



Department of
Environmental
Conservation



2019 PROGRESS REPORT: TROUT SURVEY

Delaware Tailwaters Fisheries Investigation Plan:

**A Joint Project of the New York State Department of
Environmental Conservation and the Pennsylvania
Fish and Boat Commission 2018-2020**

May 18, 2020

Delaware Tailwaters Fisheries Investigation Plan, 2018 - 2020

Delaware Fishery-Independent Monitoring Survey Plan, 2018 - 2020

2017-2019 Progress Report Trout Survey

January 29, 2020

The New York City (NYC) reservoir tailwaters in the upper Delaware River Basin (Delaware Tailwaters) are an increasingly popular destination water for wild trout fishing. The New York State Department of Environmental Conservation (NYSDEC) and Pennsylvania Fish and Boat Commission (PFBC) have agreed supporting a Joint Fisheries Investigation Plan¹ (Plan). This Plan identifies information most urgently needed to inform a new fisheries management plan and a set of strategies to collaboratively obtain that information over the next three years, 2018 – 2020. Electrofishing surveys were conducted during the 2017 and 2018 season to estimate population characteristics of brown and rainbow trout in the Delaware tailwaters². Findings within this progress report are considered provisional and subject to modification pending additional analysis, scrutiny and review over the duration of the Plan lifespan.

In 2017, exploratory night-time boat electrofishing occurred once a month from June through October in the West Branch Delaware River (West Branch) at four fixed sampling sites. Our primary goal was to identify suitable sampling locations that were favorable to sampling for adult sized trout using nighttime boat electrofishing. Additionally, exploratory day-time backpack electrofishing occurred once a month from July through October in the West Branch at five fixed sampling sites and ten fixed sampling sites total in West Branch tributaries.

In 2018, night-time boat electrofishing was to occur once a month from April through October in the West Branch Delaware River (West Branch) at four fixed sampling sites. Additionally, day-time backpack electrofishing was to occur once a month from July through October in the West Branch at five fixed sampling sites and ten fixed sampling sites total West Branch tributaries. Flows were adequate for sampling in April, May, June and most of July. Rain started in late July making sampling in August, September and October difficult, some sampling was canceled while other sampling events were squeezed in when flows were adequate. The West Branch and its tributaries experienced a number of flash floods in 2018.

In 2019, night-time boat electrofishing was to occur once a month from April through October in the West Branch Delaware River (West Branch) at four fixed sampling sites. Additionally, day-time backpack electrofishing was to occur once a month from July through October in the West Branch at five fixed sampling sites and ten fixed sampling sites total West Branch tributaries. Sampling occurred as planned, no sampling was canceled.

Night-time boat electrofishing

In 2017, at all four sample sites, there were 830 brown trout and 45 rainbow trout captured (Table 1a) for a total of 30 independent samples. In 2018, 1221 brown trout and 147 rainbow trout were captured (Table 1b) for a total of 36 independent samples. In 2019, 2927 brown trout and 277 rainbow trout were captured (Table 1c) for a total of 56 independent samples. Brown trout were consistently caught at the two upriver sites (Laurel Bank and Airport Road) when compared to the two downriver sites (Balls Eddy and Shehawken). As expected, higher brown trout occurrences were reflective of the relatively stable, cold-water habitat at the upriver sites. The reverse pattern was observed for rainbow trout, with rainbow trout catches being higher at the downriver most site, the Shehawken Pool. Rainbow trout prefer faster-flowing pool and riffle habitat which is prevalent in the Shehawken Pool sample location.

¹ <http://www.dec.ny.gov/outdoor/112782.html>

² http://www.dec.ny.gov/docs/fish_marine_pdf/dfiptroutmonitor.pdf

Table 1a. Total catch of brown trout and rainbow trout from night-boat electrofishing June-October 2017*.

Site	Size	Brown Trout					Rainbow Trout				
		Jun	Jul	Aug	Sep	Oct	Jun	Jul	Aug	Sep	Oct
<i>Laurel Bank</i>	<i>Total</i>	100	56	92	72		0	0	1	2	
	≥12"	26	29	40	32		0	0	1	2	
	≥16"	13	16	15	17		0	0	1	1	
	≥20"	2	3	5	0		0	0	0	0	
<i>Airport Road</i>	<i>Total</i>	99	40		45		2	2		0	
	≥12"	50	24		29		1	2		0	
	≥16"	29	16		15		1	1		0	
	≥20"	2	2		2		0	0		0	
<i>Balls Eddy</i>	<i>Total</i>	43	74	78		56	2	2	4		1
	≥12"	39	61	56		51	2	2	1		1
	≥16"	13	29	30		31	1	0	0		0
	≥20"	1	1	3		3	0	0	0		0
<i>Shehawken</i>	<i>Total</i>	31	11	5		28	5	8	6		11
	≥12"	28	6	4		27	3	5	5		5
	≥16"	20	2	2		20	0	0	1		2
	≥20"	2	0	0		1	0	0	0		0

*Blanks indicate not sampled, zeros indicate sampled no fish. Balls Eddy & Airport Road in September was not sampled due to a scheduling conflict.

