RESTORING PARADISE IN MOSCOW, IDAHO

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The Palouse-Clearwater Environmental Institute

Founded in 1986, Palouse-Clearwater Environmental Institute (PCEI) is a regional environmental nonprofit based in Moscow, Idaho serving northern Idaho and eastern Washington. The mission of the PCEI is to increase citizen involvement in decisions that affect our region's environment. PCEI has four established program areas: watersheds restoration, alternative transportation, education and outreach and community agriculture. Through community organizing and education, PCEI assists members of our communities in making environmentally sound and economically viable decisions that promote a sustainable future. PCEI was recently honored as a "Founder of the New Northwest" by Sustainable Northwest for our efforts to combine community development, cultural diversity, and environmental awareness in our programs and projects. Community support and respect for our work is strong. For more information see our website: www.pcei.org.

Improving our Home Watershed: Paradise Creek

In 1989, Paradise Creek was listed as a Water-Quality limited stream by the Idaho Department of Environmental Quality (IDEQ) and the Washington State Department of Ecology (WDOE). The designated beneficial uses protected under Idaho Water Quality Standards are cold water biota, secondary contact recreation and agricultural water supply. Since 1990, Palouse-Clearwater Environmental Institute (PCEI) has directed projects to survey discharge pipes, remeander channel segments, restore floodplains, revegetate riparian areas, stabilize streambanks, construct wetlands and educate our community about the Paradise Creek Watershed.

Paradise Creek is located in the Palouse Basin. The Palouse River is a tributary to the Snake River, the largest tributary to the Columbia River in the Pacific Northwest. Originating from Moscow Mountain (elev. 4,983 ft.), in Latah County, Idaho, Paradise Creek flows southwest for 20 miles, through Moscow, Idaho (elev. 2,520 ft.), ultimately to enter the South Fork of the Palouse River in Pullman, Washington. Average annual precipitation is 24 inches in Moscow, mostly occurring as snow or rain in the winter months. Paradise Creek drains 34 square miles, and is comprised of 55 stream segments, of which 49 flow through agricultural fields. Wetlands associated with riparian areas along Paradise Creek are in poor condition due to past and present management activities such as draining and tiling. In late winter and early spring, melting snowpack and rain fall onto frozen soils causes peak runoff and flood events, with the largest event approximately 1,000 cfs. During periods of low flow, in the summer, effluent from the Moscow Wastewater Treatment Plant (MWWTP) contributes more than 90% of the flow in Paradise Creek below Moscow.

Cropland is the most prevalent land use (approximately 73%) in the Paradise Creek Watershed, but provides the least diverse plant community type. The lack of multi-story riparian vegetation is probably the most limiting factor to restoring a diversity of wildlife species and available

habitat in the watershed. Over 240 species of wildlife are seen in our watershed, including elk, moose, mink, bobcat and cougar, with the greatest diversity found in birds. Over 160 species have been observed, including bald eagles, warblers, long-eared owls, peregrine falcons, and Rufous and Calliope hummingbirds. Historically, Paradise Creek supported cold-water fisheries. Currently, the creek only supports limited pollution tolerant fish species; Redside Shiner, Speckled Dace, Northern Squawfish, Columbian Largescale Sucker and Longnose Sucker.

Today, Paradise Creek is a simplified ecosystem impacted by habitat destruction, excessive sediment, nutrients, high temperatures, altered flow, pathogens and ammonia, which combined, have significantly decreased its biological integrity and impaired its beneficial uses. Negative impacts on the stream continue to increase along with growth in the urban areas of Moscow and Pullman, so that it is becoming even more difficult for the creek to repair itself.

In 1994, PCEI received "Phase One" of the "Paradise Creek Watershed Restoration" grant from the Idaho Division of Environmental Quality and EPA under section 319 of the Clean Water Act to restore the floodplain and streambanks at a site owned by the Moscow School District, and to develop an erosion control ordinance for the City of Moscow (see article in *Land and Water* May/June 1997). Currently, we are in the process of completing "Phase 7," of Paradise Creek watershed restoration, also supported by The Idaho Department of Environmental Quality, which calls for the implementation of the nonpoint source controls to achieve Total Maximum Daily Load allocations, as outlined in the TMDL Implementation Plan, written by the Paradise Creek Watershed Advisory Group in 1999. The project includes: animal waste prevention and treatment wetlands, revegetation of riparian areas in the urban and agricultural environment, streambank stabilization and agricultural land restoration in association with other local agencies and community partners.

