program to older grades over time. For example, Park Place students can begin the program, continue as mentors during middle school, then return to sampling the creek using more advanced methods as they enter high school.

The high school teachers have also discussed continuing the project in some capacity, including having all of their physical science classes do the nitrate testing lab that Roger Harris developed. They have also discussed incorporating Newell Creek's watershed into other physical science, such as mapping the watershed's topography or documenting landslides and "tree creep" in the canyon.

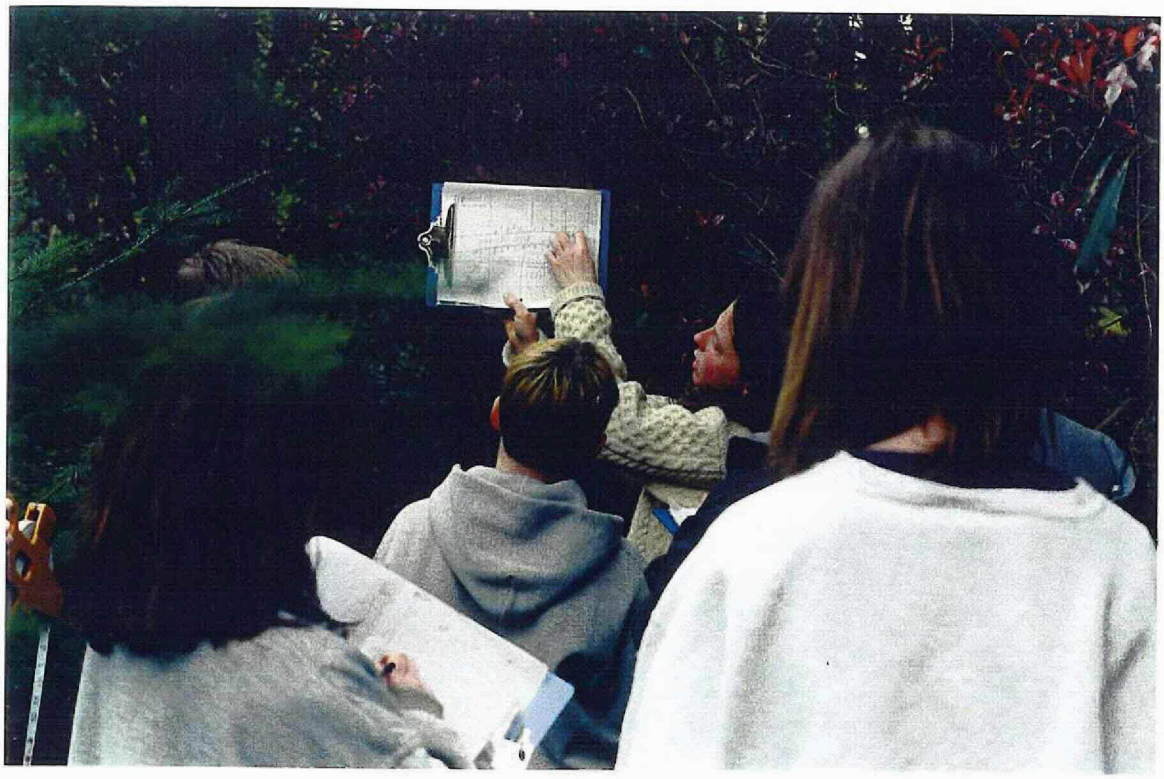
We would also like to expand the program to Ogden Middle School in the next two years, because the 6th grade students that are "graduating" from Park Place will be entering 7th grade at Ogden. In this way, we hope to offer opportunities for students who have participated in the Newell Creek Volunteer Monitoring Program in the past to participate as mentors and active water monitors.

Section 3

Photo documentation

Park Place Elementary teachers and parent volunteers attend refresher training, learning tools and techniques for the October 2, 1997 sampling

Students from Oregon City High School measure oxygen and pH at Newell Creek's headwaters on October 9, 1997.



After receiving instruction in mapping, students try their hand at drawing aerial views of the stream and surrounding vegetation (Spring sampling, Park Place).

