APPENDIX A

Stream Electrofishing Survey Data (2017)

This section of the report includes stream survey data completed by the Bureau of Freshwater Fisheries in 2016. All surveys, unless specifically noted otherwise, are sampled in accordance to the Bureau's established stream sampling protocol which is consistent with EPA's Rapid Bioassement Protocol for Wadeable Streams. The Bureau's wadeable stream survey protocol can be found in Appendix B. The Bureau also assesses in-stream and riparian conditions by performing a Habitat Assessment at the time of each survey. This assessment is consistent with the EPA Rapid Bioassessment sampling habitat assessment protocol with regional modifications (Appendix C). Basic water quality parameters are also measured.

Surveys are listed alphabetically by stream name within identified watershed areas. Each survey is identified by the specific Activity by which it was funded. It is important to note, however, the use of established stream sampling protocols permits data to be used beyond the specific Activity for which they were collected. Data provided for the purposes of this report is only a summary of the individual stream survey data collected by the DFW's Bureau of Freshwater Fisheries. All stream data collected under the Bureau's standardized sampling protocol is entered into the Division's FishTrack database.

Stream Surveys in the Upper Delaware (North) & Wallkill Region

(Shimers Brook to Paulins Kill and Wallkill River)

Beerskill Creek

Date: 08/08/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Temperature Study – TP Stream
Location: **Cemetary Road**

Water Chemistry / Habitat

Water Temperature (°C): 15.6
Dissolved Oxygen (mg/L): 9.48
Specific Conductance (uS/cm): 88.1
pH: 7.73
Alkalinity (mg/L): 27
Sample Length (m): 150
Habitat Assessment Score: 169 Optimal

Fish Species	Number	Length (mm)
Chubsucker, Creek	1	0 - 0
Dace, Blacknose	37	0 - 0
Darter, Tessellated	2	0 - 0
Eel, American	17	0 - 0
Lamprey, Sea	7	0 - 0
Pickerel, Redfin	6	72 - 174
Sculpin, Slimy	58	0 - 0
Shiner, Golden	1	0 - 0
Sucker, White	1	0 - 0
Sunfish, Pumpkinseed	1	82 - 82
Trout, Brook (YOY)	9	60 - 83
Trout, Brook	8	156 - 193

Summary: Beerskill Creek is a small stream that flows out of both Highpoint State Park and Stokes State Park and ultimately into the Little Flat Brook. This tributary to the Big Flat Brook is classified as *Trout Production* and was electrofished on 8/8/17 to assess the wild trout population's structure relative to the stream temperature regime. In 2015, 29 wild Brook Trout (8 young-of-the-year (YOY)) were found and in 2016, 27 wild Brook Trout (13 YOY) were found indicating that the population is moderately abundant. Previous surveys, at a site further upstream, found Brook Trout numbers of 20 in 1968, 18 in 2004, and 7 in 2013. The data from the continuous temperature monitor at this location will tell us, if, how often, and how long temperatures are a stressor for Brook Trout. Several warmwater species were found in the 2015 and 2016 surveys that were never documented in previous surveys. The competition for resources from these species is a concern for the Brook Trout population. It is unknown if these warmwater species have recently moved into Beerskill Creek or if they have been at this location previously since this downstream location was first surveyed in 2015. A total of 17 wild Brook Trout, including 9 YOY, were captured during this survey. Slimy Sculpin (soon to be listed state Threatened) were also captured.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *Trout Production* streams. This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Collenburg)

Big Flat Brook

Date: 08/15/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Trout Special Regulation Area
Location: **Old Police Barracks between Rt. 206 and Rt. 560**

Fish Species	Number	Length (mm)
Chub, Creek	2	0 - 0
Dace, Blacknose	66	0 - 0
Dace, Longnose	24	0 - 0
Darter, Tessellated	8	0 - 0
Eel, American	23	0 - 0
Lamprey, Sea	3	0 - 0
Minnow, Cutlip	12	0 - 0
Pickerel, Chain	1	44 - 44
Sculpin, Slimy	25	0 - 0
Shiner, Common	8	0 - 0
Sucker, White	9	0 - 0
Sunfish, Bluegill	1	119 - 119
Trout, Rainbow	5	0 - 282

Water Chemistry / Habitat

Water Temperature (°C): 18.2
Dissolved Oxygen (mg/L): 8.82
Specific Conductance (uS/cm): 85.4
pH: 7.57
Alkalinity (mg/L): 24
Sample Length (m): 150
Habitat Assessment Score: 180 Optimal (2015)

Summary: Prior to 2014, special trout fishing regulations (fly fishing for most or all of the year and harvest allowed) had been in place for over 50 years on a 4.1 mile stretch of the Big Flat Brook/Flat Brook. In 2014, year-round *Catch and Release - Artificials Only* fishing regulations were implemented. Electrofishing surveys have been conducted annually within this special regulation area since 2012 to assess the trout fishery. Described below are the results from the station located the furthest upstream of the survey stations.

Although the special regulation section is classified as *Trout Production* and is trout-stocked, relatively few trout have been encountered at the previously sampled survey locations. In 2015, one of the survey locations was moved upstream to this survey location in an effort to locate more trout. Unfortunately, more trout were not found at this new location in 2017, 2016, or 2015. A possible explanation as to why we are not finding a higher number of stocked trout in these surveys was that trout are swimming out of the C*atch & Release* regulated area, but a 2017 telemetry study to determine stocked trout movement in the *Catch & Release* regulated area of the Big Flat Brook indicated that fish are not moving out of the *Catch & Release* regulated area on their own. A possible reason for the low trout numbers may be due to a high level of predation from natural predators such as Great Blue Herons, Bald Eagles, Common Mergansers, River Otters, and American Mink. The telemetry study showed that possibly 100% of the tracked fish were eaten by predators before the end of the summer and many were eaten within the first few weeks after stocking. This predation rate on stocked fish seems higher than average in the Flat Brook, but further studies would have to be done to determine if the predation rate is in fact higher in the Flat Brook than the average location in New Jersey. A native fish species of special interest to biologists based on its low abundance statewide and unique habitat requirements, the soon to be listed state Threatened Slimy Sculpin, was found at this location. Overall, 187 individual fish were collected representing 13 different species.

Recommendation: The data from the electrofishing surveys, along with continuous water temperature and angler survey/catch data will be used to evaluate fishing regulation changes on the trout fishery. The trout movement / telemetry study which began in 2017 to indicate if and/or when trout are moving out of the catch and release regulation area will also be used to evaluate fishing regulation changes on the trout fishery. (Shramko)

Big Flat Brook

Date: 08/15/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Trout Special Regulation Area
Location: **Rt. 560, Downstream off unnamed dirt rd bw Rt 560 & Warner's Hole**

Fish Species	Number	Length (mm)
Dace, Blacknose	101	0 - 0
Dace, Longnose	19	0 - 0
Darter, Tessellated	13	0 - 0
Eel, American	28	0 - 0
Madtom, Margined	1	0 - 0
Minnow, Cutlip	4	0 - 0
Sculpin, Slimy	11	0 - 0
Shiner, Common	10	0 - 0
Sucker, White	4	0 - 0
Trout, Rainbow	19	257 - 332

Water Chemistry / Habitat

Water Temperature (°C):	18.2
Dissolved Oxygen (mg/L):	9.05
Specific Conductance (uS/cm):	85.5
pH:	7.71
Alkalinity (mg/L):	22.5
Sample Length (m):	150
Habitat Assessment Score:	156 Sub-Optimal (2015)

Summary: Prior to 2014, special trout fishing regulations (fly fishing for most or all of the year and harvest allowed) had been in place for over 50 years on a 4.1 mile stretch of the Big Flat Brook/Flat Brook. In 2014, year round *Catch and Release - Artificials Only* fishing regulations were implemented. Electrofishing surveys have been conducted annually within this special regulation area since 2012 to assess the trout fishery. Described below are the results from the station located downstream of Rt. 560 and upstream of a popular fishing location known as "Warner's Hole".

Although the special regulation section is classified as *Trout Production* and is trout-stocked, relatively few trout have been encountered at the previously sampled survey locations. In 2015, one of the survey locations was moved upstream to this survey location. This new sampling location is located very close to several trout stocking points that were stocked this spring. It is thought that due to the proximity to trout stocking locations, this site may produce higher than average trout numbers. The 2017 survey collected 19 Rainbow Trout (stocked this spring) which is slightly higher than the average number of trout found in the 2015 and 2016 surveys done at this location of 9 trout. Nineteen Rainbow Trout found at this location is the highest number of trout collected in the 3 years this site has been electrofished, but it still is less than the number of trout expected after the *Catch and Release* regulation was implemented 4 years ago. A possible reason for this is that several trout could be seen from the bank downstream from the sampling location in a deep pool known as "Warner's Hole." Some of the fish that would have been in the sampling location may have moved into the deeper hole which is unable to be sampled by stream backpack electrofishing gear. In fact, during the 2017 telemetry study done to help determine stocked trout movement in the *Catch and Release* regulated area of the Big Flat Brook indicated that several trout moved from where they were stocked into "Warner's Hole" proving that "Warner's Hole" is a location where stocked trout will migrate to. Another possible reason for the lower than predicted trout abundance maybe due to a high level of predation from natural predators such as Great Blue Herons, Bald Eagles, Common Mergansers, River Otters, and American Mink. The telemetry study showed that almost all of the radio tagged trout in the study were eaten by predators before the end of the summer and many were eaten within the first few weeks after stocking. This predation rate on stocked fish seems higher than average in the Flat Brook, but further studies would have to be done to determine if the predation rate is in fact higher in the Flat Brook than the average location in New Jersey. A native fish species of special interest to biologists based on its low abundance statewide and unique habitat requirements, the soon to be listed state Threatened Slimy Sculpin, was found at this location. Overall, 210 individual fish were collected representing 10 different species.

Recommendation: The data from the electrofishing surveys, along with continuous water temperature and angler survey/catch data will be used to evaluate fishing regulation changes on the trout fishery. The trout movement / telemetry study which began in 2017 to indicate if and/or when trout are moving out of the catch and release regulation area will also be used to evaluate fishing regulation changes on the trout fishery. (Shramko)

Big Flat Brook

Date: 08/01/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Trout Special Regulation Area
Location: **Blewett Tract (Station 1)**

Water Chemistry / Habitat

Water Temperature (°C):	16.9
Dissolved Oxygen (mg/L):	9.19
Specific Conductance (uS/cm):	110.8
pH:	7.39
Alkalinity (mg/L):	33
Sample Length (m):	150
Habitat Assessment Score:	184 Optimal (2012)

Fish Species	Number	Length (mm)
Chub, Creek	6	0 - 0
Dace, Blacknose	37	0 - 0
Dace, Longnose	13	0 - 0
Darter, Shield	5	0 - 0
Darter, Tessellated	17	0 - 0
Eel, American	12	0 - 0
Lamprey, Sea	4	0 - 0
Madtom, Margined	1	0 - 0
Minnow, Cutlip	14	0 - 0
Pickerel, Redfin	2	83 - 168
Sculpin, Slimy	25	0 - 0
Shiner, Common	5	0 - 0
Sucker, White	19	0 - 0

Summary: Prior to 2014, special trout fishing regulations (fly fishing for most or all of the year and harvest allowed) had been in place for over 50 years on a 4.1 mile stretch of the Big Flat Brook/Flat Brook. In 2014, year-round *Catch and Release - Artificials Only* fishing regulations were implemented. Electrofishing surveys have been conducted annually within this special regulation area since 2012 to assess the trout fishery. Described below are the results from the station located from the area known as the Blewett Tract.

Although the special regulation section is classified as *Trout Production* and is trout-stocked, relatively few trout have been encountered at this survey location. In the 2017 survey, no trout were found. These results are very similar to the surveys done each year since 2012. In the 2016 survey, only one Rainbow Trout (hatchery origin) and one Brook Trout (wild fish) were found. The 2015 survey found two Rainbow Trout (hatchery origin) and one Brook Trout (wild fish), and the 2014 survey found only two Brown Trout (wild fish). No trout were present in 2013 and only eight trout (seven wild Brook Trout and one stocked Rainbow Trout) were found in 2012. It is not immediately apparent why so few trout are present at this location as habitat is suitable for trout. The *Catch & Release* regulation has been in effect for 4 years now and there has been no increase in numbers of trout found at this location as one would expect. A 2017 telemetry study to determine stocked trout movement in the *Catch & Release* regulated area of the Big Flat Brook indicated that fish are not moving out of the *Catch & Release* regulated area on their own. A possible reason for low trout abundance may be due to a high level of predation from natural predators such as Great Blue Herons, Bald Eagles, Common Mergansers, River Otters, and American Mink. The telemetry study showed that almost all of the tracked fish were eaten by predators before the end of the summer and many were eaten within the first few weeks after stocking. This predation rate on stocked fish seems higher than average in the Flat Brook, but further studies would have to be done to determine if the predation rate is in fact higher in the Flat Brook than the average location in New Jersey. Two native fish species of special interest to biologists based on their low abundance statewide and unique habitat requirements (the soon to be designated state Special Concern Shield Darter and Threatened Slimy Sculpin) were found at this location. Overall, 149 individual fish were collected representing 13 different species.

Recommendation: The data from the electrofishing surveys, along with continuous water temperature and angler survey/catch data will be used to evaluate fishing regulation changes on the trout fishery. The trout movement / telemetry study which began in 2017 to indicate if and/or when trout are moving out of the catch and release regulation area will also be used to evaluate fishing regulation changes on the trout fishery. (Shramko)

Big Flat Brook (trib) (Lake Wapalanne)

Date: 07/20/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Brook Trout Assessment
Location: **School of Conservation - behind camp buildings above Lake Wapalanne**

Fish Species	Number	Length (mm)
Eel, American	3	0 - 0
Sculpin, Slimy	55	0 - 0
Trout, Brook (YOY)	4	64 - 66
Trout, Brook	10	104 - 192

Water Chemistry / Habitat

Water Temperature (°C): 17.8
Dissolved Oxygen (mg/L): 8.78
Specific Conductance (uS/cm): 48.5
pH: 7.83
Alkalinity (mg/L): 25
Sample Length (m): 150
Habitat Assessment Score: 182 Optimal

Summary: Big Flat Brook (trib.) (Lake Wapalanne) is a small *Trout Production* stream that originates in Stokes State Forest, flows through Lake Wapalanne, and ultimately flows into the Big Flat Brook. In 2017, this stream was surveyed to assess the fish population at a survey location upstream of Lake Wapalanne. This was the first time the stream above the lake was ever surveyed. Fourteen wild Brook Trout were found of which four were young-of-the-year (YOY). Although it is always good to find a new native Brook Trout stream, the number of Brook Trout found and the low number of YOY found is a concern. This stream is typical of many of the native Brook Trout streams found in the Flat Brook Watershed, where Brook Trout numbers are suffering. It is not known at this time why the number of Brook Trout found in this stream is lower than expected. A quick assessment of the habitat and water temperature indicate that Brook Trout can survive and even thrive under these conditions, but further study would be necessary to determine if this is in fact accurate. Another possible reason for the lower Brook Trout numbers found here could be the fact that Lake Wapalanne is acting a barrier to gene flow. The lake has been around for 85 years and no mixing of Brook Trout genetics from outside this small tributary of the Big Flat Brook has occurred since the lake was artificially created by damming up the stream almost a century ago. To determine if the lack of gene flow is contributing to the low population size of Brook Trout in this tributary, a study analyzing the genetic structure of the trout living in this stream would need to occur. A native fish species of special interest to biologists based on its low abundance statewide and a unique habitat requirement (the soon to be listed state Threatened Slimy Sculpin) was also found at this location. A total of 72 individual fish representing four different species were found in this survey.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Shramko)

Big Flat Brook (trib) (W. of Lake Ashroe)

Date: 08/01/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Trout Production Reinventory
Location: **Brook Rd**

Fish Species	Number	Length (mm)
Chub, Creek	1	0 - 0
Dace, Blacknose	13	0 - 0
Eel, American	3	0 - 0
Sculpin, Slimy	1	0 - 0
Trout, Brook (YOY)	58	52 - 100
Trout, Brook	4	111 - 151
Trout, Brown (YOY)	3	65 - 78

Water Chemistry / Habitat

Water Temperature (°C): 15.5
Dissolved Oxygen (mg/L): 11.36
Specific Conductance (uS/cm): 66
pH: 7.49
Alkalinity (mg/L): 28.5
Sample Length (m): 150
Habitat Assessment Score: 164 Optimal

Summary: Big Flat Brook (trib.) (W. of Lk Ashroe) is a small *Trout Production* stream that originates in Stokes State Forest, flows into the Big Flat Brook, and is one of the most productive native Brook Trout stream in the Flat Brook watershed. In 2017, this stream was surveyed to assess the fish population at a survey location previously surveyed in 2006. Sixty-two native Brook Trout were found of which 58 were young-of-the-year (YOY). The number of wild Brook Trout found is 75% lower in the 2017 survey than the 2006 survey. In 2006, 247 Brook Trout were found (218 YOY). This decrease in total trout numbers is a concern, as any population decrease would be, but this large of loss of Brook Trout is very discouraging with regards to the long-term survival of Brook Trout in this stream and is part of a trend of decreasing and poor Brook Trout populations in the Flat Brook watershed. As alarming as this large decrease in Brook Trout population is, it is important to remember that wild trout populations can change considerably from one year to another and although a drop in numbers of this size is a cause for concern, we do not have enough data at this time to know if the drop is part of an overall trend or just part of natural stochasticity found in wild trout. To understand this further, a survey should be completed in the near future to help determine if the low numbers found in 2017 are just part of wild trout population natural stochasticity.

It is also interesting to note that in both surveys a small number of wild Brown Trout were also found. The 2006 survey found 5 YOY Brown Trout where the 2017 survey found 3 YOY Brown Trout. This stream is the only known tributary in the Flat Brook watershed where young-of-the-year Brown Trout have been found. It is also interesting to point out that the Brown Trout population size is about the same as it was in 2006 survey and does not show an increasing trend. A native fish species of special interest to biologists based on its low abundance statewide and a unique habitat requirement (the soon to be listed state Threatened Slimy Sculpin) was also found at this location. A total of 83 individual fish representing 6 different species were found in this survey.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout), but should be monitored in the next few years to determine if the loss of wild Brook Trout from 2006 to present was part of a downward population size trend or natural stochasticity. (Shramko)

Flat Brook

Date: 08/09/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Trout Special Regulation Area
Location: **Three Bridges (Flatbrook WMA)**

Water Chemistry / Habitat

Water Temperature (°C): 16.6
Dissolved Oxygen (mg/L): 10.53
Specific Conductance (uS/cm): 224.3
pH: 7.50
Alkalinity (mg/L): 67.5
Sample Length (m): 150
Habitat Assessment Score: 167 Optimal (2015)

Fish Species	Number	Length (mm)		
Bass, Largemouth	1	69	-	69
Chub, Creek	37	0	-	0
Chubsucker, Creek	1	0	-	0
Dace, Blacknose	140	0	-	0
Dace, Longnose	18	0	-	0
Darter, Shield	8	0	-	0
Darter, Tessellated	66	0	-	0
Eel, American	75	0	-	0
Fallfish	1	0	-	0
Lamprey, Sea	3	0	-	0
Minnow, Cutlip	71	0	-	0
Pickerel, Chain	1	109	-	109
Pickerel, Redfin	1	97	-	97
Sculpin, Slimy	10	0	-	0
Shiner, Common	96	0	-	0
Sucker, Northern Hog	2	0	-	0
Sucker, White	64	0	-	0
Trout, Brown (YOY)	1	77	-	77
Trout, Brown	1	310	-	310
Trout, Rainbow	42	240	-	590

Summary: Prior to 2014, special trout fishing regulations (fly fishing for most or all of the year and harvest allowed) had been in place for over 50 years on a 4.1 mile stretch of the Big Flat Brook/Flat Brook. In 2014, year-round *Catch and Release - Artificials Only* fishing regulations were implemented. Electrofishing surveys have been conducted annually within this special regulation area since 2012 to assess the trout fishery. Described below are the results from the station located the furthest downstream of the survey stations.

Although the special regulation section is classified as *Trout Production (TP)* and is trout-stocked, relatively few trout have been encountered at the previously sampled survey locations. In 2015, one of the survey locations was moved upstream to this new survey location, which is classified as *Trout Maintenance (TM)*. Of the four survey locations from this year, this location produced the most trout in 2015, 2016, and 2017 and shows that fishing is still excellent well past the spring stocking season. 42 Rainbow Trout were collected and measured; while an estimated 35 - 50 other trout were seen in a deeper hole within the survey area. The total trout seen and collected in 2017 is slightly higher than the total number of trout seen and collected in 2016 and 2015. In 2016, many trout were not collected, but 35 to 50 were seen in an area too deep to sample because of high water conditions. In 2015 Division biologist collected 47 stocked Rainbow Trout and 1 wild Brook Trout. The 2017 survey was the first time that Brown Trout were collected at this location (one of the Brown Trout was a young-of-the-year) while 0 Brook Trout were collected. This is important to note, as Brown Trout in other locations throughout New Jersey have become established and reproduce naturally. In many cases, these established Brown Trout populations outcompete native Brook Trout populations and contribute to the loss of Brook Trout throughout their range. Three native fish species of special interest to biologists based on their low abundance statewide and unique habitat requirements (the soon to be designated state Special Concern Shield Darter and Northern Hog Sucker and the soon to be listed state Threatened Slimy Sculpin) were found at this location. Overall, 637 individual fish were collected representing 19 different species.

Recommendation: The data from the electrofishing surveys, along with continuous water temperature and angler survey/catch data, will be used to evaluate fishing regulation changes on the trout fishery. More data are needed prior to recommending upgrade from *TM* to *TP*. The trout movement / telemetry study which began in 2017 to indicate if and/or when trout are moving out of the catch and release regulation area will also be used to evaluate fishing regulation changes on the trout fishery. (Shramko)

Forked Brook

Date: 08/08/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Temperature Study – TP Stream
Location: **Grau Road**

Fish Species	Number	Length (mm)
Chub, Creek	2	0 - 0
Dace, Blacknose	101	0 - 0
Eel, American	1	0 - 0
Sculpin, Slimy	9	0 - 0
Trout, Brook	11	117 - 200

Water Chemistry / Habitat

Water Temperature (°C): 15
Dissolved Oxygen (mg/L): 9.45
Specific Conductance (uS/cm): 80.5
pH: 7.61
Alkalinity (mg/L): 14.5
Sample Length (m): 150
Habitat Assessment Score: 179 Optimal

Summary: This tributary to the Big Flat Brook was electrofished on 8/8/17 to assess the wild trout populations structure relative to the stream temperature regime. Forked Brook is a small stream that flows through the forested habitat of Stokes State Forest and its habitat is comprised of small plunge pools, runs, and an intermixing of many large boulders and cobble. This is the third time in three years that this exact location was sampled as part of this study. Interestingly, 13 Brook Trout were captured in both 2015 and 2016. This year, only 11 Brook Trout were captured, none of which were young-of-the-year. Habitat here was dominated by boulder and cobble layering. Much of the cobble looks to have been pushed downstream, so much that it has caused a large blockage at its confluence with the Big Flat Brook. It is possible that this blockage causes a large impediment to immigration or emigration of any fish species. This blockage will be investigated further in the future.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *Trout Production* streams. This stream should be monitored in accordance with the schedule established for *Trout Production* stream (minimum of once every 10 years for streams having wild Brook Trout). (Collenburg)

Little Flat Brook

Date: 07/20/2017
County: Sussex
Township: Montague Twp.
Drainage: Flat Brook
Project: Brook Trout Assessment
Location: **Deckertown Turnpike**

Fish Species	Number	Length (mm)
Dace, Blacknose	19	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 19
Dissolved Oxygen (mg/L): 7.78
Specific Conductance (uS/cm): 45.4
pH: 7.95
Alkalinity (mg/L): 17
Sample Length (m): 150
Habitat Assessment Score: 160 Optimal

Summary: The Little Flat Brook is a small *Trout Production* stream originating in High Point State Park and flows into the Big Flat Brook in Sussex Co. In 2017, this stream was surveyed to assess the fish population at a new survey location in the headwaters of the Little Flat Brook in an effort to document native Brook Trout in an area that has never before been sampled. Unfortunately, the stream at this location does not have enough consistent flow to sustain a viable Brook Trout population as no trout were found. The habitat surrounding the stream and the water temperature seem adequate for Brook Trout, but the lack of flow seems to be the limiting factor for Brook Trout survival. Nineteen Blacknose Dace were the only fish collected.

Recommendation: An assessment of stream flow downstream of this location, but upstream of the upstream most impoundments (Hainesville Pond) on the Little Flatbrook, should be done to determine if any native Brook Trout reside in the Little Flat Brook upstream of these impoundments. In addition, the Little Flat Brook should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Shramko)

Little Flat Brook (trib.) (Flat Brook Office)

Date: 07/13/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Brook Trout Assessment
Location: **Behind Flatbrook Office**

Water Chemistry / Habitat

Water Temperature (°C):	14.8
Dissolved Oxygen (mg/L):	11.24
Specific Conductance (uS/cm):	419.2
pH:	8.03
Alkalinity (mg/L):	188.5
Sample Length (m):	150
Habitat Assessment Score:	153 Sub-Optimal

Fish Species	Number	Length (mm)
Dace, Blacknose	1	0 - 0
Dace, Longnose	7	0 - 0
Darter, Tessellated	1	0 - 0
Eel, American	1	0 - 0
Sculpin, Slimy	116	0 - 0
Trout, Brook (YOY)	76	52 - 98
Trout, Brook	1	116 - 116

Summary: The Little Flat Brook is a small *Trout Production* stream originating in High Point State Park and flows into the Big Flat Brook in Sussex Co. In 2017, a very small tributary to the Little Flat Brook was surveyed to assess the fish population at a new survey location in an attempt to document native Brook Trout in a tributary that has never been sampled before. Seventy-seven native Brook Trout (76 young-of-the-year) were found. This finding is very important and shows how valuable these small tributaries are to Brook Trout populations, especially when the mainstem rivers are nearing the upper threshold thermally for trout survival like the Little Flat Brook. These small, usually cold, tributaries act as thermal refuge in the summer and can also be where the majority of trout reproduction takes place. The 77 trout collected in one 150-meter survey is one of the better surveys of native Brook Trout populations in the entire Flat Brook Watershed in terms of overall numbers, but finding just one adult is a little disconcerting as young-of-the-year trout numbers can fluctuate wildly from one year to the next. More surveys in this tributary and the main-stem Little Flat Brook would need to occur to determine if the age structure results are truly a concern or if this is just an example of the stochasticity of sampling in such a small tributary.

A soon to be listed state Threatened native fish species of special interest to biologists based on its low abundance statewide and high quality habitat requirements (Slimy Sculpin) was found at this location. Overall, 203 individual fish were collected representing six different species.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Shramko)

Sparta Glen Brook

Date: 07/12/2017
County: Sussex
Township: Sparta Twp.
Drainage: Wallkill River
Project: Habitat Restoration
Location: **Rt 620 - Upstream of Sparta Glen Park in area not affected by massive landslide**

Fish Species	Number	Length (mm)
Chub, Creek	102	0 - 0
Dace, Blacknose	61	0 - 0
Dace, Longnose	10	0 - 0
Trout, Brook	2	178 - 200

Water Chemistry / Habitat

Water Temperature (°C): 21.7
Dissolved Oxygen (mg/L): 8.48
Specific Conductance (uS/cm): 244.6
pH: 7.74
Alkalinity (mg/L): 59.5
Sample Length (m): 150
Habitat Assessment Score: 162 Optimal

Summary: Sparta Glen Brook Restoration project aims to restore a section of Sparta Glen Brook that was devastated by a massive landslide from a microburst, in August of 2000, that dumped 16 inches of rain in a very short period of time. After a partial rebuild, the site again was severely damaged by Hurricane Irene in 2011. The Fred S. Burroughs North Jersey Chapter of Trout Unlimited has partnered with the Township of Sparta to restore this section of stream back into its natural state. Several electrofishing surveys have been completed before and after the restoration efforts to determine the status of the fish populations and wild Brook Trout population in this stream prior to and after the restoration efforts that occurred in the spring of 2016.

This survey was done in an area upstream of the impacted area, in an attempt to establish baseline fishery data for comparison between areas. Unfortunately, from a wild trout standpoint, we found only two adult native Brook Trout. Two Brook Trout with no young-of-the-year found shows that the stream even in the area that was not impacted by the landslides is struggling and may not be suitable for long term Brook Trout survival. The stream is impacted thermally by an impoundment upstream that is likely causing the water to warm to temperatures that maybe outside the thermal threshold for Brook Trout survival. On this day, the stream temperature was 21.7°C, which is above the optimal temperature for Brook Trout and the stress is a concern and possibly a factor in why the Brook Trout population found was so low. It is important to keep in mind that these one-time temperature readings are very limiting. To fully understand if temperature is a reason for the lower trout numbers found, a continuous temperature monitor would have to be deployed into the stream and to determine if the impoundment is the cause for the thermal stress, several continuous stream temperature monitors would have to be deployed above and below the area where the impoundment water enters Sparta Glen Brook. Overall, the 2017 survey found 174 individual fish representing four different species.