Table 1b. Total catch of brown trout and rainbow trout from night-boat electrofishing April-October 2018.*

Site	Size	Brown Trout								Rainbow Trout							
		Apr	May	Jun	Jul	Aug	Sep	Oct	Apr	May	Jun	Jul	Aug	Sep	Oct		
<i>Laurel Bank</i>	<i>Total</i>	103	125	135				82		8	4	2			4		
	≥12"	70	79	83				66		5	1	1			2		
	≥16"	12	15	16				26		1	0	0			0		
	≥20"	2	3	3				7		0	0	0			0		
<i>Airport Road</i>	<i>Total</i>	34	96	134		45	100		2	6	10		3	10			
	≥12"	27	74	99		27	62		2	5	5		1	5			
	≥16"	10	32	43		14	25		1	1	2		1	0			
	≥20"	0	2	3		1	0		0	0	0		0	0			
<i>Balls Eddy</i>	<i>Total</i>	27	49	96		32	76		8	5	13		16	17			
	≥12"	20	35	81		14	40		5	2	7		4	7			
	≥16"	12	21	53		8	24		0	1	1		2	1			
	≥20"	1	1	6		1	0		0	0	0		0	0			
<i>Shehawken</i>	<i>Total</i>	14	26	28			19		7	9	14			9			
	≥12"	13	20	21			14		4	5	6			2			
	≥16"	7	10	9			9		1	0	1			0			
	≥20"	0	0	0			0		0	0	0			0			

*Blanks indicate not sampled, zeros indicate sampled no fish. April and August were not sampled due to high water, Laurel Bank and Shehawken were not sampled in September due to equipment issues.

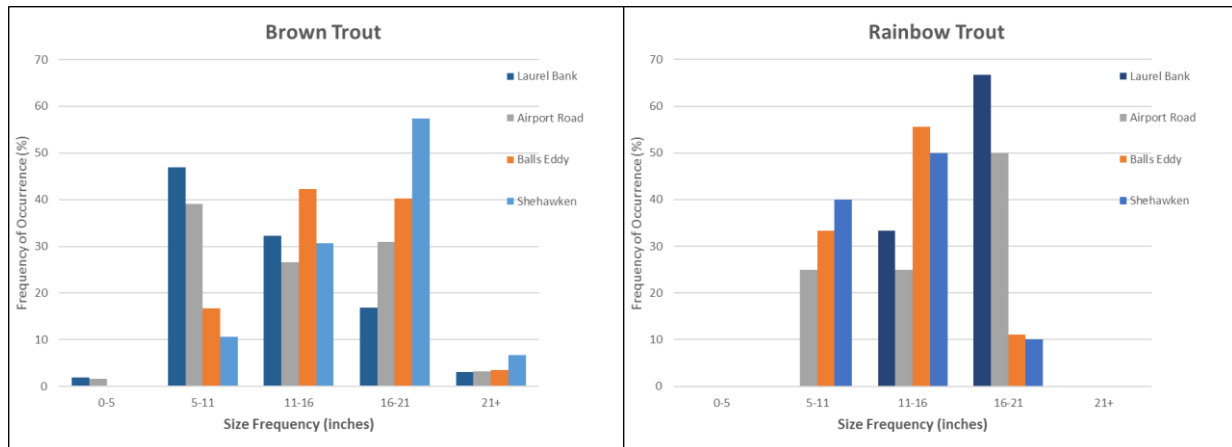
Table 1c. Total catch of brown trout and rainbow trout from night-boat electrofishing April-October 2019.*

Site	Size	Brown Trout							Rainbow Trout						
		Apr	May	Jun	Jul	Aug	Sep	Oct	Apr	May	Jun	Jul	Aug	Sep	Oct
<i>Laurel Bank</i>	<i>Total</i>	133	76	88	155	146	147	119	8	5	2	2	6	8	2
	≥12"	109	51	64	58	66	66	82	7	5	2	0	6	6	2
	≥16"	40	16	25	28	39	37	43	2	1	0	0	2	3	1
	≥20"	6	2	3	2	4	4	12	0	0	0	0	0	0	0
<i>Airport Road</i>	<i>Total</i>	111	95	72	238	226	243	124	10	7	9	6	13	5	5
	≥12"	69	60	40	76	85	79	58	10	6	6	5	11	5	5
	≥16"	33	39	21	43	42	42	32	3	2	1	2	3	2	2
	≥20"	3	2	0	4	1	2	2	0	0	0	0	0	0	0
<i>Balls Eddy</i>	<i>Total</i>	101	70	107	216	103	144	27	15	18	10	21	12	8	5
	≥12"	42	17	31	73	38	33	10	8	9	4	8	7	2	4
	≥16"	22	8	17	43	19	27	4	3	0	0	3	3	1	1
	≥20"	0	0	1	2	2	0	0	0	0	0	0	0	0	0
<i>Shehawken</i>	<i>Total</i>	19	29	22	20	45	19	32	13	20	10	16	15	15	10
	≥12"	12	15	13	11	15	4	16	7	11	7	8	8	8	5
	≥16"	3	10	8	6	8	3	8	3	3	1	3	1	2	1
	≥20"	0	0	0	0	1	0	0	0	0	0	0	0	0	0

*Zeros indicate sampled no fish.

