

Federal Aid in Sport Fish Restoration
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Annual Performance Report

2016-17

Connecticut Fisheries Division

Farmington River Management



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State of Connecticut
Department of Energy and Environmental Protection
Bureau of Natural Resources
Fisheries Division



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Study 1: Coldwater Fisheries Program
Job 5: Farmington River Management

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Cover photo: A yearling size wild Brown Trout from the West Branch Farmington River (photo credit Kierran Broatch).

Summary

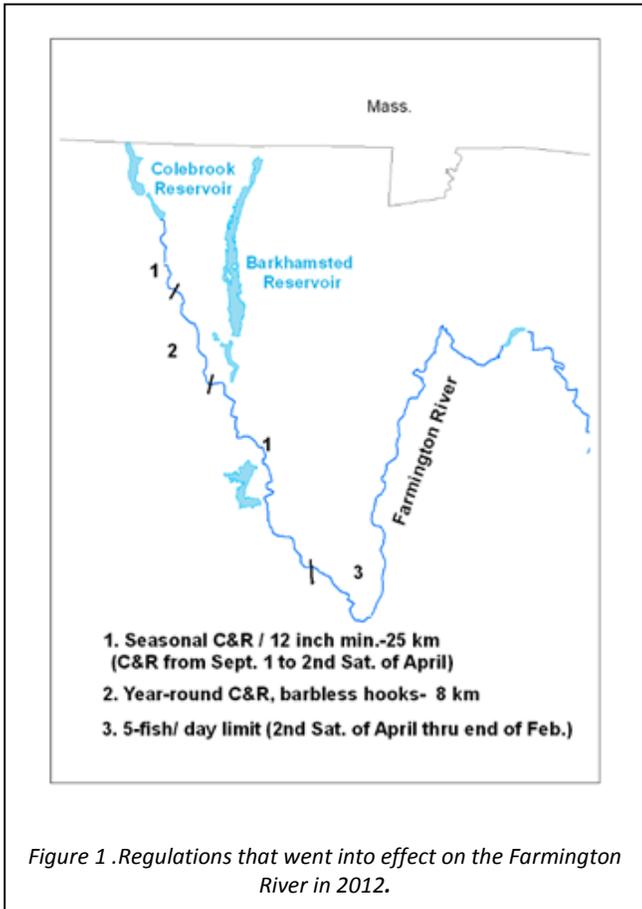
This report covers work done during 2016 on the upper 22 miles of the West Branch (WB) and mainstem Farmington River within Connecticut. Currently this stretch is managed with a Year-round Catch & Release (C&R) area along 5.6 miles of river and a Seasonal C&R area for 17.5 miles of river.

Overall, weather conditions and associated flows were not conducive for salmonid survival and growth during 2016. Severe drought conditions that began in the fall of 2015 persisted throughout this year. Flow conditions were extremely low beginning in mid-July (2-3 months earlier than normal) and into the winter. The low inflow volume of the Farmington River (<100 cubic feet per second (cfs)/day), for a significant part of the spring resulted in a rapid drop in the Colebrook Reservoir pool height during June and July. Flows for the WB Farmington River emanate from Colebrook. By August 1st, due to the low pool conditions at Colebrook, only the mandated 50cfs daily minimum flow was released into the WB Farmington River. For the first time, it was necessary to release water from the "Fisheries Pool" in early-August to mitigate high water temperatures in the lower section of the mainstem Farmington River (New Hartford-Unionville) and especially below Collinsville Dam. As the drought conditions continued through the late summer and early fall, alternative flow scenarios needed to be weighed and critical decisions made. After weighing the potential tradeoffs between ensuring adequate winter flows and/or supporting spawning in critical riverine side-braid habitats in the fall, it was determined that there was not enough water in the "Fisheries Pool" to accomplish both alternatives. Releasing increased flows, to flood the spawning areas, even over a short duration, would likely jeopardize the overwinter survival of the river's trout populations. Upstream water releases, during the fall season, from lake draw-downs and some rains within the drainage, provided a small buffer. The slightly increased flows (60-80cfs) allowed for spawning to occur within the main river channel. This is atypical from most years when spawning has been observed primarily in side-braid habitats. Whether this 2016 natural spawning by brown trout in the main river channel was successful will not be determined for 2 years.

Population samples were not conducted in fall 2016 due to the low flows and the desire to minimize any additional stress on the remaining trout population. Broodstock fish were collected for Survivor Brown Trout production. Approximately 62,000 eggs were stripped, fertilized and incubated and will provide the Survivor Brown Trout yearlings for the 2018 stockings and the 2-year old brown trout stocking for 2019.

