



**Watersheds
Program**

PCEI Invoice Final Report

January 2012

Lindsay Creek Riparian Animal Management Project Walton, Cowger, Neilson and Canyon Crest Estate Sites



Watershed: Clearwater River
Stream Name: Lindsay Creek
Project Start Date: 12/10/2007
Project End Date: 1/31/2012
Project Status: Complete
Project Code: WLC1
Contract Numbers: S227

Target Pollutants:

- Sediment
- Temperature
- Nutrients
- Bacteria

Reporting Period
Local Contact:
Regional Contact:
State Contact:

Final Report
Thomas C. Lamar, PCEI
John Cardwell, IDEQ
Dave Pisarski, IDEQ

Invoice #4
208-882-1444
208-799-3451
208-3730155

Funding Summary:

Total Project Budget:	\$256,416.25
Total 319 Grant:	\$149,774.38
Local Match:	\$106,641.87

WALTON PROJECT SUMMARY

The **Walton property** is located at the intersection of Lindsay Creek Road and Gun Club Road in Lewiston, Idaho. Riparian restoration included re-sloping and stabilization of approximately **8,258 square feet** of unstable bank and the re-vegetation of approximately **21,292 square feet** of variable width buffer.

Bank stabilization techniques include the excavation and re-sloping of the stream bank to 3:1 slopes where feasible and 2:1 where space was limited. Erosion control fabric was installed on all exposed banks the entire length of the project. The total disturbed area was seeded with a restoration seed mix, and the area was planted with **350 native shrubs and trees and 1,100 wetland rushes and sedges** to complete the project. 156 feet of fence was installed around the barn paddock area to keep livestock from watering in the creek. Off stream the landowner provided watering. In addition, a gutter was installed on the barn and the outflow pipe was buried during construction to allow for clean water to flow from the roof directly to the creek bypassing the paddock area. Following implementation activities the site was maintained for 4-years. Maintenance included the weeding and re-seeding of the native grasses and subsequent planting. In 2011 an irrigation system was installed and attached to the landowners existing irrigation pump. The site was hydro-seeded to help improve germination of the understory.

COWGER PROJECT SUMMARY

The Cowger project site is located across the street from the Walton property along Gun Club Road. Riparian restoration includes the sloping and stabilization of **788 feet** of eroding stream bank, the re-development of low flow channel and the planting of **18,932 square feet** of variable riparian buffer.

Bank stabilization techniques include the installation of straw wattles and coir logs to stabilize the steepest areas of the stream bank. The total disturbed area was seeded with a restoration seed mix, and the area was planted with **730 native shrubs and trees** to complete the project. Following implementation activities the site was maintained for 3-years. Maintenance included the weeding and supplementation plantings.

NEILSON PROJECT SUMMARY

The Neilson project site is located upstream from the Cowger and Walton Property approximately 1 mile from the Lapwai Road turnoff. Riparian restoration included the planting of **120 native trees and shrubs; 12,000 square feet** of variable riparian buffer. Following implementation activities the site was maintained for 2-years. Maintenance included the weeding and supplementation plantings.

The riparian buffer acts as a filter, reducing overland sediment flows, while filtering nutrients and bacteria generated from upland land use practices. Filter strips are shown to reduce sediment by 65%, total phosphorus by 85%, nitrogen by 70% (PSU 1992), and fecal coliform by 55% (EPA 2003). In addition to filtering pollutants, the established riparian buffer also provides shade reducing extreme summer temperatures.

ESTATES AT CANYON CREST PROJECT SUMMARY

The Canyon Crest Estate project site is located upstream from the Neilson project on an unnamed tributary to Lindsay Creek. Riparian restoration included the installation of ~~4,800~~ **linear feet of riparian fencing**. In addition, PCEI worked with HEDCO engineering on future wetland restoration design. The designs include eight earthen dams and seven cells with 48,000 sq ft of water surface area holding capacity with the goal of reducing nitrogen loading in Lindsay Creek through plant uptake. PCEI will continue to look for additional funding to complete this restoration work.

BEST MANAGEMENT PRACTICES AND PROJECT OBJECTIVES

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.

Exclude livestock from the stream and provide off-stream watering

Objective(s):

- Reduce sediments, nutrients and bacterial inputs from livestock.
- Develop strategy to improve manure management.
- Install harden rock crossing.

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.
-

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.

Involve community members, students and volunteers

Objective(s):

- Organize and implement Tammany Creek Adult Watershed Festival
- Encourage responsible stewardship of water resources and increase knowledge about water quality protection.
- Work with private landowners to achieve water quality goals.

?
WSP 4/5/12

- Promote community involvement in restoration activities.

SCOPE OF WORK AND BUDGET

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 Staff in collaboration with private landowners

Output: Obtain contract and agreements

Milestones:

- Contracts and agreements completed by April 2007.
- Photo monitoring points installed and pre-restoration activities complete by April 2007.

Milestone Indicators:

- Demonstrating successful completion of this task.
- Pre-restoration data obtained.