MUNITY SNAPSHOT

Canyon cleanup

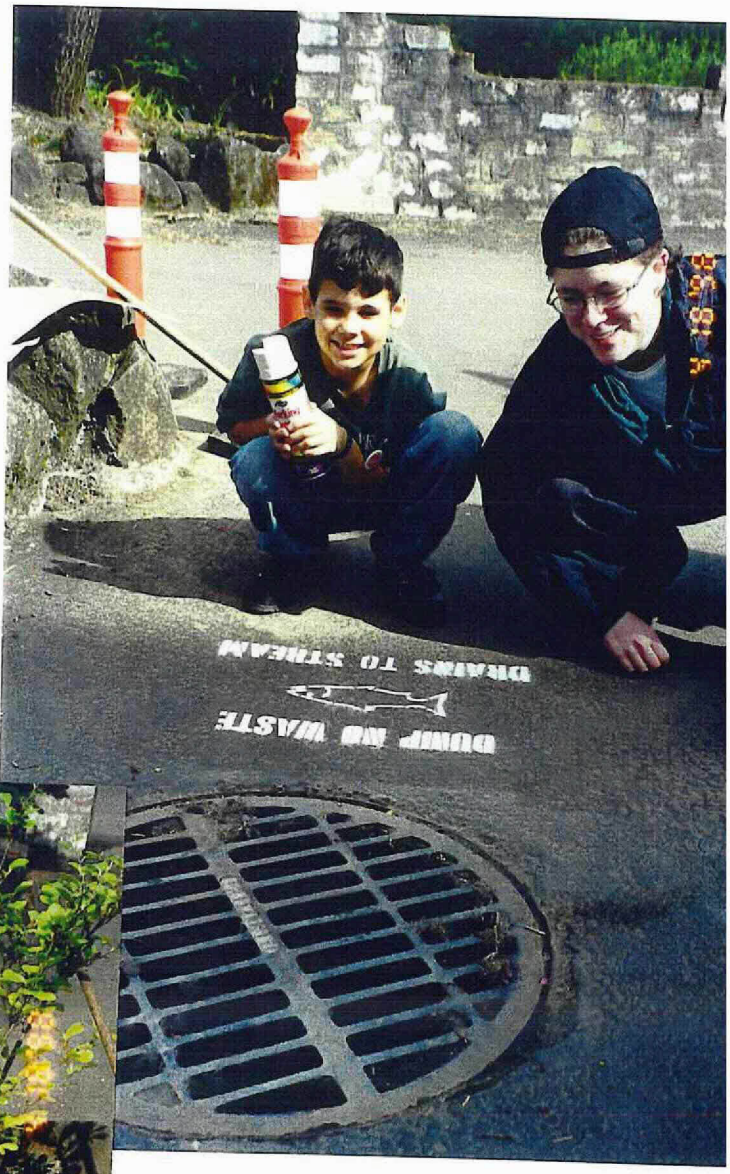
OREGON CITY — Volunteers are sought to help clean up scenic Newell Creek Canyon on Saturday — and to learn something about watersheds in the process.

The cleanup will be from 9 a.m. to 5 p.m. as part of "Saturday in Our Watershed." People of all ages are invited to pick up litter, measure water quality, stencil storm drains and remove invasive plants from the canyon.

Volunteers should meet at 9 a.m. at the John Inskeep Environmental Learning Center at Clackamas Community College. The center is at the north campus entrance at Clairmont Drive and South Beavercreek Road.

The learning center will have a water quality resource fair in conjunction with the cleanup.

Volunteers can work for as long as they like. Interested people should call Julie Higgins, Environmental Learning Center volunteer coordinator, at 657-6958, Ext. 2637.



After learning about the Newell Creek watershed, volunteers pitch in to help stencil storm drains, pick up litter, and remove invasive plants.

Newell Creek beckons volunteers for cleanup

OREGON CITY — Volunteers can help clean up around Newell Creek Canyon while learning about the watershed from 9 a.m. to 5 p.m. during "Saturday in Our Watershed" at John Inskeep Environmental Learning Center, Clackamas Community College, 19600 S. Molalla Ave., Oregon City. Call 657-6958, Ext. 2637, for information.