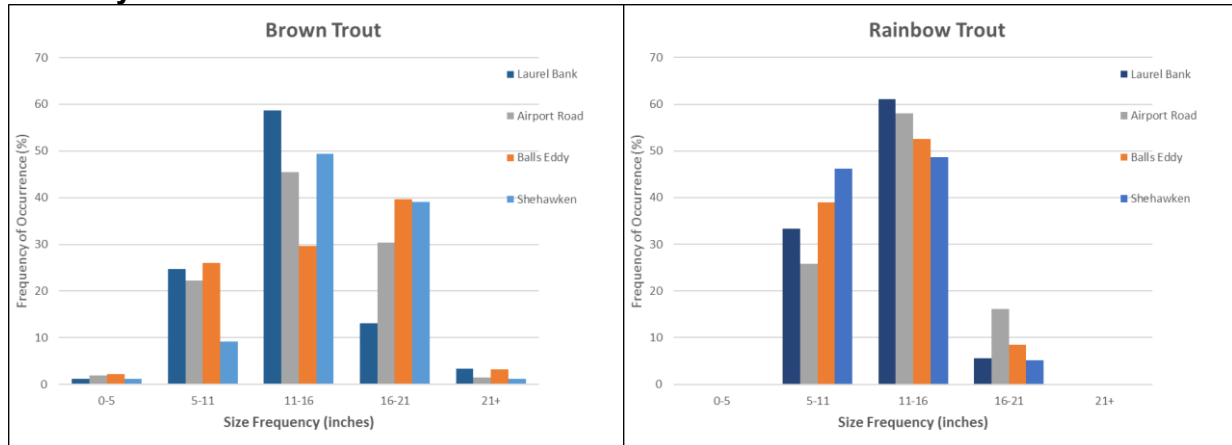
The trout population was well represented by multiple size classes, typically two – four size classes at each site (Figure 1a & 1b). The catch composition of yearling and sub-legal (<12 inches) Brown Trout decreased proceeding downriver from 39% at the Laurel Bank site to 10% at the Shehawken site in 2017, 33% at the Laurel Bank site and 22% at the Shehawken site in 2018 and 31% at the Laurel Bank site and 6% at the Shehawken site in 2019, respectively. Large-sized trout (> 16-inches) were present all sites. Brown trout > 20 inches were a rare occurrence (< 1%) at all sites in 2017, <1.2% in 2018 and 1.7% in 2019, respectively. The largest brown trout in 2017 was 29.25 inches, which was captured in July at the Airport Road site. The largest brown trout in 2018 was 26.22 inches, which was captured in June and October at the Laurel Bank site. In 2019, the largest brown was captured was 25.87 inches, which was captured in August at the Laurel Bank site. Rainbow Trout catches were predominately legal-size (> 12-inches) or larger; however, individuals over 18 inches were rare occurrences (< 1%) at all sites. The largest Rainbow Trout captured in 2017 was 19.5 inches, also in July at the Airport Road site. Only one individual over 18 inches (19.1 inches) was collected in 2018; at the Shehawken pool in May. In 2019, the largest rainbow trout was 18.8 inches, captured October at the Balls Eddy pool. Individuals over 18 inches were rare occurrences (< 1%) at all sites.

Figure 1a. Trout size distribution all months combined by each night-boat electrofishing site. June-October 2017.*



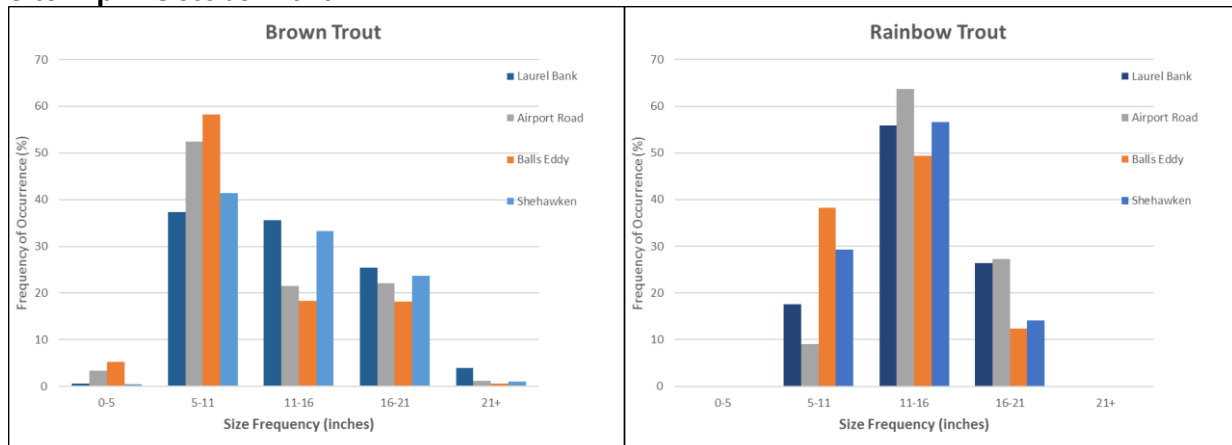
*Only Balls Eddy was sampled in June, Airport Road and Balls Eddy were not sampled in September.

Figure 1b. Trout size distribution all months combined by each night-boat electrofishing site. May-October 2018.*



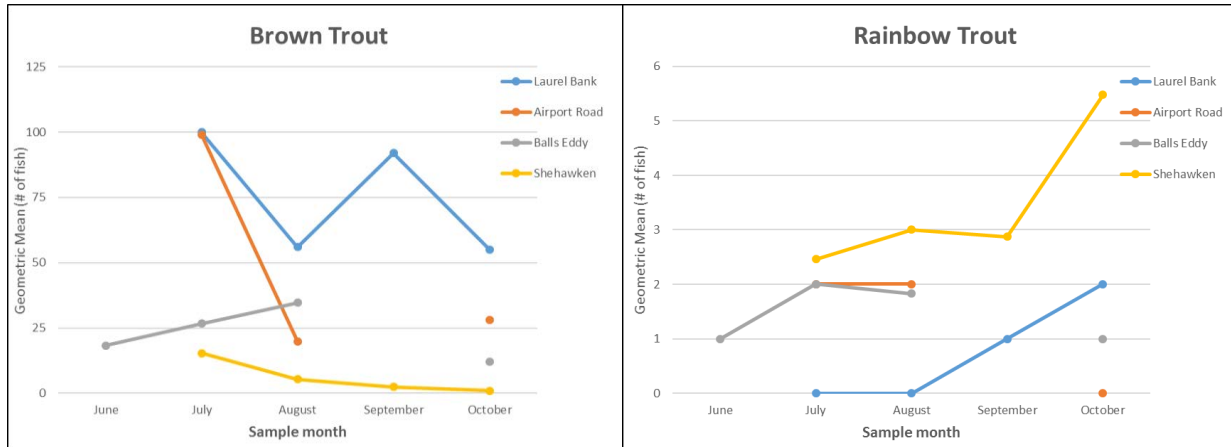
*April and August were not sampled due to high water, Laurel Bank and Shehawken were not sampled in September due to equipment issues.

