Rock Creek/Boulder Creek Volunteer Restoration 2011 Final Report

Implemented by

Wildlands Restoration Volunteers

November, 2010 - June, 2011

Note: This report covers one of multiple phases of both the Rock Creek and Boulder Creek Volunteer Restoration Projects. The continuation of the larger restoration effort affecting many miles of stream and the larger watershed could be continued for 5-7 years assuming sufficient funding can be obtained.

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Rock Creek and Boulder Creek Timeline:

Project Planning and Project Team Coordinating ---------- October, 2010 – June, 2011
Volunteer Leader Training ---------- November, 2010 – May, 2011
Volunteer Recruitment ---------- December, 2010 – June, 2011
Technical Design ---------- February – April, 2011
Materials Acquisition ---------- April, 2011
Project Implementation ---------- April – June, 2011
Project debriefs/evaluation ---------- June, 2011

Each year, WRV scouts dozens of sites that could eventually qualify for a WRV project. There are always more projects to do than resources allow, so choices must be made. These choices are made primarily by the WRV Project Selection Committee. This committee reviews all the potential projects for a given year and then ranks them. Each committee member ranks the projects from most favorite to their least favorite. These rankings are combined into a master ranking. WRV staff and committee members then evaluate the list to determine how many projects, from the top down, WRV can realistically accomplish with the resources likely to be available in the coming year. This list is presented to the Board of Directors for final approval.

The Rock Creek and Boulder Creek projects were among a slate of many projects approved for implementation in 2011 by a committee of 35 WRV volunteers in October of 2010. Committee members were asked to evaluate projects on many levels, including ecological importance, overlap with WRV's mission, logistical requirements, available partnerships to help, leadership needs, financial resources needed and available, geographic availability, number of obstacles to project completion, number of volunteer-days necessary to complete the project, the ability of the project to satisfy volunteers, and how the project would complement others in the WRV project season.

During the 2011 training season, WRV volunteers and staff trained 206 volunteers in a variety of roles for mentorship, who then were encouraged to co-lead with more experienced volunteers and staff at a variety of projects. Two well-attended events were held for the purposes of leadership and general volunteer recruitment in February of 2011. Further recruitment for the entire WRV project calendar was done through outreach events at Boulder Creek Festival, Boulder Creek Fest, Niwot Market, Rhythm on the Rails – Niwot, Rhythm on the River – Longmont, Peace Corps 50th Anniversary gathering – Boulder, CU Boulder – Peace Corps meet and greet, Colorado State Capitol – Outdoor Stewardship Day – April 21, New Vista High School – Volunteerism/Career Day, CSU Career Day – Fort Collins, Denver – Colorado & Company, REI – Denver flagship store, CU Boulder –Sewell Honors Program, REI –Boulder Adventure Film Festival, Naropa, and Micro Brews for the Environment. Finally, facebook posts on WRV's ~400 member fan page, and emails to WRV's 4,500-member listserv on dates approaching the project.

Project teams were assembled including volunteer leaders with extensive expertise, and met multiple times prior to project dates for planning.

Rock Creek Project Team:
Jean-Pierre Georges, Project Lead
Gregg Campbell, Technical Advisor
David Hirt, Technical Advisor, BCPOS
Barb Kirchner, Tool Manager Loading
Jarret Roberts & AmeriCorps, Tool Manager
Nancy Martin, Project Support Cook (PSC)
Stacey Fowler, PSC
Sue Percifield, PSC Lead
Jarret Roberts, WRV Staff

Boulder Creek Project Team:
Ian Oesser, Project Lead
Steve Johnson, Technical Advisor
Eric Fairlee, Agency Liaison
Phil Dougan, Tool Manager
Sue Percifield, PSC Lead
Dick Lindenmoyer, PSC
Ed Self, WRV Staff

