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Enhancing Public Understanding of Water Resources Issues: A Community-Based Short-Course for the Pacific Northwest

Kevin Laughlin
University of Idaho, laughlin@uidaho.edu

Ariel Szogi
Washington State University, szogi@florence.ars.usda.gov

Frank Burris
Oregon State University, frank.burris@orst.edu

Robert L. Mahler
University of Idaho, bmahler@uidaho.edu

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Abstract
A "hands on" 15-hour "community based" water quality and monitoring short-course was delivered to citizen groups at six locations in the Pacific Northwest in 2000. The University of Idaho, Washington State University, and Oregon State University Cooperative Extension Systems, USDA-CSREES, and the Idaho Water Resources Research Institute (IWRRI) partnered in design, development, and delivery. This short-course increased participant understanding, awareness of water issues, and improved water-monitoring skills. A 17-module guide and an evaluation model were developed. This learning experience dramatically improved learners' understanding of complex water resource issues and prepared them to plan, monitor, and assess local water issues.

Kevin Laughlin
Extension Educator, Natural Resources/4-H Youth Development
University of Idaho
Boise, Idaho
laughlin@uidaho.edu

Ariel Szogi
Former Agriculture and Natural Resources Extension Educator
Washington State University
Yakima, Washington
szogi@florence.ars.usda.gov

Frank Burris
Coos-Curry County Watershed Agent
Oregon State University
Gold Beach, Oregon
Frank.Burris@orst.edu

Robert L. Mahler
Professor of Soil Science and Water Quality Coordinator
University of Idaho
Moscow, Idaho
bmahler@uidaho.edu

Karen Loeffelman
Extension Support Scientist, PSES Department
University of Idaho
Moscow, Idaho
karenl@uidaho.edu

Valdasue Steele
Benewah County Extension Educator
University of Idaho
St. Maries, Idaho
vsteele@uidaho.edu

Lynn Alderson
Former Agriculture Extension Educator
Washington State University
North Central, Washington

Introduction

> *"The most important thing I learned was the protocol for testing--definitions are critical when comparing and refuting results of various interest groups. Remain open minded/neutral through the process. Consider results in light of specific situations." ~* Yakima County, WA

> *"I have become more concerned with drinking water issues. For the past year I have been concentrating on water quality for fish habitat on agricultural lands and had forgot the importance of quality drinking water for yourself." ~* Curry County, OR

> *"Science not politics -- the main idea is hands-on experience." ~* Yakima County, WA

These comments typified outcomes from a water quality and monitoring short-course conducted in the Pacific Northwest in 2000. Understanding the complex issues of water quality and monitoring in the region starts with education. The lack of water quality information and limited public awareness about the beneficial uses of water are major issues that affect every community. Many citizens are not aware of mandated assessments of their local water resources, nor do they understand the part they can play in monitoring their own watershed and protecting water quality. Land grant universities can provide adult public education to develop a greater understanding of water issues, such as water use, quality, and quantity.

Citizens indicated that there was a need for greater harmony (balance) between agriculture, industry, growth, development, and the environment in our region (USDA-CSREES, Goals 2000). In addition, citizens also desired to increase their understanding of water quality and monitoring (Mahler, 1999).

Because of these conditions, the following water-related opportunities were identified by PNW stakeholders and addressed in a pilot short-course at the community level. This pilot program was developed as a model "to plug the water awareness gaps" using the best possible source of information--the community members themselves and partners from their land grant universities. Through a grant awarded by USDA-CSREES, land grant university partners responded and designed a short-course that employed a do-think-learn model that would:

1. Enhance the understanding and awareness of the TMDL (total maximum daily load) implementation process;
2. Empower citizens to protect their water supply;
3. Enhance water use effectiveness;
4. Measure the level of contaminant loading in surface water resources; and
5. Increase understanding and awareness of the water issues in the region.