Task Complete:

Following funding decision and issue of subcontract agreement between PCEI and DEQ, the original landowner on Tammany Creek decided that he no longer wanted to be part of the project. PCEI spoke with DEQ representative John Cardwell who suggested that the money be reallocated to Lindsay Creek. Both Tammany Creek Watershed Advisory Group and the Lindsay Creek Watershed Advisory Group agreed to the modification. Landowners were solicited and in 2007 the Walton family agreed to participate in the project. Landowner agreements were secure. Solicitation of landowner participation continued for the life of the project. In 2009 following the Adult Watershed Festival held at the Walton project site, the neighbors Bill and Joann Cowger agreed to participate in the project. In 2010 Vicki Neilson began her participating and in summer 2011 the owners of Estates at Canyon Crest agreed to participate. Prior to the restoration on any of the sites, pre-monitoring data was obtained which included the installation of permanent photo points.

Cost: \$4,738.97

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 and Idaho Department of Water Resources Alter-A-Stream Channel Permit and EPA NOI Permit.

Responsible Party: PCEI

Output: Complete restoration and outreach plan. All permits obtained.

Milestones:

- PCEI has developed design for projects in collaboration with agency personnel, engineers and landowner.
- Engineers have preformed site visit and surveys to collect necessary data needed to complete permit requirements.

Milestone Indicators:

- Permits are submitted by May 2007.
- Designs are complete by July 2007.
- Permits obtained by July 2007.

Task Complete:

PCEI hired TerraGraphics Environmental Engineers to complete survey and design work for the project. Following project survey and the development of the project designs. PCEI submitted required permits for the excavation portion of the Walton project. Army Corps of Engineers issued a permit on August 12, 2008. State of Idaho Water Resources issued a permit on September 22, 2008 and Nez Perce County Floodplain Development was issued on September 19, 2008. EPA Low Erosivity Waiver Certification was granted in September 2008.

Cost: \$18,665.09

Restoration

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

Responsible Party: PCEI technical staff, subcontractors, private property owners, and community volunteers organized by PCEI.

Output: Stream bank re-sloped and stream bank stabilization revetments installed

Milestones:

- Excavation work is complete September 2007.
- Stream bank stabilization is complete September 2007.
- Necessary stabilization modifications are complete June 2008.
- Post-restoration data collection begins.

Milestone Indicators:

- 2,000 linear feet of stream bank has been stabilized.
- Post-restoration data is obtained.

Task Complete:

In October 2008 PCEI hired Curry, Inc out of Lewiston to complete excavation activities the Walton Project site. 322 linear feet of stream bank was re-sloped using a track hoe. Excavation activities took two days to complete and included the leveling of the barn paddock area and the installation of the gutter overflow piping. Following excavation of the site the disturbed area was seeded with native grasses. Erosion control fabric was installed over the seeded areas. Photos were taken flowing excavation and installation of the erosion control fabric. A total of 1,804 linear feet of stream bank was stabilized during the life of the project.

Cost: \$30,888.87

Task 4: Plant native riparian vegetation

Responsible Party: PCEI technical staff, subcontractors, private property owners, and community volunteers organized by PCEI.

Output: Riparian buffer has been planted.

Milestones:

- Native grass, willow poles and woody plant stock are planted by October 2007.
- Plant success is evaluated.
- Plant protector maintenance and subsequent plantings are complete by May 2008.
- Post-restoration monitoring continues.
- Final planting is complete by October 2008.

Milestone Indicators:

- Vegetation success, photo monitoring and canopy cover monitoring data is gathered.
- 80% plant survival is observed.
- 22,500 square feet of riparian buffer established.

Task Complete:

Planting activities took place on the Walton, Cowger and Neilson properties during the life of the project. Plant protectors were installed on all plants located out of ordinary high flows to help with weed management and to help with survival counts. Survival counts were completed in July 2010 a year following the planting of 350 trees and shrubs on the Walton Project site. A 92% survival rate was observed. A total of 1,200 trees and shrubs and 1,100 wetland rushes and sedges were planted and 45,418 square feet of riparian buffer was planted on all three sites. Canopy cover and photo monitoring data was collected.

Cost: \$66,391.46

Task 5: Educate community regarding watershed issues and riparian restoration.

Responsible Party: PCEI Staff, volunteers and AmeriCorps members.

Output: Organize and implement the first annual Adult Watershed Festival in Lindsay Creek. Publications in newsletters and other media, including community presentations.

Milestones:

- Implement workshop related to small ranching operations and water quality.
- Project is featured in PCEI Newsletter distributed to members throughout Idaho.
- Project is featured on PCEI restoration project database accessible online at www.pcei.org.
- Media is contacted regarding project details and event schedule.

Milestone Indicators:

- Lindsay Creek landowners participate in hands on learning about small ranch management and water quality.
- Over 800 PCEI members throughout Idaho are informed about restoration work on the Lindsay Creek.
- 548 individuals on average view PCEI restoration project database monthly.
- PCEI restoration project featured in the local newspaper.

