Biological Perspective on Stream Restoration

Restoration of Big Bear Creek Watershed
Lycoming County, PA

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Muncy Creek Restoration Project

During 2000, the Endless Mountains Resource Conservation Trust received a grant through the CHP program to conduct a Preliminary Assessment of the Muncy Creek watershed, extending from the headwaters to the confluence with the West branch of the Susquehanna River. In addition, the Muncy Creek Watershed Association, with funding provided by PADEP Growing Greener Grant, hired two CWI summer interns to perform a physical assessment of Muncy Creek. The interns documented sites of impairment from the headwaters of Muncy Creek, near Nordmont, to its confluence with the West Branch of the Susquehanna River. Using a GPS unit and a data collection form the interns documented the location of each site, bank height, bank angle, density of roots, particle size, stream width, length of site, distance from erosion to a structure, type of structure, and the number of pictures taken of the site, if any. In all, 175 sites of the stream bank erosion and gravel deposition were documented. **Currently**, CWI interns are involved in monitoring water chemistry, macroinvertebrates and fish along the main stem of Muncy Creek with particular emphasis in the area between Nordmont and Sonestown.

Big Bear Creek Stream Restoration Project

The Fish and Wildlife Service, in cooperation with the Dunwoody -Big Bear Hunting and Fishing Club and other partners including DEp Growing Greener Grant and Lycoming College, has initiated a watershed restoration project on Big Bear Creek in Lycoming County, Pennsylvania. This project proposes to stabilize and improve aquatic habitats throughout the 3.8 miles (6.13 km) of the main stem of Big Bear Creek. The stream is classified as a high quality cold water fishery, and has a long history of providing quality trout fishing. Detailed records document the quality of the fishery -- primarily for native brook trout -- for over 100 years. Since 1972, the stream has suffered from three natural floods and one human-caused event. Hurricanes Agnes and Eloise, and a January 19, 1996 flood were the natural events. All moved significant amounts of sediment and caused severe bank erosion and debris jams. In 1996, a dam on the headwaters was declared unsafe and removed, dumping 100 years of accumulated sediment into the channel. Stream clearing work by Plunketts Creek Township further contributed to the habitat degeneration.

This project is designed to control the ongoing bank erosion, reduce the sediment load and improve fish habitats. Natural channel design methods using the science of fluvial geomorphology are being used. Work on the project involves re-grading the channel to a stable configuration where necessary and employing a variety of rock and log vanes. In 1999, forty-two structures were installed on 4000 feet of stream with an additional 85 installed in 2000 and 2001. An intensive monitoring program to document water quality, macroinvertebrates and the fishery was initiated by Lycoming College prior to construction and will continue for five years.

Big Bear Creek

Electro-shocking at Big Bear

Big Bend Watershed

- 17 square miles watershed
- Project area lower 3.5 miles

Special Thanks

This project would not have been possible without the support of several people and organizations.

- DEP - WRAP and Growing Greener Grants
- The U.S. Fish and Wildlife Service (esp. Dave Putnam and Casey Clapsaddle)
- Dunwoody Club (esp. Bill Worobec and Bob Wayne)
- Sunbury Grouse Club (adjacent land owner)
- PPL (tree planting)
- Penn State University
- Gleim Environmental Group
- Lycoming College Biology Department and Clean Water Institute (Growing Greener & Merck/AAA's Grant)

Project Goals

- Natural stream channel design for:
- Habitat Stability (especially banks)
- Develop a stable fishery

What is Fluvial Geomorphology?