The goal of the short-course was to expand existing partnerships and distribute water quality and monitoring information to a broad group of water users, educators, and leaders in Pacific Northwest communities. This model can be used as a springboard to action in local communities by service organizations, commodity groups, and other organizations with existing local, state, regional, or national water quality assessment and monitoring programs. One major objective of the effort was to foster critical thinking, problem solving, and effective decision making skills with individuals, community groups, citizen leaders, and teachers that have practical application in the water resources managed in their community.

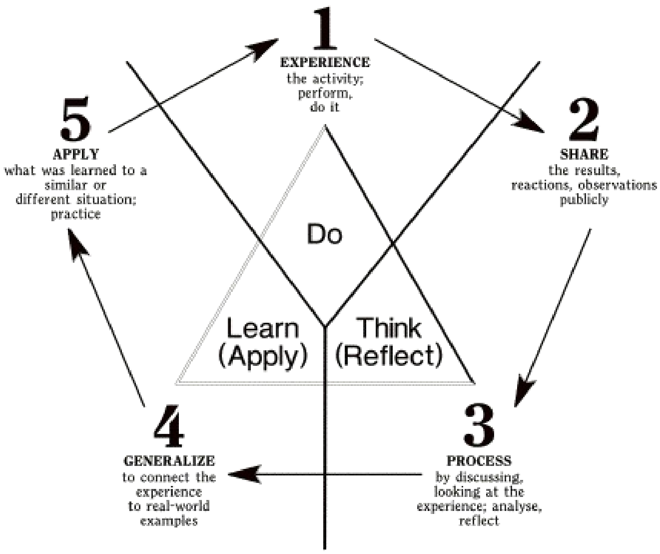
Methods

Over a period of 6 months, the University of Idaho (UI), Washington State University (WSU), and Oregon State University (OSU) Cooperative Extension System partners, USDA-CSREES, and the Idaho Water Resources Research Institute (IWRRI) developed and delivered a pilot water quality and monitoring short-course. This short-course was targeted to citizen groups at six locations in Idaho, Oregon, and Washington. Over 20 other public, private, and non-profit agencies or organizations also teamed up to support each short-course locally.

County Extension System (CES) practitioners, identified by principal investigators, were contacted regarding interest in participating in 15 counties in the three states. Practitioners in five counties invited local water experts and elected officials to join the short-course coordinators in presenting instruction. The short-course was delivered in local Extension offices, a field research station, a Grange, a community college, a community center, a USDA center, and an arboretum. Field sites were located on nearby streams, ponds, lakes, and reservoirs.

This non-formal short-course consisted of 15 hours of structured training plus follow-up provided by the local Extension practitioners. Each pilot was conducted on four consecutive days to locally selected groups of no more than 20 learners from each community. The short-course was implemented using the do-think-learn exploratory learning model (Deen & Newman, 1993, Figure 1). Exploratory learning is expressed by explore (do), reflect, and apply. Participants explore or experience a learning activity. They share the results and reflect upon what they observed and felt about the activity. Participants then apply the activity to everyday life and their community.

Figure 1.
Experimental learning model (after Deen & Newman, 1993)



This model is continuous, since application may lead to additional exploration and reflection. Learners completed an icebreaker activity as focus groups prioritized local water issues at each of the six sites. Organizers used a modified nominal group process (Johnson et al., 1987) and used five adhesive dots to prioritize the water quality related issues listed by learners for each community. Learners were then introduced to a short-course model that included a guide with five parts (water, watersheds, and beneficial uses; ground, drinking, and surface water monitoring; indicators of surface water quality; experience surface water quality and monitoring in the field; and options for citizen involvement) and 17 "activity based" modules that covered expert and locally selected topics (Table 1).