Figure 1c. Trout size distribution all months combined by each night-boat electrofishing site. April-October 2019.



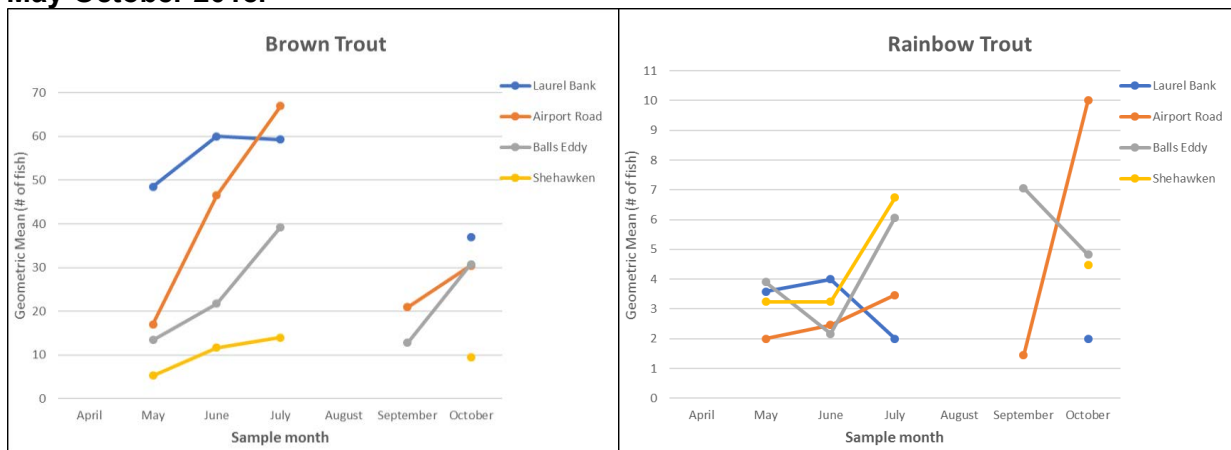
Species-specific relative abundance expressed as geometric means of total trout caught per site, averaged among the two sampling runs are depicted by water and month in Figure 2a, 2b, & 2c. Geometric means represent the natural log transformed total catch. Brown trout geometric mean generally decreased throughout the sampling season and rainbow trout geometric means generally increased in 2017. In 2018 and 2019 geometric mean generally increased then decreased throughout the sampling season.

Figure 2a. Geometric means of trout by month at each night-time boat electrofishing site. July-October 2017.*



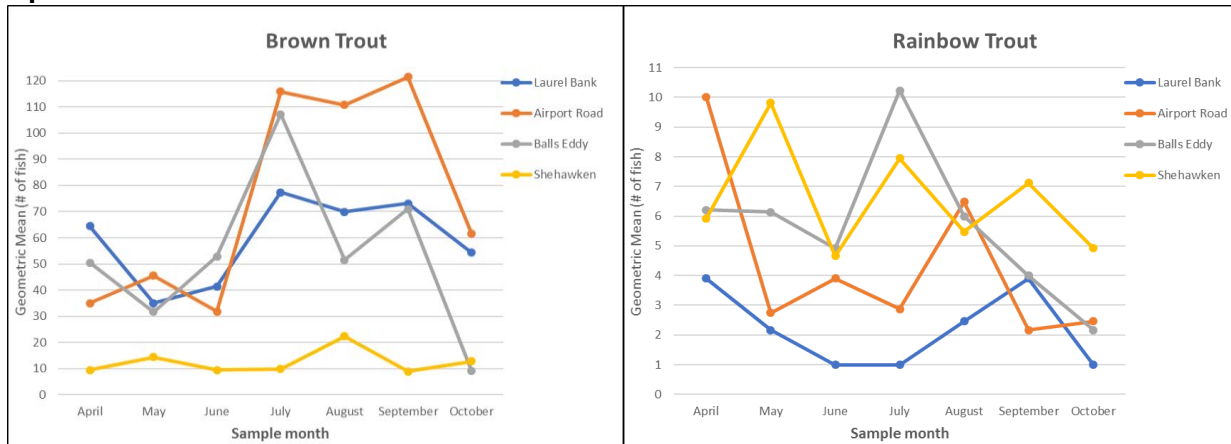
*Only Balls Eddy was sampled in June, Airport Road and Balls Eddy were not sampled in September.

Figure 2b. Geometric means of trout by month at each night-time boat electrofishing site. May-October 2018.*



*April and August were not sampled due to high water, Laurel Bank and Shehawken were not sampled in September due to equipment issues.

Figure 2c. Geometric means of trout by month at each night-time boat electrofishing site. April-October 2019.



