



# **DEERFIELD RIVER TROUT SPAWNING SURVEY PROTOCOLS**

Prepared for

**Deerfield River Watershed  
Chapter of  
Trout Unlimited**

By

Michael B. Cole  
Cole Ecological, Inc.

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## **BACKGROUND & INTRODUCTION**

While juvenile trout of natural origin have been determined to be present in the Deerfield River, the source of these fish – the mainstem Deerfield River, tributary streams, or both – is presently unknown. The Deerfield River Watershed Chapter of Trout Unlimited (DRWTU) will perform trout spawning ground surveys of the Deerfield River in order to begin to understand the extent to which trout successfully spawn in the Deerfield River. The objectives of this first year of surveys are:

- 1) document trout spawning activity in the river in the project-affected area of the Deerfield River,
- 2) begin to determine the distribution and abundance of trout redds in the project-affected area of the Deerfield River below Fife Brook dam,
- 3) determine the extent to which spawning redds are subject to de-watering (stranding) or otherwise highly variable water depths and velocities, relative to the current hydro project operations,
- 4) determine the proportion of complete and incomplete redds and whether redd completion rates are related to water depth at low flows, and
- 5) quantify winter survival of trout eggs in Deerfield River redds and determine if survival rates are related to water depth at low flow.

In order to achieve these objectives, weekly spawning ground surveys will be performed by trained DRWTU members from early November through at least early December (or as long as new redd construction continues to be documented by survey teams). Three teams of at least two people each will survey selected river reaches within the project-affected area between Fife Brook Dam and the #4 Deerfield Dam. Flows and turbidity will determine the precise timing of weekly surveys. Surveys will primarily occur on foot, but rafts or canoes may at times be necessary to ensure a complete inventory of redds within survey reaches. Shoreline surveying will ensure that redds prone to dewatering are located. Four survey reaches, each measuring 1-to-2 miles long, will be selected across the project-affected area. Reaches will be selected based on

knowledge of concentrated spawning activities in previous years. Tentatively, the reaches selected for these surveys are as follows:

Reach 1: Immediately below Fife Brook Dam to Carbus Bend (1.06 mi.)

Reach 2: Shady Pool to Bridge to Nowhere (0.9 mi.; this crew will also check the upper end of Beaver Island and the side channel on river right upriver of Zoar Gap)

Reach 3: Zoar Gap to Cold River (2.1 mi.)

Reach 4: Charlemont – exact location to be determined.

During each weekly survey, redds and fish using redds will be counted within each survey reach. Each redd will be identified as a complete or test (incomplete) redd according to the characteristics described later in this document. Redd locations will be marked on maps of the river. New redds not occurring in previous weeks' surveys will be noted. The location of spawning activity will also be recorded with a hand-held GPS unit, either as individual redds (in areas of pocket spawning) or by recording GPS points around areas of extensive spawning activity. The number of redds within these larger areas will be enumerated for density estimates. At each spawning location, a number of habitat variables will be measured and recorded. Survey crews will also gently disturb redd gravels with a hand rake to ascertain the presence of eggs. In a second round of surveys to occur in early 2018, redds determined to contain eggs will be revisited in the late winter/early spring (after a sufficient number of degree days have accrued) to assess egg survival shortly prior to hatching and emergence. A report of the findings of this first year of surveys will be prepared for distribution to agencies and other interested parties.

## **SPAWNING SURVEY METHODS**

### **FIELD TRAINING**

A field training will be held on the first day of fall spawning surveys. This training is required for all participants. Participants will learn how to identify and mark redds, how to collect data associated with redds, how to record and store lat/long with a GPS.

In addition to learning the field survey protocols, survey teams will be established, and the survey schedule for the remainder of the season will be established.

## **NECESSARY EQUIPMENT**

Per survey team of 2 or 3 people:

- Redd marker bags (muslin bags)
- Flagging tape (choose a color for the given year and stick with it on all surveys)
- Sharpies and pencils
- Datasheets
- Ruler (mm)
- Kick net
- Long-handled rake (with 1-cm graduations for making measurements)
- GPS unit
- Maps of reach
- Plastic vials filled with ethanol (for collecting eggs)
- **Optional: Waterproof/Underwater camera** (not provided by Cole or TU)
- **Waders, warm field gear, raingear, hat, polarized sunglasses** (not provided by Cole or TU)
- **Daypack for carrying survey gear and personal items** (not provided by Cole or TU)

## **SURVEY TIMING**

Surveys will be initiated during the first week of November in 2017. Each reach will be surveyed once a week through the survey period. Surveys will continue until at least the end of the November. Surveys will continue into and through December until no new redd construction from the prior week is documented.

