

# NORTH CAROLINA TROUT RESOURCES MANAGEMENT PLAN



Division of Inland Fisheries  
North Carolina Wildlife Resources Commission  
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## INTRODUCTION

Trout fisheries represent a significant portion of angling opportunities in the mountain region of North Carolina. These coldwater resources, including Brook Trout (*Salvelinus fontinalis*), Rainbow Trout (*Oncorhynchus mykiss*), and Brown Trout (*Salmo trutta*) populations, are important ecological and cultural assets of the State.

North Carolina has approximately 4,000 miles of streams capable of supporting trout and providing angling opportunities. However, these streams are located at the southern range of coldwater fishery habitat in the eastern United States, which restricts trout populations to higher elevations. In addition, the underlying granitic geology of western North Carolina limits the overall productivity of the State's trout streams. This combination of factors results in wild trout populations often characterized by fish less than 3-years old and less than 10 inches in length.

Of the estimated 4,000 miles of trout waters in North Carolina, approximately 2,000 miles are designated as Public Mountain Trout Waters (PMTW) and managed by the North Carolina Wildlife Resources Commission (Commission). Nearly 1,000 miles of these streams are managed to protect self-sustaining, wild trout populations. The Commission annually stocks approximately 900,000 hatchery-raised trout to maintain fisheries within the remaining 1,000 miles of PMTW.

In 2006, North Carolina had an estimated 131,055 resident trout anglers (Responsive Management 2007). Approximately 1.4 million days were spent fishing for trout in PMTW in 2008, and the total economic output associated with these trout fishing activities was estimated to be \$174 million (Responsive Management 2009). Nationally, trout anglers contributed an estimated \$13.6 billion to the economy of the United States in 2006 (USFWS 2010).





## PURPOSE

The purpose of the Commission's trout management program is to use science-based decision making and biologically sound management principles to enhance the quality and quantity of Brook Trout, Rainbow Trout, and Brown Trout populations for continued and varied trout angling opportunities. Due to the ecological, recreational, and economic importance of North Carolina's trout resources, and given these resources are limited and are subject to degradation, having a broad plan for managing these resources is imperative. The North Carolina Trout Resources Management Plan

(Plan) will serve as a guiding document for trout management in North Carolina, and supporting documents and issue papers will be developed as appropriate to facilitate its implementation and added as Appendices to the Plan. This Plan supports the Commission's goals and objectives outlined in its Strategic Plan (NCWRC 2010). Successful implementation of this plan will require the support and cooperation of individual anglers, angling organizations, and other government agencies with an interest in protecting and enhancing trout resources.

## PLANNING PROCESS

The Commission adopted a trout management plan in 1989 that defined strategic goals for managing the State's trout resources (NCWRC 1989). To craft revisions to the initial plan, staff compiled the results of biological and socioeconomic research conducted since 1989 to inform trout management. Information was also gathered from trout angling constituents and management partners to assist with identification of critical program areas and specific goals for each area. Input meetings were held with Commission staff and other resource management partners (Blue Ridge Parkway, Eastern Band of Cherokee Indians, Great Smoky Mountains National Park, North Carolina State Parks, Trout Unlimited and U.S. Department of Agriculture Forest Service). In addition, five focus group meetings were held with 42 trout anglers to receive their insights regarding trout management in North Carolina. Focus group participants

represented anglers affiliated with organized angling groups (Federation of Fly Fishers, Trout Unlimited, or private fishing clubs), anglers not associated with organized angling groups, and trout angling guides. Selected participants from each of the five focus groups were asked to serve on an angler advisory committee to provide further input as the program areas and goals were refined.

The Commission's Fisheries Committee reviewed and approved the final draft of the Plan on June 19, 2013. The Commission adopted the Plan on June 20, 2013.

Five critical program areas (Trout Management, Resource Protection and Habitat Enhancement, Research, Angler Access, and Education and Communications) and specific goals for each area have been identified.



## **PROGRAM AREA AND GOALS**

### **Program Area 1. Trout Management**

- Goal 1. Identify, protect, and enhance Brook Trout populations.
- Goal 2. Provide diverse, high-quality trout fishing opportunities.
- Goal 3. Provide a sound regulatory structure to manage Public Mountain Trout Waters.
- Goal 4. Maximize the fishery potential of stocked trout resources.

