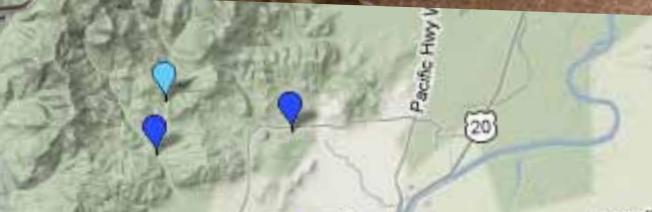




# StreamWebs

## Student Stewardship Field Book



Sensitive / Intolerant	
# found	
caddisfly	
mayfly	
riffle beetle	
stonefly	
water penny	
dobsonfly	

**OSU**  
Oregon State  
UNIVERSITY

Extension Service



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# Freshwater is a very, very, very limited resource and needs your help!

Our home waters may be in trouble, but you can be a part of the solution to save our streams! Here's how...

Use the 10 Step Model in the StreamWebs Student Stewardship Field Book to design your own unique project that will benefit the health of your local watershed.

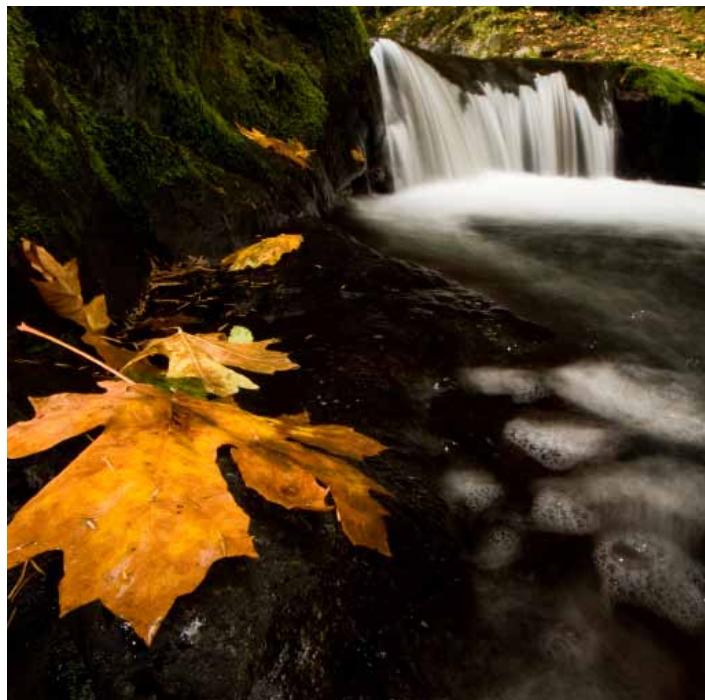


A **watershed** is an area of land that drains to a common point such as a river, lake or stream. A watershed includes all the land as well as tributaries that drain to that common point.

The StreamWebs Student Stewardship Field Book will walk you through the process of designing and implementing your own unique project and becoming a steward of your home waters.



**Stewardship** is the careful and responsible management of something entrusted to one's care (stewardship of our natural resources).



## 1. Review the 10 steps

Each step represents a major building block in the Student Stewardship Project model. Sections for each step are in chronological order with each step building on the former step. The starting point is identifying the need for a project and the finish line includes ways to wrap up by sharing about and reporting on the project. Many of the steps include worksheets, which are all available in correlating sections of the StreamWebs Student Stewardship Field Book.

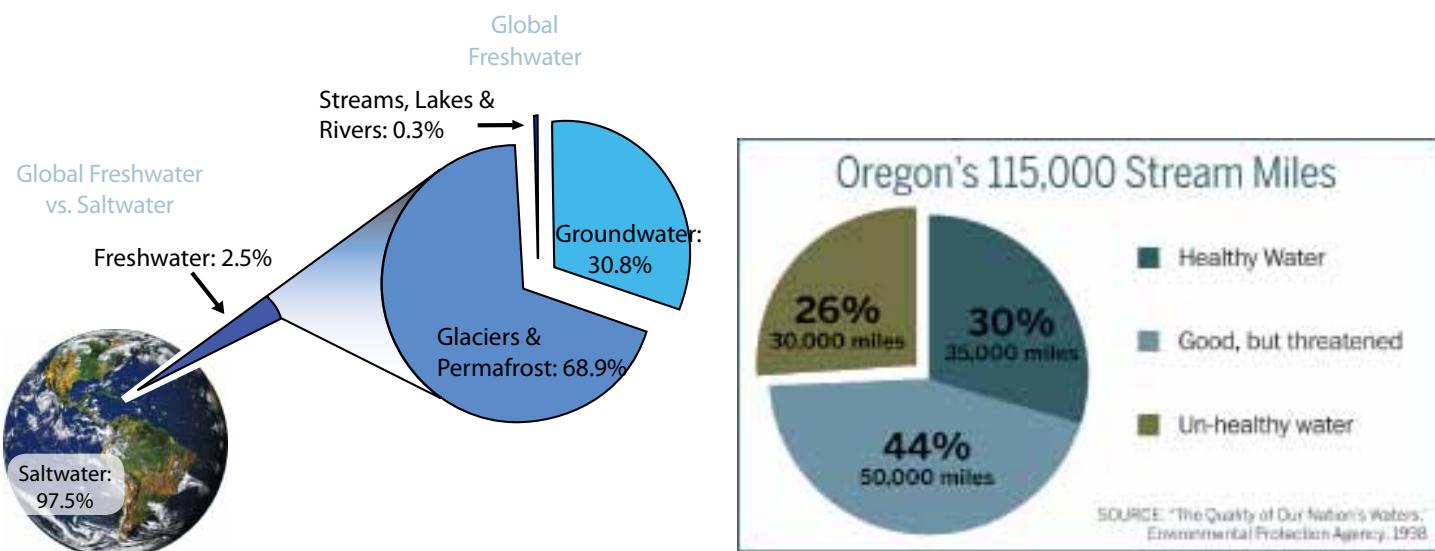
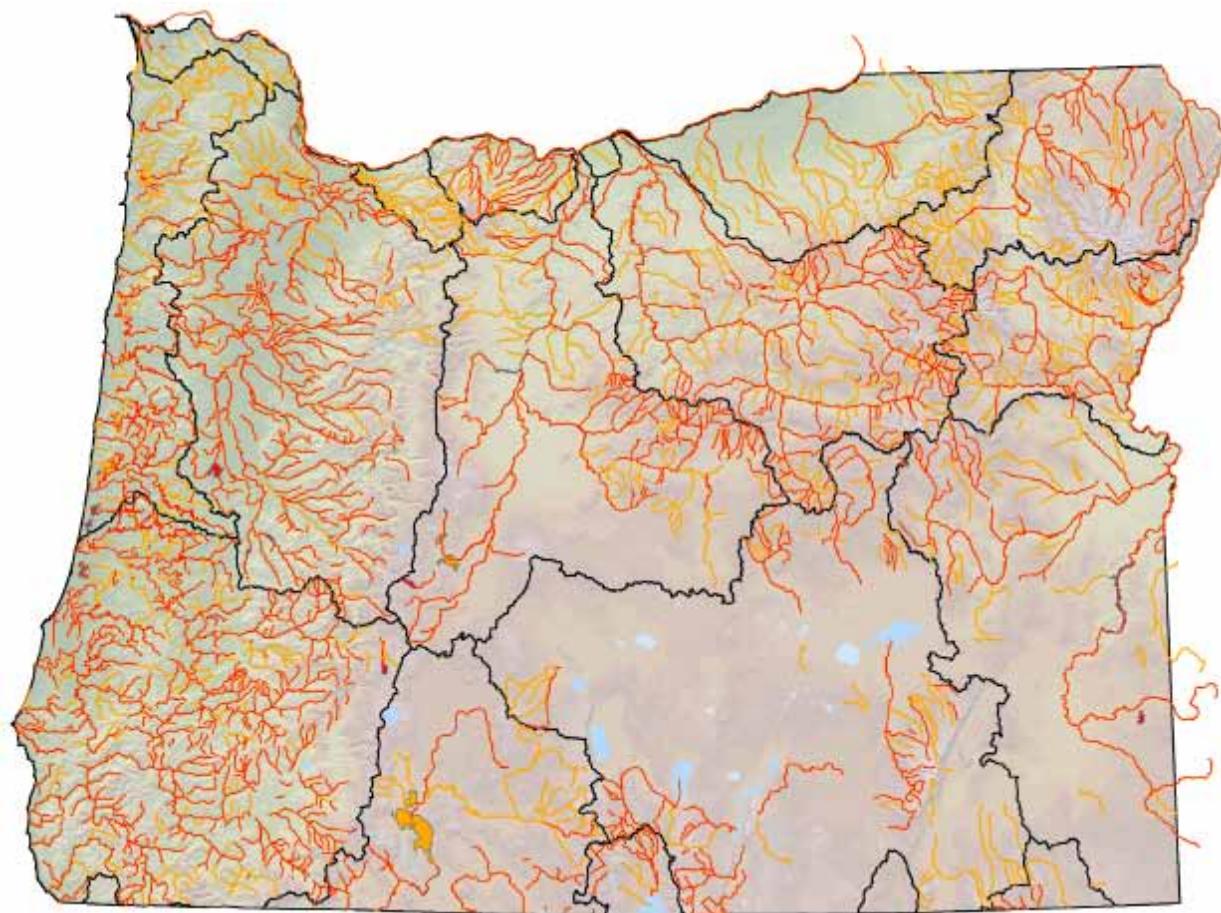
**The 10 Step Model is based on 5 distinct phases:**  
INVESTIGATION, PREPARATION, ACTION, REFLECTION and DEMONSTRATION

- Step 1: Needs Assessment**
- Step 2: Feasibility Study**
- Step 3: Project Planning**
- Step 4: Confirm Commitments**
- Step 5: Research & Design**
- Step 6: Review & Revise**
- Step 7: Project Action**
- Step 8: Reflect & Evaluate**
- Step 9: Prepare to Share**
- Step 10: Demonstrate & Celebrate**

## 2. Review project planning worksheets

Project planning worksheets are available in each section of the StreamWebs Student Stewardship Field Book. These worksheets are in sequential order guiding you through what happens first to what happens last. Your unique project may not require each of the worksheets and data sheets, but be sure to complete those that are relevant as you work your way through your project. Keep in mind that you will need to research additional information and compile extra resources to create a StreamWebs Student Stewardship Field Book that is as

# The Freshwater Problem



# Step 1: Needs Assessment



If you are reading this, you probably have a project idea in mind. If you don't already have a project in mind, you might wonder where to start. This step will help you launch your investigation into developing a project idea. First and foremost, spend a moment brainstorming about the things you find interesting. How would you like to approach the project? What inspires you about the natural world? What types of learning activities are you most drawn to? Writing? Art? Science? Outdoor Exploration? Consider the way you best connect to the natural world as you assess what the ecological and educational needs are for your project. To begin the preparation phase of your project, use the format below to help you brainstorm a need you can address with a project. Consider asking others in your community (peers, teachers, family, etc.) to participate in a meeting to discuss, review and assess the following three needs...

- Complete the Pre-Project Student Survey and the Support Survey

Now that you have completed the surveys, before you select a project, you will need to investigate and determine the following 3 things:

## 1. Education Goals

- Complete the My Education Goals worksheet to investigate your personal education goals.

## 2. Restoration Priorities

- If the information is available in the StreamWebs Student Stewardship Field Book, review the Regional Watershed Information section first.
- Next contact your local Watershed Council to identify the specific restoration needs within the watershed. A Watershed Council helps to manage this area of land and water.
- If the information is available in the StreamWebs Student Stewardship Field Book, review the Project Information section.
- Now brainstorm: What opportunities exist for watershed improvement in your local watershed... invasive non-native vegetation? Native plantings? Interpretive signage?

This information will help you to identify the priorities within the watershed and specific sites that may need attention, helping you to focus your project idea. Your teacher or group leader and OSU Extension Service staff can assist you in making these connections.

## 3. Community Need

Great projects have a vision for addressing real need within the community. Consider the following;



**"Those who contemplate the beauty of the earth find reserves of strength that will endure as long as life lasts."**

- Rachel Carson

- Is there a need within the community in regards to the watershed that is not being met? Look, listen and speak.
- What stream is in your community?
- What's going on in your community?
- Do people know what a watershed is? Do they visit the local creek?
- Do their actions enhance or have a negative impact on watershed health?

Your project CAN be restoration focused, but doesn't necessarily have to involve direct restoration. Your project could create awareness or promote action on a watershed issue that interests you. You could find, gather and report information of public interest, or you could consider a combination of the possibilities listed below:

- create a mural of the watershed to be displayed in your community
- start an annual event to raise awareness about your watershed
- conduct scientific research and present your project findings to your community

List the project needs you have identified here:

Education: \_\_\_\_\_

Restoration: \_\_\_\_\_

Community: \_\_\_\_\_

You may want to check out the project examples for inspiration to help you determine your project idea. The local watershed council representative, your teacher or group leader and OSU Extension Service can assist you in developing a project idea, based on the needs you listed above.



Based on the needs assessment, my/our Student Stewardship Project idea is: \_\_\_\_\_

### Organizing Question:

Before moving into preparing the details of your project, it's important to develop an organizing question. This question connects your project idea with a big picture objective and can provide the necessary framework for project learning.

The organizing question can also assist you in developing a hypothesis, can determine the methods you use to test your hypothesis and help guide your data collection. If you are working with a class or team, you may want to develop supporting questions based on the organizing question.



When developing an organizing question, consider that effective organizing questions will:

- provoke & sustain interest
- include natural & social systems & topics
- stimulate inquiry & focus work
- allow for integration of multidisciplinary activities
- require you to propose & evaluate several possible solutions
- are related to everyday life

Examples of effective organizing questions are:

- What impact does our school have on Johnson Creek?
- How does the Columbia River affect the economy of our community?
- In what ways does development in our community affect the Upper Deschutes watershed?
- Does our chosen site along Whychus Creek provide an adequate riparian zone and habitat for a wide variety of organisms?



- What vegetation can we plant to improve the riparian function and habitat along the stream?
- Does Eagle Creek provide a safe and healthy habitat for salmon?
- Do side channels play an important role in providing habitat for juvenile salmonids?

Based on the needs assessment and project idea, my/our Organizing Question is: \_\_\_\_\_

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The StreamWebs website interface is displayed, featuring a top navigation bar with links for My Profile, Search Projects, Add Project, About, and Resources. A sub-navigation bar for the 'Tenino Court Site' includes View, Edit, View Data, and View Gallery. To the right is a compass rose icon. Below the navigation is a map showing the project location. On the left, there's a sidebar with 'Project Description' (a forested area with a seasonal creek), 'Project Stewards' (empty), and a 'DATA GRAPH WATER QUALITY' button. A yellow sticky note labeled 'DATA' is overlaid on the sidebar.

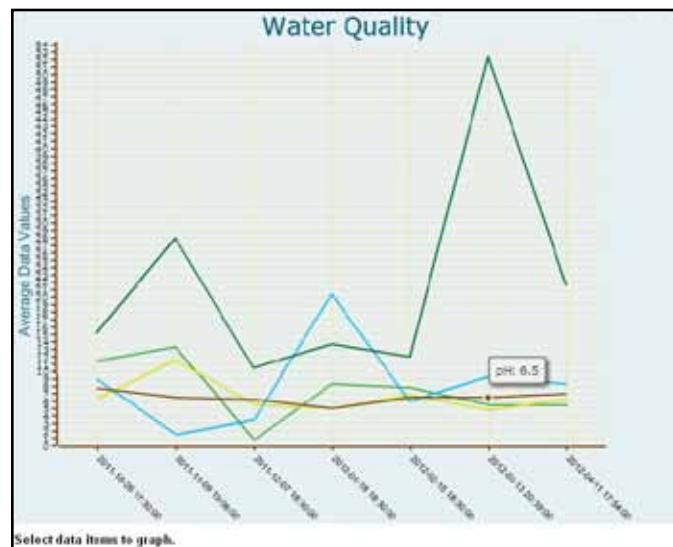
Throughout your Student Stewardship Project, you are going to be making use of the resources, database, and stewardship applications in the StreamWebs Student Stewardship Network ([www.streamwebs.org](http://www.streamwebs.org)).

Register with the site as soon as possible, so you are ready to dive in when the time comes (use the HELP link in the upper right corner if you have trouble getting started). Take a look at the resources, browse other projects in your neighborhood and throughout the state, and familiarize yourself with the layout and tools. You will be prompted to enter your data and other project materials into the site as you work your way through this Field Book, but you are encouraged to keep regular field journals in StreamWebs as your project unfolds.

This screenshot shows the StreamWebs project page for 'Clackamas Web Academy'. It features a map of the project area with several monitoring stations marked. To the left, there are three tabs: 'DATA' (yellow), 'GRAPH WATER QUALITY' (blue), and 'GALLERY' (blue). Below the map, a list of available data is shown:

- Water Quality Data: 04/11/12, 03/13/12, 02/15/12, 01/18/12, 01/04/12, 11/00/11, 12/07/11, 11/09/11, 11/09/11

Below the data list are two buttons: '+ New Data' and '+ New Gallery'. At the bottom of the page, there are links for 'Oregon State University' and 'Invasive Species Tracking'.





# Student Stewardship Project

## PRE-PARTICIPATION SURVEY

Extension Service

Hello student! We appreciate you taking the time to fill out this questionnaire. This questionnaire is designed to help us understand a little more about your experiences. There are directions listed below. Answer questions as best you can. If you're not sure of an answer you may leave it blank.

Name \_\_\_\_\_ School/Group \_\_\_\_\_

Date \_\_\_\_\_ Teacher/Group Leader \_\_\_\_\_

Grade \_\_\_\_\_

Please circle the number that best describes what you think:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I know what a watershed is.	1	2	3	4	5
2. I know facts and information about my watershed's history, geography, wildlife, and/or plants.	1	2	3	4	5
3. I have freely explored outdoor sites in my watershed.	1	2	3	4	5
4. I am not comfortable being outside in the woods or by a creek or stream.	1	2	3	4	5
5. I have the skills to use equipment and techniques to investigate my watershed.	1	2	3	4	5
6. I have practiced these skills while examining my watershed.	1	2	3	4	5
7. I have had time to creatively write or reflect on experiences in my watershed.	1	2	3	4	5
8. I am part of the watershed ecosystem.	1	2	3	4	5
9. I am not concerned about the problems and issues affecting my watershed.	1	2	3	4	5
10. I enjoy talking with other people about issues impacting my watershed.	1	2	3	4	5
11. I am interested in caring for my watershed by getting involved in a stewardship project (planting trees, trash clean-ups, etc.).	1	2	3	4	5
12. I don't think it's important to share projects with my community.	1	2	3	4	5
13. I believe I can contribute to the health of my watershed.	1	2	3	4	5
14. I would like to research or resolve a local watershed issue.	1	2	3	4	5
15. I would like to find an internship or job with an organization that deals with watershed issues.	1	2	3	4	5
16. I have no interest in studying watershed related issues in college.	1	2	3	4	5

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Please circle the number that best describes what you think:					
17. I have participated in a watershed project with a class I have received credit for.	1	2	3	4	5
18. I have had the opportunity to work with professional natural resources and community partners.	1	2	3	4	5
19. I have not participated in the planning and implementation phases of a watershed restoration project.	1	2	3	4	5
20. I have professionally presented and shared about my project at a summit, event, in StreamWebs™, or through a publication.	1	2	3	4	5
21. I understand the importance of teamwork to achieve project goals.	1	2	3	4	5
22. I feel valued as part of my project team.	1	2	3	4	5

How many watershed stewardship projects have you participated in? (Please circle)

0      1      2      3      4      5      5+

Please describe the most recent project (if applicable):

Do you have any ideas for projects you could create or participate in to help improve the health of your watershed?

Please describe why you participated in this project:

How will you share what you learn?

Is there anything else you would like to share?



# Student Stewardship Project

## SUPPORT SURVEY

Extension Service

This document will be used to support teachers, students and group leaders in their efforts to connect with their local watershed through Student Stewardship Projects. Please complete the form and return it to OSU Extension Service Education Staff for review.

### Pre-project needs - please check all that apply:

- Site selection – do you need assistance finding a project site?
- Project selection – do you need assistance designing a project? (selecting an audience, choosing a project type: restoration, mapping, creative documentation, monitoring, data collection, and community awareness)
- Education/Graduation requirements – do you need assistance aligning student activities with standards, benchmarks or requirements?
- Career-Related Learning – are you interested in having students assume career roles related to the project?
- Community Outreach – do you need assistance identifying local issues and/or local partners?
- Curricular materials – do you need activity or program ideas or outlines?
- Resources – do you need grants or funding for your project?
- Evaluation – do you need assistance developing and implementing an evaluation plan?
- Evaluation – Would you be willing to administer a brief student evaluation or have your students participate in a focus group?

### Instructors – Do you need support from field or classroom instructors and professionals?

If yes, please check all that apply:

Field: \_\_\_\_\_ Classroom: \_\_\_\_\_

- \_\_\_\_\_ Regional Watershed Overview
- \_\_\_\_\_ Water Resources
- \_\_\_\_\_ Water Ecology
- \_\_\_\_\_ Water Science/Hydrology
- \_\_\_\_\_ Geology/Topography
- \_\_\_\_\_ Geography
- \_\_\_\_\_ Land & Water Uses
- \_\_\_\_\_ Soils
- \_\_\_\_\_ Botany
- \_\_\_\_\_ Riparian Ecology/Forestry
- \_\_\_\_\_ Climate
- \_\_\_\_\_ Fish Biology
- \_\_\_\_\_ Ornithology/Wildlife
- \_\_\_\_\_ Wildlife Tracking
- \_\_\_\_\_ History
- \_\_\_\_\_ Native Cultures
- \_\_\_\_\_ Economy/Business
- \_\_\_\_\_ Eco-Art
- \_\_\_\_\_ Journalism
- \_\_\_\_\_ Monitoring

Instructors (continued)

Field: Classroom:

\_\_\_\_\_ \_\_\_\_\_ Restoration  
\_\_\_\_\_ \_\_\_\_\_ Sociology  
\_\_\_\_\_ \_\_\_\_\_ Other: \_\_\_\_\_

Post-project needs - please check all that apply:

- Reports – do you need technical assistance in helping develop project reports?
- Writing or Reflection – would you like to share the project work through OSU Extension Service publications, including freshwater stewards, a publication of student watershed-related work, or through local press?
- Online Publication – do you need assistance posting project summaries, descriptions, and data on StreamWebs?
- Community Presentations – do you need help identifying or arranging student presentations at related public meetings, partner board meetings, and regional student education/science summits?

Date: \_\_\_\_\_ Name: \_\_\_\_\_

School: \_\_\_\_\_

I am a (please check one of the following):

Teacher     Student     Project Manager     Other: \_\_\_\_\_

Email: \_\_\_\_\_ Phone #: \_\_\_\_\_

Address: \_\_\_\_\_

How did you find out about OSU Extension Service and receiving support for Student Stewardship Projects?

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Thank you for taking the time to complete this support survey. Once returned to OSU Extension Service, the appropriate Education Coordinator will follow up with you regarding support for your Student Stewardship Project.



# Student Stewardship Project

NEEDS REVIEW - my education goals

Extension Service

Answer the following questions to help you determine your education goals:

1. Why do you want to participate in a Student Stewardship Project?

2. What do you hope to learn from participating in this project?

3. What are some of your personal interests and talents?

4. Are you required to participate in a project for school credit or graduation?

YES       NO

If the answer is YES, talk with your teacher to see how you can get school credit through participation in this project. Will your project satisfy any of the following:

Service Learning     Senior Project     Career Related Learning     Other

---

Have you considered working with multiple teachers on your project?

