

Big Spring Creek Habitat Enhancement and Fishery Management Plans

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Big Spring Events and Activities Center
Newville, PA

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Topics Discussed in this Presentation

- Overview of 2010 Habitat Enhancement Project
- Results of Physical Habitat, Fish Cover, and Electrofishing Surveys
 - 2010 Project Model and Treatment Reaches
 - Proposed Phase 2 Project (Willow Tree) Reach
- Overview of How PFBC Intends to Move Forward with the Phase 2 Project
- Summary of How PFBC Proposes to Manage the Big Spring Trout Fishery

Overall Goal of Big Spring Creek Habitat Enhancement Efforts and the 2010 Project:

- Goal and objectives developed jointly by CVTU, BSWA, and PFBC in December 2006
- To improve the instream habitat conditions of Big Spring Creek so that the creek supports a thriving, healthy, wild trout fishery throughout its entire length, targeting brook trout if feasible.

2010 Project Objectives

- To improve instream habitat and riparian vegetative conditions for a variety of aquatic and terrestrial wildlife species
- To remove the remains of the Piper Mill and Thomas Hatchery Dams, and implement habitat enhancement activities that will result in a more natural-looking stream channel with appropriate dimensions (width and depth)
- To increase habitat diversity and provide adequate habitat for all life-stages of trout, ultimately resulting in a sustainable, wild trout destination fishery
- To monitor pre- and post-implementation physical habitat and biological conditions, and use this monitoring information to guide additional habitat enhancement activities on Big Spring Creek and other limestone spring creeks

2010 Project Habitat Enhancement Approach

- Use a productive segment of Big Spring Creek as a model for enhancing unproductive segments

- Model reach criteria:
 - Un-impounded
 - Relatively high abundance of brook trout
 - Relatively low abundance of rainbow and brown trout
 - Physical habitat conditions similar to those described in the literature as optimal for brook trout

- Initial project area from the boards at the “Ditch” to ~150 ft downstream of the remains of the Thomas Hatchery Dam

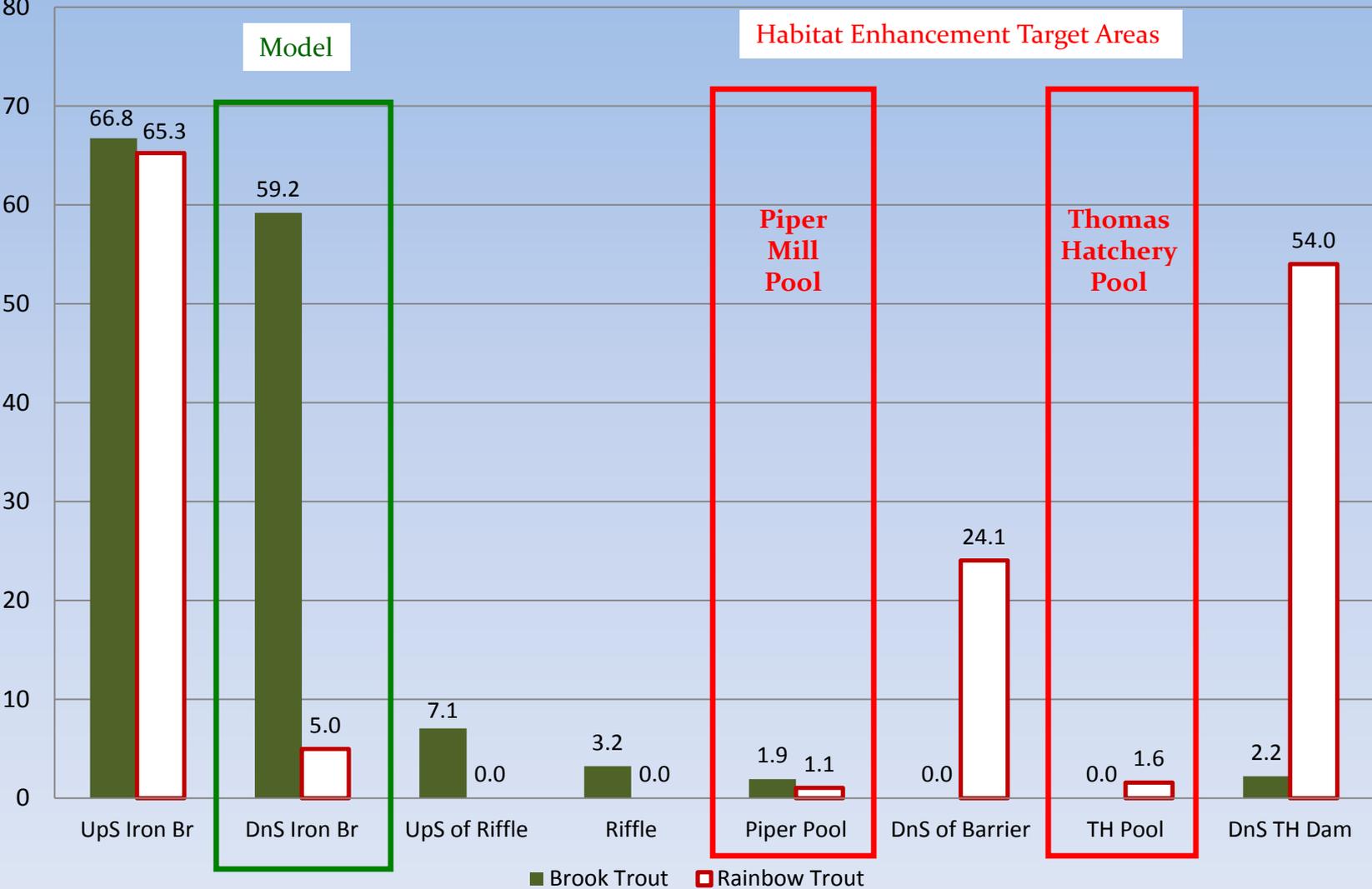
- Divided the project area into eight distinct Assessment Reaches

2010 Project Habitat Enhancement Approach

- Conducted field surveys of physical habitat, fish cover, and trout fishery conditions (Summer 2007)
- Identified potential model and treatment reaches based on:
 - Existing fishery and habitat conditions, and
 - Published brook trout habitat suitability information



Brook and Rainbow Trout CPUE Biomass September 2007 (Kg/Ha)



Model Reach



Treatment Reach

Piper Mill Dam



Thomas Hatchery Dam



Piper Mill Pool Treatment Reach



2010 Project Timeframe

- Design and permitting work completed by Rivers Unlimited in August 2010
- Project was constructed by Gleim Environmental in September 2010



Before and After Monitoring Results of 2010 Project and Existing Conditions in the Proposed Phase 2 (Willow Tree) Reach

