INVESTIGATIONS AND MANAGEMENT OF NEW JERSEY'S FRESHWATER FISHERIES RESOURCES

2013

State of New Jersey
Division of Fish and Wildlife
Bureau of Freshwater Fisheries
Research and Management Unit

NEW JERSEY DIVISION OF
Fish and Wildlife

State of New Jersey

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Governor

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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

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INTRODUCTION

Highlights for 2013

In 2013 The Bureau of Freshwater Fisheries Research and Management Unit conducted 200 surveys at 98 different waterbodies throughout the state to address a variety of recreational and resource management needs and in response to emerging fisheries issues.

The year began with close monitoring of 11 freshwater coastal lakes that suffered the wrath of Hurricane Sandy in 2012. Record setting high tides inundated these freshwater ecosystems with saltwater, sediment, and debris. After the storm, salinity levels of the lakes exceeded 0.5 parts per thousand (ppt) which resulted in kills of freshwater fish. Salinity levels were monitored over time and, 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.

An ambient water temperature monitoring network was established on streams having trout fisheries that are recreationally important or of conservation interest. A total of 29 thermographs (instruments that continuously monitor temperature) were deployed on 17 recreationally important trout streams and 5 small streams having populations of wild brook trout. The temperature data will be used to assess current temperature conditions, evaluate long term trends, determine if ambient water quality is consistent with surface water quality standards, and aid in the management of coldwater (trout) fisheries in these streams.

Of the 200 surveys conducted in 2013, 40 were stream surveys. Of the 40 stream surveys, 24 were utilized to assess and/or determine the classifications of classify New Jersey's fresh waters. The state's surface classification 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. Data confirmed existing surface classifications on 14 stream segments. In addition, 26 temperature and dissolved oxygen profiles were conducted on 17 lakes classified as trout maintenance to identify the extent of trout supporting water (water temperature $\leq$ 21ºC and dissolved oxygen $\geq$ 4 mg/L). The data will be utilized not only to confirm existing waterbody classifications but also towards managing waters for existing or potential trout fisheries and trout stocking programs.

In September (2013) the Pequest Trout Hatchery experienced trout mortality due to furunculosis, a fish disease caused by the bacterium *Aeromonas salmonicida salmonicida*. This was the first time in the hatchery's 31 year history that the disease had been documented. This bacterium is considered an obligate pathogen, meaning it requires a fish host in order to survive. The outbreak resulted in the Division euthanizing almost 21,000 trout scheduled to be stocked within. Since the hatchery water discharges into the Pequest River, a popular trout-stocked stream, electrofishing was conducted along the river to obtain trout for analysis. 100 trout were analyzed and all tested negative for furunculosis. However, one trout collected upstream of the hatchery tested positive for another fish pathogen, IPN (Infectious Pancreatic Necrosis). Although these pathogens are not harmful to humans, they are of concern because they are capable of causing

mortality in trout held in captivity (hatchery) and in the wild (stocked trout and naturally occurring wild trout).

The year also marked the commencement 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. The focus in 2013 was developing sampling techniques and protocols for assessing Muskellunge, which are stocked in ten waterbodies statewide.

Warmwater fisheries assessments of popular species such as Largemouth and Smallmouth Bass surveys were completed at 35 waterbodies. Of the 35 assessments conducted, 24 assessed the status of the fisheries, 7 assessed the success of previous stockings, 2 evaluated existing regulations, and 2 assessed the impacts of saltwater intrusion on fisheries in coastal lake. As a result of these surveys, fish were stocked in 9 waterbodies to supplement and enhance their existing fisheries. Two more impoundments are scheduled to be stocked in 2014.

In addition to the substantial effort devoted to conducting numerous aquatic assessments, this year also marks the first time for an online angler survey. Developed in conjunction with a telephone survey of trout anglers in 2012, the online survey targeted trout anglers and covered topics including, but not limited to, gear and bait preferences, how often and how many trout are kept per trip, usage and preference of trout conservation areas, participation in and satisfaction with the fall and winter trout stocking programs, along with preferences for trout species and creel limits related to the fall trout stocking program. The online survey information, coupled with additional angler utilization and fisheries surveys, resulted in important regulatory changes in 2014 on two of the state's most popular trout fisheries.

Surveys conducted in 2013 also assessed native fishes, invasive fishes/aquatic plants, coldwater fisheries (wild Brook Trout and Lake Trout), anadromous fishes, and trout anglers.

In addition to the highlights just mentioned, this report describes a host of other field work and activities conducted by the Bureau's Research and Management Unit staff. 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 perform countless tasks that help maintain and enhance New Jersey's freshwater fisheries resources. The Bureau's work is funded by both the dedicated monies of Hunter and Anglers Fund and the Sport Fish Restoration Program. A site list of field surveys conducted in 2013 and a location map is presented in a subsequent section in this report entitled "2013 Field Sampling Locations" (in Table 1, Figure 2).

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.

The Bureau of Freshwater Fisheries is responsible for the propagation, protection, and management of the State's freshwater fisheries resources as well as promoting its recreational use. In addition to raising and distributing over 3.5 million fish annually, the Bureau conducts research and management surveys, classifies the state's waterways, provides technical input on a variety of watershed and habitat based issues, facilitates habitat restoration projects, serves as a liaison 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 also administers approximately 600 permits annually to provide for the effective management and protection of the State's aquatic resources.

Organizationally, the Bureau is divided into two units; the Fish Culture Unit, responsible for the raising of 19 species of fish and the stocking of over 300 waterbodies each year, and the Research and Management Unit, responsible for the protection and management of the aquatic resources throughout the State.

The Fish Culture Unit is comprised of the Pequest Trout Hatchery and the Charles O. Hayford Hatchery in Hackettstown. The Pequest Trout Hatchery raises and stocks over 725,000 brook, brown, and rainbow trout each year during the spring, fall, and winter trout stocking programs. Pequest also provides brown trout for the Division's elusive Sea Run Brown Trout program in the Manasquan River. The Hackettstown Hatchery raises 15 species of freshwater fish with over 1,500,000 million released each year throughout the state. The hatchery also supplies county Mosquito Control Commissions, under the direction of the State Mosquito Control Commission, with sunfish, killifish, and Gambusia to assist with the Commission's efforts for effective mosquito control. Both the Pequest and Hackettstown Hatcheries are in operation 24 hours a day, 7 days a week.

Research and Management Unit

The Research and Management Unit has personnel in two regionally placed offices: Lebanon Field Office (Hunterdon County) and the Southern Regional Office (Camden County). This unit 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 research projects each year.

The Research and Management Unit 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 Research and Management Unit also administers permits for fish stocking, water lowering, commercial harvests, and scientific collecting to further provide for the effective management and protection of the State's aquatic resources.

For management purposes, the State is divided into six regional watershed management areas (Figure 1). Due to current staffing shortages vacant management regions have been subdivided and reassigned to remaining biologists. The mainstem Delaware River region is vacant. In addition to regional responsibilities, each biologist also has a specific area of expertise and oversees related research and management programs. The Division also has a fish pathologist, Dr. Jan Lovy, who works closely with the Bureau of Freshwater Fisheries.

Mark Boriek – Principal Fisheries Biologist
Passaic Region (Passaic, Hackensack, and Hudson) and Upper Atlantic,
General Fisheries Management, and Anadromous Fish Management

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

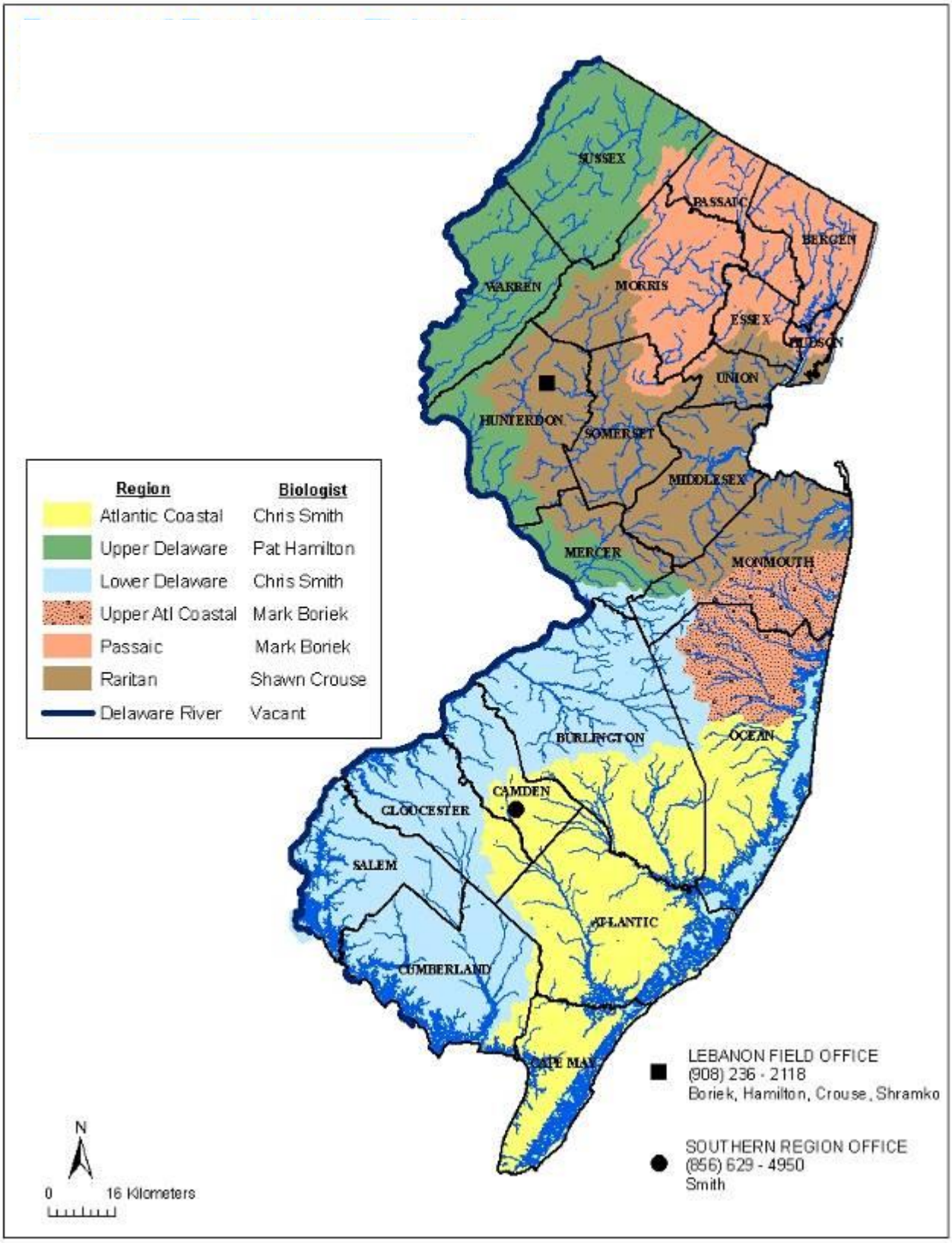
Chris Smith – Principal Fisheries Biologist
Southern Region (Lower Delaware & Lower Atlantic Coastal),
Warmwater Research & Management, and Invasive Species

Shawn Crouse – Principal Fisheries Biologist
Raritan Region (Raritan, Arthur kill, Raritan Bay, Shrewsbury, & Navesink),
General Fisheries Management, and Native Fishes

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

Scott Collenburg - Wildlife Worker
General Fisheries Surveys, Warmwater Assessment, and Opening Day Angler Survey

FIGURE 1. NJDFW, Bureau of freshwater Fisheries – 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 permits and through a Federal excise tax on the manufacturing of hunting and fishing related equipment. This includes both the Bureau's fish culture operations and research and management activities. 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 $5 million dollars to the Division each year. Of this, 2.5 million is allocated to the Bureau of Freshwater Fisheries to operate its two state-of-the-art fish culture facilities, the Pequest Trout Hatchery and the Hackettstown Hatchery, and to support the state's freshwater research and management efforts. The remaining funds are used to fund other activities within the Division such as 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 2013 the Bureau of Freshwater Fisheries requested $1,132,805 from the Sport Fish Restoration Program. Of this amount, $900,000 was allocated to the Bureau's fish culture operations to support put-take-grow (delayed harvest) fish stocking programs under Federal Grant F-50-D (grant budget cycle January 1, 2013 – December 31, 2013). The remaining $232,805 was allocated to Bureau's research and management activities conducted under Federal Grant F-48-R (grant budget cycle November 1, 2012 – October 31, 2013). Unfortunately, due to declining revenues in the Sport Fish Restoration Program this one-year budget for Federal Grant F-48-R was later cut by 25% to $174,616 during 2013.

The five-year agreement for Federal Grant F-48-R was renewed for the period November 1, 2012 – October 31, 2017. As part of that renewal process the grant was restructured to give the Bureau the ability to initiate new activities in response to changing needs without having to request modifications to the grant. The restructuring also improved the grant's compatibility with new USFWS's reporting requirements using TRACS, an online data management system for tracking wildlife and sport fish restoration grants. Federal Grant F-48-R now is now

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 the activities conducted under each project, during the period November 1, 2012 – October 31, 2013, 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. Anadromous Fisheries Assessment
2. Cessation of Trout Stocking in Trout Production Streams Assessment
3. Coolwater Fisheries Assessment
4. Database Management – *FishTrack*
5. Electrofishing Safety Plan
6. Inventory of Trout Production Streams
7. Lake Inventory
8. Lake Trout Population Assessment
9. Special Regulation Trout Area Assessment
10. Stream and Lake Assessments for Surface Water Classification
11. Temperature Monitoring in Streams
12. Trout Supporting Status of Trout Maintenance Lakes Assessment
13. Wild Brook Trout Assessment

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. Online Trout Angler Survey
2. Opening Day Trout Angler Survey
3. Trout Angler Logbook Program

TABLE 1. 2013 field sampling locations.

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

● Funding source or reason of data collection
▲ Data are applicable to additional projects

	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation Trout Stkg (I)	Special Reg. Trout Assessment(I)	Coolwater Assessment (I)	Invasive Species (II)	Species Management (I)	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Southern Region (Lower Delaware River and Lower Atlantic Coastal)																
Alloway Lake (Salem)												▲			NA	33
Cooper River Lake (Camden)								▲				●	▲		NA	34
DOD Lake (Salem)												●	▲		NA	34
East Creek Lake (Cape May)												●			NA	34
Hilliards Creek (aka Millard Ck UNT) (Camden)								●								46
Lake Audrey (Cumberland)												●			NA	35
Makepeace Lake (Atlantic)												●	▲		NA	36
Maskells Millpond (Salem)												●			NA	36
Mason's Run (Camden)														●	NA	61
Newton Lake (Camden)								●		●		▲	▲		NA	50
Parvin Lake (Cumberland)												●	▲		NA	37
Salem Canal (Salem)												●			NA	38
Shaws Mill Pond (Cumberland)												●	▲		NA	38
Silver Lake (Gibbsboro, Camden)								●							NA	46
Stafford Forge Impoundments (Ocean)												●	▲		NA	38
Stephan's Lake (Atlantic)												●	▲		NA	38
Stewart Lake (Gloucester)										●					NA	50
Stone Tavern Lake (Monmouth)												●			NA	38
Sunset Lake (Cumberland)										●					NA	50
Union Lake (Cumberland)										●		●	▲		NA	39,50

TABLE 1. 2013 field sampling locations (cont.).

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

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	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill)																
Assunpink Lake (Monmouth)												●	▲	●	NA	33,60
Barkers Mill Brook					●								▲		✓	A2
Beerskill			●	●	●								▲		✓	A3
Big Flat Brook				●											NA	55
-Between Rt. 206 and Rt. 560 bridge	▲					●							▲		✓	A-4
-Upstream of Blewett Tract (station #2)	▲					●							▲		✓	A-5
-Upstream of Blewett Tract (station #1)	▲					●							▲		✓	A-6
Brass Castle Creek					●								▲		✓	A-7
Culvers Lake (Sussex)	▲			●								▲	●		NA	B-2,42
Delaware River																
-Kittatinny Boat Launch													●		NA	42
-Route 46, below Paulinskill confluence													●		NA	42
-Route 46, King Cole Restaurant													●		NA	42
-Route 611 and Frost Hollow Road													●		NA	42
-Route 611, 1200m ups Bushkill Ck.													●		NA	42
-Route 611, 700m ups Bushkill Ck.													●		NA	42
-Phillipsburg Boat Launch													●		NA	42
-Riegelsville Bridge piers								▲					▲	●	NA	46

TABLE 1. 2013 field sampling locations (cont.).

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

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	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill) (cont.)																
Delaware River (cont.)																
-Kingwood Boat Launch													●		NA	42
-River Road and Fairview Road													●		NA	42
-Delaware River (cont.) -Byram Boat Launch													●		NA	42
Flat Brook	▲			●		●							▲		✓	A-8,22
Forked Brook			●												✓	
Furnace Lake							●								NA	31
Grinnell Lake (Sussex)													●		NA	42
Lake Hopatcong (Morris/Sussex)	▲			▲					●				▲		NA	B-3,32
Livingston Ponds Brook	▲	●	●										▲		✓	A-9
Mercer Lake (Mercer)												●	▲		NA	34
Morris Lake (Sussex)	▲			●											NA	B-5
Mountain Lake							●								NA	31
Musconetcong River				●							●		▲		NA	24,40
Paulinskill River				●											NA	24
Paulinskill River (trib.) (Stillwater Station)			●		●								▲		✓	A-10

TABLE 1. 2013 Field Sampling Locations (cont.).