### **Program Area 2. Resource Protection and Habitat Enhancement**

- Goal 1. Minimize degradation and loss of trout waters and associated riparian habitat.
- Goal 2. Improve trout habitat quality and quantity.
- Goal 3. Manage and minimize adverse effects of invasive species.

### **Program Area 3. Research**

- Goal 1. Obtain routine measurements of social and economic data regarding trout management programs.
- Goal 2. Conduct biological surveys to determine the effectiveness of stocked trout and wild trout management strategies.
- Goal 3. Evaluate alternative trout management practices.

### **Program Area 4. Angler Access**

- Goal 1. Secure permanent public access to trout fisheries.
- Goal 2. Improve angling access for trout anglers with special needs.

### **Program Area 5. Education and Communication**

- Goal 1. Increase the awareness of trout fishing opportunities.
- Goal 2. Maintain and enhance trout fishing information.
- Goal 3. Evaluate enhancing public awareness of trout stocking events.
- Goal 4. Continue to cultivate interactions with trout anglers.



## Trout Management

The Commission will work to protect trout resources and provide consistent, high-quality angling opportunities through management of PMTW. Commission-managed waters provide a diversity of angling opportunities and rely upon a variety of regulatory classifications. The most effective and efficient management approaches will continue to be developed, refined and implemented to ensure that these valuable resources are protected and anglers have quality fishing opportunities.

### Goal 1. Identify, protect, and enhance Brook Trout populations.

Brook Trout is the only salmonid species native to North Carolina. However, anthropogenic impacts to the landscape and introductions of nonnative trout have greatly reduced its range. Intensive stockings of northern strain Brook Trout also diminished the genetic integrity of many endemic, Southern Appalachian Brook Trout populations. Trout anglers deemed that it is important for the Commission to specifically devote resources to Brook Trout management (Responsive Management 2007) and the species should receive special management emphasis. All streams identified with unique populations will continue to be managed exclusively for Brook Trout and no other trout species will be introduced.

*Population Data.*—The Commission has undertaken a long-term effort to identify and genetically type North Carolina’s wild Brook Trout populations. To date, approximately 600 wild Brook Trout populations have been identified, and the Commission will maintain current and accurate distribution and genetics data to guide management efforts.

*Genetic Analysis.*—Results from genetic testing indicate 38% of Brook Trout populations are of Southern Appalachian origin, 10% are of northern origin, and 52% are of mixed genetic origin. The Commission will use additional genetic information (microsatellite DNA analysis) to gain further insight regarding historic distribution of Southern Appalachian Brook Trout, examine current population relatedness, and develop a restoration framework. Continued protection of existing Southern Appalachian Brook Trout populations, and the restoration of those extirpated populations, can only be achieved if managers have a firm understanding of the genetic variance associated with the species.

*Restoration.*—Once a restoration framework based upon genetic, climate, and other applicable data has been established, reclamation of Southern Appalachian Brook Trout streams will be considered in areas where other trout species have displaced Southern Appalachian Brook Trout or where degraded habitats have been improved enough to support self-sustaining Southern Appalachian Brook Trout populations. Emphasis will be given to streams with natural barriers to prevent upstream invasion by other trout species following reclamation, and translocated or hatchery-reared, Southern Appalachian Brook Trout will be stocked into renovated streams.



Triploid Trout.—The Commission will continue its practice of releasing sterile, triploid trout within stocked trout fisheries to protect the genetic integrity of wild Brook Trout populations.

## **Goal 2. Provide diverse, high-quality trout fishing opportunities.**

Angling opportunities for trout in public waters will be provided through management of wild and stocked trout populations.

Wild Trout Fisheries.—Wild trout fisheries are of primary importance as renewable natural resources, and maintaining them as wild resources will continue to be emphasized. The purpose of wild trout management is to provide wild trout populations adequate protection while allowing them to be fished, including opportunities for harvest. Stable population densities will be maintained by using size and creel limits and managing habitats.

Stocked Trout Fisheries.—Many streams lack wild trout or support low-level wild trout populations that are inadequate to maintain self-sustaining fisheries; hatchery fish may be used in these situations to improve angling opportunities. Because the number of fish, size of fish, frequency and seasonality of stocking events, and distribution of fish can all be controlled, a diversity of fishing opportunities will be provided for anglers. Future trout management within PMTW will focus exclusively on existing Brook Trout, Rainbow Trout, and Brown Trout, and not the introduction of other salmonids.

