PCEI Invoice
Final Report
February 2011

South Fork Clearwater River Watershed Riparian Restoration Project
Kirtner Property and Rylaarsdam property

Watershed: South Fork Clearwater River
Stream Name: South Fork Clearwater River
Project Start Date: 5/15/2006
Project End Date: 10/01/2010
Project Status: Complete
Project Code: WCW1
Contract Numbers: S180

Reporting Period	**Final Report**	**Invoice #4**
Local Contact:	Thomas C. Lamar, PCEI	208-882-1444
Regional Contact:	John Cardwell, IDEQ	208-799-3451
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Funding Summary (includes both Kirtner and Rylaarsdam Projects):

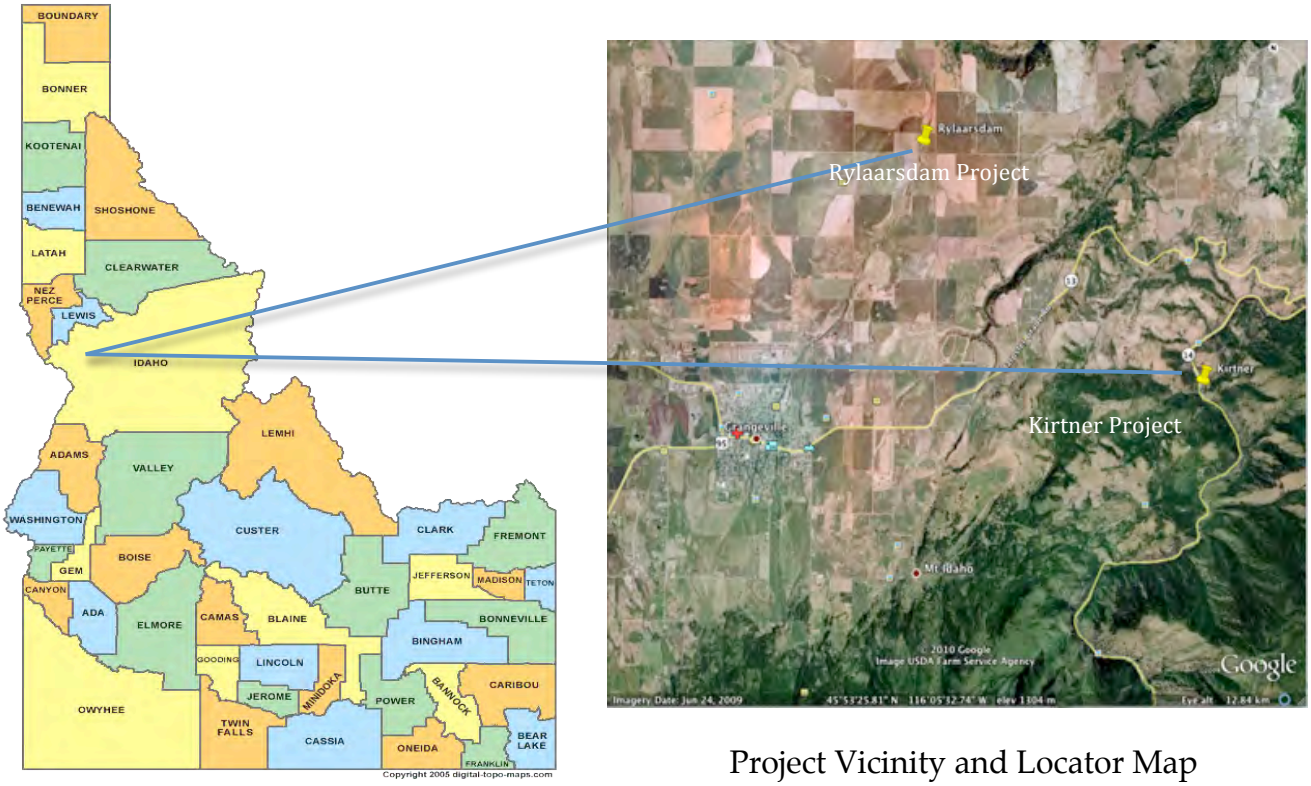
Total Project Budget:	$328,427
Total 319 Grant:	$181,435
Local Match:	$146,992

Location Details	Kirtner Project	Rylaarsdam Project
Latitude	45.9344 °N	45.9761°N
Longitude	116.0081 °N	116.0081 °N
Locale	Main stem of the South Fork Clearwater River near Dewey Mine	Located on Three Mile Creek – Tributary of South Fork of the Clearwater River
Township, Range, Section	T30N R4E Section 18 NE SW	T30N R4E Section 33 SE SE

Target Pollutants:

- Sediment
- Temperature
- Nutrients
- Bacteria

Kirtner Waterbody Type(s): River
Rylaarsdam Waterbody Type(s): Stream
Hydrologic Unit Code: 17060305



Project Vicinity and Locator Map

KIRTNER PROJECT SUMMARY

The **Kirtner property** is located near mile marker 3 on Highway 13 on main stem SF CWR. Riparian restoration included re-sloping and stabilization of approximately **350 feet** of unstable bank and the re-vegetation of approximately **5,500 square feet** of variable width buffer.

Bank stabilization techniques include the excavation and resloping 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. A rock toe was installed on a 100-foot section in order to connect and mimic bank substrate of the South Fork Clearwater River. The total disturbed area was seeded and hydro mulched with a restoration seed mix, and the area was planted with **361 native shrubs and trees** to complete the project.