Dear Larry,

Thank You so much for teaching us about pH, dissolved oxygen and temperature. I had alot of fun. I learned that the water at Newell Creek is clean, has good D.O. and has a good pH. I really enjoyed going to the E.L.C and I learned alot about water quality's and macroinvertebrates. I hope to come again soon.

Thanks Again.

Lindsey Wells

Dear. John, thank you for helping us at the E.L.. It was so fun. I liked when we tested the temperature.

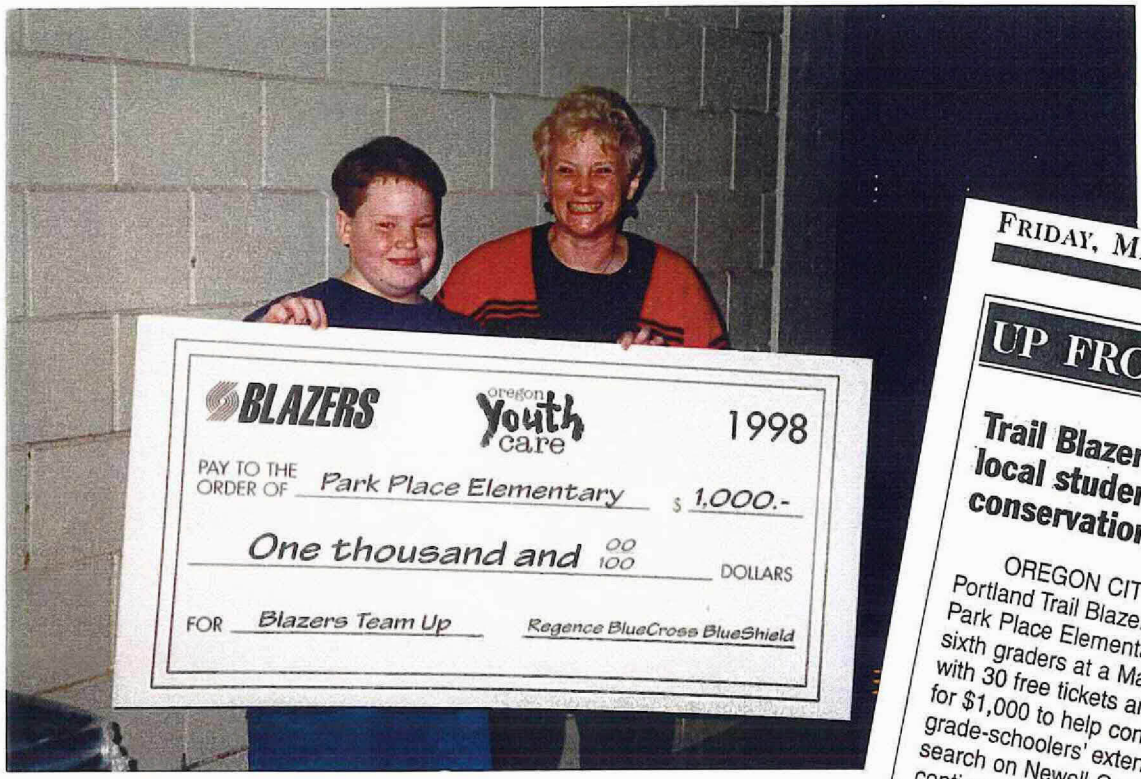
I hope I can come back and look for more bugs and test the pH, temperature, acidity, and dissolved oxygen.. I learned alot, thank you.

Sincerely,

nick Burks

A group of 12 honors students from Park Place visit the ELC for winter sampling on February 3, 1998. After testing temperature, oxygen, and pH in Newell Creek, they decide that it's okay to release the silver salmon they raised at school into the creek.

Park Place Elementary receives $1,000 award from the Portland Trail Blazers for their work on Newell Creek.



FRIDAY, MARCH 13, 199

UP FRONT...

