

**2010-2015**  
**Pennsylvania Department of Conservation and Natural Resources**  
**Bureau of Forestry**  
**Brook Trout (*Salvelinus fontinalis*) Conservation Plan**



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## EXECUTIVE SUMMARY

Brook trout are the official state fish and are important to the Commonwealth for numerous reasons. They are indicators of superior water quality, provide recreational angling opportunities, and are a symbol of our state's outdoor traditions. The brook trout is a charr, and is the only salmonid native to the coldwater streams of Pennsylvania.

This conservation plan provides the framework for conserving brook trout (*Salvelinus fontinalis*) on Pennsylvania State Forest land. The Bureau of Forestry, through sound ecosystem management, maintains a healthy, viable forest for many species of plants and wildlife. However, species whose fragility has been documented or keystone species often need specific strategies to ensure long term survival. Prioritizing the conservation of brook trout on Pennsylvania's State Forest lands is consistent with increased levels of conservation throughout its native range in the eastern United States as evidenced by the Eastern Brook Trout Joint Venture, as well as the Pennsylvania Fish and Boat Commission's (PFBC) listing of wild brook trout in its State Wildlife Action Plan as a species of greatest conservation need (PFBC 2007). Therefore, a plan has been developed for the conservation of the species on State Forest lands.

Pennsylvania's 2.2 million acres of certified "well-managed" State Forest land provide critical habitat for brook trout and thousands of stream miles. This is especially important considering that brook trout have been extirpated or greatly reduced from over 70% of the subwatersheds in which they historically occurred (EBTJV 2005). The Pennsylvania Bureau of Forestry therefore, has a unique responsibility to conserve and protect this keystone species.

While the contents of this plan were designed for use on State Forest lands, the principles and recommendations are equally applicable to private forestlands, and can be promoted and adopted by individual forestland owners, industrial forestland owners, and forestry consultants wherever possible. It is also recommended that individuals contact the Pennsylvania Fish and Boat Commission if they have questions regarding brook trout management or habitat requirements. Contact information for the regional PFBC offices is located in Appendix XIII-XIV.

This conservation plan presents 1) an identification of the conservation goal and objective targeted by the plan 2) an assessment of the threats believed to be the most current and important to the status of brook trout on State Forest land, and 3) the recommended conservation and management actions whose implementation would help attain that goal and objective.

To ensure steady progress toward the conservation objective of brook trout on State Forest land, every 5 years Bureau of Forestry staff will review the status of the brook trout conservation plan. Revision of the plan may be warranted if there are changes in threats, conservation strategies or other pertinent information. Every year as stream classifications are added or updated by the PFBC or the Pennsylvania Department of Environmental Protection (DEP), Bureau of Forestry staff will ensure this information is conveyed to the appropriate State Forest District.

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## **BROOK TROUT CONSERVATION GOAL**

Forest ecosystem management maintains the health of the forest ecosystem by implementing practices that promote the long-term health of forested systems. The Bureau of Forestry, through sound ecosystem management, manages the state forest system to ensure its long-term health, viability and productivity while providing suitable habitats for many species of plants and wildlife. The Bureau of Forestry has established terrestrial, wetland, aquatic/riparian, and cave habitats guidelines, which are implemented in normal operating plans on State Forest lands to ensure healthy habitats and communities. The Bureau of Forestry also creates specific management strategies for certain Special Management Areas, several species identified as keystone species, species of special conservation concern, and for species whose fragility is documented.

The eastern brook trout (*Salvelinus fontinalis*) is the only salmonid native to the coldwater streams of Pennsylvania and is the Commonwealth's official state fish. Brook trout serve as indicators of the health of the watersheds they inhabit and can provide early warning that the health of the entire system is at risk. Brook trout are also a prized sport fish and provide anglers with many hours of recreational opportunities. The brook trout is a recreationally and culturally important species and indicator of high water quality and forest health.

Although Pennsylvania supports a considerable wild brook trout resource, many of the historic threats continue to persist and new challenges place additional stresses on the landscape and its remaining brook trout habitat. The Bureau of Forestry sustainably manages 2.2 million acres of forestland in Pennsylvania, which contains many miles of brook trout habitat. This represents large blocks of contiguous, certified "well-managed" forest where numerous high quality brook trout streams exist. Therefore, it is imperative that the Bureau of Forestry continually evaluates and implements effective brook trout conservation strategies and practices.

The goal of the Pennsylvania Bureau of Forestry Brook Trout Conservation Plan is to:

- ❖ *Maintain and implement strategies that sustain and enhance healthy, naturally reproducing, brook trout populations on State Forest Lands*

## **INTRODUCTION**

Brook trout are members of the family Salmonidae, represented by the salmons, trouts, charrs, whitefishes, and ciscos. Although these groups vary greatly in outward appearance they are all grouped together because they have two common features, adipose and pelvic fins. The word charr for this group of species is an appropriate choice. It is derived from the Celtic word *cear*, which means “blood”. This is suitable because the sides of all charr turn blood red during the fall spawning period. The brook trout’s Latin name, *Salvelinus fontinalis*, also is fitting given the meaning of each word. *Salvelinus* is an old Germanic word for Arctic charr found in the Alps. *Fontinalis* is Latin for “dweller near springs”.

During the Oligocene Epoch, something in the environment caused the main stem of the salmonids to separate from other bony fishes. Soon thereafter, the charrs separated from the salmon and true trout. Salmonids that became charrs appear to have had a slightly different physiology from their contemporaries (Karas 1997). This difference allowed them to move into and successfully colonize waters colder than other fish could tolerate as glaciers began to infringe upon the Northern Hemisphere.

Brook trout distributions were profoundly impacted by glaciers. There have been at least 10 separate ice ages within the last million years. During glacial periods, the ice front advanced and retreated in pulses, each lasting many thousands of years. During advances, ice sheets flowed south to the northern border in the center of Pennsylvania and about halfway down into the northeast and northwest corners of the Commonwealth (Karas 1997).

The glaciers that reached the northeast and northwest corners of Pennsylvania filled the valleys with glacial till and smothered their streams. The tops of the rest of the mountains in Pennsylvania were spared the glacial movement. When the southern periphery of the glaciers in New York began to melt, water at its base emptied into the headwaters of the Susquehanna River. This became a temporary highway for the northward recolonization of the brook trout from Virginia and Maryland. This gave brook trout in Pennsylvania the opportunity to start moving up the state’s numerous river systems, whose headwaters had probably been locked in snow and ice for millennia. At this time brook trout were distributed everywhere over the state, where they now represent some of the oldest examples of this species (Karas 1997).

## **BACKGROUND**

Pennsylvania has a long history with brook trout and it is clear as to why it was designated as the official state fish. Philadelphia was home to the first angling club in the United States which was formed in 1732, called the Schuylkill Club. The enjoyment and pride Pennsylvanian’s have for their state fish has not waned over the years. Pennsylvania has some of the finest trout fishing in the country (Karas 1997). Currently, more than 250 stream sections, with over 700 miles of stream, have been identified by

biologists as having exceptional populations of wild brook trout and are rated as Class A waters (PFBC 2009). The reason Pennsylvania can lay claim to so many wonderful brook trout streams is because of its northerly latitude and unique geology. The Appalachian Mountain range, running through the state, consists of long, steep, parallel ridges with deep, river-filled valleys between them.

Historically, brook trout were present in nearly every coldwater stream and river in the eastern United States (MacCrimmon and Campbell 1969). Unfortunately, historical land uses altered the landscape, greatly diminishing the presence of brook trout across Pennsylvania. The result of widespread lumbering led to the decrease in forested riparian buffers and, increased erosion and elevated water temperatures, causing many streams to become unsuitable for brook trout. Pennsylvania is also a leading producer of coal which often resulted in chronic pollution from acid mine drainage. Unable to thrive in poor water quality or degraded habitats, the decline in brook trout populations mirrored the broader decline in the health of the region's lands and waters. Although reduced from historical population levels, brook trout continue to be distributed across a broad range of the state.

According to the Pennsylvania Fish and Boat Commission there are approximately 1,524 wild brook trout stream sections (5,044 miles) across Pennsylvania (PFBC 2009). This is a conservative number and only includes those waters where stream surveys have been conducted. Much of this resource is fragmented and largely exists in first through third order headwater streams. The primary strongholds for wild brook trout populations occur within the Northern Tier and center regions of the state, which contain the largest blocks of State Forest Land. Although Pennsylvania supports a considerable wild brook trout resource, stressors continue to persist and threaten the landscape and its remaining brook trout habitat. Therefore, it is more important than ever to ensure adequate measures are implemented to sustain healthy, naturally reproducing populations of brook trout on state forest land and across the state.

## ***LIFE HISTORY***

### *General Habitat*

Brook trout are the most generalized and adaptable of all *Salvelinus* species (Raleigh 1982, Karas 1997). Brook trout habitat in Pennsylvania is typically first, second and third order headwater streams. Habitat is generally characterized as silt-free, spring-fed, riffle-run areas. These areas usually contain mixed gravels, cobbles and sand bottoms (Heft 2006, Raleigh 1982). Well vegetated and stable stream banks are important in the formation and protection of in-stream conditions found along undercut banks and under woody debris or large rock ledges used for resting, feeding, and escape cover. Habitat type varies with the size of the stream and local geology.

### *Cover Requirements*

Cover is recognized as one of the most essential components of brook trout streams, directly influencing the population size a stream can support. Cover can consist of instream objects (large rocks, stumps, logs, and roots), overhanging vegetation, submerged vegetation, rocky substrate, depth, and water surface turbulence (Giger 1973, Raleigh 1982, Heft 2006). Cover for adult brook trout should be located in areas with

low stream bottom visibility, suitable water depth, and low current velocity. Canopy cover is critically important in maintaining shade for stream temperature control and in providing allochthonous materials to the stream. In addition, a well vegetated riparian area protects against watershed erosion.

Salmonids occupy different habitats in winter than in summer. The amount of adequate overwintering habitat rather than summer rearing habitat has been indicated as a major limiting factor in salmonid densities in some streams (Raleigh 1982, Heft 2006). Bustard and Narver (1975) indicated that winter water temperatures between 4-8 °C trigger hiding behavior. By hiding within or near cover trout are protected from physical damage from ice and conserve metabolic energy.

#### *Instream Flow*

Another critical habitat parameter in quality trout habitat is the annual flow regime. The most critical period is typically during late summer and winter when the lowest flows are usually detected. A base flow  $\geq 55\%$  of the average annual daily flow is considered excellent, a base flow of 25-50% is considered fair, and  $< 25\%$  is considered poor for maintaining quality brook trout habitat (Binns and Eiserman 1979, Raleigh 1982). Brook trout often inhabit streams that receive ground water discharge (Threinen and Poff 1963) which helps to maintain suitable water temperatures throughout the summer.

#### *Water Quality*

Brook trout appear to be more tolerant than other trout species of low pH (Heft 2006). The optimal pH range for brook trout appears to be 6.5-8.0, with a tolerance range of 4.0-9.5. Although fingerlings have been identified in a bog stream in Pennsylvania with a pH less than 4.75 (Dunson and Martin 1973), Menendez (1976) demonstrated that continued exposure to pH below 6.5 resulted in decreased hatching and growth in brook trout.

Brook trout are sight feeders, which can be impaired by high or persistent water turbidity. Raleigh (1982) indicated that optimum turbidity values for brook trout growth are approximately 0-30 Jackson Turbidity Units. An accelerated rate of sediment deposition in streams may reduce local brook trout production because of the negative effects on production of food organisms, smothering of eggs and embryos, and the loss of escape and overwintering habitat (Raleigh 1982).

#### *Temperature Tolerance*

Temperature plays a very important role in fish growth and is likely the single most important factor limiting the geographic distribution of brook trout. Water temperature is directly related to respiration rate and, therefore, metabolic rate. If metabolism is low fish growth is poor due to longer foraging times and more consumption (Flebbe et al. 2006, Heft 2006). Indirect influence of water temperature on fish affects growth rate by limiting food abundance, altering toxicity of water borne pollutants, and changing oxygen concentration and biochemical demand (Heft 2006).

The reported upper and lower temperature limits for brook trout vary, but generally may be found in waters with a temperature range between 0-21° C (32-70° F). Summer stream temperatures appear to be the most important single factor influencing

brook trout distribution and production (MacCrimmon and Campbell 1969). The literature suggests that brook trout can tolerate brief exposure to water temperatures up to 22°C (71.6 ° F), but populations are more stable and productive when water temperatures don't exceed 19°C (66.2° F) (Heft 2006). Raleigh (1982) and Drake and Taylor (1996) indicated that optimal temperature range for growth and survival is 11-16°C (51.8-60.8 ° F). For reproductive means, a mean temperature of 9°C (48.2° F) is required for optimal development and hatching success, while the reported temperature for maximum growth of juvenile brook trout was 14.4°C (58° F) (Heft 2006).