CHRF Grant 2010 - Wildlands Restoration Volunteers Budget

Project	Task	Match	Cost
Rock Creek Riparian Restoration	Staff (project leadership, site visits, design, planning, vol recruitment, post project eval/monitoring)	$86,625	$5,112
Rock Creek Riparian Restoration	Materials (plants, erosion matting, seed, amendments, mulch, etc.)		$7,356
Rock Creek Riparian Restoration	Transportation (for truck to haul tools/materials and staff mileage @ $0.40)		$127
Rock Creek Riparian Restoration	Food to Feed Volunteers ($7/day/vol)		$245
Rock Creek Riparian Restoration	Other Construction (labor and materials)	$127,658	
Rock Creek Riparian Restoration	Project Implementation (volunteers)	$14,720	
Rock Creek Riparian Restoration	Tools and Equipment	$700	$500
Rock Creek Riparian Restoration	Training for volunteers (crew leadership, project leadership, riparian and wetland restoration skills, project support, first aid, etc.)--12 essential trainings and mentorship for over 250 volunteer leaders, many directly engaged with this project		$1,500
Rock Creek Riparian Restoration	Volunteer Appreciation (awards program, celebrations)		$300
Rock Creek Riparian Restoration	Accident Insurance for Volunteers		$400
Rock Creek Riparian Restoration	Postage, printing and misc. office costs		$200
Rock Creek Riparian Restoration	Overhead		$2,361
Subtotal - Rock Creek		**$229,703**	**$18,101**
Boulder Creek Riparian Restoration	Staff (project leadership, site visits, design, planning, vol recruitment, post project eval/monitoring)	$7,500	$3,100
Boulder Creek Riparian Restoration	Materials (plants, erosion matting, seed, amendments, mulch, etc.)	$5,000	
Boulder Creek Riparian Restoration	Transportation (for truck to haul tools/materials and staff mileage @ $0.40)		$167
Boulder Creek Riparian Restoration	Food to Feed Volunteers ($6/day/vol)		$490
Boulder Creek Riparian Restoration	Project Implementation (volunteers)	$6,304	
Boulder Creek Riparian Restoration	Tools and Equipment	$600	$200
Boulder Creek Riparian Restoration	Training for volunteers (crew leadership, project leadership, riparian and wetland restoration skills, project support, first aid, etc.)--12 essential trainings and mentorship for over 250 volunteer leaders, many directly engaged with this project		$1,000
Boulder Creek Riparian Restoration	Volunteer Appreciation (awards program, celebrations)		$150
Boulder Creek Riparian Restoration	Accident Insurance for Volunteers		$200
Boulder Creek Riparian Restoration	Postage, printing and misc. office costs		$50
Boulder Creek Riparian Restoration	Overhead		$803
Subtotal - Boulder Creek		**$19,404**	**$6,160**
TOTAL		**$249,107**	**$24,261**

WRV Project Planning:

Once specific projects are selected and scheduled, a leadership team is assembled to plan and implement the project, typically including a project leader, technical advisor(s), project support cooks, crew leaders, agency liaison, tool manager, and a project medic. WRV staff collaborates with many skilled volunteers with professional backgrounds in ecology, botany, hydrology, and civil engineering in the planning and design process. Teams typically meet once or twice in the months before a volunteer project and conduct 2-3 field visits to complete technical designs and logistical plans. Detailed technical specifications are prepared and reviewed by the public land agency partner(s). The site is flagged and staked, as appropriate for hand labor or equipment operators. Crew leaders and other project leadership staff meet in the weeks before the volunteer event to finalize logistical plans to help ensure a safe, smooth project implementation phase. After completion, the team evaluates each project in logistical and ecological categories.