Trail Blazers reward local students for conservation efforts

OREGON CITY — The Portland Trail Blazers honored Park Place Elementary's fifth and sixth graders at a March 8 game with 30 free tickets and a check for $1,000 to help continue the grade-schoolers' extensive research on Newell Creek and their continued efforts to improve the creek's water quality.

The Blazers presented the check to the students during half-time of the team's game with the Denver Nuggets. The school was given 30 tickets.

Ali Grimshaw, Terry Ahlgrim and Augusta Shipsey, the teachers of the combined fifth and sixth grade class, said they hadn't yet figured out what they would do with the money but promised it would be something that was both educational and fun.

The nearly 100 students have been visiting the creek regularly, charting its pH balance, temperature, dissolved oxygen count and inhabiting macro invertebrates. The studies are aimed to gauge which kinds and how much life the creek can support.

Oregon City News

We start each sampling day in the spring (March 30, 31, April 1) with an introduction and Stream Walk. Then, each class splits into four groups and visits two of four stations: water quality (upstream/downstream) and macroinvertebrates (upstream/downstream), where trained leaders guide them through sampling.

Students use goggles and gloves to protect themselves during dissolved oxygen tests. Then, an ELC volunteer helps them compare the dissolved oxygen test results to oxygen standards.

Using large D-nets and small dip nets, students search for macroinvertebrates living in the creek, then they identify and count the "bugs" to determine stream water quality.

Study wins honor, cash for Park Place

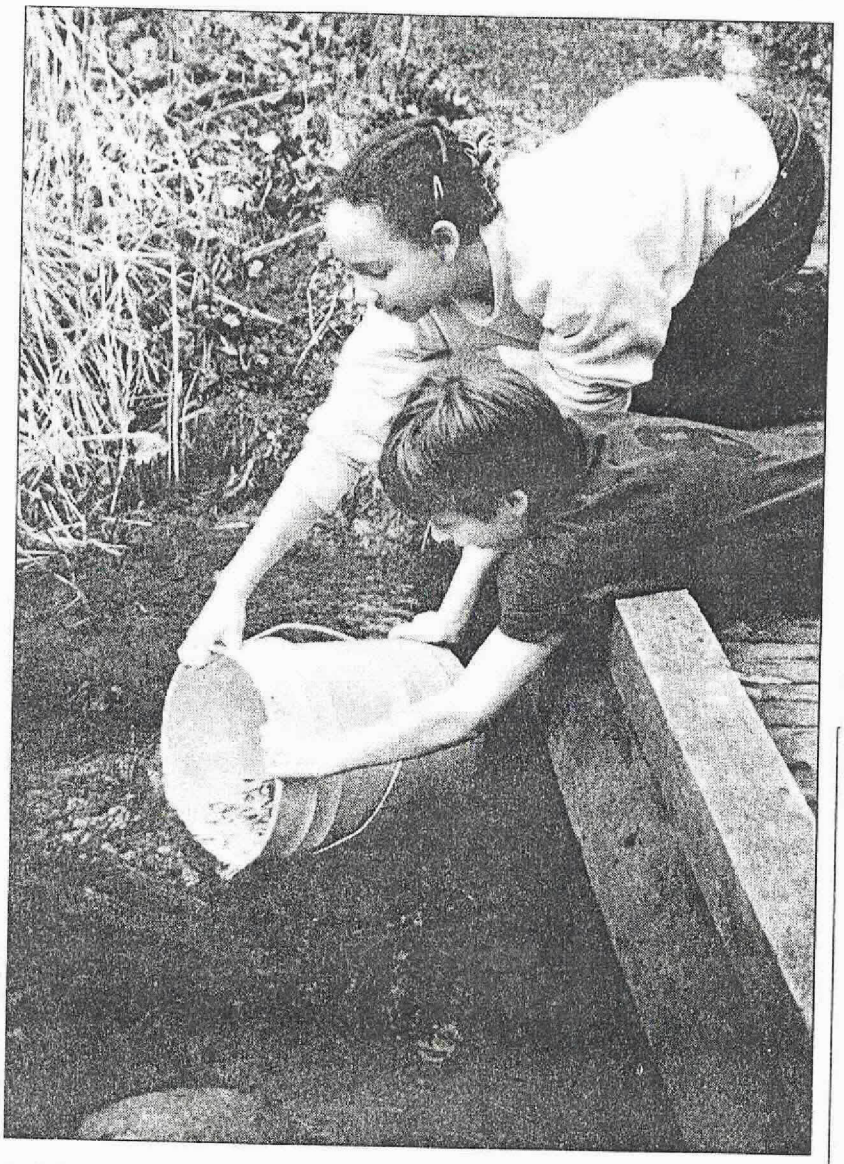
Park Place Elementary fifth- and sixth-graders recently were honored for their work studying Newell Creek.