Recommendation: Continuous stream temperature monitors should be deployed in several areas near and around the restoration area and above and below the Morris Lake outflow confluence with Sparta Glen Brook. (Shramko)

Sparta Glen Brook

Date: 07/12/2017
County: Sussex
Township: Sparta Twp.
Drainage: Wallkill River
Project: Habitat Restoration
Location: **Rt. 620 Sparta Glen Park - Area of massive landslide restoration**

Fish Species	Number	Length (mm)
Chub, Creek	8	0 - 0
Dace, Blacknose	160	0 - 0
Dace, Longnose	168	0 - 0
Trout, Brook	2	181 - 275

Water Chemistry / Habitat

Water Temperature (°C): 20.1
Dissolved Oxygen (mg/L): 8.78
Specific Conductance (uS/cm): 276.1
pH: 7.77
Alkalinity (mg/L): 73.5
Sample Length (m): 150
Habitat Assessment Score: 150 Sub-Optimal

Summary: Sparta Glen Brook Restoration project aims to restore a section of Sparta Glen Brook that was devastated by a massive landslide from a microburst, in August of 2000, that dumped 16 inches of rain in a very short period of time. After a partial rebuild, the site again was severely damaged by Hurricane Irene in 2011. The Fred S. Burroughs North Jersey Chapter of Trout Unlimited has partnered with the Township of Sparta to restore this section of stream back into its natural state. Several electrofishing surveys have been completed before and after the restoration efforts to determine the status of the fish populations and wild Brook Trout population in this stream prior to and immediately after the restoration efforts that occurred in the spring of 2016.

The 2017 survey found two adult native Brook Trout. It may be too early to determine the overall success of the restoration efforts, which will not be fully understood for several years, but the survey did not find any natural reproduction, which could have occurred this past year. These results by no means defines the success or failure of the restoration project, as this is just the first full year after the restoration efforts were completed. It is likely that we will not know the full benefits of the restoration efforts for several years, as the instream habitat changes will take several seasons to find equilibrium and the riparian plantings will take several years before their stream shading / thermal benefits are fully felt. The 2016 and 2015 surveys also found two native Brook Trout each year, which also compares similarly with other surveys done in 2001 and 2009 where six wild Brook Trout and two wild Brook Trout were found respectively. These surveys give a solid baseline on the native Brook Trout population. It will be very interesting to compare this baseline to future surveys as the trout respond to the effects of the restoration efforts. Overall, the 2017 survey found 338 individual fish representing four different species.

Recommendation: Additional surveys should be completed in the restoration area for several years after the restoration efforts were completed to monitor the impacts of the restoration efforts. Continuous stream temperature monitors should be deployed in several areas near and around the restoration area. (Shramko)

Stony Brook (Stokes State Forest)

Date: 08/24/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Brook Trout Assessment
Location: **Coursen Rd - Above Stony Lake**

Fish Species	Number	Length (mm)
Shiner, Golden	8	0 - 0

Water Chemistry / Habitat

Water Temperature (°C):	16
Dissolved Oxygen (mg/L):	7.44
Specific Conductance (uS/cm):	40.9
pH:	6.03
Alkalinity (mg/L):	12.5
Sample Length (m):	150
Habitat Assessment Score:	125 Sub-Optimal

Summary: Stony Brook has been regulated as a *Wild Trout Stream* since the adoption of this special regulation in 1990. The lower section of Stony Brook below Stony Lake has been sampled many times in the past, most recently in 2015, where a small native Brook Trout population was found. It is believed that Stony Lake is having a negative thermal impact on Stony Brook and could be the primary reason for the small and struggling Brook Trout population. In fact, a sampling location just below Stony Lake was electrofished in 2015 and did not find any Brook Trout, as the temperature of the stream that day was 21.8°C, which is too warm for optimal Brook Trout survival.

In an attempt to find a more robust Brook Trout population where thermal conditions are more suitable for Brook Trout survival, a survey was completed in Stony Brook above Stony Lake. Division staff did find more suitable thermal conditions above the lake (16.0°C), but unfortunately other stressful habitat conditions (mainly low flow) were found, resulting in no Brook Trout being found. In fact, only eight Golden Shiners were found, indicating that Stony Brook above Stony Lake has environmental conditions not suitable for most fish populations.

Recommendation: This data (and data from surveys previously conducted on trout production streams statewide) will be used to determine if the *Wild Trout Stream* regulation should be modified and/or if new regulations for wild trout are warranted. (Shramko)

Tuttles Corner Brook (Trib.) (Camp Olympia)

Date: 08/25/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Brook Trout Assessment
Location: **Flatbrook Rd. Above Small Pond**

Fish Species	Number	Length (mm)
Eel, American	1	0 - 0
Lamprey, American Brook	1	0 - 0
Sculpin, Slimy	117	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 13
Dissolved Oxygen (mg/L): 8.04
Specific Conductance (uS/cm): 85.8
pH: 7.32
Alkalinity (mg/L): 25
Sample Length (m): 150
Habitat Assessment Score: 121 Sub-Optimal

Summary: A small *Trout Production* tributary to Tuttles Corner Brook that flows out of Stokes State Forest was electrofished to monitor the fish populations and distributions above and below a small pond in Stokes State Forest. These surveys were done to gain information of the impacts on habitat conditions and fish populations by the on stream impoundment with a focus on native Brook Trout, which are declining in New Jersey and throughout their historical range. The information found here is from the survey that was done upstream of a pond bisecting the stream from its upper and lower sections.

When comparing the two surveys above and below the impoundment, two things stand out. First, the temperature of the stream above the pond was a very cool 13°C, compared to 18°C below the pond. Even though the air temperature was also cooler when the survey above the lake was completed, the reading of 13°C is very cool and shows what the temperature of the tributary would be if there was not an impoundment warming the water. This cooler water temperature would benefit Brook Trout. The second interesting thing that stands out is how different the fish assemblage is between the surveys. The survey location above the pond shows little impact from the pond as zero warmwater fishes were found. In fact, the presence of 117 Slimy Sculpin indicates that this section of stream is not thermally stressed and remains cool all year round as Slimy Sculpin need cool clean water to survive. What is interesting and alarming is the fact that zero Brook Trout were found above the pond, even though they were found immediately below the pond. There are a few different reasons this may occur, but the most important fact is that this shows how the pond is acting as a barrier and not allowing the Brook Trout found below the pond into a more suitable thermal environment. The pond is creating more stressful conditions for Brook Trout by warming the stream, increasing competition from species that otherwise would not be found and acting as a barrier to more suitable thermal conditions and stream habitat. These factors are all likely contributors to the poor Brook Trout population found below the pond. A total of 119 individual fish, representing three different species were found in this survey, including the Slimy Sculpin, a soon to be listed state Threatened native fish species of special interest to biologists based on its low abundance statewide and high quality habitat requirements.

Recommendation: The on-stream impoundment should be removed to restore the stream and enhance the habitat found below the impoundment. This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Shramko)

Tuttles Corner Brook (Trib.) (Camp Olympia)

Date: 08/18/2017
County: Sussex
Township: Sandyston Twp.
Drainage: Flat Brook
Project: Brook Trout Assessment
Location: **Flatbrook Rd. Below Small Pond**

Water Chemistry / Habitat

Water Temperature (°C):	18
Dissolved Oxygen (mg/L):	8.23
Specific Conductance (uS/cm):	74.8
pH:	7.48
Alkalinity (mg/L):	26
Sample Length (m):	150
Habitat Assessment Score:	167 Optimal

Fish Species	Number	Length (mm)
Bass, Largemouth	1	62 - 62
Chub, Creek	2	0 - 0
Dace, Blacknose	5	0 - 0
Dace, Longnose	1	0 - 0
Darter, Tessellated	10	0 - 0
Madtom, Margined	3	0 - 0
Pickerel, Chain	2	120 - 265
Pickerel, Redfin	4	78 - 179
Sucker, White	8	0 - 0
Sunfish, Bluegill	2	76 - 105
Sunfish, Pumpkinseed	19	66 - 94
Trout, Brook	4	162 - 222

Summary: A small *Trout Production* tributary to Tuttles Corner Brook that flows out of Stokes State Forest was electrofished to monitor the fish populations and distributions above and below a small pond in Stokes State Forest. These surveys were done to gain information of the impacts on habitat conditions and fish populations by the onstream impoundment with a focus on native Brook Trout, which are declining in New Jersey and throughout their historical range. The information found here is from the survey that was done downstream of a pond bisecting the stream from its upper and lower sections.

The fish assemblage clearly shows the impact of the pond as Largemouth Bass, Bluegill Sunfish and Pumpkinseed Sunfish were found. These species would not normally be found in a headwaters stream such as this if there wasn't an impoundment nearby. The pond itself is fairly small and does not seem to be having a large impact downstream from a thermal perspective, as the water temperature found was 18°C. The presence of the Brook Trout shows that stream temperatures do not exceed 23°C for an extended period of time, a temperature shown to be too warm for Brook Trout survival. This however does not mean that the pond isn't still having a negative impact on Brook Trout and their long-term survival. Any thermal pollution to a native Brook Trout stream in New Jersey is a concern. Only four Brook Trout were found, in which none of them were young-of-the-year, is major concern. Based on the surrounding habitat and on Brook Trout population sizes sampled in Tuttles Corner Brook, this tributary to Tuttles Corner Brook should have a better Brook Trout population than what was found. The additional stressors from an increased stream temperature and competition from atypical headwater stream species are likely contributing to an already stressed Brook Trout population. It is important to keep in mind that this one-time temperature reading is very limiting. To fully understand if temperature is a reason for the lower trout numbers found, a continuous temperature monitor would have to be deployed into the stream. A total of 61 individual fish representing 12 different species were found in this survey.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Shramko)

Stream Surveys in the Upper Delaware (South) Region

(Delawanna Creek to Lockatong Creek)

Musconetcong River

Date: 08/22/2017
County: Warren
Township: Franklin Twp.-Warren Co.
Drainage: Musconetcong River
Project: General Fisheries Survey
Location: **Valley Station Road; (uppermost of 2 surveys)**

Fish Species	Number	Length (mm)
Bass, Rock	1	139 - 139
Chub, Creek	2	0 - 0
Dace, Blacknose	40	0 - 0
Dace, Longnose	3	0 - 0
Darter, Tessellated	13	0 - 0
Eel, American	70	0 - 0
Minnow, Cutlip	24	0 - 0
Sucker, White	16	0 - 0
Sunfish, Redbreast	1	100 - 100

Water Chemistry / Habitat

Water Temperature (°C): 21.2
Dissolved Oxygen (mg/L): 9.75
Specific Conductance (uS/cm): 622
pH: 8.20
Alkalinity (mg/L): 113.5
Sample Length (m): 105
Habitat Assessment Score: 168 Optimal

Summary: Two electrofishing surveys were conducted on 8/22/17 in the Musconetcong River within the Musconetcong River WMA parcel located just upstream of a private fishing club (Warren Rod and Gun Club #2) and the Musky Trout Hatchery. The Musconetcong River is classified *Trout Maintenance* and is trout-stocked (spring and fall) by Fish and Wildlife within this WMA property and at many other locations where public fishing is allowed. Two contiguous sections of the river were electrofished to obtain current data that could be useful in determining if an in-stream fish habitat enhancement project proposed by Trout Unlimited would be beneficial. The surveys did not follow the established sampling protocol because the three backpack electrofishers/nine-person crew could not adequately electrofish the entire width of the river (75 - 82 ft wide). In addition, the block net used at the upstream survey boundaries only blocked a portion of the river width and partially failed during both surveys due to the swiftness of the current. Because of these factors fish that would normally have been collected avoided capture. Consequently, these surveys provide qualitative fish data (i.e. fish species present) and do not reflect the overall number of fish present in the sections surveyed. In the uppermost survey only 105 m was electrofished because WMA property boundary (where the block seine was placed) was encountered before 150 m could be completed. Eight native fish species commonly found in the river were documented (American Eel, Creek Chub, Blacknose and Longnose Dace, Cutlip Minnow, White Sucker, Tessellated Darter, Rock Bass, and Redbreast Sunfish). No native fish of conservation concern were encountered. Although anglers have reported catching small trout (5 – 6 in) in this area, which suggests trout may be reproducing in this river reach, this was not confirmed by the survey data as no trout were collected. Assorted substrate types (including bedrock) were noted as was the lack of deep pools.

Recommendation: Habitat for adult trout could be enhanced by creating several deep, well-defined pools. The bedrock substrate and areas along the river-right bank (which has good mussel habitat) in this stream section should not be disturbed. (Hamilton)

*******NON – STANDARDIZED SURVEY********

Musconetcong River

Date: 08/22/2017
County: Warren
Township: Franklin Twp.-Warren Co.
Drainage: Musconetcong River
Project: General Fisheries Survey
Location: **Valley Station Road; (lowermost of 2 surveys)**

Fish Species	Number	Length (mm)
Dace, Blacknose	59	0 - 0
Dace, Longnose	11	0 - 0
Darter, Tessellated	13	0 - 0
Eel, American	73	0 - 0
Minnow, Cutlip	32	0 - 0
Sucker, White	4	0 - 0
Sunfish, Redbreast	4	69 - 105
Trout, Brown	2	195 - 243
Trout, Rainbow	1	272 - 272

Water Chemistry / Habitat

Water Temperature (°C): 20.1
Dissolved Oxygen (mg/L): 9.34
Specific Conductance (uS/cm): 602
pH: 7.95
Alkalinity (mg/L): 111.5
Sample Length (m): 150
Habitat Assessment Score: 172 Optimal

Summary: Two electrofishing surveys were conducted on 8/22/17 in the Musconetcong River within the Musconetcong River WMA parcel located just upstream of a private fishing club (Warren Rod & Gun Club #2) and the Musky Trout Hatchery. The Musconetcong River is classified *Trout Maintenance* and is trout-stocked (spring and fall) by Fish and Wildlife within this WMA property and at many other locations where public fishing is allowed. Two contiguous sections of the river were electrofished to obtain current data that could be useful in determining if an in-stream fish habitat enhancement project proposed by Trout Unlimited would be beneficial. The surveys did not follow the established sampling protocol because the nine-person crew could not adequately electrofish the entire width of the river (75 - 82 ft wide) with three backpack electrofishers. In addition, the block net used at the upstream survey boundaries only blocked a portion of the river width and partially failed during both surveys due to the swiftness of the current. Because of these factors, fish that would normally have been collected avoided capture. Consequently, these surveys provide qualitative fish data (i.e. fish species present) and do not reflect the overall number of fish present in the sections surveyed. The lowermost survey (150 m stretch surveyed) began just upstream from the Warren Rod and Gun Club #2 property boundary. Seven native fish species (none were species of conservation concern) commonly found in the river were documented were encountered, as well as two Brown Trout and one Rainbow Trout. The Rainbow Trout was a stocked (hatchery origin) fish (10.7 in) and the smaller of the two Brown Trout (7.6 in) was considered a wild trout. The origin (wild or hatchery) of the other Brown Trout (9.6 in) was unclear. Although anglers have reported catching small trout (5 – 6 in) in this area, which suggests trout may be reproducing in the river, this was not confirmed by the survey data as no YOY were encountered. The lack of deeper pools and wide uniformly shallow expanses of water in the lower end of this this survey stretch was noted. Anglers fishing slightly downstream in the private club stretch on the day of the survey commented that the trout stocked by Fish and Wildlife on the state WMA property quickly find their way into their private stretch (where an in-stream habitat project was completed over five years ago).

Recommendation: Habitat for adult trout could be enhanced by creating several deep, well-defined pools in this survey section. (Hamilton)

*******NON – STANDARDIZED SURVEY*******

Pequest River

Date: 08/17/2017
County: Warren
Township: Independence Twp.
Drainage: Pequest River
Project: General Fisheries Survey
Location: **Alphano Road; (uppermost of 2 surveys)**

Water Chemistry / Habitat

Water Temperature (°C):	18.8
Dissolved Oxygen (mg/L):	8.37
Specific Conductance (uS/cm):	482.6
pH:	8.19
Alkalinity (mg/L):	203
Sample Length (m):	150
Habitat Assessment Score:	115 Sub-Optimal

Fish Species	Number	Length (mm)
Bullhead, Yellow	1	175 - 175
Chub, Creek	4	0 - 0
Chubsucker, Creek	2	0 - 0
Dace, Blacknose	1	0 - 0
Darter, Tessellated	49	0 - 0
Eel, American	28	0 - 0
Hybrid, Sunfish	1	92 - 92
Killifish, Banded	14	0 - 0
Lamprey, Sea	5	0 - 0
Pickerel, Redfin	20	76 - 183
Shiner, Common	1	0 - 0
Shiner, Golden	4	0 - 0
Shiner, Swallowtail	16	0 - 0
Sunfish, Bluegill	8	69 - 96
Sunfish, Pumpkinseed	2	94 - 100
Sunfish, Redbreast	1	72 - 72

Summary: Two electrofishing surveys were conducted on the Pequest River in 2017 to obtain current fish data within the Pequest WMA parcel known as the Kenco acquisition (acquired by NJDEP in 2012). Many years ago, a previous landowner channelized the river and the adjacent land was ditched by to improve drainage for agriculture. This was common practice throughout Great Meadows, a low-lying area through which the Pequest River flows. The result is long, deep, clay/sand-bottomed pools with little in-stream woody material or other structure to provide habitat diversity. In 2017 Fish and Wildlife initiated a wetland restoration project on this property. The project involved placing coarse woody material (tree root wads and tree trunks) in the river to provide in-stream habitat diversity, and sloping and revegetating vertical bank of the Pequest River to reduce erosion. A small tributary stream will also be realigned to include a meander. The two surveys were conducted prior to the start of those activities. This low gradient section of the Pequest River is classified as *Non-Trout* and though it is not currently stocked with trout, Fish and Wildlife does stock trout (spring and fall) both upstream and downstream of this property. The electrofishing surveys conducted on 8/17/17 utilized three back electrofishers and a nine-person crew. The survey on the uppermost section yielded 16 fish species – Redfin Pickerel, American Eel, Bluegill, Pumpkinseed, Redbreast Sunfish, a hybrid sunfish, Tessellated Darter, Banded Killifish, Common Shiner, Golden Shiner, Swallowtail Shiner, Creek Chub, Blacknose Dace, Creek Chubsucker, Yellow Bullhead, and Sea Lamprey. Although no native fish of conservation concern were encountered, a species not commonly found in New Jersey, the Swallowtail Shiner, was present at this location and has been documented in past electrofishing surveys conducted elsewhere on the Pequest River.

Recommendation: The electrofishing survey should be repeated to assess the in-stream fish habitat enhancement project. Once the stream bank has been stabilized with vegetation the stream should be stocked with trout. (Hamilton)

Pequest River

Date: 08/17/2017
County: Warren
Township: Independence Twp.
Drainage: Pequest River
Project: General Fisheries Survey
Location: **Alphano Road; (lowermost of 2 surveys)**

Water Chemistry / Habitat

Water Temperature (°C): 18.5
Dissolved Oxygen (mg/L): 7.85
Specific Conductance (uS/cm): 481
pH: 8.01
Alkalinity (mg/L): 194.5
Sample Length (m): 150
Habitat Assessment Score: 108 Poor

Fish Species	Number	Length (mm)
Bass, Rock	1	82 - 82
Bullhead, Yellow	2	121 - 175
Darter, Tessellated	37	0 - 0
Eel, American	35	0 - 0
Lamprey, Sea	2	0 - 0
Pickerel, Redfin	13	72 - 113
Shiner, Common	1	0 - 0
Shiner, Golden	1	0 - 0
Sucker, White	4	0 - 0
Sunfish, Bluegill	12	42 - 116
Sunfish, Pumpkinseed	3	44 - 87
Sunfish, Redbreast	5	58 - 90

Summary: Two electrofishing surveys were conducted on the Pequest River in 2017 to obtain current fish data within the Pequest WMA parcel known as the Kenco acquisition (acquired by NJDEP in 2012). Many years ago, a previous landowner channelized the river and the adjacent land was ditched by to improve drainage for agriculture. This was common practice throughout Great Meadows, a low-lying area through which the Pequest River flows. The result is long, deep, clay/sand-bottomed pools with little in-stream woody material or other structure to provide habitat diversity. In 2017 Fish and Wildlife initiated a wetland restoration project on this property. The project involved placing coarse woody material (tree root wads and tree trunks) in the river to provide in-stream habitat diversity, and sloping and revegetating vertical bank of the Pequest River to reduce erosion. A small tributary stream will also be realigned to include a meander. The two surveys were conducted prior to the start of those activities. This low gradient section of the Pequest River is classified as *Non-Trout* and though it is not currently stocked with trout, Fish and Wildlife does stock trout (spring and fall) both upstream and downstream of this property. The electrofishing surveys conducted on 8/17/17 utilized three back electrofishers and a nine-person crew. The survey on the lowermost section yielded 12 fish species – Tessellated Darter, American Eel, Redfin Pickerel, Bluegill, Pumpkinseed, Redbreast Sunfish, Common Shiner, Golden Shiner, White Sucker, Yellow Bullhead, Rock Bass, and Sea Lamprey.

Recommendation: The electrofishing survey should be repeated to assess the in-stream fish habitat enhancement project. Once the stream bank has been stabilized with vegetation the stream should be stocked with trout. (Hamilton)

Stephensburg Brook

Date: 08/14/2017
County: Morris
Township: Washington Twp.-Morris Co.
Drainage: Musconetcong River
Project: Temperature Study - TP Streams
Location: **Stephensburg Road**

Fish Species	Number	Length (mm)
Chub, Creek	33	0 - 0
Dace, Blacknose	137	0 - 0
Dace, Longnose	3	0 - 0
Darter, Tessellated	14	0 - 0
Eel, American	28	0 - 0
Sucker, White	3	0 - 0
Trout, Brook (YOY)	58	45 - 86
Trout, Brook	2	156 - 170
Trout, Brown (YOY)	1	68 - 68
Trout, Brown	1	265 - 265

Water Chemistry / Habitat

Water Temperature (°C): 18
Dissolved Oxygen (mg/L): 8.94
Specific Conductance (uS/cm): 311.5
pH: 7.65
Alkalinity (mg/L): 36
Sample Length (m): 150
Habitat Assessment Score: 154 Sub-Optimal (2015)

Summary: This tributary to the Musconetcong River was electrofished on 8/14/17 to assess the wild trout population structure relative to the stream temperature regime. Habitat here consists of a good mix of riffles, runs, and pools, and of cobble layering and undercut banks. A heavy amount of erosion is visible in spots. Wild Brook Trout were first found here in a survey completed in 1970 and again in 2002. Then, in a survey conducted in 2014, wild Brown Trout were documented for the first time in this stream. Species encountered during this survey included 60 wild Brook Trout ranging from 45 – 170 mm (1.8 – 6.7 in), including 58 young-of-the-year (YOY), and 2 wild Brown Trout ranging from 68 – 265 mm (2.7 – 10.4 in), including 1 YOY. A large majority of the trout captured during the survey were YOY and this is inconsistent with what was captured the last two years. However, one objective of this study is to understand these types of population fluctuations, the causative factors that are influencing them, and what implications it has on the standard operating procedures of stream electrofishing surveys.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *Trout Production* streams. This stream should be periodically monitored in accordance with the established schedule (every five years for a *Wild Trout Stream*). (Collenburg)

West Portal Creek

Date: 07/20/2017
County: Hunterdon
Township: Bethlehem Twp.
Drainage: Musconetcong River
Project: Brook Trout Restoration - Bio
Location: **Asbury-West Portal Road (uppermost of 2 surveys)**

Fish Species	Number	Length (mm)
Dace, Blacknose	8	0 - 0
Eel, American	1	0 - 0
Trout, Brook (YOY)	10	83 - 117
Trout, Brown (YOY)	119	60 - 106

Water Chemistry / Habitat

Water Temperature (°C): 14.6
Dissolved Oxygen (mg/L): 10.38
Specific Conductance (uS/cm): 399.6
pH: 7.74
Alkalinity (mg/L): 95
Sample Length (m): 150
Habitat Assessment Score: 162 Optimal (2002)

Summary: On May 5, 2016 a catastrophic fish kill occurred in this *Trout Production* tributary to the Musconetcong River. Thousands of fish inhabiting a three-mile section of the creek were killed when a tractor trailer traveling on I-78 caught fire and the truck's detergent cargo was washed into the creek. Prior to the spill, Brown Trout (a non-native trout species) were abundant and Brook Trout (a native trout species) were sparse. Slimy Sculpin, a rare fish species soon to be listed state Threatened, was also present. During 2016 and 2017 the creek was electrofished periodically to assess the recovery of the fishery and Brown Trout, when encountered, were removed to give the existing native Brook Trout an opportunity to recolonize the creek with minimal competition from Brown Trout. In 2017 two standardized surveys were conducted at sites previously surveyed prior to the fish kill. The uppermost of these two sites was previously electrofished in 2002 (150 m stretch) and four fish species were present – Brown Trout (168 individuals, of which 96 were YOY), Brook Trout (6 individuals, of which 5 were YOY), American Eel (4), and Sculpin (1). When this site was resurveyed on 7/20/17 four fish species were present – Brown Trout (119 individuals, all considered YOY), Brook Trout (10 individuals, all considered YOY, though the largest individuals could be older), American Eel (1), and Blacknose Dace (8). Despite efforts to eradicate Brown Trout in 2016, they reproduced successfully in this stream reach in the fall of 2016, and in 2017 were ten times more numerous than Brook Trout at this location (and elsewhere in the creek). The results of the electrofishing effort in 2017 to remove Brown Trout from this stream are summarized in the Brook Trout Restoration portion of the Investigations and Management of New Jersey's Freshwater Fisheries Resources 2017 report.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout Trout) or more frequently if additional management actions are undertaken to restore wild Brook Trout. (Hamilton)

West Portal Creek

Date: 07/20/2017
County: Hunterdon
Township: Bethlehem Twp.
Drainage: Musconetcong River
Project: Brook Trout Restoration - Bio
Location: **Asbury- West Portal Road; (lowermost of 2 surveys)**

Fish Species	Number	Length (mm)
Chub, Creek	4	0 - 0
Dace, Blacknose	157	0 - 0
Dace, Longnose	25	0 - 0
Darter, Tessellated	6	0 - 0
Eel, American	29	0 - 0
Sucker, White	6	0 - 0
Trout, Brown (YOY)	3	76 - 84

Water Chemistry / Habitat

Water Temperature (°C): 14.7
Dissolved Oxygen (mg/L): 9.94
Specific Conductance (uS/cm): 397.8
pH: 7.96
Alkalinity (mg/L): 105
Sample Length (m): 150
Habitat Assessment Score: 167 Optimal (2015)

Summary: On May 5, 2016 a catastrophic fish kill occurred in this *Trout Production* tributary to the Musconetcong River. Thousands of fish inhabiting a three-mile section of the creek were killed when a tractor trailer traveling on I-78 caught fire and the truck's detergent cargo was washed into the creek. Prior to the spill, Brown Trout (a non-native trout species) were abundant and Brook Trout (a native trout species) were sparse. Slimy Sculpin, a rare fish species soon to be listed state Threatened, was also present. During 2016 and 2017 the creek was electrofished periodically to assess the recovery of the fishery and Brown Trout, when encountered, were removed to give the existing native Brook Trout an opportunity to recolonize the creek with minimal competition from Brown Trout. In 2017 two standardized surveys were conducted at sites previously surveyed prior to the fish kill. The lowermost site of the two sites was previously electrofished on 8/27/15 to assess a fish habitat enhancement project completed earlier that year (in March). In that survey 24 wild Brown Trout (17 were YOY) and 8 other fish species were present – Blacknose Dace (200), White Sucker (29), American Eel (23), Longnose Dace (21), Creek Chub (8), Common Shiner (7), Slimy Sculpin (6), and Tessellated Darter (4). The perceived low density of trout was attributed to the use of inexperienced volunteers (netting the fish) and the short-term effects of disturbances related to the restoration. The electrofishing survey conducted at this location on 7/20/17 yielded Blacknose Dace (157) was again the most abundant species, followed by American Eel (29), Longnose Dace (25), White Sucker (6), Tessellated Darter (6), Creek Chub (4), and Brown Trout (4 YOY). The effort to remove Brown Trout in 2016 may have been successful in limiting Brown Trout abundance and reproduction in this stretch. Unfortunately Brook Trout were either absent or too sparse at this general location and unable to capitalize on the low Brown Trout density and reproduce successfully. The results of the electrofishing effort in 2017 to remove Brown Trout from this stream are summarized in the Brook Trout Restoration portion of the Investigations and Management of New Jersey's Freshwater Fisheries Resources 2017 report.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout Trout) or more frequently if additional management actions are undertaken to restore wild Brook Trout. (Hamilton)

Stream Surveys in the Upper Passaic Region

(Pompton, Pequannock, Wanaque, Ramapo, Upper Passaic, Whippany, & Rockaway)

Pequannock River

Date: 07/11/2017
County: Morris
Township: Riverdale Boro
Drainage: Pequannock River
Project: General Fisheries Survey
Location: **Hamburg Turnpike-Waterfall Village Apt**

Water Chemistry / Habitat

Water Temperature (°C): 21.4
Dissolved Oxygen (mg/L): 9.06
Specific Conductance (uS/cm): 263.7
pH: 7.98
Alkalinity (mg/L): 37
Sample Length (m): 150
Habitat Assessment Score: 153 Sub-Optimal

Fish Species	Number	Length (mm)
Dace, Blacknose	107	0 - 0
Darter, Tessellated	4	0 - 0
Minnow, Cutlip	23	0 - 0
Shiner, Common	11	0 - 0
Sucker, White	8	0 - 0
Trout, Brown (YOY)	2	70 - 71
Trout, Brown	12	187 - 307
Trout, Rainbow	1	0 - 0

Summary: The trout stocked section of the Pequannock River is a popular location to fish and is known to hold populations of wild Brown Trout. Four electrofishing surveys were conducted in the trout stocked section to monitor the status of the wild population. The most upstream location was next to Waterfall Court in Bloomingdale and the most downstream section was upstream of the Hamburg Turnpike bridge in Pompton Lakes (which includes the Seasonal Trout Conservation Area (STCA)). Surveys were conducted in these classified *Trout Production* locations on July 10th and July 11th. An electrofishing survey was conducted on 7/11/17 inside the trout stocked section behind Waterfall Village, an apartment complex off Hamburg Turnpike. The last time this section was surveyed was in the early 1990's and a wild Brown Trout population was present. A total of 14 wild Brown Trout (including 2 young-of-the-year) and 1 stocked Rainbow Trout was captured in this survey. The population of Brown Trout has remained stable but low in abundance. Due to this section's popularity to anglers, harvest of wild Brown Trout may contribute to the low abundance of the population. This survey will help guide management of this popular fishery.