Geographic Distribution.—Trout angling opportunities will have broad geographic distribution. The Commission will evaluate existing and future PMTW to determine if resources are spatially allocated in an appropriate manner.

Tailrace and Impoundment Resources.—Trout angling opportunities in impoundments and tailraces are important to anglers (Responsive Management 2007). The Commission will continue to manage these resources, and where possible, additional waters will be considered for inclusion into PMTW.

Managing Public Mountain Trout Waters.—As efforts are taken to establish and maintain high-quality fisheries, the Commission will likewise judiciously remove PMTW when public access, habitat, or water quality is reduced to the point that management objectives cannot be met.

Other Aquatic Species.—Impacts to other aquatic species will be evaluated prior to implementing any trout management actions.



### Goal 3. Provide a sound regulatory structure to manage Public Mountain Trout Waters.

Public Mountain Trout Waters are currently managed using seven regulatory classifications: Hatchery Supported Trout Waters; Wild Trout Waters; Catch and Release/Artificial Lures Only Trout Waters; Catch and Release/Artificial Flies Only Trout Waters; Delayed Harvest Trout Waters; Wild Trout/Natural Bait Waters; and Special Regulation Trout Waters. The Commission also establishes trout fishing regulations for waters that contain trout, but are not designated as PMTW (undesignated waters). The protection and use of North Carolina's trout resources will be provided through a strong regulatory base.

*Regulatory Complexity.*—Responsive Management (2007) found that the majority of anglers fished for multiple years within a 5-year period and 87% of anglers were satisfied with current trout fishing regulations. However, new and out-of-state anglers often perceive trout fishing rules and angling license requirements to be complex and difficult to comprehend. By continually examining its regulatory base and license structure, the Commission will strive to identify and reduce hindrances for current and potential North Carolina trout anglers, without compromising resource protection and angling opportunities.

*Regulatory Enforcement.*—The Commission will continue to assure that appropriate trout fishing regulations are developed, published, and equitably enforced.

### Goal 4. Maximize the fishery potential of stocked trout resources.

Many streams and impoundments supported by stocked fisheries have potential for increased angling opportunities, and the Commission will explore possible modifications to enhance these resources.

*Allocation of Stocked Trout.*—The Commission will allocate stocked trout across all waters in an objective and consistent manner to take advantage of favorable biological conditions and sociological indicators. Important factors such as public access, fishing pressure, preferred catch rate, average stream flows, and seasonal water temperatures will be used to determine fish densities, frequency of stockings, timing of stockings, stocking locations, and duration of stockings throughout the calendar year.

*Quality of Stocked Trout.*—A majority of anglers are satisfied with the size and quality of trout stocked by the Commission (Responsive Management 2007). The Commission will continue to provide high-quality stocked trout to meet angler expectations.

*Species Ratios.*—Trout species show different responses to angling (Besler et al. 2005). The Commission will consider alternative species ratios to maximize angling opportunities.



Trout Production Needs.—Current demand has fully utilized the available production capabilities of Commission trout rearing facilities. Limitations to production will be evaluated and addressed.

## Resource Protection and Enhancement

To protect trout populations, the Commission will maintain an active policy of protecting fisheries habitats. Efforts to enhance and restore trout habitat will also be emphasized. Threats to trout habitat include land-disturbing activities associated with residential and commercial developments, road construction, in-line impoundments, improper agricultural practices, impediments to fish passage, and invasive species. Although impacts exist region-wide, habitat loss is more severe on private lands where streams are often channelized or moved, their canopies are removed, flow regimes altered, or they are impacted by sediment. In addition, point and non-point source discharges often result in a decline of water quality due to increased temperatures, high nutrient loads, acid deposition, and other substances toxic to fish. Impacts are often reflected by negative changes in stream ecology, such as reduced abundance and diversity of aquatic invertebrates, which are an important part of the trout diet, and the loss of pools, adequate substrate, and cover necessary to support trout populations.

### Goal 1. Minimize degradation and loss of trout waters and associated riparian habitat.

Trout habitats and associated riparian areas continue to be degraded as anthropogenic impacts persist in the mountain region. The Commission will continue to emphasize the importance of maintaining high-quality habitats for trout.

Permit Application Review.—The Commission works with regulatory agencies such as the North Carolina Department of Environment and Natural Resources and the United States Army Corps of Engineers to review permit applications for projects having potential impacts to aquatic resources. Measures to protect fishery resources can be requested during the review process. The Commission will continue to place emphasis on this program and will strive to obtain mitigation for impacted resources.