The Oregon City students, who studied the creek with the help of the Environmental Learning Center at Clackamas Community College, received $1,000 from the Portland Trail Blazers. Their work also was highlighted during a recent learning fair at the center.

SCHOOL NOTEBOOK

By Lisa Daniels

The students decided to donate the $1,000 they won to the center.



Park Place Elementary students Heather Scoggins and Greg Fish release salmon in Newell Creek as part of their water project.

Student Scientists Monitor Newel Creek

Oregon City School District students are getting some hands-on experience with environmental monitoring thanks to the John Inskeep Environmental Learning Center at Clackamas Community College.

John LeCavalier, learning center executive director, said the Center last year received a $6,000 grant from the Metropolitan Service District's Greenspaces Environmental Education program. The funds are being used to train student volunteers from Park Place Elementary School and the Freshman Campus to monitor environmental conditions in Newell Creek.

Through its Greenspaces program, Metro has purchased about 130 acres along Newell Creek to ensure its protection. Development along the watershed, particularly in the Newell Creek Canyon area, must follow certain practices to protect the creek.

"There's been much community support to protect the canyon resource," LeCavalier said.

Since the Environmental Learning Center is located at the headwaters of Newell Creek and all the district schools are located within the Abernethy-Newell drainage area, it makes sense for the two entities to team up to ensure the continued quality of Newell Creek.

The Park Place and freshman students perform a series of water-quality tests, such as checking water temperature and oxygen levels. Their information helps the City of Oregon City and other agencies keep tabs on the health of the watershed.

"Not only is the students' work valuable to the community," LeCavalier said, "the program is providing them with some hands-on, real-world, science training."

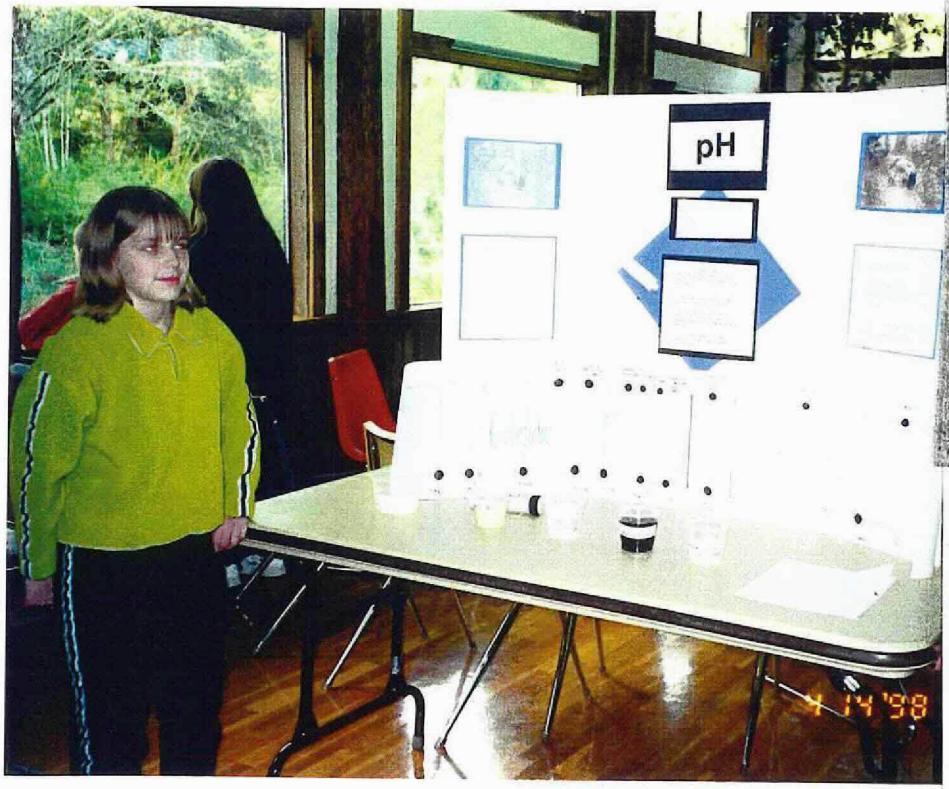
Students prepared for their monitoring role by attending the Student Water Research Project at Saturday Academy and a follow-up session with Environmental Learning Center staff. The district is contributing money to the project from Eisenhower Grant funds.

