Restoration of the Clark Fork River’s Trout Fishery: Identifying the Challenges and Focusing on Solutions

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  – Joe Naughton, MSU

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• Photos
Background

• Purpose of recent work
  – Update old data
  – Provide new information (tagging)
  – Use information for restoration planning

• Methods
  – Population surveys (e.g., electrofishing)
    • Abundance, species comp, demographics & population dynamics
  – Tagging
    • Movement, survival and habitat use (life history)
  – Caged fish
    • Effects of water quality on survival
Background

• **Purpose**
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Methods (cont.)

1) Population surveys
   - Sampled 137 streams
   - >120 mi. of river

2) Tagging
   - Radio tags (Clark Fork)
   - PIT tags (Silver Bow)

3) Caged fish bioassays
   - Young trout
   - Impact and control sites
Methods: PIT Tag
Methods:
Radio Tag
Outline

• Silver Bow Creek
  – Survey and inventory
  – Tagging
  – Caged Fish
  – Fishery status

• Clark Fork River
  – Same

• Goals and Priorities
  – Silver Bow Creek
  – Clark Fork River
  – Needs and Priorities
Silver Bow Surveys: Recent History

2002

- Below German Gulch Section
- Ramsay Section
- Lower Area One Section
- Rocker Section
- Father Sheehan Section
2006

Fish in all sections and first trout in fall sampling
2010

- Trout in all sections
Westslope cutthroat trout

1 yr

2 yr

3 yr

--- Adults ---

German Gulch

Silver Bow Creek
Status: Remediation is Helping...

e.g., upstream of Durant Canyon

Relative abundance of fishes in Silver Bow Creek at Miles Crossing before (2009) and after (2011) remediation. Survey section length was 0.6 km.

<table>
<thead>
<tr>
<th>Species</th>
<th>2009</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Westslope cutthroat trout</td>
<td>0</td>
<td>20</td>
</tr>
<tr>
<td>Brook trout</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Longnose suckers (≥ 140 mm)</td>
<td>6</td>
<td>1</td>
</tr>
<tr>
<td>Longnose suckers (&lt; 140 mm)</td>
<td>26</td>
<td>365</td>
</tr>
</tbody>
</table>

2009 2011
...but challenges remain
2008 Caged Fish Study
- August
△ Sites
- High mortality related to small rain events
- Survival was high at other sites

4% Survival (metals; not remediated)

0% Survival (metals and ammonia; WWTP)
CLARK FORK RIVER
Methods: Clark Fork Survey
Results: Brown Trout Dominate
Trout abundance: 1987 vs. 2009

---Different----

------------Similar-------------→
Clark Fork @ Origin: Poor Recruitment

Beginning of Clark Fk – 2008
2 yrs old

Beginning of Clark Fk – 2009

Below Garrison – 2010
More typical

2 yrs old
Methods: Radio-Tagging

- 269 trout tagged during 2009 – 2011
  - 185 brown trout
  - 57 westslope cutthroat trout

- Looked at movement and survival
Results: Brown Trout Spawning Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent Spawning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mainstem</td>
<td>21.5</td>
</tr>
<tr>
<td>Total Tributaries</td>
<td>78.5</td>
</tr>
<tr>
<td>Little Blackfoot R.</td>
<td>21.5</td>
</tr>
<tr>
<td>Flint Cr.</td>
<td>16.9</td>
</tr>
<tr>
<td>Gold Cr.</td>
<td>12.3</td>
</tr>
<tr>
<td>Racetrack Cr.</td>
<td>10.8</td>
</tr>
<tr>
<td>4 other Tributaries</td>
<td>16.9</td>
</tr>
</tbody>
</table>
Cutthroat Spawning Locations

<table>
<thead>
<tr>
<th>Location</th>
<th>Percent Spawning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bateman Cr.</td>
<td>22.2</td>
</tr>
<tr>
<td>Harvey Cr.</td>
<td>18.5</td>
</tr>
<tr>
<td>Little Blackfoot R.</td>
<td>14.8</td>
</tr>
<tr>
<td>Brock Cr.</td>
<td>14.8</td>
</tr>
<tr>
<td>7 other Tributaries</td>
<td>29.6</td>
</tr>
</tbody>
</table>

Only in 2009

None
Methods: Survival by Habitat Reach
Copper Concentrations

Discharge and Dissolved Copper Concentrations, 2009-2011

Data obtained from USGS field samples
Adult Brown Trout Survival

Brown Trout Yearly Survival, by Reach

- Estimated Yearly Survival
  - Reach A: 0.3
  - Reach B: 0.4
  - Reach C: 0.6

Average annual survival from Vincent 1987
Adult Brown Trout Survival, in Time

Estimated Cu Concentrations (micro-g. L)

- Estimated Monthly Survival Rates
- Acute Cu Conc.
- BNT Survival
- Temperature > 20C

A ~83% monthly survival
B ~87% monthly survival
C ~90% monthly survival

4/1/09  8/1/09  12/1/09  4/1/10  8/1/10  12/1/10  4/1/11  8/1/11  12/1/11
0 10 20 30 40
0.80 0.85 0.90 0.95 1.00
Methods and Results:
Survival of Caged Fish 2011

