INVESTIGATIONS AND MANAGEMENT OF NEW JERSEY'S FRESHWATER FISHERIES RESOURCES 2014

State of New Jersey
Division of Fish and Wildlife
Bureau of Freshwater Fisheries

INVESTIGATIONS AND MANAGEMENT OF NEW JERSEY'S FRESHWATER FISHERIES RESOURCES 2014

Including
Sport Fish Restoration Grant F-48-R

Job Performance Reports Segment 26 Extension
(November 1, 2013 – October 31, 2014)

and

Final Reports

February 2015

New Jersey Department of Environmental Protection
Division of Fish and Wildlife
Bureau of Freshwater Fisheries

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

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Tom Peck, Ryan Preston, Scott Ward

New Jersey's Freshwater Research and Management activities are funded entirely by New Jersey's licensed anglers. These activities benefit the state's 8 million residents by protecting and assessing New Jersey's vital freshwater resources.

Clean water for fish means clean water for us and generations to come

TABLE OF CONTENTS

INTRODUCTION

Highlights for 2014

The Bureau of Freshwater Fisheries conducted 216 surveys throughout the state in 2014, to address a variety of recreational and resource management needs, including response to emerging fisheries issues. 178 surveys were conducted at 118 waterbodies in which fish were collected, with over 40,000 fish representing 70 species identified and enumerated by state fisheries biologists. These surveys were conducted to satisfy a wide variety of projects, putting staff in the smallest of our streams in search of wild Brook Trout, to the warmwater expanse of Lake Hopatcong to assess Largemouth Bass, Smallmouth Bass, Muskellunge, and Walleye, and to the depths of Round Valley Reservoir to monitor its reproducing Lake Trout population. Most surveys are used to monitor populations, assess stocking programs, map the distribution of rare native fishes, document or control populations of invasive fishes/aquatic plants. This report documents the ongoing fisheries management activities across New Jersey performed by the Division of Fish and Wildlife and the status of its fisheries resources in 2014.

Of the 178 fisheries surveys conducted in 2014, 69 were stream electrofishing surveys. These surveys contribute valuable data used for multiple projects and fisheries management functions, including the classification of New Jersey's surface waters within the Department's Surface Water Quality Standards N.J.A.C. 7:9B. This system is the regulatory cornerstone that helps protect our critical watersheds. These assessments use important stream health indicators such as the presence of Brook, Brown, and Rainbow Trout to identify high water quality and critical habitat areas. Six surveys produced results that warrant upgrades to current classifications. The most significant of these upgrades is on the Lamington (Black) River, where documentation of trout reproduction in its headwaters and a section downstream of the existing *trout production* segment, which are currently classified as *non-trout*. Fifty surveys conducted confirmed existing stream classifications.

Fish & Wildlife has documented reproducing trout populations in nearly 200 streams (or stream segments) statewide, but only a handful of these (36) are currently designated as *Wild Trout Streams*. These 36 streams are not stocked with hatchery trout, but rather rely upon the wild, naturally reproducing trout populations inhabiting these streams to provide a recreational fishery. The *Wild Trout Stream* regulation, which is more stringent than the statewide general trout regulation, has changed little since it was adopted in 1990. In 2014, the Bureau of Freshwater Fisheries conducted 46 electrofishing surveys on sections of all 36 designated *Wild Trout Streams*, yielding 3,137 trout, with a mean of 68 trout per survey. Brown Trout were by far the most abundant trout species caught (65% of total), followed by Brook Trout (25%), Rainbow Trout (10%). The data collected on the *Wild Trout Streams*, as well as data from other streams having naturally reproducing trout populations, will be further analyzed to evaluate the current *Wild Trout Stream* regulation and determine if changes are warranted.

In September of 2013, furunculosis, a disease primarily affecting cold water species of fish such as trout, was discovered affecting the trout in the raceways at the Division's Pequest Trout Hatchery for the first time in the hatchery's 31 year history. The disease is caused by the bacterium *Aeromonas salmonicida* (ultimately, 220,000 trout had to be euthanized). This bacterium is considered an obligate pathogen, meaning it requires a fish host in order to survive.

Osprey feeding on infected fish in the wild may have spread the bacteria through contact with trout at the hatchery.

The Division implemented a plan to control the disease at the hatchery and it was necessary to modify the trout stocking program in order to conserve and protect our wild trout resources and other year round trout fisheries. The losses, coupled with restrictions on the use of Brown Trout that were treated for the disease resulted in significant changes to the Division's 2014 Spring Trout Stocking Program. As a result, the spring baseline of 570,000 trout was not met.

In 2014, nineteen state and privately stocked waters were electrofished in late spring in response to the hatchery outbreak. Trout and warmwater fish species encountered were carefully inspected for visible lesions and symptomatic fish were submitted to Division Fish Pathologist for further inspection and/or testing. Although the South Branch of the Raritan River upstream of the Lake Solitude Dam was not stocked by the Division in 2014, a few symptomatic fish collected in the Ken Lockwood Gorge, tested positive for the bacteria. No evidence of furunculosis was found at other locations. The effort put forth monitoring fish heath reaped additional benefits, such as gathering information on bass populations. In order to minimize future impacts, the Division is currently raising all Rainbow Trout, as they were less vulnerable to succumbing to the bacterial disease than Brook and Brown Trout.

Lake Hopatcong, New Jersey's largest lake at 2,686 acres, was the subject of an extensive sampling and data analysis effort spanning 2013 – 2014 (22 field days). Fish capture techniques utilized include boat electrofishing, seining, trapnetting, and gillnetting. The product of this endeavor is a report that will guide a balanced management strategy for the lake's fisheries resource. Lake Hopatcong has one the highest species diversities in the state with 28 species documented during the survey. Many species have been introduced for recreational purpose (Largemouth Bass, Walleye, Muskellunge, etc.), however a few of New Jersey's rare native species still inhabit these nutrient rich waters (Bridle Shiner and Bluespotted Sunfish). Lake Hopatcong's recreational use is as diverse as the fish population. Recreational boaters, water skiers, wave runners, anglers, swimmers and lake residents all play an integral part in the management of the lake.

This year also marked the second year of the Coolwater Fisheries Assessment. This multi-year project will evaluate trophy coolwater fisheries for Muskellunge, Northern Pike, Walleye, and Hybrid Striped Bass. These fisheries are primarily maintained by annual stockings of fish reared at the Division's Hackettstown State Fish Hatchery. Four waterbodies were the selected for trap netting surveys this year. Northern Pike were targeted at Farrington Lake and Pompton Lake, while Walleye and Muskellunge were targeted at Lake Hopatcong and Monksville Reservoir. Data indicate viable fishing opportunities at all four lakes, with Lake Hopatcong standing above the rest with high numbers and large sizes of both Muskellunge and Walleye. In fact, all but 2 of the 71 Walleye exceeded the minimum harvestable size of 18 inches.

Largemouth Bass are the most popular and widely distributed of the state's game species. New Jersey has over 400 impoundments open to the general public for fishing and thousands more in private ownership scattered throughout the state. These lentic environments offer excellent fishing opportunities for a variety of species such as bass, sunfish, crappie, and pickerel. These species naturally reproduce in these waterways and often do not require active stocking to sustain

their populations. The Bureau of Freshwater Fisheries conducted electrofishing surveys at 21 lakes and ponds throughout the state to assess the status of their fisheries. Crews also collected fish with a 20 ft. seine to assess the reproductive success of warmwater species at 23 lakes and ponds.

In 2014, the Bureau's stream temperature monitoring program was expanded to 31 thermographs (instruments that continuously monitor temperature), deployed on 17 recreationally important trout streams and 5 small streams having populations of wild Brook Trout. Both water and air temperatures are recorded in wild Brook Trout streams as part of an Eastern Brook Trout Joint Venture initiative to assess climate change. The temperature data will be used to assess current habitat conditions, evaluate long term trends, determine if ambient water quality is consistent with surface water quality standards, and aid in the management of coldwater fisheries.

In 2012, eleven freshwater coastal lakes suffered the wrath of Hurricane Sandy, as record setting high tides inundated these freshwater systems with saltwater, sediment and debris, often resulting in mortality of freshwater fish. Salinity levels were monitored over time. Fortunately, abundant spring rains in 2013 greatly assisted in the recovery of several of these waters and they were re-stocked with suitable freshwater fishes. In 2013, Deal Lake, Sunset Lake, and Lake of the Lillies were able to be restocked. In 2014, salinity checks were conducted at Silver Lake, Lake Como, Spring Lake, Carteret Park Pond, and Wesley Lake. All were found to have recovered from Hurricane Sandy and were stocked with warmwater fish. Hooks Creek Lake in Cheesequake State Park did not fare as well. Water quality and reproduction checks wer repeated this year to determine its state of recovery. Salinity has decreased since the storm going from 11.8 ppt in January of 2013, to 9.6 ppt in June of 2013, to 3.8 ppt in on June 1, 1014. Biologists will continue to monitor salinity levels to determine when they are adequate to restock (<0.5ppt).

In addition to these highlights, this report describes a host of other field work and activities conducted by the Bureau of Freshwater Fisheries. The efforts of full-time Bureau personnel are complemented by a dedicated and talented seasonal staff, who provide incredible insight, enthusiasm, and the labor which is vital to raising fish at our fish hatcheries, conducting fisheries surveys statewide, and performing countless tasks that help maintain and enhance New Jersey's freshwater fisheries resources. The Bureau's work is made possibly by both the dedicated monies of the Hunter and Anglers Fund and the Sport Fish Restoration Program.

Bureau of Freshwater Fisheries

The mission of the Bureau of Freshwater Fisheries (BFF) is to protect and manage the state's freshwater fish resources to maximize their long-term biological, recreational, and economic value for all New Jerseyans. Our goals are:

1) To maintain New Jersey's rich variety of freshwater fish species at stable healthy levels and enhance the many habitats on which they depend;

2) To educate New Jerseyans on the values and needs of our freshwater fish resources and to foster a positive human/wildlife co-existence;

3) To maximize the recreational and commercial use of New Jersey's freshwater fishes for both present and future generations.

On May 3, 2014 freshwater fish culture and maintenance operations (Fish Culture Unit) were removed from the Bureau of Freshwater Fisheries. This is the first time since the early days of the Division that fish culture operations were separated from the protection and management of the state's fisheries resources. The Fish Culture Unit was further split into three separate entities; Pequest Trout Hatchery; Hackettstown State Fish Hatchery; and the Maintenance Unit. The reorganization resulted in only research and management operations remaining within the Bureau.

The Bureau of Freshwater Fisheries has personnel in two regionally placed offices: Lebanon Field Office (Hunterdon County) and the Central Regional Office (Monmouth County). The Bureau oversees the management and protection of the state's over 27,000 miles of streams and over 400 public lakes. The biologists also carry out a number of freshwater projects each year.

The Bureau conducts fishery surveys, classifies the state's waterways, provides technical input on a variety of watershed and habitat based issues, facilitates habitat restoration projects, serves as liaisons to a variety of sportsmen groups, and provides information to the general public, in a variety of forums, concerning the status of the state's fishery resources. The Bureau of Freshwater Fisheries also administers permits for fish stocking, water lowering, commercial harvests, and scientific collecting to further provide for the effective management and protection of the's aquatic resources.

The Bureau of Freshwater Fisheries works closely with the Division's fish pathologist, Dr. Jan Lovy, within the Office of Fish and Wildlife Health and Forensics. The fish pathology laboratory is located at the Pequest Trout Hatchery outside Oxford, NJ, and close to the Hackettstown Hatchery. Dr. Lovy conducts disease monitoring and research in wild and hatchery-raised fish populations throughout the state. For disease diagnostics staff works with the NJ Animal Health Diagnostic Laboratory (NJ AHDL). The AHDL is a state-of-the-art facility equipped with molecular biology suites, a virology laboratory with cell culture facilities maintaining fish cell lines, and modern bacterial diagnostic equipment. The AHDL also provides diagnostic services in fish health for private fish hatcheries.

The Bureau currently has six fisheries biologists on staff. Although duties at this time have been delegated in several ways, the primary delineation is based on regional watershed management areas. The state is divided into six regional watershed management areas (Figure 1), but due to

staffing shortages vacant management regions have been subdivided and reassigned to remaining biologists. In addition to regional responsibilities assigned to most of the biologists, each has a specific area of expertise and oversees related research and management programs:

Mark Boriek – Principal Fisheries Biologist
Fisheries Management in the Passaic Region (Passaic, Hackensack, and Hudson) and Upper Atlantic, and Anadromous Fishes Research & Management

Scott Collenburg – Assistant Fisheries Biologist
General Fisheries Surveys, Coolwater Research & Management, Stream Temperature Monitoring, and Opening Day Angler Survey

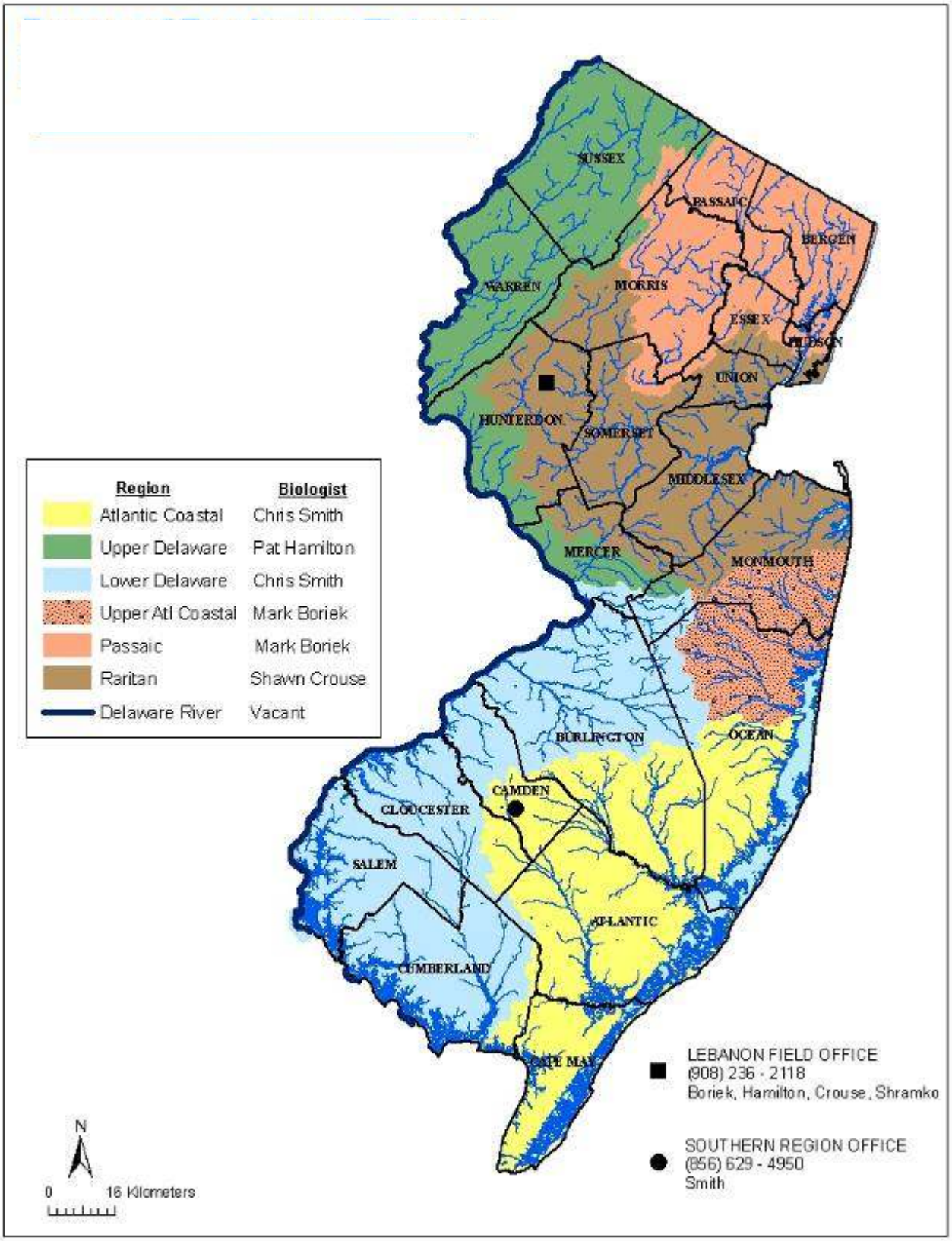
Shawn Crouse – Principal Fisheries Biologist
Fisheries Management in the Raritan Region (Raritan, Arthur kill, Raritan Bay, Shrewsbury, & Navesink) and Native Fishes Research & Management including State Wildlife Action Plan.

Pat Hamilton – Principal Fisheries Biologist
Fisheries Management in the Upper Delaware Region (Upper Delaware & Wallkill), Coldwater Research & Management, and Federal Grant Coordinator

Ross Shramko – Senior Fisheries Biologist
General Fisheries Surveys, Trout Stocking Coordinator, GIS, Database Management, and Angler Surveys

Chris Smith – Principal Fisheries Biologist
Fisheries Management in the Southern Region (Lower Delaware & Lower Atlantic Coastal), Warmwater Research & Management, and Invasive Species

FIGURE 1. NJDFW, Bureau of Freshwater Fisheries – 2014 Fisheries Management Regions.



Funding

The Division's Bureau of Freshwater Fisheries is funded entirely by New Jersey sportsmen, through the sale of fishing licenses and through a Federal excise tax on the manufacturing of hunting and fishing related equipment. This "user-pays" system has made great strides in financing the management of New Jersey's fish and wildlife resources, not only to the benefit of licensed hunters and anglers but to every one of the state's over 8 million residents. Wildlife associated recreation also generates $2.2 billion dollars into the state's economy each year, with an estimated 300,000 freshwater anglers generating $138 million dollars alone. The two funding sources are described below and after each activity described later in this report the funding source is indicated as either Hunter and Angler Fund or Federal Grant F-48-R (with Project Number I, II, or III specified).

Hunter and Angler Fund - Licenses, Stamps, and Permits

The sale of freshwater fishing licenses and trout stamps generates over $3.5 million dollars to the Division each year. Of this, 1 million is allocated to the Bureau of Freshwater Fisheries to support the state's freshwater research and management efforts. The remaining funds are used to fund other activities within the Division such as Fish Culture operations, Information and Education, Lands Management, and Law Enforcement, as well as Administrative staff.

Sport Fish Restoration Program

Federal excise tax money is distributed through the Sport Fish Restoration Fund administered by the United States Fish and Wildlife Service (USFWS). The Sport Fish Restoration Program, established by an amendment to the Dingell-Johnson Act of 1950, provides funding for the management, conservation and restoration of fishery resources. The Sport Fish Restoration Program is funded by revenues collected by the manufacturers of fishing rods, reels, creels, and lures, who pay an excise tax on these items to the U.S. Treasury. The program is a cost-reimbursement program, where the state covers the full amount of the approved project then applies for reimbursement for up to 75% of project expenses.

For the one-year grant cycle, November 1, 2013 – October 31, 2014, the Bureau requested and received $232,800 from the Sport Fish Restoration Program for fisheries research and management activities conducted under Grant F-48-R, Investigations and Management of New Jersey's Freshwater Fisheries Resources. Grant F-48-R is comprised of three projects that focus on (1) assessing and managing fisheries, (2) restoring fisheries and their aquatic habitats, and (3) managing the recreational use of fisheries. The grant's three projects, project objectives, and activities conducted under each project, during the period, are listed below.

Federal Grant F-48-R

Project I: Assessment of the Biological Integrity of Inland Fisheries

Objective: To assess the biological integrity New Jersey's aquatic resources through the collection of physical, chemical, and biological data and use this information to develop, implement, and evaluate management and stocking strategies to improve and enhance sport fishing.

Activities:
1. Coolwater Fisheries Assessment
2. Anadromous Fisheries Assessment
3. Wild Trout Stream Regulation Assessment
4. Lake Inventory – Lake Hopatcong Fisheries Management Plan
5. Lake Trout Population Assessment – Round Valley Reservoir
6. Special Regulation Trout Area Assessment
7. Stream and Lake Assessments for Surface Water Classification
8. Temperature Monitoring – Streams
9. Trout Supporting Status of Trout Maintenance Lakes Assessment
10. Wild Brook Trout Assessment
11. Database Management – *FishTrack*

Project II: Protection and Restoration of Inland Fisheries and Aquatic Habitats

Objective: To protect, maintain, and restore healthy fisheries and their aquatic habitats in New Jersey's inland waters.

Activities:
1. Aquatic Invasive Fishes and Plants Management
2. Conservation and Restoration of Fish Habitat
3. Wild Fish Population Health Assessment

Project III: Management of Recreational Fisheries Users

Objective: To obtain and use pertinent information on freshwater angler attitudes, preferences, participation, and resource utilization to protect, manage, and enhance sport fisheries.

Activities:
1. Warmwater/Coolwater Angler Survey
2. Opening Day Trout Angler Survey
3. Trout Angler Logbook Program

The Bureau of Freshwater Fisheries conducted 216 surveys throughout the state in 2014. The map below demonstrates the survey quantity, geographic distribution, and type (Figure 2). 178 surveys were conducted at 118 waterbodies in which fish were collected, most of which include the determination of basic water quality parameters such as dissolved oxygen, temperature, pH, etc. An additional 38 locations were water quality surveys only. A complete list of field locations surveyed in 2014 is found in Table 1, following the map.

FIGURE 2. Field sites sampled in 2014 by NJDFW, Bureau of Freshwater Fisheries.

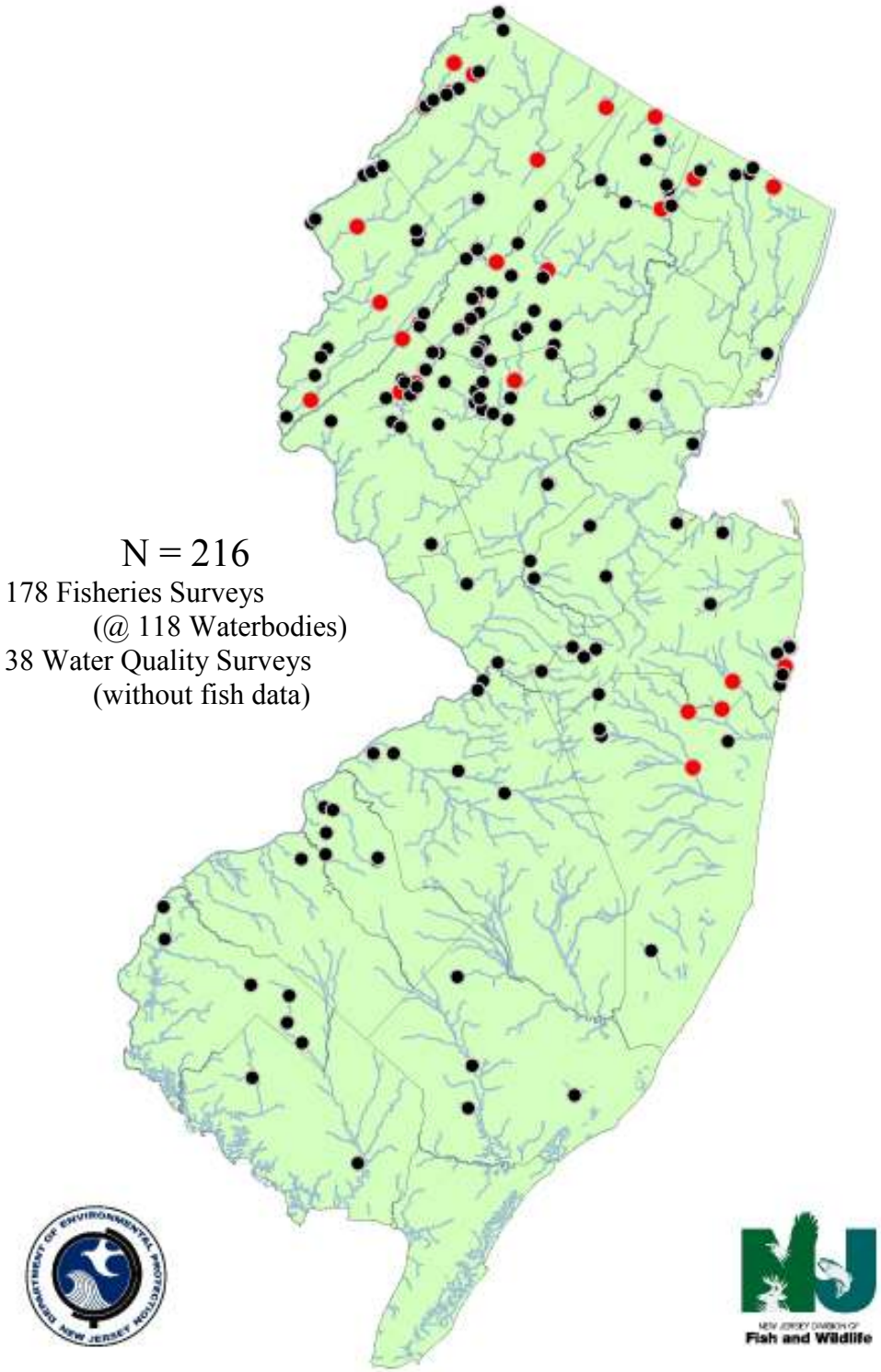


TABLE 1. 2014 field sampling locations

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Southern Region (Lower Delaware River and Lower Atlantic Coastal)																
Allentown Lake							▲				●	●	▲		NA	51, 57
Cooper River Park Pond							●				▲				NA	67
Crystal Lake												●	▲		NA	58
Daretown Lake											●				NA	51
Delaware River							▲				●				NA	51
Delaware River and Crosswicks Creek							▲				●				NA	67
DOD Lake								●			▲				NA	51, 72
Elmer Lake											●				NA	52
Game Creek							●				●				NA	52
Gropps Lake											●				NA	52
Hammonton Lake								●			▲				NA	52, 72
Heritage Park Pond											●				NA	53
Hillards Creek							●								NA	67
Lake Audry											●				NA	53

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Southern Region (Lower Delaware River and Lower Atlantic Coastal) (continued)																
Lake Lenape											●				NA	53
Lake Lonnie												●	▲		NA	58
Lake Nummy														●	NA	79
Mary Elmer Lake								●			▲				NA	54, 72
Newton Lake								●							NA	78
Palatine Lake											●				NA	54
Pemberton Lake								●			▲				NA	54, 72
Prospertown Lake								●			▲				NA	54, 72
Rising Sun Lake											●				NA	54
Runnemede Lake								●							NA	78
Silver Lake (Camden)							●								NA	67
Stafford Forge Lake											●		▲		NA	55
Stewart Lake							●				▲				NA	55, 67
Stone Tavern Lake											●	●	▲		NA	56, 59
Swedes Lake												●	▲		NA	60
Turnmill Lake											●				NA	56
Woolmans Lake (aka Buttonwood Lake)														●	NA	79

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill)																
Alexauken Creek								●					▲			72
Assunpink Lake												●	▲		NA	57
Bear Brook (Johnsonburg) (aka Dark Moon Brook)	▲	●	▲										▲		✓	40, 43, A2
Bear Creek – Bear Creek Road Route 612	▲	●	▲										▲		✓	40, 43, A3
Bear Creek – Route 519	▲	●	▲										▲		✓	40, 43, A4
Beerskill				■												33
Big Flat Brook – bw Rt. 206 & Rt. 560 bridges	▲		▲	■	●								▲		✓	26, 33, 40, A5
Big Flat Brook – Station 1, upstrm Blewitt Tract	▲		▲	■	●								▲		✓	26, 33, 40, A6
Big Flat Brook – Station 2, upstrm Blewitt Tract	▲		▲		●								▲		✓	26, 40, A7
Clove Brook (aka Mill Brook)	▲	●	▲										▲		✓	40, 43, 70, A8
Colonial Lake								●							NA	75
Dunnfield Creek – Delaware Water Gap at I-80	▲	●	▲										▲		✓	40, 43, A9
Dunnfield Creek – 1.3km upstream of I-80	▲	●	▲										▲		✓	40, 43, A10
Flat Brook	▲		▲	■	●								▲		✓	26, 33, 40,A11
Forked Brook				■												33
Hakihohake Creek (aka Little York Brook)	▲	●	▲										▲		✓	40, 43, A12
Hances Brook (trib.) (Rockport)	▲	●	▲										▲		✓	40, 43, A13
Honey Run								●								72

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill) (continued)																
Jefferson Lake				●											NA	77
Lake Aeroflex				●											NA	32, B2
Lake Hopatcong						●				●	●		▲		NA	23,46,48,70, H, I
Lake Musconetcong				●				●								75
Merrill Creek – Richline Road	▲	●	▲										▲		✓	40, 43, A14
Merrill Creek – Prospect Street	▲	●	▲										▲		✓	40, 43, A15
Merrill Creek Reservoir														●		22, 31, 81
Musconetcong River				■				●	●						NA	33, 62, 78
Paulins Kill				■												33, 63
Parker Brook	▲	●	▲										▲		✓	40, 43, A16
Pequest River				■												33
Pohatcong Creek – Valley Road								●								72
Pohatcong Creek – Ravine Road				■												33
Pohatcong Creek – Creek Road								●					▲			72, A17
Saffin Pond											●	●	▲		NA	55, 59
Steenykill Lake												●	▲		NA	59
Stephensburg Creek	▲	●	▲	■									▲		✓	33, 40, 43,A18

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
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- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill) (continued)																
Stony Brook (Sussex)	▲	●	▲										▲		✓	40, 43, A19
Tilcon Lake	●			●								●	▲		NA	22, 32, 60, 89
Van Campens Brook – Brink Road	▲	●	▲										▲		✓	40, 43, A20
Van Campens Brook – Millbrook	▲	●	▲										▲		✓	40, 43, A21
Van Campens Brook – Depew access area	▲	●	▲										▲		✓	40, 43, A22
Walkill River				■												33
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic																
Alberta Lake												●	▲		NA	57,
Bear Swamp Brook	▲	●	▲										▲		✓	40, 43, A23
Como Lake				●												45
Garrison Pond												●	▲		NA	58
Hibernia Brook								●								72
Indian Grove Brook	▲	●	▲										▲		✓	40, 43, A24
Jackson Brook	▲	●	▲										▲		✓	40, 43, A25
Jersey City Reservoir #3												●	▲		NA	58
Manasquan River				■												33

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
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Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic (continued)																
Metedeconk River, N/Br				■												33
Metedeconk River, S/Br				■												33
Monksville Reservoir						●									NA	22, 46, H
Pascack Brook								●								72
Passaic River	▲	●	▲										▲		✓	40, 43, A26
Pequannock River – TCA				■												33
Pequannock River – Cross Road	▲	●	▲										▲		✓	40, 43, A27
Pequannock River – Generant Factory	▲	●	▲										▲		✓	40, 43, A28
Pompton Lake						●									NA	46, H
Ramapo River				■												33
Rockaway River				■												33
Saddle River – Lake Street	▲	●	▲										▲		✓	40, 43, A29
Saddle River – Stone Church Road	▲	●	▲										▲		✓	40, 43, A30
Silver Lake (Bergen)				●										●	NA	45
Silver Lake (Monmouth)				●										●	NA	45
Spring Lake (Monmouth)				●								●	▲	●	NA	59
Toms River				■												33

