

Silver Bow Creek

REMEDICATION & RESTORATION OF SILVER BOW CREEK

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A Superfund Success Story

The cleanup of Silver Bow Creek has been ongoing since 1999 as part of a Superfund remedial action coordinated by the Montana Department of Environmental Quality (DEQ) in consultation with the U.S. Environmental Protection Agency (EPA). In 2000, the Natural Resource Damage Program (NRDP) of the Montana Department of Justice and the Greenway Service District (GSD) formed a partnership with DEQ, bringing a restoration component to the project that goes beyond the remediation (cleanup) required under Superfund. Since 1999, much of Silver Bow Creek has been transformed from a severely injured, nearly lifeless stream to an ecosystem that is recovering its original character and value.

PROJECT BACKGROUND



1908 Flooding of Silver Bow Creek

Contamination History - Silver Bow Creek extends from Butte approximately 22 miles to the Warm Springs Ponds, the headwaters of the Clark Fork River (see Map, page 5). Since the late 1880's, tailings and other mine wastes containing high concentrations of metals were discharged directly to Silver Bow Creek and redistributed through a massive flood in 1908 and other flood events. These toxic discharges impacted the stream and floodplain with heavy metals and virtually eliminated aquatic life in the stream. Tailings deposited in the floodplain are toxic to plants and resulted in a floodplain that was largely devoid of vegetation and generally incapable of supporting wildlife.

Remedial Response - In 1983, EPA listed the Silver Bow Creek/Butte area as one of multiple Superfund sites in

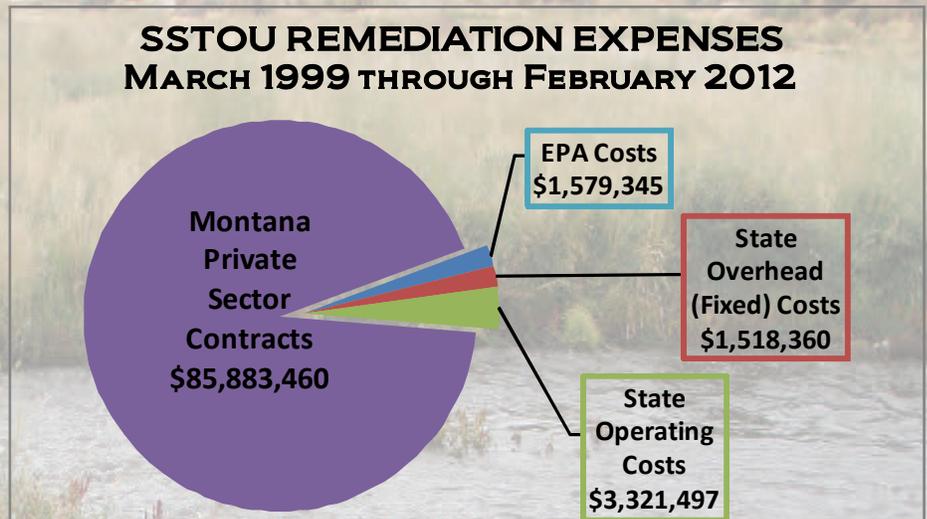
the Upper Clark Fork River Basin (UCFRB). The 22 miles of streamside tailings along Silver Bow Creek were designated as the Streamside Tailings Operable Unit (SSTOU) within the overall Superfund site. Initially the EPA named the Atlantic Richfield Company (ARCO), through its acquisition of the Anaconda Company, as the primary party responsible for remediation of the SSTOU and other Superfund sites in the Upper Clark Fork Basin. EPA and DEQ issued a Record of Decision (ROD) for the site in November 1995 identifying the final site remedy and the agencies' cleanup rationale. The largest components of remedial action specified in the SSTOU ROD are excavation of tailings and related contaminated soils from the Silver Bow Creek floodplain and reconstruction of the stream channel and floodplain. For planning purposes, the SSTOU was divided into four subareas (Subareas 1 through 4), each with a distinct geologic and geographic character (see Map, page 5).