### *Food Habits*

Brook trout have been described as being opportunistic in their feeding habits. Larger brook trout have been found to feed on a wide range of organisms and can be carnivorous (Heft 2006). Small to medium size brook trout rely more heavily upon aquatic insect larvae and terrestrial invertebrates (Heft 2006). Common insects consumed include species of stoneflies, mayflies, caddisflies, midges and chironomids. Other food items include leeches, worms, spiders, ants, mollusks, clams, snails, cladocerans, amphipods, decapods, diatoms and any number of associated stream fishes, including juvenile brook trout and those of non-native trout (Heft 2006).

### *Reproduction*

In most areas of the United States spawning begins by mid-October and is usually over by early December. Brook trout typically begin migrating upstream in late-summer, seeking gravel-bottomed areas in cold, spring-fed tributaries, and spawn in late October and early November (Heft 2006).

Redd (nest) building is done by the female and is defended for a time by both the male and the female. Brook trout generally select areas of upwelling spring water for spawning under natural conditions (Webster and Eiriksdottir 1976). During the egg laying process, the female brook trout brushes the eggs into interstitial spaces in the gravel after each egg release and fertilization by the male, and then excavates another pit immediately upstream of the previously constructed pit (Heft 2006). Females may spawn with different males. After the eggs are fertilized and the male has left the female remains at the redd for a short time.

## **AQUATIC CLASSIFICATIONS**

In Pennsylvania several regulatory authorities including the Department of Environmental Protection (DEP), Pennsylvania Fish and Boat Commission (PFBC), and Department of Conservation and Natural Resources (DCNR) determine the special protection designations of waters.

### Department of Environmental Protection:

- High Quality Waters (HQ). HQ waters include a stream or watershed which has excellent quality waters and environmental or other features that require special water quality protection. (State Forest land contains 19% (4,420 miles) of the 23,033 total miles of HQ waters statewide)
- Exceptional Value Waters (EV). EV waters include a stream or watershed which constitutes an outstanding national, state, regional or local resources, such as waters which are used as a source of unfiltered potable water supply, or waters of wildlife refuges or State Game Lands, or waters which have been characterized by the PFBC as “Wilderness Trout Streams” and other waters of substantial recreational and ecological significance. (State Forest land contains 30% (1,413 miles) of the 4,793 total miles of EV waters statewide)

### Pennsylvania Fish and Boat Commission:

- PA Class A Brook Trout Streams, which support a population of naturally produced brook trout of sufficient size and abundance to support a long-term and rewarding sport fishery. (State Forest land contains 41% (298 miles) of the 732 total miles of Class A Brook Trout Streams statewide)
- PA Wilderness Trout Streams, which are areas where wild trout fishing is in a remote, natural, unspoiled environment that is of superior quality. All streams in this classification qualify for EV designation.
- Naturally Reproducing Trout List documents all assessed streams that have natural reproduction of trout in them (Class A, B, C, D streams). Wetlands that are hydraulically connected to these streams qualify for EV Wetland Protection under Chapter 105. These streams qualify for EV wetland protection.

### Department of Conservation and Natural Resources:

- A wild or scenic river shall be free flowing and supportive of native fish and wildlife with the shoreline being pristine in character.
- A pastoral river recognizes the capability and productivity of agricultural activities. The view from a pastoral river or its banks shall be predominantly pastoral or farming country side.
- A recreational and modified recreational river’s recreational use must be compatible with the resource to support that use without degradation

### Pennsylvania Natural Heritage Program

- The Pennsylvania Aquatic Community Classification Project was developed to apply standardized aquatic ecosystem classifications and reference conditions
- This will allow conservation planners to identify, characterize and map existing locations of freshwater plants and animals and their habitats across the state and assess their relative conservation priority. The project will help identify the highest priority areas for

aquatic resource protection as well as augment and strengthen statewide conservation programs while providing important data to watershed groups and other organizations in order to assist local watershed planning, protection and restoration efforts. For more information on the project refer to <http://www.naturalheritage.state.pa.us/ACC/ACCUser'sManual-Ch.8-PhysicalStreamTypes.pdf>.

## **SIGNIFICANCE of WATER CLASSIFICATION to RESOURCE PROTECTION**

All commonwealth waters are protected for a designated aquatic life use as well as a number of water supply and recreational uses. The Pennsylvania Department of Environmental Protection (DEP) applies criteria based on use designations to permit development activities in watersheds. In addition, streams with excellent water quality may qualify for special protection. Special protection use designations include High Quality Waters (HQ) or Exceptional Value Waters (EV). The water quality of HQ streams should be maintained and protected, unless a person seeking a permit or approval that affects water quality is able to successfully demonstrate that a lower water quality is necessary to accommodate an important economic or social development (25 Pa. code Chapter 93.4a(c)). EV waters are to be protected at their existing quality; water quality shall not be lowered.

If the Pennsylvania DEP determines that a water body's designated use is inappropriate, it will apply an existing use protection until it is incorporated as a designated use in a final rulemaking. Existing use protection is identical to designated use protection. The uses are protected on a waterbody segment when the DEP issues a permit or approval for an activity which may impact the use.

Wild trout streams managed as Wilderness Trout Streams qualify for the EV designation. The Wilderness Trout Streams programs emphasize trout angling in a relatively natural and remote setting.

Class A trout waters qualify for the HQ-CWF designation. They receive special protection afforded by the antidegradation provisions of the federal Clean Water Act. This indicates that any activity that proposes to discharge to a Class A stream must comply with more stringent standards than those applied to other non-special protection waters.

Wild trout streams are also protected, at a minimum, under the Cold Water Fishes (CWF) designation in 25 Pa. Code Chapter 93 because of their ability to support or maintain a population of wild trout. Permits issued for streams designated EV must be conditioned to maintain their existing level of water quality.

Stream sections classified as biomass Class A, B, C, or D have significance in how streams are managed with respect to instream flow protection. For example, the Susquehanna River Basin Commission recognizes the Pennsylvania Fish and Boat Commission's (PFBC) biomass criteria as the basis for establishing varying levels of habitat impact criteria in its water withdrawal policy. DEP also typically follows these same criteria in its water allocation permit reviews.

PFBC Approved Trout Waters (e.g., stocked trout waters) are protected by the CWF and Trout Stocking (TSF) aquatic life uses in addition to the HQ and EV special protection uses. Trout waters designated CWF are designed to protect all of the stream's coldwater aquatic life uses. Trout waters designated TSF are designed to protect stocked trout during spring. Stream and wetland encroachment permits in these watersheds often include a seasonal restriction to minimize conflicts with trout fishing.

Recognizing the appropriate use designations to all streams that contain or impact potential brook trout habitat on State Forest lands is an important step towards developing appropriate habitat management goals, guidelines, and monitoring processes for the species on an eco-regional or landscape level. While existing buffer guidelines are designed to avoid degradation to aquatic resources from management activities such as timber harvesting and road/trail building; they are inadequate in terms of supporting a systematic analysis of the state forest as a brook trout habitat support system. Classifying currently unclassified waters would enable the Bureau of Forestry to more efficiently target resources towards habitat improvement, recreational angling opportunities and guidelines, and monitoring efforts.

## **STRESSORS AND THREATS**

Although brook trout are still present in many of Pennsylvania's watersheds, their distribution is much reduced compared to historic levels. In order for the Bureau of Forestry to successfully reach its goal of *maintaining and implementing strategies that sustain and enhance healthy, naturally reproducing brook trout populations on State Forest land* it is important to understand what factors are most impacting their current status. Some of the major threats/stressors impacting brook trout on State Forest land include residual effects from past land management practices, increases in water temperature, introduced species, sedimentation and erosion, in-stream flow, pollutants, inadequate water quality protection on unassessed streams, and recreational activities (Hudy et al. 2008; EBTJV 2005; PFBC 2009; Personal Communication with PFBC, Trout Unlimited, Department of Environmental Protection, EBTJV, and Coldwater Heritage Partnership).

### **Issue 1: Land Management**

Land use decisions made over the past hundred years have severely impacted the quality of brook trout streams and rivers. The lumbering era during the late 1800's and early 1900's resulted in the clearing of the landscape including streamside vegetation leaving poor riparian conditions, which impacted water temperature and increased erosion. This undoubtedly caused many streams to become unsuitable for brook trout. Today some areas of the landscape are still recovering from these and other poor management practices.

Another more current threat is the development related to the Marcellus gas extraction. The area's most likely to be impacted by natural gas development are rich in high quality wild trout streams. Natural gas exploration has the potential to negatively impact the Commonwealth's aquatic resources from well pad and right-of-way development (i.e. improper erosion and sedimentation control, habitat fragmentation, increased impervious surface), water withdrawals, and the possibility of ground water contamination.

### **Issue 2: Increasing Water Temperatures**

A change in water temperatures is a serious threat to stenothermal fishes, those with narrow thermal ranges and generally intolerant of habitat perturbations, such as brook trout. Water temperature is an important factor in fish growth and reproductive success, as well as, an important factor limiting the brook trout's geographic distribution. Many factors are affecting water temperatures in Pennsylvania streams. Some major factors include any land use activity that removes vegetative cover, disturbs the soil mantle, reduces infiltration rates, decreases soil moisture storage, or increases overland flow. Barriers, such as dams and poorly designed culverts or bridges, within streams can also impound water, causing water temperature to increase.

It is also predicted if the climate change predictions are assumed significant amounts of trout habitat would be lost, as well as an increase in fragmentation, leaving wild brook trout populations vulnerable to extirpations (Flebbe et al. 2006). Water withdrawals from power plants, natural gas extraction and other activities may also impact water

temperatures if decreases in water levels occur during summer months and other times with low stream depths.

### **Issue 3: Introduced Species**

Introduced species can have a severe impact on brook trout populations. Invasive species can have negative impacts on brook trout populations by altering habitat, such as the algae *Didymosphenia geminata*, which can interrupt the life cycle of aquatic invertebrates which brook trout feed upon. Non-native/invasive vegetation along the riparian zone can cause changes in macro invertebrate community structure that affects trout food availability, and changes in distribution of other fish species that alter interactions with the stream fish community (Flebbe et al. 2006). Hemlock woolly adelgid (*Adelges tsugae*), an asian exotic insect species that feeds on the fluid of hemlock trees, often effectively kills the trees, which may have significant impacts on brook trout. Several studies indicate there could be a significant reduction in aquatic diversity and brook trout abundance should hemlock succumb to hemlock woolly adelgid (Ross et al. 2003, Synder et al. 2002). Introduced fish, such as brown trout and rainbow trout, have been documented, to negatively impact brook trout. These species share similar ecological and physiological requirements, which can lead to competition and act as a biological barrier (DeWald and Wilzbach 1992, Larson and Moore 1985, Fausch and White 1981). These are just a few examples of how introduced species can become stressors to brook trout populations.

### **Issue 4: Sedimentation and Erosion (roads)**

Sedimentation build up from poorly designed or maintained roads can effect feeding and reproduction for brook trout. Sedimentation negatively impacts aquatic macroinvertebrates, which are the main food source of brook trout. Additionally, brook trout are sight feeders so an increase in turbidity from sedimentation can make feeding more difficult. Also, runoff and sedimentation build up can destroy good spawning habitat. A reduction in riparian vegetation can increase sedimentation levels from rain runoff as well. An increase in development near/within riparian areas can also increase sedimentation and erosion.

### **Issue 5: Instream Flow**

Instream flow can have large impacts on brook trout health and movements. Water practices that alter or reduce streamflow, or increase water withdrawals may affect the sustainability of brook trout populations. In particular, late summer stream flow, annual stream flow variation, and water velocity are in-stream habitat attributes that are highly correlated to trout density. Hydromodifications, such as channelizations and streambank and shoreline erosion, can adversely impact in-stream and streamside fish and wildlife habitat, as well as, alter water temperature and sediment transport patterns. These activities include: straightening, widening, deepening or relocating rivers or streams to improve flood control, navigation, or drainage, and dam construction and maintenance. Many of these changes can also create physical barriers for brook trout movement.

