

Management of Wild Trout

Overview

New Jersey has a surprising abundance and variety of self-sustaining wild trout populations. Brook trout, the state's only native salmonid, occurs most often, followed by brown trout, rainbow trout, and lake trout. Populations of wild brook, brown and rainbow trout inhabit nearly 1,000 miles of streams located in small, upland streams in the northern tier of the state. The state's second largest impoundment supports a reproducing lake trout population. Wild trout are important indicators of high water quality and the ability of waters to support reproducing trout populations is recognized and protected through NJDEP regulatory programs. They also represent a renewable resource that can and does provide angling recreation without the economic cost of stocking. Strategies that guide DFW wild trout management efforts include activities related to inventorying, monitoring, habitat preservation and restoration, and education and communication.

Importance of Wild Trout

Trout that are able to complete their life cycle in a natural aquatic habitat, and maintain a population through natural reproduction, are termed wild trout. The survival of self-sustaining populations of wild trout is not dependent upon the stocking of hatchery-reared trout. Because of their high water quality and habitat requirements, trout are valuable indicators of healthy aquatic ecosystems. The importance of water quality, as related to the ability of a stream or lake to support wild (reproducing) trout populations is recognized in New Jersey through the state's surface water classification system. Waters that support reproducing trout populations are referred to as "trout production waters" and are classified as FW2-Trout Production Category 1 (FW2-TP(C1)). Through this classification trout production waters receive one of the highest levels of protection available from activities that could potentially impact coldwater quality and habitat, through a variety of NJDEP regulatory programs (see Classification of NJ Trout Waters section).

Wild trout are a renewable resource that help provide a diversity of desirable trout angling opportunities without the cost of stocking hatchery-reared trout costs. Though generally smaller than their hatchery-reared counterpart, wild trout tend to be more colorful and challenging to catch. They are valued by anglers who enjoy fishing for naturally reproduced trout found in many small streams that typically flow into larger, trout-stocked streams. In a survey of New Jersey trout anglers, 20 percent indicated that they fished for wild trout in 2002 (Responsive Management 2003). Streams that are home to wild trout are also highly regarded by recreationists other than anglers (hikers, birders, and the occasional canoeist or kayaker) who are attracted to these aquatic ecosystems. Not only are there tangible economic benefits resulting from these recreational activities, perhaps more importantly are the intangible benefits to all residents that reflect quality of life values.

New Jersey's Wild Trout Resources

Currently nearly 1,000 miles of streams, or five percent of streams statewide, in New Jersey contain populations of wild brook, brown, and rainbow trout (Table 5). A reproducing population of lake trout has been established in a 2,365-acre reservoir. Three watersheds, the Upper Delaware, upper Raritan (North and South Branches), and Pequannock are particularly rich in wild trout resources (Figure 4). On average 30 percent of the streams in these watersheds are inhabited by wild trout populations and statewide, 80 percent of the wild trout streams occur in these three watersheds (Table 5).

Of the four salmonid species that currently reproduce in New Jersey freshwaters, only the brook trout, whose ancestors colonized this region following deglaciation 12,000 years ago, is native to the state. Over the last century reproducing populations of three non-native trout species (brown, rainbow, and lake trout) have become established through stocking efforts intended to replenish depleted populations and enhance recreational angling. Although historical information regarding the occurrence of trout in New Jersey dates back to the late 1800's, organized scientific efforts to collect empirical data on wild trout populations did not begin until the late 1960's. From 1968 to 1972 a research study conducted by DFW documented the occurrence and distribution of trout statewide, including the occurrence of wild trout populations in 75 streams (or stream segments). Since then, DFW has conducted stream surveys annually to identify additional wild trout streams and occasionally monitor the status of previously documented wild trout populations. To date, reproducing salmonid populations have been documented in 175 streams or stream segments and one lake (Appendix B, Part II).

Wild trout require cold water temperatures year round and a rocky substrate suitable for spawning in order to survive and reproduce. The occurrence of these habitat essentials in New Jersey is strongly influenced by the temperate climate and physiogeography. Habitat suitable for wild trout populations can be found primarily in small streams scattered throughout the Appalachian foothills and mountains within two northern physiographic provinces (Ridge and Valley, and Highlands) (Figure 5). The elevation and topography associated with these regions help provide and maintain cold summer water temperatures (through springs and groundwater inputs) and good physical habitat (pools and riffles, rocky substrate). Over 90 percent of New Jersey's trout production streams are located in these regions and most can be characterized as freestone streams, steep to moderate gradient, variety of high quality in-stream habitat, low temperature, well oxygenated waters that are relatively unfertile. Physical habitat (pool depth and woody debris) is believed to have the greatest influence in fish size and abundance.



The status of the four salmonid species that reproduce naturally in New Jersey waters is briefly summarized later in this section.

TABLE 5.— Land area, total stream length and proportion of trout production streams for each watershed management area in New Jersey, as documented through DFW surveys conducted from 1968 through 2003.

Watershed Management Area	Watershed land area		Total length of all streams		Total length of trout production (wild trout) streams		Percentage of trout production streams
	(km ²)	(mi ²)	(km)	(mi)	(km)	(mi)	(%)
1	1931.37	745.71	1927.73	1197.83	561.00	348.59	29.1
2	539.76	208.40	630.78	391.95	51.01	31.70	8.1
3	616.05	237.86	754.31	468.71	233.87	145.32	31.0
4	488.24	188.51	458.91	285.16	14.24	8.85	3.1
5	427.47	165.05	515.26	320.16	1.51	0.94	0.3
6	936.25	361.49	1142.58	709.96	127.62	79.30	11.2
7	465.02	179.55	276.82	172.01	0	0	0
8	1212.89	468.30	1374.26	853.92	483.11	300.19	35.2
9	910.71	351.63	1047.12	650.65	0	0	0
10	737.12	284.60	782.18	486.02	0	0	0
11	704.25	271.91	882.26	548.21	75.07	46.65	8.5
12	1204.36	465.01	1198.39	744.65	0	0	0
13	2056.81	794.14	2593.58	1611.58	0	0	0
14	1700.36	656.51	2587.53	1607.82	0	0	0
15	1624.31	627.15	2161.26	1342.94	0	0	0
16	866.42	334.53	2130.73	1323.97	0	0	0
17	3194.12	1233.26	4650.33	2889.58	0	0	0
18	1013.58	391.35	1156.92	718.88	4.71	2.92	0.4
19	908.52	350.78	1365.04	848.20	0	0	0
20	655.25	252.99	1066.59	662.75	0	0	0
Total	22192.85	8568.71	28702.58	17834.95	1552.14	964.46	100

