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**SOURCE Program Teacher Guide**

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Dear Teacher,

Thank you for participating in our SOURCE watershed program! As you likely already know, Salish Sea Expeditions’ SOURCE program traditionally takes place in the classroom (with some outside adventures on campus) over a 2 week period or a total of 10 classroom hours. These two weeks are packed with activities, lectures, and science experiments aimed at increasing student knowledge on watershed and storm water issues and inspiring future water quality stewards!

This packet is designed to provide materials and answer questions that you may have about our program. In this packet, you will find in-depth information about our program, classroom handouts, and a guide to the EALRs met through completion of SOURCE. This Teachers’ Guide is filled with information that will answer questions and prepare you for your SOURCE adventure, but please feel free to contact us at anytime.

Using INQUIRY-BASED SCIENCE is key to the experience that students have with Salish Sea Expeditions. Inquiry-based science is a student-centered, active learning approach focused on questioning, critical thinking, and problem solving. It provides students with opportunities to take the initiative, observe and question phenomena, pose explanations of what they see, devise and conduct tests to support or contradict their theories, analyze data, and draw conclusions from their experimental data. Students will help direct their own learning experience.

Lastly, if you have questions or concerns about your program, please do not hesitate to contact us at any time. We look forward to working with you and helping your students plan an expedition of learning and adventure!

Thank you,

Kristen Cann
Education Director
Kristen@salish.org
206-780-7848 ext 2#

Eric Strickler
Program Manager
eric@salish.org
206-780-7848 ext 4#
What is a watershed? Unfortunately most students as well as adults are not able to answer this simple question even though our lives are so intricately connected to the watersheds we live in. Without this understanding, it becomes harder for us to understand the role each of us as individuals play on the amount of pollution that enters the streams, rivers, lakes, and ultimately the Puget Sound. The SOURCE program aims to remedy this disconnect by cultivating student awareness of watershed ecosystem processes and to encourage student understanding and responsibility of the role humans play in the creation of storm water pollution. Upon completion of this program, students will understand that the products they use at home or in their daily life can have a significant and direct impact on the health of the Puget Sound and the flora and fauna that live there.
PROGRAM OVERVIEW

SOURCE combines innovative classroom study with scientific research and experimentation using the inquiry based learning model to encourage student ownership and participation. SOURCE provides an educational opportunity for youth to learn scientific principles and practice problem-solving skills while investigating scientific issues surrounding the waters of Puget Sound. SOURCE programs have three main components:

Learning Segment 1: Background
- Salish educators use lectures, discussions, and activities to help develop student understanding of watershed ecology and dynamics, storm water processes, the scientific method, and relevant place based issues.

Learning Segment 2: Experimentation
- Students collect water samples from various storm water collection points around campus. Working in small groups they develop and carry out their own storm water research experiments using aquatic monitoring equipment and tools provided by Salish.
- Students are encouraged to follow all of the steps of the scientific method to ensure the complete scientific research process from Question and Hypothesis all the way to Conclusion and Communication is carried out.
- Salish staff work with students to help them correctly graph and analyze their data and to use that data to create informed and thoughtful conclusions.
**Learning Segment 3: Presentation**
- Working in their small groups, students develop a PowerPoint presentation in which they account for their full scientific process including data analysis, evaluation, conclusion, and solutions, which they present to their peers on the last days of the SOURCE program.
- Salish staff are there to help students each step of the way and to provide feedback on presentation context and performance.

**Student Science Symposium**
- Upon completion of SOURCE, student delegates are invited to present and share their findings to an audience of peers, scientists, and the local community at Salish’s annual Student Science Symposium that occurs in June of each year.
- Participants also get to listen to presentations given by policy and science professionals who link this research to locally relevant marine and watershed issues in the Puget Sound.

**LEARNING TARGETS**

Students will be able to achieve the following learning targets after completing all three learning segments:
- I can explain the human impact on the watershed I live in, make observations and describe water quality relationships.
- I can design and carry out a research project on water quality in my own watershed.
- I can present and evaluate storm water science projects with my peers and think critically to create a watershed stewardship action plan.

By the end of the program, not only do we hope that students will walk away with a deeper understanding of the role humans play in our Puget Sound watershed, but we also hope to have inspired curiosity of the environment we live in and the confidence to further pursue scientific interests. We love exploring the world of science and we want students to as well!
RESOURCES FOR PARTICIPANTS

SOURCE participants are provided access to:
- Customized curriculum development for watershed research and integration with your current teaching objectives;
- Teacher trainings to assist you in facilitation of inquiry based learning in a field research setting;
- Access to sampling equipment and field resources;
- Staff consultation and at least 1 additional classroom visit, if desired;
- Participation in our June Student Science Symposium where student delegations will present their research to both SOUND and SOURCE participants, peers, local scientists, and the community.