National Forests.—The Commission will collaborate with the U.S. Department of Agriculture Forest Service to ensure that forest management activities comply with its land management guidelines for protecting fisheries resources.

Dissemination of Trout Data.—The Commission will provide trout distribution data to State regulatory agencies annually. Additional trout data will be shared with management partners as appropriate.

Resource Value.—The Commission will continue to work with landowners, municipalities, and other constituents to promote the significance of maintaining high-quality habitats for all trout waters of the State.

## Goal 2. Improve trout habitat quality and quantity.

Many PMTW could produce and support more trout if habitat quality and quantity were improved. The Commission will pursue improvements to water quality and collaborate with public and private land-owners to reduce habitat degradation.

*Habitat Improvement.*—The Commission will evaluate and implement approaches to rehabilitate and enhance affected trout habitats such as stabilizing banks, increasing fish passage, restoring riparian areas, remediating of acid deposition, or altering hydraulics of the stream channel.

## Goal 3. Manage and minimize adverse effects of invasive species.

Invasive aquatic organisms are a threat to the ecological stability of North Carolina's waters. Recent range expansion of the freshwater diatom *Didymosphenia geminata* and diseases, such as whirling disease, have impacted trout waters throughout the United States.

*Prevention.*—The Commission will work with management partners within North Carolina to develop a comprehensive approach to prevent the introduction and spread of these unwanted organisms. Further, the Commission also will consult with the Southern Division of the American Fisheries Society's Trout Committee to verify that its invasive species plan is consistent with efforts across a multi-state scale.

*Informing Constituents.*—Proper methods to manage and minimize the impacts of invasive species will be communicated to constituents.



### *Habitat Improvement*

rehabilitating and enhancing habitat quality and quantity to support more trout and provide better fishing opportunities

Jacob Rash



## Research

Trout research will be directed toward identification of appropriate management practices and evaluation of the efficacy of these practices in achieving defined goals. Anglers will be consulted to identify focus areas that have the potential of being addressed through research and management. Where appropriate, research projects will be designed to utilize anglers in the collection of data.

### **Goal 1. Obtain routine measurements of social and economic data regarding trout management programs.**

Routine socioeconomic research is necessary to build upon existing data, monitor anglers' expectations of trout management, and measure the economic contributions of Commission-managed trout waters to North Carolina's economy.

*Angler Opinion Data.*—Gathering angler input data will allow the Commission to identify topics that are important to trout anglers and should be considered in the management of trout resources. Data have previously been collected through a supplemental trout questionnaire added to the 1985 statewide angler opinion survey (Van Horn et al. 1987), a creel survey of selected Hatchery Supported Trout Waters (Besler et al. 2005), the 2006 trout angler opinion survey (Responsive Management 2007), and focus and advisory group meetings held in 2010–2011.

*Economic Evaluation.*—The Commission will collect economic data periodically and use these data to promote the importance of trout fishing in North Carolina. In 2008, an evaluation of the economic impact of Public Mountain Trout Waters was conducted (Responsive Management 2009). These data have allowed the Commission to expand partnerships with communities throughout the mountain region.

### **Goal 2. Conduct biological surveys to determine the effectiveness of stocked trout and wild trout management strategies.**

Data collected from biological surveys will guide management decisions.

*Commission Surveys.*—Routine stream surveys are necessary to document changes to the distribution of wild trout populations, and research projects will be developed to evaluate the impacts of management practices on trout populations as needed.

*University Research.*—The Commission will continue to support university research that benefits trout resource management.

*Stocked Trout.*—Efforts to assess current and future use of stocked trout will continue to be developed to assure the wise use of hatchery-raised fish. In 2011, a research project was initiated in conjunction with North Carolina State University to evaluate the persistence and movement of stocked trout. The results of this study will be critical for informing managers and implementing future trout management recommendations.

