Chittenango Creek Angler Survey 2014

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Abstract

An angler survey was conducted from April 1 through October 15, 2014, on the brown trout (*Salmo trutta*) stocked sections of Chittenango Creek, Madison County. The stocked section was broken into four reaches based on the stocking policy and management type. The four reaches were named upper, lower-1, catch and release and lower-2. The purpose of the survey was to estimate the amount of fishing effort expended in the stocked sections of Chittenango Creek. This information will be used to help refine stocking policies for the four stocked sections by updating and improving the estimates of angler effort. Fishing pressure for the 19.3 miles of stream was estimated to be 13,893 angler hours, or 171 hours/acre during the survey period. The catch and release section had the highest overall effort with 455 hours/acre. The overall trout catch rate for Chittenango Creek anglers was 1.18 trout/hour. The catch and release section had the highest average catch rate with 1.42 trout/hour. The estimated total brown trout catch ranged from 15,492 when summing the catches by stream section, to 16,214 when adding up the monthly totals. These values are 0.98 and 1.03 times the 15,700 trout that were stocked in the stream in 2014. The estimated brown trout harvest rate was 12%. Total brown trout harvest ranged from 1,211 when estimating harvest by stream section to 1,362 when summing the monthly values.

Introduction

Brown trout (*Salmo trutta*) is the main species targeted by anglers in four heavily stocked sections of Chittenango Creek, Madison County, with the stocked trout being important in maintaining the quality of the fishery. Fishing effort is a principal element used by the New York State Department of Environmental Conservation (DEC) when determining trout stream stocking rates. A previous angler survey was conducted on Chittenango Creek in 1997 to estimate fishing effort (Lemon 1998). The 1997 survey was a three month (April-June) modified approach of Zielinski and Engstrom-Heg's (1993) "mini-survey" creel census method, which resulted in an overall fishing pressure estimate of 283 hours/acre (Lemon 1998). In comparison, a fishing intensity of 300 hours/acre is considered "moderate" or "average" by NYS standards (Engstrom-Heg 1990). Since that 1997 survey, there have been numerous changes to trout fishing regulations statewide, within DEC Region 7, and for Chittenango Creek itself. For Chittenango Creek, the most notable change was the establishment of a 2.2 mile section of stream open on a year around basis to catch and release angling, with artificial lures only. A previous year around special regulation section from Route 20 north to the Conrail railroad line had only been in effect for one season at the time of the 1997 survey. Using the results of the 1997 survey and other biologist decisions the stocking policies were adjusted to adapt to the new regulation and management modifications. In addition to the management changes, there also appears to be a trend of decreasing stream based trout angling effort across the state. During a 2011-2013 angler survey covering eight

trout streams across the state, Alexiades et al. (2014) found a decrease in angler effort (hours/acre) from historic levels on 6 of the 8 streams surveyed. To better quantify and update the data on the recreational fishery for Chittenango Creek, a season-long, April 1 to October 15 2014 angler survey was conducted to estimate angling effort, trout catch and harvest rates, total trout caught and harvested for four stocked stream sections. This information will be used to help refine stocking policies for the four stocked sections by improving our estimates of angler effort.

Study Area

The stocked trout sections of Chittenango Creek flow through a mix of forest, agricultural land and suburban development. Chittenango Creek has a fair amount of public access for anglers, with 2.9 equivalent miles of Public Fishing Rights (PFR's) along the stream (Figure 1). An equivalent mile is defined as both stream banks for a distance of one mile; therefore, access to only one stream bank for one mile would constitute 0.5 equivalent miles. State Route 13 also borders the creek for much of its length, allowing easy access. There are three DEC owned Angler Parking Areas on Chittenango Creek along with numerous informal parking areas.

The four stocked sections of Chittenango Creek are presented in Figures 2a-2d, and are designated as; upper, lower-1, catch and release, and lower-2. The catch and release section divides the lower sections. The upper, lower-1, and 2 sections are managed under DEC management type As, which are described as stocked streams with no minimum length limit, having significant unused carrying capacity and light to moderate fishery. The creek is stocked with put-grow-take fish, usually in two increments (Engstrom-Heg 1990). While the catch and release section is management type AsNK which are special regulation areas based primarily on stocked trout (Engstrom-Heg 1990). The upper section is 8.4 miles long and 35.2 acres, running from Coulter Road north to Route 20 in the Village of Cazenovia. The lower-1 section stretches from Route 20 north to the Town of Fenner/Town of Sullivan line at mile marker 1219 on Route 13 and is 7.1 miles long and 30.8 acres. The catch and release section is 2.2 miles long and 8.4 acres and runs from the northern end of lower-1 section downstream to Route 13 mile marker 1237 south of the Village of Chittenango. The lower-2 section begins at the end of the catch and release section and runs downstream to Russell Street in Chittenango and is 1.6 miles long and 6.9 acres.

Trout fishing regulations on Chittenango Creek followed the statewide regulation of an open season from April 1-Sept 30, until 1982 (Appendix 1). In 1982 the section from Route 20 northward expanded to an open season of April 1-Nov 30. This regulation remained in effect until 1996, when the same section went to a year around open season. In 2010 a 2.2 mile year around catch and release, artificial lure only section of the creek was established. The following special trout fishing regulations existed during the 2014 creel survey. The upper section had an open season of April 1-Oct 15, any size minimum length, and a daily limit of 5 trout with no more than 2 longer than 12 inches. The lower sections had the same minimum length and daily limit but an all year open season. While the catch and release section was also open all year, it was catch and release and artificial lures only (Table 1).

Chittenango Creek was stocked with 15,700 brown trout in 2014; 13,760 one-year old and 1,940 two-year olds. The first stocking increment took place on April 3rd, second on May 12th, and the final increment on May 23rd (Table 2).

Methods

A roving angler survey was conducted on Chittenango Creek from April 1 to October 15, 2014. A survey agent drove a predetermined route along each stream section counting all anglers visible from the road and all parked cars which appeared to belong to anglers (Appendix 2). Counts were conducted three times during a survey day, at the start of a shift, three hours after the first count, and the third count started three hours after the second count; count runs averaged 61 minutes but were treated as instantaneous counts in the analysis. The daily starting location of the count run, either upper or lower, was randomly assigned, but all subsequent count runs each day started at the same location. The starting time alternated between an early morning start and a late morning start so that both dawn and dusk hours were covered throughout the survey. The early morning start time was chosen because it allowed detection of most anglers who began their angling day at first light, but still provided the survey agent a reasonable start time to their work-day. The late morning starting time varied depending on day length so that the final block of interviews always ended at sunset.

Upon completing a count run, the survey agent proceeded back along the route interviewing as many anglers as possible with the questionnaire presented in Appendix 3 before the start of the next count. These brief angler interviews were conducted to provide estimates of the mean number of anglers per vehicle, mean length of completed trip, angler catch rates, total catch, total harvest, fishing method, and county of origin (or state of residence) of anglers fishing Chittenango Creek. Additionally, anglers were asked whether they favored the catch and release only section of the stream, if they had ever fished that section, and also if they had fished the year around section during the typical closed season (Oct 16- March 30).

On average, one weekend day and one weekday were sampled per week. The technician was also conducting a survey on Ninemile Creek, Onondaga County and would alternate days between streams (Zollweg-Horan 2016). In planning a one weekend day and one weekday schedule on each stream, a conscious decision was made to accept less precision in the resulting estimates of effort and catch because the point estimates would still provide useful management information for both Chittenango and Ninemile creeks. Effort data was stratified by day-type (weekdays and weekend/holidays). Total angler effort was estimated by three different methods. Method one (angler + car) followed the protocol outlined by Prindle and Bishop (2015) for non-Salmon River Lake Ontario tributaries, minus the drift-boat counts. As part of the calculations to estimate angler effort, a mean number of anglers/car was determined from angler interviews. This value was multiplied by the daily mean of the three car counts per site, for sites where a direct angler count was not possible. There were five sites where only angler counts were used. A total estimated daily angler count for the creek was obtained by summing the car count adjusted angler estimate and direct angler count values. This sum was then multiplied by the number of fishing hours on that day (Appendix 4). Fishing effort was also estimated as it was done by Lemon (1998), with separate estimates of angling effort based on angler

counts (angler) and for vehicle counts (car). Lemon (1998) used the Zielinski and Engstrom-Heg (1993) "mini-survey" formula. As the 2014 survey was a full season survey, the method outlined by Pollock et al. (1994) was used instead for both the angler count and car count (Appendix 4). For angler counts, the daily mean angler count for each site was multiplied by the number of fishing hours in that day. For car counts, a mean number of anglers/car was determined from angler interviews. This angler/car metric was multiplied by the mean of the three daily car counts for each site to give an instantaneous angler count estimate. This estimated instantaneous angler count was then multiplied by the number of fishing hours in that day.

Interview data used for calculating catch and harvest rates was stratified by month and stream section. The ratio of means estimator for complete trip interviews and a mean of ratios estimator on incomplete trip interviews were used to estimate catch rates. These values were then combined to obtain a single weighted estimate (Lockwood 2005; Appendix 4). All trips <0.5 hours were eliminated to reduce potential biases associated with short trips (Pollock et al. 1994).