NEW JERSEY DIVISION OF Fish and Wildlife

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	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill) (cont.)																
Pequest River				●											NA	24
-Alphono Road										●			▲		-	50
-Johnsonburg Road										●			▲		-	50
-Long Bridge Road										●			▲		-	50
-Pequest Hatchery Road										●			▲		-	50
-Pequest Furnace Road										●			▲		-	50
Pequest River (trib.) (Petersburg)	▲	▲	●										▲		✓	A-16
Pohatcong Creek				●											NA	24
Saffin Pond (Morris)												●	▲		NA	37
Shimers Brook	▲				●								▲		✓	A-17
Silver Lake (Warren)	▲			●											NA	B-6
Spring Mills Brook	▲				●								▲		✓	A-18
Stephensburg Creek				●											NA	24
Tilcon Lake (Morris)	▲			●											NA	B-7
Tuttles Corner Brook	▲		●		●								▲		✓	A-19
Wallkill River				●											NA	24
Walkill River (trib.) (Ogdensburg)	▲	●											▲		✓	A-20
Walkill River (trib.) (Sparta)	▲	●	●										▲		✓	A-21
Waywayanda Lake (Sussex)	▲			●											NA	B-8

TABLE 1. 2013 Field Sampling Locations (cont.).

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

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	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Upper Delaware Region (Upper Delaware & Wallkill) (cont.)																
White Lake (Hardwick) (Warren)	▲			●											NA	B-9
White Lake (Sparta) (Warren)	▲			●											NA	B-10
Willow Crest Lake (Sussex)												●	▲		NA	39
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic																
Bear Swamp Brook	▲		●										▲		✓	A-22
Beaver Brook (Morris-Rockaway)	▲		●										▲		✓	A-23
Boonton Reservoir (Morris)	▲			●											NA	B-11
Burnt Meadow Brook																
-Fire Road	▲		●										▲		✓	A-24
-Colfax Drive	▲		●										▲		✓	A-25
-Magee Road	▲		●										▲		✓	A-26
Burnt Meadow Brook (trib.) (Harrison Mtn. Lake Outlet)	▲		●										▲		✓	A-27
Burnt Meadow Brook (trib.) (Lake Sonoma Outlet)	▲		●										▲		✓	A-28
Charlotteburg Reservoir (Passaic)	▲			●											NA	B-12
Clarks Pond (Essex)												●	▲		NA	34
Edgemont Memorial Park Pond (Morris)												●			NA	35
Fox Brook	▲		●										▲		✓	A-29

TABLE 1. 2013 Field Sampling Locations (cont.).

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

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Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic (cont.)																
Franklin Lakes Nature Preserve Lk (Bergen)												●	▲		NA	35
Green Pond (Morris)	▲			●											NA	B-13
Greenwood Lake (Passaic)	▲			●											NA	B-14
Greystone Psychiatric Hospital Lower Pond (Morris)												●	▲		NA	35
Greystone Psychiatric Hospital Upper Pond (Morris)												●	▲		NA	35
Hedden Park Lake (Morris)												●	▲		NA	35
Hewitt Brook	▲		●										▲		✓	A-30
Hewitt Brook (trib.) (outlet of Green Turtle Lk.)	▲		●										▲		✓	A-31
Lake Sonoma	▲			●								●	▲		NA	B-15
Manasquan River				●											NA	24
Metedeconk River, N/BR				●											NA	24
Metedeconk River, S/BR				●											NA	24
Mill Brook (Morris)																
-Mill Brook Road Bridge					●								▲		✓	A-32
-Palmer (Franklin) Road Bridge					●								▲		✓	A-33
Monksville Reservoir (Passaic)	▲			●									●		NA	B-16
Pequannock River				●											NA	24

TABLE 1. 2013 Field Sampling Locations (cont.).

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	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Rockaway River				●											NA	24
Ramapo River (trib) (Oakland)	▲		●										▲		✓	A-34
Ramapo River				●											NA	24
Russia Brook (trib.) (S of Mt. Paul)	▲		●										▲		✓	A-35
Scarlet Oak Pond (Bergen)	▲			●											NA	B-17
Sheppards Lake (Passaic)	▲			●											NA	B-18
Silas Condit Park Pond (Morris)												●	▲		NA	38
St. Paul's Monastery Lake (Morris)	▲			▲								●	▲		NA	B-19
Sunrise Lake (Morris)												●	▲		NA	39
Toms River				●											NA	24
Wanaque River				●											NA	24
Woodcliff Lake (Hudson)												●	▲		NA	39
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)																
Black River				●											NA	24
Best Lake (Somerset)												●	▲		NA	34
Capoolong (Cakepoulin) Creek	▲												▲	●	✓	A-36
Carnegie Lake (Mercer)							●					●	▲		NA	31
Carteret Park Pond (Middlesex)													▲	●	NA	31
Farrington Lake (Middlesex)												▲	●		NA	42

TABLE 1. 2013 Field Sampling Locations (cont.).

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

● Funding source or reason of data collection
▲ Data are applicable to additional projects

	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (cont.)																
George Lake (Morris)												●	▲		NA	35
Hooks Creek Lake													▲	●	NA	30
Kays Pond (Morris)												●	▲		NA	35
Lamington River	▲												●		✓	A-37
Lenape Park Lake (Union)												▲	▲	●	NA	71
Millstone River																
-Griggstown Causeway													▲	●	✓	A-38
-Blackwells Mills													▲	●	✓	A-39
-Wilhousky St. – downstream of dam								▲					▲	●	NA	A-40
-Wilhousky St. – upstream of dam													▲	●	NA	A-41
Nelson Lake (Middlesex)												●	▲		NA	37
Nomahegan Brook																
-below Lower Echo Lake Park Pond													▲	●	NA	A-42
-Lenape Park -end of Nomahegan Drive													▲	●	NA	A-43
Orange Reservoir (Essex)												●	▲		NA	37
Pike Run	▲												▲	●	✓	A-44
Rahway River																
-Springfield Ave.													▲	●	NA	A-45
-Kenilworth Blvd.													▲	●	NA	A-46

TABLE 1. 2013 Field Sampling Locations (cont.)

NEW JERSEY DIVISION OF Fish and Wildlife

Bureau of Freshwater Fisheries
2013 Field Sampling Activities

● Funding source or reason of data collection
▲ Data are applicable to additional projects

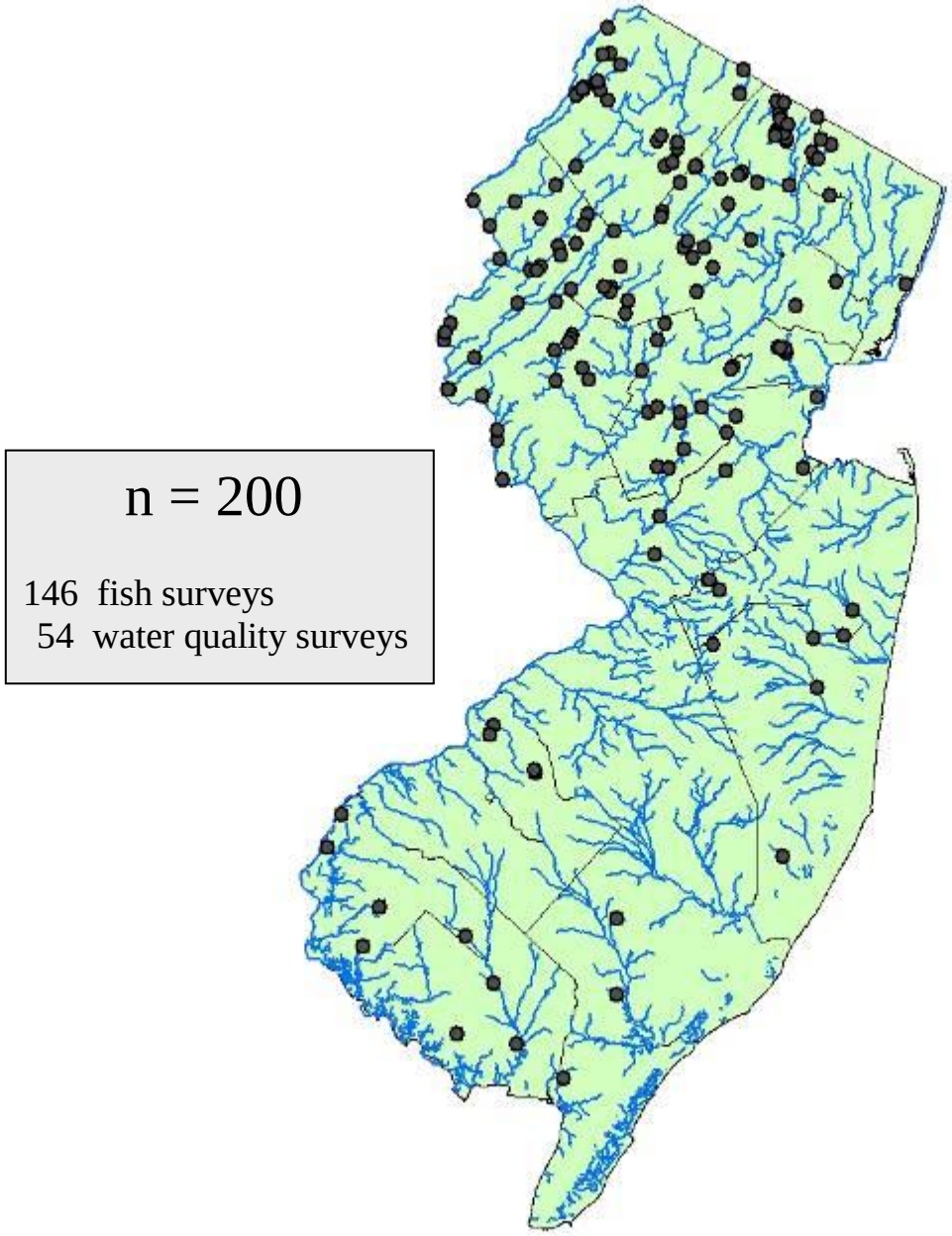
	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (cont.)																
Raritan River																
-Dukes Island State Park													●		NA	43
-Old York Road near Woodmere St.													●		NA	43
-Dukes Parkway													●		NA	43
-Main Street Bridge													●		NA	43
-Landing Lane Bridge													●		NA	43
Raritan River, N/Br. (trib.) (Leone Pond)																
-upstream of disturbed site													▲	●	✓	A-47
-disturbed site													▲	●	✓	A-48
Raritan River, N/Br.				●												24
Raritan River, S/Br.				●												24
-Claremont Stretch - Old Stocking Point	▲					●							▲		✓	A-49
-Claremont Stretch - Fiber Optic Cross	▲					●							▲		✓	A-50
-Ken Lockwood Gorge - Boulder Field	▲					●							▲		✓	A-51
-Ken Lockwood Gorge - Below Trestle	▲					●							▲		✓	A-52
Rockaway Creek, S/Br.																
-above trestle	●												▲		✓	A-53
-below trestle													▲	●	NA	A-54

TABLE 1. 2013 Field Sampling Locations (cont.)

	Federal Grant F-48-R (Project I or II)											Hunter &Angler Fund				
	Classification (I)	Inventory of Trout Production Streams (I)	Brook Trout Assess. (I)	Temp. / DO Monitor. (I)	Cessation of Trout Stkg (I)	Special Reg. Trout Asses.	Coolwater Assessment (I)	Invasive Species (II)	Species Management	Fish Health (II)	Anadromous (I)	Warmwaterr Fisheries Asstessment	Native Fishes	Miscellaneous	RBA Stream Sampling Protocol Applied*	Results Page #
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink) (cont.)																
Rockaway Creek, S/Br. (trib.) (E of Lebanon Field Office)													▲	●	NA	A-55
Round Valley Reservoir (Hunterdon)									●				▲	●	NA	19
Turkey Brook				●											NA	
Watchung Lake (Somerset)												●	▲		NA	37
Westfield Pond (Union)												▲	▲	●	NA	68
Wilhoughby Brook				●											NA	

** 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.*

FIGURE 2. Field sites sampled in 2013 by NJDFW, Bureau of Freshwater Fisheries.



COLDWATER FISHERIES

Cessation of Trout Stocking in Trout Production Streams Assessment

NJDFW discontinued stocking trout in eight small trout production streams during the period 2005 – 2010. This management action was taken to protect New Jersey's wild trout resources, particularly Brook Trout, the only salmonid native to New Jersey, and to better utilize hatchery trout in waters not having self-sustaining trout populations. In 2013 these eight streams were surveyed at sites where surveys had been conducted previously (prior to 2002) to provide comparative data. Two of the streams surveyed in 2013 no longer had wild Brook Trout (Barkers Mill Brook and Shimers Brook) and the wild Brook Trout populations in two other streams (Beerskill and Tuttles Corner Brook) were considered fragile due to low abundance. Restoration (translocation of wild fish/habitat enhancement) was recommended for these four streams. For the four remaining streams (Brass Castle Creek, Mill Brook, Paulins Kill tributary, and Spring Mills Brook) no action or, in some cases, consideration of special trout fishing regulations were recommended. The results of this study are summarized below (Table 2); more detailed information for each stream can be found in the referenced Appendix pages. (Federal Grant F-48-R, Project I)

TABLE 2. Trout production streams surveyed by NJDFW in 2013 to evaluate cessation of trout stocking.

Stream	County	2013 survey date	Wild trout species present/status	Trout management recommendations	Results page number
Barkers Mill Brook	Warren	8/9/13	none	Assess water quality/habitat for potential brook trout restoration (translocation of wild fish)	A2
Beerskill	Sussex	8/14/13	brook/fragile	Assess water quality/habitat for potential brook trout restoration	A3
Brass Castle Creek	Warren	8/9/13	brown/stable	Continue current strategy (no stocking); determine brook trout status in other catchments	A7
Mill Brook (Mill Bk Rd)	Morris	8/8/13	brown/stable	Continue current strategy (no stocking); consider special trout fishing regulations	A32
Mill Brook (Palmer Rd)	Morris	8/8/13	brown/fragile	Continue current strategy (no stocking)	A33
Paulins Kill Tributary (Stillwater Station) AKA Roy Spring Brook	Sussex	8/16/13	brook/stable	Continue current strategy (no stocking); consider special trout fishing regulations	A10
Shimers Brook	Sussex	8/19/13	none	Assess water quality - potential brook trout restoration (translocation of wild fish)	A17
Spring Mills Brook	Hunterdon	8/2/13	brown/stable	No change - continue current strategy (no stocking)	A18
Tuttles Corner Brook	Sussex	8/16/13	brook/fragile	Assess water quality/habitat to determine if habitat restoration or enhancement will increase brook trout abundance	A19

Inventory of Trout Production Streams

Waters used by trout for spawning and nursery areas are classified as *Trout Production* under the state's Surface Water Quality Standards. New Jersey has nearly 200 *Trout Production* streams and most of these are small tributaries and headwaters of larger rivers in the northern part of the state. Wild, naturally reproducing trout are important indicators of healthy ecosystems, requiring superior water quality and pristine habitat. Despite the protection that state regulatory programs afford *Trout Production* waters, ongoing changes in land use have impacted these coldwater fisheries populations. In particular native Brook Trout have declined dramatically over the last century due to land use changes which have affected the quality of their habitat.

Trout Production streams are periodically surveyed (on average once every 20 years) to assess the status of their wild, naturally reproducing trout populations. The surveys are conducted using established protocols which include electrofishing a 150 m reach, physicochemical measurements, and the EPA Rapid Bioassessment for habitat (with regional modifications) (Barbour et al. 1999) (Appendices C and D). The data collected through these surveys are evaluated to determine if population changes have occurred and to develop management strategies to protect this fragile resource. The data are also used by the Eastern Brook Trout Joint Venture (a National Fish Habitat Partnership) as part of a range wide effort to conserve and manage brook trout in the eastern U.S.

In 2013 four Trout Production streams were surveyed (Table 3). Wild Brook Trout continue to inhabit 3 of the 4 streams surveyed (Livingston Ponds Brook, Wallkill River (Trib.) (Sparta), and Pequest River (Trib.) (Petersburg). Wild Brown Trout previously documented in Livingston Ponds Brook when last surveyed in 1990 were not present in 2013. One stream (Wallkill River (Trib.) (Ogdensburg)) where wild Brook Trout were previously documented (1991) was devoid of trout in 2013. (Federal Grant F-48-R, Project I)

TABLE 3. Inventory of trout production streams – 4 surveys conducted in 2013 by NJDFW.

	2013			Prior to 2013	
Watershed & Stream Name	Survey Date	Reproducing Trout Species	Results Page #	Survey Date	Reproducing Trout Species
Delaware River Watershed					
Pequest River (Trib.) (Petersburg)	9/12/13	brook	A16	8/1/91	brook
Wallkill/Pochuck River Watershed					
Livingston Ponds Brook (Vernon)	7/26/13	brook	A9	7/26/90	brook & brown
Wallkill River (Trib.) (Ogdensburg)	9/5/13	none	A20	8/28/91	brook
Wallkill River (Trib.) (Sparta)	9/5/13	brook	A21	7/1/92	brook

Lake Trout Population Assessment

Lake trout (*Salvelinus namaycush*) fisheries exist in two waterbodies within New Jersey, Round Valley Reservoir and Merrill Creek Reservoir. Surplus lake trout have been periodically stocked into Monksville Reservoir from 2004 - 2012, however it did not develop into a significant fishery and surplus lake trout are no longer stocked there.