Background

The Farmington River is a federally designated Wild and Scenic River (14 miles) and regionally recognized trout fishery. Cold, hypolimnetic water releases from Goodwin Dam (Colebrook Reservoir) create a unique tailwater fishery that supports a sizeable trout population throughout the year. In 1988, a Trout Management Area (TMA) was designated for a 1.8 mile section of the river. Year-round catch-and-release trout fishing regulations were instituted to capitalize on this unique fishery resource (Hyatt 1986). Since its original inception, the TMA has been expanded twice to accommodate angler demand and to reduce congestion (Hagstrom et al. 2005 & 2010). While the trout fishery has historically been supported by hatchery stockings, during the last 15 years, a wild Brown Trout population has become established and continues to increase within the year-round catch-and-release TMA. A major reason for this was the development of a Survivor Brown Trout program. Annual stocking of different sizes (i.e. year classes) of Survivor Brown Trout has produced excellent fishing and this strain has shown an



ability to prosper in the river. The selective use of river captured, “holdover” broodstock appears to have conserved desirable Brown Trout genetic traits that appear to have supported development of, and increases in, the resident wild Brown Trout population.

In 1994, a Seasonal TMA (catch-and-release regulations in effect for only part of the year) was established in a downstream section of the mainstem river in Avon, Burlington and the Unionville sections of the river. Over the intervening years a variety of trout regulations



Trout population sampling in the Farmington River takes two stream electrofishing crews, several live carts and a tank truck to transport Survivor broodstock back to the hatchery. A full sampling crew can be 16-20 people per day.

have been used to manage different sections of the river including: catch-and-release, length and creel limits, as well as terminal tackle limitations (barbless hooks). Current work has focused on evaluating the effects of recently enacted, streamlined trout fishing regulations in the river above Unionville. The entire 22 miles of the upper river from Goodwin Dam to Rte 177 in Unionville can now be fished year round. This includes the 5.3 mile year-round TMA (Fig. 1- section with regulation #2) where no harvest is permitted.

The focus of this progress report concerns events and sampling that occurred during the 2016-17 study period. A severe drought and unprecedented (since the inception of the TMA's) low-flow conditions inhibited angling and eventually led to a significant late-summer, coldwater fish-kill (re: trout) in the lower Farmington River TMA. Considerable insights were gained in regards to the interrelationships between high air temperatures, water temperatures, and flow augmentation, especially on the lower Farmington River from this unfortunate situation

Approach

Standard trout stockings (numbers, species, sizes) specific to each area of the river were done each spring, summer and fall. Fin clipping and/or elastomer tagging were used to mark and later identify specific groups of stocked trout.

Brood stock collection is conducted in late summer using methods similar to the site-specific, standardized electrofishing protocols (Hagstrom et al. 2010). When broodstock are collected "holdover" Brown Trout that have over-wintered (> 1 year) are preferentially collected to serve as broodstock for the development and maintenance of the Survivor Brown Trout strain (see sidebar on pg.7); fish of wild origin are selected whenever possible. In order to meet minimum egg production numbers, some recently stocked fish (5-6 months survival in the river) may be selectively culled and can also be taken for broodstock when necessary.

Prior surveys conducted during the first week of November (2008-2012) had documented spawning locations under normal flow conditions. In most years spawning had been observed primarily in side-braid habitats. To determine the current spawning activity of trout, under extreme low flow conditions, redd surveys were conducted by Fisheries staff and volunteers on November 4th 2016. The surveys were along fixed lengths of river where previous spawning had been documented.