Recommendation: Currently, regulations provide protection to the wild Brown Trout population that exists in this section at the same level as they protect the trout that are stocked here. It was suggested by several anglers to regulate the Pequannock River, or part of it, under the new Wild Trout Regulations because of the wild trout that inhabit this section. This would maintain or increase the minimum size limit to 9 or 12 in, dependent on the category chosen, and would be more restrictive to the gear that can be used. More data and discussions should be broached to reach the most comprehensive management strategy for this section. This stream should be monitored in accordance with the schedule established for *Trout Production* stream (minimum of once every 20 years for streams having wild Brown and/or RainbowTrout). (Collenburg)

Pequannock River

Date: 07/11/2017
County: Morris
Township: Riverdale Boro
Drainage: Pequannock River
Project: General Fisheries Survey
Location: **Hamburg Turnpike - Appelt**

Water Chemistry / Habitat

Water Temperature (°C):	20.4
Dissolved Oxygen (mg/L):	8.93
Specific Conductance (uS/cm):	278.8
pH:	7.62
Alkalinity (mg/L):	38
Sample Length (m):	150
Habitat Assessment Score:	178 Optimal

Fish Species	Number	Length (mm)
Bass, Smallmouth	1	252 - 252
Chub, Creek	8	0 - 0
Dace, Blacknose	60	0 - 0
Darter, Tessellated	8	0 - 0
Fallfish	1	0 - 0
Minnow, Cutlip	16	0 - 0
Shiner, Common	9	0 - 0
Sucker, White	1	0 - 0
Sunfish, Bluegill	1	65 - 65
Sunfish, Redbreast	1	147 - 147
Trout, Brown (YOY)	5	65 - 85
Trout, Brown	4	166 - 264
Trout, Rainbow	4	129 - 310

Summary: The trout stocked section of the Pequannock River is a popular location to fish and is known to hold populations of wild Brown Trout. Four electrofishing surveys were conducted in the trout stocked section to monitor the status of the wild population. The most upstream location was next to Waterfall Court in Bloomingdale and the most downstream section was upstream of the Hamburg Turnpike bridge in Pompton Lakes (which includes the Seasonal Trout Conservation Area (STCA)). Surveys were conducted in these classified *Trout Production* locations on July 10th and July 11th. This electrofishing survey was conducted on 7/11/17 inside the trout stocked section near Appelt Park off Hamburg Turnpike. The last time this section was surveyed was in the early 1990's and a wild Brown Trout population was present. A total of 9 wild Brown Trout (including 5 young-of-the-year) and 3 stocked Rainbow Trout were captured in this survey. The population of Brown Trout has remained stable but low in abundance. An interesting find in this survey was one 129 mm Rainbow Trout that was potentially wild. This may be the first documentation of wild Rainbow Trout in the Pequannock River, however, several schools that participate in our Trout in the Classroom program stock small Rainbow Trout at this park. The population of Brown Trout has remained stable but in low abundance. Due to this section's popularity to anglers, harvest of wild Brown Trout may contribute to the low abundance of the population. This survey will help guide management of this popular fishery.

Recommendation: Currently, regulations provide protection to the wild Brown Trout population that exists in this section at the same level as they protect the trout that are stocked here. It was suggested by several anglers to regulate the Pequannock River, or part of it, under the new Wild Trout Regulations because of the wild trout that inhabit this section. This would maintain or increase the minimum size limit to 9 or 12 in, dependent on the category chosen, and would be more restrictive to the gear that can be used. More data and discussions should be broached to reach the most comprehensive management strategy for this section. This stream should be monitored in accordance with the schedule established for *Trout Production* stream (minimum of once every 20 years for streams having wild Brown and/or RainbowTrout). (Collenburg)

Pequannock River

Date: 07/10/2017
County: Morris
Township: Riverdale Boro
Drainage: Pequannock River
Project: General Fisheries Survey
Location: **Hamburg Turnpike - STCA**

Water Chemistry / Habitat

Water Temperature (°C): 20.2
Dissolved Oxygen (mg/L): 9.19
Specific Conductance (uS/cm): 313.5
pH: 7.73
Alkalinity (mg/L): 38
Sample Length (m): 150
Habitat Assessment Score: 139 Sub-Optimal

Fish Species	Number	Length (mm)
Bass, Largemouth	1	105 - 105
Bass, Smallmouth	5	109 - 123
Darter, Tessellated	5	0 - 0
Fallfish	2	0 - 0
Minnow, Cutlip	3	0 - 0
Mudminnow, Eastern	1	0 - 0
Shiner, Spottail	2	0 - 0
Sunfish, Bluegill	11	57 - 166
Sunfish, Pumpkinseed	3	84 - 85
Sunfish, Redbreast	5	102 - 151
Trout, Brown (YOY)	1	82 - 82
Trout, Brown	13	167 - 427
Trout, Rainbow	18	270 - 327

Summary: The trout stocked section of the Pequannock River is a popular location to fish and is known to hold populations of wild Brown Trout. Four electrofishing surveys were conducted in the trout stocked section to monitor the status of the wild population. The most upstream location was next to Waterfall Court in Bloomingdale and the most downstream section was upstream of the Hamburg Turnpike bridge in Pompton Lakes (which includes the Seasonal Trout Conservation Area (STCA)). Surveys were conducted in these classified *Trout Production* locations on July 10th and July 11th. This electrofishing survey was conducted on 7/10/17 inside the STCA just below I-287. The last time this section was surveyed was in the early 1990's and a wild Brown Trout population was present. A total of 14 wild Brown Trout (including 1 young-of-the-year) and 18 stocked Rainbow Trout were captured in this survey. Three of the captured Brown Trout exceeded 15 inches (the minimum size limit on STCAs is 15 inches excluding the period from opening day of trout season to May 20th). The population of Brown Trout has remained stable, but in low abundance. This survey will help guide management of this popular fishery.

Recommendation: Currently, regulations protect the wild Brown Trout population that exists in this section with a minimum 15-inch limit during a majority of the year. However, it was suggested by several anglers to regulate the Pequannock River, or part of it, under the new Wild Trout Regulations. This would lower the minimum size limit to 9 or 12 in, dependent on the category chosen, and would be more restrictive to the gear that can be used. More data and discussions should be broached to reach the most comprehensive management strategy for this section. This stream should be monitored in accordance with the schedule established for *Trout Production* stream (minimum of once every 20 years for streams having wild Brown and/or Rainbow Trout). (Collenburg)

Pequannock River

Date: 07/10/2017
County: Morris
Township: Riverdale Boro
Drainage: Pequannock River
Project: General Fisheries Survey
Location: **Hamburg Turnpike - upstream**

Water Chemistry / Habitat

Water Temperature (°C):	18.8
Dissolved Oxygen (mg/L):	10.31
Specific Conductance (uS/cm):	322.7
pH:	7.80
Alkalinity (mg/L):	39
Sample Length (m):	150
Habitat Assessment Score:	147 Sub-Optimal

Fish Species	Number	Length (mm)
Bass, Largemouth	1	127 - 127
Bass, Rock	7	119 - 170
Bass, Smallmouth	28	32 - 312
Dace, Blacknose	22	0 - 0
Darter, Tessellated	12	0 - 0
Fallfish	1	0 - 0
Minnow, Cutlip	1	0 - 0
Shiner, Common	1	0 - 0
Shiner, Spottail	1	0 - 0
Sucker, White	15	0 - 0
Sunfish, Bluegill	16	50 - 105
Sunfish, Pumpkinseed	5	78 - 147
Sunfish, Redbreast	10	57 - 167
Trout, Brown	9	190 - 382
Trout, Brown (YOY)	4	67 - 82
Trout, Rainbow	1	303 - 303

Summary: The trout stocked section of the Pequannock River is a popular location to fish and is known to hold populations of wild Brown Trout. Four electrofishing surveys were conducted in the trout stocked section to monitor the status of the wild population. The most upstream location was next to Waterfall Court in Bloomingdale and the most downstream section was upstream of the Hamburg Turnpike bridge in Pompton Lakes (which includes the Seasonal Trout Conservation Area (STCA)). Surveys were conducted in these classified *Trout Production* locations on July 10th and July 11th. This electrofishing survey was conducted on 7/10/17 inside the STCA just upstream of Hamburg Turnpike in Pompton Lakes. The last time this section was surveyed was in the early 1990's and a wild Brown Trout population was present. A total of 13 wild Brown Trout (including 4 young-of-the-year) and 1 stocked Rainbow Trout were captured in this survey. It is estimated that an additional 5-10 trout evaded capture in a deep hole in the beginning of the survey. The largest Brown Trout captured exceeded 15 inches (the minimum size limit on STCAs is 15 inches excluding the period from opening day of trout season to May 20th). The population of Brown Trout has remained stable but in low abundance. Due to this sections popularity to anglers, harvest of wild Brown Trout may contribute to the low abundance of the population. This survey will help guide management of this popular fishery.

Recommendation: Currently, regulations protect the wild Brown Trout population that exists in this section with a minimum 15-inch limit during a majority of the year. However, it was suggested by several anglers to regulate the Pequannock River, or part of it, under the new Wild Trout Regulations. This would lower the minimum size limit to 9 or 12 in, dependent on the category chosen, and would be more restrictive to the gear that can be used. More data and discussions should be broached to reach the most comprehensive management strategy for this section. This stream should be monitored in accordance with the schedule established for *Trout Production* stream (minimum of once every 20 years for streams having wild Brown and/or RainbowTrout). (Collenburg)

Pequannock River (trib.) (Irish Brook)

Date: 07/13/2017
County: Passaic
Township: Bloomingdale
Drainage: Passaic River - Upper
Project: Brook Trout Assessment
Location: **Reeve Ave**

Fish Species	Number	Length (mm)
Chub, Creek	135	0 - 0
Dace, Blacknose	47	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 19.4
Dissolved Oxygen (mg/L): 8.86
Specific Conductance (uS/cm): 670
pH: 7.68
Alkalinity (mg/L): 110
Sample Length (m): 150
Habitat Assessment Score: 145 Sub-optimal

Summary: This tributary to the Pequannock River was electrofished on 7/13/17 to investigate the presence of wild Brook Trout and is currently classified, by default, as *Trout Production*. This tributary has never been sampled in the past and flows into the trout stocked section of the Pequannock River, which is also classified as *Trout Production*. Wild Brown Trout are commonly found in the Pequannock River and it is presumed that many of the tributaries that have not been sampled would have the potential of holding wild trout as well. The survey on this tributary did not find any wild Brook Trout. Only two species were captured, including Creek Chub and Blacknose Dace. The tributary is surrounded by a residential development close to downtown Bloomingdale. If Brook Trout did exist in this stream in the past, they have now been extirpated in this section. A survey conducted downstream did discover a single wild Brown Trout, but poor conditions caused by human impacts are likely reasons Brook Trout are absent here.

Recommendation: Additional surveys are not necessary in this section. (Collenburg)

Pequannock River (trib.)(Van Dam)

Date: 07/13/2017
County: Passaic
Township: Bloomingdale
Drainage: Passaic River - Upper
Project: Brook Trout Assessment
Location: **Brandt Lane**

Fish Species	Number	Length (mm)
Chub, Creek	122	0 - 0
Dace, Blacknose	39	0 - 0
Darter, Tessellated	12	0 - 0
Sucker, White	12	0 - 0
Trout, Brown (YOY)	1	71 - 71

Water Chemistry / Habitat

Water Temperature (°C): 18.5
Dissolved Oxygen (mg/L): 6.38
Specific Conductance (uS/cm): 575
pH: 6.72
Alkalinity (mg/L): 79
Sample Length (m): 150
Habitat Assessment Score: 101 Marginal

Summary: This tributary flows into the Pequannock River from the north near the Township of Riverdale's Appelt Park and has the current default classification of *Trout Production*. This stream has never been previously sampled, but could have been the source of the lone 128 mm Brook Trout that was collected in the October 2, 2007 Pequannock River survey that occurred within the Appelt Park area. Wild populations of Brown Trout are known to exist throughout the Pequannock River, and many tributaries within the Pequannock River watershed hold wild trout populations. In this survey, no Brook Trout were found but a single young-of-the-year Brown Trout (71 mm) was located. A total of 186 fish were collected and five different species. The stream's temperature was recorded at 18.5℃, which is less than the threshold (21℃) necessary for Brook Trout survival, however the overall habitat was not complex and it was scored as 101 in habitat assessment. Additionally, GIS maps show this stream flowing out of a residential neighborhood in the upper sections, potentially leading to water quality degradation. Possibly Brook Trout existed in this stream at one time, but it does not seem likely that the one taken in 2007 came from this source. It seems more likely that local public-school districts that were participating in the Trout in the Classroom (TIC) program that raised and released Brook Trout at the time were the source of the fish in question.

Recommendation: Additional surveys may be necessary to investigate wild trout production. (Collenburg)

Pequannock River (trib.)(W. of Federal Hill)

Date: 07/13/2017
County: Passaic
Township: Bloomingdale
Drainage: Passaic River - Upper
Project: Brook Trout Assessment
Location: **Hamburg Turnpike**

Fish Species	Number	Length (mm)
Chub, Creek	3	0 - 0
Dace, Blacknose	2	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 20.0
Dissolved Oxygen (mg/L): 7.94
Specific Conductance (uS/cm): 44.8
pH: 7.41
Alkalinity (mg/L): 25
Sample Length (m): 150
Habitat Assessment Score: 106 Marginal

Summary: This unnamed tributary flows into the Pequannock River from the north at the Township of Riverdale's Appelt Park and currently has a default classification of *Trout Production*. The water comes off the western side of a topographically raised piece of land known from GIS map layers as Federal Hill. This waterbody has never been previously sampled, but could be the source of the lone 128 mm Brook Trout that was collected in the October 2, 2007 Pequannock River survey that occurred within the Appelt Park area. In the Pequannock River watershed, no other Brook Trout have ever been gathered in any other sampling events conducted, until surveys occur above Charlottesburg Reservoir. Wild populations of Brown Trout are known to exist below the impoundment. In this current survey, no Brook Trout were found and only 5 total fish of either two species, Creek Chub or Blacknose Dace, were produced. The stream's temperature was recorded at 20°C, which is less than the threshold (21°C) necessary for Brook Trout survival), however it was also very shallow (average 0.1 m) and habitat has been degraded. Additionally, the stream flows out of a pond closer to the source, potentially leading to water quality degradation as well. Brook Trout possibly existed in this stream at one time, but it does not seem likely that the one taken in 2007 came from this source. Poor habitat conditions caused by human impacts are likely reasons that Brook Trout are absent here.

Recommendation: Additional surveys are not necessary in this section. (Collenburg)

Stream Surveys in the Lower Passaic & Upper Atlantic Region

(Lower Passaic, Saddle, Hackensack, Pascack, & Elizabeth to Toms)

Bear Brook (Park Ridge)

Date: 08/14/2017
County: Bergen
Township: Park Ridge Boro
Drainage: Hackensack River
Project: Classification
Location: **Pine Drive**

Fish Species	Number	Length (mm)
Carp, Common	3	0 - 0
Chub, Creek	114	0 - 0
Dace, Blacknose	36	0 - 0
Dace, Longnose	86	0 - 0
Sucker, White	14	0 - 0
Sunfish, Pumpkinseed	133	0 - 0
Trout, Brown	1	236 - 2

Water Chemistry / Habitat

Water Temperature (°C): 19.1
Dissolved Oxygen (mg/L): 9.89
Specific Conductance (uS/cm): 988
pH: 7.82
Alkalinity (mg/L): N/A
Sample Length (m): 150
Habitat Assessment Score: 154 Sub-Optimal

Summary: This *Non-Trout* tributary to Woodcliff Lake was backpack electrofished at Pine Drive, Park Ridge, NJ on 8/14/17. An angler called to report that, in the 1960's, he had caught trout at this site. The area is locally known as Atkins Glen. The brook runs through a wooded ravine with steep sides at the top of which there is a high density of individual homes. The brook has a cobble, pebble and gravel bottom, with pools and riffles. It has the appearance of a trout stream. Creek Chub (114), Common Carp (3), Blacknose Dace (36), Longnose Dace (86), White Sucker (14), Pumpkinseed (2), and one wild Brown Trout (236 mm) were collected. The water temperature was 19.1℃. This site was just upstream of the site where a Brown Trout (hatchery origin) was collected on 8/5/16 (the first time Bear Brook was ever sampled). Woodcliff Lake, into which Bear Brook flows, is a water supply reservoir owned by Suez North America, a private utility. Shoreline fishing is allowed on a permit basis. It has never been stocked. Trout are stocked by NJDFW in the spring and fall in Mill Pond, Park Ridge, approximately one mile upstream of Woodcliff Lake Reservoir.

Recommendation: Monitor this section and upstream in the future to determine if more trout are present / reproducing. (Boriek)

Cresskill Brook

Date: 08/21/2017
County: Bergen
Township: Alpine Boro
Drainage: Hackensack River
Project: Brook Trout Assessment
Location: **Church Street, upstream of bridge**

Fish Species	Number	Length (mm)
Dace, Blacknose	346	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 17.4
Dissolved Oxygen (mg/L): 9.66
Specific Conductance (uS/cm): 634
pH: 7.53
Alkalinity (mg/L): 124.5
Sample Length (m): 150
Habitat Assessment Score: 152 Sub-Optimal

Summary: This sole *Trout Production* stream in the Hackensack River drainage is a tributary to Tenakill Brook. On 8/21/17 it was backpack electofished for the first time at Church Rd. This is the most upstream site ever sampled. As no Brook Trout were collected in 2016 and 2017 at the two downstream sites (Duck Pond Rd. & the restored site), it was conjectured that the trout may have moved upstream to this site. Unfortunately, no trout were collected. Blacknose Dace (346) were collected. The water temperature was 17.4°C.

Recommendation: This *Trout Production* stream will be monitored in this section next year. If no Brook Trout are collected at that time, their population will be deemed extirpated. (Boriek)

Cresskill Brook

Date: 08/08/2017
County: Bergen
Township: Alpine Boro
Drainage: Hackensack River
Project: Brook Trout Assessment
Location: **Duck Pond Road, upstream**

Fish Species	Number	Length (mm)
Dace, Blacknose	437	0 - 0
Sunfish, Green	1	0 - 0
Sunfish, Pumpkinseed	1	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 18.2
Dissolved Oxygen (mg/L): 8.68
Specific Conductance (uS/cm): 412.5
pH: 7.91
Alkalinity (mg/L): 90
Sample Length (m): 150
Habitat Assessment Score: 140 Sub-Optimal

Summary: This sole *Trout Production* stream in the Hackensack River drainage is a tributary to Tenakill Brook. On 8/8/17 Cresskill Brook was backpack electrofished at its regular monitoring site, upstream of Duck Pond Rd. No Trout were collected. Blacknose Dace (437) were collected. The water temperature was 18.2℃. In 2016, 315 Blacknose Dace (315) were collected. In 2009 Brook Trout (20) were collected (no young-of-the-year). Blacknose Dace (189) were also collected at that time.

Recommendation: This *Trout Production* stream will be monitored in this section next year. If no Brook Trout are collected at that time, their population will be deemed extirpated. A water temperature logger should be installed in this section to determine if this book is suitable for the reintroduction of Brook Trout. (Boriek)

Cresskill Brook

Date: 08/08/2017
County: Bergen
Township: Demarest Boro
Drainage: Hackensack River
Project: Brook Trout Assessment
Location: **Deer Hill Rd. (Wruble Property)**
House #9 removed concrete pool site

Fish Species	Number	Length (mm)
Dace, Blacknose	637	0 - 0
Sunfish, Green	1	0 - 0
Sunfish, Pumpkinseed	1	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 18.8
Dissolved Oxygen (mg/L): 8.93
Specific Conductance (uS/cm): 533.2
pH: 7.65
Alkalinity (mg/L): **77**
Sample Length (m): 150
Habitat Assessment Score: 155 Sub-Optimal

Summary: This sole *Trout Production* stream in the Hackensack River drainage is a tributary to Tenakill Brook. The *Non-Trout* section was backpack electrofished on 8/8/17 at a section that had been restored in 2011 after an on-stream cement swimming pool was removed. No trout were collected. Blacknose Dace (637), Green Sunfish (1) and Pumpkinseed Sunfish (1) were collected. The water temperature was 18.8°C. In 2016, no Trout were collected and the majority of fish collected were Blacknose Dace. In 2010, prior to the restoration, electrofishing revealed Brook Trout (5), including one young-of-the-year. Pumpkinseed (2), Brown Bullhead (2), and Blacknose Dace (275) were also collected at that time.

Recommendation: This *Trout Production* stream will be monitored in this restored section next year. If no Brook Trout are collected at that time, their population will be deemed extirpated. (Boriek)

Peach Orchard Brook

Date: 06/17/2017
County: Union
Township: Roselle Boro
Drainage: Morses Creek
Project: General Fisheries Survey
Location: **Warinanco Park Roadway, within park**

Fish Species	Number	Length (mm)
Hybrid, Sunfish	2	0 - 0
Killifish, Banded	45	0 - 0
Mummichog	7	0 - 0
Sunfish, Bluegill	1	0 - 0
Sunfish, Green	36	0 - 0
Sunfish, Pumpkinseed	10	0 - 0

Water Chemistry / Habitat

Water Temperature (°C):
Dissolved Oxygen (mg/L):
Specific Conductance (uS/cm):
pH:
Alkalinity (mg/L):
Sample Length (m): 280
Habitat Assessment Score: N/A

Summary: Union County's 2017 BioBlitz was held at Warinanco Park on 6/17/17. The fish team, led by New Jersey Department of Environmental Protection, Division of Fish and Wildlife, sampled Warinanco Park Pond and Peach Orchard Brook. The team used a variety of sampling methods including boat electro-shocking (using mild electrical currents to temporarily stun the fish for easy capture and identification) and seining. Eleven fish species were collected within the park, five of which were found in Peach Orchard Brook during a non-standardized backpack electrofishing survey that spanned approximately 280 m. Native species include Pumpkinseed, Banded Killifish, and Mummichog. Non-native species include Bluegill and the invasive Green Sunfish. Fish were displayed for the public in an aquarium and was popular among children, that were excited to handle many of the fishes collected from the park they also learned fish identification.

Recommendation: No additional surveys in this Peach Orchard Brook are necessary at this time. (Crouse)

*******NON – STANDARDIZED SURVEY*******

St. Gabriel Brook

Date: 08/03/2017
County: Bergen
Township: Saddle River Boro
Drainage: Saddle River
Project: Classification
Location: **107 E. Saddle River Road**

Fish Species	Number	Length (mm)
Bass, Largemouth	1	0 - 0
Chub, Creek	174	0 - 0
Dace, Blacknose	121	0 - 0
Darter, Tessellated	25	0 - 0
Sucker, White	1	0 - 0
Sunfish, Bluegill	1	0 - 0
Sunfish, Green	4	0 - 0
Weatherfish, Oriental	3	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 17.6
Dissolved Oxygen (mg/L): 10.92
Specific Conductance (uS/cm): 523.6
pH: 7.75
Alkalinity (mg/L): 138.5
Sample Length (m): 150
Habitat Assessment Score: 135 Sub-Optimal

Summary: This tributary to the trout stocked, *Non-Trout* classified Saddle River had never been sampled. A local angler called to report that he caught wild Brown Trout there. He was concerned about the negative effects of a proposed nearby equestrian center. The creek was narrow and partially shaded. It had a moderately low flow. Backpack electrofishing on 8/3/17 revealed Creek Chubs (174), Blacknose Dace (121), Tessellated Darters (25), White Sucker (1), Bluegill (1), Green Sunfish (4), and Oriental Weatherfish (3). The invasive Green Sunfish and Oriental Weatherfish were removed. Oriental Weatherfish have been known in the Saddle River drainage. No Trout were collected. The water temperature was 17.6°C.

