

**STATE OF MONTANA
DEPARTMENT OF JUSTICE
Natural Resource Damage Program
1301 East Lockey, P.O. Box 201425
Helena, MT 59620-1425
(406) 444-0205/FAX 444-0236**

Restoring Silver Bow Creek

An Educational CD-Rom

January 2006

From the late 1800s until the 1980s, Butte mining operations in southwestern Montana discharged millions of tons of tailings and other mining wastes directly and indirectly into Silver Bow Creek, the headwaters of the Clark Fork and Columbia rivers. As a result, toxic levels of arsenic, cadmium, copper, lead, zinc, and other hazardous substances are pervasive throughout the Silver Bow Creek and Clark Fork River ecosystems. These toxic discharges produced a metals-impacted floodplain and streambed sediments and virtually eliminated aquatic life in the stream.

Silver Bow Creek extends from Butte approximately 23 miles to the Warm Springs Ponds, which are the headwaters of the Clark Fork River. The creek is part the largest contiguous area of Superfund sites in the United States that extends 120 miles from Butte to the Milltown reservoir. The cleanup and restoration of Silver Bow Creek has been ongoing since 1999. To date, five miles of the upper reaches of Silver Bow Creek have been cleaned up and clean-up planning has been completed for an additional three miles.

The Silver Bow Creek cleanup and restoration effort is the largest creek restoration project of its size in the United States to date. The educational CD-ROM, "Restoring Silver Bow Creek" provides the visual context necessary to comprehend the enormous size of the pollution problem, cleanup, reconstruction and restoration effort.

Artist Todd Trigsted spent ten years filming the cultural and environmental impacts of Butte's copper mining industry. Some of this work, and new work under contract with the Montana Department of Justice's Natural Resource Damage Program (NRDP), was consolidated for this educational CD-ROM. This CD is one part of the NRDP-funded environmental education program for schools in the Upper Clark Fork River Basin. To obtain additional copies of CD, call us at 406-444-0205 or e-mail us at nrdp@mt.gov.

How to Use the “Restoring Silver Bow Creek CD”

Your D drive will open when the disk is inserted. Scroll to “Intro.exe” and double click the icon. This will start and open the disc. On the first page, there is introduction to “Restoring Silver Bow Creek.” Click on “enter” to advance. After the opening credits, the menu will show two options. One is “install Quicktime movie player” and the second is “begin program.” If you begin the program and see a red “X” where the movie should start, you need to install the Quicktime Movie Player. Follow the instructions on screen to install the Quicktime Movie Player. You do not need an internet connection to do so. Once installed, or if your computer already has Quicktime, click “begin program” to advance.

The CD will start with a section entitled “Creek Characterized.” At the top of this screen in the black area there are subtitles for various subjects related to characterization of Silver Bow Creek. As you work your way through the program, click on the various titles. Each title category has subtitles in the tan area, and sometimes also in the black area below the tan area. By clicking on these subtitles, you can view the various choices for viewing photographs, panoramic views, videos, or diagrams associated a particular topic. When you see small pictures on the bottom of your screen, click on them to see bigger versions of the pictures.

Enjoy the show!

CREEK CHARACTERIZED – 7 minutes (The numbers provided below indicate the estimated time in minutes it will take to view a particular section).

A. Creek Introduction – 2:20

1. **Historical Perspectives Movie** – 2:20: Montana poet and Butte resident Phil Atkins offers a historical perspective of how mining activities impacted a once pristine Silver Bow Creek.

B. Creek Background – 2:00

1. Photos
 - a. Creek on Topo
 - b. Butte landscape with water overlay from 1896 – location of creek before pit.
 - c. Close up of #2
 - d. Cross Section view
 - e. Vertically-exaggerated image
 - f. Silver Bow Creek (SBC) running through pit
 - g. Horseshoe Bend

C. Clean Up Overview – 1:00

1. Map with 1-7 marked; click on numbers to see pictures
 - a. SBC leaving Butte running red
 - b. Willow growing
 - c. Construction
 - d. Cow bone
 - e. Opportunity Ponds
 - f. Warm Springs Ponds liming plant
 - g. Warm Springs Ponds

D. Creek Panoramic – 1:40

1. SBC in morning
2. Rocker Construction
3. Copper Mountain
4. Copper Mountain
5. Clark Fork River streambank
6. Clark Fork River streambank
7. Train with waste

INDUSTRIAL HISTORY – 20 minutes 40 seconds

A. Mining History – 7:20

1. **Mining in Butte Movie** – 3:20: Former U.S. Representative Pat Williams discusses growing up in Butte during its mining heyday.
2. Photos – 4:00
 - a. Copper Prep Ion Exchange
 - b. Copper water pumped from Kelley Mine
 - c. Prep Plant (tin cans) diverted from SBC
 - d. Sacred Heart Church becomes part of Berkeley Pit
 - e. Locations around pit
 - f. Snow Geese
 - g. Snow Goose necropsy

B. Landscapes – 7:30

1. Panoramic views
 - a. Smoke 1880
 - b. Mines
 - c. Current waste piles
 - d. Continental Pit
 - e. View from the west
 - f. Waste piles
 - g. Alternative views of the Berkeley Pit

C. Waste Created – 3:50

- Hugh McGone trial – Smoke and Tailings, 8 photos with explanatory text

D. Industrialized Creek – 2:00

1. Photos
 - a. Water leaving Butte
 - b. Tailings removed (Looking N. of I-90)
 - c. Ramsey Flats
 - d. Tailings ledge
 - e. Copper Column
 - f. Copper Sulfate Crystals
 - g. Copper Bone

ENVIRONMENTAL INJURIES – 14 minutes

A. Injuries Defined – 1:30

1. **Injury Introduction Movie** – 1:30: Carol Fox, NRDP, describes the types of injuries caused by mining to Silver Bow Creek that were covered in the State's natural resource damage lawsuit.