Before 2010 Project



Immediately After 2010 Project



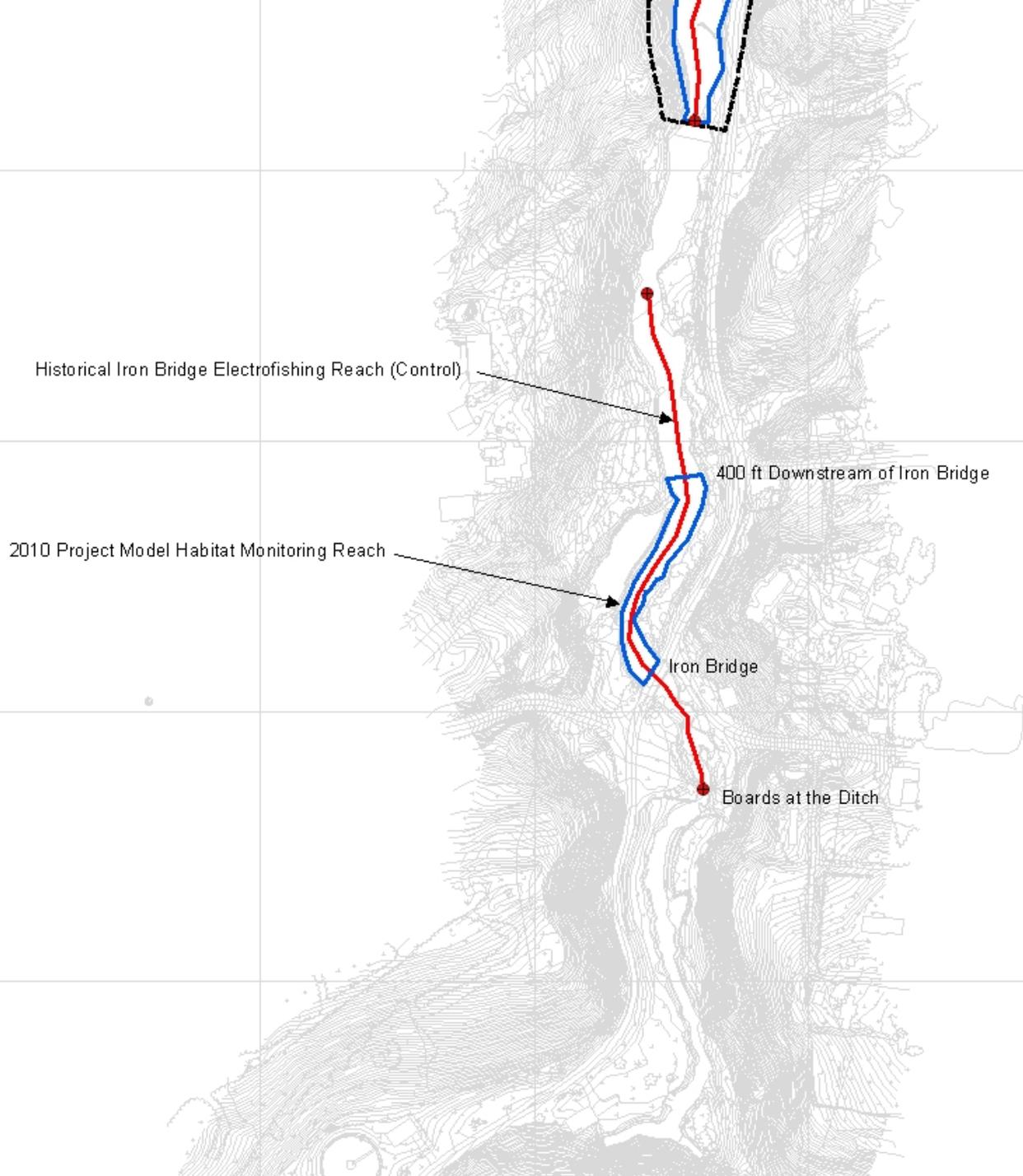
Before and After Monitoring Results of 2010 Project and Existing Conditions in the Proposed Phase 2 (Willow Tree) Reach

Before 2010 Project



October 31, 2012





Thomas Hatchery Pool Habitat Monitoring Reach

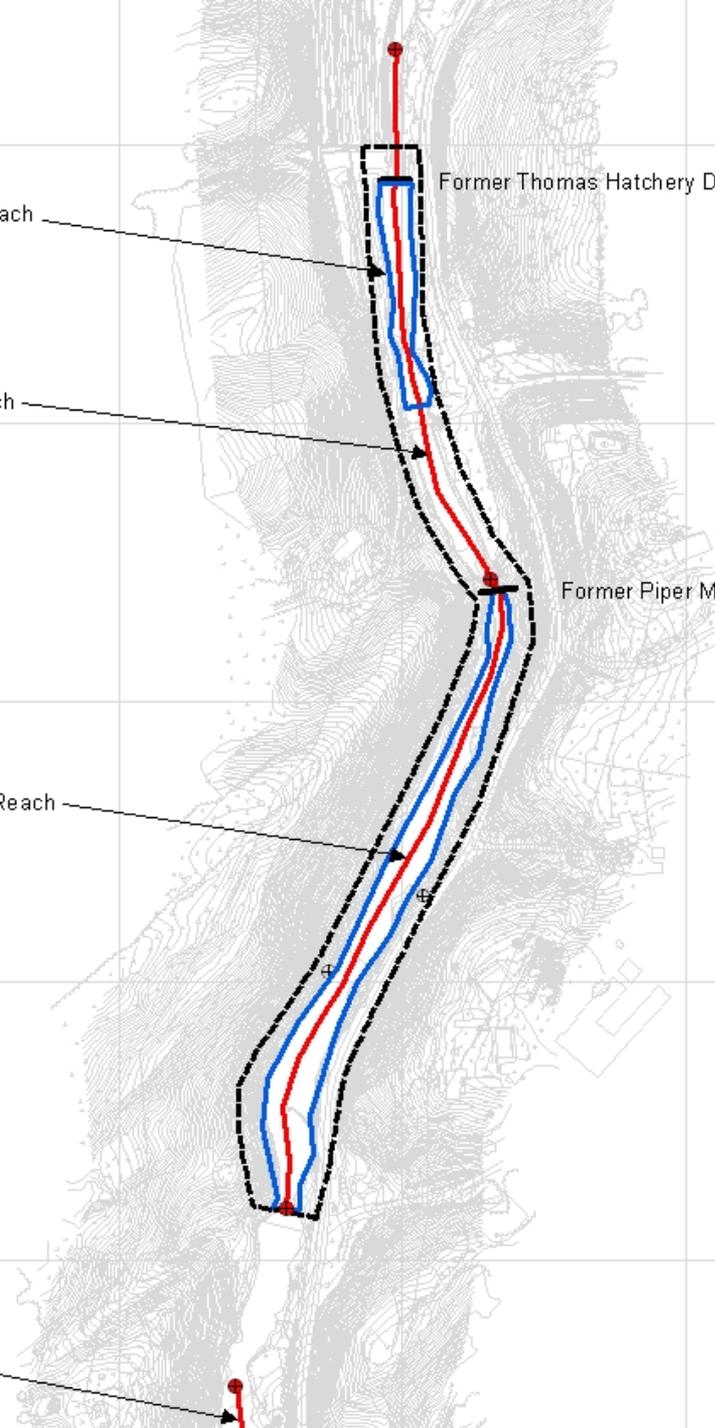
Historical Thomas Hatchery Electrofishing Reach

Piper Mill Pool Electrofishing & Habitat Monitoring Reach

Historical Iron Bridge Electrofishing Reach (Control)

Former Thomas Hatchery Dam

Former Piper Mill Dam (Fish Barrier)