Recommendation: No future sampling is required. (Boriek)

Stream Surveys in the Raritan Region

(Mainstem Raritan River and all tributaries)

Beaver Brook (Hunterdon)

Date: 08/16/2017
County: Hunterdon
Township: Clinton Twp.
Drainage: Raritan River - South Branch
Project: Trout Stocking Discontinued
Location: **Old Allerton Road, end at USGS dam**

Water Chemistry / Habitat

Water Temperature (°C):	19
Dissolved Oxygen (mg/L):	9.14
Specific Conductance (uS/cm):	504.6
pH:	7.95
Alkalinity (mg/L):	96.5
Sample Length (m):	150
Habitat Assessment Score:	124 Sub-Optimal

Fish Species	Number	Length (mm)
Bass, Largemouth	1	77 - 77
Chub, Creek	10	0 - 0
Dace, Blacknose	60	0 - 0
Dace, Longnose	42	0 - 0
Darter, Tessellated	62	0 - 0
Eel, American	24	0 - 0
Shiner, Common	1	0 - 0
Sucker, White	6	0 - 0
Sunfish, Bluegill	1	0 - 0
Sunfish, Green	4	80 - 116
Trout, Brown	4	172 - 355
Trout, Brown (YOY)	13	75 - 112
Trout, Rainbow	1	395 - 395

Summary: NJDFW discontinued stocking trout in eight small trout production streams during the period 2005 – 2010. This management action was taken to protect New Jersey's wild trout resources and to better utilize hatchery trout in waters not having self-sustaining trout populations. As of February, 2018, Beaver Brook (Clinton) is managed as a *Wild Trout Stream*, under the new *Wild Brown Trout Enhancement* regulation and will no longer be stocked. Recent angler count surveys indicate to poor angler usage. Two electrofishing surveys were conducted in 2017 along this stream to obtain baseline data prior to cessation of trout stocking. The second survey was located upstream of Old Allerton Road in Clinton. Despite the close proximity of a suite of human impacts within the watershed, consisting of developments, a golf course, many roads and impervious surfaces, Beaver Brook, wild Brown Trout persist. Seventeen Brown Trout, including 14 young-of-the-year (YOY) and one stocked Rainbow Trout was collected during this survey on 8/16/17. The largest Brown Trout measured 355 mm (14.0 inches). The Allerton Road site was also surveyed 2001, in which 40 YOY and 7 older fish were collected, however none were over 9 inches. Another survey was conducted downstream from this location this summer, in which six Brown Trout were collected, none of which were YOY. Water temperature at the time of the survey was adequate at 19.0℃ (66.2℉). Previous surveys along this stream have consistently produced wild Brown Trout. In 2015, 25 wild Brown Trout and 4 stocked Rainbow Trout were captured upstream of Leigh Street. Five of the Brown Trout were over 229 mm (9 in), which may indicate a desirable fishery, however concern was warranted for the sustainability of Brown Trout in Beaver Brook, because only four YOY were found. This concern was heightened in 2017, when only six Brown Trout were captured, none of which were YOY. Flows in this stream are typically very low during summer months. Drought conditions experienced from fall of 2015 through the winter of 2016-17 likely put additional stress on this population. A survey was conducted during the summer of 2012, nearly five miles upstream in Clinton, in which 25 YOY and 24 older than YOY were encountered, five of which exceeded 9 inches. The Green Sunfish were removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: Additional surveys will be conducted at this location in 2018 and subsequent summers to provide comparative data that will be used to assess changes to the fish assemblage after cessation of trout stocking and this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 5 years for streams designated *Wild Trout Streams*). (Crouse)

Beaver Brook (Hunterdon)

Date: 08/16/2017
County: Hunterdon
Township: Clinton Town
Drainage: Raritan River - South Branch
Project: Trout Stocking Discontinued
Location: **Old Highway 22, upstream of Leigh Street**

Water Chemistry / Habitat

Water Temperature (°C):	20.7
Dissolved Oxygen (mg/L):	
Specific Conductance (uS/cm):	553
pH:	8.11
Alkalinity (mg/L):	120
Sample Length (m):	150
Habitat Assessment Score:	114 Sub-Optimal

Fish Species	Number	Length (mm)
Chub, Creek	18	0 - 0
Dace, Blacknose	57	0 - 0
Dace, Longnose	12	0 - 0
Darter, Tessellated	47	0 - 0
Eel, American	15	0 - 0
Shiner, Common	1	0 - 0
Shiner, Spottail	2	0 - 0
Sucker, White	29	0 - 0
Sunfish, Bluegill	1	112 - 112
Sunfish, Green	1	113 - 113
Sunfish, Pumpkinseed	1	95 - 95
Trout, Brown	6	204 - 296
Trout, Rainbow	3	288 - 319

Summary: NJDFW discontinued stocking trout in eight small trout production streams during the period 2005 – 2010. This management action was taken to protect New Jersey's wild trout resources and to better utilize hatchery trout in waters not having self-sustaining trout populations. As of February, 2018, Beaver Brook (Clinton) is managed as a *Wild Trout Stream*, under the new *Wild Brown Trout Enhancement* regulation and will no longer be stocked. Recent angler count surveys indicate to poor angler usage. Two electrofishing surveys were conducted in 2017 along this stream to obtain baseline data prior to cessation of trout stocking. The first survey was located upstream of the Leigh Street bridge in Clinton. Despite the close proximity of a suite of human impacts within the watershed, consisting of developments, a golf course, many roads and impervious surfaces, Beaver Brook has reproducing Brown Trout. Last sampled on August 28, 2015, 25 wild Brown Trout and 4 stocked Rainbow Trout were captured in a 150-m sampling reach. Five of Brown Trout were over 229 mm (9 in), which may indicate a desirable fishery, however concern is warranted for the sustainability of Brown Trout in Beaver Brook, because only four young-of-the-year (YOY) were found. This concern was heightened in 2017, when only six Brown Trout were captured, none of which were YOY. Water temperature was not terribly elevated at the time of survey (20.7℃ / 69.3℉). Flows in this stream are typically very low during summer months. Drought conditions experienced from fall of 2015 through the winter of 2016-17 likely put additional stress on this population. Another survey was conducted upstream from this location at Allerton Road this summer, in which 17 Brown Trout, including 13 YOY were captured. The Allerton Road site was also surveyed 2001, in which 40 YOY and 7 older fish were collected, however none were over 9 inches. A survey was conducted during the summer of 2012, nearly five miles upstream of the sites in Clinton, in which 25 YOY and 24 older than YOY were encountered, five of which exceeded 9 inches. The Green Sunfish was removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: Additional surveys will be conducted at this location in 2018 and subsequent summers to provide comparative data that will be used to assess changes to the fish assemblage after cessation of trout stocking and this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 5 years for streams designated *Wild Trout Streams*). (Crouse)

Black Brook (Hunterdon)

Date: 08/10/2017
County: Hunterdon
Township: Union Twp.-Hunterdon Co.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Van Syckles Road**

Fish Species	Number	Length (mm)
Chub, Creek	103	0 - 0
Dace, Blacknose	108	0 - 0
Dace, Longnose	16	0 - 0
Darter, Tessellated	13	0 - 0
Shiner, Spotfin	3	0 - 0
Trout, Brown	5	197 - 260

Water Chemistry / Habitat

Water Temperature (°C): 15.6
Dissolved Oxygen (mg/L): 9.74
Specific Conductance (uS/cm): 152.6
pH: 7.50
Alkalinity (mg/L): 27
Sample Length (m): 150
Habitat Assessment Score: 145 Sub-Optimal

Summary: Black Brook is a small stream that flows into the Spruce Run Reservoir in Hunterdon County and is currently classified as *Trout Production* (*TP*). It was regulated as a *Wild Trout Stream* until 2018 when it was dropped from the regulations due to a low population size. A backpack electrofishing survey was conducted here on 8/10/17 to collect more data for the purpose of assessing the wild trout population structure relative to the stream temperature regime. Since construction of the Spruce Run Reservoir (in 1964) and the management practices implemented since it is construction (trout stocking in the reservoir), wild trout populations have been in flux. Brook Trout and Rainbow Trout were originally found here in surveys conducted in 1969 and 1976. Brown Trout were first documented in 2003, and it was also the last survey that Rainbow Trout and Brook Trout were documented. Surveys conducted in 2014, 2015, and 2016 found a small population of wild Brown Trout (captured 11, 13, and 11 wild Brown Trout in each respective survey) remain in this small tributary. No more than 32 trout (in 1969) have been captured in any survey. A total of 5 wild Brown Trout ranging from 197 - 260 mm were encountered during the survey. The wild Brown Trout population continues to persist here, but the small population size and extirpation of Brook Trout are indicators of a stressed salmonid environment.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *TP* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 20 years for streams having wild Brown and/or Rainbow Trout). (Collenburg)

Drakes Brook (trib.)(Mt. Olive)

Date: 07/26/2017
County: Morris
Township: Mount Olive Twp.
Drainage: Raritan River - South Branch
Project: Trout Production Re-Inventory
Location: **Flanders-Bartley Road**

Fish Species	Number	Length (mm)
Bass, Largemouth	1	40 - 40
Dace, Blacknose	111	0 - 0
Sunfish, Pumpkinseed	8	80 - 103
Unknown Gambusia spp.	1	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 16.2
Dissolved Oxygen (mg/L): 9.29
Specific Conductance (uS/cm): 330.9
pH: 7.83
Alkalinity (mg/L): 31
Sample Length (m): 15
Habitat Assessment Score: 124 Sub-Optimal

Summary: This unnamed tributary to Drakes Brook was last surveyed in 1994. The presence of one young-of-the-year (YOY) Brook Trout obtained during the 1994 survey resulted in the upgrade of its surface water classification from *Non-Trout* to *Trout Production*. Other fish previously encountered included Blacknose Dace (100+), Creek Chub (35), Bluegill (3), and Green Sunfish (1). Unfortunately, no trout were found during the survey conducted on 7/26/17. The numbers of Blacknose Dace (111) and sunfish species were similar to the 1994 survey. A substantial rock dam 53 m upstream from the Flanders-Bartley Road bridge, that may have been constructed since the 1994 survey. This dam has resulted in a substantial amount of sand deposition on the upstream side and prevents fish passage. The 2017 survey was conducted upstream of this dam, whereas the 1994 survey notes indicate the survey was centered around the bridge. Water temperature (16.2℃) was suitable at the time of survey. The habitat assessment was sub-optimal, with a score of 141, losing points for its shallowness, the dam, and its lack of a riparian buffer downstream of the survey area.

Recommendation: The lack of wild trout at this location is concerning, therefore follow up surveys should be conducted in the near future to determine if Brook Trout have been extirpated from this stream section. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Crouse)

Electric Brook

Date: 07/19/2017
County: Morris
Township: Washington Twp.-Morris Co.
Drainage: Raritan River - South Branch
Project: Brook Trout Assessment
Location: **Fairview Avenue**

Fish Species	Number	Length (mm)
Chub, Creek	64	0 - 0
Dace, Blacknose	290	0 - 0
Dace, Longnose	12	0 - 0
Trout, Brown (YOY)	3	61 - 66
Trout, Brown	1	218 - 218

Water Chemistry / Habitat

Water Temperature (°C): 22.3
Dissolved Oxygen (mg/L): 8.42
Specific Conductance (uS/cm): 290.5
pH: 7.96
Alkalinity (mg/L): 40.5
Sample Length (m): 150
Habitat Assessment Score: 139 Sub-Optimal

Summary: An electrofishing survey was conducted on 7/19/17 on a section of Electric Brook that is a braid that connects to a tributary referred to as Raritan River S/B (trib.)(Long Valley), both of which are *Trout Production* streams. Its confluence with the South Branch is within the portion that as of February, 2018 is regulated as a *Wild Trout Stream – multiple wild trout species present*, which is just upstream of the boundary managed as a *Trout Stocked Stream – Wild Brown Trout Managed*. When Electric Brook was last surveyed in 2012 and 2007, Brook Trout were in low numbers (1 and 2 respectively) and Brown Trout were abundant (52 and 72 respectively). The receiving stream, Raritan River S/B (trib.)(Long Valley), was last surveyed in 1996, a 600ft (183m) survey was sampled and 20 Brook Trout young-of-the-year (YOY) were found (extrapolated to 16 for comparison to the current standard of 150 m). Notes from the 1996 survey also indicate that "many more were missed."

Unfortunately, no Brook Trout and only 4 wild Brown Trout were encountered in the 2017 survey. Water temperature was considered high at 22.3℃ when recorded this year. A second indication of a stressed system is that the number of Blacknose Dace (290) and an abundance of Creek Chubs (64) were found. The lack of Brook Trout may be due to a combination of factors, including but not limited to elevated water temperatures and competition with and predation by Brown Trout. In addition, it is not known whether or not this section of stream has constant flow, as its source (Electric Brook) has 2 distinct flow paths. The habitat assessment scored a sub-optimal value of 139, losing points primarily due to its shallow and wide nature and lack of riparian vegetation understory. A dam immediately downstream of the bridge on Fairview Avenue impounds water and fragments habitat, which means that recolonization of Brook Trout would have to come from Electric Brook only.

Recommendation: No further surveys are necessary at this location. Electric Brook should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Crouse)

Hickory Run

Date: 08/11/2017
County: Hunterdon
Township: Lebanon Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Hickory Run Road**

Water Chemistry / Habitat

Water Temperature (°C): 16.9
Dissolved Oxygen (mg/L): 9.3
Specific Conductance (uS/cm): 205
pH: 7.52
Alkalinity (mg/L): 31.5
Sample Length (m): 150
Habitat Assessment Score: 183 Optimal

Fish Species	Number	Length (mm)
Bass, Largemouth	1	107 - 107
Chub, Creek	12	0 - 0
Dace, Blacknose	11	0 - 0
Sunfish, Bluegill	1	144 - 144
Trout, Brook (YOY)	102	46 - 94
Trout, Brook	32	110 - 202

Summary: This tributary to the South Branch of the Raritan River was electrofished on 8/11/17 to assess the wild trout population structure relative to the stream temperature regime. A survey conducted in 1969, upstream of Hickory Farm Dairy, found a wild Rainbow Trout population, but the last survey to document wild Rainbow Trout in this location was in 2002. Furthermore, wild Brook Trout were not documented here until 2002. Rainbow Trout were historically stocked in the farm pond located on the stream but this has been discontinued. It could be the stocking of Rainbow Trout was supplementing the naturally reproducing population, but then declined and has been replaced by Brook Trout that were able to more successfully occupy this stream. Downstream of this pond, a mixed population of Brown Trout and Brook Trout exists and the small dam is acting as a barrier to the passage of Brown Trout. This survey was conducted upstream of the Hickory Farm dam. Species encountered in this survey included 124 wild Brook Trout. The number of Brook Trout here has fluctuated each of the last four years from 254 (221 YOY) to 198 (125 YOY) to 92 (36 YOY) to 124 (134 YOY). One of the objectives of this study is to understand these types of population fluctuations, the causative factors that are influencing them, and what implications it has on the standard operating procedures of stream electrofishing surveys. This stream is regulated under the new set of *Wild Trout Stream* regulations as a *Native Brook Trout Stream*.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* (*TP*) streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored with the schedule established for *TP* streams (minimum of once every 5 years for streams designated *Wild Trout Stream*). (Collenburg)

Lamington (Black) River (Trib) (Ironia)

Date: 07/26/2017
County: Morris
Township: Randolph Twp.
Drainage: Raritan River - North Branch
Project: Trout Production Re-Inventory
Location: **Pleasant Hill Road**

Fish Species	Number	Length (mm)
No Fish Found		

Water Chemistry / Habitat

Water Temperature (°C): 13.7
Dissolved Oxygen (mg/L): 10.5
Specific Conductance (uS/cm): 396
pH: 7.44
Alkalinity (mg/L): 44.0
Sample Length (m): 150
Habitat Assessment Score: 124 Sub-Optimal

Summary: Prior to being surveyed in 1995, this unnamed tributary to the Lamington River was classified by default as *Non-Trout*. Electrofishing results in 1995 discovered 44 Brook Trout, 5 of which were older than young-of-the-year (YOY), which substantiated the stream's classification to be upgraded to *Trout Production*. Unfortunately, when surveyed this year no fish were found. Many frogs, salamanders, and worms responded to the electrical current, therefore ruling out faulty equipment. Water temperature (13.7°C) and quality at the time of survey were adequate for trout survival. The habitat assessment scored sub-optimal (143) and instream habitat looked really good, however human impact was obvious as several stormwater discharge pipes, a perched culvert, and an abundance of garbage (primarily lumber, tarps, and beverage containers) was found throughout the reach. Drought conditions that persisted from the fall of 2015 through the summer of 2016 is a possible explanation for the lack of fish.

Recommendation: Subsequent electrofishing surveys should be done in this tributary to determine the extent of the fishless condition. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). Additional inquiries should be pursued in an attempt to determine impacts and limiting factors within the watershed. (Crouse)

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Millstone River

Date: 05/12/2017
County: Somerset
Township: Franklin Twp.-Somerset Co.
Drainage: Millstone River
Project: Millstone River Restoration
Location: **Griggstown Causeway**

Water Chemistry / Habitat

Water Temperature (°C):	14.6
Dissolved Oxygen (mg/L):	7.4
Specific Conductance (uS/cm):	307.4
pH:	7.82
Alkalinity (mg/L):	45.5
Sample Length (m):	86
Habitat Assessment Score:	N/A

Fish Species	Number	Length (mm)
Dace, Blacknose	1	0 - 0
Dace, Longnose	2	0 - 0
Darter, Shield	1	0 - 0
Darter, Tessellated	35	0 - 0
Eel, American	44	0 - 0
Fallfish	1	0 - 0
Killifish, Banded	15	0 - 0
Madtom, Tadpole	1	0 - 0
Pickerel, Chain	1	275 - 275
Shiner, Common	2	0 - 0
Shiner, Satinfin	3	0 - 0
Shiner, Spottail	38	0 - 0
Sucker, White	8	0 - 0
Sunfish, Bluegill	7	40 - 110
Sunfish, Pumpkinseed	1	116 - 116
Sunfish, Redbreast	2	50 - 58
Unknown Gambusia spp.	2	0 - 0

Summary: In anticipation of the removal of the Weston Causeway Dam on the Millstone River, a fish assemblage study was initiated during the fall of 2016. The first spring electrofishing survey was conducted approximately 9 miles upstream at the Griggstown Causeway with a Smith Root electrofishing barge. A standardized survey of 150 m could not be conducted due to excessive depth due to high spring flows of 207 CFS. As a result, only 86 m could be surveyed. This limited survey resulted in only 164 individual fish and only 17 species, all but the Bluegill and Mosquitofish sp. (*Gambusia*) of native origin. The most abundant fish at this location was the American Eel, composing 44 individuals, most of which were collected in the rip-rap under the bridge. No anadromous species were encountered. One species soon to be listed as state *Special Concern*, the Shield Darter, was found during this survey. A second species of state Special Concern, the Comely Shiner, was found at this location during both fall sampling events. Tadpole Madtom was found at this location, which is one of the few locations in NJ it is found north of the geologic fall line.

Recommendation: Additional electrofishing surveys will be conducted at this location during each spring and fall season from now until the spring of 2020. (Crouse)

*******NON – STANDARDIZED SURVEY*******

Millstone River

Date: 10/02/2017
County: Somerset
Township: Franklin Twp.-Somerset Co.
Drainage: Millstone River
Project: Millstone River Restoration
Location: **Griggstown Causeway**

Water Chemistry / Habitat

Water Temperature (°C): 17
Dissolved Oxygen (mg/L): 5.77
Specific Conductance (uS/cm): 614
pH: 7.17
Alkalinity (mg/L): 64.5
Sample Length (m): 150
Habitat Assessment Score: N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	4	108 - 340
Bass, Rock	1	34 - 34
Bullhead, Yellow	2	175 - 200
Catfish, White	2	50 - 55
Chub, Creek	5	0 - 0
Crappie, Black	3	68 - 212
Dace, Blacknose	1	0 - 0
Dace, Longnose	10	0 - 0
Darter, Shield	6	0 - 0
Darter, Tessellated	142	0 - 0
Eel, American	145	0 - 0
Fallfish	4	0 - 0
Killifish, Banded	13	0 - 0
Lamprey, Sea	1	0 - 0
Madtom, Tadpole	1	0 - 0
Pickerel, Chain	1	188 - 188
Shiner, Comely	10	0 - 0
Shiner, Common	13	0 - 0
Shiner, Satinfin	24	0 - 0
Shiner, Spottail	328	0 - 0
Shiner, Swallowtail	30	0 - 0
Sucker, White	27	0 - 0
Sunfish, Bluegill	37	34 - 136
Sunfish, Green	5	42 - 89
Sunfish, Pumpkinseed	8	40 - 135
Sunfish, Redbreast	63	27 - 17

Summary: In anticipation of the removal of the Weston Causeway Dam on the Millstone River, a fish assemblage study was initiated during the fall of 2016. A second fall electrofishing survey was conducted approximately 9 miles upstream at the Griggstown Causeway with a Smith Root electrofishing barge. The fish assemblage was diverse at this location, with 26 species documented, 21 of which are native to NJ. The most abundant fish at this location was the Spottail Shiner, composing 328 of the 886 fishes found. The only anadromous species that has been encountered during any of the surveys at this location is the Sea Lamprey, which were also documented upstream of both the Blackwells Mills Dam and the Weston Causeway Dam in 2013, which was previous to the partial breaching of the dam. This indicated that neither dam was an impediment to Sea Lamprey migration. Two species soon to be listed as state *Special Concern* were found, including Comely Shiner and Shield Darter. Tadpole Madtom was found at this location, which is one of the few locations in NJ it is found north of the geologic fall line. This site consistently produces relatively few non-native piscivores (10 combined Largemouth Bass, Rock Bass, and the invasive Green Sunfish) and 37 Bluegills. The Green Sunfish were removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: Additional electrofishing surveys will be conducted at this location during each spring and fall season from now until the spring of 2020. (Crouse)

*******NON – STANDARDIZED SURVEY*******

Millstone River

Date: 05/12/2017
County: Somerset
Township: Franklin Twp.-Somerset Co.
Drainage: Millstone River
Project: Millstone River Restoration
Location: **Blackwells Mills Road Bridge**

Water Chemistry / Habitat

Water Temperature (°C):	14.3
Dissolved Oxygen (mg/L):	7.73
Specific Conductance (uS/cm):	300.2
pH:	7.99
Alkalinity (mg/L):	37.5
Sample Length (m):	150
Habitat Assessment Score:	N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	2	200 - 252
Bass, Rock	1	210 - 210
Bass, Smallmouth	2	203 - 273
Bullhead, Yellow	2	89 - 97
Catfish, Channel	1	552 - 552
Crappie, Black	1	166 - 166
Dace, Longnose	1	0 - 0
Darter, Tessellated	25	0 - 0
Eel, American	56	0 - 0
Killifish, Banded	3	0 - 0
Madtom, Margined	1	0 - 0
Madtom, Tadpole	2	0 - 0
Pickerel, Chain	2	205 - 239
Pickerel, Redfin	1	166 - 166
Shad, American	1	524 - 524
Sucker, White	2	0 - 0
Sunfish, Bluegill	22	31 - 150
Sunfish, Green	15	0 - 0
Sunfish, Pumpkinseed	9	60 - 134
Sunfish, Redbreast	46	34 - 170
Unknown Gambusia spp.	1	0 - 0

Summary: In anticipation of the removal of the Weston Causeway Dam on the Millstone River, a fish assemblage study was initiated during the fall of 2016. The first spring electrofishing survey was conducted approximately 5 miles upstream at the base of the Blackwells Mills Dam with a Smith Root electrofishing barge. There was a significant drop in the number of individual fish collected from last fall (731) to this spring (196), which can be attributed to the high spring flows of 207 CFS, as compared to typical fall base flows of 60 to 100 CFS. The fish assemblage is very diverse at this location, with over 30 species documented. The most significant capture was an American Shad. This indicates that they were able to traverse the partially breached Weston Causeway Dam. This site was also accessible to an abundance of American Eels, totaling 56 (20 < 200 mm and 36 ≥ 200 mm). Two species soon to be listed as state Special Concern (Comely Shiner and Shield Darter) were found last fall, but not during this survey. It should be noted that both of our state's madtom species were found here as well, this is significant because there are very few sites in NJ in which Margined Madtoms are found this far south and Tadpole Madtoms found this far north. The only invasive fish regulated as a potentially dangerous species was encountered upstream of the dam include Green Sunfish (15), however two Oriental Weatherfish were collected last fall. The Green Sunfish were removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: Additional electrofishing surveys will be conducted at this location during each spring and fall season from now until the spring of 2020. (Crouse)

*******NON – STANDARDIZED SURVEY*******

Millstone River

Date: 10/02/2017
County: Somerset
Township: Franklin Twp.-Somerset Co.
Drainage: Millstone River
Project: Millstone River Restoration
Location: **Blackwells Mills Road Bridge**

Water Chemistry / Habitat

Water Temperature (°C): 16.3
Dissolved Oxygen (mg/L): 6.02
Specific Conductance (uS/cm): 573.4
pH: 7.55
Alkalinity (mg/L): 63
Sample Length (m): 150
Habitat Assessment Score: N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	3	103 - 193
Bass, Smallmouth	3	197 - 385
Bullhead, Brown	4	130 - 166
Bullhead, Yellow	3	106 - 192
Catfish, Channel	1	151 - 151
Crappie, Black	8	172 - 223
Darter, Shield	6	0 - 0
Darter, Tessellated	77	0 - 0
Eel, American	72	0 - 0
Fallfish	10	0 - 0
Hybrid, Sunfish spp.	3	85 - 117
Madtom, Margined	4	0 - 0
Madtom, Tadpole	2	0 - 0
Pickerel, Chain	1	362 - 362
Pike, Northern	1	306 - 306
Shiner, Comely	5	0 - 0
Shiner, Common	4	0 - 0
Shiner, Satinfin	17	0 - 0
Shiner, Spottail	105	0 - 0
Sucker, White	26	0 - 0
Sunfish, Bluegill	109	54 - 193
Sunfish, Green	7	52 - 95
Sunfish, Pumpkinseed	7	76 - 120
Sunfish, Redbreast	106	44 - 164

Summary: In anticipation of the removal of the Weston Causeway Dam on the Millstone River, a fish assemblage study was initiated during the fall of 2016. The second fall electrofishing survey was conducted approximately 5 miles upstream at the base of the Blackwells Mills Dam with a Smith Root electrofishing barge. The total number of individual fish collected has rebounded from the poor number encountered during the high flows of last spring, in that 584 were handled. The fish assemblage is very diverse at this location, with over 30 species documented. Once again, an abundance of American Eels, totaling 72 (23 < 200 mm and 49 ≥ 200 mm). Three of the most commonly encountered species at this location typically are Bluegill, Redbreast Sunfish, and Spottail Shiner. Although not collected this spring, two species soon to be listed as state Special Concern (Comely Shiner and Shield Darter) were found during both fall surveys. Once again, both of our state's madtom species were found here as well, this is significant because there are very few sites in NJ in which Margined Madtoms are found this far south and Tadpole Madtoms found this far north. The only invasive fish regulated as a potentially dangerous species was encountered upstream of the dam include Green Sunfish (7), however two Oriental Weatherfish were collected last fall. All invasive species were removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: Additional electrofishing surveys will be conducted at this location during each spring and fall season from now until the spring of 2020. (Crouse)

*******NON – STANDARDIZED SURVEY*******

Mine Brook (trib.)(E. of Mine Mtn)

Date: 07/27/2017
County: Somerset
Township: Bernardsville Boro
Drainage: Raritan River - North Branch
Project: Trout Production Re-Inventory
Location: **Rippling Brook Way**

Fish Species	Number	Length (mm)
Chub, Creek	9	0 - 0
Dace, Blacknose	411	0 - 0
Sunfish, Bluegill	3	25 - 64
Sunfish, Green	1	65 - 65
Sunfish, Pumpkinseed	2	66 - 70
Trout, Brook	5	147 - 197

Water Chemistry / Habitat

Water Temperature (°C): 17.8
Dissolved Oxygen (mg/L): 9.02
Specific Conductance (uS/cm): 268.1
pH: 7.68
Alkalinity (mg/L): 45.5
Sample Length (m): 150
Habitat Assessment Score: 127 Sub-Optimal

Summary: This Bernardsville Boro tributary to the North Branch of the Raritan River was surveyed on 9/15/95 to classify its trout supporting capability. Data obtained warranted its upgrade from a default classification of *Non-Trout* to *Trout Production*. Wild Brook Trout (36) and Blacknose Dace (50) were captured in 1995. This stream was once again surveyed on 7/27/17 and only 5 Brook Trout ranging from 147 - 197 mm (5.8 – 7.8 in), with no young-of-the-year (YOY) present. The small population size and lack of YOY is concerning for the sustainability of Brook Trout in this stream. Other species encountered include Creek Chub (9), Bluegill (3), Pumpkinseed (2), Green Sunfish (invasive) (1), and an abundance of Blacknose Dace (411). Incidence of Occurrence value of 30.9 was calculated, as no YOY trout were found. This fish assemblage indicates a stressed stream condition; the Brook Trout appear to be struggling, a preponderance of the Blacknose Dace is present, and the other species are commonly found in moderately degraded lotic habitats. Other stressors noted include severe bank erosion and a large perched culvert fragmenting habitat. Although the riparian buffer in the immediate vicinity appears to be intact, Somerset Hills Country Club is in the headwaters of this tributary and likely explains the stream's flashiness as evident in erosional scars and incised channel. All things considered, it appears the Brook Trout population in this tributary is in trouble. The Green Sunfish was removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: The lack of YOY Brook Trout at this location is concerning, therefore follow up surveys should be conducted in the near future to determine if the Brook Trout population is viable. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Crouse)

Mine Brook (trib.)(S. of Mine Mtn)

Date: 07/27/2017
County: Somerset
Township: Bernardsville Boro
Drainage: Raritan River - North Branch
Project: Trout Production Re-Inventory
Location: **Douglass Avenue**

Fish Species	Number	Length (mm)
Bass, Largemouth	3	36 - 40
Chub, Creek	57	0 - 0
Dace, Blacknose	79	0 - 0
Darter, Tessellated	43	0 - 0
Sucker, White	1	0 - 0
Sunfish, Green	23	63 - 114
Sunfish, Pumpkinseed	21	59 - 91

Water Chemistry / Habitat

Water Temperature (°C): 15.9
Dissolved Oxygen (mg/L): 9.96
Specific Conductance (uS/cm): 277.4
pH: 7.75
Alkalinity (mg/L): 44.5
Sample Length (m): 105
Habitat Assessment Score: 123 Sub-Optimal

Summary: An electrofishing survey was first conducted on this tributary to Mine Brook on 9/15/95. At that time 19 Brook Trout and 60 Blacknose Dace were collected, resulting in the recommendation to upgrade its surface water classification from its *Non-Trout* default to *Trout Production*. It was once again sampled on 7/27/17 and unfortunately no trout were encountered. Although this stream is classified as *Trout Production* from its source downstream to the Douglass Road bridge, it comes as no surprise that Brook Trout were not found here. The fish assemblage in this section of stream reflects the surrounding landscape, as an extensive complex of ponds are found both upstream and downstream. It consists of typical tolerant stream (lotic) fishes such as Blacknose Dace (79), Creek Chub (57), Tessellated Darter (43), and White Sucker (1), in addition to species better suited to non-moving (lentic) water such as Largemouth Bass (3), Pumpkinseed (21), and Green Sunfish (invasive) (12). An Incidence of Occurrence value of 17.1 (*Non-Trout*) was calculated, however *Trout Production* streams are not downgraded. A small dam at the upper end of the sample reach blocks fish passage, diverts water into 1.5-acre pond, reduces flow in in a section of the stream before it reenters the stream with water that has been warmed in the pond. The bridge at Douglass Avenue is lined with riprap along the upstream side and has a perched culvert at lower end. Water temperature at the time of survey was suitable for trout (15.9°C), however it was recorded just after 9am and is not likely indicative of its upper thermal limits, as moderate amount of solar radiation that reach the stream in this area and the impoundments likely warm the stream to a greater extent during periods of elevated air temperatures. The habitat was sub-optimal (123) losing points primarily due to the amount of sediment in pools, the alteration of the channel in the form of onstream impoundments, diversions, and culverts and impacts to the riparian area. The Green Sunfish was removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: Under the existing conditions, it is not likely that Brook Trout will re-establish in this stretch of stream. Additional surveys should be conducted along this stream to determine if Brook Trout have been extirpated. A monitoring schedule will follow. (Crouse)

Oakdale Creek

Date: 07/26/2017
County: Morris
Township: Chester Twp.
Drainage: Raritan River - North Branch
Project: Trout Production Re-Inventory
Location: **Oakdale Road**

Fish Species	Number	Length (mm)
Chub, Creek	29	0 - 0
Dace, Blacknose	249	0 - 0
Eel, American	2	0 - 0
Lamprey, American Brook	6	0 - 0
Mudminnow, Eastern	7	0 - 0
Pickerel, Redfin	1	157 - 157
Shiner, Golden	3	0 - 0
Sunfish, Green	1	159 - 159
Trout, Brook	32	137 - 246
Trout, Brook	66	49 - 163

Water Chemistry / Habitat

Water Temperature (°C): 15.1
Dissolved Oxygen (mg/L): 10.1
Specific Conductance (uS/cm): 430.5
pH: 8.43
Alkalinity (mg/L): 45
Sample Length (m): 150
Habitat Assessment Score: 174 Optimal

Summary: Previous to this electrofishing survey, only one standardized survey was conducted on Oakdale Creek. The survey was conducted in November of 1970 and 12 wild Brook Trout were caught, totaling 0.8 lbs. Other fish captured included Redfin Pickerel (16), Eastern Mudminnows (8), and White Suckers (3). A total of 99 Brook Trout were collected 7/26/17. The population consisted of 67 young-of-the-year (YOY) and 32 older than YOY with an impressive number (10) over 8 inches (203 mm). This survey confirms the surface water classification of *Trout Production*. (Note: DEP's Surface Water Standards GIS layer incorrectly identifies this stream as *Non-Trout*.) The stream section that was surveyed contained several deep pools, in excess of 0.6 m deep, which is substantial for its narrow width which averages 1.5 m wide. Although the entire reach held Brook Trout, the larger individuals were congregated in these pools. Although this stream is encroached by several roads and is fragmented by bridges and small dams, and invaded by Japanese Knotweed and Multiflora Rose, its riparian buffer and canopy are dense, which is serving to shade the stream very well. In fact, the canopy was so thick at several places, that the 150 m reach had to be adjusted to include the bridge on Oakdale Road. Stream temperature was 15.1°C. All but 1 of the 397 fish that were collected in this sample are native species. The only non-native species collected was a Green Sunfish (invasive) that was infested with Blackspot Disease and Yellow Grub, both parasitic flatworms (trematodes) encyst on the exterior of the host fish and are visible to the naked eye. Both require fish-eating birds, snails, and fish hosts to complete their life cycle. Both are common New Jersey waters and pose no threat to human health. The Green Sunfish was removed from the stream, as required by the regulations governing the possession or release of "potentially dangerous fish" (invasive).

