NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

TROUT REDD COUNT MONITORING FOR THE DELAWARE TAILWATERS

2018-2020

Prepared for the Fisheries Investigation Plan for the Delaware Tailwaters

February 28, 2018

Trout Redd Count Monitoring
Delaware Tailwaters 2018-2020
January 31, 2018

Problem Statement

The information on trout spawning intensity for the wild trout fishery of the West Branch Delaware River (West Branch) and East Branch Delaware River (East Branch) tailwaters is outdated and nonexistent for the tributaries and the Delaware River. It predates changes to the Flexible Flow Management Program (FFMP) that significantly increased reservoir releases. Connectivity might be lacking between the main stems and spawning tributaries. Flushing spillage from the reservoir has been reduced, resulting in concerns that tributary fluvial fan buildup might be inhibiting trout access to the tributaries. Sedimentation and temperature changes in the main stems may be altering the spawning locations and overall usage.

Need Statement

Documentation of the extent of main stem and tributary trout spawning in the tailwaters is needed to better understand and manage the fishery. The need for present day redd count surveys was identified by the Fisheries Investigation Plan (FIP) for the Delaware Tailwaters as necessary to develop a new fisheries management plan for the tailwaters system that effectively sustains natural reproduction of wild trout.

Research Objectives

Within the FIP Objective 1 for fisheries independent data:

1. Acquire a quantitative assessment of the West Branch and West Branch tailwaters trout spawning.
2. Acquire a quantitative assessment of trout spawning in the tributaries of West Branch, East Branch and Delaware River.

Plan Strategy

In this section, the specific information required for each objective is identified and the approach to obtain that information is described. Timeline of proposed plan is shown in Table 1.

OBJECTIVE ONE: Acquire a quantitative assessment of the main stem tailwaters brown and rainbow trout spawning.

1. Information Need: Estimates of the spawning intensity is needed for wild brown trout and wild rainbow trout in the Delaware tailwaters.
   a. Relative abundance of redds.
   b. Redd occurrences relative to West Branch and East Branch flow rates/river stage and sedimentation.
2. Approach: To obtain the above estimates the following methods will be employed:

a. Daytime redd counts in November for brown trout and between April 15th and 30th for rainbow trout at predetermined reaches to be completed by PFBC & NYSDEC, three total personnel spanning the entire width of the river (Figure 1).
    i) West Branch, Cannonsville weir downriver to confluence with East Branch:
        1) Cannonsville weir downriver to Route 17 overpass, Stillesville reach totaling 2.5 miles.
        2) Route 17 overpass downriver to Hale Eddy Bridge, Deposit reach totaling 4.8 miles.
        3) Hale Eddy Bridge down to Ball's Eddy Creek, Hale Eddy reach totaling 4.8 miles.
        4) Ball's Eddy Creek down to confluence with East Branch, Ball's Eddy reach totaling 4.6 miles.
    ii) East Branch, Downsville to East Branch:
        1) Downsville covered bridge downriver to Corbett bridge, Downsville reach totaling 3.4 miles.
        2) Corbett bridge downriver to Shinhopple bridge, Corbett reach totaling 3.4 miles.
        3) Shinhopple bridge downriver to Harvard bridge, Shinhopple reach totaling 6.1 miles.
        4) Harvard bridge downriver to Old State Route 17 bridge, Harvard reach totaling 3.3 miles.
b. Measure total water depth (mm) at undisturbed section of riffle where redds are observed, a calibration metric tool will be developed to account for variations in water depth and flow rate, therefore, low flow water depth per count site can be determined.

OBJECTIVE TWO: Acquire a quantitative assessment of trout spawning in the tributaries of the West Branch, East Branch and Delaware River.