Day-time backpack electrofishing

In 2017, at the 15 YOY sites, there were 1571 brown trout and 1119 rainbow trout captured (Table 2a) for a total of 42 independent samples. In 2018, there were a total of 1932 brown trout and 452 rainbow trout captured (Table 2b) for a total of 38 independent samples. In 2019, there were a total of 3412 brown trout and 919 rainbow trout captured (Table 2c) for a total of 60 independent samples. Brown trout and rainbow trout were consistently caught at all sites. Sherman Creek had the highest number of brown trout collected and Sands Creek had the highest number of rainbow trout collected in 2017. In 2018, West Branch had the highest number of brown trout collected, even though it was only sampled in July. Sands Creek had the highest number of rainbow trout collected. In 2019, West Branch had the highest number of brown trout collected and Sands Creek had the highest number of rainbow trout collected.

Table 2a. Total catch of brown trout and rainbow trout from day-time backpack July – October 2017.*

Site	Size	Brown Trout	Rainbow Trout
West Branch	Total	455	36
	Young of year	432	36
	Yearling & older	23	0
Balls Creek	Total	91	112
	Young of year	86	112
	Yearling & older	5	0
Cold Spring Creek	Total	95	85
	Young of year	33	83
	Yearling & older	62	2
Roods Creek	Total	169	49
	Young of year	111	39
	Yearling & older	58	10
Sands Creek	Total	169	539
	Young of year	131	487
	Yearling & older	38	52
Shehawken Creek	Total	224	193
	Young of year	163	184
	Yearling & older	61	9
Sherman Creek	Total	368	105
	Young of year	279	99
	Yearling & older	89	6

*Cold Spring Creek was not sampled in July. Shehawken and Balls Creek were not sampled in September due to a scheduling conflict.

Table 2b. Total catch of brown trout and rainbow trout from day-time backpack July – October 2018.*

Site	Size	Brown Trout	Rainbow Trout
West Branch	Total	549	31
	Young of year	546	31
	Yearling & older	3	0
Balls Creek	Total	74	61
	Young of year	64	61
	Yearling & older	10	0
Cold Spring Creek	Total	330	27
	Young of year	316	22
	Yearling & older	14	5
Roods Creek	Total	236	29
	Young of year	204	12
	Yearling & older	32	17
Sands Creek	Total	279	143
	Young of year	254	124
	Yearling & older	25	19
Shehawken Creek	Total	125	113
	Young of year	104	109
	Yearling & older	21	4
Sherman Creek	Total	339	48
	Young of year	292	44
	Yearling & older	47	4

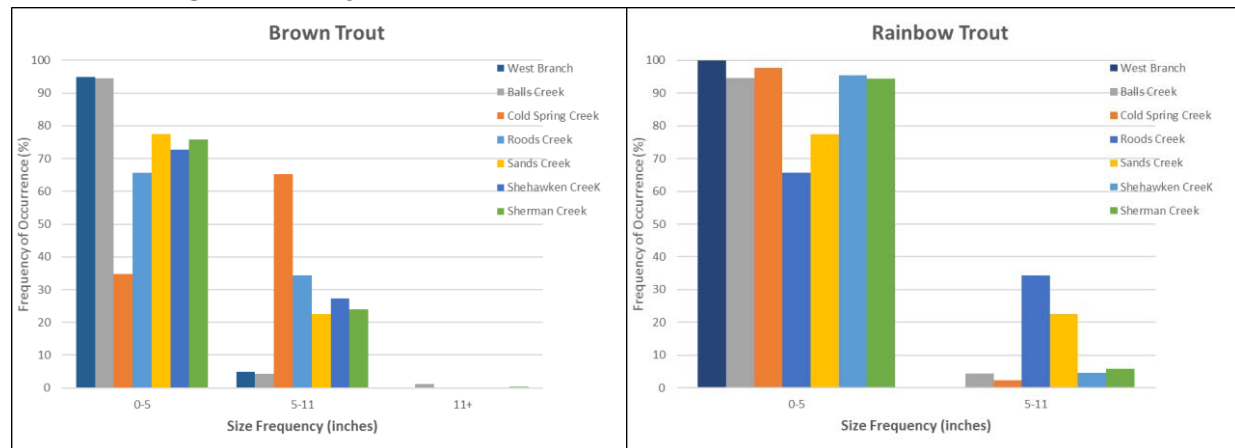
*The following tributaries were not sampled during some monthly intervals. West Branch after July, Balls Creek and Sherman in August, Cold Spring in September, Shehawken in August and September.

Table 2c. Total catch of brown trout and rainbow trout from day-time backpack July – October 2019.

Site	Size	Brown Trout	Rainbow Trout
West Branch	Total	1089	53
	Young of year	1070	53
	Yearling & older	19	0
Balls Creek	Total	123	148
	Young of year	97	143
	Yearling & older	26	5
Cold Spring Creek	Total	500	134
	Young of year	439	112
	Yearling & older	61	22
Roods Creek	Total	306	45
	Young of year	217	36
	Yearling & older	89	9
Sands Creek	Total	445	313
	Young of year	389	290
	Yearling & older	56	23
Shehawken Creek	Total	265	126
	Young of year	204	122
	Yearling & older	61	4
Sherman Creek	Total	682	96
	Young of year	547	84
	Yearling & older	135	12