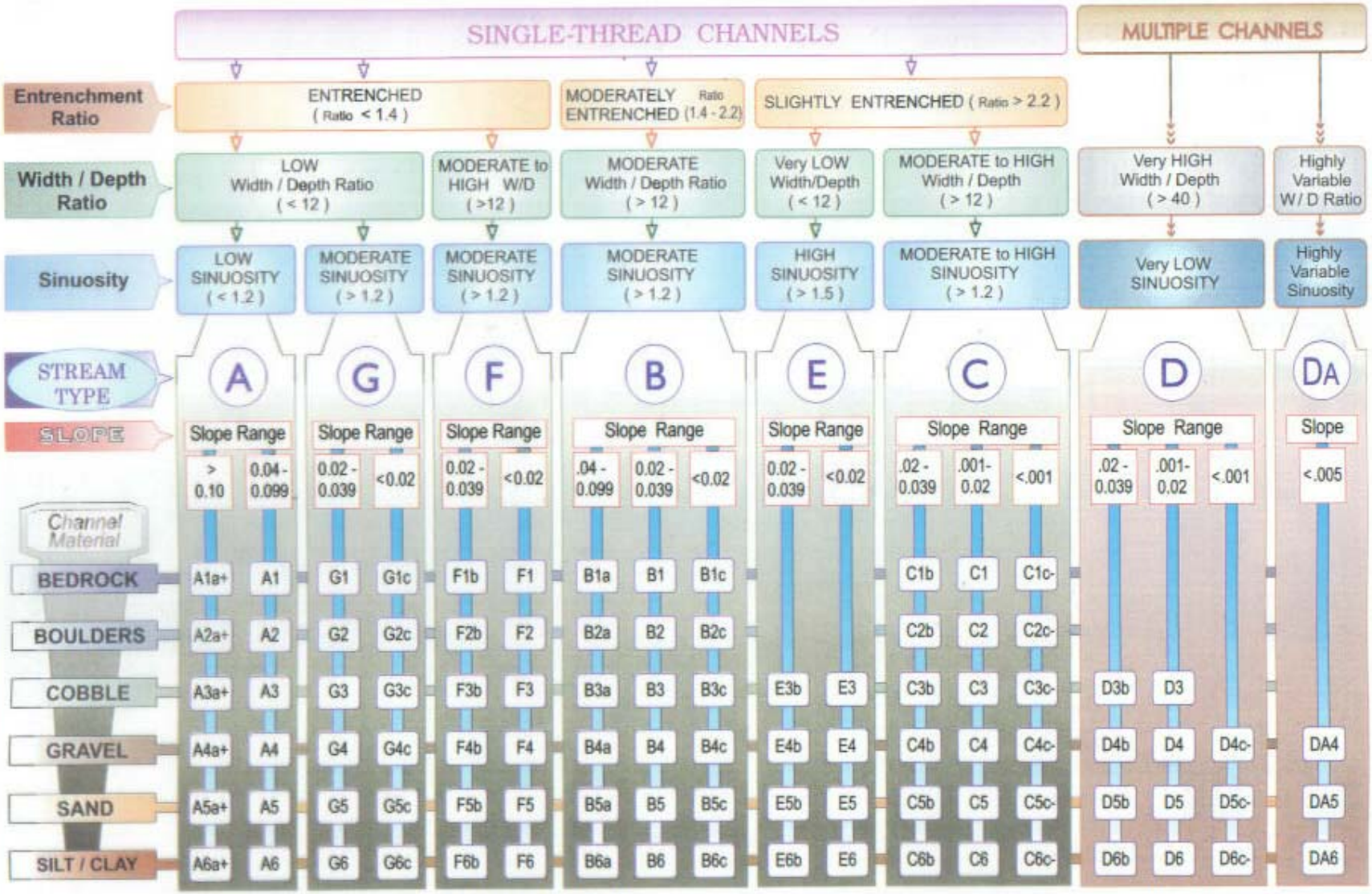
- The study of characteristics origin, and development of streams.

Rosgen Stream Classification

- Dave Rosgen has developed a system of stream classifications.
- His system compares streams to each other.
- Method allows consistent terms for communication.

Stream Characteristics

- Width/depth ratios
- Gradient
- Sinuosity
- Entrenchment
- Channel material composition
- Geology
- Land use



KEY to the ROSGEN CLASSIFICATION of NATURAL RIVERS. As a function of the *"continuum of physical variables"* within stream reaches, values of ***Entrenchment*** and ***Sinuosity*** ratios can vary by +/- 0.2 units; while values for ***Width / Depth*** ratios can vary by +/- 2.0 units.