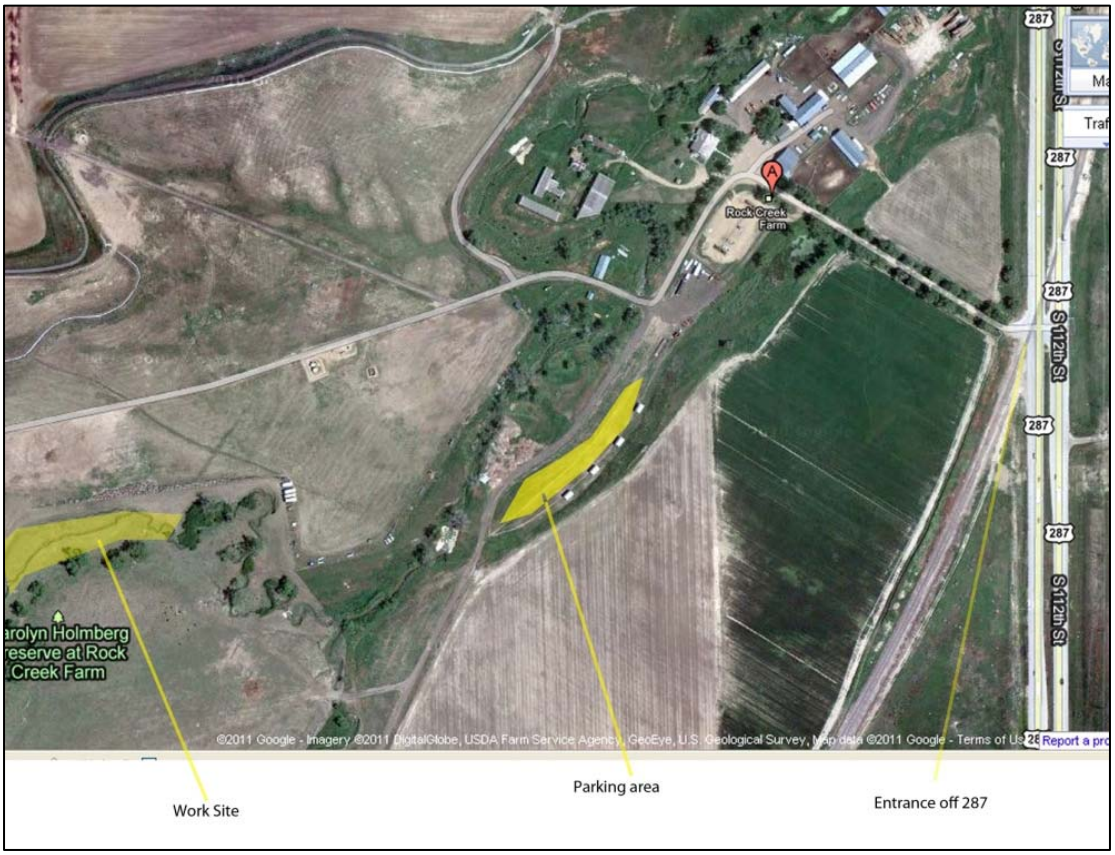
Rock Creek Project Summary:

The Rock Creek site is located within the Carolyn Holmberg Preserve in Boulder County, CO, west of Highway 287 approximately 2 miles north of US-36. The purpose of the project was to help stabilize the banks of the newly restored Rock Creek channel.

Boulder County Parks and Open Space (BCPOS) and the Urban Drainage and Flood Control District (UDFCD) engaged a consultant to design a new and stable stream channel. A contractor then excavated a new channel, after filling in the old channel, and installed erosion matting along the banks of new channel. The matting will help reduce the likelihood of erosion during storm events until the vegetation along the new channel has matured.

As part of the implementation of the plan, Wildlands Restoration Volunteers (WRV) coordinated volunteers on a planting project with the following objectives: 1) Restoration of 1.5 acres of native riparian habitat along 800 linear feet of stream; 2) Conversion of a non-native plant dominated system to a native plant dominated system; 3) Approximately 7,000 native trees/shrubs planted; 4) Completion of approximately 90 volunteer days, yielding 800 volunteer hours valued at $16,680.

Rock Creek will benefit from the development of a natural and sustainable streamside plant community that will reduce sedimentation, protect banks from erosion, increase wildlife diversity and moderate stream flows. The root structure of these plants will help hold the stream banks in place and the plants will create valuable riparian wildlife habitat for species such as the northern leopard frog, a species of state concern.
David Hirt, Plant Ecologist, represented BCPOS at the volunteer event, answering questions and checking volunteer work. Hirt has overseen the project since inception.



Rock Creek Background:

Land development along Rock Creek has led to extensive stream-bank and bed erosion due to increases in the volume and rate of runoff. Additional surface flow linked to the upstream presence of the Town of Superior's water treatment plant has led to instable channel morphology and notable changes in stream hydrology. The stream channel was straightened to aid in agricultural production, a practice that has led to increases in average stream velocities and 3-4 feet of erosion in the streambed. Historical grazing practices and coal mining activities in the watershed also led to deterioration of riparian areas and stream health. While mature stands of cottonwood and peachleaf willow were still supported, changes observed in Rock Creek's morphology had reduced the suitability of the area for new establishment of woody hydrophytic wetland and riparian species.

This photo shows the erosion of Rock Creek stream banks, prior to restoration work.

The down-cutting of the stream channel has caused the elevation of the water table along the stream to drop, thereby drying out the associated riparian area. If left alone, the down-cutting would have continued moving upstream until the channel hit an impenetrable area, e.g., bedrock or large cobbles. BCPOS, along with the UDFCD, has been working to restore this and other sections of Rock Creek to a stable, natural stream channel near the original stream channel.