Table 1.
Modules, Topics, and Content Coverage of the Pacific Northwest Water Quality and Monitoring Short-Course

Day	**Module**	**Topic**	**Coverage**
Wednesday	**01** (55 Min.)	**Introduction/Expectations; Learn, Plan, and Act**	Pre-test, water issues, water quality assessment, monitoring and protection
Wednesday	**02** (45 Min.)	**Water and Watershed Concepts**	Water facts, stream systems, watersheds, point/non-point pollution; USGS map reading
Wednesday	**03** (35 Min.)	**Waters Beneficial Uses and TMDLs**	Water uses, Section 303d lists
Wednesday	**04** (35 Min.)	**Survey of Local Water Uses / Resources**	Expert review of water use, resources, and local issues
Thursday	**05** (55 Min.)	**Ground Water, Drinking Water, and Standards**	What is ground water, surface water? Water standards
Thursday	**06** (35 Min.)	**Why We Monitor and Volunteer Monitoring**	Getting started: Idaho, Oregon, and Washington resources

Thursday	**07** (35 Min.)	**How We Monitor/ Practical Reporting**	Types of water monitoring and assessment; record keeping
Thursday	**08** (35 Min.)	**Addressing Key Local Water Concerns**	Issues investigation, beliefs and values
Friday	**09** (55 Min.)	**Surface Water Quality Indicators including Chemistry**	Temperature, BOD, pH, DO, turbidity, fecal coliforms, phosphates, nitrates, solids
Friday	**10** (35 Min.)	**Water Testing Kits**	Recommended equipment list; suggestions and local sources
Friday	**11** (35 Min.)	**Physical Habitat Assessment**	Field observations; transect measurements; reach evaluation
Friday	**12** (45 Min.)	**Biological Habitat Assessment**	Benthic macroinvertebrates; insect life cycles; aquatic plants; algae; bacteria; DO
Friday	**13** (35 Min.)	**Safety and Access Issues**	Personal health and environmental safety, site maps, directions, protocol
Saturday	**14** (240 Min.)	**Orientation, Safety Review, Streamwalk: Monitoring Stream Surface Waters**	Physical habitat assessment; Surface water quality indicators; Biological habitat assessment
Saturday	**15** (120 Min.) **or**	**Monitoring Ponds, Lakes & Reservoirs (Opt. A.)**	Synthesis, application of monitoring principles to new water body and site
Saturday	**16** (120 Min.)	**Monitoring Beach/Estuary Surface Waters (Opt. B.)**	Synthesis, application of monitoring principles to new water body and site
Saturday	**17** (25 Min.)	**Options for Citizen Involvement**	A sampling of regional and national water quality or monitoring programs as options for local citizen involvement; Post-test

The guide also contained a participant journal, glossary, overheads, a space for handouts, and an appendix. The guide was modeled after one developed by the Groundwater Foundation (Herpel, 1999). Each local community had significant input on the emphasis areas of each program. In addition, one optional graduate, under-graduate, or teacher in service credit could be arranged for taking this course.

Two keys to the success of the short-course were the flexibility of the program to emphasize the issues identified by learners as important to them and their communities and the hands-on nature of the instruction. All key water quality and monitoring concepts (Adams, 1992; Mitchell & Strap, 2000; Rabe & White, 1992; US EPA, 1998) were reinforced with designed activities utilizing multiple intelligence theory (Gardner, 1993). During the instruction, learners wrote in their journals about their experience, completed a map reading exercise using USGS maps of the field sites, shared in discussion pairs, did role plays about monitoring experiences, and tested water samples from their homes or communities. They also demonstrated, compared, and contrasted how to use monitoring equipment for ten water quality parameters (coliform bacteria, nitrate, phosphate, pH, turbidity, total dissolved solids [TDS], total solids, temperature, biological oxygen demand [BOD], and dissolved oxygen [DO]).

Pre- and post-tests were completed by participants and returned in person or by mail to each local Extension office. These tests were designed with three purposes in mind:

1. To gauge understanding of and introduce water, watershed, and monitoring concepts;
2. To reinforce concepts presented in the short-course; and
3. To measure knowledge, attitude, and behavior change.