Round Valley Reservoir has a Lake Trout population in is surveyed each fall by the Division of Fish and Wildlife 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. Gillnet surveys are conducted every fall, when mature lake trout seek out suitable spawning habitat along the boulders lining the reservoir's dams. Eight experimental gillnets, each net with three varying mesh size openings, are used to capture a range of lake trout from juveniles to sub-adults (yielded 98 lake trout in 2013). Eight large-mesh gillnets (6" stretch mesh) are set near the reservoir's north and south dams to capture mature adult lake trout as they begin congregating to spawn over the rocky substrate (yielded 95 lake trout in 2013). Length and weight information is collected to assess physical condition of the fish using relative weight analysis. In addition, sex, finclips, and sexual development information are also recorded.

17 lb. lake trout captured in Round Valley Reservoir in 2013.

The 193 lake trout is the most collected in recent years. Unfortunately, the trend of decreasing numbers of large lake trout (>24 inches) coupled with increasing numbers of small lake trout (<24 inches) is resulting in a less desirable trophy lake trout fishery. Although large fish are still caught in our nets (2013 largest fish was 39.2 in. and 20.2 lbs.), they are becoming less common. Data will be analyzed and compared to lake trout data collected in previous years. The Division continues to encourage the harvest of lake trout from 15 to 24 inches, with the intention of achieving a more desirable fishery for trophy fish. (Federal Grant F-48-R, Project I)

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. The lake trout survey data collected in recent years has provided mounting evidence that the lakers were successfully reproducing and in 2013 the annual stocking of lake trout (which began in 1988) was discontinued. During the annual survey of the reservoir's lake trout fishery in 2013, conducted by the consultant over a three-day period (October 30 – November 1), 35 lake trout were captured, ranging in size from 240 – 767 mm (9.4 – 30.2"). Of these, 21 (60%) did not have fin clips. These results were similar to the 2012 survey results (35 lakers captured, 22 (63%) without finclips). Lake trout stocked in this reservoir were fin-clipped prior to their release (except for the first stocking in 1988) and the continued prevalence of unclipped fish indicates the lake trout are naturally reproducing and that stocking this species is no longer necessary.

Largest lake trout (11.4 lbs.) captured in Merrill Creek Reservoir in 2012.

Special Regulation Trout Area Assessment

Fishing regulation changes have been proposed for two special regulation trout areas – a 2.2 mile section of the Raritan River – South Branch known as the Ken Lockwood Gorge and a 4.1 mile section of the Big Flat Brook/Flat Brook having fly fishing regulations all or part of the year. The proposed regulation (catch & release, artificial lures and flies only, open year round) is intended to improve angler catch rates and satisfaction in these popular trout fishing areas. Electrofishing surveys have been conducted in the past at established locations within these special regulation areas. In 2013 these locations were surveyed (two in the Ken Lockwood Gorge, three on the Big Flat Brook, and one on the Flat Brook) to provide baseline information that will be used to evaluate the effect of the anticipated regulation change on these trout fisheries. In addition, surveys (2) were also conducted in one other special regulation area on the Raritan River – South Branch known as the Claremont Stretch to obtain current information on that stretch. (Federal Grant F-48-R, Project I)

Flat Brook/Big Flat Brook (Sussex) – The four sites on this stream that were previously electrofished in 2012 were surveyed again in 2013.. The Big Flat Brook (between Rt 206 & Rt 560 bridges), two sites upstream of the Blewitt Tract, and the Flat Brook, above the Roy Bridge. Similar to 2012, few trout wild or stocked were captured at any of the four sites. The Big Flat Brook, between Rt 206 & Rt 560 bridges yielded the most trout with only eight captured. No large trout were collected - the largest was a stocked rainbow trout, 309 mm (12.2 in). or young-of-the-year found. The water temperature was noticeably cooler this year compared to the surveys conducted at these locations last year.

Raritan River South Branch – Claremont Stretch (Morris) - The Claremont Stretch, a 1.1 mile section of the Raritan River South Branch, was surveyed to assess the fish assemblage and the current Year Round Trout Conservation Area regulations. Two surveys were conducted at locations routinely monitored every few years, last of which was in 2007. Know for relatively abundant wild brown and brook trout populations, only 24 brook trout were collected, which is a decline compared to the last survey in which 97

were collected. Slimy sculpin, another species highly intolerant of habitat or water quality degredation, experienced a similar trend dropping from 171 to 44. Brown trout increased from 129 to 162. This section of stream will continue to be monitored.

Raritan River South Branch – Ken Lockwood Gorge (Morris) –Two surveys were conducted at locations routinely monitored every few years, last of which was in 2006 and 2007. Recent data warrants the upgrade in NJ's Surface Water Quality Standards from "Trout Maintenance" to "Trout Production," with the presence of young-of -the-year (YOY) Brown Trout. Wild Rainbow Trout and Brook Trout were also found in lesser abundance. One wild tiger trout (brook and brown trout hybrid) measuring 6.7 inches was also encountered. Over the last three sampling events in 2006, 2007, and 2013, the total number of trout has increased from 96 to 126 to 212 respectively. When broken down by species, Brown Trout have increased in number from 84 and 73 to 150 in 2013, the Rainbow Trout have increased from 9 to 23 to 50, while Brook trout went from 30 to 2 to 11 respectively. The number of trout over 9 inches (general trout minimum size, although not applied on this Trout Conservation Area) has increased from 54 to 82 to 149 respectively. Although the number of trout over the minimum size limit of 15 inches has increased, from 0 to 2 to 6 respectively, there are still very few. This section of stream will continue to be monitored to determine the effect of the catch and release regulations.

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 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 must be renewed annually.

The 2013 monitoring network consisted of 17 recreationally important trout streams and 5 small streams having populations of wild brook trout (Table 4). 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. A total of 29 thermographs (Onset Hobo Pro v2) were deployed in 2013 to record temperature at 30 minute intervals year round. Water temperature data from 15 of 19 sites on major trout-stocked streams was analyzed and summarized. Unfortunately thermographs at four sites did not provide usable data for analysis. The 2013 data was analyzed and a summary report, entitled *2013 Stream Temperature Monitoring* can be found in Appendix G. One of the graphs from this report (Figure 3) illustrates the temperature issues that many of these trout streams experience during the summer months. This stream temperature monitoring program will continue at the current sites in 2014. Additional sites may be targeted

for monitoring, including the S/Br. Raritan River – Claremont Stretch. (Federal Grant F-48-R, Project I)

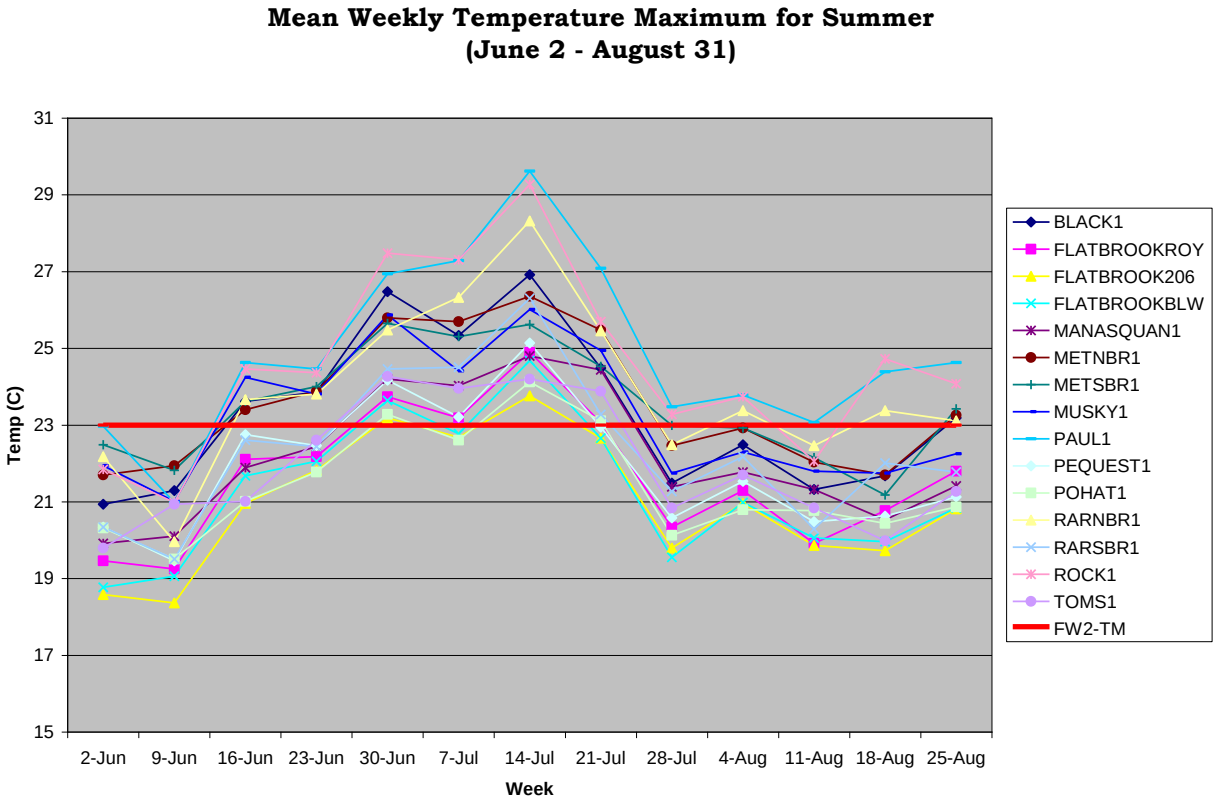
TABLE 4. Temperature monitoring network established in 2013 by NJDFW.

Stream	Site ID	Classification	Monitoring Type
Black River	BLACK1	Trout Maintenance	water
Big Flat Brook*	FLATBROOKBLW	Trout Maintenance	water
Big Flat Brook*	FLATBROOKROY	Trout Maintenance	water
Flat Brook*	FLATBROOK206	Trout Maintenance	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
Paulinskill	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	Trout Maintenance	water
Raritan River, N/Br.	RARNBR1	Trout Maintenance	water
Raritan River, S/Br.	RARSBR1	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

* Temperature monitoring initiated in 2012 at 3 sites on the Big Flat Brook/Flat Brook to assess potential trout regulation changes was continued in 2013.

** Thermographs deployed in the following streams experienced problems in 2013:
Pequannock River – Data screening revealed errors due to improper settings. Thermograph was given proper settings and reinstalled.
Ramapo River – Data screening revealed errors due to exposure to air. Thermograph was relocated to a more suitable location.
Wanaque River – Data screening revealed errors due to exposure to air. Thermograph was relocated to a more suitable location.
Wallkill River – Data screening revealed errors due to deep water and was moved to a more suitable location.

Figure 3. Graph depicts the 7-day rolling average of the daily average maximum temperature for each site monitored during summer weeks encompassing June 1 to August 31, 2013. The horizontal red line "FW2-TM" is the surface water standard that Trout Maintenance streams should not exceed.



Trout Stocking Allocations

Annually, the Division of Fish & Wildlife's Freshwater Fisheries Research and Management Unit 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. 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.

There were no changes to the Trout Formula methodology used to determine spring trout allocations for 2013. We are continuing to use a spring baseline of 570,000 trout to determine individual weekly allocations. A summary of trout stocked during 2013, by season and species is found in Table 5.

TABLE 5. 2013 Trout stocking summary by season/program.

Spring 2013 Trout Stocking Summary				
Species	Type	Avg. Length	Lbs.	# Fish
Rainbow Trout	Production	11.4"	118,696	197,181
	Broodstock	15.6" & 23.8"	4,473	1,927
Brook Trout	Production	11.0"	130,045	253,097
	Broodstock	16.5"	5,258	2,200
Brown Trout	Production	10.9"	86,818	158,363
	Broodstock	16.4" & 22.4"	7,680	2,065
		Totals	352,970	614,833
Fall 2013 Trout Stocking Summary				
Species	Type	Avg. Length	Lbs.	# Fish
Rainbow Trout	Production	14.5"	12,039	7,975
Brook Trout	Production	14.8"	19,185	12,005
		Totals	31,224	19,980
Winter 2013 Trout Stocked Lakes Program Summary				
Species	Type	Avg. Length	Lbs.	# Fish
Rainbow Trout	broodstock	15.2"	7,152	4,810

Trout stocking was suspended in 2013 for the following waterbodies:

Takanassee Lake (Monmouth) - The dam on Takanassee Lake was severely damaged from storms last October. Repairs on the dam were not completed before the 2013 trout stocking season. Takanassee Lake was not allocated any trout for 2013 and the fish usually allocated for Takanassee Lake were re-allocated among the rest of the trout stocked waters.

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. Biologists will continue to monitor salinity levels to determine if salinity levels have dropped sufficiently to allow trout stocking in 2014.

Stocking locations for streams & rivers are ever changing. For example, when ownership of the land along a trout stocked stream changes, stocking locations may be gained or lost from the trout stocking program. This can affect the total stream stocking mileage used to determine trout allocations, and may result in more or less trout stocked in a particular stream. In addition to the adding or dropping of stocking locations, general stream mile database corrections occur due to continued communication with the Lands Management Staff and the use of GIS mapping to assess stream mileage of trout stocked sections.

Trout Stocked Stream Mileage was updated on the following waters:

Musconetcong River (Warren / Hunterdon) - This section of the Musconetcong River trout stocking stream mileage was recalculated using GIS mapping technology and was increased from 12.6 miles to 13.3 miles. This 0.7 mile addition resulted in an increase of 1,210 fish in 2013.

Papakating Creek (Sussex) - The Papakating Creek trout stocking stream mileage was reduced from 3.4 miles to 1.25 miles due to the loss of a stocking location and recalculation of the total stream mileage based upon the remaining stocking locations. This 2.15 mile reduction resulted in a decrease of 810 fish in 2013.

Pohatcong Creek (Warren) - The Pohatcong Creek (below rt. 31) trout stocking stream mileage was recalculated using GIS mapping technology and was increased from 9.4 miles to 11.5 miles. This 2.1 mile addition resulted in an increase of 3,260 fish in 2013.

Whippany River (Morris) - The Whippany River (above Whitehead Rd.) trout stocking stream mileage was recalculated using GIS mapping technology and was increased from 1.1 miles to 1.5 miles. This 0.4 mile addition resulted in an increase of 180 fish for 2013.

Other Trout Allocation Changes:

Stony Lake (Sussex) - It was brought to our attention that there is no boating restriction on Stony Lake therefore; the boating restriction variable on Stony Lake used in the trout allocation formula in 2012 was changed to no boating restrictions on Stony Lake for 2013. This change results in a 20% increase in trout allocated for Stony Lake. The lake received 260 more trout than in 2012.

In September of 2013, furunculosis, a fatal disease affecting 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*. The disease is not transmissible to people. The disease was believed to have been 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. As a precaution, the hatchery also euthanized all trout in the pools/raceway system downstream of the affected raceway. In total, 21,000 were euthanized with carbon dioxide as a result of the outbreak. The outbreak resulted in no large three year old broodstock, or brown trout, for distribution during the fall stocking program. Additional biosecurity measures were implemented including significant increases in disease testing at the facility. (Hunter and Angler Fund)

Wild Brook Trout Assessment

Anthropogenic landscape changes and past management practices have negatively impacted New Jersey's freshwater resources. In particular, resulting land use changes have taken their toll on native Brook Trout populations. Of the four species of trout occurring within New Jersey, Brook Trout are the least tolerant of habitat degradation. Habitat alteration and fragmentation, diminished water quality, and non-native salmonids have contributed to the decline of wild Brook Trout in New Jersey. Wild populations of Brook Trout persist in less than half their original range in New Jersey, and in some watersheds the status of brook trout is unknown. They have been extirpated from 96 sub-watersheds within the state.

Wild brook trout.

NJ Division of Fish and Wildlife (DFW) actively participates in the Eastern Brook Trout Joint Venture, a unique partnership initiated in 2004 to unify range-wide efforts to protect, restore, and enhance aquatic habitat of Brook Trout in the eastern U.S. Through this partnership, a comprehensive assessment of the current status and resulting conservation plan was developed to help ensure the long-term viability of wild brook trout, not only in New Jersey but also across their entire native range.

In watersheds where the status of wild brook trout is unknown (Eastern Brook Trout Joint Venture's range-wide assessment) or poorly documented, streams are surveyed using established protocols (Appendix C). Physicochemical parameters measured include water temperature, dissolved oxygen, pH, alkalinity, conductivity, specific conductance, stream width, stream and depth, and substrate type. The EPA Rapid Bioassessment sampling habitat assessment protocol is also used to assess in-stream habitat and riparian conditions (Barbour et al. 1999) with regional modifications (Appendix D). The information collected is entered into *FishTrack*, (Fish and Wildlife's freshwater fish computerized database) and provided to the Eastern Brook Trout Joint Venture (EBTJV) partnership for range-wide mapping and planning purposes. NJDFW staff actively participates in EBTJV's planning activities. The information collected is also used to identify and prioritize NJ watersheds and streams for wild brook trout restoration. Appropriate projects will be initiated through partnerships with stakeholder groups (landowners and conservation organizations such as watershed associations and Trout Unlimited).