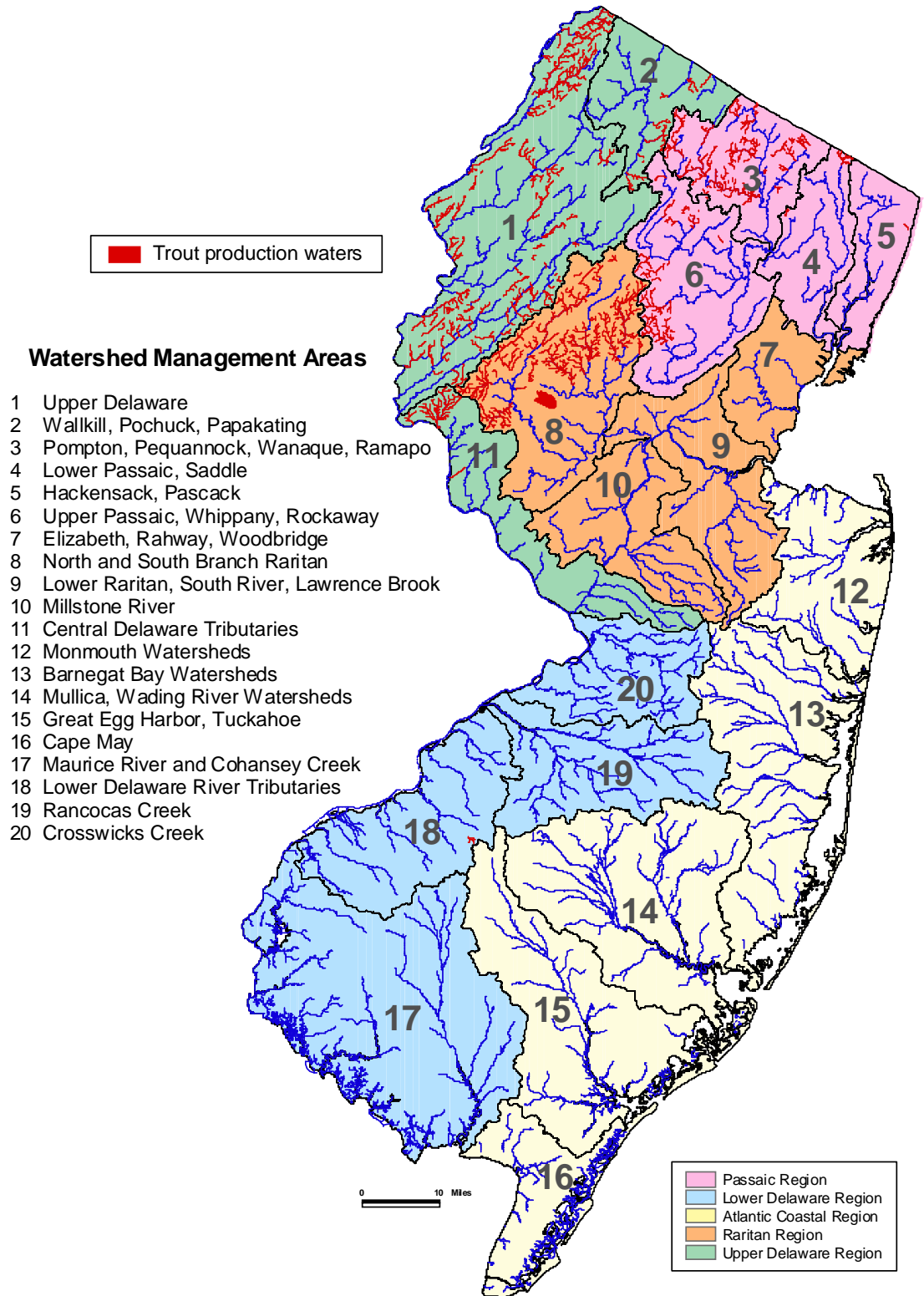


FIGURE 4.— New Jersey’s watersheds and freshwaters having known reproducing salmonid populations (trout production waters) as documented through DFW surveys conducted from 1968 through 2003.

