Silver Bow Creek – Balancing Competing Priorities and Lessons Learned

2012 Riparian Restoration in Contaminated Environments Conference

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THANKS

- DEQ
- NRDP
- EPA
- Greenway Services District
- Pioneer Technical Services
WHAT'S IN STORE

- Brief Overview of the Streamside Subarea 4 Project
- Summarize Key Design Criteria
- Lessons Learned in Construction
- Lessons Learned in 2010 and 2011 Floods
- Design Changes
- Summary
PROJECT OVERVIEW MAP

Anaconda

Project Area

Butte
Approximately 9 Miles of Stream
Approximately 1.8M CY Tailings
Approximately 1300 Acres of Floodplain
Long Channelized Reaches
Few Owners – Mostly DEQ
Numerous Existing Grade and Flood Controls
Ice Jams and Overflow Channels
TAILINGS IN FLOODPLAIN
CONRAINTS AND CONTROLS

Highway Bridges
Elevated Bench
Silver Bow Creek
Active Railroad
Historic Floodplain Limit
CHANNELIZING REACH

Alluvium Berms to Contain the Channel

Channel With Limited Planform, Uniform Grade
Ice Jam In Main Channel

Flows Diverted to Side Channel
SIDE CHANNEL EROSION

Diverted Flows Eroding Tailings
Coordinate Remedy/Restoration Actions
- Bankfull Flow – 210 CFS
- Floodplain Access/Flood-Prone Area
- Native Channel Substrate
- Sediment Transport Issues
- Infrastructure Protection/Constraints
- Variable Plan Form and Channel Width
- Minimal Existing Channel Crossings
- Flexible Floodplain Design
- Favorable Site Setting - Geology
LESSONS LEARNED IN CONSTRUCTION

- Compaction of Fill In Channel Corridor
- Floodplain Grading and Fill Haul
- Point Bars/Bend Radii
- Tighter QA/QC
- Fabric Issues - Substitution
  - Reseeding
  - Ice Damage
- Channel Shelf
CONSTRUCTION ISSUES

Additional Removal

Haul Road

Limited Stockpile Areas on East

Excess Fill On West
SPACE CONSTRAINTS

Stockpile

Point Bar/Channel Width Issues

Seeding Problems
ICE DAMAGE

Fabric tears

Ice Hooks
2010 AND 2011 FLOODS

- Summarize Flows
- Damage Areas and Repairs
- Aerial Photos
- Ground Photos
- Changes to Bankfull Flow Statistics
2010 FLOOD FLOWS

USGS 12323600 Silver Bow Creek at Opportunity MT

Discharge, cubic feet per second

Jun 05 2010
Jun 12 2010
Jun 19 2010
Jun 26 2010

Median daily statistic (23 years)  Measured discharge
Discharge  Period of approved data
SA4 CHANNEL AT BANKFULL

06/05/2010
AERIAL FLOOD PHOTO

Cutoff Channel

Extra Removal

Cutoff Channel

Flood-Prone/Scour Areas
2011 FLOOD FLOWS

USGS 12323600 Silver Bow Creek at Opportunity MT

Discharge, cubic feet per second

- Median daily statistic (23 years)
- Measured discharge
- Discharge
- Period of approved data
POST FLOOD PHOTO
Flood-Prone/Scour Areas
Stream Channel
Flood-Prone/Scour Areas
### Days of Bankfull Flow

<table>
<thead>
<tr>
<th>Years of Record</th>
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<tr>
<td>Normal Range of Bankfull Days/Year</td>
<td>7-14</td>
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<tr>
<td>Bankfull Days Before 2010</td>
<td>115</td>
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<tr>
<td>Bankfull Days/Year Before 2010</td>
<td>5.5</td>
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<td>Bankfull Days in 2010</td>
<td>24</td>
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<tr>
<td>Bankfull Days in 2011</td>
<td>47</td>
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<tr>
<td>Bankfull Days After 2011</td>
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<td>Bankfull Days/Year After 2010</td>
<td>6.3</td>
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<tr>
<td>Bankfull Days/Year After 2011</td>
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Larger Channel
Coir Fabric/Coir Rolls
Shallower Bank Slopes
Minimum Channel Dimensions
Floodplain Swales or Side Channels
Compaction in Fill Areas
QA/QC
REVISED CHANNEL CAPACITY

USGS 12323600 Silver Bow Creek at Opportunity MT

Annual Peak Streamflow, in cubic feet per second

1400
1200
1000
800
600
400
200
0


450
300
210
2011 FLOOD FLOWS

USGS 12323600 Silver Bow Creek at Opportunity MT

Discharge, cubic feet per second

<table>
<thead>
<tr>
<th>Date</th>
<th>Discharge</th>
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<tbody>
<tr>
<td>May 21, 2011</td>
<td>50</td>
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<tr>
<td>May 28, 2011</td>
<td>100</td>
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<tr>
<td>Jun 04, 2011</td>
<td>300</td>
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<tr>
<td>Jun 11, 2011</td>
<td>450</td>
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<td>Jun 18, 2011</td>
<td>210</td>
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<tr>
<td>Jun 25, 2011</td>
<td>800</td>
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2010 FLOOD FLOWS

USGS 12323600 Silver Bow Creek at Opportunity MT

Discharge, cubic feet per second

Median daily statistic (23 years) — Measured discharge
Discharge — Period of approved data


450 — 300 — 210
REVISED CHANNEL

Coir Log

20 CFS Low Flow Line

Shelf/Sideslope

CONCEPTUAL DEFORMABLE CHANNEL WIDE RIFFLE SECTION (TYPICAL)
210 CFS At Top of Coir Log
REVISED CHANNEL

~300 CFS At Top 6:1 Grade Break
~450 CFS At Top of Fabric
~500 CFS At Floodplain Connection
Shelf/Sideslope

Native Rocky Substrate

Wider Upper Width Protected By Fabric
Larger Channel Capacity
Floodplain Still At Risk
Limited Initial Stability
Side Channels/Terraces
Ice Jams Remain A Wildcard
QA/QC Is Key
Expect and Budget for Some O&M/Repair
QUESTIONS?
THANKS!