Restoration - In a 1999 state, federal and tribal settlement, ARCO agreed to pay \$215 million to the State of Montana to resolve certain claims. From the settlement amount, \$80 million plus interest was set aside for DEQ and EPA to remediate Silver Bow Creek and the remaining portion of the original settlement was placed in the UCFRB Restoration Fund. The GSD obtained grants from the Restoration Fund that are being used to enhance the cleanup of Silver Bow Creek. These grants involve various habitat improvements and development of a recreation trail and access points along the creek. To date, DEQ, NRDP and GSD have successfully worked together to remediate and restore more than 80% of Silver Bow Creek.

PROJECT STATUS TODAY

The Silver Bow Creek cleanup is proceeding as planned with the following major accomplishments:

- ☞ Of the 22 miles of Silver Bow Creek in the SSTOU, the first 11 miles (Subareas 1 and 2) are completely reconstructed, 1 mile in Subarea 3 is complete with 1 1/2 miles under construction, and 2 1/2 miles in Subarea 4 are complete with 2 miles under construction.
- ☞ When complete, the reconstructed creek will be approximately 24 miles long.
- ☞ Of the 1,400 acres of tailings and impacted soils in the floodplain, approximately 1,310 acres of tailings-impacted area have been remediated and restored.
- ☞ Nearly 4.1 million cubic yards of the estimated 4.5 million cubic yards of tailings have been removed from the floodplain.
- ☞ Approximately 95% of the \$91 million (including interest) spent to date in completing the Superfund remediation has been paid to Montana contractors. The remaining funds have been for DEQ and EPA oversight and out-of-state construction materials.
- ☞ To date, approximately \$9.5 million has been spent for restoration actions along the stream and floodplain. An additional \$5.3 million is expected to be spent over the next two to three years.
- ☞ DEQ started work along the stream in 1999 and expects contractors to complete the cleanup by 2015.



NATIONAL AND INTERNATIONAL RECOGNITION

The remediation and restoration of Silver Bow Creek, perhaps the largest project of its kind in the United States, has won local, national and international awards for environmental excellence. In 2005, the project won two awards from the National Association of Environmental Professionals; one for environmental stewardship and the other for conservation of excellence. Also in 2005, the Green Organization, based in the United Kingdom, presented DEQ with an International Green Apple Environmental Award. In 2006, the Environmental Excellence in Habitat Restoration/Enhancement award was presented by the Montana Contractors Association to one of the project's construction contractors. In 2011, the Montana Wetland Council and Montana Watershed Coordination Council presented their Special Agency Individuals Award to DEQ Superfund Project Manager Joel Chavez and Project Officer Tim Reilly for their outstanding work in taking the project far beyond procedural requirements.

REMEDICATION vs. RESTORATION...WHAT'S THE DIFFERENCE?

Remediation is performed according to the remedy selection provisions of the Superfund law and addresses the contamination in a manner that eliminates the most direct threats to human health and the environment. Remedies are performed in accordance with specific legal requirements that set “cleanup levels”, such as water quality standards, or that require actions to be conducted in a certain manner, such as mine reclamation laws. Remediation completes the vast majority of the work necessary to cleanup Silver Bow Creek.

Restoration actions occur under the natural resource damages provisions of the Superfund law. Designated natural resource trustees, including the State of Montana, can obtain damages from a party responsible for the contamination to return the resource to its pre-impact condition and to compensate for the public’s lost use of the resource. The damages are typically based on the residual injury to the resources after the benefits of remedy are considered since remedies often do not return the area to its



Subarea 4 Reach R Remediation in Progress

completely uncontaminated or “baseline” condition. The damages collected can be used by the trustee to restore the injured resources to their baseline condition, replace the lost resources, or acquire the equivalent of the lost resources. The restoration actions being conducted along Silver Bow Creek enhance remedy to return the area to a more natural condition, to help the stream and floodplain recover to baseline conditions more quickly, and to provide public access to the restored stream channel and floodplain.