Elementary students did tests in the spring and fall, and they will head back out to do more tests in the winter and again in the spring. The freshman campus students monitor the creek monthly.

On April 14, the students will present their work at an event at John Inskeep Environmental Learning Center. "This is a showcase for the students to present information collected and the work done," LeCavalier said. At a later date, which has yet to be set, the Center will host a community event called Saturday in Our Watershed, which will feature educational events and perhaps a clean-up of the watershed.

LeCavalier would like to see all the Oregon City schools involved with the Center. He sees the growing relationship between the Environmental Learning Center and the Oregon City School District as a natural development. "Environmental education is our primary goal and so is getting students involved in the community."

Students set up their displays for the student watershed fair in the afternoon. The event runs from 6:00-8:00 pm.



Student fair

Oregon City students will showcase their water quality research during the Student Wat shed Fair from 6:30 to 8 p.m. Tuesday at the John Inskeep Environmental Learning Center the Clackamas Community College main campus.

During the fair, students from Park Place El mentary and Oregon City High School's freshman campus will discuss what they have learn since they began their study of the Newell Creek's water quality in September.

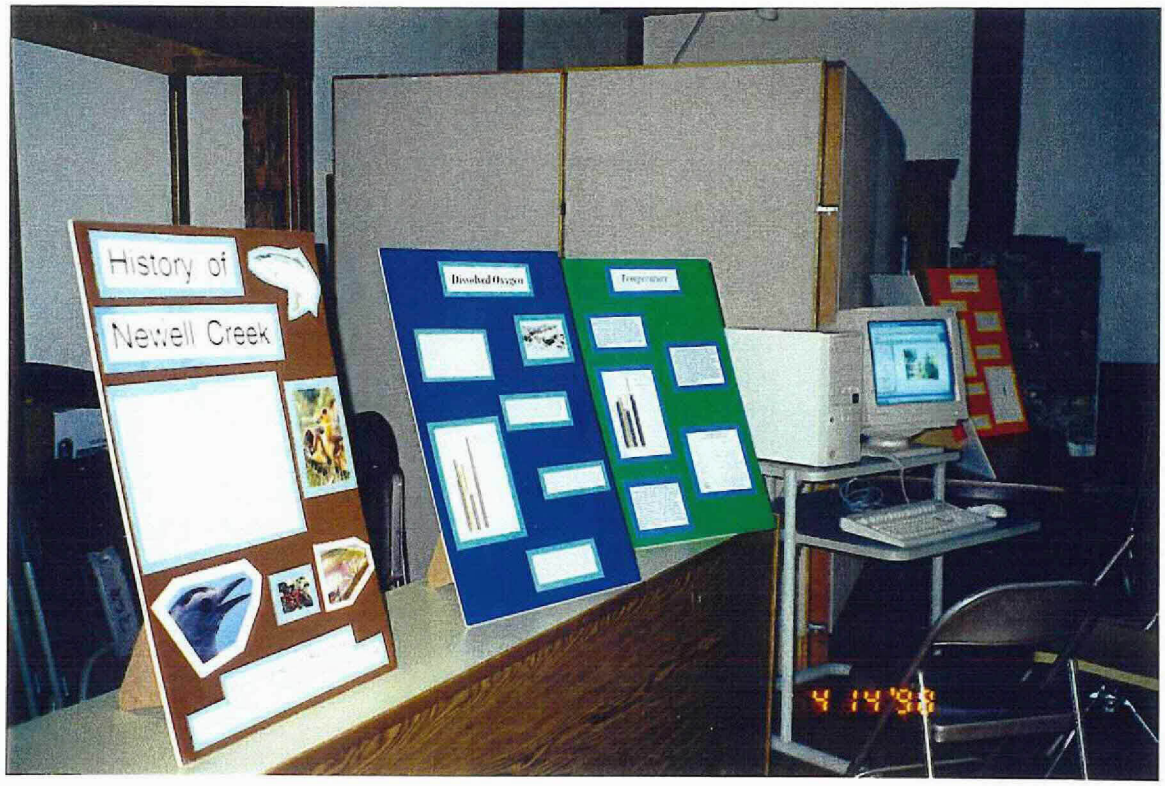
Students have tested the creek water's temperature and collected insect samples at the ce ter's site on the Oregon City campus of Clackamas Community College.