In 2013, twelve previously un-sampled sections of *Trout Production* streams in the Passaic River and Hackensack River drainages were surveyed to document the occurrence and distribution of wild Brook Trout (Table 6). Wild Brook Trout were present in only one survey, conducted on the mainstem of Hewitt Brook (Passaic County). Wild Brown Trout were present at two locations on the mainstem of Burnt Meadow Brook and are 2.3 km (1.4 miles) downstream of a documented wild brook trout population. No trout were found in the other nine surveys. This data is used by NJDFW and the Eastern Brook Trout Joint Venture to assess the status and health of wild Brook Trout populations at the catchment (smallest watershed) level. In addition,

wild Brook Trout were found at six additional locations, surveyed under a variety of other jobs and/or funding sources (Table 6). (Federal Grant F-48-R, Project I)

TABLE 6. Assessment and occurrence of wild brook trout in 2013.

Stream	Suvey Date	Reproducing Trout Species	Results Page #
Bear Swamp Brook	8/6/13	none	A22
Beaver Brook (Morris-Rockaway)	8/6/13	none	A23
Beerskill *	8/14/13	brook	A3
Burnt Meadow Brook (mainstem)			
Fire Road	8/5/13	none	A24
Colfax Drive	7/30/13	brown	A25
Magee Road	7/30/13	brown	A26
Burnt Meadow Brook (trib.) (Harrison Mtn. Lake Outlet)	7/30/13	none	A27
Burnt Meadow Brook (trib.) (Lake Sonoma Outlet)	8/5/13	none	A28
Fox Brook	7/25/13	none	A29
Hewitt Brook	7/23/13	brook	A30
Hewitt Brook (trib.) (Outlet of Green Turtle Lk)	7/23/13	none	A31
Livingston Ponds Brook *	7/26/13	brook	A9
Paulins Kill (trib.) (Stillwater Sta.) *	8/6/13	brook	A10
Pequest River (trib.) (Petersburg) *	9/12/13	brook	A16
Ramapo River (trib) (Oakland)	7/25/13	none	A34
Russia Brook (trib.) (S of Mt. Paul)	8/15/13	unknown	A35
Tuttles Corner Brook *	8/16/13	brook	A19
Wallkill River (trib.) (Sparta) *	9/5/13	brook	A21

* Data collected during surveys performed under other projects/funding sources.

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 is left is directly open to the ocean. As the timeframe for rebuilding is uncertain it has been removed from the Division's popular trout stocking program. In its place, Franklin Lake, West Long Branch will be stocked with trout.

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.

Silver Lake, Bradley Beach after Hurricane Sandy

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. After the storm salinity levels of the above lakes recorded in January ranged from 0.20 - 11.8 ppt (Table 7).

TABLE 7. Coastal lake salinity levels (ppt).

Date	Carteret Park Pond	Deal Lake	Fletcher Lake	Hooks Creek Lake	Lake Como	Lake of the Lillies	Silver Lake	Sunset Lake	Sylvan Lake	Wesley Lake
1/29/13	Not recorded	0.74	0.20	11.8	0.42	6.61	4.43	3.01	0.92	0.60
6/19/13	7.6	0.13	0.14	9.60	0.20	0.28	2.34	0.26	0.20	0.11

The severity of the fish kills varied with the salinity and the species. Deal Lake experienced large die-offs of Carp and to a lesser extent, Northern Pike. Some Largemouth Bass, Channel Catfish and sunfish survived. Lake of the Lillies and Sunset Lake suffered more extensive fish kills. In addition to extensive fish kills, Fletcher Lake, Lake Como, Sylvan Lake, and Wesley Lake were also infiltrated with large amounts of sand and debris. Future plans to dredge these waters are under discussion and restocking plans are currently on-hold.

Recovery of these waters will take time as most of these waters have little fresh water inputs to offset the elevated salinity levels. Some lakes only receive runoff via local storm drains. Fortunately, abundant spring rains n 2013 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 July 2013 Deal Lake, Sunset Lake, and Lake of the Lillies were able to be restocked.

Carteret Park Pond was intentionally drawn down, so that it could be flushed with freshwater supplied by municipal water. A shoreline seining survey yielded Pumpkinseeds, Golden Shiners and Koi. The pond was re-stocked with 568 Largemouth Bass (4" – 12"), 133 large Bluegills, and 87 Brown Bullheads (3" – 6").

Salinity levels at Hooks Creek Lake still remain elevated. A seining survey conducted in 2013 yielded only Banded Killifish, Mummichog, White Perch, and American Eel. These freshwater fish species can tolerate high salinity levels. Salinity levels will continue to be monitored in 2014. (Hunter and Angler Fund)

Coolwater Fisheries Assessment

The Coolwater Fisheries Assessment was initiated in 2013 to assess coolwater fisheries that are primarily 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 using trap nets during the spring when mature muskies congregate for spawning and are more vulnerable to capture. A total of five Muskellunge were captured (one each at Furnace Lake and Carnegie Lake, and three at Mountain Lake) and the results for each lake are summarized below. The use of trap nets and other sampling gear will be refined and expanded in the future to the other waterbodies where this species is stocked. (Federal Grant F-48-R Project I)

Furnace Lake (Warren) - Two South Dakota style trap nets were set for four days and checked on May 2, May 3, May 7, and May 8. One Muskellunge was captured during the effort and the most notable find was a healthy Black Crappie population. A total of eleven species were captured during the survey.

Mountain Lake (Warren) - Two South Dakota trap nets were set to fish for three days and checked on May 2, 3, and 7. Three Muskellunge were captured during the effort and the other most notable find was a healthy Black Crappie population. A total of ten species were captured during the survey.

Carnegie Lake (Mercer) - A total of 10 trap nets were set on Carnegie Lake from May 14 through May 17. Three to four trap nets were set daily and allowed to fish for approximately 24 hours. One Tiger Muskellunge was captured during the survey. Other than this fish, a total of 16 other fish species were captured during the survey. High catch rates of Brown Bullheads, White Crappie, and Black Crappie were observed. Sizes of Black Crappie and White Crappie were impressive with a good number reaching 9 or 10 inches. Bluegill and White Perch were also found to be very abundant.

Lake Inventory

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 base upon which to recognize future changes requiring remedial management efforts.

Electrofishing boat.

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 is analyzed and the 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.

In 2013, a comprehensive inventory of **Lake Hopatcong** (New Jersey's largest lake) was initiated and is scheduled to be completed by Spring of 2015. Reproduction checks were completed at Lake Hopatcong in Morris County on August 26th and 28th as part of the lake inventory. A total of 78 seining locations were sampled by two sampling crews. A total of 14 species of fish were collected including Largemouth Bass, Smallmouth Bass, Bluegill, Bluespotted Sunfish, Tessellated Darter, Pumpkinseed, Bridle Shiner, Satinfin Shiner, Rock Bass, Chain Pickerel, Yellow Perch, Redbreast Sunfish, Walleye, and Banded Killifish.

An electrofishing survey was completed on the night of October 9th at Lake Hopatcong. A total of 14 species of fish were collected. Yellow Perch were the most abundant species collected. Notable catches include 18 Largemouth Bass, 32 Chain Pickerel, and 5 Walleye were collected. An electrofishing survey was completed during the day on October 18th at Lake Hopatcong. A total of 13 species of fish were collected. Alewife were the most abundant species observed. Notable catches include 12 Largemouth Bass, the largest was 445mm; one Smallmouth (510 mm); and six Chain Pickerel, the largest was 595 mm.

Gill nets were set on October 22nd and retrieved on October 23rd. Four 126' x 6' experimental gill nets were set in different sections of the lake covering a variety of habitat types. The depth at which the nets were set ranged from 10' – 35'. White Perch were the most abundant of the 13 species collected with gillnets. Notable were the 39 Walleye and 15 Hybrid Striped Bass. Additional sampling will be completed during the spring and summer of 2014. Physical, chemical and biological data collected over this two-year period will be used to update 1995-1996 fisheries management plan. (Federal Grant F-48-R, Project I)

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. These assessments can include shoreline seining to identify and determine the extent of reproduction within a waterbody. Results are used to determine if supplemental stockings are warranted or to access the success of previous stockings. More intensive sampling includes boat electrofishing, coupled with water quality measurements in addition to reproductive checks.

In 2013, fisheries assessments were completed at 35 waterbodies. Reproductive checks were completed at 27 waterbodies, while more intensive electrofishing surveys, mostly targeting Largemouth Bass, were conducted at 5 waterbodies. Sampling that included both electrofishing and reproduction checks, were conducted at two waterbodies to assess the status of Largemouth Bass populations present. Trap nets were utilized at one location. Of the 35 assessments, twenty-four were conducted to assess the status of the fisheries, seven to assess the success of previous stockings, two to evaluate existing regulations, and two on coastal lakes to assess the impacts of saltwater intrusion on the fisheries. Results from nine of the surveys resulted in supplemental fish stockings in 2013 and two additional impoundments are scheduled to be stocked in 2014. (Hunter and Angler Fund)

2013 sampling activities include:

Alloway Lake (Salem County) - Completed boat electrofishing survey at Alloway Lake on October 25th during the day. Sampling occurred around the perimeter of the lake. A total 57 Largemouth Bass were collected, of which 49 were > 200 mm (stock size). Total electrofishing time was 2 hours. Electrofishing was completed to evaluate the Largemouth Bass population since *Lunker Bass* regulations were imposed.

Assunpink Lake (Monmouth) – This lake is a popular *Lunker Bass* lake. A total of 21 sites were seined and an assortment of warmwater fishes were found, including Largemouth Bass, Chain Pickerel, Yellow Perch, Pumpkinseed, Bluegill, Bluespotted Sunfish, Black Crappie, and Golden Shiner. Low numbers of young-of-the-year Largemouth Bass (0 – 6) were encountered at all but one site, where 17 were captured.

Largemouth Bass from Assunpink Lake

A boat electrofishing survey was also completed at Assunpink Lake on October 29th during the day. Sampling occurred around the entire perimeter of the lake. A total of 53 Largemouth Bass >200 mm (stock size) were collected and 50 largemouth <200 mm (stock size) were collected. The total run time was 1.5 hours.

Best Lake (Somerset) - Shoreline seining was conducted at this 6-acre lake to assess the existing fish population. 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. It is recommended that additional surveys are conducted to monitor the fish population and for Largemouth Bass to be stocked in 2014.

Clarks Pond (Essex) - Reproductive checks were completed at this 7-acre lake. Eleven seine hauls conducted at various locations around the pond's perimeter yielded a significant number of young-of-the-year Pumpkinseeds, no young-of-the-year Largemouth Bass, an abundance of Mosquitofish and 5 invasive Green Sunfish. This pond was dredged, and stocked several years ago. As its source of water is runoff from surrounding roads and parking lots, it has again, quickly become filled with silt. This pond was removed from the trout stocking list and stocking of warmwater fish is not recommended.

Cooper River (Camden) - Reproductive checks were completed at Cooper River Park Lake on August 5th to evaluate the Largemouth Bass population. Largemouth Bass were collected at 5 of the 15 locations sampled. Seven species of fish were collected including Mosquitofish, Largemouth Bass, Bluegill, Pumpkinseed, Tessellated Darter, Black Crappie, and Banded Killifish. Mosquitofish were collected in high numbers with 400 captured.

DOD Lake (Salem) - Reproduction checks and a dissolved oxygen temperature profile were completed at DOD Lake in on August 16th. In 2013, DOD Lake was stocked with 2,650 young-of-the-year Smallmouth Bass by the Hackettstown State Fish Hatchery. Nine species of fish were collected including Mosquitofish, Largemouth Bass, Bluegill, Bluespotted Sunfish, Smallmouth Bass, American Eel, Yellow Perch, Pumpkinseed, and Banded Killifish.

East Creek Lake (Cape May) – A boat electrofishing survey was completed at East Creek Lake on August 21st. Sampling occurred around the entire perimeter of the lake to evaluate the stocking of Largemouth Bass. A total of 14 Largemouth Bass were collected. Many of which represented the year class that was stocked. This indicates that stocking Largemouth Bass was successful to bolster the existing Largemouth Bass population. Additional species collected include, Chain Pickerel, Mud Sunfish, yellow perch, brown bullhead, Creek Chubsucker, Bluegill, American Eel, Golden Shiner, Blackbanded Sunfish, and Bluespotted Sunfish.

Edgemont Memorial Park Pond (Morris) - Reproductive checks were completed at this 15.5-acre pond, which was recently dredged and refilled. The stocking of Largemouth Bass, Bluegills, Bullheads, and Fathead Minnows was recommended. As a result, 2,371 young-of-the-year Bluegills and 1,731 young-of-the-year Largemouth Bass were stocked by Hackettstown State Fish Hatchery in 2013.

Franklin Lakes Nature Preserve Lake (Bergen) – Reproductive checks were completed at this 75-acre lake. Twelve seine hauls conducted at various locations around the lake's perimeter yielded a significant number of young-of-the-year sunfish species, and few young-of-the-year Largemouth Bass. As a result, 7,500 young-of-the-year Largemouth Bass were stocked by Hackettstown State Fish Hatchery.

George Lake (Morris) - Reproductive checks were conducted at George Lake as a follow up to the complete draining and dredging that occurred in 2007. George Lake has been stocked several times with warmwater fish since 2008. An adequate number of Largemouth Bass, panfish, and bullheads were collected, indicating the fishery has rebounded well. No further actions are required.

Greystone Psychiatric Hospital Upper and Lower Lakes (aka Morris Plains Lakes) (Morris) – Reproductive checks were completed at these unnamed ponds, adjacent to the North Branch of the Whippany River, that were recently taken over by Morris County Parks Department. As a result of few individuals captured, 500 young-of-the-year Bluegills and 480 young-of-the-year Largemouth Bass were stocked by Hackettstown State Fish Hatchery in 2013.

Hedden Park Pond (Morris) – Reproductive checks were completed at this 6-acre lake. Twelve seine hauls conducted at various locations around the pond's perimeter yielded few young-of-the-year Sunfish and few young-of-the-year Largemouth Bass. As a result Hedden Park was stocked in 2013 by the Hackettstown State Fish Hatchery with 500 young-of-the-year Bluegills and 600 young-of-the-year Largemouth Bass.

Kays Pond (Morris) – Reproductive checks were completed at this 7-acre lake. Fifteen seine hauls conducted at various locations around the pond's perimeter yielded few young-of-the-year sunfish and few young-of-the-year Largemouth Bass. As a result, 725 young-of-the-year Largemouth Bass were stocked in 2013 by the Hackettstown State Fish Hatchery. The stocking of sunfish is also recommended.

Lake Audrey (Cumberland) - An electrofishing survey was completed at Lake Audrey on July 18th to evaluate the Largemouth and Smallmouth Bass population. The one hour electrofishing survey was completed during the day around the perimeter of the lake. A fish kill was reported in March consisting of mostly sunfish however bass were also reported to have been affected. At that time of the fish kill the pH was determined to have dropped substantially (below 5) to levels which were observed prior to the large liming project completed in 2006. There were only five Largemouth and one Smallmouth Bass collected during electrofishing. Individuals ranged from 338 mm to

465 mm and were in excellent condition. Additional adult Largemouth Bass of similar size were observed but unaffected by the electrofishing boat presumably to the low pH and high conductivity which has had a negative effect on electrofishing efficacy in the past. Adult Bluegill and Pumpkinseed were observed in good numbers and in the process of spawning.

In addition to an electrofishing survey, two reproduction surveys were completed at Lake Audrey on July 19th and August 2nd. A total of 22 seining locations were sampled. Only one young-of-the-year Largemouth Bass was collected and no young-of-the-year sunfish were collected. A few intermediate sized Bluegill and Pumpkinseed were collected. Species diversity was rather low. It appears that the low pH (4.24 on August 2nd) is not adequate to support reproduction of both bass species as well as sunfish. Surplus Largemouth Bass from Hackettstown Hatchery are anticipated to be stocked this fall to supplement the poor reproduction.

A final boat electrofishing survey was conducted at Lake Audrey in Cumberland County on August 21st. Sampling occurred around the entire perimeter of the lake. An unusual algae bloom was present and water color was significantly different than in previous years. Dissolved oxygen was very low, 4.40 mg/l and pH was 4.37. It is suspected that low pH has adversely affected the fish population. The lake will need to be limed in order to reestablish the fish population. A total of eight Largemouth Bass were collected.

Lake Sonoma (Passaic) – Reproductive checks were completed at this 20-acre lake located in a remote part of Norvin State Forest. Twelve seine hauls conducted at various locations around the lake's perimeter yielded a significant number of young-of-the-year sunfish species, and few young-of-the-year Largemouth Bass. Largemouth Bass stocking is recommended.

Makepeace Lake (Atlantic) - Reproduction checks were completed at Makepeace Lake on July 15th. Bluespotted Sunfish were found in good abundance, at all age groups and collected at each of the four sampling locations. The diversity was rather low with only Bluespotted and Blackbanded Sunfish collected. Water chemistry was not collected however the pH is known to be extremely low which directly correlates with low productivity and diversity.