In 2003, BCPOS hired a team of consultants to complete a conceptual stream restoration master plan for all of Rock Creek through the Carolyn Holmberg Preserve at Rock Creek Farm. The team of consultants included ERO Resources, Holdeman Landscape Architecture, and Moser and Associates Engineering. Recommendations on stream restoration were made based on aerial surveys, a review of existing hydrologic reports and stream flow data, analysis of the watershed and hydrological changes from upstream urban development, and channel stability analysis with hydrologic modeling (HECRAS). Rock Creek Farm 3 rated a low functioning condition due to lack of pools and riffles, sufficient root mass to withstand high flows on less than 50% of the stream bank, severe bank erosion, narrow riparian zone, a single age class of trees, and low species diversity.

In 2007, BCPOS partnered with the UDFCD and the Colorado Division of Wildlife (CDOW) to further study this specific reach of Rock Creek, and to develop construction designs. Dr. David Cooper, a wetland and riparian ecologist at Colorado State University, was brought in to study the groundwater for potential wetland creation/restoration and to support the development of a restoration design. Groundwater wells were installed and monitored over two years from 2007 through 2008. Temporary structures were constructed in the stream to determine the effect on groundwater. The purpose of this work was to determine the proper elevation of the new stream in order to elevate groundwater to support wetlands and riparian area. In 2009, the hydrology study was completed by Dr. Cooper and the information was used to help assist in the stream restoration design.

Engineers from Short Elliott Hendrickson Inc. (SEH) were contracted to conduct engineering studies and to develop technical construction plans for stream restoration. Data was gathered by SEH on a reference reach of Coal Creek, a stream that parallels Rock Creek in the same watershed, to develop a natural stream design for the restoration of Rock Creek. A detailed survey of Coal Creek was performed to gather information on stream channel bed profile, channel cross-sections, and plan form. Four cross-sections were surveyed along the reference reach; two were located at riffles and two were located at pools. An aerial photograph of Coal Creek was also used to determine plan form, more specifically, the average belt width and meander length of the channel. A pebble count was performed in three locations, two riffles and one pool, along the reference reach. Hydraulic calculations were then modeled after the Coal Creek reference reach for the Rock Creek reach to be restored. In early 2010, 90% construction designs were completed by SEH.

In 2005, the first phase of a stream restoration project on Rock Creek was completed downstream of this project site on the same property. The current reach is upstream of the previously restored site. At that time, WRV volunteers planted over 5,400 wetland plants. Then with help from the Healthy Rivers Fund in 2010, WRV returned 3 miles up-steam to plant over 1,400 native shrubs and willows in a newly restored section of the stream channel. As part of BCPOS' larger effort to restore the entirety of Rock Creek, in 2011, with the help of the Healthy Rivers Fund, volunteers planted over native 500 willow poles, 20 trees, 40 native shrubs, and nearly five thousand wetland plugs to restore another newly recreated stretch.

Rock Creek Methodology:

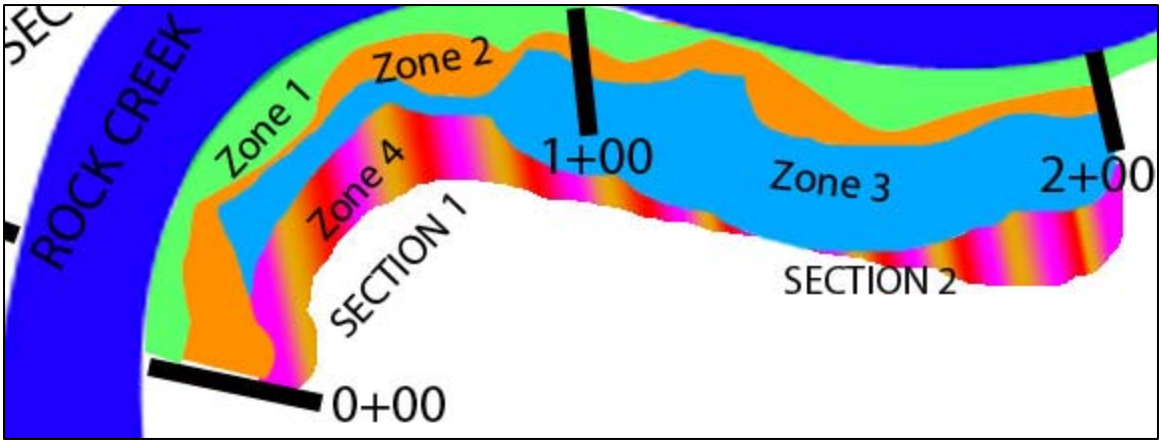
Work was planned by BCPOS, which engaged multiple partners for implementation; WRV implemented planting and seeding as part of a larger watershed restoration project.