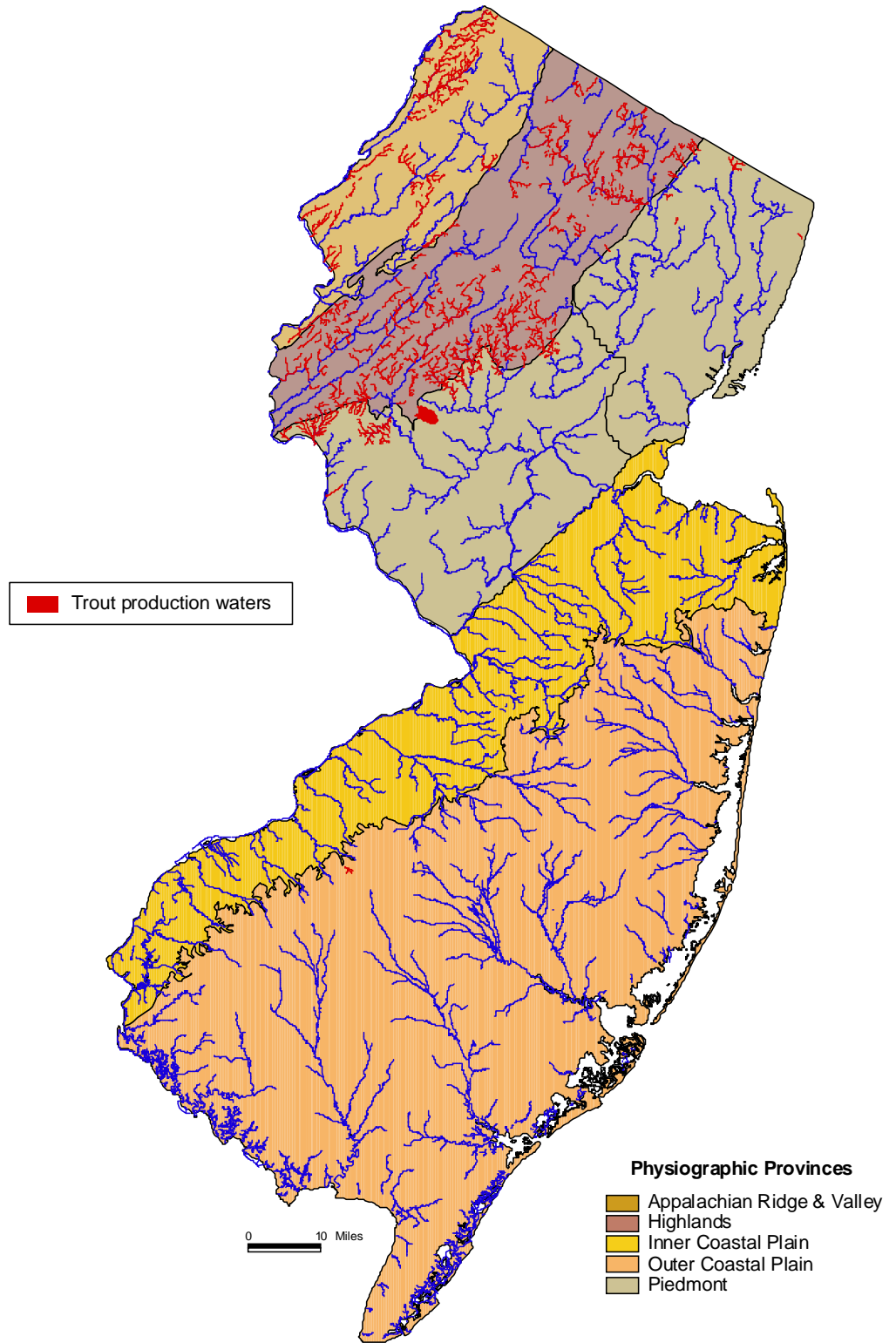


FIGURE 5.— New Jersey’s physiographic provinces and freshwaters having reproducing salmonid populations (trout production waters) as documented through DFW surveys conducted from 1968 through 2003.

Brook Trout (*Salvelinus fontinalis*)

The brook trout is New Jersey's only native salmonid and in 1992 was officially designated the state fish. Wild brook trout populations occur in streams located in seven northern counties (Sussex, Warren, Morris, Passaic, Bergen, Hunterdon, and Somerset Counties), and in one stream located in a southern county (Camden County).

Reproducing populations have been confirmed in 121 streams or stream sections, and in 94 of these, brook trout is the sole salmonid inhabitant (Figure 6). The introduction of non-native salmonids, through widespread stocking over the last century, resulted in the establishment of reproducing populations of wild brown and rainbow trout, some of which co-exist with brook trout or may have displaced brook trout. Of 27 streams co-inhabited by brook trout and at least one nonnative salmonid, brown trout occur in 23, rainbow trout in one, and all three species occur in three streams.



The occurrence of brook trout would perhaps be more widespread, however competition with the more aggressive brown trout, and the brook trout's noted vulnerability to angling and preferences for colder temperatures, have undoubtedly helped to relegate brook trout to colder headwater streams. This has been casually observed in a number of streams, most notably in Van Campens Brook. In headwater streams, brook trout are typically small and seldom achieve sizes greater than 12 inches, with 5 - 10 inches the size range typically observed for the majority of adult fish. The brook trout's small size (in terms of both population and individual fish) and confining habitat undoubtedly influence angler preferences. The majority of trout anglers (82 percent) fish in waters that are stocked with cultured trout that average 10.5 inches (Responsive Management 2003). Twenty of the 35 streams currently regulated as *Wild Trout Streams* contain wild brook trout populations.

In 2004 a unique partnership, the Eastern Brook Trout Joint Venture (EBTJV), was formed to unify range-wide efforts to protect, restore, and enhance aquatic habitat of brook trout in the eastern U.S. EBTJV is the nation's first pilot project under the National Fish Habitat Initiative (www.fishhabitat.org). This collaborative, multi-state endeavor involves state and federal agencies, regional and local governments, businesses, conservation organizations, academia, scientific societies, and private citizens. DFW participates in the EBTJV by providing data for the range-wide assessment and assisting in the development of a conservation plan and strategies to deal with threats to brook trout and their habitat.