FIGURE 5-3. Classification key for natural rivers.

A Stable Reach

Instability at Big Bear Creek

- Hurricane Agnes
- Hurricane Eloise
- Removal of a 100 year old dam on the main stream and release of large sediment deposits
- The January 19, 1996 flooding
- Sediment from inappropriate road maintenance
- Installation of inappropriate fish habitat structures

Severe Bank Erosion at Big Bear

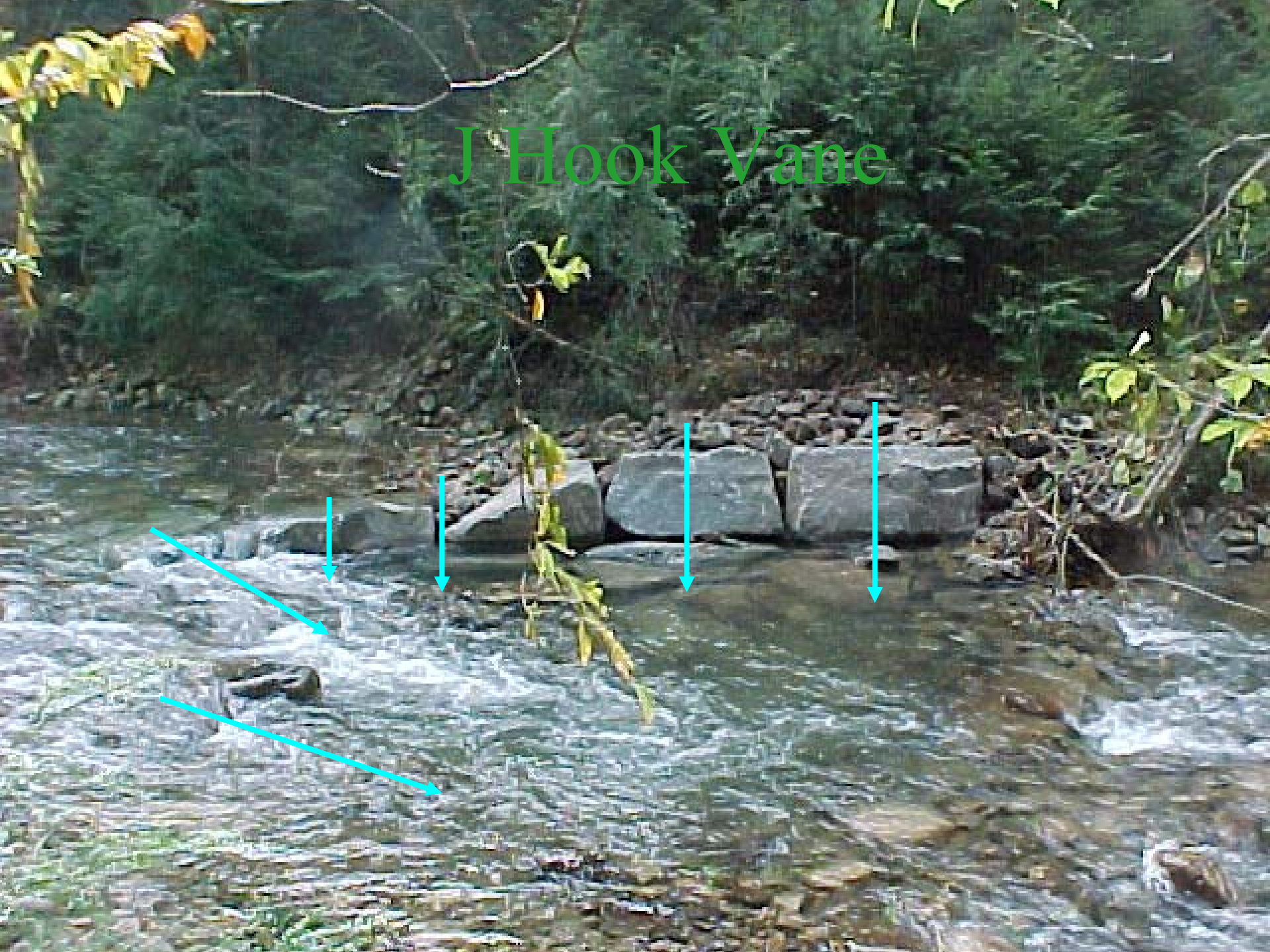
Signs and Symptoms of Instability

Biomonitoring – Lycoming College

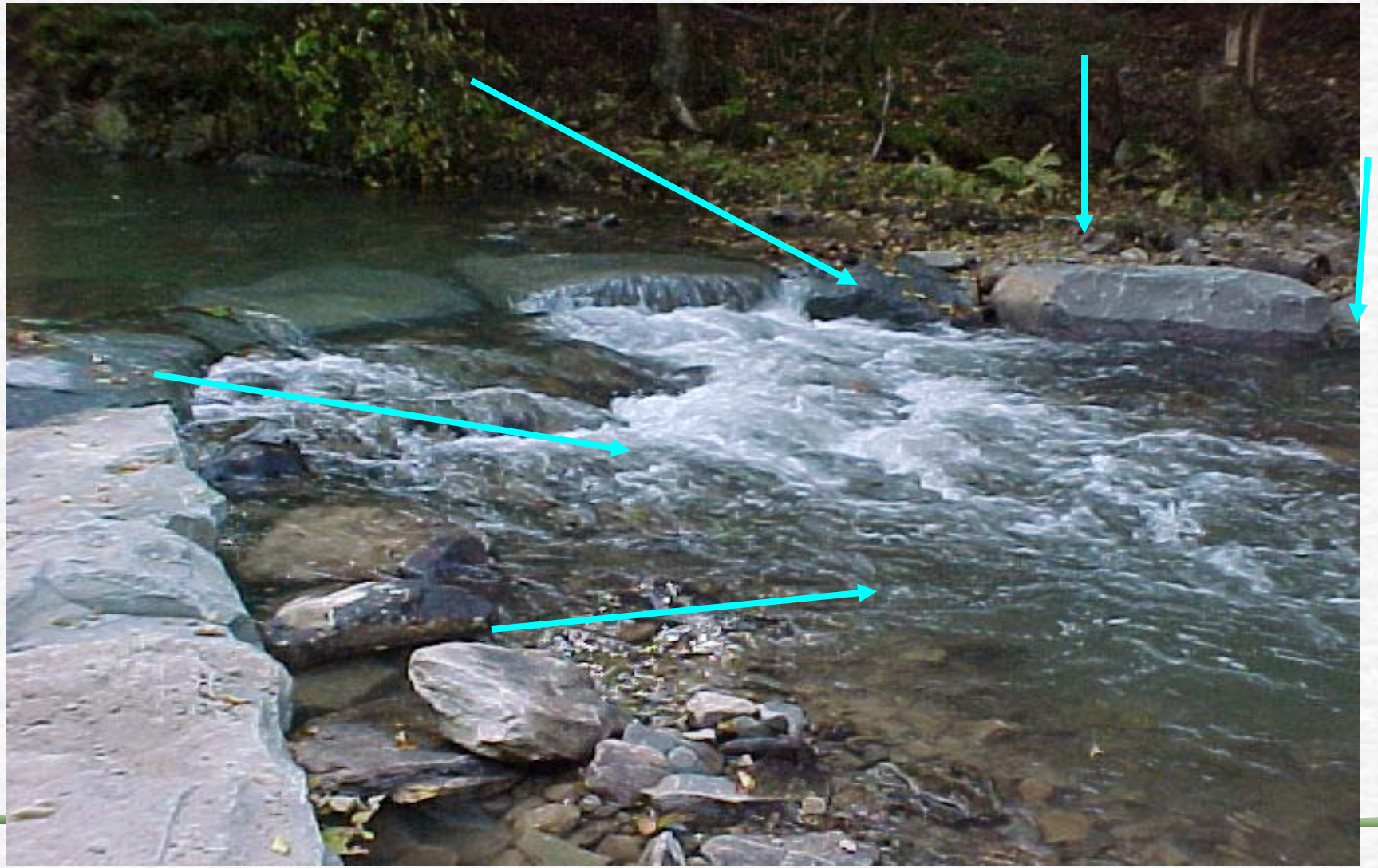
- Physical/Chemical Water Data
- Benthic Macroivertebrates
- Fish
- 5 year pre and post restoration work – started June 1999