### **Issue 6: Pollutants**

Pollution from abandoned mine drainage (AMD), acidic deposition, agriculture and other industrial practices have had and often continue to have detrimental impacts on the health and survival of brook trout populations and other aquatic biota. Acid deposition results from the release of nitrogen oxide, sulfur dioxide and ammonia into the atmosphere. The

Maryland MBSS program reports that acidic deposition from atmospheric input is the most common source of stream acidification in Maryland. AMD is the other main source of acidification impacting brook trout streams in Pennsylvania. AMD alters the water quality by increasing acidity which therefore, allows the release of naturally occurring metals such as iron, aluminum, and manganese which are toxic to aquatic organisms (Susquehanna Basin Commission 2008). Waterways impacted by acid mine drainage or acidic deposition typically have elevated concentrations of heavy metals, such as iron, aluminum, and manganese. Heavy metals decrease the pH tolerance of brook trout and negatively influence the growth rate, development, behavior and metabolic processes of brook trout. In addition, heavy metals may also adversely affect macroinvertebrate populations and habitat quality, indirectly influencing brook trout. A relatively new threat to Pennsylvania's water resources includes Marcellus gas activity. There are concerns over the potential for contaminated fluid spills.

### **Issue 7: Inadequate Water Quality Protection on Unassessed Streams**

There are 64,345 streams totaling approximately 86,000 miles of flowing water in Pennsylvania (PFBC 2009). The Pennsylvania Fish and Boat Commission has conducted surveys and/or implemented management on approximately 4,877 streams totaling 24,959 miles. Thus, only about 8% of the streams and 29% of the total stream miles are being actively managed. A considerable portion of the streams not yet assessed are likely to support wild trout populations. The primary threats to unassessed waters are inadequate water quality protection due to the unknown presence or abundance of wild trout and the resulting permitting actions that are not properly conditioned to protect wild trout. Proper stream classification is critical as the likelihood that these streams will be impacted by stressors will increase in the future (PFBC 2009).

### **Issue 8: Recreational Activities**

Stressors can also exist inadvertently from recreational users of the streams and forests. Stream degradation can occur from frequent ATV or mountain bike use in the stream and on the stream bank. Access areas for canoeing, kayaking or other boating activities can also degrade stream side vegetation. All of these activities also have the possibility of introducing non-native plants to new areas, which can change insect type and shade along stream banks. Angling activities can also cause stress on the water resources (Undercoffer 1996). Management of waters which experience heavy angling activity should take into consideration protection of trout populations from the possibility of losses due to the stresses of hooking, handling and releasing fish (PFBC 2009).

## **EXISTING POLICIES AND GUIDELINES**

The Bureau of Forestry implements practices that promote the long-term health of the forested systems in Pennsylvania. The aim is the maintenance of ecosystem integrity from a landscape perspective, which includes aquatic ecosystems. The Bureau of Forestry currently employs many strategies across the landscape to protect streamside forests and brook trout populations on State Forest land (see Appendix III-VI). The following are a list of the most relevant policies implemented by the Bureau of Forestry which assist in meeting the goal of *maintaining and implementing strategies that sustain and enhance healthy, naturally reproducing brook trout.*

### **Policies to Achieve Brook Trout Conservation**

#### **Issue 1: Land Management**

##### **Policies:**

- a. Exceptional Value waters have a 135-foot total width aquatic habitat buffer on both sides of the stream. Tree cutting is only permitted for the protection of property of human safety. (See Appendix III for inner and outer zone widths)
- b. High Quality waters have a 135-foot total width aquatic habitat buffer on both sides of the stream. (See Appendix III for inner and outer zone widths)
- c. Perennial cold water streams have a 135-foot width aquatic habitat buffer on both sides of the stream. (See Appendix III for inner and outer zone widths)
- d. Wilderness trout streams have a 200-foot total width aquatic habitat buffer on both sides of the stream. Tree cutting is only permitted for the protection of property of human safety. (See Appendix III for inner and outer zone widths)
- e. Well drilling must be 300 feet from HQ and EV waters and Wilderness Trout Streams and 200 feet from all other streams or water bodies.
- f. Coordinate with the PFBC's Division of Environmental Services prior to applying pesticides within stream buffers
- g. Retain high canopy forests along water courses and water bodies
- h. Stabilize stream banks to prevent siltation and provide refuge areas

#### **Issue 2: Increasing Water Temperatures**

##### **Policies:**

- a. Retain high canopy forests along water courses and waterbodies

- b. Minimize any land use activity that may remove cover or disturb the soil in riparian areas with extensive buffers. If disturbances do result in the removal of the riparian zone vegetation or canopy, Bureau of Forestry attempts to restore the area as soon as possible
- c. Marcellus operations are required to submit a water plan with water management analysis to the Bureau of Forestry for approval prior to water withdrawal
- d. Exceptional Value waters have a 135-foot total width aquatic habitat buffer on both sides of the stream. Tree cutting is only permitted for the protection of property of human safety. (See Appendix III for inner and outer zone widths)
- e. High Quality waters have a 135-foot total width aquatic habitat buffer on both sides of the stream. (See Appendix III for inner and outer zone widths)
- f. Perennial cold water streams have a 135-foot width aquatic habitat buffer on both sides of the stream. (See Appendix III for inner and outer zone widths)
- g. Wilderness trout streams have a 200-foot total width aquatic habitat buffer on both sides of the stream. Tree cutting is only permitted for the protection of property of human safety. (See Appendix III for inner and outer zone widths)
- h. Well drilling must be 300 feet from HQ and EV waters and wilderness trout streams and 200 feet from all other streams or water bodies.
- i. Work with other stakeholders to assess possible mitigation practices for climate change on State Forest land

### **Issue 3: Introduced Species**

#### **Policies:**

- a. Implement integrated pest management for hemlock woolly adelgid, which relies on survey and monitoring of the insect and its hemlock host. Management involves a variety of techniques, such as biological, chemical, cultural, and silvicultural control to reduce the populations to less damaging levels
- b. Support and follow PFBC guidelines, that prohibit hatchery trout from being introduced into Commission approved Class A wild trout streams or Wilderness Trout Streams
- c. Aggressively try to remove all invasive species along riparian areas, where reasonably possible
- d. Plant native species, where possible, along riparian areas when revegetating for erosion control or other revegetation projects

#### Issue 4: Sedimentation and Erosion

##### Policies:

- a. Logging operations are kept away from the streams to prevent soil disturbance near the stream
- b. In wet areas, logging operations are restricted to the summer months
- c. Roads and trails must be located away from stream courses except where stream courses cannot be avoided
- d. Roads, log landings, and skid trails should be constructed only during dry weather
- e. Herbaceous cover on portions of disturbed areas subject to erosion should be established prior to or as quickly as possible
- f. Sedimentation basins should be constructed at approaches to bridges or culverts in a stream channel to impound water from roads or skid trails
- g. Roads must be drained adequately by cross drains with either metal, open top, or box culverts, or broad based intercepting dips
- h. The maximum grade on all roads and bulldozed skid trails should be less than 10%
- i. Compartment soil maps should be consulted for the presence of highly erodible soils with severe equipment limitations
- j. An approved metal gate must be installed at the entrance of the main haul roads and oil gas access roads to protect road systems from erosion
- k. Environmentally sensitive maintenance dirt and gravel roads guidelines are followed, which are generated from the Dirt and Gravel Road Center at Pennsylvania State University, State College
- l. Exceptional Value waters have a 135-foot total width aquatic habitat buffer on both sides of the stream. Tree cutting is only permitted for the protection of property of human safety. (See Appendix III for inner and outer zone widths)
- m. High Quality waters have a 135-foot total width aquatic habitat buffer on both sides of the stream. (See Appendix III for inner and outer zone widths)
- n. Perennial cold water streams have a 135-foot width aquatic habitat buffer on both sides of the stream. (See Appendix III for inner and outer zone widths)
- o. Wilderness trout streams have a 200-foot total width aquatic habitat buffer on both sides of the stream. Tree cutting is only permitted for the protection of property of human safety. (See Appendix III for inner and outer zone widths)
- p. Well drilling must be 300 feet from HQ and EV waters and Wilderness Trout Streams and 200 feet from all other streams or water bodies.

## **Issue 5: Instream Flow**

### **Policies:**

- a. Prohibiting any in stream activities that might result in silt washing downstream unless an erosion and sedimentation control plan has been approved
- b. Marcellus operations are required to submit a water plan with water management analysis to the Bureau of Forestry for approval
- c. Bureau of Forestry has water management checklists for each well site

## **Issue 6: Abandoned Mine Drainage and other Pollutants**

### **Policies:**

- a. Coordinate with the PFBC's Division of Environmental Services prior to applying pesticides within stream buffers
- b. Limestone is incorporated in road restoration and maintenance to increase the pH of runoff to combat acid precipitation
- c. District personnel monitor stream conditions wherever possible when performing field duties. If a pollution event (or potential event) from sedimentation, thermal, or chemical sources is suspected, personnel should immediately report the incident to the proper authorities including the PFBC Bureau of Law Enforcement, DEP, and the appropriate Conservation District.
- d. Well-drilling sites must be at least 300 feet from HQ and EV waters and Wilderness Trout Streams and a minimum of 200 feet from all other streams or water bodies including vernal pools and intermittent streams.
- e. Incorporate buffering material to roads and infrastructure to treat runoff (See Bureau of Forestry Silviculture Manual)

## **Issue 7: Recreational Activities**

### **Policies:**

- a. ATV activity is restricted to designated areas only
- b. ATV trails are divided into summer and winter use to reduce vehicle impact on soils, trails, and streams
- c. Recreational trails are clearly marked and bridges are maintained
- d. Risk assessments are conducted to reduce risk of invasive species introductions along recreational trails

## **MANAGEMENT ACTIONS**

The Bureau of Forestry has extensive land management strategies to protect and conserve ecosystem processes across the landscape, including water resources. However, specific management actions are being implemented on known brook trout streams (Appendix I and II) and potential (unassessed) brook trout streams. These activities will be updated as they are completed and new information is available.

### **Management Actions to Achieve Brook Trout Conservation**

#### **Issue 1: Land Management**

##### **Actions:**

- a. Potential and current brook trout streams will be determined for each district (see Appendix I and II for current stream classifications on State Forest land)
- b. After determining brook trout streams district personnel will be informed and given a list of potential limiting factors for brook trout that may include parameters such as (Appendix VII):
  - a. epifaunal substrate/available cover
  - b. pool substrate characterization
  - c. pool variability
  - d. sediment deposition
  - e. channel flow
  - f. channel alteration
  - g. channel sinuosity
  - h. bank stability
  - i. vegetative protection
  - j. riparian vegetative zone width
- c. If a potential limiting factor is determined the PFBC Habitat Management Division should be contacted for further analysis and the Ecological Services section of the Bureau of Forestry should be informed (see Appendices XIV-XVI for contact information). This may involve placing fish habitat enhancement structures, woody debris, or boulders into streams to increase in-stream habitat (See Lutz 2007)
- d. Utilize programs such as the Coldwater Heritage Partnership program, Natural Heritage Inventory program and/or Eastern Brook Trout Joint Venture to conduct conservation planning where necessary.

#### **Issue 2: Increasing Water Temperatures**

##### **Actions:**

- a. Identify low head dam locations on high priority brook trout streams (Appendix VIII)

- b. Low-head dams that no longer serve any purpose should be considered for dam removal where feasible and when funds or opportunities exist
- c. Topography and Geology section review water withdrawal plans prior to approval (Appendix XI)
- d. Encourage minimizing withdrawals during critical summer months

### **Issue 3: Introduced Species**

#### **Actions:**

- a. A part of the Bureau of Forestry's mission is to manage for natural genetic diversity and native species; therefore, management should strive to preserve, as well as possible, our native species. Therefore, the Bureau of Forestry supports the investigation of phasing out stocking on certain Class B trout streams
- b. Stocking of any stream (by PFBC or others) on DCNR lands should be based on prior consultation with the appropriate District Forester, Ecological Services section of the Bureau of Forestry, and the PFBC Area Fisheries Manager (See Appendices XIV-XVI for contact information).
- c. On high priority brook trout streams active management should occur to remove invasive species from riparian areas
- d. Develop brochure in coordination with PFBC, Trout Unlimited, DEP, Coldwater Heritage Partnership, and USGS for anglers on State Forest land about brook trout as a resource.