B. Injury Photos – 1:15

1. 1906 Colorado Smelter
2. Silver Bow Creek
3. Largest Superfund site
4. Copper
5. Copper
6. Rain washing metals into Silver Bow Creek
7. Frog

C. Volume of Waste – 4:30

1. Panoramic views of Subareas One, Two, Three and Four

D. Tailings and Water – 3:45

1. Contaminant Sources, Water Pathways, and Geochemical Mechanisms of Subareas One, Two, Three and Four. Click on the Subarea of your choice first, then click on the sources, pathways, or mechanism explanations for each Subarea.

E. Flooding and Tailings – 3:00

1. **Tailings Profile Movie** – 1:00: Greg Mullen, NRDP, describes the tailings shown in a streambank profile in the Ramsey Flats area.
2. Photos – 2:00
 - a. Mine wastes in the SBC floodplain
 - b. Flood of 1908
 - c. Tailings in streambank & train above
 - d. Other Storm events
 - e. Tailings in streambank
 - f. Tailings in streambank

REMEDIATION – 22 minutes, 20 seconds

- A. Remediation Defined – Text – :30**
- B. Remediation Introduced Movie – 1:30:** Joel Chavez, DEQ, introduces the State’s remediation effort at SBC.
- C. Superfund Process – Text Terms – 2:00**
- D. Remediation Actions – 16:30**
 - 1. Tailings – **Before/After Remediation Movie** – 3:45: Joel Chavez, DEQ, shows some sections of SBC that are awaiting remediation and other sections further upstream that have been remediated. He describes the coordination between restoration and remediation.
 - 2. Photos – 1:00
 - a. SBC Near KOA in Butte
 - b. SBC Near KOA in Butte
 - c. Tailings along SBC with markers
 - d. Copper Salts
 - e. Monitoring wells
 - f. Copper sulfates
 - 3. Creek Dewatered – 2:25
 - a. **Dewatering Movie** – 1:25, DEQ consultant John Sutton describes the dewatering process used during construction.
 - b. Photos – 1:00
 - 1. Water saturated tailings
 - 2. Prior to dewatering
 - 3. Dewatering pipe
 - 4. Dewatering pond
 - 5. Dewatering Pump
 - 6. Progress of Reconstruction
 - 4. Tailings Excavation – 6:00
 - a. **Excavation Process Movie** – 1:00: DEQ consultant John Sutton explains the tailings excavation phase of construction.
 - b. Photos
 - 1. Tailings Excavated
 - 2. Stockpiled Tailings
 - 3. Tailings loaded on train cars
 - 4. Tailings sprayed
 - 5. **Train Movie** – 2:00 (click on photo #5): Shows footage of the excavated wastes being transported from SBC to Opportunity Ponds.

6. **Disposal at Opportunity Ponds Movie** – 3:00 (click on photo #6): Charlie Coleman, EPA, describes the tailings transport to and disposal at the Opportunity Ponds and explains the planned reclamation of these ponds when disposal activities are completed.
5. Creek Reconstructed – 3:20
 - a. Photos
 1. Heavy rock excavated
 2. Rocks protect newly constructed SBC streambank
 3. Stages of reconstruction
 4. Reconstruction West of Nissler Bridge
 5. Streambank depth
 6. Finished Streambank

RESTORATION – 34 minutes, 10 seconds

A. Restoration Defined – 1:00

B. Restoration Introduced, Movie – 2:00: Carol Fox, NRDP, describes the damages covered in the lawsuit and the types of projects eligible for restoration grant funds.

C. Restoration Overview – 1:50

1. Photos
 1. Creek design at Ramsey Flats
 2. Reinforcing streambanks
 3. Organic matter addition
 4. Streambank revegetation
 5. Rocker area – one year after planting
 6. Subarea one – two years after planting

D. Restoration Details – 19:20

1. **Stream Sinuosity Movie** – :40: Greg Mullen, NRDP, describes planned restoration at Ramsey Flats, which is also shown in aerial footage.
2. **Design Movie** - 2:00: DEQ consultant Bill Bucher shows the engineering designs for stream reconstruction at Ramsay Flats.
3. **Organic Material Movie** – 1:25: DEQ consultant Rich Prodgers describes the benefits of adding organic material for successful revegetation.
4. **Revegetation Movies**
 - 1) **Types of Plants Movie** – 4:10: DEQ consultant Rich Prodgers shows examples of plants used for remediation and restoration efforts.
 - 2) **Planting Techniques Movie** – 1:30: Employees of Bitterroot Restoration, DEQ consultants, describe planting techniques.

5. Completed Sections – 3:40
 - 1) **Geology Background Movie** – 1:00, Joel Chavez, DEQ explains the geology of SBC
 - 2) **Rocker Area Movie** – 2:20, Joel Chavez, DEQ, describes the challenges of working within existing infrastructure such as active railroads in the Rocker area.
 - 3) **Before/After Movie** – 0:20: Joel Chavez, DEQ describes the remediation and restoration goals using before/after footage.
6. **Greenway Movie** – 2:15: Dori Skrukud, Butte-Silver Bow, describes the SBC Greenway project and the benefits a restored creek corridor will have to future generations.

E. Funded NRDP Projects – 10:00

Click on the names of the projects to see pictures and information on each project site. Click on the box that says “Map” to return to the map. Note: This information was current as of fall 2003. More recent information on projects, including recently funded projects, is available on the NRDP website at <http://doj.mt.gov/lands/naturalresource>.

To view the credits, click in the lower right corner where it says “Credits.” To exit the program, click “Exit”.