Results

Learners in the Short-Course

A total of 109 citizens from eight counties in Washington State, three counties in Oregon, and two counties in Idaho enrolled at one of the six sites in this pilot. Individuals and groups reached included students, teachers, irrigation and conservation district members, farmers, ranchers, environmental volunteers, city and county land use planners, realtors, Tribal members, environmental and biologist consultants, and urban and rural homeowners. Fifty-seven (57) percent of the learners were between the ages of 44-65, nearly 18% were aged 30-44, 13% were 18-30, 6% were under 18, and 6% were over 65.

Outcomes

The short-course pilot increased public involvement in the potential range of solutions to those water quality issues identified at each site where the program was delivered. Important outcomes were identified in reports by cooperating CES practitioners, issues data collected, and observations by the pilot coordinator. They included:

- Learners initially completed focus groups on water issues occurring in their community and region. Over 40 important water issues were identified and ranked at the pilot sites that needed to be addressed over the next 5 years (Table 2).
- Learners liked how the pilot brought the whole picture of water in our PNW region into perspective. When individuals completed the short-course, many were ready to join an existing monitoring group as a trainee and/or start their own planning and/or learning related to specific water quality projects or programs in their area or region.
- The pilot provided individuals and community leaders with new skills and awareness about water quality and monitoring. It developed partnerships, explored water issues that affected citizens at the community (watershed) level, and fostered commitment to protecting water resources by local empowerment.
- Learners developed skills in monitoring biological, physical, and chemical aspects of surface water quality. Many tested their own drinking water sources (wells, springs, and water systems) for the first time.
- The pilot enabled the development and/or supported at least four new or existing community volunteer monitoring workgroups. It also provided links to existing water monitoring and/or assessment programs in individual communities, regions, and state.
- Teachers who attended the short-course gained resources and instructional methods that they planned to share with an estimated 150 students in the region during the school year.

Table 2.
Water Issues Ranked and Prioritized by Focus Groups During PNW Water Quality and Monitoring Pilots July-December 2000
(Click the table for a larger version.)

Water issues identified in Idaho, Oregon, and Washington by 'pilot' short-course learners	Benewah, ID N = 10	Yakima #1, WA N = 17	Curry, OR N = 9	Lincoln, OR N = 10	Douglas/ Chelan, WA N = 13	Yakima #2, WA N = 22
Water quantity, use, and conservation (domestic, municipal, agricultural, industrial, recreational)	1	3	4	2	6	6
Municipal and domestic drinking water quality	3	1	2	x	3	1
Water quality related to land use planning (agriculture, development, stream riparian areas)	x	5	6	5	x	4
Endangered Species Act; degradation of water quality for fish and other aquatic life	x	6	x	3	5	x
Water rights	x	4		x	1	2
Extractive operations and industries (logging, mining, ranching, mushroom, and brush picking)	5	x	5	6		x
Flooding events, storm water runoff	4	x	x	x		x
Surface water quality health related issues (e. coli, etc)	x	6	3			5
Groundwater protection and contamination	6	2		x	x	
Point source pollutants from farms (nitrates) and ranches	2	x	x			6
Water awareness by public	x	x		1		
Septic waste disposal, systems, and on flood plains			1	x		x
Water supply and demand for growth, storage, distribution, costs!		x		4		x
Loss of function of wetlands and riparian areas		x	x			3
Use of science, not theory, to make water related judgments and policy decisions					2	
Government regulations vs. help or advice (education)					4	

Total N = 81, x = Issue identified but not ranked, or not ranked in top 6.
Numbers 1- 6 are the priority for each focus group where 1 = highest priority issue

Pre- and Post-Course Test Results

Learners who enrolled in the pilot were required to complete a pre-test before acceptance in the PNW Water Quality and Monitoring Short-Course. Post-tests measured learning and gauged how the short-course might be improved. Eighty-three (83) individuals completed pre-tests prior to or before participating in the short-course. Forty-six (46) post-tests were returned for evaluation giving a 55% response rate with respect to pre-tests. Learners, based upon completion of this learning experience, ranked eight summary statements. The lowest ranked statement (rank 2.1) still indicated the materials that they received will be used in organizing their own or a group water monitoring effort (Table 3).