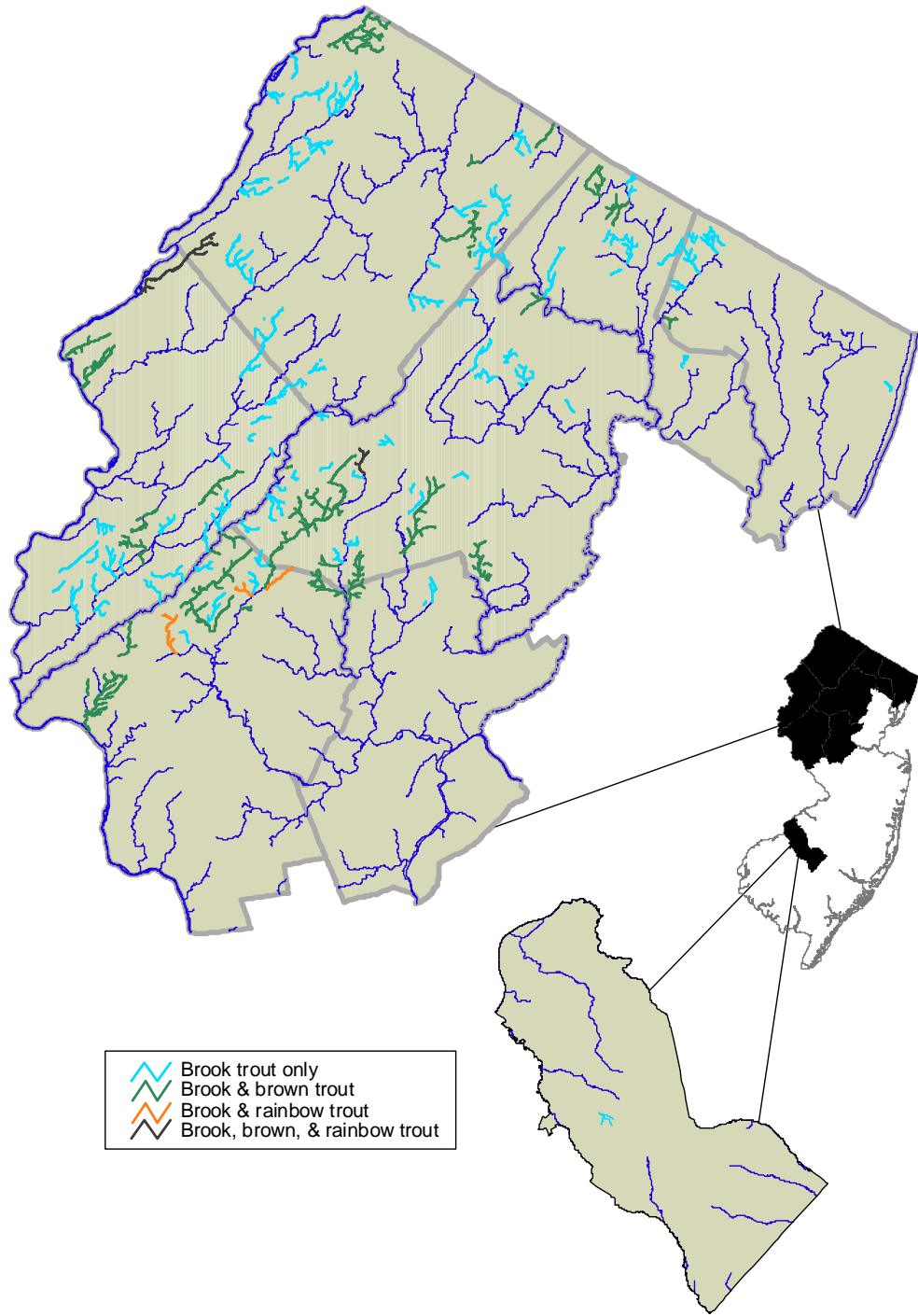


FIGURE 6.— Distribution of wild brook trout in New Jersey as documented through DFW surveys conducted from 1968 through 2003.

The first goal of the Venture was to assess the current status of brook trout within their historic range. With the exception of New York, where 5th level watersheds were used, 6th level Hydrologic Unit (HU) watersheds (subwatersheds) were selected for the assessment since they were the smallest size watershed with current available data and provide a reasonable scale for future development of conservation management strategies (Hudy and Thieling 2005). These subwatersheds average approximately 34 square miles in size.

A classification system was designed and used to consistently determine the percentages of lost self-sustaining brook trout habitat within each subwatershed. For example, the presence of self-sustaining non-native coldwater fish species within the native range of brook trout was considered evidence that brook trout should have occurred in that habitat. Initial classifications were later validated during site visits with EBTJV partners from the U.S. Forest Service's Fish and Aquatic Ecology Unit to ensure consistent assessments among the states. The watershed level brook trout classifications and summary characteristics can be summarized as follows:

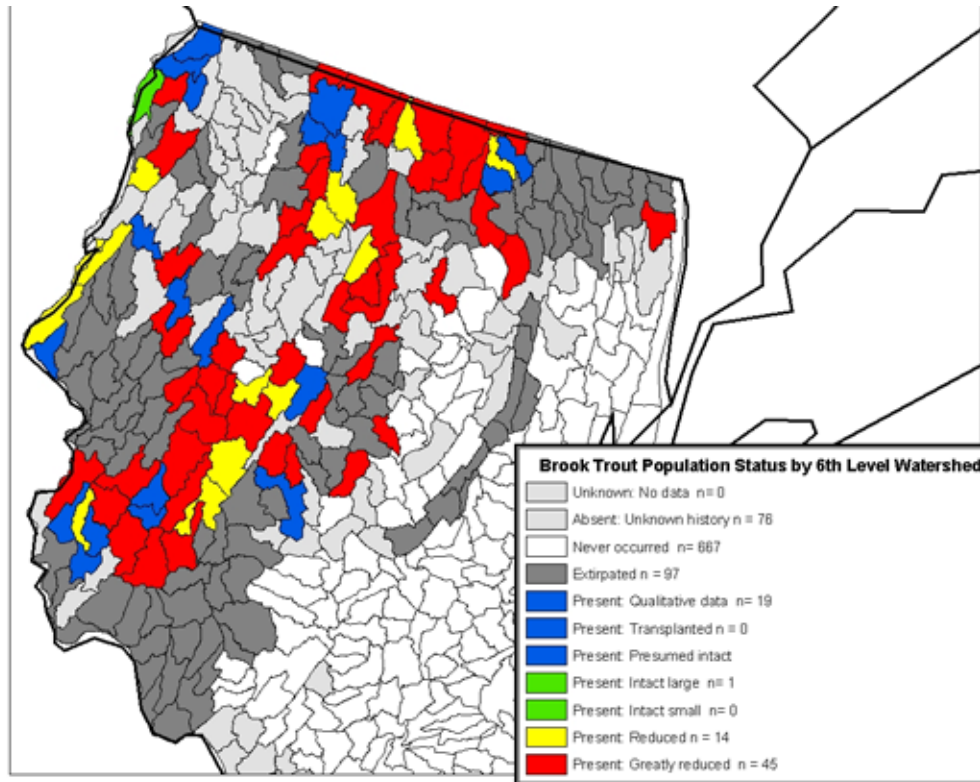
Classification	Summary Characteristics
Unknown	No data or not enough to classify further
Absent: unknown history	Brook trout currently not in watershed; historic status unknown
Never occurred	Historic self sustaining populations extirpated
Extirpated	All historic self-sustaining populations extirpated.
Present: Qualitative	No quantitative data; qualitative data show presence
Present: Intact	High percentage (> 90%) of historic habitat occupied by self sustaining populations
Present: Reduced	Reduced percentage (50% to 90%) of historic habitat occupied by self-sustaining brook trout
Present: Greatly reduced	Greatly reduced percentage (1% to 49%) of historic habitat occupied by self-sustaining brook trout.