Results and Discussion

The Chittenango Creek angler survey covered a 198 day period with a total of 55 sample days consisting of 28 weekend days and 27 weekdays. Only one holiday occurred on a sample day during the Chittenango survey, Labor Day (Monday, Sept 1) and it was counted in the weekend strata. A total of 705 cars and 636 anglers were counted along Chittenango Creek during the survey. This was 36% fewer cars and 42% less anglers than during the same time period on Ninemile Creek (Zollweg-Horan 2016). It was also 120 fewer cars and 115 less anglers than were counted during the 1997 Chittenango Creek survey, which was only a three month survey (Table 3). The average number of anglers per car varied by month, with April having the highest, 1.63 anglers/car and October having the lowest, 1.05 anglers/car.

Angler Effort

Estimates of angler hours based on the three different methods varied greatly, with angler + car counts having the largest estimate of angler hours with 17,502 hours (standard error, SE 1,211) (Table 4). Estimates based just on car counts varied substantially from estimates based on angler counts. Angler counts for the four Chittenango Creek stream sections (upper, lower-1, catch and release, and lower-2) resulted in effort estimates that were 60, 60, 75 and 46 percent, respectively, of the estimated effort based on car counts (Table 4). This disparity between estimates was even greater than the one reported by Lemon (1998) for the 1997 Chittenango Creek angler survey. Because of this difference, and to compare this survey to the 1997 survey, car counts were felt to be a more reliable estimate of effort as there were portions of the stream that anglers could not be seen from the road. The remainder of this report will deal only with effort estimates based on car counts, unless otherwise noted.

The total estimated angler effort based on car counts was 13,892 hours (SE 891; Table 4). This is about one third of the estimated effort of 49,499 hours that was observed for Ninemile Creek during the same time period (Zollweg-Horan 2016). The 2014 effort was just 60% of the estimated 23,049 angler hours reported by Lemon (1998). This 1997 survey was only a three month survey (April 1-June 30), and estimates of angler effort for the entire season were derived by multiplying the total April-June effort by

1.33 as suggested by Engstrom-Heg and Hulbert (1983). If we take the April-June estimated angler effort for 2014 and multiply it by 1.33, we get 12,148 angler hours; a difference of 1,744 less hours than the estimated 13,892 hours. The lower-1 stream section accounted for 44% (6,158 hours) of the total angler hours of effort on the stream, followed by the catch and release section which accounted for 27% (3,811 hours) of the effort. The upper and lower-2 sections each accounted for 14% of the effort (Table 5). June showed the most angler hours with 3,460, followed closely by May with 3,212 angler hours (Table 5). Weekday effort was greater than weekend effort for each month (Table 6).

Considering the catch and release section is only 2.2 miles long, when comparing effort by angler hours/mile, the catch and release section had the largest amount of effort at 1,732 angler hours/mile. The lower-2 section had the second most angler hours/mile with 1,222. The overall angler hour/mile for the 19.3 miles of stream surveyed was 720 hours/mile (Table 7).

Overall angler effort for the 81.3 acres of stream was estimated at 171 hours/acre (Table 8). A fishing intensity of 150 hours/acre is considered “light” by NYS standards (Engstrom-Heg 1990). This is also considerably less effort than the 283 hours/acre reported by Lemon (1998). The upper section had the lowest effort at 56 hours/acre and the catch and release section had the most with 455 hours/acre (Table 8). The catch and release section effort would be considered “heavy” by NYS standards (Engstrom-Heg 1990). In 1997 the upper section had an estimated 118 hours/acre while the lower (includes lower-1, catch and release, and lower-2 section) had 414 hours/acre (Lemon 1998).

Angler Trips

Average complete trip length of interviewed anglers was 2.44 hours (SD 1.4, n=164). The incomplete trips that were at least 30 minutes in length, had a shorter average trip length of 2.08 hours (SD 1.5, n=370). The total estimated number of angler trips for Chittenango Creek in 2014 was 5,694, a 42% decline from the estimated 9,850 trips in 1997 (Table 9). In order to make the comparison between the 2014 and the 1997 surveys, the lower-1, catch and release, and lower-2 sections were combined into one lower section as was the case in 1997. The catch and release section did not exist until 2010. The catch and release section had the highest number of estimated trips per mile in 2014, with 710 trips/mile (Table 10).

Catch Rates

Angler interviews that were at least a half-hour long, provided catch rate information from 534 trips representing 1,170 hours on Chittenango Creek. A total of 1,238 brown trout and 4 brook trout (*Salvelinus fontinalis*) were caught by these anglers. Because only 4 brook trout were caught, estimates relating catch and harvest are based solely on brown trout. It should be noted, that the number of angler interviews were not evenly spread across the four stream sections. With the upper, lower-1, catch and release, and lower-2 sections accounting for 8, 47, 32, and 13 percent, respectively, of the interviews. This may have somewhat inflated the catch rate with the high proportion of interviews taking place in the catch and release area. The estimated total brown trout catch on Chittenango Creek ranged from 15,492 when estimating catch by stream section (Table 11), and 16,214 by month (Table 12). These values are 0.98 and 1.03 times the 15,700 trout that were stocked in the stream in 2014.

Catch rates varied considerably by section and month, with the catch and release section having the highest overall catch per unit effort (CPUE) with a weighted mean of 1.42 trout/hour, the upper section had the lowest CPUE at 0.93 trout/hour (Table 11). The pooled catch rate of Chittenango anglers was 1.18 trout/hour, which is 2.4 times greater than the targeted catch rate of 0.5 trout/hour specified in Engstrom-Heg (1990). This catch rate was slightly higher than the pooled catch rate of 1.10 trout/hour reported by Lemon (1998) for Chittenango Creek and is 1.6 times higher than the estimated CPUE of 0.74 trout/hour on Ninemile Creek during the same time period in 2014 (Zollweg-Horan 2016). The only month falling below the targeted rate of 0.5/hour was April, with 0.18 trout/hour. Stream conditions from April 1, the opening day of trout season, through April 6th were unfavorable due to high and turbid water. The poor stream condition during the first week of the season likely contributed to the low catch rate in April. Given that two of the three stockings increments took place in May, it is not surprising that the month of May had the highest CPUE of 1.93 trout/hour. May also had the largest estimated total brown trout catch at 6,184 while June was second with 5,460 (Table 12). The catch and release section had the greatest estimate for number of trout caught per mile with 2,451, which is 1.9 times the 2014 stocking of 1,270 brown trout in that section.

During the angler interviews lengths were taken on 67 brown trout; averaging 277 mm (10.9 inches; SD 59mm). Brown trout were also examined to determine origin; wild, stocked or unknown. Of the 67 examined, 76% were believed to be stocked, 18% wild and 6% unknown (Table 13). If we assume 18% of the estimated total catch of brown trout were wild, we would have an estimated catch of wild brown trout of 2,788 to 2,918.

Harvest Rates

The estimated overall harvest of brown trout ranged from 1,211 when estimating harvest by stream section (Table 14), to 1,362 by month (Table 15). Though only 2.2 of the 19.3 miles of stocked stream (11%) are in the catch and release only area, the vast majority of trout caught throughout the creek were still released by anglers. Only 12% (88 of 715) of the reported brown trout caught outside of the catch and release section were harvested (Table 16). This is a significantly lower harvest rate then the 33% reported by Lemon (1998) for Chittenango Creek. It's also lower than the mean harvest rate of 30% reported by Alexiades et al. (2014) for the statewide survey, and the 21% harvest rate reported by Zollweg-Horan (2016) for Ninemile Creek. Reported harvest rates varied throughout the season with April having the highest rate at 38% and August having the least, 1% (Table 16). One brown trout was kept in the catch and release section by an unknowing angler. Along with the brown trout, four brook trout were caught by interviewed anglers, with one being harvested for a rate of 25%. Brook trout are not a significant component of the recreational fishery.

Angler Methods

During interviews, anglers were asked about the angling method, or combination of methods, they were using. Of the 571 anglers interviewed, 57% were fly fishing, 19% were using artificial lures (other than flies) and 11% were fishing with bait. The remainder of the anglers were using a combination of methods (Table 17). If we combine all anglers indicating bait as a method used, and combine all

anglers using just artificial lures or flies, it comes out to 22% were bait anglers and 78% lure or fly only anglers. This was almost the opposite of what was found by Alexiades et al. (2014) during the statewide survey where lure or fly only anglers made up just 10-30% of anglers. It also differs from Ninemile Creek where 56% of anglers used bait and 44% used lures or flies (Zollweg-Horan 2016). Mean catch rates for each method on Chittenango Creek were 0.66 trout/hour for bait and 1.15 trout/hour for artificial lures.

Angler Residency

Anglers from twelve different states were surveyed on Chittenango Creek, with anglers from as far away as Wyoming and Colorado. Ninety-eight percent of anglers were NYS Residents, with anglers from Madison and Onondaga counties comprising 80% of all anglers, 40% coming from each. Twenty-one New York counties were represented with anglers from as far west as Erie County, and as far south as Queens County (Table 18).

Angler Opinions

Anglers on Chittenango Creek were asked to provide their opinion on three questions (Appendix 3). The first was whether they have fished the catch and release only section of Chittenango Creek. Of those who responded, 57% (215 of 377) had fished the catch and release section. The second question was whether they favored or opposed the 2.2 mile catch and release section. The vast majority of respondents were in favor of having that section, 85% (319 of 377), while 25 respondents were opposed to the catch and release section (7%), and 33 had no opinion (9%). The final question was whether they had fished the year-round section of the creek (from Route 20 north to Conrail railroad line) during the traditional closed season (Oct 16 to March 31). The vast majority (72%) of respondents had not fished that section during that period (Table 19).