Key Findings

Flows and water temperatures

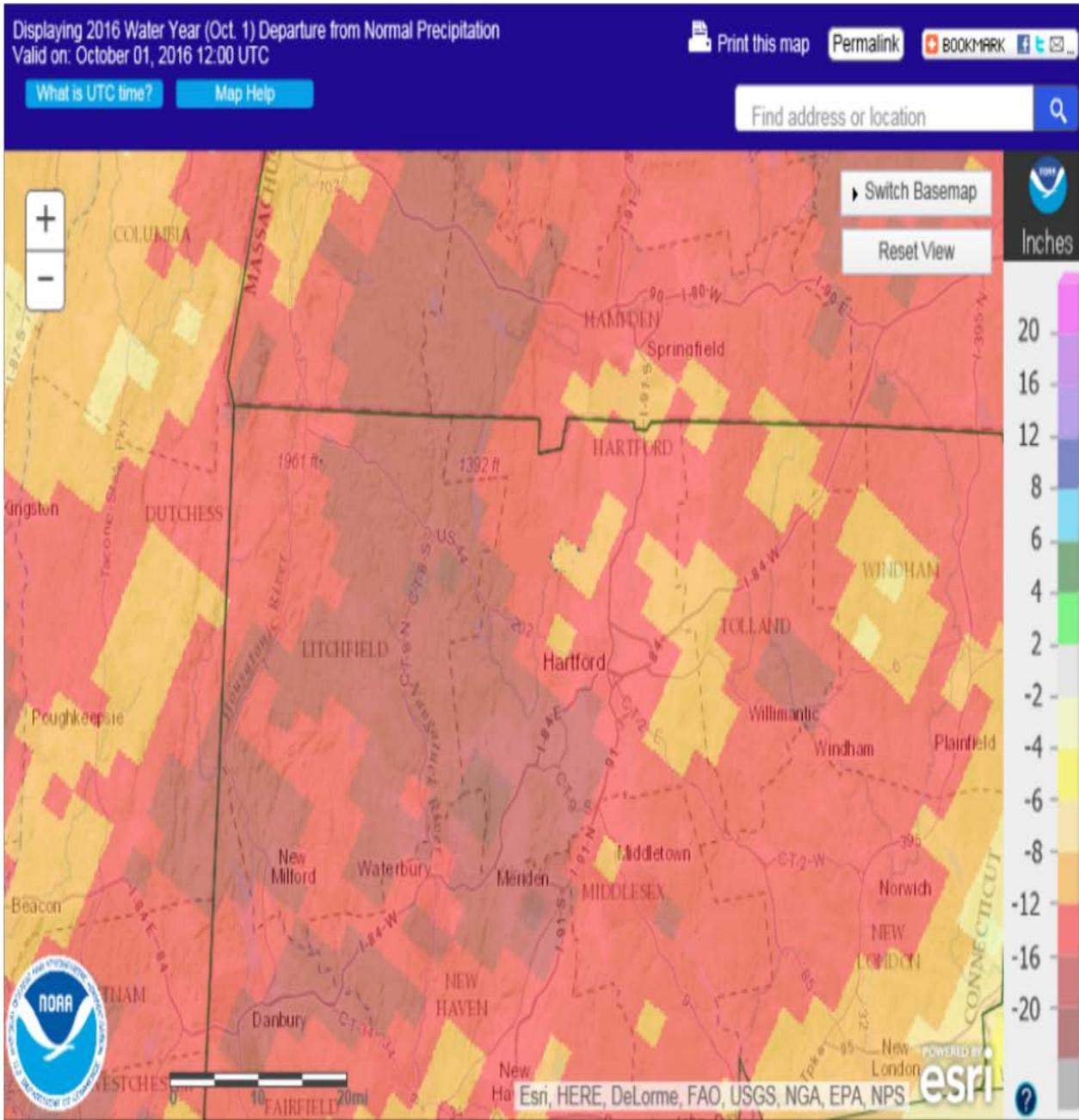
Annual changes in weather patterns can impact salmonid growth, survival and spawning success. The overall effect of weather and flows over the last 6 years is outlined in Table 1. During 2010-2015 conditions ranged from droughts during the spawn to a hurricane which produced 20,000 cubic feet second (cfs) river flows. In 2016, a drought that began in fall 2015 continued through the year. Rainfall deficits for the Farmington Basin exceeded 16-20 inches for most of the basin (Figure 2).

Due to the drought conditions and the resultant lack of inflow, Colebrook Reservoir was drained to record low levels (the standing pool was ~80ft below full levels in October of 2016). This resulted in an agreement between the MDC and the Fisheries Division to initiate a protracted water saving measure, reducing flows to 50cfs in late July (App. 2). This measure also initially necessitated augmenting flows from the Fisheries Pool at a low level (20cfs). In mid-August a period of high air temperatures and high humidity created river water temperatures above the short-term lethal limits of trout (28°C or 80°F). The conditions forced fish to seek thermal refuge out of the mainstem river channel in smaller, cooler stream mouths. This phenomenon was most prevalent in the lower river in the Canton/Burlington/Avon sections of the Farmington River. During this brief heat wave water temperatures as high as 28°C were recorded. In an effort to protect the already highly stressed trout population in the lower river during this high temperature event, additional water/flow (50cfs) was called for from the Fisheries Pool and added to further augment the flows for several days. Thus flows were increased to 100cfs for 3 days and river water temperatures, especially in the lower river were decreased slightly. Eight thermal refuges along the Farmington River from New Hartford to Unionville were closed to Fishing from August 18th to September 15th. Trout mortality due to heat and bird predation were documented in this section of the river during several days of the high heat. By the beginning of September, air temperatures had declined and the fishing closures ended. The drought continued into the fall with scattered rain: September (2 inches), October (2.4 inches) and November (2.7 inches). This is below the normal rainfall amounts that support increased river flows for spawning.