In this study, 11,374 subwatersheds within the native range of brook trout in the eastern U.S. were classified. Brook trout were found persisting in 3,344 subwatersheds and have been extirpated from 1,166 subwatersheds. Of the 3,344 subwatersheds where self-sustaining populations of brook trout persist, the following statistics indicate substantial losses have occurred in these subwatersheds:

- 45% have lost over 50% of the habitat supporting self-sustaining brook trout;
- 15% have lost 10 - 49% of the habitat supporting self-sustaining brook trout; and
- 9% remain intact, having lost less than 10% of the habitat supporting self-sustaining brook trout

The status of New Jersey's self-sustaining brook trout populations is even more disturbing than these range-wide statistics (see color-coded map below). Of 919 subwatersheds statewide, self-sustaining brook trout populations are present in 79 (red, yellow, green, and blue areas), are believed extirpated from 97 subwatersheds (55% of the habitat historically occupied by self-sustaining populations – dark gray areas), and

never occurred in 667 subwatersheds (white areas). These numbers may change since the historical range of brook trout is unknown for 76 subwatersheds (light gray areas) and the status of existing self-sustaining populations is uncertain in 19 watersheds (blue areas).



Opportunity - Continue to document brook trout distribution in New Jersey, with particular focus on subwatersheds where the brook trout status is currently classified as unknown.

Opportunity - Sample stream segments in 6th level HUC units where self-sustaining populations of brook trout are present, but the extent of their occurrence is uncertain (blue areas on map).

Another component of the range-wide assessment was the identification of key stressors to brook trout populations within the subwatersheds. Across its historic range, the top five stressors to brook trout populations were: increased water temperatures (20%), agriculture (15%), urbanization (10%), one or more exotic fish species (7%), and degraded riparian habitat (7%). In New Jersey, the top five stressors to brook trout populations were very similar to the range-wide stressors, with the notable exception that dams replaced agriculture as the second highest stressor. Additional information on key stressors and their effects on this important indicator species can be found in the EBTJV's 2005 report entitled "Conserving the Eastern Brook Trout: An Overview of Status, Threats, and Trends."

Opportunity - Develop and implement a conservation plan specific to brook trout, that dovetails with the EBTJV, to ensure the long-term survival of New Jersey's state fish and only native salmonid.

Opportunity - Investigate the current status of brook trout and determine if a special designation (i.e. Species of Special Concern, Threatened, etc.) is warranted.

Brown Trout (*Salmo trutta*)

First introduced to New Jersey in 1908, this European salmonid has established reproducing populations in 76 streams (or stream sections) in the northern half of the state (Figure 7). Of these streams, 23 are also inhabited by brook trout, 4 by rainbow trout, and three streams are inhabited by all three salmonid species. The brown trout is generally more tolerant of warmer water and more aggressive and dominant over the other two salmonid species. These traits have likely resulted in the displacement of brook trout from their natal streams or relegated brook trout to upstream headwater areas less favorable for brown trout. Wild brown trout tend to grow to a larger size (15 inches) and can be more difficult to catch with hook and line, and these qualities make them an attractive quarry for trout anglers.



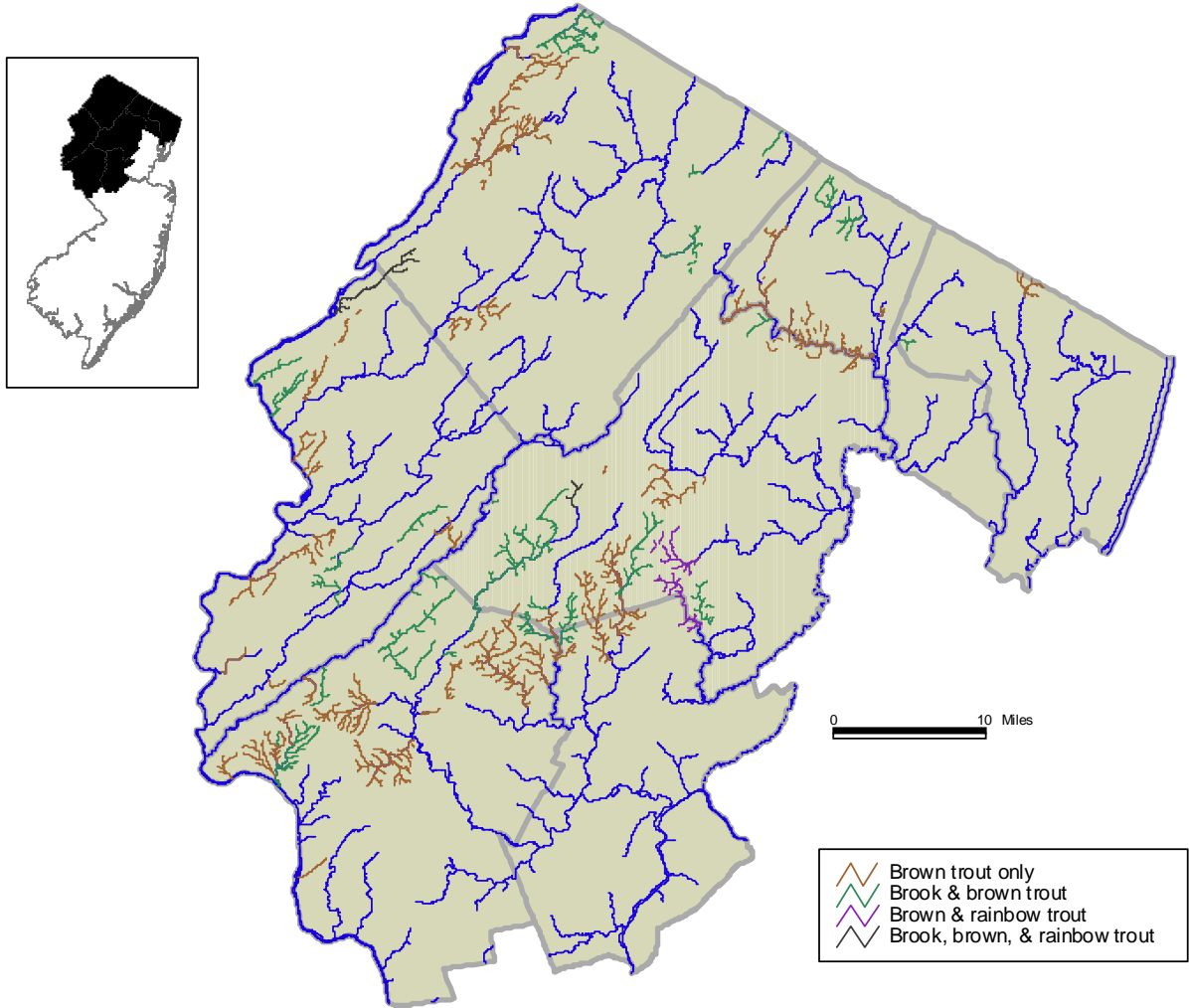


FIGURE 7.— Distribution of wild brown trout in New Jersey as documented through DFW surveys conducted from 1968 through 2003.