TABLE 1. 2014 field sampling locations

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic (continued)																
Upper Lake Riviera												●	▲		NA	60
Verona Park Pond								●							NA	72
Wanaque River – upstrm of Monksville Reservoir				■												33
Wanaque River – Back Beach Park	▲	●	▲										▲		✓	40, 43, A31
Wanaque River – Boulevard Avenue	▲	●	▲										▲		✓	40, 43, A32
Wanaque River – Meadow Brook	▲	●	▲										▲		✓	40, 43, A33
Wesley Lake				●										●	NA	45
West Brook	▲	●	▲										▲	●	✓	40, 43, A34
Whippany River	▲	●	▲										▲		✓	40, 43, A35
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)																
Amwell Lake								●							NA	72
Ash Brook – Raritan Road, immediately below													▲	●		103, A36
Ash Brook – Raritan Road, dwnstrm at powerline													▲	●		103, A37
Bee Brook	▲		▲										●		✓	40, 65, 82,A38
Best Pond												●	▲		NA	57
Black Brook	▲	●	▲										▲		✓	40, 43, A39

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (continued)																
Burnett Brook	▲	●	▲										▲		✓	40, 43, A40
Cakepoulin (Capoolong) Creek								●					▲			72, A41
Carteret Park Pond				●										●	NA	45, 57
Chambers Brook	▲		▲										●		✓	40, 65, 82,A42
Cold Brook	▲	●	▲										▲		✓	40, 43, A43
Colts Neck Municipal Pond (Lower)												●	▲		NA	58
Colts Neck Municipal Pond (Upper)												●	▲		NA	58
Duck Pond												●	▲		NA	58, 70
Farrington Lake						●									NA	46, H
Flanders Brook	▲	●	▲										▲		✓	40, 43, A44
Heathcote Brook	▲		▲										●		✓	40, 65, A45
Herzog Brook (aka Lomerson Brook)	▲	●	▲										▲		✓	40, 43, A46
Hickory Run	▲	●	▲										▲		✓	40, 43, A47
Hooks Creek Lake				●								●	▲	●	NA	45
India Brook – Doby Road	▲	●	▲										▲		✓	40, 43, A48
India Brook – Mountainside Road	▲	●	▲										▲		✓	40, 43, A49
Lancelot Pond								●								77

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

● Funding source or reason of data collection
▲ Data are applicable to additional projects
■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (continued)																
Lamington (Black) River – Rattlesnake Rd, site 2	●		▲										▲		✓	29, 40, 81,A50
Lamington (Black) River – Rattlesnake Rd, site 1	●		▲										▲		✓	29, 40, 81,A51
Lamington (Black) River – Lamington Road	●		▲										▲		✓	29, 40, 81,A52
Lamington (Black) River – McCan Mill Road	●		▲										▲		✓	29, 40, 81,A53
Lamington (Black) River – Hacklebarney SP	●		▲	■									▲		✓	29,33,40,81,A54
Lamington (Black) River – Kay Env. Center	●		▲										▲		✓	29, 40, 81,A55
Lamington (Black) River (trib.) (N of Readington)	▲		▲										●		✓	40, 65, A56
Ledgewood Brook	▲	●	▲										▲		✓	40, 43, A57
Manalapan Lake								●							NA	72
Metlars Pond												●	▲		NA	58
Muddy Run	▲		▲										●		✓	40, 65, 82,A58
Nomahegan Park Pond												●	▲		NA	59
Pumpkin Patch Brook								●								78
Raritan River, N/Br				■												33
Raritan River, N/Br (trib.) (W of Bedminster)	▲		▲										●		✓	40, 65, A59
Raritan River, S/Br – Washington Street	▲		▲	■				▲					▲	●	✓	28, 33, 40,A60
Raritan River, S/Br – Raritan River Road	▲		▲					▲					▲	●	✓	28, 40, A61

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (continued)																
Raritan River, S/Br – Vernoy Road	▲		▲					▲					▲	●	✓	28, 40, A62
Raritan River, S/Br – Schooley's Mtn. Road	▲		▲	■				▲					▲	●	✓	28, 33, 40,A63
Raritan River, S/Br – Bartley Road	▲		▲					▲					▲	●	✓	28, 40, A64
Raritan River, S/Br – Stephen's Mill Road	▲		▲					▲					▲	●	✓	28, 40, A66
Raritan River, S/Br – Ken Lockwood Gorge			▲	■				●								27, 33, 72
Raritan River, S/Br – Bartley Road			▲					●								72, A65
Raritan River, S/Br (trib.) (NE of Lake Solitude)			▲													40, 81, A67
Rinehart Brook	▲	●	▲										▲		✓	40, 43, A68
Rockaway Creek N/Br	▲	●	▲										▲		✓	40, 43, A69
Rocky Run	▲	●	▲										▲		✓	40, 43, A70
Rosedale Lake								●							NA	72
Round Valley Reservoir										●					NA	22, 30
Sidney Brook (aka Grandin Stream)			▲					●					▲			72, A71
Spooky Brook Park Pond												●	▲		NA	59
Stony Brook (Morris-Washington)	▲	●	▲										▲		✓	40, 43, A72
Teetertown Brook	▲	●	▲										▲		✓	40, 43, A73

TABLE 1. 2014 field sampling locations (continued)

Bureau of Freshwater Fisheries
2014 Field Sampling Activities

- ● Funding source or reason of data collection
- ▲ Data are applicable to additional projects
- ■ Continuous Temperature Monitoring

	Federal Grant F-48-R (Project I or II)										Hunter &Angler Fund					
	Classification (I)	Wild Trout Stream As. (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Special Reg. Trout As. (I)	Coolwater Assess. (I)	Invasive Species (II)	Fish Health (II)	Anadromous (I)	Miscellaneous	Warmwater Assessment	Reproduction Checks	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (continued)																
Trout Brook (Hacklebarney)	▲	●	▲										▲		✓	40, 43, A74
Turkey Brook	▲	●	▲	■									▲		✓	33, 40, 43,A75
Veterans Memorial Lake												●	▲		NA	60
Watchung Lake												●	▲		NA	60
Willoughby Brook (aka Buffalo Hollow Brook)	▲	●	▲	■									▲		✓	33, 40, 43,A76

** The Bureau of Freshwater Fisheries strives to use established sampling protocols for all field sampling efforts. However, certain sampling objectives adherence to established sampling protocols would be prohibitive to accomplishing project goals. In these instances non-standardized surveys are performed and are identified in appropriate areas within this document.*

COLDWATER FISHERIES

Assessment of Trout Supporting Status of Trout Maintenance Lakes

Most New Jersey lakes are unable to support salmonids (trout and salmon) year-round, because they are generally shallow (less than 50 feet deep) and lack trout supporting water during the summer, due to anoxic conditions in their colder bottom waters and warm surface waters. Generally only deep lakes, typically those at least 15 m (50 ft) deep and not overly eutrophic, have a horizontal layer of water midway between the surface and bottom that is both cold and well-oxygenated that can support trout during the crucial summer months. Only a handful of lakes and reservoirs in the northern part of the state are capable of supporting trout year-round.

The trout supporting status of a lake is determined by conducting a temperature/dissolved oxygen profile during the summer months, when conditions can become stressful or lethal for trout. Conditions are considered suitable for trout survival when profile data documents a layer of water having a temperature $\leq$ 21ºC and dissolved oxygen $\geq$ 4 mg/L. Thirty lakes and reservoirs that have met this criteria have been classified *Trout Maintenance* (*TM*) in the state's Surface Water Quality Standards (SWQS). One reservoir that has both year-round trout supporting water and a reproducing trout population has been classified *Trout Production* (*TP*). In addition, two lakes currently classified as *Non-trout* (*NT*) have been recommended for upgrade to *TM* based upon recent profile data collected by NJDFW.

Many of these waters, especially those currently stocked with trout/salmon by NJDFW, have recent profile data and their trout fisheries are being managed appropriately for either year-round (put-grow-take) or seasonal (put-and-take) trout fisheries. Others, primarily those that are not trout-stocked, have not been assessed since they were originally surveyed over 40 years ago. Outdated water quality data limits the ability of NJDFW to effectively manage the recreational fisheries in those waterbodies that are open to public fishing. This study was undertaken to obtain current data on all 33 lakes and reservoirs classified as *TP* or *TM (*or recommended for upgrade from *NT* to *TM*) to assist NJDFW in determining if there may be additional opportunities to establish year-round coldwater (trout/salmon) fisheries using catchable or sub-catchable cultured (hatchery-reared) trout.

Over a two-year period (2012 – 2013) temperature/dissolved oxygen profiles were conducted during late July/August in the deepest part of 33 lakes and reservoirs to assess their current ability to support trout. Profiles conducted by NJDFW utilized a YSI meter, having a cable marked in one-foot increments. Measurements were generally taken at 5 to 10 foot intervals, except when marked changes were observed (typically in the metalimnion) measurements were taken more frequently (1-ft increments). Profile data for two reservoirs (Merrill Creek and Wanaque) was provided by their owners. The individual profile data for each waterbody is available in the Bureau's annual Investigations and Management of NJ Freshwater Fisheries Reports for 2012 and 2013 and the results are summarized in table below. Trout supporting water was documented in 18 of 33 waterbodies and was absent in the remaining 15. The results are discussed below and are separated into four groups according to current trout supporting status and in relation to public fishing opportunity. (Federal Grant F-48-R, Project I)

15 Lakes Capable of Supporting Trout Year Round (Open to Public Fishing)

Two exceedingly deep reservoirs, Round Valley Reservoir and Merrill Creek, have the most extensive layer of summer trout habitat (118 and 158 ft thick, respectively) in New Jersey. Both are stocked annually with catchable Brown and Rainbow Trout, have reproducing Lake Trout populations, are regulated as *Trophy Trout Lakes*, and their fisheries are regularly assessed. Due to their low productivity and concerns with the stability of alewife forage base, stocking of surplus trout is not recommended.

Six lakes (Lake Aeroflex, Lake Wawayanda, Shepherd Lake, White Lake (Warren), Clinton Reservoir, and Tilcon Lake) that have suitable summer trout habitat (but not as extensive as is found in the *Trophy Trout Lakes*), and are stocked by NJDFW with catchable trout and/or subcatchable/catchable salmon, are regulated as *Holdover Trout Lakes*. Consideration should be given to evaluating the trout fisheries in these lakes to determine if the existing regulation and trout allocations should be adjusted to provide a more satisfactory year-round trout fishery.

Three lakes (Furnace Lake, Mountain Lake, and Scarlet Oak Pond) that have varying amounts of summer trout habitat are annually stocked with catchable trout by NJDFW. Mountain Lake was dropped from the stocking program in 2006, but was later reinstated in 2014 (stocked only once, prior to opening day) because of improved shoreline fishing access. The layer of trout supporting water at Furnace Lake was only 2 ft thick and at Mountain Lake was only 4 ft. These two lakes have had profiles conducted in the past which found summer trout supporting water to be absent or marginal at best. The trout fisheries at both lakes are considered to be put-and-take (seasonal), though holdover trout may be caught occasionally, depending on summer conditions. Also, both are annually stocked with Muskellunge and this predatory fish likely takes its toll on stocked trout to some degree. Little is known about the success of trout stocking at Scarlet Oak Pond. Since boating is not allowed, the stocked trout are not accessible to anglers during the summer/early fall, because the water that can be fished from the shoreline is too warm for trout. Because of this boating access limitation, and the existing opportunity to fish for stocked trout in the Ramapo River immediately adjacent to the pond, the possibility that this lake may be better suited for stocking surplus trout, rather than catchable trout should be further explored.

Four lakes having suitable summer trout habitat that are not currently stocked by NJDFW are Gardner's Pond, Iliff Lake, White Lake (Sussex), and Monksville Reservoir. Trout stocking was discontinued at Iliff Lake in 1998, due to poor shoreline access and no boating access. The lake is located just upstream of Lake Aeroflex, and trout stocking shifted to Lake Aeroflex when it was purchased by the state because it was considered a superior location in terms of access and ability to provide year-round trout fishing. Gardner's Pond is located just downstream of Lake Aeroflex. It was stocked with surplus (subcatchable) Brown Trout (1,000 – 4,000) in late August/early September over a 3 year period (2007 – 2009), but it is not known if a trout fishery developed as a result of this stocking. Although it may not be prudent to stock catchable trout at Gardner's and Iliff, given their close proximity to Aeroflex (which is stocked with trout and salmon), these two lakes may be good candidates for stocking surplus trout that are sublegal when stocked, but have the potential to grow to catchable size. White Lake (Sussex) is another lake that could be considered for trout stocking, particularly since Sparta Township has acquired lakefront property and the lake is

now more accessible to the public. Monksville Reservoir was annually stocked with catchable trout from 1989 – 2004, but was dropped from the stocking program in 2005 when profile data indicated summer trout habitat was extremely variable, and often absent, from year to year. As a result, a holdover trout fishery never seemed to develop at the reservoir. The stocking density of catchable trout allotted there was also low (because of its large size), and this was likely a factor as well. Surplus Lake Trout were also stocked in the reservoir (2004 – 2012), but a fishery for them did not develop. These four waterbodies may warrant further consideration for trout/salmon stocking, particularly with surplus fish when available.

3 Lakes Capable of Supporting Trout Year-Round (Closed to Public Fishing)
Charlotteburg Reservoir, Lake Rutherford, and Morris Lake had summer trout habitat, however, because they supply potable water their owners do not allow the general public to fish them. As a consequence, NJDFW does not stock fish in these lakes or actively manage their fisheries. At Charlotteburg, the last reservoir in Newark's water supply system, trout supporting water barely registered at a depth of only 16 ft below the surface, despite an overall depth of 65 ft. Although much shallower, Lake Rutherford (37 ft deep) had slightly more trout supporting water 20 – 23 ft below the surface and could provide year-round trout fishing (if stocked). Morris Lake (123 ft deep) had a substantial layer of trout-supporting water (21 – 89 ft below the surface). This lake would provide an excellent year-round fishery for trout if stocked; it is unfortunate that the owner (Newton) only allows their residents to fish the lake (one permit issued daily). Although no stocking permits have been issued for this lake, an angler reported catching a large Tiger Trout from the lake in 2014, and it is suspected that fish are being stocked illegally.

10 Lakes Lacking Suitable Summer Trout Habitat (Open to Public Fishing)
Profiles conducted at ten *TM* lakes provided data that indicated summer trout habitat was absent. Although NJDFW has been aware of this condition prior to 2012 in most of these (recent profile data collected prior to 2012 available for most), catchable trout continue to be stocked in three waterbodies (Lake Hopatcong, Stony Lake, and Swartswood Lake) that are popular with anglers, to provide seasonal (put-and-take) trout fisheries. Trout supporting water in the summer has occasionally been documented at both Lake Hopatcong and Swartswood Lake, but is marginal at best for trout, and too inconsistent to reliably provide a year-round trout fishery.

Trout stocking was discontinued at four large waterbodies (Cranberry Lake, Canistear Reservoir, and Spruce Run Reservoir in 2006, and Greenwood Lake in 1998) in the 2000's when data indicated trout habitat was lacking. Given their trout allocations, the stocking densities were considered too low to provide attractive seasonal trout fisheries. Three other waterbodies (Oak Ridge Reservoir, Splitrock Reservoir, and Lake Marcia) have not been stocked with trout and stocking is not recommended in the two reservoirs (due to their large size) or in Lake Marcia (due to the proximity of other trout-stocked lakes and streams nearby).

5 Lakes Lacking Suitable Summer Trout Habitat (Closed to Public Fishing)
The five waterbodies in this category are Culver's Lake, Silver Lake (Warren County), Boonton (Jersey City) Reservoir, Green Pond, and Wanaque Reservoir. Silver Lake had been stocked annually with trout in the spring by NJDFW prior to 1986, because a private

landowner there allowed public fishing. Currently the owners of these waterbodies do not allow public fishing, therefore NJDFW does not stock fish in these lakes or actively manage their fisheries.

Summary of 34 temperature & dissolved oxygen profiles conducted on 33 lakes in New Jersey during the summer of 2012 and 2013. The criteria used for trout supporting water in New Jersey lakes is water temperature $\leq$ 21ºC and dissolved oxygen $\geq$ 4 mg/L; depth of trout supporting water, if present, measured from the surface. A "T" and/or "S" following the waterbody name indicates the Division currently stocks Trout and/or Salmon.

Waterbody[a]	County	Surface area (acres)	Survey date	Total depth (ft)	Depth(s) of trout supporting water[b] (ft)	Public Fishing Status	Owner
Upper Delaware Region (Upper Delaware & Wallkill)							
Cranberry Lake	Sussex	192	7/26/12	15	none	open	State
Culvers Lake	Sussex	539	8/5/13	45	none	closed	Normandeau Associates
Furnace Lake (T)	Warren	56	8/8/12	31	13 – 14	open	Oxford Township
Gardner's Pond	Sussex	25	8/31/12	41	16	open	State
Iliff Lake	Sussex	37	8/7/12	33	14 – 15	open	Andover Township
Lake Aeroflex (T&S)	Sussex	101	8/7/12	102	18 – 34	open	State
Lake Hopatcong (T)	Morris/ Sussex	2,685	8/2/12	51	none	open	State
			8/19/13	50	none	open	
Lake Marcia	Sussex	19	8/28/12	20	none	open	State
Lake Rutherford	Sussex	66	8/28/12	37	20 – 23	closed	Sussex Borough
Merrill Creek Res. (T)	Warren	650	8/16/13	184	26 – 184	open	Merrill Creek Owners Group
Morris Lake	Sussex	142	8/27/13	123	21 – 89	closed	Newton Town
Mountain Lake (T)	Warren	122	8/8/12	37	16 – 20	open	State
Silver Lake	Warren	62	8/14/13	30	none	closed	multiple private landowners
Stony Lake (T)	Sussex	15	8/28/12	14	none	open	State
Swartswood Lake (T)	Sussex	494	8/2/12	42	none	open	State
Tilcon Lake (S)	Morris	88	7/30/13	50	20 – 43	open	State
White Lake	Sussex	30	8/26/13	70	18 – 29	open	Sparta Township, YMCA, and other unknown
White Lake (T)	Warren	65	7/26/13	44	18 – 36	open	Warren County
Waywayanda Lake(T&S)	Sussex	255	7/25/13	80	13 – 70	open	State

Summary of 34 temperature & dissolved oxygen profiles conducted on 33 lakes in New Jersey during the summer of 2012 and 2013. The criteria used for trout supporting water in New Jersey lakes is water temperature $\leq$ 21ºC and dissolved oxygen $\geq$ 4 mg/L; depth of trout supporting water, if present, measured from the surface. (continued)

Waterbody[a]	County	Surface area	Survey date	Total depth	Depth(s) of trout	Public Fishing	Owner
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic							
Boonton Reservoir a.k.a. Jersey City Reservoir	Morris		8/8/13	75	none	closed	Jersey City
Canistear Reservoir	Passaic	350	8/3/12	39	none	open[c]	Newark City
Charlotteburg Reservoir	Passaic	325	7/30/13	65	13	closed	Newark City
Clinton Reservoir (T)	Passaic	424	8/3/12	41	17 – 19	open[c]	Newark City
Green Pond	Passaic	507	8/8/13	45	none	closed	Green Pond Corp.
Greenwood Lake	Passaic	1,920	7/29/13	49	none	open	State
Monksville Reservoir	Passaic	505	7/22/13	87	13 – 74	open	State
Oak Ridge Reservoir	Passaic	464	8/13/12	52	none	open[c]	Newark City
Scarlet Oak Pond (T)	Bergen	22	7/23/13	49	13 – 22	open[d]	Bergen County
Shepherd Lake (T)	Passaic	74	7/23/13	29	15 – 22	open	State
Splitrock Reservoir	Morris	554	8/31/12	27	none	open[d]	Jersey City
Wanaque Reservoir	Passaic	2,310	8/15/13	64	none	closed	North Jersey District Water Supply Commission
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)							
Round Valley Reservoir	Hunterdon	2,350	7/27/12	167	32 – 150	open	State
Spruce Run Reservoir	Hunterdon	1,290	7/27/12	68	none	open	State

[a] These waters are classified *Trout Maintenance*, with three exceptions: Round Valley Reservoir is classified *Trout Production*; Tilcon Lake and Morris Lake are classified *Non-trout* but have been recommended for upgrade to *Trout Maintenance*.
[b] Vertical distance, measured from water surface.
[c] Permits required to fish (in addition to a fishing license) and to launch a boat.
[d] Boating permitted; shoreline fishing not permitted.

NJDFW currently stocks trout and/or salmon in 13 of 33 reservoirs, lakes, and ponds classified as TP or TM (or recommended for upgrade to TM) in the state's SWQS. These 33 waterbodies were surveyed to assess their current ability to support trout year round and determine if there might be additional opportunities to stock trout to provide year round public trout fishing. Summer trout supporting water was documented in 18 waterbodies, though some had minimal trout supporting water (1 – 5 feet thick) that would likely prevent the establishment of consistent year round trout fisheries. White Lake (Sussex County) should be considered for trout stocking because it has excellent trout supporting water, is open to public fishing, and is not currently trout-stocked. Consideration should be given to discontinuing the stocking of catchable-sized trout (or substituting smaller trout) at Scarlet Oak Pond (Bergen County) because boating is not allowed (which inhibits angler access to trout).

Catch & Release Trout Regulation Assessment

Catch & Release fishing regulations were implemented in 2014 on two trout-stocked streams – the Flat Brook/ Big Flat Brook former fly stretch and the Ken Lockwood Gorge on the S/Br. Raritan River. Electrofishing surveys have been conducted on these streams to provide data for evaluating the effect of the regulation change on these trout fisheries. In 2014 four sites on the Flat Brook/Big Flat Brook that were previously electrofished in 2012 and 2013 were again surveyed. Although the S/Br. Raritan River was surveyed in 2012 and 2013, no standardized electrofishing surveys were conducted in the Ken Lockwood Gorge in 2014.

Flat Brook/Big Flat Brook - Four sites on the Flat Brook/Big Flat Brook previously electrofished in 2012 and 2013 were surveyed again in 2014. Although this stream reach is trout-stocked in the spring and fall, and trout naturally reproduce, few trout were encountered during these surveys (see table below). Trout appear to be utilizing deep, non-wadeable pools in this stream, as evidenced by the informal (non-standardized) electrofishing survey that was conducted in a large deep pool (see footnote in table) in which 15 trout were captured and others eluded capture. Additional information is compiled in Appendix A (pages A5-A7 & A11). (Hunter & Angler Fund)

Electrofishing locations along the Big Flat Brook and Flat Brook from 2012 – 2014.

Year	Water Temp	Total Trout	Brook Trout		Brown Trout		Rainbow Trout	
			Wild	Stocked	Wild	Stocked	Wild	Stocked
Big Flat (between Rt. 206 & Rt. 560 bridges (Old barracks)								
2012	19.9°C (67.8°F)	3				2		1
2013	17.1°C (62.8°F)	8	2			1		5
2014	17.6°C (63.7°F)	3	3					
Big Flat (Station 2 – upstream from Blewitt Tract)								
2012	20.8°C (69.4°F)	3	3					
2013	18.6°C (65.5°F)	7	5			1		1
2014	17.6°C (63.7°F)	8	5		3			
Big Flat (Station 1 – upstream from Blewitt Tract)								
2012	19.1°C (66.3°F)	8	7					1
2013		0						
2014	17.5°C (63.5°F)	2			2			
Flat Brook (above Roy Bridge - just downstream of rifle range pool)*								
2012	18.8°C (65.8°F)	6	1		1	2		2
2013	16.3°C (61.3°F)	4	1		1			2
2014	17.3°C (63.1°F)	2			1			1

* In addition to this site, the "rifle range pool" was electrofished. Due to the large size of the pool (wide, long, and deep) not all the trout were captured, however, a total of 15 trout (14 Rainbow Trout and 1 Brook Trout) were netted. They ranged in size from 11.3 – 15.7 inches and all appeared to be of hatchery origin (stocked). The brook has many pools similar to this one that hold trout but are difficult to effectively sample. The four sites that have been electrofished the past three years do not provide a complete picture of the stream's ability to hold trout.

Raritan River South Branch - No standardized electrofishing surveys were conducted in the Ken Lockwood Gorge in 2014, primarily because of a combination of circumstances related to the Furunculosis outbreak at the Pequest Trout Hatchery. Because of the disease outbreak, NJDFW did not stock trout in the spring of 2014 in the S/Br. Raritan River upstream of Lake Solitude to protect the stream's wild trout fishery. This stream reach was, however, stocked privately with trout from a private fish hatchery approved by NJDFW. During the summer an angler fishing the Gorge reported catching a Rainbow Trout with visible lesions, prompting staff to conduct electrofishing surveys that resulted in the removal of more than one hundred stocked and wild trout for health testing by our fish pathologist (see section on Wild Fish Population Health Assessment, page 71). These unusual events contributed to the decision to bypass standard electrofishing surveys until normal stocking resumes, presumably in 2015. (Federal Grant F-48-R, Project I)

General Fisheries Surveys

The **South Branch of the Raritan River** was electrofished at six locations from High Bridge upstream to Mount Olive, consisting of one survey approximately every three to four miles along the river. These fish assemblage surveys were conducted for several reasons, including but not limited to: 1) baseline fisheries data that in many cases has not been collected in approximately 20 years, 2) a rare opportunity to conduct surveys during a year in which the Division did not stock trout due to the Furunculosis outbreak in the Pequest Trout Hatchery, 3) assessment of wild trout fishery, and 4) disease surveillance following Furunculosis positive trout were found in the Ken Lockwood Gorge WMA. (Hunter & Angler Fund)

Trout were collected at all six survey locations, consisting of large numbers of wild Brown Trout, moderate levels of wild Brook Trout, and a few wild Rainbow Trout (see table below). Surveys are inline with other statewide observations that indicate a shift towards increasing wild Brown Trout abundance, in lieu of wild Brook Trout. The only stocked trout encountered were two Rainbow Trout. All fish appeared healthy.

Additional information is compiled in Appendix A (pages A60-A66) and in the Surface Water Classification Assessment section (page 80). Subsequent surveys should be conducted to monitor for the presence of Furunculosis in the fishery. Surveys would also be beneficial to assess the current stocking program and management of the river.

South Branch Wild Brown Trout

Six electrofishing locations along the Raritan River S/Br in 2014.

SWQS Classification	Water Temp	Total Trout	Brook Trout		Brown Trout		Rainbow Trout	
			Wild	Stocked	Wild	Stocked	Wild	Stocked
Washington Street, High Bridge Boro, Downstream of Lake Solitude (page A60)								
FW2-TM	17.8°C (64.0°F)	12			11			1
Raritan River Road, Lebanon Twp., Across from Hickory Run and Little Brook (page A61)								
FW2-TM *FW2-TP(C1)	18.3°C (64.9°F)	24	6		16		1	1
Vernoy Road, Tewksbury Twp., Below Vernoy Road Bridge (page A62)								
FW2-TP(C1)	17.0°C (62.6°F)	56	7		49			
Schooley's Mountain Road, Washington Twp., Downstream of Claremont Stretch (page A63)								
FW2-TP(C1)	17.8°C (64.0°F)	128	47		79		2	
Bartley Road, Washington Twp., Bartley Wildlife Management Area (page A64)								
FW2-TP(C1)	15.7°C (60.3°F)	38	3		35			
Stephen's Mill Road, Mount Olive Twp., Downstream of Mt. Olive Complex Dam (page A66)								
FW2-TM *FW2-TP(C1)	17.7°C (63.9°F)	34			34			

* Proposed change to SWQS based on data previously submitted to Bureau of Water Monitoring and Standards, Environmental Analysis Restoration and Standards.

The **Lamington (Black) River** was electrofished at six locations from the Kay Environmental Center downstream to Fiddler's Elbow Country Club along Rattlesnake Bridge Road, spanning 11.5 miles of the river. These fish assemblage surveys were conducted for several reasons including but not limited to: 1) compare current status of the fishery to the existing Surface Water Quality Standards, 2) collect baseline fisheries data that in many cases has not been collected in many years, 3) gather baseline data in within the confines of Fiddler's Elbow Country Club prior to a planned stream habitat project that is tentatively scheduled for 2015. (Federal Grant F-48-R, Project I)

Lamington River Wild Brown Trout y-o-y

Four to Eight wild Brown Trout (see photo on right) were collected at five of six survey locations. Three wild Brook Trout were found in the upper-most location. Two stocked trout were encountered in the upper reaches (see table below). Additional information is compiled in Appendix A (pages A50-A55). Recommended changes to NJ's SWQS can be found on pages 80. From a water quality and habitat standpoint, it was encouraging to find wild Brown Trout in some of the lower reaches of this river, as it is currently classified as *Non-Trout*. It is recommended to invest efforts to try to identify the factors that limit the reproductive capacity of trout, particularly in the vicinity of Kay Environmental Center down through Hacklebarney State Park, as the habitat is optimal and there are several *Trout Production* streams nearby.

Six electrofishing locations along the Lamington River in 2014.

SWQS Classification	Water Temp	Total Trout	Brook Trout		Brown Trout		Rainbow Trout	
			Wild	Stocked	Wild	Stocked	Wild	Stocked
Fiddler's Elbow Country Club Site 2, Readington Twp. (page A50)								
FW2-NTC1 *FW2-TP(C1)	22.2°C (72.0°F)				5			
Fiddler's Elbow Country Club Site 1, Readington Twp. (page A51)								
FW2-NTC1 *FW2-TP(C1)	25.1°C (77.2°F)				4			
Lamington Road Bridge, Tewksbury Twp. (page A52)								
FW2-TM(C1) *FW2-TP(C1)	20.2°C (68.4°F)				8			
McCan Mill Road, Tewksbury Twp. (page A53)								
FW2-TP(C1)	22.3°C (72.1°F)				8			
Hacklebarney State Park, Washington Twp. (page A54)								
FW2-TMC1	18.3°C (64.9°F)			1	6			1
Kay Environmental Center, Chester Twp. (page A55)								
FW2-TMC1	20.4°C (68.8°F)		3					

* Proposed change to SWQS based on data previously submitted to Bureau of Water Monitoring and Standards, Environmental Analysis Restoration and Standards.

Lake Trout Population Assessment

Lake Trout (*Salvelinus namaycush*) fisheries exist in two waterbodies within New Jersey, Round Valley Reservoir and Merrill Creek Reservoir. Although stocked for years, the Lake Trout populations in these two reservoirs are now entirely supported by natural reproduction and are no longer stocked by the Division's Hackettstown Hatchery. Surplus Lake Trout were periodically stocked into Monksville Reservoir from 2004 - 2012, however it did not develop into a significant fishery. As a result, Lake Trout are no longer stocked in NJ waters.