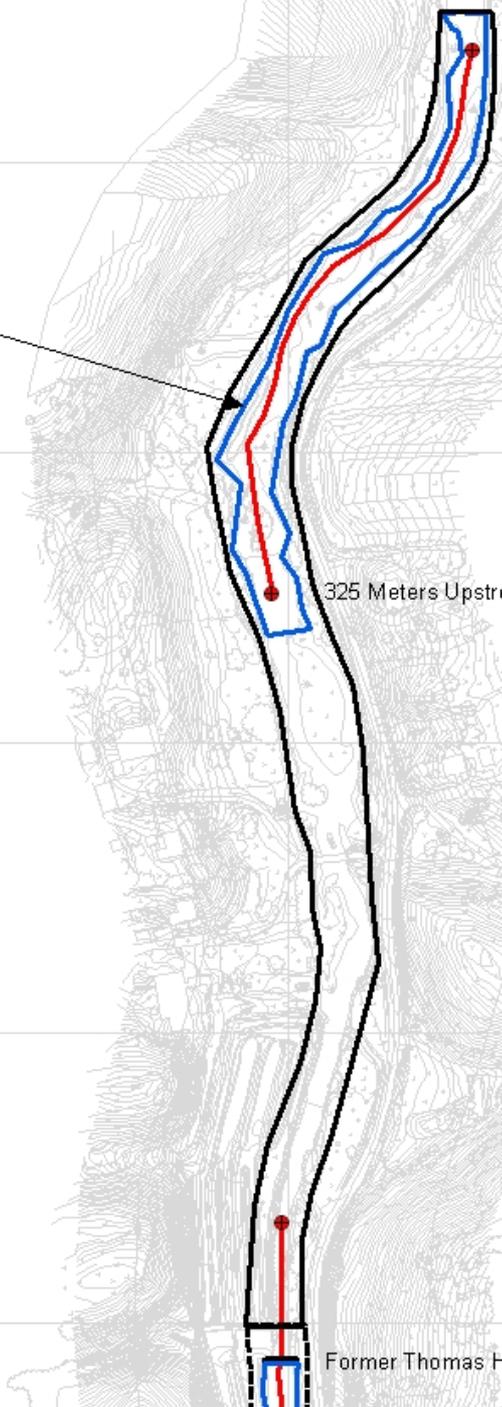


Willow Tree Parking Lot

Willow Tree Electrofishing & Habitat Monitoring Reaches

325 Meters Upstream of Willow Tree Parking Lot

Former Thomas Hatchery Dam



Narrowing and Deepening of the Channel

- Constructed ~0.7 Acres of Riparian Shelves
- Planted Over 5,000 Native Wetland Herbaceous Plugs (28 Species)
- Planted 100 Native Wetland Shrubs (8 Species)

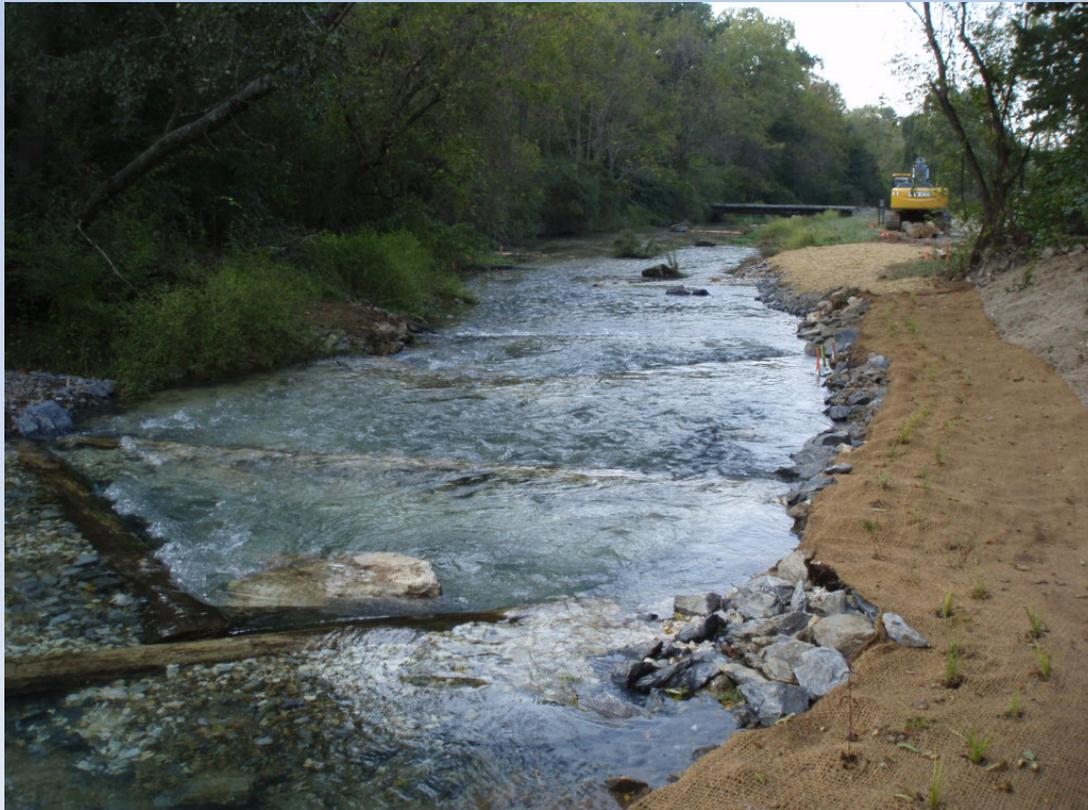


Photo: B. Ferris



Narrowing and Deepening of the Channel

- Constructed six log water staging devices, each consisting of 5 to 8 Logs
- Work in conjunction with riparian shelves to increase water depth
- Control water surface elevation & velocity
- Influence soil moisture conditions of riparian shelves
- Designed and constructed to allow for passage of fish



Width & Depth

| Parameter | Life Stage (Optimal) | Model Before | Model After | Treatment Before | Treatment After | Willow Tree 2011 |
|--------------------------------|----------------------|--------------|-------------|------------------|-----------------|------------------|
| Mean Width (ft) | | 48.3 | 48.6 | 57.1 | 45.8 | 77.7 |
| | | | | | | |
| Mean Thalweg Depth (ft) | | 1.76 | 1.77 | 1.22 | 2.01 | 1.55 |
| Brook Trout Condition | Adult (1.38 Min.) | Optimal | Optimal | Sub-Optimal | Optimal | Optimal |
| Rainbow Trout Condition | Adult (1.48 Min.) | Optimal | Optimal | Sub-Optimal | Optimal | Optimal |
| | | | | | | |
| Mean Depth (ft) | | 1.13 | 1.10 | 0.74 | 1.27 | 0.89 |
| Brook Trout Condition | Adult (0.89-2.63) | Optimal | Optimal | Sub-Optimal | Optimal | <u>Optimal</u> |
| Rainbow Trout Condition | Adult (2.20 Min.) | Sub-Optimal | Sub-Optimal | Sub-Optimal | Sub-Optimal | Sub-Optimal |

