UPDATE
Silver Bow Creek
REMEDIATION & RESTORATION OF SILVER BOW CREEK

~ A Superfund Success Story ~

The cleanup of Silver Bow Creek has been ongoing since 1999 as part of a Superfund remedial action being 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 formed a partnership with DEQ, bringing a restoration component to the project that goes beyond remediation (clean up) required under Superfund. Since 1999, much of Silver Bow Creek has been transformed from a severely injured resource area to an ecosystem that is recovering its original character.

PROJECT BACKGROUND

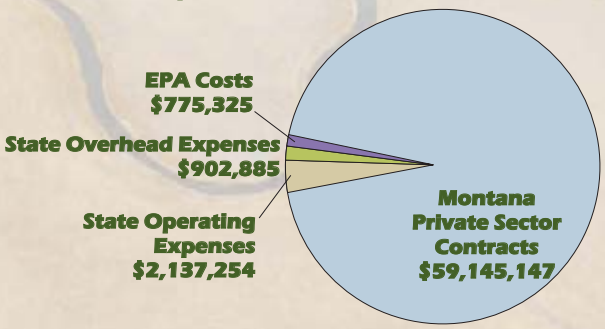
Contamination History - Silver Bow Creek extends from Butte approximately 22 miles to the Warm Springs ponds, a water treatment facility located at the headwaters of the Clark Fork River (see map on page 5). Since the late 1800's, tailings and other mine wastes containing elevated concentrations of metals have been discharged to Silver Bow Creek through 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 have resulted in a floodplain that is largely devoid of vegetation and is 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. The agency later designated the approximately 22 stream miles of streamside tailings along Silver Bow Creek as an operable unit (OU) within this overall Superfund site. The Streamside Tailings Operable Unit (SSTOU) has become one of the areas of focus for Superfund cleanup in the Butte area. Initially, EPA named ARCO as the primary party responsible for remediation of the SSTOU and other Superfund sites in the Upper Clark Fork River Basin through its acquisition of the Anaconda Company. EPA and DEQ issued a Record of Decision (ROD) for the site in November 1995 that identifies the final site remedy and the agencies' rationale for selecting that remedy. The major remedial action that resulted from issuance of the ROD is excavation of tailings and related impacted soils from the floodplain of Silver Bow Creek 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 project overview map insert).

Restoration - In a 1999 state, federal and tribal settlement, ARCO agreed to pay $215 million to the State to resolve certain claims. From the settlement amount, $80 million plus interest was set aside for DEQ and EPA to implement the remedy for Silver Bow Creek. Some of the remaining amount is being used to enhance the cleanup of Silver Bow Creek through NRDP grants to the local Greenway Service District (GSD) that involve various habitat improvements and development of a recreation trail and access features along the creek. DEQ and EPA are coordinating the cleanup of the Silver Bow Creek remedy with NRDP and GSD. To date DEQ, NRDP, and GSD have successfully worked together to remediate and restore about 70% of Silver Bow Creek.

STREAMSIDE TAILINGS EXPENSES

March 1999 - September, 2008



WINTER 2009

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 within the operable unit, the first 10 miles are completely reconstructed, 2.5 miles in Subarea 4 are partially reconstructed, and 2.5 miles in Subarea 3 are currently in the design process.

- Of the 1,400 acres of contaminated tailings and soils alongside the stream, approximately 950 acres of tailings impacted area have been remediated and restored
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- So far, almost 3.3 million cubic yards of tailings of the estimated 4.5 million cubic yards have been removed from the flood plain.

- DEQ started work along the stream in 1999 and expects contractors to complete the cleanup by 2012.

- Approximately 95% of the $63 million spent so far in completing Superfund remediation has been paid to Montana contractors; the remaining funds have been for DEQ and EPA project oversight and out-of-state material suppliers.

- To date, about $6 million has been spent for natural resource damage restoration actions along the stream and floodplain; another $8 million is expected to be spent over the next two to three years. All restoration and remedial expenditures are accounted for as separate funds.