Recommendation: No additional surveys are necessary at this time. This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). DEP's Surface Water Standards GIS layer should be revised to identify this stream as a *Trout Production* stream. (Crouse)

Raritan River S/B

Date: 08/24/2017
County: Morris
Township: Mount Olive Twp.
Drainage: Raritan River - South Branch
Project: South Branch Headwaters Study
Location: **River Road, upstream of Flanders-Drakestown Road**

Water Chemistry / Habitat

Water Temperature (°C):	19.7
Dissolved Oxygen (mg/L):	8.41
Specific Conductance (uS/cm):	518.4
pH:	7.55
Alkalinity (mg/L):	41.7
Sample Length (m):	2,414
Habitat Assessment Score:	N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	4	0 - 0
Bullhead, Yellow	12	0 - 0
Chub, Creek	110	0 - 0
Crappie, Black	2	0 - 0
Dace, Blacknose	300	0 - 0
Dace, Longnose	150	0 - 0
Darter, Tessellated	200	0 - 0
Eel, American	2	0 - 0
Killifish, Banded	1	0 - 0
Madtom, Margined	3	0 - 0
Mudminnow, Eastern	5	0 - 0
Pickerel, Chain	15	0 - 0
Pike, Northern	4	0 - 0
Shiner, Common	1	0 - 0
Shiner, Golden	1	0 - 0
Sucker, White	120	0 - 0
Sunfish, Bluegill	50	0 - 0
Sunfish, Pumpkinseed	50	0 - 0
Sunfish, Redbreast	5	0 - 0
Trout, Brook (YOY)	4	84 - 108
Trout, Brook	24	163 - 265

Summary: A 1.5 mile stretch of the Raritan River South Branch was surveyed in Mount Olive Twp. to determine if reproducing Brown Trout (non-native) have established upstream of the old YMCA dam, which was previously exclusive to wild Brook Trout (native). During the late 2000's, DEP Dam Safety determined that this dam was to either be removed or rehabilitated as it was deemed a hazard. Before a decision was made by the property owners, an intermediate position was taken by DEP Dam Safety in which it was determined suitable to notch the dam in order to relieve the head pressure and minimize potential negative impacts. This occurred in 2008 and subsequently, staff noticed the first wild Brown Trout above the dam, with an increasing number as time progressed, although young-of-the-year were never documented. Wild Brown Trout inhabiting the river below the dam were able to traverse the notch under high flow conditions. The dam was later rebuilt to an elevation similar to its original height, therefore the notch (dispersal path) was no longer present.

The establishment of reproducing Brown Trout would be considered a threat to the wild Brook Trout, and therefore considered deleterious. Fortunate for wild Brook Trout in this watershed, no Brown Trout were found during the summer of 2015 survey or during the recent survey on 8/24/17. Twenty-eight wild Brook Trout were found in this 1.5 mile stretch, which is an intermediate number as compared to the other eight identical surveys conducted from 2010 to through 2015 which produced 84, 40, 18, 3, 34, 91, 17, and 4 Brook Trout respectively. This wide range of numbers may convey population fluctuations or may be related to movement between the mainstem and its tributaries. Fortunately, several surveys also conducted this summer (and in recent years), indicate thriving Brook Trout populations in most of the tributaries upstream of the dam, therefore indicating the ability to recolonize.

Recommendation: Starting in 2018, this section of the river will be managed as a *Wild Trout Stream - Native Brook Trout Stream* and should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 5 years for streams designated *Wild Trout Streams*). No trout species should be stocked upstream of the YMCA dam. Periodically monitor the fish assemblage within this section of the South Branch of the Raritan River by repeating the techniques used during this survey. (Crouse)

*******NON – STANDARDIZED SURVEY*******

Raritan River S/B (trib.)(Drakestown)

Date: 08/29/2017
County: Morris
Township: Mount Olive Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Joy Drive**

Fish Species	Number	Length (mm)
Chub, Creek	34	0 - 0
Dace, Blacknose	88	0 - 0
Dace, Longnose	1	0 - 0
Darter, Tessellated	3	0 - 0
Pickerel, Chain	1	119 - 119
Sunfish, Bluegill	1	62 - 62
Trout, Brook (YOY)	46	62 - 102
Trout, Brook	14	124 - 179

Water Chemistry / Habitat

Water Temperature (°C): 14.1
Dissolved Oxygen (mg/L): 10.24
Specific Conductance (uS/cm): 345.2
pH: 7.34
Alkalinity (mg/L): 32.5
Sample Length (m): 150
Habitat Assessment Score: 176 Optimal

Summary: This tributary to the South Branch of the Raritan River was electrofished on 8/29/17 to assess the wild trout population structure relative to the stream temperature regime. Approximately ten electrofishing surveys have been conducted since 2009 at this location, primarily driven by Division hourly employee and Doctoral candidate Luke Diglio, who at the time, was conducting a study on this subwatershed. Data were gathered and a mark and recapture study was conducted as part of his doctoral dissertation titled, "An Assessment of New Jersey *Trout Production* Systems: A Movement Towards Sustainability." Surveys conducted here found an abundance of wild Brook Trout. Species encountered during this survey included 60 Brook Trout ranging from 62 – 179 mm (2.4 – 7.0 in), including 46 young-of-the-year (YOY). This is the fifth survey since 2011 that has been conducted in the same location and data is indicating that the total number of Brook Trout has the tendency to fluctuate. In 2011, 2012, 2015, 2016, and 2017 the total number of Brook Trout captured are 84 (64 YOY), 163 (107 YOY), 110 (38 YOY), 75 (37 YOY), and 60 (46 YOY) respectively. One of the objectives of this study is to understand these types of population fluctuations, the causative factors that are influencing them, and what implications it has on the standard operating procedures of stream electrofishing surveys.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* (*TP*) streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 20 years for streams having wild Brown and/or Rainbow Trout). (Collenburg)

Raritan River S/B (trib.)(S. of Hoffmans)

Date: 07/19/2017
County: Hunterdon
Township: Lebanon Twp.
Drainage: Raritan River - South Branch
Project: Trout Production Re-Inventory
Location: **KLG (Raritan River Road)**

Fish Species	Number	Length (mm)
Chub, Creek	4	0 - 0
Dace, Blacknose	39	0 - 0
Sunfish, Bluegill	5	50 - 81
Sunfish, Green	5	68 - 90
Trout, Brown (YOY)	3	66 - 77
Trout, Brown	4	138 - 165

Water Chemistry / Habitat

Water Temperature (°C): 22.9
Dissolved Oxygen (mg/L): 7.15
Specific Conductance (uS/cm): 175.3
pH: 7.86
Alkalinity (mg/L): 46
Sample Length (m): 97
Habitat Assessment Score: 160 Optimal

Summary: In an effort to monitor *Trout Production* stream every 20 years, this unnamed tributary that flows into the South Branch of the Raritan River was surveyed on 7/19/17. This tributary enters the South Branch near the middle of the Ken Lockwood Gorge WMA, which is managed as a *Catch and Release Area*. When last surveyed in 1996, 16 Brook Trout (7 young-of-the-year (YOY) and 9 older than YOY) and one Brown Trout YOY were encountered in a 600ft (183m) survey. Contemporary survey protocols call for a 150-m stream length to be electrofished, however only 97m were surveyed at this time due to a dense canopy of multiflora rose and a significantly braided channel. To better compare the two surveys, fish data were extrapolated to the 150-m standard. Since last surveyed, both water temperature (22.4℃ in 1996) and the extrapolated number of Blacknose Dace (57 in 1996 and 60 in 2017) remain comparable, however the extrapolated number Brown Trout are increasing (<1 in 1996 to 11 in 2017). It appears that Brook Trout no longer inhabit this section of the stream, as none were encountered. The physical habitat appears to be intact, consisting primarily of large boulders and cobble arranged in step pools at a relatively high gradient. One factor that may have contributed their disappearance includes the elevated water temperatures of 22.9℃ and the presence of Green Sunfish (5) and Bluegill (5), likely coming downstream from a pond owned by the Hunterdon County Educational Services Commission in the stream's headwaters. A second factor is the presence and/or increase of Brown Trout, which likely colonized upstream from the South Branch of the Raritan River. The potential loss of this Brook Trout in this location is concerning, as it is on the southern periphery of its core New Jersey range.

Recommendation: Additional surveys should be conducted along this stream to determine if Brook Trout have been extirpated. A monitoring schedule will be determined. (Crouse)

*******NON – STANDARDIZED SURVEY*******

Raritan River S/B (trib.)(S. of Schooleys Mtn)

Date: 07/31/2017
County: Morris
Township: Washington Twp.-Morris Co.
Drainage: Raritan River - South Branch
Project: Trout Production Re-Inventory
Location: **Columbia Trail - 1.2 miles North of Middle Valley Road**

Fish Species	Number	Length (mm)
Dace, Blacknose	2	0 - 0
Dace, Longnose	1	0 - 0
Sculpin, Slimy	7	0 - 0
Trout, Brook (YOY)	68	53 - 99
Trout, Brook	8	126 - 186
Trout, Brown	1	148 - 148
Trout, Brown (YOY)	4	63 - 74

Water Chemistry / Habitat

Water Temperature (°C): 14.4
Dissolved Oxygen (mg/L): 11.01
Specific Conductance (uS/cm): 228.8
pH: 7.44
Alkalinity (mg/L): 37.5
Sample Length (m): 150
Habitat Assessment Score: 159 Sub-Optimal

Summary: This unnamed *Trout Production* tributary flows into the South Branch of the Raritan River from the north between Long Valley and Middle Valley. As of February 2018, this section of the South Branch of the Raritan River is managed as a *Trout Stocked Stream – Wild Brown Trout Managed*. Last surveyed on 7/17/95, 17 Brook Trout (including 16 young-of-the-year (YOY) and 1 older individual), 1 YOY Brown Trout, and 25 Blacknose Dace were found. The electrofishing survey conducted on 7/31/17 produced promising results consisting of Brook Trout (76) (68 of which were YOY), Brown Trout (5) (4 of which were YOY), Slimy Sculpin (soon to be listed as State Threatened) (7), Blacknose Dace (2), and Longnose Dace (1). This is a relatively large number of Brook Trout to be found in a stream that averages 1.9 m (6.2 ft) wide. The presence of Slimy Sculpin is also an indication of minimally impacted conditions and cold temperatures, which was supported by a temperature of 14.4°C. The relatively small number of Brown Trout may be related to the dispersal limitation imposed by a perched grouted riprap floor under the Columbia Trail bridge. The habitat assessment score was towards the upper end of sub-optimal, losing points due to a lack of deep water (nothing greater than 0.5 m), channel flow status, and the presence of the perched nature of the bridge.

Recommendation: No additional surveys are necessary at this time. This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 5 years for streams designated *Wild Trout Streams*). (Crouse)

Raritan River S/B (trib.)(SW of Budd Lake)

Date: 08/29/2017
County: Morris
Township: Mount Olive Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Route 46**

Fish Species	Number	Length (mm)
Chub, Creek	21	0 - 0
Dace, Blacknose	310	0 - 0
Trout, Brook	2	120 - 135
Trout, Brook (YOY)	1	98 - 98

Water Chemistry / Habitat

Water Temperature (°C): 14.4
Dissolved Oxygen (mg/L): 10.07
Specific Conductance (uS/cm): 622.2
pH: 7.55
Alkalinity (mg/L): 35
Sample Length (m): 150
Habitat Assessment Score: N/A

Summary: This tributary of the South Branch of the Raritan River was electrofished on 8/29/17 to assess the wild trout population structure relative to the stream temperature regime. Approximately ten electrofishing surveys have been conducted since 2009 at this location, primarily driven by Division hourly employee and Doctoral candidate Luke Diglio, who at the time, was conducting a study on this subwatershed. Data were gathered and a mark and recapture study was conducted as part of his doctoral dissertation titled, "An Assessment of New Jersey *Trout Production* Systems: A Movement Towards Sustainability." Among other things, the work here discovered a healthy wild Brook Trout population and data showed that the population abundance here has the tendency to fluctuate. During surveys in 2015 and 2016, 24 and 18 wild Brook Trout were captured, respectively. The survey conducted this year captured only 3 wild Brook Trout, including 1 young-of-the-year. The population abundance is low in this section. This is the highest tributary in the watershed and has good gradient compared to other tributaries nearby. A factor that may be contributing to the low population size may be impacts from Route 46 that could contribute to high flows during rain events and degraded streambanks. One of the objectives of this study is to understand these types of population fluctuations, the causative factors that are influencing them, and what implications it has on the standard operating procedures of stream electrofishing surveys.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* (*TP*) streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 20 years for streams having wild Brown and/or Rainbow Trout). (Collenburg).

Rinehart Brook

Date: 08/23/2017
County: Morris
Township: Washington Twp.-Morris Co.
Drainage: Raritan River - North Branch
Project: Temperature Study - TP Streams
Location: **Hacklebarney State Park upstream of Main Trail Bridge**

Fish Species	Number	Length (mm)
Dace, Blacknose	45	0 - 0
Eel, American	4	0 - 0
Trout, Brook (YOY)	2	85 - 89
Trout, Brown	49	129 - 232
Trout, Brown (YOY)	9	79 - 89

Water Chemistry / Habitat

Water Temperature (°C): 19
Dissolved Oxygen (mg/L): 8.87
Specific Conductance (uS/cm): 300.9
pH: 7.47
Alkalinity (mg/L): 40.5
Sample Length (m): 150
Habitat Assessment Score: 171 Optimal

Summary: Rinehart Brook is a small stream that flows through Hacklebarney State Park and ultimately into the Black River. It is currently classified a *Trout Production (TP)* stream and one of the two streams inside Hacklebarney State Park that is regulated as a *Wild Trout Stream*. New regulations in 2018 on *Wild Trout Streams* will change the regulations on Rinehart Brook to *Native Brook Trout Stream*. In the headwaters, Rinehart Brook's surrounding land use is a mix of agricultural and residential areas before it reaches the heavily forested state park dominated by Eastern hemlocks. This tributary was electrofished on 8/23/17 as part of the ongoing stream temperature study that is being conducted on a handful of *TP* streams. Species encountered during this survey included 58 wild Brown Trout ranging from 79 – 232 mm (3.1 – 9.1 in), including 9 young-of-the-year (YOY). This is low compared to previous surveys conducted in 2004, 2014, 2015, and 2016 where a total of 143 (100 YOY), 95 (55 YOY), 94 (44 YOY), and 86 (44 YOY) wild Brown Trout were captured in each survey. Two wild Brook Trout were captured during this survey, but before 2017, a wild Brook Trout has not been captured at this site since 1996 (only one). This survey was done in conjunction with a project to restore the wild Brook Trout habitat in Rinehart Brook. Therefore, all Brown Trout captured during this survey were relocated into the Black River.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *TP* streams. As management action is proceeding in the removal of Brown Trout from this system, investigation into wild trout population dynamics may discontinue as natural fluctuations in the present population are no longer observable. Temperature monitoring will continue. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 5 years for streams designated *Wild Trout Stream*). (Collenburg)

Rinehart Brook

Date: 08/23/2017
County: Morris
Township: Washington Twp.-Morris Co.
Drainage: Raritan River - North Branch
Project: Brook Trout Restoration - Bio
Location: **Hacklebarney State Park, upstream of Main Trail Bridge**

Fish Species	Number	Length (mm)
Dace, Blacknose	33	0 - 0
Eel, American	1	0 - 0
Trout, Brook (YOY)	1	78 - 78
Trout, Brown (YOY)	2	0 - 0
Trout, Brown	10	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 19
Dissolved Oxygen (mg/L): 8.87
Specific Conductance (uS/cm): 300.9
pH: 7.47
Alkalinity (mg/L): 24.3
Sample Length (m): 150
Habitat Assessment Score: 171 Optimal

Summary: Rinehart Brook is a small stream that flows through Hacklebarney State Park and ultimately into the Black River. It is classified a *Trout Production (TP)* stream and one of the two streams inside Hacklebarney State Park that is regulated as a *Wild Trout Stream*. This stream was electrofished on 8/23/17 as part of the ongoing stream temperature study that is being conducted on a handful of *TP* streams. A Brook Trout restoration project was also initiated on Rinehart Brook, a tributary to the Black River within Hacklebarney State Park. The non-native Brown Trout has become the dominant trout species and the native Brook Trout reside in small numbers. This tributary was electrofished twice on 8/23/17 in an effort to determine capture efficiency. This survey was conducted within 1 hour of the initial survey (see data on previous page). The first pass resulted in the collection of 58 wild Brown Trout ranging from 79 – 232 mm (3.1 – 9.1 in), including 9 young-of-the-year (YOY) and two YOY wild Brook Trout (79 – 89 mm). All fish from the first pass were temporarily removed. As expected, not all fish were captured on the first pass. Upon the second pass (this survey), only 12 Brown Trout and 1 Brook Trout were captured, 20% and 50% of the respective first pass totals. American Eels totals declined from 4 to 1 after the first pass (25% of 1st pass). Capture efficiency for Blacknose Dace was not as great, with 45 collected during the first pass and 33 collected during the second pass (73% of 1st pass). This was conducted in an open system, with no blocknets, therefore fish may have moved in and out of the sample reach. For more information see the Brook Trout Restoration section of the 2017 *Investigations and Management of New Jersey's Freshwater Fisheries Resources* report.

Recommendation: Additional surveys will resume in 2018, with intentions of continuing to remove any Brown Trout that were not captured during 2017. This study is likely to continue for several years. The existing Brook Trout population will be monitored, to determine if they rebound in response to a reduced/eliminated Brown Trout population. An insufficient rebound may result in the enhancement by with individuals from the neighboring Trout Brook. (Crouse)

Rockaway Creek, S/Br.

Date: 08/29/2017
County: Hunterdon
Township: Lebanon Boro
Drainage: Raritan River - North Branch
Project: Anticipated Cessation of Trout Stocking
Location: **Kullman Industries Campus Drive**

Fish Species	Number	Length (mm)
Chub, Creek	8	0 - 0
Dace, Blacknose	97	0 - 0
Dace, Longnose	28	0 - 0
Darter, Tessellated	50	0 - 0
Shiner, Common	1	0 - 0
Sucker, White	11	0 - 0
Sunfish, Bluegill	1	80 - 80
Trout, Brown	4	246 - 450
Trout, Brown (YOY)	16	80 - 153

Water Chemistry / Habitat

Water Temperature (°C): 15.1
Dissolved Oxygen (mg/L): 9.84
Specific Conductance (uS/cm): 623
pH: 7.98
Alkalinity (mg/L): 133.5
Sample Length (m): 150
Habitat Assessment Score: 158 Optimal

Summary: NJDFW discontinued stocking trout in eight small *Trout Production* streams during the period 2005 – 2010. This management action was taken to protect New Jersey's wild trout resources and to better utilize hatchery trout in waters not having self-sustaining trout populations. The South Branch of Rockaway Creek was most recently stocked during the spring of 2017 and will be stocked no longer. This stream has low angler usage. Two electrofishing surveys were conducted in 2017 along this stream to obtain baseline data prior to cessation of trout stocking. The first survey was located near Kullman Industries Campus Drive in Lebanon Boro. This site was chosen because it was previously surveyed in 2008 and 2002. Previous surveys resulted in the capture of 7 Brown Trout (2 young-of-the-year (YOY)) and 25 Brown Trout (12 YOY) respectively. The recent survey resulted in 20 Brown Trout (16 of which were YOY). This stream consistently produces wild Brown Trout, some of which are large. The largest captured during each of the last three surveys at this location has ranged from 375 – 450 mm (14.8 – 17.7 in). No stocked Rainbow Trout were encountered. The remainder of the assemblage has remained consistent.

Recommendation: Due to the presence of a desirable wild Brown Trout fishery, this stream may be considered for future addition to the *Wild Trout Stream - Wild Brown Trout Enhancement Stream*. Additional surveys will be conducted at this location in 2018 and subsequent summers to provide comparative data that will be used to assess changes to the fish assemblage after cessation of trout stocking. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 20 years for streams having wild Brown and/or Rainbow Trout). (Crouse)

Rockaway Creek, S/Br. (trib.) (Lebanon Boro)

Date: 08/29/2017
County: Hunterdon
Township: Lebanon Boro
Drainage: Raritan River - North Branch
Project: Anticipated Cessation of Trout Stocking
Location: **Main Street**

Fish Species	Number	Length (mm)
Chub, Creek	38	0 - 0
Dace, Blacknose	277	0 - 0
Darter, Tessellated	12	0 - 0
Shiner, Common	1	0 - 0
Sucker, White	28	0 - 0
Trout, Brown (YOY)	12	88 - 130
Trout, Brown	4	219 - 359
Trout, Rainbow	2	274 - 278

Water Chemistry / Habitat

Water Temperature (°C): 15.4
Dissolved Oxygen (mg/L): 10.09
Specific Conductance (uS/cm): 629
pH: 7.97
Alkalinity (mg/L): 124
Sample Length (m): 150
Habitat Assessment Score: 152 Sub-Optimal

Summary: NJDFW discontinued stocking trout in eight small trout production streams during the period 2005 – 2010. This management action was taken to protect New Jersey's wild trout resources and to better utilize hatchery trout in waters not having self-sustaining trout populations. The South Branch of Rockaway Creek was most recently stocked during the spring of 2017 and will be stocked no longer. Two electrofishing surveys were conducted in 2017 along this stream to obtain baseline data prior to cessation of trout stocking. The second survey was located at Main Street in Lebanon Boro. This site was chosen because it was previously surveyed in 2002. Previous surveys resulted in the capture of 5 Brown Trout (2 of which were young-of-the-year (YOY). The recent survey resulted in 16 Brown Trout (12 of which were YOY). This stream consistently produces wild Brown Trout, some of which were large. The largest captured during each of the last two surveys at this location measured 300 and 359 mm (11.8 and 14.1 in). Two stocked Rainbow Trout were also captured.

Recommendation: Due to the presence of a desirable wild Brown Trout fishery, this stream may be considered for future addition to the *Wild Trout Stream - Wild Brown Trout Enhancement Stream*. Additional surveys will be conducted at this location in 2018 and subsequent summers to provide comparative data that will be used to assess changes to the fish assemblage after cessation of trout stocking. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 20 years for streams having wild Brown and/or Rainbow Trout). (Crouse)

Rocky Run

Date: 08/11/2017
County: Hunterdon
Township: Lebanon Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Rocky Run Road**

Fish Species	Number	Length (mm)
Dace, Blacknose	102	0 - 0
Trout, Brook	14	118 - 180
Trout, Brook (YOY)	36	62 - 86

Water Chemistry / Habitat

Water Temperature (°C): 17
Dissolved Oxygen (mg/L): 9.4
Specific Conductance (uS/cm): 236
pH: 7.55
Alkalinity (mg/L): 36.5
Sample Length (m): 150
Habitat Assessment Score: 159 Sub Optimal

Summary: This tributary to the South Branch of the Raritan River was electrofished on 8/11/17 to assess the wild trout population structure relative to the stream temperature regime. The stream was classified as *Trout Production* (*TP*) and regulated as a *Wild Trout Stream* (*WTS*). New regulations for *WTS* go into effect in 2018 and Rocky Run will be regulated as a *Native Brook Trout Stream.* The survey was conducted just upstream of an onstream impoundment that blocks upward migration into this section. Brown Trout and Brook Trout are known to exist below this impoundment. Species encountered during this survey included 50 wild Brook Trout ranging from 62 – 180 mm. Surveys were conducted here in 2009, 2014, 2015, 2016, and 2017 and captured a total of 22 (9 YOY), 69 (61 YOY), 81 (32 YOY), 51 (23 YOY), and 50 (36 YOY), respectively, indicating that the population of trout here fluctuates.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *TP* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be periodically monitored in accordance with the established schedule for *TP* streams (every five years for a *Wild Trout Stream*). (Collenburg)

Spruce Run Creek

Date: 08/01/2017
County: Hunterdon
Township: Glen Gardner Boro
Drainage: Raritan River - South Branch
Project: Fish Kill
Location: **Main Street Glen Gardner,**

Fish Species	Number	Length (mm)
Bass, Largemouth	4	56 - 61
Chub, Creek	1	0 - 0
Dace, Blacknose	47	0 - 0
Dace, Longnose	60	0 - 0
Eel, American	1	0 - 0
Sucker, White	11	0 - 0
Trout, Brook (YOY)	1	82 - 82
Trout, Brown	20	191 - 421
Trout, Brown (YOY)	48	73 - 100
Trout, Rainbow	10	225 - 294

Water Chemistry / Habitat

Water Temperature (°C): 18.7
Dissolved Oxygen (mg/L): 10.52
Specific Conductance (uS/cm): 295.6
pH: 7.76
Alkalinity (mg/L): 45
Sample Length (m): 150
Habitat Assessment Score: N/A

Summary: During the weekend of July 29 and 30 2017, Eastern Concrete Inc. released a large amount of sediment from their stone quarry in Glen Gardner into Spruce Run Creek. This *Trout Production* stream, a major tributary to Spruce Run Reservoir, supports a wild Brown Trout population and is also trout stocked. A 1.7-mile section of the stream, from the quarry discharge, to Spruce Run Reservoir was impacted. Accumulations of sediment was estimated to be approximately 2-4 inches throughout most of the stream, with most significant accumulations of 20 inches near the point of discharge. Water quality taken on August 1 indicated no significant difference above and below the impacted area. Upon arrival, a few dead fish including Brown Trout, crayfish, and amphibians such as Pickerel Frogs were observed.

