Palouse-Clearwater Environmental Institute

Final Project Report

Friends of Flannigan Creek Restoration Project

Broyles, Lawrence, Panteja, Reynolds, and Rogers properties

Watershed: Palouse River
Stream Name: Flannigan Creek
Project Start Date:
Project End Date:
Project Status: Complete
Project Code: WFC1
Contract Numbers: S209

Reporting Period: Final Report November 2010

Local Contact:	Thomas C. Lamar, PCEI	208-882-1444
Regional Contact:	John Cardwell, IDEQ	208-799-3451
State Contact:	Dave Pisarski, IDEQ	208-373-0115

Funding Summary:

Total Project Budget:	$ 167,843
Total 319 Grant:	$ 95,777
Local Match:	$ 72,066

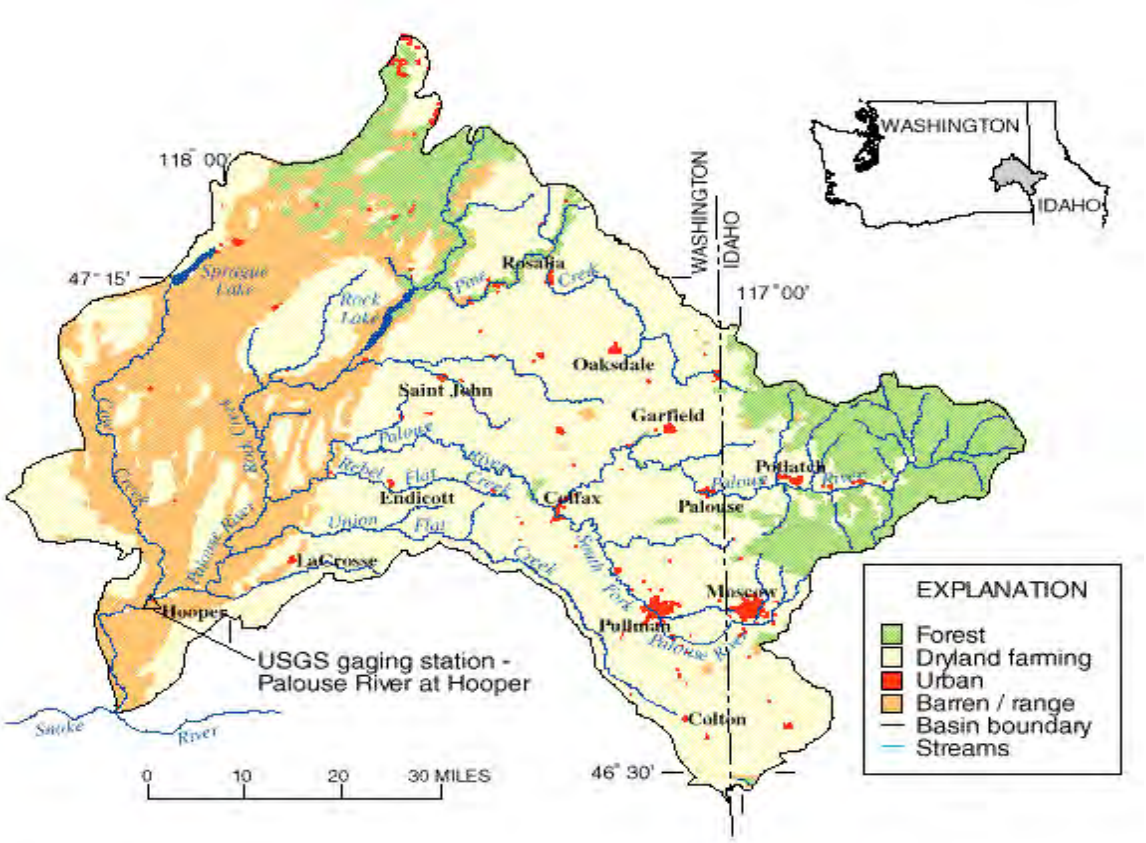
Project Location:
Latitude: 46.852°N **Longitude: -**116.9418°W

Target Pollutants:

- Temperature
- Sediment
- Nutrients
- Bacteria

Waterbody Type(s): Intermittent
Hydrologic Unit Code: 17060108

Map 1: Project Locator Map, Latah County Idaho



Project Summary

The Flannigan Creek Riparian Restoration Project was designed under the priorities developed by the Palouse River Tributaries Watershed Advisory Group (WAG) during the creation of the Palouse River tributaries Total Maximum Daily Load (TMDL). Restoration work took place on private properties in the upper Flannigan Creek Watershed (Map 1) where the West Fork of Flannigan Creek meets the main stem Flannigan Creek. Restoration work targeted reductions in sediment, bacteria, nutrients and temperature, pollutants for which the TMDL on Flannigan Creek was established. In addition, this project improved riparian habitat through native plantings. Agriculture, grazing and forestry are major land uses in the watershed. According to the TMDL (IDEQ 2004), sediment loading to Flannigan Creek is 23 times greater than background levels and 8 times greater than the estimated load capacity, requiring a 67% load reduction in sediment. Nutrient load reduction for Flannigan Creek is between 0.004 lbs per day and 0.275 lbs per day in the lower watershed. Bacteria data evaluated under the TMDL show numerous exceedances above the state standard for secondary contact recreation beneficial designated use.

Six adjacent landowners have participated in riparian restoration work on their property. Water quality improvement projects focused on stabilizing stream banks where active erosion was visible and increasing wetland area in priority locations that will collect and filter runoff. Riparian plantings focused on bare areas due to the recent burn and areas where construction activities were underway. Much of the stream has adequate canopy cover. The stabilization and revegetation of **1,336 feet** of stream bank will reduce in-stream erosion. Bank stabilization techniques included the excavation and resloping of the stream bank and the installation of erosion control fabric. The **330,280 square foot** variable riparian buffer was planted with native woody, herbaceous and grass species. The riparian buffer acts as a filter reducing overland sediment flows, while filtering nutrients and bacteria

generated from upland land use practices. Filter strips have been shown to reduce sediment by 65%, total phosphorous by 85%, nitrogen by 70% (PSU 1992) and fecal coliform by 55% (EPA 2003). In addition to acting as a filter for pollutants, the established riparian buffer will also provide shade reducing extreme summer temperatures.

Wetland swales were enhanced and created in areas suitable for filtration of runoff caused by land use practices currently underway in the watershed. Wetlands increase filtration of pollutants and expand storm water holding capacity in the watershed.

Project Goals & Objectives

1. Stabilize stream banks with erosion control fabric and revetment materials
   Objective(s): Reduce stream bank erosion by stabilizing eroding banks using bioengineering techniques.
   Reduce erosion by re-sloping stream banks with minimum 2:1 slope.

2. Restore the natural riparian area plant community
   Objective(s): Reduce sediment loading through bank stabilization, lower water velocity, and sediment trapping.
   Reduce sediment, nutrient, and bacterial loading through filtration of overland runoff.
   Decrease stream temperatures by restoring in-stream cover and riparian canopy.
   Improve wildlife habitat by providing attributes like forage, cover, and in-stream habitat.

3. Enhance and create wetland filter ponds and swales
   Objective(s): Increase storm water holding capacity and groundwater recharge surface area in the upper watershed.
   Improve filtration of overland runoff.
   Expand and enhance wildlife habitat.
   Reduce water velocity to improve bank stabilization.

4. Involve community members, students, and volunteers
   Objective(s): Encourage responsible stewardship of water resources and increase knowledge about water quality protection.
   Work with private landowners to achieve water quality goals.
   Promote community involvement in restoration activities.

April 2007: *Eroding and incised banks characterize the project reach on Flannigan Creek.*

February 2006: *Lack of riparian vegetation has lead to the sloughing of the bank in many areas along the project reach.*

Restoration Timeline

Project Planning

Task 1: Consult with property owners and concerned parties. Seek technical support, guidance, and approval of project from federal, state, county, city entities, and landowners.

Responsible Party: PCEI Watersheds Program in collaboration with agency personnel and PR WAG.
Output: Obtain contract and agreements
Milestone: March 2007, August 2008
Cost: $3,142.33

Complete
Contracts and agreements completed by April 2007 and April 2008. Photo monitoring points were installed and pre-restoration activities complete by April 2007 and September 2008. Project designs complete and PCEI staff met with all participating parties to ensure approval of project design, scope, and timeline. All participating parties have signed landowner contracts. Photo monitoring was conducted following all excavation activities. Negotiations with upstream landowner enabled us to extend the project onto the adjoining upstream property in 2008 and 2009.