Streambank Restoration Plantings

and ecological enhancements. The NRDP no longer manages a grants program and is working under a framework approved in late 2011 by the Governor, entitled *2011 Upper Clark Fork River Basin Long Range Priorities and Fund Allocation Guidance Plan*, which is available from the NRDP website.

Montana Natural Resource Damage Program - In 1999, the State of Montana received approximately \$130 million for restoration of injured natural resources in the UCFRB through a partial settlement of its natural resource damage lawsuit against ARCO. From 2000 through 2010, the Governor of Montana approved seven specific grants to the GSD totaling \$15.6 million for projects that coordinate restoration and remedy actions, such as ecological improvements to the stream and floodplain habitat. These actions were coordinated through the NRDP, DEQ and the GSD. The GSD took the lead role in construction and coordination with DEQ of access feature components, such as trail construction, and in acquiring fee title or easements for public recreational use and protection of the remediated and restored floodplain. The NRDP took the lead role in coordinating the ecological components with DEQ, such as additional floodplain enhancement with shrubs, trees and wetlands. In 2011, the Governor approved an additional \$8 million to the GSD for the Silver Bow Creek Greenway for both access features

REMEDIAL & RESTORATION ACTIONS TO DATE

The following paragraphs provide a brief summary of remedial and restoration actions along Silver Bow Creek. ARCO, under EPA direction, led previous effort to clean up waste areas above the upper end of the SSTOU, including the historic Colorado Tailings area. These activities continue as part of the Butte Priority Soils Operable Unit remedy.



Recovering Stream Channel in Subarea 2

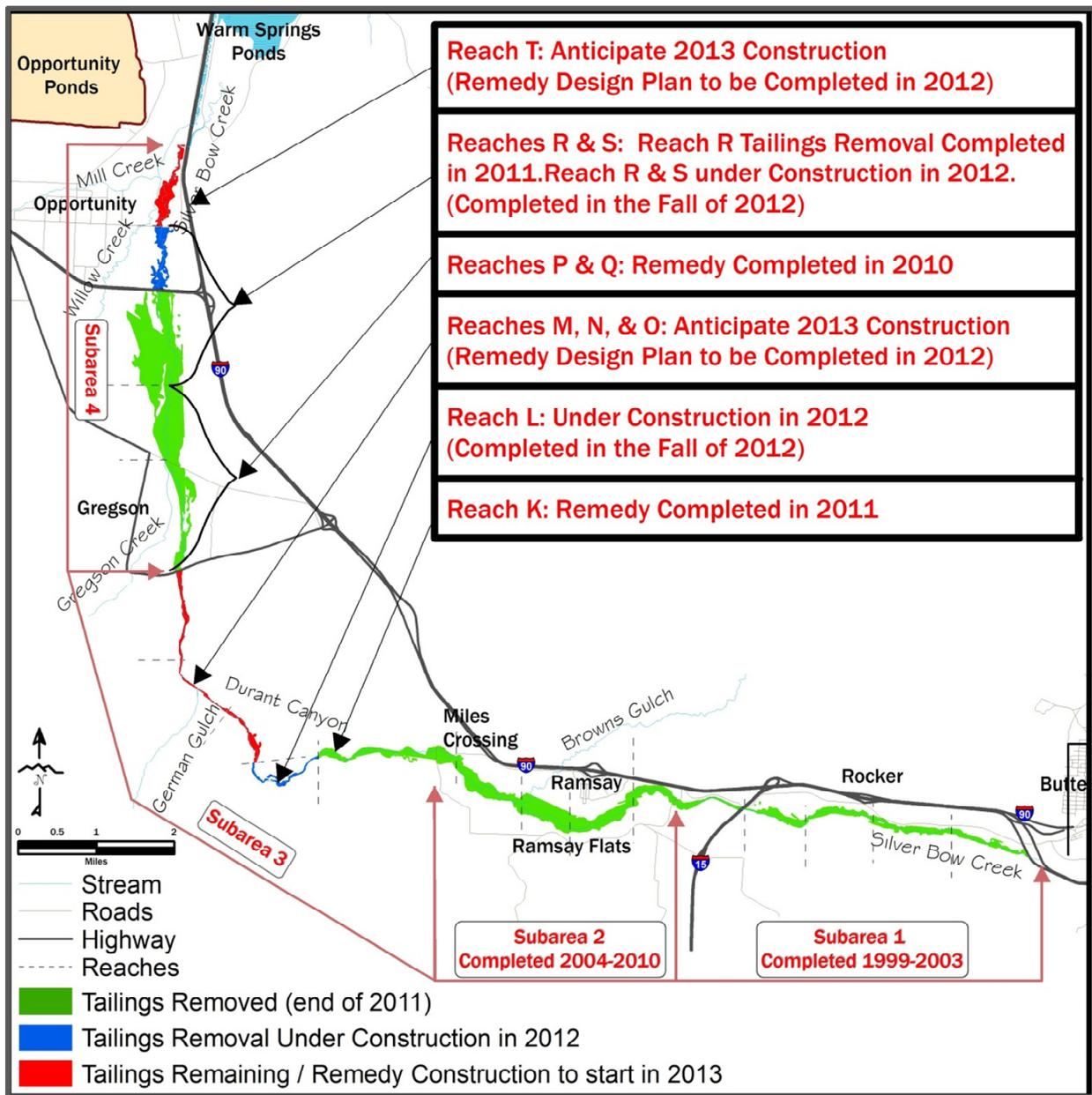
Subarea 2 - Construction in Subarea 2 began in 2004 and was completed in 2010. The most notable accomplishment in Subarea 2 was the complete removal of more than 1.6 million cubic yards of tailing from the “Ramsay Flats” deposit. This removal allowed the Silver Bow Creek to follow a longer, more varied channel alignment and provided space to construct numerous wetlands. The removal of the entire tailings deposit, which exceeded the requirements of the ROD, was accomplished with a combination of remedial and restoration funds. Revegetation of Subarea 2 was completed in 2010, and additional wetland plants, trees and shrubs were added in 2011.