Two electrofishing surveys were conducted on August 1 to determine if the fish assemblage had survived the initial impact. The first survey was conducted in a 150 m section immediately downstream of the discharge and a second 150-m site was sampled approximately 1 mile further downstream. An abundance of wild Brown Trout including young-of-the-year (YOY) were found at both sites (68 and 52 respectively), a few stocked Rainbow Trout (10 and 3 respectively), and one wild Brook Trout YOY was found at each site. Other common fish species were encountered as well. Numbers of fish collected were likely underestimated due to decreased visibility in the turbid water. A healthy fish assemblage was found at both sites, however without a rapid cleanup effort, it was anticipated that they will not survive and/or will not be able to adequately spawn. The cleanup commenced within days and lasted until 11/29/17.

Recommendation: Additional electrofishing surveys will be conducted during the summer of 2018 to determine the extent of the impacts to the fishery, in particular species diversity, abundance, and whether or not trout were able to successfully spawn and if any recruitment took place. Surveys may have to continue for several years. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Crouse)

Spruce Run Creek

Date: 08/01/2017
County: Hunterdon
Township: Lebanon Twp.
Drainage: Raritan River - South Branch
Project: Fish Kill
Location: **Route 31 across from Rocky Run Road**

Water Chemistry / Habitat

Water Temperature (°C):	19.7
Dissolved Oxygen (mg/L):	9.61
Specific Conductance (uS/cm):	306.6
pH:	7.88
Alkalinity (mg/L):	44
Sample Length (m):	150
Habitat Assessment Score:	N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	25	48 - 70
Bass, Smallmouth	22	52 - 212
Dace, Blacknose	22	0 - 0
Dace, Longnose	26	0 - 0
Darter, Tessellated	87	0 - 0
Eel, American	4	0 - 0
Perch, Yellow	1	144 - 144
Sucker, White	25	0 - 0
Sunfish, Bluegill	4	60 - 115
Sunfish, Pumpkinseed	2	72 - 95
Trout, Brook (YOY)	1	87 - 87
Trout, Brown (YOY)	42	65 - 104
Trout, Brown	10	175 - 299
Trout, Rainbow	3	275 - 305

Summary: During the weekend of July 29 and 30, 2017, Eastern Concrete Inc. released a large amount of sediment from their stone quarry in Glen Gardner into Spruce Run Creek. This *Trout Production* stream, a major tributary to Spruce Run Reservoir, supports a wild Brown Trout population and is also trout stocked. A 1.7-mile section of the stream, from the quarry discharge, to Spruce Run Reservoir was impacted. Accumulations of sediment was estimated to be approximately 2-4 inches throughout most of the stream, with most significant accumulations of 20 inches near the point of discharge. Water quality taken on August 1 indicated no significant difference above and below the impacted area. Upon arrival, a few dead fish including Brown Trout, crayfish, and amphibians such as Pickerel Frogs were observed.

Two electrofishing surveys were conducted on August 1 to determine if the fish assemblage had survived the initial impact. The first survey was conducted in a 150 m section immediately downstream of the discharge and a second 150 m site was sampled approximately 1 mile further downstream. An abundance of wild Brown Trout including young-of-the-year (YOY) were found at both sites (68 and 52 respectively), a few stocked Rainbow Trout (10 and 3 respectively), and one wild Brook Trout YOY was found at each site. Other common fish species were encountered as well. Numbers of fish collected were likely under estimated due to decreased visibility in the turbid water. A healthy fish assemblage was found at both sites, however without a rapid cleanup effort, it was anticipated that they will not survive and/or will not be able to adequately spawn. The cleanup commenced within days and lasted until 11/29/17.

Recommendation: Additional electrofishing surveys will be conducted during the summer of 2018 to determine the extent of the impacts to the fishery, in particular species diversity, abundance, and whether or not trout were able to successfully spawn and if any recruitment took place. Surveys may have to continue for several years. Otherwise, this stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout). (Crouse)

Stony Brook (Washington)

Date: 08/21/2017
County: Morris
Township: Washington Twp.-Morris Co.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Columbia Trail Walking Bridge**

Water Chemistry / Habitat

Water Temperature (°C):	18.4
Dissolved Oxygen (mg/L):	9.5
Specific Conductance (uS/cm):	251.8
pH:	7.74
Alkalinity (mg/L):	41
Sample Length (m):	150
Habitat Assessment Score:	168 Optimal

Fish Species	Number	Length (mm)
Chub, Creek	26	0 - 0
Dace, Blacknose	254	0 - 0
Dace, Longnose	29	0 - 0
Darter, Tessellated	37	0 - 0
Eel, American	1	0 - 0
Lamprey, Sea	7	0 - 0
Mudminnow, Eastern	1	0 - 0
Sculpin, Slimy	101	0 - 0
Sucker, White	37	0 - 0
Sunfish, Bluegill	1	41 - 41
Sunfish, Green	9	54 - 127
Sunfish, Redbreast	1	102 - 102
Trout, Brook (YOY)	9	58 - 98
Trout, Brook	2	195 - 215
Trout, Brown (YOY)	37	49 - 95
Trout, Brown	19	103 - 384

Summary: This tributary of the South Branch of the Raritan River was electrofished on 8/21/17 to assess the wild trout populations structure relative to the stream temperature regime. The first survey conducted here in 1969 discovered a wild Brown Trout and Brook Trout population, with Slimy Sculpin present. Many years have passed since the next survey was conducted on this stream but the species composition has not changed much except for the dominant trout species (now Brown Trout). The current survey encountered a total of 11 species with Blacknose Dace, Slimy Sculpin, and Brown Trout being the most prevalent. The Slimy Sculpin, considered an excellent indicator of water quality, is soon to be listed state Threatened. A total of 56 wild Brown Trout were captured, including 18 young-of-the-year (YOY), and 11 wild Brook Trout, including 9 YOY. Another interesting note is that 184 wild Brown Trout were captured in 2015, 84 were captured in 2016, and 56 were captured in 2017, a decline each of the last three years. This stream is also subject to high flows, altering the stream channel as evidenced by exposed substrate and erosion on stream banks and areas of silt and sand deposited. Otherwise, undercut banks and large pools (some at depths of 3.5-4 feet deep) are abundant here which provide ample cover in times of low flows. In contrast, upstream sections of this same stream has much less fine sediments and embedded substrate, which provides habitat through cobble layering creating interstitial spaces beneficial to the Slimy Sculpin's habitat preference (263 Slimy Sculpin captured from 2015 survey upstream of Naughtright Road). The 2017 site is further downstream from multiple ponds and impoundments. The Brook Trout population is struggling throughout the stream reach.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *TP* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be periodically monitored in accordance with the established schedule for *TP* streams (every five years for a *Wild Trout Stream*). (Collenburg)

Sun Valley Brook

Date: 08/21/2017
County: Morris
Township: Mount Olive Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Wolfe Road**

Fish Species	Number	Length (mm)
Chub, Creek	84	0 - 0
Dace, Blacknose	81	0 - 0
Dace, Longnose	12	0 - 0
Darter, Tessellated	5	0 - 0
Sucker, White	1	0 - 0

Water Chemistry / Habitat

Water Temperature (°C): 19
Dissolved Oxygen (mg/L): 8.61
Specific Conductance (uS/cm): 529.3
pH: 7.49
Alkalinity (mg/L): 41
Sample Length (m): 150
Habitat Assessment Score: 173 Optimal

Summary: Sun Valley Brook is a tributary of the South Branch of the Raritan River and has been part of the Stream Temperature Monitoring Study. Because of this, stream temperature of notable concern has been documented here. Continuous stream temperature data that was collected over the past two years was analyzed and extreme spikes in temperature were seen to coincide with rainfall events. Spikes in stream temperature were extreme enough to cause acute thermal stress and a high possibility of death would inherently occur in any coldwater trout inhabiting downstream of the source of thermal pollution. In 2016, Bureau of Freshwater Fisheries crews were out to investigate the source and found the main source of thermal pollution to be the drainage coming from Wolfe Road and directly channeled into the stream via culverts. In addition, multiple ephemeral channels that were coming from a development directly upstream of Wolfe Road were believed to be contributing to the thermal impact. Two fish surveys conducted since 2011 have not found Brook Trout below Wolfe Road bridge. In 2016, two additional surveys were conducted to determine the status of Brook Trout above the thermally impacted area (Wolfe Road) and documented their presence. This is added evidence that the thermal impact may be forcing Brook Trout to stay or be relegated to upstream sections of Sun Valley Brook. This survey was conducted on 8/21/2017 and downstream of the thermal impact. No coldwater fish species was documented.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* (*TP*) streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 10 years for streams having wild Brook Trout). (Collenburg)

Teetertown Brook

Date: 07/31/2017
County: Hunterdon
Township: Lebanon Twp.
Drainage: Raritan River - South Branch
Project: Wild Trout Stream Assessment
Location: **Hollow Brook Road in Teetertown Preserve**

Fish Species	Number	Length (mm)
Chub, Creek	137	0 - 0
Dace, Blacknose	77	0 - 0
Trout, Brook (YOY)	4	66 - 96

Water Chemistry / Habitat

Water Temperature (°C): 15.9
Dissolved Oxygen (mg/L): 10.22
Specific Conductance (uS/cm): 168.8
pH: 7.54
Alkalinity (mg/L): 38
Sample Length (m): 150
Habitat Assessment Score: 159 Sub-Optimal

Summary: Teetertown Brook is managed as a *Wild Trout Stream* and flows into the section of the South Branch of the Raritan River is managed as a *Trout Stocked Stream – Wild Brown Trout Managed* since February, 2018. Previous to this survey in Teetertown Brook, the most recent survey was conducted in 2014 for the *Wild Trout Stream* Assessment, in which both wild Brook Trout (49) and wild Brown Trout (44) were found, with the largest Brown Trout measuring 365 mm (14.4 in). It was decided to conduct an additional survey approximately 0.9 miles upstream in the ravine section of Hunterdon County Park's Teetertown Preserve. The section within the ravine and the area surveyed in 2014 are separated by a dam that measures approximately 5 ft in height. During the 2017 Freshwater Fisheries Forum held at the Hackettstown State Fish Hatchery, an angler suggested that the Division samples the ravine section, as he has only caught Brook Trout in that area. No known surveys were previously conducted in this section, therefore an electrofishing survey was conducted on 7/31/17. Although the water temperature (15.9℃) and habitat (high end of Sub-Optimal 159) were well suited for an abundance of trout, only four wild Brook Trout were found. Concern for the sustainability of this population due to small population size is warranted. A relatively large number of Blacknose Dace (77) and Creek Chubs (137), with approximately half of all individuals carrying unspecified aquatic leaches. Based on the findings, it appears the angler was correct, that the only salmonid species found in this section is Brook Trout.

Recommendation: This stream should be monitored in accordance with the schedule established for *Trout Production* streams (minimum of once every 10 years for streams having wild Brook Trout), however additional surveys should be considered during the interim due to the small number of Brook Trout encountered. The *Wild Trout Stream - multiple wild trout species present* regulation, adopted in February, 2018, is appropriate for the lower end of this stream because both Brook and Brown Trout are present. Consideration to the newly adopted *Wild Trout Stream-Native Brook Trout* for the area above the dam is not necessary at this time. (Crouse)

Trout Brook (Hacklebarney)

Date: 08/23/2017
County: Morris
Township: Chester Twp.
Drainage: Raritan River - North Branch
Project: Temperature Study - TP Streams
Location: **Hacklebarney State Park**

Fish Species	Number	Length (mm)
Dace, Blacknose	122	0 - 0
Dace, Longnose	3	0 - 0
Eel, American	11	0 - 0
Trout, Brook (YOY)	75	49 - 99
Trout, Brook	43	121 - 232

Water Chemistry / Habitat

Water Temperature (°C): 18.7
Dissolved Oxygen (mg/L): 8.96
Specific Conductance (uS/cm): 317.6
pH: 7.33
Alkalinity (mg/L): 55
Sample Length (m): 150
Habitat Assessment Score: 179 Optimal

Summary: Trout Brook is a small stream that flows through Hacklebarney State Park and ultimately into the Black River. It is currently classified a *Trout Production (TP)* stream and one of the two streams inside Hacklebarney State Park that is regulated as a *Wild Trout Stream* (*WTS*). New regulations in 2018 on *WTS* will change the regulations on Rinehart Brook to *Native Brook Trout Stream*. This tributary of the South Branch of the Raritan River was electrofished on 8/23/2017 to assess the wild trout populations structure relative to the stream temperature regime. Past surveys have found an abundant and persistent population of wild Brook Trout here. A natural barrier ~100 m downstream of the survey's start point has kept Brown Trout relegated below the barrier. Species encountered during this survey included 118 wild Brook Trout, including 75 young-of-the-year. The total is much less than in 2015 and 2016 when 194 and 205 Brook Trout were captured, respectively. Blacknose Dace and Longnose Dace were also present. One objective of this study is to determine the causative factors of the trout populations fluctuations. Additional surveys may be necessary.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *TP* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 5 years for streams designated *Wild Trout Stream*). (Collenburg)

Turkey Brook

Date: 08/14/2017
County: Morris
Township: Mount Olive Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Stephens Mill road**

Water Chemistry / Habitat

Water Temperature (°C):	17.1
Dissolved Oxygen (mg/L):	9.88
Specific Conductance (uS/cm):	490.6
pH:	7.73
Alkalinity (mg/L):	22
Sample Length (m):	150
Habitat Assessment Score:	N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	1	51 - 51
Chub, Creek	11	0 - 0
Dace, Blacknose	70	0 - 0
Dace, Longnose	8	0 - 0
Darter, Tessellated	2	0 - 0
Mudminnow, Eastern	1	0 - 0
Sculpin, Slimy	84	0 - 0
Sucker, White	6	0 - 0
Sunfish, Bluegill	2	73 - 85
Sunfish, Pumpkinseed	1	74 - 74
Trout, Brook	9	128 - 182
Trout, Brook (YOY)	15	64 - 89
Trout, Brown	4	148 - 196
Trout, Brown (YOY)	48	56 - 88

Summary: This tributary to the South Branch of the Raritan River was electrofished on 8/14/17 to assess the wild trout populations structure relative to the stream temperature regime. A survey conducted in 1969 discovered a wild Brook Trout population here. Since then, Brown Trout have been either directly or indirectly introduced into the system. Approximately nine electrofishing surveys have been conducted since 2009 at this location, primarily driven by Division hourly employee and Doctoral candidate Luke Diglio, who at the time, was conducting a study on this subwatershed. Data were gathered and a mark and recapture study was conducted as part of his doctoral dissertation titled, "An Assessment of New Jersey *Trout Production* Systems: A Movement Towards Sustainability." Multiple surveys have shown Brown Trout populations dominate the species composition closer to the confluence with the South Branch of the Raritan River. Headwater sections are still dominated by Brook Trout, helped by a few on stream impoundments. Species encountered in this survey included 24 wild Brook Trout, including 15 young-of-the-year (YOY), and 52 wild Brown Trout, including 48 YOY. The balance of these two populations seem to fluctuate from year to year, but Brown Trout are typically more abundant at the location of the survey. A total of 9 species were encountered during the survey. Of special note, 84 Slimy Sculpin were captured during the survey and continue to do well in Turkey Brook (soon to be listed state Threatened). Turkey Brook is currently regulated as a *Wild Trout Stream* and new regulations in 2018 on *WTS* will change the regulations on Turkey Brook. It is still categorized under the regulations as a *WTS.*

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *Trout Production* (*TP*) streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 5 years for streams designated *Wild Trout Stream*). (Collenburg)

Willhoughby Brook

Date: 08/10/2017
County: Hunterdon
Township: Lebanon Twp.
Drainage: Raritan River - South Branch
Project: Temperature Study - TP Streams
Location: **Route 31**

Water Chemistry / Habitat

Water Temperature (°C):	17.5
Dissolved Oxygen (mg/L):	8.81
Specific Conductance (uS/cm):	185.7
pH:	7.47
Alkalinity (mg/L):	51
Sample Length (m):	150
Habitat Assessment Score:	149 Sub-Optimal

Fish Species	Number	Length (mm)
Bass, Largemouth	10	63 - 82
Bass, Smallmouth	4	66 - 71
Bullhead, Brown	2	52 - 75
Bullhead, Yellow	2	152 - 156
Dace, Blacknose	11	0 - 0
Dace, Longnose	17	0 - 0
Darter, Tessellated	22	0 - 0
Eel, American	3	0 - 0
Sucker, White	2	0 - 0
Sunfish, Green	1	118 - 118
Sunfish, Redbreast	1	135 - 135
Trout, Brook	1	193 - 193
Trout, Brown (YOY)	5	82 - 90
Trout, Brown	3	223 - 237

Summary: This tributary to the Spruce Run Reservoir was electrofished on 8/10/17 to assess the wild trout population structure relative to the stream temperature regime. It is currently classified as a *Trout Production* (*TP*) stream and regulated as a *Wild Trout Stream* (*WTS*). New regulations in 2018 on *WTS* will change the regulations on Willhoughby Brook. It is still categorized under the regulations as a *WTS.* A survey conducted over a mile upstream from this location in 2014 indicated abundant populations of wild Brook Trout and wild Brown Trout. The survey conducted in this location in 2015 and 2016 found that this section was dominated by larger trout of both species. There was a concern in 2015 and 2016 that the population of Brook Trout is low and may be struggling compared to the Brown Trout. Again, for a third year in a row, Brown Trout outnumbered the Brook Trout by a great deal. Encountered during this survey was a total of one wild Brook Trout (193 mm) and 8 Brown Trout ranging from 82 – 237 mm, including five YOY. A potential factor limiting Brook Trout success in Willoughby Brook may be the stream's sensitivity to climatic factors and their innate intolerance to thermal degradation. In preliminary analysis of stream temperature on Willhoughby Brook, it was determined to be the most sensitive of the streams being assessed to changes in air temperature. This stream also had the highest number of all summer time readings above 21℃ (47%). This is considered the temperature above which, feeding, growth, and ultimately survival of trout begins to be negatively affected. A possible outcome of higher temperatures here, is the more tolerant and aggressive Brown Trout can take advantage and outcompete the native Brook Trout.

Recommendation: This survey is part of a stream temperature study that is currently being conducted on 14 *TP* streams. This stream will be monitored in this section for the next 1-2 years to study the relationship of stream temperature on wild trout life cycles in New Jersey and help guide in the management of our *TP* streams. This stream should be monitored in accordance with the established schedule for *TP* streams (minimum of once every 5 years for streams designated *Wild Trout Stream*). (Collenburg)

Stream Surveys in the Lower Delaware Region

(Assunpink Creek to Maurice River)

Scotland Run

Date: 07/13/2017
County: Gloucester
Township: Clayton Boro
Drainage: Maurice River
Project: Native Species Inventory
Location: **Downstream of Wilson Lake. 20 meters downstream of Clayton-Williamstown Rd. bridge/dam**

Water Chemistry / Habitat

Water Temperature (°C):	29.7
Dissolved Oxygen (mg/L):	6.02
Specific Conductance (uS/cm):	120
pH:	7.04
Alkalinity (mg/L):	
Sample Length (m):	150
Habitat Assessment Score:	N/A

Fish Species	Number	Length (mm)
Bass, Largemouth	12	0 - 0
Bullhead, Brown	41	0 - 0
Bullhead, Yellow	3	0 - 0
Darter, Swamp	1	0 - 0
Eel, American	4	0 - 0
Madtom, Tadpole	3	0 - 0
Mudminnow, Eastern	8	0 - 0
Perch, Pirate	9	0 - 0
Pickerel, Chain	5	0 - 0
Shiner, Golden	9	0 - 0
Sunfish, Bluegill	76	0 - 0
Sunfish, Bluespotted	1	0 - 0
Sunfish, Pumpkinseed	11	0 - 0

Summary: A two backpack electrofishing survey was conducted on 7/13/17 on Scotland Run downstream of Wilson Lake in the town of Clayton. A 150-m stretch was sampled 20 meters downstream of the Clayton-Williamstown Rd. bridge crossing. The primary goal of the survey was the collection and documentation of Ironcolor Shiners, a species soon to be designated state Endangered. This survey was intended to provide qualitive fish data (i.e. fish species present) and may not reflect the overall number of fish present in the sections survived. Unfortunately, no Ironcolor Shiners were collected during this survey. Run time was 2,326 seconds (39 minutes). Scotland Run was last sampled in 2016 via backpack electrofishing further downstream below Malaga Lake. Ironcolor Shiners were successfully collected during that survey.

Recommendation: This survey is part of an ongoing native fish study that is being conducted throughout the state. Additional sampling should be conducted on this watershed over the next several years to determine the extent of Ironcolor Shiner distribution. (Boehm)

APPENDIX B

Field Sampling Protocols
Lake Profiles and Wadeable Streams

Lakes – Dissolved Oxygen / Temperature Profiles

Most New Jersey lakes deeper than 3 m (10 ft) thermally stratify during the summer. The epilimnion (surface waters) becomes too warm to support coldwater fishes (trout), and the metalimnion and hypolimnion (middle and bottom waters), while often cold enough for trout, often have dissolved oxygen levels too low to support trout (and other fish species). Only deep lakes (generally at least 15 m (50 ft) deep), that are not overly eutrophic, maintain sufficient levels of dissolved oxygen in some portion of the strata below the epilimnion during the summer and early fall. New Jersey lakes are characteristically shallow and therefore most are too warm to support trout through the critical summer months. They are however quite suitable for a multitude of other cool and warmwater species. The criteria used to determine a lake's trout-supporting capabilities is water temperature $\leq$ 21ºC (69.8ºF) and dissolved oxygen $\geq$ 4 mg/L (Hamilton and Barno 2006).

Dissolved oxygen and temperature profiles are performed during mid–August at the deepest point of the impoundment using a YSI oxygen meter with cable marked in one-foot increments. Measurements are generally taken at 5 to 10-foot intervals, but more frequently (1-ft increments) when marked changes are observed (typically in the metalimnion). A secchi disk (also marked in one-foot increments) is used to measure water transparency.

For QA/QC purposes oxygen meters are re-verified on a monthly basis against a Winkler Titration of deionized water samples. The re-verification procedure is also repeated after any atypical field readings to verify the meter is functioning properly. Meters are field calibrated prior to each use according to the manufacturer specifications.

Wadeable Streams - Electrofishing

As with lakes the summer months are a critical time period for trout survival due to elevated temperatures, lower dissolved oxygen concentrations, and reduced flows. Streams are sampled from June through mid-September of each year using electrofishing gear. Electrofishing provides for the safe, effective sampling of resident fishes with limited associated mortality. Prior to 1980, A.C. electrofishing equipment was used to sample stream fish populations. This sampling gear consisted of two or three paddle-type electrodes powered by a gas generator and operated by a four to six-person crew (two or three electrode-bearers, one or two netters, and one generator operator). With technological advances in electrofishing gear, D.C. electrofishing equipment, powered by battery or generator, has been used almost exclusively since 1980. A battery-powered D.C. backpack unit, having one paddle-type electrode and used by an operator and one or two netters, has been in used since 1980 to sample small streams. On larger streams a gas generator is used in conjunction with a conversion box (to convert A.C. to D.C.), two or three electrodes, and a five to seven-person field crew.

The standard sampling distance, which has been used during and since the original stream surveys, is 182.9 meters (600 feet). This length was occasionally shortened when trout reproduction was found or when conditions such as an abundance of warmwater species or physical stream conditions indicated that trout would not be found. Occasionally a prospective stream or site would not be sampled based upon a visual, water temperature, or pH check that indicated conditions unsuitable for trout. Lack of water, excessive turbidity, temperatures in excess of 24°C, and extremely low pH values (4.0 or less) would result in sampling site rejection. Since 2001, in an effort to standardize data collection efforts across various research and field inventories a distance of 150 meters was established and is used on streams when young-of-the-year trout are encountered. Since the development of the Incidence of Occurrence was based on a sampling distance of 182 meters (600 feet) this distance is still used for classifying streams when young of the year trout are not encountered.

Sampling methods follow those outlined by Kurtenbach (Kurtenbach, 1994) and as defined in the EPA manual "Rapid Bioassessment Protocols for Use in Wadeable Streams and Rivers" (Barbour 1999) and are consistent, for comparative purposes, with data collection efforts for other Activities. All sites are sampled under typical stream flows during the months of June through September. Electrofishing gear is used to provide pulsed direct current to collect fishes. Settings on each of the stream units vary depending on the conductivity and flow conditions at each site, output usually ranges from 3 to 4 amperes. A typical backpack field crew consists of three persons, one to wear the backpack and netters. Stream widths exceeding the capabilities of one backpack unit are either sampled with two backpack teams traveling in tandem or with a two-paddle streamside generator. The type of unit selected is based upon stream width, depth, and contour of the stream environment. One up-stream pass is made through the sample stretch. The sample stretch length is 150 meters for streams having naturally reproducing trout populations and 182 meters (600 feet) for *Trout Maintenance* or *Non-Trout* waters. Sampling time averages approximately 2.5 hours per site.

All fish encountered are collected without bias to species or size. Fishes with lengths greater than 20 mm are identified to the species level, counted, and examined for disease or anomalies. Anomalies such as visible lesions, tumors, skeletal anomalies, and fin damage may be an indication of impaired conditions. Any obvious injuries due to electrofishing are noted, but not considered anomalies. Total length measurements are taken on all trout and other game species. Retained specimens are preserved in 10% formalin solution in the field. Specimens are then transferred to a 70% ethanol solution for long-term preservation 2-3 weeks after initial collection.

In addition to fish collection, basic physical and chemical parameters of the stream environment are also measured and recorded on the Bureau's Stream Survey Data Sheet. All physical and chemical data are collected one-time-only, thus no long-term data is collected. Physical parameters included stream depth, stream width, substrate type, and shade index. YSI Model 85 and YSI Model 60 meters are used to determine chemical parameters such as dissolved oxygen, temperature, salinity, conductivity, and pH. For QA/QC purposes oxygen meters are re-verified on a monthly basis against a Winkler Titration of deionized water samples. The re-verification procedure is also repeated after any atypical field readings to verify the meter is functioning

properly. Meters are field calibrated prior to each use according to the manufacturer specifications. Alkalinity and specific conductance data have been collected since 2002. In-house laboratory staff determine alkalinity via titration. The reference temperature and temperature coefficient for specific conductance are 25°C and 1.91% respectively.

A stream habitat assessment is also conducted at each site, in accordance with criteria established by the EPA (EPA 1999). The habitat assessment is intended to evaluate various aspects of the aquatic habitat, surrounding terrestrial environment, and potential anthropogenic factors that may impact the aquatic biota of the stream. Habitat Assessments have been designed for two stream types - high gradient (riffle/run prevalent) and low gradient (glide/pool prevalent) streams. High Gradient Habitat Assessments are conducted on most streams north of the Fall line, in the Piedmont, Highlands, and Appalachian Valley and Ridge physiographic provinces. Natural high-gradient streams have substrates composed primarily of coarse sediment particles (i.e. gravel or larger) or frequent coarse particulate aggregations along stream reaches. Low gradient habitat assessments are conducted on streams in the Coastal Plain and in other moderate to low gradient landscapes. Natural low gradient streams have substrates of fine sediment or infrequent aggregations of more coarse (gravel of larger) sediment particles along stream reaches. Data are recorded on the Bureau's High Gradient Habitat Assessment Data Sheet and Low Gradient Habitat Assessment Data Sheet (Appendix B).

For the habitat assessment, ten specific physical parameters are assessed. For a low gradient stream the parameters are: epifaunal substrate, pool substrate, pool variability, sediment deposition, channel flow status, channel alteration, channel sinuosity, bank stability, vegetative protection, and riparian vegetative zone width. The assessment for a high gradient stream substitutes pool substrate, pool variability, and channel sinuosity with embeddedness, velocity/depth regime, and frequency of riffles or bends. The first five parameters of each assessment are assessed within the stretch of the stream electrofished. Assessments of the five remaining variables are based upon a larger stream reach that extends 150 meters upstream and downstream of the electrofished stretch. Each assessment variable is divided into four condition categories: optimal, sub-optimal, marginal, and poor, each with established criteria. Twenty points are allotted for each of the ten variables resulting in a maximum score of 200. The left and right banks of a stream, determined by facing downstream, are assessed separately for bank stability, vegetative protection, and riparian vegetative zone width. Biologists from the Bureau of Freshwater Fisheries have received habitat assessment training from EPA staff.