Task 2: Develop restoration and outreach plan and obtain all required permits from federal, state, and local agencies including but not limited to: Army Corps of Engineers Section 404 Permit, Idaho Department of Water Resources Alter-A-Stream Channel Permit and EPA NOI Permit.

Responsible Party: PCEI, IDEQ, USFS, ISCC, NRCS and local residents.
Output: Complete restoration and outreach plan. All permits obtained.
PCEI has developed design for projects in collaboration with agency personnel, engineers and landowners.
Engineers have preformed site visits and surveys to collect necessary data
Milestones: July 2007, September and October 2008, June 2009
Cost: $3,096.60

Complete
PCEI completed project designs and surveys by July 2007 for initial project and by August 2008 for extension in conjunction with the landowners and TerraGraphics Environmental Engineers. All permits were obtained. The Army Corps of Engineers Section 404 Permit was received October 1, 2007 and modified for extension and received September 25, 2008. The Idaho Department of Water Resources issued a letter on September 28, 2007, and resubmitted for the extension and accepted on September 30, 2008 and again on June 17 2009 for the final excavation of the hardened rock crossing. The EPA NOI Permit was received September 17, 2007 and October 27, 2008 for the project extension, and the Latah County Floodplain Development Permit was approved on September 26, 2007 and again on October 22, 2008.

October 2007: *Banks were resloped 3:1 from ordinary high water mark at 2′ above streambed.*

October 2007: *Stream bank berm is removed reconnecting floodplain to the creek.*

October 2007: *Large wetland was created at the toe of the fire-affected slope to filter overland flows that have increased since a fire that burned up the area 4 years ago.*

October 2007: *Sara Cucksey, PCEI Project Manager directs construction crew.*

Restoration

Task 3: Excavate stream bank and floodplain. Install stream bank stabilization structures and seed native grasses.

Responsible Party: PCEI technical staff, agency personnel, subcontractors, private property owner, and community volunteers organized by PCEI.
Output: Stream bank re-sloped and stream bank stabilization revetments installed
Milestone: October 2007, 2008
Cost: $45,227.01

Complete

Earthwork began on the October 1, 2007 and concluded on the October 5, 2007 on the Broyles, Lawrence, Panteja, and Rogers' properties. During the five days of excavation 420 tons of soil was removed from the banks and floodplain and deposited on the adjacent Reynolds property. 704 linear feet of stream banks were excavated and resloped to facilitate the reconnection of the floodplain with the creek. 16,522 cubic feet of wetlands were created to filter and slow water velocities to help decrease sedimentation. Following excavation stream banks were hydro-mulched with a mixture of wood pulp and restoration seed mix. Coir fabric was installed along the bank to hold seed in place and minimize erosion. Photo monitoring continued through excavation and post-stabilization activities. Two brush revetments were installed on steep and eroding banks on the Rogers' property not accessible to the excavator.

October 14, 2008, excavation of 632 linear feet of stream bank commenced on the Reynolds' property and was complete on October 17, 2008. An additional 2,644 cubic feet of wetlands were installed, bringing the project total to 19,166 cubic feet of wetland capacity. A hardened rock crossing was installed on August 11-13, 2009, thus completing the excavation applications for the Friends of Flannigan Creek Restoration Project. Monitoring to evaluate construction effectiveness will continue through winter and spring 2011.

October 2007: *Hydro-mulching was used on site to help increase seed germination rate and to help stabilize banks following excavation activities.*

October 2007: *Steep banks throughout the project extent were resloped and stabilized with hydro-mulch and erosion control fabric. Following stabilization activities the site was planted with native trees and shrubs.*

Task 4: Plant native riparian vegetation

Responsible Party: PCEI technical staff, subcontractors, private property owners, and community volunteers organized by PCEI.
Output: Restoration site is vegetated
Milestones: October 2007, October 2008 and October 2009
Cost: $30,483.11

Complete
Community volunteers and PCEI AmeriCorps members installed the initial planting of **1,800 wetland plants** and **475 woody plants** on site during the fall of 2007. Plant protectors were installed on all plants that will not be subject to direct flow.

One hundred willow poles were installed in the spring 2008. In the fall of 2008 an additional **362 woody plants** were planted throughout the project site, concentrating on the Reynolds property and filling in throughout the entire project extent.

During the fall of 2009, an additional **60 woody plants** were installed by community volunteers and **30 trees** to be installed by the landowner. Additional seed was spread to compete with the weedy species on areas excavated in the fall of 2008. In 2010 multiple plantings took place, bringing the project total to **2,066 native shrubs and trees** and **2,457 rushes and sedges** planted throughout the multi-landowner project site to date, and our records show a **70% survival rate**.