### **Issue 4: Sedimentation and Erosion**

#### **Actions:**

- a. Work with the PFBC to construct log/stone deflectors during road rehabilitation to provide long-term road stabilization while improving aquatic habitat, where appropriate (Appendix IX)
- b. When possible, maintain herbaceous vegetation in road ditches, as this can greatly stabilize ditchlines and reduce sediment being transported by road runoff to streams
- c. Follow PFBC culvert design on all wild trout streams to ensure fish passage, which maintains habitat and population connectivity (Appendix X)

### **Issue 5: Instream Flow**

#### **Actions:**

- a. Identify low head dams on high priority brook trout streams on State Forest land (Appendix VIII)

- b. Low-head dams that no longer serve any purpose should be considered for dam removal where feasible and when funds or opportunities exist
- c. Follow PFBC culvert design on all wild trout streams to ensure fish passage and instream flow (Appendix X)
- d. Marcellus operations are required to submit a water plan with water management analysis to the Bureau of Forestry's Ecological Services section for approval prior to water withdrawal (see "Practical Steps for Evaluating Groundwater Withdrawals on PA State Forest Lands" for complete document) (See Appendix XI for checklists)
- d. Look for funding and opportunities to retrofit existing culverts to improve fish passage on wild brook trout streams on State Forest lands

### **Issue 6: Abandoned Mine Drainage and other Pollutions**

#### **Actions:**

- a. Work with DEP's Bureau of Abandoned Mine Reclamation (BAMR) and partners to identify good candidates for Priority III funding to improve water quality for brook trout and other cold-water species, and advocate to make water quality restoration a high priority for Surface Mine Control Reclamation Act Title IV funds in Pennsylvania
- b. Work with DEP's BAMR and partners to combine the restoration of Priority I and II Health and Safety Abandoned Mine Drainage sites with the elimination, treatment, or improvement of adjacent Priority III sites
- c. As clean up is occurring determine if stream habitat improvement is needed and work with PFBC Habitat Management Division and Ecological Services section of the Bureau of Forestry

### **Issue 7: Unassessed Waters**

#### **Actions:**

- a. Work with PFBC and outside groups to determine high priority assessment areas on State Forest land
- b. Following established PFBC protocols, conduct assessments with PFBC staff and/or other groups on high priority areas
- c. When conducting assessments determine if stream habitat improvement is needed and work with PFBC Habitat Management Division and other groups such as Trout Unlimited to implement habitat improvement projects
- d. Once assessed, inform districts of new classifications if changes are made
- e. Once assessed, make recommendations to DEP for stream upgrades

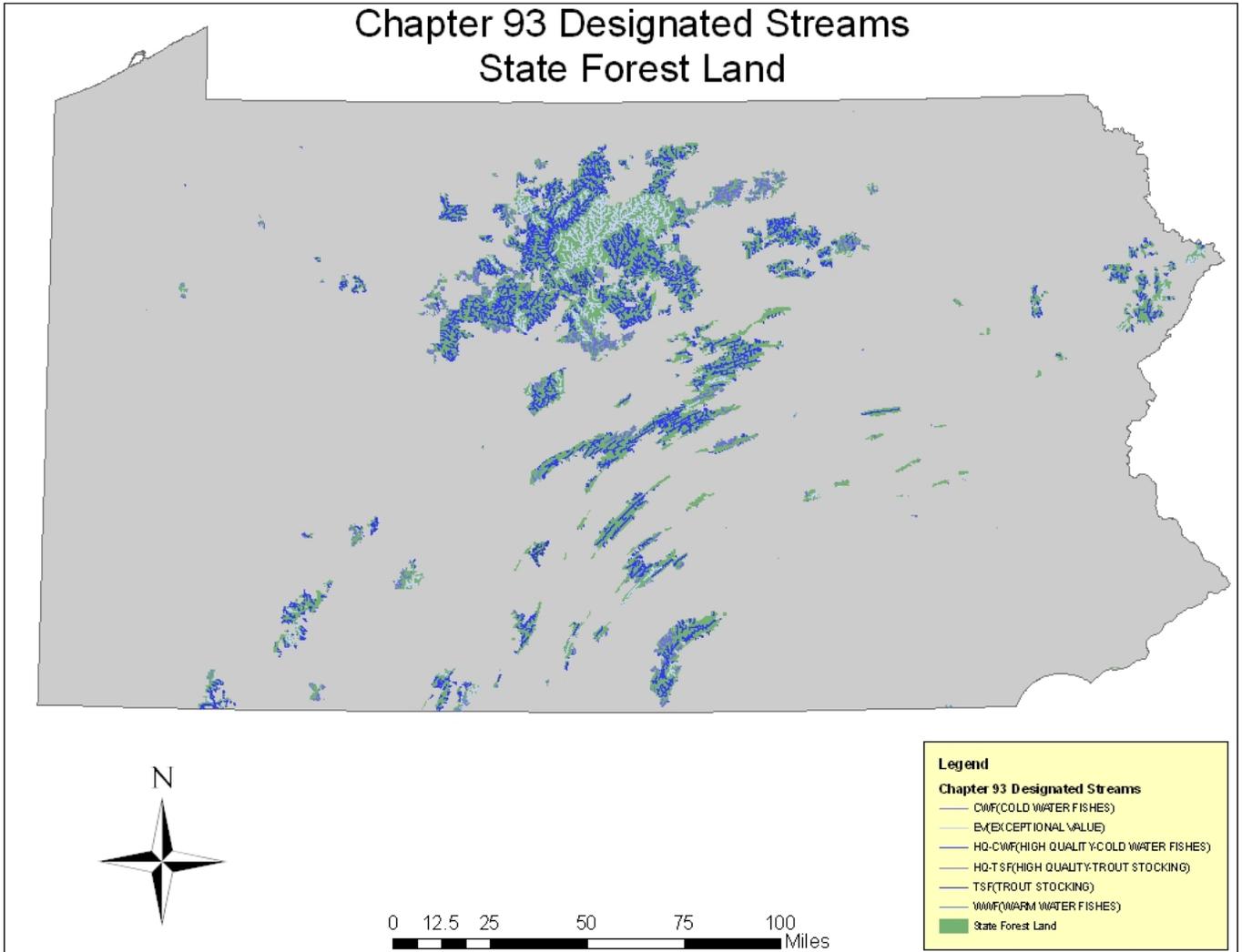
- e. Even if unassessed DCNR may petition a stream for a classification upgrade. Work with PFBC to determine potential stream upgrades. Contact Ecological Services for petition information and send petition to DEP (see Appendix XII for contact information)
- f. Investigate additional streams for potential addition to the Wilderness Trout Streams Program

**MANAGEMENT PLAN REVIEW AND REVISIONS**

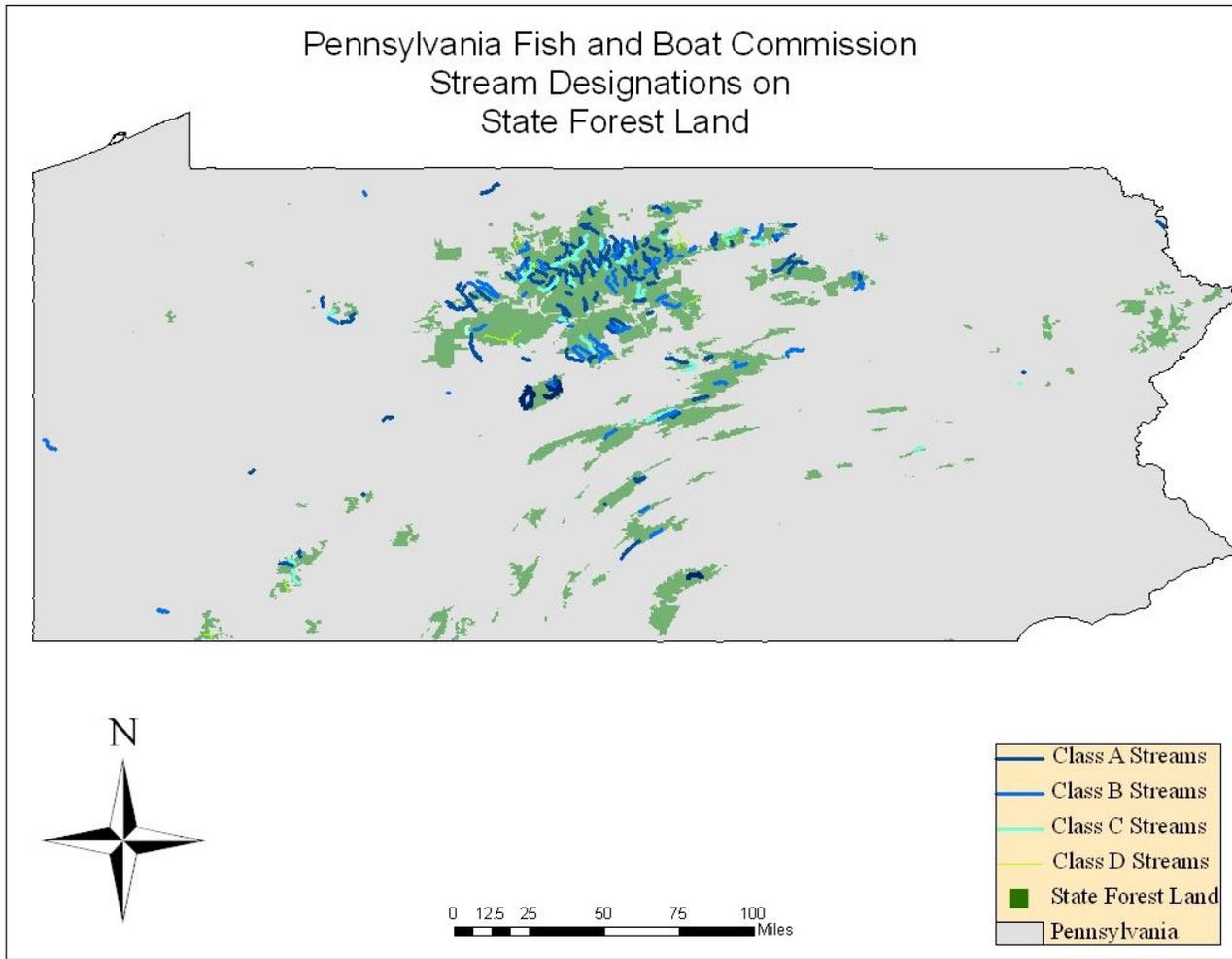
To ensure steady progress toward the conservation objective of brook trout on State Forest land, every 5 years Bureau of Forestry staff will review the status of the brook trout conservation plan. Revision of the plan may be warranted if there are changes in threats, conservation strategies or other pertinent information. Every year as the Bureau of Forestry is informed of new classifications by the Pennsylvania Fish and Boat Commission and the Department of Environmental Protection; the appropriate forest districts will receive the new information with reminders on what these classifications mean for operations and other necessary information.

# APPENDICES

## I. Map of Chapter 93 Designated Streams on State Forest land



## II. Map of Pennsylvania Fish and Boat Stream Designations on State Forest land



### **III. Bureau of Forestry Guidelines for Specific Aquatic Habitat Buffer Designations**

#### **Aquatic Habitat Buffer Guidelines, Effective January 1, 2007**

##### ***Purpose***

Areas around wetlands, vernal ponds, spring seeps, streams, lakes, ponds, and impoundments should be designated as aquatic habitat buffers. These guidelines provide a standard set of operating procedures to be followed when conducting management activities in or near aquatic habitats on State Forest land. Management efforts should focus on providing connectivity, wildlife habitat, and protecting water quality.

##### ***General Guidelines Applicable to Aquatic Habitat Buffers***

The following guidelines apply to all aquatic habitat buffers:

- A. Earth disturbance activities should be avoided whenever possible.
- B. Snags and cavity trees should be retained as they provide exemplary habitat for bats, woodpeckers, and other cavity nesters.
- C. Dead and downed woody material should be retained. It creates critical microhabitat for many species and provides large reservoirs of organic matter needed for nutrient cycling.
- D. If possible and where appropriate, aquatic habitat buffers should be linked to provide connectivity for wildlife.

##### ***Inner and Outer Management Zones***

For each aquatic habitat buffer, an “inner” and “outer” zone is specified. The following describes the purpose, management, restrictions, and permitted activities for the two zones:

##### **Inner Zone:**

The inner zone functions as a core area of protection that allows minimal human disturbance.

- 1. Tree cutting is only permitted for the protection of property or human safety.

##### **Outer Zone:**

The outer zone functions as a transition area. The goal of this zone is to maintain a diverse community of tree, shrub, and herbaceous plants and vertical stratification.

- 1. Silvicultural activity is permitted in the outer zone. Entry by motorized equipment should be limited.
- 2. Prescriptions should focus on selection treatments where appropriate.
- 3. Harvests should consider the prescribed treatments in adjacent stands and employ a gradual or feathered transition area (i.e., vertical and horizontal stratification) from the outermost limit of the aquatic habitat buffer to the inner zone.

### **Waiver Process**

Considering the variability of conditions and circumstances across the State Forest, deviations might be necessary and/or beneficial to any of the aquatic habitat buffer guidelines. Requests for waivers will be reviewed per the following process:

1. If the activity is part of a silvicultural treatment (including District Forester timber sales), submit the request as part of the timber sale proposal. The Silviculture Section will then route the request to the Ecological Services Section and Assistant State Forester for Resource Planning and Stewardship for a one-week review. Comments will be compiled by the Silviculture Section and documented in the Timber Sale file. The Assistant State Forester for Resource Planning and Stewardship will make the final decision.
2. If the activity is not part of a silvicultural treatment, a standard Environmental Review should be submitted to the Planning Section.
3. Exceptions to this review process include regular road, trail, and infrastructure maintenance.