Structures for Stabilization

- Rock Vane
- Cross Vane
- J-Hook Vane
- Root Wad
- W-Weir

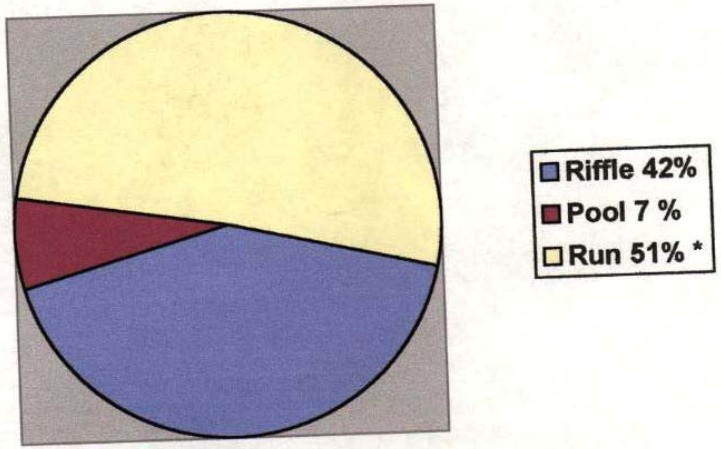

J Hook Vane

Cross Vane



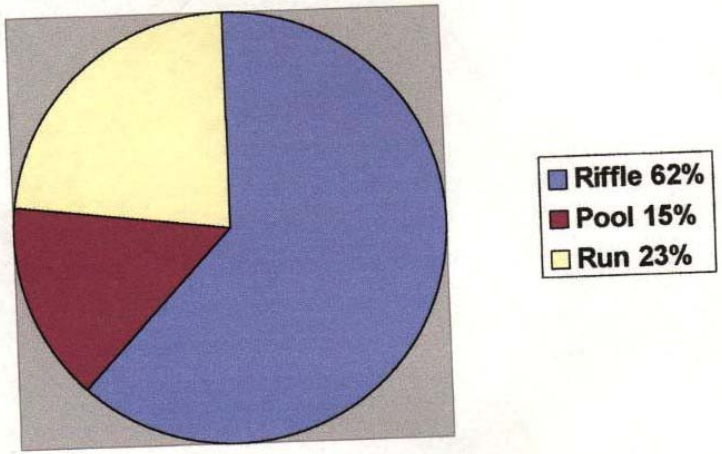
Percent Composition of Macro habitats along 3.2 miles of Big Bear Creek

July 1999 – Prior to Remediation



* 6% of Run Section was dried up with subsurface water flow

June 2002 – After Remediation



Collection of Fish Data on Big Bear

Fish in Big Bear Creek

- Brook Trout (*Salvelinus fontinalis*)
- Brown Trout (*Salmo trutta*)
- Slimy Skulpin (*Cottus cognatus*)
- Long Nose Dace (*Rhinichthys cataractae*)
- Black Nose Dace (*Rhinichthys atratulus*)