After careful observation of the project site for two growing seasons, tree protectors were removed in the fall of 2009. This tactic aims to limit damage to plants being crushed from the snowfall in the winter, and to minimize the possibility that the protectors may draw attention to the vegetation for browse by deer. The project site will continue to be monitored for vegetative success and changes in channel morphology.

Public Outreach and Education

Task 5: Educate community regarding watershed issues and riparian restoration

Responsible Party: PCEI Watersheds and Education Program staff, volunteers and AmeriCorps members.
Output: Publications in newsletters and other media, community presentations
Milestone: Throughout entire grant cycle
Cost: $1,729.74

Complete

A project sign was installed in 2007 at the project boundary to inform neighbors about restoration activities. A letter was also mailed to individuals in the watershed informing them about restoration activities. The project landowners were chosen as the "Landowners of the Year" and are featured in the fall/winter 2007 PCEI Environmental News. The project is also featured on our website and can be viewed by the public at http://www.pcei.org/water/project.htm?pid=78. Project details were updated periodically during the field seasons. The media was contacted regarding the two volunteer events held at the project site. The PCEI volunteer event schedule was sent to our volunteer database of 1,348 volunteers. Public outreach continued through the fall of 2009. We will continue to update our website with new photos as they become available.

October 2007: *Friends of Flannigan Creek Project spans 4 private land holdings. Landowners are very excited to improve water quality.*

October 2007: *Volunteers from the University of Idaho help plant trees at the Flannigan Creek Restoration Project.*

Task 6: Recruit, train and mobilize volunteers

Responsible Party: PCEI Watersheds Program and Education Program staff, volunteers and AmeriCorps members.
Output: Heightened public awareness of the restoration and conservation initiatives underway in the watershed promoting community participation and collaboration.
Milestone: Planting seasons concluding October 2007, May and October 2008, and October 2009.
Cost: $573.09

Complete

Volunteers were contacted with details about the volunteer events held at the restoration site during October 2007. PCEI volunteer events are advertised in our bimonthly volunteer newsletter, "Volunteer Me" which can be found at http://www.pcei.org/VolunteerMe.htm, and on the web at http://www.pcei.org/calendar.htm. Volunteer recruitment continued through Fall 2009. Our planned events were advertised through our volunteer newsletter, on our online calendar and through press releases sent to local media sources. Three teams of AmeriCorps members were trained to perform restoration and community outreach activities and participated in project activities through November 2009. To date **volunteers have completed 1,339 hours** at the project site. **Fourteen PCEI AmeriCorps members** participated in restoration and outreach activities, including **16**

scheduled volunteer events at the site, spending a total of **566 hours** working on project specific activities.

October 2007*: Lena Whitmore Elementary School 5th graders work together to plant over 100 trees and shrubs.*

October 2007: *Students learn about water quality and restoration activities during the planting event.*

October 2007

1. Six volunteers finished installing erosion control fabric along upper reach of stream on the Broyles property. Nearly 400 wetland plugs and sedges were planted along the creek and in and around the created wetlands...the local dogs were helping out and got a hold of a few of our plugs! Two volunteers salvaged existing snowberry plants that were pulled up by the excavator and replanted them.

2. PCEI staff set out 400 plants throughout entire Flannigan Creek site. Eighteen fifth graders in Jill Diamond's class at the Lena Whitmore School in Moscow planted 119 trees and shrubs. The students also placed tree protectors around the plants and gave them a good drink of water. The landowners were very generous and provided a delicious snack for everyone who helped out!

3. Seventy-five volunteers came out to the site! They planted 281 trees and shrubs and 1000 herbaceous wetland perennials with a three-person AmeriCorps Team. The plants were also protected and watered in.

4. Professor Jolie Kaytes landscape architecture class from Washington State University helped plant, seed wetlands, count plants on site, and install erosion control fabric. The total plant count amounted to 444 native shrubs and trees planted on site. Approximately 25 square feet of erosion control fabric was installed on an unnamed tributary of Flannigan creek.

5. Six volunteers joined the AmeriCorps crew to finish installing erosion control fabric along upper reach of Flannigan Creek. Approximately 380 herbaceous wetland rushes and sedges were planted...the local dogs were trying to help, but made off with a few. Two volunteers salvaged snowberry plants that were removed by the excavator and replanted them.