Table 3.
Ranked Learning Experiences of 46 PNW Water Quality and Monitoring Short-Course Learners at Six Locations in Oregon, Washington, and Idaho

Ranked Average	Learning Experiences where 1 = Strongly Agree
1.2	I would recommend this program to my neighbors, friends, and colleagues.
1.4	The material presented in the field was at an appropriate level.

1.4	The short-course overall was a good learning experience that I will share with others in my community.
1.6	This short-course was beneficial to me and I will use it in my profession (natural resource manger, rancher, irrigator, environmental activist, teacher, community organizer, etc.).
1.7	The material presented in the classroom was at an appropriate level.
1.7	I am more technically competent to discuss water resource issues because of this short-course.
1.9	The materials that I received will be used in organizing my own or a water monitoring group effort.
2.1	The amount of time spent completing this short-course was appropriate.
PNW Water Quality and Monitoring participants indicated rank by circling **1 if they strongly agreed** with the statement to **6 if they strongly disagreed** with each statement based upon completion of this learning experience. The average rank was determined by use of weighted averages and based upon number of participants who ranked preference at each site.	

Many of the participants were able to recall their pre-test expectations and described to what extent they were met. Their most frequent expectation was to learn how to monitor the quality of a stream, lake, pond, or river and gain hands-on experience. They were also interested in improving their understanding and awareness of local water quality issues. Several other key expectations included understanding water chemistry and how to improve and protect their water resource. To a great extent, post-test respondents indicated these expectations were met by this short-course. Expectations in the areas of enabling them to defend/protect their farm from inappropriate regulatory agency decisions, better understand watersheds, and identify water problems and specific pollution sources were not met or were met to a lesser extent.

The Most Important Ideas and Insights Participants Learned

The most important idea that participants learned was the "Learn, Plan, and Act" process. The Learn-Plan-Act model focuses on engaging community members in the learning process using their water resources, encouraging them to plan and reflect together, and then to act based upon the things they learned, the facts they uncovered, and the best plan for the water resources in their community.

The short-course also empowered learners to plan and carry out water management programs through monitoring and assessment using selected protocols. Several learners were energized to teach students or to share the knowledge they gained with their resource agencies or organizations. Learners indicated that they benefited from being referred to local water experts and that their awareness of water issues was improved.

The items that learners most frequently identified as having learned at the short-course were: how to monitor for water quality, ways to improve water protection, and methods of contaminant prevention. Several participants also noted that learning the parameters to measure water were an important outcome of this course. Learners identified over 40 different "important things" they learned in this course.

As a result of the short-course learners most frequently planned to monitor their own creek, spring, or well. Several participants planned to conduct monitoring efforts in their communities, many with school age youth. Other key actions planned by participants included protecting groundwater, volunteering with watershed planning groups, or working on riparian improvements on their own land, ranch, or arboretum.

Learners identified the resource notebook that was provided to them as the most important aspect of their learning experience, followed closely by the fact that the short-course increased their understanding of water and water quality (Table 4). They also ranked the do-think-learn (hands-on) approach that taught them how to monitor water quality in their streams, lakes, and ponds very highly. Short-course learners also felt the pilot raised their awareness of local water quality issues and taught them how to determine if their drinking water was safe.

Table 4.
Ranked Learning Experiences of 46 PNW Water Quality and Monitoring Short-Course Participants at Six Locations in Oregon, Washington, and Idaho
(Click the table for a larger version.)