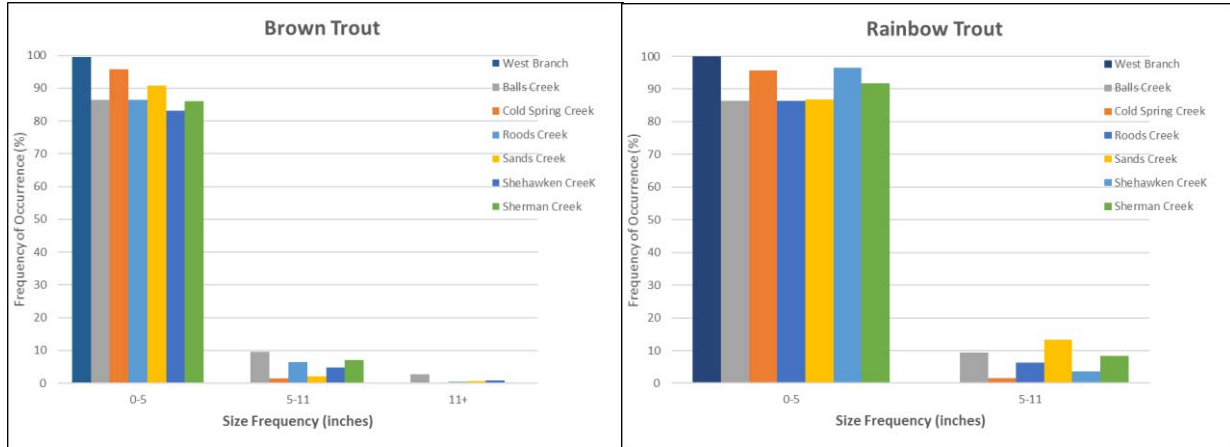
The trout population at the day-time backpack electrofishing sites was dominated by YOY trout <5" in total length (Figure 3a, 3b & 3c). The abundance of trout was a surprise to both PFBC and NYSDEC because historical surveys did not collect the high numbers of trout that were observed during this study.

Figure 3a. Trout size distribution all months combined at each day-time backpack electrofishing water. July-October 2017.*



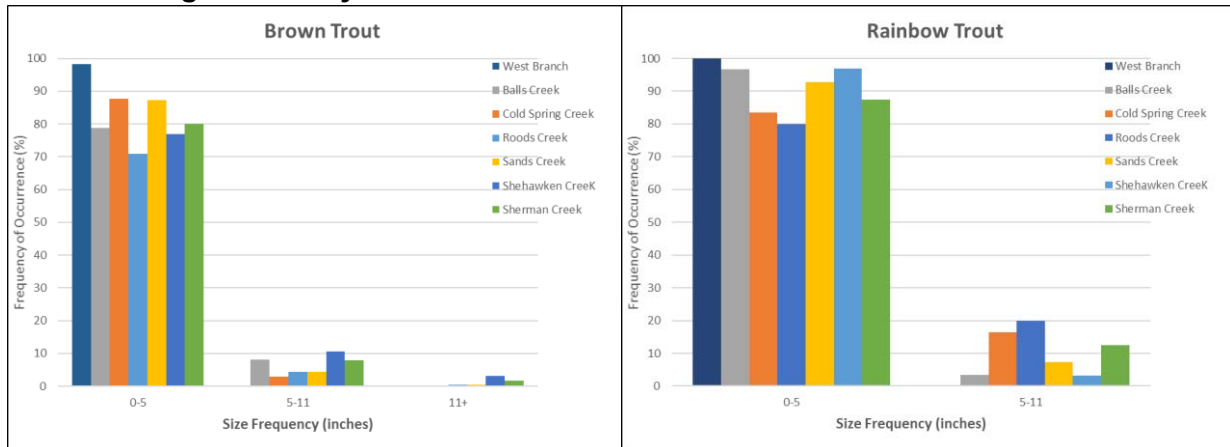
*Cold Spring Creek was not sampled in July, Shehawken and Balls Creek were not sampled in September.

Figure 3b. Trout size distribution all months combined by each day-time backpack electrofishing water. July-October 2018.*



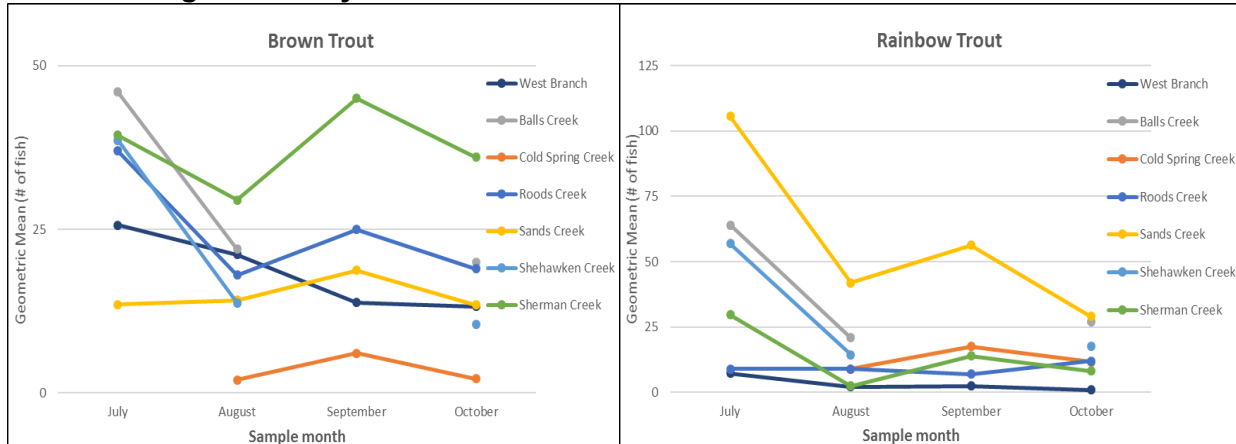
*The following tributaries were not sampled during some monthly intervals. West Branch after July, Balls Creek and Sherman in August, Cold Spring in September, Shehawken in August and September.

Figure 3c. Trout size distribution all months combined by each day-time backpack electrofishing water. July-October 2019.