Velocity & Substrate

| Parameter | Life Stage (Optimal) | Model Before | Model After | Treatment Before | Treatment After | Willow Tree 2011 |
|---|---------------------------------|--------------|-------------|------------------|-----------------|------------------|
| Mean Velocity (ft/sec) | | 0.67 | 0.82 | 0.86 | 0.75 | 0.46 |
| Brook Trout Condition | Spawning (0.12 – 1.11) | Optimal | Optimal | Optimal | Optimal | Optimal |
| Rainbow Trout Condition | Spawning (0.60 – 2.30) | Optimal | Optimal | Optimal | Optimal | Sub-Optimal |
| | | | | | | |
| % Fine + Coarse Gravel (2 – 64 mm) | Spawning (Brook Trout) | 47 | 49 | 44 | 41 | 41 |
| % Coarse Gravel (16 – 64 mm) | Spawning (Rainbow Trout) | 21 | 22 | 26 | 23 | 10 |
| | | | | | | |
| % Cobble or Larger (>64 mm) | | 14 | 16 | 10 | 16 | 14 |
| Brook Trout Condition | Juvenile Cover (10% Min.) | Optimal | Optimal | <u>Optimal</u> | Optimal | Optimal |
| Rainbow Trout Condition | Juvenile Cover (12% Min.) | Optimal | Optimal | Sub-Optimal | Optimal | Optimal |

Increased Fish Cover

- Constructed Ten 20'-Long Modified Mud Sills
- Added 19 Habitat Logs
- Placed 101 Habitat Boulders
- Constructed 6 Rock Clusters

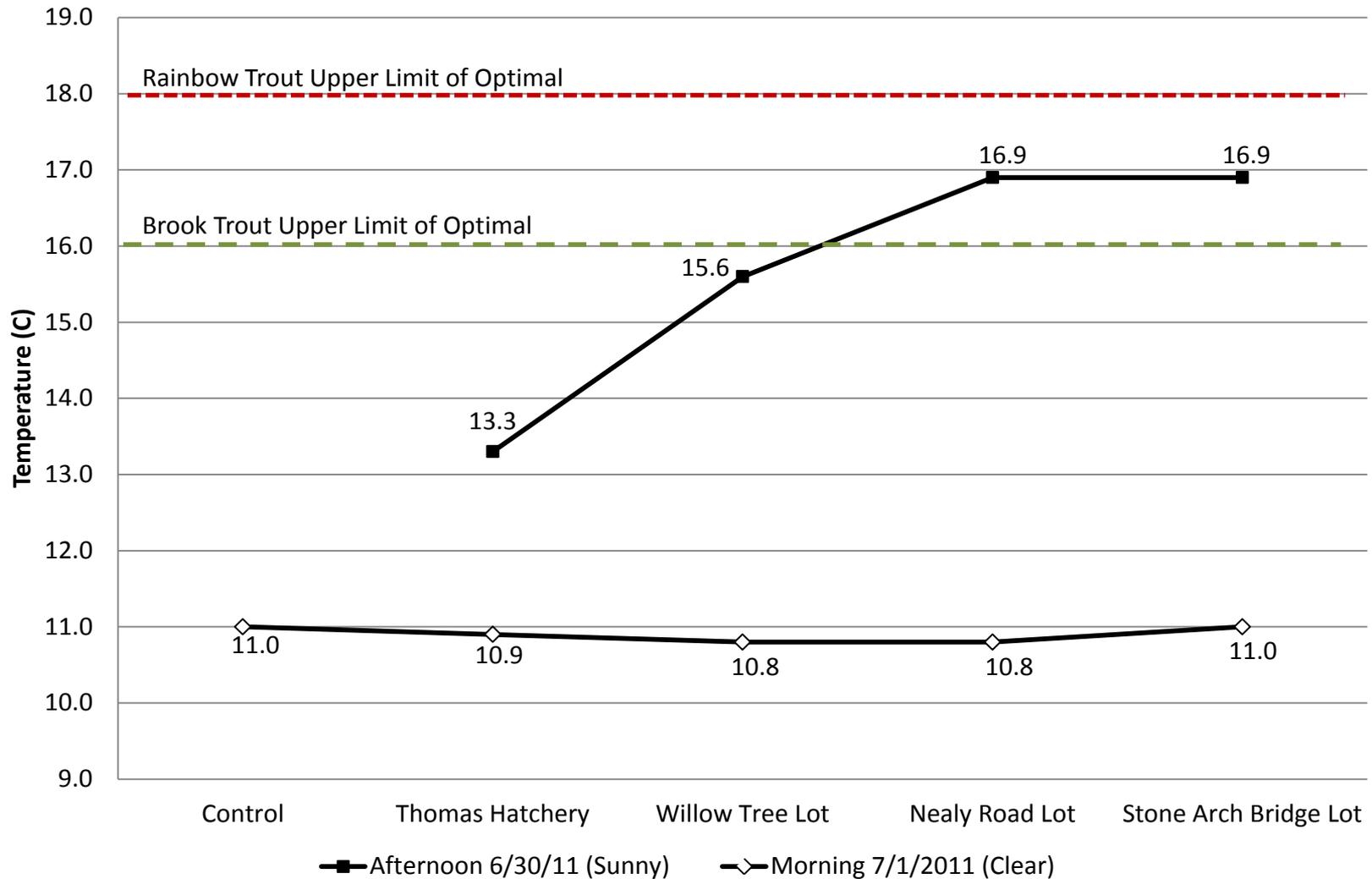


Fish Cover

| Parameter | Life Stage (Optimal) | Model Before | Model After | Treatment Before | Treatment After | Willow Tree 2011 |
|---|----------------------|--------------|-------------|------------------|-----------------|------------------|
| % Adult Fish Cover (fish > or = 8 inches in length) | | 14 | 9 | 3 | 20 | 14 |
| Brook and Rainbow Trout Condition | Adult (12% Min.) | Optimal | Sub-Optimal | Sub-Optimal | Optimal | Optimal |
| % Adult Fish Cover Provided by Aquatic Plants | Adult | 10 | 4 | 2 | 12 | 12 |
| % Adult Fish Cover Other than Aquatic Plants | Adult | 4 | 5 | 1 | 8 | 2 |
| | | | | | | |
| Mean Distance to Closest Adult Fish Cover (ft) | Adult | 5 | 8 | 18 | 6 | 13 |
| | | | | | | |
| % Total Fish Cover | | 29 | 32 | 30 | 34 | 53 |
| Brook and Rainbow Trout Condition | Juvenile (14% Min.) | Optimal | Optimal | Optimal | Optimal | Optimal |