1. Information Need: Estimates of the trout spawning intensity is needed for the West Branch, East Branch and Delaware River tailwater tributaries:
    a. Relative abundance of redds.
    b. Redd occurrences relative to West Branch, East Branch and Delaware River flow rates/river stage.
2. Approach: To obtain the above estimates the following methods will be employed:
    a. Daytime redd counts in November for brown trout and between April 15th and April 30th for rainbow trout at those tributaries outlined in the FIP (Figure 1).
        i) Counts using the datasheet shown in Table 2 will be performed by volunteers according to PFBC protocol developed by Mark Hartle (see attached). The amount of work completed will solely depend on the availability of volunteers.
        ii) Establish fixed-reach sites for assessment in subsequent annual surveys based on location and abundance of redds.
    b. Measure total water depth (mm) at undisturbed section of riffle where redds are observed.

Evaluate/Inform

1. Results evaluation
    a. Relative importance of waterbody and reach (tributary or mainstem) for spawning trout.
    b. Compare spawning intensity in relation to mainstem and tributary flows.
    c. Compare redd abundance to subsequent young-of-the-year estimates to determine if a relationship can be established and assess spawning success.
    d. Annual trends should a sufficient times-series be generated.
2. Results will inform management plan and other associated river impactors.
    a. Future sampling priorities and potential regulation changes.
    b. Recommend priority projects to NYSDEC BOH, TU and anglers for road crossings/culverts, habitat protection and enhancement.

c. Refinement of the Decision Support System for predicting spawning habitats relative to flow rates, should a sufficient times-series be generated.

Literature Cited

Fisheries Investigation Plan for the Delaware Tailwaters 2018-2020, New York State Department of Environmental Conservation and Pennsylvania Fish and Boat Commission, 2017