Table 1. Historic overview of weather and flow effects on fishing and trout (White = Average/Red = negative/Green = positive). The darker the color the more intense the impacts were.

Year	Spring	Summer	Fall
2011	Average (100-300cfs)	Average (100-300cfs)	Hurricane Irene –Scour events-(~20,000 cfs)
2012	Ideal fishing conditions early spring-mild winter	Low flows (<100cfs) late summer. Some anglers stopped fishing	Average
2013	Average	Atypical high (>500cfs) early summer flows	Warmer than Average Fall with low flows (<100cfs)
2014	Average	High flows (>600cfs) in May and June made river unfishable.	Warmer than Average Fall with low flows
		Cool summer temperatures meant a 3 week longer growth period for trout	
2105	Average	Ideal fishing; flows conditions-normal to low flows	Warmer than Average Fall with low flows
2016	Good Fishing Conditions- Flow dropped below average in April and May	Ideal Fishing conditions at first, flows dropped in late July to historic low levels. First heat related fish kill documented in the lower Farmington River.	Very low flows continue, many spawning areas dewatered.

Figure 2. Rainfall deficit for the Farmington River Valley during Oct 2015 and Oct 2016. Over 20 inches below normal in spots.



Annual trout population sampling

In past years fish population sampling was typically conducted during the second week of September at fixed standard stations, (see Hagstrom et al. 2012). In 2016 there was concern that extensive sampling might further stress the trout population during these unprecedented low flows. Based on these concerns, standardized sampling was not conducted. Instead abbreviated sampling, to only collect broodstock fish, was done in three locations along the river; Morgan Brook Pool, Halford’s Run and the Spring Hole.

Broodstock sampling was successful in collecting 96 sexually mature fish deemed suitable for spawning. Generally 100-120 broodstock are collected, so the 2016 collections were slightly below our normal target. FD had raised the target number of broodstock take to 150 in 2015 to expand the number of eggs and ultimately of Survivor Brown trout available for stocking to other locations. Later in the fall of 2016, approximately 62,000 eggs were taken and will provide the Survivor Brown Trout yearlings for the 2018 stockings and the 2-year old brown trout stocking for 2019.

Flows and trout spawning

As mentioned in previous reports, long-standing water rights (see sidebar in Discussion section, pg. 9) are tied to flow timing, volume and duration for the West Branch Farmington River. As part of these regulated (or statutory) water rights, there is a limited amount of water available in the Fisheries Pool (3.3 billion gals. held in Colebrook Reservoir) to augment flows should the need arise. While this reserved volume of water will allow for some flow augmentation, in most years the Fisheries Div. does not “call for” the allocated Fisheries Pool until October. Due to the extreme drought and low flows

Survivor Brown Trout Program



The concept of the Survivor program is to use fish that survive in the river (both stocked and wild fish) to produce the next generation of fish to be stocked. The rationale is that the environment selects the fish with the best adapted genes to survive, and this breeding program conserves and reinforces those genes and characteristics. Since 1993 trout from the Farmington River have been used for Survivor strain broodstock. The eggs from these trout are raised to produce fish for stocking the Trout Management Area. They are stocked two years after the fish are spawned and their eggs taken. The young survivor Brown Trout are marked with a small colored tag called an elastomer tag (see circled area in picture below) in clear tissue behind the eye to distinguish how old they are and when they were stocked. The initial results from this program were a doubling of survival rates of stocked Browns to adult size. These fish survive and “holdover” far better than standard trout produced at our state hatcheries. Survivor trout can be easily identified by their missing/clipped adipose fin (fleshy fin normally located just in front of the tail on the back) and the elastomer tags.

that date needed to begin using water from the Fisheries Pool was advanced by over 2 months in the summer of 2016. In addition, later in 2016, it became evident through flow simulations that there might be further problems. Flow and water storage data from Colebrook indicated that there was not a sufficient volume of water stored in Colebrook Reservoir (re: the Fisheries Pool) to provide for minimal but adequate summer flows and to also allow for a slight flow increase, early in the fall, to cover historic spawning areas (side-braid channels) through the spawning and incubation period. Due to the drought in 2015-2016 a unique situation was presented that indicated there would need to be potential tradeoffs between providing flows that supported the trout population during the end of the summer and through the winter versus slightly increasing flows to ensure adequate conditions to maximize natural spawning. The decision was made to try to prolong minimum flows and protect the existing trout population. This decision did not come without some “costs”. It meant that it would not be possible to flood the spawning areas in the fall with water from the Fisheries Pool, unless a significant and dramatic change to the prevailing weather patterns ensued and alleviated or ended the drought conditions. This did not happen.