Round Valley Reservoir has a Lake Trout population, which is closely monitored by NJDFW to evaluate the status of this trophy trout fishery. Lake Trout reared at the Hackettstown Hatchery were stocked in this deep reservoir (maximum depth 160 feet) from 1977 until 1995. In 1985, evidence that natural reproduction was occurring within the reservoir was documented. By 1995 it was determined that the population was capable of maintaining itself by natural reproduction, thus stocking was discontinued. Gill net surveys are conducted every fall, when mature Lake Trout seek out suitable spawning habitat along the boulders lining the reservoir's dams. Eight experimental gill nets, each net with varying mesh size openings, are used to capture a range of Lake Trout from juveniles to sub-adults. Eight large-mesh gill nets (6" stretch mesh) are set near the reservoir's north and south dams to capture mature Lake Trout as they begin congregating to spawn over the rocky substrate. Length and weight data are collected to assess physical condition of the fish using relative weight analysis. In addition, sex, finclips, and sexual development information are also recorded. (Federal Grant F-48-R, Project I)

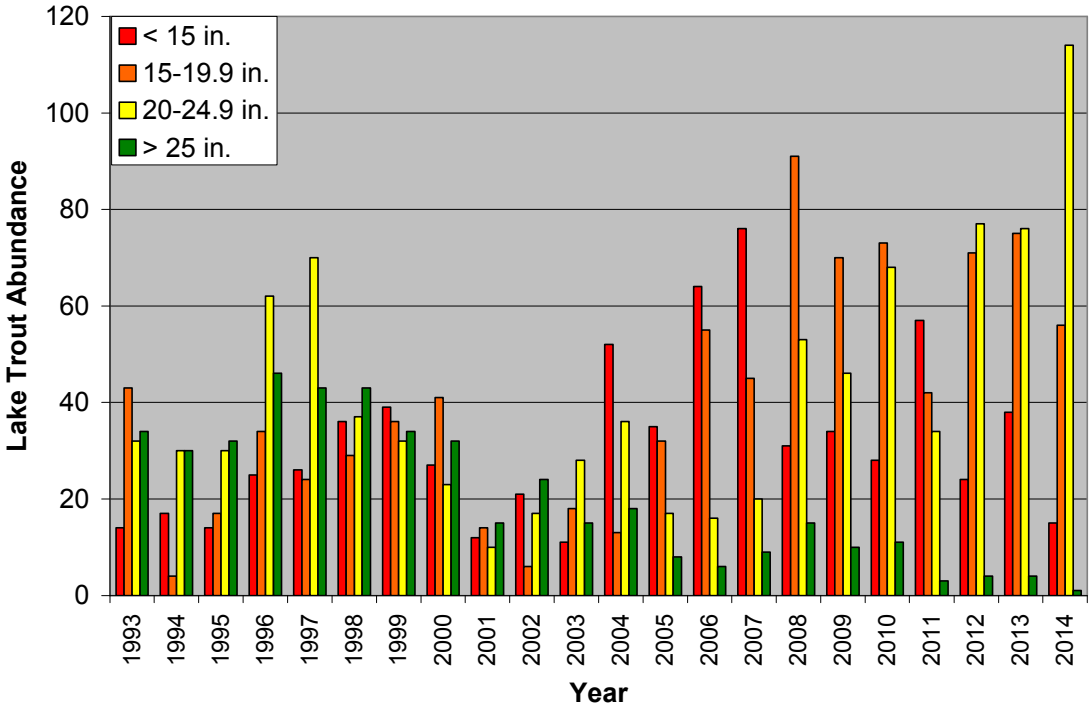
9.1 lb. Lake Trout from RVR

In 2014 the large-mesh gill nets set overnight and retrieved on November 13 and 14 resulted in the capture of 135 Lake Trout ranging from sub-adults to adults. Combined with 50 juvenile to sub-adult Lake Trout captured with experimental gill nets on October 21 and 22, the 186 Lake Trout is among the most collected in recent years. Unfortunately, the trend of decreasing numbers of large Lake Trout is resulting in a less-desirable trophy Lake Trout fishery. The number of Lake Trout encountered during our monitoring program over 25 inches has steadily declined since 1996. During the mid-1990's more than 40 individual fish over 25 inches were documented. That number has decreased to single digits in recent years (see figure below). In fact, this is the first year no Lake Trout over 30 inches or over ten pounds were caught. The largest individual was a female measuring 28.7 inches and weighing 9.1 lbs (see photo above). Despite few individuals reaching trophy proportions, the Lake Trout population is doing well, as the total number documented while monitoring has steadily increased since 2001.

Since 2008 and then again in 2012, the regulations were modified to increase harvest, aiming to reduce competition and facilitate better condition and faster growth. This management strategy seems to have worked, as the number of Lake Trout from 15 to 20 inches has

declined, while those from 20 to 25 inches have increased (see figure below). In fact, the number of Lake Trout from 20 to 25 inches peaked this year (n=117) as compared to the 16 to 20 collected each year from 2005-2007, prior to the regulation change. The Division plans to continue to encourage the harvest of Lake Trout from 15 to 24 inches with the intention of achieving a more desirable trophy fishery.

Number of Lake Trout captured (by size) during annual gill net surveys at Round Valley Reservoir since 1993.



Merrill Creek Reservoir is a 650-acre privately-owned reservoir located in Harmony Twp., Warren County that is open to public fishing. Following construction and filling in 1988, a variety of fish species have been stocked in this deep-water reservoir (200 ft deep) by NJDFW to establish and maintain desirable sport fisheries for Smallmouth Bass as well as Rainbow, Brown, and Lake Trout. The reservoir's fishery is managed by the Merrill Creek Owners Group in cooperation with Fish and Wildlife. This team meets annually to review and discuss fisheries data collected by the owner and their consultant, and to make management decisions. In recent years, Lake Trout have been the primary management focus and the owner's consultant annually monitors the Lake Trout population in the fall using gill nets. When the gill net survey data indicated that Lake Trout were naturally reproducing in the reservoir, stocking of this species was discontinued in 2013.

In 2014, to supplement fisheries data collected by the owners' fisheries consultant, the Bureau of Freshwater Fisheries deployed four experimental gill nets overnight in the reservoir to target small lake trout. A total of 27 lake trout were captured, ranging in size from 190 – 636 mm (7.5 - 25 in). Of these, only one was fin clipped, signifying that it had been stocked. The remaining 26 lake trout captured were not finclipped and are considered to be the product of natural reproduction. (Hunter & Angler Fund)

Landlocked Salmon Stocking Tilcon Lake (Morris)

200 landlocked Atlantic salmon were stocked in Tilcon Lake, Morris County, on April 17. The fish were originally obtained as fingerlings (8"), in May 2013, from Massachusetts Department of Fish and Game in exchange for surplus Northern Pike from the Hackettstown Hatchery. These salmon were held in the Hackettstown Hatchery for nearly a year so they could be grown and stocked at a much larger size, 15-20 inches. Anglers have already reported catching these salmon from Tilcon Lake (photo at right). Anglers have also reported catching the larger salmon stocked last fall in lakes Wawayanda and Aeroflex, which averaged 14 inches when stocked. The ability of our hatchery to grow the salmon to a larger size is making a big difference in the success of this stocking program.

A temperature/dissolved oxygen profile was also conducted at Tilcon Lake in late July to monitor its summer coldwater (trout/salmon) habitat (Appendix B-3). The profile was conducted in the deepest part of the lake (50 ft) and documented a horizontal layer of trout supporting water 19 – 43 feet beneath the surface (criteria: water temperature $\leq$ 21ºC (69.8ºF) and dissolved oxygen $\geq$ 4 mg/L). This lake has been recommended for classification as *Trout Maintenance* based upon profiles conducted in previous years. *Holdover Trout Lake* fishing regulations were implemented at Tilcon Lake in 2014. (Hunter & Angler Fund)

Stream Temperature Monitoring

In 2013 the Bureau established an ambient stream temperature monitoring network on streams having trout fisheries that are recreationally important or of conservation interest. The temperature data collected will be used to assess current temperature conditions, evaluate long term trends, determine if ambient water quality is consistent with DEP's Surface Water Quality Standards, and aid in the management of coldwater (trout) fisheries in these streams. Integral to the establishment of this monitoring network was the development of a quality assurance plan that complied with NJDEP's regulations concerning the certification of laboratories and environmental measurements under N.J.A.C. 7:18-1 et seq. A Quality Assurance Project Plan (QAPP) for Ambient Stream Water and Air Temperature Monitoring was prepared and subsequently approved by NJDEP's Office of Quality Assurance in July 2013. This certification is renewed annually. (Federal Grant F-48-R, Project I)

The monitoring network consisted of 17 recreationally important trout streams and 5 small streams having populations of wild Brook Trout (see table below). The trout production streams have paired water/air temperature monitoring and are part of an Eastern Brook Trout Joint Venture initiative to assess climate change. In 2014 two additional sites were added to our stream temperature monitoring program to learn more about stream temperature gradients in the South Branch of the Raritan River within the Claremont section and below Lake Solitude. The Bureau now has a total of 31 thermographs (Onset Hobo Pro v2), deployed to record temperature at 30 minute intervals year round. Five continuous air and stream temperature monitoring sites (Willoughby Brook, Turkey Brook, Forked Brook, Beerskill Creek, and Stephensburg Creek) were also checked and calibrated to maintain the validity of our stream temperature data. For full report, see **Appendix G**.

NJDFW Stream Temperature monitoring network 2014.

Stream	Site ID	Classification	Monitoring Type
Black River	BLACK1	Trout Maintenance	water
Big Flat Brook	FLATBROOKBLW	Trout Production	water
Big Flat Brook	FLATBROOKROY	Trout Maintenance	water
Flat Brook	FLATBROOK206	Trout Production	water
Manasquan River*	MANASQUAN1	Trout Maintenance	water
Metedeconk River, N/Br	METNBR1	Trout Maintenance	water
Metedeconk River, S/Br.	METSBR1	Non-Trout	water
Musconetcong River	MUSKY1	Trout Maintenance	water
Paulins Kill	PAUL1	Trout Maintenance	water
Pequannock River	PEQUAN1	Trout Maintenance	water
Pequest River	PEQUEST1	Trout Maintenance	water
Pohatcong Creek	POHAT1	Trout Maintenance	water
Ramapo River	RAM1	Non-Trout	water
Raritan River, N/Br.	RARNBR1	Trout Maintenance	water
Raritan River, S/Br.	RARSBR1	Trout Maintenance	water
Raritan River, S/Br.	RARSBRCLMT	Trout Production	water
Raritan River, S/Br.	RARSBRSLTD	Trout Maintenance	water
Rockaway River	ROCK1	Trout Maintenance	water
Toms River	TOMS1	Trout Maintenance	water
Wallkill River	WALL1	Trout Maintenance	water
Wanaque River	WAN1	Trout Maintenance	water
Beerskill	BEERS1	Trout Production	water & air
Forked Brook	FORKED1	Trout Production	water & air
Stephensburg Creek	STEPHEN1	Trout Production	water & air
Turkey Brook	TURK1	Trout Production	water & air
Willoughby Brook	WILLO1	Trout Production	water & air

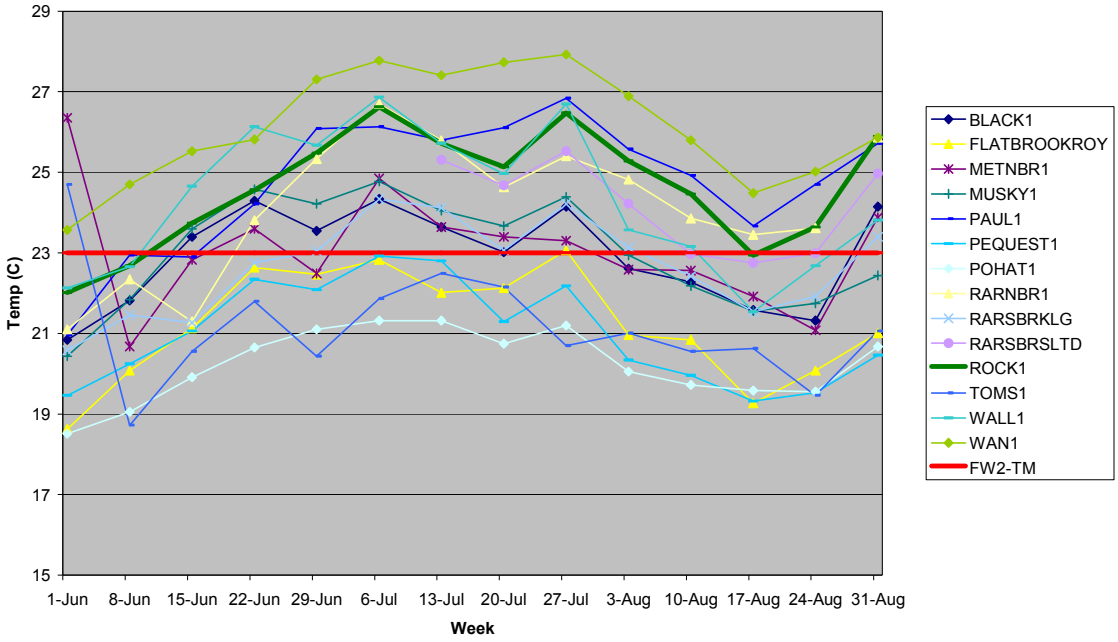
* Thermograph deployed in this stream experienced problems in 2014. Data screening revealed errors due to exposure to air and the thermograph was subsequently moved to a more suitable location.

Results from the summer stream temperature data collected in 2014 revealed that many stream sections that were monitored and are classified as *Trout Maintenance* exceed New Jersey's Surface Water Quality Standards (see figure below). The New Jersey Administrative Code (N.J.A.C.) 7:9B states that for waters classified as FW-TM "temperatures shall not exceed a daily maximum of 25 degrees Celsius or rolling seven-day average of the daily maximum of 23 degrees Celsius, unless due to natural conditions." Furthermore, this year's summer proved to be more mild than recent years, with the statewide

average temperature 0.8°F below the 1981-2010 average, and precipitation 0.26 inches above the 1981-2010 average (McCarty 2014). Regardless, stream temperatures for coldwater fish were less stressful in these sections in 2014 as the FW-TM standard was exceeded less frequently compared to the previous year.

The graph below depicts the 7-day rolling average of the daily maximum stream temperature for each site monitored during summer weeks encompassing June 1 to August 31, 2014. The horizontal red line "FW2-TM" depicts the rolling 7-day average of the daily maximum of 23°C surface water criteria that *Trout Maintenance* streams should not exceed.

2014 Mean Weekly Temperature Maximum for Summer (June 1 - August 31) vs FW2-TM Standard



Trout Stocking Allocations

Annually, the Division of Fish & Wildlife's Bureau of Freshwater Fisheries determines which waterbodies and how many trout per waterbody will be stocked statewide. The allocation methodology uses a combination of biological, physical, and social factors to equitably allocate trout over a 10-week period to all trout-stocked waters in the spring. Fall and winter programs are established as well. A computerized database containing different variables for each stream, lake, and pond is used in conjunction with a formula to calculate individual weekly allotments of trout. The database is annually reviewed and updated by biologists. (Hunter & Angler Fund)

In September of 2013 furunculosis, a fatal disease affecting primarily cold water species of fish such as trout, was discovered in broodstock raceways at the Division's Pequest Trout Hatchery. The disease is caused by a bacterium known as *Aeromonas salmonicida*. Osprey feeding on infected fish in the wild may have spread the bacteria through contact with trout at the hatchery. The following is a timeline indicating when outbreaks of Furunculosis occurred and how it affected the 2014 stocking season:

2013 – 2014 Pequest Trout Hatchery Furunculosis Timeline

- September 2013
  - Broodstock located in the "E" and "I" Lines test positive for *A. salmonicida* and euthanized, limiting the number of broodstock that would be stocked during the following spring stocking season.
- September to December 2013
  - Production Brown Trout located in the "G" and "H" Lines test positive *A. salmonicida*.
  - Production Brook Trout located in the "B" Line test positive for *A. salmonicida*.
  - Plan to treat infected raceways with antibiotics, test prior to stocking, and if the antibiotic treatment worked and these re-tested fish test negative, than these fish can be stocked in certain waterbodies.
  - The New Trout Stocking Program Plan was adjusted to limit the spread of the trout with *A. salmonicida* to the wild. (The Plan states that all fish will be tested just prior to stocking and that no fish will be stocked if they currently test positive for the *A. salmonicida*.)
  - A plan to begin stocking prior to the normal pre-season dates was also formulated, but did not occur due to weather and environmental conditions (snow & ice) making earlier stockings impossible.
- March 2014
  - Production Brook Trout ("C" Line) tested positive for *A. salmonicida* (previously non-exposed and negative) and were euthanized. The new shortage of these fish resulted in additional changes to the stocking plan. New changes are as follows:
    - Five lakes (Columbia Lake, Lake Hopatcong, Lake Musconetcong, Little Swartswood Lake, & Swartswood Lake) will be stocked Pre-season only.
    - Waterbodies with closed in-season stocking dates, scheduled to receive non-exposed trout, were shortened from 4 weeks of in-season stocking to 3 weeks of in-season stocking.
    - All other waterbodies in the category of only receiving non-exposed trout were reduced from 4 weeks to 2 weeks of in-season stocking dates.

- April 2014
  - Production Brook Trout ("B" Line) (previously positive for *A. salmonicida* and treated with antibiotics) did not respond to treatment and were found to still be positive for *A. salmonicida* just prior to stocking. These fish were euthanized, creating a shortage in this category of fish and another change to the stocking plan was needed. New changes are as follows:
    - All stockings of waterbodies in the category "can be stocked with exposed fish that tested positive at one time, were treated with antibiotics and test negative just prior to stocking" was concluded on the Tuesday of week 2 due to a shortage of trout. This category was previously scheduled for 4 weeks of stocking.
  - Stocking of all other categories of trout continued through Week 4 where fish were available.
  - Fall & Winter stocking was also affected by the *A. salmonicida* as only yearling trout averaging 8-10 inches were stocked instead of the two-year old trout (avg. 14-16 in.) that are normally stocked.
  - Impacts from the Furunculosis outbreak will continue for years to come as the Division has decided to raise only Rainbow Trout at the Pequest Trout Hatchery for the next few years. The Rainbow Trout has shown resistance to Furunculosis to reduce the potential for future outbreaks. It is unknown when the Division will return to raising Brook and Brown Trout.

Four Categories of Trout Stocked Waterbodies

(See **Appendix F** for complete list of waters stocked and not stocked with trout in 2014.

1. **Waterbodies not stocked in 2014**. Trophy Trout Lakes, Holdover Trout Lakes, certain smaller *Trout Production* streams, and selected smaller waters directly connected to *Trout Production* streams. This eliminates risk of transferring bacteria to year-round trout fisheries with trout from compromised facility. This is a better use of limited number of "negative" or never exposed trout, as waters with resident trout provide anglers fishing opportunities regardless of stocking this year, therefore they could be used in places that will not provide trout fishing opportunities without stocking.
2. **Waterbodies stocked with trout never exposed to *A. salmonicida* and never tested positive**. Primarily larger and more popular streams that either are connected to or have resident trout populations. This provided the highest protection while minimizing impact to anglers. The traditional 7 week in-season stocking season was shortened to 4 weeks in-season.
3. **Waterbodies stocked with trout that were downstream (exposed) to the *A. salmonicida*, but never tested positive.** These are Rainbow Trout located in the "F" Line. These waterbodies either support trout year-round but are not connected to *Trout Production* waters or waters in Pinelands.
4. **Waterbodies stocked with fish exposed to *A. salmonicida* that tested positive at one time, were treated with antibiotics and test negative just prior to stocking.** These waterbodies do not support trout year-round and are not in the Pinelands. These waters received many more trout in 2014 than previous years with most of the trout stocked early in the pre-season. This will make the most fish available to anglers when angler density is at its highest (opening day) and will get the fish into a less stressful environment (less crowded in the wild) as soon as possible. Five new river sections and three lakes were added to the trout stocking program for 2014 only. These waterbodies received exposed, but negative trout, to help distribute the large numbers of trout in this category without overstocking the other available waterbodies in this category.

A summary of trout stocked during 2014, by season and species is found in the table below.

Spring 2014 Trout Stocking Summary				
Species	Type	Avg. Length	Lbs.	# Fish
Rainbow Trout	Production	11.4"	117,265	213,930
	Broodstock	16.5" & 21.8"	7,622	1,750
Brook Trout	Production	14.5"	2,237	1,880
	Broodstock	-	-	-
Brown Trout	Production	10.8"	82,395	153,115
	Broodstock	-	-	-
		Totals	**209,519**	**370,675**
Fall 2014 Trout Stocking Summary				
Species	Type	Avg. Length	Lbs.	# Fish
Rainbow Trout	Production	9.2"	6,269	22,470
	Broodstock	18.6"	1,448	450
Brown Trout	Production	8.2"	910	3,840
		Totals	**8,627**	**26,760**
Winter 2014 Trout Stocked Lakes Program Summary				
Species	Type	Avg. Length	Lbs.	# Fish
Rainbow Trout	Production	10.0"	1,850	4,975
Brown Trout	Production	9.3"	2,764	7,870
		Totals	**4,614**	**12,845**

Trout Stocking Program Changes For 2014

(based on 2014-2015 Fish Code)

New Trout Stocked Waterbodies Added To The Trout Stocking Program in 2014

Franklin Lake (Monmouth Co.) Franklin Lake, a 15 acre lake located in West Long Branch, was added in place of Lake Takanassee which was dropped from the Division's trout stocking program due to severe damage to the lake's bulkhead from Hurricane Sandy (see page 45). Franklin Lake is publically accessible with 75% of its shoreline open to angling. It has adequate parking, and its addition will maintain trout stocking opportunities within the local area. Franklin Lake will receive 1,170 trout in 1 pre-season stocking and 3 in-season stockings.

Manalapan Lake (Middlesex Co.) Manalapan Lake is a 45 acre impoundment located in Thompson County Park in Middlesex County. 70% of its shoreline is accessible for fishing with minimal shoreline vegetation making this a very desirable location for a put-and-take seasonal trout fishery. The car top boat launch was recently converted to a formal boat launch. Manalapan Lake is located within 6 miles from Farrington Lake which was dropped from the Division trout stocking program this year. Manalapan Lake will receive 1,870 trout in 1 pre-season stocking and 3 in-season stockings.

Mountain Lake (Warren Co.) Mountain Lake is a 116 acre lake located in Liberty Township, Warren County. The lake was part of the trout stocking program until 2006 when it was dropped due to poor public access which resulted in poor angler turnout. Since that time Liberty Township has acquired property along the shoreline and the boat launch is now a free launch increase public access. Mountain Lake is scheduled to receive 600 trout and will only be stocked one time during the pre-season. The lake will remain open to fishing during the pre-season trout fishing period due to the presence of other early season fisheries such as Muskellunge, but this will allow anglers an early season opportunity to catch and release trout during this time period as well.

Nomahegan Park Pond (Union Co.) Nomahegan Park Pond is a 6 acre pond located within the 95 acre Nomahegan Park in Cranford Township, Union County. 100% of this publicly owned pond's shoreline is accessible to anglers, although regeneration of shoreline vegetation may limit some access. The surrounding urban area and easy public access will provide more opportunities for trout fishing in an area where other nearby trout stocked waters receive very high angler pressure and participation in the trout stocking program. Nomahegan Park Pond will receive one pre-season stocking of 390 trout.

Trout Stocked Waterbodies Removed From The Trout Stocking Program:

Farrington Lake (Middlesex Co.) Large lakes, such as Farrington Lake, yield lower return rates for trout resulting in low angler success and interest comparative to their size. The trout stocking allocation formula allocates less than 3 trout/acre, which is significantly less than smaller waterbodies in the Division's trout stocking program. Because most anglers fish the stream-like section of Lawrence Brook that feeds Farrington Lake, the Lawrence Brook section from Davidson's Mill Pond dam downstream to Church Lake will still be stocked, however the main portion of Farrington Lake (from Church Lane to Farrington Lake Dam will no longer be stocked as it was removed from the Division's trout stocking program starting 2014.

Lake Takanassee (Monmouth Co.) The bulkhead at Lake Takanassee in Long Branch Twp. was severely damaged during Hurricane Sandy resulting in the draining of the lake (see page 45). The timeframe for completing bulkhead repairs and refilling the lake is uncertain. The lake has been inundated with saltwater in the past impacting the lake's freshwater fisheries including the viability of stocked trout. Therefore, it has been removed from the Division's trout stocking program.

Shadow Lake (Monmouth Co.) Due to limited public access and low angler participation, Shadow Lake was dropped from the Division's trout stocking program in 2014.

Trout stocking was suspended in 2014 for the following waterbody:

Hooks Creek Lake (Middlesex) Storm surge from Hurricane Sandy pushed saltwater from the Atlantic Ocean into the lake resulting in unsuitable salinity levels for trout and other freshwater fish species (see page 45). Biologists will continue to monitor salinity levels to determine if salinity levels have dropped sufficiently to allow trout stocking in 2015

Wild Brook Trout Assessment

Wild Brook Trout

Anthropogenic landscape changes and past management practices have negatively impacted New Jersey's freshwater resources, particularly Brook Trout, the state's only native trout species. Of the three species of trout that reproduce in New Jersey streams, Brook Trout are the least tolerant of habitat degradation. Habitat alteration and stream fragmentation, diminished water quality, and competition with non-native trout (Brown and Rainbow Trout) have contributed to the decline of wild Brook Trout in New Jersey. Wild populations of Brook Trout now persist in less than half their original range in New Jersey.

NJDFW actively participates in the Eastern Brook Trout Joint Venture (EBTJV), a unique partnership initiated in 2004 under the National Fish Habitat Initiative (*www.fishhabitat.org*). EBTJV is a geographically focused, locally driven, and scientifically based effort to protect, restore and enhance aquatic habitat throughout the range of the eastern Brook Trout. The Venture has produced a range-wide population assessment of wild Brook Trout; completed extensive work that identifies key threats to wild Brook Trout and their habitats; and developed conservation strategies to protect, enhance and restore wild Brook Trout. EBTJV is currently working on refining the subwatershed status map to the catchment scale and NJDFW conducts surveys to assess the status of Brook Trout in catchments that lack survey data. This data, as well as data from stream surveys conducted as part of other activities, is entered into FishTrack (NJDFW's computerized freshwater fisheries database) and shared with the EBTJV.

In 2014 no catchments were specifically targeted for sampling to document the occurrence and distribution of wild Brook Trout for the EBTJV. However, 69 stream surveys conducted in 2014 under a variety of other jobs and/or funding sources provide, data that can be used to document the presence /absence of wild populations of Brook Trout, as well as Brown and Rainbow Trout (see table below). Reproducing Brook Trout populations (confirmed by the presence of young-of the-year trout) were documented in 25 of these surveys. Brook Trout reproduction was discovered in one previously un-sampled small tributary to the S/Br. Raritan River (Tributary NE of Lake Solitude) and in several previously un-sampled sections of the mainstem of the S/Br. Raritan River. This data set has been provided to EBTJV. (Federal F-48-R, Project I)

Presence/absence of wild trout species in 69 stream surveys conducted in 2014 using standardized sampling protocols. A species was considered wild (naturally reproduced, not stocked) when young-of-the-year fish were found. An "*" following the species name indicates that only trout older than young-of-the-year were found and these were considered wild based upon a visual assessment of their fin wear and erosion.

Stream	Location	Wild trout sp	Page
Upper Delaware Region (Upper Delaware & Wallkill)			
Bear Brook	Rt. 612, Johnsonburg	Brook	A2
Bear Creek	Bear Creek Road (2nd downstream bridge	Brook*	A3
Bear Creek	Rt. 519 Bridge	none	A4
Big Flat Brook	Between Rt. 206 and Rt. 560	Brook	A5
Big Flat Brook	Upstream of Blewitt Tract (#1)	Brown*	A6
Big Flat Brook	Upstream of Blewitt Tract (#2)	Brook* & Brown*	A7
Clove Brook	Rt. 23 bridge	Brown	A8
Dunnfield Creek	Del. Water Gap (parking lot off I-80)	Brook & Brown	A9
Dunnfield Creek	Approx. 1.3 km upstream from I-80	Brook & Brown	A10
Flat Brook	Off Rt. 615 (below rifle range pool)	Brown*	A11
Hakihokake Creek (AKA Little York Brook/Creek)	Sweet Hollow Road	Brown	A12
Hances Brook (Trib.) (Rockport)	Highland Avenue bridge	Brook	A13
Merrill Creek	Prospect St. bridge	Brook & Brown	A14
Merrill Creek	Richline Road bridge	none	A15
Parker Brook	Crigger Road, Stokes State Forest	Brook	A16
Stephensburg Brook	Stephensburg Road bridge	Brook & Brown	A18
Stony Brook	Kittle Road	Brook	A19
Van Campens Brook	Brink Road bridge	Brook Brown & Rainbow	A20
Van Campens Brook	Blairstown-Millbrook Road bridge	Brook & Rainbow	A21
Van Campens Brook	Depew Recreation Site Access Road	Brook Brown & Rainbow*	A22
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic			
Bear Swamp Brook	Bear Swamp Brook Road bridge	Brook	A23
Indian Grove Brook	Hardscrabble Road	Rainbow	A24
Jackson Brook	Hedden Park	Brown	A25
Passaic River	Jockey Hollow Road	Brown & Rainbow	A26
Pequannock River	Cross Road bridge	Brown	A27
Pequannock River	Generant Valve Factory	Brown	A28
Saddle River	Lake Street bridge	Brown	A29
Saddle River	Stone Church Road bridge	Brown	A30
Wanaque River	Boulevard Avenue	Brown	A31
Wanaque River	Back Beach Park	Brown	A32
Wanaque River	Meadow Brook confluence	Brown*	A33
West Brook	West Brook Road	Rainbow	A34
Whippany River	Tingley Road	Brown & Rainbow*	A35

Presence/absence of wild trout species in 69 stream surveys conducted in 2014 using standardized sampling protocols. A species was considered wild (naturally reproduced, not stocked) when young-of-the-year fish were found. An "*" following the species name indicates that only trout older than young-of-the-year were found and these were considered wild based upon a visual assessment of their fin wear and erosion. (continued)

Stream	Location	Wild trout sp	Page
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)			
Bee Brook	Scutter's Mill Road	none	A38
Black Brook	Van Syckle's Road	Brown*	A39
Burnett Brook	Rt. 24 bridge	Brown	A40
Chambers Brook	Airport Road / Love Road	none	A42
Cold Brook	Vliettown Road	Brown	A43
Flanders Brook	Rt. 206 bridge	Brook*, Brown, & Rainbow	A44
Heathcote Brook	Ridge Road	none	A45
Herzog Brook (AKA Lomerson Bk)	Longview Road	Brook* & Brown	A46
Hickory Run	Hickory Run Road	Brook	A47
India Brook	Doby Road	Brook & Brown	A48
India Brook	Mountainside Road	Brown & Rainbow	A49
Lamington River (Black River)	Fiddler's Elbow Country Club (#2)	Brown*	A50
Lamington River (Black River)	Fiddler's Elbow Country Club (#1)	Brown	A51
Lamington River (Black River)	Lamington Road Bridge	Brown	A52
Lamington River (Black River)	McCan Mill Rd	Brown	A53
Lamington River (Black River)	Hacklebarney State Park	Brown*	A54
Lamington River (Black River)	Kay Environmental Center	Brook*	A55
Lamington River (Trib.) (N. of Readington)	Cedar Road	none	A56
Ledgewood Brook	Emmans Road	Brown	A57
Muddy Run	Burnt Mills Road	none	A58
Raritan River N/Br (Trib.) (W. of Bedminster)	Matthews Drive	none	A59
Raritan River S/Br	Washington Street	Brown	A60
Raritan River S/Br	Raritan River Road	Brook*,Brown, & Rainbow	A61
Raritan River S/Br	Vernoy Road	Brook & Brown	A62
Raritan River S/Br	Schooley's Mountain Rd	Brook, Brown, & Rainbow	A63
Raritan River S/Br	Bartley WMA	Brook & Brown	A64
Raritan River S/Br	Stephens Mill Road	Brown	A66
Raritan River S/Br (Trib.) (NE of Lake Solitude)	River Road	Brook & Brown*	A67
Rinehart Brook	Hacklebarney State Park	Brown	A68
Rockaway Creek N/Br	Rockaway Road	Brown	A69
Rocky Run	Rocky Run Road	Brook	A70
Stony Brook	Naughtright Road	Brook & Brown	A72
Teetertown Brook	Trimmer Road bridge	Brook & Brown	A73
Trout Brook	Hacklebarney State Park	Brook	A74
Turkey Brook	Hacklebarney State Park	Brook & Brown*	A75
Willhoughby Brook	Buffalo Hollow Road	Brook & Brown	A76

Wild Trout Stream Regulation Assessment

Wild Brook Trout from Merrill Creek

Fish & Wildlife has documented reproducing trout populations in nearly 200 streams (or stream segments) statewide, but only a handful of these (36) are currently designated as *Wild Trout Streams*. These 36 streams are not stocked with hatchery trout, but rather rely upon the wild, naturally reproducing trout populations inhabiting these streams to provide a recreational fishery. The *Wild Trout Stream* regulation, which is more stringent than the statewide general trout regulation, has changed little since it was adopted in 1990. Currently the regulation provides for a limited harvest of two trout daily, measuring 229 mm (9 in) (three streams have a 305 mm (12 in) minimum size on Brown Trout), from the Opening Day of the trout season in April through September 15.