Management Recommendations

As a result of the findings of the 2014 angler survey on Chittenango Creek the following actions are recommended:

1) Recalculate the number of trout stocked in each section using the effort estimates generated in the survey.
2) Continuation of the 2.2 mile year around catch and release, artificial lure only section. Despite the low overall harvest rates documented on the stream, the overwhelming support for the Catch and Release section demonstrates the demand for this type of fishing experience in the region.
3) Continuation of the year around harvest section. Though most of the anglers interviewed (72%) hadn't taken advantage of this open season, it does provide an opportunity for anglers who wish to fish for trout during the winter months.

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Table 1. Trout fishing regulations in 2014 for the four stream sections on Chittenango Creek, Madison County.

Section	Species	Open Season	Minimum Length	Daily Limit	Method
Upper	Trout	April 1 through Oct 15	Any size	5-with no more than 2 longer than 12”	
Lower-1 and 2		All year			
Catch and Release		All year	Catch and release only		Artificial lures only

Table 2. Number of brown trout stocked in 2014 for each of the four sections of Chittenango Creek.

	Date Stocked			
	4/3/2014	5/12/2014	5/23/2014	
	First Increment		Second Increment	**Section**
Stocked Section	One year olds	Two year olds	One year olds	**Total**
Upper	2,990	400	1,810	5,200
Lower-1	2,460	1,000	4,140	7,600
Catch and Release	970	300		1,270
Lower-2	530	240	860	1,630
Total	**6,950**	**1,940**	**6,810**	**15,700**

Table 3. Number of cars and anglers counted on Chittenango Creek and Ninemile Creek during the angler survey period of April 1 to October 15, 2014 and April 1 to June 30, 1997.

			Total	
Stream	Year	Period	Cars	Anglers
Chittenango	1997	April 1-June 30	825	751
Chittenango	2014	April 1-Oct 15	705	636
Ninemile	2014	April 1-Oct 15	1,912	1,508

Table 4. Estimated number of angler hours based on angler counts, car counts, and angler+car, along with standard error (SE) on Chittenango Creek for the period April 1 to October 15, 2014.

	Estimated Angler Hours					
Section	Angler Count[1]	SE	Car Count[1]	SE	Angler + Car[2]	SE
Upper	1,153	276	1,969	431	2,642	617
Lower-1	3,644	393	6,158	616	8,379	879
Catch & Release	2,811	327	3,811	389	3,760	444
Lower-2	886	148	1,955	275	2,721	340
Total	**8,494**	599	**13,892**	891	**17,502**	1,211

1 Method outlined by Pollock et al. (1994).
2 Method outlined by Prindle and Bishop (2015).

Table 5. Estimated number of angler hours on Chittenango Creek by month based on car counts along with standard error (SE) for the period April 1 to October 15, 2014.

	Estimated Angler Hours					
Month	Upper	Lower-1	Catch & Release	Lower-2	**Total**	SE
April	686	975	436	366	**2,462**	493
May	576	1406	969	263	**3,212**	665
June	303	1575	943	639	**3,460**	372
July	81	597	417	229	**1,323**	222
August	191	849	448	162	**1,650**	226
September	125	640	486	245	**1,496**	278
October	8	118	112	52	**290**	26
Total	**1,969**	**6,158**	**3,811**	**1,955**	**13,893**	1,001
% of Effort	**14%**	**44%**	**27%**	**14%**		

Table 6. Estimated number of angler hours on Chittenango Creek by month for weekdays (WD) and weekends (WE) for the period April 1 to October 15, 2014.

	Estimated Angler Hours								
	Upper		Lower-1		Catch & Release		Lower-2		
Month	WD	WE	WD	WE	WD	WE	WD	WE	**Total**
April	383	303	436	539	234	201	206	160	**2,462**
May	391	184	922	484	670	298	176	86	**3,212**
June	149	154	796	779	597	346	498	141	**3,460**
July	57	25	286	310	256	161	142	87	**1,323**
August	121	69	451	397	266	182	60	102	**1,650**
September	38	87	332	308	221	265	149	96	**1,496**
October	0	8	110	8	88	24	44	8	**290**
Total	**1,139**	**830**	**3,333**	**2,825**	**2,333**	**1,477**	**1,274**	**680**	**13,892**
% of Effort	**8%**	**6%**	**24%**	**20%**	**17%**	**11%**	**9%**	**5%**	

Table 7. Estimated number of angler hours/mile on Chittenango Creek by month for the period April 1 to October 15, 2014.

	Estimated Angler Hours/Mile				
Month	Upper	Lower-1	Catch & Release	Lower-2	**All**
April	81	137	198	229	
May	68	198	440	164	
June	36	222	429	399	
July	10	84	189	143	
August	22	120	204	101	
September	15	90	221	153	
October	1	17	51	32	
Total	**232**	**867**	**1,732**	**1,222**	**720**
% of Effort	**6%**	**21%**	**43%**	**30%**	

All = 13,893/19.3 miles

Table 8. Estimated number of angler hours/acre on Chittenango Creek by month for the period April 1 to October 15, 2014.

	Estimated Angler Hours/Acre				
Month	Upper	Lower-1	Catch & Release	Lower-2	**All**
April	20	32	52	53	
May	16	46	116	38	
June	9	51	113	92	
July	2	19	50	33	
August	5	28	54	23	
September	4	21	58	35	
October	0.2	4	13	8	
Total	**56**	**200**	**455**	**282**	**171**
% of Effort	**6%**	**20%**	**46%**	**28%**	

All = 13,893/81.3 acres

Table 9. Total angler trips per section and per mile based on estimated angler effort and average complete trip length for Chittenango Creek for the 1997 (Lemon 1998) and 2014 angler census.

			Estimated		
Year	Section Length (miles)	Average Complete Trip Length	Total Angler Hours	Angler Trips	Number of Trips/mile
2014					
Upper	8.4	2.44	1,969	807	96
Lower*	10.9	2.44	11,923	4,887	448
Total	**19.3**		**13,892**	**5,694**	**295**
1997					
Upper	8.5	2.34	4,141	1,770	208
Lower	10.5	2.34	18,908	8,081	770
Total	**19.0**		**23,049**	**9,850**	**518**

*Lower includes lower-1, catch and release, and lower-2 sections.

Table 10. Total angler trips per section and per mile based on estimated angler hours and average complete trip length for Chittenango Creek for the period of April 1 to October 15, 2014.

			Estimated		
2014	Section Length (miles)	Average Complete Trip Length	Total Angler Hours	Angler Trips	Number of Trips/mile
Upper	8.4	2.44	1,969	807	96
Lower-1	7.1	2.44	6,158	2,524	355
Catch & Release	2.2	2.44	3,811	1,562	710
Lower-2	1.6	2.44	1,955	801	501
Total	**19.3**		**13,892**	**5,694**	**295**

Table 11. Estimated catch of brown trout on Chittenango Creek based on weighted mean catch rates by stream section for the period of April 1 to October 15, 2014.

		Estimated					
	Wt Mean	Brown Trout			Angler		
Section	Trout/Hour	Caught	Caught/Mile	Caught/Acre	Hours	Miles	Acres
Upper	0.933	1,837	219	52	1,969	8.4	35.2
Lower-1	1.03	6,318	890	205	6,158	7.1	30.8
Catch & Release	1.42	5,392	2,451	642	3,811	2.2	8.4
Lower-2	0.995	1,945	1,215	282	1,955	1.6	6.9
Total	**1.12**	**15,492**	**803**	**191**	**13,892**	**19.3**	**81.3**

Table 12. Estimated catch of brown trout on Chittenango Creek based on weighted stratified mean catch rates and estimated effort by month for the period of April 1 to October 15, 2014.

Month	Wt Mean Trout/hour	Estimated Brown Trout Caught	Estimated Angler Hours
April	0.18	436	2,462
May	1.93	6,184	3,212
June	1.58	5,460	3,460
July	0.90	1,188	1,323
August	0.98	1,617	1,650
September	0.72	1,080	1,496
October	0.86	250	290
Total	**1.17**	**16,214**	**13,892**

Table 13. Brown trout measured and examined to determine if wild or stocked on Chittenango Creek during angler interviews for the period of April 1 to October 15, 2014.

Origin	Number	Percent	Average Length (mm)	Standard Deviation (mm)
Stocked	51	76%	263	48
Wild	12	18%	305	60
Unknown	4	6%	367	87
Total	**67**		**277**	**59**

Table 14. Estimated harvest of brown trout on Chittenango Creek based on weighted mean catch rates by section for the period of April 1 to October 15, 2014. Not counting catch and release section.

Section	Wt Mean Trout/Hour	Estimated Brown Trout Harvest	Harvest/Mile	Harvest/Acre	Angler* Hours	Miles	Acres
Upper	0.11	224	27	6.4	1,969	8.4	35.2
Lower-1	0.14	844	119	27.4	6,158	7.1	30.8
Lower-2	0.07	143	89	20.7	1,955	1.6	6.9
Total	**0.12**	**1,211**	**71**	**16.6**	**10,082**	**17.1**	**72.9**

*Does not include catch and release section estimated hours of effort.

Table 15. Estimated harvest of brown trout on Chittenango Creek based on weighted stratified mean harvest rates and estimated effort by month for the period of April 1 to October 15, 2015. Not counting catch and release section.

		Estimated	
Month	Wt Mean Trout/Hour	Brown Trout Harvest	Angler* Hours
April	0.06	120	2,026
May	0.27	612	2,243
June	0.16	408	2,517
July	0.18	159	906
August	0.02	19	1,202
September	0.04	37	1,010
October	0.04	6	178
Total	**0.14**	**1,362**	**10,082**

*Does not include catch and release section estimated hours of effort.