RYLAARSDAM PROJECT SUMMARY

Completed riparian restoration activities on the **Rylaarsdam property** complement conservation measures implemented by Idaho Soil and Water Conservation District. The methods implemented include the removal of cattle from the riparian area, and limiting water access with fencing. The landowner installed off-stream watering troughs to deter cattle from accessing the creek for drinking water.

Riparian restoration includes the sloping and stabilization of an **3,860 feet** of eroding stream bank, the re-development of low flow channel and the planting of a **68,705 square feet** of variable riparian buffer. Wetland swales were excavated during the restoration process. These wetlands provide additional filtration potential and increase storm water holding capacity.

Bank stabilization techniques included excavating and resloping the stream bank and the installation of coir log and erosion control fabric. The **82,000 square foot** variable riparian buffer was planted with **1,420 native woody, 3,280 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 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.

PROJECT GOALS & OBJECTIVES

1. Restore natural stream channel morphology by creating a low-flow channel, stream banks with gentle slope, and a functional floodplain.

   Objectives(s):
   Reduce erosion by re-sloping stream banks with minimum 2:1 slope.
   Reduce water temperatures with a low-flow channel and pools.
   Reduce water velocity and scouring of stream banks.

2. Stabilize stream banks with erosion control fabric and revetment materials.

   Objective(s):
   Reduce stream bank erosion stabilizing eroding banks using bioengineering techniques.

3. 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 and cover.

4. Involve community members, students and volunteers.

   Objective(s):
   Encourage responsible stewardship of water resources and increase knowledge about water quality protection.
   Initiate stream walk and trash cleanup on the main stem SF CWR to promote community involvement in restoration activities.

Rylaarsdam Project

November 2006: *PCEI AmeriCorps members Courtney Rush and Emily Wolf pose in front of the restoration sign.*

October 2006: *Newly constructed point bar. The restoration plan was designed to mimic the natural meanders of the creek. Stream bank slopes were resloped to a minimum 3:1 in most places.*

April 2010: *PCEI 2010 AmeriCorps members plant willow poles in the wetland near Luke's Gulch road using a stinger and teamwork.*

Pre-Restoration

Kirtner, October 2005: *Eroding bank with be stabilized during restoration efforts in order to reduce sediment loading to the South Fork Clearwater River.*

Construction Phase

Kirtner, October 2010: *Banks stabilized with 3:1 slopes and a rock toe.*

Planting Phase

Kirtner, October 2010: *Sedge mats were installed to help strengthen the toe and stabilize the banks.*

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.

Kirtner Output: Obtain contract and agreements
Milestone: September 2010

Complete
Landowner agreements were secured in 2006. An information packet was mailed to adjacent landowners regarding the scope of the restoration project. Idaho Transportation Department (ITD) was consulted regarding the property adjacent to the Kirtner land. It is believed that the fill ITD deposited downstream exacerbated erosion problems on the Kirtner property and the landowner requested the restoration work to included the ITD land. PCEI staff and TerraGraphics Environmental Engineers met with ITD engineers to review and discuss the project scope and design. Through discussions it was determined that the US Forest Service secured an easement from ITD on the property adjacent to the landowner. The easement was slated for eventual bridge development for access across the river. A bridge was never constructed and litigation between the US Forest Service and the landowner across the river is underway in regards to access.

Discussions continued throughout the life of the project. In September 2010, all constituents were in agreement, and the project was completed.

Rylaarsdam Output: Obtain contract and agreements
Milestone: May 2006

Complete
Landowner agreements were secured in 2006. PCEI worked with scientists from the Soil Conservation Commission and engineers from TerraGraphics on this project. When needed, technical support and guidance was sought from other government agencies and non-governmental organization throughout the project.

Task 1 Cost: **$5,640.69**

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.

Kirtner Output: Complete restoration and outreach plan. All permits obtained.
Milestone: October 2009, September 2010

In 2006 and 2007, landowner negotiations and property boundaries were a primary focus; the permit process was deferred until these issues were solved. In 2008 PCEI Staff contacted the US Forest Service to request access to complete restoration activities; the request was denied. As a result the landowner sent a formal letter to the District Ranger. The USFS rescinded the denial allowing restoration activities to take place on the easement adjacent to the Kirtner Property. Due to the time involved in the land negotiations, restoration activities were not completed in 2008 as planned. A new timeline was developed dependent on the IDEQ approval of a contract extension for the project.

In late 2008 project constituents (Landowner, PCEI, IDEQ, United States Forest Service, Idaho Transportation Department, and Idaho Fish and Game) involved understood the parameters and agreed to move forward.

The project was again delayed in 2009 due to a lengthy environmental assessment process. The Endangered Species Act formal Assessment for the project resulted in the approval of the project by the Department of the Army Corps of Engineers, and the Idaho Department of Water Resources. Once PCEI obtained needed permits and contracts were in place the weather conditions were incompatible with excavation activities. Thus, the authorization process continued into 2010; with turnover in the Forest Service and multiple years of permit extensions, and many project stakeholders, the potential for additional delays was high. Eventually, all key players obliged, and excavation on the project began September 21, 2010.

An outreach plan was developed and is being followed by PCEI. Engineers completed survey and designs for the Kirtner Project in 2007 and 2009. The Army Corps of Engineers and Idaho Water Resources have approved a Joint 404 Permit. Permits were issued August 18, 2006 and September 8, 2010. Each permit was extended for the 2010 commencement of excavation. No Rise Certification requirements have been met. As a result of the required Biological Assessment findings, restrictions were put on the permit requiring us to conduct work during low flow period of September 1 through October 31, 2010. We were unable to meet this requirement due to negotiations with the landowner and USFS, and therefore were not able to proceed with excavation activities in 2006. Site survey and data collection was complete in fall 2008. Data analysis by the engineers determined the added stream bank did not alter the previous No Rise Certification. Approval was granted by USFS to move forward with excavation in September 2010, permit extensions were granted to include the addition stream bank.