Seventy-two volunteers, including 12 AmeriCorps members, planted approximately 30 trees (5-gallon stock), 600 willow stakes, and 5,600 containerized grasses, rushes, and sedges (10-cubic inch stock), as wells as seeding along the re-created banks of Rock Creek. Additionally, Boulder County directed their Youth Corps to plant 2,058 plants purchased by WRV.

Trees and container plants were staged in the middle of the work area. To help increase success, willows were harvested on site, allowed to soak in order to help develop roots, and staged in the pools along Rock Creek. The planting area was divided into four different zones based on environmental requirements of the different species. Zones were delineated using colored flagging tape pinned to the ground. All staged containerized plants were separated into proper planting zone groups at the staging area, each group clearly labeled with a sign designating its proper zone.

The table below summarizes the plant species used and the planting zone they now occupy**.** Professional ecologists David Hirt and Gregg Campbell determined species and zones.

Species	**Zone**	**Color**	**Size**	**Number**
Sandbar willow	1	Lime Green	2-4 ft long	600
Emory's sedge	2	Orange	10 cu in	1058
Prairie cord grass (driest)	2	Orange	10 cu in	364
Nebraska sedge	3	Blue	10 cu in	588
Common three –square	3	Blue	10cu in	1323
Field sedge (driest)	3	Blue	10 cu in	294
Western wheatgrass	4	Pink	10 cu in	1764
Alkali sacaton	4	Pink	10 cu in	98
Plains cottonwood	4	Gold Flag	5 gal	20
Peach-leaf willow	4	Red Flag	5 gal	10



This was the first time this flagging technique was used at WRV. Survey results and project debrief notes show volunteers and leaders were happy with the results and recommend its use again as necessary.

Most containerized plants and willow stakes were planted through erosion mat. Wherever possible, matting fibers were stretched rather than cut to place plants. The nominal distance between plantings for all species except willows was 18 in (1 ½ ft). Distance between willows is 2 ft. BCPOS provided pre-cut wire mesh for protective tree collars. Volunteers used hollow-probe dibbles to dig holes for wetland plants, which were then planted by hand, one by one. Care was taken to ensure air pockets were not left next to plant roots in all cases.

Volunteers plant according to flagging and staging of plants at Rock Creek on April 16, 2011.

Rock Creek Results:

Objective 1)	Restoration of 1.5 acres of native riparian habitat along 800 linear feet of stream.
Achievement 1)	Restoration of 1.1 acres of native riparian habitat along 1,600 feet of stream. When wetland habitat is included, this rises to 1.4 acres of habitat restored.
Objective 2)	Conversion of a non-native plant dominated system to a native plant dominated system.
Achievement 2)	Planting continued the process of establishing a native-dominated system along the stream bank. The objective will take years to achieve, since the hills surrounding the riparian zone are covered in weeds, however, the areas seeded and planted seem to be doing quite well.
Objective 3)	Approximately 7,000 native plants/shrubs/trees planted.
Achievement 3)	Approximately 7,835 plants, shrubs and trees planted.
Objective 4)	Completion of approximately 90 volunteer days, yielding 800 volunteer hours valued at $16,680.
Achievement 4)	Completion of approximately 72 volunteer days, yielding 706 volunteer hours valued at $14,720.

Previous to this planting project, existing plants were uniform in age and type from the top to the bottom of the bank. The new meander added habitat area, and a mix of species was intentionally zoned for diversity along the bank. Some plants were chosen intentionally to benefit northern leopard frog, and in general the riparian community is now more structurally and biologically diverse.

Survey results showed no major injuries, satisfied volunteers, a smooth project completion, and that the educational component, a Birds of Prey talk provided by partner group Birds of Prey Foundation was incredibly well-received. A project debrief meeting was held to go over survey results and make conclusions. Recommendations for future project teams included:

- Emailing technical notes to crew leaders at least a week in advance of a project
- Holding crew leader orientation meetings on-site when locations are near volunteers' residences
- Videoing a site-visit and publishing on YouTube when locations are further away
- Bringing one lopper and two more shovels per crew would be ideal
- Using photos of this project to demonstrate good use of detailed flagging
- Repeating the method of having return volunteers raise their hands and pairing them to say hello to first-time volunteers

Overall the project was very well executed, and two volunteers were recommended for new leadership positions as part of the process.