PROGRAM TIMELINE

A standard SOURCE program typically occurs over a 2 week period, during which we work within your class period time allotment to complete all 3 learning segments, so as to minimize any inconvenience or disruption of your normal class flow. In total the program takes approximately 10 hours and so can be modified by any variation of hours to best suit your needs (ex. 5 visits at 2 hours each, etc).

In addition, it should be noted that SOURCE is designed to be as flexible as possible and is willing to work with teachers who have the resources to travel outside the school campus to perform studies at various sites in the Puget Sound region. If you have any suggestions or ideas, just tell us!
RATIONALE

SOURCE creates citizen scientists, providing students with a richer understanding of the local area watershed, waterways and the impacts of human development. Students gain sense of place through background information lessons before exploring the interconnections of the environment through the lens of the scientific method.

While applying new concepts students decide what information interests them most and begin to use higher order thinking (critical thinking) to discuss among their peers responding and manipulated variables to design a logical project. Inquiry based science projects incorporate critical thinking, making predictions, and problem solving, following complicated instructions, and working cooperatively. Through an inquiry-based learning model, students direct their learning while using skills in reading, writing, math, communication and technology. Source addresses diverse student needs and multiple intelligences through student centered, hands-on activities that included assessment of learning as well as assessment for learning.

LEARNING OUTCOMES

• As a result of engaging with this Unit Plan students will learn important natural concepts relevant to where they live and how humans interact and impact our natural environment.
• Students identify local water ways including their home watershed address, retention ponds, creeks, storm drains, and any other possible runoff collection points students observe.
• Students will learn to think critically about water quality and how to use the scientific methods as a tool to further their understanding.
• While working together students will learn the value of and new skills in communication and cooperation.
• Students use all of their knowledge and skills from the Unit Plan to demonstrate their ability to logically create an action plan.
• Students create a visual drawing of a watershed and storm water concepts displaying flow of water and human impacts.
• Students research and present information on a water quality parameter, and the impacts on life in the environment.
• Students write a scientific prediction, which includes responding, and manipulated variables and a logical hypothesis.
• Students operate and problem solve water quality data collection techniques to use equipment to measure water quality and interpret data to form a conclusion.
• Students write a scientific conclusion.
• Students present research project to peers and explain why it is important.
• Students identify water quality issues within their home watershed and create a
watershed steward action plan.

Appendix A: SOURCE LEARNING TARGETS

### Background Information and Project Design

<table>
<thead>
<tr>
<th>I can define watershed and storm water. I can name two local watersheds and describe two ways people affect watershed health</th>
<th>I can draw a watershed/storm water system and describe how water flows through systems and landscapes. I can predict where to find sources of high and low water quality.</th>
<th>I can describe four different water quality parameters and their affects on life in the Puget Sound</th>
<th>I can design a water quality project, including manipulated and responding variables, and predict what I will find out.</th>
<th>I can design a water quality research project and demonstrate data collection techniques using different tools and problem solving strategies.</th>
</tr>
</thead>
</table>

### Project Design and Stewardship

| I can continue demonstrating water quality collection techniques and begin to interpret data collected. | I can collaborate with other students to form a conclusion; this includes graphing and analysis to support or refute my prediction, evaluation of project, ideas for the future and new questions. I can explain relationships between the water quality data and Puget Sound ecosystem health. | I can collaborate with other students to create (synthesize) a research project into a presentation. | I can present and explain a research project clearly and effectively. | I can collaborate with other students to explain the importance of research on water, the Puget Sound and planet Earth. I can collaborate with other students to generate ideas for healthy water action strategies. |
Appendix B: CLASSROOM HANDOUTS
Research Question:

Responding variable: ____________________  Manipulated variable: ____________________

Prediction (if . . . then . . . because)

IF: ____________________________________________________________________________

Then: ________________________________________________________________________

Because: _____________________________________________________________________

Materials:  Procedure:

Control Variables:

<table>
<thead>
<tr>
<th>Data</th>
<th>Data</th>
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<tbody>
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</tbody>
</table>

Data Graph
Source
Watershed Concept Map

Island

Category: land Area

Mountains

Non-examples Of watersheds

Examples of watersheds

Watershed

Characteristics Properties

Human Impacts

Notes:
SOURCE Watershed Unit Assessment

1. Watershed-Storm water drawing (15 Points)
   Includes watershed concepts (1 2 3 4 5)
   Includes storm water concepts (1 2 3 4 5)
   Clarity and includes water flow (1 2 3 4 5)

2. Water Quality data collection (15 Points)
   Care for equipment (1 2 3 4 5)
   Scientific Exactness – reads and follows directions (1 2 3 4 5)
   Focus for Learning – use of time efficiently (1 2 3 4 5)

3. Participation (20 Points)
   Presents information from group work in a mature manner (1 2 3 4 5)
   Field Behavior helps class achieve stated goals (1 2 3 4 5)
   Does best to help all students learn in all phases of project (1 2 3 4 5)
   Participates in class activities and lectures (1 2 3 4 5)