Spring, Summer, and Fall 2008

6. Five enthusiastic volunteers came out to help us put in willow poles that were collected along the Clearwater and Snake River. Over 100 poles were planted with a pump-operated stinger. A stinger a metal contraption about 1 inch in diameter and 6 feet long with handles and a place where it is attached to a garden hose, which is then fitted to the

pump. The stinger digs a hole with pressurized water, making it easier to get the willow poles to the proper depth so rooting can take place. Some volunteers helped push wetland plugs back into soil because they had been pushed up during the winter from frost action.

7. A three-person AmeriCorps Crew joined three cub scouts and two chaperones, and two landowner family members. The volunteers helped to plant 20 Mackenzie willow and 40 Redosier Dogwood plants. All the plants were also watered and protected with tree guards. Some volunteers helped with the important task of weeding Canada thistle.

8. Four AmeriCorps members, and two volunteers performed site maintenance including weeding activities and watering plants. Site maintenance is extremely important to keep the native plants thriving and the unwanted species at bay.

9. Ten volunteers came out to give a hand for Make a Difference Day with a three-person AmeriCorps Crew. Hundreds of plants were planted and protected with tree guards and watered in. Over 1000 Linear Feet of erosion control fabric was installed, and hundreds of rushes and sedges were planted along the creek and in the recently constructed wetland.

October 2009

10. Eleven volunteers joined the AmeriCorps team for the final project event of the season. The project sign was installed in a new location, 60 trees were planted, areas with low grass germination were reseeded, and 100 tree protectors were removed during the finale volunteer event on Flannigan Creek.

2010 Events

11. Twenty-three University of Idaho students from a Soils Science lab along with four AmeriCorps members planted 100 native plants and weeded 500 square feet of teasel. They planted 10 Drummond willow poles along the riparian corridor.

12. Four AmeriCorps members worked with forty-two University of Idaho students from a Soils Science lab to plant 101 native plants and 54 Drummond willow poles.

13. There were 69 students from Environmental Science classes at WSU along with four watershed AmeriCorps members fencing the riparian corridor along the Flannigan Creek. They also weeded the area and watered previously installed plants.

14. There were 71 students from Environmental Science classes at WSU along with four watershed AmeriCorps members fencing the riparian corridor along the Flannigan Creek. They also weeded the area and watered previously installed plants.

15. There were 82 students from Environmental Science classes at WSU along with four watershed AmeriCorps members fencing the riparian corridor along the Flannigan Creek. They also weeded the area and watered previously installed plants.

16. There were 78 students from Environmental Science classes at WSU along with four watershed AmeriCorps members fencing the riparian corridor along the Flannigan Creek. They also weeded the area and watered previously installed plants. The accomplishments of the four days with this class included 5,000 square feet of the site weeded and 1,000 ft of fencing finished.

Post-Restoration Monitoring, Reporting and Evaluation

Task 7: Issue reports according to US EPA grant reporting requirements.
Responsible Party: PCEI Watersheds Program management staff.
Output: Regular project progress updates and monitoring data submitted to IDEQ.
Milestone: April 2008, and October 2008
Load reduction estimates updated annually.
Final report summarizing implementation process, work scope and effectiveness evaluation submitted at the end of contract.
Cost: $3,096.60

Complete
This report satisfies the final reporting requirements for project completion. Load Reduction estimates were recalculated using site-specific measurements from mapping efforts following excavation activities.

Before:

September 2007: *Photo point 3 upstream. Prior to restoration. Steep, unstable and actively undercutting banks throughout the restoration project.*

After

October 2007: *Photo point 3 upstream. Pos-construction banks were hydro-seeded with native grasses. Erosion control fabric helps stabilize banks.*

October 2008: *The banks of the Reynolds' property Flannigan Creek are resloped to minimize erosion. The black fencing helps to minimize disturbance to the creek from rollback and runoff in case of a rain event.*

August 2010*: Brush revetment installed to reduce active in-stream erosion in areas on the bank that were difficult to access with excavating equipment.*

Task 8: Collect, analyze, and report monitoring information.
Responsible Party: PCEI, IDEQ, and community volunteers

Output: Inclusion of monitoring information in semi-annual reports and final evaluation
Milestone: October 2007, April 2008, and October 2008
Monitoring data collected according to monitoring plan and timeline.
Data entered into PCEI database.
Data analyzed.
Data results summarized in reports to IDEQ.
Monitoring data and evaluation included in semi-annual reports.
Compilation of data summarized in final report submitted at the end of contract.
Cost: $5,334.04

Complete
A monitoring plan has been developed and is included in this report. Five permanent photo-monitoring points are positioned to monitor bank stabilization and vegetation establishment success. Pre- and post-restoration photos were taken are included in this report.