Benewah Rank		Yakima #1 Rank		Curry Rank		Lincoln Rank		D/C Rank		Yakima #2 Rank		Totals Rank		Short-course Learning Experience
Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	
2.6	**1.2**	2.0	**1.9**	**2.0**	1.8	2.0	**1.5**	**1.5**	**1.6**	2.0	1.7	**2.0**	**1.7**	Sessions were active "hands-on" learning.
4.2	1.4	2.3	2.2	3.1	2.0	2.8	3.5	2.0	2.4	**1.9**	**2.6**	2.4	2.2	It provided "in-depth" technical strategies for WQ monitoring.
2.8	**1.0**	2.2	2.0	2.2	1.8	**1.6**	2.0	2.5	2.2	2.0	1.6	2.2	1.8	It created an awareness of water quality issues.
3.6	2.4	**1.8**	2.4	3.5	3.2	3.0	**1.5**	2.2	2.2	2.0	3.6	2.4	2.6	Taught me how to maintain water monitoring equipment.
0.0	1.6	0.0	1.8	**0.0**	**1.4**	0	**1.5**	NA	1.8	0.0	1.7	0.0	**1.7**	Taught me how to monitor water quality in water resources.
1.2	**1.0**	**1.4**	**1.7**	**1.9**	**1.5**	**1.4**	2.5	**1.6**	**1.5**	**1.7**	**1.5**	**1.6**	**1.5**	Increased my understanding of water and water quality.
4.2	1.6	2.8	2.4	2.9	2.5	2.4	3.0	2.6	2.5	2.4	2.0	2.7	2.2	Designed sessions that used "lecture/discussion" learning.
4.4	1.8	2.2	3.1	2.9	2.8	**1.7**	3.0	3.0	3.3	2.1	2.6	2.5	2.8	Provided models for community WQ monitoring action.
4.0	2.2	2.9	3.6	3.5	3.0	2.6	3.5	3.4	3.3	2.1	2.8	2.8	3.1	Designed sessions addressed planning & zoning WQ issues.
4.0	2.8	2.7	3.1	2.6	2.5	2.2	3.5	2.8	4.0	2.4	2.4	2.6	3.0	Follow-up sessions are planned into the learning experience.
3.6	1.4	**1.9**	**1.7**	**2.0**	**1.3**	2.5	**1.0**	**1.8**	**1.1**	**1.7**	**1.3**	**2.0**	**1.4**	Provided a "resource notebook" to support learning.
4.2	1.6	2.7	2.7	2.7	2.0	2.8	2.0	2.8	2.0	2.7	2.2	2.8	2.2	Provided "web sites" to support learning.
1.2	**1.2**	**1.9**	2.3	3.3	1.5	2.5	2.0	2.5	1.9	2.5	1.8	2.3	1.8	Taught me how to know if my drinking water is safe.
5	**5**	18	**14**	11	**5**	10	**2**	13	**11**	26	**9**	83	**46**	Number of participants at each pilot site that completed post-tests.

Participants indicated rank by circling **1** if an experience was **most important** to **6** if it was **least important** to their successful completion of this (short-course and its purposes) learning experience.
Average rank determined by use of weighted averages based upon number of participants who ranked preference at each site.

For the 14 water quality parameters taught, a greater percentage of learners felt confident in monitoring or testing water quality after the short-course. Confidence improvement ranged from 19 to 50% depending upon the parameter measured between the pre- and post-test (Table 5). Across all parameters participant confidence improvement averaged 34%.

Table 5.
Percentage of Learners Who Felt Confident in Monitoring or Testing Water Quality Parameters Before and After the PNW Water Quality and Monitoring Short-Course at Six Sites in Oregon, Washington, and Idaho
(Click the table for a larger version.)