4. Storm water concepts and presentations (50 Points)
   Thorough background (1 2 3 4 5)
   Prediction includes all parts, logically explained, refers to water quality concept.
   Data and graph are clearly labeled and easy to read (1 2 3 4 5)
   Data is analyzed and a logical conclusion is drawn (1 2 3 4 5)
   Conclusion is backed by claims and evidence (1 2 3 4 5)
   Evaluation of project (1 2 3 4 5)
   Three new questions for research (1 2 3 4 5)
   Grammar, mechanics, spelling (1 2 3 4 5)
   Original thought, language, and words (2 4 6 8 10)
Writing a Conclusion Template

Name: ___________________    Period: ____   Date: ___________

Research Question: ______________________________________________________

<table>
<thead>
<tr>
<th>Prompt</th>
<th>Your sentence(s)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>From the data, I can infer that</strong>…(answer the research question here)</td>
<td></td>
</tr>
<tr>
<td><strong>For example, when</strong>… (identify changed MV &amp; the average high data)</td>
<td></td>
</tr>
<tr>
<td><strong>Whereas</strong>… (identify changed MV &amp; the average low data)</td>
<td></td>
</tr>
<tr>
<td><strong>The hypothesis was supported / not supported</strong> because…(use the difference between high/low data to explain)</td>
<td></td>
</tr>
</tbody>
</table>

Rewrite your sentences above into a final conclusion paragraph below.

Conclusion Scoring Guide:

| _____ Answers the investigative question by explaining how the MV effects the RV | + = perfect |
| _____ Includes high and low data from investigation | √ = included but could be improved |
| _____ Uses data to state if hypothesis is supported or not | – = Not included |
| _____ Describes the difference between the high and low data (include how much, if data is numerical) | 4 = all + |
|                                               | 3 = +/- |
|                                               | 2 = +/- |
|                                               | 1 = more than one |
SOURCE PRESENTATION CHECKLIST

TITLE SLIDE

☐ Relevant Project Title
☐ Include Student Names
☐ School Name
☐ Date of Presentation

PARAMETERS BACKGROUND SLIDE

☐ Define your parameter (include interesting facts)
☐ What products is it in?
☐ How does it affect aquatic life?
☐ Human health affects, if any?

MAP SLIDE

☐ Include map of site (ex. School campus)
☐ Mark approximate sampling locations if possible

PREDICTION/HYPOTHESIS SLIDE

☐ Clearly state your prediction statement so that is easily understood by your audience

VARIABLES SLIDE

☐ Label and explain responding variable
☐ Label and explain manipulating variable
☐ Label and explain any controlled variables

MATERIALS SLIDE

☐ Include experiment materials
☐ Include water collection and sampling materials
PROCEDURES SLIDE

☐ Include water collection procedures
☐ Include experiment procedures
☐ Be thorough enough that the audience can repeat your experiment

DATA TABLE/GRAPH

☐ Clearly title and label all parts of your tables and graphs
☐ Include units on all measurements (ex. ppm, mL, etc)

DATA ANALYSIS/CONCLUSION

☐ Explain what the data is telling you
☐ Do you agree, disagree, or are you left undecided about the hypothesis? Explain why and use data to explain your case.
☐ Include ideas for ways to help solve or minimize your storm water pollutant parameter

EVALUATION

☐ List 3 things you think you did well
☐ List 3 things you would do to improve your experiment (assuming that you had all the resources and time that you needed)

TESTABLE RESEARCH QUESTIONS

☐ List 3 research ideas you’d be interested in exploring further
Source Group Information Form

Please complete this form and fax it to (206)780-9005, email the information to kristen@salish.org, or mail it to: 647 Horizon View Place Bainbridge Island, WA 98110

Group/School Name:______________________________________________________
Teacher/Organizer: ____________________ E-mail: _____________________________
School Phone #: _________________ Home/Cell Phone #:________________________
Secondary Contact: _________________ E-mail: _____________________________
School Phone #: _________________ Home /Cell Phone #:________________________
Grade/Age of Students: _______/________ School District: ______________________
# of Students:  female______ male_____ # of Adults: female________ male________
# of ELL Students _____ # of students that attended boat trip_______
Mailing address: __________________________________________________________
County: ________________________ Free & Reduced lunch % of school: ____________
Billing Address (if different from above): ______________________________________

School/Group Type (circle one): Public  Private  Home  Other _________________

<table>
<thead>
<tr>
<th>ETHNICITY</th>
<th># OF STUDENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>African American</td>
<td></td>
</tr>
<tr>
<td>Asian American</td>
<td></td>
</tr>
<tr>
<td>Caucasian</td>
<td></td>
</tr>
<tr>
<td>Native American</td>
<td></td>
</tr>
<tr>
<td>Latino</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td></td>
</tr>
<tr>
<td>Total # in Class</td>
<td></td>
</tr>
</tbody>
</table>
School Program Planning & Logistics