Subarea 3 - Cleanup began in 2009 and has been largely completed from Miles Crossing to the mouth of Durant Canyon. The volume of the tailings deposited in Subarea 3 is less than the other Subareas, but the narrow canyon combined with the constraints of two active railroads make tailings removal complicated and time consuming. In 2012, DEQ will divert a portion of Silver Bow Creek into a large pipe to provide safe access to the work areas in the narrowest part of the canyon. Remedial design is underway for the remainder of Subarea 3 (extending from ~1.6 miles upstream of German Gulch north to Fairmont Road) with construction scheduled to be completed by the Fall of 2014. This design segment will include a large-scale fish barrier which will serve to isolate native cutthroat trout in German Gulch Creek from other species in the greater Clark Fork River drainage basin. Subarea 3 also includes a large box culvert system installed by the GSD using NRDP grant funds to reroute the stream through a portion of the historical floodplain, lengthening the channel by 0.3 miles, providing access to an additional 19 acres of floodplain, simplifying stream diversion for cleanup, and providing a future trail underpass through one of the active railroads.



Tight Working Spaces in Durant Canyon

PROJECT OVERVIEW MAP



Subarea 4 - Remedial action has been ongoing since 2004. Tailings removal and new stream channel construction have been substantially completed from Fairmont Road north to Highway I. Tailings excavation and new stream channel construction is underway in the area extending from Highway I north to Stewart Street and will be completed by the Fall of 2012. The remedial design plan is in process for the remaining reach from Stewart Street north to the Warm Springs Ponds and construction is scheduled to be completed by the Fall of 2013. Remedy and restoration plans for the remaining areas include a series of ponds and wetlands adjacent to the newly constructed Silver Bow Creek channel.