Rainbow Trout (*Oncorhynchus mykiss*)

Rainbow trout, native to western North America, were first introduced to New Jersey in 1882. Despite widespread stocking over the last century, rainbow trout are the least common of the three stream dwelling salmonids in New Jersey. Reproducing populations have been documented in only thirteen streams in north Jersey and five of these are inhabited solely by rainbow trout (Figure 8). Of the remaining seven streams, four are co-inhabited by brown trout, one by brook trout, and three streams have reproducing populations of all three species.



The reason behind the paucity of wild rainbow trout streams is unknown although it is suspected that physical habitat and stream gradient influence their distribution. Wild rainbow trout do not grow very large, with 8 - 12 inches considered a large fish.

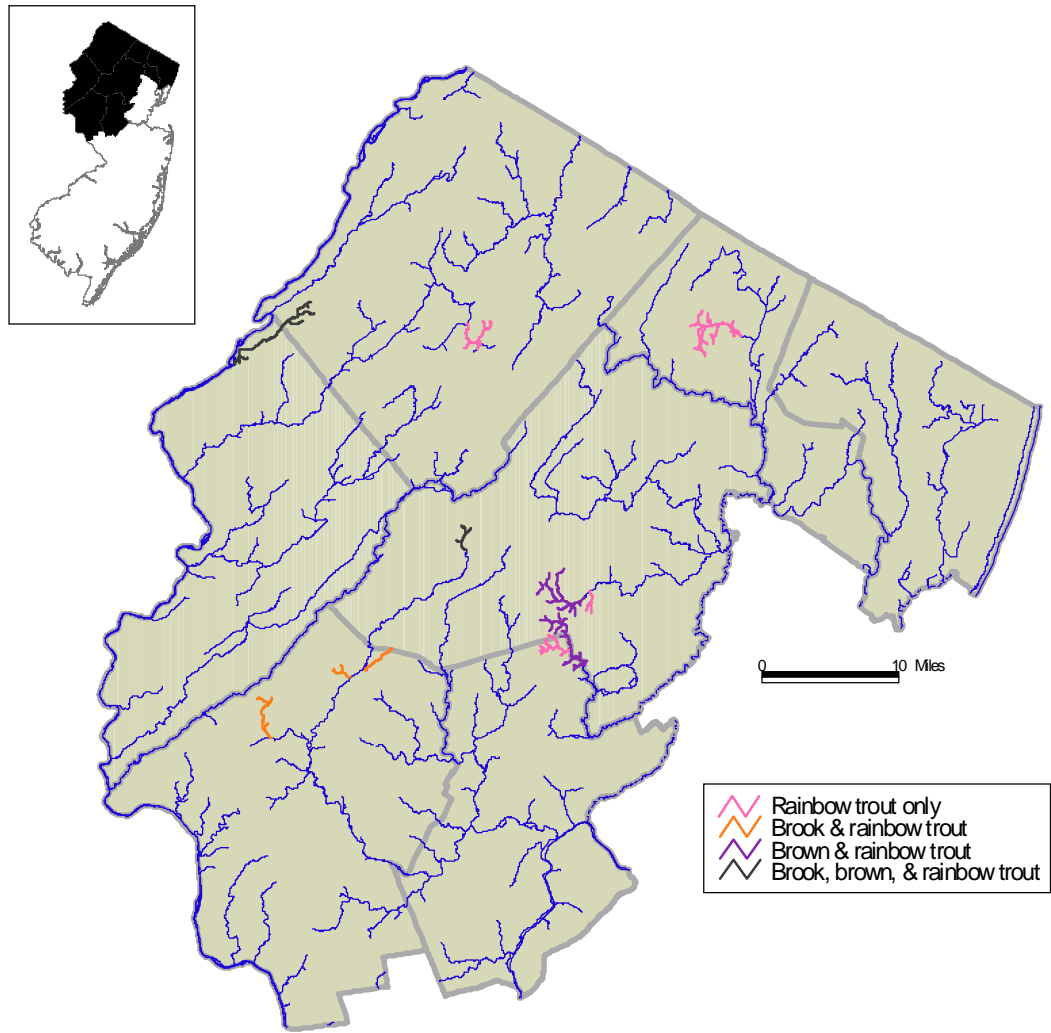


FIGURE 8.— Distribution of wild rainbow trout in New Jersey as documented through DFW surveys conducted from 1968 through 2003.

Lake Trout (*Salvelinus namaycush*)

Native to more northerly North American latitudes, the lake trout is a relative newcomer to New Jersey waters. In 1977 this species was introduced into Round Valley Reservoir (Figure 9), a large, deep-water reservoir (2,350 surface acres, 160 feet deep) that has ample salmonid habitat, particularly during the summer when most other New Jersey lakes lack a suitable strata of cold, well-oxygenated water.

Lake trout were stocked to provide anglers with a local opportunity to fish for a long-lived salmonid having the ability to grow to a very large size. It was expected that as the population matured, adult lake trout would attempt to spawn over the large boulders lining the face of the



dams and saddle dikes. In the mid-1980's successful reproduction was first documented. Supplemental stocking of hatchery-produced fingerlings continued until the when it was determined that natural reproduction was sufficient to maintain a desirable fishery. The opportunity to angle for trophy salmonids (brown, rainbow, and lake) has made this reservoir a popular fishing destination. Lake trout have also been stocked annually into Merrill Creek Reservoir (650 surface acres, 210 feet deep) since 1988. Although similar spawning habitat is available for lake trout in this reservoir, successful reproduction has not been documented.