Teacher Goals & Objectives in relation to Source Storm Water Program. Consider a water quality focus or a product focus:

- 
- 
- 

List of coursework topics conducted in class to prepare students for Source Research Project:

- 
- 

Possible data collection sites for both onsite and offsite monitoring:

- 
- 
- 

Experience with Watershed and Storm water concepts:

Experience with water quality data collection procedures and or equipment:

Current local water related issues that would better prepare Salish staff to provide a meaningful educational experience:

Confirm Source Research Logistics

Confirm Classroom Visit Dates: ________________________________
Confirm Data Collection Sites: ________________________________
Field Data Collection Dates: ________________________________

A/V Equipment Available in Classroom (Laptop, Projector, Speakers, etc.): Yes No
Are you a Salish Alum? Yes No
Travelling by bus? Yes No
Bus Line Phone Contact: ________________________________
Mini Grant form: Yes No

Emergency Contact - Program Director Cell Phone: 516.443.9109
Source Program Coordinator: 206.715.0423 ext. 3

http://salish.org/sourceeducatorsonly
What are Surfactants?

- "Surface Acting Agents"
- Reduces liquid surface tension, especially water
- Play a role in removal of dirt
- Molecules surround particles and break them up
- Referred to as wetting agents and foamers

What are they found in?

- Detergents
- Fabric softeners
- Paints
- Anti-fogs
- Shampoos
- Inks
- Adhesives
- Ski-Snowboard wax
- Shampoos and hair conditioners
- Toothpastes
- Petroleum, oil refining, petrochemical, and gas industries

What are we testing?

- Levels of surfactants in water near local areas of town
- If they are accidentally getting into water sources
- If surfactants are affecting our drinking water, other water sources and our environment

Where did we test?

- Safeway Town: Water collected behind Silverscreen
- Sportsman's Club Road Detention Pond
- Drinking Water: Collected at BHS
- Public Swimming Pool
- BHS Field water
- Grand Forest

Prediction

IF...we test the water for surfactants from
- the sportsman pond
- the pool
- field water
- drinking water
- grand forest water...
Variables

RESPONDING:
• Surfactants

MANIPULATED:
• Drinking water,
• Sportsman Pond
• Pool
• Field
• Grand forest
• Safeway Town

CONTROL:
• Materials
• Methodology

Materials

• pH Adjustment Powder - 50g
• Sodium chloride Reagent - 10g
• DS Indicator Reagent
• 0.5 plastic spoon
• 0.1 plastic spoon
• 1.0 mL plastic pipet
• Goggles
• Rubber gloves

Methods

1. Rise a tube with the sample H2O and fill up tube with sample.
2. Add 0.5g pH adjustment powder (shake well)
3. Add 2.0 mL of DS indicator (shake well)
4. Wait 5 minutes
5. Rinse a new clean tube for a blank sample
6. Test blank THEN test sample in colorimeter

Table

<table>
<thead>
<tr>
<th></th>
<th>Pool</th>
<th>Sportsman Club Pond</th>
<th>Drinking H2O</th>
<th>Grand Forest</th>
<th>Field</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pool</td>
<td>1.8 ppm</td>
<td>1.8 ppm</td>
<td>0.5 ppm</td>
<td>1.6 ppm</td>
<td>0.2 ppm</td>
</tr>
<tr>
<td>Sportsman</td>
<td>2.4 ppm</td>
<td>1.4 ppm</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Club Pond</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Drinking H2O</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Grand Forest</td>
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<td></td>
<td></td>
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<tr>
<td>Field</td>
<td></td>
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</tbody>
</table>

Graph

Conclusion: Part I

WHAT OUR DATA MEANT:
• Our data showed that the Safeway Town run off had the highest level of surfactants at 2.44ppm.

HOW IT MATCHED WITH OUR PREDICTION:
• Our prediction wasn't supported by our data. We predicted that the pool would have the highest level of surfactants, but our data showed that the Safeway Town run off sample had the greater amount.

Conclusion: Part II

WHAT WE LEARNED:
• Safeway and Sportsman Pond had the most surfactants because they are surrounded by more buildings.
• Pool did contain some surfactants, but not nearly as much as like Safeway or Sportman pond.

WHAT WE WOULD CHANGE FOR NEXT TIME:
• Collect data from places that are surrounded by more buildings to compare the range of surfactants from neighborhood to neighborhood.
EXAMPLE OF A NON TRADITIONAL OFFSITE PROJECT:

Seventh and eighth grade students from the Odyssey School focused on the Blakely Harbor Watershed of Bainbridge Island for their field research. Content building prior to field research entailed learning about the history and use of the site. Through research and communication with the City of Bainbridge Island for historical data, they investigated the health of marine, brackish, and fresh water habitats. The scope of sampling included noting the abundance of biological indicator species and macroinvertebrates, the amount of nitrates, phosphates, and the dissolved oxygen found in each environment. Students collected field data three times over the course of two months. Back in the classroom, Salish staff assisted in synthesizing their data and prepared them for presenting their findings at the Puget Sound Student Science Symposium.
APPENDIX D. WATERSHED / STORM WATER CONCEPTS EALRs

Learning Target 1: I can define watershed and storm water concepts. I can name two local watersheds and describe two way people affect watershed health.