Rylaarsdam Output: Complete restoration and outreach plan. All permits obtained.
Milestone: May 2006

Complete

A restoration and riparian protection plan has been developed in conjunction with the landowner and the Idaho Soil and Water Conservation Commission (ISWCC). The restoration plan is complete and has been approved. Restoration activities began in late summer 2006 and continued through fall of 2007.

A 404 Joint Stream Alteration Permit was issued on April 14th, 2006. Water Quality Certification from the Idaho Department of Environmental Quality was issued on May 3rd, 2006. No specific Idaho County permits were required for the project.

Task 2 Cost: **$21,597.97**

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

Kirtner Output: Stream bank re-sloped and stream bank stabilization revetments installed.
Milestone: October 2010

Complete
Excavation activities began on September 24, 2010 and were complete on September 29, 2010. The banks were resloped to between a 2:1 and 3:1 grade. A rock toe was installed and integrated into the bank just at water level to protect the bank and mimic the existing bank conditions on nearby banks.

Rylaarsdam Output: Stream bank re-sloped and stream bank stabilization revetments installed.
Milestone: August 2006, 2007, and 2009

Complete
Excavation activities began on August 28, 2006. After three weeks of re-sloping **3,860 feet of banks**, earthwork was completed on September 22, 2006. Over **6,000 cubic yards** of soil was removed to create more stable stream banks and reconnect the stream with the floodplain. Areas along the stream that were stable were not excavated. The fill soil from excavation was relocated to suitable areas within the project site. The entire area of disturbed floodplain was seeded with grasses and covered with straw or coconut fiber mulch. In lieu of a planned but cost prohibitive culvert or bridge, the landowner opted to install fencing, construct an access road on the far side of the barn, put up gutters on the barn, and move some cattle to make the smaller enclosure suitable. These practices were implemented to meet requirements contracted by the Idaho Soil and Water Conservation Commission (ISWCC). Fencing excludes cattle from the creek providing a suitable buffer. The fencing and manure management plan was designed by the ISWCC and the landowner under a separate state funded grant.

Coir logs were used to create a low flow channel in areas that were uncharacteristically wide. The coir log was used to solidify the toe of the slope and a soil wrap was then used to stabilize the new slope. Erosion control fabric was installed throughout the site along the freshly excavated stream banks. The erosion control fabric provides bank stability during the high flows of winter. Over time the erosion control fabric will biodegrade and the grasses and plant species will then provide the stability necessary to help reduce erosion on the site.

A **29,922 ft^3 volume capacity** wetland system was created throughout the project to filter runoff from an upstream adjacent storm water drain and overland flow erosion. Prior to restoration activities, the storm water would flow directly into Threemile Creek. In addition to filtering overland flows, the wetland will provide valuable wildlife habitat. After only two days, a pair of Blue-winged teal was already swimming the wetland's open water. The wetland was designed to provide a diversity of habitat, including variable water depths and an island for nesting protection.

Additional wetland swales were created throughout the floodplain to provide storm water holding capacity and to help filter overland flows from the adjacent agricultural fields.

Task 3 Cost: **$ 74,957.95**

Task 4: Plant native riparian vegetation.

Kirtner Output

Output: Restoration site is vegetated.
Milestone: September 2010

Complete

Thirty-three sedge mats were installed the entire length of the project. The sedge mats will help stabilize newly sloped banks and add to the function and aesthetics of the project. The project site was hydro-seeded with a restoration mix on September 30. A group of students from the Grangeville school district planted **361 native trees and shrubs** on the banks and top of bank throughout the project site.

Rylaarsdam Output: Restoration site is vegetated.

Milestone: October 2006; May 2007; October 2007

Complete

Vegetation reestablishment began with the seeding of native grasses and emergent wetland plants installed immediately following excavation. Plantings of native trees and shrubs began in early October with the assistance of student volunteers from the Moscow and Grangeville areas. With the help of volunteers and PCEI staff upwards of **1,420 shrubs and trees** were planted on the project site, and approximately **3,280 herbaceous wetland plugs** were planted along the stream and in and near the wetlands and swales. Additional native riparian plantings were installed during community volunteer events, throughout the project timeline. A plant species list was developed with the help of local botanists and included many species already growing in the PCEI nursery.

Task 4 Budgeted Cost: **$45,923.68**

PUBLIC OUTREACH AND EDUCATION

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

Kirtner Output: Publications in newsletters and other media, community presentations.
Milestone: Grangeville School planting, September 2010.

Complete/Ongoing
A project sign installed at the project site in 2006. The project was featured in the Summer/Fall edition of the PCEI Environmental News. A web page was developed to feature project details. The public can view project details at http://www.pcei.org/water/project.htm?pid=70.

Rylaarsdam Output: Publications in newsletters and other media, community presentations.
Milestone: Throughout entire grant cycle; Project site clean-up and prep Spring and Fall 2007, 2008, 2009, and 2010

Complete Ongoing
Landowners within the Threemile Creek drainage were contacted to foster awareness of the restoration project and its benefits. A sign was installed at the project site prior to project implementation to identify the site as a restoration project and provide contact information for the public. A press release was sent out to the local media describing restoration activities, benefits and timeline. Local community groups were contacted and informed about the community events. Flyers were put up in local businesses around Grangeville. Radio announcements were aired to increase public awareness for the project. The project was also featured in our Summer/Fall volume of the PCEI Environmental News and on our website. Additionally, Watersheds program staff developed a poster that highlights this restoration project. This poster was displayed during the 2007 Idaho Environmental Summit in Boise, Idaho (Figure 1). Project details can be viewed by the public at http://www.pcei.org/water/project.htm?pid=68.

