THE IMPACT OF LARGE WOODY DEBRIS ON HABITAT RESTORATION

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ABSTRACT

Creating suitable trout habitat in the Salmon Kill, a tributary to the Housatonic River, in northwestern Connecticut is a goal for Trout Unlimited (TU) and the local community. Currently, trout habitat on the Salmon Kill is degraded due to historical and current land use practices. As a result ,the streambanks are steep and eroding, the channel is wide with limited deep pools and limited overhead cover. Large wood treatments and riparian plantings are the treatments planned for the restoration project currently underway.

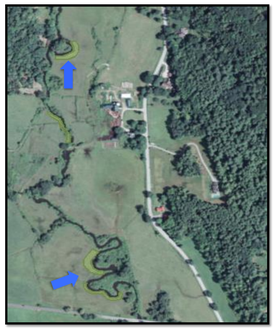
TU's large-scale habitat restoration project is in an intermediate phase; there are many things that have to be done before this project is complete. I participated in the establishment of photo monitoring points, researching restoration methods, and evaluating fish survey data that was gathered prior to and then following restoration activities. Data gathered following restoration of the first three sites will help guide the restoration process. The results are promising. After sampling along Salmon Creek sites destined for restoration a native brook trout (*Salvelinus fontinalis*) was captured during electrofishing monitoring by CT Department of Energy and Environmental Protection (CT DEEP). The trout was hiding under a new log structure just installed along at one of the restoration sites.

INTRODUCTION

Like a number of freshwater ecosystems, the Salmon Kill in Salisbury, Connecticut, has been impacted by a number of anthropogenic stressors. In 2012, Trout Unlimited began a comprehensive restoration project in the Salmon Kill. Funds for this project came from the Housatonic River Natural Resource Damages Fund in response to the release of the PCBs into the Housatonic River (Mayland, K. 2016). The goal of the restoration project is to improve water quality and instream habitat for native and wild trout. After two years of careful planning, establishing relationships, and community outreach, project implementation began in 2015.

The Salmon Kill project reach spans 6 miles, with over 24 unique sites identified during an assessment as needing improvements . Restoration activities planned include the installation of large wood treatments, streamside plantings, and instream rock clusters to create a diversity of habitat.

My project included research, field work, and data interpretation pertaining to the effect of large wood installation on habitat restoration. Large wood is important to stream health: wood helps maintains the shape of waterways, shades the area, creates feeding opportunities, and produces deep pools of cooler water, which provides refuge for trout and other cold water species during periods of high summer temperatures (Angermeier, P. L. 1984).



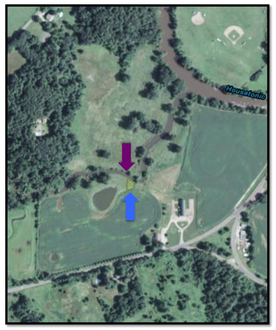


Fig 1. The three restoration sites on the Salmon Kill are highlighted in green. I conducted pre- and post-monitoring of the two sites indicated by ⬆, and I conducted post monitoring at one site indicated by ⬆. Trout Unlimited hopes to restore 24 sites along the Salmon Kill.

METHODS

The following were used to develop baseline photo monitoring stations of three large woody debris installations. The baseline stations will be used over time to assess the effectiveness of restoration goals.

Study Area

- **Salmon Kill Watershed in northwest Connecticut (Fig.2-A).**
- **Three unique sites restored-such as Site 2 at Whippoorwill Farm, where restoration was completed (Fig. 1).**
- **Monitoring of large wood installations occurred at 3 construction sites.**

Data Collection & Analysis at Monitoring Points

- **Step up photo points at two sites prior to implementation of large wood treatments and did follow-up photo monitoring at one site (Fig. 2 – B, C).**
- **At each photo point, I recorded the latitude and longitude using a GPS, and then photos were taken of the site using a whiteboard to report site-specific information.**
- **I researched the effects of large wood on stream ecology.**
- **Evaluated the fish data collected before and after restoration at one site.**

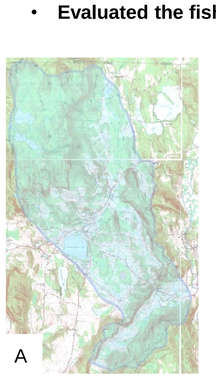


Fig 2. (a) This is a topographic map of the Salmon Kill Watershed. (b) This is a photo of the site before restoration. The whiteboard lists all of the necessary information to identify this site, including coordinates, site number, site name, date, and the photo point. (c) This is a photo of the same site after restoration.

Fish Data

This is fish data taken from site 2 at Whippoorwill Farm. These tables show the difference between pre-restoration (2013) and post-restoration (2015) fish collection data.

Selected Fish Sample (Table 1)

	Brown Trout	Brook Trout	White Sucker	Blacknose Dace	Creek Chub
2013	49	0	112	107	35
2015	54	4	85	150	82

General Population Data (Table 2)

	H(Shannon Diversity)	Number of Species	% Cold Water Fish
2013	1.46	10	51.43%
2015	1.38	6	55.59%

RESULTS

Photo Monitoring

- **The photo points can be used as a standard for which growth of riparian vegetation and structure of the wood restoration can be measured (Fig. 2).**
- **These points will be used to evaluate the effectiveness of the restoration project.**

Literature Review

- **Woody debris is an effective material for restoration, as anaerobic conditions prolong life (Angermeier, P. L. 1984).**
- **It is anticipated that wood will maintain shape of the Salmon Kill, provide feeding and habitat opportunities to native trout, and create shading and deep thermal pools (Angermeier, P. L. 1984).**

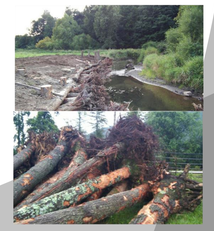
Fish Data

- **Fish diversity has decreased from 1.46 to 1.38 pi x ln(pi) (Table 2)*.**
- **Brook trout have increased from being nonexistent to making up a total of 1.06% of species sampled (Table 1).**
- **Presence of cold water fish rose from 51.43% to 55.59% (Table 2)**.**
- **There were 10 species found in 2013 and 6 in 2015 (Table 2). Of these, only 4 of these species were similar.**

***Decreasing diversity: not necessarily bad, implies that there are less species, but the present species are important.**
****Electrofishing data from different times of the year: increase in cold water species may be due to seasonal (and temperature) variation.**

CONCLUSIONS

The purpose of this project was to determine the effect of large woody debris on habitat restoration. Though this project is abstract in some ways, the procedures outlined above are very important parts of TU's Salmon Kill restoration project. The literature review and knowledge gained through study of naturally occurring wood in streams will be used in predicting and projecting the future of this project. Photo monitoring points—that can be accurately located—serve as the basis for which future studies of impact will be measured. The evaluation of fish data ensures the success of the project; when results show increasing cold water fish species, the restoration has been proven successful. There will be countless opportunities for future study as a result of the work accomplished here.



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Mayland, K. 2016 "Housatonic River Natural Resources Restoration Project." Connecticut D.E.E.P. Connecticut D.E.E.P., n.d. Web. 7 Mar. 2016.
Angermeier, P. L., and J.R. Karr. 1984 "Relationships between woody debris and fish habitat in a small warmwater stream." Transactions of the American Fisheries society 113.6 (1984): 716-726.