COMBINED REMEDIATION AND RESTORATION

Since 2000, the Governors of Montana have approved six GSD/NRDP grant applications, totaling nearly \$15.6 million and approved an \$8 million set aside in 2011 for a total of \$23.6 million. The grants and set aside include:

- Restoring aquatic, riparian/wetland, and upland ecosystems within the entire Silver Bow Creek corridor.
- Acquiring and providing public access to a passive recreational corridor along Silver Bow Creek in coordination with remedy.
- Wherever feasible, restoration actions are included in the remediation plans and designs and constructed by DEQ under a single contract.



Enhanced Stream Channel and Wetlands in Ramsay Flats

Aquatic Habitat Enhancements - Aquatic habitat has been enhanced by constructing a longer, meandering stream channel, installing more pools, and varying stream widths. These features not only augment remedial actions but also enhance the recovery of aquatic resources to a near pre-disturbance condition. Beginning in 2006, trout were found in the stream, largely because of the improved water quality from tailings removal. The enhanced habitat will help the burgeoning fish populations to grow and thrive. The habitat improvements are designed and constructed by DEQ with the incremental costs funded through the NRDP/GSD grants.

Public Access & Trail Construction - The GSD is constructing a trail along Silver Bow Creek. The trail includes trailheads, rest areas, bridges, railroad crossings, and other features to provide and control public access to the restored Silver Bow Creek Corridor. The GSD has acquired easements and lands for public access along much of the stream corridor that is not owned by DEQ. To date, two trailheads and approximately 2-1/2 miles of trail have been constructed; a 2 mile trail segment is scheduled for construction in 2012.

Ramsay Flats Tailings Removal - The Silver Bow Creek ROD allowed treating a large portion of the Ramsay Flats tailings deposit in place. DEQ used NRDP funds from a GSD grant to remove approximately 336,000 cubic yards of tailings covering approximately 100 additional acres of Ramsay Flats. Removal of all tailings in this area allowed development of a longer more naturally functioning stream and floodplain with large wetland complexes.

Floodplain Revegetation Enhancements - DEQ also uses GSD/NRDP grant funds to enhance the ecological character of the area. These activities include adding organic matter to soils placed in the floodplain, constructing wetlands, and planting trees and shrubs throughout the floodplain. These floodplain revegetation efforts have enhanced remedial efforts already completed at the site and are helping to restore severely injured wildlife habitat along the corridor. The planting efforts are carried out as a carefully coordinated effort between DEQ and NRDP.



Greenway Bridge Over Silver Bow Creek

NOTABLE PROJECT ACHIEVEMENTS

Significant improvements have occurred since remediation and restoration of Silver Bow Creek began:

Improved Water Quality and Fish – A primary goal of the SST OU remedy is to re-create a stream capable of supporting fish. Cleanup work in Silver Bow Creek and upstream areas near Butte has greatly improved surface and groundwater quality compared to pre-cleanup levels. Recent sampling of Silver Bow Creek in the remediated areas showed metals concentrations meeting drinking water standards and much closer to meeting aquatic life standards than prior to cleanup. Fish surveys completed in Silver Bow Creek have shown that populations of westslope cutthroat, brook trout, sculpins, and suckers have been re-established in the creek.



Westslope Cutthroat in Silver Bow Creek

Flood Update - Silver Bow Creek experienced higher than normal spring runoff in 2010 and 2011, immediately after completion of channel reconstruction in Subarea 3 Reach K and Subarea 4 Reaches P and Q. These high flows exceeded the capacity of the stream channel and flowed over the newly reconstructed and un-vegetated floodplain, causing minor damage to the stream banks and floodplain. Because tailings were removed, the flooding eroded only clean materials and only minor repairs were needed to fix the damage.