Task 5 Budgeted Cost: **$7,250.64**

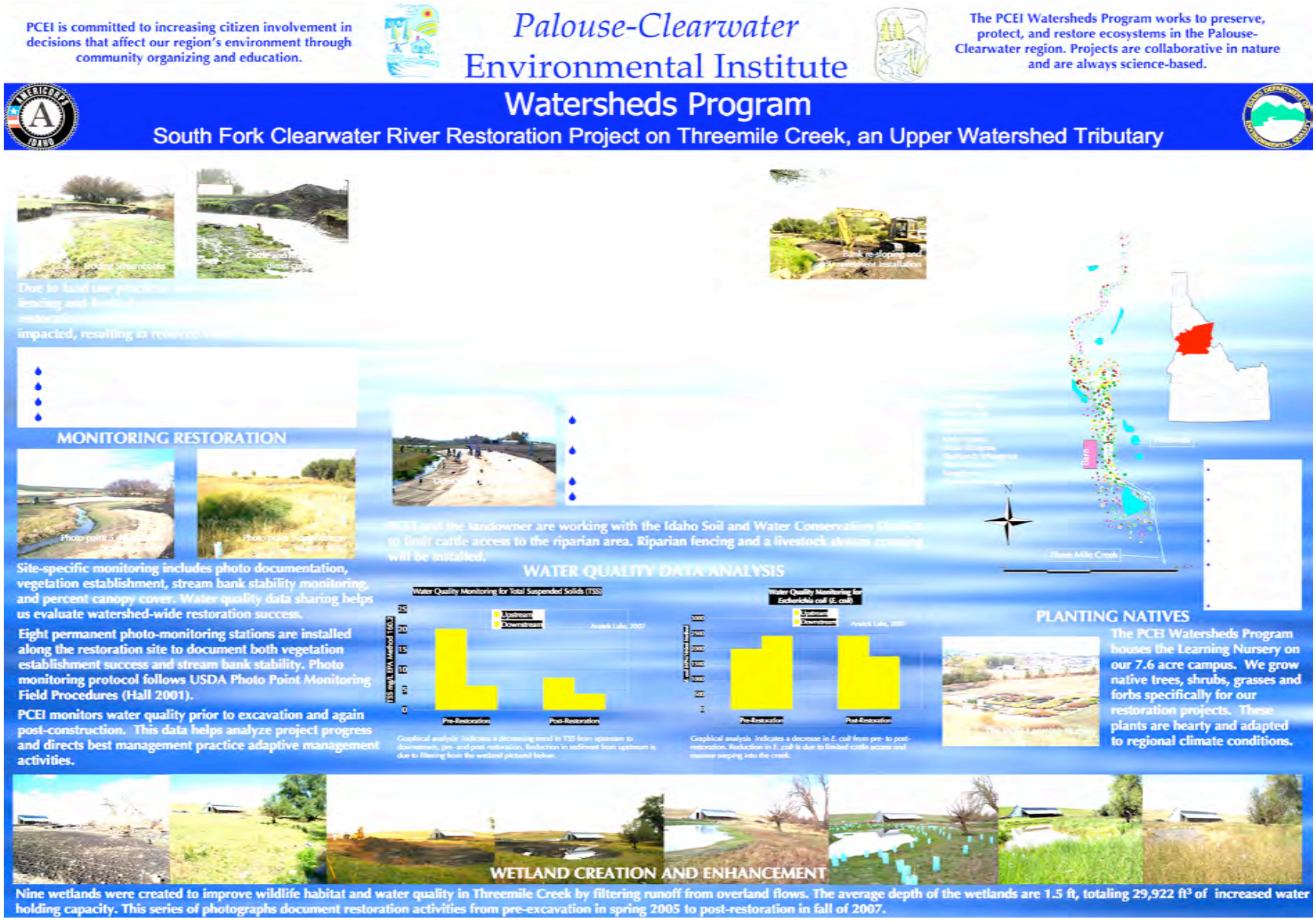


Figure 1: Rylaarsdam Project Poster

Task 6: Recruit, train and mobilize volunteers.

Kirtner Output:

Milestone: Heightened public awareness of the restored reach Planting seasons concluding September 2010.

Complete/Ongoing

Community groups and schools were contacted and informed about our restoration projects. Additional outreach tasks were completed during spring and summer 2008 and 2009. Connections were made with the Grangeville School district, which participated in planting activities in fall 2010. At total of **156 volunteer hours** were donated by area high school students.

Rylaarsdam Output:

Heightened public awareness of the restored reach Community planting days and volunteer activities during planting seasons, 2,430 hours of volunteer time.
Milestone: Planting seasons concluding October 2006, May 2007 and September 2007.

Complete/Ongoing

A total of six volunteer events were held at the restoration site. Volunteers from the University of Idaho Residence halls, Grangeville School District Students, and Community Volunteers helped to plant, protect, mulch and water a total of 1,420 shrubs and trees. Volunteers also helped install 400 linear feet of erosion control fabric to protect the excavated stream banks and seed from high water flows in the spring. A Watersheds Festival was conducted in 2008, highlighting the restoration project, and providing an outdoor experiential education opportunity for area fifth graders. Volunteers put in over **1,491 labor hours** to help PCEI accomplish restoration goals.