Table 16. Reported catch, harvest, and harvest rates of brown trout on the Upper and Lower sections of Chittenango Creek by month for the period of April 1 to October 15, 2014.

	Brown Trout		
Month	Caught	Harvested	% Harvest
April	16	6	38%
May	176	25	14%
June	212	38	18%
July	74	14	19%
August	150	1	1%
September	81	3	4%
October	6	1	17%
Total	**715**	**88**	**12.3%**

* Does not include catch and release area.

Table 17. Angling Methods of all interviewed anglers on Chittenango Creek for the period of April 1 to October 15, 2014.

Methods	Anglers*	Percent	Trout			Mean
			Caught**	Harvested	% Harvest	Trout/Hr
Bait Fishing (B)	62	11%	96	26	27%	0.83
Bait & Fly Fishing (BF)	8	1%	22	4	18%	0.83
Bait & Fly & Artificials (BFL)	6	1%	13	10	77%	1.02
Bait & Artificials (BA)	47	8%	20	9	45%	0.27
Fly Fishing (F)	324	57%	889	10	1%	1.19
Fly Fishing & Artificials (FL)	17	3%	6	0	0%	0.19
Artificial Lures (L)	107	19%	205	32	16%	1.18
Total	**571**		**1,251**	**91**	**7%**	
Bait Combined (B, BF, BFL, BL)	123	22%	151	49	32%	0.66
Artificial Combined (F, FL, L)	448	78%	1,100	42	4%	1.15
Total	**571**		**1,251**	**91**	**7%**	

*All angler interviews, regardless of time fished.

** 1,247 brown trout and 4 brook trout.

Table 18. Angler residency of interviewed anglers on Chittenango Creek for the period of April 1 to October 15, 2014.

Number of Anglers	State	County	Frequency
1	CO		0%
1	IL		0%
1	MA		0%
1	MI		0%
1	NC		0%
2	NH		0%
1	OH		0%
2	PA		0%
2	VA		0%
1	WV		0%
1	WY		0%
2	NY	Albany	0%
2	NY	Broome	0%
9	NY	Cayuga	2%
1	NY	Chenango	0%
1	NY	Columbia	0%
1	NY	Cortland	0%
1	NY	Erie	0%
2	NY	Herkimer	0%
1	NY	Jefferson	0%
1	NY	Livingston	0%
230	NY	Madison	40%
3	NY	Monroe	1%
34	NY	Oneida	6%
226	NY	Onondaga	40%
21	NY	Oswego	4%
1	NY	Otsego	0%
1	NY	Queens	0%
3	NY	Saratoga	1%
1	NY	Schenectady	0%
1	NY	Tioga	0%
14	NY	Tompkins	2%

Table 19. Angler opinions of several questions asked during interviews on Chittenango Creek for the period April 1 to October 15, 2014.

Interview questions	Yes	No	No Opinion	N	% Yes	% No	% No Opinion	Previously Interviewed
Have you fished the catch and release section?	215	162		377	57%	43%		189
Are you in favor of this 2.2 mile section of catch and release?	319	25	33	377	85%	7%	9%	189
Have you fished the year-round section from Oct 16 to March 31?	104	273		377	28%	72%		189

Appendix 1. History of Trout Fishing Regulations on Chittenango Creek, Madison County.

1982-1995: Chittenango Creek north of Route 20, trout, April 1-Nov 30, any size, limit 10. The statewide regulation was, trout, April 1-Sept 30, any size, limit 10.

1996: Chittenango Creek from Route 20 north to Conrail railroad line, trout, all year, 5 trout plus 5 brook trout under 8 inches. Statewide was April 1-Oct 15, 5 trout any size. Madison County had a special regulation of 5 trout any size plus 5 brook trout under 8 inches.

2002: Madison County special regulation, trout, daily limit 5- with no more than 2 longer than 12", plus 5 brook trout under 8". Statewide was still any size, daily limit 5.

2010: Catch and release section was opened on Chittenango Creek, and the 5 brook trout under 8" was eliminated from Madison County waters.

Table 1. Trout fishing regulations in 2014 for the four stream sections on Chittenango Creek, Madison County.

Section	Species	Open Season	Minimum Length	Daily Limit	Method
Upper	Trout	April 1 through Oct 15	Any size	5-with no more than 2 longer than 12”	
Lower-1 and 2		All year			
Catch and Release		All year	Catch and release only		Artificial lures only

Table 2. Number of brown trout stocked in 2014 for each of the four sections of Chittenango Creek.

	Date Stocked			
	4/3/2014	5/12/2014	5/23/2014	
	First Increment		Second Increment	**Section**
Stocked Section	One year olds	Two year olds	One year olds	**Total**
Upper	2,990	400	1,810	5,200
Lower-1	2,460	1,000	4,140	7,600
Catch and Release	970	300		1,270
Lower-2	530	240	860	1,630
Total	**6,950**	**1,940**	**6,810**	**15,700**

Table 3. Number of cars and anglers counted on Chittenango Creek and Ninemile Creek during the angler survey period of April 1 to October 15, 2014 and April 1 to June 30, 1997.

			Total	
Stream	Year	Period	Cars	Anglers
Chittenango	1997	April 1-June 30	825	751
Chittenango	2014	April 1-Oct 15	705	636
Ninemile	2014	April 1-Oct 15	1,912	1,508

Table 4. Estimated number of angler hours based on angler counts, car counts, and angler+car, along with standard error (SE) on Chittenango Creek for the period April 1 to October 15, 2014.

	Estimated Angler Hours					
Section	Angler Count[1]	SE	Car Count[1]	SE	Angler + Car[2]	SE
Upper	1,153	276	1,969	431	2,642	617
Lower-1	3,644	393	6,158	616	8,379	879
Catch & Release	2,811	327	3,811	389	3,760	444
Lower-2	886	148	1,955	275	2,721	340
Total	**8,494**	599	**13,892**	891	**17,502**	1,211

1 Method outlined by Pollock et al. (1994).
2 Method outlined by Prindle and Bishop (2015).

Table 5. Estimated number of angler hours on Chittenango Creek by month based on car counts along with standard error (SE) for the period April 1 to October 15, 2014.

	Estimated Angler Hours					
Month	Upper	Lower-1	Catch & Release	Lower-2	**Total**	SE
April	686	975	436	366	**2,462**	493
May	576	1406	969	263	**3,212**	665
June	303	1575	943	639	**3,460**	372
July	81	597	417	229	**1,323**	222
August	191	849	448	162	**1,650**	226
September	125	640	486	245	**1,496**	278
October	8	118	112	52	**290**	26
Total	**1,969**	**6,158**	**3,811**	**1,955**	**13,893**	1,001
% of Effort	**14%**	**44%**	**27%**	**14%**		

Table 6. Estimated number of angler hours on Chittenango Creek by month for weekdays (WD) and weekends (WE) for the period April 1 to October 15, 2014.

	Estimated Angler Hours								
	Upper		Lower-1		Catch & Release		Lower-2		
Month	WD	WE	WD	WE	WD	WE	WD	WE	**Total**
April	383	303	436	539	234	201	206	160	**2,462**
May	391	184	922	484	670	298	176	86	**3,212**
June	149	154	796	779	597	346	498	141	**3,460**
July	57	25	286	310	256	161	142	87	**1,323**
August	121	69	451	397	266	182	60	102	**1,650**
September	38	87	332	308	221	265	149	96	**1,496**
October	0	8	110	8	88	24	44	8	**290**
Total	**1,139**	**830**	**3,333**	**2,825**	**2,333**	**1,477**	**1,274**	**680**	**13,892**
% of Effort	**8%**	**6%**	**24%**	**20%**	**17%**	**11%**	**9%**	**5%**	

Table 7. Estimated number of angler hours/mile on Chittenango Creek by month for the period April 1 to October 15, 2014.

	Estimated Angler Hours/Mile				
Month	Upper	Lower-1	Catch & Release	Lower-2	**All**
April	81	137	198	229	
May	68	198	440	164	
June	36	222	429	399	
July	10	84	189	143	
August	22	120	204	101	
September	15	90	221	153	
October	1	17	51	32	
Total	**232**	**867**	**1,732**	**1,222**	**720**
% of Effort	**6%**	**21%**	**43%**	**30%**	

All = 13,893/19.3 miles

Table 8. Estimated number of angler hours/acre on Chittenango Creek by month for the period April 1 to October 15, 2014.

	Estimated Angler Hours/Acre				
Month	Upper	Lower-1	Catch & Release	Lower-2	**All**
April	20	32	52	53	
May	16	46	116	38	
June	9	51	113	92	
July	2	19	50	33	
August	5	28	54	23	
September	4	21	58	35	
October	0.2	4	13	8	
Total	**56**	**200**	**455**	**282**	**171**
% of Effort	**6%**	**20%**	**46%**	**28%**	

All = 13,893/81.3 acres

Table 9. Total angler trips per section and per mile based on estimated angler effort and average complete trip length for Chittenango Creek for the 1997 (Lemon 1998) and 2014 angler census.

			Estimated		
Year	Section Length (miles)	Average Complete Trip Length	Total Angler Hours	Angler Trips	Number of Trips/mile
2014					
Upper	8.4	2.44	1,969	807	96
Lower*	10.9	2.44	11,923	4,887	448
Total	**19.3**		**13,892**	**5,694**	**295**
1997					
Upper	8.5	2.34	4,141	1,770	208
Lower	10.5	2.34	18,908	8,081	770
Total	**19.0**		**23,049**	**9,850**	**518**

*Lower includes lower-1, catch and release, and lower-2 sections.