6-8 PS3A Energy exists in many forms which include: heat, light, chemical, electrical, motion of objects, and sound.
6-8 PS3B Heat (thermal energy) flows from warmer to cooler objects until both reach the same temperature. Conduction, radiation, and convection, or mechanical mixing, are means of energy transfer.

6-8 ES3D Earth has been shaped by many natural catastrophes, including earthquakes, volcanic eruptions, glaciers, floods, storms, tsunami, and the impacts of asteroids.
6-8 ES3E Living organisms have played several critical roles in shaping landforms that we see today.

Learning Target 2: I can draw a watershed /storm water system and describe how water flows through systems and landscape. I can infer on my watershed design where there would be the most health and unhealthy water.

6-8 LS2A An ecosystem consists of all the populations living within a specific area and the nonliving factors they interact with. One geographical area may contain many ecosystems.
6-8 LS2C The major source of energy for ecosystems on Earth's surface is sunlight. Producers transform the energy of sunlight into the chemical energy of food through photosynthesis. This food energy is used by plants, and all other organisms to carry on life processes. Nearly all organisms on the surface of Earth depend on this energy source.
6-8 LS2D Ecosystems are continuously changing. Causes of these changes include nonliving factors such as the amount of light, range of temperatures, and availability of water, as well as living factors such as the disappearance of different species through disease, predation, habitat destruction and overuse of resources or the introduction of new species.
6-8 LS2E Investigations of environmental issues should uncover factors causing the problem and relevant scientific concepts and findings that may inform an analysis of different ways to address the issue.

6-8 ES2B The Sun is the major source of energy for phenomena on Earth's surface, such as winds, ocean currents, and the water cycle.
6-8 ES2C In the water cycle, water evaporates from Earth's surface, rises and cools, condenses to form clouds and falls as rain or snow and collects in bodies of water.
6-8 ES2D Water is a solvent. As it passes through the water cycle, it dissolves minerals and gases and carries them to the oceans.
6-8 ES2G Landforms are created by processes that build up structures and processes that break down and carry away material through erosion and weathering.

**Learning Target 3. I can describe four different water quality parameters and their affects on life.**

Reading:
1. The student understands and uses different skills and strategies to read.
   1.1. Use word recognition skills and strategies to read and comprehend text.
   1.2. Use vocabulary (word meaning) strategies to comprehend text.
   1.3. Build vocabulary through wide reading.
   1.4. Apply word recognition skills and strategies to read fluently.
3. The student reads different materials for a variety of purposes.
   3.1. Read to learn new information.
   3.2. Read to perform a task.

Social Studies, Geography
The student uses a spatial perspective to make reasoned decisions by applying the concepts of location, region, and movement and demonstrating knowledge of how geographic features and human cultures impact environments.

3.1 Understands the physical characteristics, cultural characteristics, and location of places, regions, and spatial patterns on the Earth's surface.
3.2 Understands human interaction with the environment.

Communication:
1. The student uses listening and observation skills and strategies to gain understanding.
   1.1. Uses listening and observation skills and strategies to focus attention and interpret information.
   1.1.1. Applies a variety of listening strategies to accommodate the listening situation.
   1.1.2. Applies a variety of listening and observation skills/strategies to recall and interpret information.
   1.2. Understands, analyzes, synthesizes, or evaluates information from a variety of sources.
   1.2.1. Analyzes relationships within and between visual and auditory information.
   1.2.2. Analyzes mass media for bias and the use of persuasive techniques.
3. The student uses communication skills and strategies to effectively present ideas and one's self in a variety of situations.
   3.1. Uses knowledge of topic/theme, audience, and purpose to plan presentations.
   3.1.1. Applies skills to plan and organize effective oral communication and presentation.
   3.2. Uses media and other resources to support presentations.
   3.2.1. Uses available technology and resources to support or enhance a presentation.
   3.3. Uses effective delivery.
   3.3.1. Applies skills and strategies for the delivery of effective oral communication and presentations.

Education for Environment and Sustainability:
Standard 2:
The Natural and Built Environment
Students engage in inquiry and systems thinking and use information gained through learning experiences in, about, and for the environment to understand the structure, components, and processes of natural and human-built environments.

**Learning Target 4:** I can design a water quality project, including two manipulated and two responding variables, and predict what I will find out.


6-8 SYSB The boundaries of a system can be drawn differently depending on the features of the system being investigated, the size of the system, and the purpose of the investigation.

6-8 SYSC The output of one system can become the input of another system.

6-8 SYSD In an open system, matter flows into and out of the system. In a closed system, energy may flow into or out of the system, but matter stays within the system.