Task Complete:

*PCEI completed the first ever Adult Watershed Festival at the Walton Project site in summer 2008. The PCEI Volunteer Coordinator appeared on the local television to promote the event and to inform the community about our restoration work in the area. Neighbors and interested community members gathered around the BBQ to listen to music by the local band **Forgotten Freight**. Site tours were given to interested landowners. In addition to the Adult Watershed Festival, PCEI also worked with the local schools to implement a Watershed Festival for 1st, 4th and 6th graders. The students planted trees, learned about wildlife, and the water cycle. Project successes and photo history were updated regularly on the PCEI website <<http://www.pcei.org/water/project.htm?pid=80>>.*

Cost: \$2,063.89

Task 6: Recruit, train and mobilize volunteers.

Responsible Party: PCEI Staff, volunteers and AmeriCorps members.

Output: Heightened public awareness of the restoration and conservation initiatives underway in the watershed promoting community participation and collaboration.

Milestones:

- Local organizations, community groups and schools are contacted regarding participation in volunteer activities.
- Volunteer events conducted during planting field season.
- Intern and volunteer monitoring training complete.

Milestone Indicators:

- 1,250 volunteer hours donated to the implementation of the restoration project.
- 373 intern hours donated to the implementation and monitoring of the restoration project.

Task Complete:

PCEI held 13 outreach events on our project sites engaging volunteers and PCEI interns from the local community in 875 hours of community service. Landowners completed 126 hours of service on the project sites. PCEI educators worked with the Lewiston High School on water quality learning session on the Walton Project site. Students collected data and learned about watershed restoration techniques. They also participated in implementation activities. PCEI participated in numerous community events promoting our restoration work. We set up booths at events such as the Lewiston Earth Day celebration and Alive at Five. Clearwater Paper became a project supporter providing cash match and volunteer labor to our projects on Lindsay Creek.

Cost: \$10,852.08

Task 7: Issue reports according to US EPA grant reporting requirements.

Responsible Party: PCEI Staff

Output: Regular project progress updates and monitoring data submitted to IDEQ.

Milestones:

- IDEQ, LC WAG and the Clearwater Basin Advisory group (CBAG) informed about project progress.

Milestone Indicators:

- Semi annual report complete by October 2007, 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.

Task Complete:

Detailed invoice reports were submitted following implementation activities. This report satisfies final report requirements.

Cost: \$4,738.97

Task 8: Collect, analyze, and report monitoring information.

Responsible Party: PCEI and community volunteers

Output: Inclusion of monitoring information in semi-annual reports and final evaluation

Milestones:

- Monitoring data collected according to monitoring plan and timeline.
- Data entered into PCEI database.
- Data analyzed.
- Data results summarized in reports to IDEQ.

Milestone Indicators:

- Monitoring data and evaluation included in semi annual reports issued October 2007, April 2008, October 2008.
- Compilation of data summarized in final report submitted at the end of contract.

Task Complete:

A monitoring plan was created during the initial planning stages of the project. The plan was designed to support our project goals and objectives and is summarized below. Data summary is included in Table 1.

Cost: \$6,864.11

Task 9: Evaluate project and utilize adaptive management strategies.

Responsible Party: PCEI Staff

Output: Evaluation in reports. Presentation to WAG

Milestones:

- Project goals are evaluated at the beginning of each field season.
- Project implementation techniques and strategies are evaluated throughout the entire contract period.

Milestone Indicators:

- Implementation strategy and timeline modified to maintain project goals.
- Implementation techniques and strategies modified to improve project success.
- Adaptive management findings included in semi annual and reports submitted to IDEQ October 2007, April 2008, and October 2008.
- Adaptive management findings presented to IDEQ, CBAG and PR WAG at the end of contract.

Task Complete:

Adaptive management strategies for this project included the installation of a temporary irrigation system on the Walton project and the installation of wood stakes to secure blue tubes.

Cost: \$4,569.95

MONITORING PLAN

PCEI will work with IDEQ, and the LC WAG to coordinate monitoring at the restoration sites. Monitoring both before and after restoration work is essential for evaluation of the project. Beneficial Use Reconnaissance Program (BURP) surveys conducted by IDEQ before and after restoration will be used to make comparisons and to determine beneficial support status of the stream. Photo documentation will be conducted prior to restoration, during restoration, and to photo monitor stream bank and riparian area conditions after completion. Photo monitoring will continue for at least ten years post-restoration. Volunteers from the community and organizations like AmeriCorps will be enlisted for project monitoring, focusing on quantitative monitoring of sediment wherever possible. PCEI will support high school or college research projects to monitor the results of the Lindsay Creek Riparian Animal Management Project. We will seek funding from other sources to support further monitoring efforts.

A monitoring plan has been designed in order to evaluate both site-specific goals and watershed-wide conditions. Site-specific monitoring will be used to evaluate BMP effectiveness, while watershed-wide monitoring will give us a broader understanding of stream conditions. Since PCEI will have completed three projects within the Lindsay Creek watershed by winter 2012.

Site-specific monitoring includes photo documentation, vegetation establishment, stream bank stability monitoring, and percent canopy cover. Water quality data sharing will help us evaluate watershed-wide restoration success.