APPENDIX C

Habitat Assessment Data Sheets

NJ Division of Fish and Wildlife

Bureau of Freshwater Fisheries

Habitat Assessment - Datasheet

High Gradient Streams

Stream Name		Date
Location		
WMA	Drainage	
Assessment Completed By:	Weather	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1. Epifaunal Substrate **Available Cover**	Greater than 70 % of substrate favorable for epifaunal colonization and fish cover;mix of snags submerged logs, undercut banks cobble and other stable habitat and at stage to allow full colonization potentia. (Logs/snag are not new fall and not transient.)	40-70% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	20-40 % mix of stable habitat;habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 20% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Embeddedness Assessed in riffle area	Gravel, cobble and boulder particles are 0-25 % surrounded by fine sediment. Cobble layering provides habitat diversity.	Gravel, cobble and boulder particles are 25-50 % surrounded by fine sediment	Gravel, cobble and boulder particles are 50-75% surrounded by fine sediment	Gravel, cobble and boulder particles are more than 75 % surrounded by fine sediment
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Velocity/Depth Regime	All four velocity/depth regimes are present: (slow-deep, slow-shallow, fast deep, fast shallow) Slow is < 0.3 m/s, deep is > 0.5 m	Only 3 of the 4 regimes are present. If fast-shallow is missing, score lower than if missing other regimes.	Only 2 of the 4 regimes are present. If fast-shallow or slow shallow are missing score low.	Dominated by 1 velocity/depth regime. Usually slow deep
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 5 % of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 5 -30% of the bottom affected; slight deposition in pools	Moderate depostion of new gravel, sand or fine sediment on old and new bars; 30-50% of the bottom affected;sediment deposits at obstructions, constrictons and bends;moderate deposition of pools prevalent.	Heavy deposits of fine material, increased bar development;more than 50% of the bottom changing frequently;pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present in standing pools
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Above parameters are to be evaluated for the length of the sample reach only.

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present;usually in areas of bridge abutments;evidence of past channelization, ie. dredging (greater than past 20 yr) may be present but recent channelization is not	Extensive channelization and/or embankments or shoring structures present on both banks; and 40-80% of the stream reach is channelized and disrupted.	Banks shored with gabion or cement;over 80% of the stream reach channelized and disupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Frequency of Riffles (or bends)	Occurrence of riffles relatively frequent;ratio of distance between riffles divided by width of stream < 7:1 (generally 5 to 7);In streams where riffles are continuous, placement of boulders or other large natural obstructions is important. Variety of habitat is key.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 and 15.	Occassional rifle or bend, bottom contours provide some habitat; distance between riffles divided by the width of the stream is between 15 and 25	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio > 25.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability Left and right bank determined by facing downstream	Banks stable:evidence of erosion or bank failure absent or minimal;little or potential for future problems. < 5% of the bank affected	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion;high erosion potential during floods.	Unstable;many eroded areas:"raw" areas frequent along straight sections and bends;obvious bank sloughing;60-100% of bank has erosional scars.
SCORE	**Left Bank** 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non woody plants; vegetative disruption through grazing or mowing minimal or not evident;almost all plants allowed to grow naturally	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented;disruption evident but not affecting full growth potential to any great extent;more than 1/2 potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation;disruption obvious;patches of bare soil or closely cropped vegetation common;less than one-half of the potential plant stubble height remaining..	Less than 50 % of the streambank surfaces covered by vegetation;disruption of streambank is very high;vegetation has been removed to 5 cm or less tin average stubble height.
SCORE	**Left Bank** 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width	Width of riparian zone > 18 meters;human activities (i.e. parking lots, roadbeds, clear cuts, lawns or crops) have not impacted zone.	Width of riparian zone 12-18 meterts;human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters;human activities have impacted zone agreat deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE	**Left Bank** 10 9	8 7 6	5 4 3	2 1 0
	Right Bank 10 9	8 7 6	5 4 3	2 1 0

Above parameters are to be evaluated 1 sampling length broader upstream and 1 sampling length broader downstream

TOTAL SCORE ☐

NJ Division of Fish and Wildlife

Bureau of Freshwater Fisheries

Habitat Assessment - Datasheet

Low Gradient Streams

Fish and Wildlife

Stream Name		Date
Location		
WMA	Drainage	
Assessment Completed By:	Weather	

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
1.Epifaunal Substrate / Available Cover	Greater than 50% of substrate favorable for epifaunal colonization and fish cover; mix of snags,submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full colonization potential (i.e. logs/snags that are not new fall and not transient)	30-50% mix of stable habitat; well-suited for full colonization potential; adequate habitat for maintenance of populations; presence of additional substrate in the form of newfall, but not yet prepared for colonization (may rate at high end of scale)	10-30% mix of stable habitat;habitat availability less than desirable; substrate frequently disturbed or removed.	Less than 10% stable habitat; lack of habitat is obvious; substrate unstable or lacking.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
2. Pool Substrate	Mixture of substrate materials, with gravel and firm sand prevalent; root mats and submerged vegetation common.	Mixture of soft sand, mud or clay; mud may be dominant; some root mats and submerged vegetation present	All mud or clay or sand bottom; little or no root mat;no submerged vegetation	Hard-pan clay or bedrock;no root mat or vegetation
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
3. Pool Variability	Even mix of large-shallow (> half the stream cross section and < 1 m deep), large-deep(> half the stream cross section and > 1 m deep), small shallow (< half the stream cross section and < 1 m depth), small-deep (< half the stream cross section and > 1m depth) pools present.	Majority of pools large deep; very few shallow pools present (< 1 m in depth)	Shallowpools (< 1 m depth) much more prevalent than deep pools (> 1 m depth)	Majority of pools small and shallow (< half the stream cross section and < 1m in depth) or pools absent.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
4. Sediment Deposition	Little or no enlargement of islands or point bars and less than 20 % of the bottom affected by sediment deposition.	Some new increase in bar formation, mostly from gravel, sand or fine sediment; 20-50% of the bottom affected; slight deposition in pools	Moderate deposition of new gravel, sand or fine sediment on old and new bars; 50-80% of the bottom affected;sediment deposits at obstructions, constrictons and bends;moderate deposition of pools	Heavy deposits of fine material, increased bar development;more than 80% of the bottom changing frequently;pools almost absent due to substantial sediment deposition.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
5. Channel Flow Status	Water reaches base of both lower banks, and minimal amount of channel substrate is exposed.	Water fills > 75% of the available channel; or < 25% of channel substrate is exposed.	Water fills 25-75% of the available channel, and/or riffle substrates are mostly exposed.	Very little water in channel and mostly present in standing pools
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1

Above parameters are to be evaluated for the length of the sample reach only.

Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
6.Channel Alteration	Channelization or dredging absent or minimal; stream with normal pattern	Some channelization present;usually in areas of bridge abutments;evidence of past channelization, ie. dredging (greater than past 20 yr) may be present but recent channelization is not	Extensive channelization and/or embankments or shoring structures present on both banks; and 40-80% of the stream reach is channelized and disrupted.	Banks shored with gabion or cement;over 80% of the stream reach channelized and disupted. Instream habitat greatly altered or removed entirely.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
7. Channel Sinuosity	The bends in the stream increase the stream length 3 to 4 times longer than if it was a straight line. (Note-channel braiding is considered normal in coastal plains and other low lying areas. This parameter is not easily rated in these	The bends in the stream increase the stream length 1 to 2 times longer if it was in a straight line.	The bends in the stream increase the stream length 1 to 2 times longer if it was in a straight line.	Channel straight; waterway has been channelized for a long distance.
SCORE	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1
8. Bank Stability Left and right bank determined by facing downstream	Banks stable:evidence of erosion or bank failure absent or minimal;little or potential for future problems. < 5% of the bank affected	Moderately stable; infrequent, small areas of erosion mostly healed over. 5-30% of bank in reach has areas of erosion.	Moderately unstable; 30-60% of bank in reach has areas of erosion;high erosion potential during floods.	Unstable;many eroded areas:"raw" areas frequent along straight sections and bends;obvious bank sloughing;60-100% of bank has erosional scars.
SCORE **Left Bank**	10 9	8 7 6	5 4 3	2 1 0
SCORE **Right Bank**	10 9	8 7 6	5 4 3	2 1 0
9. Vegetative Protection	More than 90% of the streambank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non woody macrophytes;vegetative disruption through grazing or mowing minimal or not evident;almost all plants allowed to grow naturally	70-90% of the streambank surfaces covered by native vegetation, but one class of plants is not well represented;disruption evident but not affecting full growth potential to any great extent;more than one-half of the potential plant stubble height remaining.	50-70% of the streambank surfaces covered by vegetation;disruption obvious;patches of bare soil or closely cropped vegetation common;less than one-half of the potential plant stubble height remaining.	Less than 50 % of the streambank surfaces covered by vegetation;disruption of streambank is very high;vegetation has been removed to 5 cm or less in average stubble height.
SCORE **Left Bank**	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0
10. Riparian Vegetative Zone Width	Width of riparian zone > 18 meters;human activities (i.e. parking lots, roadbeds, clear cuts, lawns or crops) have not impacted zone.	Width of riparian zone 12-18 meterts;human activities have impacted zone only minimally.	Width of riparian zone 6-12 meters;human activities have impacted zone agreat deal.	Width of riparian zone < 6 meters; little or no riparian vegetation due to human activities.
SCORE **Left Bank**	10 9	8 7 6	5 4 3	2 1 0
Right Bank	10 9	8 7 6	5 4 3	2 1 0

Above parameters are to be evaluated 1 sampling length broader upstream and 1 sampling length broader downstream

TOTAL SCORE ☐

APPENDIX D
List of New Jersey Freshwater Fishes

(Revised 2016)

Scientific Name	Common Name	Trophic Guild	Tolerance	Historical Presence	Status Pending
Petromyzontidae:					
Lampetra appendix	American Brook Lamprey	NF	IS	N	SC
Petromyzon marinus	Sea Lamprey	PF	MT	N	S
Acipenseridae:					
Acipenser brevirostrum	Shortnose Sturgeon	BI	IS	N	E
Acipenser oxyrhynchus	Atlantic Sturgeon	BI	IS	N	E (FED)
Lepisosteidae:					
Lepisosteus osseus	Longnose Gar	P	M	EX	NA
Amiidae:					
Amia calva	Bowfin	P	TS	NN	NA
Anguillidae:					
Anguilla rostrata	American Eel	P	TS	N	S
Monopterus albus	Asian Swamp Eel	G	TS	E	I
Clupeidae:					
Alosa aestivalis	Blueback Herring	PL	MT	N	NE
Alosa mediocris	Hickory Shad	I/P	US	N	NE
Alosa pseudoharengus	Alewife	PL	MT	N	NE
Alosa sapidissima	American Shad	PL	MT	N	NE
Drosoma cepedianum	Gizzard Shad	G	TS	N	NE
Salmonidae:					
Oncorhynchus mykiss	Rainbow Trout	I/P	IS	NN	NA
Salmo salar	Atlantic (Landlocked)	P	IS	NN	NA
Salmo trutta	Brown Trout	I/P	IS	E	NA
Salvelinus fontinalis	Brook Trout	I/P	IS	N	SC
Salvelinus namaycush	Lake Trout	P	IS	NN	NA
Osmeridae:					
Osmerus mordax	Rainbow Smelt	I	IS	N	NE
Umbridae:					
Umbra pygmaea	Eastern Mudminnow	I	TS	N	S
Channidae					
Channa Argus	Northern Snakehead	P	TS	E	I

Scientific Name	Common Name	Trophic Guild	Tolerance	Historical Presence	Status Pending
Esocidae:					
Esox americanus	Redfin Pickerel	P	MT	N	S
Esox lucius	Northern Pike	P	IS	NN	NA
Esox masquinongy	Muskellunge	P	IS	NN	NA
Esox niger	Chain Pickerel	P	MT	N	S
Cyprinidae:					
Carassius auratus	Goldfish	G	TS	E	NA
Carpiodes cyprinus	Quillback	BI	TS	N	S
Cyprinus carpio	Common Carp	G	TS	E	NA
Exoglossum maxillingua	Cutlip Minnow	BI	IS	N	S
Hybognathus regius	Eastern Silvery Minnow	H	MT	N	S
Notemigonus crysoleucas	Golden Shiner	G	TS	N	S
Notropis amoenus	Comely Shiner	I	TS	N	SC
Cyprinella analostana	Satinfin Shiner	I	TS	N	S
Cyprinella spiloptera	Spotfin Shiner	I	TS	N	S
Margariscus margarita	Pearl Dace	G	MT	NN	NA
Notropis bifrenatus	Bridle Shiner	I	IS	N	E
Notropis chalybaeus	Ironcolor Shiner	I	IS	N	E
Luxilis cornutus	Common Shiner	I	MT	N	S
Notropis husdonius	Spottail Shiner	I	MT	N	S
Notropis procne	Swallowtail Shiner	I	MT	N	S
Pimephales notatus	Bluntnose Minnow	G	TS	NN	NA
Pimephales promelas	Fathead Minnow	G	TS	NN	NA
Rhinichthys atratulus	Blacknose Dace	BI	TS	N	S
Rhinichthys cataractae	Longnose Dace	BI	MT	N	S
Semotilus atromaculatus	Creek Chub	I	TS	N	S
Semotilus corporalis	Fallfish	I	MT	N	S
Ctenopharyngodon idella	Grass Carp	H	MT	E	I
Catostomidae:					
Catostomus commersoni	White Sucker	BI	TS	N	S
Erimyzon oblongus	Creek Chubsucker	BI	MT	N	S
Hypentelium nigricans	Northern Hog Sucker	BI	IS	N	SC
Ictaluridae:					
Ameiurus catus	White Catfish	I/P	MT	N	S
Ameiurus melas	Black Bullhead	BI	MT	NN	NA
Ameiurus natalis	Yellow Bullhead	BI	MT	N	S
Ameiurus nebulosus	Brown Bullhead	BI	TS	N	S
Ictalurus punctatus	Channel Catfish	I/P	MT	NN	NA
Noturus gyrinus	Tadpole Madtom	BI	MT	N	S
Noturus insignis	Margined Madtom	BI	IS	N	S
Pylodictis olivaris	Flathead Catfish	P	TS	NN	I
Aphredoderidae:					
Aphredoderus sayanus	Pirate Perch	I	MT	N	S

Scientific Name	Common Name	Trophic Guild	Tolerance	Historical Presence	Status Pending
Cyprinodontidae:					
Fundulus diaphanus	Banded Killifish	I	TS	N	S
Fundulus heteroclitus	Mummichog	I	TS	N	S
Poeciliidae:					
Gambusia affinis	Mosquitofish	I	TS	NN	NA
Gambusia holbrooki	Eastern Mosquitofish	I	TS	N	U
Gasterosteidae:					
Apletes quadracus	Fourspine Stickleback	I	MT	N	NE
Gasterosteus aculeatus	Threespoine Stickleback	I	MT	N	NE
Pungitius pungitius	Ninespine Stickleback	I	MT	N	NE
Moronidae:					
Morone americana	White Perch	I/P	MT	N	S
Morone saxatilis	Striped Bass	P	MT	N	U
Centrarchidae:					
Acantharchus pomotis	Mud Sunfish	I	MT	N	SC
Ambloplites rupestris	Rock Bass	I/P	MT	NN	NA
Enneacanthus chaetodon	Blackbanded Sunfish	I	IS	N	SC
Enneacanthus gloriosus	Bluespotted Sunfish	I	IS	N	S
Enneacanthus obesus	Banded Sunfish	I	IS	N	S
Lepomis auritus	Redbreast Sunfish	I	MT	N	S
Lepomis cyanellus	Green Sunfish	I/P	TS	NN	I
Lepomis gibbosus	Pumpkinseed	I	MT	N	S
Lepomis gulosus	Warmouth	I/P	TS	NN	NA
Lepomis macrochirus	Bluegill	I	TS	NN	NA
Micropterus dolomieu	Smallmouth Bass	I/P	MT	NN	NA
Micropterus salmoides	Largemouth Bass	P	MT	NN	NA
Pomoxis annularis	White Crappie	I/P	TS	NN	NA
Pomoxis nigromaculatus	Black Crappie	I/P	MT	NN	NA
Percidae:					
Etheostoma fusiforme	Swamp Darter	BI	IS	N	S
Etheostoma olmstedi	Tessellated Darter	BI	MT	N	S
Perca flavescens	Yellow Perch	I/P	MT	N	S
Percina peltata	Shield Darter	BI	IS	N	SC
Sander vitreus	Walleye	P	IS	NN	NA
Cottidae:					
Cottus cognatus	Slimy Sculpin	BI	IS	N	T
Cobitidae:					
Misgurnus anguillicaudatus	Oriental Weatherfish	G	TS	E	I
Soleidae:					
Trinectes maculatus	Hogchoker	G	IS	N	NE

Key:

Abbrev.	Term	Definition
Trophic Guild		
BI	Benthic	Specialist feeder that primarily consumes insects taken from the bottom substrate.
H	Herbivore	A species that consumes plant and algae materials.
I	Insectivore	A species that consumes primarily insects.
NF	Nonparasitic	A species that feeds by filtering algae and other microorganisms found in detritus.
G	Generalist	A species that consumes a wide variety of food types from a wide variety of habitats.
P	Piscivore	A species that primarily consumes fish.
PF	Parasitic	A species that feeds by attaching to and rasping a hole in the side of a large fish.
PL	Planktivore	A species that consumes small organisms (algae and animals) that float in the water column.
Historical Presence		
E	Exotic	A non-native species introduced from a foreign country.
EX	Extirpated	A native species no longer present, either as a result of natural causes or because of eradication by humans.
N	Native	In the U.S., a species historically occurring in a geographic range previous to the arrival of the first European settlers.
NN	Non-Native	A species found outside of their historical range. The occurrence of a non-native species may be a result of intentional stocking (sportfish or biological control), unintentional stocking (escape), or a response to habitat/climatic changes.
Tolerance		
IS	Intolerant Species	A species most sensitive to environmental degradation. These species have historical distributions significantly greater than presently occurring populations.
MT	Moderately Tolerant Sp.	A species moderately sensitive to environmental degradation. These species can withstand slight environmental conditions, but can not tolerate significant impact.
TS	Tolerant Species	A species least sensitive to environmental degradation. These species can withstand stressful environmental conditions and often become a dominant member in the fish assemblage.
Status (Formal status review completed and approved by ENSAC in 2016, but not yet implemented into formal regulation.)		
E	Endangered	A species whose prospects for survival within the state are in immediate danger due to one or several factors and likely requires immediate action to avoid extinction within NJ.
T	Threatened	A species that may become Endangered if conditions surrounding it begin to or continue to deteriorate, thus is one that is already vulnerable.
SC	Special Concern	A species that warrants special attention because of inherent vulnerability to environmental deterioration or habitat modification that would result in their becoming Threatened if conditions surrounding the species begin or continue to deteriorate.
S	Secure/ Stable	A species that appear to be secure in NJ and not in any immediate foreseeable danger of becoming Endangered, Threatened, or Special Concern.
NA	Not Applicable	This species does not occur in NJ with regularity or predictability. (ie. Extirpated or Non-native).
NE	Not Evaluated	A species not evaluated as part of the recent species evaluation, due to significant life-history component in brackish/marine habitats.
I	Invasive	A non-native species that has the potential to cause ecologic or economic harm, identified as a Potentially Dangerous Fish Species in N.J.A.C. 7:25-6.2. (2010)
Miscellaneous		
U	Undetermined / Unknown	A species in which not enough information exists on which to base a judgement.

Stocked Trout Movement Study in the Flat Brook Catch and Release Area: Preliminary Findings (2017)

Investigations and Management of New Jersey's Freshwater Fisheries Resources (APPENDIX E)

By
Ross Shramko, Senior Fisheries Biologist

December, 2017

New Jersey Department of Environmental Protection

Division of Fish and Wildlife

Bureau of Freshwater Fisheries

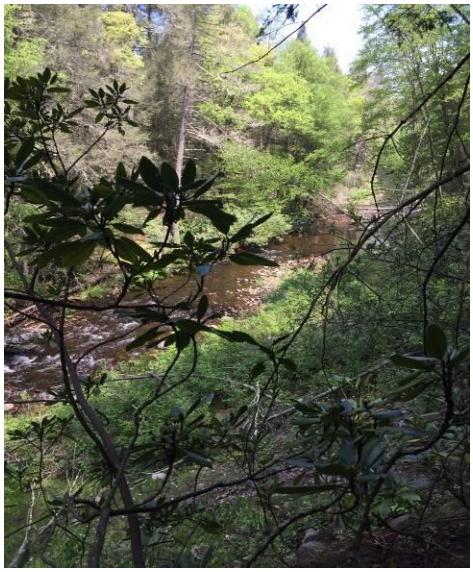
Sportfish Restoration Grant F-48-R

This grant was paid for by fishing license sales and matching Dingell-Johnson/Wallop-Breaux funds available through the Federal Sportfish Restoration Act.

Stocked Trout Movement Study in the Flat Brook Catch and Release Area: Preliminary Findings

Introduction

The Big Flat Brook / Flat Brook is located in the northwestern portion of New Jersey in Sussex County. Its headwaters originate out of Saw Mill Pond in Montague Township, Sussex County and terminate at its confluence with the Delaware River in Walpack Township, Sussex County. Along the way, the Big Flat Brook joins with the Little Flat Brook and the two streams from this point forward are known just as the Flat Brook. The portion of stream where this stocked trout telemetry study took place is both upstream and downstream of the confluence with the Little Flat Brook in both the Big Flat Brook and the Flat Brook sections. For the purpose of this study we will refer to this section as the "Flat Brook."



predation.Picturesque view of Big Flat

The Flat Brook watershed is one of New Jersey's most intact watersheds. Although impacted by logging throughout its history, the Flat Brook watershed has not been subjected to the same impacts from urbanization that many other watersheds in the state have succumbed to. The majority of the stream flows through multiple state parks and federally protected lands that have kept urban development restricted. While walking along the stream, one can feel the remoteness of this area and many anglers will fish the Flat Brook just for the scenery and remoteness the Flat Brook elicits. The watershed is 93% forested and 2.5% agriculture, with a very small amount of the remaining 4.5% as urban. Many of the tributaries that flow into the Flat Brook system are classified as *Trout Production* and have reproducing native Brook Trout. This classification is obtained by the simple fact that biologists have documented reproducing trout in them. The *Trout Production* classification gives the highest protection to the stream from development and other impacts by keeping the riparian buffers intact. The mainstem Big Flat Brook coming out of Sawmill Pond is classified as *Non-Trout*, as the water is too warm to support trout year-round and therefore no reproduction has been found. This *Non-Trout* classification continues for about 6.5 miles downstream, to a point located in Stokes State Forest where electrofishing sampling has documented trout reproduction in the mainstem Big Flat Brook. From this point to an area known as Three Bridges, the Big Flat Brook is classified as *Trout Production*. From the Three Bridges location to the confluence with the Delaware River the Flat Brook is classified as *Trout Maintenance*, which means that the waterbody has temperatures suitable to hold trout over throughout the summer months, but trout reproduction has not been documented.

The Flat Brook is part of the NJ Division of Fish & Wildlife's Spring and Fall Trout Stocking Programs. It is considered one of the state's most popular stocked trout waters and falls under a special regulation created due to the popularity of the streams found in this category, where the water is closed to fishing until 5:00pm on the day that it is stocked. The Flat Brook is allocated

34,000 trout in the spring, which is the 3rd most trout allocated waterbody in New Jersey behind the Musconetcong River and the South Branch of the Raritan River. The Flat Brook & the South Branch of the Raritan River have the only *Catch and Release* regulated areas in the state. These *Catch and Release* areas were created in 2014 to give anglers a place where stocked trout cannot be harvested and in theory, these areas will have more fish available to anglers for recreation year-round. Unfortunately, angler success has not always been very good. Many anglers call the Division of Fish and Wildlife annually to complain about the lack of fish found throughout the Flat Brook. Division biologists have also been surprised by the low numbers of trout found in many electrofishing surveys conducted throughout the Flat Brook watershed over time.

Beginning in 2012, the Division of Fish and Wildlife began collecting data to establish a baseline in the soon to be designated a *Catch and Release* area. The *Catch and Release* area begins at Route 206 and continues downstream to the Roy Bridge found in the Flat Brook / Roy Wildlife Management Area. Four 150-meter backpack electrofishing surveys were done annually to aid Division of Fish and Wildlife biologists with baseline data to evaluate the effects of this regulation change beginning in 2012 and continuing until present. These surveys were conducted in the summer months as with standard operating procedure of electrofishing sampling. As with previous surveys done throughout the Flat Brook, biologists found less trout than expected in a waterbody that should be able to hold trout throughout the year. It was hypothesized that after the *Catch and Release* regulation went into effect, during the spring of 2014, that the electrofishing surveys would show an increase in the number of stocked trout. After five years of study, it became clear that stocked trout are not holding throughout the *Catch and Release* regulation area in good numbers. Some trout may be utilizing deep, non-wadeable, very difficult to sample pools in the stream, while other trout may be migrating out of the *Catch and Release* regulated area outright or are subject to high predation rates.

To help biologists understand if and when trout might be migrating out of the *Catch and Release* area, six additional surveys were conducted in 2016 and one in 2017. These additional surveys were very different than the typical standardized 150-m surveys conducted previously. In an attempt to sample a larger area, these surveys covered a total of 1,200 nearly contiguous meters, with only few pools throughout the 1,200 m that were too deep to sample with backpack electrofishing units. In these deeper pools, visual observations of the trout were counted. These surveys began in May and June, much closer to the spring trout stocking, in hopes to find an increased number of stocked trout. Although biologists did find an increase in overall stocked trout per 100 m during the 1200 m surveys in comparison with the summer time 150 m surveys, the total number of trout per 100 m was still far below what would be expected in a *Catch and Release* area after receiving being stocked. Biologists also found far less trout than the comparable *Catch and Release* regulated area on the South Branch of the Raritan River, where biologists are seeing an increase in stocked trout per 100 m after the regulation went into effect. For more information on these surveys, see the *Trout Waters with Special Regulations* section of the *Investigations and Management of New Jersey's Freshwater Fisheries Resources* 2017 report.

So, what is happening to the stocked trout in the Flat Brook system? It is a possibility that the trout are swimming long distances and leaving the *Catch and Release* area and possibly even leaving the Flat Brook system entirely. It is also possible that the trout are remain in the *Catch*

and Release area in deep pools, where electrofishing equipment cannot collect these fish. It is also possible that these trout are being lost to some sort of predation. To help answer these questions, NJ Division of Fish and Wildlife staff implemented a trout telemetry study in the *Catch and Release* area on the Flat Brook that began in the spring of 2017.

Methods and Materials

A total of 40 radio telemetry transmitters were surgically implanted into 40 Rainbow Trout from the Pequest Trout Hatchery. 20 radio tagged trout were released on April 12, 2017, one week after opening day of the 2017 trout fishing season. By waiting until after opening day, the radio tagged trout were not influenced by the amount of angling pressure that occurs on the busiest day of the entire trout season. The remaining 20 radio tagged trout were released about a month later on May 17, 2017. The difference in stocking periods will allow for analysis of potential effects of flow and temperature between the two stocking periods. There was an attempt to find each tagged fish daily for the first two weeks after each stocking period, then every other day after the first two-week period for the remainder of the study. In addition, an un-manned station was deployed near the confluence with the Delaware River to record any tagged fish that were about to leave the Flat Brook system entirely. This un-manned station surveyed the immediate area for any transmitter 24 hours a day, 7 days a week.

Radio transmitter surgically implanted into Rainbow Trout

The Advanced Telemetry Systems F-1580 implant transmitters were surgically implanted in each trout, one day prior to each stocking event. The tagged trout were held at the Pequest Hatchery in a portioned off section of raceway overnight. This overnight time period allowed for the drops of transmitters from suture failure and made sure that each fish came out of the surgery healthy and ready for release. Each transmitter weighed 3.6 grams, about 2% of the overall weight of the trout. This is below the accepted weight determined by other radio telemetry studies that would not impact the movement or behavior of the tagged trout. The study was schedule to conclude about 230 days after stocking, when the batteries of the transmitters were projected to fail.

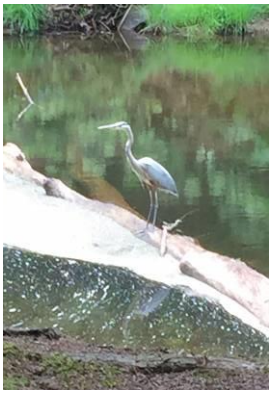
Radio tagged trout being stocked into Catch and Release Area of Big Flat Brook

Individual trout from the production line of the Pequest Trout Hatchery measured 10.5 inches and weighed on average 0.5 pounds. They were anesthetized using MS-222 (Tricaine-S, tricaine methanesulfonate) and were immobilized on a surgical board upside down. A tube with flowing water was inserted in the mouth to allow the fish to "breath," and the abdomen was sterilized with iodine. A ½ inch

incision was made in the abdomen and a curved needle is placed in the incision and poked through the side of the trout. The tag end of the antenna was threaded into the needle and then the needle was pulled through the side of the trout. The body of the tag is then placed into the abdominal cavity. From here the incision is closed with two non-absorbable sutures. After surgery is complete, the trout were allowed to recover overnight in a separated area of the hatchery to see how they come out of the anesthesia and to make sure the transmitters did not fall out.

After each fish was stocked at the three pre-determined stocking locations, an attempt to locate each fish was made daily for the first two weeks after stocking and about every other day after the first two weeks from each stocking event. To locate each fish, staff would walk to the last known location of each fish, scanning for a signal. Once a signal was found, staff would determine, to the highest accuracy possible, where exactly the signal was coming from. Locations could usually be determined down to the habitat level. Locations such as head of pool, a riffle below a pool, a root ball, or some other micro habitat level would be used to describe exact locations of the fish. When possible, visual confirmation of an external wire was noted to confirm the signal was emitted from a live fish. The latitude / longitude of each location was recorded using handheld Garmin GPS units. If a fish had not moved from a known location for several days and no visual of a live fish, an attempt to move the fish by wading into the pool was done to determine if the signal was emulating from a live fish or a dropped tag. This proved to be very difficult depending on the depth of the pool and in many cases a determination could not be made.