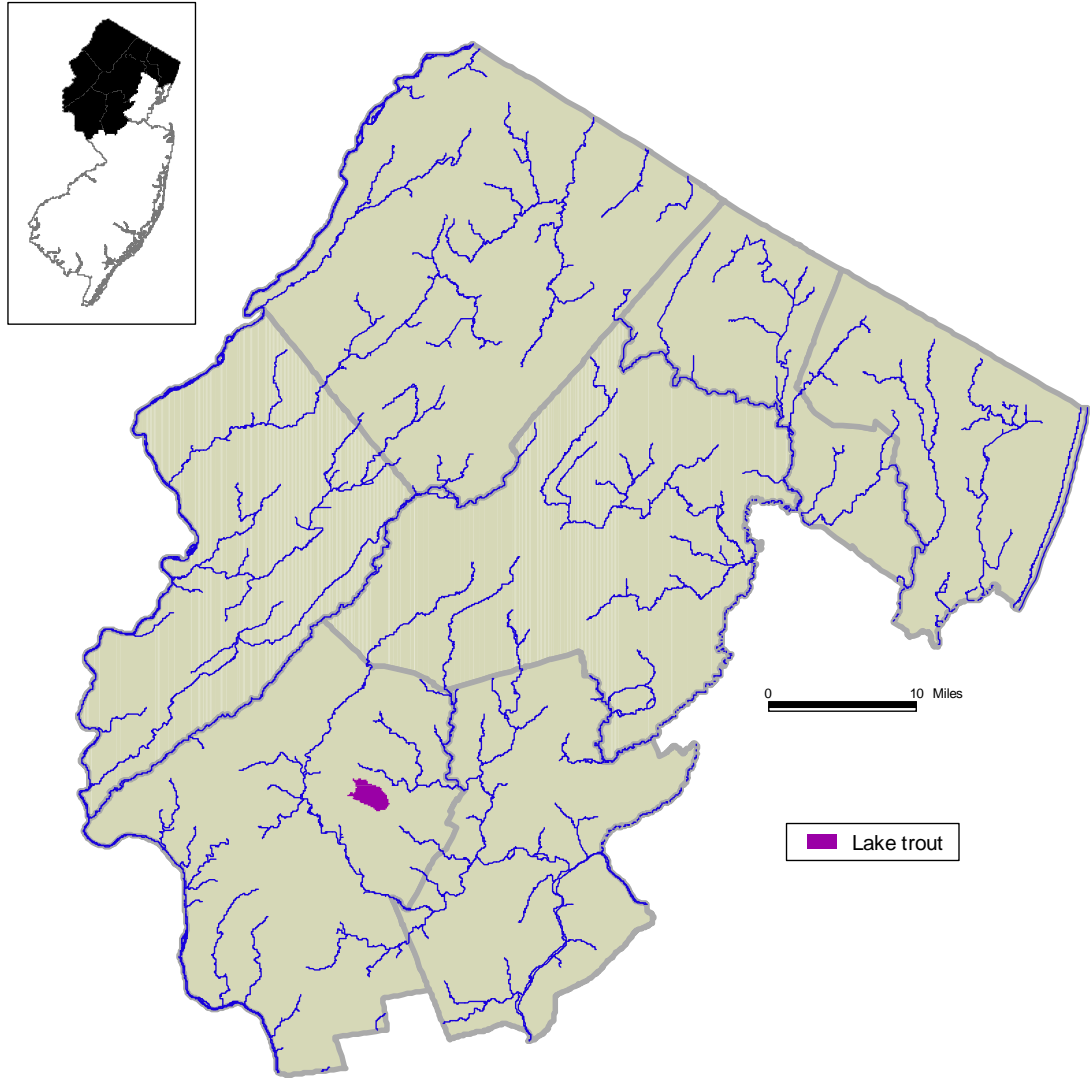


FIGURE 9.— Distribution of wild lake trout in New Jersey as documented through DFW surveys conducted from 1968 through 2003.

Management Strategies for Wild Trout

Bureau of Freshwater Fisheries activities, which guide the DFW's efforts in managing the state's wild trout, can be categorized into four strategies: resource inventory, research and monitoring, regulations and habitat preservation, protection and restoration.

Resource Inventory

The first step in managing New Jersey's wild trout populations is to have and maintain an inventory of wild trout populations (and their aquatic habitats) so that species distributions can be mapped. Presented in this plan, for the first time, are the species distribution maps for New Jersey's four reproducing salmonid species. Survey data collected by the DFW over a 36-year period was used to prepare these distribution maps. This information is in a format that can be interfaced with other GIS information layers and used by resource managers to assist in the development of strategies for managing these valuable fish communities and their habitat as a unit.

Current inventory activities include:

Classification of NJ Trout Waters (Job II-2 under Federal Grant F-48-R)

Surveys are conducted in the summer to determine the trout supporting status of waters not previously surveyed or classified waters that may qualify for a higher classification. Recommendations for classification changes are forwarded to NJDEP for consideration in the Surface Water Quality Standards.

Research and Monitoring

Monitoring provides information needed to evaluate management success and provides a scientific basis for modifying management practices. It involves the collection of information through programs, investigations, and evaluations. Examples of monitoring activities are documenting new populations and determining population trends, changes in species distributions, changes in habitat, and angler preferences and exploitation (fishing). Information gathered can then be evaluated and used to guide management decisions.

Current research and monitoring activities include:

Re-Inventory of Trout production Waters (Job II-2 under Federal Grant F-48-R) Seventy-five trout production streams surveyed between 1968 and 1973 are being resurveyed to document changes in fish community structure as related to changing land use.

Opportunity - Prioritize and establish a monitoring schedule for wild trout populations.

Brook Trout Genetics Study

Widespread hatchery supplementation and translocations, by well-intentioned managers and anglers may have resulted in displacement of ancestral

(heritage) brook trout from their native streams or interbreeding with cultured, non-native brook trout strains. The origin of brook trout inhabiting New Jersey waters is under investigation using molecular genetics technology. If populations that have been unaffected by past management practices can be identified then genetic conservation of these “heritage” populations can be integrated into management strategies.

Lake Trout Population Monitoring

The lake trout populations in Round Valley Reservoir and Merrill Creek Reservoir are monitored each fall using gill nets to assess fish condition and natural reproduction. The information collected is used to determine if new regulatory or management strategies are warranted.