Task 9: Evaluate project and utilize adaptive management strategies.
Responsible Party: PCEI Watersheds Program management and technical staff, agency personnel, subcontractors and Palouse River Tributaries Watershed Advisory Group.
Output: Evaluation in reports
Presentation to WAG
Milestone: Reports: October 2007, April 2008, and October 2008
Presentation: Adaptive management findings presented to IDEQ, CBAG, and PR WAG at the end of contract.
Cost: $3,094.60

Complete/Ongoing
Project evaluation is ongoing and both old tried and true techniques as well as new applications were evaluated under site-specific circumstances during the life of the project. Bank stabilization activities will be evaluated following high flows of winter. Plant success and germination rate are monitored annually in July following the initial growing season. We have also implemented hydro- mulching activities on the banks of the project in the hopes that the seed germination rate will increase to help combat weed issues that arise following ground disturbance. A new restoration grass seed mix was used to help increase initial germination rate.

Monitoring Plan

Monitoring both before and after restoration work is essential for evaluation of the project. Photo documentation was conducted prior to restoration, during restoration, and post-implementation. Photo monitoring will continue for at least ten years post-restoration.

A monitoring plan has been designed in order to evaluate site-specific goals and evaluate BMP effectiveness. Site-specific monitoring will include photo documentation, vegetation establishment, stream bank stability monitoring, and percent canopy cover. Water quality data was collected prior to restoration implementation.

Thirteen permanent photo-monitoring stations are distributed throughout project site on five landowners' properties to document both vegetation establishment success and stream bank stability. Photo monitoring protocol will follow USDA Photo Point Monitoring Field Procedures (Hall 2001).

To evaluate bank stability photo monitoring will occur twice a year in spring following high-flow and in mid-summer at base-flow conditions. BMPs used for bank stabilization on the restoration site include: re-sloping of stream banks, re-connecting the flood plain with the stream, coir log installation, erosion control fabric installation and re-vegetation. Stream cross-section data was gathered at transects in order to evaluate morphological changes through time. Transect data collection will occur 3-5 years following restoration.

Vegetation establishment success will also be tracked through photo monitoring. Photos will be taken during the first week of August and then yearly for 10 years following restoration. This fixed date will set a consistent reference point for comparing changes in growth and production. Vegetation will be monitored yearly in late summer for three years following restoration activities. Canopy density will be evaluated annually in late summer using a densiometer. Canopy density will be measured every 100 feet for the length of the site.

To ensure quality data collection experienced PCEI staff will be responsible for training both staff and volunteers on data collection protocol and methodology.

Since land use practices have not been significantly changed within the watershed, local restoration site conditions will be evaluated with the understanding that, on a broad scale the influence of the surrounding degraded reaches may mask the positive effects of small restoration activities. By monitoring, PCEI will be better equipped to understand the causes of local restoration successes and needed improvements and be able to determine the best course of future restoration and conservation efforts.

Load Reduction Estimate

Load reduction calculations to estimate nutrient and sediment reductions demonstrate the effectiveness of the BMPs. Assumptions made when calculating sediment and nutrient load reductions include:

- The edge of the field will be the point of deposition for the sediment and nutrient reduction estimates.
- Once the BMP or system of BMPs is established, the stabilized condition is assumed to control all of the erosion delivered to the edge of the field.
- Phosphorus and nitrogen reductions are calculated as sediment-borne nutrients by the direct volume equation. Dissolved nutrients carried by runoff waters are not calculated in BMP effectiveness models.
- The load reduction is an annual load reduction and can be reported as tons per year or pounds per year.

The pollutant load reduction calculations for urban and agricultural runoff are from the EPA-approved Region 5 BMP effectiveness model. For the length of waterfront stabilized, load reductions were calculated using the direct volume calculations in Equation 1.

