Bull Shoals & Norfork Tailwaters Management Plan

2008-2013

Based on Fisheries Science, Public Input from Facilitated Workshops, and Non-Resident Angler Mail-in Questionnaires

Prepared by
Arkansas Game and Fish Commission
Fisheries Division

In cooperation with
Bull Shoals & Norfork Tailwaters Citizen Advisory Committee

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Plan Mission Statement

Improve the recreational fishing experience on Bull Shoals & Norfork Tailwaters by optimizing angler access, improving water quality, enhancing physical habitat for fish, and providing quality trout fishing opportunities while maintaining satisfactory angler catch rates.

Purpose of the Plan

The purpose of this plan is to establish specific goals and objectives, which will guide the future management of the trout fisheries in Bull Shoals and Norfork Tailwaters. These goals and objectives are designed to address, as extensively as possible, the desires and expectations of the public as they pertain to the management of these tailwaters. The deliverable elements of the plan are based on scientific fisheries principles and are intended to maintain and enhance recreational fishing opportunities on these waters.

Development of the Plan

Central to the plan development process was an intensive public involvement effort used to help insure that the desires and expectations of the angling public were embodied in these goals. This is part of a new process that the Arkansas Game and Fish Commission (AGFC) is using in which the public plays an integral role in determining the future of trout fishing in Arkansas. The services of Dynamic Solutions Group (DSG), a firm that specializes in natural resource facilitation, were contracted to assist AGFC in this endeavor.

The first step in the public involvement process was a series of five focus group meetings held in February 2007. Each focus group met with the DSG facilitator separately and consisted of 7-8 members of the public. The focus groups provided an initial look at what likely would be the primary issues related to these fisheries.

The Bull Shoals & Norfork Tailwaters Citizen Advisory Committee (BS&NTCAC) was formed in April 2007 to assist AGFC throughout the remainder of the management plan process. The BS&NTCAC consists of individuals that represent a cross-section of the anglers and other stakeholders with an interest in these fisheries. The BS&NTCAC has provided information and perspectives to help AGFC in plan development and will play an important role in plan implementation and evaluation.

The heart of the public involvement process consisted of a series of public workshops held in May 2007. The first of the public workshops was the Mountain Home Trout Summit, which was followed by a second workshop in Mountain

View. Attendees at these workshops asked to discuss and respond to each of the following questions:

1. What should be the goals of the Bull Shoals and Norfork Tailwaters Management Plan? In other words, what does success look like?

2. What are your issues or concerns or problems about trout management on the Bull Shoals and Norfork Tailwaters?

3. What are your recommendations, suggestions or advice concerning actions that should be taken regarding trout management on these tailwaters?

Comments heard during these meetings identified four key issues that the public wanted addressed in the management plan for Bull Shoals and Norfork Tailwaters. These were improved water quality, increased enforcement of regulations on these waters, an improvement in the average size of trout caught by anglers, and increased cooperation between AGFC and other state and federal agencies.

Based on this input, AGFC developed an initial set of management options aimed at improving the average size of trout caught by anglers on these waters. These were made available to the public in Septemeber 2007. Public comments on these options were heard at a public review workshop in November. In December 2007, AGFC submitted to the public a first draft of the management plan. Again the public was given the opportunity to provide their input at a second public review workshop in January 2008.

Plan Implementation and Evaluation

The management strategies outlined in this plan will be implemented over the next 5 years. As major strategies are implemented, they will be evaluated in order to answer the question; did we achieve what we set out to accomplish? In 2013, this plan will be revisited to determine if management objectives were met and to insure that plan goals are still in line with public values and interests.

Critical to the success of this plan is increased stakeholder involvement and communication as well as cooperation with other government agencies. This plan will be implemented through an open public process that adapts to changing conditions.

Background

The tailwaters of Norfork and Bull Shoals Dams were created upon the completion of these dams in 1944 and 1952, respectively. Construction of the White River Dams was authorized by the Flood Control Act of 1938. Specifically, Norfork and Bull Shoals Dam were authorized by the Flood Control Act of 1944, which amended the 1938 Act.

As with other dams in the Southeastern United States, initial operations from these projects created coldwater habitat that was unsuitable for native fish species. To mitigate for the loss of the warmwater fishery, fingerling rainbow trout (*Onchorynchus mykiss*) were experimentally stocked in 1948 and 1952 in Bull Shoals and Norfork Tailwaters. Experimental stockings of rainbow trout and brown trout (*Salmo trutta*) demonstrated the phenomenal growth potential of these waters. Regular trout rainbow trout stockings began in 1955.