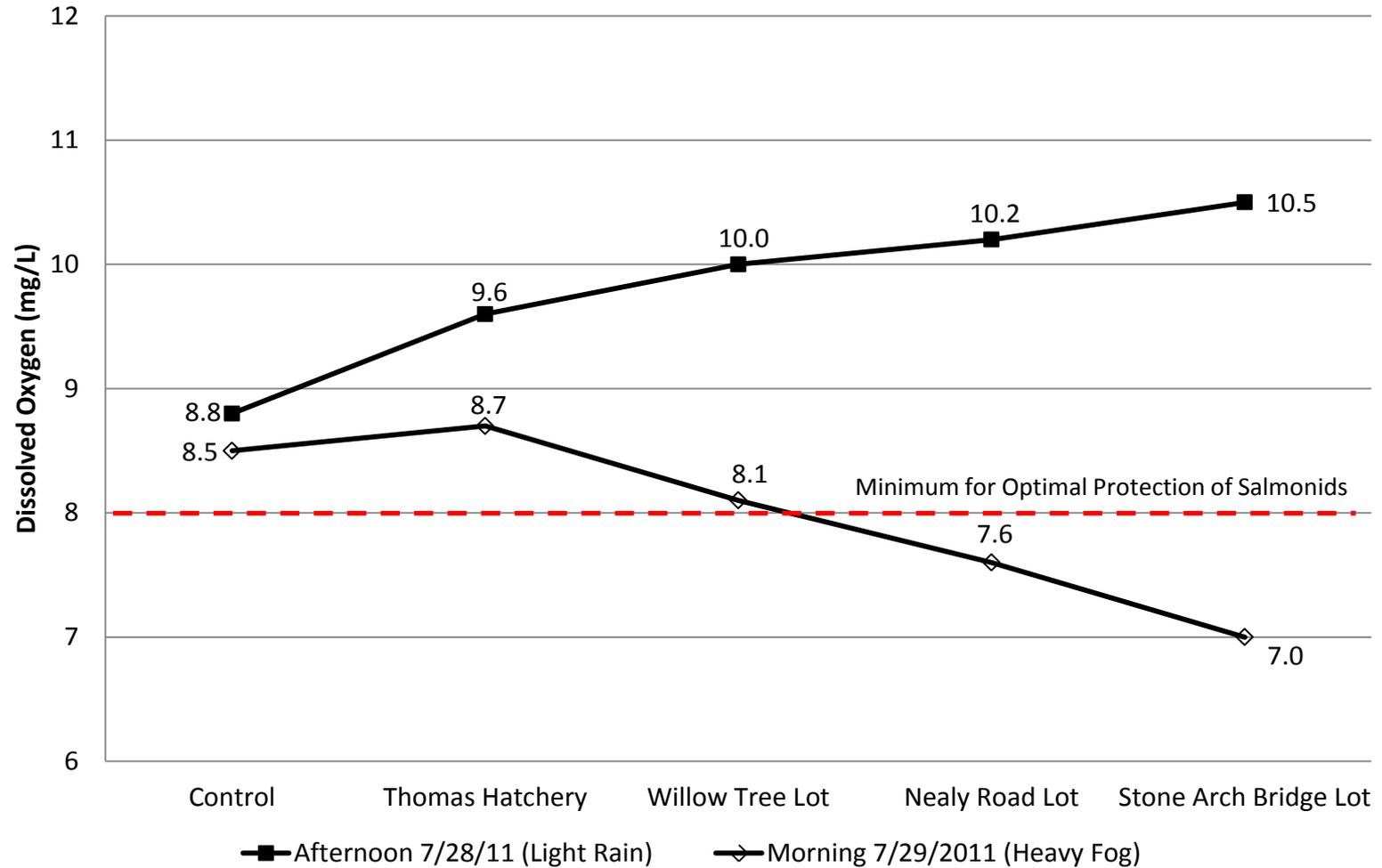
Water Temperature (Summer 2011)

Temperature from Afternoon 6/30/11 to Morning 7/1/11



Dissolved Oxygen (Summer 2011)