Subject Area	Possibilities for my project	Additional ideas	Can I receive credit?
Math	collecting and analyzing data		
Science	learning about life cycles in the natural world, chemistry, and habitats		
Art	developing a creative arts project to demonstrate your findings		
Social Studies	compiling cultural and social research about your project		
English/Writing/Journalism	submitting a letter of interest for a job within the project, writing poetry, journal entries		
Natural History	research the geological and biological history of your project area		

# Project Examples

These project examples are meant to help you brainstorm the project that most interests you and will help you explore your home waters through exciting, creative and inquiry driven investigations. Your project should be developed based on the three things listed in Step 1 of the 10 Step Model: Education Goals, Restoration Priorities and Community Needs. Keep in mind, that a project could include 1 or more of the ideas below or something else entirely! You and your group or class should decide on a project idea with the guidance of OSU Extension Service and support of your teacher or group leader.

**Creative Writing** – share something that interests and inspires you about your local watershed through creative writing

**Stream Restoration Projects** – remove invasive species and/or plant native plants to restore healthy function of the riparian zone



**Photography** – photograph something that interests and inspires you in your local watershed and share your photos with the community

**Photo-point Monitoring** – monitor the progress of a stream restoration site over time through taking specific photographs at identified priority locations

**Videography** – create a video that traces the path of water from the headwaters to confluence

**Journalism** – report about a local restoration project or need within the watershed

**Field Research** – conduct field research to determine the health of a stream or overall health of the watershed – this can include parameters such as chemical water quality testing, macroinvertebrate sampling, plant identification and in-stream habitat assessments

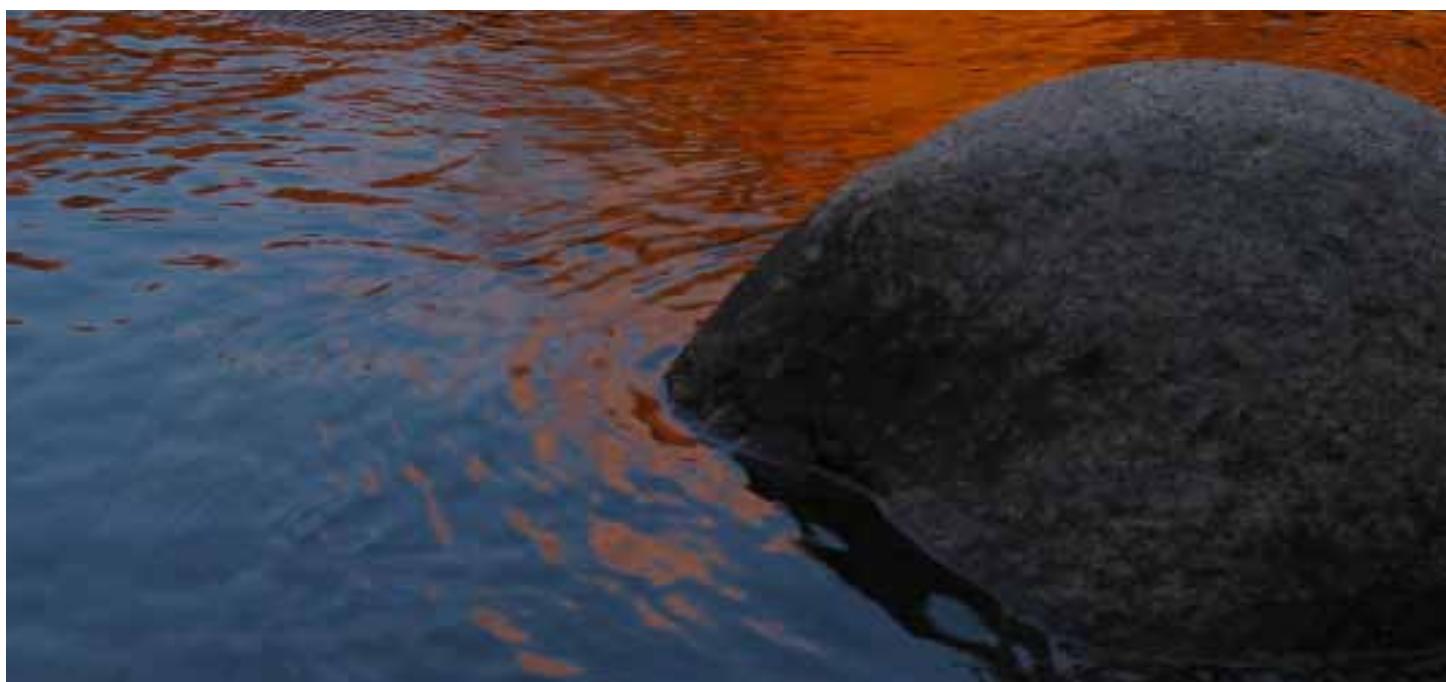
**Art** – develop a creative art project such as a mural to portray the life of a stream over time, depicting the watershed and each of the components within it or the life cycle or a salmon

**Mapping** – create a map of the stream pre and/or post restoration work or create a three dimensional map of the watershed

"The single defining quality of leaders is the capacity to create and realize a vision."  
- Warren Bennis

Record additional ideas in the space below:

My initial project idea:



## Step 2: Feasibility Study



So far, you have investigated and identified a need, you have your initial project idea in mind and you have developed an organizing question. Before moving on in preparation, this step will help you determine if the project is possible and what it will take to make it happen. As any seasoned watershed steward is well aware, there are many ecological as well as social factors that contribute to the effectiveness and overall success of a project. We know that you want to be a successful student steward, so take some time now to evaluate the feasibility of your project.

### Simply put, how realistic is your project idea?

- Complete the Can you do it? worksheet. This worksheet will help you determine whether the support you have is enough to complete your project. You will conduct a site visit and then develop an initial budget and time line. Site planning is a critical part of early project planning. Visiting the project site to conduct a careful assessment is imperative for a successful project. Gather your project team and walk the entire site. The site walk will help you refine your goals, estimate your budget, assess equipment needs and identify community partners.
- Based on the results from the Can you do it? worksheet, list the feasibility results you have identified here:

**Budget:** \_\_\_\_\_

**Timeline:** \_\_\_\_\_

**Community Support:** \_\_\_\_\_

**Site Name:** \_\_\_\_\_

Based on the feasibility study, my/our Student Stewardship Project is feasible:

- YES, we are ready to get going - move to Step 3
- MAYBE, but we think we need additional support - based on what you still need, brainstorm how you can achieve the support needed
- NO, we need to review our project needs and revise our project idea - review Step 1

"The person who says it cannot be done should not interrupt the person doing it."  
- Unknown





# Student Stewardship Project

## FEASIBILITY STUDY - can you do it?

Extension Service

Complete the following worksheet to determine if your project is possible and what resources you need in order to complete your project.

## 1. Do you have COMMUNITY SUPPORT?

**Did you or someone from your group submit your Support Survey to OSU Extension Service?**

YES  NO

Have you talked with your local Watershed Council?  YES  NO

After talking with your teacher/group leader, OSU Extension Service and the Watershed Council Coordinator, do you have a list of professionals you can ask for assistance from to carry out your project?

If not, spend some time researching on the internet to discover who you might be able to reach out to for professional assistance with your project.

If yes, list them below and invite them to join you for your project!

## 2. Site Visit – this step in your feasibility study is to visit and map out your proposed project site

- Plan an initial site visit with your project team and invite all relevant professionals to join you (OSU Extension Service, Watershed Council Coordinator, Forest Service, etc)
- During the visit, walk the site, draw a base map of the site, and assess project goals and needs. Explore the site making observations in changes of vegetation, slope of the land and significant water and land features. Record what you notice, being sure to include native & invasive vegetation and noting the restoration possibilities.

List of potential things to identify while developing a project site base map:

- Stream location
- Parking
- Native vegetation: percent of cover & general type
- Invasive plant species: percent of cover & general type
- Identify a restroom location on site or nearest available
- Water location(s)
- Equipment drop locations - dumpsters, recycling, etc.
- Potentially hazardous areas
- Sensitive areas - wetlands, stream banks, erosion zones, etc.
- Work zones - what you're planning to do and where
- A map legend
- A compass rose
- Scale

Check out the sample project base map later in this section.

In addition to creating a base map during your site visit it is also important to:

- Take photos
- Test and review your project goal and organizing question to ensure they are realistic
- List supply and equipment needs that arise:

Some general questions that should be considered during the site visit:

Is the site easy to get to? (e.g.: Is it on a public transportation route? Is the site well-marked? Are there signs leading up to it?)

YES  NO

Notes:

Is the site on a public or private space?

YES  NO

Notes:

Does the site have any other resources that could be donated to your project? (e.g. tools, staff time, publicity, etc.)

YES  NO

Notes:

Are there any potential safety concerns? If so, how can they be dealt with?

YES  NO

Notes:

Is the site accessible?

YES  NO

Notes:

Will the site be an adequate space for you to fulfill your project goals? Does it seem compatible for your project idea?

YES  NO

Notes:

Bring a field guide with you and list or draw the following during your site visit:

Native Plants Present:	Invasive Species Present:
Sun & Wind Exposure:	Soil Conditions:
Slope of Land:	General Observations:

Based on your observations, are there any actions you need to take related to your project idea?

3. Do you have the TIME?

Based on your initial project idea, estimate how much time you anticipate needing to complete your project from start to finish:

# of Classroom days or hours \_\_\_\_\_ # of Field days or hours \_\_\_\_\_

# of Community Sharing/Presenting days or hours \_\_\_\_\_

Total # of: \_\_\_\_\_ Hours      \_\_\_\_\_ Days      \_\_\_\_\_ Weeks      \_\_\_\_\_ Months

Do you have that kind of time available in class or on your own time?

YES  NO

4. Do you have the MONEY? - Create an initial project budget:

ITEM	# Needed	Estimated Cost	Total
Water Quality Project Kits:			
Thermometers		15	
Turbidity tubes		50	
Chemical testing kits (pH, nitrate, DO)		100	
Other:			
Restoration Project Kits:			
Boots		25	
Waders		50	
Shovels		25	
Gloves		5	
Other:			
Photo-point Monitoring Project Kits:			
GPS unit		300	
Digital camera		200	
Meter boards		25	
Compass		15	
100' measuring tape		35	
Other:			
Survey Project Kits:			
Macroinvertebrate collection tubs, etc.		20	
Field guides		30	
Large aquatic D-nets		100	
2-way magnifiers		12	
15' rope with ring (transects)		10	
Laminated charts/visual aids		10	
Other:			
Creative Arts Project Kits:			
Paint brushes/Colored Pencils		5	
Clipboards/Paper		5	
Other:			
Transportation:			
Bus Passes		2	
School Bus		150	
Student or Parent Drivers - Gas		.25 per mile	

TOTAL ESTIMATED PROJECT COST: \_\_\_\_\_

Based on your estimated project costs, do you need additional funding to support your project?

YES  NO

Have you looked into available grants and possible funding opportunities?  YES  NO

The Diack Ecology Education Program is one program that makes grants so that students can develop their own ecology project. Students desiring a grant should submit a request in narrative and outline form at the following website: <http://diack-ecology.org>.

Have you looked into StreamWebs yet?

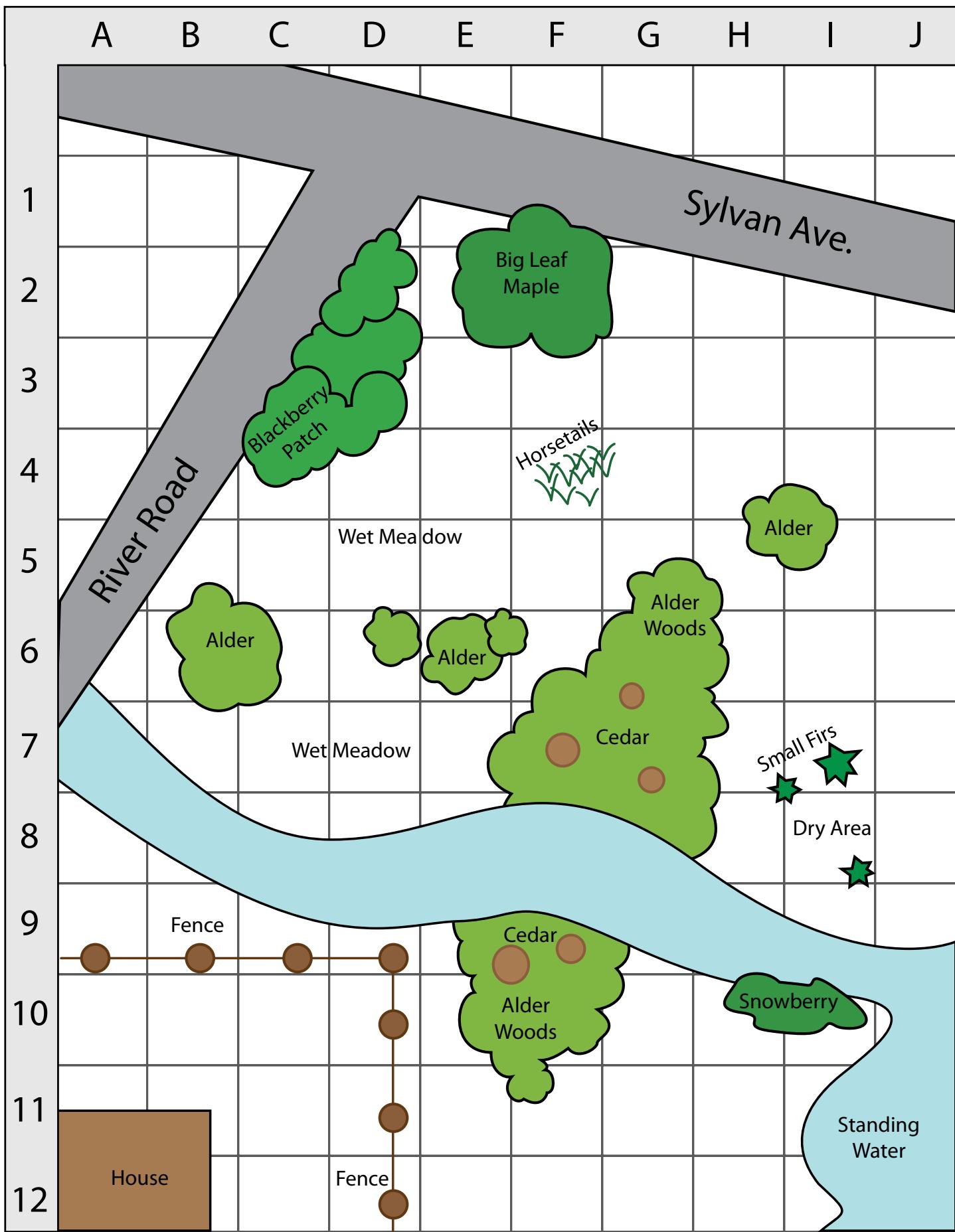
YES  NO

Can you borrow equipment if you can't purchase it at this time?

YES  NO

If YES, from who and how do you plan to arrange to use the equipment?

# Sample – Project Site Base Map





# Step 3: Project Planning



If you have moved on to this step, you believe that your project idea is possible and your project is one step closer to happening! This doesn't necessarily mean you have everything you need to fully implement your project right now, but you're off to a great start! This step will help you continue to prepare for your project by brainstorming and mapping out more details of initial project development. Just as you need to plan and think through any sort of activity or event, take some time to consider all of the actions, supplies, materials, people, etc that you will need to implement your project.

So you know your project idea is possible, now what are the possibilities? Will you need researchers? Data collectors? Someone to organize communications? Will you need a project manager? An artist?

- Check out the Job Descriptions in this section and create a list of the specific teams you will need to get the job done!

Now that you know what jobs are needed for the project, think about what you would like to do. Have you thought about a career that might interest you? Is there something specific that you are great at or enjoy doing? The jobs available through Student Stewardship Projects will help you explore your career goals and personal interests while expanding on your personal strengths that will contribute to the success of the

project. You may want to discuss the jobs in further detail with your teacher or group leader and OSU Extension Service.

- Apply for the job of your choice by writing and submitting a letter of interest and resume to your teacher or group leader. Check out the Sample Letter of Interest and Resume in this section. Remember, this could be an opportunity to work with your English teacher to receive a writing credit for your work!

Once you have submitted a letter of interest for the job of your choice, your teacher or group leader will be working with OSU Extension Service to identify student teams, project managers and thus determine student jobs.

Every successful project, no matter how simple or complex, requires the careful management of tasks. One of the most important parts of the project planning process is a clear timeline. The timeline helps you see how your vision will be realized through specific steps happening on a regular schedule. A timeline is critical for the following reasons:

- removes confusion about how the project will happen
- makes your planning team meetings more efficient
- ensures no important steps are missed
- helps you delegate and assign tasks
- helps you successfully respond to changes



"Today's preparation determines tomorrow's achievements."

- Unknown

- After your individual job and project team members have been identified, complete the Project Planning Worksheet. This will assist you in developing a timeline, tasks and brainstorming ideas for sharing and evaluating your Student Stewardship Project. Be sure to carefully manage and adjust the timeline and tasks throughout your project planning process to keep your project on track.

Additional resources in the StreamWebs Student Stewardship Field Book that will help you develop your project plan include:

- Project Equipment Lists (based on job positions & teams)
- Regional Watershed Information section (if available)
- Project Information section (if available)



- As you go through the rest of this Field Book, the job icons below will help you identify which responsibilities you need to perform in the course of your project. For example, should you apply and be accepted for the position of **Creativity Engineer**, you will need to be on the lookout for the "CE" icon throughout the rest of this Field Book.



- Each job role will have unique responsibilities in the field and classroom. Work with your team to make sure your data, artwork, video, images, etc., are being loaded into **StreamWebs**. Appoint one person from your team to upload so you don't duplicate.



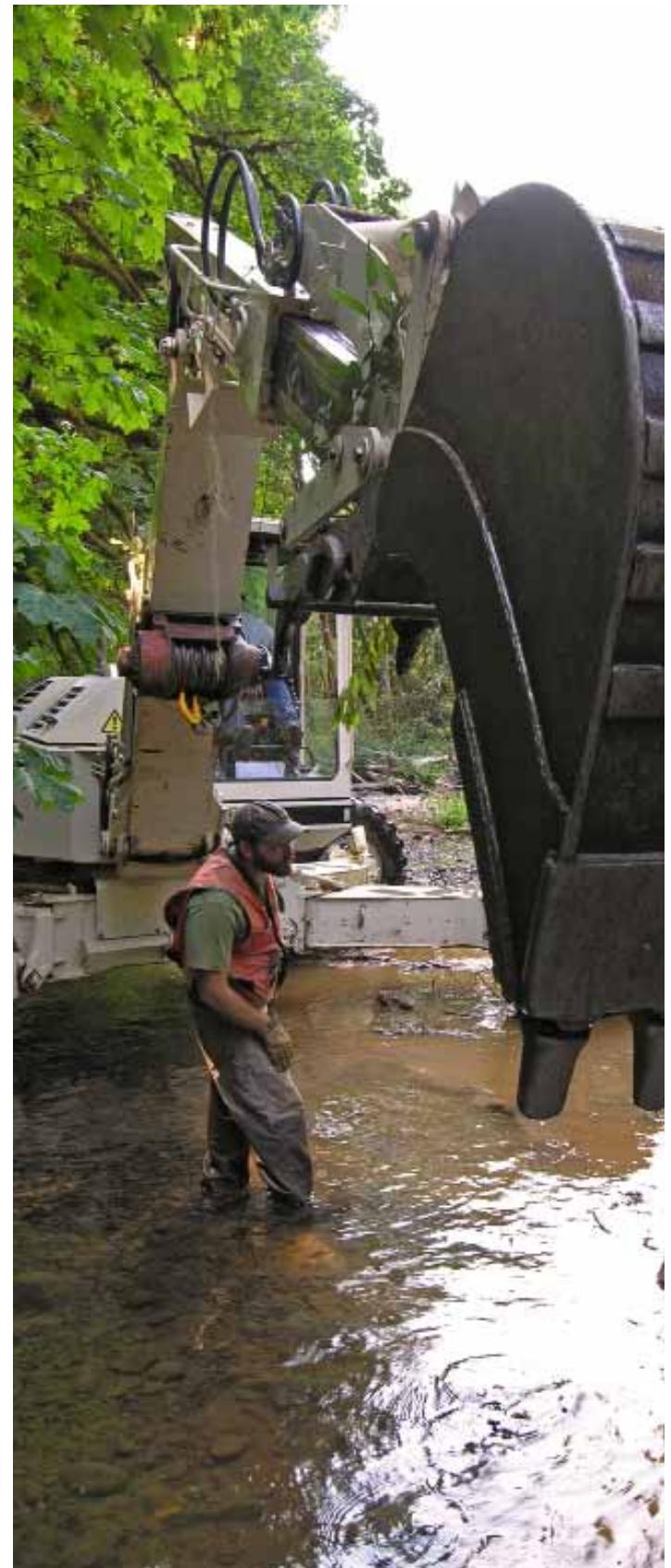
Time to register a profile in StreamWebs ([streamwebs.org](http://streamwebs.org)) if you haven't already!!

# Employment Opportunities in the Outdoors

## Position Classifications in Resource Management Agencies (not a complete list)

- Recreationist
  - Recreation Planner
  - Interpreter
  - Ranger
    - Wilderness Ranger
  - Forester
  - Hydrologist
  - Social Scientist
  - Soil Scientist
  - Landscape Architect
  - Economist
  - Archeologist
  - Engineer
- Resource Protection
- Wildland Fire Control
    - Entomologist
    - Pathologist
  - Range Conservationist
  - Wildlife Biologist
  - Geologist
  - Geographer
  - Research Scientist
- Law Enforcement Officer
- Administrative Officer
  - Personnel Officer
  - Ecologist
  - Meteorologist
  - Fisheries Biologist
  - Botanist
  - Geneticist
  - Program Analyst
  - Public Affairs Officer
  - Teacher (Job Corps)

- Requires specialized undergraduate degree
- Requires specialized graduate degree



## **Public Resource Agencies - Federal, State, and Local (not a complete list)**

### **Federal:**

National Park Services (NPS)  
National Forest Service (FS)  
U.S. Fish and Wildlife Service (USF&WS)  
Bureau of Land Management (BLM)  
Bureau of Reclamation (BoR)  
Bureau of Indian Affairs (BIA)  
U.S. Army Corps of Engineers (CoE)  
U.S. Armed Forces Recreation Centers (AFRC)  
National Oceanic and Atmospheric Administration (NOAA)  
Environmental Protection Agency (EPA)  
National Biological Survey (NBS)  
Geological Survey (USGS)  
Soil Conservation Service (SCS)  
Department of Transportation (DOT)

### **State:**

50 State Departments of Natural Resources  
(Conservation Departments)  
State Parks  
State Fish and Wildlife  
State Environmental Protection  
University and College Adventure Organizations

### **Local:**

County or Regional Parks Departments  
County Forest Preserves  
County Forestry Department  
City Engineers or Utility Department  
City and County Planning and Zoning Departments  
Local secondary Schools - Environmental and  
Outdoor Recreational Specialist

## **Opportunities in Private Employment (not a complete list)**

### **Outfitters and Guides:**

River  
Rock Climbing  
Fishing  
Hunting  
Wilderness Guide  
Interpreter  
Cave Exploration

### **Eco-Tourism:**

Tour Guide (Interpretation)  
Tour Manager  
Resort manager

### **Facility Management:**

Golf Course  
Private Hunting and Fishing Resorts  
Equestrian

### **Retail Business:**

Outdoor Outfitters  
Outdoor Equipment  
Gun Safety  
Demonstration  
Testing  
Training and Education Facilitation  
Water Related Activities  
Kayaking  
Canoeing  
Sailing  
Boat Safety  
Climbing Walls  
Wilderness Survival





# Project Manager Job Description

**ORGANIZATION:**

OSU Extension Service

Contact: \_\_\_\_\_

**MISSION:**

OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

**LOCATION:**

Position will be based: \_\_\_\_\_

Restoration work will occur at the following site: \_\_\_\_\_

**PROJECT OVERVIEW:**

Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

**JOB SUMMARY:**

The position is directly responsible for the management of the restoration project. Specifically, the Project Manager's role is to plan, coordinate, implement, and supervise each phase of restoration project work. Successful Project Managers must be able to use leadership skills to effectively direct others and accomplish daily restoration tasks. Responsible for developing a restoration plan and site map, Project Managers will gain valuable knowledge about restoration techniques and methods. Using effective time management, planning, leadership, and organization skills, Project Managers will lead each project phase by using supportive communication. Project Managers will oversee all project steps to ensure successful project outcomes.