### **Guidelines for Specific Aquatic Habitat Buffer Designations**

The following guidelines apply for specific water body designations. In cases where multiple designations exist, guidelines for the most restrictive designation will apply.

The guidelines are organized according to the following outline:

#### **A. Streamside Forests**

- Wilderness Trout Streams and Wild Rivers
- Exceptional Value (EV) Streams and Scenic Rivers
- High Quality (HQ) and All Other Perennial Streams
- Intermittent or Ephemeral Streams

#### **B. Lakes, Ponds, and Impoundments**

#### **C. Vernal Ponds**

#### **D. Spring Seeps**

#### **E. Wetlands**

#### **A. Streamside Forests:**

The aquatic habitat buffer begins at the top edge of the bank and applies to both sides of the stream. The widths of most aquatic habitat buffers do not vary with slope unless otherwise specified; however, management activities are not advisable on slopes exceeding 40%. The following guidelines are listed in decreasing order of restrictiveness for various stream designations.

**Table 1. Minimum Aquatic Habitat Buffer for Wilderness Trout Streams and Wild Rivers\***

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
200	0	200

\* Wild River management plans supersede these guidelines.

**Table 2. Minimum Aquatic Habitat Buffers for Exceptional Value (EV) Streams and Scenic Rivers†**

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
135	0	135

† Scenic River management plans supersede these guidelines.

**Table 3. Minimum Aquatic Habitat Buffers for High Quality (HQ) Streams and All Other Perennial Streams**

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
30	105	135

**Table 4. Minimum Aquatic Habitat Buffers for Intermittent or Ephemeral Streams**

Intermittent streams are referred to as zero order streams with definable bed and banks. Water does not flow through the channel all of the time, but aquatic invertebrates and some vertebrates can survive in the moist substrate. Ephemeral streams only occasionally have water flowing.

Slope of Land Above Stream (%)	Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
0-10	0	40	40
11-20	0	50	50
21-30	0	60	60
31-40	0	70	70
40+	Activity may not be advisable due to erosion potential. Extreme care must be taken to prevent movement of soil.		

**B. Lakes, Ponds, or Impoundments:**

The aquatic habitat buffer for lakes, ponds, and impoundments starts at the edge of the water as it would exist during median capacity levels.

**Table 5: Minimum Aquatic Habitat Buffers for Lakes, Ponds, or Impoundments ‡**

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
30	105	135

‡ Individual lake management plans supersede these guidelines.

### C. Vernal Ponds:

A vernal pond is a small, temporary body of water in a depression that is fed by surface runoff, lacks surface outflow, and is maintained by a high water table (does not persist year-round). Vernal ponds are also referred to as ephemeral or fluctuating pools.

**Table 6. Minimum Aquatic Habitat Buffers for Vernal Ponds**

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
100	100	200

Additional Guidelines for Vernal Ponds:

1. Restrict harvest operations within outer zone to **November through January**.
2. When the vernal ponds occur as groups in the landscape, the aquatic habitat buffer will begin around the edge of the entire vernal pond grouping.
3. Shading should be maintained and soil and leaf litter disturbance should be minimized throughout the aquatic habitat buffer.
4. Ruts created within the outer zone must be graded or raked to the original contour.
5. Shrub and herbaceous vegetation should be encouraged in the aquatic habitat buffer. They provide important food sources for wildlife and their presence helps to minimize invasion by non-native and invasive plant species.

### D. Spring Seeps:

A spring seep is a permanent or intermittent discharge of water that emerges from the ground and flows across the soil surface without defined bed and banks. The limits of the seep are demarked by the extent of surface water, water-stained leaves, or other signs of hydrology (e.g., oxidized root channels).

**Table 7. Minimum Aquatic Habitat Buffer for Spring Seeps**

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
30	70	100

Additional Guidelines for Spring Seeps:

1. Avoid soil and leaf litter disturbance within the aquatic habitat buffer.
2. Limit harvest activity to dry or frozen conditions when possible.
3. Ruts created within the outer zone must be graded or raked to the original contour.
4. Fell trees away from seeps and leave tops in wetland if they fall into standing water.
5. Encourage herbaceous vegetation around and below seeps and retain all valuable food producing small tree and shrub species in the vicinity of seeps, especially those seeps that remain open through the winter. Establish wildlife food shrubs and coniferous cover near seeps if needed (consult with the Ecological Services Section for list of plant species).

## E. Wetlands:

Wetlands are legally defined under Section 404 of the Federal Clean Water Act and Chapter 105 regulations issued pursuant to the Pennsylvania Dam Safety and Encroachment Act as: “areas that are inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances, do support a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, bogs, and similar areas.” Wetlands are typically characterized by hydrophytic vegetation, hydric soils, and the presence of water at or near the surface for a portion of the year.

**Table 8. Minimum Aquatic Habitat Buffers for Wetlands**

*Wetland buffer guidelines have not been finalized and will be distributed as an addendum once finalized.*

Width of Inner Zone (Ft.)	Width of Outer Zone (Ft.)	Total Width of Aquatic Habitat Buffer (Ft.)
To be determined	To be determined	To be determined

### Additional Guidelines for Wetlands:

1. All wetlands will be protected or enhanced.
2. Fell trees away from wetlands. Leave tops in wetlands if trees fall into standing water.
3. Wetlands will be inventoried and evaluated according to the Landscape Examination procedures.
4. Proposed activities in wetlands will undergo an Environmental Review, as detailed in the Overview Section of the State Forest Resource Management Plan, prior to implementation.
5. Wetlands may be created or developed in suitable areas. An Environmental Review must be completed. Consult the Ecological Services Section. Other sources of information include the PA Game Commission, PA Fish and Boat Commission, PA DEP Bureau of Watershed Management, and the USDA Natural Resource Conservation Service.

### *Additional Guidelines for Aquatic Habitat Buffers*

1. Fords are prohibited on Exceptional Value (EV), High Quality (HQ), and Wilderness Trout Streams.
2. Portable sawmill sets and debarking and chipping operations are not permitted within:
  - a. 300 feet plus 10 feet for each percent slope of HQ waters
  - b. ¼ mile of EV waters and Wilderness trout streams
3. New public use roads should be kept at least ¼ mile away from streams, unless topography or other physical features are an issue.
  - a. Administrative roads within ¼ mile of streams should be gated to prevent public access by motor vehicles. Exceptions include administrative roads leading to leased camp sites, rights-of-way to private interior holdings, and gated roads open during hunting season.
  - b. Parallel roads and trails should be located at least 200 feet plus four feet for every one percent of slope away from the stream bank.

4. Well drilling sites must be located 300 feet from EV, HQ, and Wilderness Trout Streams and 200 feet from all other streams or water bodies. Refer to the *Oil and Gas Guidelines* for specific details.
5. Strip-mining will not be permitted within one-quarter mile of any waterbody.
6. Aquatic habitat buffers should be monitored for the presence of non-native invasive plant and animal species. Whenever possible, attempts should be made to control the invasive species and to restore native species in the aquatic habitat buffer (Consult the Ecological Services Section for assistance).

## IV. Bureau of Forestry Water Resource Related Policies

(See State Forest Resource Management Plan, Department of Conservation and Natural Resources-2003)

- Roads and trails must be located away from stream course except where stream crossings cannot be avoided. The distance between stream and roads and/or trails should be 50 feet plus 4 feet for each one percent of slope. (managing water resources guidelines, Silviculture manual guidelines within watersheds)
- Stream crossings should be avoided whenever possible. When a road or skid trail must cross a watercourse, closed culverts or bridges must be used. (managing water resources guidelines, Silviculture manual guidelines within watersheds)
- Fords are prohibited on all streams in watersheds used by municipalities, institutions, and private users for potable water supply and on Wilderness Trout Streams/Exceptional Value Waters. (Managing water resources guidelines, Special Protection Waters Guidelines). In use of a ford the following conditions must apply: (Silviculture manual guidelines within watersheds)
  - Stream width prohibits bridges construction cost.
  - Stream has solid bottom and approaches that contain rock, stone and gravel.
  - Additional tonnage of rock, stone or gravel for a minimum distance of 50 feet to be applied on approaches with intercepting dips or culverts to prevent stream sedimentation.
  - Ford location is at right angle to the stream channel
  - No objection to fording the stream by the PFBC Conservation Officer.
  - Skidding across fords is prohibited.
- Log landings should be constructed at least 200 feet from streams, ponds, lakes, and marshes to reduce the risk of sedimentation. Special diversions and sedimentation basins should be installed as necessary. (managing water resources guidelines, Silviculture manual guidelines within watersheds)
- Logging operations should be kept away from the streams to prevent soil disturbance near the stream. Trees cut below the level of the road should be moved uphill with a winch. (managing water resources guidelines, Silviculture manual guidelines within watersheds)
- In critical locations such as excessively wet areas, stream bottoms and highly erodible soils, logging operations should be restricted to the summer months. (managing water resources guidelines, Silviculture manual guidelines within watersheds)
- Portable sawmill sites and debarking or chipping operations are not permitted within 300 feet plus 10 feet for each percent slope of HQ waters and ¼ mile of EV waters and wilderness trout streams (Managing water resources guidelines, Special Protection Waters Guidelines, Silviculture manual guidelines within watersheds)
- All proposed applications of pesticides having the potential to affect aquatic resources must be submitted to the Division of Environmental Services, for review. (managing water resources guidelines)
- District personnel should monitor stream conditions whenever possible when performing field duties. If a pollution event (or potential event) from sedimentation, thermal, or chemical sources is suspected, personnel should immediately report the location, nature, and extent of the event to the District Forester, Ecological Services, DEP, PFBC, or any other agency with jurisdiction. (managing water resources guidelines)
- All camping must be at least 100 feet from any stream or other open water source. (managing water resources guidelines)

- Access: A roadless zone where public motor vehicle traffic is excluded should be established for ¼ mile on each side of the stream. (Special Protection Waters Guidelines)
- All roads and trails- the distance between the stream and a parallel road or trail should be 200 feet plus 4 feet for each 1% of slope (Special Protection Waters Guidelines)
- For HQ waters, culverts and bridges are permitted if they can be installed with minimal disturbance (Special Protection Waters Guidelines)
  - For EV and wilderness trout streams, culverts are permitted only on small tributary streams (averaging < 10 feet in width prior to June 15) and no closer than 200 yards of the main stream. Bridges are permitted only if they can be installed without equipment entering the stream channel during construction
- No fill can be placed in the stream channel and no bank alterations will be permitted (Special Protection Waters Guidelines)
- Roads and trails within ¼ mile of all intermittent and perennial streams will be restored upon termination of activity (Special Protection Waters Guidelines)
- An approved metal gate must be installed at the entrance of the main haul roads and oil gas access roads to protect road systems from erosion by unauthorized vehicles (Special Protection Waters Guidelines, Silviculture manual guidelines within watersheds)
- Construction of pipeline and power line corridors in riparian areas should be avoided whenever possible. When they cannot be avoided, all disturbed areas adjacent to the stream will be restored per procedures in the silviculture manual and Oil and Gas Guidelines and recommendations provided by the Ecological Services Section. Mulch will be applied to slopes greater than 15 percent. (Special Protection Waters Guidelines)
- Pipeline stream crossings will be permitted only after proper review by the DEP (Special Protection Waters Guidelines)
- All existing roads within the limited access zone may be used for administrative purposes. New access roads needed for resource management can be constructed within the limited access zone providing the roads are gated and posted to exclude public motor vehicles. (Special Protection Waters Guidelines)
- Exceptions to the foregoing management requirements can be granted by joint approval of the State Forester and the Director of the DEP Bureau of Water Quality Management. Exceptions will be granted only for justifiable social or economic reasons.
- Earth disturbance activities should be avoided whenever possible. Disturbed areas such as skid roads, haul roads, log decks, etc., and should be confined to no more than 10% of the sale area. (Silviculture manual guidelines within watersheds)
- Dead and downed woody material should be retained. It creates critical microhabitat for many species and provides large reservoirs of organic matter needed for nutrient cycling. (Silviculture manual guidelines within watersheds)
- If possible and where appropriate, aquatic habitat buffers should be linked to provide connectivity for wildlife. (Silviculture manual guidelines within watersheds)
- Compartment soil maps should be consulted for the presence of highly erodible soils with severe equipment limitations. Extra precautions will have to be applied in such areas. Wetlands, and soils of poor drainage should be avoided. (Silviculture manual guidelines within watersheds)
- The maximum grade on all roads and bulldozed or heavily used skid trails should be less than 10%. The optimum is between 4% and 10% to reduce accelerated