The fair will give elementary students an opportunity to demonstrate how they used bugs, snails and worms to estimate water quality. Th also will show visitors their poetry and artwork and how to do water quality tests. The high school students will present their water quality research and conclusions, and they will demonstrate their new Web site for Newell Creek.

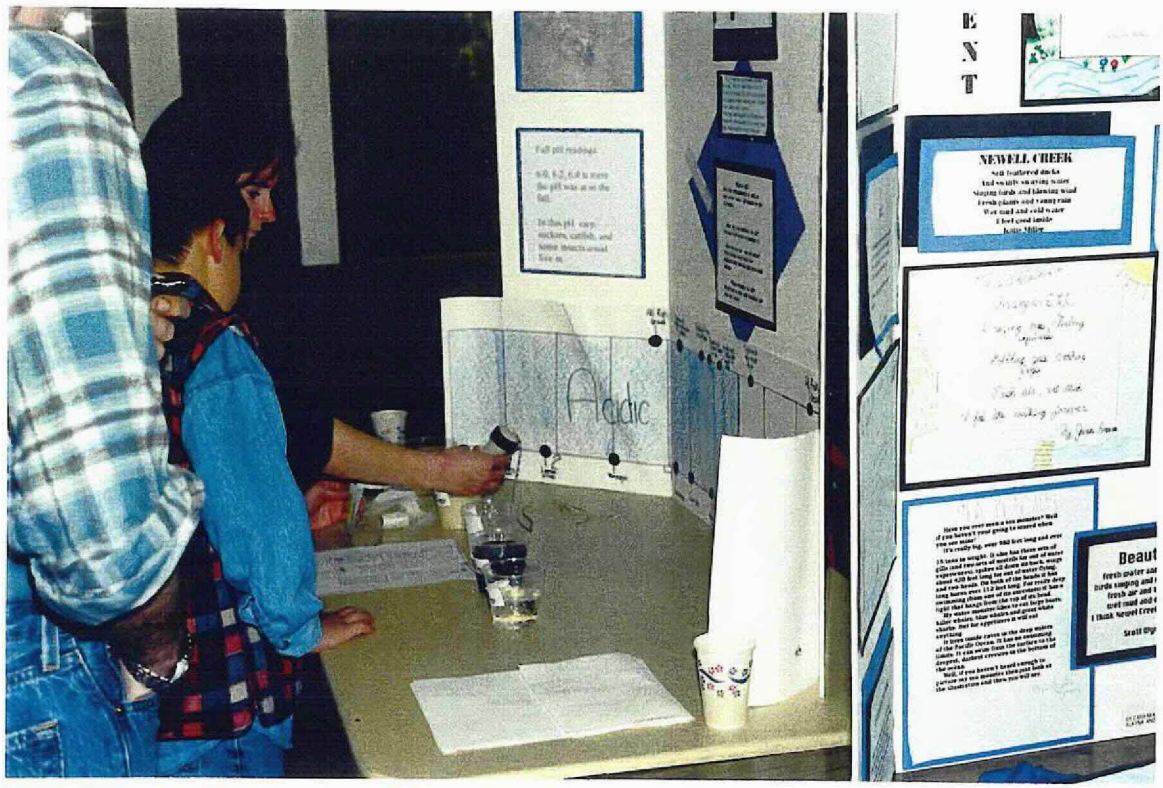
The fair is part of the Newell Creek volunteer monitoring program, which was financed by an environmental education grant from Metro Greenspaces. The learning center coordinates the program, including providing technical assistance to teachers.