Aside from the flow issues during the late summer and fall of 2016, there were questions as to the overall condition of the trout in the upper WB Farmington River, especially in terms of the ability of Brown Trout to spawn. Additionally, there were questions regarding whether the Browns would be able to spawn in other areas of the river, given that the preferred areas (side-braid channels) would not be flooded during the fall-winter of 2016-17. While handling fish during the broodstock collections in September, it became apparent that the trout were in suitable physical condition (re: sexually mature) to spawn.

Why DEEP can augment the Farmington River’s Flow.

Farmington River flows are the result of a complex set of business and government regulated agreements. The Colebrook Dam was built by the Army Corps of Engineer and MDC and the Goodwin Dam by MDC. The dams are operated for multiple uses: flood control and hydro-electric production at two upstream locations; Colebrook Dam (Colebrook) and Goodwin Dam (Hartland) and further downstream at the Rainbow Dam (Farmington River Power Company, Windsor)

The Water Master at MDC must balance all of these requirements when determining daily releases. As part of this process, a pre-determined limited volume of water (the Fisheries Pool) was designated for use by the DEEP-FD to augment flows when necessary to improve river conditions for fish. The Fisheries Pool was established as mitigation (as allowed for by the Federal Fish and Wildlife Conservation Act) following the construction of Colebrook Dam, a federal action. This is not a large volume of water (3 billion gallons) compared to the total reservoir capacity and is only replenished if the reservoir reaches full pool height in the winter/spring. It is used only when needed such as during drought conditions.

Subsequently, redds surveys were conducted on November 4th, similar to the timing of past surveys done in 2008-2010. Three two-man crews searched sections of river where spawning activity had been observed in the past. The physical/flow condition of the side-braids, where historically the greatest observed spawning activity had occurred, were noted and any new or additional spawning



The rarely seen bridge at the upper end of Colebrook Reservoir-almost dry.

sites recorded (Appendix 4a &4b). On the day of the survey, Brown Trout were observed actively spawning throughout all mainstem river sections surveyed. Redds were located primarily in the main river channel, in areas not previously observed to support successful nest building or spawning. The braided section of the WB Farmington, between the Church Pool and Morgan Brook was the only prior, high use spawning area that was observed to be active, despite this falls low flows (60-75cfs). The remainder of the side braids were totally dry.

It remains to be seen how successful or unsuccessful the 2016 natural spawning in these new spawning locations on WB Farmington River will be. It is likely that given the flows to date that these

redds will result in a successful spawn, but that cannot be confirmed without population sampling in the fall of 2018. The eggs that were placed in these redds are not guaranteed to hatch. Flow modeling indicates that sudden increase in flows of more than 500cfs could negatively affect fry production and would likely result in the main channel redds being scoured. In addition, these new redds locations are in shallower waters than usual and therefore, these areas could be potentially damaged by freezing or anchor ice.

In an attempt to mitigate the effects of the summer mortalities, 8,000 yearling brown trout were stocked into the lower Farmington River in late September and October. These stockings were done after all threat of high water temperatures were past. The yearling-size fish should reach a catchable size by late spring 2017.

Recommendations

- Maintain current trout stockings to support the heavy recreational use of this river.
- Continue annual fall Survivor strain broodstock collections.
- Continue adherence to practices and expand timeframe for egg collection to ensure the genetic diversity of brood stock (both wild and hatchery raised fish) selected for the continuation of the Survivor program.
- Monitor fall flows to ensure adequate spawning condition for wild and holdover Brown Trout and augment flows as needed.
- Based on the numerous years of annual trout population sampling, transition to an alternate year population sampling regime (i.e. every other year).