Loading tailings on train cars

Stream bank restoration

NATIONAL & INTERNATIONAL RECOGNITION

The remediation and restoration of Silver Bow Creek, perhaps the largest project of it type 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 one for **conservation excellence**. Also in 2005, the Green Organization, based in the United Kingdom, presented DEQ with an **International Green Apple Environmental Award**. More recently in 2006, the construction contractor received an award from the Montana Contractors Association for **Environmental Excellence in Habitat Restoration/Enahancement**.

Remediation is performed in accordance with the remedy selection provisions of the Superfund law. Remediation actions address 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.

Planting Stream Bank Willows as Part of Restoration

Restoration actions occur under the natural resource damages provisions of the Superfund law. Designated natural resource trustees, including the State, can obtain damages from a party responsible for the contamination to return the resource to its uncontaminated condition and to compensate for the public's loss of use of the resource. The damages are typically based on the residual injury to the resources after the anticipated effect of remedy is considered, since remedies often do not return the area to its completely uncontaminated or "baseline" condition. The damages collected can be used by the trustee to restore the injured resources to their baseline condition, to replace the lost resources, or to acquire the equivalent of the lost resources. The restoration actions being conducted along Silver Bow Creek are intended to return the area to a more natural condition.

Stream Bank Investigation

Montana Natural Resource Damage Program Restoration Grants

The state of Montana obtained approximately $130 million for restoration of injured natural resources in the Upper Clark Fork River Basin (UCFRB) through a partial settlement of its natural resource damage lawsuit against ARCO in 1999. In February 2000, the state released the UCFRB Restoration Plan Procedures and Criteria document that provides the framework for expending these restoration funds via an annual grants process. Projects that will improve water resources, fish and wildlife habitat and populations, public recreation, and public water supplies in the UCFRB are eligible for funding The Montana NRDP administers the UCFRB Restoration Grant process and receives annual grant applications. In January 2008, the state began its tenth grant cycle.

Fish Sampling Shows Trout Have Returned to Silver Bow Creek

REMEDIAL & RESTORATION ACTIONS TO DATE

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

Subarea 1 - DEQ initiated cleanup activities at the upper end of Silver Bow Creek in 1999 by removing streamside tailings to a local repository and reconstructing the stream channel in Subarea 1. This effort continued in the downstream direction until all of Subarea 1 was remediated by the end of 2003. Beginning in 2001, mine wastes were transported by train to the Atlantic Richfield Waste Management Area (near Opportunity), and restoration elements to improve stream habitat were added to the design.