Permanent photo-monitoring stations are set up along both restoration sites to document vegetation establishment success and stream bank stability. Photo monitoring protocol will follow USDA Photo Point Monitoring Field Procedures (Hall 2001).

To evaluate bank stability after excavation, photo monitoring will occur following high-flow and in July 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 5-10 years following restoration as resources provide.

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 sets a consistent reference point for comparing changes in growth and production. Canopy density will be evaluated yearly 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.

Both Idaho Department of Environmental Quality's Beneficial Use Reconnaissance data and water quality data gathered by Idaho Association of Soil Conservation Districts will be used to represent pre-restoration conditions. Follow up data collection will be continued by both of these agencies. This data will be necessary to evaluate watershed-wide water quality conditions. Sampling sites are located throughout the South Fork Clearwater River watershed.

In Kind Donations

PCEI donated supplies, vehicle transport, administrative support and direct rent and occupancy costs to the project. PCEI volunteers and interns contributed 875 hours towards planting, weeding and monitoring on the project sites. Landowners contributed hours towards the project success and Aqua Lawn provided hydro-seeding services for a reduced fee. Clearwater Paper contributed towards the education and outreach component of the project providing both in-kind match and volunteer labor. TerraGraphic Environmental Engineers donated the use of their survey equipment to the project. Volunteers donated over 155 hours of volunteer labor to the project. Local businesses also supported volunteer events through the donation of food and beverages.

Walton Project Monitoring

2008 Pre-restoration



2009 Post-restoration



2010 Post-restoration





Pre-Restoration

Steep, eroding banks and lack of native vegetation along the stream characterize this reach of Lindsay Creek.

April 2008



Pre-Restoration

The lack of native vegetation and frequent soil disruption by livestock (buffalo and cattle) has led to the invasion of noxious weeds. Modifying the current livestock management practices will significantly aid in the recovery of Lindsay Creek.

July 2008



Excavation

Both the north and south (shown here) banks were re-sloped to help stabilize the banks and remove weeds to provide suitable planting area to complete the re-vegetation of the stream banks.

October 2008



Hydro-mulching

A hydro-mulch mixture of native and restorative grasses was sprayed throughout the site on all exposed soil. The hydro-mulched grasses will help with the stabilization of the banks and will also help to out-compete invasive species.

October 2008



Erosion Control Fabric

With the help of several student volunteers, over 300 feet of erosion control fabric was installed on steep stream banks to support native plant growth, protect the newly seeded native grasses, and reduce erosion. The fabric, which is composed of hemp fiber and coconut husk, will biodegrade over the course of several seasons.

October 2008



Lindsay Creek Volunteer Work Day

Over 200 native trees and shrubs along with 1,000 wetland sedge and rush plugs were planted thanks to the effort of several Washington State University students, community volunteers and PCEI's own AmeriCorps members!

October 2008



Improved Gutter System

A new gutter system was installed to redirect rainwater from the barn roof to an outflow pipe, which drains directly into Lindsay Creek. The new gutter and pipe system prevents rainwater from running off the barn roof onto the steep banks and through the buffalo pasture reducing erosion, nutrients and bacteria from entering Lindsay Creek.

October 2008



Bank Stabilization

Waddle installation on Cowger property for bank stabilization and erosion control. Later, plants are planted along newly restored banks.

March 2010



Post Erosion Control

The end product after waddles and coirs have been placed in bank for stabilization and blue tubes set over the new plants for protection during Saturday Restoration Event.

March 2010



Canyon Crest Estate Project Site

Trash accumulates on the banks of Lindsay Creek along our project site. Restoration designs will include a series of in-channel wetlands to help reduce nitrogen levels in the creek.

April 2011



International Students Help Clean Site

A group of Scholarships for Education & Economic Development (SEED) Program students from Central America, South American and the Caribbean help prep the Walton site for hydro-seeding and the installation of the temporary irrigation system.

October 2011



Neilson Project Site

Native trees and shrubs were planted along Lindsay Creek. Weed control has been an ongoing challenge on all of our sites along Lindsay Creek. Poison hemlock and scotch thistle are the dominant weed on site.