Fishing Regulations

Regulations provide protection to wild trout populations by managing the size, number and time frame for which trout may be taken. Presently, wild trout populations are afforded protection under two specific regulations; the Wild Trout Stream regulation and general statewide regulations. Established in 1990, there are currently 35 streams (or portions thereof), encompassing 135 miles of stream, that are designated and regulated as *Wild Trout Streams*. This figure represents 20 percent of the streams that have been identified as having reproducing trout populations. Selection was loosely based upon a stream’s ability to support a quality fishery for wild trout and geographic distribution since increasing public awareness and recognition of these waters was considered important. A number of the streams selected had been traditionally stocked with cultured trout and this practice was discontinued. Fishing is permitted from opening day of each year to September 15, with a minimum size limit of 7 inches and a limit of two fish per day. The streams are catch and release only the remaining part of the year providing protection during their critical spawning period. Only artificial lures may be used.

The general statewide regulations afford a 7-inch minimum on all trout caught within the state. This minimum size limit was incorporated into the statewide general regulations in 1997 to protect wild trout populations in streams not designated under the *Wild Trout Stream* regulation or other special regulations. However, no protection is provided during the spawning period and the daily creel is 6 fish per day from opening day through May 31 and 4 fish the remainder of the year, with the exception of the pre-season stocking closure when no fishing is permitted.

A small number of trout production waters, or stretches there of, are afforded protection through special regulations. Further elaboration on these and other fishing regulations, as well as their development over the years, can be found in the Fishing Regulations section of this plan.

Opportunity - Approximately 140 trout production streams are not trout-stocked or regulated as a *Wild Trout Stream*. The harvest of these wild trout is currently governed by the statewide general regulation. The need to have more stringent regulations governing the harvest of wild trout in these trout production streams should be explored.

Opportunity - Evaluate trout production streams currently regulated as *Wild Trout Streams*, *Trout Conservation Areas*, and *Fly Fishing Only Areas* to determine if existing fishing regulations provide for appropriate level of recreation that is consistent with maintaining viable wild trout populations.

Habitat Preservation, Protection and Restoration

Land use changes and issues are considered key factors that influence and impact water quality and fish communities in New Jersey's freshwaters. Land use activities that increase summer water temperatures, increased sediment transport and deposition, and cause in-stream flow extremes are considered to be the greatest threats to wild trout habitat. Habitat preservation and protection, and efforts to minimize impacts from land use disturbances are essential to maintaining self-sustaining wild trout populations. It is more effective to preserve habitat than to restore it after it has been damaged. Watershed based management, which treats fish communities and their habitat as a unit, aids in prevention of habitat destruction and fragmentation that can lead to species declines and shifts in species composition.

Opportunity - Prioritize trout production streams for the purpose of acquisition and/or easements provide to the NJDEP Green Acres Program.

Opportunity - Identify habitats and ecosystem types that support wild trout and are in danger of being lost or drastically altered. Explore ways to protect landscapes in which wild trout occur through links with management initiatives for other biotic resources (plants, birds, herptiles, etc.).

Opportunity - Evaluate the necessity and desirability of continued stocking of cultured salmonids on trout production streams currently trout-stocked by DFW.

Opportunity - Determine if there are linkages between wild trout populations and topographic characteristics (gradient and elevation), soils, land-use, physicochemical characteristics, and other features to develop a tool for identifying potential or historical wild trout habitat.

Opportunity - Identify land-use changes that have affected wild trout and aspects within watersheds that if improved or modified would restore or sustain healthy wild trout populations

Education and Communication

Another component of successful wild trout management is involvement of stakeholder groups. These groups may include, but are not limited to fishing clubs, conservation organizations, watershed associations, recreational clubs, local environmental commissions, etc. Although at times these groups may have conflicting interests, they can be a strong ally and advocate in conservation of the ecosystems in which wild trout reside. It is also important to recognize the interests of the large majority of individual

anglers, which do not belong to organized groups, who are impacted by management decisions.

Opportunity - Organizations and individuals often lack the resources needed to effectively combat land development projects in their communities that may negatively affect wild trout resources and turn to DFW for assistance. DFW provides technical information upon request but could become more proactive by preparing fact sheets, and providing current fisheries information so that potential impacts to wild trout resources can be addressed.

Opportunity - Develop a program that involves land owners, local communities and school systems in stewardship activities that promotes awareness of the value of wild trout and their ecosystems and encourages stewardship.

Opportunity - Educate the public on the value of wild trout through informational materials (e.g. a brochure on the state fish, video on stream restoration) and the DFW website.

Wild Trout Management Policy

Wild trout are valued as indicators of healthy aquatic ecosystems and help provide New Jersey trout anglers with a diversity of angling opportunities. DFW actively manages wild trout populations and their ecosystems through actions designed to conserve and protect this valuable resource for enjoyment by all citizens. Brook trout, New Jersey's state fish and only native salmonid species, is considered a species of special concern that will be perpetuated and maintained. The policy for wild trout management shall include, but is not limited to the following:

1. Habitat protection and restoration will be the principal long-term management strategy for trout production streams.
2. Wild, self-sustaining trout fisheries will be promoted and emphasized as the preferred and most efficient management strategy management for trout.
3. Designated *Wild Trout Streams* will have wild trout populations sufficient in magnitude to provide a satisfactory angling experience and appropriate angling regulations that will maintain trout populations at desirable levels.
4. The stocking of non-native or cultured fish species (including salmonids) has the potential for negatively affecting wild trout populations. DFW will adhere to the following guidelines when reviewing stocking requests or applications for streams having self-sustaining trout populations:
 - a) Streams designated as *Wild Trout Streams* will not be stocked with cultured trout.
 - b) Streams having self-sustaining trout populations that are not designated as a *Wild Trout Streams*, and have not been stocked with cultured trout since 2000, may not be stocked with cultured trout.

- c) Streams having self-sustaining trout populations that are not designated as a *Wild Trout Streams*, and have been stocked with cultured trout since 2000 will be evaluated on a case by case basis. The ability of the existing wild population to sustaining a desirable fishery will be a prime consideration. If stocking is allowed then DFW stocking guidelines regarding species selection will be followed.
5. Establishment or re-establishment of wild trout populations in waters having suitable habitat will be achieved using genetically suitable stock and brook trout will be the preferred species. In the absence of conservation genetic guidelines, translocations using wild stock may be considered provided established fish health policies are followed.

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