Wetland Construction

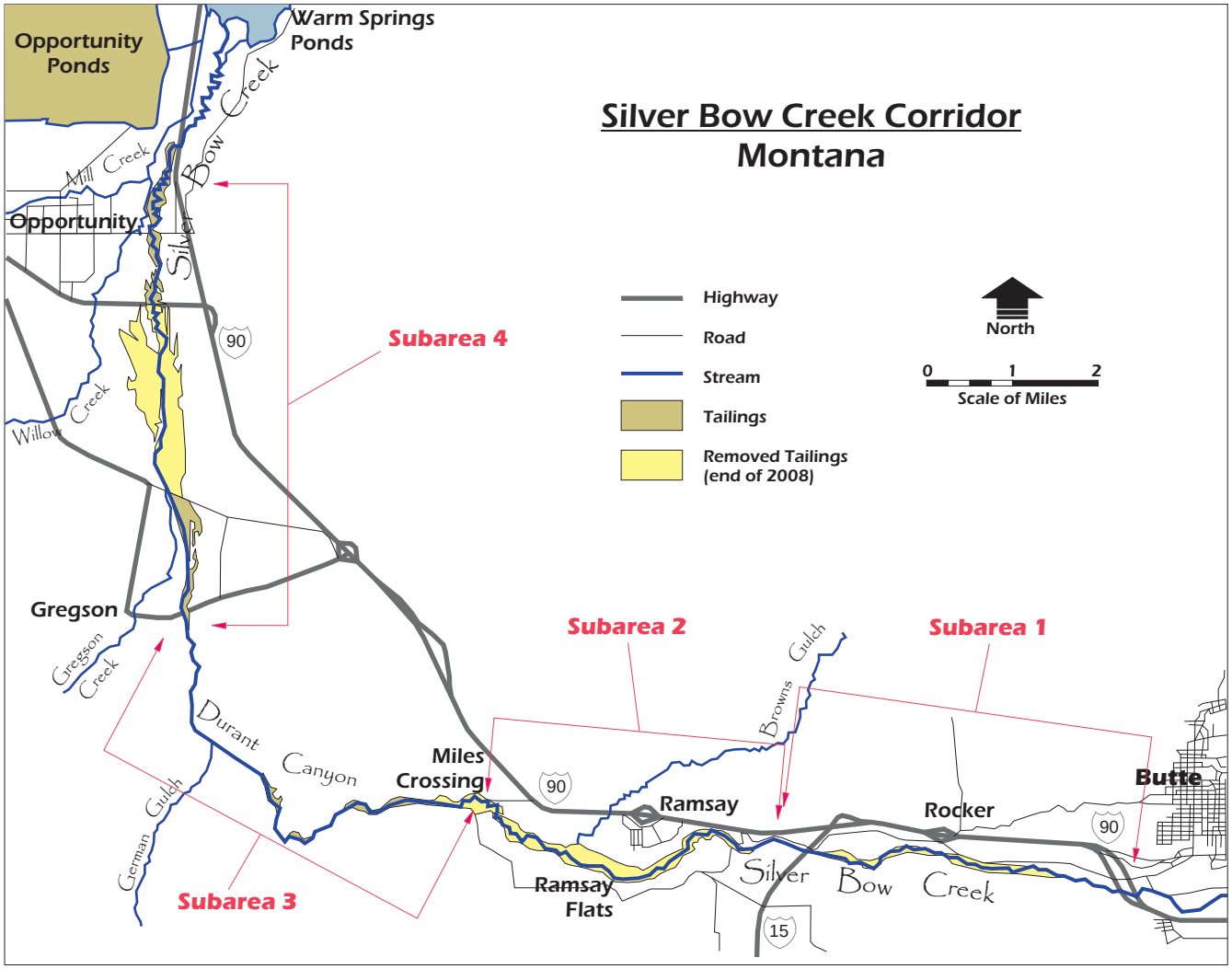
Subarea 2 - Construction of Subarea 2 began in 2004 and is continuing at present. The most notable accomplishment here was the removal of over 1.2 million cubic yards of tailings from the Ramsay Flats deposit. This allowed the reconstruction of Silver Bow Creek in a longer, more varied channel alignment and the construction of numerous wetlands. The removal of the entire tailings deposit, which exceeded the requirements of the Record of Decision, was accomplished with a combination of remedial and restoration funds. The remediation and restoration of Subarea 2 will be complete in 2009.

Reestablished Wetlands

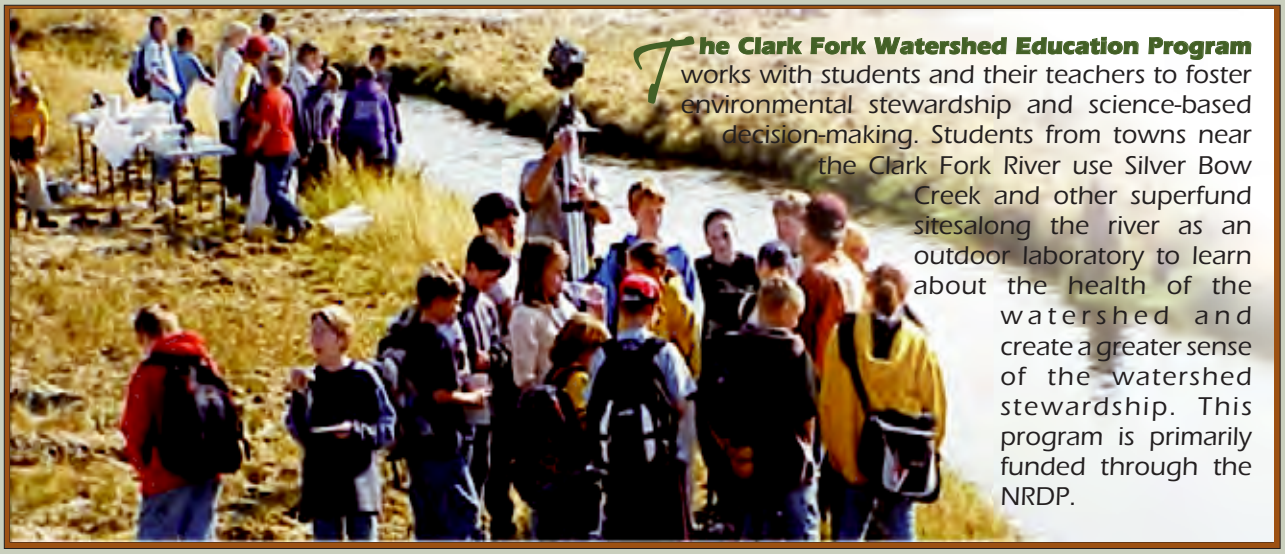
Subarea 3 - Studies are currently being concluded on Subarea 3 as we prepare for design and construction of this unique portion of Silver Bow Creek. Starting in 2006, test pit investigations were initiated to determine the extent of tailings, and channel investigations were undertaken to determine the characteristics of the existing channel and develop a conceptual design for the five-and-a-half mile stream section through Durant Canyon. Although there are relatively small tailings deposits in this subarea, the restricted space in the canyon and the steepness of the stream channel will provide different design and construction challenges.