In 2014 the Bureau of Freshwater Fisheries conducted 46 electrofishing surveys on sections of all 36 designated *Wild Trout Streams* (see table below). Eight streams were surveyed at 2 or 3 locations, due to their length or because they have two unconnected regulated sections. Brown Trout were found in 33 surveys, Brook Trout in 22 surveys, Rainbow Trout in 9 surveys, and Tiger Trout (a hybrid of Brook and Brown Trout) in 1 survey. No trout were found at one location in Merrill Creek, upstream of Merrill Creek Reservoir, however Brook and Brown trout were found at the location below the reservoir. Trout were found at on one of two Bear Creek locations. Collectively the 46 surveys produced 3,137 trout, with a mean of 68 trout per survey. Brown Trout were by far the most abundant trout species caught (65% of total), followed by Brook Trout (25%), Rainbow Trout (10%), and Tiger Trout (1 individual). (Federal Grant F-48-R, Project I)

Wanaque River
Wild Brown Trout

The majority of the regulated *Wild Trout Streams* are small tributaries to larger, trout-stocked streams. These small streams often have relatively few (or no) trout that exceed the minimum harvestable size of 228 mm (9 in). Some of the larger *Wild Trout Streams*, such as Van Campens Brook, Pequannock River, and Wanaque River (see photo on right) produce larger Brown Trout, and on these waters the minimum harvestable size for this species is 305 mm (12 in).

The data collected in 2014 on the *Wild Trout Streams*, as well as from other streams having naturally reproducing trout populations, will be further analyzed to evaluate the current *Wild Trout Stream* regulation and determine if changes are warranted.

Results of 46 electrofishing surveys conducted in 2014 on 36 New Jersey streams regulated as *Wild Trout Streams*.

			Number of Trout[1]				Results
Stream Name	**County**	**Location**	**BKT**	**BNT**	**RBT**	**Total**	**Page #**
Bear Brook	Warren	Rt. 612	24	0	0	24	A2
Bear Creek	Warren	Rt. 519	0	0	0	0	A4
Bear Creek	Warren	Bear Creek Road	1	0	0	1	A3
Bear Swamp Brook	Bergen	Bear Swamp Bk Rd	24	0	0	24	A23
Black Brook	Hunt	Van Syckle's Road	0	13	0	13	A39
Burnett Brook	Morris	Rt. 24	0	74	0	74	A40
Cold Brook	Hunt	Vliettown Road	0	67	0	67	A43
Clove (Mill) Brook	Sussex	Rt. 23	0	14	0	14	A8
Dunnfield Creek	Warren	1.3 km upstream	9	58	0	67	A10
Dunnfield Creek	Warren	Del. Water Gap	5	114	0	120*	A9
Flanders Brook	Morris	Rt. 206	1	56	27	84	A44
Hakihohake Ck (Lt Yk Bk)	Hunt.	Sweet Hollow Road	0	95	0	95	A12
Hance's Brook	Warren	Highland Avenue	0	5	0	5	A13
Herzog (Lomerson) Brook	Morris	Longview Road	1	93	0	94	A46
Hickory Run	Hunt	Hickory Run Road	254	0	0	254	A47
India Brook	Morris	Doby Road	12	44	0	56	A48
India Brook	Morris	Mountainside Road	0	155	34	189	A49
Indian Grove Brook	Somerset	Hardscrabble Road	0	0	24	24	A24
Jackson Brook	Morris	Hedden Park	0	72	0	72	A25
Ledgewood Brook	Morris	Emmans Road	0	95	0	95	A57
Merrill Creek	Warren	Richline Road	0	0	0	0	A14
Merrill Creek	Warren	Prospect Street	34	197	0	231	A15
Parker Brook	Sussex	Crigger Road	3	0	0	3	A16
Passaic River	Morris	Jockey Hollow Rd	0	13	8	21	A26
Pequannock River	Passaic	Cross Road	0	126	0	126	A27
Pequannock River	Passaic	Generant Factory	0	8	0	8	A28
Rinehart Brook	Morris	Hacklebarney SP	0	105	0	105	A68
Rockaway Creek, N/Br	Hunt	Rockaway Road	0	58	0	58	A69
Rocky Run	Hunt	Rocky Run Road	69	0	0	69	A70
Saddle River	Passaic	Lake Street	0	69	0	69	A29
Saddle River	Passaic	Stone Church Road	0	38	0	38	A30
Stephensburg Brook	Morris	Stephensburg Rd	15	3	0	18	A18
Stony Brook	Morris	Naughtright Road	2	102	0	104	A72
Stony Brook	Sussex	Kittle Road	12	0	0	12	A19
Teetertown Brook	Hunt	Trimmer Rd	49	44	0	93	A73
Trout Brook	Morris	Hacklebarney SP	118	0	0	118	A74
Turkey Brook	Morris	Flanders-Drakestwn Rd	23	5	0	28	A75
Van Campens Brook	Warren	Millbrook	50	0	42	92	A21
Van Campens Brook	Warren	Brink Road	5	22	27	54	A20
Van Campens Brook	Warren	Depew access area	1	59	4	64	A22
Wanaque River	Passaic	Back Beach Park	0	82	0	82	A32
Wanaque River	Passaic	Boulevard Avenue	0	9	0	9	A31
Wanaque River	Passaic	Meadow Brook	0	1	0	1	A33
West Brook	Passaic	West Brook Road	0	0	144	144	A34
Whippany River	Morris	Tingley Road	0	94	2	96	A35
Willhoughby Brook	Hunt	Buffalo Hollow Rd	70	52	0	122	A76

[1] BKT= Brook Trout; BNT=Brown Trout; RBT=Rainbow Trout * Total includes one Tiger Trout

COOLWATER / WARMWATER FISHERIES

Coastal Lakes Monitoring - Hurricane Sandy

In 2012, eleven freshwater coastal lakes suffered the wrath of Hurricane Sandy as record setting high tides inundated these freshwater systems with saltwater, sediment and debris. Lake Takanassee in Long Branch was hit the hardest. The outlet structure separating this freshwater impoundment from the ocean failed; what little was left is directly open to the ocean. As the timeframe for rebuilding is uncertain, it has been removed from the Division's trout stocking program. In its place, Franklin Lake, West Long Branch was stocked with trout. (Hunter & Angler Fund)

Silver Lake, Bradley Beach after Hurricane Sandy

The 10 other waterbodies; Carteret Park Pond (Carteret), Deal Lake (Asbury Park), Fletcher Lake (Asbury Park), Hooks Creek Lake @ Cheesequake St. Park (Matawan), Lake Como (Spring Lake), Lake of The Lillies (Pt. Pleasant), Silver Lake (Bradley Beach), Sunset Lake (Asbury Park), Sylvan Lake (Bradley Beach), and Wesley Lake (Asbury Park) all experienced freshwater fish kills due to saltwater intrusion with salinities ranging from 0.20 to 11.8. The salinity of freshwater is usually less than 0.5 parts per thousand (ppt). Water between 0.5 ppt and 17 ppt is considered brackish and the average ocean salinity is 35 ppt.

Fortunately, abundant spring rains in 2013 greatly assisted the recovery of several waters. Follow-up measurements taken in June 2013 showed considerable improvements in salinity levels with seven lakes dropping below 0.5 ppt. In 2013, Deal Lake, Sunset Lake, and Lake of the Lillies were able to be restocked. In 2014, salinity checks were conducted at Silver Lake, Lake Como, Spring Lake, and Wesley Lake. All were found to have recovered from Hurricane Sandy were stocked with warmwater fish.

Carteret Park Pond was intentionally drawn down, so that it could be flushed with freshwater supplied by municipal water and has been monitored since. Water quality data was collected and salinity levels have returned to near-normal levels of 0.26 ppt in 2014. Observations of fish included approximately 30 to 40 five-inch Largemouth Bass plus young-of-the-year (YOY), 100 adult sunfish plus YOY, and 3 adult bullheads. Additional fish were eventually stocked by the Hackettstown Hatchery, including Largemouth Bass, Channel Catfish, and sunfish.

Hooks Creek Lake in Cheesequake State Park did not fare as well. Although salinity has dropped from 11.8 ppt in January of 2013, to 9.6 ppt in June of 2013, it remains elevated at 3.8 ppt as of June 1, 2014. Species encountered during seining include Mummichog, Banded Killifish, Atlantic Silverside, White Perch, and Gizzard Shad. Biologists will continue to monitor salinity levels to determine if salinity levels have dropped sufficiently to allow the stocking of freshwater fish species such as Largemouth Bass, sunfish, and trout.

Coolwater Fisheries Assessment

The Coolwater Fisheries Assessment was initiated in 2013 to assess coolwater fisheries that are maintained by annual stockings (Muskellunge, Northern Pike, Walleye, and Hybrid Striped Bass). In 2013 the focus was on developing sampling techniques and protocols for assessing Muskellunge, which are stocked in ten waterbodies statewide. Three of these lakes (Furnace Lake, Mountain Lake, and Carnegie Lake) were selected for sampling in 2013 using trap nets during the spring when mature muskies congregate for spawning and are more vulnerable to capture. A total of five Muskies were captured during 2013 sampling, three at Mountain Lake (rate of 0.5 fish/net), 1 at Furnace Lake (rate of 0.125 fish/net), and 1 at Carnegie Lake (rate of 0.09 fish/net). Just as important as the fish that were captured and data that was collected in 2013, was the development and beginning of our Coolwater Assessment Program which will continue to be improved upon and provide information to anglers about our coolwater fish stocking program. In 2014, the second year of the Coolwater Assessment, four waterbodies (Farrington Lake, Pompton Lake, Lake Hopatcong, and Monksville Reservoir) were the selected for spring trap netting surveys. The results from these surveys are presented below and in greater detail in **Appendix H**. (Federal Grant F-48-R, Project I)

At Farrington Lake the target species was Northern Pike and the catch of Northern Pike there was low to moderate. A total of seven Northern Pike were captured and they ranged in size from 397 – 945 mm long and 0.4 – 5.32 kg (see table below). Of the Northern Pike captured, the majority were larger individuals, with only one smaller than 27 inches. The overall mean W_r for Northern Pike collected was 101 ± 7.43 and ranged from 84 – 108 which indicated the fish were in very good condition.

At Pompton Lake the target species was Northern Pike and the catch of Northern Pike at this lake was low to moderate. However, anglers that interacted with the survey crew indicated that they did very well fishing for Northern Pike and have seen others do well fishing for Northern Pike on Pompton Lake. One angler reported catching four Northern Pike on the southern end of the lake the night before we checked our nets. Setting a total of eight trap nets yielded three Northern Pike and ranged in size from 505 – 670 mm long and 0.790 – 1.955 kg (see table below).

At Lake Hopatcong the target species were Walleye and Muskellunge. A total of ten Muskellunge were captured, ranging in size from 991 – 1210 mm long and 6.6 – 16 kg. Of the Muskellunge captured, the majority were larger individuals, with all 10 exceeding the minimum harvestable size of 914 mm (36 in) and 7 exceeding trophy size of 1016 mm (40 in)! (See photo on right) The overall mean W_r for Muskellunge collected was 102 ± 9.34 and ranged from 78 – 120 which indicates most fish were in very good condition. A total of 71 Walleye were captured and ranged in size from 419 – 720 mm long and 0.64 – 3.755

kg. Of the Walleye captured, the majority were larger individuals (PSD of 100, RSD_P of 86, and RSD_m of 23), with all but 2 of the 71 exceeding the minimum harvestable size of 18 inches. The overall mean W_r for Walleye collected was 90 ± 2.06 and ranged from 71 – 132 which indicates below average fish condition. CPUE of both Walleye and Muskellunge indicate that their population size is moderate to good, providing plenty of action for anglers.

At Monksville Reservoir the target species were Walleye and Muskellunge. A total of two Walleye were captured and ranged from 588 – 660 mm long and 2.066 – 3.04 kg (two additional Walleye were captured in the Spring). All were larger than 23 inches and one was in excess of 27 inches and 7.5 lbs. (See photo to right). Two Muskellunge were captured and ranged from 1005 – 1009 mm long and 8.62 – 9.3 kg in weight, both were in good condition with a W_r of 104 and 111 respectively. Anglers that interacted with the survey crew indicated that the Muskellunge fishing was great at this reservoir and that they regularly caught them. On one day, while tending the nets, an angler held up a freshly caught Muskellunge in excess of 40 inches and then released it back into the water. The Walleye population seems to have declined since the last survey conducted in 2003.

Catch per unit effort (CPUE) and stock density indices for Spring Trap Netting on Lake Hopatcong, Farrington Lake, Pompton Lake, and Monksville Reservoir.

Species	Number	% of Pop by Number	Nets Set	CPUE	PSD	95% CI (+/-)	RDS_P	RDS_m
Lake Hopatcong								
Walleye	71	1.2	29	2.45	100	1	86	23
Muskellunge	10	0.2	29	0.34	100	10	100	40
Farrington Lake								
Northern Pike	7	0.2	16	0.44	86	44	71	14
Pompton Lake								
Northern Pike	3	0.1	8	0.38	-	-	-	-
Monksville Reservoir								
Walleye	2	0.1	16	0.13	-	-	-	-
Muskellunge	2	0.1	16	0.13	-	-	-	-

The complete report with additional data for the 2014 Coolwater Assessment can be found in Appendix H. (Federal Grant F-48-R, Project I)

Lake Inventories

Successful management of New Jersey's warm and cool water fisheries resource is based upon specific knowledge of their physical, chemical, biological, and use characteristics. Such knowledge may serve to direct immediate management recommendations or be used as a baseline, upon which to recognize future changes, requiring remedial management efforts. (Federal Grant F-48-R, Project I)

Under this activity physical, chemical and biological data is collected utilizing standard sampling techniques. Physical parameters include morphometry, bathymetry, access, watershed, and aquatic vegetation characteristics. Chemical parameters include general water chemistry and sediment nutrient characteristics. Biological parameters include fish species composition, abundance (catch-per-unit-effort), length frequency distribution, and calculated indices of population structure and dynamics such as proportional stock density (PSD), relative weight (W_r), age, and growth. The data are analyzed and results are used to develop management recommendations and prepare an individualized fisheries management plan for the waterbody. These plans are summarized and published for dissemination to the angling public.

Lake Inventory: Lake Hopatcong

Lake Hopatcong is situated on the border of Sussex and Morris Counties, and the Boroughs of Mount Arlington, Hopatcong, Jefferson, Roxbury Township and Byram Township surround the lake. Lake Hopatcong was formed by damming two ponds, Great Pond and Little Pond and the Musconetcong River. The outflow of Lake Hopatcong now forms the Musconetcong River. The lake has a surface area of 2686 acres (1087 hectares), with a maximum depth of about 58 feet and an average depth of 18 feet.

The shoreline of Lake Hopatcong is highly developed consisting of residential homes, marinas, swimming beaches and restaurants. Lake Hopatcong serves as a year round residence for thousands of New Jersey residents and attracts thousands of anglers, boaters and swimmers each year. Lake Hopatcong offers boaters a number of ramps and access points at the many private marinas around the lake. The two primary public boats ramps are located at Lake Hopatcong State Park and Lee's County Park.

The Division of Fish and Wildlife and the Knee Deep Club (lake's local fishing organization) have stocked Lake Hopatcong for many years. Stocking programs and species emphasis have changed over the years just as the land use has changed on the shorelines of the lake. Changing water quality and the introduction of invasive plant species such as Eurasian milfoil and water chestnuts have altered management strategies both above and below the water. Extensive water quality monitoring as well as active water level monitoring and management are integral parts to managing the largest freshwater lake in New Jersey.

Lake Hopatcong Smallmouth Bass (left) and Largemouth Bass (right)

Materials and Methods

Water quality parameters were measured at various locations in the lake. Dissolved oxygen, conductivity, pH, and temperature were measured in the field using hand held Yellow Springs Instrument (YSI) meter (Professional Plus model). Alkalinity was determined in the laboratory from water samples collected in August 2013, using a titration method.

A 13.2 Smith-Root electrofishing boat was used during all electrofishing-sampling periods. A total of six electrofishing surveys were completed at Lake Hopatcong during the 2013 – 2014 sampling period, of which five were conducted at night and one during the day. Two surveys were completed in 2013, one at night on October 9th and one during the day on October 18th. Four night electrofishing surveys were completed in 2014, on May 14th, May 20th, June 4th and June 9th. The October 18th electrofishing survey was conducted during the day after the lake was lowered approximately two to three feet. The survey was completed during the day, to improve navigation around exposed submerged aquatic vegetation. The October 9th electrofishing survey was completed to obtain a catch per unit effort (CPUE) for all species; all individuals encountered were collected. Supplemental electrofishing surveys placed emphasis on game species including: Largemouth Bass, Smallmouth Bass, Walleye, Muskellunge, Hybrid Striped Bass, Chain Pickerel and Channel Catfish. In addition panfish, sunfish, and bullheads were collected during the June 9th survey to obtain a CPUE for the 2014 spring sampling.

A total of 19 locations were sampled via Pennsylvania style trap net during the period of April 16th to May 8th. The trapnetting was conducted concurrently as part of the coolwater fisheries assessment, which was initiated in 2013 to evaluate the state's Muskellunge and Walleye stocking programs. Locations were selected based on water depth and habitat, and represented all major habitat types in Lake Hopatcong. Four experimental gillnets were set at locations previously sampled in 1997 at a similar time of year.

Length and weight measurements were taken on all game and panfish species collected. Proportional stock densities (PSD), relative stock densities (RSD), and relative weights (W_r) were calculated for Largemouth Bass, Chain Pickerel, Bluegill, Pumpkinseed, Yellow Perch, and Black Crappie. Scales were removed from a sub-sample of all gamefish species, and later mounted between two microscope slides, viewed using a microfiche projector, and aged. Back-calculation was used to obtain information on the growth history of year classes of Largemouth Bass, Smallmouth Bass, Bluegill, Pumpkinseed, Yellow Perch, Black Crappie, Chain Pickerel, Muskellunge, Hybrid Striped Bass, and Walleye.

Fisheries Results

Lake Hopatcong is New Jersey's largest lake and has one the highest species diversities in the state with 28 species represented during the survey. Many of the species have been introduced for recreational purpose however a few of New Jersey's rare native species (ie. Bridle Shiner and Bluespotted Sunfish) still inhabit these nutrient rich waters. Lake Hopatcong's recreational use is as diverse as the fish population. Recreational boaters, water skiers, wave runners, anglers, swimmers and lake residents all play an integral part in the management of the lake. A balanced management strategy is necessary to achieve and maintain all management goals. See **Appendix J** for the full Lake Hopatcong Lake Inventory Report.

Twenty-eight species, representing ten families and seven orders were collected during the 2013-2014 sampling at Lake Hopatcong. The most abundant species collected during trap netting and all sampling gears combined was Bluegill. Trap nets were utilized during the spring to specifically target Walleye and Muskellunge, however trap nets provide a good assessment of the overall fish population. A total of 22 species and 6,118 individual fish were collected by trap net during the sampling period of April 16th to May 8th, 2014. A total of 29 individual net sets were completed at 19 locations. Eighty-one percent all fish collected were panfish, consisting of Bluegill, Black Crappie, Yellow Perch, and Pumpkinseed.

A total of 18 species and 898 individual fish were collected during six electrofishing surveys. Yellow Perch were the most abundant species collected during electrofishing and had the highest catch per unit effort (CPUE) during electrofishing. Thirteen species of fish (n=212) were collected utilizing gillnets in October 2013. White Perch (n=64) were the most abundant by that sampling method. Eighteen species of fish and (n=2,419) were collected by shoreline seining in August 2013. Bluegills were the most abundant young of the year fish collected. In total, 9,647 fish were collected in Lake Hopatcong during the 2013-2014 sampling period.

Warmwater Fisheries Assessment

New Jersey has over 400 impoundments open to the general public for fishing and thousands more in private ownership scattered throughout the state. These lentic environments offer excellent fishing opportunities for a variety of species such as bass, sunfish, crappie, and pickerel. These species naturally reproduce in these waterways and often do not require active stocking to sustain their populations. The Bureau of Freshwater Fisheries conducts abbreviated fisheries surveys on lakes and ponds throughout the state to assess the status of the fisheries. Largemouth Bass are the most popular and widely distributed of the state's game species. Electrofishing surveys are conducted at various times throughout the state to assess the status of bass populations in waters located throughout the state.
(Hunter & Angler Fund)

Allentown Lake (Monmouth) – A boat electrofishing survey was completed at Allentown Lake on August 19th. A total of 30 minutes of sampling was completed along the perimeter of the lake. There were 16 Largemouth Bass collected ranging in size from 115 – 480 mm. This would be considered a good catch rate for this region of the state based on time of year and daytime sampling. Allentown Lake has been heavily impacted by sedimentation, which limits the fish population.

Daretown Lake (Salem) – A boat electrofishing survey was completed at Daretown Lake on August 15th. A total of 30 minutes of electrofishing was completed around the perimeter of the lake. A total of 35 Largemouth Bass ranging in size from 85 – 346 mm were collected. The fish population has been severely impacted by overharvest in recent years. As a result, young-of-the-year Largemouth Bass were stocked in 2012. The 2012 year class appears to be well represented based on length distribution and average growth. An additional stocking of young of the year is recommended in 2015.

Delaware River (Burlington) – A boat electrofishing survey was completed at the Delaware River in Bordentown on August 25th. The survey was completed at high tide and very few fish were encountered. Total electrofishing time was 1.5 hours. A follow-up survey at low tide was completed on August 29th. A total of 18 Largemouth Bass were collected ranging in size from 135 – 460 mm. There appears to be a very good year class of the young-of-the-year (y-o-y) Largemouth Bass, which presumably is a result of the abundant submerged aquatic vegetation present in the Delaware River in the last couple years. Native wild celery as well as hydrilla and elodea have vastly expanded throughout the river. Tidal water Largemouth Bass populations have been shown to be positively correlated with SUV abundance. In addition, five y-o-y Walleye collected which were stocked by Hackettstown earlier this year. Walleye are occasionally caught by anglers in the tidal portion of the river, however no stocking has been done in the past. Surplus Walleye were stocked in 2014 to establish a Walleye fishery in the tidal section of the Delaware. Two small Flathead Catfish were also observed. Total electrofishing time was one hour.

DOD Lake (Salem) – A daytime electrofishing survey was completed at the DOD Lake WMA on June 27th to assess the Largemouth Bass population. The total run time was 1.5 hours. Thirty-one Largemouth Bass were collected, which correlates to a CPUE of 20 bass/hour, the largest weighing 1.86 kg (4.1 lbs) and 485 mm. The CPUE was 31

bass/hour when electrofishing was conducted at night in 2002. The population was well distributed and in good condition. Three bowfin were also collected which were previously not encountered during sampling.

Elmer Lake (Salem) – An electrofishing survey was completed on July 22nd at Elmer Lake to evaluate the Largemouth Bass population which may have been impacted by a recent dam reconstruction. Additional young-of-the-year Largemouth Bass were stocked in the lake in 2012. A total of 18 bass greater than the 200 mm stock size were collected during one hour of electrofishing. A total of 17 bass below the stock size were collected. This would be considered a moderate catch rate for daytime electrofishing during the summer. Age I and II Largemouth were well represented and indicate the fish population should continue to improve following the dam reconstruction.

Game Creek (Salem) – A boat electrofishing survey was completed on August 5th in the Game Creek portion of Salem Canal to evaluate the Largemouth Bass population and monitor for the presence of Northern Snakeheads. Recent reports were received indicating that Northern Snakeheads have made their way into the Game Creek and Salem Canal areas, through a floodgate within the Dupont facility. A total of 15 Bowfins were collected however no Snakeheads were observed. There were 27 Largemouth Bass collected during 1.5 hours of electrofishing. The bass population appears to have been affected by either fishing pressure or the presence of the Bowfin in recent years. This would be considered a moderate catch rate for this location, considering sampling was conducted during the daytime and in the summer.

Gropps Lake (Mercer) – A boat electrofishing survey was completed on July 28th to update records and evaluate the fish population. No recent data was available for Gropps Lake. A total of 13 Largemouth Bass were collected during one hour of electrofishing. Additional night electrofishing would be necessary to fully evaluate the fish population. However, based on angler reports and the few anglers observed fishing at the location, the low catch rate is probably a good indicator of the poor Largemouth Bass population. Stocking of additional Largemouth Bass is recommended for two years and then reevaluating the lake by electrofishing. Species also present included Black Crappie, Bluegill, Brown Bullhead, Chain Pickerel, White Catfish, Warmouth, White Sucker, Gizzard Shad and Yellow Perch.

Hammonton Lake (Atlantic) – A boat electrofishing survey was completed on July 29th at Hammonton Lake to evaluate the Largemouth Bass population. A fisheries inventory and management plan was completed in 2007. Largemouth Bass have been stocked in the lake two times since then to improve the population. A total of 28 Largemouth Bass were collected during one hour of electrofishing. The size distribution was consistent with 2007 sampling and ranged from 161 – 438 mm. The population consists mostly of smaller fish demonstrated by a PSD of 50 and RSD_{15} of 0. PSD and RSDp are indices of balanced fish populations. A PSD of 50 indicates that 50 percent of bass collected are above the 12" size limit. No fish collected greater than 15". No additional stocking is required at this point, however additional electrofishing should be completed in 2016. Residents have repeatedly complained about excessive aquatic vegetation growth and

performed winter lowering. Bladderwort did not appear to be problematic this season however the lake was significantly covered with what appeared to be naiad.

Heritage Park Pond (Atlantic) – An electrofishing survey was completed at Heritage Park Pond located in Absecon. This was the first time this waterbody has had an electrofishing survey. The town requested a survey due to poor fishing success in recent years despite ongoing stockings of Largemouth Bass in 2011, 2012 and 2013. The pond once had a thriving Largemouth Bass population however in recent years fishing has been rather poor. Overfishing and possibly impacts by a robust spring cormorant population may have significantly impacted the fish population. A total of 13 Largemouth Bass were collected, six of which were greater than 200 mm, during one hour of electrofishing. A total of 11 Channel Catfish were collected. The Largemouth Bass population would be considered poor based on sampling results. A significant algae bloom has been present for over five years now and may also have affected the fish population. The pH of 10.15 was much higher than normal due to the problematic planktonic algae bloom.

Lake Audrey (Cumberland) – An electrofishing survey was completed on August 7th at Lake Audrey to evaluate the bass population. A total of six Largemouth Bass (309 – 410 mm) were collected during one hour of electrofishing. There were no Smallmouth Bass collected or observed. The pH was extremely low at 4.61. Due to the low pH young-of-the-year Largemouth Bass were stocked in 2014. The stocking of Smallmouth Bass was discontinued due to the drop in pH. Largemouth Bass were not abundant but were in good condition. An additional liming is necessary to sustain the fishery and should be considered in the near future. An excellent Largemouth Bass population could be established if the pH were higher.

Lake Lenape (Atlantic) – A boat electrofishing survey was completed on July 30th at Lake Lenape to evaluate the Largemouth Bass population. A total of 14 Largemouth Bass were collected during one hour of electrofishing. All individuals were greater than the 200 mm stock size. The PSD of 93 and RSD_{15} of 79 are above the recommended 40-70 PSD values and the 10-25 RSD_{15} values for a balanced population. The population is considered unbalanced and dominated by larger individuals. Four individuals were in excess of four pounds. The two largest were 544 mm and 2.790 kg (6.15 lbs) and 535 mm and 2.470 kg (5.44 lbs). The lake was stocked with surplus Largemouth Bass last year however no Age I individuals were observed. A number of young-of-the-year were observed and indicate a strong year class. Waters with low pH often have highly variable spawning success. Night electrofishing should be completed in two years to further monitor the Largemouth Bass population. Recruitment appears to be a problem due to lack of shoreline or submerged vegetation.

Lake Lenape
Largemouth Bass

Mary Elmer Lake (Cumberland County) - An elecrofishing survey was completed at Mary Elmer Lake located in Bridgeton to assess the Largemouth Bass population and evaluate whether any trout stocked during the spring were still present. A total of one hour of daytime electrofishing was completed and resulted in 27 Largemouth Bass and three Brown Trout. The Largemouth Bass appears to be balanced and well distributed however has been impacted by fishing pressure and harvest. The CPUE was 59 bass/hour during night electrofishing in 2004 when an inventory was completed. In addition, one Channel Catfish and two White Catfish were collected.

Palatine Lake (Salem) - A boat electrofishing survey was completed on October 15th at Palatine Lake, Salem County to evaluate the warmwater fish population. A total of 43 Largemouth Bass greater than the 200 mm stock size were collected during one hour of electrofishing. The PSD was 98 and RSD_{15} was 58. Both are indicators of a population that is out of balance despite producing excellent fishing opportunities. Reproduction appears to be very good based on the number of young-of-the-year bass observed. Palatine Lake is an impoundment of the Muddy Run tributary of the Maurice River situated upstream of Parvin State Park and Rainbow Lake WMA; and downstream of Elmer Lake WMA. The lake was previously not sampled. A survey was completed to establish a comparison of lakes with varying degrees of fishing pressure.

Pemberton Lake (Burlington) – An electrofishing survey was started on June 30th at Pemberton Lake however was only partially completed due to equipment failure. A total of 17 Largemouth Bass were collected. A significant algae bloom was occurring and recent fishing reports from the lake were rather poor. A follow-up survey was completed on July 18th. A total of 17 additional Largemouth Bass were collected in one hour of electrofishing. A significant algae bloom was still present. The bass population is unbalance consisting of mostly small fish. The stocking of young-of-the-year Largemouth Bass was recommended and completed by Hackettstown Hatchery in 2014. Stocking young-of-the-year Largemouth Bass should be done again in 2015. Another electrofishing survey will be completed in 2017 to evaluate the stocking.

Prospertown Lake (Ocean) – The dam at Prospertown Lake WMA was repaired in 2012 and the lake was restocked in 2012 with warmwater fish. Prospertown Lake also received additional trout during the 2014 Spring Trout Season. A daytime electrofishing survey was completed on June 19th. The total run time was 1.75 hours. A total of 24 Largemouth Bass were collected, many of which were adult fish that had not been collected during the fish salvage. The fish population appeared to being doing well despite being completely drained only a few years ago. A total of 10 species were collected, including two Brown Trout.