(1) $E = [AE*RLR*DB]/2000$ lbs/ton

where:
E = bank erosion over sampled stream reach (tons/year/sample reach)
AE = eroding area (ft2)
RLR = lateral recession rate (ft/yr)
DB = bulk density of bank material (lbs/ft3)

The lateral recession rate for a severe erosive condition will be 0.5 ft/yr, and the improved condition will have a lateral recession rate of 0.02 ft/yr. Load reductions for wetlands are calculated via direct volume. The nearest climate center is Moscow, with 23.55 inches per year annual average precipitation for the period of record (Western Regional Climate Center 2004). The soil texture is a silt, clay loam (STATSGO) with a bulk density of 80 pounds per cubic foot of soil (Michigan DEQ 1999). The standard nutrient content of silt loam is (Michigan DEQ 1999):

- 1.60 pound of phosphorus per ton of soil
- 3.20 pound of nitrogen per ton of soil

Total sediment load reduction: 1,136 tons/year

Total phosphorus load reduction: .57 tons/year

Total nitrogen load reduction: 1.25 tons/year

In-Kind Donations

Match contributions were generated for the project during construction, erosion control material installation and planting activities. TerraGraphics Environmental Engineers donated the cost of survey equipment and some engineering labor to the project. Landowner participation, volunteer hours, equipment rental, and food for volunteers provided additional in-kind match. The landowner spent significant time helping us with the project by mowing he site prior to excavation, providing the crew and volunteers with snacks during the workday and by allowing the fill material to be disposed of on site, eliminating the cost of hauling the fill to the landfill.

References

Hall, F.C. 2001. *Ground-based Photographic Monitoring*. Gen. Tech. Rep. PNW-GTR-503. Portland, OR: U.S. Department of Agriculture, Forest Service, and Pacific Northwest Research Station. 340 p.

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Pennsylvania State University 1992. Nonpoint source database. In U.S. EPA Guidance specifying management measures for sources of nonpoint pollution in coastal waters.

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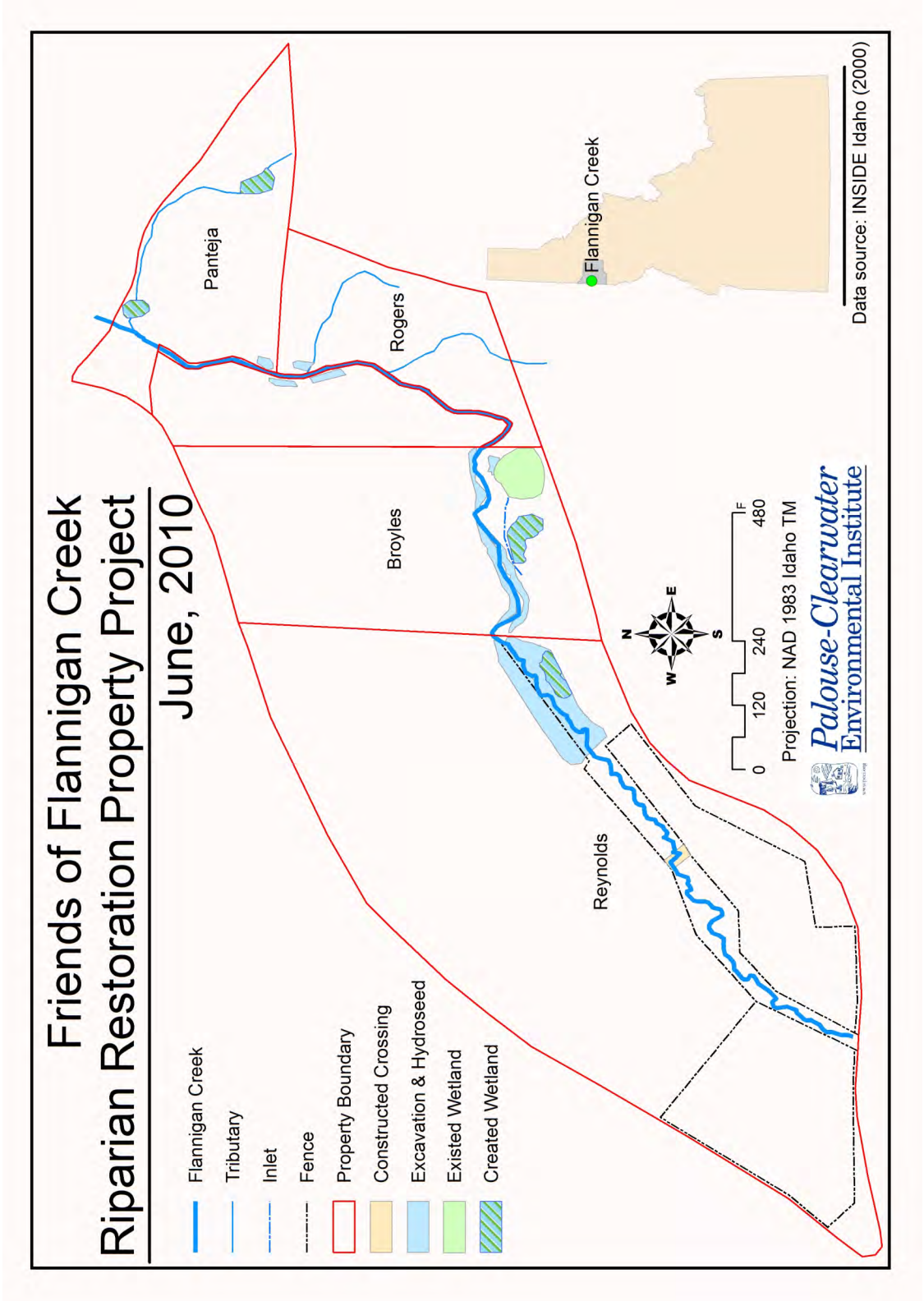
Appendix A
Site Statistics