Maskells Millpond (Cape May) - Completed boat electrofishing survey at Maskells Millpond on August 19th. Sampling occurred around only one quarter of the lake due to a low bridge preventing access. The survey was to evaluate the stocking of Largemouth Bass. A total of 37 Largemouth Bass were collected in 30 minutes. The catch rate of 67 bass/hour is rather high especially for daytime electrofishing. Year classes stocked by Hackettstown State Fish Hatchery were well represented, indicating that stocking Largemouth Bass was successful to bolster the existing Largemouth Bass population. Three memorable sized Largemouth Bass in excess of five pounds were collected.

Mercer Lake (Mercer) – This county-owned lake was surveyed at 18 locations as part of a broader assessment of the lake's fish population. A total of 11 fish species were

collected: Largemouth Bass, Chain Pickerel, Yellow Perch, Pumpkinseed, Bluegill, Redbreast Sunfish, Green Sunfish, Gizzard Shad, Banded Killifish, Spottail Shiner, and Tessellated Darter. In 2013, 8,700 young-of-the-year Largemouth Bass were stocked, Mercer Lake is also stocked annually with approximately 550 Muskellunge (up to 9.4") by the Hackettstown State Fish Hatchery.

Nelson Lake (Middlesex) - Nelson Lake was left fishless following a fish salvage prior to its draining in 2010 for a dam repair. The Division committed to restock and monitor the fishery. An assortment of warmwater fish from the Hackettstown Fish Hatchery were stocked in 2011 and 2012. Shoreline seining was conducted at this 15-acre lake to assess the existing fish population. Adequate numbers of young-of-the-year warmwater species were collected, including Largemouth Bass, Bluegill, and Pumpkinseed. Other species encountered include Golden Shiner and Common Carp. The fishery appears to have rebounded well and no additional sampling or stocking is necessary at this time.

Orange Reservoir (Essex) - Orange Reservoir, a private lake in the headwaters of the Rahway River West Branch, was recently opened to public fishing. A reproductive check was conducted using a 20ft. seine to collect fish in the littoral habitat. Largemouth Bass, Bluegill, Yellow Perch, and White Perch were documented.

Parvin Lake (Salem County) - Reproduction checks were completed at Parvin Lake on August 15th. 5,000 young-of-the-year Largemouth Bass were stocked in 2013 order to bolster the Largemouth Bass population. Nine species of fish were collected including Largemouth Bass, Bluegill, Bluespotted Sunfish, Tadpole Madtom, Swamp Darter, White Crappie, Black Crappie, Pumpkinseed and Banded Killifish.

Round Valley Reservoir (Hunterdon) - Round Valley Reservoir was seined on July 10 and 16 to determine if the Golden Shiners that were stocked in recent years by Round Valley Trout Association were reproducing. Although no Golden Shiners were found, an assortment of other baitfish species were documented including Banded Killifish and Spotfin Shiner. An additional 332,545 Golden Shiners were stocked by Hackettstown State Fish Hatchery in 2013. The reservoir is also stocked annually with approximately 6,720 Brown and Rainbow Trout.

Saffin Pond (Morris) – This Morris County Park lake was drained for dam rehabilitation and refilled in 2012. An assortment of fish species reared at the 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 smallmouth fishery in the lake. In 2013, 1,322 young-of-the-year Smallmouth Bass had been stocked. A variety of warmwater fishes were collected at 12 seining sites, including SMB and LMB, Yellow Perch, Pumpkinseed, Banded Killifish, Golden and Common Shiner. The seining was conducted not long after the fingerlings were stocked in the lake, so it is not known if the young-of-the-year smallmouth encountered were those recently stocked or the result of natural reproduction.

Salem Canal (Salem) - An electrofishing survey was completed at the Salem Canal on August 9th to evaluate the Largemouth Bass population. A lake inventory and management plan was completed in 1999. Additional electrofishing sampling, including testing for Largemouth Bass virus was completed in subsequent years. A new concrete boat ramp was constructed a few years ago which increased the number of bass fishing tournaments at the location. The electrofishing survey resulted in a good number of Largemouth Bass collected and a well-distributed population. Overall condition was good and reproduction appears to be adequate. The increase in the number of tournaments does not appear to have had a negative effect. The crappie population appears to be good with a few individuals near two pounds collected

Shaws Mill Pond (Cumberland) - Reproduction checks were completed at Shaws Mill Ppond on August 2nd. Largemouth Bass were collected at five of the seven seining locations sampled. Seven species of fish were collected including Mud Sunfish, Bluespotted Sunfish, Bluegill, Pumpkinseed, Largemouth Bass, Creek Chubsucker, and Redfin Pickerel.

Silas Condit Park Pond (Morris) - Reproductive checks were completed at this 10-acre lake. Ten seine hauls conducted at various locations around the pond's perimeter yielded a significant number of young-of-the-year sunfish and few young-of-the-year Largemouth Bass. As a result 1,350 young-of-the-year Largemouth Bass and 75 Brown Bullheads (3" – 6") were stocked by Hackettstown State Fish Hatchery.

Stafford Forge Impoundments 1, 2 and 3 (Ocean) - Reproductive checks were completed at Stafford Forge Impoundments located in Stafford Township on July 26th. Due to limited seining locations only a few Redfin Pickerel and Swamp Darter were documented. Bluespotted Sunfish were collected at all seining locations in good numbers. There were no Largemouth Bass collected which is expected based on the low pH levels that ranged from 4.66 – 4.74. Additional reproductive checks may be scheduled.

Stephan's Lake (Atlantic) - A seining survey was completed at Stephan's Lake on July 2nd to evaluate the warmwater fish population. The location had been previously a private hunting and fishing club and is now part of the Lenape Farms WMA. Only a few seining locations were available. Four seining locations were sampled with a 20' fine mesh seine. Largemouth Bass and sunfish were collected at two of the four locations. An additional 2,500 young-of-the-year Largemouth Bass were stocked in 2013 in anticipation of the added fishing pressure due to being a new public fishing area. A boat electrofishing survey was also completed at Stephens Lake on August 14th targeting Largemouth Bass. A total of 23 Largemouth Bass were collected in 45 minutes. No additional stocking is recommended at this time.

Stone Tavern Lake (Monmouth) – A boat electrofishing survey was completed at Stone Tavern Lake on October 2nd during the day. Sampling occurred around the entire perimeter of the lake. A total of 73 Largemouth Bass were collected in one hour of electrofishing. A second boat electrofishing survey was conducted on October 17th also

during the day. Sampling occurred around a portion of the lake to obtain 16 Largemouth Bass for age determination for evaluation of stocking completed in 2011. Total sampling time was 15 minutes.

Sunrise Lake (Morris) - Reproductive checks were completed at this 3-acre lake. Nine seine hauls conducted at various locations around the lake's perimeter yielded a significant number of young-of-the-year sunfish and few young-of-the-year Largemouth Bass. As a result, 300 young-of-the-year Largemouth Bass were stocked by the Hackettstown State Fish Hatchery.

Union Lake (Cumberland) - Completed reproduction checks at Union Lake in Cumberland County on July 31st. 7,814 young-of-the-year Smallmouth Bass were stocked to bolster the population in 2013. Few Largemouth Bass were collected and found at only three of the 14 seining locations. Banded Killifish were found in rather high abundance however young-of-the-year Bluegill were only found at one location. There appeared to be less diversity and abundance of young-of-the-year fish as in previous years. A boat electrofishing survey was also completed at Union Lake on August 20th. Sampling occurred upstream with the confluence of the Maurice River. Five Largemouth Bass and one Smallmouth Bass were collected during the 45 minute sampling period. Above average flows hindered the sampling effort.

Watchung Lake (Somerset) - Reproductive checks were conducted at Watchung Lake in Watchung in response to an intentional water lowering, to search for a missing body, that occurred early January 2013. There was a concern that the fish population would be negatively impacted by this lowering. An adequate number of Largemouth Bass and panfish were collected, indicating the fishery should rebound well. No further actions are required.

Willow Crest Lake (Sussex) – Located in the Neldon Brook watershed which feeds Swartswood Lake, this lake was drained and the dam rehabilitated in 2011-2012. An assortment of warmwater fish species reared at the Hackettstown State Fish Hatchery have been stocked in this lake. A variety of warmwater fishes were collected at 20 seining sites, including Largemouth Bass, Chain Pickerel, Yellow Perch, Pumpkinseed, Bluegill, Crappie, Banded Killifish, and Golden Shiner. In 2013, an additional 3,000 young-of-the-year Largemouth Bass were stocked.

Woodcliff Lake (Hudson) – Reproductive checks were completed at this 15 acre lake. Twelve seine hauls, conducted at various locations around the lake's perimeter, yielded adequate numbers of young-of-the-year largemouth bass and sunfish. Therefore, stocking was not recommended.

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 alewife and blueback herring, was prohibitted. These regulations were put in place due to concerns about the significant coastwide 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 coastwide 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. 2013 field activities include:

> **Musconetcong River (Warren) -** During the spring (April/May) four surveys were conducted in the Musconetcong River (just upstream of its confluence with the Delaware River) to determine if anadromous fish (river herring and American Shad) in the Delaware were entering and utilizing the Musconetcong River. Although these migratory fish species were not found during the limited surveys conducted, they may ultimately benefit from ongoing efforts that have resulted in the removal of the two lowermost dams and the planned removal of three more dams on the lower Musconetcong River. (Federal Grant F-48-R, Project II).

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 F. 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, Swallowtail Shiner, Northern Hog Sucker, Mud Sunfish, Blackbanded Sunfish, Bluespotted Sunfish, Banded Sunfish, Shield Dater, and Slimy Sculpin. 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.

Blackbanded Sunfish.

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.

In 2013, our *FishTrack* database underwent a QA/QC review for data collected since 2000, which was conducted under Federal Grant F-48-R. This was a necessary step to create accurate species distribution maps for all freshwater fishes native to NJ, which was subsequently initiated.

A formal review process will be 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.

Shield Darter.

In 2013, surveys were conducted at seven waterbodies, specifically targeting native fishes (see below). These observed trends may be representative of the loss of native fishes and the homogenization of our fisheries within New Jersey. (Hunter and Angler Fund)

Culvers Lake (Sussex) - Culvers Lake was seined as part of a fisheries survey to determine if bluespotted sunfish and bridle shiners, native species that were collected in

1950, are still present 60 years later. Methods include using a 20ft. seine to collect fish in the littoral habitat. Species encountered include Largemouth Bass, Chain Pickerel, Pumpkinseed, Bluegill, Redbreast Sunfish, Rock Bass, Yellow Perch, Tessellated Darter, Alewife, and Bluespotted Sunfish. The most numerous species encountered were young-of-the-year sunfishes of the Lepomis Genera and young-of-the-year Largemouth Bass. Bluespotted Sunfish were found at 2 of 16 seining locations. No Bridle Shiners were found.

Delaware River (Warren/Hunterdon) – The Delaware River was seined in five locations using a 20'x 4' seine. The Kittatinny boat launch at the Delaware Water Gap produced Smallmouth and Largemouth Bass, Bluegill, Rock Bass, Fallfish, Brown Bullhead, Tessellated Darter, White Sucker, Banded Killifish, Spotfin, Satinfin, Swallowtail, and Spottail Shiners. King Cole's produced Largemouth Bass, Redbreast Sunfish, Fallfish, White Sucker, Banded Killifish, Spotfin, Satinfin, and Swallowtail Shiners. Kingwood Boat Launch produced juvenile American Shad, Pumpkinseed, and Spotfin Shiner. River Road in Kingwood Township produced Largemouth and Smallmouth Bass, juvenile American Shad, Bluegill, Pumpkinseed, Redbreast Sunfish, Fallfish, Spotfin, Satinfin, Common, and Spottail Shiners. Byram Boat Launch produced Smallmouth Bass, Rock Bass, Tessellated Darter, Spotfin, Swallowtail, and Spottail Shiners.

Farrington Lake (Middlesex) - Conducted fisheries survey at Farrington Lake to determine if several native species, such as Swamp Darter, Bluespotted, Blackbanded, and Mud Sunfish, all collected in 1950, are still present over 60 years later. Methods include using a 20ft. seine to collect fish in the littoral habitat. Seining was difficult due to the diminished water levels, however of the species being sought after, only Bluespotted Sunfish were collected. Largemouth Bass young of the year numbers were minimal, however this can be expected by mid-October.

Grinnell Lake (Sussex) - Conducted fisheries survey at Grinnell Lake to determine if bridle shiners, native species that were collected in 1950, are still present over 60 years later. Methods include using a 20ft. seine to collect fish in the littoral habitat. Species encountered include Largemouth Bass, Redbreast Sunfish, and Bluegill. Seining was difficult due to steep topography and soft substrate. No Bridle Shiners were found.

Lamington River (Somerset) The Lamington River was electrofished in Burnt Mills, upstream of its confluence with the Raritan River North Branch on July 24. The survey was conducted for two primary reasons; first to determine in any stocked trout were holding over from the spring stocking and second to look for native species such as the Bridle Shiner which was documented in this section in 1973. No trout were encountered and water temperatures were 73.4F (23.0C). Bridle Shiners were not found, which is not surprising as they are disappearing throughout their native range. The only relatively rare species encountered is the Shield Darters, in which 16 were found. This information is important to the mapping and assessment of our native fishes.

Monksville Reservoir (Passaic) - Monksville Reservoir was seined to determine the presence of reproducing fish as part of an effort to determine the statewide status of our native fish species. Largemouth Bass, Bluegill, Pumpkinseed, Bluespotted Sunfish, Green Sunfish, Chain Pickerel, and Banded Killifish were documented.

Raritan River (Somerset/Middlesex) – The Raritan River was seined in five locations on 9/27/2013 using a 20'x 4' seine. The Duke Island State Park section produced Swallowtail Shiner, Spotfin Shiner, Pumpkinseed, Bluegill, Banded Killifish, Tessellated Darter, and Mosquitofish sp. Downstream of the former Roberts Street Dam produced Swallowtail Shiner, Spotfin Shiner, Bluegill, Tessellated Darter, and Mosquitofish sp. Dukes Parkway in Bridgewater Township produced Swallowtail Shiner, Spotfin Shiner, and Banded Killifish. Main Street Bridge in South Bound Brook Borough produced Mosquitofish sp. The Landing Lane Bridge location produced Spottail Shiner, Spotfin Shiner, and Banded Killifish.

All fisheries surveys conducted by the Bureau contribute valuable information to the status and distribution of fishes. Surveys conducted at 96 sites encountered relatively common fish species, but 15 of these sites yielded significant findings of some of New Jersey's less common native fishes (Table 8).

TABLE 8. Significant findings of native fishes in 2013.

Species	Water Body	Number Collected	Survey Data Page
Bridle Shiner	Pike Run, Lake Hopatcong	29	A44
Comely Shiner	Millstone River (Griggstown Causeway)	11	A38
	Millstone River	2	A40
	Pike Run	2	A44
Ironcolor Shiner	Pequest River	Present	A12
Northern Hog Sucker	Big Flat Brook (Between Rt 206 and Rt 560)	1	A4
	Big Flat Brook (Upstream from Blewett Tract - Station #2)	6	A5
	Big Flat Brook (Upstream from Blewett Tract - Station 1)	6	A6
Shield Darter	Capoolong (Cakepoulin) Creek	1	A36
	Big Flat Brook (Upstream from Blewett Tract - Station 2)	3	A5
	Big Flat Brook (Upstream from Blewett Tract - Station 1)	4	A6
	Flat Brook	4	A8
	Lamington River	16	A37
	Millstone River (Griggstown Causeway)	18	A38
	Millstone River (Blackwells Mills Road bridge)	10	A39
Slimy Sculpin	Beerskill	29	A3
	Big Flat Brook	15	A4
	Big Flat Brook (Upstream from Blewett Tract - Station 2)	6	A5
	Big Flat Brook (Upstream from Blewett Tract - Station 1)	6	A6
	Flat Brook	9	A8
	Raritan River (Claremont stretch, old stocking point)	23	A49
	Raritan River (Claremont stretch, fiber optic crossing)	21	A50
	Tuttles Corner Brook	1	A19

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.

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.

During 2013 eleven surveys were completed at three waterways to assess the status of aquatic invasive fishes in New Jersey (Table 9). Eleven surveys were for Asian Swamp Eel control and two surveys were conducted to assess the size of a known population of Northern Snakehead. In addition, flathead catfish were documented in the Delaware River, Riegelsville Bridge, and the Millstone River, Wilhousky St. Bridge, as part of other field sampling activities. (Federal Grant F-48-R, Project II)

TABLE 9. Invasive species sampling locations in 2013.

Location	Drainage	Date	Species Targeted	Gear	Run Time (sec)	Number
Hilliards Creek (downstream @Foster Ave)	Cooper River	6/28/13	Asian Swamp Eel	Electrofishing	1000	0
Hilliards Creek (downstream @Foster Ave)	Cooper River	7/22/13	Asian Swamp Eel	Electrofishing	1298	1
Hilliards Creek (downstream @Foster Ave)	Cooper River	8/12/13	Asian Swamp Eel	Electrofishing	1732	1
Hilliards Creek (upstream @ Alton Ave)	Cooper River	6/28/13	Asian Swamp Eel	Electrofishing	7365	13
Silver Lake	Cooper River	6/28/13	Asian Swamp Eel	Electrofishing	4628	124
Silver Lake	Cooper River	7/22/13	Asian Swamp Eel	Electrofishing	5146	69
Silver Lake	Cooper River	7/29/13	Asian Swamp Eel	Electrofishing	3689	45
Silver Lake	Cooper River	8/12/13	Asian Swamp Eel	Electrofishing	4182	27
Silver Lake	Cooper River	8/23/13	Asian Swamp Eel	Electrofishing	3600	40
Newton Lake	Newton Creek	7/3/13	Snakehead	Electrofishing	5400	2
Newton Lake	Newton Creek	7/17/13	Snakehead	Electrofishing	3600	0
Newton Lake	Newton Creek	8/5/13	Snakehead	20' seine	N/A	0
Delaware River* (Riegelsville Bridge)	Delaware River	May 2013	Flathead Catfish	Electrofishing	-	4
Millstone River* (Wilhousky Rd. bridge)	Raritan River		Flathead Catfish	Electrofishing	-	1

* 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 a successful eradication.