Rising Sun Lake (Monmouth) – An electrofishing survey was completed at Rising Sun Lake on June 26th. A total of one hour of daytime electrofishing was completed. A total of 109 Largemouth Bass were collected, of which 55 were below the 200 mm stock size. The lake has a rather low diversity of fish species with Largemouth Bass the dominant species. The PSD of 38 and none over 15 inches indicates the population is not balanced. Young-of-the-year Largemouth Bass were stocked in 2011 and appear to be well represented. Fishing results received from WMA Tournament Permits indicate poor

fishing in recent years. Fewer anglers are also fishing at the location. In 2008 there were 15 WMA Fishing Tournament Permits issued and only 7 in 2014. Additional Bluegill and possibly Yellow Perch should be introduced to increase the forage base.

Saffin Pond (Morris) - This county-owned 13-acre pond, located in the Highlands, was drained for dam repairs and refilled in 2012. The pond's features (rocky dam surface, scattered rocks in pond bed, minimal aquatic vegetation, and 1110 ft elevation) made it a good candidate location for establishing Smallmouth Bass. Smallmouth Bass (primarily fingerlings, but some older) have been stocked in the pond annually over the past three years. Shoreline seining conducted the past two years revealed little in terms of successful SMB reproduction. To better assess the status of the SMB fishery the entire perimeter of the pond was electrofished during the daytime. It was apparent from this survey that Largemouth Bass (LMB) not only survived the drawdown, but were reproducing successfully, and dominating the bass fishery. A total of 92 bass were collected and of these, 79% (73 individuals) were LMB and only 21% (19 individuals) were SMB. The size range for bass was: SMB 100- 336 mm (3.9 – 13.2 in) and LMB 77 – 424 mm (3 – 16.7 in). Other species encountered were Yellow Perch, Pumpkinseed, Brown Bullhead, and Bluegill. Interestingly, four of the LMB captured exhibited scoliosis, a deformed spine (see photo). This condition sometimes occurs as the result of an injury; however, its presence in four individuals suggests it is likely the result of a congenital birth defect.

Stafford Forge Impoundment #1 (Ocean) – An electrofishing and seining survey were completed at Stafford Forge Impoundment #1 WMA on July 24th to evaluate the fish population. A total of 30 minutes of electrofishing and two seining locations were sampled. A total of 10 Largemouth Bass greater than 200 mm were collected during daytime electrofishing and ranged from 252 -430 mm. The fish population is limited by the low pH of 5.04. Six young-of-the-year (y-o-y) Largemouth Bass were collected from the two seining locations as well as seven Banded Sunfish and one y-o-y Chain Pickerel.

Stewart Lake (Gloucester) - An electrofishing survey was completed at Stewart Lake located in Woodbury on June 24th to assess the Northern Snakehead and Largemouth Bass populations. A total of two adult Snakeheads and 40 Largemouth Bass greater than the 200 mm stock size, ranging from 235 mm-478 mm, were collected during 1.5 hours of daytime electrofishing. A PSD of 62 and RSD_{15} of 22 indicate the population is balanced. The numbers are consistent with previous electrofishing surveys and suggest that the Snakehead population has not had an impact on the Largemouth Bass population.

Stone Tavern Lake (Monmouth) - An electrofishing survey was completed at Stone Tavern Lake on July 21st to evaluate the Largemouth Bass population. A total of 69 Largemouth Bass greater than the 200 mm stock size and 13 below stock size were collected during one hour of boat electrofishing. The population appears be balanced based on a PSD of 60 and RSD_{15} of 5 and in good condition.

Stone Tavern Lake
Largemouth Bass

Turnmill Lake (Ocean) – An electrofishing survey was completed at Turnmill Lake, located in the Colliers Mills Wildlife Management Area. One hour of electrofishing was completed to evaluate the fish population status as a result of fish placed in Turnmill Lake from a fish salvage at Prospertown Lake. Despite the large number of fish that were placed in the lake only six Largemouth Bass greater than the 200 mm stock size, and eight less than the stock size were collected. Very few Bluegill and Chain Pickerel were present. A recommendation was made to the hatchery to stock additional fish prior to the Outdoor Expo in September. The fish population is most likely limited by the low pH and depth of the pond (less than four feet average depth).

Warmwater Fish Reproduction Checks

Shoreline seining is conducted in 23 lakes and ponds in July through mid-September to assess the status of warmwater fish reproduction, which aids in the management of their fisheries and helps assess stocking success or need. These data are also beneficial in documenting the presence of both native and invasive species. (Hunter & Angler Fund)

Alberta Lake (Monmouth) - A seining survey was completed to evaluate the reproduction of warmwater fish. Only 2 sites were sampled with a 20'x6' seine due to the heavily vegetated shoreline. No young-of-the-year Largemouth Bass and 31 young-of-the-year sunfish were collected. Plans are to inform the municipality that recreational use of the lake could be improved by clearing some areas of vegetation to improve shoreline access for anglers.

Allentown Lake (Monmouth) – A seining survey was completed at Allentown Lake on August 13th to evaluate the reproduction of warmwater fish. Five locations were sampled using a 20' seine. Young-of-the-year (y-o-y) Largemouth Bass were collected at two out of five locations sampled. A total of 17 y-o-y Largemouth indicates reproduction is good. Bluegills were the most abundant species collected.

Assunpink Lake (Monmouth) – A seining survey was completed at Assunpink Lake on July 16th to evaluate the reproduction of Largemouth Bass. Five sites were sampled with a 20' seine. A total of 23 young-of-the-year Largemouth Bass were collected, indicating good reproduction.

Best Lake (Somerset) – Seining data at this 6-acre lake in recent years indicated that a very unbalanced fish assemblage is present in Best Lake, Watchung Borough. The lake was drained in 2008 for a dam repair and then impacted by Hurricane Irene in 2011. Warmwater fish were stocked in 2009, 2011, and 2012. Seining data indicate extensive sunfish (primarily Bluegill and Pumpkinseed) reproduction is taking place as hundreds of young-of-the-year were collected with nearly every 20 ft. seine haul. Unfortunately, few Largemouth Bass were encountered in 2012 and 2013 while Green Sunfish and Mosquitofish were abundant. A fish salvage was conducted by a private consultant at Lake Surprise in May of 2014 and Largemouth Bass (along with several other species) were relocated into Best Lake (also into Watchung Lake and Seeley's Pond) in an effort to balance the fishery. When seined in 2014, it appears that a greater balance has been achieved, but should still be monitored.

Carteret Park Pond (Middlesex) - Carteret Park Pond was impacted by the saltwater inundation caused by Hurricane Sandy. It was intentionally drawn down, so that it could be flushed with freshwater supplied by municipal water and has been monitored since. Water quality data was collected and salinity levels have returned to near-normal levels of 0.26 ppt. At the time of survey, a private company was spraying herbicides in the water, therefore shoreline seining was not conducted. However, observations include approximately 30 to 40 five-inch Largemouth Bass plus young-of-the-year (y-o-y), 100 adult sunfish and y-o-y, and 3 adult bullheads. It is recommended that additional fish are stocked by the Hackettstown Hatchery, including Largemouth Bass, Channel Catfish and sunfish.

Colt's Neck Ponds A and B (Monmouth) - Two ponds in Colt's Neck, referred to as Colt's Neck Ponds A (4.4 acres) and B (1.6 acres) were seined to evaluate the recovery of their fisheries following a dredging project in 2012, when Pond A was completely drawn down and fish were removed and Pond B was only slightly lowered and no salvage was required. Pond A was restocked in 2013 with Largemouth Bass, Black Crappie, Bluegill, and Brown Bullhead. Although Largemouth Bass and Bluegill young-of-the-year were collected in both ponds, it is recommended the Hackettstown Hatchery stocks additional sunfish into both ponds to increase their numbers.

Crystal Lake (Burlington) – A seining survey was completed at Crystal Lake in Willingboro on August 14th to evaluate the reproduction of warmwater fish. Nine locations were sampled using a 20' seine. Largemouth Bass were collected at seven of the locations. A total 14 young-of-the-year Largemouth Bass indicates reproduction is good. An electrofishing survey is recommended in 2015 to further evaluate the fish population.

Duck Pond (Somerset) – Duck Pond in Colonial Park were seined to assess the warmwater fish populations. Seining data indicate Largemouth Bass and sunfish species are well balanced. Two individual plants of the invasive Water Chestnut were observed and removed. Somerset County Parks was notified of the presence of the invasive plant.

Garrison Pond (Bergen) – A seining survey was completed to evaluate the reproduction of warmwater fish. Twelve sites were sampled with a 20' seine. A total of 46 young-of-the-year Largemouth Bass and 1,079 young-of-the-year sunfish were collected. Recommend the future stocking of Largemouth Bass, Brown Bullheads, and Channel Catfish.

Jersey City Reservoir #3 (Hudson) – A seining survey was completed to evaluate the reproduction of warmwater fish. Twelve sites were sampled with a 20'x6' seine. A total of 25 young-of-the-year Largemouth Bass and 443 young-of-the-year sunfish were collected. Recommend the future stocking of Largemouth Bass, Brown Bullheads, and Channel Catfish.

Lake Lonnie (Burlington) – A seining survey was completed at Lake Lonnie in Delran on August 14th to evaluate the reproduction of warmwater fish. Four locations were sampled using a 20' seine. Largemouth Bass were collected at three locations. A total of 12 young-of-the-year (y-o-y) bass indicate good reproduction considering the small size of the pond. No further stocking or sampling is needed. Bluegill was the most abundant species, with 90 y-o-y and 47 intermediates collected.

Metlar's Pond (Somerset) – Mettlar's Pond in Colonial Park were seined to assess the warmwater fish populations. Twelve seine pulls resulted in a total of 11 Largemouth Bass and 353 Bluegill and Pumpkinseeds, indicating a well balanced fish community. No further action is necessary.

Nomahegan Park Pond (Union) - This 7 acre pond in Cranford, Union Co. was seined to determine how the fishery is progressing following a dredging project that occurred in

2013. Fish were salvaged from this pond last year, but recolonization was likely, as it is connected to some backwater areas between the pond and the Rahway River. The pond was restocked by the Division's Hackettstown Hatchery with fingerling Largemouth Bass, Bluegill, Black Crappie, and Brown Bullheads in 2013. Seining results indicate a diverse warmwater fishery consisting of fish of various sizes, including young-of-the-year. No further stocking is necessary as this fishery is on its way to recovery.

Saffin Pond (Morris) – This lake was drained for dam rehabilitation and refilled in 2012. An assortment of fish species reared at the Division's Hackettstown State Fish Hatchery have been stocked in this lake, most notably Smallmouth Bass (SMB), rather than Largemouth Bass (LMB), in a concerted effort to establish a fishery for Smallmouths in this lake. Unlike the seining effort last year, which was inadvertently conducted after SMB fingerlings were stocked, this year's seining effort was conducted before the annual stocking of SMB fingerlings. SMB do not appear to be reproducing successfully, as no young-of-the-year fish were encountered (the three SMB captured were too large to be y-o-y). Bridle Shiners were documented in Saffin Pond in 2013, however none were found this year, which should be a consideration in future stocking of game species.

Spooky Brook Park Pond (Somerset) – Spooky Brook Park Pond in Colonial Park was seined to assess the warmwater fish population. Twelve seine pulls resulted in a total of 89 Largemouth Bass and 243 Bluegill and Pumpkinseeds, indicating a well balanced fish community. No further action is necessary.

Spring Lake (Monmouth) - A seining survey was completed to evaluate the reproduction of warmwater fish. Twelve sites were sampled with a 20'x6' seine. A total of 79 young-of-the-year Largemouth Bass and 14 young-of-the-year Pumpkinseeds were collected. Recommend the future stocking of sunfish to better balance the fishery.

Steenykill Lake (Sussex) – This 30-acre lake, in High Point State Forest, was built in 1938 and is located in the headwaters of Mill (Clove) Brook. The Hackettstown Hatchery stocked Smallmouth Bass in 1946 and for many years the lake was managed for this species. Although initially successful, over time Largemouth Bass eventually re-established themselves and became the dominant bass species. Results from seining revealed a diverse warmwater fishery including many Chain Pickerel and sunfish. Largemouth Bass, Yellow Perch, and Black Crappie were also present. Largemouth Bass and sunfish numbers were low and a supplemental stocking of each may improve the fishery for these species. The last time this lake was seined (1962), Bridle Shiners were found; none were found in 2014. It is recommended to conduct additional surveys to determine if Bridle Shiners have been lost and should they be considered prior to stocking of game species.

Stone Tavern Lake (Monmouth) – A seining survey was completed at Stone Tavern Lake on July 16th to evaluate the reproduction of Largemouth Bass. Two sites were sampled near the boat launch. A total of six young-of-the-year Largemouth Bass were collected. An electrofishing survey was completed in addition to the seining survey on July 22nd. A total of 80 Largemouth Bass were collected in one hour of sampling indicating a high catch per unit effort. The population appeared to be well balanced and in good condition.

Reproduction and recruitment are good. No further sampling and stocking are need. The size distribution of Largemouth Bass has improved in the last couple years.

Swedes Lake (Burlington) – A seining survey was completed at Swedes Lake in Delran on August 14th to evaluate the reproduction of warmwater fish. Ten locations were sampled using a 20' seine. Largemouth Bass were collected at seven locations. A total of eight species of fish were collected, Bluegill were the most abundant species, with 108 young of the year collected. Twenty-one young-of-the-year Largemouth Bass were collected and indicate good reproduction.

Tilcon Lake (Morris) – This 88-acre lake, is located in Allamuchy Mountain State Park in Mt. Olive Township. When the Musconetcong River breached its banks during severe flood events in the early 2000's, water from the river inundated this former quarry and created the lake. In the recent past the lake has been stocked with Smallmouth Bass and when *Holdover Trout Lake* regulations were implemented in 2014, Fish & Wildlife began stocking Landlocked Salmon. In 2014 the lake was seined to assess warmwater/coolwater fish reproduction. Results from seining indicated a diverse warmwater fishery including many young-of-the-year Largemouth Bass and the presence of a less ubiquitous species, Bluespotted Sunfish. Largemouth Bass far outnumbered sunfish species, indicating an unbalanced fishery. Additional surveys are recommended.

Upper Lake Riviera (Ocean) - A seining survey was completed to evaluate the reproduction of warmwater fish. Twelve sites were sampled with a 20'x 6' seine. A total of 8 young-of-the-year Largemouth Bass and 129 young-of-the-year sunfish were collected. The heavily vegetated shoreline and deep drop offs hindered seining. Numerous adult Largemouth Bass were observed. Based on observations no additional stocking is warranted at this time.

Veterans Memorial Lake (Monmouth) - This 1 acre pond in Hazlet was drained in 2008, dredged, and refilled. Since no fish were found when it was drawn down, it was thought that water quality may be an issue. This pond's excessively soft substrate makes seining difficult and no fish were encountered in 2011. Subsequent pH measurements indicated the water in the pond was very acidic, ranging from 4.5 to 4.9, which is below the levels necessary for Largemouth Bass and sunfish to successfully spawn in this pond. Unless the pH elevates to levels closer to neutral, the only strategy to maintain a Largemouth Bass and a sunfish community would be to stock regularly to maintain the population artificially. Recommendations will be made to Hazlet Township moving forward.

Watchung Lake (Somerset) - Water quality and seining was conducted at Watchung Lake to assess the condition of the existing fishery. Seining data indicate a balanced population of bass and sunfish, with adequate reproduction of both, therefore additional stocking is not necessary. A large Tilapia sp. (possibly a Nile Tilapia, Blue Tilapia, or hybrid thereof) approximately 12 inches was collected, (2 more were observed but not captured) which served as interesting find as they have not been previously documented in NJ waters, with the exception of Carnegie Lake in 2014. This exotic warmwater species is unlikely to survive winter conditions in NJ, as they can not tolerate temperatures below approximately 50°F. It is recommended that biologists follow up to determine if the Tilapia sp. is found in this waterbody in 2015.

ANADROMOUS FISHERIES

A number of New Jersey's river systems serve as important migratory pathways for fish. Each spring anadromous species such as American Shad, Alewife, Atlantic Sturgeon, Blueback Herring, Sea Lamprey, Shortnose Sturgeon, and Striped Bass navigate from marine waters to fresh waters of the state to spawn. In late summer and early fall, their young return home to marine waters to remain until maturity. In contrast, catadromous species such as American Eel reside in fresh waters throughout the state and migrate to open ocean waters to spawn.

With perhaps the exception of lampreys, these species are of great ecological, recreational, and commercial value to New Jersey and many other Atlantic coast states. The monitoring and restoration of these fisheries is a fundamental aspect in ensuring the population's well being. As these species reside in both fresh and marine waters they are cooperatively management between the Bureau of Freshwater Fisheries and the Bureau of Marine Fisheries. As stocks migrate up and down the entire east coast, the management of species falls under the jurisdiction of the Atlantic States Marine Fisheries Commission (ASMFC). As a result, for New Jersey, primary management of these species falls to the Bureau of Marine Fisheries.

In March 2012 the recreational and commercial harvest of migratory river herring (Alewife and Blueback Herring) was prohibited. These regulations were put in place due to concerns about the significant coast-wide decline of river herring stocks and to comply with federal mandates outlined by the Atlantic States Marine Fisheries Commission. In 2013 a similar moratorium was placed on American Shad with the exception of the Delaware River, its bay and estuaries. The exact cause for these coast-wide declines remains uncertain, but numerous factors such as loss of spawning habitat, impediments to fish passage (i.e. dams), water quality degradation and fishing all likely played a role.

Freshwater efforts consist of monitoring fish passage through fish ladders, technical assistance for dam removal projects on migratory pathways, periodic confirmation of historic migratory pathways and identification of new runs. (Federal Grant F-48-R, Project I)

2014 activities include:

Island Farm Weir Fish Ladder on Raritan River- The NJ Bureau of Freshwater Fisheries monitored the fish ladder at the Island Farm Weir from 1996 – 2003, and in 2005, 2011, and 2012. The final report for JOB I-5: American Shad Restoration in the Raritan River, was submitted in January 2013. Beginning in the spring of 2013, the Department of Marine & Coastal Sciences at Rutgers University conducted the monitoring under the direction of Dr. Olaf Jensen, assisted by graduate student, Orion Weldon. The opening date for the ladder in 2014 was April 4th. The last day was June 30th, 2014. There were a few gaps in video recording due to maintenance and high-water events. The total number of individual fish that were observed passing through the fish ladder was 6,221, which is a relatively high number going back to 1996. The total number of American Shad was 271, which is about average

since 1996. The peak number of American Shad (592) occurred in 2001. These simplified numbers are difficult to compare from one year to the next and may not reflect the actual number of fish using the ladder, because of differences in which counting begins and ends, the total number of days viewed per year, and the viewing conditions.

Prior to the 2014 migratory run, Bureau staff met on-site with Bryan Sojkowski, USF&WS Fish Passage Engineer at the Island Farm Weir Fish Ladder on the Raritan River. The USFWS was performing inspections of several fish ladders throughout the state. At the Island Farm Weir, there are concerns that accumulated sediments were affecting the attraction water system used to guide fish to the ladder entrance. The sediments caused the grating system to dislodge causing considerable turbulence in the entrance to the ladder. Mr. Sojkowski concurred the turbulence would be a deterrent to American Shad and the addition of a trash rack would greatly reduce the accumulation of large debris. As a result, the ladder was dewatered, silt was vacuumed, and attraction water grate was reset.

Musconetcong River - Sampled the fish population in the Musconetcong River below the Hughsville dam (Pohatcong Twp., Warren County) in an effort to determine if anadromous fishes (American Shad, Blueback Herring, Alewife, as well as Striped Bass) are migrating upstream during the spring. The dam is the first impediment to upstream fish migration upstream from the Delaware River now that two lower dams (Finesville and Riegelsville) have been removed in recent years. A collaborative effort (the Musconetcong River Restoration Partnership) is underway to remove dams on the main stem of the Musconetcong River. This partnership involves non-governmental organizations (Musconetcong Watershed Association, Trout Unlimited, American Rivers, and North Jersey RC&D), federal/state agencies (NRCS, USNPS, USFWS NOAA, NJ Div. Fish & Wildlife). The presence of anadromous fishes would heighten the ecological importance of removing this dam and improve the chances of obtaining grants to fund the dam removal.

The swift, treacherous currents, deep non-wadeable water, and lack of access for a heavy electrofishing boat limited our ability to effectively sample this area with traditional electrofishing gear. A trap (fyke) net was deployed in the river over a three-day period (May 13 – 16) in an attempt to collect fish, but the only fishes captured were a Bluegill and the partial remains of a White Sucker, along with several snapping turtles. Several Sea Lampreys were observed attached to the face of the dam and a Gizzard Shad (migratory but not anadromous species) was also found dead along the Hunterdon County shoreline. In addition, an angler produced a picture of a small Striped Bass he caught at the base of the dam earlier this year. (Federal Grant F-48-R, Project I)

Paulins Kill - Fishing activity for American Shad below the Columbia Lake dam was observed on two occasions. The dam is located less than ½ mile upstream from the Paulins Kill's confluence with the Delaware River and is a barrier to upstream anadromous fish migration (shad and river herring). There is growing interest in removing the dam to improve fish passage. Reportedly a long-time fishing hotspot for shad in the spring, the Division had not previously (officially) confirmed/documented their presence. On April 28 an angler was observed catching an American Shad approximately 300 ft below the dam (see photo on right). Anglers were observed fishing closer to the dam on May 4 and though they indicated catching several shad that day, none were observed landing a fish. (Federal Grant F-48-R, Project I)

NATIVE SPECIES

New Jersey is home to nearly 60 Native Fishes, which form a significant component of the state's aquatic biological diversity and natural resource heritage. A list of fish species found in New Jersey can be found in Appendix E. While many native fish species are common, abundant, and widely distributed, there also some that are of conservation concern including, but are not limited to the Bridle Shiner, Ironcolor Shiner, Comely Shiner, Northern Hog Sucker, Mud Sunfish, Blackbanded Sunfish, Bluespotted Sunfish, Banded Sunfish, Shield Dater, Slimy Sculpin, and Brook Trout. Many factors including land use changes, habitat loss, decline in water quality, and presence of invasive species threaten the survival of all aquatic biota, primarily those most sensitive.

Slimy Sculpin

The loss of any of these unique fish species through human impact is an undesirable outcome and represents a failure of our resource stewardship. In addition, natural factors such as climatic variations and watershed succession may dictate the future decline or expansion of fishes that are on the periphery of their established ranges. Further study is required to determine the current abundance and distribution of these nongame fishes throughout the state, including additional fisheries surveys, gathering additional fisheries data from other agencies, mapping, and determination of status for each species, all of which will result in the formation specific management objectives.

A formal review process was initiated in 2014 to determine the status of our native freshwater fishes, known as the Delphi Technique. It is a systematic method for reaching consensus among experts in which absolute, quantitative answers are either unknown or unknowable. It is an iterative process characterized by anonymity among the participating experts, controlled feedback via the principal investigator and a statistical estimator of group opinion. By structuring the group communication process, the Delphi Technique helps the group reach a consensus of opinion by incorporating all available data and disseminating those data among all participants. The Delphi will assist the Division's efforts towards updating New Jersey's State Wildlife Action Plan. To assist the Delphi efforts, the Division of Fish and Wildlife created species distribution maps using GIS, based on data collected from 2000 through 2012. (Hunter and Angler Fund)

Preliminary Delphi Results

Sixty-five species were evaluated by an expert panel during round one, in which status selections, confidence levels, and comments were submitted by reviewers and compiled by ENSP staff.

Consensus was reached during Round One on the following 34 species:
Endangered: Shortnose Sturgeon
Secure/Stable: (32 species).Sea Lamprey, American Eel, Gizzard Shad, Satinfin Shiner, Spotfin Shiner, Cutlip Minnow, Eastern Silvery Minnow, Common Shiner, Golden Shiner, Spottail Shiner, Swallowtail Shiner, Blacknose Dace, Creek Chub, Fallfish, White Sucker, Creek

Chubsucker, Yellow Bullhead, Brown Bullhead, Tadpole Madtom, Margined Madtom, Redfin Pickerel, Chain Pickerel, Eastern Mudminnow, Pirate Perch, Banded Killifish, Mummichog, White Perch, Bluespotted Sunfish, Redbreast Sunfish, Pumpkinseed, Tessellated Darter, Yellow Perch
Not Applicable: Longnose Gar
No Opinion (therefore removed): Rainwater Killifish, Fourspine Stickleback, Threespine Stickleback, Ninespine Stickleback, Hogchoker, and Rainbow Smelt.

Consensus was reached during Round Two on the following nine species:
Endangered: Ironcolor Shiner
Threatened: Slimy Sculpin
Special Concern: Northern Hogsucker
Secure/Stable: Swamp Darter, Banded Sunfish, Quillback, White Catfish
Not Applicable: Black Bullhead, Bluntnose Minnow
No Opinion (therefore removed): Blueback herring, Alewife, Hickory Shad, American Shad, Gizzard Shad, Spotfin Killifish.

Subsequent rounds for species in which a consensus has not been reached after the first two rounds are scheduled for 2015. These species include: American Brook Lamprey, Brook Trout, Bridle Shiner, Blackbanded Sunfish, Comely Shiner, Mud Sunfish, and Shield Darter.

Native Species Data Collection Efforts

In 2014 surveys were conducted at six waterbodies, specifically targeting native fishes (see table below).

List of sites surveyed in 2014 searching for less common freshwater fish species.

Stream	Survey Date	Less Common Fish Species Encountered	Results Page #
Bee Brook (Middlesex)	7/9/14	None	A38
Chambers Brook (Somerset)	6/30/14	None	A42
Heathcote Brook (Middlesex)	7/9/14	American Brook Lamprey, Pirate Perch	A45
Lamington River (trib) (N of Readington) (Hunterdon)	6/27/14	None	A56
Muddy Run (Somerset)	6/30/14	None	A58
Raritan River N/Br (trib) (W of Bedminster) (Somerset)	6/27/14	Bridle Shiner, Swallowtail Shiner	A59

All fisheries surveys conducted by the Bureau contribute valuable information to the status and distribution of fishes. Surveys conducted at nearly 200 sites relatively common fish species were encountered, however 66 of these sites yielded significant findings of some of New Jersey's less common native fishes (see table below).

List of less common species in which Consensus was not reached or consensus of Special Concern, Threatened, Endangered was reached during the Delphi, including number of locations in which each species was encountered during 2014.

Species	Proposed status after Round 2	Number of sites	New sites
American Brook Lamprey	No Consensus	14	
Bridle Shiner	No Consensus	1	1
Brook Trout	No Consensus	30	1
Blackbanded Sunfish	No Consensus	0	
Comely Shiner	No Consensus	0	
Ironcolor Shiner	Endangered	0	
Northern Hog Sucker	Special Concern	3	
Mud Sunfish	No Consensus	0	
Shield Darter	No Consensus	6	
Slimy Sculpin	Threatened	12	

The Bridle Shiner is likely to be listed as either an Endangered or Threatened species, via nomination through the Delphi. Four waterbodies in which they were previously documented were surveyed in 2014, however none were found. These waters include the Big Flatbrook (1960), Steenykill Lake (1962), Lamington River (1973), and Saffin Pond (2013). Additional surveys should be conducted on these waters to conclusively determine if the Bridle Shiner has been lost at these locations. The presence of Bridle Shiners (historical and/or present) at specific waterbodies should be considered in all management decisions, including fish stocking.

INVASIVE SPECIES

Aquatic Invasive Fishes Management

New Jersey is host to over 85 freshwater fish species and of these nearly 60 are native. Native fishes contribute to the biological integrity of aquatic communities and may also be economically, recreationally, and culturally important. Introductions of invasive, non-native fish and aquatic plants are a growing concern of natural resource managers in New Jersey and elsewhere because of their potential to dominate and destroy aquatic ecosystems causing irreversible economic and cultural damage. (Federal Grant F-48-R, Project I)

In New Jersey ten species of fish have been identified having the potential to become a significant threat to indigenous animals, the environment, or public safety hazard. These include: Asian Swamp Eel, *Monopterus albus*, Bighead Carp, *Hypophthalmichthys nobolis*, Brook Stickleback, *Culaea inconstans*, Flathead Catfish, *Pylodictis olivaris*, Grass Carp (diploid), *Ctenopharyngodon idella*, Green Sunfish, *Lepomis cyanellus*, snakeheads, *Channa spp*., Oriental Weatherfish, *Misgurnus anguillicaudatus*, Silver Carp, *Hypophthalmichthys molitrix*, and Warmouth, *Lepomis gulosus.* To date, all but the Silver Carp have been documented in New Jersey waters. Possession and/or release of live potentially dangerous fish species is prohibited and when these species are encountered while angling they must be destroyed.

Locations surveyed by NJDFW in 2014 for invasive fish species are listed and described in detail in table below.

Locations sampled by NJDFW for invasive species in 2014.

Location	Drainage	Date	Species Targeted	Sampling Gear	Run Time (sec)	Number of Fish
Cooper River Lake	Cooper River	8/4/14	Snakehead	Electrofishing	3,600	1
Delaware River (Crosswicks Creek)*	Delaware River		Flathead Catfish	Electrofishing	3,600	2
Hilliards Creek (downstream @Foster Ave)	Cooper River	7/25/14	Asian Swamp Eel	Electrofishing	2,700	0
Silver Lake	Cooper River	7/17/14	Asian Swamp Eel	Electrofishing	3,856	44
Silver Lake	Cooper River	7/25/14	Asian Swamp Eel	Electrofishing	3,759	37
Silver Lake	Cooper River	8/12/14	Asian Swamp Eel	Electrofishing	4,500	20
Silver Lake	Cooper River	8/18/14	Asian Swamp Eel	Electrofishing	3,600	22
Stewart Lake*	Woodbury Creek	6/24/14	Snakehead	Electrofishing	5,400	2

* Sampled as part of other field activities

Asian Swamp Eel

Monitoring and control of the Asian Swamp eel has been limited to backpack electrofishing removal methods. The complexity of the habitat and physiological adaptability of the Asian Swamp eel significantly hinders chances of successful eradication.

Asian swamp eel.

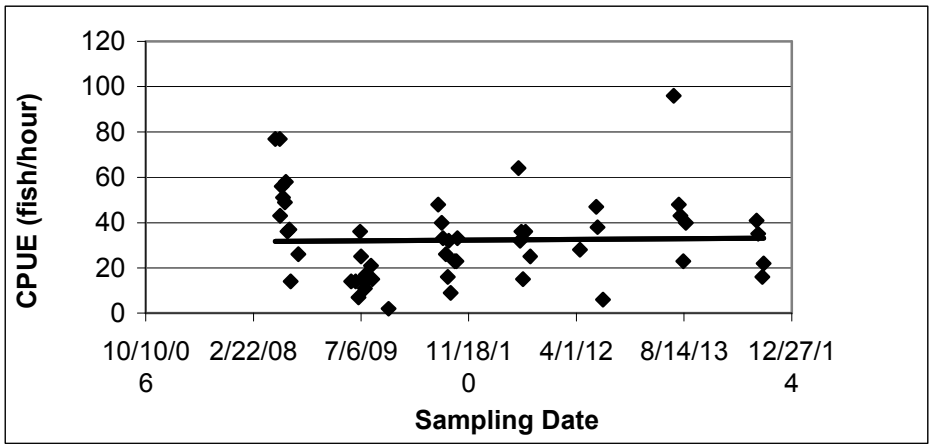
Hilliards Creek (Camden) – A backpack electrofishing survey was completed downstream of Silver Lake on July 25th, from Foster Ave to the first bridge crossing. No Asian Swamp Eels collected or observed during 45 minutes of electrofishing.