East Mountain View Road Restoration Project

This article will focus on our most recent urban restoration project on Paradise Creek located in the City of Moscow. The main restoration objectives for this channelized reach of Paradise Creek included; to reduce the amount of sediment entering the creek from urban runoff and to alleviate erosion occurring along strambanks, the creation of a functional floodplain, and the reestablishment of native riparian vegetation along the channel banks and in the floodplain to create a riparian corridor. The project was planned to be constructed in 2001 but was delayed as a result of increased modeling needs, until this past summer, 2002. Revegetation efforts began immediately following construction in the fall of 2002 and will continue in 2003. Monitoring and maintenance of the site will continue for up to ten years, primarily by community volunteers, AmeriCorps members and University students and professors. Future plans for the site include an educational observation deck and boardwalk and a path through the site for the public

Prior to restoration the 860 ft reach of stream channel had near vertical, slumping, eroding streambanks that were straightened and incised due to dredging activities. The banks were generally steep averaging between 1H:1V and 2H:1V. Near vertical under cut and eroded banks contributed sediment to the creek. Streambanks were either exposed soil or covered with reed canary grass and other invasive weeds. Except for a few non-native willows, the site was completely devoid of riparian species to shade the creek. The reach flows from the east to the

west at the site and the project boundaries were defined as a city road and bridge to the west, a public charter school upstream to the east, an apartment complex with a parking lot to the south and a house and horse pasture to the north.

Working with the City of Moscow and TerraGraphics Environmental Engineering, PCEI designed a restoration plan to increase the flood storage capacity of this reach by lowering the floodplain by two feet and constructing two major meanders, a narrow low flow channel, and associated wetlands. The constructed channel was intended to mimic natural conditions as much as possible. The lowflow channel was designed with a 3 foot bottom width and a depth of 1.5 feet. In addition a revegetation plan was devised, using exclusively native woody and herbaceous species of the Palouse Basin. Approximately two and a half acres of floodplain were created. The goals of this project were ecological as well as societal. We aimed to reduce listed non-point source pollutants (sediment, bacteria, temperature, and nutrients) in Paradise Creek by decreasing sediment delivery by installation of shallow wetlands, and reducing instream erosion by stabilizing severely eroded streambanks and improving aquatic and riparian habitat by vegetating with native plants. This was fundamentally a community based restoration project, designed to raise citizen awareness about water resources and increase stewardship within our community, as well as provide a recreational, educational and aesthetic benefit.

Channel Stabilization

A variety of bioengineering techniques were used for bank stabilization. Bank revetments were placed in scour susceptible zones along outer bend banks. Extensive revetments were required because of the flashy flow regime of this stream and because of downstream sediment concerns. Bank revetments will also ensure the stability of the channel over time, which is a concern that was particularly important with the urban setting of the project. At the upstream end of the project, a log crib revetment was utilized for enhanced bank stability as well as to simulate an overhanging bank for shade and habitat. To stabilize the path of the previous channel a buried log crib revetment was installed. The buried log crib was placed in the newly constructed bank to direct the flow of the water in the new channel. A soil wrap was also placed in front of the log crib. Soil wraps consist of wrapping soil like a burrito and have the added and can be planted into. On the outside of both meander bends 4-5 foot diameter rootwads were installed. On the downstream meander bend, coir logs were used in conjunction with the rootwads, to stabilize the toe of the slope. The coir logs also have the added benefit of being planted with native herbaceous vegetation.