Task 6 Cost: **$7,737.23**

MONITORING, EVALUATING AND REPORTING

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

Kirtner Output: Semi-annual reports

Milestone: October 2006, April 2007, and September 2007, and February 2011.
This report satisfies final reporting requirements.

Due to project size limitations, water quality parameters were not determined nor assessed for this project.

Rylaarsdam Output: Semi-annual reports

Milestone: October 2006, April 2007, September 2007, and February 2011.
This report satisfies the final reporting requirements.

Pre and Post Water Quality and vegetation monitoring data was collected throughout the life of the project. Total Suspended Solids (TSS) and E. Coli (Table 1) samples were taken by PCEI staff and AmeriCorps members and assessed by Anatek Labs in Moscow Idaho. When taking water quality data, transects are set, and two samples for each parameter

is taken. PCEI uses the first sample as the official sample, and the second is considered a duplicate for quality control. A relative percent difference was calculated to compare the result from the duplicate is to the official sample. This percentage indicates the accuracy of the sampling methods. Our results indicate that improvements in our sampling techniques are needed.

Table 1: Rylaarsdam Property TSS and E. Coli Parameters

Date	Upstream	TSS (mg/L)	Relative % Difference (field duplicates)	E. Coli (MPN/100ml)	Relative % Difference (field duplicates)	Downstream	TSS (mg/L)	Relative % Difference (field duplicates)	E. Coli (MPN/100ml)	Relative % Difference (field duplicates)
8/17/06	Sample	11.7	72%	2419.2	18%	Sample	8.6	7%	2419.2	0
	Duplicate	20.1		1986.3		Duplicate	8		2419.2	
8/31/07	Sample	17.6	66%	2419.2	0%	Sample	4.77	15%	1986.3	13%
	Duplicate	6.04		2419.2		Duplicate	4.04		1732.9	
7/18/08	Sample	12.6	9%	770.1	25%	Sample	77.3	40%	1046.2	17%
	Duplicate	13.7		579.4		Duplicate	46.2		866.4	

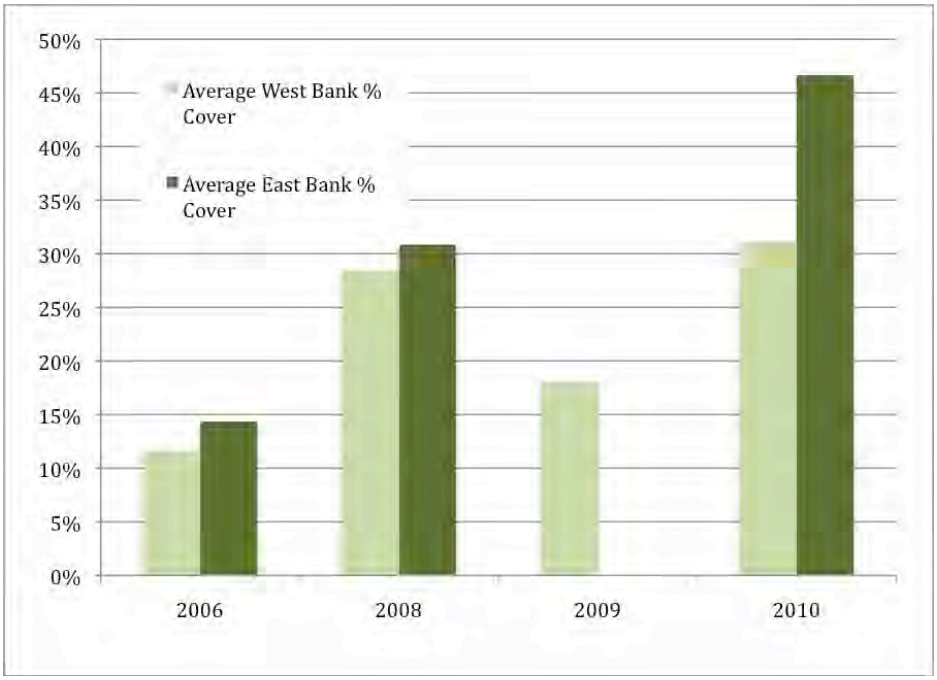
Other parameters are measured onsite by the field crew including Conductivity, Turbidity, pH, Flow, Dissolved Oxygen, and Water Temperature (Table 2). Each value represented in the table is an average of three trials taken in the field. The TMDL set allowable levels for pollutants. Table 2 illustrates Threemile creek water quality in many cases does not meet the set standard. The post restoration conditions are not optimal for aquatic life, nor do they indicate significant improvement in water quality. However we did not expect to see noticeable shifts in water quality due to the size of the project in proportion to the entire watershed. Additionally, land use practices have not changed significantly enough to expect watershed wide improved water quality. Over time PCEI does anticipate that the restoration practices employed in this project will lead to water quality improvements in the parameters measured.

Table 2: Rylaarsdam Property Multiple Water Quality Parameters

Date	Conductivity (mV)	Turbidity (NTU)	pH	Average Flow (ft^3/sec)	Disolved Oxygen (ppm)	Water Temp ($^{\circ}C$)
2008 (US)	290	<5	5.67	0.136	8	21
2008 (DS)	290	<5	5.83	0.094	5.6	15
2010 (US	150	<5	5.83	0.503	10	17
2010 (DS)	290	<5	5.67	0.118	8	21

Vegetative canopy data was also assessed throughout the course of the project (Figure 2). The figure indicates a noticeable upward trend in increased canopy from 2006 to 2010. While PCEI would like to see the increasing canopy cover trend continuing, four years is not enough time to evaluate canopy cover success.