**RESPONSIBILITIES:**

With input and supervision from the Education Coordinator at OSU Extension Service, the Project Manager is responsible for:

- (1) Project Planning—Project Manager's role is to become familiar with restoration methods and techniques necessary in effective restoration projects and monitoring plans.
- (2) Project Design—Collect and organize project documentation (i.e. data sets, sketches, photographs, site map, journal entries, etc.) to develop a project plan.
- (3) Time Management—Effectively manage time to ensure that project outcomes and deadlines are met. Delegate responsibilities and tasks to all team members.
- (4) Logistics—Manage and organize planning and scheduling for field tasks, classroom tasks, and homework. Work with others to plan and schedule tasks in a manner that is reasonable and achievable.

- (5) Communications— Articulate clear, concise, and consistent external communications. Check in with other students often to clarify expectations and ensure effective communication. Communicate often with OSU Extension Service to ensure project success.
- (6) Quality— Supervise project quality control. Oversee all project steps (i.e. project design, plant salvage, plant transport, plant transplant, watering, etc.) to ensure successful project outcomes.

#### QUALIFICATIONS:

##### Necessary

- Interest in habitat restoration techniques.
- Ability to lead and direct others in a helpful and supportive way.
- Experience and/or interest in managing and coordinating project details.
- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.
- Ability to work independently.
- Master of logistics, details, and organization.
- Proven ability to meet deadlines.

##### Desired

- Interest in developing leadership skills.
- Prior management and/or leadership experience.

#### BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

#### PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.



# Hydrologist Job Description

**ORGANIZATION:**

OSU Extension Service

Contact: \_\_\_\_\_

**MISSION:**

OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

**LOCATION:**

Position will be based: \_\_\_\_\_

Restoration work will occur at the following site: \_\_\_\_\_

**PROJECT OVERVIEW:**

Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

**JOB SUMMARY:**

The Hydrologist is responsible for evaluating stream health and its relationship to the surrounding forest. This includes assessing water quality and forest health as well as the relationship between them by various means. The Hydrologist will;

- Test pH levels, turbidity, dissolved oxygen and temperature.
- Evaluate the riparian buffer (noting presence/ lack of human development that may impact stream health).
- Identify forest factors that are influencing water quality (i.e. bank erosion, presence of woody debris, invasive/native plants, etc...).
- Track Precipitation, stream flow and drought or flood susceptibility.
- Recommend ways to improve stream channel health.

**RESPONSIBILITIES:**

With input and supervision from the Education Coordinator at OSU Extension Service, the Hydrologist is responsible to and for:

- (1) Lab Equipment – Manage, maintain and ensure proper use of lab equipment.
- (2) Assessment – Assess water quality, riparian health and surface hydrology.
- (3) Communication – Articulate clear, precise data and represent project site accurately.
- (4) Development - Based on channel assessment, identify problem areas and share ideas for potential restoration projects.
- (5) Quality – Use consistent methodology when collecting data.

## QUALIFICATIONS:

### Necessary

- Strong organization skills.
- Ability to work independently and/or cooperatively with a team.
- Ability to follow direction; be safe and responsible.

### Desirable

- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.
- Basic understanding of chemistry.
- Strong interest in working outdoors.

## BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

## PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.

# R

## Riparian Restoration Specialist Job Description

ORGANIZATION:  
OSU Extension Service  
Contact: \_\_\_\_\_



MISSION:  
OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

LOCATION:  
Position will be based: \_\_\_\_\_  
Restoration work will occur at the following site: \_\_\_\_\_

PROJECT OVERVIEW:  
Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

JOB SUMMARY:  
The Riparian Restoration Specialist is responsible for identifying native and invasive species in the riparian area and if identified as necessary, assisting in designing a restoration plan that will enhance site ecology and biodiversity. This includes research to a) find appropriate vegetation for the habitat being restored & b) ensure proper methods for removal of invasive species & restoration planting. Responsibilities include coordinating planting days with Project Managers, consisting of setting time, date and transportation in addition to acquiring plants and tools. After data is collected and analyzed, all scientists and Project Managers will discuss results and proposals for restoration. The Riparian Restoration Specialist will verify the best course of action with OSU Extension Service and present the final plan to all team members.

RESPONSIBILITIES:  
With input and supervision from the Education Coordinator at OSU Extension Service, the Riparian Restoration Specialist is responsible to and for:

- (1) Lab Equipment – Take proper care of lab equipment and other OSU Extension Service or school resources.
- (2) Data Collection – Identify, record and categorize vegetation in riparian zone.
- (3) Assessment – Assess biodiversity of riparian zone and current site conditions to determine watershed health and the implications for wildlife habitat.
- (4) Research – Conduct necessary research to determine appropriate restoration project actions, methods and tasks.
- (5) Communication – Articulate clear, precise data and represent project site accurately. Confer with other team

scientists and Project Managers.

- (6) Development - Based on assessment, if necessary, collaboratively design a restoration plan that considers plant types, watering methods, ideal locations, and invasive species removal.
- (7) Quality – Ensure quality and effective invasive species removal and planting by practicing proper methodology as well as supervising others.

#### QUALIFICATIONS:

##### Necessary

- Strong organization skills.
- Ability to work independently and/or cooperatively with a team.
- Ability to follow direction; be safe and responsible.
- Detail oriented.
- General understanding of ecology.
- Interest in conducting riparian research .
- General understanding of project goals and objectives.

##### Desirable

- Interest in learning more about riparian ecosystems, watershed health, restoration methods and restoration project design.
- Basic understanding stream function and riparian areas.
- Strong interest in working outdoors.
- Working knowledge of native and non-native plants.

#### BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

#### PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.

# P

## Photo-Point Specialist Job Description

ORGANIZATION:  
OSU Extension Service  
Contact: \_\_\_\_\_



MISSION:  
OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

LOCATION:  
Position will be based: \_\_\_\_\_  
Restoration work will occur at the following site: \_\_\_\_\_

PROJECT OVERVIEW:  
Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

JOB SUMMARY:  
The position is directly responsible for managing and coordinating project photo point monitoring. The Photo-Point Specialist will work with the team scientists and project manager to establish priority locations for setting up photo points and will coordinate logistics of photo point monitoring which includes: attaining accurate GPS coordinates, taking a compass bearing on photo points, accurate measurements, documentation and data collection. Ongoing photo points pre and post project work should be documented and shared with the Project Manager and all partners.

RESPONSIBILITIES:  
With input and supervision from the Education Coordinator at OSU Extension Service, the Photo-Point Specialist is responsible to and for:

- (1) Collaborate - Work with Project Manager and team to determine and set up the priority photo points.
- (2) Lab Equipment – Take proper care of lab equipment and other OSU Extension Service or school resources.
- (3) Assessment – Assess pre and post project photo points and analyze and compile results of project collaboratively with other team scientists and data.
- (4) Communications - Articulate clear, precise data and represent project site accurately. Confer with other team scientists and Project Managers. Share results with all project partners.
- (5) Quality - Ensure quality and effective photo point monitoring by following protocols provided as well as supervising others.

## QUALIFICATIONS:

### Necessary

- Ability to engage others.
- Interest in photography.
- Ability to work with a team.
- Excellent record keeping and organizational skills.

### Desirable

- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.
- GPS, Compass and/or GIS experience.

## BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

## PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.



## Field Biologist Job Description

### ORGANIZATION:

OSU Extension Service

Contact: \_\_\_\_\_



### MISSION:

OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

### LOCATION:

Position will be based: \_\_\_\_\_

Restoration work will occur at the following site: \_\_\_\_\_

### PROJECT OVERVIEW:

Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

### JOB SUMMARY:

The Field Biologist is responsible for investigating the presence of wildlife at and around the project site, including instream collection and identification of aquatic macroinvertebrates and fish surveys. This is a challenging job since humans tend to scare wildlife away. For this reason you will have to use all your senses to determine what animals have been present. Some things you will rely on are tracking paw prints, scat identification, habitat disturbance and building (tree chewing and scratching, nests and burrows), food remnants, and most of all listening, looking and moving quietly through the forest. Collection of macroinvertebrates requires taking samples at various points along the stream to collect data. The Field Biologist will quantify taxa to assess the health and biodiversity of the invertebrate community. After data collection, the Hilsenhoff Biotic Index (HBI) will be used to help determine the health of the stream. Factors that may have determined results will be analyzed. The Field Biologist will then discuss results with other scientists on the team to determine the best course of action for site restoration.

### RESPONSIBILITIES:

With input and supervision from the Education Coordinator at OSU Extension Service, the Wildlife Specialist is responsible for:

- (1) Lab Equipment – Take proper care of lab equipment and other OSU Extension Service or school resources
- (2) Data Collection – Identify, record and categorize aquatic macroinvertebrates
- (3) Assessment – Assess biodiversity of aquatic macroinvertebrates. Articulate clear, precise data and represent project site accurately. Confer with other team scientists.
- (4) Development - Based on assessment, collaborate with other team scientists and Project Manager to design a

restoration plan

- (5) Quality – Ensure quality, effective and minimum impact sampling techniques. Field books are available through OSU Extension Service to assist with identification.
- (6) Documentation – You will be responsible for keeping a journal of the wildlife you discover. You may include a picture or photo of animal markings and a written description of the circumstance/encounter.
- (7) Research – What animals do you expect to find here today? What animals were found here 100 – 200 years ago? What has led to this change?
- (8) Assessment – Based on what you've found, put together a report to help others understand the state of wildlife at this site and, ultimately, the importance of its restoration and/or protection.

#### QUALIFICATIONS:

##### Necessary

- Strong organization skills.
- Ability to work independently and/or cooperatively with a team.
- Ability to follow direction; be safe and responsible.
- Detail oriented.
- General understanding of wildlife.
- Ability to engage sensory awareness in project.
- General understanding of macroinvertebrates in the aquatic food web.

##### Desirable

- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.
- Basic understanding of biology.
- Strong interest in working outdoors.

#### BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

#### PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.

# S

## Social Scientist Job Description

**ORGANIZATION:**

OSU Extension Service

Contact: \_\_\_\_\_

**MISSION:**

OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

**LOCATION:**

Position will be based: \_\_\_\_\_

Restoration work will occur at the following site: \_\_\_\_\_

**PROJECT OVERVIEW:**

Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

**JOB SUMMARY:**

Our environment and our watersheds have seen varying degrees of human impact and human/nature interactions (both bad and good). These cultural interactions affect the character of place and create the social context within the watershed. Interactions between people and place influence not only the character of each section of a creek through time but actually affect stream function. Humans can't always predict the outcome of interplay between cultural choices and the creek and the historical needs of water have changed over time. The Social Scientist strives to research and understand all of these relationships and the ecological and social outcomes. This position is directly responsible for engaging the public and promoting restoration project goals and successes. Specifically, the Social Scientist will inform the public of restoration data results, artistic accomplishments, technical information and other project developments and outcomes. The Social Scientist will select material from the group project for publication and/or compose such material. She or he may also help arrange displays, make speeches for public presentations and conduct interviews with community members to compile a "social history" of the project site.

**RESPONSIBILITIES:**

With input and supervision from the Education Coordinator at OSU Extension Service, the Social Scientist is responsible to and for:

- (1) Collaboration – Work with team to determine the message to be portrayed about your project in the media.
- (2) Public relations - Sharing project goals with the public and answering questions via communication media (television, newspaper, web page). Conduct at least one interview with a local community member to understand the social/historical interactions between the creek and the community. Use the information

from the interview to write a one page oral history of the creek.

- (3) Project Preparation- Give/prepare speeches and/or help with display design for presentations.
- (4) Project Design - Collect and organize project documentation (i.e. sketches, photographs, site map, journal entries, etc.) to produce presentations and communication about the project.
- (5) Communications - Articulate clear, concise, and consistent external communications. Check in with other students often to clarify expectations and ensure effective communication.
- (6) Quality - Ensure accurate representation of project in media sources.
- (7) Public Presentation - Participate and present at a watershed summit.
- (8) Create a one page narrative describing the cultural history of the creek/watershed
- (9) Inspire two pieces of creative writing from your team (poetry or prose) describing the essence of the creek and/or your connection to it
- (10) Develop a hypothesis to answer the question, "How have human perspectives about the creek changed over the last 100 years?"

#### QUALIFICATIONS:

##### Necessary

- Interest in media communications.
- Ability to engage others.
- Maintain favorable public perception of project.
- Understand target audience interests and values.
- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.
- Ability to work independently.
- Master of logistics, details, and organization.
- Proven ability to meet deadlines.

##### Desired

- Experience conducting interviews.

#### BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

#### PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project job positions.



## Communications Specialist Job Description

**ORGANIZATION:**

OSU Extension Service

Contact: \_\_\_\_\_

**MISSION:**

OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

**LOCATION:**

Position will be based: \_\_\_\_\_

Restoration work will occur at the following site:  
\_\_\_\_\_

**PROJECT OVERVIEW:**

Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

**JOB SUMMARY:**

The position is directly responsible for engaging the public and promoting restoration project goals and successes. Specifically, the Communications Specialist will inform the public of restoration data results, artistic accomplishments, technical information and other project developments and outcomes. The Communications Specialist will select material from the group project for publication and/or compose such material. She or he may also help arrange displays and make speeches for public presentations.

**RESPONSIBILITIES:**

With input and supervision from the Education Coordinator at OSU Extension Service, the Communications Specialist is responsible to and for:

- (1) Collaborate - Work with Project Manager and team to determine the message to be portrayed about your project in the media.
- (2) Public relations - Sharing project goals with the public and answering questions via communication media (television, newspaper, web page).
- (3) Introduce project – Prepare & give speeches & design displays for presentations.
- (4) Project Design - Collect and organize project documentation (i.e. sketches, photographs, site map, journal entries, etc.) to share with media.

- (5) Communications - Articulate clear, concise, and consistent external communications. Check in with other students often to clarify expectations and ensure effective communication.
- (6) Quality - Ensure accurate representation of project in media sources.
- (7) Present - Participate in at least one presentation to the local watershed council, soil and water conservation district, or other recognized group.
- (8) Publications – Choose and submit team work to *freshwater Stewards* and seek out additional publication opportunities.

#### QUALIFICATIONS:

##### Necessary

- Ability to engage others.
- Maintain favorable public perception of project.
- Understand target audience interests and values.
- Ability to work independently.
- Master of logistics, details, and organization.
- Proven ability to meet deadlines.
- Clear written and verbal communication skills.

##### Desirable

- Interest in media communications.
- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.
- Previous experience with public speaking.

#### BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

#### PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.



# Creativity Engineer Job Description

ORGANIZATION:  
OSU Extension Service  
Contact: \_\_\_\_\_



MISSION:  
OSU Extension Service and its partners seek to encourage our learners at all levels to make personal investments in improving their own watershed in whatever ways are most appropriate - whether that be through their personal choices, volunteering or as part of their career.

LOCATION:  
Position will be based: \_\_\_\_\_  
Restoration work will occur at the following site: \_\_\_\_\_

PROJECT OVERVIEW:  
Student Stewardship Projects provide students with the opportunity to become truly engaged in the restoration and preservation of their local watershed. Project ideas are student driven and address local issues related to watershed health. Students participate in place-based service learning projects ranging from scientific investigations to creative arts explorations. Students have opportunities to present their findings and share their creations with their peers and communities through OSU Extension Service publications, website, student summits and local events.

JOB SUMMARY:  
The position is directly responsible for the project documentation of the restoration project. Specifically, the Creativity Engineer's role is to document each phase of monitoring and restoration project work in a variety of creative ways. This can include journalism, photography, sketching, sculpture, painting, and/or graphic design. Creativity Engineers will collect and organize project documentation (i.e. sketches, photographs, paintings, journal entries, etc.) and create a high quality community presentation. Creativity Engineers will produce either journalistic or creative writing pieces to be submitted and published in *freshwater Stewards*. Photos, sketches, or paintings may accompany writing.

RESPONSIBILITIES:  
With input and supervision from the Education Coordinator at OSU Extension Service, the Creativity Engineer is responsible to and for:

- (1) Project Documentation—Creativity Engineer's role is to use writing, sculpture, photography, or drawing to document each phase of restoration project work.
- (2) Graphic Design—Collect and organize project documentation (i.e. sketches, photographs, paintings, journal entries, etc.) and create high quality community presentations.
- (3) Journalism— Produce either journalistic or creative writing pieces to be submitted and published in *freshwater Stewards*. Photos, sketches, or paintings may accompany writing.
- (4) Time Management— Effectively manage time to ensure that publishing and presentation deadlines are met. Delegate responsibilities to all team members.

- (5) Logistics-- Manage and organize planning and scheduling for creative field tasks, classroom tasks, and homework.
- (6) Communications-- Articulate clear, concise and consistent external communications.
- (7) Quality – Assist Education Coordinator with product quality control (effectiveness, graphic design, delivery, creativity, etc.).

#### QUALIFICATIONS:

##### Necessary

- Interest in drawing, photography and/or graphic design.
- Experience and/or interest in journalistic or creative writing.
- Interest in learning more about ecosystems, natural history, restoration, and watershed issues.

##### Desirable

- Ability to work independently.
- Master of logistics, details, and organization.
- Proven ability to meet deadlines.

#### BENEFITS:

This is an unpaid position. School credit may be available. Details should be discussed among students, teachers and a representative from OSU Extension Service.

#### PROCESS:

Please submit a letter of interest to your teacher and/or OSU Extension Service. Remember to include your school, teacher, grade level and the best way to contact you. For assistance in writing a letter of interest, please refer to the StreamWebs Student Stewardship Field Book for a sample letter and/or contact your English teacher for support and potential writing credit. We will set up a meeting with you and your teacher to finalize project positions.

# Sample – Letter of Interest

Date

Your Name

Your Email

Job Title

Project Name/Site

Dear Teacher Name,

I have read about Student Stewardship Projects and after careful consideration of the available project jobs I am interested in the Creativity Engineer job. I am interested in pursuing a career in the arts and would like to learn more about the project and the job opportunity.

I have taken a sculpture class and creative writing class, as well as having personal experience as an artist. In addition, I completed an internship at the Portland Ceramics Studio. I am interested in leading the class to create a nature sculpture reflecting the style of Andy Goldsworthy which could represent our Student Stewardship Project in a creative way.

My resume, which is enclosed, contains additional information on my experience and skills. I would appreciate the opportunity to discuss the project with you and to provide further information on my candidacy. I can be reached anytime by email.

Thank you for your time and consideration. I look forward to speaking with you about this exciting opportunity.

Sincerely,

*Your Signature*

Your Typed Name

# Sample – Resume

**FirstName LastName**  
School Address Here  
email: phjones@email.com

## **Education**

Portland High School, Portland, Oregon  
2007-2010

## **Work Experience**

Sales Associate, The Retail Store  
June 2008 – Present  
• Maintain and restock inventory.  
• Provide customer service.  
• Operate computerized cash register system.

Child Care  
2007 – Present  
• Provide child care for several families after school, weekends and during school vacations.

Portland Ceramics Studio  
June – July 2007  
• Summer intern  
• Operated kiln  
• Lead Saturday ceramics workshops for community

## **Achievements**

National Honor Society: 2004, 2005, 2006  
Academic Honor Roll: 2002 - 2006

## **Volunteer Experience**

Portland Literacy Program  
Race for the Cure

## **Interests / Activities**

Member of Portland High School Tennis Team  
Girl Scout  
Natural Resources

## **Computer Skills**

Proficient with Microsoft Word, Excel, and PowerPoint, and Internet

## **Classes of Relevance**

Introduction to Sculpture  
Creative Writing



# Student Stewardship Project

## PROJECT PLANNING WORKSHEET

Who's in Charge?



Project: \_\_\_\_\_ Date: \_\_\_\_\_

Name(s): \_\_\_\_\_

The organizing question for my (our) project is:

To answer the question, I (we) need to investigate:

I (we) need to complete the following activities:

WHO	will do WHAT	by WHEN	RESOURCES NEEDED
			<input type="checkbox"/> MONEY <input type="checkbox"/> SUPPLIES <input type="checkbox"/> SUPPORT <input type="checkbox"/> TIME <input type="checkbox"/> OTHER:

At the end of the project, I (we) will demonstrate learning through sharing and celebrating the project by (refer to Step 9):

WHAT	HOW	with WHO	WHERE	WHEN
		How do you plan to invite them?	Do you need to reserve a space?	

The challenges I (we) anticipate are:

The goal of the project is:

The outcomes I (we) expect are:

How will I (we) evaluate the project? - refer to Step 8 for reflection & evaluations ideas



# Student Stewardship Project

## PROJECT EQUIPMENT LIST

Extension Service

Who's in Charge?



Below is a list of suggested supplies and equipment for potential Student Stewardship Projects. You can use this list to determine what you have and what you might need for your project. Or, create your own list specific to your project.

### MACROINVERTEBRATE SAMPLING:

- 1-2 D-nets
- 6 small green nets
- 5-6 pairs of boots various sizes
- 2 dish trays
- 2 ice cube trays
- 2 turkey basters
- 4 eye droppers
- 2 guides to PNW Aquatic
- 1 dish tray
- 2-2 Way Magnifiers
- Invertebrate pollution charts
- 6 pair forceps

### WATER QUALITY TESTING:

- pH kit LaMotte #3353
- DO kit LaMotte #5860
- Thermometer (immersible)
- pH/ temperature chart
- Turbidity/DO chart
- pH & DO kit directions
- Wastewater container
- 1 pair boots
- Titrating Bottles
- Sharps Container
- soap
- Turbidity Tube
- Sample Bottle
- bag of latex gloves (8 Pairs)
- goggles

### RIPARIAN:

- Animal Tracks Book
- Plant ID Book
- Tree ID Book
- 15 ft rope
- 100 ft measuring tape
- stream buffer chart
- Shovels
- Gloves
- Plant Tubes
- Plant Stakes
- Loppers

### CREATIVE ARTS:

- Paint
- Brushes
- Field Journals
- Pencils
- Camera

### PHOTO-POINT MONITORING

- 100' Measuring Tape
- Meter Board
- GPS Unit
- Digital Camera
- Compass



# Step 4: Confirm Commitments



At this point, you have refined your project planning and you are ready to meet with your established project teams. Now is your opportunity to reach out into the wider community to tell others about your project idea, get them excited AND involved! This step will help move you into action...

## Personal Commitment

Now that you know your job responsibilities and project team members for the Student Stewardship Project, it is time to confirm your personal commitment to the project.

- Review and sign the My Stewardship Agreement. In addition, you may want to brainstorm other specific project expectations with your project team.

## Partner Commitment

Work with your teacher or group leader and OSU Extension Service's education staff to research, identify and contact professionals and specialists you may want to get involved with your project. If you have taken on the job of Wildlife Specialist or Project Manager, you may want to consider contacting a Fish Biologist with ODFW or the Forest Service.

- Use the Partner Agreement worksheet to help establish the contributions and responsibilities agreed upon by both parties as you enlist community professionals to help with your project. Be sure to insert the completed Partner Agreement into your StreamWebs Student Stewardship Field Book for future reference.