County	Benewah		Yakima #1		Curry		Lincoln		Douglas/ Chelan		Yakima #2		Total Y & N		Confi-dence Response Total		Confi-dence Improve-ment
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre - Post
Monitor / test for coliform bacteria	2-40	2-40	6-33	7-50	1-09	2-40	3-30	2-100	1-8	4-36	9-35	5-56	22 Y 61 N	22 Y 24 N	26	48	22
Monitor / test for nutrients (nitrate and phosphorus)	2-40	5-100	9-50	10-71	5-45	3-60	1-10	2-100	2-16	10-91	10-38	8-89	27 Y 56 N	37 Y 9 N	32	80	48
Monitor / test for lead, iron, and sulfate	2-40	2-40	8-44	7-50	3-27	3-60	0-0	2-100	1-8	5-45	9-35	7-78	25 Y 58 N	25 Y 21 N	30	54	24
Monitor / test for pH	3-60	5-100	12-67	13-93	5-45	4-80	6-60	2-100	6-48	11-100	16-62	9-100	48 Y 35 N	43 Y 03 N	58	94	36
Monitor / test for turbidity	2-40	5-100	10-55	13-93	4-36	3-60	3-30	2-100	1-8	8-73	9-35	9-100	29 Y 54 N	39 Y 07 N	35	85	50
Monitor / test for total dissolved solids (TDS)	2-40	4-80	7-39	9-64	3-27	4-80	3 30	1-50	1-8	4-36	8-31	9-100	24 Y 59 N	30 Y 16 N	29	65	36
Monitor / test for hardness	2-40	5-100	8-44	9-64	4-36	3-60	1-10	2-100	1-8	10-91	11-42	9-100	27 Y 56 N	37 Y 09 N	32	80	48
Monitor / identify macro-inverte-brates (insects, leaches, etc.) in streams.	2-40	4-80	9-50	9-64	3-27	4-80	3-30	1-50	0-0	7-64	11-42	5-56	28 Y 55 N	29 Y 17 N	34	63	29
Monitor / identify physical stream, river, or lake character-istics	2-40	4-80	9-50	11-79	5-45	3-60	3-30	2-100	2-16	8-73	14-54	7-78	35 Y 48 N	34 Y 12 N	42	74	32
Monitor / identify aquatic plants and animals	3-60	4-80	8-44	6-43	3-27	4-80	1-10	1-50	0-0	4-36	9-35	4-44	24 Y 59 N	22 Y 24 N	29	48	19
Total participants in pre-test / post -test	5	5	18	14	11	5	10	2	13	11	26	9	83	46	100	100	

In the post-test, learners indicated the two most common causes of water pollution or water quality problems were agricultural chemicals or fertilizers (70%) and inadequate septic systems (72%) (Table 6). Participants who considered road construction and urban development as a cause of water quality problems increased from 34 to 41% with respect to the pre-test. Interestingly, those indicating agricultural or natural resource harvesting or tillage decreased from 33% to 23%. All of the other seven common causes of water pollution were reported at about the same levels in the pre- and post-tests. Over 90% of post-test learners were able to identify the three major groups of water body characteristics examined during a monitoring effort or assessment as physical, chemical, and biological.

Table 6.

What 46 Participants Thought Were the Most Common Causes of Water Pollution or Water Quality Problems in Their Community Before (Pre) and After (Post) PNW Water Quality and Monitoring Short-Course

(Click the table for a larger version.)

County	Benewah, ID		Yakima #1, WA		Curry, OR		Lincoln, OR		Douglas/ Chelan, WA		Yakima #2, WA		Totals		%	
	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post	Pre	Post
a) Leaking underground tanks	0	1	12	6	1	1	1	0	1	2	13	3	**41**	**13**	34	28
b) Chemical spills	0	0	8	4	0	1	0	0	2	2	6	1	**24**	**8**	19	17
c) Inadequate septic systems	2	3	7	9	6	4	6	2	5	8	18	7	**77**	**33**	**53**	72
d) Poorly designed waste disposal systems	2	2	9	5	4	4	4	1	2	1	6	2	**42**	**16**	33	35
e)Agricultural chemicals or fertilizers	1	3	15	10	8	2	3	1	7	9	20	7	**86**	**32**	65	70
f) Use and disposal of household and yard wastes	1	2	10	5	2	2	2	1	1	2	10	2	**40**	**14**	31	30
g) Road construction & urban development	2	2	5	3	4	2	3	2	2	3	12	7	**47**	**19**	**34**	41
h) Agriculture or natural resource harvesting or tillage	1	2	8	3	4	0	1	2	1	0	12	3	**37**	**10**	**33**	**22**
i) E-coli problems	1	1	10	6	2	1	2	0	2	2	9	3	**39**	**13**	31	28
j) Other (please specify):	Na, Beaver Fever disease		Na, Cows in creeks		Excess rainfall		Herbicides, post logging operations		2 Don't know		Poor runoff quality - urban buildup with poor stream setbacks. Mining and forestry practices.					
Total Response	5	5	18	14	11	5	10	2	13	11	26	9	83	46	100%	