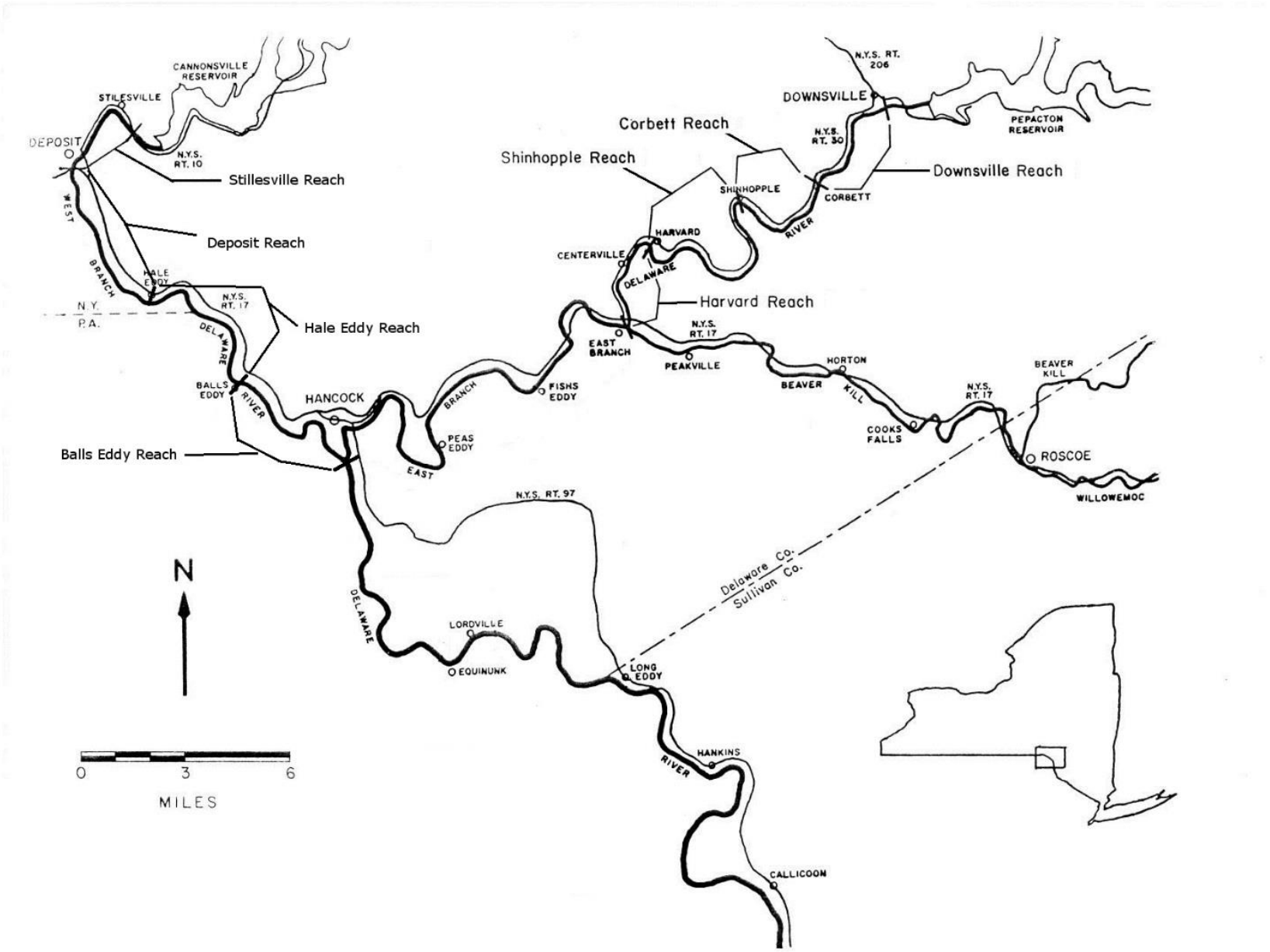

Figure 1. Map of the sample reaches.

TABLE 1. Timeframe of Proposed Plan

Year/Task	Personnel	J	F	M	A	M	J	J	A	S	O	N	D
2018													
Data collection	West Branch main stem, 3 personnel for 3 days				✔							✔	
Data collection	West Branch tributaries, Volunteers, Unknown				✔							✔	
Data collection	East Branch main stem, 3 personnel, for 4 days				✔							✔	
Data collection	East Branch tributaries, Volunteers, Unknown												
Vol Coordination	2 Biologists (1 each agency), two days/month, 7.5 hr. shift												
Training/QA/QC	2 Biologists (1 each agency), one day/month, 10 hr. shift				✔							✔	
Data Analysis	2 Biologists (1 each agency), unknown time commitment												✔
2019													
2018 Annual report	2 Biologists (1 each agency)	✔	✔										
Data collection	West Branch main stem, 3 personnel for 3 days				✔							✔	
Data collection	West Branch tributaries, Volunteers, Unknown				✔							✔	
Data collection	East Branch main stem, 3 personnel, for 4 days				✔							✔	
Data collection	East Branch tributaries, Volunteers, Unknown												
Vol Coordination	2 Biologists (1 each agency), two days/month, 7.5 hr. shift												
Training/QA/QC	2 Biologists (1 each agency), one day/month, 10 hr. shift				✔							✔	
Data Analysis	2 Biologists (1 each agency), unknown time commitment												✔
2020													
2019 Annual report	2 Biologists (1 each agency)	✔	✔										
Data collection	West Branch main stem, 3 personnel for 3 days				✔							✔	
Data collection	West Branch tributaries, Volunteers, Unknown				✔							✔	
Data collection	East Branch main stem, 3 personnel, for 4 days				✔							✔	
Data collection	East Branch tributaries, Volunteers, Unknown												
Vol Coordination	2 Biologists (1 each agency), two days/month, 7.5 hr. shift												
Training/QA/QC	2 Biologists (1 each agency), one day/month, 10 hr. shift				✔							✔	
Data Analysis	2 Biologists (1 each agency), unknown time commitment												✔
2021													
2020 Data Analysis	2 Biologists (1 ec agency), unknown time commitment	✔											
2020 Annual report	2 Biologists (1 ec agency), unknown time commitment	✔	✔										

Table 2: Trout Redd Survey Field Data Sheet

Water name:	Date (mm/dd/yy):	Time Start (hh:mm AM/PM)
Tributary to:		Time End (hh:mm AM/PM)
Evaluator's names:		
Association name:		
Water visibility (circle single response):	1	bottom clearly visible, no impediment to determining redd occurrences, no discoloration of the water
	2	bottom slightly obscured, occurrences of redds have a small chance to be missed/overlooked, water discoloration evident
	3	bottom mostly obscured, high probability of missing occurrences of redds, water discoloration excessive
General weather description:		