Expenditures

Total Cost:	\$36,880
Federal Share:	\$27,660
State Share:	\$9,220

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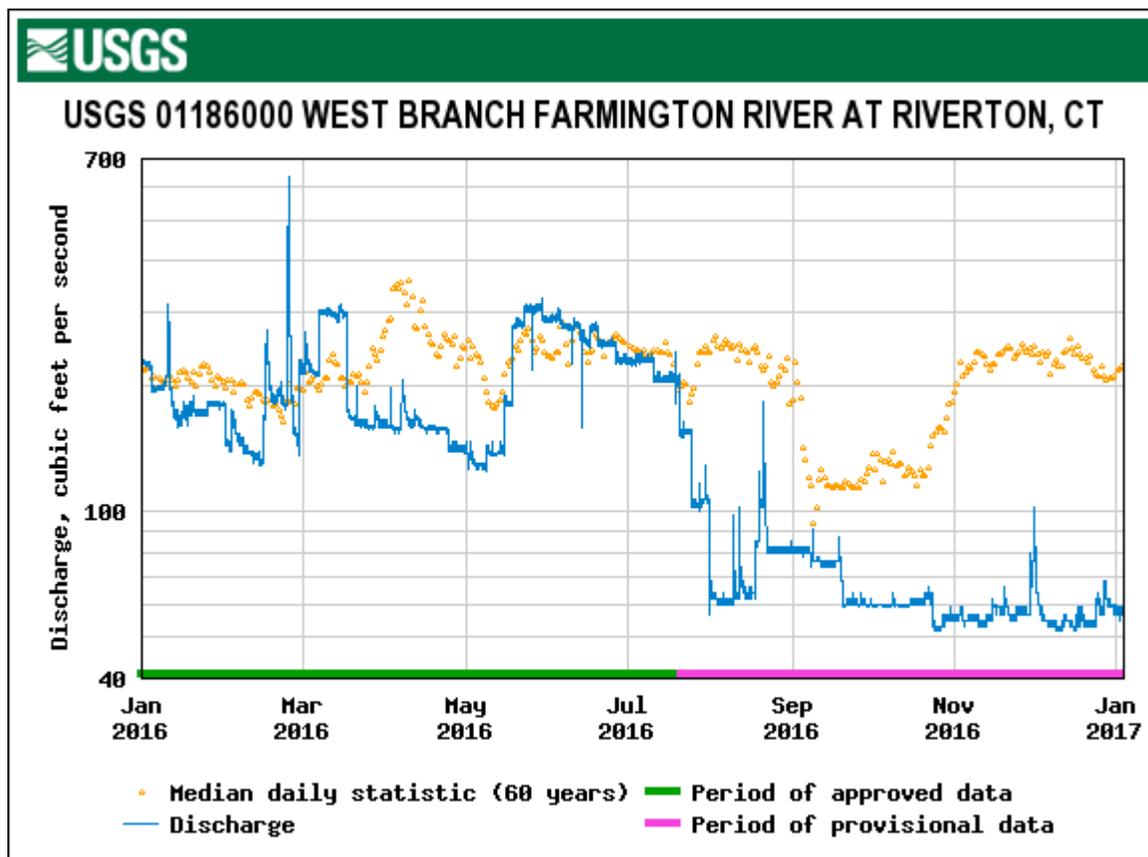
In addition, we would like to acknowledge the exceptional help from the staff of the Burlington State Fish Hatchery who maintained and spawned the brood stock as well as raising the Survivor strain Brown Trout for this project: Rick VanNostrand, Jamie Hayes, Joseph Ravita, Chris Pleil, Steve Piera and Rob Castrogiovanni.

Appendices

Appendix 1. Past and current regulations on the Farmington River with designation of angler survey zones and lengths.