- erosion and transportation cost of removing forest products from the sale area. (Silviculture manual guidelines within watersheds)
- Roads must be drained adequately by cross drains with either metal, open top, or box culverts, or broad based intercepting dips. (Silviculture manual guidelines within watersheds)
  - Roads log landings, and skid trails should be constructed only during dry weather. (Silviculture manual guidelines within watersheds)
  - Sedimentation basins should be constructed at approaches to bridges or culverts in a stream channel to impound water from roads or skid trails. (Silviculture manual guidelines within watersheds)
  - Close sale supervision must be exercised. The erosion and sedimentation control plan must be carefully followed. The greatest risk of erosion is during active logging. Drainage structures must be maintained. Water bars should be installed and temporary bridges and culverts removed at cutting block closure. (Silviculture manual guidelines within watersheds)
  - A herbaceous cover on portions of disturbed areas subject to erosion on sawmill sites, roads, log landings, and skid trails should be established prior to or as quickly as possible to comply with the Timber Harvesting Erosion and Sedimentation Manual. (Silviculture manual guidelines within watersheds)
  - Appalachia Standards sections 6.5g. to 6.5 t. will be adhered to for harvesting operations near streams and bodies of water. Currently Bureau of Forestry policy exceeds the Appalachia Standards when harvesting near streams. (Silviculture manual guidelines within watersheds)
  - Considering the variability of conditions and circumstances across the State Forest, deviations might be necessary and/or beneficial to any of the aquatic habitat buffer guidelines. Requests for waivers will be reviewed per the following process: (Silviculture manual guidelines within watersheds)
    - If the activity is part of a silvicultural treatment (including District Forester timber sales), submit the request as part of the timber sale proposal. The Silviculture Section will then route the request to the Ecological Services Section and Assistant State Forester for Resource Planning and Stewardship for a one-week review. Comments will be compiled by the Silviculture Section and documented in the Timber Sale file. The Assistant State Forester for Resource Planning and Stewardship will make the final decision.
    - If the activity is not part of a silvicultural treatment, a standard Environmental Review should be submitted to the Planning Section.
    - Exceptions to this review process include regular road, trail, and infrastructure maintenance as well as approved and permitted fish habitat improvement projects.

## **V. Bureau of Forestry In-stream Restoration and Improvement Guidelines**

- Woody debris may be removed from streams when it threatens infrastructure (i.e. bridges)
- All in stream alterations require an Environmental Review and an encroachment permit from DEP Bureau of Dams and Waterways Management and the notification and, in certain instances, the approval of the PFBC.
- Prohibit any in stream activities which might result in silt washing downstream unless an erosion and sedimentation control plan has been filed and approved
- For more information on in stream restoration and improvements, contact the PFBC and the Bureau of Forestry Ecological Services Section

## **VI. Bureau of Forestry Streamside (riparian) Maintenance, Restoration and Improvement Guidelines**

- Retain high canopy forests along water courses and waterbodies
- Stabilize eroding stream banks to prevent siltation and to provide overhead cover for trout. Seed exposed and plant native tolerant woody species such as willow, alders or silky dogwoods. Consult with the Ecological Services section for riparian zone seeding and planting recommendations
- When natural disturbances (fire, wind throw, flood, or defoliation) result in the removal of the riparian zone canopy, attempts should be made to restore the riparian zone as soon as possible
- If wind throw occurs in riparian zones, keep tree in place-do not remove. Trees cut within 50-ft of the stream should be winched out
- Roads and rights-of-way should be located away from stream courses. The filter strip between a stream and road or ROW should be a minimum of 50 feet plus 4 feet for each one percent of slope, or where there is an effective filter strip
- Stream crossings should be avoided whenever possible. If roads must cross watercourses, even small springs and seeps; they must do so on culverts, bridges or approved fords. Consider using open-bottom arch culverts where fish passage is a concern. Stream crossings should be at a right angle to the stream.
- The remoteness of these streams should be considered whenever additional access is proposed for timber management or mineral development. New administrative access roads that will make Remote Trout Streams more accessible should be closed to motorized vehicles.

# VII. PA Fish and Boat Commission Habitat Assessment Forms

(See Lutz 2007)

## HABITAT IMPROVEMENT FOR TROUT STREAMS

### Habitat Assessment Field Data Sheet – High Gradient Streams (side 1)

Stream Name:	Location:		
Station #:	Rivemile:	Basin/Sub-basin:	Agency:
Lat:	Long:	Date:	Reason for Survey:
Investigators:	Time:            am    pm		
Investigators:		TOTAL SCORE:	

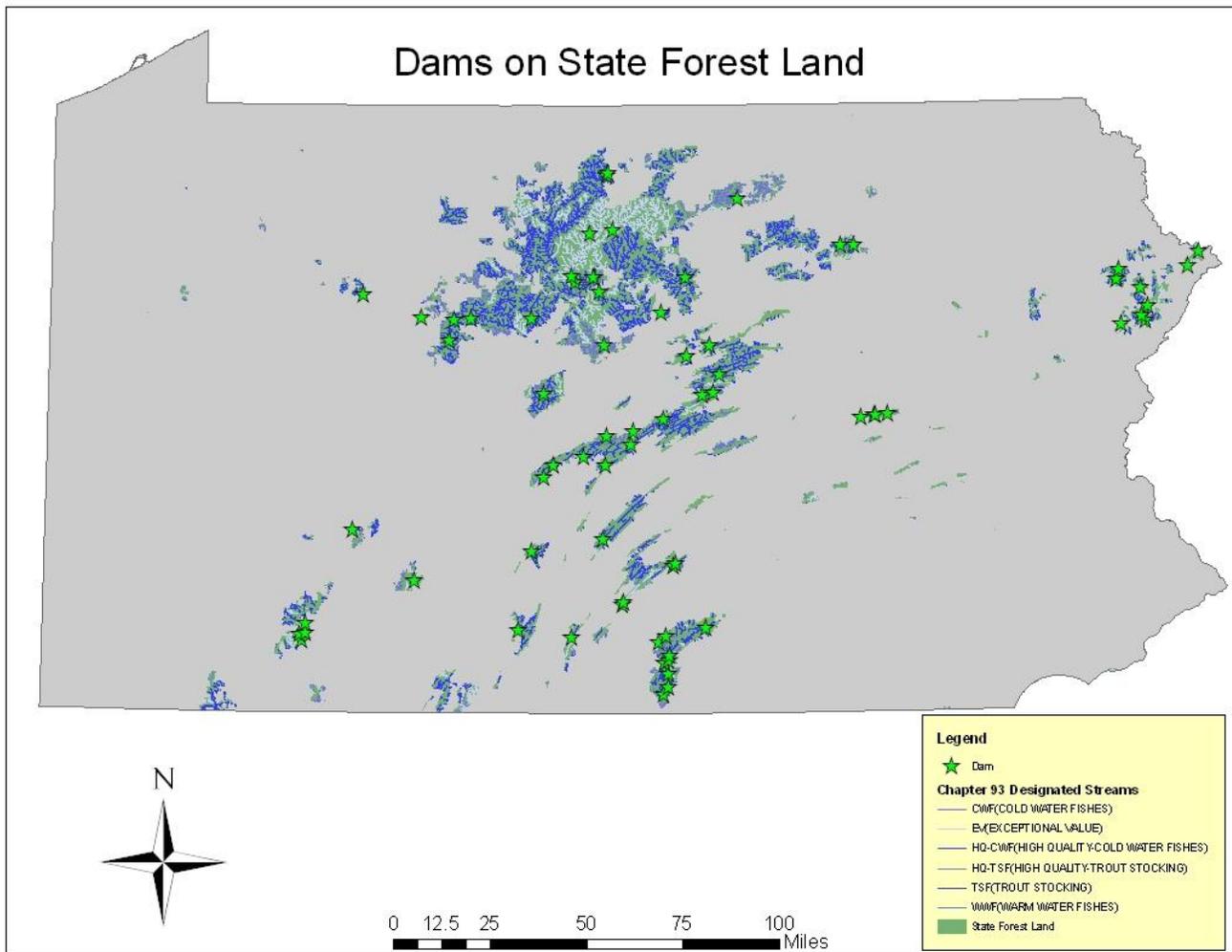
Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
<b>1. Epifaunal Substrate/ Available Cover</b>	Greater than 70% of substrate favorable for epifaunal colonization & fish cover; mix of snags submerged logs, undercut banks, cobble or other stable habitat and at stage to allow full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

## HABITAT IMPROVEMENT FOR TROUT STREAMS

### High Gradient Streams (side 2)

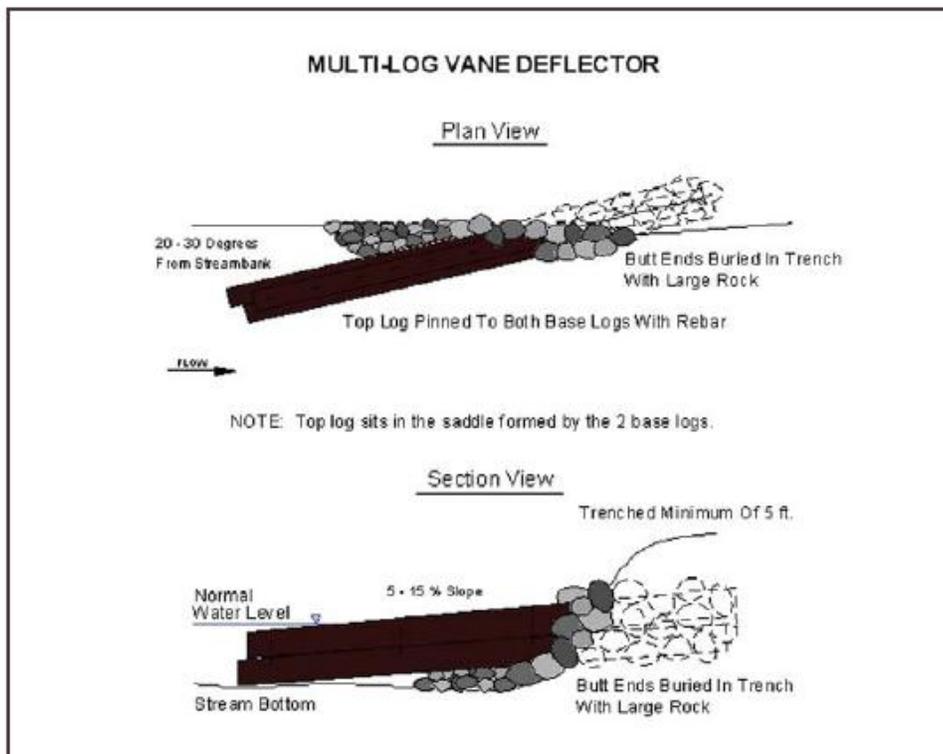
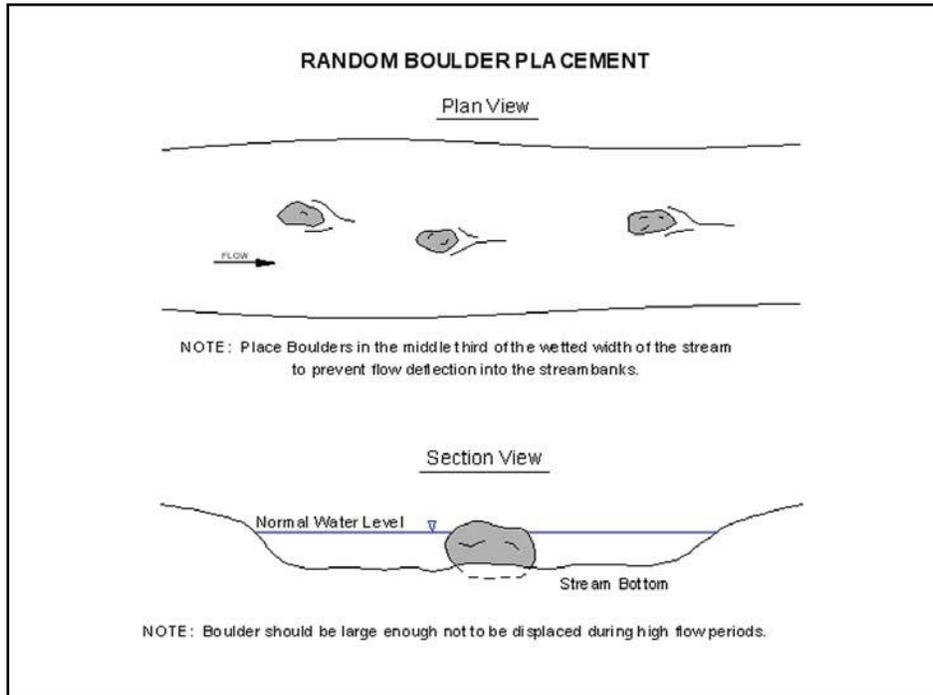
Habitat Parameter	Condition Category			
	Optimal	Suboptimal	Marginal	Poor
<b>6. Channel Alteration</b>	Channelization or dredging absent or minimal; stream with normal pattern.	Some channelization present, usually in areas of bridge abutments; evidence of past channelization, i.e. dredging (greater than past 20 years) may be present, but recent channelization is not present.	Channelization may be extensive; embankments or shoring structures present on both banks; and 40-80% of stream reach channelized and disrupted.	Banks shored with gabion or cement; over 80% of the stream reach channelized and disrupted; instream habitat greatly altered or removed entirely.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>7. Frequency of Riffles (or bends)</b>	Occurrence of riffles relatively frequent; ratio of distance between riffles divided by width of the stream < 7:1 (generally 5 to 7); variety of habitats is key in streams where riffles are continuous, placement of boulders or other large natural obstruction is important.	Occurrence of riffles infrequent; distance between riffles divided by the width of the stream is between 7 to 15.	Occasional riffle or bend; bottom contours provide habitat; distance between riffles divided by the width of the stream is between 15 to 25.	Generally all flat water or shallow riffles; poor habitat; distance between riffles divided by the width of the stream is a ratio of > 25.
SCORE:	20 19 18 17 16	15 14 13 12 11	10 9 8 7 6	5 4 3 2 1 0
<b>8. Bank Stability</b>	Banks stable; evidence of erosion or bank failure absent or minimal; little potential for future problems. < 5% of bank affected.	Moderately stable; infrequent, small areas of erosion mostly healed over. 5 - 30 % of bank in reach has areas of erosion.	Moderately unstable; 30 - 60 % of bank in reach has areas of erosion; high erosion potential during floods.	Unstable; many eroded areas; raw areas frequent along straight sections and bends; obvious bank sloughing; 60 - 100 % of bank has erosional scars.
Note: Determine left & right banks by facing downstream.				
Score (LB):	10 9	8 7 6	5 4 3	2 1 0
Score (RB):	10 9	8 7 6	5 4 3	2 1 0
<b>9. Vegetative Protection</b>	More than 90% of the stream bank surfaces and immediate riparian zone covered by native vegetation, including trees, understory shrubs, or non-woody macrophytes; vegetative disruption through grazing or mowing minimal or not evident; almost all plants allowed to grow naturally.	70 - 90% of the stream bank surfaces covered by native vegetation, but one class of plants is not well represented; disruption evident but not affecting full plant growth potential to any great extent; more than one-half of the potential plant stubble height remaining.	50 - 70% of the stream bank surfaces covered by vegetation; disruption obvious; patches of bare soil or closely cropped vegetation common; less than one-half of the potential plant stubble height remaining.	Less than 50% of the stream bank surfaces covered by vegetation; disruption of stream bank vegetation is very high; vegetation has been removed to 5 centimeters or less in average stubble height.
Score (LB):	10 9	8 7 6	5 4 3	2 1 0
Score (RB):	10 9	8 7 6	5 4 3	2 1 0
<b>10. Riparian Vegetative Zone Width</b>	Width of riparian zone > 18 meters (58'); human activities (parking lots, roadsbeds, clearcuts, lawns or crops) have not impacted zone.	Width of riparian zone 12 - 18 meters (39'-58'); human activities have impacted zone only minimally.	Width of riparian zone 6 - 12 meters (20'-39'); human activities have impacted zone a great deal.	Width of riparian zone < 6 meters (20'); little or no riparian vegetation due to human activities.
Score (LB):	10 9	8 7 6	5 4 3	2 1 0
Score (RB):	10 9	8 7 6	5 4 3	2 1 0