6-8 SYSE If the input of matter or energy is the same as the output, then the amount of matter or energy in the system won't change; but if the input is more or less than the output, then the amount of matter or energy in the system will change.

6-8 SYSF The natural and designed world is complex; it is too large and complicated to investigate and comprehend all at once. Scientists and students learn to define small portions for the convenience of investigation. The units of investigation can be referred to as "systems."


6-8 INQA — Question— Scientific inquiry involves asking and answering questions and comparing the answer with what scientists already know about the world.

6-8 INQB — Investigate— Different kinds of questions suggest different kinds of scientific investigations.

6-8 INQC — Investigate— Collecting, analyzing, and displaying data are essential aspects of all investigations.

6-8 INQD — Investigate— For an experiment to be valid, all (controlled) variables must be kept the same whenever possible, except for the manipulated (independent) variable being tested and the responding (dependent) variable being measured and recorded. If a variable cannot be controlled, it must be reported and accounted for.

**Learning Target 5:** I can demonstrate data collection techniques using different equipment.


6-8 APPA People have always used technology to solve problems. Advances in human civilization are linked to advances in technology.

6-8 APPB Scientists and technological designers (including engineers) have different goals. Scientists answer questions about the natural world; technological designers solve problems that help people reach their goals.

6-8 APPC Science and technology are interdependent. Science drives technology by demanding better instruments and suggesting ideas for new designs. Technology drives science by providing instruments and research methods.
6-8 APPD The process of technological design begins by defining a problem and identifying criteria for a successful solution, followed by research to better understand the problem and brainstorming to arrive at potential solutions.

6-8 APPE Scientists and engineers often work together to generate creative solutions to problems and decide which ones are most promising.

6-8 APPF Solutions must be tested to determine whether or not they will solve the problem. Results are used to modify the design, and the best solution must be communicated persuasively.

**Learning Target 6:** I can evaluate water quality collection techniques and begin to interpret data collected.


6-8 INQD — Investigate — For an experiment to be valid, all (controlled) variables must be kept the same whenever possible, except for the manipulated (independent) variable being tested and the responding (dependent) variable being measured and recorded. If a variable cannot be controlled, it must be reported and accounted for.

6-8 INQE — Model — Models are used to represent objects, events, systems, and processes. Models can be used to test hypotheses and better understand phenomena, but they have limitations.

6-8 INQF — Explain — It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.

6-8 INQH — Intellectual Honestly — Science advances through openness to new ideas, honesty, and legitimate skepticism. Asking thoughtful questions, querying other scientists’ explanations, and evaluating one’s own thinking in response to the ideas of others are abilities of scientific inquiry.

**Learning Target 7:** I can collaborate with other students to form a conclusion; this includes graphing and analysis to support or refute my prediction, evaluation of project, ideas for the future and new questions. I can explain relationships between the water quality data and Puget Sound ecosystem health.

Education for Environment and Sustainability

Standard 1: Ecological, Social, and Economic Systems

Students develop knowledge of the interconnections and interdependency of ecological, social, and economic systems. They demonstrate understanding of how the health of these systems determines the sustainability of natural and human communities at local, regional, national, and global levels.

Writing:

1. The student understands and uses a writing process.
   1.1. Prewrites to generate ideas and plan writing.
   1.2. Produces draft(s)
   1.3. Revises to improve text.
   1.4. Edits text

2. The student writes in a variety of forms for different audiences and purposes.
   2.1. Adapts writing for a variety of audiences
   2.2. Writes for different purposes.
3. The student writes clearly and effectively.
   3.1. Develops ideas and organizes writing.
   3.2. Uses appropriate style.
   3.3. Knows and applies writing conventions appropriate for the grade level.

Math
4. Core Content: Probability and data
4.A Represent the sample space of probability experiments in multiple ways, including tree diagrams and organized lists.
4.B Determine the theoretical probability of a particular event and use theoretical probability to predict experimental outcomes.
4.C Describe a data set using measures of center (median, mean, and mode) and variability (maximum, minimum, and range) and evaluate the suitability and limitations of using each measure for different situations.
4.E Evaluate different displays of the same data for effectiveness and bias, and explain reasoning.

6. Core Processes: Reasoning, problem solving, and communication
6.A Analyze a problem situation to determine the question(s) to be answered.
6.B Identify relevant, missing, and extraneous information related to the solution to a problem.
6.C Analyze and compare mathematical strategies for solving problems, and select and use one or more strategies to solve a problem.
6.D Represent a problem situation, describe the process used to solve the problem, and verify the reasonableness of the solution.
6.E Communicate the answer(s) to the question(s) in a problem using appropriate representations, including symbols and informal and formal mathematical language.
6.F Apply a previously used problem-solving strategy in a new context.
6.G Extract and organize mathematical information from symbols, diagrams, and graphs to make inferences, draw conclusions, and justify reasoning.
6.H Make and test conjectures based on data (or information) collected from explorations and experiments.