Section or river mile and specific location (GPS)	Downstream limit	Upstream limit	Total length(mi)
Tally			# Redds
Water Depths(inches)			

Section or river mile and specific location (GPS)	Downstream limit	Upstream limit	Total length(mi)
Tally			# Redds
Water Depths(inches)			

Section or river mile and specific location (GPS)	Downstream limit	Upstream limit	Total length(mi)
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Water Depths(inches)			

DRAFT

Draft Habitat Management Trout Stream Protocol

Redd Surveys

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Division of Environmental Services

Draft Habitat Management Trout Stream Protocol
Redd Surveys

Introduction

The primary purpose of redd surveys is to identify and protect critical spawning habitat. Since habitat improvement projects are directed primarily toward creating or enhancing adult holding areas on wild trout streams, it is important to know if projects may negatively impact existing spawning areas. The methodology in this protocol uses an actual redd count and does not try to model depth, velocity or substrate type to predict where spawning may occur. Suitable habitat actually used by trout spawning in a particular stream section is the benchmark used to evaluate potential harm by a habitat improvement project. Wild trout populations that have limited spawning habitat or limited numbers may suffer greater impacts than a robust population if a prime spawning area is eliminated by a habitat improvement project. This protocol element is designed to prevent loss of actual spawning habitat.

Methods

Identification of spawning habitat uses the methodology developed by Dr. Robert Carline (USGS Cooperative Fish and Wildlife Unit, Pennsylvania State University). The progression of steps in Carline's methodology include:

1. Dividing the stream or stream segment into meaningful sections.
2. Selecting an appropriate time to perform the survey.
3. Identifying redds.
4. Tallying a redd count by section.

The desired output of a redd survey is identified stream sections or subsections date, length of section and redd count. Section length may be added after field work is completed using topographic maps or a mapping program.

In general, a team of two people is preferred for counting redds. The standard methodology for medium to large streams is that one person covers each side of the stream as the team progresses upstream. One person should be designated as record-keeper using the data sheet contained in this section. Small streams may be evaluated by one or two people. Two people can evaluate one mile of stream in approximately 1.5 hours. Additional time will be required to provide any additional documentation that is considered to be helpful such photographs and maps.

Field equipment required for a redd survey is uncomplicated and is listed below.

Waders (hip boots for very shallow water)	Polarized glasses
Clipboard	Pencil
Survey sheets	Seasonably warm clothing
Wading staff or stick	

Since the survey uses a large scale, equipment for measurements is not typically necessary. If a project is proposed, a measuring tape would assist in scaling the evaluation. The following resources are necessary, but may remain in the office or lab.

USGS 1:24,000 scale topographic map and map wheel

OR

Mapping program with a measuring tool such as Terrain Navigator®

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Stream sections
Stream sections can be based on landmarks, change in water quality or physical features, or a change in land use. Sectioning strategy may be taken directly from stream sections identified by the PFBC Bureau of Fisheries, Fisheries Management Section, since similar considerations are employed for section identification. Subdividing sections into subsections is helpful when a small stream areas are being targeted. (Example: Evaluation of a 300' upstream area, a 200-300' stream portion being considered for a habitat improvement project, and a 300' downstream area.)

Timing
Redd surveys must be conducted after a significant amount (80-90%) of spawning has occurred. Limestone streams in particular, can have late and prolonged spawning periods. Timing does not need to be delayed until all spawning has been completed. Carline (personal communication) indicated that selection of redd sites by late spawners frequently is over top of existing redds. Looser gravel may actually attract females to preexisting redd sites. Carline believes that little is gained by waiting until spawning has concluded. Delay allows earlier redds to be colonized by periphyton, which causes them to blend into the surrounding stream bottom and makes identification more difficult. We recommend using the following table that was developed with input from area fisheries managers to identify appropriate timing of a redd survey.