Contract	S175							
Lead Agency	Palouse-Clearwater Environmental Institute							
Project Name	Flannigan Creek Riparian Restoration Project—Multiple Landowners							
Owners	Broyles, Panteja, Reynolds, Rogers, and Lawrence							
Funding	DEQ 319 Nonpoint Source Grant							
Project Location	**Lat**	46.854		**Long**		-116.943		
	Qtr Sec	SWNE	**Sec**	34	**Rng**	R4W	**Twnshp**	T41N
Project Installation Date(s)	September 2008 to July 2010							
Project Dimensions	**Length (ft)**	2,658		**Width (ft)**		15		
Project Area	**Sq Ft**	573,345		**Acres**		13.16		
Stream bank Sloping and Stabilization	**Side 1 (ft)** East Bank	1,753		**Side 2 (ft)** West Bank		1,753		
Vegetated Buffer	**Side 1 (ft)** North Bank	26,295		**Side 2 (ft)** South Bank		26,295		
Woody Species	2,066							
Emergent Species	2,457							
Area Grass Seeded: Acres ft^2	**Side 1 (ft^2)** North Bank	16,212		**Side 2 (ft^2)** South Bank		13,958		
Wetlands Created: 3	**Area (ft^2)**		**Avg. Depth (ft)** 1		**Capacity (ft^3)** 19,166			
Wetland 1	2,489		1.5		3,734			
Wetland 2	3,529		1.5		5,294			
Wetland 3	1,949		1.5		2,924			
Wetland 4	1,344		1.5		2,016			
Livestock Restrictions	**Length (ft)**		**Width (ft)**		**Area (ft^2)**			
Reynolds property West	1,217 (perimeter)				90,278			
Reynolds property South	245,864 (perimeter)				74,939			
Hardened Rock Creek Crossing	46		22		1,058			
TMDL Parameters of Concern Addressed by the Project	Sediment Temperature Bacteria Nutrients							
Other Benefits	Habitat improvements							
Restoration Practices	Stream bank re-sloping and stabilizing Wetland construction Wetland enhancement Native riparian plantings Riparian Fencing Animal and Equipment Crossing							

Appendix B
Project Map



Appendix C
Species List

Woody Plants
Black Cottonwood
Black Hawthorne
Blue Elderberry
Chokecherry
Common Snowberry
Coyote willow
Douglas Fir
Drummond Willow
Golden Currant
Mackenzie Willow
Mallow Ninebark
Oceanspray
Ponderosa Pine
Quaking Aspen
Redosier Dogwood
Rocky Mountain Maple
Serviceberry
Syringa
Thinleaf Alder

Grasses
Sandburg's Bluegrass
Bluebunch Wheatgrass
Basin Wild Rye
Tufted Hairgrass
Idaho Fescue
Indian R icegass
Prairie Junegrass

Herbaceous Perennials
Baltic Rush
Beaked Sedge
Common Rush
Creeping Spike Rush
Daggerleaf Rush
Hardstem Bulrush
Inflated Sedge
Nebraska Sedge
Slender Rush
Small-fruited Bulrush
Softstem Bulrush
Three Square Bulrush