Rock Creek Monitoring:

As of June, 2011, David Hirt of BCPOS visually estimated transplant survival rates at 85%, with the highest survival rates at the lowest levels of stream bank, especially the *Carex* species. Photo points were created during the project for before-after sequences to provide qualitative estimates of treatment effect over time.

Continued monitoring will be necessary to evaluate long-term success, giving the trees and shrubs time to grow and wetland plants time to establish. The following information will be gathered in the future:

- In 1-2 years, transplant survival rates will be estimated to determine the success of the planting plan and its response to the existing hydrologic, climatic, and soil conditions. This monitoring will be undertaken by agency staff, and subsequent plantings scheduled if survival rates are not up to par.

- The contractor took aerial photos and a second set is planned to be taken to show differences before and after volunteer work at the site.

- Within the next year, the UDFCD must monitor the site to demonstrate at least 70% of vegetation is restored for the Colorado Storm Water Management Permit required to construct the meander, as well as an Army Corps of Engineers Permit.

The Agency does not plan to formally monitor lateral stream migration, changes in meander patterns, or channel degradation. However, periodic site visits by agency staff will assess these variables subjectively to determine if goals were met or if future adjustments are needed.

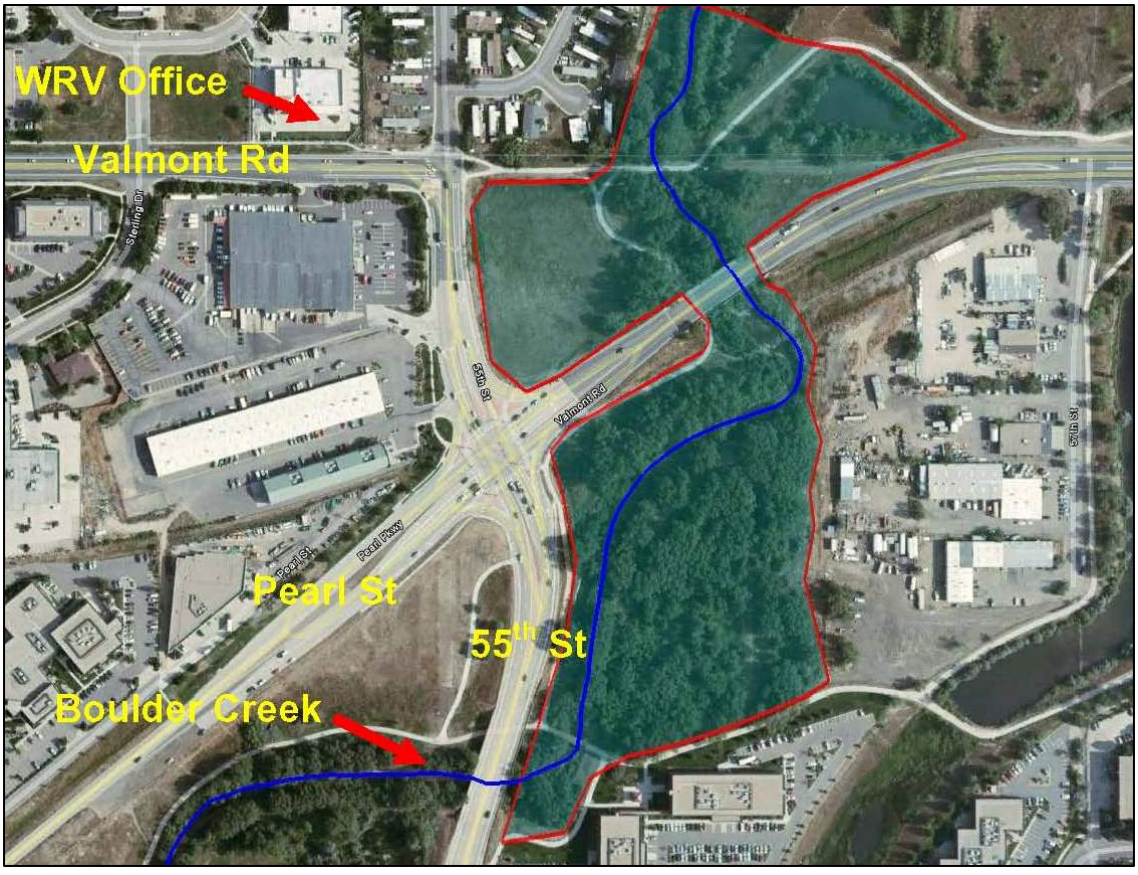
Follow-up photo at photo-point shows general seeding and planting success as of June 29, 2011 (reference photo on page 10).