Table 4-1. Recommended timing for redd surveys

Species	Freestone streams North of I-80	Freestone streams South of I-80	Limestone streams North of I-80	Limestone streams South of I-80
Brook trout	Oct. 15 to Nov. 10	Oct. 15 to Nov. 15	Oct. 15 to Nov. 10	Oct. 20 to Nov. 15
Mixed brook and brown	Nov. 5 to Dec 1	Nov. 10 to Dec 5	Nov. 10 to Dec 1	Nov. 10 to Dec 10
Brown trout	Nov 10 to Dec 10	Nov 15 to Dec 15	Nov 15 to Dec 20	Nov 20 to Dec 31
Rainbow trout				

Redd surveys repeated in different years should be completed within ±7 days of previous surveys. It is understood that high flows and turbidity may make adjustment of survey timing necessary.

Redd identification
A trout redd can be generally described as an oval-shaped area of cleaned gravel with a depression from which gravel was dislodged at the upstream end and a slightly humped portion of loosely packed gravel termed the tailspill area at the downstream end. The tailspill covers eggs deposited in a single pit or series of pits as trout spawn in a downsteam to upstream progression through the redd area. Refer to Figure 4-1 for a photograph of a typical redd. The point of the stick shows the pit and some typically larger substrate remaining after the pit is dug. The boot is adjacent to the loose gravel in the tailspill area.

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Figure 4-1.

Typical redd showing pit near stick at top and tailspill covering eggs below.

Add trout spawning behavior section with references

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Counting redds

Guidelines are necessary to standardize what is counted as a redd and what is not. Trout may explore a likely spawning area and test the substrate for suitability. Cleaned areas of substrate without loose gravel over an area appearing to be excavated and covered are not counted as a redd. Lightly probing the downstream portion with a stick helps the evaluator examine if the substrate is tightly packed, which would indicate that no redd is present. Carline (personal communication) defines the dimensions of a redd as approximately 1.5 by 3 feet. A larger area will be counted as more than one redd and judgement must be made regarding how many redds a disturbed area contains.

Figure 4-2.

Overhead view showing three nearly overlapping redds, which are outlined for clarity.

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Redd Surveys

Side-by-side pits with loose gravel extending 3 to 3.5 feet downstream would be counted as two redds. An area of 2' by 5' may be counted as three if loose gravel is prevalent across the disturbed area or as 4 if four specific overlapping pit/tailspill areas can be identified. Figure 4-2 on the next page provides reviewer's eye view of a stream portion and how a count was made. Trout spawn in a relatively narrow range of attributes for depth, current velocity and substrate size. The evaluator's experience can direct his/her effort to focus on areas of the stream with suitable conditions for spawning.

Red counts are quantitative data. However, since evaluator judgement must be exercised as described above in counting closely spaced redds and redds made over top of pre-existing redds may not be counted, resulting counts should be considered an index of spawning activity and not an absolute number. Carline (personal communication) believes that the actual number of redds is probably within ± 20% of the field redd count.

Redd Survey Field Data Sheet
Standardization of data collection is desirable. A sample field data sheet follows on the next page to assist evaluators in data collection. Photographs or maps may be attached if desired to complete the file.

Redd Survey results
The redd survey result should be considered an index of spawning activity that identifies key spawning areas. This methodology is recognized as requiring judgement when overlapping redds occur. Additional spawning activity may also occur after the survey is made. The redd count result is expected to be within ± 20% of the actual number of redds. Carline (personal communication) does use results to compare spawning activity among various years in the same stream. Redd count results could also be compared between different streams. The Habitat Improvement Section will use results to protect existing spawning habitat.

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Pennsylvania Fish and Boat Commission
Bureau of Fisheries

Redd Survey Field Data Sheet

Stream:	Date:
Subbasin:	Tributary to:
County:	
Purpose of survey:	
Evaluators:	

Trout species present:				
Section OR Subsection		Downstream limit	Upstream limit	Length in m
Tally				#Redds
Section OR Subsection		Downstream limit	Upstream limit	Length in m
Tally				#Redds
Section OR Subsection		Downstream limit	Upstream limit	Length in m
Tally				#Redds
Section OR Subsection		Downstream limit	Upstream limit	Length in m
Tally				#Redds
Section OR Subsection		Downstream limit	Upstream limit	Length in m
Tally				#Redds
Section OR Subsection		Downstream limit	Upstream limit	Length in m
Tally				#Redds

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