Dissolved Oxygen Concentration from Afternoon 7/28/11 to Morning 7/29/11



Response of Fishery

Photo Taken on September 19, 2010



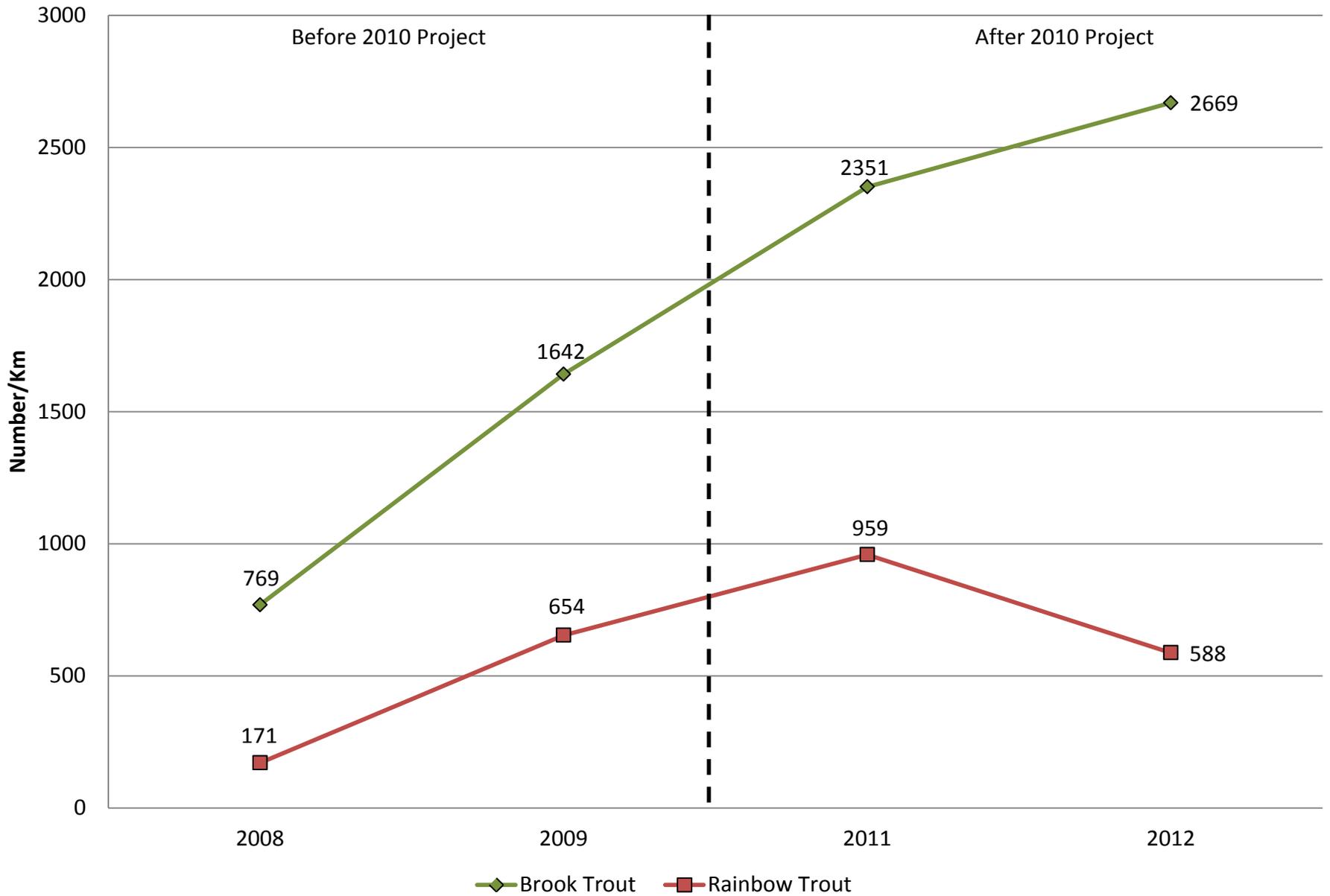
Photo: N. McGarrell

Response of Fishery

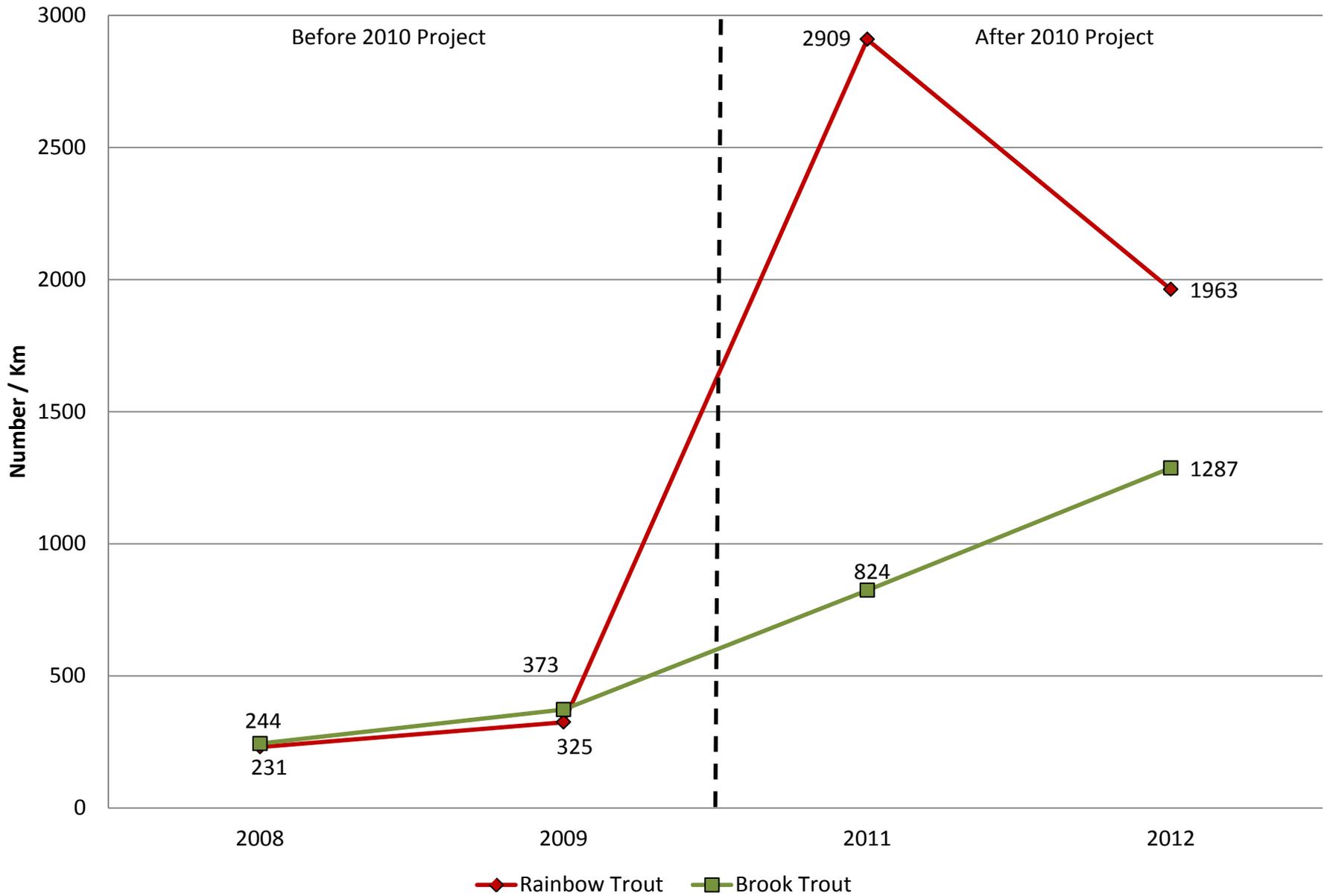
- Trout Fry
- Photo Taken on January 24, 2011



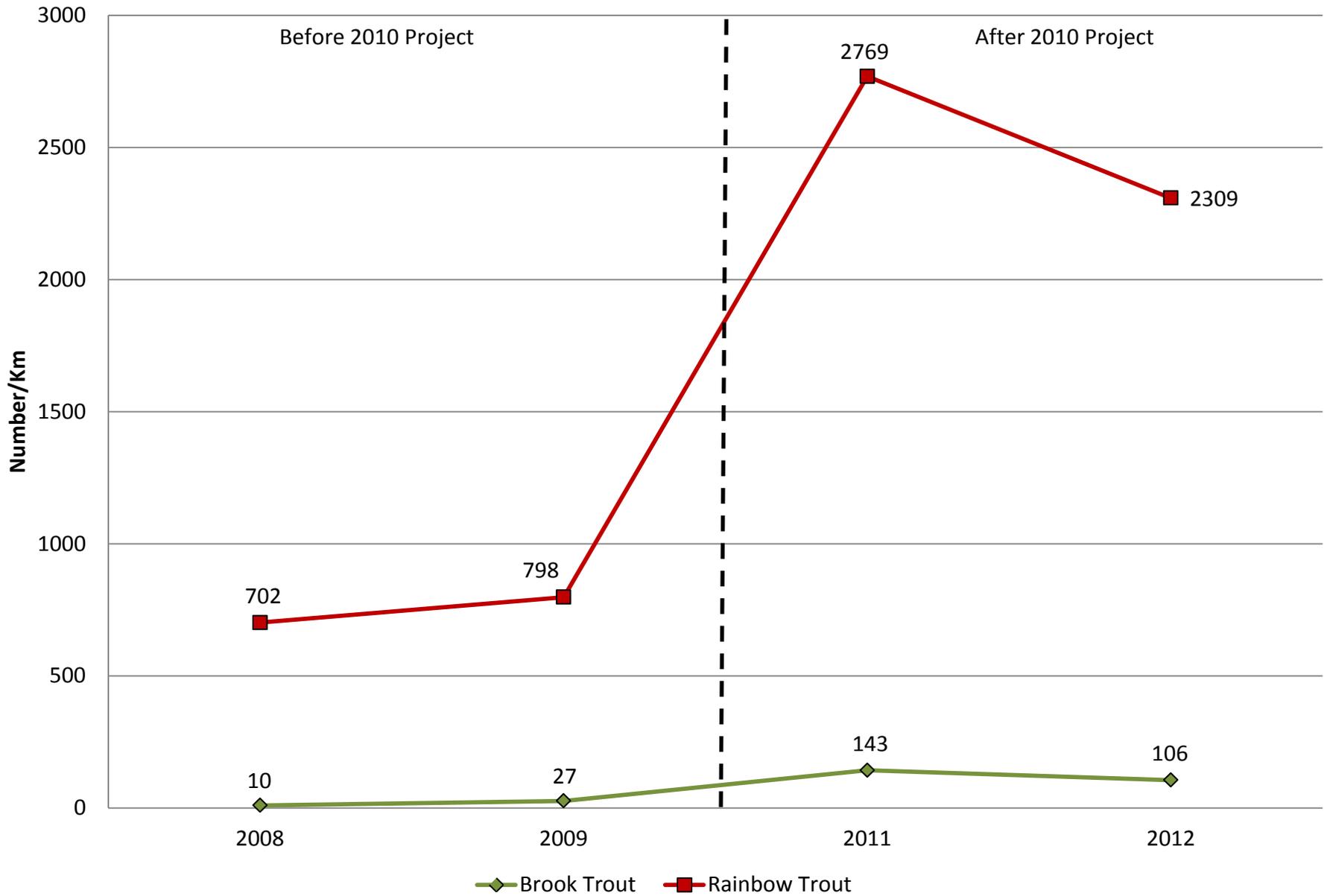
Control Reach (RM 4.77) Trout Abundance (2008-2012)