Implications

Working with diverse audiences through learner/community-centered instruction enhanced rather than distracted from the learning opportunity at each site. Participants often engaged in examining their water issues together. At three sites, learners with opposite views on issues sat next to each other as co-learners. They teamed in the monitoring activity and grew because of the process. Key to the success of the short-course was for all learners to be reminded daily that the purpose was education not advocacy of a particular belief or value. Before encouraging discussions, presenters reminded all attendees that respect, responsibility, and safety for all their fellow learners was expected. This fostered a healthy learning environment and engaged each individual as a learner rather than as a water polluter, environmental advocate, or water user.

Participants reported learning took place at three levels during the short-course.

- **Level one** - Participant interaction (sharing), lecture/discussion, "hands-on" activities, and keeping a personal journal within the four day course supported individual and group learning;
- **Level two** - Reading and using the PNW Water Quality & Monitoring Guide that had basic information for future personal or community water education efforts; and
- **Level three** - Those with a keen interest in specific topics accessed web sites listed in each module (with in-depth and research based information).

Often CES practitioners try to move learners to adoption of practices too soon after they have been provided information. This short-course provided a bridge for those with an interest in water to act on that interest as individuals and communities. It laid a foundation of knowledge, skills, and attitudes using the "Do-Think- Learn" model (Deen & Newman, 1993) in order for learners to implement the "Learn-Plan-Act" process. Learners built upon their interests and improved their understanding of water awareness, quality, and monitoring.

Originally, program planners had wanted the program to certify the participants as water quality monitoring "licensees" after 15 hours of training. After testing this pilot, it was clear that clientele wanted to be lifted to a next level of knowledge, skills, and attitudes before engaging in the action of water quality assessment, planning, or monitoring. This short-course accomplished the learners' goals and prepared them for a second level of training as monitors, volunteers, or policy makers through further training. Planners learned to be careful in targeting groups and to be realistic in setting citizen group goals.

Conducting the program in the three states was instructive in examining learner readiness. This short-course was also analyzed using the adoption diffusion model (Rogers, 1983; Havelock, 1973) and social action process (Beal & Bohlen, 1971).

While all learners benefited from this pilot effort, in Coastal Oregon the extensive network and existing resources devoted to water quality perhaps merited a more advanced program. Many citizens in Oregon had already adopted water quality measures or implemented monitoring efforts. The short-course may benefit late adopters or laggards to water quality issues or monitoring efforts.

By contrast, in one northern Idaho community the early adopters were beginning to engage in the water resources use and water quality learning process. In Idaho this short-course can fill the needs of water resource education in those counties where increased awareness, allocation of resources, and learner readiness have been identified in advance.

On the other hand, in central Washington citizens had passed the awareness stage and were ready to adopt new ideas. They were actively engaged in seeking water quality solutions and resources for a large group of water issues. The pilot drew the largest participation in Washington because resources had been allocated and learners were ready.

Summary

This educational pilot program helped citizens in the Pacific Northwest to learn how to protect their watersheds and understand how surface water quality and monitoring practices work. The short-course filled an educational need for those that participated. Participants reported learning took place at three levels during the short-course. Based upon the evaluation of collected data, the pilot objectives of understanding and awareness about water issues, empowerment of citizens, water use, and measurement were met or exceeded. Turning that newly acquired knowledge into action is the next step and challenge for pilot participants and CES practitioners.

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