The Arkansas Game and Fish Commission currently manages trout fisheries in the White River from Bull Shoals Dam to the Highway 58 Bridge at Guion and in the North Fork of the White River from Norfork Dam to its confluence with the White River (Figure 1). Four species of trout are currently stocked into the Bull Shoals and Norfork Tailwaters. These are rainbow trout, brown trout, cutthroat trout (*Onchorynchus clarkii*), and brook trout (*Salvelinus fontinalis*).

Rainbow trout in Bull Shoals and Norfork Tailwaters are managed primarily as put-and-take fisheries. Natural reproduction of this species is inadequate to support the level of angling pressure these fisheries receive. Therefore, maintenance of these fisheries relies on the stocking of catchable rainbow trout (mean length = 11 inches). Fish managed under a put-and-take strategy are meant to be highly exploited by anglers and numbers stocked are set to support good catch rates and maximize stocking efficiency.

In 1995, several catch and release (C&R) areas were established on Bull Shoals and Norfork Tailwaters. These areas were implemented to provide quality rainbow trout fishing opportunities in certain sections of these rivers. The specific objective of these areas was to increase the abundance rainbow trout 16 inches or larger by minimizing mortality associated with harvest and hooking injuries.

Brown trout, brook trout, and cutthroat trout in Bull Shoals and Norfork Tailwaters are managed under a put-grow-and take strategy. This technique is used to create larger, quality sized trout in waters that are suitable for trout growth and survival, but where reproduction is limited. Trout for put-grow-and take management are stocked as yearlings at an average size of 6 inches and protected by minimum length limits. Brown trout and cutthroat trout are currently managed under a 16-inch minimum length limit in these waters. Brook trout are managed with a 14-inch minimum length limit.

The sport fisheries in the Bull Shoals and Norfork Tailwaters are managed by AGFC under the authority of Amendment 35 to the Arkansas Constitution.

Current Status

Habitat – The eight turbines of Bull Shoals Dam are capable of releases ranging from 200 to 30,000 cfs. The 90-mile Bull Shoals tailwater is characterized by alternating shoals and pools. Substrate is mostly gravel, but ranges from bedrock in scoured areas to sand in silt in some pools. Aquatic vegetation is relatively scarce due to the scouring effects of full hydropower releases and frequent water level fluctuations of 8-10 feet. An invasive algae, *Didymosphenia geminata* (Didymo), was discovered in this tailwater in 2003 and now covers much of the substrate in the upper portion of the tailwater. Water releases from Bull Shoals Dam are favorable for trout survival and range from 41° - 65° F. However, certain areas of the Bull Shoals Tailwater are prone to high summer water temperatures. These areas include the reach from Buffalo City to the confluence with the Norfork Tailwater and areas downstream of Calico Rock. During periods of non-generation during the summer, water temperatures in these areas may exceed 75° F (Figures 2&3).

Releases from Norfork Dam's two turbines range in magnitude from 100 to 6,000 cfs. River channel morphology is characterized by alternating shoals and pools. Substrate varies from bedrock to boulders, but consists mostly of gravel and cobble. Some rooted macrophytes are present. Didymo is also now present in the Norfork Tailwater. Temperatures of the hypolimnetic releases from Norfork Dam range from 41° - 58° F.

Seasonal dissolved oxygen deficits in both Bull Shoals and Norfork Lakes during July-November often result in hydropower releases that are often low in dissolved oxygen (Figures 4& 5). Over the years several fish kills in these tailwaters have been attributed to low dissolved oxygen with the most recent occurring below Norfork Dam in November 2006. Modification of dam operations by the U.S. Army Corps of Engineers (USACOE) and the Southwestern Power Administration (SWPA) has somewhat improved the dissolved oxygen levels in dam releases. However, dissolved oxygen levels during much of the July-November period still fall below the state standard of 6.0 ppm. In 2004, the Arkansas Department of Environmental Quality (ADEQ) listed both the Bull Shoals and Norfork Tailwaters as 303 (d) impaired waters due to sub-standard dissolved oxygen levels.

Stocking – Approximately 1.2 million catchable rainbow trout are stocked in the Bull Shoals Tailwater annually for a stocking rate of around 13,300 trout/mile (Figure 6). The Norfork Tailwater receives over 90,000 catchable rainbow trout

(20,510 trout/mile) each year (Figure 7). Rainbow trout are stocked year-round with seasonal and spatial stocking rates adjusted to match angling pressure.

