Evaluating the Potential of Passive Stream Restoration as a Method to Minimize the Impact of Whirling Disease on Native Fish

Eriek Hansen, Phaedra Budy, and Gary Thiede

Spring Runoff Conference
Logan, Utah
April 5-6, 2007
Introduction

- Threats to species
- Individual effects
- Synergistic effects
- Population or community level

Habitat alteration
Synergistic effects
Exotic species
Disease

Impact

Time
Livestock Grazing - *Myxobolus cerebralis* “Whirling Disease”
Direct Effects of Livestock Grazing

- Vegetation
  - Consumption
  - Trampling

- Soil
  - Compaction
  - Erosion

- Stream channel
  - Collapse and shear Banks

- Waste inputs
Indirect Effects of Livestock Grazing

- Increased erosion & sedimentation
  - Increased Tubifex habitat
  - Decreased fish habitat
- Increased nutrient inputs
  - Tubifex proliferation
- Increased stream temperatures
  - Tubifex proliferation
  - TAM proliferation and viability
  - Decrease fish health
  - Increased whirling disease infection & prevalence
Whirling Disease Impacts

- Physical deformities
  - Cranial
  - Mandibular (feeding)
  - Vertebral (swimming)
- Whirling behavior
- Reduced growth
- Reduced fecundity
- Mortality
  - Direct
  - Indirect
Bonneville Cutthroat Trout

• Endemic to Bonneville Basin
  – Utah, Nevada, Idaho, and Wyoming
• Current range 33% of historic distribution
• Susceptible to whirling disease
• Conservation agreement
Goals/Objectives

• Bonneville cutthroat trout conservation
• Restore riparian processes
• Improve water quality
• Exclude livestock grazing
• Document restoration response
  – Aquatic and riparian habitat
  – Fish health & condition
  – Impact & prevalence of whirling disease
• Short and long term response
Study Area

- Logan River
- Bonneville cutthroat trout
- Habitat condition
- Exotic species
- Whirling disease
  - Tributaries serve as refugia?
- Study sites
  - Restoration
  - Reference
Study Area and Design

- **Before After Control Impact (BACI)**
- **Impact**
  - Livestock exclusion
  - Spawn Creek
- **BEFORE** (2005)
- **AFTER** (2006)
- **Reference sites**
  - Temple Fork
  - Franklin Basin
**Impact Site**

- **Exclosure**
  - 3 km stream fenced
  - 67 hectares
  - 2 km upper watershed

- **Sample sites**
  - 3 fish & water quality
  - 7 stream & riparian habitat

- **Grazing**
  - June-October
  - Rotation
  - Riparian area July
Methods

• Water quality (e.g., nutrients, turbidity)
• Discharge
• Channel characteristics
• Substrate
• Vegetation
• Invertebrates
• Fish
• Whirling disease prevalence
Results

• Final BEFORE year (2005)
• First AFTER year (2006)
• Grazing effects and short-term restoration response
  • Impact site
    – Intra-annual (within BEFORE year)
    – Inter-annual (BEFORE vs. AFTER years)
  • Reference sites
    – Inter-annual (Impact vs. Reference sites)
The graph illustrates the turbidity levels (NTU's) over time from January 2005 to October 2006, comparing an impact site and two reference sites.

- **Impact site** shows a decrease in turbidity levels after the implementation of livestock exclusion.
- **Reference-1** and **Reference-2** also show a decrease in turbidity levels after the implementation of livestock exclusion.

The graph highlights the impact of livestock exclusion on turbidity levels, indicating a significant reduction.
Total Kjeldahl Nitrogen

BEFORE

AFTER

Grazing

Livestock exclusion

Impact site
Reference-1
Reference-2
Average temperature (°C)

- Impact site
- Reference-1
- Reference-2

Optimal range for whirling disease

Temperature variations from January 2004 to January 2007, with different colored lines representing different data sets and the optimal temperature range for whirling disease highlighted.
Summary

- Impact site short term responses
  - Intra-annual
  - Inter-annual
- Turbidity
- Nutrients
- Reference sites
- Temperature
- Whirling disease
Conclusions and Implications

- Resilient system
- Long term response monitoring
- Natural variation
- Small attainable changes needed
  - Vegetation
  - Stream shading
- Applicability
  - Whirling disease management
Collaborators and Funding Sources

**Collaborators/Volunteers**

- Cache Anglers Chapter-Trout Unlimited
- Fisheries Experiment Station-UDWR
- Fish and Aquatic Ecology Unit-USFS
- Logan Ranger District-USFS
- Dedicated Hunter Program-UDWR
- Utah Cooperative Fish and Wildlife Research Unit-USGS
- John Carter-Western Watersheds
- Utah State University Faculty/Staff
- USU Student Subunit-Bonneville Chapter AFS
- Mike R. Ebinger-GIS/Mapping

**Funding Sources**

- Utah Division of Wildlife Resources
  - Federal Aid, Sport Fish Restoration
  - Blue Ribbon Fisheries
- U.S. Forest Service
- Utah Division of Water Quality
- Utah State University
- Trout Unlimited
  - Cache Anglers, Embrace a Stream, Utah Council, Weber Basin Anglers
- The Stonefly Society
- Bridgerland Audubon Society
- Sportsmen for Fish and Wildlife
- Bonneville Chapter of the AFS
- Bridgerland Outdoor Coalition
Thank you