Figure 2: Vegetative Cover



Task 7 Cost: **$5,359.69**

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

Kirtner Output: Monitoring information included in all previously submitted reports.
Milestone: October 2006, April 2006, and October 2

Complete
Pre-restoration activities were conducted in 2006-2009. Four permanent photo-monitoring locations were established at the Kirtner Project. A Monitoring Plan for the restoration project was developed Photos were taken prior to any restoration activities and will be taken regularly throughout the project duration and beyond. Pre- and Post- restoration photographs of two permanent photo points are represented in the photographs below.

A Global Positioning System (GPS) was used to locate the Kirtner project prior to excavation activities in order to develop a map to monitor river activity and success of techniques, as well as to monitor vegetation establishment and succession. The site will be mapped with data from spring 2011 to establish river morphology measurements.

Photo Point 1 Downstream

Pre-Restoration
June 2006
Actively eroding banks with severe undercut with great potential for sediment loading to the South Fork Clearwater River.

During Excavation
September 2010
Excavator shapes banks. The constructed rock toe connects and mimics the native bank makeup.

Post Excavation
September 2010
Students from Grangeville help plant trees and shrubs. The erosion control fabric will help the restoration seed mix germinate and adhere to the banks.

Photo Point 2 Upstream

Pre-Restoration
July 2006
Looking upstream, the in tact rock and sedge toe is noticeable, and the undercut bank extends to just downstream of the red building.

During Excavation
September 2010
Excavated banks were sloped to a 3:1 ratio where possible. The native sedge and rock toe is evident near the red out building.

Post Excavation
September 2010
Newly sloped banks recently hydro-seeded. Sedge mats installed behind constructed rock toe.

Rylaarsdam Output: Inclusion of monitoring information in semi-annual reports and subsequent invoice reports.

Milestone: October 2006, April 2006, October 2007, and December 2010

Complete

A Monitoring Plan for the restoration project has been developed. Six permanent photo documentation points are installed on the restoration site. Photos were taken prior to any restoration activities and will be taken regularly throughout the project duration. Pre- and Post- restoration photographs of three permanent photo points are represented below.

The site was mapped prior to excavation activities in order to develop a restoration design for the site. After excavation was completed the site was re-mapped in order to obtain a more accurate load reduction estimate and to establish baseline stream morphology measurements.

Task 8 Budgeted Cost: **$7,887.76**

Photo Point 1 Downstream

Pre-Restoration

November 2006

August 2008

Photo Point 5 Downstream

Pre-Restoration

November 2006

August 2007

Photo Point 6 Upstream

August 2006

November 2006

August 2007

Task 9: Evaluate project and utilize adaptive management strategies.

Kirtner Output: Evaluation in reports.
Milestone: January 2007, October 2007, and December 2010

Rylaarsdam Output: Evaluation in reports presentation to WAG.
Milestone: Reports: January 2007, October 2007, and December 2010
Presentation: Spring 2007

Complete/ongoing
Project evaluation is ongoing. Following excavation activities the projects will be evaluated for bank stabilization and vegetation establishment success. The monitoring plan details the techniques and timeline for assessing project progress.

Task 9 Budgeted Cost: **$5,079.40**

MONITORING PLAN

PCEI will work with IDEQ, and the SF CWR 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 SF CWR Riparian Restoration 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 two projects within the South Fork Clearwater River watershed by winter 2010.

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 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 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.

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

LOAD REDUCTION ESTIMATES

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) $E = [AE*RLR*DB]/2000 \text{ lbs/ton}$

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 Kooskia, with 24.24 inches per year annual average precipitation for the period of record (Western Regional Climate Center 2004). The soil texture is a sandy loam (STATSGO) with a bulk density of 105 tons per cubic tons of soil (Michigan DEQ 1999). The standard nutrient content of sandy loam is:
- 1.36 pound of phosphorus per ton of soil
- 2.72 pound of nitrogen per ton of soil

(Michigan DEQ 1999).

Table 3: Annual Load Reductions (tons/year)