Some of the community professionals I have identified and received partner agreements from are:  
i.e. Joe Smith, a Fish Biologist with the Forest Service

---

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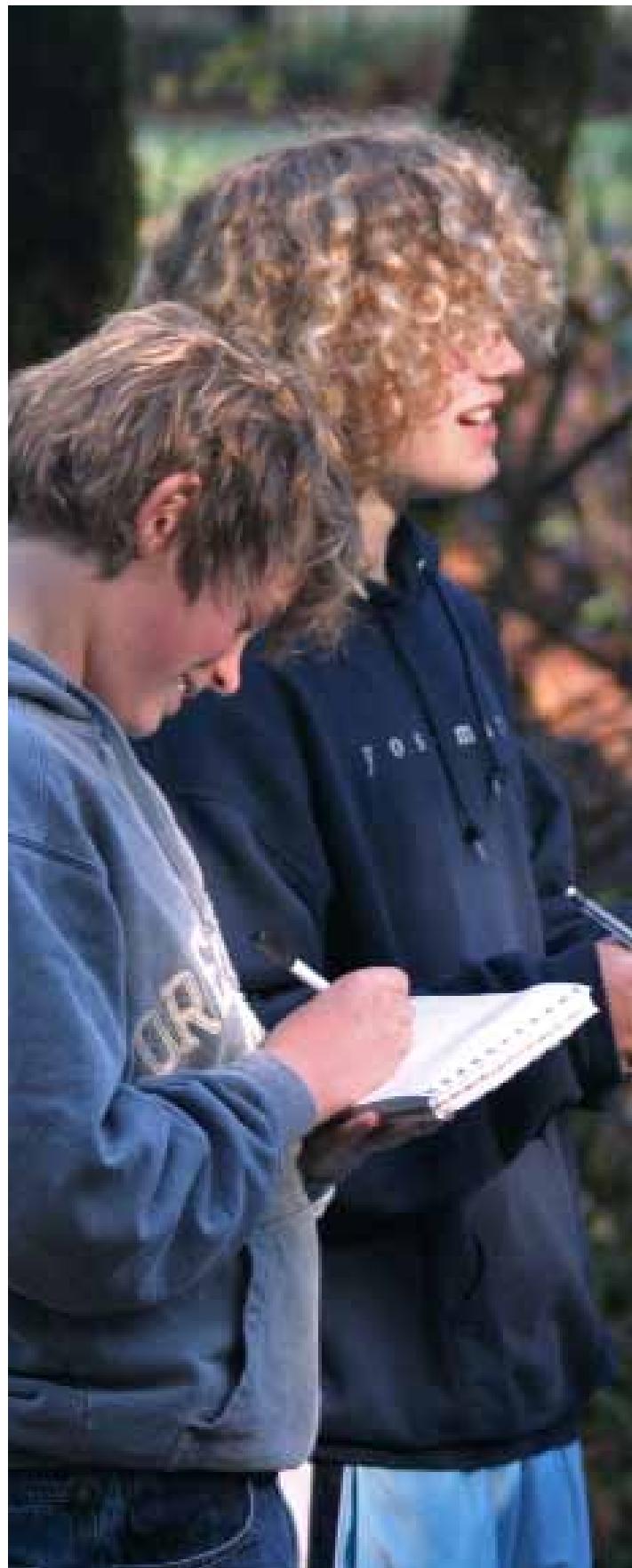
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Our project site is located on:

- public land and I (we) have communicated with the appropriate land agency regarding the project
- private land and I (we) have communicated with the land owner and have permission to move forward with the project

"Nothing new that is really interesting comes without collaboration."

- James Watson





# Student Stewardship Project

## MY STEWARDSHIP AGREEMENT

Time to register a profile in StreamWebs  
(streamwebs.org) if you haven't already!!

## Who's in Charge?



### RESEARCH

- Conduct interviews as needed
- Conduct field observations and data collection
- Review and utilize information in my StreamWebs Student Stewardship Field Book
- Contribute to my StreamWebs Student Stewardship Field Book with additional research from a variety of sources such as: internet, books, newspaper, etc.

Initial here: \_\_\_\_\_

### JOURNAL

- Keep documented & dated entries for each project day
- Include written entries to support the project
- Include sketches to support the project

Initial here: \_\_\_\_\_

### DATA SHEETS

- Learn and utilize accurate data collecting techniques
- Data collected will be legible and complete
- Data collected will be accurate
- An explanation of data such as charts and graphs will be included

Initial here: \_\_\_\_\_

### TEAM PARTICIPATION

- Communicate regularly with my team, Project Manager and teacher/group leader
- Follow through with my designated tasks
- Contribute my ideas
- Follow through with expectations of my job as the: \_\_\_\_\_

Initial here: \_\_\_\_\_

### DEMONSTRATION

- Accurately and professionally share the outcomes of my project with my community

Initial here: \_\_\_\_\_

### PROJECT EXPECTATIONS

(use this space to add personalized project expectations)

- 
- 
- 
- 

Name: \_\_\_\_\_ Project: \_\_\_\_\_

By signing here, I am making my commitment to my (our) Student Stewardship Project

Signature: \_\_\_\_\_ Date: \_\_\_\_\_





# Student Stewardship Project

## PARTNER AGREEMENT

Extension Service

Who's in Charge?



Thank you for participating in a partnership that will assist me (us) in implementing a Student Stewardship Project, your professional knowledge and expertise is greatly appreciated. The Student Stewardship Project – 10 Step Model is a step by step framework to guide students, with the support of their teacher or group leader through meaningful watershed based project learning. Project ideas are student driven and address real and relevant local issues related to watershed health. Student Stewardship Projects engage students in the maintenance and preservation of their local watersheds through experiential learning that is place-based and tied to ecological and educational goals. Projects range from scientific investigations, on-the-ground restoration and creative arts, then culminate with an opportunity for students to share with and present to their peers and community. I (we) look forward to our partnership and sharing our project with you!

### General Project Information

School/Group: \_\_\_\_\_ Teacher Name/Group Leader: \_\_\_\_\_

My Name: \_\_\_\_\_ I am the project: \_\_\_\_\_

Email: \_\_\_\_\_ Phone #: \_\_\_\_\_

Project: \_\_\_\_\_ Site: \_\_\_\_\_

Project Overview: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Your assistance is needed in the:

Field     Classroom     Other: \_\_\_\_\_

Do you own or manage the land at the project site?     YES     NO

If YES, do you agree to give us access to the project site during the duration of our project?     YES     NO

Specifically your contributions will include: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you for agreeing to help me (us) with the following:

### Watershed Topics

- |  |   |
|--|---|
| <input type="checkbox"/> Water Resources           | <input type="checkbox"/> Fish Biology         |
| <input type="checkbox"/> Water Ecology             | <input type="checkbox"/> Ornithology/Wildlife |
| <input type="checkbox"/> Water Science/Hydrology   | <input type="checkbox"/> Wildlife Tracking    |
| <input type="checkbox"/> Geology/Topography        | <input type="checkbox"/> History              |
| <input type="checkbox"/> Geography                 | <input type="checkbox"/> Native Cultures      |
| <input type="checkbox"/> Land & Water Uses         | <input type="checkbox"/> Economy/Business     |
| <input type="checkbox"/> Soils                     | <input type="checkbox"/> Eco-Art              |
| <input type="checkbox"/> Botany                    | <input type="checkbox"/> Journalism           |
| <input type="checkbox"/> Riparian Ecology/Forestry | <input type="checkbox"/> Monitoring           |
| <input type="checkbox"/> Climate                   | <input type="checkbox"/> Restoration          |
| <input type="checkbox"/> Sociology                 | <input type="checkbox"/> Other: _____         |

Partner contribution details:

DATE	SITE	TIME	CONTRIBUTION

Partner Name: \_\_\_\_\_ Agency/Organization: \_\_\_\_\_

Email: \_\_\_\_\_ Phone #: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

# Step 5: Research & Design



Now that you have established roles and determined where your project will take place, it is time to implement field, classroom and community-based research. Consider this as the scuba diving step and dive into researching all of the cool information about your watershed! Whether through primary (field work) or secondary (research) data collection, your scuba diving mission will help you discover important and intricate details about your project. This will provide you with a deeper understanding and will put your individual and team skills and interests into action...

- Meet with your project team to research your part of the project and begin brainstorming the design of your project plan.

At this point, it would be helpful to revisit and refer to your unique job description for your project for guidance. Depending on your specific project job and team, your research and design should be a combination of field, classroom and community-based research and could include:

- Review maps and project information.
- Review the watershed assessment and plans.
- Map it – refer to the Sample Restoration Design Map and create a map of your project site that includes restoration design plans.

- Use the Data Sheets provided or insert your own to collect baseline data for your project.
- Initiate field observations by simply sketching and writing about your project site.
- Use the Project Information Sheet to outline details of the project so they are documented and can be easily referred to and shared with others. You should also give a copy of this to your project partner and the appropriate land owner for their records.
- Use the Weekly Planning Sheet to identify individual and team tasks for each week of the project.
- Refer to the Sample Research and Interviews for inspiration.
- Refer to the Actively Managed Streamside Buffer Chart as you design your project plans.

# Sample – Restoration Design Map

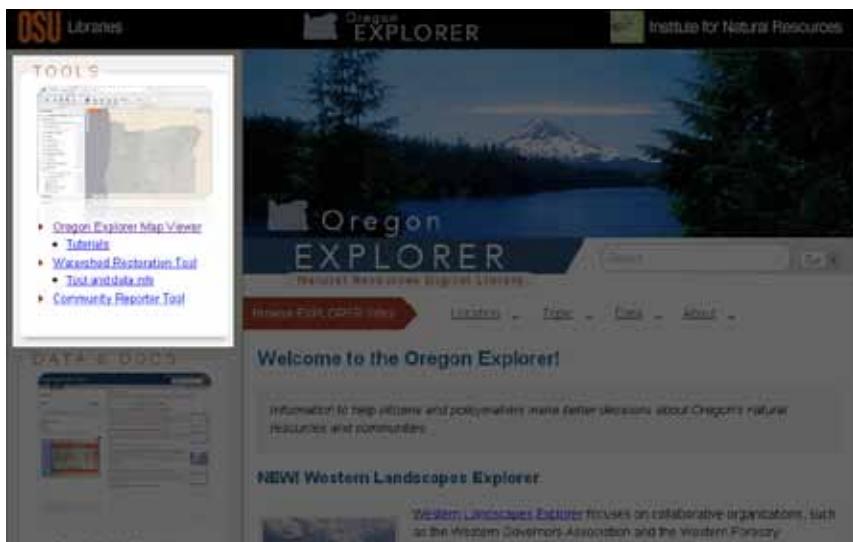


## Mapping Your Project with Oregon Explorer Map Viewer

There are several ways to map your stewardship project online. One of the best in Oregon is the Oregon Explorer Map Viewer, which allows you to (1) create maps of your project site, (2) measure the area of your full project site and individual regions within the site, (3) mark trees, wildlife tracks/habitat, and other site features, (4) overlay watershed and stream data, land use data, fish distribution data, and much more, and (5) export your map in various formats.

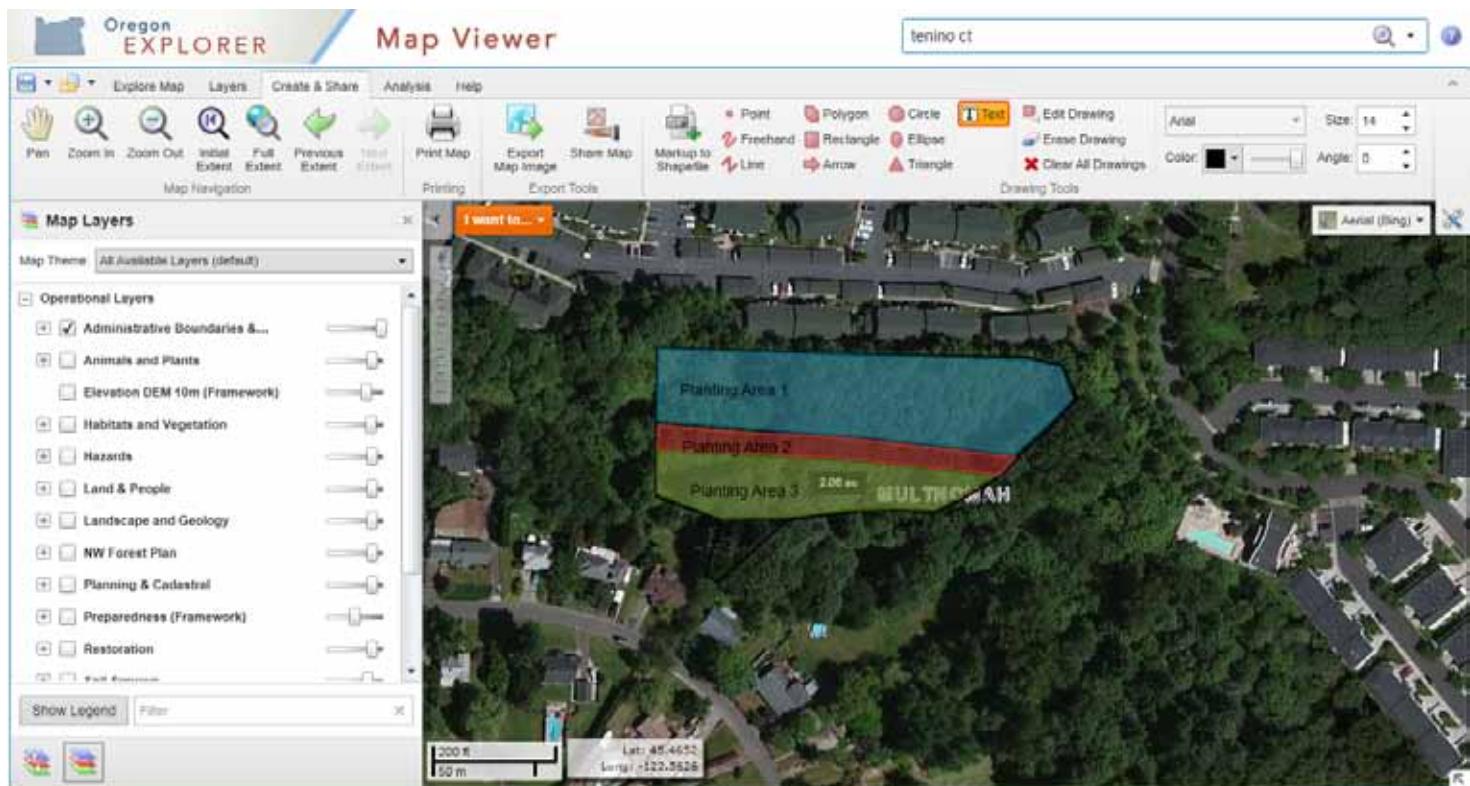
You can use Oregon Explorer Map Viewer to organize your project planning, design restoration, and share your project details with partners and the community.

Oregon Explorer's video tutorials will help you get started. Launch Oregon Explorer at [oregonexplorer.info](http://oregonexplorer.info).



## Getting Started with Oregon Explorer

1. Go to [oregonexplorer.info](http://oregonexplorer.info)
2. Watch the Map Viewer TUTORIALS
3. Map your Project Site!
4. Upload map to StreamWebs





# Student Stewardship Project

## PROJECT INFORMATION SHEET

Time to add your project site in StreamWebs  
(streamwebs.org) if it doesn't exist already!!

Who's in Charge?



Project Name:		
Project Site (address of stream location):		
Watershed:		
Project Type:	<input type="checkbox"/> Monitoring <input type="checkbox"/> Planting <input type="checkbox"/> Invasive Species <input type="checkbox"/> Other	
If Other:		
Project Goal/Organizing Question:		
What habitat issues will this project address?		
Site capacity (max # of participants):		
When will the project take place?		
Duration:		
Will this project be ongoing?	<input type="checkbox"/> YES	<input type="checkbox"/> NO
What community need will this project address?		
Contact name:		
Contact information:		
Organizations/Groups involved:		
Other project information:		
What types of monitoring and/or maintenance would be required to ensure project success?		
Monitoring activity:	Number of times per year:	Who will be responsible?





# Student Stewardship Project

WEEKLY PLANNING SHEET

Enter this information into a StreamWebs  
Field Journal ([streamwebs.org](http://streamwebs.org))!

Who's in Charge?



Project: \_\_\_\_\_ Team: \_\_\_\_\_

Name: \_\_\_\_\_ Date: \_\_\_\_\_

This week I will work on the following products:

Begin By Myself

Continue with \_\_\_\_\_

Complete with \_\_\_\_\_

1.

2.

This week I will work on the following products:

Begin By Myself

Continue with \_\_\_\_\_

Complete with \_\_\_\_\_

1.

2.

This week I will investigate/research:

Begin By Myself

Continue with \_\_\_\_\_

Complete with \_\_\_\_\_

1.

2.

End of the week reflections:

What did I learn?

What do I need to plan/investigate for next week?

Adapted from: Project Based Learning - second edition



## Sample – Research and Interviews: Social Scientist

1. What is the cultural history surrounding Whychus Creek? Research the following topics and write a two page narrative about the social and ecological history of Whychus Creek.
  - Where does Whychus Creek begin and how does it change along the way? Describe the path of Whychus Creek.
  - What were the Native American tribes who lived in the Whychus watershed? What natural resources did the Native Americans use from the area?
  - Who were the first settlers in the Sisters/Whychus Creek area?
  - How was Whychus Creek originally used? Describe early irrigation and agricultural uses of the waters of Whychus Creek.
  - How is Whychus Creek used and valued today?
2. Consider local community members who have a connection to Whychus Creek. With your group, compile a list of 5-7 community members who live in Sisters and have either a historical, personal, or professional connection to Whychus Creek. Next to the names of the people on your list, use as many descriptive words as you can to characterize their connection to the creek. (Example: Kolleen Yake—naturalist, watershed writer, trail runner, creek teacher, sun worshiper, works for a watershed council, likes fish, plants trees.) Once you have finalized your list with your group, call and/or email your top two community members and try to set up either phone or in-person interviews.
3. What is the natural hydrology of the stream that you are working at? What modifications have been made to the stream channel and/or floodplain?

"You must be the change you wish to see in the world."

- Mahatma Gandhi



## Step 6: Review & Revise



You are now outfitted with knowledge and plans, before you continue your action, press the pause button, rewind and check-in on your progress. This is a great time to ensure that you are on the path to project success!

Have you added your field notes, research and completed worksheets to the StreamWebs Student Stewardship Field Book and to [streamwebs.org](http://streamwebs.org)?

YES       NO

If YES, move on and review Steps 1 – 5 of the 10 Step model

If NO, insert those items at this point and then begin your review of Steps 1 – 5.

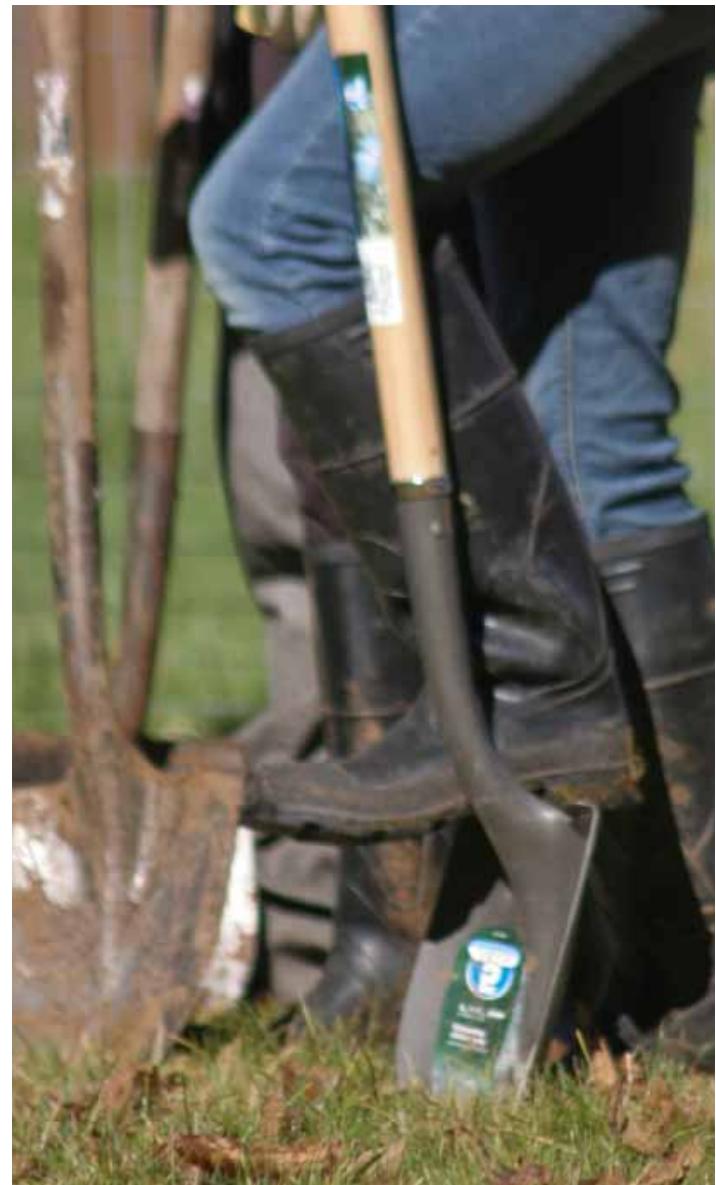
Next, complete the Project Progress Form individually or with your team and then check in with your teacher or group leader. In addition to your teacher/group leader, you may want to consider presenting your project idea and plans to OSU Extension Service's education staff and other project partners for feedback.

Do changes need to be made to your project plans?

YES       NO

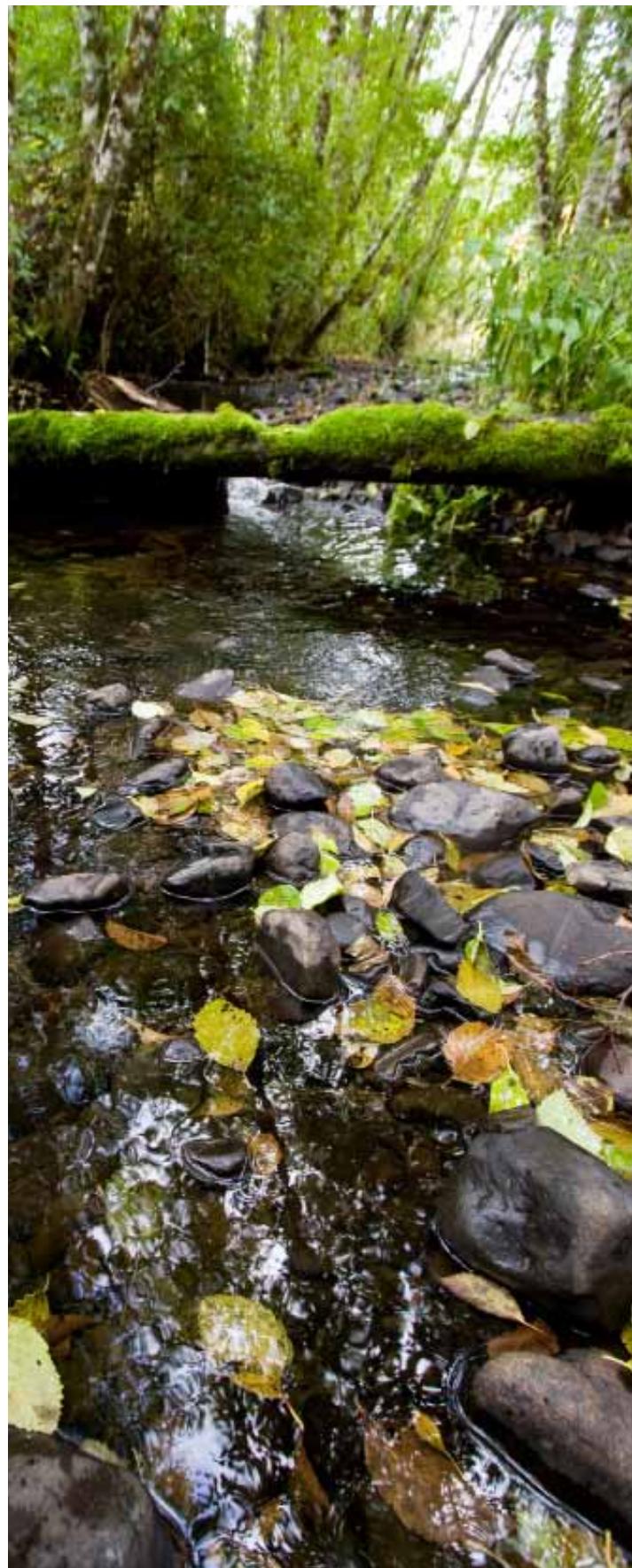
If YES, work with your team to implement those changes before moving onto Step 7.