## VIII. Dam locations on Trout Streams on State Forest land

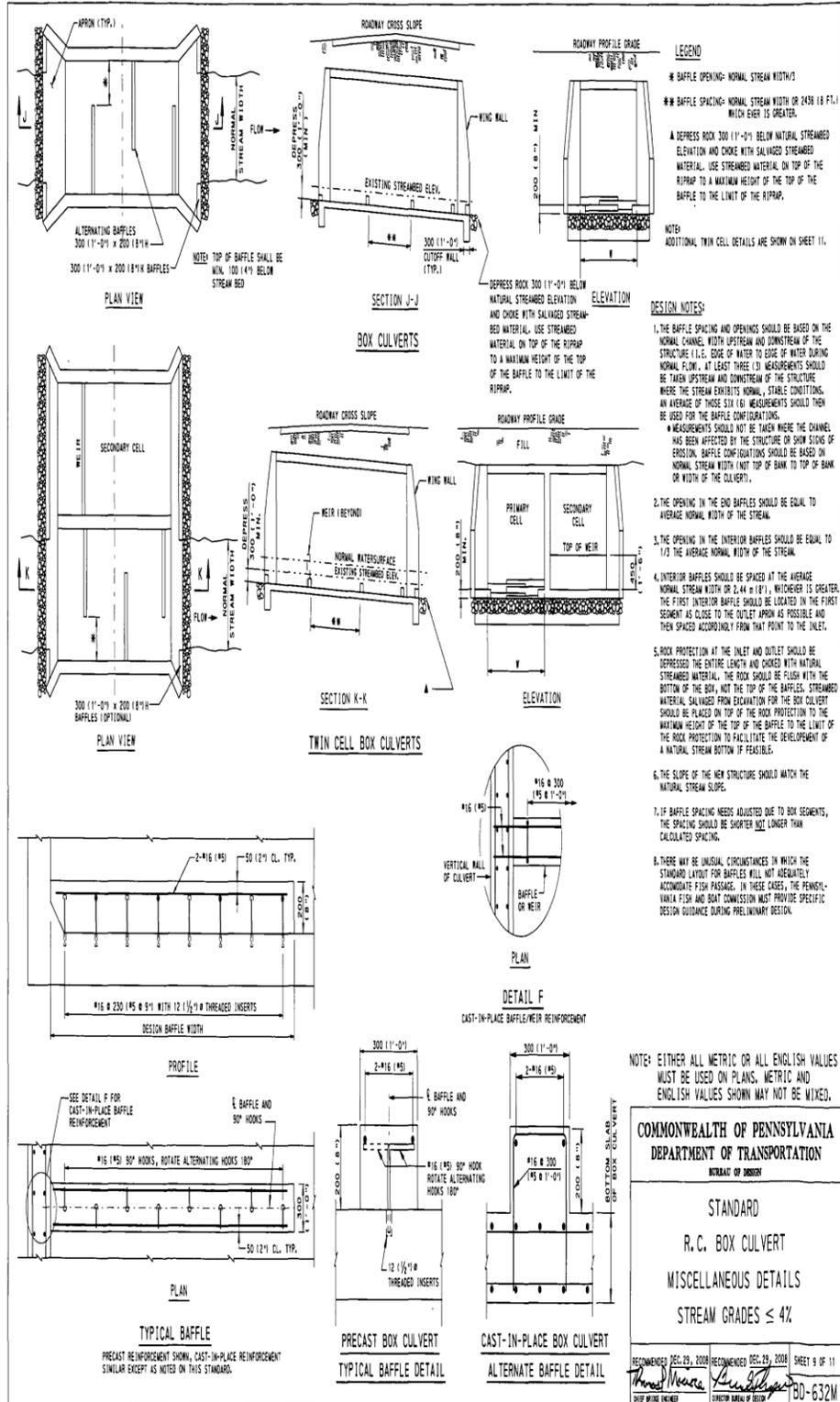


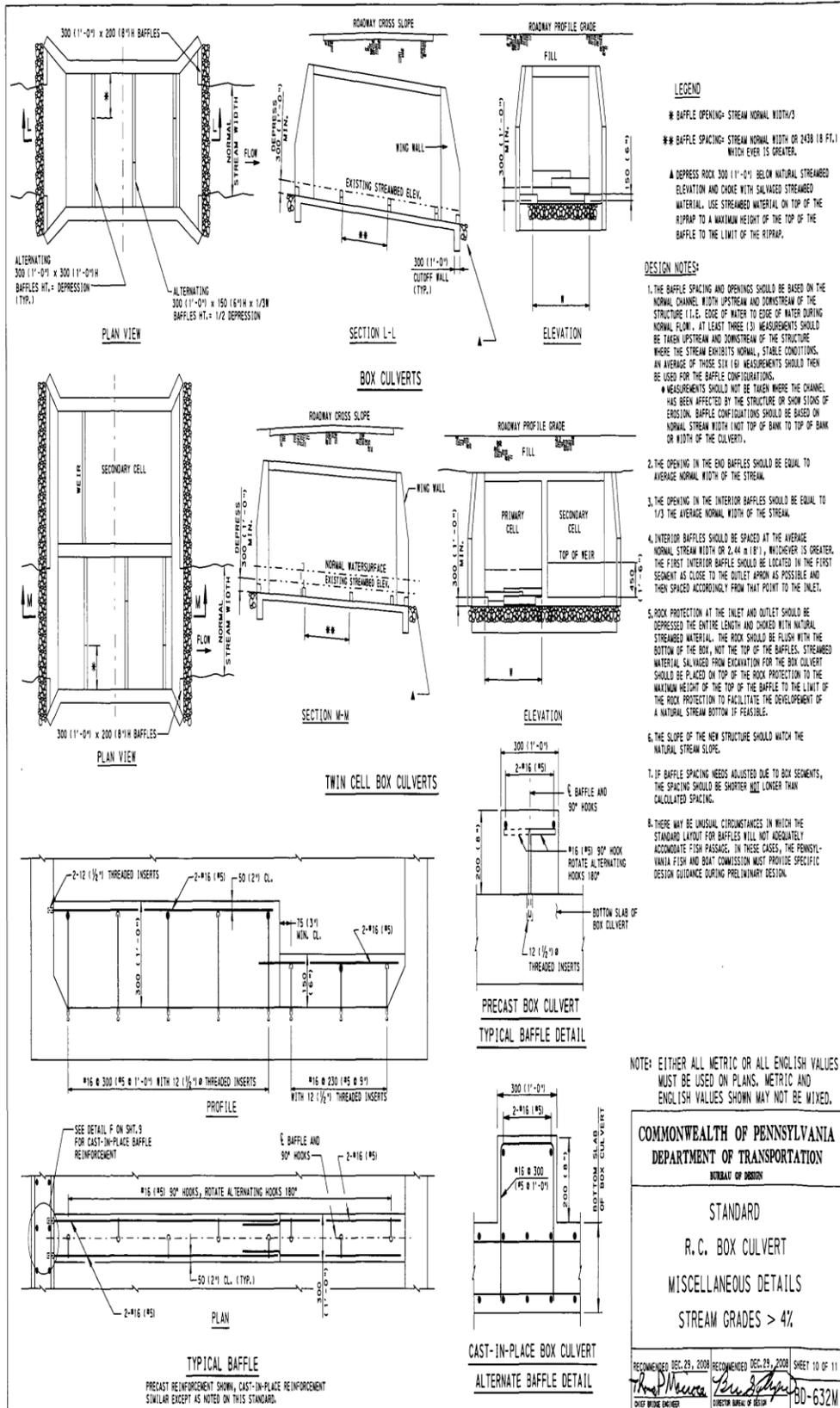
# IX. Examples of log/stone deflector designs from the Pennsylvania Fish and Boat Commission

(See Lutz 2007)



# X. Updated Bureau of Forestry culvert designs







**TopoGeo Analysis Criteria**  
***Surface Water Withdrawals***

Latitude:  
Longitude:  
Location Name:

Township:  
County:  
USGS Quadrangle:

Watershed:  
River Basin (minor):  
River Basin (major):

Name & Designation of Stream (Chap. 93):  
Average Stream flow (Q7-10):  
Characterize Stream low-flow:

Proposed Withdrawal (gallons per day):  
Anticipated Pumping Hours per Day:

Average Annual Precipitation:  
Name & Location of Precip Gauge:

General Stream Characteristics (including water chemistry):