October 2011



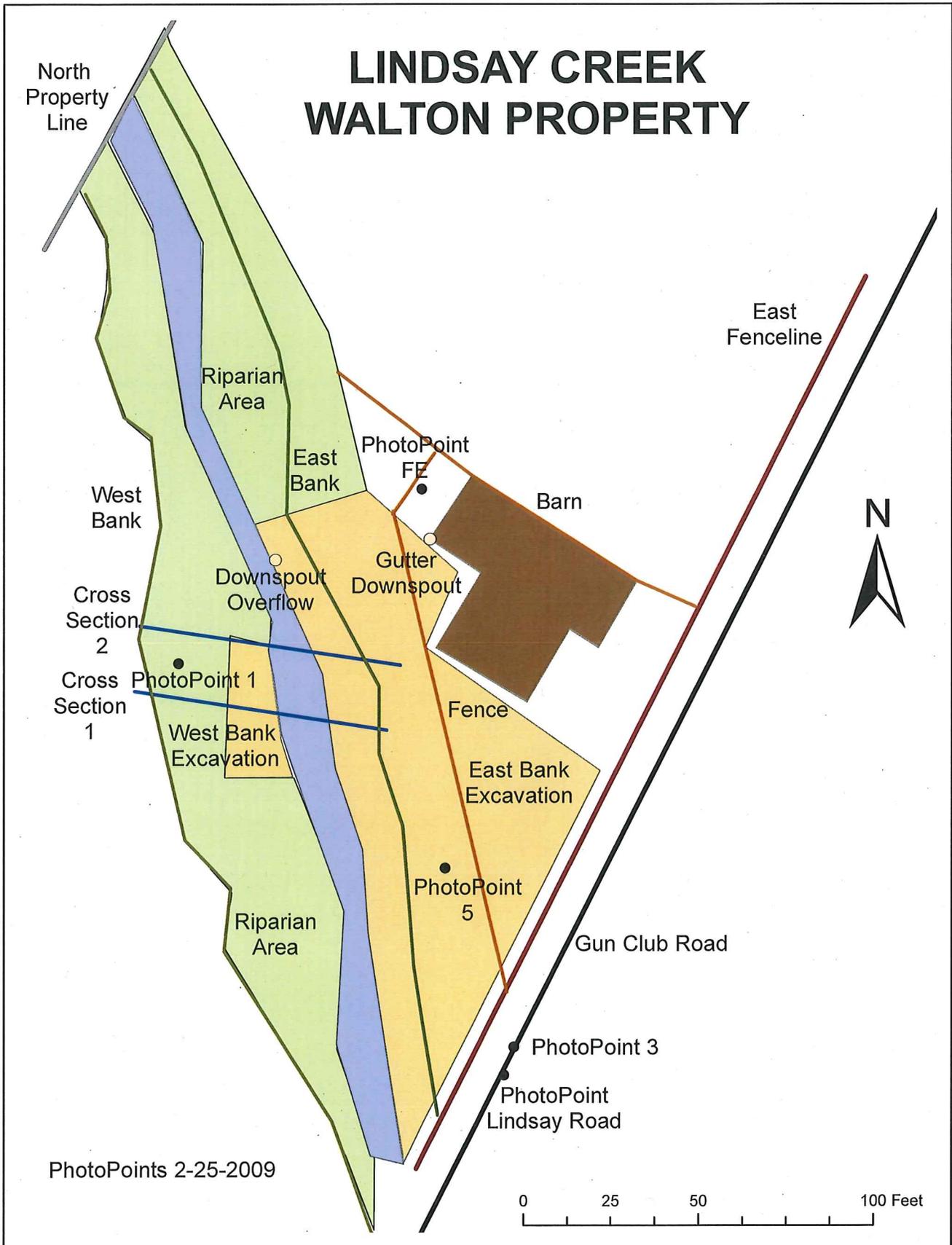
Trash Cleanup Along Lindsay Creek Road

University of Idaho fraternity cleans the piles of trash and debris that litter Lindsay Creek road. Canyon Crest Estates, a PCEI restoration project, borders Lindsay Creek Road.

October 2011

Appendix A

LINDSAY CREEK WALTON PROPERTY

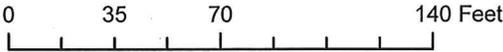
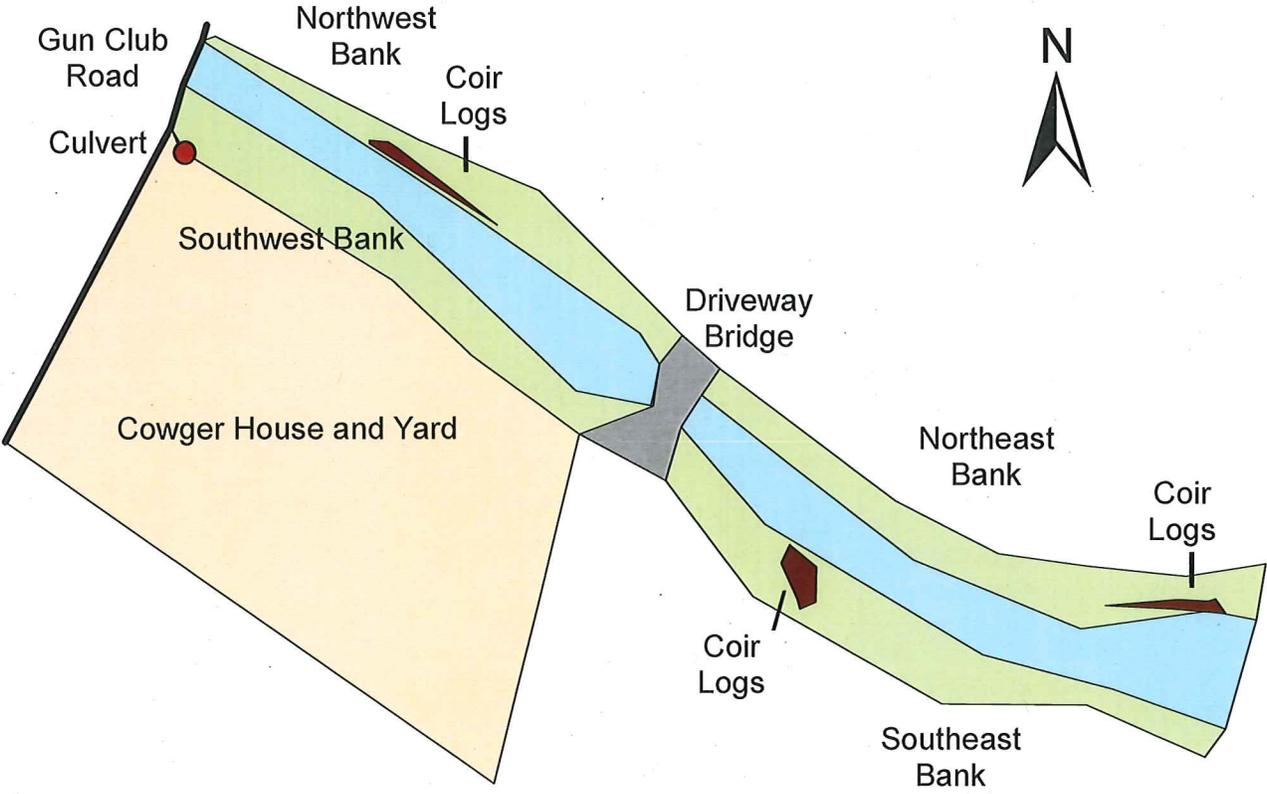