The Bull Shoals Tailwater receives approximately 100,000 brown trout annually and the Norfork tailwater receives about 10,000 brown trout. Total annual stocking numbers of cutthroat trout for Bull Shoals and Norfork are195,000 and 25,000, respectively. Both the Bull Shoals and Norfork Tailwaters are stocked with about 15,000 brook trout each. Brook trout are generally stocked in the upper reaches of Bull Shoals Tailwater. Brown trout, brook trout, and cutthroat trout are all stocked at an average length of about 6 inches.

Angler Use and Success - Each year anglers direct an estimated 1,272,275 and 226,215 hours of angling effort toward the Bull Shoals and Norfork Tailwaters, respectively. This equates to about 20,200 fishing trips on the Norfork Tailwater and 113,600 trips on Bull Shoals Tailwater annually. On a per-mile basis, the Norfork Tailwater (50,270 hours/mile) receives almost four times the amount of angling pressure than does Bull Shoals Tailwater (14,295 hours/mile).

During a 2003 survey of Arkansas trout anglers average trip expenditures were estimated at $326/trip for Bull Shoals Tailwater and $299/trip for Norfork Tailwater. Multiplying these values by the estimated number of angling trips results in an estimated $6,039,800 and $37,033,600 in direct economic impact for the Norfork Tailwater and Bull Shoals Tailwaters, respectively.

Current rainbow stocking rates appear to be providing satisfactory put-and-take fisheries on these tailwaters with angler catch rates generally greater than 0.8 fish/hour and often exceeding 1.0 fish/hour. A catch rate for rainbow trout of 0.8 – 1.0 fish/hour has been determined to be a satisfactory catch rate for anglers and this is used as a target range for management of put-and-take fisheries. Anglers harvest rainbow trout at a rate of 0.2 – 0.4 fish/hour suggesting a relatively high rate of voluntary release of fish caught.

Fifty-seven percent of the rainbow trout caught by anglers on Bull Shoals Tailwater measure 12 inches or less with little variation among different sections of the tailwater (range 55 – 58%). Rainbow trout measuring 12-16 inches make up approximately 42% of the catch for this species (range 41 – 44%). The remaining 1% of the rainbow trout caught by anglers on Bull Shoals are larger than 16 inches in length. On Norfork Tailwater about 60% and 36% of the rainbow trout caught are in the <12 inch and 12-16 inch length group, respectively. Four percent of the rainbow trout caught on the Norfork Tailwater exceed 16 inches in length.

Brown trout represent most of the larger trout caught by anglers on both Bull Shoals and Norfork Tailwaters. In fact, the former world record brown trout weighing over 38 pounds was caught on Norfork Tailwater. The percentage of

brown trout caught that exceed 16 inches on the Norfork Tailwater averages 13%. On Bull Shoals Tailwater the percentage of brown trout in this size group ranges from 13% upstream of Buffalo City to 8% downstream of Calico Rock.

Angler catch rates of brown trout vary among different sections of the two tailwaters. Brown trout catch rates on the Norfork tailwater average 0.20 fish/hour. On the Bull Shoals Tailwater catch rates for this species range from 0.03 fish/hour below Calico Rock to 0.14 fish/hour in the upper sections.

Cutthroat trout catch rates on the Bull Shoals Tailwater range from 0.06 fish/hour upstream of Buffalo City to 0.01 fish/hour downstream of Calico Rock. Anglers on the Norfork Tailwater catch cutthroat trout at a rate of 0.10 fish/hour. Catch rates for brook trout on all sections of Bull Shoals Tailwater (≈ 0.01 fish/hour) are lower than that on the Norfork Tailwater (0.03 fish/hour)

Trout Populations – Long-term population monitoring data is not available for the Norfork Tailwater. Current population data for this resource comes from an electrofishing sample conducted in October 2003 and more recently in October 2007.

During the 2003 sample, the electrofishing catch rate for rainbow trout was 268 fish/hour (Figure 8). The relative abundance of rainbow trout was substantially higher in the catch-and-release area (439 fish/hour) than in the area near Quarry Park (140 fish/hour).

Rainbow trout observed during the 2003 sample averaged 13 inches in length (Figure 9). Approximately 7% of the rainbow trout in the C&R area measured 16 inches or longer compared to 2% at Quarry Park.