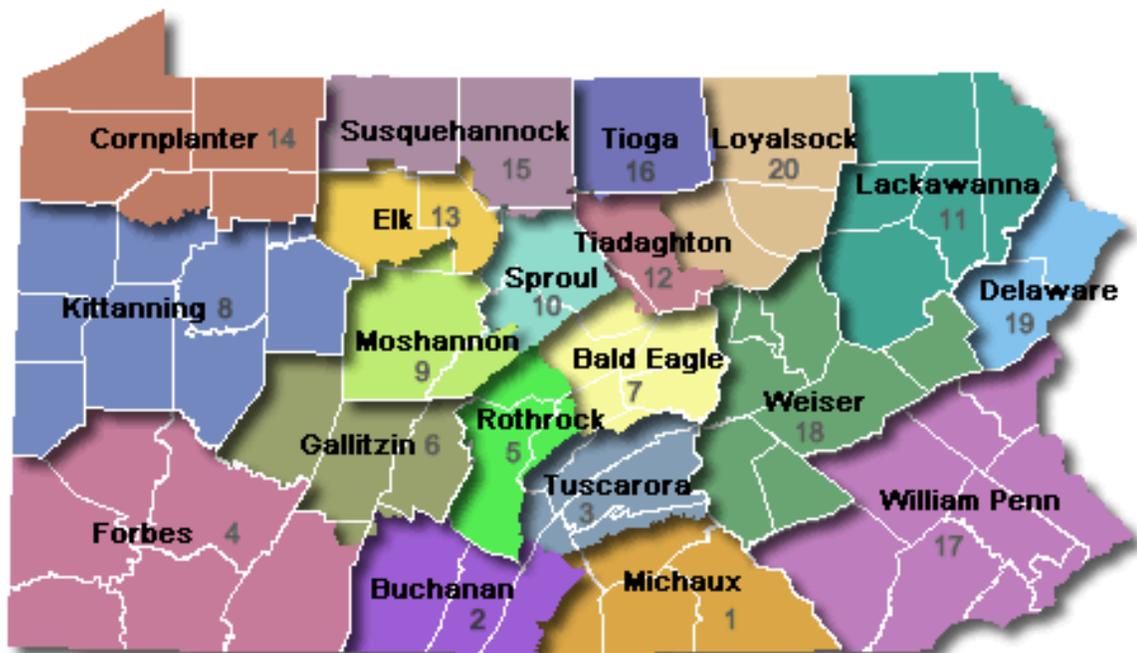
Characterization of GW-SW Connections:

Adjacent Water Users – SW intake:

Adjacent Water Users – GW w/ current water level and hydrologic conditions:

## XII. Bureau of Forestry Ecological Services Section and Field Office Contact Information

<b>Bureau of Forestry Ecological Services Section Harrisburg, PA</b> 717-787-3444	
<b>Chief</b>	Ellen Shultzabarger
<b>Clerical Staff</b>	Deborah Fisler
<b>Wildlife Biologists</b>	Emily Just *Contact for brook trout
	Aura Stauffer
<b>Botanists</b>	Chris Firestone Carrie Gilbert
<b>Environmental Review Manager</b>	Rebecca Bowen
<b>Environmental Review Specialists</b>	Emilee Boyer Richard Shockey Kelly Sitch Andrew Rohrbaugh

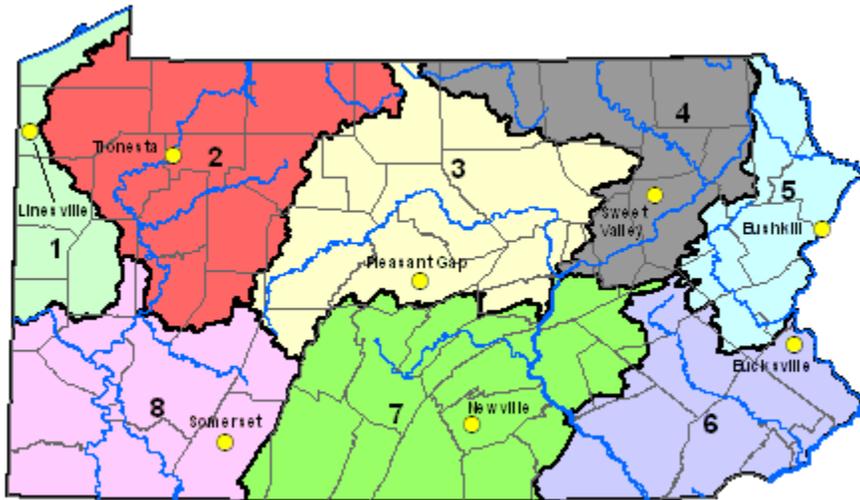


**Field Offices  
Bureau of Forestry  
Department of Conservation & Natural Resources  
District Foresters**

<p><b>#1 MICHAUX</b> Roy Brubaker 10099 Lincoln Way East Fayetteville, PA 17222-9609 Tel: 717-352-2211 FAX: 717-352-3007</p>	<p><b>#2 BUCHANAN</b> James S. Smith 440 Buchanan Trail McConnellsburg, PA 17233-8204 Tel: 717-485-3148 FAX: 717-485-9283</p>
<p><b>#3 TUSCARORA</b> Gene Odató 4455 Big Spring Rd Blain, PA 17006-9434 Tel: 717-536-3191 FAX: 717-536-3335</p>	<p><b>#4 FORBES</b> Edward A. Callahan PO Box 519 Laughlintown, PA 15655-0519 Tel: 724-238-1200 FAX: 724-238-5000</p>
<p><b>#5 ROTHROCK</b> Jason Albright 181 Rothrock Lane Huntingdon, PA 16652 Tel: 814-643-2340 FAX: 814-643-6304</p>	<p><b>#6 GALLITZIN</b> Terence G. Stemmler PO Box 506 Ebensburg, PA 15931-0506 Tel: 814-472-1862 FAX: 814-472-1876</p>
<p><b>#7 BALD EAGLE</b> Amy G. Griffith 18865 Old Turnpike Rd Milmont, PA 17845 Tel: 570-922-3344 FAX: 570-922-4696</p>	<p><b>#8 Kittanning</b> Gary L. Frank 158 South Second Avenue Clarion, PA 16214 Tel: 814-226-1901 FAX: 814-226-1704</p>
<p><b>#9 MOSHANNON</b> Robert G. Merrill, Jr. 3372 State Park Road Penfield, PA 15849-1722 Tel: 814-765-0821 FAX: 814-765-0621</p>	<p><b>#10 SPROUL</b> Douglas J. D'Amore 15187 Renovo Road Renovo, PA 17764 Tel: 570-923-6011 FAX: 570-923-6014</p>
<p><b>#11 LACKAWANNA</b> Nicholas P. Lylo RR1 Box 230 Dalton, PA 18414 Tel: 570-945-7133 FAX: 570-945-7249</p>	<p><b>#12 TIADAGHTON</b> Jeffrey S. Prowant 10 Lower Pine Bottom Road Waterville, PA 17776 Tel: 570-753-5409 FAX: 570-753-5721</p>
<p><b>#13 ELK</b> Jeanne M. Wambaugh 258 Sizerville Road Emporium, PA 15834 Tel: 814-486-3353 FAX: 814-486-5617</p>	<p><b>#14 CORNPLANTER</b> Cecile M. Stelter 323 N. State Street North Warren, PA 16365-4867 Tel: 814-723-0262 FAX: 814-723-0270</p>
<p><b>#15 SUSQUEHANNOCK</b> Christian J. Nicholas PO Box 673 Coudersport, PA 16915-0673 Tel: 814-274-3600 FAX: 814-274-7459</p>	<p><b>#16 TIOGA</b> Roy A Siefert One Nessmuk Lane Wellsboro, PA 16901 Tel: 570-724-2868 FAX: 570-724-6575</p>

<p><b>#17 WILLIAM PENN</b>  Joseph Frassetta  845 Park Road  Elverson, PA 19520-9523  Tel: 610-582-9660  FAX: 610-582-9692</p>	<p><b>#18 WEISER</b>  Mark W. Deibler  Box 99  Cressona, PA 17929  Tel: 570-385-7800  FAX: 570-385-7804</p>
<p><b>#19 DELAWARE</b>  Nicholas P. Lylo  HC 1 Box 95A  Swiftwater, PA 18370-9723  Tel: 570-895-4000 or 4001  FAX: 570-895-4041</p>	<p><b>#20 LOYALSOCK</b>  Richard A. Glinski  6735 Route 220  Dushore, PA 18614  Tel: 570-946-4049  FAX: 570-946-4059</p>

### XIII. PFBC Fisheries Management Areas and Contact Information



The Fish & Boat Commission has nine (9) area fisheries management offices. Fishery managers conduct surveys (biologist reports) of Pennsylvania waters, document the status of fisheries, and develop comprehensive plans for managing fishery resources that are consistent with the protection, conservation and enhancement of the quality and diversity of the resource.

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**Area 1**

13300 Hartstown Road  
Linesville, PA 16424  
*Telephone:* (814) 683-1036  
*Fax:* (814) 683-4215

**Area 2**

172 Hatchery Lane  
Tionesta, PA 16353  
*Telephone:* (814) 755-3890  
*Fax:* (814) 755-3452

**Area 3**

450 Robinson Lane  
Pleasant Gap, PA 16823-9620  
*Telephone:* (814) 359-5118  
*Fax:* (814) 359-5153

**Area 4**

5566 Main Road  
PO Box 88  
Sweet Valley, PA 18656-0088  
*Telephone:* (570) 477-5717  
*Fax:* (570) 477-2090

**Area 5**

Federal Road US Route 209  
PO Box 155 Bushkill, PA 18324-0155  
*Telephone:* (570) 588-6388  
*Fax:* (570) 588-7700

**Area 6**

P.O. Box 356  
Revere, PA 18953  
*Telephone:* (610) 847-2442  
*Fax:* (610) 847-8424

**Area 7**

844 Big Spring Road  
Newville, PA 17241-9473  
*Telephone:* (717) 776-3170  
*Fax:* (717) 776-4980

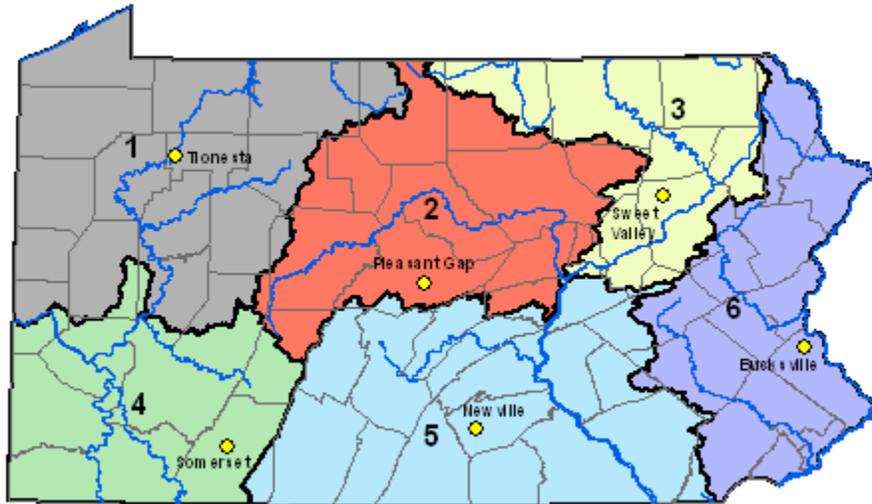
**Area 8**

236 Lake Road  
Somerset, PA 15501-1644  
*Telephone:* (814) 445-3454  
*Fax:* (814) 445-3497

**Area 9 (Lake Erie Research)**

7895 West Lake Road  
PO Box 531  
Fairview, PA 16415  
*Telephone:* (814) 474-1515  
*Fax:* (814) 474-1749

## XIV. PFBC Habitat Management Areas and Contact Information



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### Area 1

Route 62, HCR 2, Box 1  
Tionesta, PA 16353  
*Telephone:* (814) 560-1201  
*Fax:* (814) 755-3501

### Area 2

450 Robinson Lane  
Bellefonte, PA 16823  
*Telephone:* (814) 359-5119  
*Fax:* (814) 359-5153

### Area 3

5566 Main Road  
Sweet Valley, PA 18656  
*Telephone:* (570) 477-3985  
*Fax:* (570) 477-3221

### Area 4

236 Lake Road  
Somerset, PA 15501  
*Telephone:* (814) 279-3080  
*Fax:* (814) 445-3497

### Area 5

844 Big Spring Road  
Newville, PA 17241  
*Telephone:* (717) 776-5871  
*Fax:* (717) 776-4980

### Area 6

P.O. Box 356  
Revere, PA 18953  
*Telephone:* (610) 847-5983  
*Fax:* (610) 847-8424

## XV. DEP Water Quality and Standards Contact Information

<b>DEP Office of Water Management Bureau of Water Standards and Quality</b>	
Monitoring Chief	Tony Shaw
	tshaw@state.pa.us
	(717) 783-3862
Water Pollution Biologist 2	Michael J. Lookenbill
	<a href="mailto:mlookenbill@state.pa.us">mlookenbill@state.pa.us</a>
	(717)783-2959

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