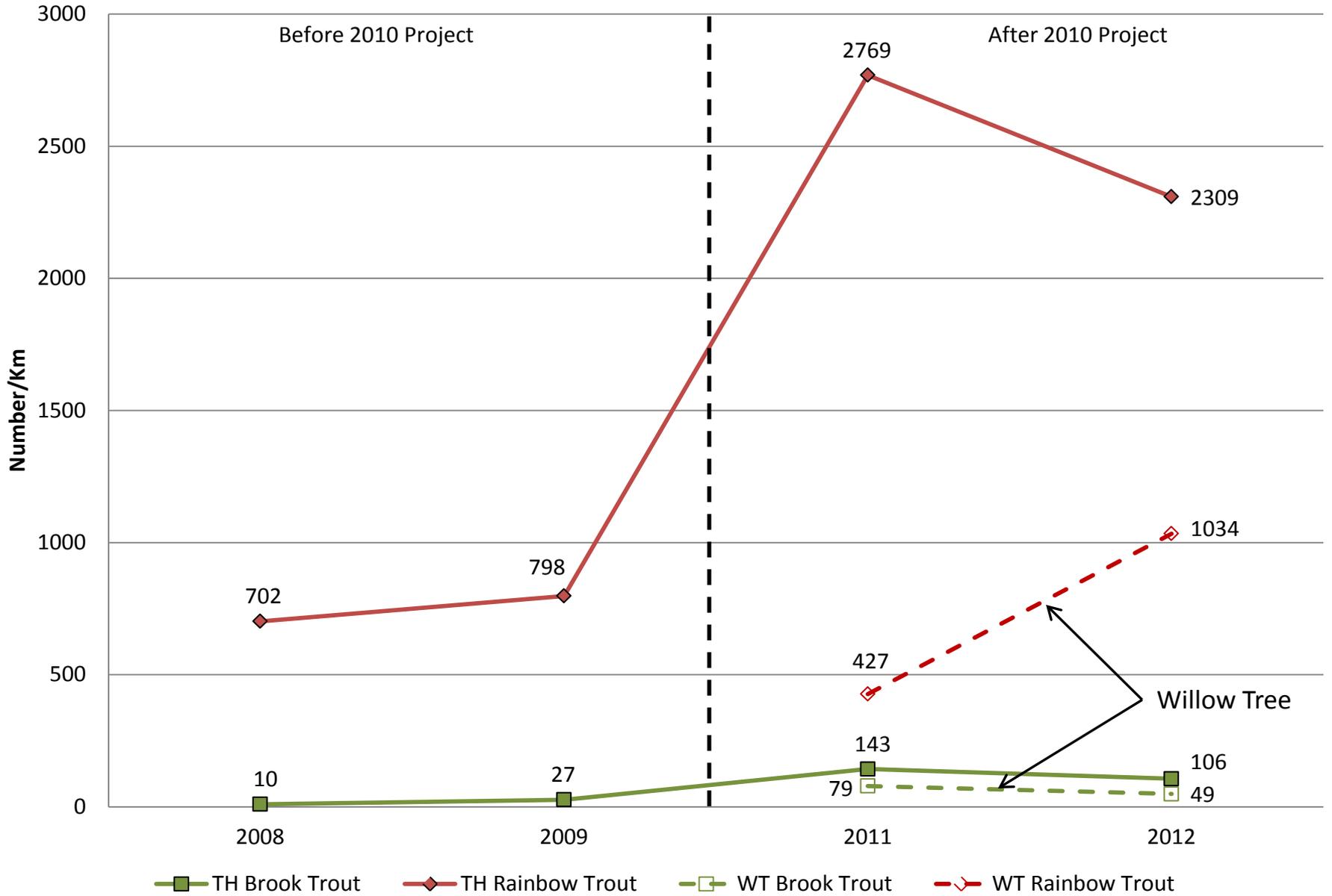
Piper Mill Pool Reach (RM 4.47) Trout Abundance (2008 - 2012)



Thomas Hatchery (RM 4.29) Trout Abundance (2008-2010)



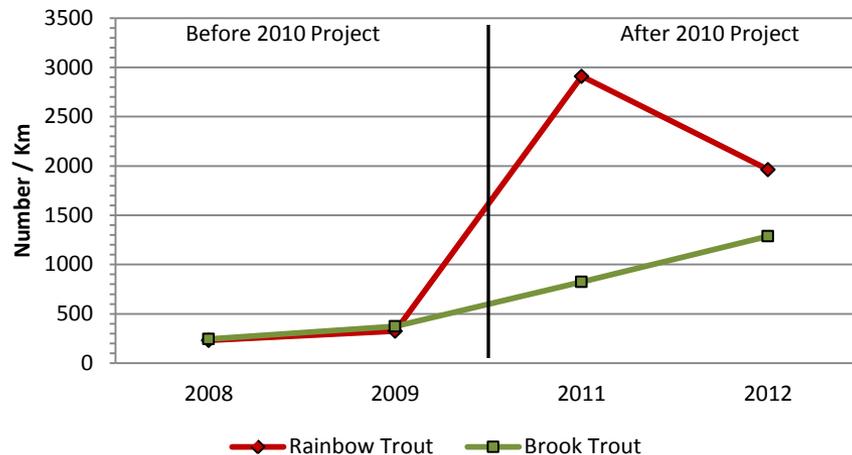
Thomas Hatchery (RM 4.29) and Willow Tree (RM 3.88) Trout Abundance



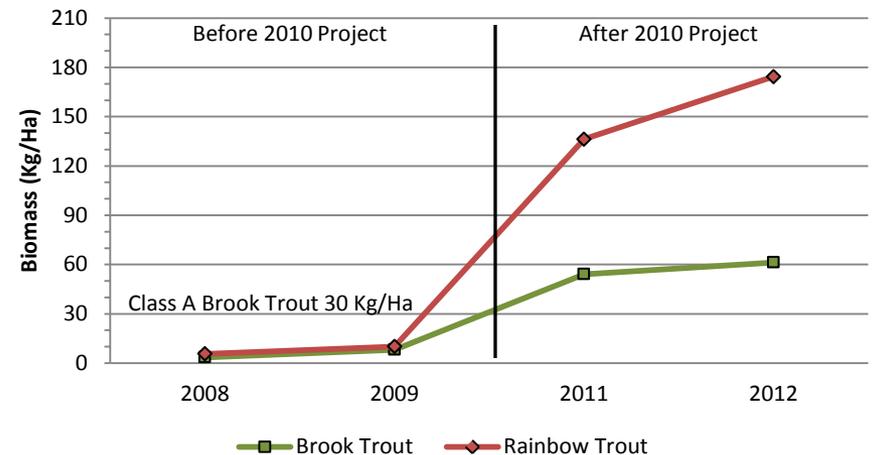
Current Status of Fishery

- Short-term response of fishery to 2010 Project
- Long-term response minimum of seven years total (September 2017)