In 2003 brown trout at the Quarry Park site (463 fish/hour) were more abundant than in the C&R area (254 fish/hour), although this difference is likely a result of most brown trout being stocked near Quarry Park (Figure 10). Brown trout collected during this sample averaged 14.3 inches in length. Overall, 24% percent of the brown trout in the 2003 sample exceeded 16 inches in length (Figure 11).

Brook trout were also most abundant near Norfork Dam, although this is likely a result of this species' preference for colder water temperatures nearer the dam. Electrofishing catch rates for brook trout averaged 119 fish/hour at Quarry Park compared to 5 fish/hour in the catch-and-release area. Brook trout in Norfork Tailwater averaged 12.9 inches in length with 13% exceeding the 14-inch minimum length limit for this species.

Cutthroat trout were the least abundant species in Norfork Tailwater with an overall catch rate of 27 fish/hour. The cutthroat observed during this sample had an average length of 14.8 inches with 36% exceeding 16 inches.

Compared to the 2003 sample on the Norfork Tailwater the relative abundance of rainbow trout in 2007 was substantially lower (154 fish/hour) (Figure 8). This decline can largely be attributed to a significant decrease in electrofishing catch rates in the C&R Area from 2003 to 2007 (154 fish/hour). The cause for this decline may be a result of the loss of a stocking site in the middle reach of this tailwater. Although trout are not stocked directly into the C&R area, fish may move into the C&R area from the nearby stocking point and would contribute to the relative abundance in this area. Additionally, the high relative abundance of rainbow trout observed in 2003 may have been the result of an exceptionally high stocking rate in 2002.

Recent population data for Bull Shoals Tailwater consists of partial samples conducted in 2005 and 2006. In 2005, four sites were sampled as part of a catch-and-release area evaluation study. The four sites were the Bull Shoals C&R Area, Cane Island, the Sylamore C&R Area, and Optimus. In 2006, the Rim Shoals C&R and Red Bud areas were sampled.

Rainbow trout catch per unit effort in the Bull Shoals C&R Area was 194 fish/hour was substantially higher than that observed at Cane Island (93 fish/hour) (Figure 12). Likewise, rainbow trout were more abundant in the Rim Shoals C&R Area (204 fish/hour) when compared to the Red Bud site (56 fish/hour), which is not under special regulations. Electrofishing catch rates for rainbow trout for the Sylamore C&R Area and Optimus were 80 fish/hour and 91 fish/hour, respectively.

Lengths of rainbow trout collected during the 2005 and 2006 samples ranged from 9-21 inches. Rainbow trout in the Bull Shoals C&R Area had a mean length of approximately 14 inches while the rainbow trout at all other sample sites averaged about 12 inches.

Brown trout were substantially more abundant in the upper reaches of Bull Shoals Tailwater (Figure 13). Catch rates for the Bull Shoals C&R area and Cane Island were136 fish/hour and 155 fish/hour, respectively. Conversely, catch rates for brown trout averaged 22 fish/hour at Optimus and 16 fish/hour in the Sylamore C&R Area. The relative abundance of brown trout in the Rim Shoals C&R Area (110 fish/hour) was higher than that observed at Red Bud (74 fish/hour).

Current growth and mortality estimates for trout populations come from two University of Arkansas Cooperative Research Unit (UACRU) research project. The movement and mortality study indicates that the Bull Shoals C&R area provides rainbow trout with the greatest protection from angling mortality. The

annual survival estimate for rainbow trout in this area is nearly 80% compared to just 10% in an adjacent area under put-and-take regulations. Rainbow trout tagged in the Rim Shoals C&R area had an annual survival rate of about 53% compared to 68% for those tagged outside. Substantial variation in survival estimates for Rim Shoals prevented detection of significant differences for inside/outside estimates. This same study suggested that environmental factors may play the biggest role in the failure of the Sylamore C&R area to produce larger trout. All rainbow trout tagged within this area had emigrated from the study reach by the end of May, when water temperatures were at their warmest and before higher flows occurred. The UACRU movement and mortality study found that the average length of home ranges of resident rainbow trout was generally smaller than the length of the Norfok C&R area. This study also found that fish tagged within the C&R area usually stayed within its boundaries. These results suggest that the length of the Norfork C&R is sufficient to reduce angling mortality of these fish. Survival estimates from this investigation do indicate an improvement in annual survival of fish within the area (40%) compared to those outside (25%). Low precision in the outside estimate, however, prevented detection of a statistically significant difference.