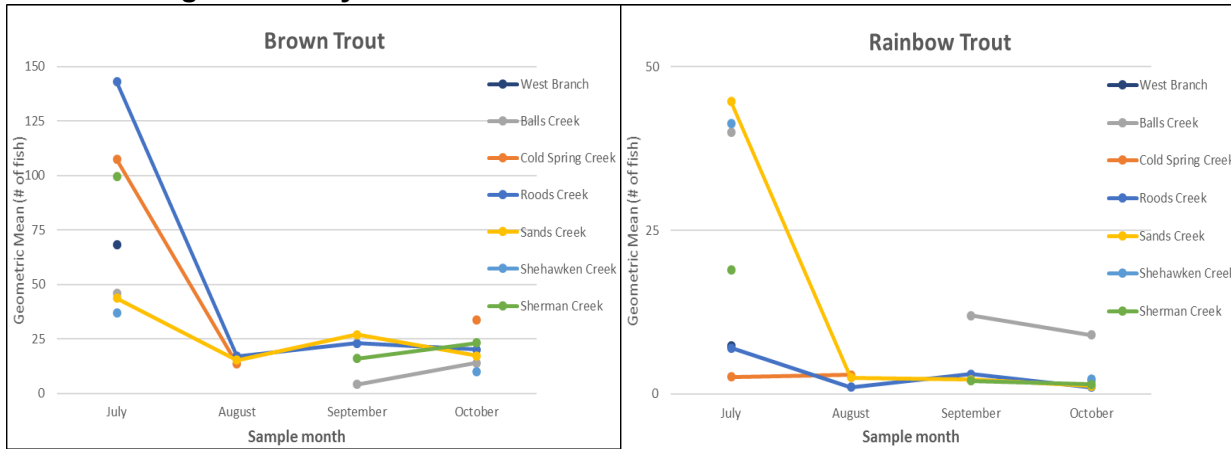
Species-specific relative abundance expressed as geometric means of total trout caught, averaged among the sampling sites are depicted by water and month in Figure 4a, 4b & 4c. Geometric means represent the natural log transformed total catch. Geometric means are based on five sites for West Branch and two sites for tributaries except Roods and Balls Creek which is based on one site per tributary. Geometric mean was generally higher in July than October at most sites in 2017, 2018, and 2019.

Figure 4a. Geometric means of YOY trout by month at each day-time backpack electrofishing water. July-October 2017.*



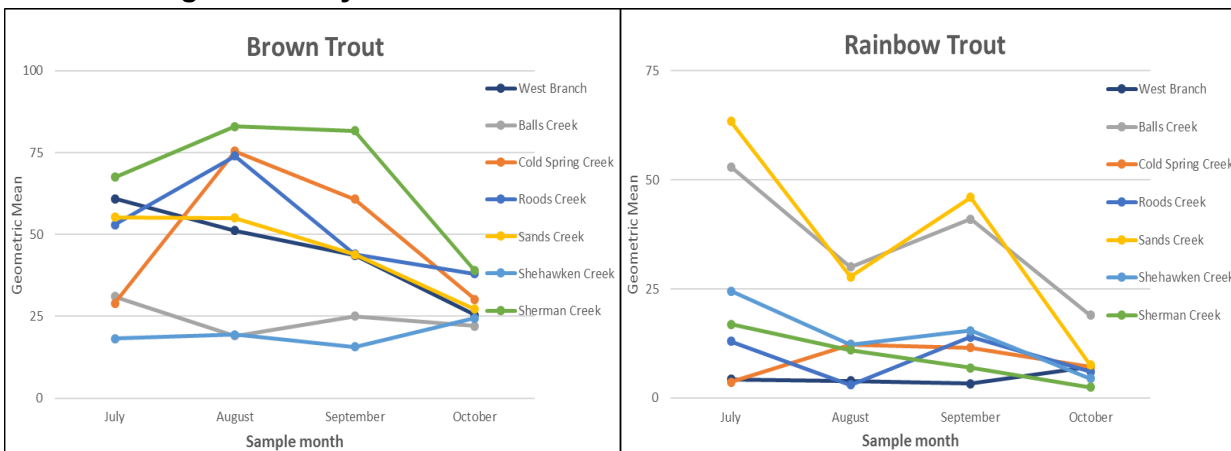
*Cold Spring Creek was not sampled in July, Shehawken and Balls Creek were not sampled in September.

Figure 4b. Geometric means of YOY trout by month at each day-time backpack electrofishing water. July-October 2018.*



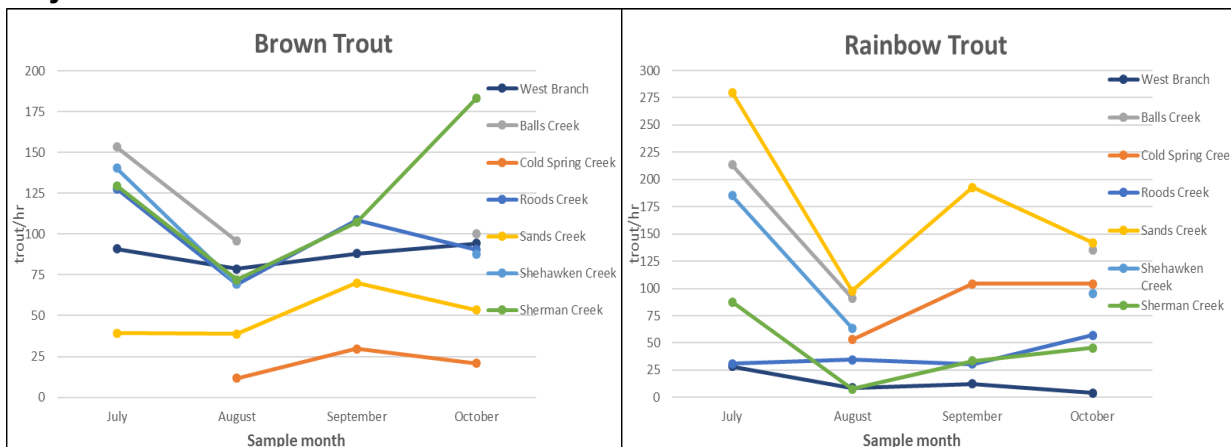
*The following tributaries were not sampled during some monthly intervals. West Branch after July, Balls Creek and Sherman in August, Cold Spring in September, Shehawken in August and September.