## **SURVEY REACH LOCATIONS**

Surveys will occur in a number (four or more) of index reaches, each approximately ½ mile in length. Index reaches will be selected based on known use of these areas in previous years by spawning fish. If surveys continue in future years, these same index reaches can be revisited to evaluate differences in spawning effort across

years. Survey reaches should be easy to access and should allow for crossing the river at several locations through the reach during low flows to allow the survey crew access to both side of the river. Ideally, both sides of the reach are walked during the survey to better ensure a thorough inventory of redds occurring in the reach.

## **COMMENCING THE SURVEY**

Upon arrival at the survey reach, first complete all heading information on the reach survey form. Surveys can be performed walking in an upriver or downriver manner. If possible, the crew should walk the entire bank on one side of the river, recording redd locations and attendant data as they proceed, and then cross the river and walk back to the starting point via the opposite bank to be sure that redds were not omitted from the survey. As an alternative, one crew member may cross the river and proceed in the same direction as the crew on the opposite bank. A water temperature (and time of recording) should also be measured at the other end of the reach.

## **IDENTIFYING REDDS**

### **COMPLETE REDDS**

Redds are areas within river gravels that are excavated by female trout and in which eggs are laid and fertilized. The redd construction process includes the excavation of an initial pit, laying and fertilizing the eggs within the pit, and the covering the eggs by the female with loose gravels. The result of this process is a fully formed redd, **complete** with a “classic pit and tailspill”. These completed redds have also been called “true” redds (Dunham and Rieman, 2001). Particularly when freshly constructed, these **completed** redds are easy to spot and recognize. They will generally be several feet long and oblong, running parallel to the river flow.



Figure 1. A complete “pit and tailspill” redd: this one from the Deerfield River in October, 2013. Note oblong shape.

### TEST REDDS

Test redds (potential redds) are redds that are not fully constructed. These redds will be smaller, less oblong, and will lack the tailspill, the feature indicating that eggs have likely been deposited and covered. Test redds will also be recorded, but will be differentiated from complete redds on the survey form. Each will also be carefully checked for eggs, as described later. Classifying a redd as complete or test will depend primarily on the presence of the tailspill and oblong shape. If you’re unsure about these features and no eggs are present, call it a test redd. In subsequent weeks, these test redds should be re-checked to determine whether they have been completed and eggs have been laid in them. If their status changes, all of this new information should be recorded on the data form, accordingly.





Figure 2. A test (or incomplete) redd. Note lack of tailspill and roundish overall shape. This redd was photographed in the Deerfield River in October 2013.

### SUPERIMPOSITION & CHAINING

New redds constructed over older redds is termed superimposition. If you are unsure of **superimposition** – do not call a new redd. Tips for identifying superimposition include: a) a buried marker bag at the site from a previous redd, b) clearly new gravels on top of an old tailspill, c) seeing fish actively working at the site (per Barnett and Paige). New redds superimposed on top of older redds should be counted and marked as new redds.

Trout may use the pit of a previous redd as an egg pocket and then bury eggs leading to a **chain of redds** in an upstream direction. In order to call a new redd, look for: a) new gravels in the tailspill material, b) buried marker bags at the site, c) fish active on the new redd site, d) clear headwall cut that hasn't yet collapsed or sloughed away (with time, these definite boundaries fade). Each redd in a chain should be counted as a separate redd (per Barnett and Paige).

**If redds are side by side with no space between them.** In order to count two redds, you must see 2 definite pits and 2 definite tailspills (Barnett and Paige). If any one of these components is missing, count the redd as a single site. As a general rule, whenever two or more potential redds are touching each other (no space of un-excavated material occurs between them), two or more redds can only be counted by the presence of two or more pits AND tailspills.

## DATA COLLECTION

All data are to be recorded on the Field Data Forms provided on write-in-the-rain paper for these surveys (example at end of this document). As redds are encountered, they are first marked with a rock-filled cloth bag at the end of the tailspill (per Barnett and Paige). Record the redd ID number on the cloth bag AND on an 18-inch piece of orange flagging. Tie the bag closed and tie the piece of flagging to the bag string. To minimize risk of losing the rock bags to high flows and better ensure the relocation of the redds in the early spring, the rock-fill bag should be buried in the gravel at the very back of the redd so only the flagging tape is clearly visible.

Holding a GPS over the redd, record **lat/long** (in decimal degrees) and store the waypoint in the GPS using the redd ID# as the waypoint code. If the water is too deep or wading is too dangerous to approach the redd, record what information you can from as close as possible, and note the distance from the redd where observations were made. Flagging should also be hung on woody vegetation on the bank directly across from the redd. A single piece of flagging on the bank may be used to mark the location of a group of redds. Write each redd ID# on the flagging. The following measurements are made when a redd can be reached via safe wading:

With the wading staff, record the **water depth** from the center of the redd pit, and measure **the total length of the redd** (in cm), as measured from the most upstream portion of the redd to the most downstream point on the tailspill. Be sure to also record the time the water depth was recorded.