If NO, move onto Step 7 – Project Action!



"Nothing new that is really interesting comes without collaboration."

- James Watson





# Student Stewardship Project

## PROJECT PROGRESS

Enter this information into a StreamWebs  
Field Journal ([streamwebs.org](http://streamwebs.org))!

Who's in Charge?



Project: \_\_\_\_\_ Date: \_\_\_\_\_

Team: \_\_\_\_\_ Position: \_\_\_\_\_

Name(s): \_\_\_\_\_

I (we) had the following goals/question:

I (we) have accomplished the following:

My (our) next steps are:

My (our) most important concerns/problems/questions are:

I (we) have learned so far:

My (our) project still fits into our original budget:  YES  NO

If NO, the following changes should be made:

My (our) project still fits into the original timeline:  YES  NO

If NO, the following changes should be made:



# Step 7: Project Action



The name says it all; you have prepared, activated the project and made any necessary revisions, now press play to keep up the action. This is the time when the waders are on, cameras are rolling, dirt is flying, and students are knee deep in stewardship!

- Continue to utilize the Weekly Planning Sheet (from Step 5) and refer back to the Project Progress Form (from Step 6), inserting them into the Project Action Section as you move forward with your project.
- Document all of your work through your field journal and data sheets being sure to insert them into the StreamWebs Student Stewardship Field Book and at [www.streamwebs.org](http://www.streamwebs.org).

At this point in the project, each team and student job should be fully in place and functioning collaboratively with all partners. Some examples include:

- Project Managers are supervising and guiding the project activities
- Hydrologists are collecting water quality data
- Communications Specialists are recording and documenting progress
- Creativity Engineers are developing creative art projects to complement the project action
- **EVERYONE** is getting their feet wet and their hands dirty!

Data sheets for field job roles are included in the next few pages. These are sample forms to identify what types stewardship activities are available. Print the full data sheets from StreamWebs: [streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)



## WATER QUALITY DATA FORM

School: \_\_\_\_\_

Teacher: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Stream/Site Name: \_\_\_\_\_ Lat \_\_\_\_\_ Long \_\_\_\_\_

Any fish present?  Yes  No # of live fish: \_\_\_\_\_ # of carcasses: \_\_\_\_\_

[www.streamwebs.org](http://www.streamwebs.org)



Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

TEST	Sample 1	Sample 2	Sample 3	Sample 4
<b>Water Temperature</b> <input type="checkbox"/> °C <input type="checkbox"/> °F				
Equipment used?	Vernier <input type="checkbox"/> Manual <input type="checkbox"/>			
<b>Air Temperature</b> <input type="checkbox"/> °C <input type="checkbox"/> °F				
Equipment used?	Vernier <input type="checkbox"/> Manual <input type="checkbox"/>			
<b>Dissolved Oxygen (mg/L)</b>				
Equipment used?	Vernier <input type="checkbox"/> Manual <input type="checkbox"/>			
<b>pH</b>				
Equipment used?	Vernier <input type="checkbox"/> Manual <input type="checkbox"/>			
<b>Turbidity (NTU)</b>				
Equipment used?	Vernier <input type="checkbox"/> Manual <input type="checkbox"/>			

Adapted from: Environmental Services City of Portland



Print data sheets at:  
[streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)

SAMPLE

## STREAM FLOW DATA FORM



Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

[www.streamwebs.org](http://www.streamwebs.org)

School: \_\_\_\_\_ Teacher: \_\_\_\_\_  
 Date: \_\_\_\_\_ Time: \_\_\_\_\_ Weather: \_\_\_\_\_  
 Stream/Site Name: \_\_\_\_\_

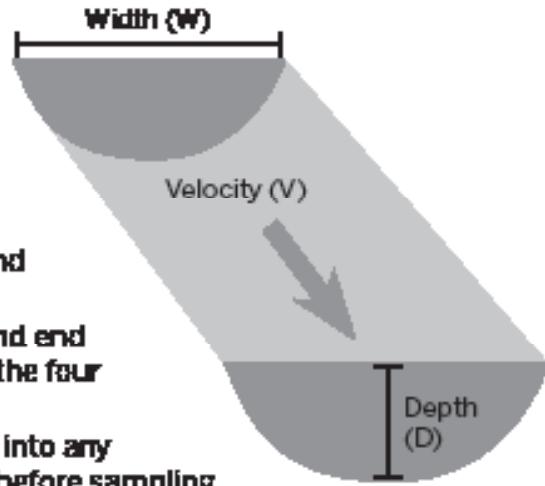
### Measuring Stream Flow with Vernier

#### What You Need:

- |  |   |
|--|---|
| <input type="checkbox"/> Measuring staff | <input type="checkbox"/> Measuring tape   |
| <input type="checkbox"/> LabQuest        | <input type="checkbox"/> Flow Rate Sensor |

#### Procedure:

1. Measure the Width (W) of the stream at your start and end points and get the average.
2. Measure the Depth (D) at two points for both the start and end points of your section of stream, and find the average of the four measurements.
3. Plug the Flow Sensor into the LabQuest right away (plug into any channel) to ensure a warm up time of at least 5 minutes before sampling. (This should be done as your next group is in transition to your station so while you are welcoming them and explaining the water quality station your probes are warming up).
4. Assemble Flow Rate Sensor by connecting the alternating black and white plastic rods together (two black rods, one with propeller and one without, as well as two white rods).
5. Submerge the entire propeller half way to the bed of the stream. Do not stick the rod so far in that the cords get wet. It is best to get a reading as close to the middle of the stream as possible, keep in mind the safety of the students and only take a sample that is no more than knee deep.
6. Using the stylus, change the unit of measurement by pressing the screen in the box providing the Velocity (V) reading (m/s and f/s), this will give you a drop down menu and allow you to change between units of measurement.
7. Once the reading has become steady and you have properly recorded data, carefully disassemble the pieces of the Flow Rate Sensor and you are ready for cleanup.



Width (W):  
 Width (ft) = \_\_\_\_\_

Depth (D):  
 Depth (ft) = \_\_\_\_\_

Velocity (V):  
 Velocity (ft/s) = \_\_\_\_\_

#### Stream Flow (Q):

$$\text{Stream Flow} = \frac{(\text{ft})}{(\text{Q})} \times \frac{(\text{ft})}{(\text{W})} \times \frac{(\text{ft/s})}{(\text{D})} \times \frac{(\text{V})}{(\text{ft/s})} = \text{cubic feet per second (cfs)}$$



Print data sheets at:  
[streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)

SAMPLE



Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

[www.streamwebs.org](http://www.streamwebs.org)

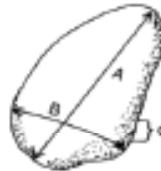
Name: \_\_\_\_\_

School: \_\_\_\_\_ Teacher: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Stream/Site Name: \_\_\_\_\_

Weather: \_\_\_\_\_



- (A) Long axis
- (B) Intermediate axis
- (C) Short axis

The intermediate axis is the pebble's diameter.

Pebble counts are an important component of analyzing stream characteristics. The distribution of sediment material on the streambed can inform you about a variety of different stream functions and hydrologic conditions, including erosion potential, woody debris, and aquatic species habitat.

Material	Size (mm)	Tally	#
silt/clay	0 - 0.062		
very fine sand	0.062 - 0.125		
fine sand	0.125 - 0.25		
medium sand	0.25 - 0.5		
coarse sand	0.5 - 1		
very coarse sand	1 - 2		
very fine gravel	2 - 4		
fine gravel	4 - 6		
fine gravel	6 - 8		
medium gravel	8 - 11		
medium gravel	11 - 16		
coarse gravel	16 - 22		
coarse gravel	22 - 32		
very coarse gravel	32 - 45		
very coarse gravel	45 - 64		
small cobble	64 - 90		
medium cobble	90 - 128		
large cobble	128 - 180		
very large cobble	180 - 256		
small boulder	256 - 362		
small boulder	362 - 512		
medium boulder	512 - 1024		
large boulder	1024 - 2048		
very large boulder	2048 - 4096		



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**SAMPLE**



# StreamWebs™

Student Stewardship Network

## MACROINVERTEBRATE SAMPLING



Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

[www.streamwebs.org](http://www.streamwebs.org)

Name: \_\_\_\_\_

School: \_\_\_\_\_ Teacher: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Weather: \_\_\_\_\_

Stream/Site Name: \_\_\_\_\_ Time spent sorting/identifying: \_\_\_\_\_

# of people sorting/identifying: \_\_\_\_\_  Riffle     Pool

**Directions:**

1. Record the number of each type of organism found in the # found column of each section.
2. Then circle the number in the score column (3, 2, or 1) if any of that organism was found.
3. Complete the equation at the bottom by adding up the circled numbers from each score column.

### SENSITIVITY TO POLLUTION

#### Sensitive / Intolerant

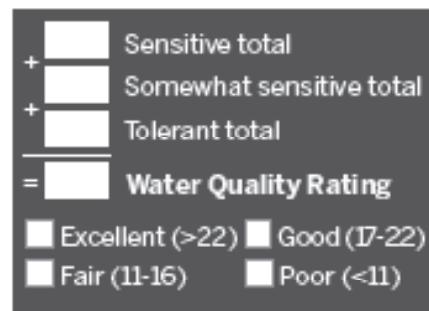
	# found	score
caddisfly 		3
mayfly 		3
riffle beetle 		3
stonefly 		3
water penny 		3
dragonfly 		3
Sensitive TOTAL =		

#### Somewhat Sensitive

	# found	score
clam/mussel 		2
crane fly 		2
crayfish 		2
damselfly 		2
dragonfly 		2
scud 		2
fishfly 		2
alderfly 		2
mite 		2
Somewhat Sensitive TOTAL =		

#### Tolerant

	# found	score
aquatic worm 		1
blackfly 		1
leach 		1
midge 		1
snail 		1
mosquito larva 		1
Tolerant TOTAL =		



Adapted from Environmental Services  
City of Portland



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[streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)

SAMPLE

**OSU StreamWebs®**  
 Oregon State University  
 Extension Service  
**Student Stewardship Network**  
**INVASIVE SPECIES TRACKING**

Name: \_\_\_\_\_

School: \_\_\_\_\_ Teacher: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Stream/Site Name: \_\_\_\_\_

Weather: \_\_\_\_\_

**Instructions:** Collect GPS points for each invasive plant you find. For individual plants and small clusters, record the coordinates under "POINTS" below. For large areas of coverage by a single invasive, record on the back of this form ("POLYGON"). For large areas, take GPS coordinates around the area of infestation, recording each point on the back of the form. Be sure to take two photos of the invasive as well. When you return to the classroom, use the Invasive Species Tracking function in StreamWebs to record your points and polygons on the map. As you roll over with your mouse, the map will display the GPS coordinates in the bottom right hand corner. You can match these coordinates with those from your data form.

**POINTS (Individual plants or small clusters)**

GPS POINTS		
Coordinate	Latitude (degrees N)	Longitude (degrees W)
Coordinate 1		
Coordinate 2		
Coordinate 3		
Coordinate 4		
Coordinate 5		
Coordinate 6		
Coordinate 7		
Coordinate 8		
Coordinate 9		
Coordinate 10		
Coordinate 11		
Coordinate 12		
Coordinate 13		
Coordinate 14		
Coordinate 15		
Coordinate 16		
Coordinate 17		
Coordinate 18		
Coordinate 19		
Coordinate 20		
Coordinate 21		



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**INVASIVE NAME (Common):**

**INVASIVE NAME (Scientific):**

**PHOTO ID(s):**

**Early Detection Rapid Response (EDRR) Species?:**

YES

No

**Ownership of Land (if known):**

R

Print data sheets at:  
[streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)

SAMPLE

**OSU StreamWebs®**  
Student Stewardship Network  
**CANOPY COVER SURVEY**

Name: \_\_\_\_\_

School: \_\_\_\_\_

Teacher: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

Stream/Site Name: \_\_\_\_\_

Weather: \_\_\_\_\_

**Directions:** Working with a partner, take one sample of canopy cover in each cardinal direction using the spherical densiometer. Once you have the densiometer positioned correctly, fill in the areas on this worksheet that are covered with canopy shade. If the square is 50% shaded or more, fill in the entire square. Record the number of shaded boxes for each sample. Add up the numbers for all four samples. The result is your estimated percent canopy for your location.

	A	B			
C	D	E	F		
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V		
W	X				

# Shaded Boxes \_\_\_\_\_

North

	A	B			
C	D	E	F		
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V		
W	X				

# Shaded Boxes \_\_\_\_\_

East

	A	B			
C	D	E	F		
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V		
W	X				

# Shaded Boxes \_\_\_\_\_

South

	A	B			
C	D	E	F		
G	H	I	J	K	L
M	N	O	P	Q	R
S	T	U	V		
W	X				

# Shaded Boxes \_\_\_\_\_

West

$$\text{North} + \text{East} + \text{South} + \text{West} = \text{Estimated \% Canopy}$$

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SAMPLE

**OSU StreamWebs™**  
Student Stewardship Network  
**RIPARIAN SOIL SURVEY**  
**DATA FORM**

Oregon State  
UNIVERSITY  
Extension Service



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[www.streamwebs.org](http://www.streamwebs.org)

School: \_\_\_\_\_ Teacher: \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_ Weather: \_\_\_\_\_

Stream/Site Name: \_\_\_\_\_

Landscape Position:

- Summit
- Slope
- Depression
- Large Flat Area
- Stream Bank

Cover Type:

- Bare Soil
- Rocks
- Grass
- Shrubs
- Trees

Land Use:

- Urban
- Agricultural
- Recreation
- Wilderness
- Other

Distance from stream: \_\_\_\_\_

Distinguishing site characteristics:

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*Reference: GLOBE® 2005 Appendix- 2 Soil*

## SOIL CHARACTERIZATION SURVEY ACTIVITY

**Task:** Use an auger to expose a soil profile to determine soil characteristics within the riparian zone.

**What You Need:**

- Soil auger
- Spray bottle
- Riparian Soil Survey data form

**In the Field:**

**Exposing the Soil Profile**

1. Identify a location where an auger can be used to expose a soil profile.
2. Remove the surface vegetation.
3. Place the auger at the top of the soil and turn the auger one complete revolution ( $360^\circ$ ) to dig into the ground. Do not turn the auger more than one complete circle ( $360^\circ$ ) to prevent the soil from being compacted.
4. Remove the auger with the sample from the hole
5. Keeping the soil sample inside the auger, identify if you have more than one soil horizon in your sample. If no, use the soil characterization key to identify your sample. If yes, use the soil characterization key to identify all different soil horizons.
6. For each soil horizon found, collect a small sample in your hand (about the size of a ping-pong ball). Using the spray bottle, moisten the soil and work between your fingers until it is the same moisture throughout. Begin the soil characterization key (on the back).



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SAMPLE



Oregon State  
UNIVERSITY

Student Stewardship Network

## RIPARIAN & AQUATIC SURVEY



Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

[www.streamwebs.org](http://www.streamwebs.org)

Name \_\_\_\_\_

School \_\_\_\_\_

**Teacher:** \_\_\_\_\_

Date: \_\_\_\_\_ Time: \_\_\_\_\_

**Weather:**

## What You

□ ■ □ □

- Riparian & Aquatic Area Survey data form     10 ft Books/charts     100 ft tape measure

STREAM SURVEY			
Survey Area			
Length of stream (in feet):			
# of riffles:			
# of pools:			
Substrate	Very Little	Some	A Lot
Silt/Organic matter ( <i>stays suspended</i> )			
Sand ( <i>settles to bottom when disturbed</i> )			
Gravel ( <i>pea to baseball size</i> )			
Cobble ( <i>baseball to bowling ball size</i> )			
Boulders ( <i>larger than a bowling ball</i> )			
Bedrock ( <i>solid rock</i> )			
Instream Woody Debris	Very Little	Some	A Lot
Small ( <i>6 inch diameter x 10 ft length</i> )			
Medium ( <i>12 inch diameter x 20 ft length</i> )			
Large ( <i>24 inch diameter x 35 ft length</i> )			
Comments:			
Vegetation Type	Very Little	Some	A Lot
Coniferous trees ( <i>with needles</i> )			
Deciduous trees ( <i>with leaves</i> )			
Shrubs			
Small plants			
Ferns			
Grasses			

**More to Identify? Use the back of this form.**



**Print data sheets at:**  
[streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)

# SAMPLE

**RIPARIAN AREA TRANSECT  
DATA FORM**



Now you can share your field data quickly and easily using StreamWebs™. You can graph your water quality data, compare your macroinvertebrate count with other schools, and learn more about your home watershed. To find out more, visit: [www.streamwebs.org](http://www.streamwebs.org)

School: \_\_\_\_\_ Teacher: \_\_\_\_\_  
Date: \_\_\_\_\_ Time: \_\_\_\_\_ Weather: \_\_\_\_\_  
Stream/Site Name: \_\_\_\_\_

**What You Need:**

- 100-foot tape measure       Riparian Area Transect data form  
 15-foot rope with a ring attached in the middle of its length       Instructions  
 Plant and tree identification books or charts

**Procedure:**

1. Set the transect. Stretch the transect tape measure from the water's edge or a clearly discernible high water line perpendicular to the stream into the riparian area. Hold the two ends so that the tape is stretched out to its full 100' length. The tape is divided into five parts, each 20 feet long. These divisions mark off five 20-foot "zones" in the riparian area, "Zone 1," "2," "3," etc.
2. Count trees. Place the ring on the 15-foot rope over the transect tape. Start from the 0-foot mark, and walk parallel to the transect tape towards the 100-foot mark. Each time you reach one of the 20-foot marks, check to see if the rope touches any trees, shrubs, etc., by using the rope to measure out a circle with a diameter of 15 feet (an area with a radius of 7.5 feet, with the attached ring as the centerpoint). Identify any plants within the diameter of the area that the rope covers. Then tell the recorders whether the plants are conifers or hardwood trees; or shrubs; and the zone that they are in.



3. Record data. Record your data on the back of this form. The recorders should fill out the information about the transect site at the top of the data form, record the number of conifers, hardwood trees and shrubs. Additional comments about dead wood, side channels, etc., may also be recorded. Either during the data collection or after, enter data on the graph on the reverse of this form. Shade in the box above the appropriate zone in either the conifer or hardwood category. Shade one box per tree tallied.



Print data sheets at:  
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**SAMPLE**



Share your field data quickly and easily using StreamWebs. Find out what the macroinvertebrates you found say about your stream, keep track of your photopoints, graph water quality data, upload a video, and much more.

[www.streamwebs.org](http://www.streamwebs.org)

Photopoint monitoring allows the Photopoint Monitoring Specialist to document before and after project site conditions and monitor changes in habitat. Photopoint monitoring is a vital part of accurately assessing project success over time, while also "telling the story" of your project site in a visual way.

## EQUIPMENT

- Digital Camera
- GPS
- Photo Labeling Form
- Compass
- Field Markers (optional)
- Measuring Tape
- Pen or Pencil
- Permanent Marker
- Clipboard (2)
- Meter Board

## INSTRUCTIONS

### 1. Select Camera Points and Photopoints:

- Select points that are representative of the areas to be monitored or protected from disturbance (i.e. not within the stream's active channel or at the immediate edge of streambank).
- Select points that allow pictures to be taken upstream, downstream, and across the channel.
- At a minimum, select one Camera point and three Photopoints.

### 2. Site Name: Record the name of the project site.

### 3. Date & Name: Record date of photograph & name of photographer:

### 4. GPS Coordinates: Record coordinates of Camera Point(s).

### 5. Map Datum: A Map Datum is a model used to plot coordinates on the earth's surface. There are many different Map Datums. Find the Map Datum used by your GPS (usually under "Menu" or "Setup") and record on your data form.

### 6. Mark and Label Points: Draw a detailed map of both your Camera Point and Photopoints. You will need to be able to return to these exact points in the future to take pictures. Label your first Camera Point "A" and its associated Photopoints "A1", "A2", "A3", etc. Name your second Camera Point "B" and its Photopoints "B1", etc. If you can, use some kind of Field Marker (e.g. rebar) to mark your Camera Points in the field.

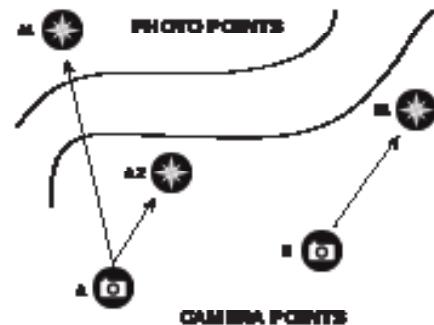
### 7. Compass Bearing: Take and record the compass bearing between each Camera Point and Photopoint.

### 8. Distance: Measure and record the distance between the Camera Point and the Photopoint.

### 9. Height: Measure and record the height of the camera when the picture is taken.

### 10. Photopoints: Take Photopoint pictures with your Photo Labeling Form and Meter Board clearly visible in the frame.

### 11. Photo Filename: Your digital photo will have a filename, usually a combination of letters and numbers. Record this filename on your data form.



Print data sheets at:  
[streamwebs.org/resources/data-sheets](http://streamwebs.org/resources/data-sheets)

SAMPLE



## How to Create a Salmondala “Painting with Sand”: The Art of Impermanence

Written by Belinda Recio, Eileen London

The ritual of sand painting can be practiced alone or with others. Generally, unless the sand painting is going to be very large, a group shouldn't exceed four people. If you are interested in practicing the ritual with a larger group, divide yourselves into pairs or small groups of three or four people.

Keep in mind that the intricately beautiful sand paintings created by Tibetan monks are the result of many years of training and practice. As you set out to create your first sand painting, keep your design simple. Finally, remember that the intention of your sand painting is more important than how perfectly it turns out. After all, it's not meant to be a lasting piece of art, but only an impermanent representation of your prayer.

### What you Need

- Black foam board or other rigid black board
- White pencil
- Straight edge
- Compass
- Protractor
- Plastic straws (you will need a half a straw to use as a chak-pur for each color of sand)
- Eye droppers (you will need one for each chak-pur)
- Plastic cups or other containers
- Colored sand
- Paper plates

### Center and Create Sacred Space

Take a moment to center yourself. You might want to light a candle or burn incense. State your prayer or intention for the sand painting, and try to be mindful of your intention throughout the ritual.

### Draw the Guidelines

Cut the board into a square that measures 20 by 20 inches for a painting surface. Find the center of the square by drawing diagonal lines from corner to corner. After you've found the center – where the diagonal lines intersect – use a white pencil and compass to draw as many circles as you want. To



section the circles, divide 360 by the desired number of sections to determine the degree measurement of each section. For example, for a circle with 16 sections, divide 360 by 16 to arrive at 22.5 degrees. Then, use a protractor to measure and mark intervals of 22.5 degrees. Now, draw lines that intersect the degree marks. After sectioning the circles, you can add figures or other geometric shapes and designs. Alternately, you can simply draw a square or circles and apply the sand spontaneously, designing as you go.

### Make the Chak-purs

Cut the straws in half and then cut one end of each half at a diagonal. The diagonally cut end will be the scoop. Remove the rubber bulbs from the eyedropper (and discard the bulbs). Insert the straight-cut end of each straw into an eyedropper so that it fits snugly. Each person who will be working on the sand painting will need one homemade chak-pur for each color of sand. Fill plastic cups or other containers with the sand so that you can easily scoop sand with the straw end of the chak-pur. You might want to place the cups of sand on paper plates to catch sand that is spilled as you work.