Table 10. Total angler trips per section and per mile based on estimated angler hours and average complete trip length for Chittenango Creek for the period of April 1 to October 15, 2014.

			Estimated		
2014	Section Length (miles)	Average Complete Trip Length	Total Angler Hours	Angler Trips	Number of Trips/mile
Upper	8.4	2.44	1,969	807	96
Lower-1	7.1	2.44	6,158	2,524	355
Catch & Release	2.2	2.44	3,811	1,562	710
Lower-2	1.6	2.44	1,955	801	501
Total	**19.3**		**13,892**	**5,694**	**295**

Table 11. Estimated catch of brown trout on Chittenango Creek based on weighted mean catch rates by stream section for the period of April 1 to October 15, 2014.

		Estimated					
	Wt Mean	Brown Trout			Angler		
Section	Trout/Hour	Caught	Caught/Mile	Caught/Acre	Hours	Miles	Acres
Upper	0.933	1,837	219	52	1,969	8.4	35.2
Lower-1	1.03	6,318	890	205	6,158	7.1	30.8
Catch & Release	1.42	5,392	2,451	642	3,811	2.2	8.4
Lower-2	0.995	1,945	1,215	282	1,955	1.6	6.9
Total	**1.12**	**15,492**	**803**	**191**	**13,892**	**19.3**	**81.3**

Table 12. Estimated catch of brown trout on Chittenango Creek based on weighted stratified mean catch rates and estimated effort by month for the period of April 1 to October 15, 2014.

Month	Wt Mean Trout/hour	Estimated Brown Trout Caught	Estimated Angler Hours
April	0.18	436	2,462
May	1.93	6,184	3,212
June	1.58	5,460	3,460
July	0.90	1,188	1,323
August	0.98	1,617	1,650
September	0.72	1,080	1,496
October	0.86	250	290
Total	**1.17**	**16,214**	**13,892**

Table 13. Brown trout measured and examined to determine if wild or stocked on Chittenango Creek during angler interviews for the period of April 1 to October 15, 2014.

Origin	Number	Percent	Average Length (mm)	Standard Deviation (mm)
Stocked	51	76%	263	48
Wild	12	18%	305	60
Unknown	4	6%	367	87
Total	**67**		**277**	**59**

Table 14. Estimated harvest of brown trout on Chittenango Creek based on weighted mean catch rates by section for the period of April 1 to October 15, 2014. Not counting catch and release section.

Section	Wt Mean Trout/Hour	Estimated Brown Trout Harvest	Harvest/Mile	Harvest/Acre	Angler* Hours	Miles	Acres
Upper	0.11	224	27	6.4	1,969	8.4	35.2
Lower-1	0.14	844	119	27.4	6,158	7.1	30.8
Lower-2	0.07	143	89	20.7	1,955	1.6	6.9
Total	**0.12**	**1,211**	**71**	**16.6**	**10,082**	**17.1**	**72.9**

*Does not include catch and release section estimated hours of effort.

Table 15. Estimated harvest of brown trout on Chittenango Creek based on weighted stratified mean harvest rates and estimated effort by month for the period of April 1 to October 15, 2015. Not counting catch and release section.

		Estimated	
Month	Wt Mean Trout/Hour	Brown Trout Harvest	Angler* Hours
April	0.06	120	2,026
May	0.27	612	2,243
June	0.16	408	2,517
July	0.18	159	906
August	0.02	19	1,202
September	0.04	37	1,010
October	0.04	6	178
Total	**0.14**	**1,362**	**10,082**

*Does not include catch and release section estimated hours of effort.

Table 16. Reported catch, harvest, and harvest rates of brown trout on the Upper and Lower sections of Chittenango Creek by month for the period of April 1 to October 15, 2014.

	Brown Trout		
Month	Caught	Harvested	% Harvest
April	16	6	38%
May	176	25	14%
June	212	38	18%
July	74	14	19%
August	150	1	1%
September	81	3	4%
October	6	1	17%
Total	**715**	**88**	**12.3%**

* Does not include catch and release area.

Table 17. Angling Methods of all interviewed anglers on Chittenango Creek for the period of April 1 to October 15, 2014.

Methods	Anglers*	Percent	Trout			Mean
			Caught**	Harvested	% Harvest	Trout/Hr
Bait Fishing (B)	62	11%	96	26	27%	0.83
Bait & Fly Fishing (BF)	8	1%	22	4	18%	0.83
Bait & Fly & Artificials (BFL)	6	1%	13	10	77%	1.02
Bait & Artificials (BA)	47	8%	20	9	45%	0.27
Fly Fishing (F)	324	57%	889	10	1%	1.19
Fly Fishing & Artificials (FL)	17	3%	6	0	0%	0.19
Artificial Lures (L)	107	19%	205	32	16%	1.18
Total	**571**		**1,251**	**91**	**7%**	
Bait Combined (B, BF, BFL, BL)	123	22%	151	49	32%	0.66
Artificial Combined (F, FL, L)	448	78%	1,100	42	4%	1.15
Total	**571**		**1,251**	**91**	**7%**	

*All angler interviews, regardless of time fished.

** 1,247 brown trout and 4 brook trout.

Table 18. Angler residency of interviewed anglers on Chittenango Creek for the period of April 1 to October 15, 2014.

Number of Anglers	State	County	Frequency
1	CO		0%
1	IL		0%
1	MA		0%
1	MI		0%
1	NC		0%
2	NH		0%
1	OH		0%
2	PA		0%
2	VA		0%
1	WV		0%
1	WY		0%
2	NY	Albany	0%
2	NY	Broome	0%
9	NY	Cayuga	2%
1	NY	Chenango	0%
1	NY	Columbia	0%
1	NY	Cortland	0%
1	NY	Erie	0%
2	NY	Herkimer	0%
1	NY	Jefferson	0%
1	NY	Livingston	0%
230	NY	Madison	40%
3	NY	Monroe	1%
34	NY	Oneida	6%
226	NY	Onondaga	40%
21	NY	Oswego	4%
1	NY	Otsego	0%
1	NY	Queens	0%
3	NY	Saratoga	1%
1	NY	Schenectady	0%
1	NY	Tioga	0%
14	NY	Tompkins	2%

Table 19. Angler opinions of several questions asked during interviews on Chittenango Creek for the period April 1 to October 15, 2014.

Interview questions	Yes	No	No Opinion	N	% Yes	% No	% No Opinion	Previously Interviewed
Have you fished the catch and release section?	215	162		377	57%	43%		189
Are you in favor of this 2.2 mile section of catch and release?	319	25	33	377	85%	7%	9%	189
Have you fished the year-round section from Oct 16 to March 31?	104	273		377	28%	72%		189

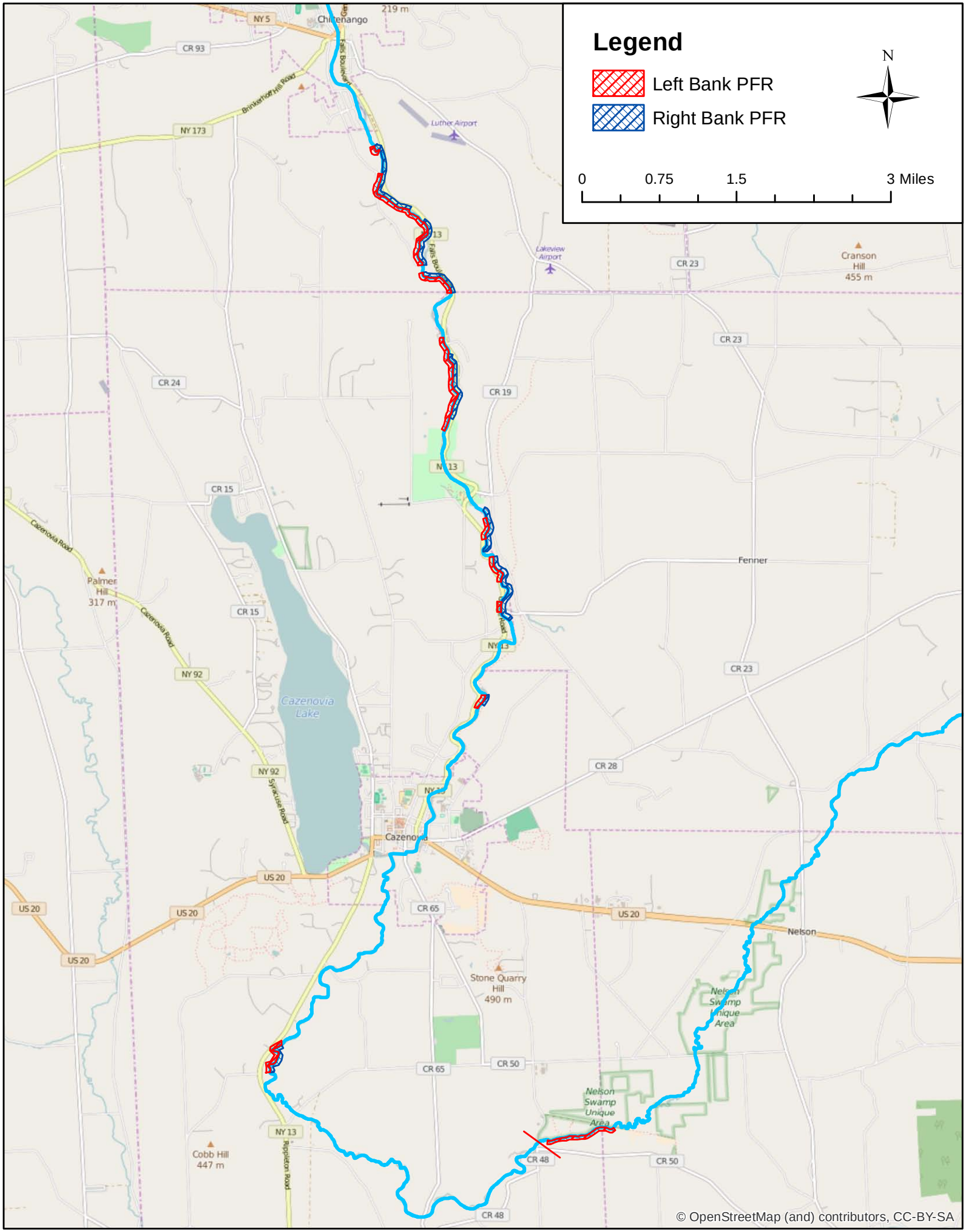

Figure 1. Public Fishing Rights (PFR) sections on Chittenango Creek, Madison County.