**Appendix B
Walton Project Site Summary Table**

Contract	S227			
Lead Agency	PCEI			
Project Category	Rural			
Owners	Mike and Pam Walton			
Funding	EPA 319			
	Lat	46.4112 N	Long	116.9761 W
Project Installation Date(s)	Excavation September 2008 Planting October 2008-2011			
Project Dimensions	Length (ft)	322	Width (ft)	66
Project Area	Sq Ft	21,292	Acres	0.49
Vegetated Buffer	Square feet	21,292		
Woody Species	350			
Emergent Species	1,100			
Area Grass Seeded	Side 1 (ft) West Bank	730	Side 2 (ft)	13,992
TMDL Parameters of Concern Addressed by the Project	Sediment Nutrients Bacteria Temperature			
Other Benefits	Habitat			
Restoration Practices	Streambank re-sloping and stabilizing Erosion control fabric Native riparian plantings			

Appendix C

LINDSAY CREEK COWGER PROPERTY



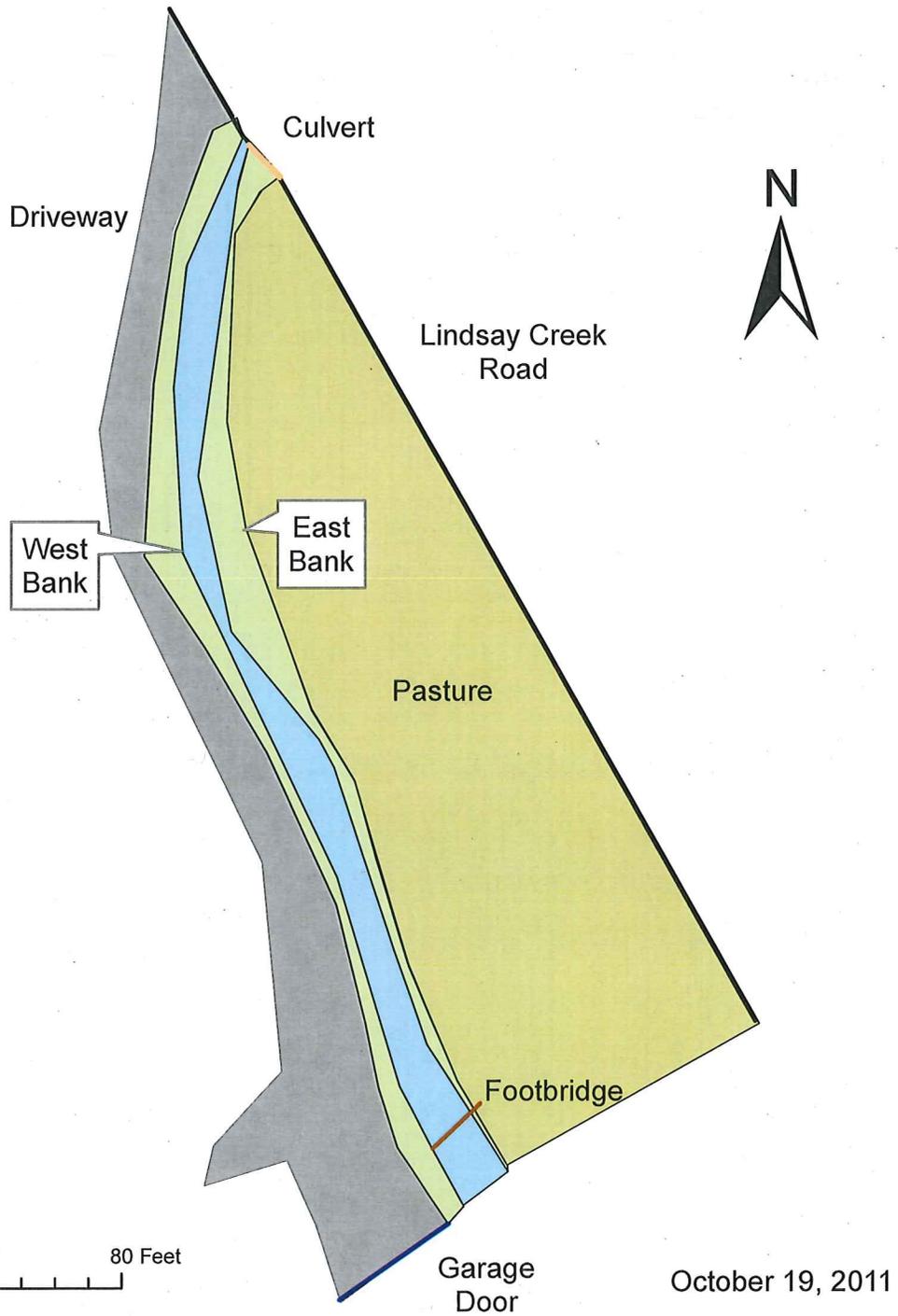
October 19, 2011

**Appendix D
Cowger Project Site Summary Table**

Contract	S227			
Lead Agency	PCEI			
Project Category	Rural			
Owners	Bill and Joann Cowger			
Funding	EPA 319			
	Lat	46.4028 N	Long	116.9656 W
Project Installation Date(s)	Planting October 2009-2011			
Project Dimensions	Length (ft)	788	Width (ft)	24
Project Area	Sq Ft	18,932	Acres	0.43
Vegetated Buffer	Sq Ft	18,932		
Woody Species	730			
Emergent Species	0			
Area Grass Seeded	Side 1 (ft) West Bank	Around areas that were disturbed with the installation of wattles and coir logs	Side 2 (ft)	Around areas that were disturbed with the installation of wattles and coir logs
TMDL Parameters of Concern Addressed by the Project	Sediment Nutrients Bacteria Temperature			
Other Benefits	Habitat			
Restoration Practices	Streambank stabilizing and terracing with wattles and coir logs Brush revetment Native riparian plantings			