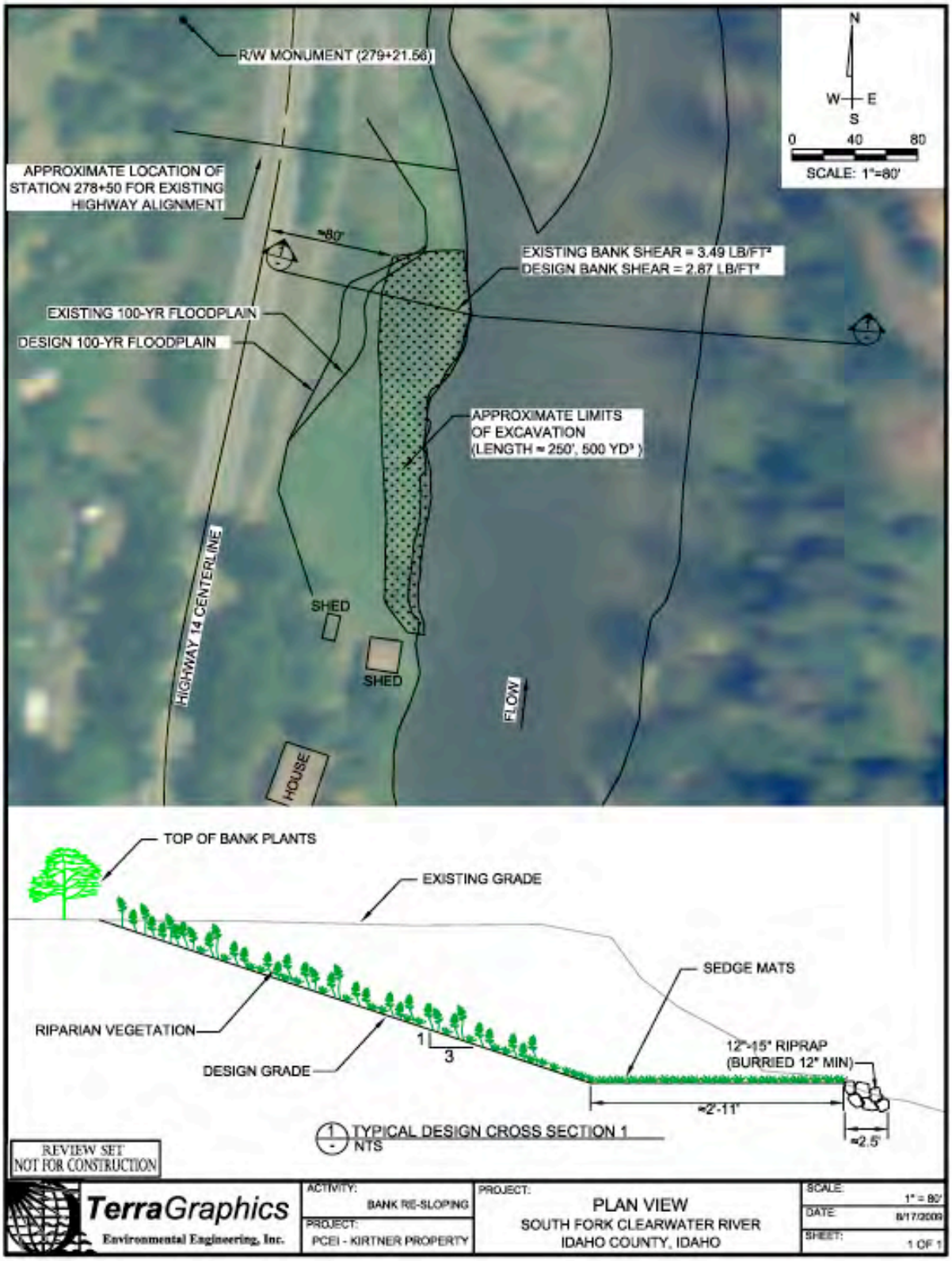
Pollutant	Kirtner	Rylaarsdam	Project Total
Sediment	1,534	1,849	3,383.0000
Posphorus	0.0675	0.8357	0.9032
Nitrogen	1.338	1.9347	3.2727

In Kind Donations

Kirtner Property
The landowner helped PCEI meet match requirement for the project in multiple ways. Two off project sites were used to store project fill, significantly reducing the cost of disposal. Additionally the landowner agreed to grade and seed the fill locations. Due to the remote project location, communication via cell phone and email was limited, but we were granted use of the landline telephone as needed. The use of a laser and level along with a utility trailer were also donated to the project. TerraGraphic Environmental Engineers donated some project supplies 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.

Rylaarsdam Property
The landowner contributed significantly to match requirements for the project. The landowner hired a truck and driver to haul all manure off site and allowed the dirt from the excavation to be placed throughout his property saving the project significantly in costs associated with hauling and disposing of the fill material. Professional Operators, Inc. donated the use of an ATV for seeding and hauling supplies throughout the site. The use of a laser and level along with a utility trailer were also donated to the project. TerraGraphic Environmental Engineers donated labor time to the project. Volunteers and AmeriCorps members donated over 1491 hours for volunteer labor to the project. Local businesses also supported volunteer events through the donation of food and beverages.

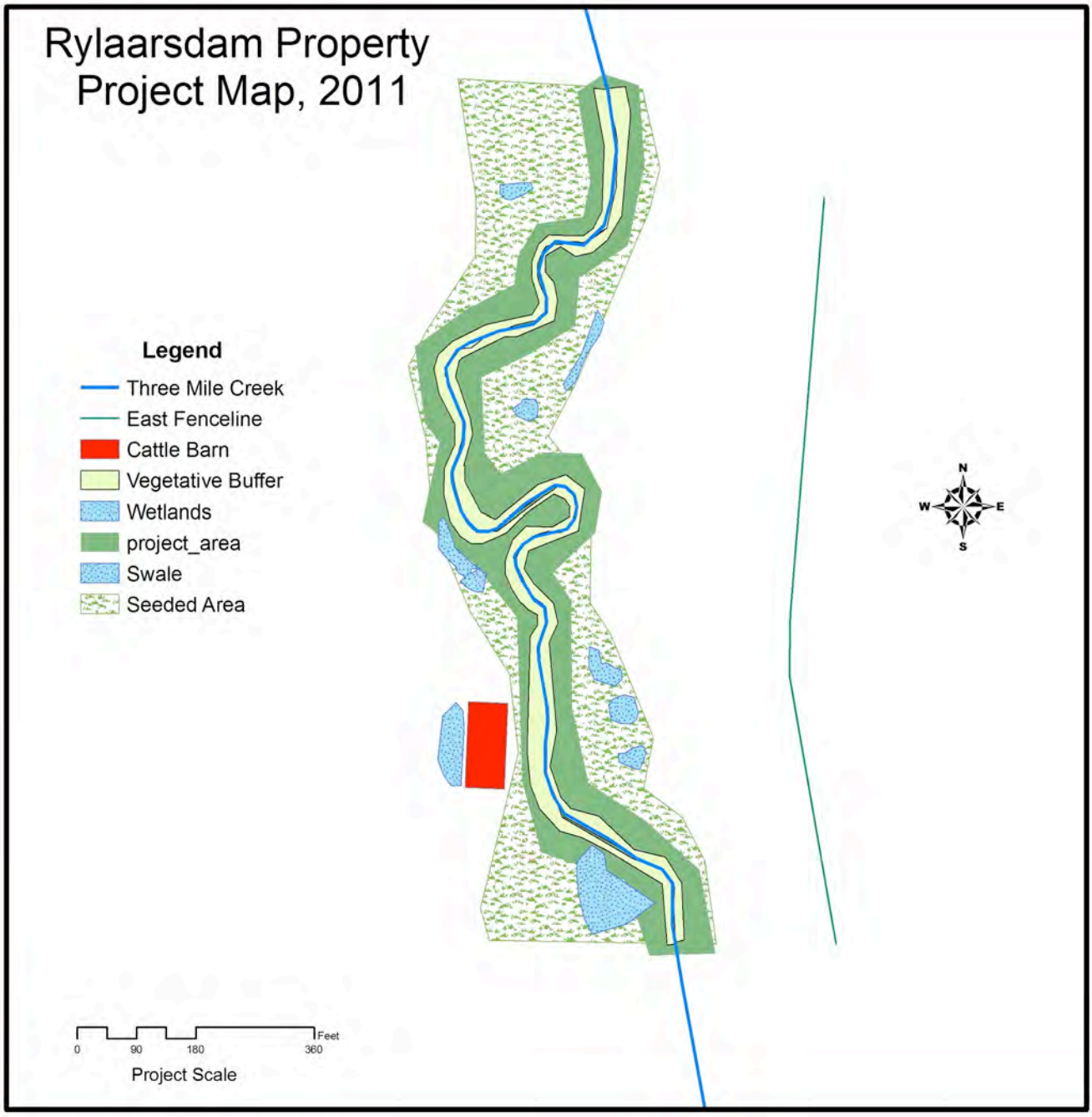
Apendix A
Kirtner Property Project Map and Design