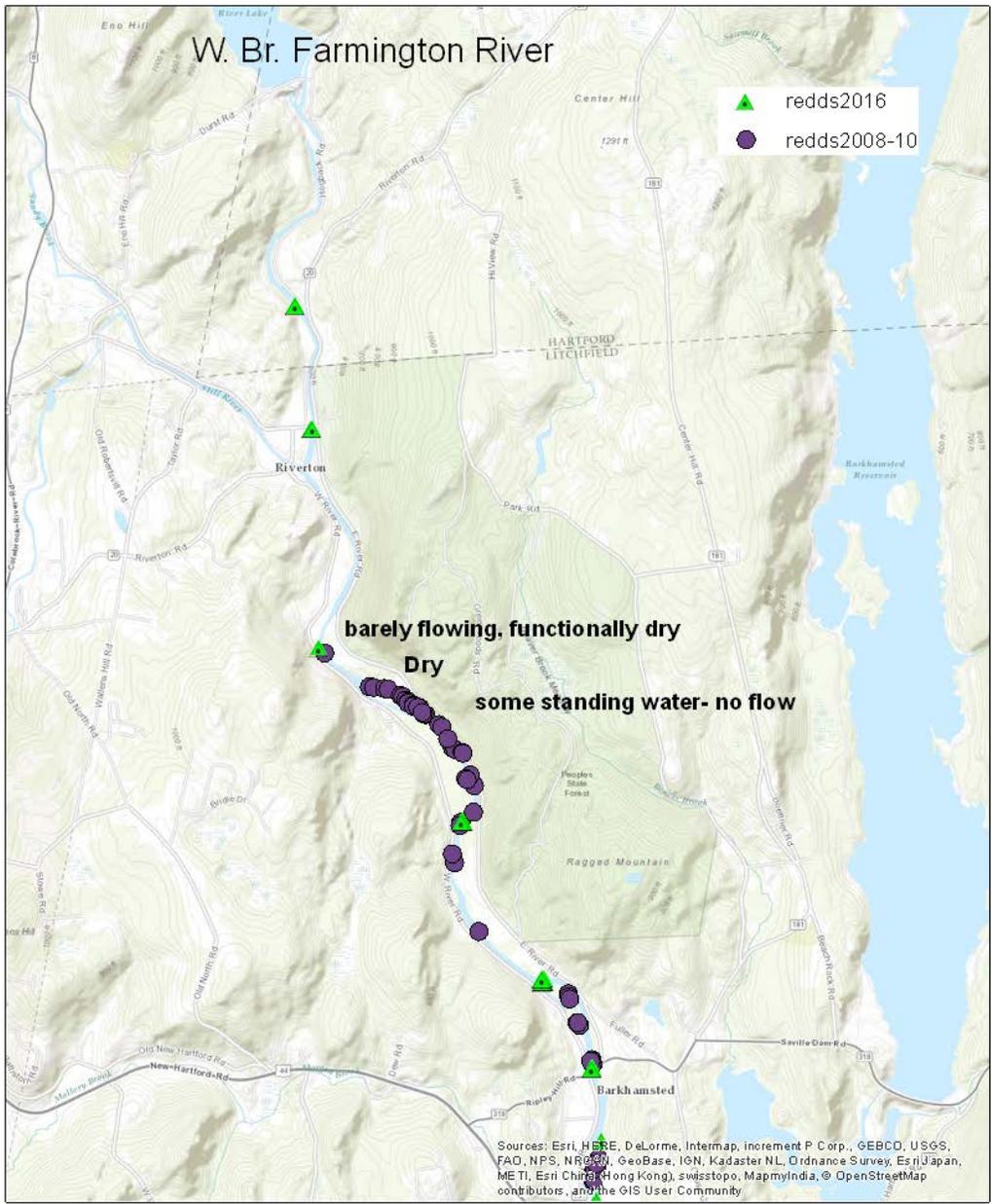
River Section	Angler Survey Zone	Pre 2012 Regulations	Approximate River Miles	New Regulation as of Jan. 2012	Approximate River Miles
Goodwin Dam downstream to the West Branch TMA	Zone 1- 3.6 mile	12"MLL, 2/day	5.8 miles	Seasonal TMA 12"MLL, 2/day 9/1-OD: C&R	3.6 miles
	Zone 2- 2.8 miles				
West Branch TMA	Zone 3- 2.5 miles	TMA C & R only (Power line in park to Route 219 Bridge)	3 miles	(Abutments below Whittemore pool to Route 219 Bridge)	5.3 miles
Route 219 - Route 44 (Satan's Kingdom)	Zone 4 8.0 miles	12"MLL, 2/day	8 miles	Seasonal TMA 12"MLL, 2/day 9/1-OD: C&R	13.4 miles
Route 44 (Satin's Kingdom) downstream to Lower Collinsville Dam		12"MLL, 2/day			
Lower Collinsville Dam downstream to Route 4 Bridge in Unionville	Zone 5 5.4 miles	Seasonal TMA 12"MLL, 2/day 9/1-OD: C&R	4.3 miles		
Route 4 to Route 177 Bridge		12"MLL, 2/day	1 mile		