Learning Target 8: I can collaborate with other students to create (synthesize) a research project into a presentation.

Communication
3. The student uses communication skills and strategies to effectively present ideas and one's self in a variety of situations.
3.1. Uses knowledge of topic/theme, audience, and purpose to plan presentations.
3.1.1. Applies skills to plan and organize effective oral communication and presentation.
3.2. Uses media and other resources to support presentations.
3.2.1. Uses available technology and resources to support or enhance a presentation.

Educational Technology:
1. Integration: Students use technology within all content areas to collaborate, communicate, generate innovative ideas, investigate and solve problems.
1.1. Innovate: Demonstrate creative thinking, construct knowledge and develop innovative products and processes using technology.
1.1.1. Generate ideas and create original works for personal and group expression using a variety of digital tools.

1.2. Collaborate: Use digital media and environments to communicate and work collaboratively to support individual learning and contribute to the learning of others.
1.2.1. Communicate and collaborate to learn with others.

2. Digital Citizenship: Students demonstrate a clear understanding of technology systems and operations and practice safe, legal and ethical behavior.
2.1 Practice Safety: Demonstrate safe, legal and ethical behavior in the use of information and technology.
2.1.1 Practice personal safety.
2.1.2 Practice ethical and respectful behavior.
2.2 Operate Systems: Understand technology systems and use hardware and networks to support learning.
2.2.1 Develop skills to use technology effectively.
2.3 Select and Use Applications: Use productivity tools and common applications effectively and constructively.
2.3.1 Select and use common applications.
2.3.2 Select and use online applications.

Learning Target 9: I can present and explain a research project.

6-8 INQF — Explain — It is important to distinguish between the results of a particular investigation and general conclusions drawn from these results.
6-8 INQG — Communicate Clearly — Scientific reports should enable another investigator to repeat the study to check the results.
6-8 INQH — Intellectual Honestly — Science advances through openness to new ideas, honesty, and legitimate skepticism. Asking thoughtful questions, querying other scientists' explanations, and evaluating one's own thinking in response to the ideas of others are abilities of scientific inquiry.
6-8 INQI — Consider Ethics — Scientists and engineers have ethical codes governing animal experiments, research in natural ecosystems, and studies that involve human subjects.

6-8 LS2E Investigations of environmental issues should uncover factors causing the problem and relevant scientific concepts and findings that may inform an analysis of different ways to address the issue.

Comm 4: The student analyzes and evaluates the effectiveness of communication.
4.1. Assesses effectiveness of one's own and others' communication.
   4.1.1. Analyzes and evaluates strengths and weaknesses of one's own communication using own or established criteria.
4.2. Sets goals for improvement.
   4.2.1 Analyzes and evaluates strengths and weaknesses of others' formal and informal communication using own or established criteria.
Learning Target 10: I can collaborate with other students to explain the importance of research on water, Puget Sound and planet Earth and generate ideas for healthy water action strategies.

Education for Environment and Sustainability
Standard 3: Sustainability and Civic Responsibility
Students develop and apply the knowledge, perspective, vision, skills, and habits of mind necessary to make personal and collective decisions and take actions that promote sustainability.
Writing:
1. The student understands and uses a writing process.
   1.1. Prewrites to generate ideas and plan writing.
   1.2. Produces draft(s)
   1.3. Revises to improve text.
   1.4. Edits text
2. The student writes in a variety of forms for different audiences and purposes.
   2.1. Adapts writing for a variety of audiences
   2.2. Writes for different purposes.
3. The student writes clearly and effectively.
   3.1. Develops ideas and organizes writing.
   3.2. Uses appropriate style.
   3.3. Knows and applies writing conventions appropriate for the grade level.
Appendix E: Hot Tips for Teachers!

The following are insider tips from other teachers and our staff to smooth out your planning process and make the most of your Salish experience...

- Schedule your SOURCE program ASAP by contacting our Education Director Kristen Cann Kristen@salish.org or by calling 206-780-7848 ext. 2#.

- Contact your building supervisor to get permission to take samples from storm drains and other various collection points around campus.

- If you have the resources, time, and energy to do a non-traditional SOURCE visit that includes off campus expeditions, be sure to set up a meeting with Kristen Cann to help flush out ideas and the ultimate schedule.

- Build Salish into your curriculum. Do background preparation on Puget Sound, the Scientific Method, watersheds, storm water, or investigate any topic that may help students prepare in achieving your own objectives. Salish is available to assist with resources and ideas.

- Distribute and collect student the Pre-trip evaluations ahead of time if possible.

- Complete the Group Info form and send it to our Education Director at Kristen@salish.org or by fax at 206-780-9005.

- Salish is very flexible and receptive—if you have questions, ideas or needs, contact us and we will do our best to accommodate you.