Asian swamp eel.

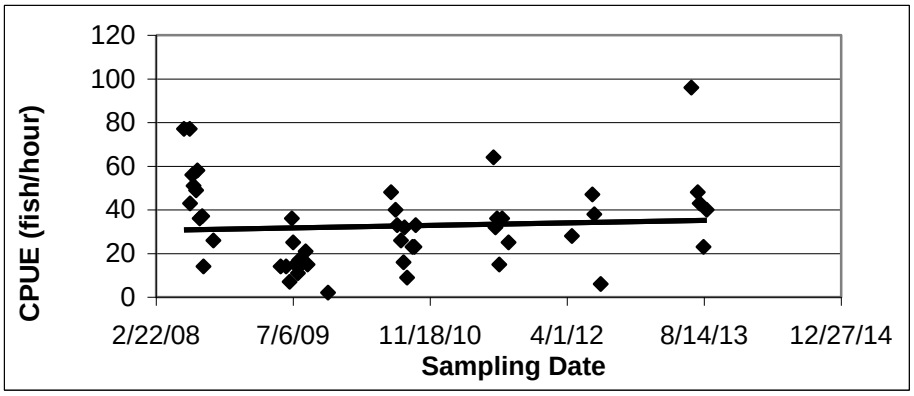
In 2013 the Bureau of Freshwater Fisheries sampled, via backpack electrofishing, Silver Lake and Hilliards Creek for Asian Swamp Eels (Table 9). Silver Lake was sampled five times for a total run

time of 5.9 hours. The CPUE for 2013 was 51 fish/hour, an increase of 21% over 2012 (Table 10, Figure 4). The catch rate was 42 fish per hour in 2012 and 39 fish per hour in 2011. A total of 320 swamp eels were collected in 2013. Of the 320 swamp eels collected, 305 were collected in Silver Lake, 13 were collected upstream of Silver Lake in Hilliards Creek below the next on stream impoundment. Two individuals were collected downstream of Silver Lake in Hilliards Creek at Foster Avenue. The Bureau of Freshwater Fisheries has collected and removed 1351 Asian swamp eels from Silver Lake during the period of June 2008 to September 2013.

TABLE 10. 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
Total	1351	143,778	39.93	30

FIGURE 4. CPUE (fish/hour) of Asian swamp eels collected from Silver Lake 2008 – 2013.



Flathead Catfish

The Delaware River was boat electrofished in the vicinity of the Riegelsville bridge (just upstream from the confluence with the Musconetcong River). Four flathead catfish were encountered ranging in size from 305 – 760 mm. Two of the individuals were captured and destroyed. One flathead catfish was collected from the Millstone River, near the Wilhousky St. bridge via boat electrofishing. The individual was 354 mm and 0.49kg.

Northern Snakehead

Northern Snakehead.

Fewer reports of northern snakehead catches were reported by anglers in 2013. Reports were received during the warmer months of the year from mid-April through September, with most reports received from May to August. In 2013, Oldmans Creek, Salem County was confirmed for the presence of northern snakeheads by anglers. Snakeheads were collected at three separate locations within the Oldmans Creek drainage, with the Harrisonville Lake dam the furthest upstream location. The confluence of Oldmans Creek with the Delaware River is downstream of the freshwater license line at the Commodore Barry Bridge. Presumable the saltwater line was further downstream than normal due to above average rainfall in the spring allowing the snakeheads to spread further downstream. One snakehead was caught by a bow angler on the Delaware River upstream of Trenton (Harmony Twp./Warren County).

Two electrofishing surveys were completed at Newton Lake, Camden County to evaluate the density of the northern snakehead population. Newton Lake has a fish ladder and a low head dam allowing snakeheads easy passage into the lake. Two adult snakeheads were collected and one more was observed. Anglers fishing at the lake reported catching one while the electrofishing survey was being conducted. The abundant aquatic vegetation in the lake appears to be favorable habitat contributing to the growing population. Despite the presence of Snakeheads the Largemouth Bass population appeared to be doing rather well with 29 individuals collected; ranging from 142 – 490 mm.

In addition, reproductive checks were conducted at Newton Lake to evaluate any negative effects of the Northern Snakehead on warmwater fish species. There were no young of the year Largemouth Bass collected during the survey. Young-of- the-year Bluegill were collected in high abundance. Further evaluation in subsequent years is required to evaluate and determine any correlation between snakeheads and reproduction of other fish species.

Aquatic Invasive Plant Management

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

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 20 waterbodies in 10 counties. Most new sightings are brought out 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.

The Division of Fish and Wildlife's Bureau of Land Management continued herbicide treatments in 2013 at Baldwin Lake and Amwell Lake, both located on Wildlife Management Areas. The Division remains optimistic that herbicide treatments may control water chestnut in targeted waters.

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 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). 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. In 2013 five field investigations were conducted by Bureau of Freshwater Fisheries staff. (Federal Grant F-48-R, Project II)

Pequest River (Warren) – In September (2013) the Pequest Trout Hatchery experienced trout mortality due to furunculosis, a fish disease caused by the bacterium *Aeromonas salmonicida salmonicida*. This bacterium is considered an obligate pathogen, meaning it requires a fish host in order to survive. It is believed that the bacterium will survive in the water for a few days to weeks depending on water conditions, but the bacteria will die if a fish host is not found. Because the hatchery water discharges into the Pequest River, a popular trout-stocked stream, electrofishing was conducted at five locations along the river to obtain trout for analysis. A total of 11 trout (1 rainbow, 2 brook, and 8 Brown Trout) were collected upstream of the hatchery discharge and over 100 trout (23 brown and an estimated 100 Rainbow Trout) were collected below the hatchery. The pathologist examined the fish and they tested negative for furunculosis. One trout collected upstream of the hatchery tested positive for another fish pathogen, IPN (Infectious Pancreatic Necrosis). Although these pathogens are not harmful to humans, they are of concern because they are capable of causing mortality in trout held in captivity (hatchery) and in the wild (stocked and naturally occurring wild trout).

Stewart Lake (Gloucester) – A fish kill consisting of primarily of gizzard shad was reported on April 2. An investigation was conducted on April 9th as daily calls continued. The investigation documented that the kill was still primarily gizzard shad with a few sunfish present. Although the fish present on April 9th were dead for too long to be conclusively tested the fish pathologist agreed that the fish kill was the result of *Aeromonas spp.*, a bacterium which can cause fish mortality in March/April as water temperature increases.

Newton Lake (Camden) – A fish kill involving gizzard shad was reported by a local angler on April 15. The kill was believed to be the result of *Aeromonas spp*. bacteria based on conditions and past *Aeromonas* fish kills confirmed at this location.

Sunset Lake (Cumberland) – The Sunset Lake dam failed in 2011 and has yet been repaired. Heavy rains caused the water level in Cohansey River to rise which allowed a school of gizzard shad to swim upstream and become trapped in the lowered lake bed when the flood waters receded. Elevated water temperatures caused insufficient oxygen levels which killed the approximately 80-100 gizzard shad. Similar kills occurred

multiple times in 2012 and these fish kills will likely continue to occur until the dam is repaired.

Union Lake (Cumberland) – A fish kill reported to have affected over 40 fish was investigated on July 31. A total of 5 channel catfish (8 - 18") and one white perch were found along the shoreline. The fish were bloated and discolored, indicating the kill had occurred a few days prior. The cause of death could not be determined and further investigation was not warranted.

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. In 2013, the Bureau did not conduct any fish salvages. (Hunter and Angler Fund)

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.

Double backpack electrofishing crew.

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. DFW 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.

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).

DFW recommends surface water classification changes to NJ's SWQS for one individual stream segment based upon the data collected within the Raritan River S/Br, Ken Lockwood Gorge

section (Table 11). This recommendation was previously submitted in to the Department in memos dated April 4, 2011 and March 11, 2013. Note that 7 of the streams surveyed (as indicated by *) are unnamed tributaries, thus the names given to them by DFW were devised either by the use of USGS topographic maps and/or descriptive names assigned while in the field.

In addition to reporting recommended changes to existing surface water classifications, DFW has reported surveys in which data confirms existing surface water classifications since 2006. The 2013 data confirmed the classifications of fourteen stream segments (Table 12). 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 the case for eleven electrofishing surveys conducted in 2013 (Table 13).

TABLE 11.— Summary of *potential surface water classification changes* supported by surveys conducted in 2013 by NJ Division of Fish & Wildlife. 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	Potential surface water classification	I.O. value	Reproducing trout species	Survey date
		Latitude (N)	Longitude (W)					
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)								
Raritan River S/Br (Ken Lockwood Gorge)	River and tributaries within Ken Lockwood Gorge Wildlife Management Area	40º42'7.5"	74º52'4.8"	FW2-TM(C1)	FW2-TP(C1) [a]	NA	Brown	8/21/13
		40º41'47.2"	74º52'18.2"					

[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.

TABLE 12.— Electrofishing surveys conducted in 2013 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 "2013 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
		Latitude (N)	Longitude (W)				
Upper Delaware Region (Upper Delaware & Wallkill)							
Flat Brook (Walpack)	NPS Route 615	41º10'57.6"	74º51'28.3"	FW2-TM(C1)	40.7	Brook [a] & Brown [a]	8/7/13
Livingston Ponds Brook (Wawayanda State Park)	Source downstream to State line	41º13'45.5"	74º25'15.3"	FW2-TP(C1)	NA	Brook	7/26/13
*Pequest River (trib.) (Petersburg)	Headwaters and tributaries downstream to Ryan Road bridge	40º53'2.5"	74º51'39.2"	FW2-TP(C1)	NA	Brook	9/12/13
Spring Mills Brook (Milford)	Entire length	40º34'47.8"	75º06'15.0"	FW2-TP(C1)	NA	Brown	8/2/13
*Wallkill River (trib.) (Sparta)	Entire length but not including Lake Saginaw	41º02'16.9"	74º37'44.1"	FW2-TP(C1)	NA	Brook	9/5/13
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic							
Burnt Meadow Brook (Stonetown)	Entire length	41º05'35.9"	74º18'27.5"	FW2-TP(C1)	NA	Brown	7/30/13
Fox Brook (Mahwah)	Entire length	41º03'57.0"	74º14'26.2"	FW2-NT	0	none	7/25/13
Hewitt Brook (W. Milford)	Entire length	41º07'54.7"	74º19'35.6"	FW2-TP(C1)	NA	Brook	7/23/13
*Russia Brook (trib) (S of Mt. Paul)	Mt. Paul Road	41º02'13.7"	74º32'38.4"	FW2-TM(C1)	54.4 [c]	wild trout sp observed [c]	8/15/13
Raritan Region (Raritan, Arthur Kill, Raritan Bay, Shrewsbury, & Navesink)							
Capoolong (Cakepoulin) Creek (Sydney)	Entire length	40º36'39.7"	74º54'40.3"	FW2-TP(C1)	NA	Brown	8/30/13
Lamington River (Burnt Mills)	Route 523 bridge to North Branch, Raritan River, including all tributaries	40º37'59.9"	74º41'15.7"	FW2-NT(C1)	5.9	none	7/24/13
Pike Run (Belle Meade)	Entire length	40º26'31.5"	74º38'51.4"	FW2-NT	6.2	none	7/31/13
Raritan River S/Br (Middle Valley)	Confluence with Turkey Brook to Rt. 512 bridge [b]	40º47'21.5"	74º46'14.8"	FW2-TP(C1)	NA	Brook [a] & Brown	7/17/13
		40º47'42.0"	74º45'58.0"				
Rockaway Creek S/Br (Clinton)	Headwaters to Readington Township boundary including all tributaries	40º38'17.1"	74º50'33.1"	FW2-TP(C1)	NA	Brown	7/9/13

[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 yoy size (<100mm) and smaller than typical stocked size (> 250mm). Incidence of Occurrence (IO) value calculated including the presence of trout. No change recommended.

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

TABLE 13.— Electrofishing surveys conducted in 2013 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 "2013 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
		Latitude (N)	Longitude (W)				
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic							
Bear Swamp Brook (Mahwah)	Entire length	41º05'27.6"	74º13'12.5"	FW2-TP(C1)	11.4	none	8/6/13
Beaver Brook (Morris-Rockaway)	From Splitrock Reservoir Dam downstream to Meriden Road Bridge	40º57'44.1"	74º27'39.2"	FW2-TP(C1)	19.6	none	8/6/13
Burnt Meadow Brook (Stonetown)	Entire length	41º06'28.1"	74º20'5.6"	FW2-TP(C1)	30.7	none	8/5/13
*Burnt Meadow Brook (trib.) (Harrison Mtn. Lake outlet)	Entire length	41º06'15.3"	74º18'57.0"	[FW2-TP(C1)]	23.1 [b]	none	7/30/13
*Burnt Meadow Brook (trib.) (Lake Sonoma outlet)	Entire length	41º06'8.6"	74º20'8.5"	[FW2-TP(C1)]	34.9 [b]	none	8/5/13
*Hewitt Brook (trib.) (outlet of Green Turtle Lake)	Entire length	41º08'26.9"	74º19'42.3"	[FW2-TP(C1)]	17.0 [b]	none	7/23/13
Ramapo River (trib) (Oakland)	Entire length	41º03'7.0"	74º14'4.4"	FW2-TP(C1)	11.2	none	7/25/13
Upper Delaware Region (Upper Delaware & Wallkill)							
Big Flat Brook	Blewett tract - upstream from (Station #1)	41º11'30.8"N	74º50'34.4"	FW2-TP(C1)	18.8	none	8/29/13
Big Flat Brook	Upstream from Blewett tract (Station #2)	41º11'38.2"N	74º50'26.9"	FW2-TP(C1)	31.3	Brook [a]	8/29/13
Big Flat Brook	Between Rt. 206 and Rt. 560 bridges	41º12'11.0"N	74º48'33.3"	FW2-TP(C1)	35.6	Brook [a]	8/7/13
*Wallkill River (trib.) (Ogdensburg)	Entire length	41º04'28.7"	74º35'41.6"	FW2-TP(C1)	13.2	none	9/5/13

[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.

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

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 lakes 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).

Lakes and reservoirs are classified as *trout maintenance* using data from temperature/dissolved oxygen profiles conducted during the late summer (for classification methodology see section entitled *Assessment and Classification of New Jersey's Fresh Waters (Job IV-1)*. 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.

A total of 26 temperature and dissolved oxygen profiles conducted on 17 lakes throughout the State during 2013, under variety of other jobs and/or funding sources, in accordance with surface water classification protocols (Appendix C). Criteria for trout supporting water is water temperature $\leq$ 21ºC and dissolved oxygen $\geq$ 4 mg/L. Data confirmed the classifications of nine lakes (Table 14). Profiles of six *Trout Maintenance* lakes indicate no trout supporting water, however an existing use (classification) is not downgraded unless proven it can not be re-established. Data collected on 8/27/13 indicates Morris Lake (aka Newton Reservoir) (41º2'51.0"N 74º36'29.5"W) should be upgraded from FW2-NT(C1) to FW2-TM(C1) as trout supporting water was found from 21 to 89 ft. in the water column (Table 14).

Tilcon Lake (40º54'30.7"N 74º45'49.4"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 this former quarry creating the lake. The lake is approximately 50 feet deep at its deepest point. The lake is not individually listed in NJ's SWQS and therefore is currently classified as FW2-NT. 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 also supports an upgrade to Trout Maintenance (Table 14).

TABLE 14.— Summary of 26 temperature & dissolved oxygen profiles conducted on 17 lakes in 2013. Results page number references in *2013 Investigations & Management of NJ's Freshwater Fisheries Resources Report*.