Snorkel Fish Counts

Figure 1 Trout Size Class Distribution 2001

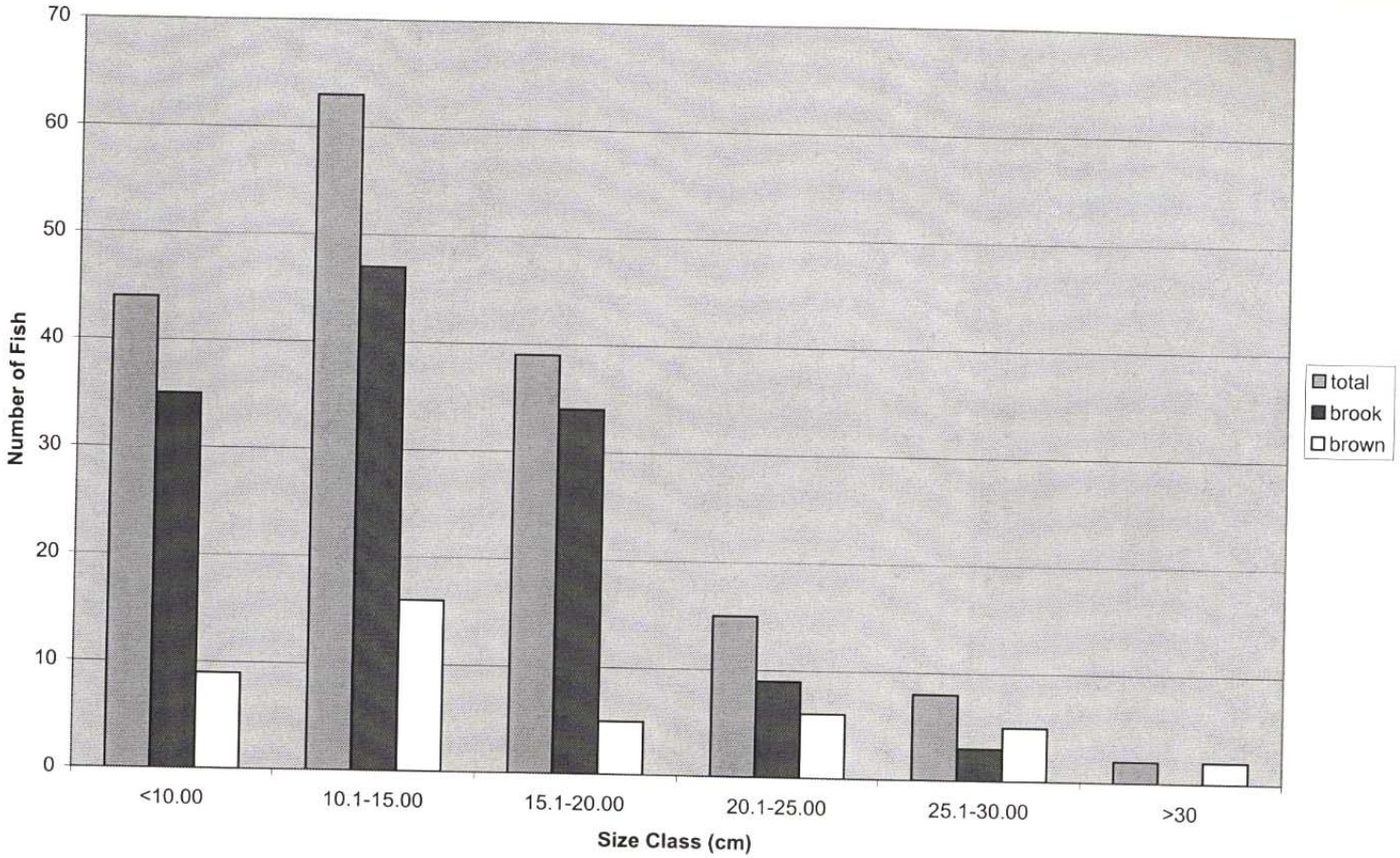