Figure 4c. Geometric means of YOY trout by month at each day-time backpack electrofishing water. July-October 2019.



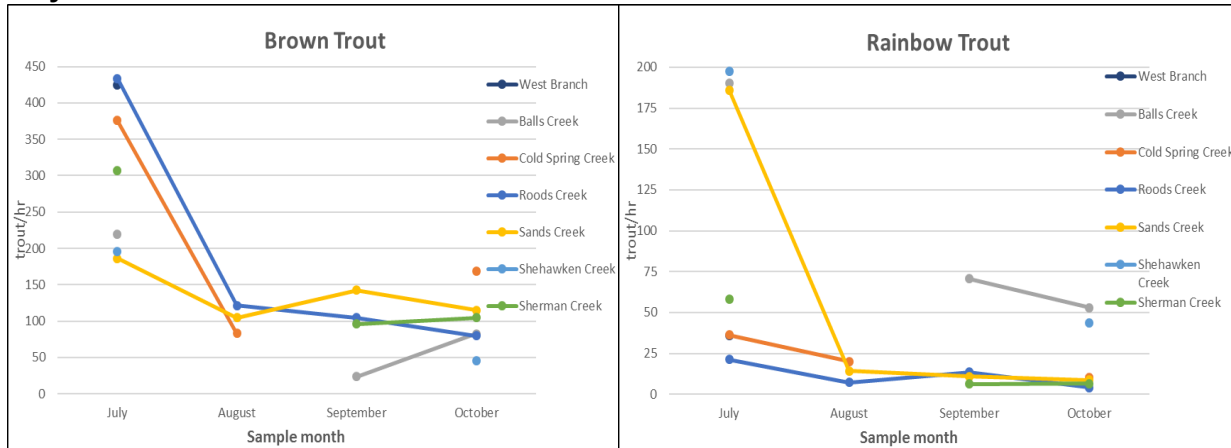
Species-specific YOY CPUE is depicted by site and month for the West Branch and the six tributaries sampled July-October, 2017, 2018 & 2019 in Figure 5a, 5b & 5c.

Figure 5a. CPUE of YOY trout by month at each day-time backpack electrofishing water. July-October 2017.*



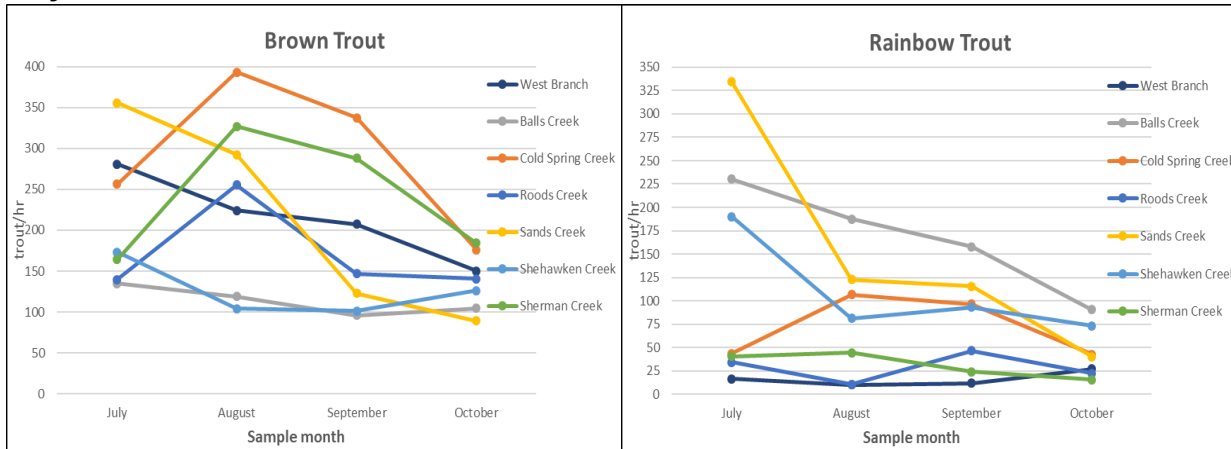
*Cold Spring Creek was not sampled in July, Shehawken and Balls Creek were not sampled in September.

Figure 5b. CPUE of YOY trout by month at each day-time backpack electrofishing water. July-October 2018.*



*The following tributaries were not sampled during some monthly intervals. West Branch after July, Balls Creek and Sherman in August, Cold Spring in September, Shehawken in August and September.

Figure 5c. CPUE of YOY trout by month at each day-time backpack electrofishing water. July-October 2019.



Observations

- Nighttime electrofishing should not occur when flows are >2000 cfs at the USGS Hale Eddy gauge for all sites, except Laurel Bank. Sampling should not occur at Laurel Bank when flows are >1600 cfs at the USGS Stilesville gauge. Elevated flows create potentially dangerous conditions and shocking essentially becomes inefficient.
- Daytime electrofishing on the West Branch should not occur when flows are >1200 cfs at the USGS Hale Eddy gauge.