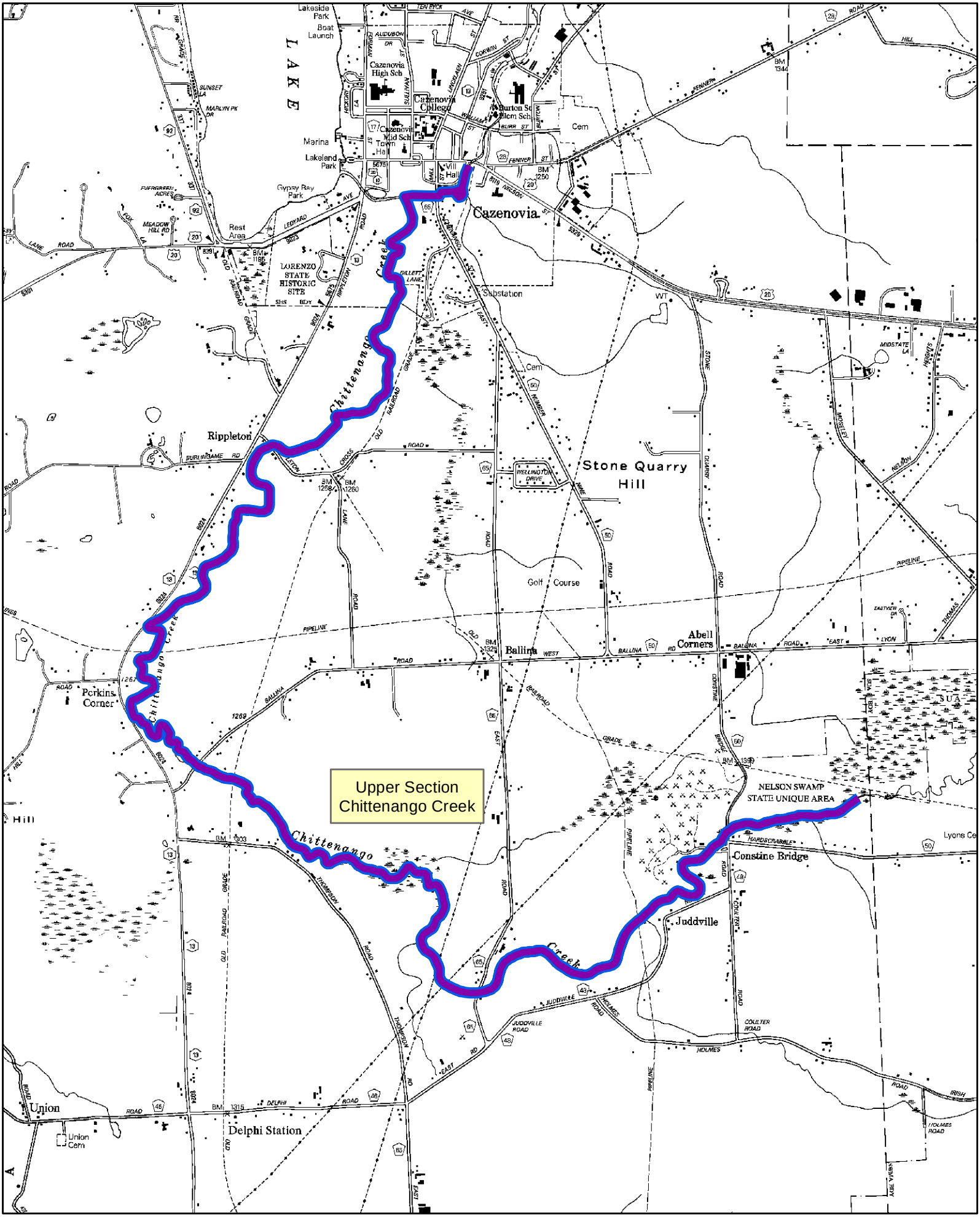

Figure 2a. The four trout stocked sections of Chittenango Creek, Upper, Lower-1, Catch and Release, and Lower-2.

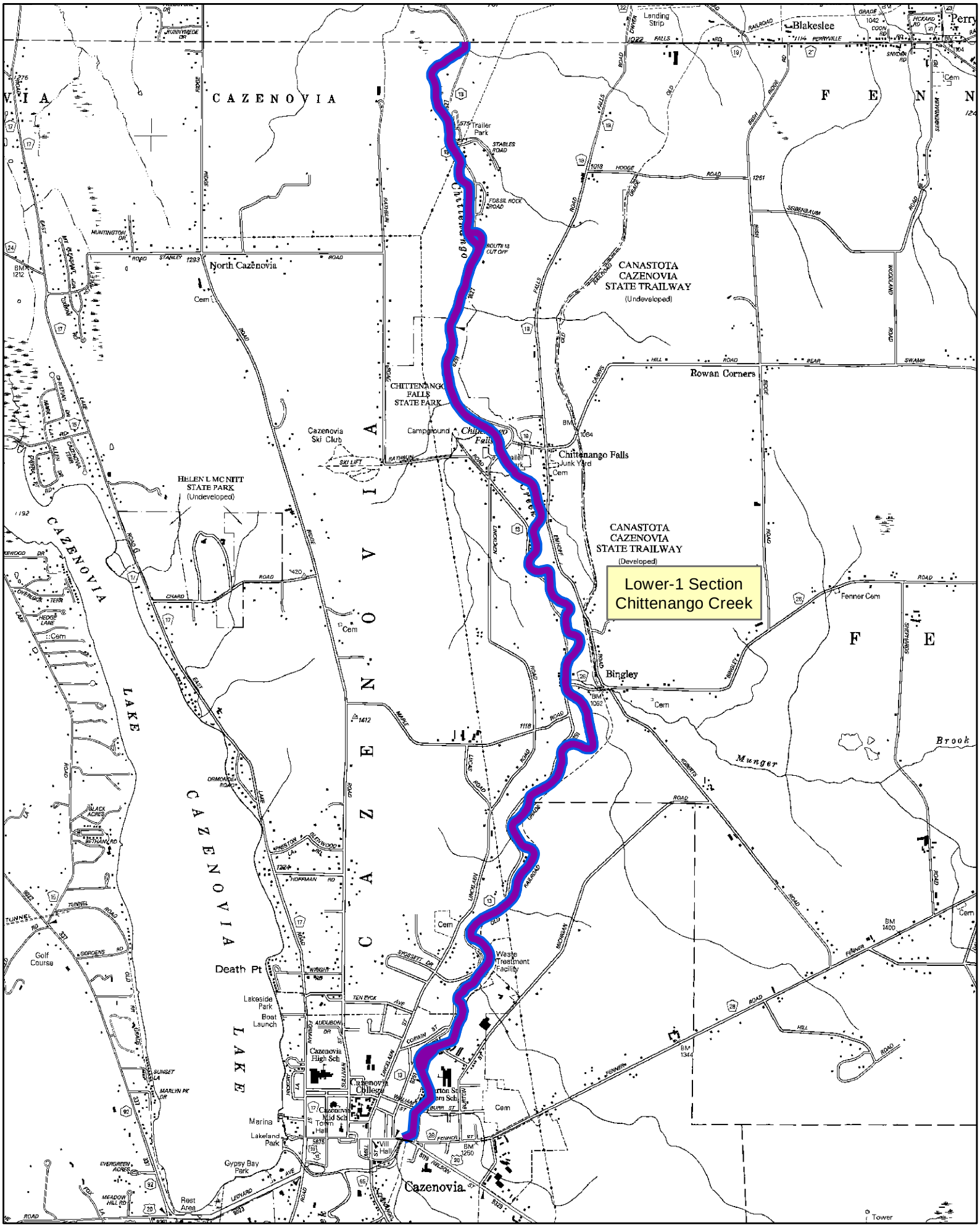

Figure 2b. The four trout stocked sections of Chittenango Creek, Upper, Lower-1, Catch and Release, and Lower-2.