Park Place teachers have used the water qua ity monitoring project throughout their curriculum, including having the students write poetry make art projects, and make maps about the creek. Recently the school was honored for its water studies with a $1,000 check from the Portland Trail Blazers.

The freshman campus has used the water quality study to enhance its physical science cu riculum. The campus has conducted water qual ty tests as part of its chemistry classes.



Student-created displays from Oregon City High School and Park Place Elementary are used to educate visitors about their project.



Under the watchful eyes of one Park Place student, a visitor tests the pH of creek water, lemon juice, and cola. Another student demonstrates how stream erosion works.

Text from the Student Watershed Fair, Park Place Display

E.L.C. Streamwalk

What we were doing on our stream walk:
We were walking along the stream recording information about the creek. We were looking to see if there was any trash around and, if so, we recorded it. We were also looking to see what kind of plants lived there. We were looking to see what kind of different animals lived by the creek.

What we saw on our stream walk.
We saw lots of things. We saw three animal tracks, a lot of little critters, ducks, and turtles. We also saw some trees, flowers, shrubs, and ground cover.

"We are looking for signs of animal houses. Also if we saw animal tracks. We were looking for stuff that would keep the stream quality good or stuff that would make the quality go down.

During the stream walk we were looking for whether the stream flows in a straight or curvy line. We were also looking for what color the water was and whether there was foam on the surface. We also looked for litter along the creek and roads, houses, golf courses, discharge pipes, etc.

Most of what we found was good for the stream.

Stream Walk Survey
The water was a milky color. There was no foam on the surface of the water. The stream did not go in a straight line, but it curves. We did not smell any unusual smells. On the stream banks we saw concrete, soil, rocks, and vegetation. The land along the stream was mostly trees. We saw bird tracks, and they were land and water birds. We did not see any fish, but we did see insects.

What we were looking for on our stream walk
We were looking for what was in the stream bed. We found boulders, cobbles, gravel, and silt. We were also looking for trash in or around the stream. We found shingles, cans, bottle caps, and caution tape. We saw concrete, soil, rocks, and vegetation along the stream banks. The vegetation near the stream was trees, grass, vines, and shrubs.

Saturday in Our Watershed

April 18, 1998
9 a.m. to 1 p.m

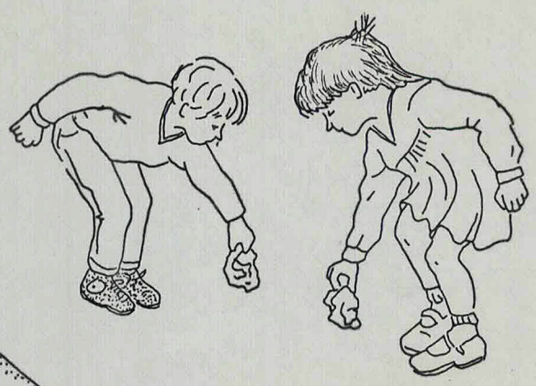
Join us for a special event celebrating the Newell Creek watershed, with fun for the whole family!

- ✡ Tour the "headwaters" of Newell Creek
- ✡ Learn why watersheds are important
- ✡ Help with hands-on water quality monitoring
- ✡ Pick up litter or remove invasive plants
- ✡ Stencil storm drains with clean water messages

For more information, call us at 657-6958, extension 2351 (or recorded information, extension 2023).

Location:

John Inskeep
Environmental Learning Center
Clackamas Community College
19600 South Molalla Avenue in Oregon City



The ELC is a participating site in the First City CleanUp and Enhancement sponsored by SOLV and the Oregon City community.