Apendix B
Rylaarsdam Property Project Statistics Table

Contract	S180							
Lead Agency	PCEI							
Project Category	Rural							
Owners	Dick Kirtner and Charles Hopkins							
Funding	EPA 319							
Project Location	**UTM**							
	Lat			**Long**				
	Qtr Sec	SENE	**Sec**	18	**Rng**	4E	**Twn**	30N
Project Installation Date(s)	September 21, 2010 – September 30, 2010							
Project Dimensions	**Length (ft)**	350		**Width (ft)**		35		
Project Area	**Sq Ft**	12,250		**Acres**		.28		
Streambank Sloping and Stabilization	**Side 1 (ft)** West Bank	350		**Side 2 (ft)**		N/A		
Vegetated Buffer	**Side 1 (ft)** West Bank	12,250		**Side 2 (ft)**		N/A		
Woody Species	361							
Emergent Species	33 Sedge Sod Mats each with 4 species of emergent vegetation							
Area Grass Seeded	**Side 1 (ft)** West Bank	12,250s		**Side 2 (ft)**				
TMDL Parameters of Concern Addressed by the Project	Sediment Nutrients Bacteria Temperature							
Other Benefits	Habitat, Safety							
Restoration Practices	Streambank re-sloping and stabilizing Streamside sediment basins Wetland construction Erosion control fabric Native riparian plantings							

Apendix C
Rylaarsdam Property Project Map



Apendix D
Rylaarsdam Property Project Statistics Table

Contract	S180							
Lead Agency	PCEI							
Project Category	Rural							
Owners	Bob Rylaarsdam							
Funding	EPA 319							
Project Location	**UTM**							
	Lat			**Long**				
	Qtr Sec	SE SE	**Sec**	33	**Rng**	R4E	**Twnshp**	T30N
Project Installation Date(s)	August 28, 2006 – September 22, 2006							
Project Dimensions	**Length (ft)**	1,930	**Width (ft)**	35				
Project Area	**Sq Ft**	135,100	**Acres**	1.58				
Streambank Sloping and Stabilization	**Side 1 (ft)** North Bank	1,930	**Side 2 (ft)** South Bank	1,930				
Vegetated Buffer	**Side 1 (ft)** North Bank	38,600	**Side 2 (ft)** South Bank	30105				
Woody Species	1,420							
Emergent Species	3,280							
Area Grass Seeded	**Side 1 (ft)** North Bank	TBD	**Side 2 (ft)** South Bank	TBD				
Wetlands Created: 6	**Area (ft^2)**		**Avg. Depth (ft)**		**Capacity (ft^3)**			
Wetland 1	8,503		2		17,006			
Swales Created: 3	**Area (ft^2)**		**Avg. Depth (ft)**		**Capacity (ft^3)**			
Swale 1								
Swale 2								
Swale 3								
TMDL Parameters of Concern Addressed by the Project	Sediment Nutrients Bacteria Temperature							
Other Benefits	Habitat							
Restoration Practices	Streambank re-sloping and stabilizing Streamside sediment basins Wetland construction Erosion control fabric Native riparian plantings							

Apendix E
Plant Lists

Woody Plants

Kirtner
Black Cottonwood
Black Hawthorne
Chokecherry
Common Snowberry
Coyote willow
Douglas Fir
Drummond Willow
Mackenzie Willow
Ponderosa Pine
Redosier Dogwood
Rocky Mountain Maple
Serviceberry
Sitka Alder
Thinleaf Alder

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

Grasses

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

Rylaarsdam

American Sloughgrass
Bluebunch Wheatgrass
Idaho Fescue
Prairie Junegrass
Tufted Hairgrass
Western Mannagrass

Herbaceous Perennials

Kirtner
Baltic Rush
Creeping Spikerush
Nebraska Sedge
Water Sedge

Rylaarsdam
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

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