Mentally prepare for the trip—teachers are often used to Doing It All and sometimes feel restless because Salish educators do all the work! If you have specific ideas of how you’d like to be involved, please share them with Salish staff; if not, sit back and enjoy the break, you deserve it!
APPENDIX F: Important questions for Teachers

- Total Number of students?
- Class schedule?
- Best possible dates, if not already established?
- Do they have a map of the school or is there a map on the school’s website?
- Major water or land features around or near the school?
- Are you familiar with any storm water features on your campus, such as detention ponds, rain gardens, storm drains?
- What is the name of the watershed your school is located in?
- Are students familiar with the scientific method?
- What will the student study before and after the Source unit?
- Are students familiar with creating Power Points?
- Do you have computers in your classroom? How many? Is there a computer lab?
- Do you have a Smart Board or Promethean Board in your classroom?
- How familiar is the teacher with co-teaching methodologies?
- How does your classroom discipline policy work?
- Are there any groups in your area that you have partnered with or would like to partner with?
APPENDIX G. Resources for more information

Watershed Resources

http://www.sharesalmonstrategy.org/resources.htm#maps – great maps of Puget sound watershed as well as individual watersheds. Has background information about specific watershed. Maps are available for purchase.
http://www.epa.gov/owow/monitoring/volunteer/ manuals and information on monitoring estuaries, lakes, streams & wetlands.
http://water.epa.gov/type/watersheds/ enter in your zip code to locate your local watershed.
http://water.usgs.gov/wsc/map_index.html – “Science In Your Watershed” and locate your watershed, active projects and much more.
http://www.nmfs.noaa.gov/

http://edna.usgs.gov/watersheds/kml_index.htm - watershed maps
http://www.dnr.wa.gov/ResearchScience/Topics/AquaticHabitats/Pages/aqr_nrsh_eelgrass_monitoring.aspx - eelgrass monitoring research
http://pugetsoundnearshore.org/technical_reports.htm reports on many environmental topics as well as formation of Puget Sound, fact sheets and documents on restoration of salmon, habitat ect.
http://www.beachwatchers.wsu.edu/ezidweb/ Interactive identification of flora and fauna of Puget Sound
http://www.watershedatlas.org/fs_indexwater.html - What’s a watershed? Interactive page

ORGANIZATIONS:
Homewaters (homewatersproject.org)
Find your Watershed—http://cfpub.epa.gov/surf/locate/index.cfm

BOOKS:
Streamkeepers Field Guide; Watershed Inventory and Stream Monitoring Methods
Author: Tom Murdoch, Martha Cheo and Kate O’Laughlin

Watershed Dynamics; Teachers Edition
Authors; William S. Carlsen, Nancy M. Trautmann and The Environmental Inquiry Team

PUBLICATIONS:
A Guide to Creating Meaningful Watershed Experiences (Chesapeake Bay Foundation)
LOCAL AGENCIES:
Libraries & Museums- Historical information
Planning departments (city, town or county)- Aerial maps, infra-red maps, zoning map & ordinances, land use plans, policies
Public Works Department- aerial photographs
Health Department- water quality, water supply, storm drainage systems, sewage treatment systems, domestic use.
    - Great resource to find streamkeeper and other public programs
City of County assessor’s office- Property owner maps
Native American Tribal Council- Historical information, (oral histories)
Electric utility companies & agencies- wide variety of maps, information on fish and wildlife populations
Civic Groups- information on physical, biological, social and political aspects of watershed.
    - Land use issues, regulations, historical information
City of Bainbridge Island
City Parks Dept
County Parks Dept
Bureau of Land Management

ENVIRONMENTAL GROUPS:
Environmental, fishing and agricultural groups- information on physical and biological, social and political aspects of watershed.
    - Land use issues, regulations, historical information
People for Puget Sound
Washington SeaGrant

STATE AGENCIES:
regulations on water quality & water use
    - issues and policies
Washington Department of Natural Resources-
Water Resource Division—Stream Flow, urban runoff, floods, base flow, low flow frequency, water temperatures, water quality
F&W Department- Fish and wildlife distributions, regulation activities
Department of Natural Resources

FEDERAL AGENCIES:
USGS- Topography maps
    - Government Planning Dept.- Comprehensive planning maps (types of future developments)
F&W Service- Fish and wildlife distributions, regulation activities
Federal Census Bureau - Demographic distributions
Geological Survey (GIS) - maps
National Weather Service office - Climate data (Storm and flood records, rainfall)
U.S. Natural Resources Conservation Service - aerial photographs, soil maps, soil types, geologic features, water resources, land use, vegetation
EPA - Policies on water quality standards, water quality issues, river and large stream information on fish and wildlife populations, habitats, water quality, recreational use
National Forest Service - information on geology, topography, soil, vegetation, water resources, land use, fish and wildlife

Colleges and Universities –
(Depts of water resources, natural resources, botany, wildlife, ecology, environmental studies, geology, forestry, agricultural, fisheries)
-Physical, biological and historical information