Subarea 4 - One million cubic yards of tailings have been removed from 500 acres of near-stream floodplain and transported by truck to the AR Waste Management Area since 2003. These areas have been revegetated in anticipation of further remediation and restoration of the stream channel.

~ Project Overview Map ~



CLARK FORK WATERSHED EDUCATION PROGRAM



The Clark Fork Watershed Education Program works with students and their teachers to foster environmental stewardship and science-based decision-making. Students from towns near the Clark Fork River use Silver Bow Creek and other superfund sitesalong the river as an outdoor laboratory to learn about the health of the watershed and create a greater sense of the watershed stewardship. This program is primarily funded through the NRDP.

Restoration Silver Bow Creek

In 1996 the Silver Bow Creek Greenway Service District was formed. In 1998, the District released its Preliminary Design Report for construction of a greenway corridor along the entire 22 plus miles of Silver Bow Creek. This plan was developed with input from many groups and hundreds of citizens from Anaconda-Deer Lodge and Butte-Silver Bow counties.

Since 2000, the Governors of Montana have approved six Greenway Service District NRDP grant applications totaling nearly $14 million. The grants involve:

- Restoring aquatic, riparian/wetland, and upland ecosystems within the Silver Bow Creek corridor; and
- Acquiring and providing public access to a passive recreational corridor along Silver Bow Creek in coordination with remedy.

Floodplain Revegetation Enhancements

Features were installed along the upper ten miles of the stream to enhance the ecological character of the area. These activities included organic matter placement on the floodplain, wetland construction, and planting of trees and shrubs throughout the floodplain. These floodplain revegetation efforts will enhance remedial efforts already completed at the site and will help to restore severely injured wildlife habitat along the corridor.