Waterbody (County)	Current surface water classification	Depth (ft) of water capable of supporting trout [a]	Potential classification change	Results page number
Upper Delaware Region (Upper Delaware & Wallkill)				
Culvers Lake (Sussex)	FW2-TM	none	no [b]	B2
Lake Hopatcong (Morris) (x3)	FW2-TM	none	no [b]	B3
Merrill Creek Reservoir [c]	FW2-TM	26 - 184	no (current confirmed)	B4
Morris Lake (Sussex) (aka Newton Reservoir)	FW2-NT(C1)	21 - 89	FW2-TM(C1)	B5
Silver Lake (Warren)	FW2-TM	none	no [b]	B6
Tilcon Lake (Morris)	FW2-NT	20 - 43	FW2-TM (recommended in 2011 based on 2007 data)	B7
Waywayanda Lake (Sussex) (x2)	FW2-TM(C1)	13 - 50 & 13 - 70	no (current confirmed)	B8
White Lake (Hardwick) (Warren)	FW2-TM	18 - 37	no (current confirmed)	B9
White Lake (Sparta) (Warren)	FW2-TM(C1)	18 - 30	no (current confirmed)	B10
Passaic Region (Passaic, Hackensack, & Hudson) and Upper Atlantic				
Boonton Reservoir (Morris) (aka Jersey City Reservoir)	FW2-TM(C1)	none	no [b]	B11
Charlotteburg Reservoir (Passaic) (x2)	FW2-TM(C1)	13 & 14 - 15	no (current confirmed)	B12
Green Pond (Morris)	FW2-TM(C1)	none	no [b]	B13
Greenwood Lake (Passaic) (x4)	FW2-TM	none	no [b]	B14
Lake Sonoma (Passaic)	FW2-NT	none	no (current confirmed)	B15
Monksville Reservoir (Passaic) (x3)	FW2-TM(C1)	13 - 74 15-17 & 55-61 none	no (current confirmed)	B16
Scarlet Oak Pond (Bergen)	FW2-TM	13 - 22	no (current confirmed)	B17
Sheppards Lake (Passaic)	FW2-TM(C1)	15 - 22	no (current confirmed)	B18
St. Paul's Monastery Lake (Morris)	FW2-NT	none	no (current confirmed)	B19
Wanaque Reservoir [c]	FW2-TM(C1)	none	no [b]	B20

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

[b] Although not confirmed, an existing use (classification) is not downgraded unless proven it can not be re-established.

[c] Profile data provided by waterbody owner.

Trout Maintenance Lakes Assessment

Thirty-one lakes and reservoirs in New Jersey are classified as *Trout Maintenance* in the State's Surface Water Quality Standards (SWQS). Lakes and reservoirs are classified as *Trout Maintenance* using data from temperature/dissolved oxygen profiles conducted during the late summer (for classification methodology see section above entitled *Stream and Lake Assessments for Surface Water Classification)*. As discussed previously, the presence and amount of trout supporting water in lakes can vary from year to year, depending on seasonal conditions (air temperature and rainfall). Many of these lakes and reservoirs waters do not have recent profile data, which limits Fish and Wildlife's ability to effectively manage these waters for existing or potential trout fisheries and trout stocking programs. In 2012 a study was initiated to target these waters and assess the current trout supporting capabilities of *Trout Maintenance* lakes during the critical summer months. Temperature/dissolved oxygen profiles were conducted on 16 waters in the initial year of the study.

In 2013 the trout supporting status of the remaining 15 lakes and reservoirs classified as *Trout Maintenance* were assessed. NJDFW conducted 21 profiles on 13 of these waters and profile data from 2 privately owned waters was provided by their owners. The data collected in 2013 and the amount of trout supporting water (if present) for each waterbody is indicated in Table 14. Of these 15 waters, 8 had trout supporting water on the day of the survey (Merrill Creek Reservoir, White Lake (Warren County), Wawayanda Lake, White Lake (Sussex County), Charlotteburg Reservoir, Monksville Reservoir (2 of 3 locations), Scarlet Oak Pond, and Shepherd Lake). (Federal Grant F-48-R, Project I)

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 on 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.

The **Eastern Brook Trout Joint Venture (EBTJV)** is a unique partnership between state and federal agencies, regional and local governments, businesses, conservation organizations, academia, scientific societies, and private citizens. The nation's first pilot project 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. Staff attended the EBTJV meeting, held in Frostburg, MD on June 11 – 12, 2013. (Federal Grant F-48-R, Project II)

The Bureau actively participates in the **Musconetcong River Restoration Partnership**, comprised of state and federal agencies (NJDEP, NRCS, NOAA, USFWS, NPS), and nonprofit organizations (Musconetcong Watershed Association, Trout Unlimited, American Rivers, and North Jersey RC&D). The Partnership works with willing dam owners and obtains grants for dam removals to improve the health of the river and restore pathways for migratory fishes. Thus far the Partnership has successfully removed four dams and is actively pursuing the removal of both the Hughesville Dam and the next dam upstream, at Warren Glen. The Hughesville Dam is owned by a private company that partially owns the Warren Glen Dam (NJDFW owns a small portion of this dam). In addition, the Army Corps of Engineers is pursuing the removal of the Bloomsbury Mill Dam (also privately-owned), located upstream of Warren Glen. (Federal Grant F-48-R, Project II)

In 2013 the Partnership received a Coastal America Partnership Award for its efforts in successfully removing the Finesville Mill Dam and was also awarded approximately $1.05M through the Disaster Relief Appropriations Act for removing the Hughesville Mill Dam. Bureau staff attended meetings and prepared letters of support for grant applications related to the removal of these dams.

Technical Assistance Activities

In 2013, staff also provided technical assistance related to stream restoration and dam removal projects, as described below.

> **Assunpink Lake (Monmouth)** An artificial habitat project was completed by Hunter Dalton, a Hamilton Township, Mercer County resident and member of Boy Scout Troop 91 on May 21st. Hunter has been with the Boy Scouts since 2002 and completed the artificial habitat project in route to earning Eagle Scout. A total of 100 discarded evergreen trees where places in buckets containing concrete and were deployed in

Assunpink Lake. The trees were placed at five locations in groups of 20 trees per locations in deeper sections of the lake. The trees will serve as excellent habitat for Largemouth Bass, sunfish, and Black Crappie. (Hunter and Angler Fund)

Capoolong (Cakepoulin) Creek (Hunterdon) - An electrofishing survey was conducted along Cakepoulin Creek following a stream habitat project funded by the US Department of Agriculture's Natural Resources Conservation Service (NRCS) Environmental Quality Incentives Program (EQUIP). This grant program provides financial and technical assistance to agricultural producers to help plan and implement conservation practices that address natural resource concerns and for opportunities to improve soil, water, plant, animal, air and related resources on agricultural land and non-industrial private forestland. The project restored the original dry stream bed that was abandoned following a large log/debris jam that rerouted the stream. Several wild brown trout were encountered. See additional data on page A36. (Hunter and Angler Fund)

Mason's Run, Camden County - A site evaluation of Mason's Run, Camden County was completed on July 11th with Brian Burns, to assess current sedimentation conditions as a follow up to last year's major sedimentation event. Approximately 35 tons of sediment was deposited in the stream following a failure of the golf courses irrigation system. Mason's Run supports the only reproducing brook trout population in South Jersey. Recommendations were made to install devices which will slow down rain runoff from the golf course before it enters Masons Run. In addition the need of bank stabilization of the two cart path bridges was identified and relayed to golf course staff. (Hunter and Angler Fund)

Millstone River (Somerset) The Millstone River was sampled above and below the dam at the Wilhousky Street Bridge (Manville / Weston Causeway) using the Smith-Root electrofishing boat and below the Blackwell Mills Dam and Griggstown Causeway using an electrofishing barge to gather fisheries information adjacent prior to dam removal, which is planned in the near future. These surveys provided an excellent opportunity to gather general fisheries information to assist in the management of the lower Millstone and Raritan rivers. See additional data on pages A38,A39, A40, and A41. (Hunter and Angler Fund)

Raritan River North Branch Tributary (Leone Pond) (Somerset) Conducted two electrofishing surveys on an unnamed tributary to the North Branch of the Raritan River on August 23. Surveys were in response to a DEP watercourse restoration project in Bernardsville Borough, Somerset County. The restoration is a result of a violation in which the property owner re-aligned two meandering unnamed tributaries to form one straight channel for a distance of approximately 175 feet. Amy S. Greene Environmental Consultants were hired to conduct the restoration project, which was completed in 2009. See additional data on pages A47 and A48. (Hunter and Angler Fund)

ANGLER USE ASSESSMENT

Online Trout Angler Survey

An online-based survey was conducted by Bureau staff to obtain trout angler attitudes and preferences on key components of New Jersey's trout stocking programs. The 2013 online survey consisted of questions similar to those asked in a telephone-based survey completed by a consultant (Responsive Management of Harrisonburg, VA) in 2012 (Duda 2012) under a previous grant reporting cycle. Unlike the phone survey which specifically targeted 2011 and 2012 trout stamp buyers the online survey was open to any fishing license holder, however, license holders who had not purchased a trout stamp in 2011 or 2012 were directed to alternate questions directed towards reasons why they do not trout fish in NJ.

A total of 2,063 anglers accessed the survey through the Division's website from December 18, 2012 to July 18, 2013, with the majority of responses occurring from March through June. A comparison of the license buying habits of both telephone and on-line survey participants indicated a heavy prevalence towards anglers who consistently purchase trout stamps each year in both survey types. The surveys covered topics including, but not limited to, what type of gear and bait trout anglers prefer to use, how often and how many trout are kept per trip, usage and preference of trout conservation areas, participation and satisfaction of fall and winter trout stocking programs, along with species preference and creel limits for our fall trout program. As responses between the on-line and telephone surveys were consistent for the vast majority of topics the results below are combined from both surveys. Areas where responses diverged between the two survey types are identified and the results presented separately.

General Background Info

The overwhelming majority of New Jersey trout anglers (95%) fish for trout throughout the spring trout season, while about 3% of respondents fish only on the opening day weekend. Anglers spend an average of sixteen days fishing for trout during the spring trout season (March through May). On average, anglers fish for trout the most from opening day weekend to the end of April (31% of the 25 available days during that time period), followed by the month of May (21% of the 31 available days during that time period). In contrast, only 11% of days available to fishing during the month of October (31 available days) is spent trout fishing by the average angler.

As the majority of trout waters are closed to fishing for three weeks prior to opening day, 22 % of anglers extend their trout fishing opportunities by fishing Special Regulation Areas which remain open to fishing during the pre-season closure. 40% of anglers surveyed indicated that they fish in a Year Round or Seasonal Trout Conservation Area (TCA). The Ken Lockwood Gorge on the South Branch of the Raritan River was slightly more popular (25%) than the Point Mountain TCA located on the Musconetcong River (18%). 41% of the anglers who fish the KLG indicated they were very satisfied with their fishing experiences.

The increasing trend towards catch and release continues with 65 % of trout anglers surveyed indicating they release most or all of the trout they catch. Bait such as worms, minnows, and PowerBait is the most commonly used of the three choices, but only by a very narrow margin over artificial lures and flies. 6% of anglers fish strictly with flies.

Big Flat Brook

At the time of the survey, the Division was working on the development of regulations for the 4.2 mile section of the Big Flat/Flat Brook, from Rt. 206 downstream to the Roy Bridge. Therefore, the survey also included several specific questions pertaining to angler practices for this popular trout stream. Anglers were asked if they fished, at any time during the year, the stretch of the Big Flat Brook where fly fishing regulations are in effect for all or most of the year. 22% of all survey respondents indicated they fished this section of the Big Flat Brook at some point during the year. This subset of anglers then answered a series of questions related to this special regulation area and these are their answers:

- A majority of anglers indicated that they were satisfied with their fishing experience in this stretch. 36% stated that they were very satisfied and 45% were somewhat satisfied. Very few anglers were dissatisfied (only 10% were very or somewhat dissatisfied).
- Similarly, angler satisfaction with the existing special regulations was high, with 32% very satisfied and 39% somewhat satisfied; 18% were somewhat or very dissatisfied.
- When asked to name the one thing they would change about the regulation if they could, 40% said they would change nothing, while 33% indicated they would like to change the methods/type of bait or lures that would allowed and 6% would change the timing/dates that various regulations apply.
- When asked if they would support reducing the daily creel, as a way to limit the number of trout that are harvested from this stretch of stream, many said they would strongly support (66%) or moderately support (18%) a creel limit change. Less than 15% were opposed (8% strongly and 5% moderately opposed) to a daily creel reduction.

In-season Closures

16 trout stocked rivers and streams are closed to fishing from 5 a.m. to 5 p.m. on the day they are stocked during the 7-week period after opening day. These waters are mostly larger rivers and streams that are heavily stocked with trout, with many trout access and fishing locations near a majority of NJ's resident anglers. The In-Season closures create a perception of fairness by allowing anglers who work during conventional work week hours the same "first crack" at freshly stocked trout as someone who may not have the same timing restraints. The closures also create the perception of fairness by allowing the freshly stocked trout a period of time to acclimate to their new stream surroundings and spread out throughout a stream segment. 68% of anglers surveyed indicated that they fish in a river or stream that has an in-season stocking closure. The majority of anglers surveyed (72%) were in support of these closures with the top reason given that it allows fish the opportunity to spread out throughout an area, while those who oppose the closures (10%) stated that the closures limit an anglers time and opportunity to fish.

Fall Trout Program

60 % of all survey respondents indicated they fish for trout in the fall while 40% stated that they do no fish for fall trout. Not enough time (30%), and poor weather (28%) were the main reasons provided for trout anglers who do not fish in the fall.

In 2006, the NJ Division of Fish & Wildlife made significant changes to its fall trout program. These changes included the stocking of larger 2-year-old trout, which resulted in fewer, but larger trout being stocked. The Division also went from stocking only rainbow trout to stocking

brook, brown and rainbow trout in the fall. In the telephone survey, 54% of the anglers surveyed were aware of the change, while 45% were not at all aware. In contrast, an overwhelming 80% of the online survey participants were aware of the change, while only 19% were not aware. In a 2010 telephone survey, only 29% of anglers surveyed were aware of this significant program change and 67% were not indicating awareness of the changes is slowly occurring over time. Anglers were also asked if the change affected their participation in the fall program. 1,311 anglers from the telephone survey indicated it did affect their participation, 77% of them said they began fishing or fish more during the fall. In contrast, 6% of anglers surveyed stated that they now fish less in the fall because of the change.

Rainbow trout (39%) were the overwhelming selection for EASIEST species to catch in the fall. As for preferred species to catch, Brown Trout (25%) and Rainbow Trout (23%) were favored over Brook Trout (12%), though the majority of anglers answered that they have no preference (40%) to which species they catch in the fall. Finally, anglers were asked if they would support or oppose a possible change of stocking only rainbow trout in the fall. Interestingly, anglers were almost evenly split on this topic. 37% would support stocking only rainbow trout in the fall, while 29% stated that they would not. An additional 30% stated that they would neither support nor oppose a stocking of only rainbow trout.

Anglers were also asked about the fall creel limit of 4 trout per day. The majority (76%) agree with the statement that the current 4-trout per day creel limit allows for a sufficient number of stocked trout to be available to anglers throughout the fall. However, when asked if they would support or oppose a daily creel limit reduction from a 4-trout limit to a 2-trout limit, the answer isn't as clear. The responses for this question diverged between the two survey types (Figure 5). Of the online survey participants, 56% support a fall creel reduction where 25% oppose a fall creel reduction. The telephone survey participants, 47% support a fall creel reduction and 43% oppose a fall creel reduction. More information and analysis is needed to determine why the online survey participants slightly favor a fall creel reduction and the telephone survey participants are more evenly split on a fall creel reduction.

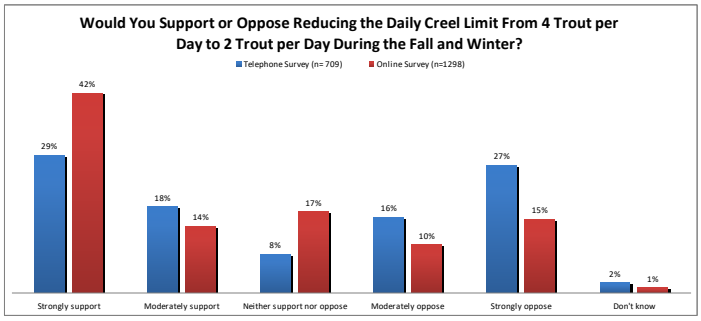


FIGURE 5. Comparison of angler responses to a question regarding daily creel limits in the fall/winter.

Conclusions

Data collected during this survey, in conjunction with fisheries survey data, was utilized in the development of year round catch and release, artificial lure and flies only regulations on a 4.2 mile section of the Big Flat Brook, and a 2.2 mile section of the Raritan River S/Br within the Ken Lockwood Gorge. The results of this survey and future surveys will continue to assist Fish and Wildlife biologists in managing recreational fishing and New Jersey's freshwater fishing resources. (Federal Grant F-48-R, Project III)

Opening Day Trout Angler Survey

New Jersey Fish & Wildlife'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. 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 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.

Lake Ocquittunk on 4/6/2013
Photo Credit: Gene Cottrell, WCC

Since 2004, Fish & Wildlife'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 (under Grant F-48-R) and the volunteer hours are used as state matching funds.

The opening day of the 2013 trout season was Saturday, April 6. A total of 43 waters (38 lakes and ponds, and 5 streams) were surveyed. The 38 WCC volunteers who participated spent 228 hours working on this survey and several staff also participated. A list of the 38 trout-stocked lakes and ponds surveyed in 2013, arranged by total number of anglers counted is provided in Table 15. For a second year in a row this survey included a special study involving eight waterbodies that were stocked pre-season with a mix of Brook and Rainbow Trout (50% each species) rather than the traditional 100% Brook Trout, to see if anglers were more successful catching one species. Overall, Rainbow Trout were caught 1.7 times more than Brook Trout in 2013 and 2.6 times more than Brook Trout in 2012. Trout that were greater than 14" in length were not included as they could have been "holdovers" (stocked the previous year) (Table 16 and Figure 6).

The complete report for the 2013 Opening Day Trout Angler Survey can be found in Appendix H. (Federal Grant F-48-R, Project III)

TABLE 15. List of lakes and ponds where the Opening Day Trout Angler Survey was conducted in 2013.