Appendix E

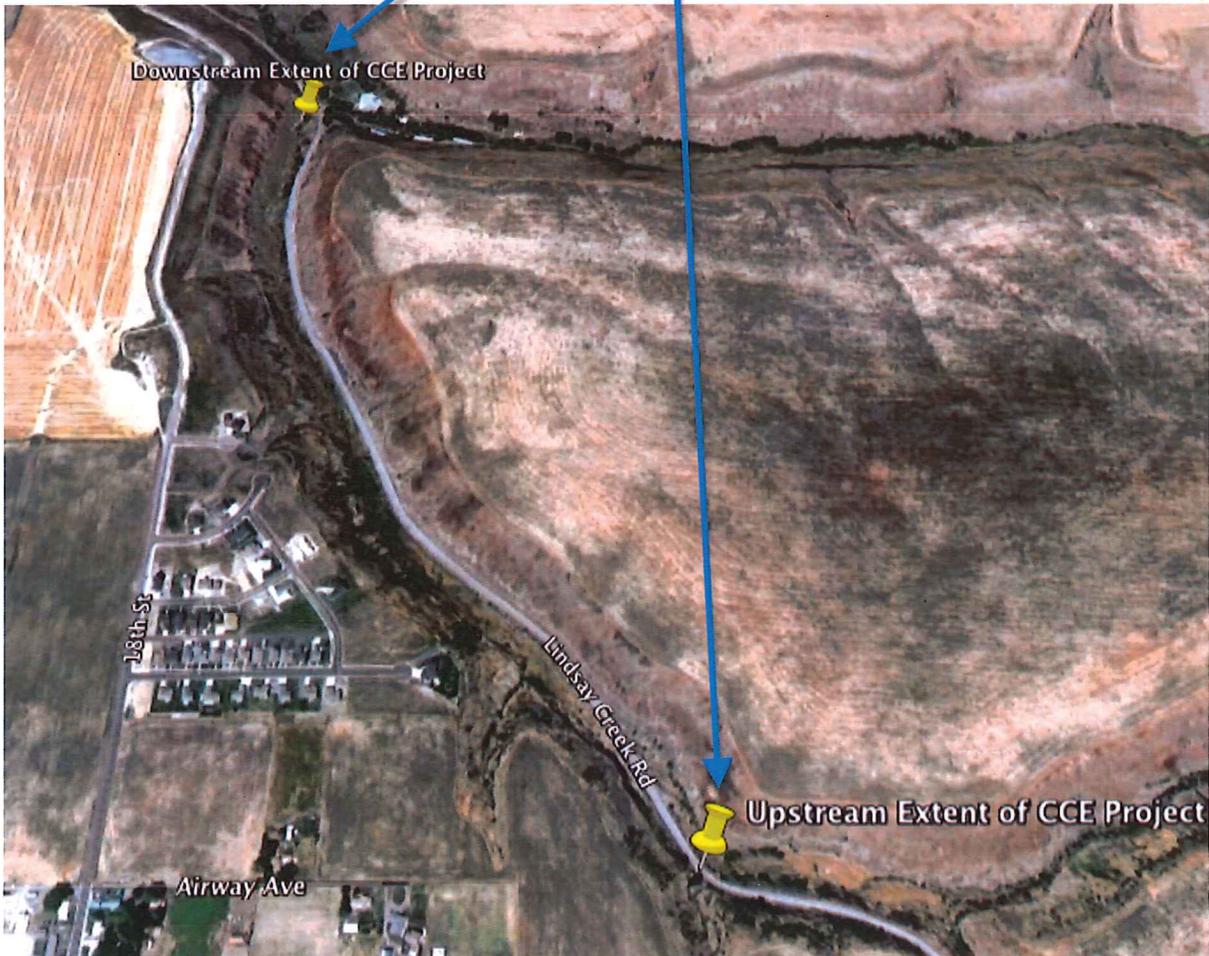
LINDSAY CREEK NEILSON PROPERTY



**Appendix F
Neilsen Project Site Summary Table**

Contract	S227			
Lead Agency	PCEI			
Project Category	Rural			
Owners	Vicki Neilsen			
Funding	EPA 319			
	Lat	46.4105 N	Long	116.9766 W
Project Installation Date(s)	Planting October 2010-2011			
Project Dimensions	Length (ft)	800	Width (ft)	15
Project Area	Sq Ft	12,000	Acres	0.12
Vegetated Buffer	Sq Ft	12,000		
Woody Species	120			
Emergent Species	0			
Area Grass Seeded	Side 1 (ft) West Bank	0	Side 2 (ft) East bank	350; upland area grazed by sheep
TMDL Parameters of Concern Addressed by the Project	Sediment Nutrients Bacteria Temperature			
Other Benefits	Habitat			
Restoration Practices	Weed control Native riparian plantings			

Appendix G Estates at Canyon Creek Project Map



Appendix H
Estates at Canyon Crest Project Site Summary Table

Contract	S227			
Lead Agency	PCEI			
Project Category	Rural			
Owners	Multiple landowners			
Funding	EPA 319			
	Lat	46.3818 N	Long	116.9329 W
Project Installation Date(s)	Fencing and designs 2011			
Project Dimensions	Length (ft)	9,600	Width (ft)	42
Project Area	Sq Ft	409,593	Acres	9.4
Riparian Fencing	Length (ft)	4,800		
Woody Species	0			
Emergent Species	0			
Area Grass Seeded	Side 1 (ft) West Bank	0	Side 2 (ft) East bank	0
TMDL Parameters of Concern Addressed by the Project	Sediment Nutrients Bacteria Temperature			
Other Benefits	Habitat			
Restoration Practices	Riparian Fencing Wetland Designs			

Appendix I Plant List

Trees and Shrubs

Black Cottonwood
Blue Elderberry