Public Access & Trail Construction

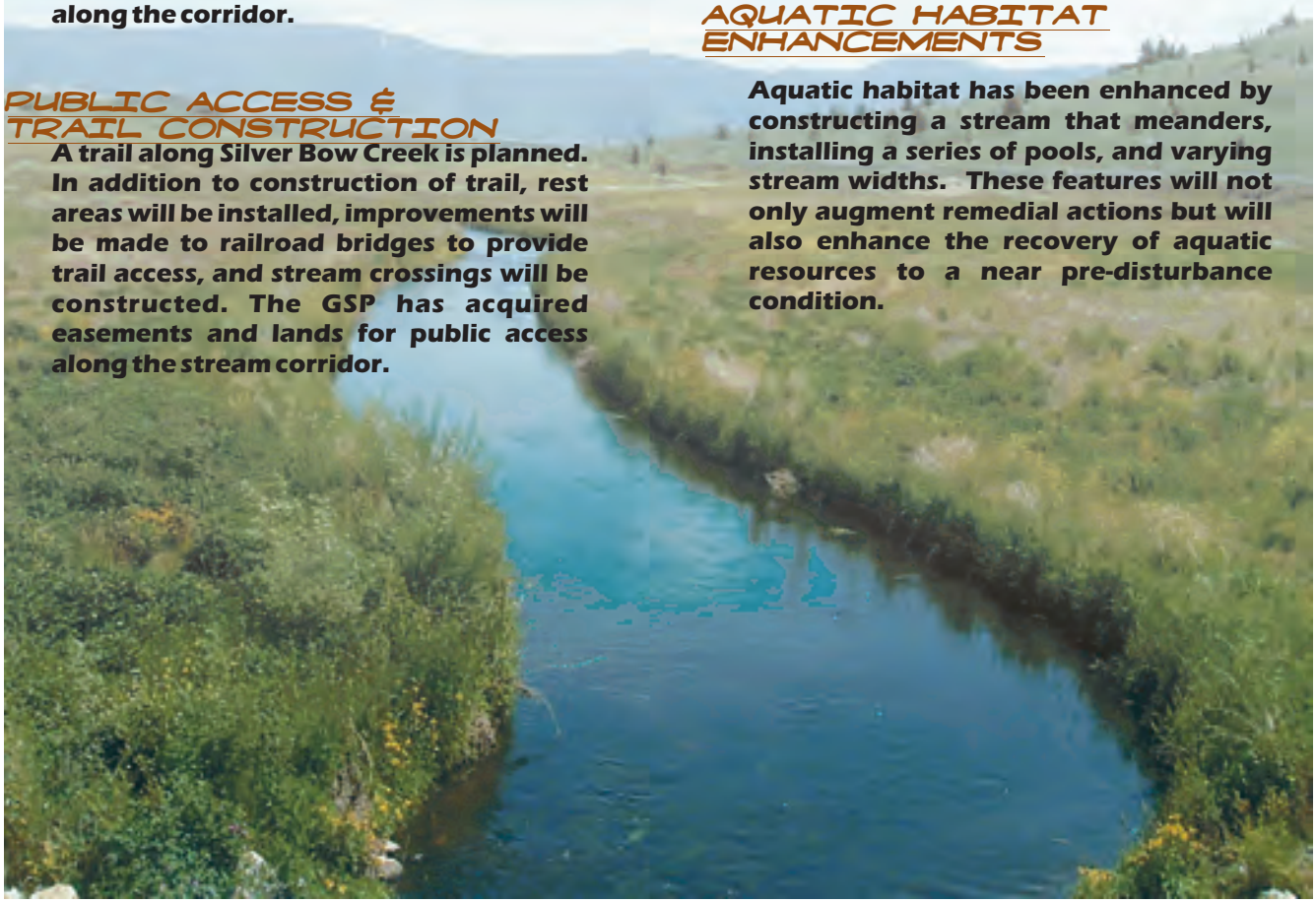
A trail along Silver Bow Creek is planned. In addition to construction of trail, rest areas will be installed, improvements will be made to railroad bridges to provide trail access, and stream crossings will be constructed. The GSP has acquired easements and lands for public access along the stream corridor.

Ramsay Flats Tailings Removal

Beyond the remedy identified under Superfund in the Silver Bow Creek Record of Decision, 336,000 cubic yards of tailings were removed on approximately 100 additional acres of Ramsay Flats. Removal of all tailings in this area allowed development of a naturally functioning stream and floodplain system.

Aquatic Habitat Enhancements

Aquatic habitat has been enhanced by constructing a stream that meanders, installing a series of pools, and varying stream widths. These features will not only augment remedial actions but will also enhance the recovery of aquatic resources to a near pre-disturbance condition.



NOTABLE PROJECT ACHIEVEMENTS

Since the commencement of remediaion and restoration of Silver Bow Creek, significant improvements have occurred in the ecosystem including:

Improved Water Quality - The quality of both surface water and groundwater within the area has improved greatly compared to pre-cleanup levels. The cleanup of Silver Bow Creek along with upstream cleanup work in Butte is responsible for the improvement in stream quality. Recent sampling of Silver Bow Creek in the remediated areas found no metals concentrations above drinking water standards and metals concentrations much closer to meeting aquatic life standards than prior to cleanup.