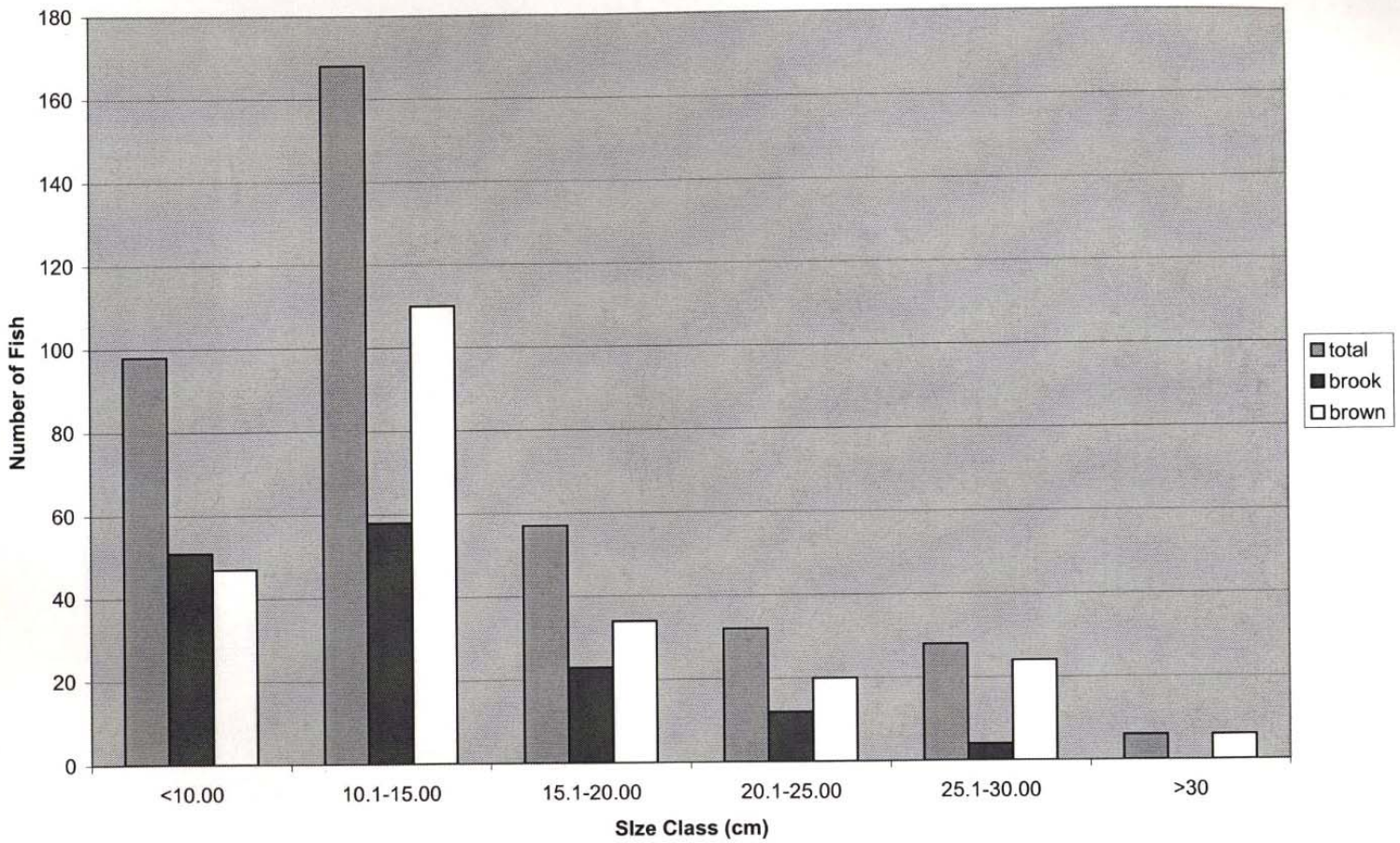
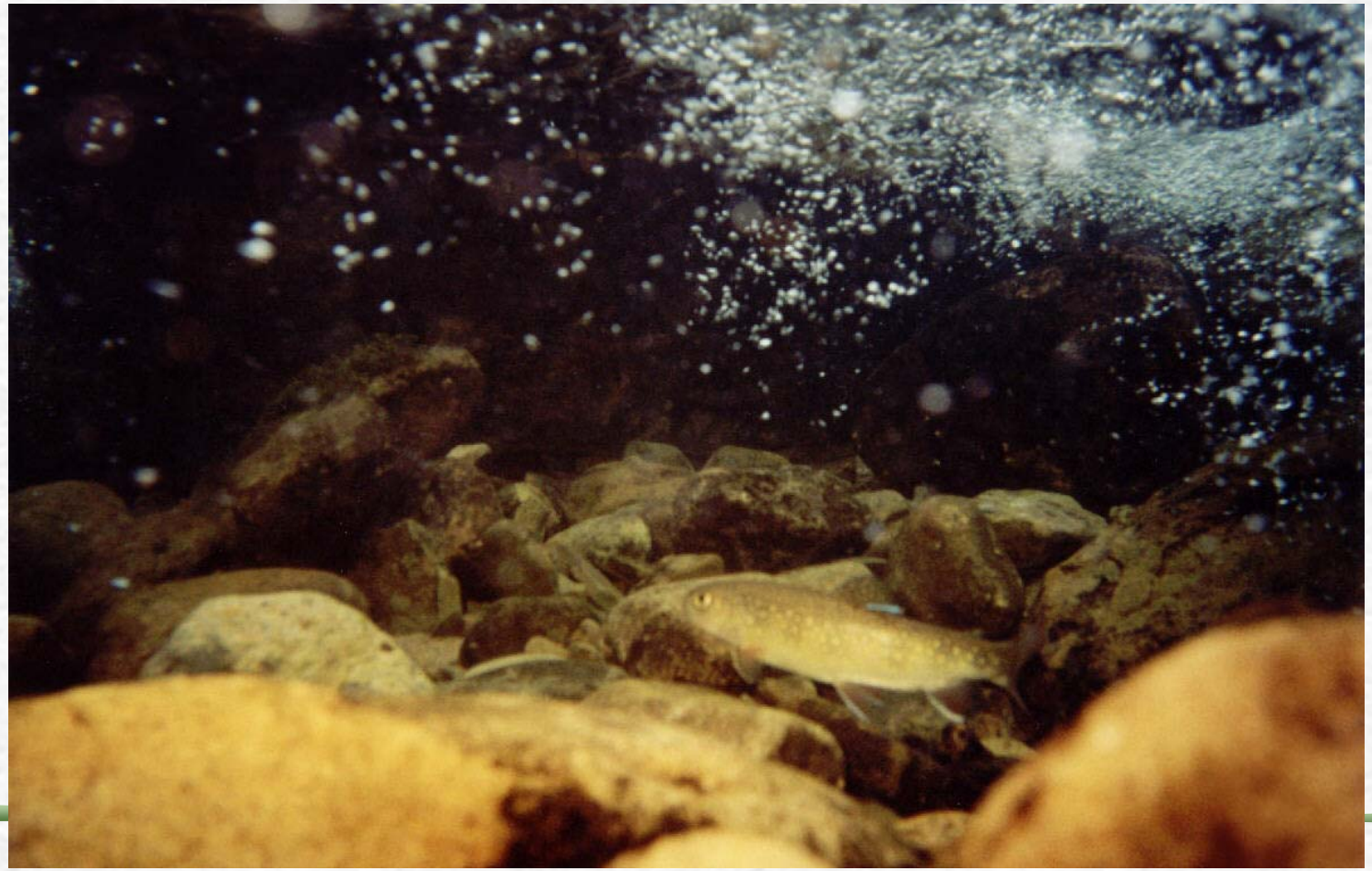


Figure 2 Trout Class Slze Distribution 2002



Snorkel Observation of a Tagged Trout



Data Collecting Goes On…

The End…