Silver Lake (Camden) – Backpack electrofishing surveys have been conducted annually at Silver Lake to monitor the Asian Swamp Eel population since 2008, when they were first discovered there. In 2014, 4 surveys were conducted and a total of 123 swamp eels were collected and removed during 4.36 hours of electrofishing (see table below). The catch-per-unit-effort (4.36 fish/hr) was relatively low (see table and figure below). Eight of the Swamp Eels captured in the third survey were sent to Rebecca Cole, a parasitologist with the USGS in Wisconsin. The eels were previously found to have parasites that are harmful to humans if the fish are ingested raw. Supplemental studies are being done with the eels provided.

History of Asian Swamp Eel collection at Silver Lake, Camden County.

Year	Number of Asian Swamp Eels Collected	Total Run Time (sec)	Total Run Time (hrs)	Catch per unit effort (CPUE)
2008	355	27,829	7.73	46
2009	189	42,065	11.68	16
2010	224	27,650	7.68	29
2011	159	14,710	4.09	39
2012	119	10,279	2.85	42
2013	305	21,245	5.9	51
2014	123	15,715	4.36	29
Total	1474	159,493	44.29	33

CPUE (fish/hour) of Asian Swamp Eels collected from Silver Lake 2008 – 2014.



Flathead Catfish

Two small Flathead Catfish were observed during an electrofishing survey conducted on the Delaware River near the confluence of Crosswicks Creek as part of general warmwater surveys (see page 51).

Northern Snakehead

Cooper River Lake (Camden) – A boat electrofishing survey was completed at Cooper River Lake on August 4th to monitor for the presence of Northern Snakeheads. Total sampling time was one hour and resulted in 1 adult Northern Snakehead, 3 Largemouth Bass, and 5 Striped Bass. The water level, which was about one foot below normal level, and increased sedimentation may have contributed to the poor results. Further electrofishing should be completed in 2015 to evaluate the effect on the Largemouth Bass population.

Game Creek (Salem) – A boat electrofishing survey was completed on August 5th in the Game Creek portion of Salem Canal to evaluate the Largemouth Bass population and monitor for the presence of Northern Snakeheads. Recent reports were received indicating that Northern Snakeheads have made their way into the Game Creek and Salem Canal areas, through a floodgate within the Dupont facility. A total of 15 Bowfin were collected however no Snakeheads were observed. There were 27 Largemouth Bass collected during 1.5 hours of electrofishing. The bass population appears to have been affected by either fishing pressure or the presence of the Bowfin in recent years. This would be considered a moderate catch rate for this location, considering sampling was conducted during the daytime and in the summer.

Stewart Lake (Gloucester) - An electrofishing survey was completed at Stewart Lake located in Woodbury on June 24th to assess the Northern Snakehead and Largemouth Bass population. A total of two adult Snakeheads and 40 Largemouth Bass greater than the 200 mm stock size, ranging from 235 mm-478 mm, were collected during 1.5 hours of daytime electrofishing. A PSD of 62 and RSD_{15} of 22 indicate the population is balanced. The numbers are consistent with previous electrofishing surveys and suggest that the Snakehead population has not had an impact on the Largemouth Bass population.

Aquatic Invasive Plant Management

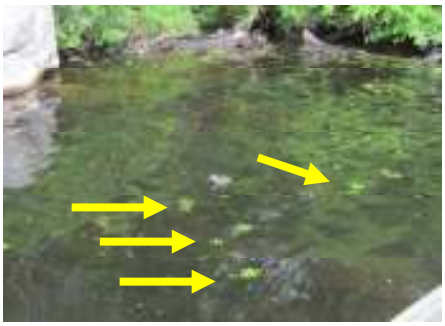
Water chestnut, a non-native aquatic plant species that can rapidly colonize a waterbody once it is established, is becoming increasingly prevalent in New Jersey's waters. Early detection is the key to water chestnut control, since smaller populations are easier to eliminate than larger ones. It also costs less to control a small infestation because plants can be individually hand-pulled. A large population requires the use of mechanical harvesters or application of aquatic herbicides to achieve control. It can be difficult and costly to eradicate water chestnut given this plant's hardiness (seed pods remain viable for 10+ years) and abundance. Water chestnut is now found in approximately 22 waterbodies in 10 counties. Most new sightings are brought to our attention by anglers, who typically mention that they were made aware of the problem via recent invasive species articles in the Freshwater Fisheries Digest. (Federal Grant F-48-R, Project I)

Water chestnut seed pods: immature (left) and mature (right).

Clove Lake - Received a report from a boater on the presence of Water Chestnut in Clove Acres Lake, a 29-acre lake in the Wallkill River watershed (Sussex County) and promptly notified the Wallkill River Watershed Management Group and the NJ Invasive Species Strike Team. The watershed group was aware of its occurrence in the lake and has been working to increase awareness and stakeholder participation. This report was also logged on the Bureau's invasive species database.

Duck Pond (Somerset County) – A few individual plants were observed and removed from Duck Pond, during a fish reproduction check survey.

Lake Hopatcong - In response to a report of water chestnut (an aggressive, invasive aquatic plant) in Lake Hopatcong near Liffy Island, a crew was sent to locate and remove them (June 11). Approximately 25 plants were found and removed from the lake. Some of these had been recently marked with pink flagging by volunteers who patrol the lake as part of a water watch. Water chestnut is not well established in this lake and it is important to remove these plants soon after they are spotted to prevent their spread.



FISH HEALTH

Wild Fish Population Health Assessment

Field investigations are conducted in response to reports of fish kills, distressed fish, unknown fish parasites, or to address potential pathogen issues in wild fish. These investigations are often a collaborative effort between the Bureau of Freshwater Fisheries staff (Federal Grant F-48-R, Project II) and the fish pathologist in the Division's Office of Fish and Wildlife Health and Forensics (under Grant FW-69-R administered by that Office).

Furunculosis

In 2014 fifteen fish health related surveys were conducted in response to an outbreak of furunculosis at the Division's Pequest Trout Hatchery. This is the first time the disease has occurred at this facility. Furunculosis, is a fatal disease predominantly affecting coldwater species of fish such as trout, though occurrences in warmwater fish species have been documented. The disease, caused by the bacterium *Aeromonas salmonicida*, occurred initially in the lowermost portion of the hatchery raceways holding large broodstock in the fall of 2013. Signs of furunculosis include darkening of the skin of affected fish as well as large boils and lesions. It is important to note the disease is not transferrable to people, however, the Division always advises against the consumption of any diseased-looking fish or animal.

The Division of Fish and Wildlife believes the disease was transferred to the hatchery by ospreys. Osprey feeding on infected fish in the wild may have spread the bacteria through contact when feeding on fish in the affected pool at the hatchery.

Initially, 21,000 large three-year-old broodstock were euthanized as the hatchery lacked sufficient raceway space to hold, treat and re-test the affected trout for the disease. Unfortunately, over the winter of 2013/2014 additional outbreaks occurred in Brook and Brown Trout production fish in both the upper and lower raceways scheduled for distribution in the spring 2014. Brown Trout were successfully treated for the disease but disease outbreaks continually reoccurred with Brook Trout despite repeated antibiotic treatments. As a result, an additional 200,000 Brook Trout were euthanized in the Spring of 2014. Although treated for the disease Brown Trout were still considered carriers of the bacterium.

In order to provide the utmost protection to resident trout populations Brown Trout were not stocked in waters with resident trout populations or in waters connected to waters having trout. The loss of 200,000 Brook Trout, and restrictions on the use of Brown Trout resulted in significant changes to the Division's 2014 Spring Trout Stocking Program (see page 36 and Appendix F).

In response to the furunculosis outbreak nineteen state stocked waters were electrofished in late spring (see table below). Stream sections of two waters, the Capoolong Creek and the Raritan River S/Br were also known to be stocked by private hatcheries. Trout and warmwater fish species encountered were carefully inspected for visible lesions. A subsample of trout captured and any trout with skin discolorations were forwarded to Division Fish Pathologist for further inspection and/or testing. With the exception of the Ken Lockwood Gorge section of the South Branch of the Raritan River no evidence of furunculosis was found. The effort put forth monitoring fish heath reaped additional benefits, such as whether or not stocked trout survived to

the electrofishing survey date and information on Largemouth Bass and other warmwater species. Information from a subset of locations is found below. (Federal Grant F-48-R, Project II)

Trout stocked waters surveyed in 2014 as follow-up to furunculosis outbreak at Pequest Trout Hatchery.

Location	County	Stocking	Fish Captured		
		State/Private	Wild Trout	Stocked Trout	Warmwater
Alexauken Creek	Hunterdon	State		X	X
Amwell Lake	Mercer	State		X	X
Capoolong Creek	Hunterdon	Both	X		X
DOD Lake	Salem	State		X	X
Hammonton Lake	Atlantic	State		X	X
Hibernia Brook	Morris	State		X	X
Honey Run	Warren	State		X	X
Manalapan Lake	Middlesex	State			X
Mary Elmer Lake	Cumberland	State		X	X
Pascack Creek	Bergen	State		X	X
Pemberton Lake	Burlington	State		X	X
Pohatcong Creek – Valley Road	Warren	State	X	X	X
Pohatcong Creek – Creek Road	Warren	Both	X	X	X
Prospertown Lake	Ocean	State		X	X
Raritan River S/Br – KLG	Hunterdon	Both	X	X	X
Raritan River S/Br – Bartley WMA	Morris	State	X		X
Rosedale Lake	Mercer	State			X
Sidney Brook	Hunterdon	State	X	X	X
Verona Lake	Essex	State		X	X

Largemouth Bass from Amwell Lake

Amwell Lake (Hunterdon) - A boat electrofishing survey was conducted on June 4 to document the presence and health of trout. It is understood that trout stocked in the spring have a limited window of survival due to increased water temperature and decreased dissolved oxygen as the summer conditions prevail. Eight stocked Brown Trout were encountered, thus documenting survival in to the month of June. Three brood stock Brown Trout were observed, but we were only able to capture one, measuring 21.7 in. (550 mm). Three Brown Trout were submitted for fish health testing; results are pending. Other species encountered include Largemouth Bass, Black Crappie, Bluegill, Pumpkinseed, Channel Catfish, Brown Bullhead, Common Carp, and Golden Shiner. The biggest Largemouth Bass was 20.7 in. (526 mm) estimated to be 4.5 lbs. (see photo on right).

Manalapan Lake (Middlesex) – Manalapan Lake was electrofished on June 30 to screen for fish pathogens and to determine stocked trout survival into the summer months. No trout were encountered, however other species appeared healthy, therefore none were submitted to our fish pathologist. Thirty-nine Largemouth Bass were collected and inspected, the largest of which was 17.0 in. and 2.8 lbs. Other species encountered include Chain Pickerel, Yellow Perch, American Eel, Pumpkinseed, Bluegill, Redbreast Sunfish, Brown Bullhead, Common Carp, White Sucker, and a Koi.

Rosedale Lake (Mercer) - Rosedale Lake was electrofished on July 1 to screen for fish pathogens pathogens and to determine stocked trout survival into the summer months. No trout were encountered, however other species appeared healthy, therefore none were submitted to our fish pathologist. Thirty-seven Largemouth Bass were collected and inspected, the largest of which was 18.5 in. and 3.3 lbs. Other species encountered include American Eel, Black Crappie, Bluegill, Redbreast Sunfish, Common Carp, White Sucker, Golden Shiner, and Gizzard Shad.

South Branch of the Raritan River – Ken Lockwood Gorge Section
A 13-15 inch Rainbow Trout with visible external lesions was caught by an angler in the Ken Lockwood Gorge section of the South Branch of the Raritan River (see photo on right). The trout was released, but photographs were submitted. Based on the image provided, the Rainbow Trout had serious skin lesions that appeared to extend into the muscle. The lesions looked to have been caused by an infectious disease. The fin condition of the fish was poor, with the pectoral and pelvic fins completely eroded, suggesting that the fish recently came from a fish hatchery.

A Bureau of Freshwater Fisheries crew of six responded by electrofishing the section of the river where the fish was released using a Smith-Root barge on two separate occasions. A total of 110 trout were captured, which included 20 hatchery-stocked Rainbow Trout, 40 naturally reproducing Brown Trout, and 50 hatchery-stocked Brown Trout. The designation of hatchery stocked vs. wild reproducing fish was made based on physical characteristics including fin wear. Fish were lethally sampled and analyzed at the Pequest Fish Pathology Laboratory. All fish were tested for bacterial diseases and Rainbow Trout were tested for viruses as well. (Federal Grant F-48-R, Project I)

No clinical disease signs were noted based on necropsy of the hatchery-stocked Rainbow Trout and the naturally reproducing Brown Trout captured in the study. These fish all tested negative for bacterial and viral diseases of concern. In the hatchery-stocked Brown Trout, five out of 50 fish had muscular and skin lesions that were suggestive of Furunculosis. Bacteriological testing confirmed Furunculosis in one fish, while the other four fish tested negative for bacteria.

Based on these findings there was evidence of Furunculosis in one hatchery-stocked Brown Trout in the river sample. Although only one fish tested positive for an active infection with the bacteria responsible for Furunculosis (*Aeromonas salmonicida*), four other fish had lesions that were suggestive of the disease. The lesions appeared as boils in the musculature, consistent with the "furuncles" that are common in fish with chronic furunculosis. Histopathology of the muscular lesions demonstrated that these muscular lesions had significant necrosis and inflammation within the lesion. It is likely that the fish were once affected with furunculosis and

were treated with antibiotics, making the detection of the bacterium difficult. Generally when fish show clinical disease signs, then the bacterium is readily isolated from the fish. When fish are treated with antibiotics lesions will still be present until they fully heal, but the bacterium would be difficult to isolate since the treatment killed most bacteria. In the one positive-fish, the bacterium was isolated directly from the skin lesion although not from kidney. Additionally the results show that the wild reproducing Brown Trout had no evidence of disease and *A. salmonicida* was not isolated from these fish.

The Division's fish health policy does not allow for stocking of trout previously affected with Furunculosis or other pathogens of concern in trout waters. Stocking from the Pequest Hatchery within the upper section of the South Branch Raritan River above Lake Solitude was last done in fall 2013 with only Rainbow Trout that were confirmed free from all pathogens of concern. No stocking was done at the Gorge in the spring 2014 because of Furunculosis issues in the hatchery. It is most likely that the Brown Trout came from sources other than the Pequest Trout Hatchery.

Additional sampling was also conducted within the Raritan River S/Br further upstream of the Gorge within the Bartley Wildlife Management Area. Eighteen Brown Trout (6-11 in.) and five Brook Trout (6-8 in.) were collected, all presumably of wild origin. All trout appeared healthy and disease free based on visual observations. No trout were submitted for laboratory analysis.

Fish Kill Investigations

In 2014 seven investigations were conducted in response to reports of fish kills. The investigations attempt to determine if the cause of the problem is fish pathogen related or the result of environmental conditions (low dissolved oxygen, elevated water temperatures, pollution etc.), or a combination of stressors. (Federal Grant F-48-R, Project II)

Colonial Lake (Mercer) - Investigated a report called in by an angler regarding 30 – 50 trapped and distressed trout at Colonial Lake that were recently stocked as part of our Fall Trout Stocking Program. Although our response was swift, arriving on the scene with a few hours of the report, there was nothing to be done as no live trout were visible. Due to an overnight rain event, some of the trout stocked the previous day became trapped in the dam's rip-rap the next day as the lake's water level receded and ceased to flow over much of the dam. The dam is a massive structure constructed of rock-filled gabion baskets (upper photo, on right). Unfortunately this design allows small fish, including recently stocked trout (lower photo, on right) to become trapped within in the voids of the rocks as they are swept over the dam and it is next to impossible to extricate them due to the wire mesh. This information was passed along to Environmental Review Section as an example of poor dam design.

Lake Musconetcong (Sussex) - This 329-acre shallow lake was partially lowered during the winter of 2013–2014 for aquatic vegetation control. Due to concerns regarding the high potential for fish kills, the lake was pro-actively surveyed in 2014 to provide data that would be helpful in managing the lake's fishery. Previously, in the late winter/early spring of 2011 a significant fish-kill occurred in the lake following a winter draw down. Dead fish were reported after ice-out and subsequently thousands of dead warmwater fish were later observed in the following weeks in the shallows. The Division's Office of Fish and Wildlife Health and Forensics determined that a bacterial infection caused by *Pseudomonas fluorescens* was the cause of death. This bacterium is an opportunistic pathogen that is always present in the environment. Infections such as these often occur in the spring and stress is a contributing factor. In this case, stress caused by the combination of the 2010-2011 winter drawdown, and the heavy and extended ice/snow cover on the lake likely caused this lethal disease outbreak.

In the spring of 2014, Lake Musconetcong was inspected for evidence of dead fish in the spring and the few dead fish observed were considered incidental mortality (i.e. not indicative of a fish kill). Live fish collected by electrofishing were provided to the fish pathologist for examination. The information collected in 2014 helped support the Division's recommendation that a draw down schedule be developed that does not involve lowering lake every year. As a result, the lake was not lowered for the winter (2014 – 2015).

In February 2014 (while the lake was drawn down), temperature/dissolved oxygen profiles were conducted at 4 – 8 locations on 2 days to determine if water quality conditions were stressful or lethal for fish. Total water depths ranged from 1.5 – 2.5 feet, water temperature ranged from 0.1°C to 2.8°C, and dissolved oxygen ranged from 0.79 – 11.97 mg/L (see table below). The temperature of the water under the ice was extremely low at all locations, just barely above freezing, and the combination of these cold temperatures and shallowness of the water is stressful for fish.

Water temperature and dissolved oxygen profiles conducted on Lake Musconetcong in February 2014.

	LAKE MUSCONETCONG					
	02/19/14			02/26/14		
Location	**Water Depth* (ft)**	**Water Temp (°C)**	**Dissolved Oxygen (mg/L)**	**Water Depth* (ft)**	**Water Temp (°C)**	**Dissolved Oxygen (mg/L)**
Site 1	0	0.1	8.01	0	0.1	10.41
South East side,	1	0.2	6.08	1	1.3	8.62
Center St, 150 ft	2	0.3	1.87	2	2.2	2.75
Site 2	0	0.1	7.80			
South East side,	1	0.3	7.04			
Center St, 50 ft	2	2.3	0.79			
Site 3	0	0.0	8.83			
Harvester, 300 ft off	1	0.8	6.61			
Port Morris Ave	2	1.6	5.10			
Site 4	0	0.1	6.70	0	0.1	11.16
Harvester, 100 ft off Port Morris Ave	1.5	1.0	4.42	1.5	2.3	2.25
Site 5	0	0.2	10.69	0	0.1	10.93
Playground	1	1.2	8.64	1	1.5	9.57
	2	0.3	7.50	2.5	2.5	8.40
Site 6	0	0.4	10.24			
Boat launch,	1	1.4	8.24			
450 ft out	2	2.8	6.30			
	3	2.4	4.77			
Site 7	0	0.1	10.03			
Boat launch,	1	1.4	8.93			
150 ft out	2	2.1	7.64			
	3	2.2	5.29			
Site 8	0	0.0	11.01	0	0.6	12.22
Boat launch,	1	1.5	6.95	1	1.3	11.57
50 ft out	2.5	2.5	4.06	2.5	1.6	11.97

In addition to measuring dissolved oxygen and temperature at Lake Musconetcong, similar measurements were performed at nearby Lake Hopatcong and Jefferson Lake for comparative purposes and warmer water temperatures were observed there (see table below).

Water temperature and dissolved oxygen profiles conducted on Lake Hopatcong and Jefferson Lake in February 2014.

LAKE HOPATCONG		
02/26/14		
Water Depth * (ft)	**Water Temp (°C)**	**Dissolved Oxygen (mg/L)**
0	1.2	12.17
1	1.8	10.92
2	2.7	10.67
3	2.8	9.52
4	3.9	3.80
5	4.1	3.51

JEFFERSON LAKE		
02/26/14		
Water Depth * (ft)	**Water Temp (°C)**	**Dissolved Oxygen (mg/L)**
0	3.7	7.96
1	4.0	7.56
2	4.0	7.82
3	3.9	7.74
4	3.9	7.92
5	3.9	7.73
6	3.9	7.51
7	3.9	7.61
8	3.9	6.95
9	4.0	4.96

Lancelot Pond (Mercer) – Investigated a fish kill at Lancelot Pond in Monroe Township. Approximately two acres, this pond located off of Lancelot Lane in a housing development off of 613/Spottswood-Englishtown Road. A maintenance worker for the housing development reported that it was an old farm pond that was maintained for recreation for residents of the development. There was a strong, sweet/fertilizer smell near the water. Water was very dark brown, with patches of lighter brown, with a visibility of less than 0.3ft. Maintenance reported the water was usually significantly clearer. The pond had two very small tributaries, the first had very dark, tea-colored water, possibly coming from local landscaping company, which maintenance reported had a very large mulch pile. Recent heavy rain could account for runoff from the mulch pile. The second tributary was choked with thick, grey-brown algae growth. Approximately 12 dead Largemouth Bass, 10 dead bullhead (unknown brown or yellow), and 200 dead sunfish were located. No dead amphibians, reptiles, birds, or mammals were spotted, although no activity from turtles or frogs was encountered during the inspection of the pond. Water quality data was taken at several points. Water temp was around 20.0°C throughout. Dissolved oxygen ranged from 1.58 to 1.67 mg/L at various points on the pond. pH was recorded at 4.46, and conductivity at 598µS/cm, at a depth of approx 2 to 2.5m. The decomposition of the mulch leachate is believed to have depleted the oxygen, resulting in the fish kill. The Township has now opened the pond to the public for fishing and it has been restocked with Largemouth Bass and Bluegill by the Division's Hackettstown Hatchery.

Musconetcong River (Warren) - Investigated a report of two unusual fish found dead in the Musconetcong River near the Asbury graphite mill that the angler believed to be striped bass. The photos provided by the angler were inconclusive. During a site visit conducted the following day one of the fish was located. It was approximately 20", had been neatly filleted, and the remnants suggested it was a Striped Bass. These fish were likely caught from saltwater (or purchased from a store) and later dumped in the river to avoid having smelly household garbage. This type of illegal dumping has been observed from time in various streams statewide.

Newton Lake (Camden) - Received a report of a fish kill at Newton Lake, Camden County on April 11th by the conservation officer for the area. The kill was investigated by the conservation officer on April 12th. The kill consisted of Gizzard Shad and Bluegill. The fish were reported to be in varying stages of decomposition, none of which were recent enough for testing. The location has been the site of numerous fish kills in the past during the same time of year. Previous fish kills were determined to be the result of *Aeromonas* spp. bacteria. Early spring fish kills as a result of this commonly found bacteria are not uncommon. It is believed spawning stress coupled with additional stress of water temperature shifts reduce the ability of certain fish to tolerate the presence of the bacteria.

Pumpkin Patch Brook (Union) - Investigated a fish kill reported by Conservation Officer Chris Wren at Pumpkin Patch Brook on September 9, 2014. Stream level and flow were low, as was dissolved oxygen at 3.35mg/L. Approximately 150 sunfish, 25 Redfin Pickerel, 15 White Sucker, 15 Tessellated Darter, 1 Banded Killifish, and several large dead crayfish were observed. Specimens were dead too long to yield useful pathological information. Much of the algae growing in the stream appeared grayish in color, possibly dead. An effluent pipe draining into the stream produced clear water, but the pool immediately below its join to the stream was very cloudy and had a distinct light green coloration. Approximately fifteen meters upstream of the pipe, no dead fish were observed, however several living sunfish and Tessellated Darters were seen. The algae in this section of the stream were a darker brown color, very noticeably different from the algae below the effluent pipe. It appears a discharge into the stream, perhaps of chlorinated water, may have been responsible for the fish kill.

Runnemede Lake (Camden) – A site inspection was completed at Runnemede Lake (Hirsch's Pond) on August 26th to evaluate conditions in the waterbody resulting from sewage spill upstream. The dissolved oxygen at the lakes outflow was 2.80 mg/l indicating that the sewage had impacted the lake. There were no dead fish observed, however a noticeable smell of raw sewage was present as well as a significant algae bloom. There was a large fish kill in 2013 which affected thousands of goldfish from a virus.

Fish Salvages

Permitted fish salvages are necessary under a variety of circumstances, such as substantial water lowering events related to projects such as the dredging of a lake or a the repair of a dam. These salvages are typically conducted by trained private aquatic consultants and are conducted under controlled circumstances, during the more favorable conditions encountered in the fall and can be a relatively simple exercise. On the other hand, every year, as the result of a catastrophic dam failure or merely a minor leak, compounded with increased water temperatures and diminished oxygen levels during the summer, countless fish are threatened with demise. During emergency situations on state owned property such as Wildlife Management Areas or those managed by the Division of Parks and Forestry, the Bureau of Freshwater Fisheries may mobilize to conduct fish salvages to rescue fish and relocate them to suitable waters. (Hunter & Angler Fund)

In 2014 fish salvages were conducted on two waterbodies:

Lake Nummy (Cape May) – A fish salvage was completed on October 29th at Lake Nummy located within Belleplain State Forrest. A dam replacement project will begin this fall, with an anticipated completion date of May 2015. The lake was lowered prior to beginning the fish salvage. A total of 4 feet of water was still present at the deepest location. Due to the low pH few large gamefish were present. Approximately 50 large Yellow Perch, 50 Chain Pickerel and 1000+ young-of-the-year Yellow Perch were relocated to East Creek Lake and Lake Audrey. Additional species collected included Yellow Bullhead, Banded Sunfish, Mud Sunfish, and Blackbanded Sunfish.

Woolman's Lake (aka Buttonwood Lake) (Burlington) - A fish salvage was completed at Woolman's Lake (Buttonwood Dam) located in Mt. Holly on May 19th. The Buttonwood Dam is the middle dam, in a serious of three ponds. The dam sustained significant damage during recent rains and required immediate lowering mandated by Dam Safety. The Town of Mt. Holly and contracted engineers were helpful and instrumental in the success of the fish salvage. A gravel boat launch area was constructed to gain us access to the pond. The pond was approximately 1.5 acres at normal water level. All fish were collected using an electrofishing boat and were relocated to the downstream impoundment. A total of 800 fish, consisting of 62 Largemouth Bass, 400 Bluegills, and 132 Brown Bullheads were collected.

SURFACE WATER CLASSIFICATION

Surface Water Classification Assessments

Trout are useful bioindicators of stream health as excellent water quality and habitat are necessary for their survival and successful reproduction. In 1968, the Bureau of Freshwater Fisheries initiated the process of identifying and classifying New Jersey waters according to their suitability to support trout. Five years later, a classification system for New Jersey waters was developed. The Bureau's classification system, although already in use by various programs within the Department, was formally recognized in 1981 under the state's newly adopted *Surface Water Quality Standards* (SWQS).

Today, waters of the state are classified according to their suitability to support trout. Lakes are classified on their ability to support trout year round, whereas streams are classified on the occurrence of natural reproduction and the presence or absence of trout and/or trout associated species (Hamilton and Barno 2006). Ultimately, the more suitable a waterway is to supporting trout the higher the classification and the more protection it will receive. The Department's Land Use Regulation Program, through Stream Encroachment, Freshwater Wetlands, and the more recently developed storm water rules acknowledge the fragile nature of these ecosystems and provide additional protective measures.

Although a vast amount of work has been accomplished in classifying New Jersey waters, waters continue to be classified and reclassified according to their trout supporting capabilities, when justified by additional field investigation data collected by the Bureau. The official surface water classification of waters is changed by NJDEP's Bureau of Freshwater and Biological Monitoring through an established rule making process. NJDFW provides recommendations for surface water classification changes to DEP's Bureau of Water Monitoring and Standards, Environmental Analysis Restoration and Standards based upon fisheries data collected annually. (Federal Grant F-48-R, Project I)

Double backpack electrofishing crew.

Stream Assessments for Surface Water Classification

During the summer months, a 150 meter section of stream is electrofished (single-pass) using one or more backpack electrofishing unit or a generator positioned on land or in a barge, with 2-3 hand-held anodes (Appendix C). All fish are captured and enumerated by species (total length measurements taken on all salmonids). Physicochemical parameters measured include water temperature, dissolved oxygen, pH, alkalinity, conductivity, specific conductance, and stream width, depth, and substrate type. The EPA Rapid Bioassessment habitat assessment protocol is used to assess in-stream habitat and riparian conditions (Barbour et al. 1999) with regional modifications (Appendix D). (Federal Grant F-48-R, Project I)

In 2014 seven electrofishing surveys were conducted specifically for classification purposes by the Bureau under Grant F-48-R, Project 1. However, data from 62 additional stream

electrofishing surveys were conducted in 2014 under a variety of other jobs and/or funding sources including, but not limited to, this Grant and the Hunter and Angler Fund (Table 1, page 10).

Collectively, 11 stream surveys conducted in 2014 support potential surface water classification changes (Table 2). The most significant of these upgrades is the Lamington (Black) River where three surveys documented trout reproduction in two separate stream segments (the headwaters and a section downstream of the existing *trout production* segment) currently classified as *non-trout*. The specific stream sections on the Lamington River recommended for upgrade are described in Table 3. Trout reproduction was also documented in an unnamed tributary to the South Branch of the Raritan River (referred to as the Raritan River, S/Br (trib.) (NE of Lake Solitude). This previously unsampled stream is not specifically listed in the SWQS and by default is classified *trout maintenance* (assumes the *trout maintenance* classification of the Raritan River South Branch). Two surveys conducted on *non-trout* sections of the Raritan River South Branch support previously recommended classification upgrades to *trout production*. The data from surveys conducted on five other streams (or stream sections) not previously sampled verified their existing default classifications of *non-trout*.

In addition to recommending changes to existing surface water classifications, since 2006 the Division has reported surveys in which data confirm existing surface water classifications. The 2014 data confirmed the classifications of fifty stream segments, therefore no action is required (Table 4). At times, electrofishing surveys yield data that neither confirm an existing use (classification), nor warrant a change to the existing use (classification), as classifications are not downgraded unless proven the existing use can not be re-established. This was true for surveys at eight locations in 2014, therefore no action is required (Table 5).

Merrill Creek Reservoir - upgrade from *Trout Maintenance* to *Trout Production*

During the period 1988 – 2012 the NJ Division of Fish & Wildlife annually stocked hatchery-reared Lake Trout (lakers) in Merrill Creek Reservoir. With the exception of the initial stocking in 1988, all lakers subsequently stocked were marked by removing a fin (referred to as a fin clip). During this 25 year period over 90,000 lakers, averaging 6.6 – 9.1 inches, were stocked in the reservoir. Unlike Brown and Rainbow Trout, Lake Trout are a long-lived trout species that is capable of spawning in a lake environment if suitable habitat is present. The reservoir's laker population has been surveyed annually since 1989 by the owner's consultant to obtain data needed to manage the recreational trout fishery. During these surveys each Lake Trout captured is examined for the presence/absence of a fin clip. Fish survey data from recent years shows an increasing prevalence of small lakers that do not have an identifying fin clip. These fish are too small to be attributed to the first year class of fish stocked in 1988 (that were not fin-clipped) indicating they are the product of natural reproduction, therefore warranting its upgrade from *Trout Maintenance* [FW2-TM] to *Trout Production* [FW2-TP(C1)] (Table 2). The Division discontinued stocking lakers in the reservoir in 2013 because natural reproduction is considered sufficient to sustain the Lake Trout fishery without supplemental stockings.