Preserving the Remedy - To help maintain the restored condition of Silver Bow Creek and its floodplain, the State of Montana has acquired 1,750 acres of land along the stream as part of its settlement with ARCO. In addition, an NRDP grant was used to acquire a 1,745 acre parcel of land extending south of Silver Bow Creek in Subarea 3 and other lands that were not part of the initial settlement with Arco.

Stabilized Stream Channel - The new stream channel constructed in the upper reaches of 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 providing increased aquatic habitat diversity.

Better Biological Diversity - Biological indicators such as aquatic insect diversity already show improvement from cleanup efforts completed at the site. Algal composition has also changed since remedial actions have begun, with a greater presence of species that are sensitive to metals.

Administrative Success - The State of Montana has shown that it can manage both remedy and restoration activities as one, integrated project and still maintain clear distinctions between the funding sources for accounting purposes.

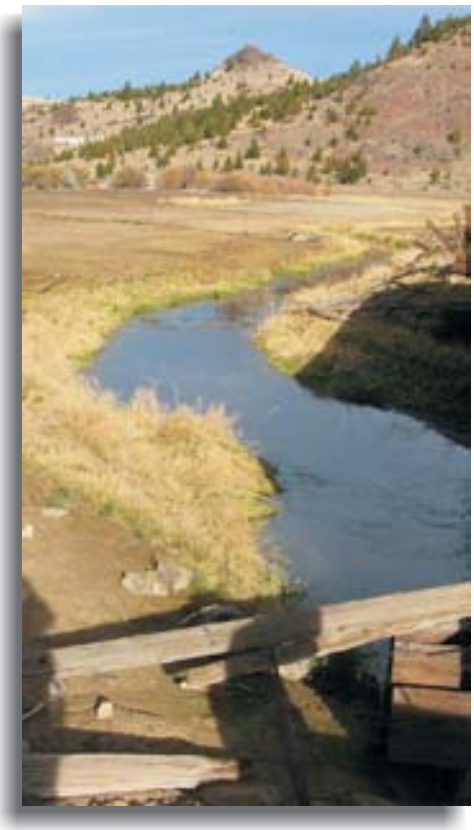
Successful Revegetation - Through replacement of tailings and contaminated soils in the floodplain of upper Silver Bow Creek with clean material and organic matter, revegetation efforts have been successful. Grasses and plants are well established through much of the remediated area, and the enhanced shrub and tree plantings resulting from activities funded by restoration grants have enhanced wildlife habitat. As the construction workers have revegetated the area, they have also implemented an aggressive weed management program.

Stream bank prior to reclamation

Post reclamation area

RECONTAMINATION ISSUES

As we cleanup Silver Bow Creek we are mindful that cleanup is still in progress in the Butte area upstream of our site. There is always the potential for contaminated water and sediments to move from upstream areas into the remediated areas of Silver Bow Creek and recontaminate the stream and its bed. In fact, shortly after cleanup began in the upper portion of Silver Bow Creek, monitoring found that fine grained sediments with high metals concentrations were entering the site in small quantities. It is likely that these sediments are carried into Silver Bow Creek during snowmelt, storms or other high runoff events. Although it is possible that some of these contaminated sediments originated within the remediated area, the presence of contaminated sediments at the upstream end suggests that most of them originate upstream of the site. Continued monitoring of sediments in the streambed through the years indicates that these contaminated sediments persist in the streambed, but the concentrations of metals in the sediments are decreasing over time, probably because of dilution of instream sediments with the addition of clean sediments eroding from the constructed Silver Bow Creek stream banks. Water quality monitoring has also shown that metals at levels that exceed standards in surface water sometimes enter the site from upstream. Although most of these contaminants will pass through Silver Bow Creek to Warm Springs Ponds, there is the potential for some metals to be removed from the stream resulting in recontamination of the stream bed. These processes could be adding to the recontamination observed in sediments in Silver Bow Creek. Recent monitoring has shown that metals concentrations entering the site may be decreasing as cleanup efforts progress at upstream sites. Further monitoring will help determine what additional measures if any beyond already planned remediation measures would need to be conducted.



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