Visual confirmation of live radio tagged trout. Notice the silver antenna trailing behind the trout.



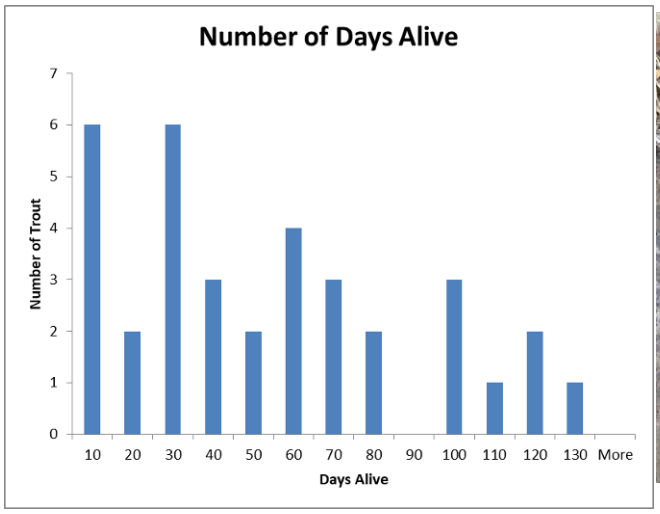
Great Blue Heron.

If a transmitter could not be found near the last known location, staff searched the entire length of the Flat Brook, from Sawmill Pond to the confluence with the Delaware River, by scanning for the signal. The un-manned station was also checked each day to see if the fish entered the Delaware River. There were a few locations where the river could not be accessed by vehicle or by foot, staff used kayaks and floated these remote areas scanning for lost signals. If there still was no signal, staff would drive around the roads throughout the Flat Brook watershed scanning for lost signals, focusing on known Great Blue Heron rookeries. Previously lost transmitters were scanned at this time as well. When a signal was detected, it was tracked and an attempt to determine how it got there was made. Was it dropped by a bird? Was there evidence that the transmitter was chewed on by a mammal?

Results

The study lasted a total of 124 days. All 40 transmitters were either lost or found outside of a fish by 9/11/17. This was far shorter than the 230 possible days of battery life. It was determined that a predator removed the fish from the stream area. Seventy-six days were spent recording at least one location of a tagged fish. An average day lasted 5.5 hours and two staff personnel were assigned on most days. This resulted on over 800 man-hours spent on this project locating tagged trout or looking for lost transmitters.

Sixteen total transmitters were lost and assumed taken away from the stream beyond the distance of the receiving equipment and could not be located. Other telemetry studies have shown reliability in the transmitters with a less than 1% failure rate. Therefore, all lost transmitters were believed to have been taken away from the stream by predation and not to transmitter failure. These fish were most likely eaten by birds and flown away from the stream. Twenty-four transmitters were found and recovered. Some of these were found on land by the remains of trout, in scat piles, or found in mammal runs or den like areas. Three transmitters were tracked to a Great Blue Heron rookery but not recovered. These transmitters were likely eaten by Great Blue Herons and regurgitated or excreted at these locations. Five transmitters were found after some time, at the exact location it was stocked. High flows and deep water made it difficult to determine when these tags were dropped and how that came to be. Due to not being able to determine if these tags were simply dropped by the trout, or if or when a predation event or dropping occurred, these five transmitters were not used in any analysis for this study, leaving a sample size of 35 not 40 transmitters. Overall, it was determined that 19 transmitters were lost due to avian predation and 16 transmitters were most likely lost due to mammal predation, but other predation types were possible. Individual tagged trout were confirmed alive 3 days to 122 days after being stocked, with an average of 52 days (see figure below).

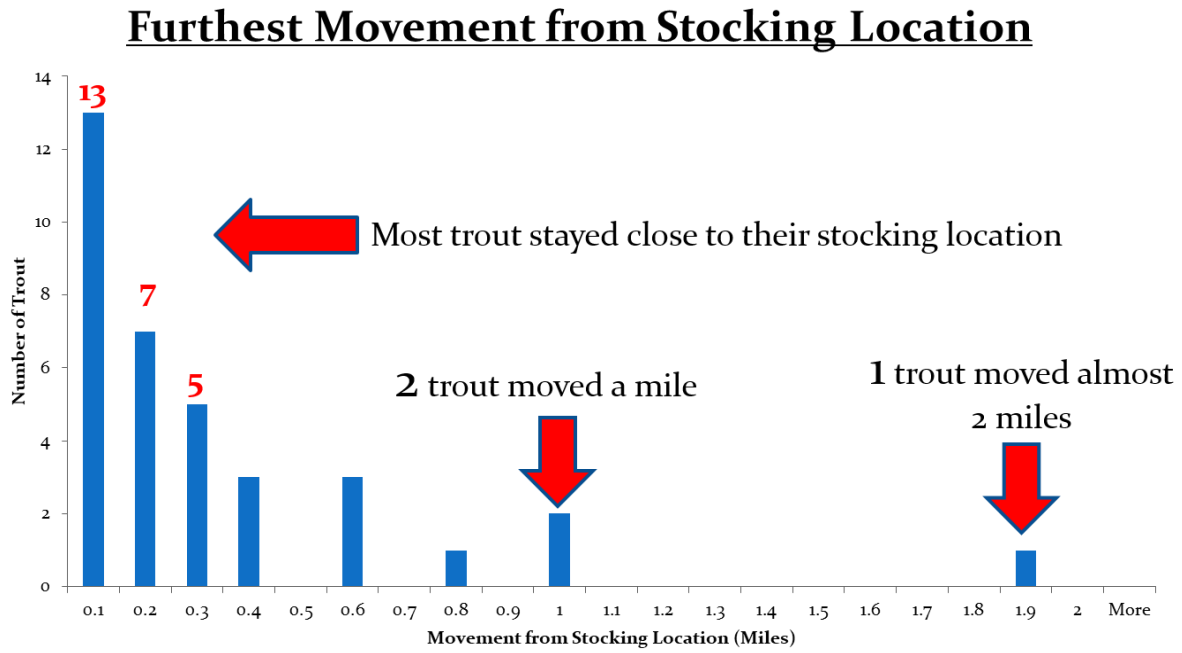


Number of days tagged trout survived.

Dropped radio transmitter found among fish scales and bones, an obvious sign of mammal

Initial movement from each of the three stocking points was recorded. Nineteen trout initially moved downstream, 10 moved upstream, and 6 did not move from their stocking location, but were determined to still be alive at least a week after stocking. The number of days each trout spent at their stocking location before moving ranged from 0 to 56 days, with an average of 12 days before moving. There was no statistical difference between stocking locations, with regards

to the number of days a fish stayed in its initial location before moving, number of days a fish remained alive, or the distance or direction a fish traveled. Furthest distance a tagged trout moved from its stocking location ranged from 0 to 1.85 miles, with an average of 0.28 miles. The total distance an individual trout moved ranged from 0 to 1.95 miles with an average of 0.45 miles (see figure below).



Discussion

This telemetry study was initiated to explain why biologists and anglers are not finding the expected numbers of stocked trout in the Flat Brook *Catch and Release* area, especially compared to New Jersey's only other *Catch and Release* regulated area, the Ken Lockwood Gorge, South Branch of the Raritan River where anglers and biologists are finding the expected numbers of stocked trout. There were a few main questions this study set out to answer. The first was, "Are trout stocked in the *Catch and Release* area leaving the Flat Brook system entirely and entering the Delaware River?" The data collected during this study confirmed that the trout are **not** leaving the Flat Brook watershed by swimming into the Delaware River. The un-manned recording station was positioned near the confluence with the Delaware River and it did not record a single radio tagged trout in its vicinity. To make sure equipment was working correctly, the un-manned station was tested by manually moving a dropped transmitter into the area of the un-manned station, for which it was properly recorded and stored in the un-manned station's log. This shows that no radio tagged trout moved into or through the area where the un-manned station was monitoring. The fact that trout are not leaving the Big Flat Brook and heading into the Delaware River is good news for anglers and the Division of Fish and Wildlife's trout stocking program because it means that trout are not leaving the area on their own accord. This means that trout are potentially remaining available to anglers at locations that the Division of Fish and Wildlife intended them to be.

Previously tagged trout carcass found on the bank of the Big Flat Brook. Notice hole in skin where an antenna exited.

A second question this study was designed to answer was, "Are the stocked trout leaving the *Catch and Release* area, but still remaining in the Flat Brook System?" Ultimately the answer to this question is no. Thirty-four of the 35 radio tagged trout remained inside the *Catch and Release* area. The single radio tagged trout that left the *Catch and Release* area swam upstream and through the upstream most boundary by crossing under the 206 bridge. This fish continued further upstream and was found 0.4 miles from the boundary. This fish was stocked at the upper most stocking location which is found only 0.35 miles from Rt. 206. What makes answering this question interesting, is that several fish did swim distances that could have taken them out of the *Catch and Release* area, if they had moved in the opposite direction or if they were stocked at a different location. For example, 4 out of the 7 trout stocked at the upper most stocking location moved in one direction, far enough to travel outside of the *Catch and Release* area, but only 1 of those 4 trout swam upstream. The other 3 traveled downstream, further into the *Catch and Release* area. If all of these fish would have traveled upstream, then the overall results of how many fish left the *Catch and Release* area would be different. Also, the lower-most stocking location was located 0.75 miles from the lower boundary of the *Catch and Release* area. Four radio tagged fish traveled an overall distance greater than 0.75 miles from their stocking point and 3 of the 4 went downstream. Hypothetically, if these fish were stocked at the lower most stocking point and if their behavior and movement distance and direction remained the same, they would have moved out of the *Catch and Release* regulated area. This is strictly hypothetical though, as there could be reasons (temperature / habitat) below the lower most stocking location that keeps fish from traveling that distance. This may have been what occurred because 0 fish that were stocked at the lower most stocking location moved far enough downstream to exit the *Catch and Release* area. In fact, the furthest distance any fish moved downstream from the lower most stocking location was 0.39 miles, which is just over half way to the downstream boundary.

The third question this radio telemetry study was designed to answer was, "Are the fish remaining in the *Catch and Release* regulated area, but moving minor distances into areas that electrofishing equipment cannot sample effectively due to depth or flow?" Results from the study showed that some of the trout are moving into these deeper pools and high flow areas. This was expected, because a lot of the deeper pools and higher flow areas are very good trout habitat. What the study also showed is that not all of the radio tagged trout moved into these deeper pools. Many trout spread out and moved throughout the *Catch and Release* area and utilized habitat that electrofishing equipment could sample effectively. Therefore, it has been determined that the reason that the electrofishing surveys have been collecting less trout than expected is not due to a large number of trout moving into the deeper pools where the electrofishing equipment cannot sample.

So now we now know that the trout are staying relatively close to where they were stocked and that many remained in locations suitable for electrofishing collection. This still does not answer why trout are not collected during these electrofishing surveys and why anglers report less than expected catch rates. The answer to this might be the fact that all 40 radio tagged trout were lost before the end of the summer. It is fairly certain that 35 of the 40 radio tagged trout were lost due to some sort of predation, while the other 5 may have been lost due to predation or simply just dropped by the fish, possibly due to suture failures. Either way, this study showed that trout are not holding over through the summer months as predicted and predation is definitely a factor as to why. Direct predation on non-radio tagged trout was also documented by staff several times during the study and staff also anecdotally noted observing several predators such as Great Blue Herons and Mergansers. Staff also saw signs of mammalian predators along the river banks in the forms of tracks, scat piles, runs, and dens.

A mammal's den found on Big Flat Brook. A dropped radio tag was found just outside this den.

Water temperatures have been monitored annually in the *Catch and Release* area since before the regulations went into effect and continued through the year this study occurred. The data from the continuous temperature monitors show that water temperatures in the Flat Brook *Catch and Release* area are suitable to hold fish year-round, but they do approach and sometimes exceed a temperature above what is considered optimal for trout. The temperature data also shows that at no time does the temperature reach a point above the critical threshold for trout survival. We analyzed the data to see if predation rates increased during or closely following the time periods in which temperatures reach above optimal thermal conditions. It is thought that at these times, the fish could become so thermally stressed that it changes their behavior and ability to evade predators. Although predation rates increased as water temperatures increased, it could not be statistically shown that increased temperature was the reason for the increase in mortality. This was mainly due to the fact that the data showed an increase in mortality rates several weeks prior to temperature increases.

A plausible explanation for the increase in predation rates found on the tagged trout could simply be due to the time of year where more predators are spending more time hunting for trout because of their reproductive life cycles. At these times, predators are not just hunting to feed themselves, but are hunting to feed their offspring and therefore an increase in predator activity occurs. The increase in predation rate on the radio tagged trout correlates nicely with the predicted increase in predator activity due to timing of their reproductive cycle, but more information in this area would be necessary to make any strong conclusions. More information about predation rates in other areas of the state would also be necessary to determine if these found predation rates in the Flat Brook *Catch and Release* area are atypical compared to predation rates on stocked trout in other areas of the state. More information about predation rates in other areas of the state would also be necessary to determine what if anything could or should be done to counteract these predation rates to keep trout available year-round for angler recreation in areas where thermal conditions allow.

The stocked trout movement study answered many key questions on why the Flat Brook *Catch and Release* area is not holding trout to expected levels, but it also unearthed, as studies often due, more questions about movement and predation rates on stocked trout in the Flat Brook system. In an attempt to further understand what is happening to stocked trout in the Flat Brook system, the Division of Fish and Wildlife is partnering with the Montclair State University and its School of Conservation to continue and expand this study for a second year. A graduate student from Montclair State along with staff from the School of Conservation will follow and expand the design of this stocked trout movement study in hopes to strengthen and add to the knowledge of stocked trout movements and predation rates in the Flat Brook system. The information garnered from the continuation of this study will be used to aid biologists with future management decisions about stocking rates on the Flat Brook and whether or not a *Catch and Release* regulation is appropriate for this area. (Shramko)

Opening Day Trout Angler Survey Data (2017)

Investigations and Management of New Jersey's Freshwater Fisheries Resources (APPENDIX F)

By
Ross Shramko, Senior Fisheries Biologist

April, 2017

New Jersey Department of Environmental Protection

Division of Fish and Wildlife

Bureau of Freshwater Fisheries

Sportfish Restoration Grant F-48-R

This grant was paid for by fishing license sales and matching Dingell-Johnson/Wallop-Breaux funds available through the Federal Sportfish Restoration Act.

County	Waterbody	Lake/ River Conditions	# of Cormorants Present	Time	# of Shoreline anglers		# of Boat anglers		Total # of anglers	Brook Trout caught				Brown Trout caught				Rainbow Trout caught				Total trout caught	comments
										<14 in		>14 in		<14 in		>14 in		<14 in		>14 in			
					adult	child	adult	child		kept	rel	kept	rel	kept	rel	kept	rel	kept	rel	kept	rel		
	Lakes and Ponds																						
Atlantic	Birch Grove Park Pond	Choppy	1 Feeding	8:00	45	30	0	0	75	0	0	0	0	0	1	0	1	0	0	0	0	2	
				9:00	50	35	0	0	85														
				10:00	30	25	0	0	55														
				11:00	9	4	0	0	13														
				12:00	6	3	0	0	9														
Atlantic	Heritage Park Pond	X	0	8:00	17	4	0	0	21	0	0	0	0	0	0	0	0	2	0	0	0	2	
				9:00	X	X	X	X	X														
				10:00	10	0	0	0	10														
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Atlantic	Tuckahoe Lake	Choppy	0	8:00	9	3	16	1	29	0	0	0	0	0	0	0	0	3	0	0	0	3	
				9:00	7	5	12	1	25														
				10:00	8	5	0	0	13														
				11:00	2	1	0	0	3														
				12:00	1	0	0	0	1														
Bergen	Mill Pond	Clear	4 Feeding	8:00	7	0	0	0	7	0	0	0	1	0	0	0	1	0	2	1	1	6	
				9:00	10	0	0	0	10														
				10:00	5	0	0	0	5														
				11:00	9	0	0	0	9														
				12:00	6	0	0	0	6														
Bergen	Dahnert's Lake	Sunny	1 Feeding	8:00	45	17	0	0	62	0	0	0	0	0	0	0	0	16	4	0	0	20	
				9:00	39	14	0	0	53														
				10:00	40	13	0	0	53														
				11:00																			
				12:00																			
Burlington	Lake Pemberton	Clear	0	8:00	12	2	2	0	16	0	0	0	0	0	0	0	0	1	0	0	0	1	
				9:00	11	2	2	0	15														
				10:00	15	0	4	0	19														
				11:00	12	1	1	0	14														
				12:00	7	0	0	0	7														
Burlington	Laurel Pond	Muddy, Choppy	3	8:00	25	6	0	0	31	0	0	0	0	0	0	0	0	5	0	0	0	5	
				9:00	32	7	0	0	39														
				10:00	22	3	0	0	25														
				11:00	0	0	0	0	0														
				12:00	0	0	0	0	0														
Burlington	Sylvan Lake	Choppy	0	8:00	76	19	22	0	117	0	0	0	0	0	0	0	0	53	0	7	0	60	
				9:00	62	18	21	0	101														
				10:00	65	14	22	0	101														
				11:00	55	10	18	0	83														
				12:00	36	11	12	0	59														
Camden	Grenloch Lake	Muddy High Choppy	0	8:00	29	12	8	0	49	0	0	0	0	0	0	0	0	6	1	4	7	18	
				9:00	12	0	0	0	12														
				10:00	2	6	0	0	8														
				11:00	8	1	0	0	9														
				12:00	4	0	0	0	3														
Cumberland	South Vineland Park Pond	Muddy	0	8:00	10	3	4	0	15	0	0	0	0	0	0	0	0	4	10	16	0	30	
				9:00	15	6	7	0	25														
				10:00	20	6	7	0	30														
				11:00	12	2	2	0	16														
				12:00	22	0	10	0	32														
Camden	Haddon Lake	Clear, Choppy	12 Feeding	8:00	17	2	0	0	19	0	0	0	0	0	0	0	0	10	1	1	0	12	
				9:00	28	2	0	0	30														
				10:00	29	3	0	0	32														
				11:00	17	4	0	0	21														
				12:00	10	0	0	0	10														

Opening Day Trout Angler Survey

County	Waterbody	Lake/ River Conditions	# of Cormorants Present	Time	# of Shoreline anglers		# of Boat anglers		Total # of anglers	Brook Trout caught				Brown Trout caught				Rainbow Trout caught				Total trout caught	comments
										<14 in		>14 in		<14 in		>14 in		<14 in		>14 in			
					adult	child	adult	child		kept	rel	kept	rel	kept	rel	kept	rel	kept	rel	kept	rel		
Gloucester	Greenwich Lake	Slightly choppy	No	8:00	28	3	0	0	31														
				9:00	35	5	1	0	41														
				10:00	37	8	2	0	47	0	0	0	0	0	0	0	0	7	0	1	0	8	
				11:00	40	6	2	0	48														
				12:00	40	6	2	0	48														
Gloucester	Swedesboro Lake	Muddy, High Water	4 to 6	8:00	10	2	1	0	13														
				9:00	13	0	2	0	15														
				10:00	15	0	1	0	16	0	0	0	0	0	0	0	0	0	0	1	0	0	
				11:00	13	0	1	0	14														
				12:00	10	2	1	0	13														
Hunterdon	Mountain Farm Pond	Muuddy	0	8:00	38	1	0	0	39														
				9:00	33	3	0	0	36														
				10:00	24	0	0	0	24	0	0	0	0	0	0	0	0	26	47	8	1	88	
				11:00	12	2	0	0	14														
				12:00	16	0	0	0	16														
Mercer	Colonial Lake	Muddy, High Water	35 Feeding	8:00	15	1	0	0	16														
				9:00	24	2	0	0	26														
				10:00	19	1	0	0	20	0	0	0	0	0	0	0	0	0	0	0	0	0	
				11:00	18	1	0	0	19														
				12:00	15	1	0	0	16														
Mercer	Rosedale Lake	Muddy	4 Feeding	8:00	35	1	2	0	36														
				9:00	0	0	0	0	0														
				10:00	40	4	4	0	44	0	0	0	0	0	0	0	0	1	1	0	0	2	
				11:00	0	0	0	0	0														
				12:00	0	0	0	0	0														
Middlesex	Englishtown Mill Pond	High, Muddy	4	8:00	14	7	2	0	23														
				9:00	21	8	2	0	31														
				10:00	18	11	0	0	29	0	0	0	0	0	0	0	0	17	4	0	0	21	
				11:00	12	5	2	0	20														
				12:00	10	6	2	0	18														
Middlesex	Manalapan	Clear	0	8:00	17	3	6	4	30														
				9:00	19	3	12	0	34														
				10:00	5	3	4	0	12	1	0	0	0	0	0	0	0	8	1	0	0	9	
				11:00	6	0	2	0	8														
				12:00	7	0	2	0	9														
Monmouth	Franklin Park Lake	Muddy Choppy	2 Feeding	8:00	50	8	0	0	58														
				9:00	61	9	0	0	70														
				10:00	43	2	0	0	45	0	0	0	0	0	0	0	0	13	4	1	0	18	
				11:00	29	3	0	0	32														
				12:00	30	4	0	0	34														
Monmouth	Lake Topenemus	Clear, Choppy	12 Feeding	8:00	38	5	7	0	50														
				9:00	33	6	7	0	46														
				10:00	31	4	4	0	39	1	0	0	0	0	0	0	0	6	0	0	0	7	
				11:00	19	4	3	0	26														
				12:00	16	3	2	0	21														
Monmouth	Spring Lake	Choppy	2 Feeding	8:00	422	224	18	2	666														
				9:00	X	X	X	X	X														
				10:00	X	X	X	X	X	4	0	0	0	2	0	0	0	41	0	0	6	53	
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Morris	Burnham Park Pond	Muddy, High Water	2 Feeding	8:00	60	15	0	0	75														
				9:00	65	22	0	0	87														
				10:00	27	15	0	0	42	0	0	0	0	0	0	0	0	1	0	0	0	1	
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														

Opening Day Trout Angler Survey

County	Waterbody	Lake/ River Conditions	# of Cormorants Present	Time	# of Shoreline anglers		# of Boat anglers		Total # of anglers	Brook Trout caught				Brown Trout caught				Rainbow Trout caught				Total trout caught	comments
										<14 in		>14 in		<14 in		>14 in		<14 in		>14 in			
					adult	child	adult	child		kept	rel	kept	rel	kept	rel	kept	rel	kept	rel	kept	rel		
Morris	Lake Musconetcong	Muddy, Choppy	1 Feeding	8:00	6	3	3	0	12	0	0	0	0	0	0	0	0	0	0	0	0	0	
				9:00	6	4	3	0	13														
				10:00	2	2	1	0	5														
				11:00	1	0	0	0	1														
				12:00	1	0	0	0	1														
Morris	Mt. Hope Pond	Clear, Choppy	3 Feeding	8:00	18	9	0	0	27	0	0	0	0	0	0	0	0	0	0	0	0	0	
				9:00	22	9	0	0	31														
				10:00	10	1	0	0	11														
				11:00	10	8	0	0	18														
				12:00	2	3	0	0	5														
Ocean	Lake Shenandoah	Choppy, High Water	10	8:00	12	1	2	0	15	0	0	0	0	0	0	0	0	0	0	0	0	0	
				9:00	11	0	1	0	12														
				10:00	8	0	1	0	9														
				11:00	8	0	1	0	9														
				12:00	5	0	1	0	6														
Ocean	Pohatcong Lake	Choppy, Windy	25-30	8:00	9	0	6	0	15	0	0	0	0	0	0	0	0	3	0	1	0	4	
				9:00	12	0	6	0	18														
				10:00	11	0	2	0	13														
				11:00	6	0	0	0	6														
				12:00	0	0	0	0	0														
Sussex	Silver Lake	Clear	0	8:00	12	0	9	0	21	0	0	0	0	0	0	0	0	18	12	0	0	30	
				9:00	12	0	7	0	19														
				10:00	14	0	7	0	23														
				11:00	15	0	6	0	21														
				12:00	15	0	6	0	12														
Union	Lower Echo Park Pond	Muddy, Choppy	1	8:00	80	6	0	0	85	0	0	0	0	0	0	0	0	7	0	3	0	10	
				9:00	72	4	0	0	76														
				10:00	61	5	0	0	66														
				11:00	59	5	0	0	64														
				12:00	54	2	0	0	56														
Warren	Columbia Lake	High	20 Feeding	8:00	5	0	1	0	6	0	0	0	0	0	0	0	0	1	0	0	0	1	
				9:00	7	0	2	0	9														
				10:00	3	0	2	0	5														
				11:00	11	1	2	0	14														
				12:00	9	0	3	0	12														
Warren	Mountain Lake	Muddy, High, Choppy	3 or 4	8:00	4	3	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	
				9:00	4	3	0	0	7														
				10:00	4	0	0	0	4														
				11:00	2	0	0	0	2														
				12:00	0	0	0	0	0														
	Streams and Rivers																						
Hunterdon	Beaver Brook	Clear	0	8:00	4	0	0	0	4	0	0	0	0	0	0	0	0	2	0	0	0	2	
				9:00	0	0	0	0	0														
				10:00	2	0	0	0	2														
				11:00	2	0	0	0	2														
				12:00	0	0	0	0	0														
Hunterdon	Hakihokake Creek	Clear, Choppy	Heron Feedin	8:00	15	11	0	0	26	0	0	0	0	0	0	0	0	8	17	0	0	25	
				9:00	15	2	0	0	17														
				10:00	8	2	0	0	10														
				11:00	7	0	0	0	7														
				12:00	5	0	0	0	5														
Hunterdon	Rockaway Creek S/Br	Clear	0	8:00	2	0	0	0	2	1	0	0	0	0	0	0	0	0	0	0	0	1	
				9:00	0	0	0	0	0														
				10:00	0	0	0	0	0														
				11:00	0	0	0	0	0														
				12:00	2	0	0	0	2														

Opening Day Trout Angler Survey

County	Waterbody	Lake/ River Conditions	# of Cormorants Present	Time	# of Shoreline anglers		# of Boat anglers		Total # of anglers	Brook Trout caught				Brown Trout caught				Rainbow Trout caught				Total trout caught	comments
										<14 in		>14 in		<14 in		>14 in		<14 in		>14 in			
					adult	child	adult	child		kept	rel	kept	rel	kept	rel	kept	rel	kept	rel	kept	rel		
Morris	India Brook	Normal	0	8:00	12	X	X	X	12	0	0	0	0	1	0	0	0	17	0	0	0	18	
				9:00	14	0	0	0	14														
				10:00	X	X	X	X	X														
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Morris	Raritan River, South Branch	Normal	0	8:00	32	0	0	0	32	0	0	0	0	0	0	0	0	15	23	0	0	38	
				9:00	14	0	0	0	14														
				10:00	X	X	X	X	X														
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Passaic	Pequannock River	High Water	0	8:00	X	X	X	X	X	0	0	0	0	1	0	0	0	16	1	0	0	18	Spot Checks along lower section of river.
				9:00	34	4	X	X	38														
				10:00	X	X	X	X	X														
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Warren	Lopatcong Creek	Slightly off color	0	8:00	X	X	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	Spot Checks throughout day.
				9:00	0	0	X	X	0														
				10:00	2	1	X	X	3														
				11:00	0	0	X	X	0														
				12:00	X	X	X	X	X														
Warren	Pequest River	Muddy, High Water	0	8:00	X	X	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	Spot Checks between S. Water Street and Rte 519 Bridge.
				9:00	20	1	0	0	21														
				10:00	X	X	X	X	X														
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Warren	Pohatcong Creek	Slightly High Water	0	8:00	X	X	X	X	X	0	0	0	0	0	0	0	0	0	0	0	0	0	Ravine Rd Spot Checls. Most anglers reported catching 3-4 fish, though no total count was taken. Generally successful fishing.
				9:00	X	X	X	X	X														
				10:00	X	X	X	X	X														
				11:00	45	4	0	0	49														
				12:00	X	X	X	X	X														
Warren	Pophandusing Creek	Slightly off color	0	8:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Spot check early in day.
				9:00	X	X	X	X	X														
				10:00	X	X	X	X	X														
				11:00	X	X	X	X	X														
				12:00	X	X	X	X	X														
Warren	Musconetcong River	Muddy, High Water	0	8:00	X	X	X	X	X	0	0	0	0	0	0	0	0	15	9	0	0	24	Spot Checks between Hughsville Dam and Asbury Bridge.
				9:00	X	X	X	X	X														
				10:00	X	X	X	X	X														
				11:00	X	X	X	X	X														
				12:00	23	5	0	0	28														