TABLE 2.— Summary of recommended surface water classification changes supported by 11 surveys conducted in 2014 by NJ Division of Fish & Wildlife, plus data on Merrill Creek Reservoir. Reproducing trout species determined by the presence of young-of-the-year (yoy) trout. A current surface water classification enclosed by brackets indicates a default surface water classification (i.e. the waterbody is not specifically listed in NJ's Surface Water Quality Standards, N.J.A.C. 7:9B). I.O. = Incidence of Occurrence; NA = Not Applicable (due to presence of trout reproduction).

Waterbody	Waterbody section	Midpoint of survey		Current surface water classification	Recommended surface water classification	I.O. value	Reproducing trout species	Survey date	Page
		Lat. (N)	Long. (W)						
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)									
*Bee Brook (Plainsboro)	Entire length	40º20'22.3"	74º36'05.5"	[FW2-NT]	FW2-NT	10.5	none	7/9/14	A38
Chambers Brook (Whitehouse)	Entire length	40º37'23.0"	74º39'48.3"	[FW2-NT]	FW2-NT	12.2	none	6/30/14	A42
Lamington River (Black River) (Oldwick)	Confluence with Cold Brook to the Route 523 bridge, including all tributaries	40º39'42.9"	74º43'44.2"	FW2-TM(C1)	FW2-TP(C1)	NA	Brown	7/11/14	A52
Lamington River (Black River) (Burnt Mills)	Route 523 bridge to North Branch, Raritan River, including all tributaries	40º38'36.8"	74º43'25.3"	FW2-NT(C1)	FW2-TP(C1)	NA	Brown	7/2/14	A51
Lamington River (Black River) (Burnt Mills)	Route 523 bridge to North Branch, Raritan River, including all tributaries	40º38'29.2"	74º43'19.7"	FW2-NT(C1)	FW2-TP(C1)	NA	Brown [c]	7/2/14	A50
*Lamington River (Trib.) (N. of Readington)	Entire length	40º39'10.7"	74º44'25.3"	[FW2-NT(C1)]	FW2-NT(C1)	13.9	none	6/27/14	A56
*Muddy Run (Bedminster)	Entire length	40º38'01.4"	74º41'50.5"	[FW2-NT(C1)]	FW2-NT(C1)	11.6	none	6/30/14	A58
Merrill Creek Reservoir (Harmony)	Entire waterbody	40º44'03"	75º6'8"	FW2-TM	FW2-TP(C1)	NA	Lake Trout	NA	81
Raritan River S/Br (Califon)	Rt. 512 bridge to downstream end of Packers Island, except segment described separately, below [b]	40º42'42.4"	74º51'19.2"	FW2-TM	FW2-TP(C1)	NA	Brown [c] & Rainbow [d]	8/15/14	A61
Raritan River S/Br (Mt. Olive)	Dam to confluence with Turkey Brook [b]	40º50'21.4"	74º44'49.9"	FW2-TM	FW2-TP(C1)	NA	Brown [a]	8/18/14	A66

*Raritan River S/Br (Trib.) (NE of Lake Solitude)	Entire length	40º40'54.4"	74º52'31.9"	[FW2-TM]	FW2-TP(C1)	NA	Brook & Brown [a]	8/25/14	A67
*Raritan River N/Br (Trib.) (W. of Bedminster)	Entire length	40º39'41.7"	74º39'24.6"	[FW2-NT]	FW2-NT	9.2	none	6/27/14	A59

[a] Potential change also supported by survey data collected in 2006 & 2007 and previously submitted to NJDEP Water Monitoring and Standards Survey in July 2011, after N.J.A.C. 7:9B was last amended (April 4, 2011) and in Memo dated March 11, 2013, titled Recommended Changes to Individual Surface Water Quality Classifications.

[b] New boundaries suggested in Memo titled Recommended Changes to Individual Surface Water Quality Classifications (March, 11 2013).

[c] Young-of-the-year trout not present, however trout from older year classes present.

[d] Rainbow Trout measured 108 mm is considered a y-o-y (although not certain, due to its relatively large size (statewide typically less than 100 mm) and small sample size, however it is believed that it was a y-o-y as the more numerous Brook and Brown Trout in this river often appear in relatively high numbers attain lengths of 105 and 125 mm respectively.

* Indicates unnamed tributary as recognized by SWQS. Name given is recommended by NJDFW.

TABLE 3.— Summary of recommended surface water classification changes to the Lamington River (Black River) supported by 6 surveys conducted by New Jersey Division of Fish and Wildlife in 2014 and 5 surveys previously conducted from 2003 through 2013.

Current segment description	Current SWQS classification	Recommended segment description	Recommended SWQS classification
(Succasunna) - Source to Rt. 206 bridge	FW2-NT(C1)	(Mine Hill Township) - Source to but not including Mine Hill Lake, including all tributaries	FW2-TP(C1)
		(Succasunna) –Mine Hill Lake to Rt. 206 bridge	FW2-NT(C1)
(Milltown) - Rt. 206 bridge to confluence with Rinehart Brook	FW2-TM(C1)	no change	
(Pottersville) - Confluence with Rinehart Brook to Camp Brady bridge, Bedminister	FW2-TP(C1)	(Pottersville) - Confluence with Rinehart Brook to River Road West, including all tributaries	FW2-TP(C1)
(Vliettown) - Camp Brady bridge to confluence with Cold Brook	FW2-TM		
(Oldwick) – Confluence with Cold Brook to the Route 523 bridge, including all tributaries	FW2-TM(C1)		
(Burnt Mills) –Route 523 bridge to North Branch, Raritan River, including all tributaries	FW2-NT(C1)	(Branchburg) River Road West to North Branch, Raritan River, including all tributaries	FW2-NT(C1)

TABLE 4.— Electrofishing surveys conducted in 2014 by NJ Division of Fish & Wildlife that *confirm existing surface water classifications* as indicted in New Jersey's Surface Water Quality Standards, N.J.A.C. 7:9B. No action is required. Reproducing trout species is determined by the presence of young-of-the-year trout. Data are found in report titled "2014 Investigation & Management of NJ's Freshwater Fisheries Resources."

Waterbody	Waterbody section	Midpoint of survey		Current surface water classification confirmed	I.O. value	Reproducing Trout Species	Date	Page
		Lat. (N)	Long. (W)					
Upper Delaware Region (Upper Delaware & Wallkill)								
Bear Brook (Johnsonburg)	Entire length	40º57'18.0"	74º52'19.5"	FW2-TP(C1)	NA	Brook	8/25/14	A2
Big Flat Brook (Sandyston)	Confluence with Parker Brook, through the Blewitt Tract, to the confluence with Flat Brook, except tributaries described under the listing for Flat Brook, below	41º12'11.1"	74º48'32.7"	FW2-TP(C1)	NA	Brook	8/5/14	A5
Clove Brook (High Point)	Those portions of the two northernmost tributaries located entirely within High Point State Park boundaries, immediately east of Lake Marcia	41º21'01.5"	74º41'14.0"	FW1(tp)	NA	Brown	8/27/14	A8
Dunnfield Creek (Del. Water Gap)	Source to Rt. I-80	40º58'48.1"	75º07'01.3"	FW1(tp)	NA	Brook & Brown	8/1/14	A10
Dunnfield Creek (Del. Water Gap)	Source to Rt. I-80	40º58'20.8"	75º07'34.7"	FW1(tp)	NA	Brook & Brown	8/1/14	A9
Hakihokake Creek (Milford)	Entire length, including headwaters known as Little York Creek	40º37'10.0"	75º04'40.5"	FW2-TP(C1)	NA	Brown	7/22/14	A12
*Hances Brook (Trib.) (Rockport)	Entire length	40º48'46.5"	74º51'37.9"	FW2-TP(C1)	NA	Brook	7/24/14	A13
Merrill Creek (Harmony)	Entire length, but not including Merrill Creek Reservoir	40º42'03.6"	75º06'57.8"	FW2-TP(C1)	NA	Brook & Brown	8/21/14	A15
Parker Brook (Montague)	Entire length	41º14'37.2"	74º43'58.3"	FW2-TP(C1)	NA	Brook	7/29/14	A16
Stephensburg Brook (Stephensburg)	Entire length	40º47'23.1"	74º52'13.4"	FW2-TP(C1)	NA	Brook & Brown	7/23/14	A18
Stony Brook (Stokes State Forest)	Outlet of Stony Lake to the confluence with Big Flat Brook	41º12'50.1"	74º46'50.4"	FW2-TP(C1)	NA	Brook	7/29/14	A19
Van Campens Brook (Millbrook)	Entire length	41º04'32.2"	74º57'35.4"	FW2-TP(C1)	NA	Brook & Rainbow	9/4/14	A21
Van Campens Brook (Millbrook)	Entire length	41º03'52.3"	74º59'0.46"	FW2-TP(C1)	NA	Brook, Brown, & Rainbow	9/4/14	A20

Van Campens Brook (Millbrook)	Entire length	41º03'28.5"	75º00'15.1"	FW2-TP(C1)	NA	Brook Brown & Rainbow [a]	8/22/14	A22
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic								
Bear Swamp Brook (Mahwah)	Entire length	41º04'04.0"	74º12'36.1"	FW2-TP(C1)	NA	Brook	7/23/14	A23
Indian Grove Brook (Bernardsville)	Entire length	40º44'28.1"	74º33'37.1"	FW2-TP(C1)	NA	Rainbow	8/28/14	A24
Jackson Brook (Mine Hill)	Source to the boundary of Hurd Park, Dover, including all tributaries	40º52'38.2"	74º34'49.7"	FW2-TP(C1)	NA	Brown	7/31/14	A25
Passaic River (Mendham)	Source downstream to, but not including, Osborn Pond or tributaries described separately below	40º45'24.0"	74º33'13.8"	FW2-TP(C1)	NA	Brown & Rainbow	8/4/14	A26
Pequannock River Mainstem (Kinnelon)	Macopin Reservoir outlet to Hamburg Turnpike bridge in Pompton Lakes Borough	41º00'42.1"	74º33'11.0"	FW2-TP(C1)	NA	Brown	8/20/14	A28
Pequannock River Mainstem (Newfoundland)	Outlet of Oak Ridge Reservoir downstream to Charlottesburg Reservoir, including all unnamed tributaries, but not including Charlottesburg Reservoir	41º03'5.8"	74º26'39.9"	FW2-TP(C1)	NA	Brown	8/20/14	A27
Saddle River (Upper Saddle River)	State line to confluence with Pleasant Brook, including all tributaries	41º03'40.1"	74º05'38.8"	FW2-TP(C1)	NA	Brown	7/24/14	A29
Saddle River (Upper Saddle River)	State line to confluence with Pleasant Brook, including all tributaries	41º04'17.6"	74º05'12.6"	FW2-TP(C1)	NA	Brown	7/24/14	A30
Wanaque River Main Stem (Pompton Lakes)	Wanaque Reservoir dam to Wanaque Ave. bridge including unnamed tributaries	41º02'04.2"	74º17'02.1"	FW2-TP(C1)	NA	Brown	8/19/14	A32
Wanaque River Main Stem (Pompton Lakes)	Wanaque Reservoir dam to Wanaque Ave. bridge including unnamed tributaries	41º01'43.4"	74º17'06.6"	FW2-TP(C1)	NA	Brown	8/19/14	A31
West Brook (West Milford)	Entire length	41º05'12.8"	74º20'17.8"	FW2-TP(C1)	NA	Rainbow	8/27/14	A34
Whippany River (Brookside)	Source to Whitehead Rd. bridge	40º47'28.3"	74º33'06.0"	FW2-TP(C1)	NA	Brown	9/3/14	A35

Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)								
Black Brook (Polktown)	Entire length	40º39'39.0"	74º56'54.6"	FW2-TP(C1)	NA	Brown [a]	8/8/14	A39
Burnett Brook (Ralston)	Entire length	40º46'30.4"	74º38'22.2"	FW2-TP(C1)	NA	Brown	7/31/14	A40
Cold Brook (Oldwick)	Entire length	40º40'30.2"	74º44'19.8"	FW2-TP(C1)	NA	Brown	8/4/14	A43
Flanders Brook (Flanders)	Entire length	40º51'00.6"	74º42'02.2"	FW2-TP(C1)	NA	Brook [a] Brown & Rainbow	7/22/14	A44
Heathcote Brook (Kingston)	Entire length	40º22'13.9"	74º36'35.2"	FW2-NT	10.4	none	7/9/14	A45
Herzog Brook (Pottersville) AKA Lomerson Bk.	Entire length	40º43'45.6"	74º42'16.3"	FW2-TP(C1)	NA	Brook [a] & Brown	8/27/14	A46
Hickory Run (Califon)	Entire length	40º42'48.1"	74º51'36.9"	FW2-TP(C1)	NA	Brook	8/25/14	A47
India Brook (North Branch, Raritan River) (Randolph)	Entire length	40º49'06.0'	74º36'04.5"	FW2-TP(C1)	NA	Brook & Brown	8/11/14	A48
India Brook (North Branch, Raritan River) (Randolph)	Entire length	40º47'13.4'	74º37'14.3"	FW2-TP(C1)	NA	Brown & Rainbow	8/11/14	A49
Lamington River (Black River) (Milltown)	Rt. 206 bridge to confluence with Rinehart Brook	40º45'48.3"	74º43'04.0"	FW2-TM(C1)	31.8	Brook [a]	8/26/14	A55
Lamington River (Black River) (Milltown)	Rt. 206 bridge to confluence with Rinehart Brook	40º44'44.3"	74º43'46.8"	FW2-TM(C1)	31.0	Brown [a]	8/26/14	A54
Lamington River (Black River) (Pottersville)	Confluence with Rinehart Brook to Camp Brady bridge, Bedminister	40º41'27.8"	74º43'18.5"	FW2-TP(C1)	NA	Brown	7/14/14	A53
Ledgewood Brook (Ledgewood)	Route 523 bridge to North Branch, Raritan River, including all tributaries	40º52'47.6"	74º39'19.9"	FW2-TP(C1)	NA	Brown	8/1/14	A57
Raritan River S/Br (Middle Valley)	Confluence with Turkey Brook to Rt. 512 bridge [b]	40º48'52.6"	74º43'44.2"	FW2-TP(C1)	NA	Brook & Brown	8/18/14	A64
Raritan River S/Br (Middle Valley)	Confluence with Turkey Brook to Rt. 512 bridge [b]	40º47'06.4"	74º46'45.0"	FW2-TP(C1)	NA	Brook Brown & Rainbow [d]	8/14/14	A63
Raritan River S/Br (Middle Valley)	Confluence with Turkey Brook to Rt. 512 bridge [b]	40º44'30.3"	74º49'28.2"	FW2-TP(C1)	NA	Brook & Brown	8/14/14	A62

Rinehart Brook (Hacklebarney)	Entire length	40º44'40.7"	74º44'09.8"	FW2-TP(C1)	NA	Brown	7/25/14	A68
Rockaway Creek N/Br (Mountainville)	Source to Rt. 523 bridge	40º41'23.8"	74º48'39.5"	FW2-TP(C1)	NA	Brown	8/22/14	A69
Rocky Run (Lebanon)	Entire length	40º41'41.4"	74º54'37.3"	FW2-TP(C1)	NA	Brook	8/6/14	A70
Stony Brook (Washington)	Entire length	40º48'14.1"	74º45'02.5"	FW2-TP(C1)	NA	Brook & Brown	8/4/14	A72
Teetertown Brook (Lebanon)	Entire length	40º44'36.7"	74º50'22.8"	FW2-TP(C1)	NA	Brook & Brown	8/6/14	A73
Trout Brook (Hacklebarney)	Entire length	40º45'04.3"	74º43'53.0"	FW2-TP(C1)	NA	Brook	7/25/14	A74
Turkey Brook (Mt. Olive)	Entire length	40º51'01.8"	74º43'51.0"	FW2-TP(C1)	NA	Brook & Brown [a]	7/22/14	A75
Willhoughby Brook (Buffalo Hollow)	Entire length	40º41'21.0"	74º54'16.3"	FW2-TP(C1)	NA	Brook & Brown	8/6/14	A76

[a] Young-of-the-year trout not present, however trout from older year classes present.

[b] New boundaries suggested in Memo titled Recommended Changes to Individual Surface Water Quality Classifications (March, 11 2013).

[c] 3 trout observed during survey, but not captured. Although the species was not identified, size indicated as wild trout, larger than typical y-o-y size (<100mm) and smaller than typical stocked size (> 250mm). Incidence of Occurrence (IO) value calculated including the presence of trout. No change recommended.

[d] Rainbow Trout measured 108 mm is considered a y-o-y (although not certain, due to its relatively large size (statewide typically less than 100 mm) and small sample size, however it is believed that it was a y-o-y as the more numerous Brook and Brown Trout in this river often appear in relatively high numbers and attain lengths of 105 and 125 mm respectively.

***** Indicates unnamed tributary as recognized by SWQS. Name given is recommended by NJDFW.

TABLE 5.— Electrofishing surveys conducted in 2014 by NJ Division of Fish & Wildlife that *neither confirm an existing use (classification), nor warrant a change to the existing use,* as classifications are not downgraded unless proven the existing use can not be re-established. Reproducing trout species is determined by the presence of young-of-the-year trout. Data are found in report titled "2014 Investigation & Management of NJ's Freshwater Fisheries Resources."

Waterbody	Waterbody section	Midpoint of survey		Current surface water classification	I.O. value	Reproducing Trout Species	Date	Page
		Lat. (N)	Long. (W)					
Upper Delaware Region (Upper Delaware & Wallkill)								
Bear Creek (Frelinghuysen)	Erie-Lackawanna Railroad trestle to confluence with Trout Brook, including all unnamed and unlisted tributaries	40º56'33.8"	74º52'31.6"	FW2-TM(C1)	17.7	none	8/29/14	A3
Bear Creek (Frelinghuysen)	Erie-Lackawanna Railroad trestle to confluence with Trout Brook, including all unnamed and unlisted tributaries	40º57'37.6"	74º52'47.5"	FW2-TM(C1)	6.5	none	8/29/14	A4
Big Flat Brook (Flatbrook-Roy)	Confluence of Big Flat Brook and Little Flat Brook to the boundary of Flatbrook-Roy Wildlife Management Area, except segments described below	41º11'38.3"	74º50'27.7"	FW2-TP(C1)	30.5	Brook [a] & Brown [a]	7/30/14	A7
Big Flat Brook (Flatbrook-Roy)	Confluence of Big Flat Brook and Little Flat Brook to the boundary of Flatbrook-Roy Wildlife Management Area, except segments described below	41º11'30.8"	74º50'34.4"	FW2-TP(C1)	24.6	Brown [a]	7/30/14	A6
Flat Brook (Walpack)	Flatbook-Roy Wildlife Management Area boundary to the Delaware River, except segments described below	41º10'57.1"	74º51'28.6"	FW2-TM(C1)	33.0	Brown [a]	8/5/14	A11
Merrill Creek (Harmony)	Entire length, but not including Merrill Creek Reservoir	40º44'57.0"	75º05'11.1"	FW2-TP(C1)	20.0	none	9/2/14	A14
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic								
Wanaque River Main Stem (Pompton Lakes)	Wanaque Reservoir dam to Wanaque Ave. bridge including unnamed tributaries	41º02'35.0"	74º17'23.0"	FW2-TP(C1)	28.5	Brown [a]	8/4/14	A33
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)								
Raritan River S/Br (Califon)	Rt. 512 bridge to downstream end of Packers Island, except segment described separately, below	40º40'00.9"	74º53'27.5"	FW2-TM	25.6	Brown [c]	8/15/14	A60

[a] Young-of-the-year trout not present, however trout from older year classes present.

[b] Current TP classification based on default, as this particular unnamed tributary was not previously sampled. Data neither confirms the existing use, nor warrants a change to the existing use, as classifications are not downgraded unless proven the existing use can not be re-established.

[c] 1 young-of-the-year trout and 10 trout from older year classes present, all of wild origin, however a recommendation to change the current classification without additional data.

Lake Assessments for Surface Water Classification

As part of the continued assessment of New Jersey waters dissolved oxygen and temperature profiles are performed to determine a lake's ability to support trout throughout the harsh summer months. During the summer most New Jersey lakes deeper than 3 m (10 ft) thermally stratify. The epilimnion (surface waters) become 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. A water temperature and dissolved oxygen profile is conducted in the deepest part of a lake using a YSI 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. The criteria used to determine trout-supporting water is water temperature $\leq$ 21ºC (69.8ºF) and dissolved oxygen $\geq$ 4 mg/L (Appendix C). If criteria are met, Lakes and reservoirs are classified as *Trout Maintenance* and they are classified as *Non-trout* if they are not met. The presence and amount of trout supporting water can vary from year to year, depending on air temperature and rainfall. Shallow lakes, particularly those less than 50 feet deep, often have little or no trout supporting water during the summer due to anoxic conditions in their colder bottom waters and warm surface waters. (Federal Grant F-48-R, Project I)

Tilcon Lake (40^{o}54'30.7"N 74 ^{o} 45'49.4"W) was formed when the Musconetcong River breached its banks during severe flood events in the early 2000's and water from the river inundated a former quarry creating the lake. The lake is approximately 50 feet deep at its deepest point. The lake is not specifically listed in NJ's SWQS and therefore assumes a *Non-trout* classification by default because it is over five acres. A temperature/dissolved oxygen profile conducted in the summer of 2007 documented the presence of trout supporting water. This data, and a recommendation for upgrade to FW2-TM, was submitted to the NJDEP Bureau of Water Quality Standards and Assessment in 2011. Data collected in 2013 and 2014 also support an upgrade to *Trout Maintenance* (Table 6).

TABLE 6.— Summary of 1 temperature & dissolved oxygen profile conducted during the summer months on lakes in 2014. Results page number references in *2014 Investigations & Management of NJ's Freshwater Fisheries Resources Report*.

Waterbody (County)	Current surface water classification	Depth (ft) of water capable of supporting trout [a]	Recommended classification change	Page
Upper Delaware Region (Upper Delaware & Wallkill)				
Tilcon Lake	FW2-NT	19 - 43	FW2-TM (recommended in 2011 based on 2007 data)	B3

[a] Depth measured from the surface; criteria for trout supporting water: water temperature $\leq$ 21ºC and dissolved oxygen $\geq$ 4 mg/L.

HABITAT RESTORATION AND TECHNICAL ASSISTANCE

Conservation and Restoration of Fish Habitat

In order to protect New Jersey's critical aquatic resources, fisheries biologists provide input on a number of land use projects each year. Coordinated through the Division's Bureau of Environmental Review, this input is directed towards minimizing land use change impacts to the state's fisheries resources. This is typically accomplished through the use of timing restrictions during critical fish spawning periods, protection of riparian buffers, and project modification, assuring best use practices are implemented at all times. However, at times a more in depth review and comments are necessary on specific projects. (Federal Grant F-48-R, Project II)

In 2014 staff also provided technical assistance related to stream restoration and dam removal projects, as described below.

Burnt Meadow Brook - A plan to enhance in-stream fish habitat on a privately-owned section of Burnt Meadow Brook, a *Trout Production* stream in Passaic County, was reviewed. Wild Brook and Brown Trout inhabit this stream. The designed plan includes the excavation and deepening of 5 pools with associated point bars and enhanced riffles over 216 linear feet of stream to improve fish habitat and sediment transport through the reach. The landowner secured a NRCS *EQUIP* grant for this project (which also includes a 25' buffer riparian planting) and construction is planned for 2015.

Great Swamp - Prepared and submitted comments on the Great Swamp Draft Conservation Plan and Environmental Assessment.

Mason's Run Stream Habitat Improvement - Attended the annual meeting for the Pine Hill Conservation Management Team. The group has elected to proceed with having a private consultant (Urbani Fisheries) complete a restoration project on Mason Run to improve trout habitat in the stream's headwaters. The project is currently in the permitting stage and will also address the sedimentation issues which have impacted the stream for many years. The trout population has been severely impacted by excessive sedimentation in recent years and should greatly benefit from these enhancements.

Merrill Creek Stream Connectivity Restoration - An onsite inspection was jointly conducted with Merrill Creek Reservoir (MCR) staff to assess the five check dams on upper Merrill Creek (above the reservoir). These habitat enhancement devices were originally installed when the reservoir was constructed (26 years ago) as mitigation for loss of stream habitat when the stream was permanently inundated by the reservoir. The check dams are periodically refurbished by MCR staff when they deteriorate. As part of the Bureau's assessment of all 36 streams regulated as *Wild Trout Streams*, a 150 m reach of upper Merrill Creek was electrofished in early September. The results of this survey were disturbing as no wild trout were found. One of the check dams was within this survey reach (see photo on right; stream flowing from top to bottom of photo) and its condition and function suggested that it might no longer be appropriate for the stream. This prompted more thorough inspection of all five

check dams. It was determined that several of the check dams, primarily those installed in low gradient sections, are doing more harm than good by backing up too much water upstream of the device and retaining sediment, or by redirecting high flow into the adjacent stream banks and accelerating erosion and siltation. It was agreed that these devices should be removed and MCR staff will oversee this effort next year.

Musconetcong River Restoration Partnership (MRRP) – The Division has representation in the Musconetcong River Restoration Partnership. The current focus of the partnership is the removal of the Hughsville and Warren Glen dams. A federal grant has been secured by the Musconetcong Watershed Association for the removal of the Hughsville dam, the first impediment on the river upstream from the Delaware River now that two dams downstream have been successfully removed. Preliminary design work and sediment analyses have been completed, and an estimated 21,000 cubic yards of sediment that lies above the dam will need to be removed and properly disposed. It is anticipated that this dam will be removed within the next two years. The next dam upstream at Warren Glen is significantly larger than Hughsville dam, and there is an estimated 250,000 cubic yards of sediment trapped above the Warren Glen dam. The Warren Glen dam (partially owned by NJDFW) is a significantly higher dam (37 feet high) efforts to remove this dam are proceeding more slowly in part because of the magnitude of the project. Also discussed is the need for biological monitoring, particularly of the fisheries, because many of the grant proposals submitted for past and future dam removals cite anadromous fish restoration as key benefit of dam removals.

Musconetcong River Stream Habitat Restoration - Provided information on the need for/desirability of improving fish habitat in a section of the Musconetcong River within our WMA ("Wattles property" – managed by NJ Audubon) that is being considered for a NRCS *EQUIP* (Environmental Quality Incentives Program) grant. This project was subsequently approved for funding under this grant.

Paulins Kill Dam Removal - Attended a meeting related to the Columbia Lake dam to discuss progress and activities related to proposed dam removal. Other participants included representatives from The Nature Conservancy, Amy Greene Environmental, Burns & McDonnell (an engineering firm), NJDEP (Dam Safety and Office of Natural Resource Restoration), American Rivers, and Trout Unlimited. Provided insight on the fisheries present and subsequently provided a bathymetric (lake bottom contour) map of the lake from our files. The map will be helpful in the group's preliminary planning efforts determining the extent sediment deposition and sediment sampling locations and re-defining the stream channel through the lake. Although the owns the dam, the lease with the owner of a hydropower generation station at the dam will hinder dam removal.

Pequest River - Met with Division's Bureau of Lands Management and Warren County Mosquito Commission (WCMC) staff to jointly inspect a section of the Pequest River near the hatchery within the Pequest WMA. The Commission wanted to show us approximately 10 sites where natural woody material had accumulated in the stream channel, which they were willing to remove to improve stream flow and to reduce off-channel mosquito breeding areas. The small and large woody material (branches and tree trunks) at each were providing excellent habitat for fishes and macroinvertebrates, and since the material was not blocking stream flow, removal was not warranted.

Pohatcong Creek (Lower) - Attended an onsite meeting, arranged by Natural Resource Conservation Service, to review proposed stream restoration projects they may fund on the lower Pohatcong Creek in addition to Musconetcong River (Wattles property).

Raritan River South Branch Fertilizer spill - Site inspection at Harby Dan Farm along West Mill Road to investigate whether a liquid fertilizer spill that occurred on the farm impacted fish in South Branch of the Raritan River. No stressed or dead fish were noted, in fact one large Rainbow Trout was observed laying in a pool at the location in which the spill occurred just hours before. The pH was expected to spike, however that was not detected.

Fertilizer Spill Site

Tuckahoe Impoundments Dam and Flood Gate Renovation Project - Attended a meeting at the Tuckahoe Office, to discuss the rehabilitation of the Tuckahoe impoundment dams and flood gates. This project is a NAWCA grant awarded to Ducks Unlimited to restore the impoundments and management of waterfowl. Management practices utilized during the 1960's and 1970's also had benefits for warmwater fish species including Largemouth Bass and Yellow Perch. It is anticipated the project should restore a viable fish population to these waters. In spring 2014 a bathymetric survey of the ponds was created by Ducks Unlimited. Unfortunately this project was temporarily put on hold due to budget and staffing issues, but it is expected the project will move forward in the near future.

ANGLER USE ASSESSMENT

License Sales Database

An Access Database of the last 8 years fishing license and trout stamp sales database (since point of sale) was created to make accessing our license information more user friendly. Staff can now query the database more efficiently and look at trends about our fishing license buyers. Information such as the age of our fishing license or trout stamp buyers and when individuals purchase a fishing license or trout stamp have been pulled from the newly formatted database and displayed in graphs to help staff identify trends to assist with future sales of fishing licenses and trout stamps. Where licenses buyers and trout stamp buyers live in the state has also been analyzed through Arc GIS software to assist with identifying geographic trends in an attempt to further assist staff and pinpoint areas to focus our outreach efforts. In the end, a more useful database was created allowing staff to access information to focus outreach efforts by better understanding who are our constituents and where are our constituents located and what their license buying trends may be. (Hunter & Angler Fund)

Opening Day Trout Angler Survey

The Division's trout stocking programs provide Garden State anglers with many opportunities to fish for trout throughout the year. Under Fish and Wildlife's spring stocking program, nearly 200 streams, ponds, and lakes throughout the state are stocked with 570,000 trout annually. The opening day of the trout season each April is greatly anticipated by anglers, who flock to these waters to fish for trout on this eventful day. To assess angler turnout and success on this important recreational day, angler counts, and interviews are conducted on various trout-stocked waters. Information on angler participation and satisfaction is used to assess trout stocking and make program changes. (Federal Grant F-48-R, Project III)

Since 2004 the Division's Wildlife Conservation Corps (WCC) volunteers have provided a valuable service by assisting with the collection of angler data on *Opening Day*. Each volunteer is assigned a trout-stocked water and provided with written instructions on how to conduct the survey, data forms, and information about their assigned waterbody. Volunteers also are asked to submit digital pictures of anglers fishing, catching fish, and holding up their catch for display, as well as a panoramic view that would be indicative of the angler turnout. Not only do the volunteers obtain much needed information regarding trout angler activity, but their visible presence has also reaped several unexpected benefits. For many anglers, this is often their first contact with a Division representative. Anglers are generally willing to provide information about their fishing experience, and many are pleased to see that Fish and Wildlife is taking an active role in managing the waterbody they are fishing. The WCC volunteers that participate have also had positive experiences, with several commenting that this was their first opportunity to assist the Division and they had fun doing it. In 2013 Fish & Wildlife began funding this survey under the Sport Fish Restoration Program (Federal Grant F-48-R, Project III) and the volunteer hours are used as state matching funds.

