Mine waste along Silver Bow Creek

Mine waste along the Clark Fork River
Clark Fork River Red Water
Contaminants of Concern

- Cadmium
- Copper
- Arsenic
- Lead
- Zinc
Warm Springs Ponds
CERCLA aka “Superfund” Law

Remediation
- Cleanup of hazardous substances to protective levels
  - Human health
  - Environment

Restoration
- Picks up where remediation leaves off
  - Return to baseline
  - Natural resources
Clark Fork River Lawsuit
Background

• 1983 Montana v. ARCO lawsuit
• 2008 Settlement of Clark Fork River Claim
• State received:
  – ~$93 Million Remediation
  – ~$27 Million Restoration
  – ~$120 Million Total
Clark Fork River
Restoration Activities

**Restoration** - Restore, Replace or Acquire the equivalent of injured natural resources covered under the lawsuit

Terrestrial  Aquatic
Additional Restoration

- Aquatics Monitoring
- Tributary Prioritization
- Channel Reconstruction
- Riparian Fencing
- Fish Screens
- Irrigation Improvements
- Riparian Planting
- Conservation Easements
- Land Acquisitions
- Project Development
Working Together
Reach A, Phase 1 Design

- Reach A, Phase 1 – Upper most section of the Clark Fork River (below Warm Spring Ponds)
- Design Review Team Meeting, Spring, 2012
- Advertise and award contract for cleanup late 2012
Overview of Preliminary Design

• Remove contaminated materials from the floodplain and rebuild with uncontaminated material, creating an inset floodplain.
• Develop secondary channels, wetlands, and point bars in the inset floodplain.
• Provide varying substrates, develop microtopography, and add roughness elements (woody debris).
• Preserve appropriately vegetated streambanks and rebuild where necessary using bioengineering techniques.
• Plant new vegetation in the niches where it will have a high likelihood of survival.
## Tailings Removal Design

### Summary of Excavation Volumes for Phase 1

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation Area</td>
<td>53.5 Acres</td>
</tr>
<tr>
<td>Tailings Removal Volume</td>
<td>268,400 CY</td>
</tr>
<tr>
<td>Average Tailings Depth</td>
<td>3.1 ft.</td>
</tr>
<tr>
<td>Over Excavation Volume (0.5 ft)</td>
<td>41,600 CY</td>
</tr>
<tr>
<td>Total Excavation</td>
<td>311,000 CY</td>
</tr>
<tr>
<td>Average Removal Depth</td>
<td>3.6 ft.</td>
</tr>
</tbody>
</table>
Reach A Phase 1 Removal Area
Streambank Design

Type 1 Bank Treatment – Brush Trench
Streambank Design

Type 2 Bank Treatment
Single Vegetated Soil Lift

- Floodplain with revegetation
- Removed Contaminated Soil
- Floodplain Alluvium Fill
- Backfill Preserved if not contaminated
- Bench extended to 1' below baseflow
- Triangular Stakes
- 12" standard density coir log wrapped in one layer of coir fabric
- 6' dormant cuttings 5 per linear foot
- Existing pruned vegetation

Clark Fork River Phase 1 Preliminary Design
Streambank Design

Type 2 Bank Treatment
Single Vegetated Soil Lift
Gap in Bank Vegetation

Clark Fork River Phase 1 Preliminary Design
Streambank Design

Type 3 Bank Treatment
Double Vegetated Soil Lift

- Floodplain with revegetation
- Optional willow cuttings
- Removed contaminated soil (standard density wrapped in one layer of fabric)
- 12" soil lifts
- 6' cuttings 5 per linear foot per layer
- General fill 4"
- Backfill
- Floodplain alluvium fill
- Existing ground
- Bench extended to 1' below baseflow
- Vegetative backfill with floodplain alluvium (1:1)
- 16" Triangular Stakes
- Cobble toe if needed

Clark Fork River Phase 1 Preliminary Design
Residential Yards

- DEQ cleaned up residential yard in and around Deer Lodge in 2010 & 2011
- ~13,000 cubic yards of contaminated material removed from residential yards
Residential Yards

During Cleanup  Completed
Residential Yards

During Cleanup

Completed
Residential Yards

During Cleanup

Completed
The Trestle Area is located in downtown Deer Lodge, MT

~ 8,000 cubic yards of contaminated material was removed from this area

~ 1,000 feet of streambanks reconstructed

Seeding and planting of over 3,000 trees and shrubs
Trestle Area Cleanup

Building Log Crib Wall

Finished Log Crib Wall
Trestle Area Cleanup

Removing Contamination  Re vegetating
Trestle Area Cleanup

Before Cleanup

After Cleanup
Clark Fork River
Reach A, Phase 1
Streambanks Pilot Project

Montana Department of Environmental Quality

Montana Department of Justice
Natural Resource Damage Program
Map of Demo Area

Clark Fork River Fieldtrip Stops
April 19, 2012

Upper End Stop

Bank Demo

PHASE 1

Warm Springs Ponds
Two Types of Bank Treatments

• Type 2 Treatment
• Modified Type 2 (B) Treatment

• Goals:
  – Test the constructability of the streambanks
  – Make modification to the streambank designs (if necessary)
  – Assist in writing the specifications for the streambanks
  – Better determine areas that are applicable to either type
  – Determine Short-term success
Type 2 (B) Bank Treatment

Optional Willow Cuttings

Floodplain Backfill as determined by cover type

Backfill with floodplain alluvium

Backfill with floodplain alluvium mixed with vegetative backfill (1:1)

C0R Fabric

16" Stake

Existing Ground

Typical Base Flow Elevation

Maintain existing pruned vegetation

Install 6" dormant willow cuttings, 5 per linear foot

1" dia. Corr log wrapped with Corr fabric

Type 2 Bank Treatment - Single Layer Vegetative Soil Lift, Good Bank Vegetation

Detail B C14
Modified Type 2 (B)

TYPE 2 BANK TREATMENT - SINGLE LAYER VEGETATIVE SOIL LIFT, GOOD BANK VEGETATION

DETAIL B
NTS C14
Pre-Construction
Single Lift Construction

River

Fill

Coir Fabric

Coir Log Core
Staking Coir Fabric

Soil Lift
First Willow Cuttings in Place
Willows Capped with Topsoil
Second Row of Willows and Plants
Watering and seeding
Limited Browse Protection
Contamination Removal
Contamination Removed
Willow Cuttings
Backfilled
Limited Plant Protection
Lessons Learned

• It is possible to construct both types of banks
• Coir “wraps” are not necessary on all streambanks
• Vegetation can be preserved on the face of the streambanks while successfully constructing bank treatment behind
• Turbidity monitoring during construction showed very little increase in turbidity (sediment loading)
Clark Fork River Field Trip Preview

Clark Fork River Fieldtrip Stops
April 19, 2012

Trestle Stop

Upper End Stop
Questions?