Substrate is characterized by an estimate of the **dominant size-class of substrate** in which the redd was excavated. Examine the substrate surrounding the redd site rather than the substrate remaining within the redd. Select a piece of substrate that best represents the dominant size and measure it to the nearest mm. Record this measurement on the data form.

## DETERMINING EGG PRESENCE

Every newly encountered redd (test or complete) will be gently disturbed to determine whether eggs are present. First, a rectangular-frame kick-net is held directly behind the tailspill by one crew member. A second crew member will gently disturb the redd from the bottom of the pit to the rear of the tailspill, concentrating on the upslope at the back of the pit (Figure 3). If a tailspill is not present, and the redd is clearly a “test” redd, gently rake the back half of the area to confirm the absence of eggs. Any disturbance of the loose gravels should stop immediately upon confirming the presence of eggs in any redd. As long as eggs are not being encountered, gentle raking should continue to a depth of several inches to confirm their absence from the redd.

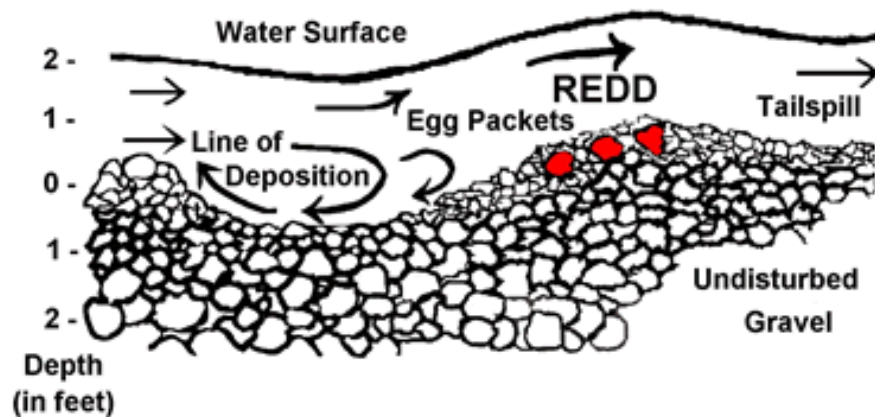


Figure 3. This figure shows the location of eggs within a redd. Image from Washington Department of Fish & Wildlife website.

Any eggs collected from redds are to be collected and preserved in the 50-ml plastic vials pre-filled with 80% ethanol. A paper label with the following information should be placed INSIDE the vial: Redd ID#, date, and collector initials.

Redds found not containing eggs will be raked in subsequent weeks only if noticeable changes have occurred to the redd size or shape. All test/incomplete redds should be revisited in all subsequent weeks to document whether any changes have occurred to

these redds. Once eggs have been determined to be present in a redd, no further searches for eggs in that redd should be made in subsequent weeks. A follow-up survey of egg survival will be made in early spring 2018, so care must be taken to disturb these redds as little as possible. Furthermore, complete redds with eggs that occur in water deeper than 30 cm (~1 foot) during low flows do NOT need to be revisited AT ALL in subsequent weeks. However, complete redds (with eggs) in water shallower less than 30 cm should continue to be visited and have water depths recorded during each weekly survey. A recap of these rules:

- DO NOT rake redds for eggs if the redd has previously been determined to support eggs or if the redd has not changed in size or shape since the last survey.
- DO NOT collect additional data from a redd if the redd has previously been determined to support eggs AND occurs in water deeper than 30 cm during low flows (~125 cfs). If unsure about the water depth criterion, collect the data.

## **LITERATURE CITED**

Barnett, H. and D. Paige. Bull Trout and Pygmy Whitefish Spawning Survey Protocol. Seattle Public Utilities.

Dunham, J. and B. Reiman. 2001. Sources and magnitude of sampling error in redd counts for bull trout. *North American Journal of Fisheries Management* 21: 343-352.



Figure 4. Proposed spawning survey Reach 1: Fife Brook Dam to Carbus Bend (0.9 mi.)



Figure 5. Proposed spawning survey Reach 2: Shady Pool to Bridge to Nowhere (0.9 mi.)



Figure 6. Proposed spawning Reach 3: Zoar Gap to island at Cold River confluence (2.1 mi.)

## DEERFIELD RIVER REDD SURVEY FIELD DATA FORM

Date	Surveyor Names	GPS Coordinates
Reach Name	Survey Start Time	Start
Reach Description	Survey End Time	End
Flows during survey (Peaking, Min, or Storm)		Weather during survey:
Did flows change during survey?		

Redd ID	Complete or Test Redd?	NEW this week?	Lat	Long	Water Depth (cm)	Water Depth TIME	Redd Total Legnth (cm)	Dom substrate size	Fish on Redd? (Y/N)	Eggs present?	Notes
SR1-110417-R01	Complete	Y			40		120	75	Y	Y	two trout on redd

Ex Redd ID: SR1-110417-R1 (Survey Reach #1, date, Redd #1)

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