The Opening Day of the 2014 trout season was Saturday, April 5th and the angler survey was conducted on this day, from 8 a.m. – 12 p.m. The 30 WCC volunteers who participated spent 139 hours working on this survey and several staff also participated. Of the 37 surveys conducted and completed, 33 were on lakes and ponds. The table below is arranged by total

number of anglers counted. On the 33 lakes and ponds surveyed, 1,830 anglers were observed fishing (an average of ~55 anglers per waterbody).

List of lakes where the Opening Day Trout Angler Survey was conducted in 2014.

County	Waterbody	BB[1]	Total # of Anglers	Total # of Trout Caught
Atlantic	Birch Grove Park Pond	**X**	201	9
Essex	Verona Park Pond	**X**	161	105
Morris	Burnham Park Pond	**X**	138	55
Camden	Oak Pond		97	-
Bergen	Dahnert's Lake	**X**	93	71
Hunterdon	Amwell Lake	**X**	89	6
Cumberland	Shaws Mill Pond	**X**	88	125
Burlington	Crystal Lake [2]	**X**	82	4
Gloucester	Greenwich Lake		69	0
Sussex	Lake Ocquittunk		67	31
Gloucester	Iona Lake		64	30
Camden	Rowands Pond		62	102
Salem	Schadler's Sand Wash Pond[2]		58	81
Atlantic	Hammonton Lake		49	30
Middlesex	Manalapan Lake		47	16
Mercer	Rosedale Lake[2]		41	3
Gloucester	Swedesboro Lake		41	0
Monmouth	Holmdel Park Pond		38	47
Monmouth	Englishtown Mill Pond		35	59
Middlesex	Roosevelt Park Pond		35	4
Gloucester	Harrisonville Lake		31	13
Cumberland	South Vineland Park Pond		30	25
Passaic	Barbours Pond		30	18
Ocean	Prospertown Lake		29	8
Gloucester	Grenloch Lake		27	69
Ocean	Lake Shenandoah[2]		26	1
Warren	Blair Lake		22	43
Mercer	Colonial Lake		22	0
Cumberland	Mary Elmer Lake		18	1
Atlantic	Heritage Park Pond[2]		14	1
Warren	Mountain Lake		8	2
Salem	DOD Lake		8	0

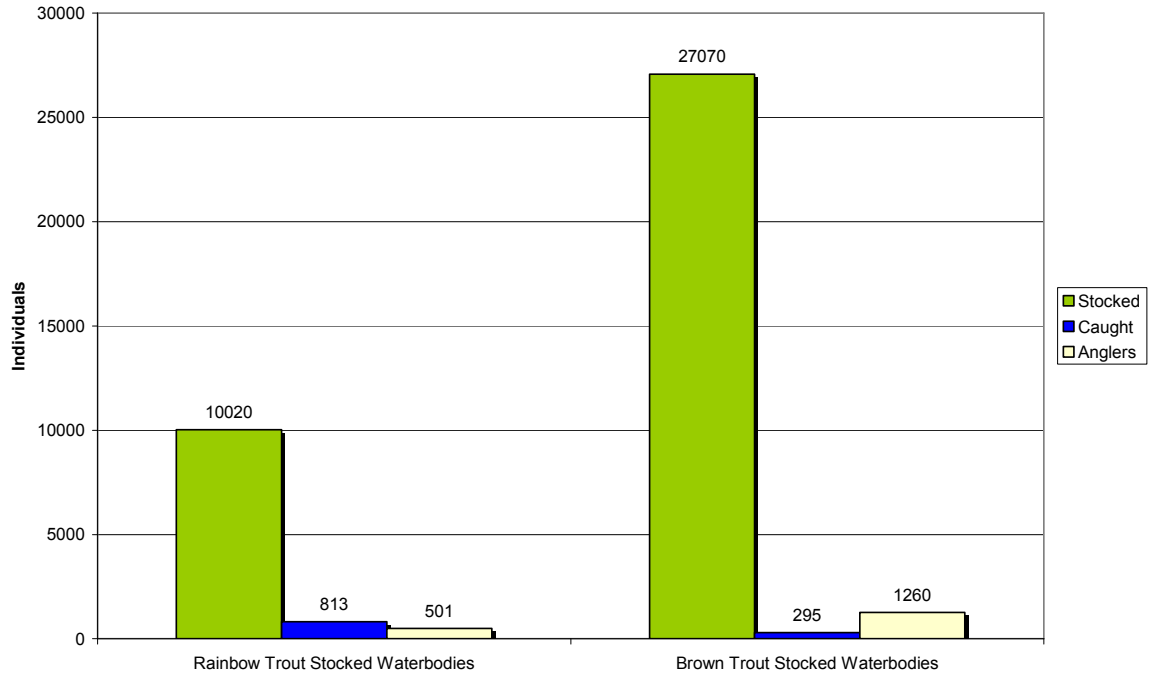
[1] Bonus Broodstock Waterbodies

[2] Angler counts were not conducted from 8a.m. - 12p.m.(refer to appendix for details)

The 33 waterbodies surveyed on Opening Day in 2014 were stocked with either Rainbow Trout or Brown Trout prior to Opening Day. This provided an opportunity to compare return to creel for these two trout species. In a study conducted in 2012 and 2013, in which both Rainbow and Brook Trout were stocked prior to opening day in eight ponds, Rainbow Trout were caught far more frequently than Brook Trout. The 2014 results indicated that Rainbow Trout gave anglers a better return to creel on lakes and ponds surveyed compared to those surveyed that were stocked with Brown Trout. Of the 10,020 Rainbow Trout stocked in 12 waterbodies surveyed, 813 Rainbow Trout were caught (8.11%) and of the 27,070 Brown Trout stocked in 20 waterbodies surveyed, just 295 Brown Trout were caught (1.09%) (see figure below). In addition, considering fishing pressure on lakes stocked with just Brown Trout was more than double (1,260 anglers counted on waterbodies stocked with Brown Trout compared to 501 anglers counted on waterbodies stocked with Rainbow Trout), it polarizes the comparison between Rainbow Trout and Brown Trout fishing success even further. In general, waterbodies stocked with Rainbow Trout had higher rates of "Trout Caught/Angler" and "Percent of Allocation Caught" (percent of allocated trout caught).

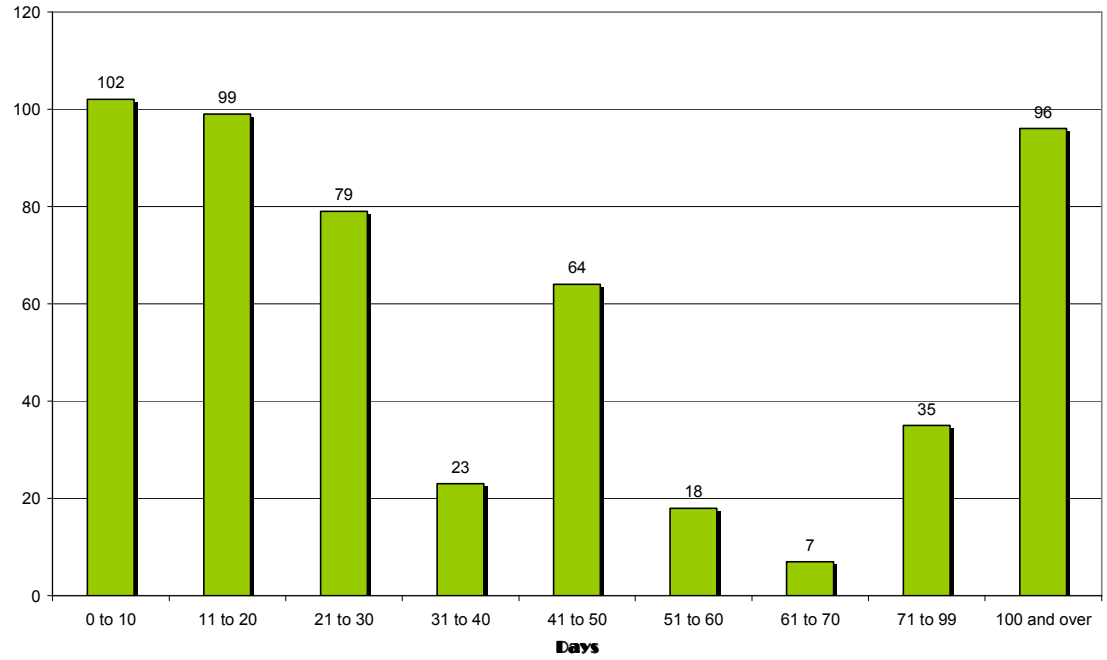
2014 trout species allocations compared to fishing effort. With less fishing pressure (501 anglers utilizing angler counts) and less Rainbow Trout stocked, Rainbow Trout still gave anglers a much higher return to creel than Brown Trout. 8.11% of the Rainbow Trout allocated were caught compared to only 1.09% of the Brown Trout allocated during the Opening Day Angler Survey.

2014 Trout Stocked vs Fishing Pressure

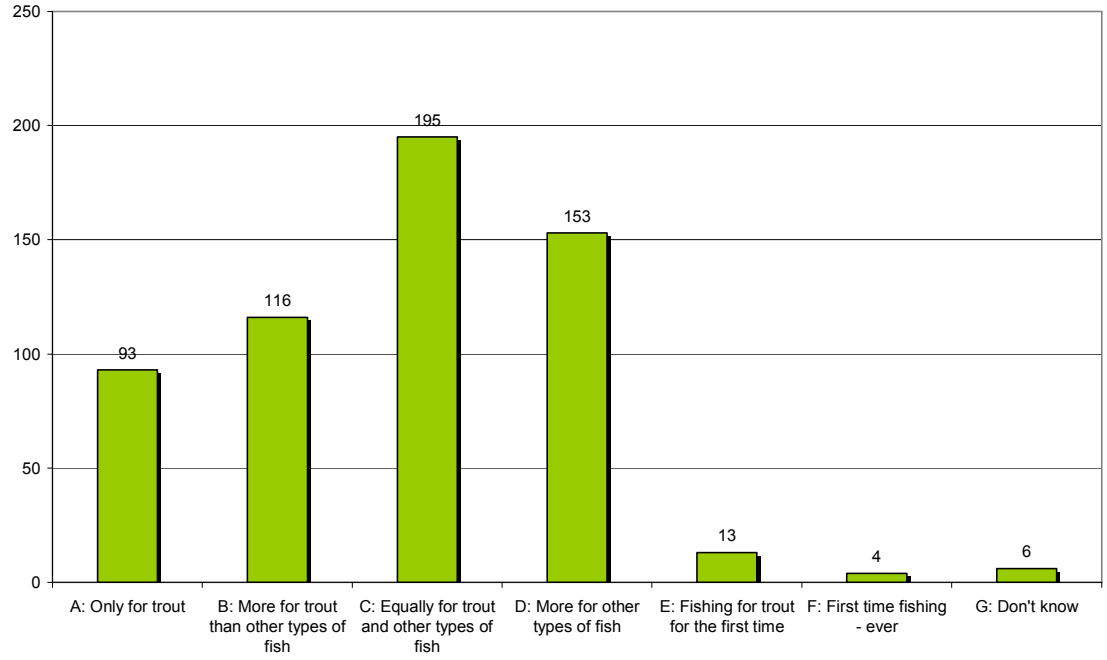


In 2014 anglers fishing select waterbodies on Opening Day were asked specific questions regarding their general fishing habits. The questions asked, and their responses were as follows:

1. How many days do you freshwater fish in NJ?



2. When freshwater fishing in New Jersey do you fish.....



Answers to these survey questions revealed that many types of anglers utilize the resource during opening day, not just anglers that fish one time a year, or anglers that fish only for trout, but a

broad spectrum of anglers find opening day appealing. This information provides additional insight into the importance of our trout stocking program to all anglers who purchase a license.

The complete report with additional data (i.e. stream surveys, complete discussions, angler survey questions) for the 2014 Opening Day Trout Angler Survey can be found in **Appendix I**. (Federal Grant F-48-R, Project III)

Trout Angler Logbook Program

NJDFW utilizes a logbook (diary) program to obtain current information regarding trout angler catch and effort on special regulation areas on trout streams. Logbooks have been distributed annually since 2012 to experienced anglers who indicate they regularly fish one or more of the areas being studied. They record information about fish harvested or released during each trip, as well as time spent fishing and gear used. At the end of the calendar year anglers return their logbooks to NJDWF and the data is then compiled and analyzed during the following calendar year. Compared to other survey methods, angler logbooks are one of the least expensive ways to collect information on a fishery. Data collected through angler logbooks supplement other data collected by NJDFW (such as Opening Day angler surveys, telephone and internet-based surveys, on-site angler creel surveys, fish population surveys using electrofishing gear, and water temperature monitoring). Collectively, this data aids in evaluating the fishery and guides managers and stakeholders in making informed decisions that benefit both the resource users and the resource. (Federal Grant F-48-R, Project III)

In 2013 the logbook program was expanded from three to seven special regulation trout fishing areas, and the logbooks were redesigned so anglers could use one logbook to record fishing trips taken to any of seven areas. The special regulation areas targeted in 2013 were:

Year Round Trout Conservation Areas (*YTCA*)

- S/Br. Raritan River – Ken Lockwood Gorge
- S/Br. Raritan River – Claremont Stretch
- Musconetcong River – Point Mtn.
- Toms River

Seasonal Trout Conservation Areas (*STCA*)

- Pequest River
- Pequannock River

Fly Fishing Area (*FFA*)

- Big Flat Brook/Flat Brook

In 2013 a total of 103 anglers participated in this logbook program and 120 logbooks were distributed (some anglers needed more than one logbook to record all their trips). Despite efforts to encourage logbook returns only 19 anglers (18%) returned their logbooks. The 2013 logbook data is presented in the table below and summarized below.

Collectively the 19 logbook anglers logged 384 trips to 6 of the 7 special regulation trout fishing areas. The Ken Lockwood Gorge on the S/Br. Raritan River was by far the most common

destination, with 168 logged trips (44%), followed by the Pequest River (92 trips, 24%), and the Big Flat Brook/Flat Brook (70 trips, 18%). The remaining 54 trips (14% of total) were to the Musconetcong River (39 trips, 10%), S/Br. Raritan River – Claremont Stretch (8 trips, 2%), and Pequannock River (7 trips, 2%). No fishing trips were recorded for the Toms River. Anglers fished an average of 2.7 to 3.9 hours per trip; the highest average trip lengths were on the Gorge (3.9 hrs/trip), Big Flat Brook/Flat Brook (3.9 hrs/trip), and Pequest (3.8 hrs/trip). The logbook data includes trips that were taken to the *STCA*'s and the *FFA* at times when the special regulations were not in effect. Interestingly, fly fishing gear was used by anglers on all but one trip (this data is not shown in the table).

Logbook anglers recorded a total catch of 2,695 trout. Catch and release fishing was practiced all the time, or nearly so; anglers recorded 2,574 trout released (96%) and failed to indicate if the remaining 121 trout were kept or released. The catch rate averaged 1.9 trout/hr, and ranged (by special regulation area) from 1.1 – 2.5 trout/hour. The average number of trout caught per trip was 7.0, and by special regulation area ranged from 3.0 – 9.3 trout/trip. The highest catch rates (per hour and per trip) occurred in the *STCA* on the Pequest River. The lowest catch rates were observed on the Claremont *YTCA* (1.1 trout/hr and 3 trout/trip), most likely because the area is not trout-stocked (the trout fishery there relies upon wild Brook and Brown Trout reproduction). The average size of trout caught (results not provided in the table) was 254 mm (10 in) and they ranged in size from 76 mm (3 in) (in the Ken Lockwood Gorge) to 711mm (28 in) (in the Pequest River).

Of the total trout caught, anglers recorded the species for 98% (2,660 trout). Overall Rainbow Trout were caught most frequently (55%), followed by Brown Trout (30%) and Brook Trout (15%). Rainbow Trout were more frequently caught in 4 four of 6 special regulations areas: Musconetcong YTCA (72%), Big Flat/Flat (59%), Pequest STCA (58%), and S/Br. Raritan – Gorge (49%). Very few rainbows (4%) were caught in the Claremont *YTCA* (S/Br. Raritan River) and Brown Trout were caught slightly more often than Brook Trout (54% vs. 42%). This is not surprising since trout are not stocked in the Claremont *YTCA* (trout fishery is dependant upon wild Brown and Brook Trout reproduction). In the Pequannock *STCA*, which is stocked with Rainbow Trout and has a reproducing wild Brown Trout population, browns were caught slightly more frequently (51%) than Rainbow Trout (46%).

Anglers were also asked to note if the origin of each trout they caught was wild, stocked, or unknown. This assessment is very subjective and can be difficult since a decision is based primarily upon fin wear and also influenced by fish coloration. Anglers reported catching 11% wild trout and 57% stocked trout. Nearly one third of the trout caught (32%) were of "unknown" origin, indicating anglers had difficulty in determining fish origin. For example, anglers fishing in the Pequest *STCA*, where trout are stocked (and naturally reproduced trout are absent, or nearly so), only 26% of the trout were considered stocked and the remainder (74%) were origin unknown (no trout were considered wild).

However, anglers appeared to be more confident in distinguishing between wild and stocked trout when fishing areas having populations of wild trout. In the Claremont YTCA (wild Brook and Brown Trout present, and not trout-stocked) none of the trout were considered "unknown origin; 92% were deemed wild and 8% were stocked (trout are stocked upstream of and downstream from this *YTCA*). On the Pequannock *STCA*, where wild Brown Trout and stocked

Rainbow Trout co-inhabit, about half the fish were wild and the other half were stocked (no "unknown" origin trout). In the Gorge *YTCA*, which is trout-stocked and where an increasing prevalence of wild trout (primarily browns, but also rainbows and brooks) has been documented, a majority of trout (72%) were considered stocked, 20% were wild, and 8% were unknown origin. The results for the Big Flat Brook/Flat Brook (trout-stocked and wild Brown and Brook Trout are present, but sparse) followed a somewhat similar trend (79% stocked, 2.2% wild, 19% unknown).

Summary of fishing trip and catch statistics for 19 anglers who participated in the 2013 Trout Angler Logbook Program which targeted 7 special regulation trout fishing areas.

Total number of trips	Hours per trip	Number of trout caught by species[1]				Total trout caught	Number of trout caught by origin			% wild caught	Number of trout caught per	
		BKT	BNT	RBT	UNK		Wild	Stocked	UNK[1]		Hour	Trip
S/Br. Raritan River – Ken Lockwood Gorge (Year Round Trout Conservation Area)												
168	3.9	146	432	544	11	1,133	231	812	90	20%	1.7	6.7
Pequest River(Seasonal Trout Conservation Area)												
92	3.8	164	194	484	16	858	0	221	637	0%	2.5	9.3
Big Flat Brook / Flat Brook (Fly Fishing Area)												
70	3.9	35	114	222	38	409	9	322	78	2%	1.5	5.8
Musconetcong River – Point Mtn. (Year Round Trout Conservation Area)												
39	3.1	42	24	168	0	234	4	160	70	2%	2.0	6.0
S/Br. Raritan River – Claremont Stretch (Year Round Trout Conservation Area)												
8	2.7	10	13	1	0	24	22	2	0	92%	1.1	3.0
Pequannock River (Seasonal Trout Conservation Area)												
7	2.9	1	19	17	0	37	18	19	0	49%	1.9	5.3
Toms River (Year Round Trout Conservation Area)												
0	0	0	0	0	0	0	0	0	0	0	0.0	0.0

[1] BKT = Brook Trout; BNT = Brown Trout; RBT = Rainbow Trout; UNK = unknown (trout species or origin).

In 2014 logbooks were prepared and distributed to 58 anglers who indicated they regularly fish the seven stream sections described above. A new special regulation (*Catch & Release Area*) went into effect in 2014, which replaced the *Fly Fishing Area* regulation on the Big Flat Brook/Flat Brook and the *YTCA* regulation on the Ken Lockwood Gorge. The 2014 logbook data (compiled in 2015) will be used to help evaluate this regulatory change.

INFORMATION AND EDUCATION

In addition to a multitude of research and management activities, the Bureau of Freshwater Fisheries actively participates in a number of Information and Education activities each year. Several such as two annual Fisheries Forums, a Public Trout Meeting, and biennial Public Hearing are directly tied to research and management activities and promulgation of regulations governing the state's freshwater aquatic resources. In addition, Bureau staff actively participates in the preparation of the Freshwater Fishing Digest. The Freshwater issue of the Digest is perhaps the most widely distributed publication throughout the Department.

Professional Meetings/Conferences

New Jersey participates in a number of regional initiatives geared towards the protection of the nation's freshwater fisheries resources. As such, state fisheries biologists participate in a number of regional panels and workshops to share information and experiences with biologists in other states on a variety of topics in the realm of fisheries management.

Eastern Brook Trout Joint Venture (EBTJV) Meeting - Attended an EBTJV meeting held at the USFWS National Conservation Training Center in Shepherdstown, WV. EBTJV is a recognized Fish Habitat Partnership operating under the National Fish Habitat Action Plan. Since its inception in 2005, the EBTJV has coordinated range wide Brook Trout conservation and habitat restoration efforts through a collaborative, multi-agency approach. EBTJV partners (17 states, federal agencies, and NGO's) periodically meet to work, both collectively and in workgroups, on strategies and on-the-ground actions to improve water quality and restore Brook Trout habitat and populations. At the meeting, the status of EBTJV's fine-scale mapping of Brook Trout occurrence at the catchment scale (using data supplied by state fisheries agencies) was reviewed. An overview of the National Fish Habitat Partnership's Data Management System, which will house the authoritative datasets for the 19 Partnerships nationwide, was presented. The Appalachian LCC-sponsored Riparian Restoration and Climate Changer Adaptation Planning Support Tool was officially released. Scientists also presented current Brook Trout research, modeling efforts, and decision support tools. This species is receiving a lot of attention due to its recreational importance, exceptional indicator of water quality/stream health, significant declines in distribution and abundance, and as an indicator of climate change. (Federal Grant F-48-R, Project I & II)

Public Presentations

Each year state fisheries biologists attend meetings of a variety of organizations which may include angling clubs, watershed groups, local planning boards, and sportsmen shows. (Hunter & Angler Fund)

In 2014, presentations on the fisheries resources within the state were presented to:

2013 North Jersey Fisheries Forum – The North Jersey Fisheries Forum was held on December, 2013. Fish pathologist, Jan Lovy, provided an update on the furunculosis outbreak at the Pequest Trout Hatchery. Chris Smith presented highlights of bass management work completed throughout the state as well as highlights of other sampling activities.

2014 South Jersey Fisheries Forum – The South Jersey Fisheries Forum was held on February 22, 2014 at the Batsto Visitor's Center. Chris Smith presented highlights of bass management work completed throughout the state as well as highlights of other sampling activities. Jeff Matthews presented information on furunculosis at the Pequest Trout Hatchery. 42 anglers attended the annual forum. A number of questions on a variety of topics were answered.

2014 Trout Meeting – Regional fisheries biologists attended the 2014 Trout Meeting held at Centenary College on March 7. 84 anglers were in attendance. Dr. Jan Lovy presented information on furunculosis and the situation at the Pequest Trout Hatchery. Biologist Ross Shramko provided information on the modified 2014 stocking program. Staff responded to concerns and inquiries from anglers concerning the modified 2014 stocking program.

DeSales University Electrofishing Demonstration – Biologists Shawn Crouse and Scott Collenburg performed a backpack electrofishing demonstration for DeSales University professor Joseph Colosi and his General Ecology class on the Pohatcong Creek in Warren County on April 22.

Palatine Lake Association – Biologist Chris Smith attended meeting on July 9th with the Palatine Lake Association and a presented a power point presentation on recent fisheries management activities and general fisheries management.

Round Valley Trout Association – Biologist Shawn Crouse prepared and presented a PowerPoint presentation at Round Valley Trout Association's meeting held on March 20. Information provided included important dates, upcoming Division events, current research and management of Round Valley Reservoir.

Public Events

Every year the Division holds an annual **Open House** at the Pequest Trout Hatchery and Natural Resource Education Center, prior to the opening of trout season. Each year thousands of people of all ages come to the hatchery to see the trout that are raised, and participate in many activities including kids fishing, shooting sports, fisherman's flea market, and much more. Staff assist in a number of facets including assisting at the Fishing Education Pond, providing demonstrations on the stripping an fertilization of eggs, providing fish for the kiddie pool, and answering questions from the general public. (Hunter & Angler Fund)

The **New Jersey WILD Outdoor Expo** is an event celebrating the state's bountiful natural resources and rich outdoor heritage. The event was held on September 13 and 14, 2014, from 10 a.m. to 5 p.m. daily at the Colliers Mills Wildlife Management Area in Jackson Township, Ocean County. The Expo is an annual event which is free of charge and takes place rain or shine. The WILD Outdoor Expo is hosted by the NJDEP Division of Fish and Wildlife, Division of Parks and Forestry, the Green Acres Program and the Conserve Wildlife Foundation of New Jersey. The event also has several sponsors, and exhibitors and vendors from the field of outdoor recreation were on site. The Expo helps people connect with the natural world by providing a unique blend of conservation information, education and hands-on opportunities to learn outdoor skills and activities. Numerous environmental and conservation exhibits, demonstrations and seminars are planned for the weekend. Visitors can learn about, and try, a wide array of activities including fishing, hiking, shooting sports, kayaking, camping skills, rock climbing, wildlife watching and much more. (Hunter & Angler Fund)

Attended the 11th **Annual NJ Teen Angler Event**, July 19, 2014 at the Pequest Hatchery Fishing Education Pond. Sixty-six Teen Anglers enjoyed the day. Not as many trout were caught as in past years. The trout may have become more wary due to the increased number of fishing classes during the week. Pete Antoniewicz, member of the Delaware River Fishermen's Association donated many lures, tackle, 2 tackle boxes & 2 Pocket Fishermen to the 2014 raffle. Some of the older teens skipped the new rod /reel combos donated by National Teen Anglers & some of the parents, preferring instead to choose 4 lures as their prize. Folsom Corporation, Mahwah, NJ donated 12 pairs of polarized sunglasses. Some of the parents also donated food for lunch. Quite a few prizes, including rod/reel combos, were left over for next year's raffle. The 12th annual event is scheduled for July 18, 2015. (Hunter & Angler Fund)

Union County's 2014 BioBlitz was held at Ash Brook Reservation and Golf Course and Oak Ridge Golf Course on June 14th. The fish team, lead by New Jersey Department of Environmental Protection, Division of Fish and Wildlife, sampled the Ash Brook and a small pond on Ashbrook golf course. Unfortunately, Robbinson's Branch and Pumpkin Patch Brook could not be sampled, due to high-water conditions from a previous rain event. The team used a variety of sampling methods including electro-shocking (using mild electrical currents to temporarily stun the fish for easy capture and identification) and seining. The fish diversity is moderate, consisting of 13 common species, with Blacknose Dace, Creek Chub, Common Shiner, Banded Killifish, and Tessellated Darter most prevalent. Other species found include American Eel, Eastern Mudminnow, Redfin Pickerel, Pumpkinseed, Bluegill, Golden Shiner, White Sucker, and Mosquitofish. All but the Bluegill and Western Mosquitofish are native to New Jersey waters. The warmwater fish assemblage encountered provides recreational opportunities for anglers, consisting primarily for sunfish. The fish team also conducted one waterfront public presentation, consisting of a fish collection demonstration by means of the use of a backpack electrofishing unit. The presentation also touched upon the job of a fisheries biologist, a summary of fishes encountered, and field identification. (Hunter & Angler Fund)

Bluegill (top)
Pumpkinseed (bottom)

OTHER FISHERIES RELATED ACTIVITIES

Permits

The Bureau of Freshwater Fisheries reviewed and issued 458 permits in 2014 to provide for the effective management and protection of the state's aquatic resources (see table below). These permits encompass 11 specific permits which include commercial harvest of aquatic species, water level management (for the protection of aquatic species), the introduction of aquatic species into waters of the state as well as the collecting of aquatic species for scientific purposes and special use permits. These permits and their review and approval not only include protection for freshwater fish, but also protection for other aquatic species such as frogs and turtles during critical spawning and hibernating periods. In addition to permits directly issued by the Bureau, the BFF also reviews Aquatic Use Permit Applications issued by the Department's Pesticide Control Program for the use of copper in waters known to be stocked or inhabited with trout. Trout are particularly sensitive to copper which is a basic agent for algal control treatments (copper sulfate) throughout the state. (Hunter & Angler Fund)

Permits issued by the Bureau of Freshwater Fisheries in 2014.

Permit Type	Number Issued
Baitfish - Commercial	5
Fish Stocking	136
Trout in the Classroom Fish Stocking	32 new
Gill Net – Staked - Commercial	0
Gill Net – Drifting - Commercial	0
Green Frog / Bullfrog -	8
Haul Seine - Commercial	1
Miniature Fyke/pot	2
Scientific Collecting	59
Snapping Turtle - Commercial	77
Special Use Limited License	27
Water Lowering	143
Total	**458**

Wildlife Management Area Fishing Tournament Permits

The popularity of recreational and tournament bass fishing was elevated to a new level during the 1960's. In an effort to unite bass anglers nationwide Ray Scott created the Bass Anglers Sportsmen Society (B.A.S.S). The goal of BASS was to emphasize conservation, education, and sportsmanship. Since 1996 the Division of Fish and Wildlife has required a permit to hold fishing tournaments on Wildlife Management Area Lakes. Permits are necessary to regulate the number of tournaments held on WMA Lakes, due to an increasing demand on our public waterbodies. The Division collects valuable information from tournament reports to supplement existing fisheries data. (Hunter & Angler Fund)

In 2014 there were 207 WMA Tournament Permits issued by the Division. This is a 32% increase from the 156 permits issue in 2010. The increase can be attributed to the addition of Salem Canal to the permitting requirement following the construction of the WMA boat ramp in 2011. Additionally, dam failures and reconstruction projects have increased utilization of a few WMA Lakes. The four most popular waters in 2014 were Union Lake (38 tournaments), Salem Canal (36 tournaments), Lake Assunpink (34 tournaments) and Stone Tavern Lake (15 tournaments). The largest bass reported to date was a 6.98 pound Largemouth from Lake Assunpink.

The tournament report forms are a vital component of the tournament permit process. The return rate has been rather poor in the last couple years. In 2014 only 24% of reports have been received. Notifications will be sent in attempt to acquire more data. It appears that the system needs to re-evaluated in order to operate efficiently and obtain necessary data.

Database Management - FishTrack

FishTrack is an Access database which houses New Jersey's freshwater fisheries stocking information and field survey data collected by NJDFW throughout the state, historically through present day. In 2014 the Field Datasheet for stream surveys was updated to improve efficiency when recording field data and when inputting data into *FishTrack*. The Main Report was also updated by adding a Species Summary Page. This page summarizes each survey by species and indicates the minimum and maximum length for each species when lengths were recorded. In addition to these changes, a Young-of-the-Year check box was added to the database so that once data is inputted it can later be quickly determined if an individual fish collected during a survey was identified as a young-of-the-year. All the trout data in *FishTrack*, including historical trout data dating back to the 1950's, was reviewed and the young-of-the-year box was checked for trout (either for individual fish or as a group, when individual lengths were not specifically recorded) where appropriate. For many surveys which had trout length data, a length-frequency graph was created to determine the age of the trout surveyed. Maintaining an accurate and consistent database is critical, because this gives staff biologists the ability and confidence to appropriately manage the state's fisheries resources. (Federal Grant F-48-R, Project I)

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