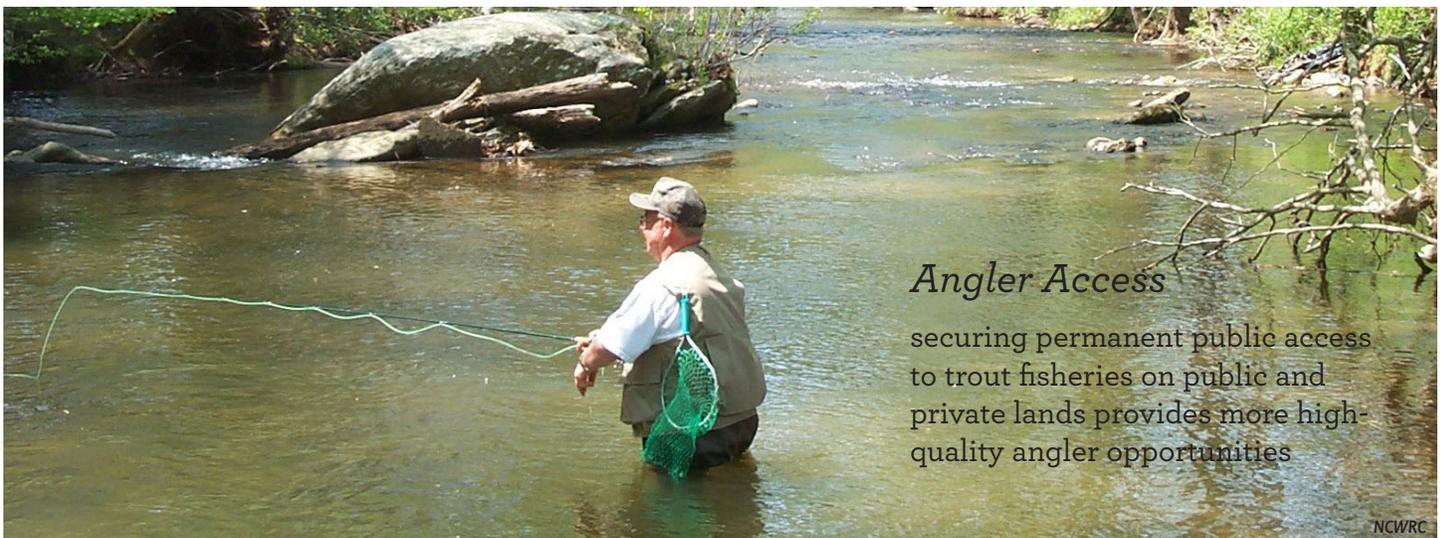
*Wild Trout.*—The Commission will seek to partner with other state and federal resource management agencies to establish criteria for long-term monitoring of wild trout populations. Such criteria will reflect the most recent data and technologies available. By partnering with other resource agencies, Commission staff will obtain the information throughout the species range, making data sets more robust.

*Climate Change.*—Efforts to assess the impacts of climate change will be coordinated with groups such as the Appalachian Landscape Conservation Cooperative, the Eastern Brook Trout Joint Venture, the Southern Division of the American Fisheries Society’s Trout Committee and the U.S. Geological Survey Southeast Climate Science Center to expand the scale of effort and maximize resources.

### Goal 3. Evaluate alternative trout management practices.

The Commission will identify and evaluate opportunities for new management practices on selected waters.

*Evaluation.*—Constituents routinely request that the Commission explore catch-and-release, trophy trout management regulations, modifications to youth-oriented regulations, and expansion of seasonal trout fisheries into other areas of North Carolina; however, prior to enacting these or other substantial changes, Commission staff will conduct issue-specific research projects to monitor biological and socioeconomic impacts and to evaluate the effectiveness of each management action.



#### *Angler Access*

securing permanent public access to trout fisheries on public and private lands provides more high-quality angler opportunities

NCWRC



## Angler Access

Lack of sufficient public access is routinely cited as one of the primary barriers associated with trout fishing, and subsequently, addressing the issue is of utmost importance to constituents and the Commission (Responsive Management 2007).

### Goal 1. Secure permanent public access to trout fisheries.

Access to approximately 85% of Hatchery Supported Trout Waters and Delayed Harvest Trout Waters occurs through private land, while very few Wild Trout Waters exist outside the National Forests. Waters on private land remain within the program at the prerogative of the landowner. Unfortunately, this instability has meant that angling opportunities are routinely lost, existing access is often fragmented, and efforts to provide high-quality angling opportunities are challenged.

*Angler Access.*—The Commission will continue to collaborate with resource partners and private landowners to retain existing PMTW and to add new PMTW. Opportunities to secure permanent or long-term angling access will be identified and evaluated.

*Access on Public Lands.*—The Commission will continue to work with partners to provide opportunities on existing publicly accessible waters.