Appendix 2. Farmington River flows above the Still River 2016

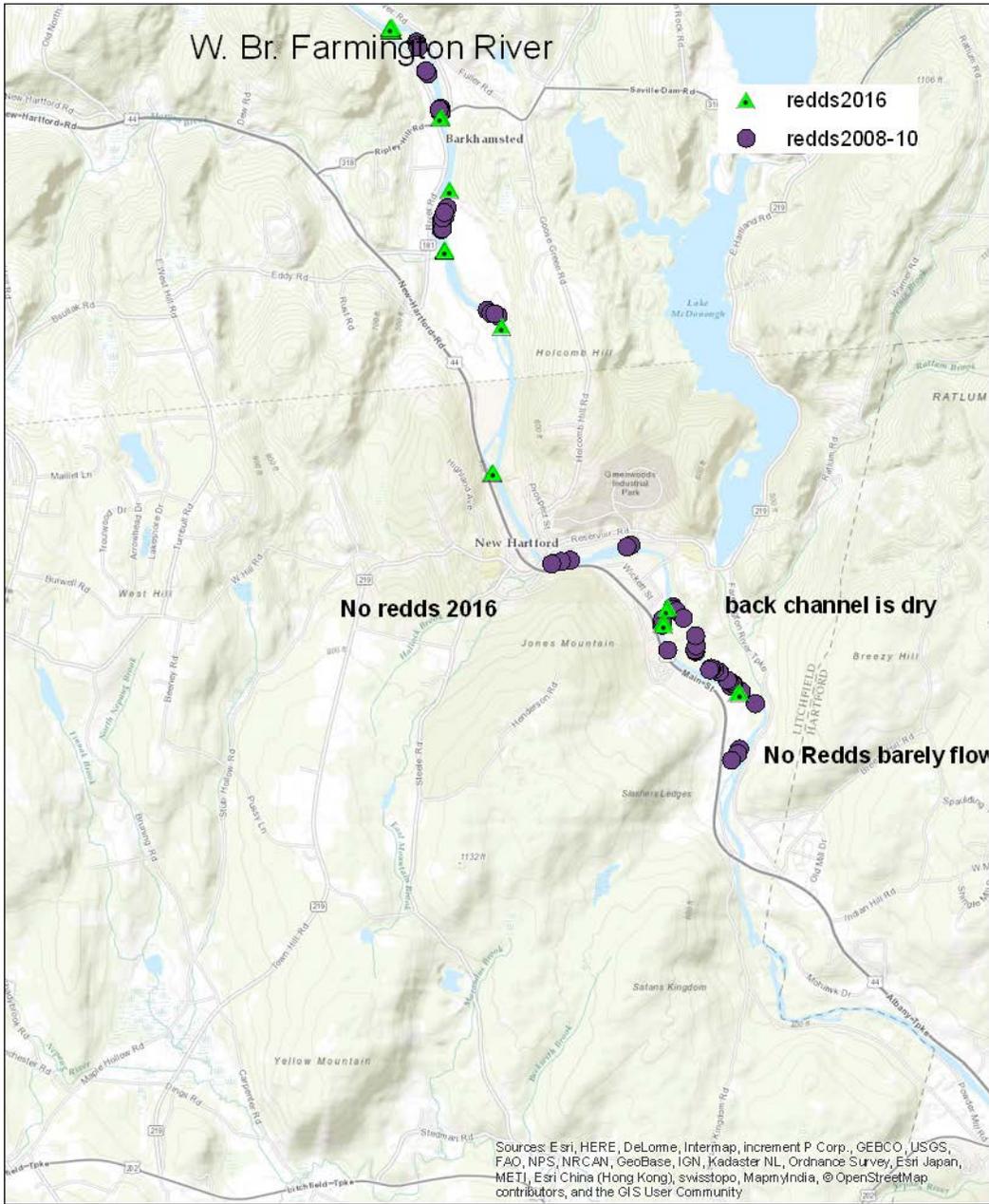


Appendix 3. List of thermal refuges closed to fishing by emergency declaration. No fishing within 100ft of the Posted signs.

- 1) East Mountain (Hallock) Brook - New Hartford
- 2) Cherry Brook - Canton
- 3) Rattlesnake Hill Brook - Canton
- 4) Burlington Brook - Burlington
- 5) Hyde Brook - Avon
- 6) Unionville Brook - Farmington (Unionville)
- 7) Hawley's Brook - Farmington (Unionville)
- 8) Pequabuck River - Farmington



Appendix 4a. Trout spawning redds observed in 2016 (Green triangles), past redds are purple circles above the Rte. 318 bridge. Comments in bold refer to conditions inside channels



Appendix 4b. Trout spawning redds observed in 2016 (Green triangles), past redds are purple circles below the Rte. 318 bridge. Comments in bold refer to conditions inside channels