Piper Mill Pool (RM 4.47) Trout Abundance (2008 - 2012)



Piper Mill Pool (RM 4.47) Trout Biomass (2008-2012)



Fishery Management Strategy for Big Spring Creek

- Goal : To optimize brook trout

- Trout Species Composition Objective for Sections 01 and 02:
 - Minimum of 70% brook trout abundance
 - Maximum of 30% other trout species combined
 - By September 2017

- Total Trout Biomass Objective for Sections 01 and 02:
 - 90 Kg/Ha (all trout species combined)
 - By September 2017



Phase 2 Project Approach

Water Quality

- Improve the water temperature and dissolved oxygen conditions

- Narrow the channel to reduce:
 - Water temperature
 - Aquatic plant photosynthesis levels
 - Variability in D.O. and water temperature

- Increase air-water interface turbulence



Phase 2 Project Approach

Spawning Substrate

- Limit coarse gravel
- Incorporate fine gravel



Phase 2 Project Approach

Depth & Velocity

- Log water staging devices: optimal spawning habitat for brook, but not rainbow
- Increase mean depth to conditions of the model reach, but not greater than
- Reduce thalweg depth conditions to just below the optimal range of rainbow
- Maintain existing mean velocity conditions



Phase 2 Project Approach

Fish Cover

- Increase adult fish cover other than aquatic plants to model reach conditions
- Reduce mean distance to closest adult fish cover to the model reach conditions



Fish Migration Barrier Consideration

- Consideration was given to constructing a fish migration barrier on Big Spring Creek and relocating rainbow and brown trout downstream of barrier
- Barriers considered:
 - Log barrier
 - Gabion barrier with log spillway
 - Rolling weir barrier
 - Electronic fish screen (Hydrolox)
 - Concrete barrier

Log Fish Migration Barrier



Gabion barrier with Log Spillway



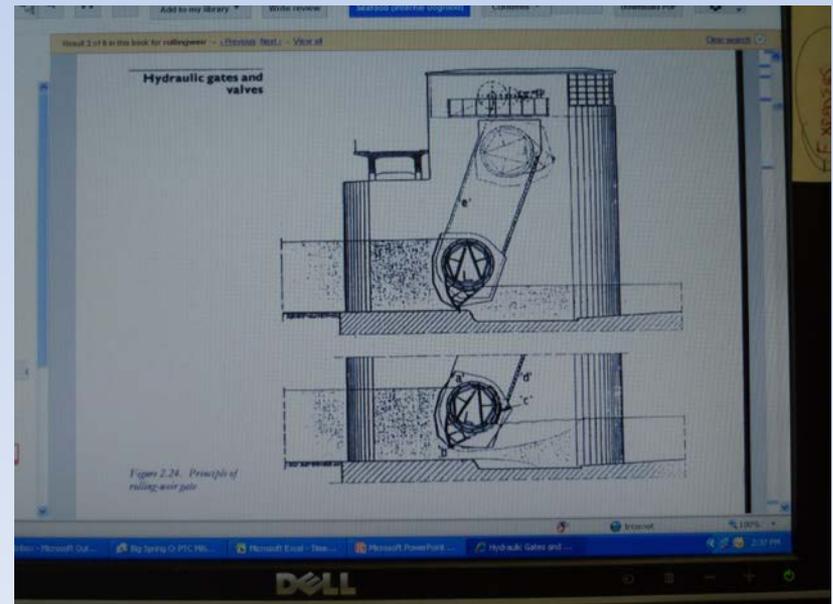
Fish Migration Barrier Consideration

- Barrier construction is not practical at this time
 - Permitting issues
 - Cost
 - Maintenance and liability issues
- Relocating fish to downstream of Laughlin Mill Dam not an acceptable alternative due to inadequate angler access (posted property)

Concrete Fish Barrier



Rolling Weir Barrier



Fishing Regulation Proposal

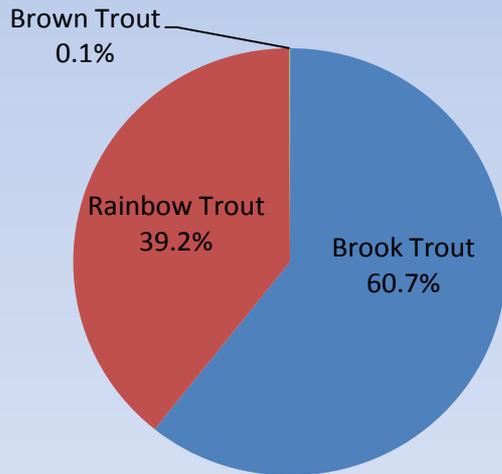
- Fishery management goal and objectives may not be obtained by habitat enhancement alone
- Competition with other trout species may prevent attainment of the goal and 70% brook trout objective
- Removal of rainbow and brown trout may be required in order to attain the goal and 70% brook trout objective



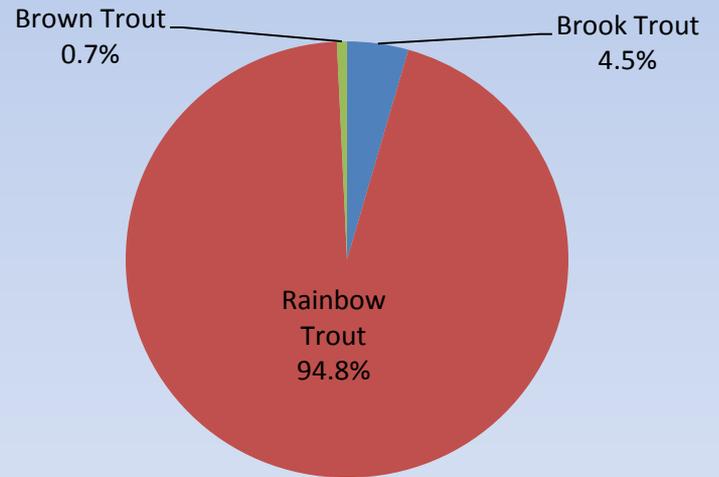
Fishing Regulation Proposal

Current (2012) Trout Species Composition

Section 01
(Boards at the Ditch to the former Piper Mill Dam)



Section 02
(Former Piper Mill Dam to Nealy Road)



Fishery Management Strategy for Big Spring Creek

- Recommend regulation change for Sections 01 and 02 beginning in 2014:
 - Fly-fishing tackle only
 - Catch-and-release of brook trout
 - Harvest of a total of five rainbow and brown trout per day greater than or equal to seven inches in length

- If species composition objective is not attained in both Sections 01 and 02 by September 2017, rainbow and brown trout removal by electrofishing will be considered



Fishing Regulation Proposal

- If rainbow and brown trout are removed they will be stocked in local, limestone spring-influenced, Approved Trout Waters, with no or low densities of wild trout



Questions