*Public Access Opportunities on Private Lands.*—The Commission will seek access opportunities on private lands through memorandum of agreement, lease, easement, or fee-simple purchase. Negotiating appropriate long-term agreements with interested landowners warrants considerable time and Commission investment; however, such actions will ensure future generations of North Carolina anglers will have access to trout fisheries.

### Goal 2. Improve angling access for trout anglers with special needs.

Every angler, regardless of age or physical ability, has the right to enjoy North Carolina's PMTW. However, trout fishing opportunities for anglers with disabilities are very limited as PMTW are not readily accessible to these anglers. By improving angling access, the Commission will extend trout fishing opportunities to numerous individuals who would otherwise have difficulty participating. The Commission will continue to improve access to quality fisheries for anglers with disabilities where appropriate.

*Facility Improvements.*—Accessible facilities such as platforms, piers, and improved trails, will be constructed to enhance access and angling opportunities for physically disabled anglers.



*Partnerships.*—The Commission will work closely with agencies and organizations (Federation of Fly Fishers, North Carolina State Parks, Project Healing Waters, Trout Unlimited, and U.S. Department of Agriculture Forest Service) familiar with the needs of the physically disabled to select appropriate sites across PMTW and to design facilities for these sites.

## Education and Communication

It is critical to share information that increases understanding of angling opportunities, aquatic stewardship, and Commission management activities. The Commission will strive to recruit and retain trout anglers through effective communication and education regarding all facets of trout management.

### Goal 1. Increase the awareness of trout fishing opportunities.

The Commission will pursue opportunities to increase awareness of its trout management program and as a result, establish a broader constituent base.

*Outreach Techniques.*—Current outreach methodologies such as the Commission’s website, news releases, social media, and electronic and print information will continue to be used to disseminate information. The Commission will continue to evaluate emerging communication platforms to disseminate information.

*Directed Marketing.*—The use of the North Carolina Department of Commerce’s Division of Tourism, Film and Sports Development or a professional firm for a directed marketing effort will be evaluated.

*Economic Impact.*—The economic importance of trout fisheries will be used to heighten community awareness of and interest in aquatic resource protection and enhancement.

### Goal 2. Maintain and enhance trout fishing information.

Constituents rely upon materials produced by the Commission to receive information regarding trout fishing opportunities.

*North Carolina Inland Fishing, Hunting and Trapping Regulations Digest.*—The Commission will continue to improve the clarity, organization, and distribution of the North Carolina Inland Fishing, Hunting and Trapping Regulations Digest (Digest) to facilitate ease of use for individuals who desire to fish for trout in North Carolina. The Digest is an important source of information for anglers. Anglers familiar with the Digest find it clear and easy to understand (Responsive Management 2007); however, comments are routinely received from individuals new to trout fishing in North Carolina regarding the difficulty of interpreting the regulations explained in the Digest.



Electronic Maps.—Anglers have expressed interest in having searchable maps available through the Commission’s website and mobile device applications. Emphasis will be placed upon development of interactive technology that can be easily updated.

Static Maps.—The Commission will continue to explore opportunities to address the needs of constituents requiring non-electronic maps. Historically, static trout fishing maps were provided via the Commission’s website and the North Carolina Trout Fishing Maps book. Although these maps are a popular source of information, content is limited and difficult to update.

Signage.—The Digest and maps help direct anglers to PMTW, but once at the water, anglers utilize Commission signage for further guidance. An evaluation of current on-stream signage will be conducted to determine its utility to anglers. Potential improvements include standardized sign placement, marker development to denote the boundary of PMTW, signs to guide access (parking and trail identification), and development of educational and informational kiosks. Developing consistent signage and distributing signs uniformly will assist anglers in easily identifying angling opportunities and becoming familiar with amenities provided.

Outreach Materials.—The Commission will continue to develop fishery-specific outreach materials such as instructional videos, educational curriculum, and literature. These high-quality educational materials will help increase public understanding of all aspects of trout management.

Non-English Information.—The Commission will explore opportunities to provide information regarding PMTW to non-English speaking anglers.

### **Goal 3. Evaluate enhancing public awareness of trout stocking events.**

Anglers consistently ask the Commission to provide dates of stocking events in advance to allow them to adequately plan their fishing trips. As the demographic of the typical North Carolina trout angler includes more individuals who travel extended distances from outside the mountain region (Responsive Management 2007), it is becoming increasingly important for these anglers to have consistent opportunities to catch trout. Responsive Management (2007) reported 61% of anglers who fish Hatchery Supported Trout Waters were interested in having stocking schedules made public prior to the stocking date.