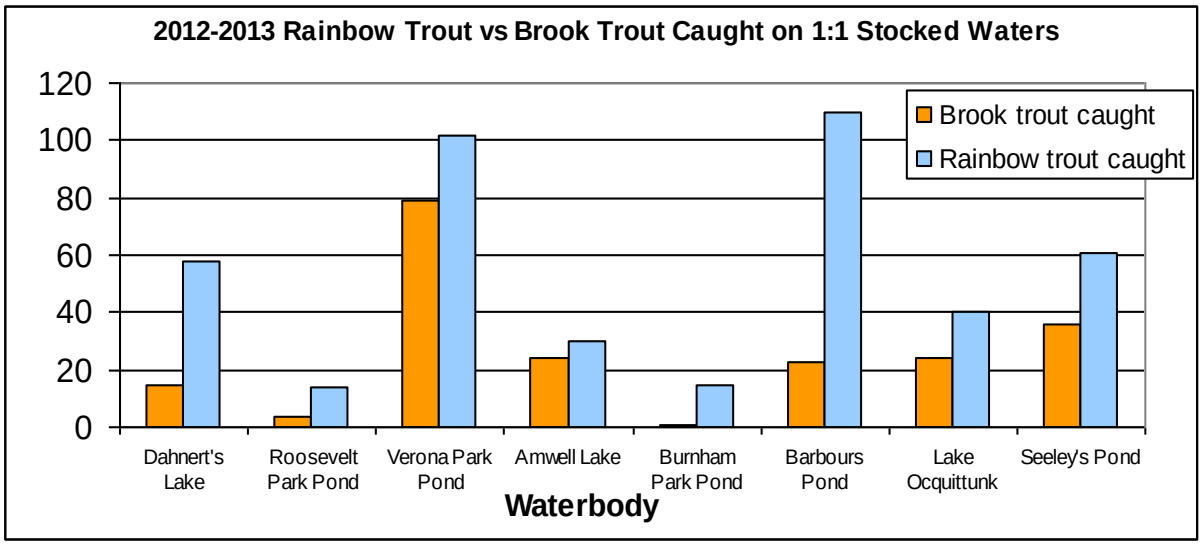
County	Waterbody	Bonus Broodstock Waters	Total # of Anglers	Total # of Trout Caught
Essex	Verona Park Pond		125	142
Cape May	Ponderlodge Pond[1]		115	-
Cumberland	Shaw's Mill Pond		91	87
Sussex	Lake Ocquittunk		79	19
Morris	Burnham Park Pond		78	2
Passaic	Barbours Pond[2]		73	64
Middlesex	Roosevelt Park Pond		73	4
Union	Lower Echo Park Pond		66	78
Monmouth	Hamilton Fire Pond	**x**	66	22
Bergen	Whites Pond	**x**	66	5
Hunterdon	Mountain Farm Pond	**x**	65	119
Middlesex	Farrington Lake		65	15
Burlington	Sylvan Lake	**x**	62	22
Bergen	Dahnert's Lake		60	20
Camden	Rowands Pond		59	41
Union	Milton Lake	**x**	56	22
Camden	Haddon Lake		54	9
Salem	Schadlers Sand Wash[1]		53	254
Mercer	Colonial Lake	**x**	50	8
Bergen	Indian Lake		43	48
Cumberland	Mary Elmer Lake		42	22
Monmouth	Topenemus Lake		41	3
Monmouth	Mohawk Pond		38	21
Passaic	Clinton Reservoir		37	0
Gloucester	Westville Lake[2]		36	40
Cumberland	South Vineland Park Pond		34	28
Hunterdon	Amwell Lake		34	22
Gloucester	Swedesboro Lake[1]		33	-
Cumberland	Giampietro Lake		31	0
Union	Seeley's Pond		29	34
Sussex	Silver Lake		26	6
Essex	Diamond Mill Pond		24	69
Sussex	Stony Lake		24	45
Monmouth	Mac's Pond		22	14
Monmouth	Garveys Pond		18	39
Sussex	Little Swartswood		18	14
Monmouth	Shadow Lake		18	6
Union	Warinanco Park Pond		14	10

[1] Angler counts not conducted from 8 a.m. to noon.

TABLE 16. Results of Opening Day catch rates for brook and rainbow trout stocked during the pre-season stocking period in 2012 and 2013.

County	Waterbody	Brook trout caught		Total Brook Trout Caught	Rainbow trout caught		Total Rainbow Trout	Rainbow trout to Brook trout Ratio
		kept	rel		kept	rel		
2013 Results								
Bergen	Dahnert's Lake	8	0	8	11	3	14	1.8
Bergen	Dahnert's Lake (4/7)	1	0	1	5	0	5	5.0
Middlesex	Roosevelt Park Pond	0	0	0	3	0	3	3 to 0
Essex	Verona Park Pond	46	17	63	52	19	71	1.1
Hunterdon	Amwell Lake	1	0	1	14	1	15	15.0
Morris	Burnham Park Pond	0	0	0	1	1	2	2 to 0
Passaic	Barbours Pond	11	0	11	51	2	53	4.8
Passaic	Barbours Pond (4/7)	10	2	12	5	0	5	0.4
Sussex	Lake Ocquittunk	4	0	4	9	0	9	2.3
Union	Seeley's Pond	13	1	14	15	1	16	1.1
	Total (2013)	94	20	**114**	166	27	**198**	1.7
2012 Results								
Bergen	Dahnert's Lake	6	0	6	32	7	39	6.5
Middlesex	Roosevelt Park Pond	0	4	4	9	2	11	2.8
Essex	Verona Park Pond	16	0	16	31	0	31	1.9
Hunterdon	Amwell Lake	23	0	23	15	0	15	0.7
Morris	Burnham Park Pond	1	0	1	13	0	13	13.0
Passaic	Barbours Pond	0	0	0	52	0	52	52 to 0
Sussex	Lake Ocquittunk	19	1	20	31	0	31	1.6
Union	Seeley's Pond	22	0	22	44	1	45	2.0
	Total (2012)	87	5	**92**	227	10	**237**	2.6
Total	**2012-2013**	**181**	**25**	**206**	**393**	**37**	**430**	**2.1**

FIGURE 6. Comparison of Opening Day catch rates for brook and rainbow trout stocked during the pre-season stocking period in 2012 and 2013.



Trout Angler Logbook Program

NJDFW launched a pilot logbook (diary) program in 2012 to obtain current information regarding trout angler catch and effort on four special regulation areas on trout streams. In 2013 the Trout Angler Logbook Program was expanded to include all eight special regulation areas (*Year Round* and *Seasonal Trout Conservation Areas* and *Fly Fishing Areas*). Logbooks were distributed to experienced anglers who indicated they regularly fished 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 cheapest 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.

In 2013 the data from logbooks issued to anglers in 2012 and returned was compiled and analyzed. The special regulation areas targeted in 2012 were the *Year Round Trout Conservation Areas* on the S/Br. Raritan River (Ken Lockwood Gorge and Claremont) and Musconetcong River (Point Mountain), and the Fly *Fishing Areas* on the Big Flat Brook. A separate logbook was issued for each stream (3 in total). Of the 90 logbooks distributed during 2012, 52 were returned and, of these, 36 had usable trip and catch data that was compiled and analyzed (Table 17). Although the percentage of 2012 logbooks returned with data was disappointing, catch data for a total of 482 fishing trips was obtained.

TABLE 17. Special Regulation Trout Areas Targeted in 2012 for the Trout Angler Logbook Program.

Location	# Logbooks Distributed	# Logbooks Returned	# Logbooks With Trip Data
S/Br. Raritan R. (Ken Lockwood Gorge/Claremont *YTCA's*)	36	17 (47%)	17 (47%)
Musconetcong R. (Point Mountain *YTCA*)	30	19 (63%)	13 (43%)
Big Flat Brook/Flat Brook (*Fly Fishing Areas*)	24	8 (33%)	6 (25%)
Total	90	52 (58%)	36 (40%)

In 2013 the Trout Angler Logbook Program was expanded to include all *Trout Conservation Areas* (*Year Round* and *Seasonal*) as well as the *Big Flat Brook Fly Fishing Areas*, with added emphasis on increasing angler participation and the return of logbooks. The logbook was redesigned so that one logbook could be used to record fishing trips taken on any of the six Tr*out Conservation Areas* and the two *Fly Fishing Areas*. In 2013 logbooks were prepared and distributed to 103 anglers who indicated they regularly fish these special regulation trout. The data from these logbooks will be compiled and analyzed in 2014. (Federal Grant F-48-R, Project III)

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.

Bureau staff participated in the **Delaware River Basin Ecosystem Flows Study**, sponsored by the Delaware River Basin Commission and led by The Nature Conservancy. The goal of the project was to review the flows needed by sensitive species in the Delaware River watershed and draft hypotheses about the relationships between flows and the species. The last two of three workshops were held in March and September 2013.
The Delaware River Basin Commission (DRBC) seeks to increase the amount of scientific information that they incorporate into basin-wide goals and standards for river flow management. Taking advantage of recent research and studies that address ecological responses to flow alteration is of particular interest. The Nature Conservancy (Conservancy) and other partners share the Commission's interest. The project purpose was to produce flow recommendations based on ecological responses to flow alteration that DRBC can incorporate into water management planning and permitting, while meeting demands for water use. The project was funded by DRBC and the work plan was developed to address several elements of the Commission's Compact (Compact), Comprehensive Plan, Water Code, Water Quality Regulations (WQR), and Water Resources Program (Nature Conservancy, 2013). (Federal Grant F-48-R, Project II)

Bureau staff actively participate in the **Musconetcong River Restoration Partnership**, comprised of state and federal agencies (NJDEP, NRCS, NOAA, USFWS, NPS), and nonprofit organizations (Musconetcong Watershed Association, Trout Unlimited, American Rivers, and North Jersey RC&D). The Partnership works with willing dam owners and obtains grants for dam removals to improve the health of the river and restore pathways for migratory fishes. Thus far the Partnership has successfully removed four dams and is actively pursuing the removal of both the Hughesville Dam and the next dam upstream, at Warren Glen. The Hughesville Dam is owned by a private company that partially owns the Warren Glen Dam (NJDFW owns a small portion of this dam). In addition, the Army Corps of Engineers is pursuing the removal of the Bloomsbury Mill Dam (also privately-owned), located upstream of Warren Glen. In 2013 the Partnership received a Coastal America Partnership Award for its efforts in successfully removing the Finesville Mill Dam and was alo awarded approximately $1.05M through the Disaster Relief Appropriations Act for removing the Hughesville Mill Dam. Bureau staff

attended meetings and prepared letters of support for grant applications related to the removal of these dams. (Hunter and Angler Fund)

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. In 2013, presentations on the fisheries resources within the state were presented to:

- Coldwater Conservation Camp electrofishing demonstration
- Freshwater Fisheries Forum (North)
- Freshwater Fisheries Forum (South)
- New Jersey Wildlife and Conservation Conference
- Outdoor Writer's Workshop
- Round Valley Trout Association
- Trout Meeting at Pequest Trout Hatchery
- Union County BioBlitz
- World Fishing & Outdoor Expo (Suffern, NY)

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 kiddy pool, and answering questions from the general public. (Hunter and 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 14 and 15, 2013, from 10 a.m. to 5 p.m. daily at the Colliers Mills Wildlife Management Area in Jackson Township, Ocean County. The 2014 dates are expected to be September 13 and 14. 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 and Angler Fund)

The 10th Annual **Teen Angler Youth Day** was held on July 20, 2013 at the Fishing Education Pond at the Pequest Trout Hatchery. The 72 teens who participated in the event kept 156 trout and won prizes (rod & reel combos, hats, t-shirts, fishing tackle and a tackle box). The 11th Annual Pequest Teen Angler Youth Day is scheduled for July 7, 2014. (Hunter and Angler Fund)

Staff participated in the **Union County's Annual BioBlitz**. The goal of the Bio-Blitz was to quantify species diversity within the public park system and to educate the public. In 2013 the event was held at Rahway River Park on June 15. Fish were collected at multiple sites along the Rahway River, Nomahegan Brook, Lower Echo Park Pond, Westfield Pond, and Lenape Park Pond. The team used a variety of sampling methods including electro-shocking and seining. The fish diversity is moderate, consisting of 14 species, with the Banded Killifish and various sunfish the most prevalent (Table 18). All but 5 species are native to New Jersey waters. Non-native species include green sunfish, Bluegill, Largemouth Bass, goldfish, and western mosquitofish. The warmwater fish assemblage encountered provides recreational opportunities for both the novice naturalist and the expert angler including Largemouth Bass and a variety of sunfish species. In addition, Lower Echo Park Pond is stocked with trout and Channel Catfish. Nomahegan Park Pond will be stocked annually with trout beginning for the 2014 fishing season. 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 and a twenty-foot seine. The presentation also touched upon the job of a fisheries biologist, a summary of fishes encountered, and field identification. (Hunter and Angler Fund)

TABLE 18. Fish species encountered during the Union County 2013 BioBlitz.

Common Name	Historical Presence	Rahway River (Lenape Park)	Rahway River (Nomahegan Park)	Nomahegan Brook (below Lower Echo Lake)	Nomahegan Brook (behind Westfield Pond)	Westfield Pond	pond at Lenape entrance
American Eel	native	x		x			
Goldfish	non-native						x
Golden Shiner	native			x			
White Sucker	native				x		
Banded Killifish	native	x		x	x		
Mummichog	native	x					x
Western Mosquitofish	non-native	x	x				x
Tessellated Darter	native	x			x		
Largemouth Bass	non-native		x	x	x	x	
Green Sunfish	non-native	x	x	x	x	x	
Pumpkinseed	native		x	x	x	x	
Bluegill	non-native	x	x	x	x	x	
Yellow Bullhead	native			x			
Brown Bullhead	native			x	x		

OTHER FISHERIES RELATED ACTIVITIES

Database Management - FishTrack

Fishtrack is an Access database which houses New Jersey's freshwater fisheries stocking information and field surveys data collected by NJDFW throughout the state historically through present day. In 2013, data validation using Quality Assurance / Quality Control (QA/QC) procedures was completed on nearly 1700 stream river surveys conducted from 2000 through 2012. Maintaining data accuracy and consistency in the database is crucial because it provides fisheries managers with an important tool to effectively manage the state's aquatic resources. (Federal Grant F-48-R, Project I)

Electrofishing Safety Plan

The NJ Bureau of Freshwater Fisheries has safely conducted thousands of electrofishing surveys since the 1960's. While electrofishing has become safer over the years, particularly as the Bureau shifted from home-made to commercially built equipment, equipment sophistication combined with a more litigious society has made it necessary to have an safety plan for this inherently dangerous activity. Plans developed by other state and federal agencies were reviewed and used to prepare an electrofishing safety plan for the Bureau. The draft plan is expected to be finalized and approved by NJDEP's Office of Health and Safety (OHS) when their concerns regarding the participation of interns, volunteers, and college students (accompanied by their professor) in electrofishing are satisfactorily addressed. Staff (full-time and seasonal) expected to participate in electrofishing received First Aid/CPR/AED training and a certificate valid for two years. (Federal Grant F-48-R, Project I)

Permits

The Bureau of Freshwater Fisheries reviewed and issued nearly 479 permits in 2013 to provide for the effective management and protection of the State's aquatic resources (Table 19). 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 throughout the state.

Each year increasing staff time is spent reviewing and approving these permits due to staffing reductions, increased complexity in the management of the state's water resources, and the variety of interests of user groups. In 2013, the Bureau addressed this growing demand by creating a webpage on the Division's website, dedicated to freshwater permits. The webpage elaborates information for applicants, identifying common mistakes on applications, outlines proper procedures and provides access to the most current application forms. These efforts should improve the quality of application submittals, encourage early coordination in application and project planning, thus avoiding delays via a more efficient review. Approximately 25% of

applications received are determined to lack basic/critical data and/or proper signatures and must be returned to applicants. (Hunter and Angler Fund)

Table 19. Permits issued by the Bureau of Freshwater Fisheries in 2013.

Permit Type	Number Issued
Baitfish - Commercial	6
Fish Stocking	131
Gill Net – Staked - Commercial	0
Gill Net – Drifting - Commercial	1
Green Frog / Bullfrog - Commercial	2
Haul Seine - Commercial	1
Miniature Fyke/pot	2
Scientific Collecting	52
Snapping Turtle - Commercial	99
Special Use Limited License	35
Water Lowering	150
Total	479

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 Divisional collects valuable information from tournament reports to supplement existing fisheries data.

In 2013 the Bureau of Freshwater Fisheries issued 200 fishing tournament permits at 19 Wildlife Management Area locations throughout New Jersey. Thirty-seven organizations were involved in fishing these tournaments. The three most popular areas among tournament anglers were Salem Canal, Lake Assunpink, and Union Lake. (Hunter and Angler Fund)

LITERATURE CITED

Barbour, M. T., J. Gerritsen, B. D. Snyder and J. B. Stribling 1999. Rapid bioassessment protocols for use in streams and wadeable rivers: periphyton, benthic macroinvertebrates, and fish, 2nd edition. EPA 841-B-99-002. U. S. Environmental Protection Agency, Office of Water, Washington, D.C.

Duda, Mark. 2012. New Jersey Trout Anglers' Opinions on Stocking and Other Trout Regulations. Responsive Management Inc., Harrisonburg, VA 22801.

Hamilton, P. L. and L. M. Barno. 2006. New Jersey Coldwater Fisheries Management Plan. New Jersey Division of Fish and Wildlife, Trenton, New Jersey.