Black Hawthorne
Chokecherry
Common Snowberry
Coyote Willow
Creeping Oregon Grape
Drummond Willow
Golden Currant
Kinnikinnick
Mackenzie Willow
Mallow Ninebark
Mountain Ash
Nootka Rose
Oceanspray
Ponderosa Pine
Quaking Aspen
Redosier Dogwood
Rocky Mountain Maple
Serviceberry
Syringa
Thinleaf Alder
Wood's Rose

Grasses

Hydroseed Mix
Basin Wild Rye
Bluebunch Wheatgrass
Idaho Fescue
Indian Ricegrass
Prairie Junegrass
Sandburg Bluegrass
Tufted Hairgrass

Tammnay Creek Dry Mix
Streambank Wheatgrass
Idaho Fescue
Prairie Junegrass
Sandburg Bluegrass
Indian Ricegrass

Pasture Mix
Orchardgrass
Forage Perennial Rye
Timothy
Annual Rye

Herbaceous Perennials

Baltic Rush
Creeping Spikerush
Hardstem Bulrush
Inflated Sedge
Small-fruited Bulrush
Softstem Bulrush
Three-square Bulrush

References

Michigan DEQ. 1999. Section 319 watersheds training manual. Surface water quality division. Nonpoint source unit. Lansing, MI: 59 p.

Rosgen, DS. L. 2004. The cross-vane, w-wier and J-hook vane structures. Their description, design and application for stream stabilization and river restoration. Wildland Hydrology Inc. publication. Accessed online October 2004 <http://www.wildlandhydrology.org>.

STATSGO. 1995. USGS 4th field HUC soil map unit layers compiled from 1994 State Soil Geographic (STATSGO) Database.

Tetra Tech, Inc. 2003. Spreadsheet tool for the estimation of pollutant load (STEPL) User's guide. For US Environmental Protection Agency. Fairfax, VA. 41 p.

Western Regional Climate Center (Web Page). Accessed October 28, 2004. URL: <http://www.wrcc.dri.edu/summary/climsmid.html>.