Brown trout – April to early September

- Turah, MT: 92%
- Clinton, MT: 100%
- Bearmouth, MT: 100%
- Rock Creek: 86%
- Flint Creek: 94%
- U/S Little Blackfoot River: 98%
- Deer Lodge, MT: 98%
- Galen, MT: 70%
- Warm Springs, MT: 100%
- Butte, MT

Was low in the 80’s
Results: 2011 Caged Fish Histology

• Cellular changes
  – Indicative of exposure to heavy metals
  – Most severe at Galen
  – Least severe at Warm Springs (just below ponds)
GOALS AND PRIORITIES
Fishery Goals

• Restore trout fisheries in CFR and SBC
  – Replace with tributary fisheries

• Improve native trout populations
  – Protect and expand where habitat is suitable
Silver Bow Cr: Restoration Potential
Westslope Cutthroat Trout from German Gulch

![Graph showing the frequency distribution of tagged and emmigrated fish by length.](image)

- Tagged (n = 365)
- Emmigrated (n = 51)

<table>
<thead>
<tr>
<th>Length (mm)</th>
<th>1 yr</th>
<th>2 yr</th>
<th>3 yr</th>
</tr>
</thead>
<tbody>
<tr>
<td>120-140</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>140-160</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>160-180</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>180-200</td>
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<td></td>
<td></td>
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<tr>
<td>200-220</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>220-240</td>
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<td></td>
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<tr>
<td>240-260</td>
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<td></td>
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<tr>
<td>260-280</td>
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<tr>
<td>280-300</td>
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<tr>
<td>300-320</td>
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<td>320-340</td>
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<tr>
<td>340-360</td>
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<tr>
<td>360-380</td>
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<tr>
<td>380-400</td>
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</tbody>
</table>

----------- Adults -----------
Westslope cutthroat trout dispersal from German Gulch

- 365 tagged
- 51 migrated to Silver Bow

German Gulch

Remediated

Butte

0*

19
37
31
21
3
9

Wastewater effluent

Antenna

Kilometers
Priority: Restoring a Cutthroat Fishery

- Warm Springs Ponds
- German Gulch
- Proposed Barrier
- German Gulch

Graph showing fish density per 100 meters along the stream.

- Fish density peaks at ~1/2 mile below German Gulch (GG).
- Priority: Restoring a Cutthroat Fishery ~1/2 mile below GG.
Priority: Improve Treatment of Waste Water
Nutrient and Metals Overload

Rain and snowmelt runoff, not all captured
Clark Fork River: Restoration Potential

![Graph showing trout per mile at different sites along the river. The graph highlights a site with a 5x increase in trout per mile compared to the expected average and the 2009 average.](image-url)
Priority: Restore the Clark Fork River Trout Fishery
Native trout: Currently: 1 – 4%
Objective: 10%

Blackfoot ~ 25%, Bitterroot ~ 10%
Clark Fk below Rock Cr ~ 7%
Priority: Conserve Bull Trout in Silver Lake System
- Similar at Harvey Creek
Clean water (Superfund cleanup)

More water:
90 cfs to Deer Lodge
- Racetrack Cr
- Silver Lk / Basin Cr Res.
- Milltown water right
Priority: Fix the Sink
- Trout are drawn to the area for spawning...
Brown Trout Yearly Survival, by Reach

Estimated Yearly Survival

0.2
0.3
0.4
0.5
0.6
0.7

...but, survival is poor

Beginning of Clark Fk – 2009

2 yrs old
A dilemma: why are numbers so low?
- As low as Silver Bow Creek!
- Past caged fish showed low survival, but…
- Last year’s caged fish survived well
- Sudden drop after Flint Cr. and increase after Rock Cr. suggest local vs. “system” effect – but what is it?
Tributary Stream

Mainstem River

Tributaries are:
1) biologically connected to the mainstem &
2) native and rec. fisheries themselves (e.g., LBF)

Priority: Look to the tribs: but why?
137+ prioritized to 28 streams + water for CFR abv. Deer Lodge (p. 1) & elsewhere

<table>
<thead>
<tr>
<th>Priority</th>
<th>Streams</th>
</tr>
</thead>
</table>
| 1 (n = 11) | Browns Gulch  
German Gulch  
Racetrack Cr. – Lower  
Little Blackfoot R. – Lower  
Warm Springs Cr. – Lower  
Warm Springs Cr. – Upper  
Storm Lake Cr.  
Barker Cr.  
WF Warm Springs Cr.  
Twin Lakes Cr.  
Instream flow CFR above Deer Lodge |
| 2 (n = 19) | 18 streams + mainstem instream flow |
tributary habitat restoration – riparian areas and water
tributary habitat – restoration –
• fish passage
Conclusions

• **SBC**: Trout are responding to remediation, but we need to improve treatment of wastewater.

• **CFR**: Galen to Warm Springs is important for trout but has high mortality, making it doubly important to address effectively.

• Biological data has refined our approach to restoring the fishery, and given us a better picture of what’s possible.

• Fishery goals are achievable, attaining them is up to us.
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