### Painting with Sand

Select the color you will use first and fill your chak-pur with the sand by using the scoop end. Hold the chak-pur

in your dominant hand as you would a pen or pencil. Now, tap the hand holding the chak-pur, or the chak-pur itself, with your other hand. This vibration will get the sand flowing. You should practice using the chak-pur so you can get a feel for how it works. For example, practice to gauge how fast the sand comes out when holding the chak-pur at different angles or how hard you need to tap to get the sand flowing. Begin your sand painting in the center and work outward. Not only is this the traditional way of working, but it will minimize the risk that you'll disturb portions of your painting that have already been completed. Applying the sand could take a few hours to a few days depending on the intricacy of your design. If a group is creating the sand painting, each person may need to work individually or a few at a time. As the sand painting takes shape, enjoy its constantly changing beauty.

### Sweeping Up and Letting Go

As hard as it is to imagine, once the sand painting is finished you will need to destroy it. Sit with the finished painting or meditate upon it, allowing its beauty to resonate through you. When you are ready, use a soft brush to "unmake" it, beginning at the outside edges and sweeping the sand in toward the center until you have a tiny mountain of colored sand. Then mindfully scoop the sand into a container. If you want to, you can save a little of the sand as a symbol of the prayer or intention you held during the sand painting's creation. Then take the sand to a river or the ocean, cast it into the water, and watch as your prayers are carried out into the world.

Any ideas? Write them here!

## How to Plant Willows and Cottonwoods for Riparian Restoration

### Introduction

Many riparian areas in the West need rehabilitation. Natural climatic events and abuses in the past have caused the destruction of vegetation and accelerated streambank and stream bottom erosion. Emphasis on water quality, aesthetics, wildlife, and fisheries has prompted interest in methods for revegetating eroding stream channels. There is increased interest in rehabilitating riparian zones with willows and cottonwoods.

### Guiding Principles of Stable Stream Channels

Riparian vegetation is a critical part of any stream system. Riparian plants provide a huge web of roots that hold the soil together. They also provide significant roughness from their above ground biomass. Determining where to plant them is often one of the hardest decisions to make. Before starting to restore a stream channel, 3 principles need to be understood. They are:

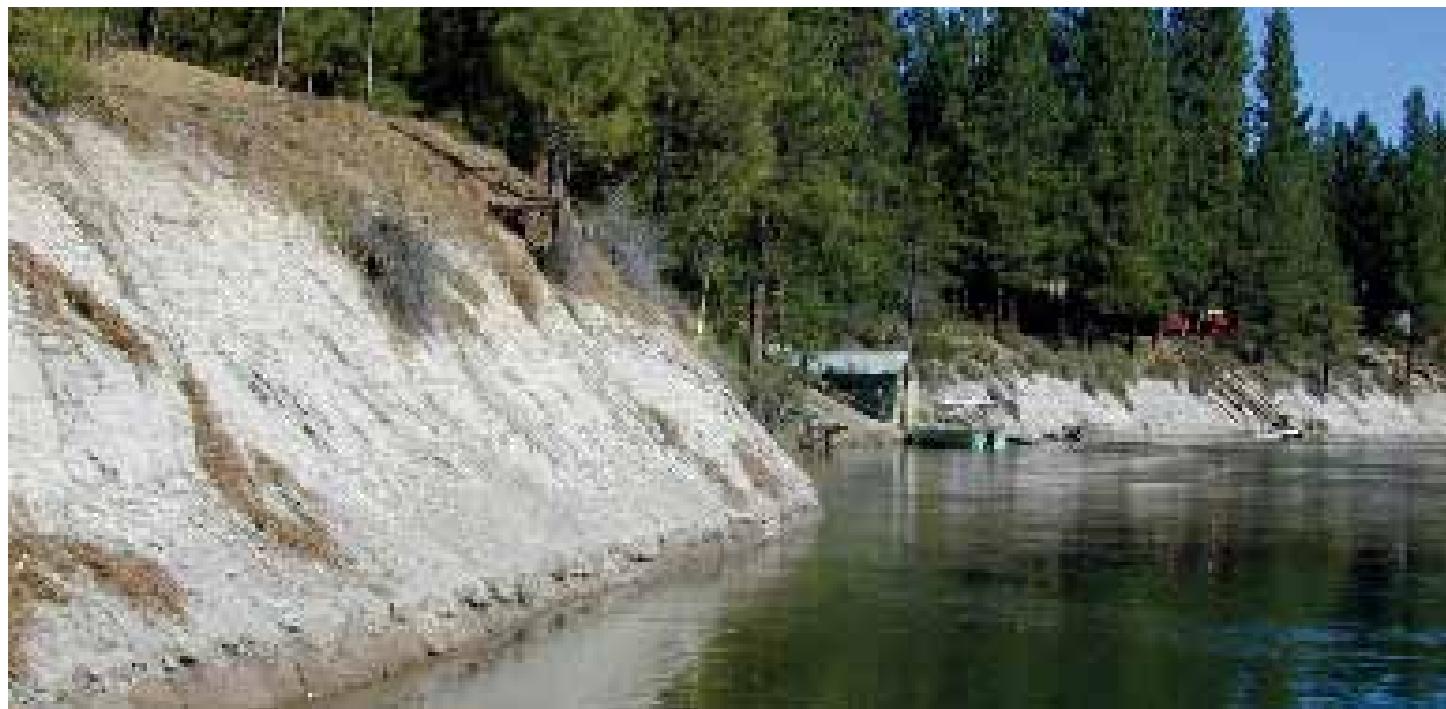
#### 1. Elevations should rise away from the central channel.

The central channel flow line must be the lowest point across the riparian area and the channel banks,

floodplains, and terraces should slope upward continuously away from the channel. The banks will be most stable if they can be stepped as they rise away from the channel. All flat areas should slope toward the river. If they are level or slope away from the river they will tend to divert overbank flows away from the main channel and could contribute to greater erosion. Banks on the outside of meanders are expected to rise more rapidly than those on the inside, but should still be stepped when possible.

#### 2. Transitions should be gradual to reduce the potential for erosion.

In order to minimize the risk of lateral bank erosion, water should flow smoothly through the stream corridor. While meander is a natural part of stream processes, tight turns can create excessive pressure to weak stream banks and increase erosion. Meanders should be gradual and within the dimensions described in specific recommendations. Floodplains and terraces should not be suddenly narrowed by buildings or other structures. Such constrictions force increases in velocity and water elevations that can increase erosion.



This is an unvegetated streambank on the Deschutes River. Many studies have been completed on erosion and sedimentation problems in the Deschutes and this type of steep bare bank discharges substantial amounts of sediment into the river when water flows are high.



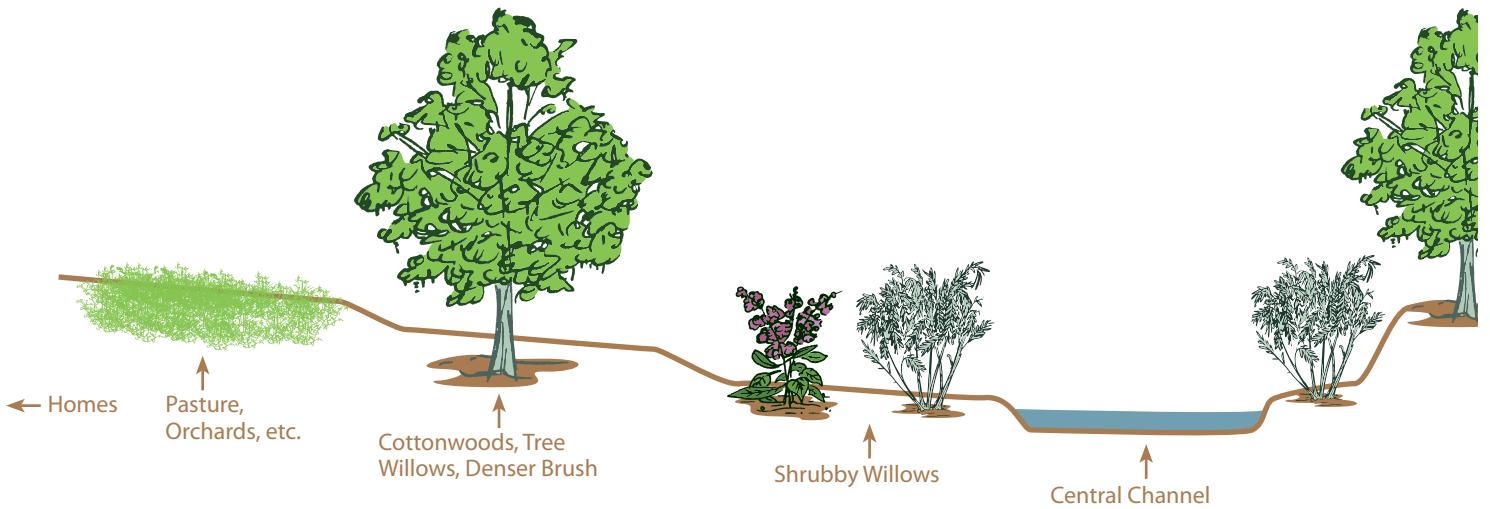


Figure 1: Roughness - Vegetation provides increasing roughness to keep high velocities in central channel.

### 3. Roughness should increase away from the central channel.

Roughness is resistance to flow contributed by vegetation, rough surfaces, or structures. Increasing roughness away from the central channel tends to center high flows and slows velocities against the more erosive stream banks and terraces. For example, the central channel should be relatively free of vegetation and other obstructions. The areas immediately adjacent to the channel (floodplains) should support dense thickets of shrubby vegetation (i.e., willows, etc) that bend with the flows (Figure 1). Areas further away from the channel (terraces) support stiffer woody vegetation (cottonwoods, willow, etc) that further slows flows. It should be noted that roughness implies a slowing of the flow not necessarily stopping the flow. Structures that completely stop or redirect flow across the floodplain/terrace should be avoided.

This Technical Note addresses principle 3 - the addition of roughness to the channel. It should be noted that planting vegetation in a riparian zone without giving serious consideration to where different species of plants should go can cause more problems than those you are trying to fix.

There are a number of steps that should be completed prior to any planting. They include a site assessment, an inventory of planting site, and a detailed survey and evaluation of the soils, water, and vegetation. Once you have determined the cause of the erosion and where high priority areas are located on the stream, you

should develop a planting plan and determine where and how to plant the vegetation that you will use. This Technical note describes how to select, harvest, treat, and plant riparian woody species.

### Site Assessment

Before jumping into the water and shoving cuttings in the ground, it is important to understand what is causing the streambank erosion, how extensive it is, and which areas need the most work. A stream assessment should be completed on the stream prior to any restoration or rehabilitation work. The assessment should identify problems on a stream reach basis. A reach is defined as a section of stream between two defined points. The assessment should identify problems such as, water removal, fish barriers, culverts, etc. that affect fish and hydrology by stream reach. It should also identify eroding areas, the type of erosion, and severity of the erosion. When the assessment is completed, there should be enough information to identify the reaches of the stream that need some kind of treatment, treatment alternatives that could be used, which reaches are the highest priority, other problems that need to be addressed, and an estimate of the potential success of a planting. Based on a good site assessment, you should be able to develop a project rehabilitation schedule or plan including a list of treatment alternatives, a cost estimate for each reach, a cost estimate for the entire project area, and a priority list of which reaches should be treated first.

### Site Considerations

Careful planning before planting is necessary to ensure the solution does not create additional problems.

# Sample – Project Action Guide: Riparian Planting

- Management (prescribed grazing system, livestock exclusion, riparian buffers, etc.) must be in place to maintain or improve riparian vegetation. Without proper management, planting efforts could be destroyed.
- If native willows or cottonwoods are not found in the vicinity, planting them may not be a good option.
- Willow and cottonwood plantings apply only to situations where the rehabilitation time frame is long enough to allow the cuttings to become established and stabilize the site. Hard structures (i.e. rock, concrete, etc.) may be more appropriate under emergency situations.
- Unrooted cuttings can be used on sites that range from flat to near vertical slopes. Risks of wash-out and mortality increase as the slopes become steeper.

A reconnaissance upstream and downstream of the site selected for revegetation may save time and effort. If there are willows and cottonwoods on adjacent sites, check the hydrology, soil and site conditions and compare them to conditions at the revegetation site. Plantings will be most successful on sites similar to the stable vegetated areas. Risk of mortality increases as soil, site, and water column parameters depart from those of the vegetated sites.

**There are reasons for vegetation not growing on the disturbed site.** Some parameters to inventory in addition to management at the revegetation site include: high streamflow velocities, sharp outside curves, vertical to near vertical or undercut banks, hanging streambanks, mixed stratigraphy of cohesive materials over gravel, and evidence of mass soil slumping. When these parameters are present, revegetation can still be considered, but the underlying causes must be addressed. Establishing vegetation is much more difficult under these conditions because the time period required for stabilization increases, the planting schedule must accelerate, and additional soil losses can be expected.

These conditions indicate engineered hard structures or bioengineering techniques not covered in this Technical Note need to be included in the planning considerations.

Some data suggests vegetative protection may be adequate if maximum streamflow velocities do not exceed 8 feet per second. Structural and bioengineering techniques should be considered for velocities greater than 8 feet per second. Woody materials should be





considered with velocities less than 8 feet per 5 second. Woody materials in conjunction with herbaceous species should be considered for velocities less than 5 feet per second. Herbaceous materials alone can be used for velocities less than 3 feet per second. Engineered hard structures or bioengineering techniques may be needed in situations where the toe of the bank is unstable.

### **Species Selection**

During the reconnaissance, identify willow, cottonwood and other riparian species, local soil and site conditions and the moisture regime. If species identification is a problem, at least identify the growth form and conditions where the plant is growing (elevation, soils, zone, etc.). Species and/or growth form identification is important so the correct plant species can be matched to the right planting zone at the revegetation site.

Willow species have several different growth forms. Willows come in all sizes, from small shrubs to large trees. There are three basic types of willows: tree-type, shrub-type, and creeping type. Tree-type species at maturity have a large crown, single or multiple stems, and dense basal area. They are usually taller than 20 ft. Shrub-type willows generally have smaller diameter multiple basal stems and rarely get taller than 15-18 ft. Creeping-type willows sucker profusely and are represented by coyote willow (*Salix exigua*).

Cottonwood species have narrow to wide crowns and some species sucker (generally only about 10% of a stand will sucker) while others have very shallow root systems.

In general, small to medium size shrubtype willows and rhizomatous or creepingtype willows are used for planting within the channel banks. These can be planted as live poles, vertical bundles or as clumps. Tree-type willows and cottonwoods are normally selected for the upper bank and floodplain areas near the transition zone and can be planted as large poles or clumps.

Mature size and growth form will affect species selection. Large species can partially block or deflect stream currents. If the mature basal size of the selected species will block streamflow near the main channel or on adjacent floodplains, another species with more flexible stems should be considered.

There are many species of willows that occur naturally in different habitats. Upland willow species are found in relatively dry areas not necessarily associated with seeps, bogs, or high water. Scouler willow, a common upland species, is rarely found on wet areas, but more commonly on or near moist areas such as springs or

# Sample – Project Action Guide: Riparian Planting

intermittent watercourses. Wetland willows are found growing in standing water or saturated conditions and are adapted to long periods of inundation.

If spreading of planted species is considered a problem, selection might include only male clones. Both willows and cottonwoods have male and female plants. Selecting male plants will reduce spreading from seeds.

More shade will be produced with tall and/or wide canopy species. This may be important for water temperatures and fish habitat. Consider the aspect. Concentrate on tree-type species with wide canopies on the south or east side of stream to achieve the most shade over the widest area. Stem flexibility is important for species at the waterline to mid-bank on streams with high velocities, debris loads, and ice flows. Species with deep or rhizomatous root systems might be better suited to streams with severe ice flows.

Livestock and wildlife can adversely impact the riparian zone. Some plant species such as willow and

cottonwood are fairly palatable. It may be advantageous to plant less palatable species, such as hawthorn, in the bank to overbank zone rather than more palatable species. Other less palatable species include: dogwood, alder, and common snowberry.

Grazing can also reduce regeneration, particularly for those species that reproduce by seed. Species selection of strong suckering or rhizomatous species may be an advantage. Improper grazing management can adversely impact even these species. A grazing management plan is needed whenever riparian areas are grazed, especially after planting. The riparian area should not be grazed for at least 3 years after planting. At the end of 3 years, the area should be assessed for grazing potential and if allowed, be grazed according to a good grazing management plan. Spring grazing is the best because animals have many foraging choices other than the planted woody species. Be careful with fall grazing because woody species are a more desirable foraging choice and there will be no regrowth before the next spring growth period. Overgrazing the woody and herbaceous riparian species will result in less bank and floodplain protection during high runoff events the following spring. The woody riparian species should be used as the key indicator species for when the livestock should be moved out of the riparian zone.

Aesthetics can usually be improved by selecting more than one species to provide differences in size, shape, color, and texture. More than 1 species or clone also increases resistance to pests and diseases, in addition to increasing diversity for wildlife. However, the species planted at the waterline should be a single species so that all the cuttings have similar characteristics for the full length of any one reach so that varying sizes and shapes do not cause the force of water to move behind that planted line.

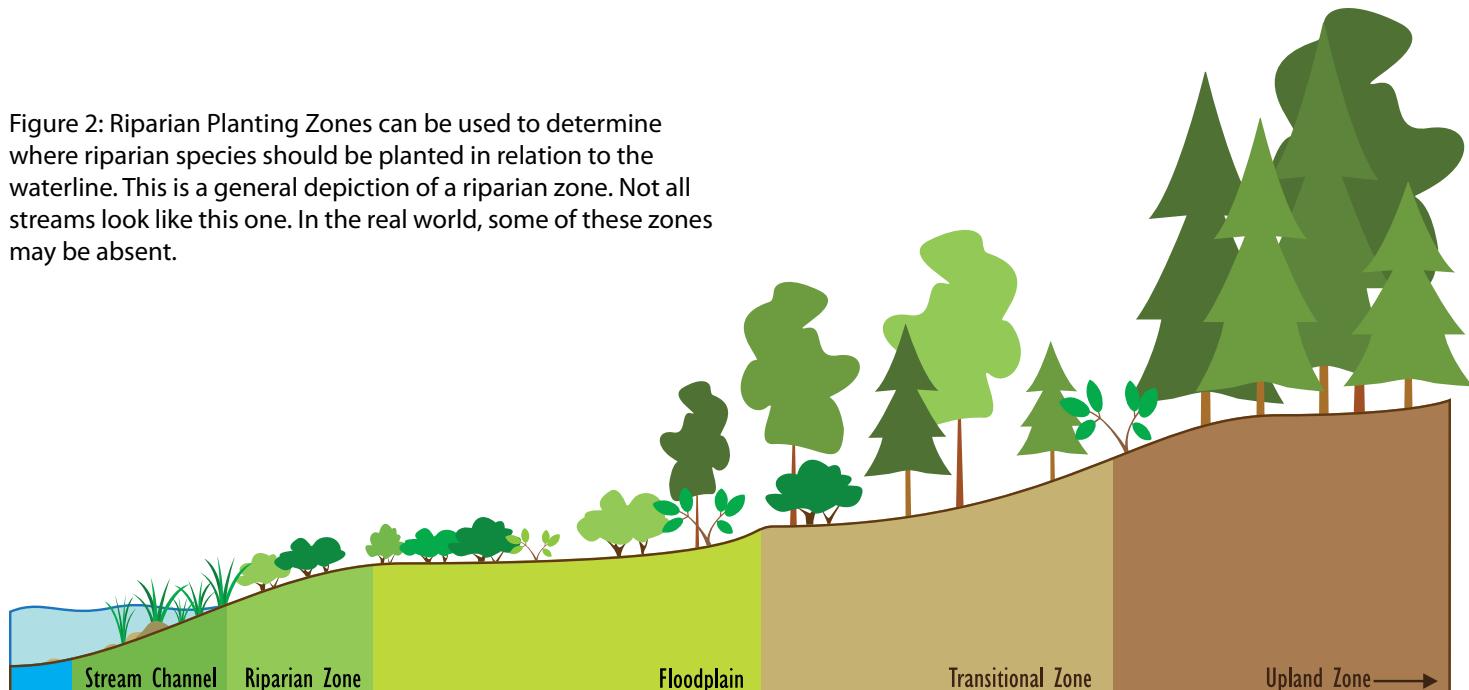
Most species of willow and cottonwood have good fire tolerance and resprout readily after being burned as long as the fire is not too hot. Many cottonwoods are more susceptible to fire as they mature.

## Species Distribution or Planting Design

A planting design should be developed to show where

Student riparian restoration design plan.

Figure 2: Riparian Planting Zones can be used to determine where riparian species should be planted in relation to the waterline. This is a general depiction of a riparian zone. Not all streams look like this one. In the real world, some of these zones may be absent.



each species is to be planted on the site. The entire problem section should be planted, not just parts of a reach or curve. This will reduce the chance of water eroding behind the planting.

Each species grows in specific ecological zones along the stream channel and flood plain. These ecological zones can be equated to planting zones. Riparian planting zones include the toe zone, bank zone, overbank zone, transitional zone and the upland zone (Figure 2).

Shrubby species are normally planted on outside curves of a stream channel as a continuous barrier. Outside curves incur more erosion from streamflow, but have a shorter inundation period. Plant the entire reach with the same mix of species. Shrubby species with flexible stems are planted on the bank zone and the overbank zone or floodplain for diversity and additional stabilization or as a buffer zone.

Plant tree species up the bank from the shrubby species or on top of the bank. The shrubby species provide protection for the tree species when planted in this manner.

The reconnaissance survey will help identify these relationships. See "Spacing" section to help with planting design and to help determine numbers of plants or cuttings needed.

## Type of Planting Stock

Cuttings, whips, plugs, containers, bare-root, potted, clumps, balled and burlap, and paper-sleeved planting stock are all viable alternatives.

Advantages of nursery stock include: good potential root development, good carbohydrate reserves, few pest or disease problems, readily available for many species, and no labor is needed to collect the stock.

Disadvantages of nursery stock include: more expensive than hardwood cuttings collected near the revegetation site, short root systems can wash out easily, short root system may not reach moist soil during the growing season, and roots of local herbaceous vegetation are in the same zone competing for moisture and nutrients.

### Stem cuttings

Stem cuttings can be divided into softwood, semi-hardwood (greenwood), and hardwood categories. Hardwood stem cuttings can also be divided into deciduous, narrowleaf evergreen, and broadleaf evergreen. This Technical Note concentrates on deciduous hardwood cuttings from moderate age stem materials. Deciduous hardwood cuttings of willow and cottonwood species are generally recommended over other types of cuttings because of the high concentration of pre-formed, dormant root primordia located throughout the length of the stems.

Pole cuttings (large diameter unrooted stems) of shrubtype willows are recommended for most plantings

# Sample – Project Action Guide: Riparian Planting

from water line to mid-bank. Pole cuttings of tree-type willows and cottonwoods are recommended on upper-banks and floodplains where the water table is relatively deep. Pole cuttings provide an effective means to reach saturated soils and establish a high concentration of roots for that portion of the stem within the moist zone.

Pole cuttings have the additional advantage of being relatively inexpensive and easy to harvest and store. They are also easy to plant. High mortality can occasionally occur, but this is somewhat offset by lower cost, ability to rapidly plant large numbers, and ease of replanting the following year.

Generally, whips (less than 3/8 inch diameter) are not recommended because energy reserves in the stem are limited and they are more susceptible to cytospora canker, a fungus that causes twig dieback.

## Container stock

Plugs, conetainers, bare-root, potted, balled and burlap and paper-sleeve planting stock are best when used:

- mid-bank to upper-bank or floodplain where long periods of inundation or water erosion are minimized
- where adequate moisture is available – i.e. natural precipitation or irrigation is adequate for species selected
- where there is no competing vegetation or a 30" diameter area around plant has the competing vegetation scalped off down to mineral soil at planting time
- where plants have a low risk of physically being pulled or eroded out due to shallow rooted systems during establishment

## Source of Cuttings from Commercial Stock

Willows and cottonwoods have been used extensively for riparian rehabilitation because they are easily established from cuttings. Cuttings can sometimes be obtained from commercial nurseries or more commonly from native stands located near rehabilitation sites.