Boulder Creek Project Summary:

WRV implemented this project in order to improve riparian habitat on Middle Boulder Creek, near the intersection of 55th Street and Pearl Parkway in west Boulder, between November of 2010 and June of 2011. The project continued the restoration and enhancement of 6 acres of riparian habitat bordering 1,500 linear feet of Middle Boulder Creek. WRV staff and pro bono consultants (volunteers) worked with City of Boulder Open Space and Mountain Parks (OSMP) to carry out technical design, implementation, and monitoring of the site. WRV assisted in restoration design, recruited the volunteers, trained volunteer leaders, planned and executed volunteer work at the site, and provided on-site environmental educational programs.

The site was composed of mostly non-native riparian forest, which more closely resembled an eastern U.S. forest than a native Colorado Front Range riparian forest, with a native plains riparian community. In 2010, OSMP and WRV had worked to remove many non-native woody trees and shrubs and selected understory noxious herbaceous weeds. The primary woody species which were removed include Russian olive, crack willow, eastern box elder, and green ash. An estimated 300 trees per acre will eventually be removed. A minimally treated buffer was left near bike paths and along Pearl Parkway to reduce public concern about tree and shrub removal.

In 2011 with the help of the Healthy Rivers Fund, WRV initiated a project with the following objectives: 1) Restoration of 6 acres of native riparian habitat along 1,500 feet of stream; 2) Conversion of a non-native plant dominated system to a native plant dominated system; 3) Eight exotic species removed from 6 acres; 4) Approximately 2,000 native trees/shrubs planted; 5) Completion of approximately 100 volunteer days, yielding 900 volunteer hours valued at $18,765. Eric Fairlee represented OSMP at the project.



Boulder Creek Background:

The Boulder Creek watershed encompasses approximately 447 square miles in the geographic center of the upper reaches of the South Platte Watershed, and includes the quickly-growing communities of Boulder, Erie, Lafayette, Louisville, Nederland, Superior and parts of Arvada, Broomfield, and Frederick. Stream flow has been monitored on Boulder Creek at the Orodell gauging station since 1906. After flowing through St. Vrain Creek, the water influenced by the Boulder Creek Watershed finally reaches the South Platte. The flow of Boulder Creek is driven by the snow pack near the continental divide, and so varies substantially from one season to the next. Peak flows typically occur in June and low flows occur between October and March.

Some segments of Boulder Creek have been put on the 303(d) list (impaired stream) for E. coli and ammonia, and some have been put on the M&E list for aquatic life because of those contaminants as well as selenium and chromium VI. Surrounded in the proposed work-site by urban development, contaminants from human activities gather on impervious surfaces until a storm washes them into nearby storm drains, and then, untreated, into Boulder Creek. While all of Boulder Creek is considered safe for swimming, contaminant levels peak right after storms.

In this area, historic wetlands had been degraded or eliminated and much of the historic native plains riparian community had been replaced by a non-native mixture of trees, with substantially reduced value to wildlife. The non-native tree canopy was unnaturally dense, overly shading the ground and preventing native understory shrubs, grasses and wildlife from thriving (see picture at left). About 50 fish species, 18 of which are non-native, inhabited Boulder Creek as of 2006. Unfortunately, rainbow trout, brown trout, and brook trout were stocked in Boulder Creek and out-compete the native greenback cutthroat trout (a Threatened species) inside the city of Boulder. Additionally, two introduced species, the New Zealand mudsnail, and the Eurasian watermilfoil, threaten ecosystems in Boulder Creek, and diatomaceous blooms have resulted from human alteration of its natural flow.

WRV's agreement with the City of Boulder to formally "adopt" this section of Boulder Creek and provide a certain amount of work each year is the first of its kind in the area. It is hoped that this type of agreement can be replicated by other organizations, and since WRV encourages collaboration with multiple partnerships with other groups our efforts will create more opportunities to participate in active stewardship.

The creek will benefit from volunteers' creation of a natural and sustainable streamside plant community that will increase wildlife diversity.