Delayed Harvest Trout Waters.—In 2012, the Commission began providing stocking dates for Delayed Harvest Trout Waters prior to stocking events. The Commission will continue to assess the release of this information.

Hatchery Supported Trout Waters.—Information regarding Hatchery Supported Trout Waters stocked during a given week is released at the end of that week. The Commission will evaluate opportunities to provide additional services to anglers who wish to be aware of stocking events in Hatchery Supported Trout Waters.

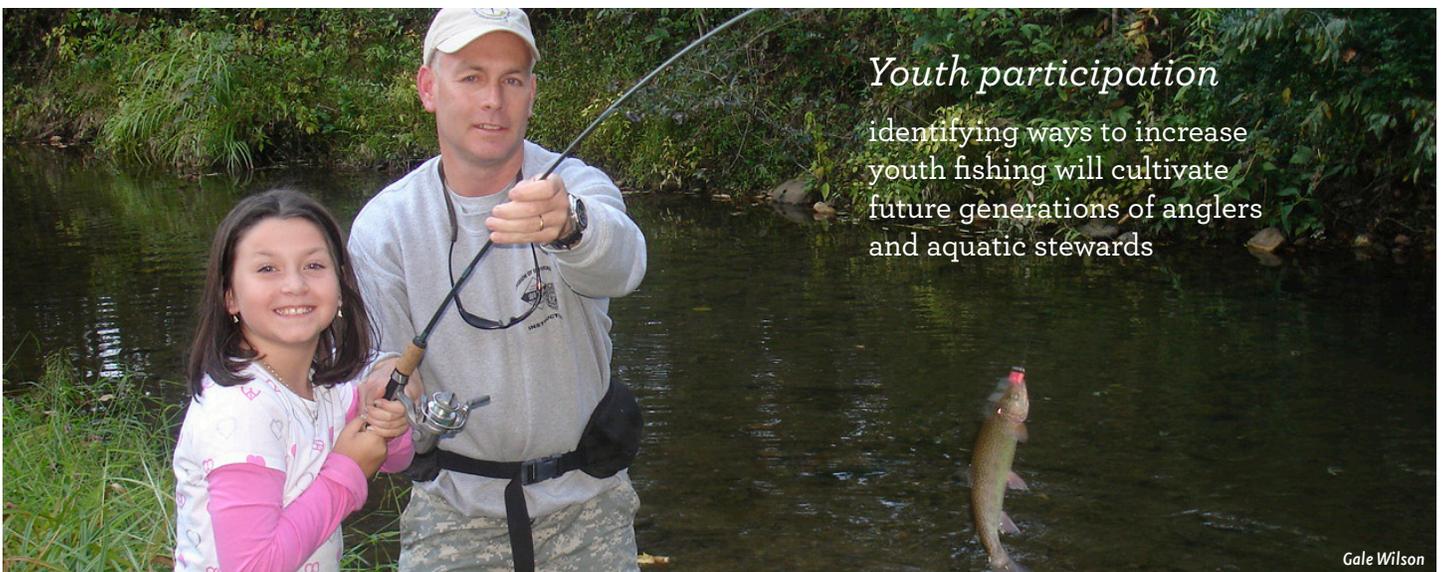
#### **Goal 4. Continue to cultivate interactions with trout anglers.**

Fostering relationships with trout anglers will facilitate the sharing of information and strengthen decisions regarding the management of trout resources. It is important for all members of the trout angling public to be involved with management processes.

Staff Interaction.—Word-of-mouth is the primary way anglers receive information about trout fishing (Responsive Management 2007). Information regarding trout management will continue to be conveyed to the public through direct staff interaction including timely responses to angler inquiries, presentations to angling groups, and participation in fishing expos and shows.

Youth Participation.—The Commission will seek to cultivate future generations of anglers and resource stewards by engaging individuals early in life. The Commission will continue to identify methods to increase youth involvement in the sport of trout fishing. Current approaches include a period of youth-only angling on Delayed Harvest Trout Waters, assistance with fish-for-fun events, and support for Trout Unlimited's Trout in the Classroom and Rivercourse programs.

New Initiatives.—The Commission, in collaboration with management partners and the trout angling public, will identify and implement new outreach activities or alterations to existing efforts to increase understanding of the Commission's trout management efforts.





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## APPENDICES

(To be added as supporting documents and issue papers are developed.)