When buying cuttings from commercial sources, released varieties of adapted species should always be specified when available.

PMCs conduct extensive research and testing with native

willows and cottonwoods collected from service area states having similar climate, soils, and topography. Once a willow or cottonwood meets the testing criteria, it is released to the public. Commercial nurseries and growers then propagate the species on a much larger scale for sale. The released variety name is the key to getting a plant adapted to conditions similar to where it was tested. All named varieties have documentation that describes growth characteristics, performance, and selection criteria. This ensures they are the same stock as originally tested.

Plugs, containers, bare-root, potted, and paper-sleeved nursery stock purchased through nurseries should be established from local materials. This could be from a local ecotype or the same watershed, but should not be from more than 200 miles east or west or 100 miles north or south or more than 2000 feet elevation difference from planting site. Ask the nursery where the stock came from.

## Source of Cuttings from Native Stands

Native willow and cottonwood stands located near the rehabilitation site are the most common source of cuttings. Native stands of willow and cottonwood are adapted to local conditions, but may have or have had insect and disease infestations which can stress the plants in the potential “mother” stand. Low water years and long periods of drought may also stress the plants. This stress means that the stem cuttings may not have peak energy reserves. Low energy reserves translate into lower establishment success.

When planning the number of cuttings to harvest, take these stress indicators into account. Always obtain permission to harvest from the landowner, private or public, before starting to cut.

## Timing of Harvest

Establishment success is significantly increased if cuttings are taken from live, dormant willows or cottonwoods either after leaf fall in late fall, winter, or very early spring before the buds start to break. Densmore and Zasada (1978) found that spring collections survived better than fall collections.

In some cases, when access to the stream is limited due to regulatory concerns or during fish migration periods



Salvaging vegetation for a riparian planting project.

(i.e. during salmon migration runs in the spring and the fall), planting may be restricted to non-dormant periods. Rather than do nothing, consider harvesting the cuttings when the plants are in full leaf. When cuttings are harvested during these growth stages, expect the establishment success rate to decrease. Experiments at the Aberdeen Plant Materials Center have shown that when the plants are leafed out and harvested, the establishment success is about 40-50%. If you plan to plant during the active growing season consider planting more cuttings to make up for the lower success rate.

### Cutting Diameter

Cuttings should generally be 3/4 inch diameter or larger depending upon the species. Rhizomatous or spreading willow stems will rarely get much bigger than 3/4 inches in diameter. Treetype willows can be several inches in diameter. Larger diameter cuttings have more energy and stored reserves than smaller diameter cuttings. Highest survival rates are obtained using cuttings 2 to 3 inches in diameter. Cuttings as large as 8 inches in diameter have been tested with excellent success. However, the larger the cutting diameter, the longer the cutting should be, and the deeper the hole should be to support it. The deciding factor for selecting

the cutting diameter is the planting method you will use (see Planting Methods). Larger diameter and longer cuttings will be needed for more severely eroding sites and where the water table is deeper. When planting into rock riprap cuttings should be at least 3- 5 inches in diameter. Cuttings this size will not bend or break when pushed between the rocks in the riprap.

### Cutting Length

Cutting length is largely determined by the depth to the mid-summer water table and erosive force of stream at the planting site. Plantings can occur at the water line, up the bank, and on top of bank in relatively dry soil, as long as cuttings are long enough to reach into the mid-summer water table. Make sure:

- 6-8 inches of cutting are in the mid-summer water table
- 3-4 buds are above the ground
- No less than 1/2 the total length is in the ground
- If long periods of inundation exceeding 30 days are likely, cuttings should be long enough to extend 6-12 inches above the expected high water level
- If weeds are a problem, the cutting should extend above herbaceous growth in summer to receive adequate light and below the weed root mass to minimize competition

# Sample – Project Action Guide: Riparian Planting

When planting for bank stabilization, the cutting should extend 2-3 feet above ground so as it leafs out, it can provide immediate bank erosion protection. The cutting should be planted as much as 3-5 feet into the ground (sometimes deeper to ensure they are in the mid-summer water table). If they are not planted this deep, moving water can erode around cutting and rip it out of the ground. Tests have shown that even with established root systems as long as 15-28 feet, the erosive power of a stream can rip a short cutting out of the ground.

## Harvesting Cuttings

Once cutting size and source locations have been determined, the actual cutting process can begin. Lopping shears, pruning shears, a small wood saw, brush cutters, or a chain saw can be used to harvest cuttings. Size of the cuttings will determine what you use to harvest them.

- Ensure all equipment is sharp and make clean cuts.
- Use live wood at least 2 year old or older. However, very old wood should not be used. Chmelar (1974) indicated that larger and older wood is required to propagate species that are difficult to root. The best wood is 2-7 years old with smooth bark which is not split or deeply furrowed.
- Avoid whips and suckers (current year's growth) because they lack the stored energy reserves necessary to consistently sprout when planted especially in dry conditions.
- No more than 1/3 of any individual plant should be removed. In the case of rhizomatous species, no more than 40-50% of the stand should be removed.
- Select branches which will not impair the source willows health and appearance.
- When harvesting from native stands, ensure the stand will not be denuded or destroyed by your cutting activity.
- Consider removing cuttings from inside the crown area rather than the more visually obvious exterior area. Try to spread your harvesting activity throughout the stand.
- Remove the apical bud plus several inches off of the cutting. The apical bud (bud at the tip of the branch) draws too much energy from stored reserves, reducing the chance of survival. Its removal will reroute energy to the side buds including the root buds. The upper

part of the stem also has the flowering parts. By cutting it off, energy is also redirected to the root and branch primordia in the older parts of stem.

- Trim off all side branches so cutting is a single stem.
- A processing consideration is to cut the top of cutting with a horizontal cut and bottom of cutting with a 45 degree cut. This allows quick recognition of cutting top (see also Sealing Harvested Cuttings).
- Care should be taken to select materials free of splitting, disease, and insect damage.

## Painting Harvested Cuttings

One of the most important steps in this process is the identification of the TOP of the cutting. If cutting is planted upside down, significant mortality can occur. To identify which end is the top of cutting, look at the leaf scar and emerging buds. Buds emerging from leaf scar always point up. In addition, the stem is usually smaller diameter near top of cutting, but this is not always obvious. The leaf scars are the most reliable key.

When the top of cutting has been identified, it can be painted. Dipping the TOP 1-2 inches of cutting into a 50:50 percent mix of light colored latex paint and water, does a number of things. Perhaps the best reason for painting the top of cuttings is it helps inexperienced planting crews plant cuttings properly, with the top up! It also helps locate the cuttings more easily for future planting evaluations. It may also prevent excessive transpiration of water from cutting (the literature is mixed on this point, but Aberdeen Plant Materials Center research shows a higher establishment rate can be expected) This technique is inexpensive, easy, and effective.

## Storage

The preferred timing for harvesting willow and cottonwood cuttings is when they are dormant. To minimize storage time, harvest cuttings in late winter to early spring and plant immediately when possible. If this is not possible, cuttings can be harvested in late fall or winter and stored in a large cooler at 33-40°F until just before planting. Cuttings can be stored for 3-4 months in a cooler. Whether cuttings are kept in a cooler, root cellar, garage, or shop floor, make sure the storage area is dark, moist, and cool at all times. If cuttings are stored at higher temperatures, a fungicide should be applied to prevent damage caused by pathogens or saprophytes.

## Treatment of Cuttings

Testing at Aberdeen PMC using fertilization, treatments with rooting hormone, or treatments with a fungicide have not significantly affected the rooting or establishment of willow and cottonwood cuttings. Many willows and cottonwoods are very easy to root without special treatment. These treatments increase cost, labor requirements, and time necessary to plant without significantly increasing survival.

## Pre-plant Soaking of Cuttings

Soaking the cuttings prior to planting will increase survival in addition to root and shoot production. Pre-soaking improves stem water content and early root and shoot initiation. The increased water content from pre-soaking allows the cuttings to cope with planting in dry conditions by delaying desiccation and loss of cell turgor. Presoaking that results in early root and shoot formation can also extend the growing period during the establishment year, which is important when establishing plants in colder climates. Soaking is important because it initiates root growth processes within the inner layer of bark in willows and cottonwoods.

Prior to planting, all cuttings should be soaked for a minimum of 24 hours. Some research recommends soaking the cuttings for as long as 10-14 days. The main criterion is that cuttings should be removed from

water prior to root emergence from the bark. This normally takes 14 days or longer depending upon species.

The entire cutting should be covered with water. Any part of cutting that is exposed will start sprouting as the soaking date comes closer to bud break. Soaking can be accomplished in a garbage can, irrigation ditch, stream, pond, lake, or other body of water that is deep enough as long as the cuttings are protected from sun and wind exposure during the soaking process. Soaking significantly increases the survival rate of the cuttings.

## Spacing Considerations

Plant cuttings about 1-3 feet apart for creeping-types, 3-8 feet apart for shrub-types and about 8-16 feet apart for tree-types. In areas where you expect erosion, plant creeping-types 1-2 feet apart to ensure better protection of the banks. If the holes are large enough, multiple stems can be planted together. Exact spacing between tree-types further up the bank in the transition zone and creeping or shrub-types in the bank or overbank zone should be based on crown characteristics and height. However, crowding cuttings a little will not stress them because they will not lack for water when planted into the mid-season water table and more dense plantings will provide better protection to the bank.

## When to Plant

BEFORE



AFTER



Whykus Creek riparian planting project completed by Sisters High School students.

# Sample – Project Action Guide: Riparian Planting

Willow and cottonwood cuttings have been successfully planted from early spring to late fall (dormant plantings).

- Preferably, cuttings should be planted in early spring after spring runoff occurs in streams or after high water drops to typical levels on reservoirs, ponds, or lakes.
- Rooted stock should be planted in early spring after frost has left soil. Avoid planting cuttings or rooted stock during the heat of summer because of the stress it places on them.
- When planting multiple sites along a stream, sites may need to be planted in different years.
- Consideration should be given to planting outside curves first and allowing time for establishment. Delay planting the inside curve until two or three years later. The inside curve is often not eroding and will begin to heal without planting. In addition, if the inside curve becomes established prior to the outside meander; there is a good chance that the stream current will be pushed into the eroding outside meander. This will increase the stress on the outside meander and make establishing woody riparian species more difficult.

## Planting Methods and Planting

### Cuttings

Backhoes, excavators, tractor-mounted posthole diggers, one- or two-person posthole diggers, soil augers, planting bars, shovels, soil probes, The Stinger, the waterjet stinger, or simply pushing the cutting



into moist soil have all been used successfully to plant willow and cottonwood cuttings. When selecting the appropriate planting method, you should keep several things in mind.

- It is essential to have good contact between cutting and soil for roots to sprout. Air pockets around the cutting will kill the roots.
- Additional soil may be needed to ensure good soil to stem contact. Preference should be given to native soil nearby to encourage mycorrhizal formation and/or nodule formation by nitrogenfixing organisms.
- Mud the cuttings in after they are placed in the hole. Use a bucket and mix soil and water together to get the consistency of cheap syrup. Pour the mix into the hole around the cutting until it reaches the surface. As the water leaches into the surrounding soil, the soil will settle out around the cutting and will ensure good soil to stem contact.
- The planting depth will determine the planting method. Deeper holes will be easier if you use a power auger, The Stinger, the waterjet stinger, or a soil auger.
- Experimentation with planting methods before starting will ensure the right equipment has been selected. This would also be a good time to train the planting crew on use of equipment, safety and planting techniques.

The Stinger is a 3.5 in diameter bar of cold rolled steel that is attached to a backhoe or excavator in place of the bucket. It is used to retrofit rock riprap with willows and cottonwoods.

The waterjet stinger is a hydrodrill that uses high pressure water to drill a hole in the streambank. This tool is composed of a high pressure water pump with 2 probes that have stainless steel nozzles that increase the water pressure so it comes out the holes in the nozzle at 80 psi. When the nozzle is placed on the streambank, the water liquefies the soil and cuts a hole as it goes down. The soil is in solution with the water. When the hole is deep enough, the probe is removed and an unrooted willow or cottonwood pole is inserted into the hole. As the water and soil solution settles, the water moves into the soil profile and the soil settles out around the cutting eliminating air pockets that might form around the cuttings resulting in excellent stem to soil contact.



### Clump Planting

Clump plantings can be used in areas where heavy runoff occurs or where the water column directly impacts vertical banks. These areas can be difficult to plant and establish with traditional methods.

- The basic procedure is to locate clumps of willows that are accessible to a backhoe.
- The backhoe digs up a clump of willows, travels back to the planting site, and places the willow clump in a predetermined location by pushing out a hole as it deposits the clump.
- Clumps are then placed close together along the entire problem section of stream to keep water from cutting around the planting. Pulling or pushing soil from the streambank above willow clumps and packing it behind clumps will improve establishment success and assist in bank shaping.
- Sod of rhizomatous grass and grass-like species can be placed behind the willow clumps to speed up recovery time of the mid to upper banks. Some minor bank shaping will improve establishment of the herbaceous material. Grass species can also be seeded by hand.
- Planting should be completed following high water flows

in the spring to reduce chance of ripping clumps out before the clumps are well rooted and start to spread.

- Temporary protection, such as steel posts with woven wire, sunlight degradable netting, etc., may be necessary to hold willow clumps in place until they are well established which may take 1-3 years. Usually, this is only necessary in areas where high velocities impact the bank.

### Permits

The landowner is responsible for all permits prior to any planting. The completed plan should be copied as needed and provided to the landowner for submission to the state Department of Water Resources and/or US Army Corps of Engineers. Each state has specific permitting requirements and the landowner is responsible for locating the appropriate agency. Normally any work done in a stream channel requires notification and approval by these agencies and the issuance of permits before work can begin.

### Management and Maintenance

Preserve or initiate management that will keep, maintain, and improve the planting and other riparian vegetation. Proper management is necessary to maintain healthy, competitive plants that function for the intended

# Sample – Project Action Guide: Riparian Planting

objectives. This is as important as the planting itself to ensure long-term rehabilitation of the riparian area. Some maintenance will be needed on site for several years after planting. Vegetation should be evaluated and monitored annually. Some replanting will be needed in succeeding years. If you don't replant the first or second year, your continuous barrier could be jeopardized. Once water gets behind the protected line you have planted, it is extremely difficult to repair the damage.

Monitoring the site is necessary so any in-stream dead organic material (i.e. old logs, dead root masses, branches, etc.) can be removed before stream flow is deflected or gravel bars form. It is much easier to prevent this kind of damage than it is to repair it. As the planting ages and plants start to develop their growth form, some may need to be trimmed or cut to stimulate smaller and denser growth. Trimming should be done in the dormant season so willow growth is not slowed

during the growing season. During the establishment period, leave standing dead branches in the clump plantings to reduce stream flow velocities, thus protecting the establishing clumps.

If livestock use the area, a prescribed grazing plan should be developed. Little to no grazing should occur during the establishment period. This can take 2-5 years depending on growing conditions. Larger planting stock may be more resistant to grazing pressure, but should be monitored closely to avoid serious damage.

Temporary fencing may be necessary to control livestock and wildlife use of the planting during the establishment period. Permanent fencing is an option to prevent grazing by livestock and/or wildlife. Consideration should be given to the creation of "riparian pastures", i.e. grazing units that include riparian zones and floodplains as a majority of the pasture. These riparian pastures increase management flexibility but often require increased maintenance as a result of heavy grazing pressure from both livestock and wildlife. Water gaps to allow livestock access to the stream when necessary should be planned in transition sections between meanders. Off site water may be a better choice in terms of protecting the riparian buffer, increased calf gains, and better overall herd health. These areas have reduced erosion potential, are generally gravelly, and can be planted to a rhizomatous willow that will resprout easily. Access to water gaps can also be protected with gravel or concrete pads if heavy trampling problems arise.

Finally it is critical to protect streambanks and plantings from continuous use during long winter feeding periods. Feed grounds should be located away from streamside areas. If this is not possible, the area should be fenced and water gaps or off-site water provided so direct access to riparian corridor is controlled and potential pollutants can be filtered prior to overland surface waters enter the stream.

## Additional information and more technical papers

Visit <http://www.plant-materials.nrcs.usda.gov/idpmc/riparian.html> for additional information on a variety of

# Step 8: Reflection & Evaluation



This valuable step will help you weave it all together. Each and every student will experience their project in unique and special ways. It is important to take some time to document your own project perspective and jot down your streamside thoughts and river reflections. Through reflection, you hit the pause button so you can make integrated connections throughout your project.

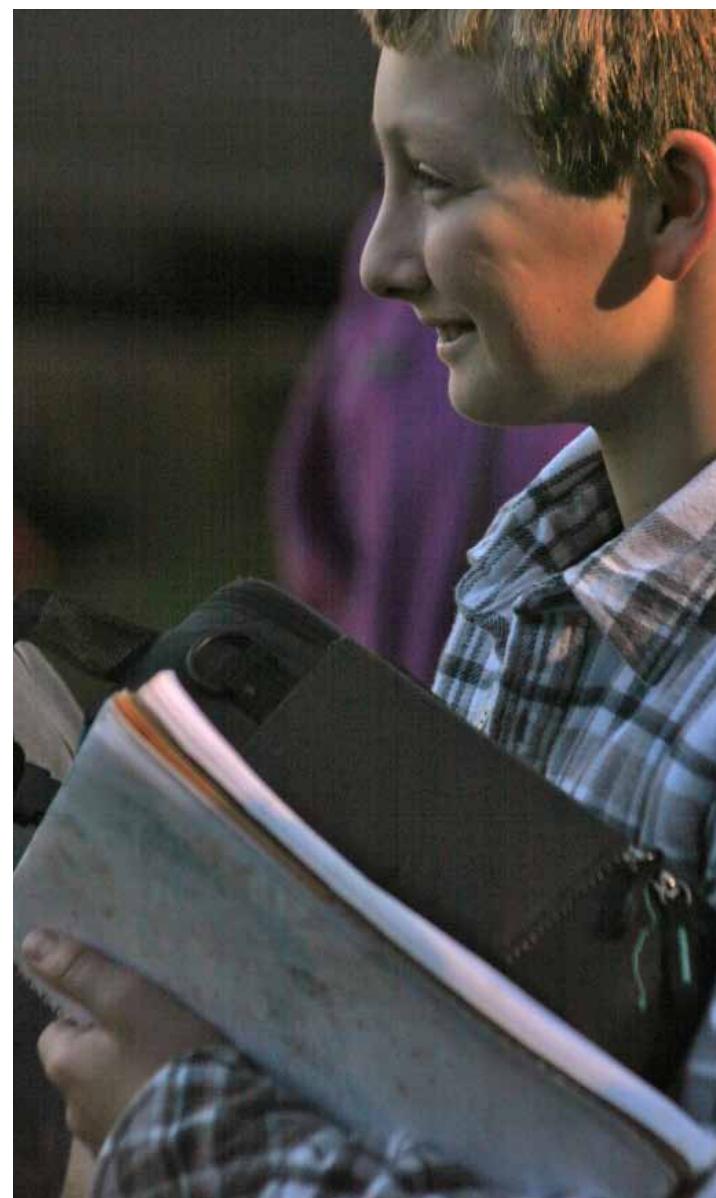
Take a moment each day you are in the field to record a journal entry. Some things you could include are:

- Date, Time & Weather
  - Field Sketches of plants or the stream
  - Notes on successes and learning opportunities
  - Inspirational notes, poems or creative writing
- You may wish to utilize some of the watershed related articles and the healthy waters journal provided for you in the StreamWebs Student Stewardship Field Book. You can read one or all of these, noticing any relevance to your project and then discuss the readings with your project team.

Additional resources in the StreamWebs Student Stewardship Field Book for Reflection & Evaluation include:

- Field Journal Entry & Writing Prompts
- 4 Square Reflection Tool
- Reflection Options Diagram

As part of the reflection and project evaluation OSU Extension Service may ask your group to participate in



# Sample – Field Journal Entry Prompts



1. What was special or unique about the activity today? What did the experience remind you of? What did you learn that you didn't know before today?
2. After viewing the interview with Kitzhaber on the Salmon & Watersheds DVD, write one paragraph about Governor Kitzhaber's environmental policy. What is your opinion about his comments regarding Oregonians' responsibility for restoration?
3. Five years from now, what do you think you will remember about this project? 10 years from now? Write a letter to yourself about your experience in this project.
4. Write a biography about your local creek/river. Tell the story and describe it's path. Describe what the creek looks like. What is inside the creek channel itself? Do you see boulders? Or gravel? Do you see any logs or sticks in the creek? What sounds do you hear when you focus your attention on the water? Describe the area along both sides of the creek. What would this place be like if there was no water? What would it look like if there was three times as much water? Describe the life of the creek as if it were a living and changing thing.
5. Summarize the historic events that have lead to the current salmon crisis in one or two paragraphs. Additionally, describe two or three restoration efforts by individuals or watershed organizations in Oregon.
6. What is "A Sense of Place?" What is your sense of place along your local creek/river? If fish and water do not inspire you, what do you see that does inspire you? Look around. Listen. What catches your attention and inspires you to listen more closely? What catches your eye and inspires you to draw it or just look a bit more closely? Write about how that might be your unique sense of this place, of this creek that flows by you every day.
7. Look around you. Listen. Draw the ecosystem interaction that you observe and hear. Is there anything unique that you see? Find something that is special about this place and draw or sketch that scene.
8. How do we best understand a stream, river, or the fish that live in it? Which do you find more compelling: science or the arts? Can the creative and the scientific be used together, or should they remain separate?
9. What is a Watershed? What watershed are you in right now? Describe how you are connected to this watershed.

All land on earth is a watershed. Humans and their activities play an important and essential role in watersheds, yet few people understand them. Still fewer know the dynamics and boundaries of the ones in which they live. A watershed is a system. It is the land area from which water, sediment, and dissolved materials drain to a common watercourse or body of water. For each watershed there is a drainage system that conveys rainfall to its outlet. A watershed may be the drainage area surrounding a lake that has no surface outlet, or a river basin as large as that of the Columbia River. Within a large watershed are many smaller watersheds that contribute to overall streamflow. A watershed includes all living and non-living things like trees, animals, mountains, buildings, streams and people. Even your school and house are a part of a watershed.
10. Draw a map of the watershed your Student Stewardship Project is in and identify the approximate location of the following:
  - your home
  - your school
  - the significant stream or body of water in this watershed
  - buildings you can identify by memory: grocery stores, restaurants, movie theatres, etc.







# Student Stewardship Project

## 4 SQUARE REFLECTION TOOL

Extension Service

Who's in Charge?



WHAT HAPPENED TODAY?	HOW DO I & MY TEAM FEEL?
NEW IDEAS:	QUESTIONS:



# Step 9: Prepare to Share



Your project has produced real results and it is important to celebrate your contributions and demonstrate what you have learned to others. This step will help you prepare to tell your Student Stewardship Project story to the community. Not only does the community want to hear about the cool goals, objectives, and outcomes of your project, it is important for you to compile your project information into a complete and final package that makes sense to you. Wrap a bow on it!

Compile your data and create the story of your project. It's important to consider multiple ways of telling the story of your Student Stewardship Project – synthesizing and analyzing the data is simply one piece to a compelling story. Remember to utilize all of your project team skills and talents to include creative arts, natural history, technology and community components in your watershed story. Your story should capture information about the organizing question you chose, hypothesis you tested, methodology you used and conclusions you were able to draw.