Boulder Creek Methodology:

Work was planned and implemented by WRV using a collaborative approach to watershed conservation. The Boulder Creek project changed between design and implementation because a pair of Cooper's hawks had been frequently witnessed circling part of the original planned project area during the month before implementation. As a result, the scope was reduced on the original reach and work was begun on the next phase of the project in a different reach of Boulder Creek in order to avoid impacting potentially nesting raptors.

Specifically, a number of volunteers were asked to switch to a different project, and those who arrived were split into three groups. One group hand-watered 1,100 plants that had been planted on the southern edge of the site in 2010 and 2011, and installed a drip-line to water 300 plants until they mature. A second group planted approximately 350 native trees and shrubs next to the creek, including ~50 chokecherry, ~25 plains cottonwood, ~ 25 peach-leaf willows, ~ 50 golden currants, and ~200 coyote willow container plants provided by the City of Boulder. A third group drug Russian olive and crack willow branches out of a marsh to easy access for a chipper run by City staff. The branches had been cut by a volunteer leader, seasonal staff and an AmeriCorps crew before the project day.

Boulder Creek Results:

Objective 1)	Restoration of 6 acres of native riparian habitat along 1,500 feet of stream.
Achievement 1)	Six acres along 1,500 feet of stream received some form of treatment, whether transplanting, cutting, or watering. This project was one in the continuation of a process to restore these 6 acres.
Objective 2)	Conversion of a non-native plant dominated system to a native plant dominated system.
Achievement 2)	Hand-watering of approximately 1,100 native plants from a WRV project in 2010, and installation of a drip line for approximately 300 native plants continued the process of converting an exotics-dominated system to a native-dominated system.
Objective 3)	Eight exotic species removed from 6 acres.
Achievement 3)	Slash cut and piling of crack willows over 2 acres continued a process to remove eight exotics targeted over 6 acres. WRV will continue to work to achieve this objective in future years.
Objective 4)	Approximately 2,000 native trees/shrubs planted.
Achievement 4)	Approximately 350 native trees and shrubs were planted
Objective 5)	Completion of approximately 100 volunteer days, yielding 900 volunteer hours valued at $18,765.
Achievement 5)	Completion of approximately 27 volunteer days, yielding 243 volunteer hours, valued at $5,066. Completion of 4.5 AmeriCorps Member days and one volunteer day, yielding nearly 50 volunteer hours valued at $1,238. Total in-kind labor and expertise valued at $6,304.

The site visit as the project date approached was very important, as that was when the Cooper's hawks were witnessed, which significantly reduced the scope of the project by preventing chainsaw work through August 15, and caused a bit of scrambling between partners to alter the location and avoid disturbing the hawks. Planting and watering went forward in a smaller zone. Some watering was done by hand instead of using more vehicles with tanks. Slash cutting and piling of the two acres of Russian olive and crack willow on the other side of Valmont had not been planned for another year, but are part of the larger restoration goals for the Boulder Creek Adopt Site. Luckily AmeriCorps crew members were available to cut trees with the help of a volunteer sawyer in advance of the volunteer event. The staff of EcoProducts, a local business partner, joined the volunteers on Earth Day to pull the slash out of a marsh for chipping.

Follow-up actions planned include two day projects in July of 2011 and one day project in October of 2011, and many projects at Boulder Creek in coming years. July, 2011 volunteer activities will mostly involve continued exotic species removal, both trees and biennial weeds, and in October volunteers will plant more native plains cottonwood,

peachleaf willow, western snowberry, wood’s rose, wild plum, western chokecherry, sandbar willow, and golden currant.

Boulder Creek Monitoring:

As of June, 2011, Eric Fairlee of OSMP visually estimated plant survival rates at 90%.

Continued long-term monitoring will be necessary to accurately evaluate the effectiveness of restoration treatments. The following information will be gathered in the future:

- Six GPS photo points were created at the Boulder Creek site during 2010 for before-after sequences and general visual qualitative estimates of plant community makeup. Photos were taken and additionally 4-5 photo points will be created in additional work areas as work progresses along the Creek.

- In the short term (1-2 years), plant survival rates will be visually estimated to determine the success of the planting plan, and vegetation response to existing hydrologic, climatic, and soil conditions. The diversity and abundance of specific shrubs and trees established will be used to project future structural diversity (i.e., the diversity of high, mid, and low canopy layers) along the restored riparian areas, based on known heights and architectures of the established species. This monitoring will be undertaken by agency staff, and subsequent plantings scheduled if survival rates are not up to par.

- City staff will visit the site to qualitatively estimate need for future weed management, which would be implemented by WRV on a maintenance basis.