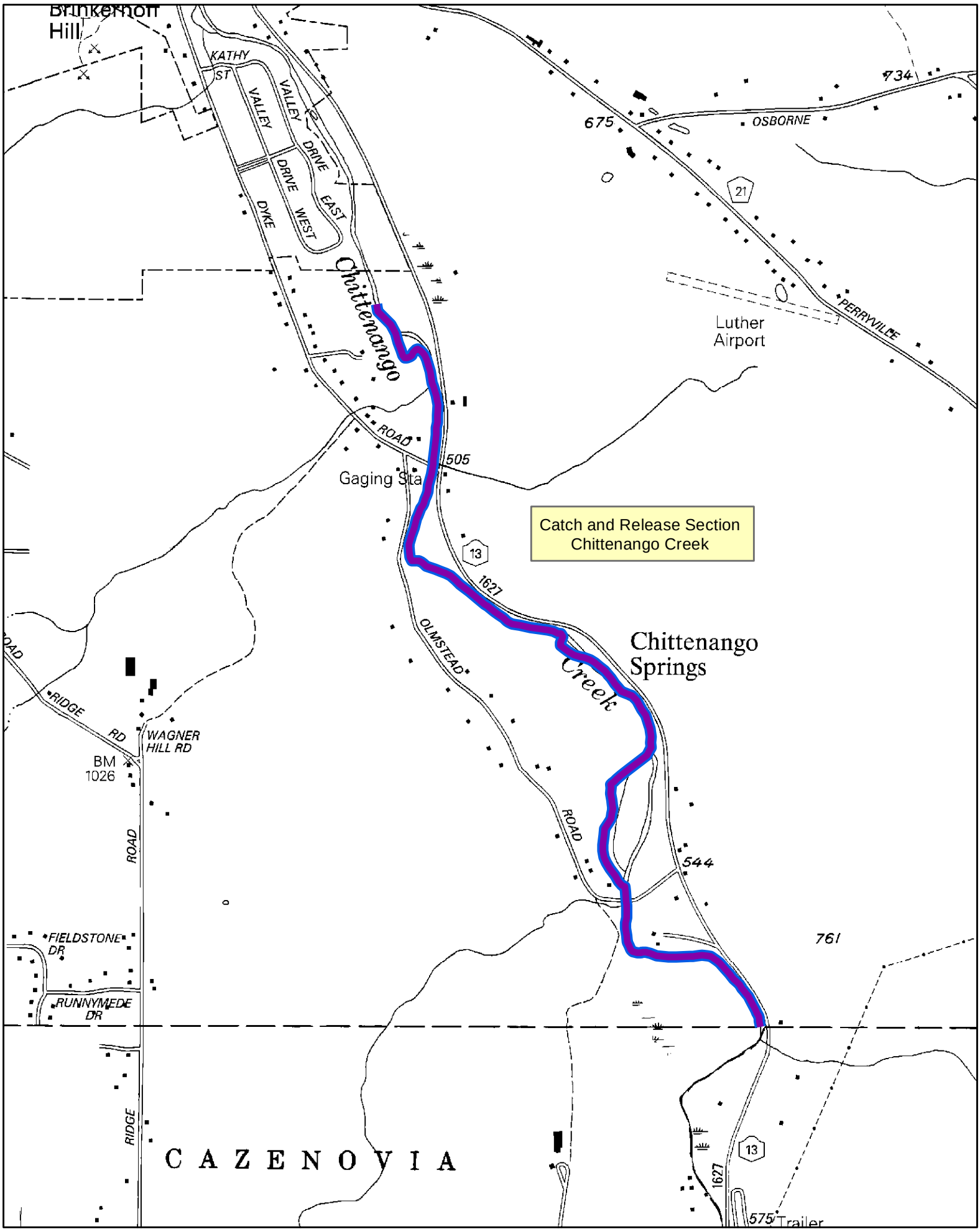

Figure 2c. The four trout stocked sections of Chittenango Creek, Upper, Lower-1, Catch and Release, and Lower-2.

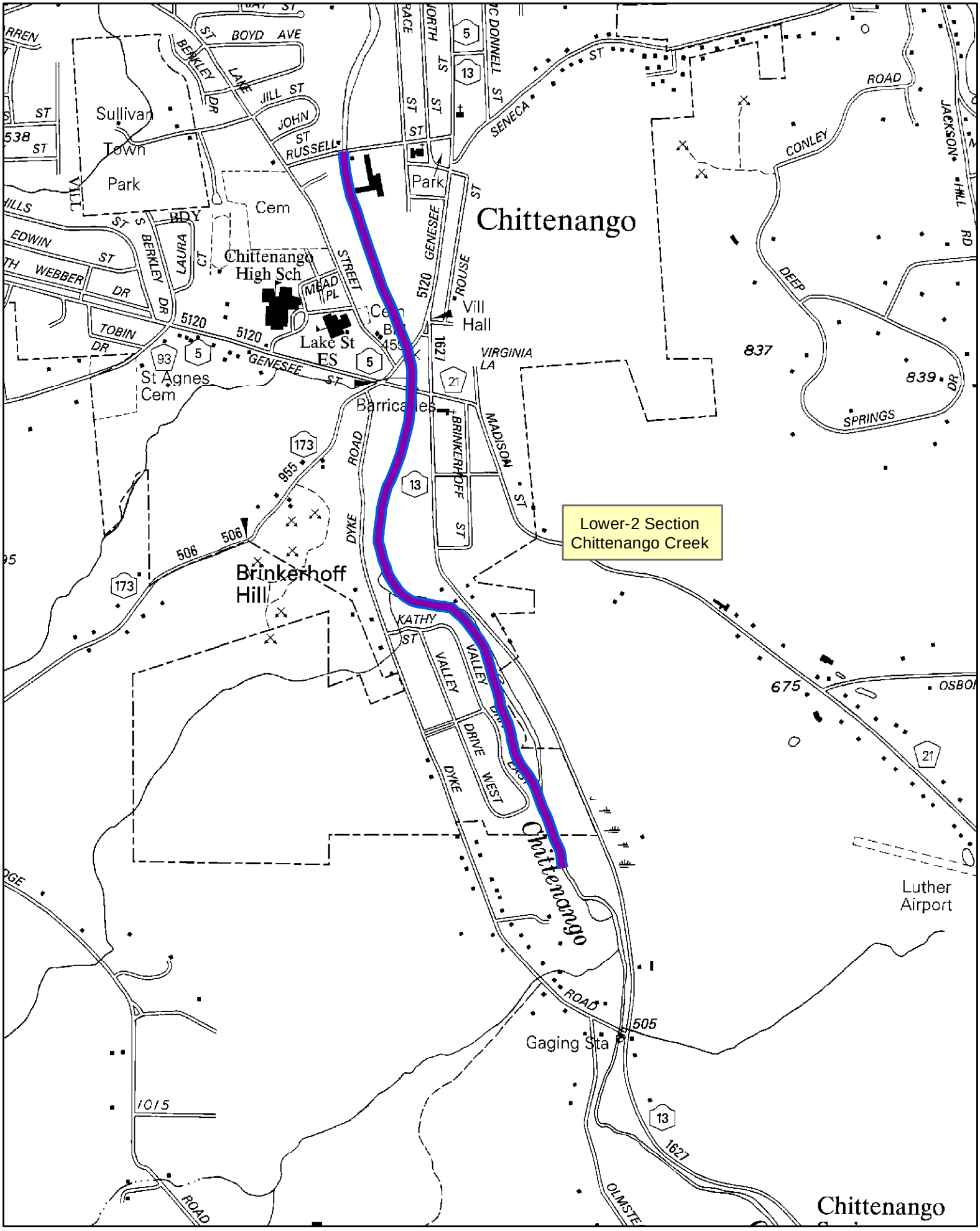

Figure 2d. The four trout stocked sections of Chittenango Creek, Upper, Lower-1, Catch and Release, and Lower-2.

Appendix 1. History of Trout Fishing Regulations on Chittenango Creek, Madison County.

1982-1995: Chittenango Creek north of Route 20, trout, April 1-Nov 30, any size, limit 10. The statewide regulation was, trout, April 1-Sept 30, any size, limit 10.

1996: Chittenango Creek from Route 20 north to Conrail railroad line, trout, all year, 5 trout plus 5 brook trout under 8 inches. Statewide was April 1-Oct 15, 5 trout any size. Madison County had a special regulation of 5 trout any size plus 5 brook trout under 8 inches.

2002: Madison County special regulation, trout, daily limit 5- with no more than 2 longer than 12", plus 5 brook trout under 8". Statewide was still any size, daily limit 5.

2010: Catch and release section was opened on Chittenango Creek, and the 5 brook trout under 8" was eliminated from Madison County waters.

Appendix 2. Chittenango Creek Angler and Car Count Form.

Angler Survey Angler and Car Count Form

Date	**Staff**
Weather	**Water Color**

Downstream ⬇

		Count #1		Count #2		Count #3	
		Time Start:		Time Start:		Time Start:	
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
UPPER	Nelson swamp -1						
	East Road-2						
	Ballina Road-3						
	DEC lot -4						
	Rippelton-5						
	Library-6						
	SUM						
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
LOWER-1	Buyeau Rd - 7						
	William St./Garage-8						
	Clark St.-9						
	Waste tr-10						
	Bingley Road-11						
	DEC lot 2-12						
	Emhoff Rd. DEC-13						
	Rte 13 Pull Offs-14						
	SUM						
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
C & R	Town Line-15						
	Olmstead Rd. Lot-16						
	Dyke Road-17						
	Pull Off-18						
	SUM						
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
LOWER-2	Below NK-19						
	Univ acc-20						
	Russel St-21						
	Route 5-22						
	SUM						
		Time ended:		Time ended:		Time ended:	

Upstream ⬆

Comments:

Appendix 3. Chittenango Creek Angler Census Questionare.