The top of bank of the stream channel was rounded off to make a smooth transition to the floodplain surface. All outside bank slopes were subsequently seeded with a native riparian grass mix and lined with 100% biodegradable geotextile fabric. Erosion control fabric was installed over the top of the slope crown onto the level edge of the floodplain surface. Open weave straw matting was used in lower energy areas; tighter weave coir matting was used in higher energy areas. The coir fabric will retain its structural integrity for at least 5 years, the straw matting for 2-3 years. This will allow time of the establishment of a dense native herbaceous ground cover on all bank surfaces.

A portion of the excavated soil was used to fill in the existing channel, the remainder of the excavated soil (5,000 cu. yards)was moved off site and used by the City of Moscow and the local university.

Wetland Creation

Two newly constructed wetland areas were also created in this project for a total of 5,260 sq. feet of wetlands. Designs called for two shallow oxbow wetlands but when it came to construction one of the wetlands was expanded to include two, for a total of three wetlands. These wetland areas are approximately 1-1.5 feet in depth and have a 5:1 slope on each side. An existing wetland at the site was extended to enhance its habitat. In November of 2002 habitat structures constructed by AmeriCorps volunteers were installed in both wetland areas. The habitat structures were built with salvaged logs approximately six inches in diameter and six to ten feet long and bundled together. They were anchored using wooden stakes and boulders and then filled with wood chips to simulate decaying logs. Four structures were installed in all, two vertical and two horizontal.

Revegetation

Our native revegetation strategy included grass seed, woody and herbaceous stock. Of particular emphasis was the Quaking Aspen (*Populous tremuloides*) - Dougles Hawthorn (*Crataegus douglassi*) riparian plant community, which was historically found along streams and wetlands in the Palouse Basin and is now endangered. Planting commenced immediately after construction. We began by harrowing the floodplain area and seeding an upland seed mix of: 1/3 Idaho Fescue (*Festuca idahoensis*), 1/3 Mountain Brome (*Bromus marginatus*) and 1/3 Secar Bluebunch Wheatgrass (*Agropyrun spicatum*) at a density of approximately one lb per 1000 square foot. The wetland depressions and lower streambanks were seeded with a native wetland mix of:1/4 Bluejoint Reedgrass, 1/4 American Sloughgrass, 1/4 Tufted Hairgrass and 1/4 Fowl Mannagrass at the same density. In addition to native seeding we also experimented with seeding of sterile winter wheat in attempt to gain vegetative cover more quickly.

Planting of over 1,500 woody trees and shrubs was kicked off with the second annual Paradise Creek Watershed festival which included 10 classes of fourth graders from Moscow schools and University of Idaho volunteers. Under the supervision of PCEI staff, the bulk of the planting was completed during the following weeks by volunteers. The following woody species were integrated into the design; Quaking Aspen (*Populous tremuloides*), Dougles Hawthorn (*Crataegus douglassi*) Rocky Mt. Maple (*Acer glabrum*), Thinleaf Alder (*Alnus incana*), Red Osier Dogwood (*Cornus stolonifera*), Serviceberry (*Amelanchier alnifolia*), Syringa (*Philadelphus lewisii*), Chokecherry (*Prunus virginiana*), Nootka Rose (*Rosa nutkana*), Douglas Spirea (*Spirea douglasii*), Common Snowberry (*Symphoricarpos albus*) and Ponderosa Pine (*Pinus ponderosa*). Since our budget allowed we made the decision to focus the planting on larger nursery stock; the majority of woody plants were one, two or five gallon sizes. As is the procedure at all our restoration sites, all woody plants (with the exception of conifers) are protected from rodent damage and browse as well as human feet by, 18 inch blue plastic tree protectors, secured in place by bamboo stakes. Ponderosa pines on site had shorter 6 inch tubes around their base.

Herbaceous plants included: Water Sedge (*Carex aquatilis*), Creeping Spikerush (*Elocharis palustris*), Baltic Rush (*Juncus balticus*), Common Rush (*Juncus effuses*), Daggerleaf Rush (*Juncus ensifolius*), Small-fruited bulrush (*Scirpus mircocarpus*). A total of 1,140 herbaceous plants were planted in 10 cubic inch sizes. In the coir logs plugs were inserted using a dibble. In the areas without coir logs, herbaceous plants were placed along the stream banks, keeping in mind the ecology of each species. In general Water Sedge and Creeping Spikerush were planted in the wettest areas of the streambanks and in the wetlands, with Daggerleaf Rush and Small-fruited Bulrush in the middle zones and Baltic Rush and Common Rush in the drier areas. In addition to the nursery plugs, PCEI staff, interns and volunteers transplanted seventy Blue Flag Iris bulbs (*Iris missiouriensis*) these bulbs were dug up and stored in pots during the Summer 2002 construction season.