## Complete the Sharing Event Worksheet

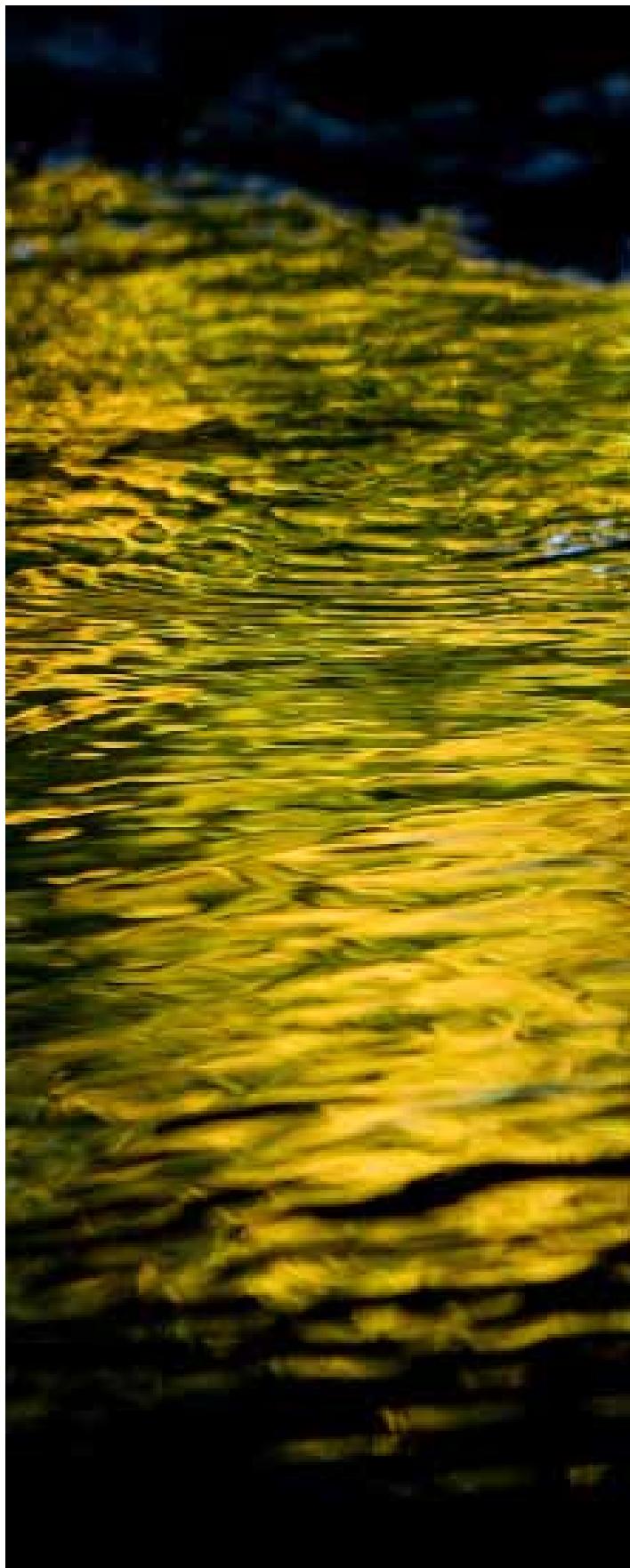
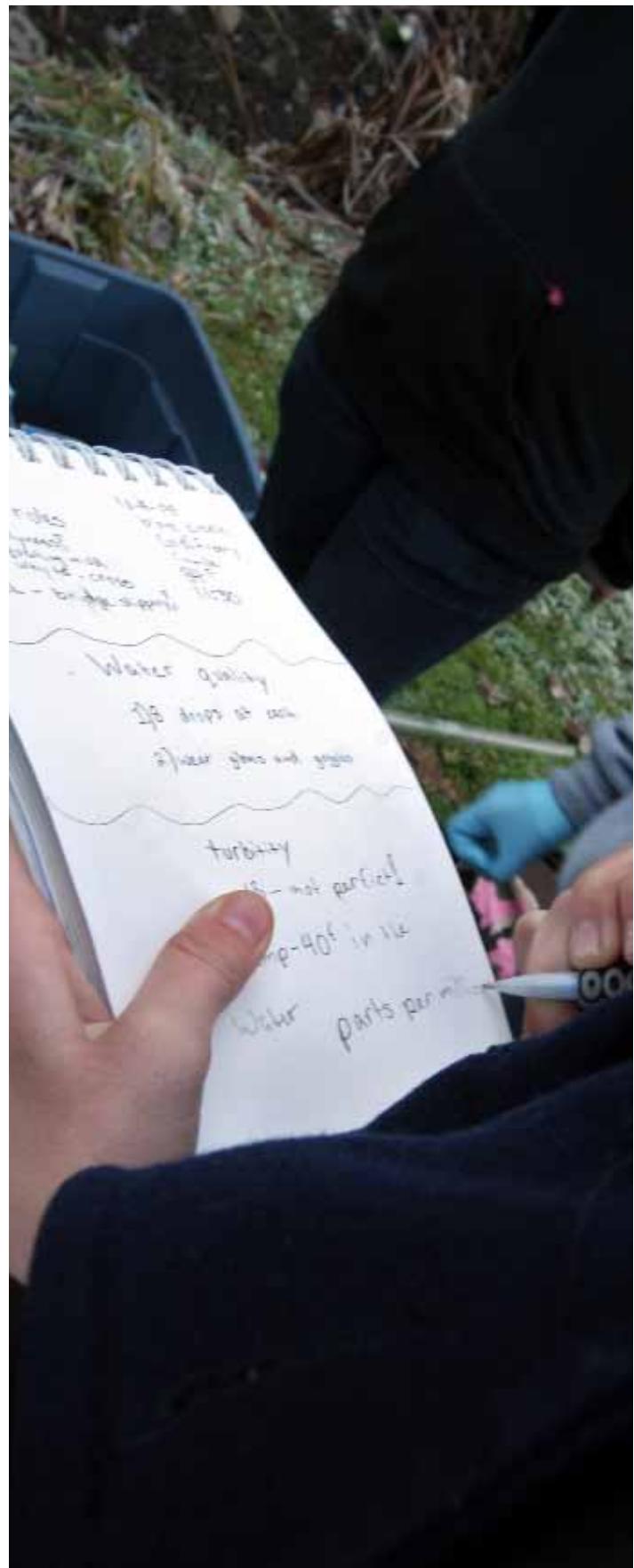
If you are participating in an oral presentation or Student Watershed Summit, be sure to refer to the Presentation Expectations and sample Power Point Presentation - this will provide you with the knowledge of how to best prepare for your presentation.

- If you haven't already, contact the media – check out the Sample Press Release
- Check out the sample Flier for a Student Watershed Summit



"We cannot teach people anything; we can only help them discover it within themselves."

- Galileo Galilei





# Student Stewardship Project

## SHARING EVENT WORKSHEET

Extension Service

Who's in Charge?



Project: \_\_\_\_\_ Date: \_\_\_\_\_ Team: \_\_\_\_\_

Student(s): \_\_\_\_\_

HOW: How do I plan to share my project and make the sharing successful?

WHO: Who will I share my project with?

- |   |   |                                 |
|---|---|---------------------------------|
| <input type="checkbox"/> City Council Members | <input type="checkbox"/> Agency Partners  | <input type="checkbox"/> Other: |
| <input type="checkbox"/> School Board         | <input type="checkbox"/> Local Businesses | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Watershed Council    | <input type="checkbox"/> Project Funders  | <input type="checkbox"/> Other: |
| <input type="checkbox"/> Media                | <input type="checkbox"/> Friends & Family | <input type="checkbox"/> Other: |

WHAT: What resources do I need to compile/create for my presentation? (i.e. PowerPoint, maps, art, etc.)

WHERE:

WHEN: Date & Time

Am I sending invitations?  YES  NO

Did I already invite my audience?  YES  NO

How?

Have I written a press release and contacted the media?  YES  NO

Was the goal of my project met?  YES  NO





# Student Stewardship Project

## PRESENTATION EXPECTATIONS

Make sure all work is uploaded to StreamWebs (streamwebs.org)!!

Who's in Charge?



Your project presentation will allow you the opportunity to showcase the results of your hard work. A presentation must include:

- A \_\_\_ MINUTE well rehearsed and professional team presentation to an audience. This must include equal member participation and speaking.
- At least THREE clear and effective VISUAL or GRAPHIC REPRESENTATIONS that enhance your presentation. This must include at least one MAP that shows the location of the project. Visual or graphic representations can be photos, graphs, charts, etc. They can be part of a poster, PowerPoint, overhead, video, displays, or a combination of all those mentioned.
- The GOALS of the project. If you are trying to test a hypothesis, answer a question, or solve a problem - state clearly what the hypothesis, question, or problem is.
- The METHODS you used to achieve your goals, including of a timeline of project steps. How did your maps help you decide on your study site(s)?
- An explanation of your DATA. What conclusions did your data provide you?
- Details about the OUTCOMES of the project. Did you achieve your goals? Did your data support your hypothesis? What do you hope will be the benefits of your project? What recommendations do you have for future actions?

TEAM MEMBERS: \_\_\_\_\_

TEACHER/SCHOOL: \_\_\_\_\_

EVALUATOR: \_\_\_\_\_

### Assessment Scale

6 - Exemplary (excellent)	3 - Developing (not quite)
5 - Advanced (very good)	2 - Limited (inadequate)
4 - Proficient (good/adequate)	1 - None

### COMMUNICATION

Standard	Score
1. Equal member participation	
2. Met ___ minute requirement	
3. Visuals enhanced presentation	
4. Good balance and flow in delivery (proper voice tone and pacing)	
5. Professional delivery (eye-contact, appropriate body language and posture)	

## PROCESS

Standard	Score
1. Project goal(s) stated	
2. Methods explained	
3. Data displayed and discussed	
4. Data analysis discussed	
5. Outcomes conveyed	
6. Use of scientific tools discussed	

## PRODUCTS

Standard	Score
1. Maps	
2. Data display	
3. Data analysis	
4. Other visuals	

## CONTENT

Standard	Score
1. Appropriate terminology used	
2. Applied understanding of ecosystems demonstrated	
3. Understanding of forest management discussed	
4. Critical/creative (out-of-the-box) thinking skills applied to achieve goals	
5. Used maps to help make project decisions	

TOTAL SCORE	
-------------	--

## WRITTEN FEEDBACK

Strengths:

Areas to Improve:

Other:

Be sure to include the following information in your presentation:

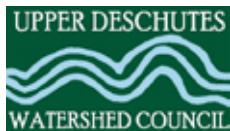
What methods did I use to reach my project goal and answer the organizing question?

How has the data from my project been compiled?

What conclusion was I able to make?

What was the outcome of my project?





**FOR IMMEDIATE RELEASE**

**Contact:** Kolleen Yake  
Upper Deschutes Watershed Council  
Education Coordinator  
(541) 382-6103 x33  
[kyake@deschuteswatersheds.org](mailto:kyake@deschuteswatersheds.org)

## Whyches Creek Student Stewardship Project

**When:** 12:00- 3:00 PM, April 14, 2009

**Where:** Whyches Creek, just off Three Creeks Road south of Sisters

**Sisters, Ore.** – The Upper Deschutes Watershed Council and WolfTree ([www.beoutside.org](http://www.beoutside.org)) will be engaging local Sisters students in the restoration of Whyches Creek. Working with assistance from the Sisters Ranger District, Three Sisters Irrigation District and Upper Deschutes Watershed Council, Sisters High School Interdisciplinary Environmental Expedition students will participate in a unique project to enhance fish and bird habitat for reintroduced steelhead.

The restoration approach is unique in that the planting will primarily involve plants salvaged from a soon-to-be piped ten-mile McKenzie Canyon/Black Butte Canal System. This nearly 100-year-old canal system diverts water from Whyches Creek to irrigate local farms. It boasts mature willow and alders, hardy riparian types of plants, which will soon be lost in the construction of the pipe. Significantly, the piping project will restore six cubic feet per second (cfs) of streamflow to the historically dewatered Whyches Creek.

The Whyches Project is an innovative long-term education and restoration project that is part of the educational programs offered by Upper Deschutes Watershed Council. Participation in the Whyches Creek Student Stewardship Project provides students with an opportunity to better understand their home creek while actively contributing to the restoration of it. Together, WolfTree and Upper Deschutes Watershed Council work with Sisters High School teachers to facilitate the connection between education and restoration.

Whyches Creek historically boasted robust runs of salmon and steelhead. With current improvements to the Pelton-Round Butte Dam due to its Federal Energy Relicensing agreement, the reintroduction of historic migratory steelhead is on the horizon. When these iconic fish return to Whyches Creek, it is of critical importance that habitat conditions along Whyches Creek are intact and healthy. The re-establishment of vegetation along the creek will dramatically increase habitat by stabilizing streambanks and providing shade - especially in conjunction with the increase of streamflow as a result of the piping project. A healthy riparian area will also significantly benefit forest birds that forage and nest in riparian areas. It will also improve the special recreation value of the creekside areas that are very near to town.

By actively involving students in the planning and implementation of the restoration of their creek, we will enhance their connection to their watershed and thus increase the watershed literacy of the community. Education Coordinator, Kolleen Yake recently commented on the project: "Our hope is that with more connection to the creek, there will be a greater likelihood of a legacy of community watershed stewardship for these iconic returning steelhead."

# # #

# Sample – Artwork



The screenshot shows a web page from StreamWebs, a student stewardship network. At the top left is the Oregon State University Extension Service logo. The main header reads "StreamWebs™ student stewardship network". The navigation menu includes "My Profile", "Search Projects", "Add Project", "About", "Resources", "Logout", and "Help". A sub-header for a project titled "Song sparrow" with "View" and "Edit" links is visible. Below this, a location pin indicates the "Tenino Court Site". The "Project Description" section states: "This is a forested area with a seasonal creek running through. The property is owned by Portland Parks and Recreation." The "Project Stewards" section lists ten individuals with their names and small profile pictures:

Project Steward	Profile Picture
Ryan	[Profile Pic]
Mallory Moon	[Profile Pic]
upset luggage	[Profile Pic]
Jessica_	[Profile Pic]
MacLennan Link	[Profile Pic]
Megan	[Profile Pic]
Silhouette	[Profile Pic]
mhollos	[Profile Pic]
Baile	[Profile Pic]
Daria	[Profile Pic]
Halle	[Profile Pic]

A detailed pencil sketch of a Song sparrow is prominently displayed in the center of the page, perched on a branch. The drawing is signed "Boyz Gaze" at the bottom.



**StreamWebs™ student stewardship network**

My Profile Search Projects Add Project About Resources Logout Help

## Photo Point Team - Presentation (Jan. 2012)

[View](#) [Edit](#)

**Tenino Court Site**

**Project Description**

This is a forested area with a seasonal creek running through. The property is owned by Portland Parks and Recreation.

**Project Stewards**

<a href="#">Ryan</a>	<a href="#">Mallory Moon</a>	<a href="#">upsettage</a>
<a href="#">jessica_</a>	<a href="#">macnugget</a>	<a href="#">lukikat</a>
<a href="#">Meagan</a>	<a href="#">vilkateit</a>	<a href="#">m_kallac</a>

**What is PPM?**

Photo Point Monitoring is the process of observing restoration projects and collecting photos of progress over time.

A diagram illustrating Photo Point Monitoring. It features a camera on the right, connected by a yellow tape measure to a circular compass rose on the left. The tape measure has markings from 2 to 10 meters. The compass rose includes cardinal directions (N, S, E, W) and intermediate points (NE, SE, SW, NW).

**Why to Restore Projects?**

It's important that the environment is restored because it is healthier for all living organisms. It also allows survival for native plants and animals that can otherwise be killed by invasive species.

Slide 3 / 12 Google docs | Menu

[Report objectionable content](#) [Favorite](#)

# Sample – Video



OSU  
Oregon State University  
Extension Service

StreamWebs™  
student stewardship network

My Profile Search Projects Add Project About Resources Logout Help

**Caddisfly casing movement**  
View Edit

Brice Creek West Trailhead

Caddisfly casing movement

Brice Creek West Trailhead

Project Description

Small creek flowing to Row River in Coast Fork Willamette Watershed. Some logging in surrounding Umpqua National Forest, but this section is mainly recreational use. The trail head is the beginning of 5 miles of wide, level, forested trail with some opportunity to analyze riparian zone. Easy access...

Project Stewards

vickie.costello...

Support for StreamWebs provided by:



Two empty casings made of pebbles, one with sticks that is alive and moving.

Report objectionable content Favorite

00:18 01:12

etc.

# Step 10: Demonstrate & Celebrate

streams were re-routed for irrigation  
and damaged Bear Creek.  
erosion was, and still is a growing  
problem because of vegetation removal and  
developments so close to the  
water zone.



It is now time to turn it up, showcase the results of your hard work and demonstrate what you have learned to others...

There are many ways to share your knowledge and experience with your peers and the community. At this point, you have already been planning for this step. This section has more information on the following suggestions for sharing:

- Find local and state-wide publications to submit your project reports to
- Upload your project to StreamWebs
- Participate in a Student Watershed Summit
- Give a school or community presentation about your project
- Present to your watershed council or soil and water conservation district



"If you want to build a ship, don't drum up people together to collect wood and don't assign them tasks and work, but rather reach them to long for the sea."

- Antoine de Saint-Exupery





# Student Stewardship Project

## TRACKING SHEET

Extension Service

Who's in Charge?



The Project Manager from your group should use this document for final reporting of your Student Stewardship Project. This information will be used for tracking and evaluation purposes and may be shared as part of on-going assessment of Student Stewardship Projects and OSU Extension Service education program's general development. You may attach an additional page if necessary.

Date: \_\_\_\_\_ Name of person reporting: \_\_\_\_\_

Please check one of the following that most closely identifies the person reporting:

Teacher     Student     OSU Extension Service Staff     Other: \_\_\_\_\_

### General Project Information

School/Group: \_\_\_\_\_ Teacher Name/Group Leader: \_\_\_\_\_

Address: \_\_\_\_\_

Grade: \_\_\_\_\_ # of Students: \_\_\_\_\_ Total # of Project Hours: \_\_\_\_\_

Please breakdown the total of approximate hours spent on each of the following:

Field Work: \_\_\_\_\_ Classroom: \_\_\_\_\_ Community Outreach: \_\_\_\_\_ Other: \_\_\_\_\_

Location of Project: \_\_\_\_\_

Partners – Please list all partners involved in the project and briefly describe their role & contribution.

Name or Organization                          Role & Contribution

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Project Dates – Please list all project dates and briefly describe the action taken on each date  
(attach another sheet if necessary).

Date                                  Description

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Please check all of the following skills and topics that apply to this project:

Watershed Topics

- |  |   |
|--|---|
| <input type="checkbox"/> Water Resources           | <input type="checkbox"/> Fish Biology         |
| <input type="checkbox"/> Water Ecology             | <input type="checkbox"/> Ornithology/Wildlife |
| <input type="checkbox"/> Water Science/Hydrology   | <input type="checkbox"/> Wildlife Tracking    |
| <input type="checkbox"/> Geology/Topography        | <input type="checkbox"/> History              |
| <input type="checkbox"/> Geography                 | <input type="checkbox"/> Native Cultures      |
| <input type="checkbox"/> Land & Water Uses         | <input type="checkbox"/> Economy/Business     |
| <input type="checkbox"/> Soils                     | <input type="checkbox"/> Eco-Art              |
| <input type="checkbox"/> Botany                    | <input type="checkbox"/> Journalism           |
| <input type="checkbox"/> Riparian Ecology/Forestry | <input type="checkbox"/> Monitoring           |
| <input type="checkbox"/> Climate                   | <input type="checkbox"/> Restoration          |
| <input type="checkbox"/> Sociology                 | <input type="checkbox"/> Other: _____         |

Skills

- |   |   |
|---|---|
| <input type="checkbox"/> Reading              | <input type="checkbox"/> Scientific Inquiry/Problem Solving |
| <input type="checkbox"/> Writing              | <input type="checkbox"/> Civic/Community Engagement         |
| <input type="checkbox"/> Public Speaking      | <input type="checkbox"/> Career Related Learning            |
| <input type="checkbox"/> Applying Mathematics | <input type="checkbox"/> Service Learning                   |
| <input type="checkbox"/> Using Technology     | <input type="checkbox"/> Other: _____                       |

Please list all known curricular benchmarks that were satisfied through this project:

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Did students have an opportunity to earn proficiency credit?  YES  NO

Did your project follow the Student Stewardship Project 10 step model?  YES  NO

Please describe how your project aligned well with the model and/or how it was different: \_\_\_\_\_  

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Did you upload the project to StreamWebs?  YES  NO

Did you share the project with the community?  YES  NO

If YES, please describe how you shared and with whom:

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Project Outcome – Please describe the final outcome of the project including any applicable numbers on plants planted, invasive species removed, stream miles worked, etc:

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# Student Stewardship Project

## POST-PARTICIPATION SURVEY

Extension Service

Who's in Charge?



Hello student! We appreciate you taking the time to fill out this questionnaire. This questionnaire is designed to help us understand a little more about your experiences. There are directions listed below. Answer questions as best you can. If you're not sure of an answer you may leave it blank.

Name \_\_\_\_\_ School/Group \_\_\_\_\_

Date \_\_\_\_\_ Teacher/Group Leader \_\_\_\_\_

Grade \_\_\_\_\_

Please circle the number that best describes what you think:

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
1. I know what a watershed is.	1	2	3	4	5
2. I know facts and information about my watershed's history, geography, wildlife, and/or plants.	1	2	3	4	5
3. I have freely explored outdoor sites in my watershed.	1	2	3	4	5
4. I am not comfortable being outside in the woods or by a creek or stream.	1	2	3	4	5
5. I have the skills to use equipment and techniques to investigate my watershed.	1	2	3	4	5
6. I have practiced these skills while examining my watershed.	1	2	3	4	5
7. I have had time to creatively write or reflect on experiences in my watershed.	1	2	3	4	5
8. I am part of the watershed ecosystem.	1	2	3	4	5
9. I am not concerned about the problems and issues affecting my watershed.	1	2	3	4	5
10. I enjoy talking with other people about issues impacting my watershed.	1	2	3	4	5
11. I am interested in caring for my watershed by getting involved in a stewardship project (planting trees, trash clean-ups, etc.).	1	2	3	4	5
12. I don't think it's important to share projects with my community.	1	2	3	4	5
13. I believe I can contribute to the health of my watershed.	1	2	3	4	5
14. I would like to research or resolve a local watershed issue.	1	2	3	4	5
15. I would like to find an internship or job with an organization that deals with watershed issues.	1	2	3	4	5
16. I have no interest in studying watershed related issues in college.	1	2	3	4	5

	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
Please circle the number that best describes what you think:					
17. I have participated in a watershed project with a class I have received credit for.	1	2	3	4	5
18. I have had the opportunity to work with professional natural resources and community partners.	1	2	3	4	5
19. I have not participated in the planning and implementation phases of a watershed restoration project.	1	2	3	4	5
20. I have professionally presented and shared about my project at a summit, event, in StreamWebs™, or through a publication.	1	2	3	4	5
21. I understand the importance of teamwork to achieve project goals.	1	2	3	4	5
22. I feel valued as part of my project team.	1	2	3	4	5

How many watershed stewardship projects have you participated in? (Please circle)

0      1      2      3      4      5      5+

Please describe the most recent project (if applicable):

Do you have any ideas for projects you could create or participate in to help improve the health of your watershed?

Please describe why you participated in this project:

How will you share what you learn?

Is there anything else you would like to share?

# Sources

The following sources were adapted and used in developing the Student Stewardship Project Model along with years of field based experience.

"How to Plant Willows and Cottonwoods for Riparian Restoration", J. Chris Hoag, USDA – NRCS Plant Materials Center, January 2007

"Project Based Learning – A Guide to Standards Focused Project Based Learning for Middle and High School Teachers", Buck Institute for Education, 2003

Learn and Serve America – A Program of the Corporation for National and Community Service  
<http://www.learnandservice.gov/>

Salmon Watch Curriculum Guide 9th Edition – OSU Extension Service

Lessons from the Bay Project Action Guide  
<http://www.doe.virginia.gov/VDOE/LFB/index.html>