Dam Spillway Upgrades - In 2011, DEQ completed a controlled breach of the temporary sediment pond dam on Silver Bow Creek near Fairmont. The pond had collected a large quantity of potentially contaminated sediment from upstream areas. High and forceful water flows put significant strain on the dam and the controlled breach prevented a sudden release of sediments to sections of the creek that had already been cleaned up. Spillway improvements completed in the fall of 2011 are expected to prevent future scouring or release of sediments from the dam until it is removed as a part of the Subarea 3 cleanup. Overall, the pond has functioned as intended and has prevented recontamination of downstream areas while allowing construction to proceed in Subarea 3 and 4 simultaneously.

Administrative Success - The State of Montana has demonstrated that both remedy and restoration activities can be implemented as one integrated project while maintaining clear distinctions between the funding sources for accounting purposes.

Stabilized Stream Channel - The new stream channel constructed in Silver Bow Creek has successfully weathered high flows, and vegetation is well established on its banks. Pools and other habitat features added by restoration funding are functioning as designed and provide increased aquatic habitat diversity.

Vegetation and Wildlife Habitat- Grasses, trees, shrubs, and plants are well established through much of remediated area, and the enhanced shrub and tree plantings resulting from activities funded by restoration grants have enhanced wildlife habitat. DEQ has also implemented an aggressive weed management program. It is now common to see a wide variety of bird species using the floodplain and wetland areas. Bald eagles, osprey, swans, blue heron, and sandhill cranes frequent the wetland areas. Deer, moose, beaver, muskrats, and mink have also been observed.



2011 Flooding on Silver Bow Creek

Subarea 3 Railroad Bridge Relocation - In cooperation with NRDP and the GSD, DEQ completed a significant trail enhancement feature in the Durant Canyon area. A large railroad bridge on the abandoned Chicago, Milwaukee, Saint Paul and Pacific railroad grade (commonly called *The Milwaukee Road*) was removed, relocated, and rebuilt to act as a pedestrian bridge. The effort preserved the historic bridge, provided a unique trail enhancement feature, allowed access to remove the tailings under the bridge, and improved the stream channel design in a constricted segment of Durant Canyon.

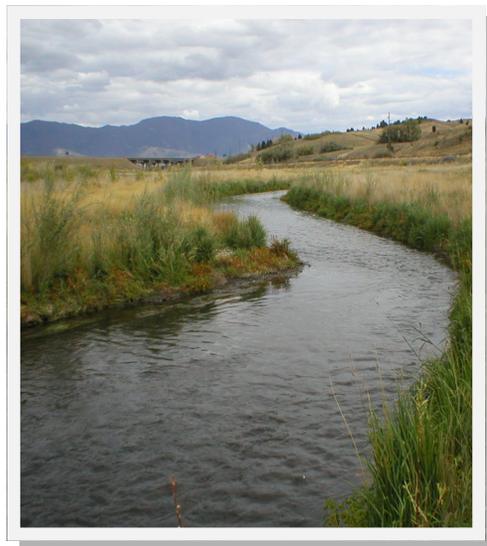


Railroad Bridge Relocation

Subarea 4 Tailings Observation Area - To provide the public with a visual comparison between the existing tailings deposits devoid of vegetation and the reclaimed and revegetated landscape provided by remedy and restoration, DEQ and NRDP are constructing a unique historic interpretation feature. A small area of tailings was left in place and isolated from the surrounding area by an armored trail berm that serves not only as a public access trail to view the tailings deposit, but also as a flood-water protection berm. When trail construction is complete, the public will be able to access this tailings observation area from the Greenway trail access point at the Highway 1 rest area.



Stream Before Restoration



Stream After Restoration

FOR MORE INFORMATION CONTACT:



GREGORY MULLEN
 1301 Lockey Avenue
 P.O. Box 201425
 Helena, MT 59620-1425
 406.444.0228
www.doj.mt.gov/lands/naturalresource



JOEL CHAVEZ
 1100 N. Last Chance Gulch
 P.O. Box 20091
 Helena, MT 59620-0091
 406.841.5031
www.deq.mt.gov/fedsuperfund/sst