Planting at this restoration site will continue Spring 2003. The bulk of this will be native willow cuttings (*Salix drummondii, Salix exigua, Salix lasiandra caudate, Salix mackenzieana*) planted near the top of all streambanks and around the wetlands, especially focusing on potentially unstable areas. Eventually willows, Red Oiser dogwood and other species will provide intertwining root networks for long-term bank stabilization in these areas. Willow cutting will be planted using a hydraulic stinger, which consists of; a 5 foot 1 inch diameter pipe that is connected to a water pump and used by inserting it into the ground to make a hole for each cutting. Cuttings are planted so that 1/3 of the plant is above ground and 2/3 below ground. Also planned for this spring will be additional Red Osier Dogwood and the planting of Cow Parsnip (*Hercleum lanatum*) in association with Quaking Aspen and Douglas Hawthorn communities and possibly, Common Camas (*Camassia quamash)*.

Community Partners

Hundreds of volunteers from the Moscow community made this project possible and will continue their stewardship and enjoyment of the project site for years to come. A total of $143,500 of in kind match has been generated to date. Idaho Department of Environmental Quality nonpoint source grant funds expended on the project total $132,000. The amount of match for this project far exceeds the 40% requirement. Partners and local match include: TerraGraphics Environmental Engineering, AmeriCorps*NCCC, City of Moscow, WSU Environmental Science Students, Moscow Elementary School Students, Synthetic Industries, and Community Volunteers.

Lessons Learned

As is always the case with restoration project designs, our actual construction in the field did not completely mirror the design on paper. A few modifications were made based on site conditions at the time of construction. These included enlarging one of the planned wetland areas to include two shallow depressions. At the time of construction for the last log crib revetment the design was a bit more flexible compared to the upstream structures and was built based on availability of materials. Also during construction, coir logs were an added between rootwads on the downstream meander bend.

In December of 2002, we observed some small rills forming near the top of the outside, upstream meander bend. The rills were forming as a result of standing water in the floodplain and

probably exacerbated by impervious surfaces adjacent to the project. We were concerned about the erosion undermining the stability of the rootwad revetment and erosion control fabric below. So, on the morning of our first snow we rented a mini excavator and dug out the problem area, and placed cobble and boulder sized rocks in the depression. Moscow has been experiencing a mild winter with lower than average snowfall and we expect this trouble section to remain stable.

Our first high water event occurred after 3 inches of rain over two days at the end of January 2003. The creek swelled to the top of the new channel and flowed overland in much of the floodplain. After the water subsided all revetments and plants remained intact.

Overall we are pleased with the success of this restoration project and we are especially appreciative of the community support it has enjoyed. As is the nature of land rehabilitation the primary determining factor in achieving habitat and stabilization goals is time. We are eager to watch this project grow and become a sustainable natural system within the City of Moscow. The extent to which the project met the stated objectives will be evaluated through further monitoring efforts by PCEI, the University of Idaho and additional project partners. Use of the term, restoration is debatable since we are not truly restoring this piece of ground to a former more pristine state. Rather we are attempting to restore the functions of the creek by providing a functioning floodplain and associated wetlands, a diverse meandering stream channel, and native Palouse Basin habitat in a setting that has much public benefit.

Resources on the Internet:
Palouse-Clearwater Environmental Institute: www.pcei.org
TerraGraphics Environmental Engineering: www.tgenviro.com
Idaho Department of Environmental Quality: www.deq.state.id.us
United States Environmental Protection Agency: www.epa.gov
The University of Idaho: www.uidaho.edu
The City of Moscow: www.ci.moscow.id.us
AmeriCorps*NCCC: www.epa.gov