2014 New York State Department of Environmental Conservation
Chittenango Creek Tributary Angler Survey

Interview ID		**Staff Initials**	
Date		**Stream Section**	Upper Lower No Kill
Site		**Angling Technique**	
Interview time	*(24 hour time)*	**Break Time ?**	
Angler Start Time	*(24 hour time)*	**# Anglers in car**	
Interview type Complete trip *(circle one)* Incomplete trip		**State of residency**	
		County of residency (if NYS)	

DEC Species Code Key: Brown trout (328), Rainbow (326), Brook trout (329)

Catch Information

				Kept Fish		
Angler number*	**Species (DEC Code)**	**Number caught**	**Number kept**	**Length**	**Wild**	**Comments**

***Angler number if conducting a "group" interview. Get each anglers individual catch information.**

Interview Questions (please circle choice)

Have you fished the Catch & Release Section of Chittenango Creek?		YES	NO
Are you in favor of this 2.2 mile section of Catch & Release on Chitt. Creek?	YES	NO	NO OPINION
Have you fished the year-round section of Chitt. Creek (from Rte. 20 north to Conrail railroad line) during the "traditionally" closed season of Oct 16 to March 31?		YES	NO

Comments:

Appendix 4. Formulas used for estimates of angling effort and catch.

Effort estimates (Prindle and Bishop 2015)

$$\hat{H}_{j,h} = [A_t + (V_{vc} * P_{vc})]_{j,h} * daylength_{j,h}$$

where:

$\hat{H}_{j,h}$ = the number of angler hours on day *j* in stratum *h*

A_t = the number of anglers counted on the stream

V_{vc} = the number of vehicles at sites on stream *i* where a direct angler count is not possible

P_{vc} = the mean number of anglers per vehicle on stream *i*

The total angling effort on a given day is the sum of the direct count anglers plus the adjusted vehicle counts for those areas where a direct count is not readily obtainable. This adjusted value is simply the vehicle count multiplied by the stream specific mean angling party size, which comes from the interview data.

Effort estimates for angler counts (Pollock et al. 1994)

Daily effort:

$$e^i = I_i \times T$$

e^i= daily effort

I=instantaneous count of anglers at time i

T= length of the fishing day

Total effort was estimated as:

$$\sum(e_i/\pi_i)$$

π_i=total probability that the ith sample unit (day) is included in the sample (month)

Effort estimates for car counts (Pollock et al. 1994)

$$e^i = (I_i \times Pi) \times T$$

e^i= daily effort

I=instantaneous count of vehicles at time i

P= mean number of anglers per vehicle

T= length of the fishing day

Total effort was estimated as:

$$\sum(e_i/\pi_i)$$

π_i=total probability that the ith sample unit (day) is included in the sample (month).

Catch and Harvest

Both the ratio of means and mean of ratios estimators are used for complete versus incomplete interviews, respectively. Since neither interview type was consistently predominant, a weighted mean catch rate formula was used to combine the two estimates into a single value (Lockwood 2005).

Ratio of Means Stratified Catch Rate Estimator for Complete Trip Interviews

y = fish caught or harvested, *x* = hours fished by angler *i* in stratum *h* and *L* is the total number of strata.

$\hat{R}_h = \frac{\overline{y}_h}{\overline{x}_h}$ is the rate in stratum *h* and $\hat{R} = \frac{\overline{y}_{st}}{\overline{x}_{st}}$ is the overall estimator

where:

$$\overline{y}_{st} = \frac{\sum_{h=1}^{L} N_h \overline{y}_h}{N} \quad \text{And} \quad \overline{x}_{st} = \frac{\sum_{h=1}^{L} N_h \overline{x}_h}{N}$$

and the variance of $\hat{R}_h$ is:

$$V(\hat{R}_h) = \left(\frac{N_h - n_h}{N_h} \right) \frac{\sum_{i=1}^{n_h} \left(y_{i,h} - \hat{R}_h x_{i,h} \right)^2}{n_h (n_h - 1) \overline{x}_h^2}$$

and the variance of $\hat{R}$ is:

$$V(\hat{R}) = \sum_{h=1}^{L} \left(\frac{N_h}{N} \right)^2 V(\hat{R}_h)$$

Mean of Ratios Stratified Catch Rate Estimator for Incomplete Trip Interviews

The catch rate estimator for stratum *h* is:

$$\overline{R}_h = \frac{\sum_{i,h=1}^{n_h} R_{i,h}}{n_h}$$

where:

i,h = interviewed angler *i* (sampling unit) in stratum *h*

n_h = the number of anglers interviewed in stratum *h*

$$R_{i,h} = \frac{y_{i,h}}{x_{i,h}}$$

$y_{i,h}$ = the number of fish caught or harvested by angler *i* in stratum *h*

$x_{i,h}$ = the number of hours fished by angler *i* in stratum *h*

And the combined catch rate estimator for all strata is:

$$\overline{R} = \frac{\sum_{h=1}^{L} N_h \left(\overline{R}_h \right)}{N}$$

where:

L = total number of stratum

N_h = total estimated anglers in stratum *h* (from interview data)

N = total estimated anglers in all strata (from interview data)

And the variance of $\overline{R}$ is:

$$V\left(\overline{R}\right) = \sum_{h=1}^{L} \left(\frac{N_h}{N} \right)^2 \frac{S^2_{R,h}}{n_h}$$

where:

$$S^2_{R,h} = \left(\frac{1}{n_h - 1} \right) \sum_{i=1}^{n_h} \left(R_{i,h} - \overline{R}_h \right)^2$$

is the sample variance of catch or harvest rates in stratum *h*

Weighted Mean Stratified Catch Weight Estimator for analyses using both interview types

$$\tilde{R} = \frac{\hat{R}\, n_{\hat{R}} + \overline{R}\, n_{\overline{R}}}{n_{\hat{R}} + n_{\overline{R}}}$$

And the variance of $\tilde{R}$ is:

$$V\left(\tilde{R}\right) = \frac{Var\ (\hat{R})\, n^2_{\hat{R}} + Var\ (\overline{R})\, n^2_{\overline{R}}}{(n_{\hat{R}} + n_{\overline{R}})^2}$$

Catch and harvest were estimated by multiplying the rates by the estimates of angler hours. Variances were calculated using the formula for variance of a product from Mood et al. (1963).

$$V(xy) = x2V(y) + y2V(x) + V(x)V(y)$$

Where: x = catch or harvest rate (fish/angler hour) and y = effort (angler hours) and the standard error of the estimated rate is: $SE\ (xy) = \sqrt{V\ (xy)}$

The 95% confidence interval is: $1.96 \times SE\ (xy)$

Appendix 2. Chittenango Creek Angler and Car Count Form.

Angler Survey Angler and Car Count Form

Date	**Staff**
Weather	**Water Color**

Downstream ⬇

		Count #1		Count #2		Count #3	
		Time Start:		Time Start:		Time Start:	
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
UPPER	Nelson swamp -1						
	East Road-2						
	Ballina Road-3						
	DEC lot -4						
	Rippelton-5						
	Library-6						
	SUM						
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
LOWER-1	Buyeau Rd - 7						
	William St./Garage-8						
	Clark St.-9						
	Waste tr-10						
	Bingley Road-11						
	DEC lot 2-12						
	Emhoff Rd. DEC-13						
	Rte 13 Pull Offs-14						
	SUM						
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
C & R	Town Line-15						
	Olmstead Rd. Lot-16						
	Dyke Road-17						
	Pull Off-18						
	SUM						
		# Vehicles	# Anglers	# Vehicles	# Anglers	# Vehicles	# Anglers
LOWER-2	Below NK-19						
	Univ acc-20						
	Russel St-21						
	Route 5-22						
	SUM						
		Time ended:		Time ended:		Time ended:	

Upstream ⬆

Comments:

Appendix 3. Chittenango Creek Angler Census Questionare.

2014 New York State Department of Environmental Conservation
Chittenango Creek Tributary Angler Survey

Interview ID		**Staff Initials**	
Date		**Stream Section**	Upper Lower No Kill
Site		**Angling Technique**	
Interview time	*(24 hour time)*	**Break Time ?**	
Angler Start Time	*(24 hour time)*	**# Anglers in car**	
Interview type Complete trip *(circle one)* Incomplete trip		**State of residency**	
		County of residency (if NYS)	

DEC Species Code Key: Brown trout (328), Rainbow (326), Brook trout (329)

Catch Information

				Kept Fish		
Angler number*	**Species (DEC Code)**	**Number caught**	**Number kept**	**Length**	**Wild**	**Comments**

***Angler number if conducting a "group" interview. Get each anglers individual catch information.**

Interview Questions (please circle choice)

Have you fished the Catch & Release Section of Chittenango Creek?		YES	NO
Are you in favor of this 2.2 mile section of Catch & Release on Chitt. Creek?	YES	NO	NO OPINION
Have you fished the year-round section of Chitt. Creek (from Rte. 20 north to Conrail railroad line) during the "traditionally" closed season of Oct 16 to March 31?		YES	NO

Comments:

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Effort estimates (Prindle and Bishop 2015)

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π_i=total probability that the ith sample unit (day) is included in the sample (month)

Effort estimates for car counts (Pollock et al. 1994)

$$e^i = (I_i \times Pi) \times T$$

e^i= daily effort

I=instantaneous count of vehicles at time i

P= mean number of anglers per vehicle

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Total effort was estimated as:

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$$S^2_{R,h} = \left(\frac{1}{n_h - 1} \right) \sum_{i=1}^{n_h} \left(R_{i,h} - \overline{R}_h \right)^2$$

is the sample variance of catch or harvest rates in stratum *h*

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The 95% confidence interval is: $1.96 \times SE\ (xy)$