Although the Bull Shoals C&R area appears to be at least somewhat successful in producing quality-size and even trophy-size rainbow trout, the full potential of this area may be limited by poor growth of rainbow trout. Preliminary results from the UACRU bioenergetics study indicate that rainbow trout <16 inches in length grow at a rate of 1.9 inches per year in the Bull Shoals C&R area. Growth slows for rainbow trout larger than 16 inches and fish in this length category grow just 0.9 in/yr. Reliable growth rates could not be estimated for the Sylamore C&R area due to low numbers of recaptured fish. The Rim Shoals C&R area was not included in this bioenergetics study; therefore no growth rate is available for this site. Growth estimates for the Norfork C&R Area indicate that rainbow trout that are less than 16 inches long are growing at a rate of 1.9 inches per year, which is considered very poor growth. Fish >16 inches are growing slightly better at 2.5 in/yr. Despite the poor growth observed for rainbow trout, brown trout in these same areas appear to be growing well. Brown trout <10 inches in length grow more than 6 in/yr in both the Bull Shoals and Norfork C&R areas. Brown trout in the 10-16 inch size range in the Bull Shoals C&R Area grow approximately 2 in/yr while the brown trout in the Norfork C&R Area grow at a rate of 4 in/yr.

Plan Goals: Six overall management goals were developed for the Bull Shoals and Norfork Tailwaters. Specific objectives and strategies were developed for each tailwater and are detailed in the remainder of this document.

People Goals

1. **Develop an open and transparent management environment by improving communication with stakeholders and partner agencies and by providing information to the public in a timely manner.**

2. **Achieve a high level of angler compliance with regulations to aid in achievement of management objectives.**

3. **Improve angling and boating access by maximizing use at existing facilities and creating additional access as needed.**

Habitat Goals

4. **Achieve water quality sufficient to support survival, growth, and reproduction of trout in the Bull Shoals and Norfork Tailwaters.**

5. **Protect and improve physical habitat in Bull Shoals and Norfork Tailwaters.**

Fish Goals

6. **Provide a diverse recreational trout fishing experience that addresses the full range of angler desires and expectations within the biological and physical capacities of Bull Shoals and Norfork Tailwaters.**

Bull Shoals Tailwater

People Goals, Objectives, and Strategies

GOAL 1. **Develop an open and transparent management environment by improving communication with stakeholders and partner agencies and providing information to the public in a timely manner.**

Objective 1.1 **Hold at least one stakeholder meeting annually to provide stakeholders with current scientific information and the status of implementation projects for the Bull Shoals Tailwater. The first meeting should be scheduled for January/February 2009.**

Strategy 1.1.1. Plan and host annual meetings of the Bull Shoals & Norfork Tailwaters Citizen Advisory Committee (BS&NTCAC).

Who: Trout Management Program and District 2 - Fisheries
When: Annually, beginning 2009

Strategy 1.1.2. Conduct annual informational meetings for the general public.

Who: Trout Management Program, District 2 - Fisheries, and BS&NTCAC
When: Annually, beginning 2009

Strategy 1.1.3. Conduct annual meeting aimed at outlining and discussing approved regulation changes for the upcoming year. These meetings will be scheduled for October or November.

Who: Trout Management Program and District 2 - Fisheries
When: Annually, beginning 2009

Objective 1.2 **Create and maintain an informational page on the AGFC website that includes the posting of recent reports and other information relating to Bull Shoals Tailwater.**

Strategy 1.2.1. Create and maintain an informational webpage dedicated to the Bull Shoals Tailwater.

Who: Trout Management Program, District 2 - Fisheries, and Communications Division
When: By 2008, although the maintenance of the website will be an ongoing process

Objective 1.3 **Disseminate information pertaining to research and management on Bull Shoals Tailwater to the public using popular media outlets.**

Strategy 1.3.1. Publish articles pertaining to research and management on Bull Shoals Tailwater in popular media outlets.

Who: Trout Management Program
When: As possible

GOAL 2. **Achieve a high level of angler compliance with regulations to aid in achievement of management objectives.**

Objective 2.1. **Achieve a high angler compliance rate as measured by the number of violations encountered during creel survey interviews.**

Strategy 2.1.1. Assess current level of angler compliance with data from ongoing creel survey on Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by January 2009

Strategy 2.1.2. Install standardized signs at all access points on Bull Shoals Tailwater.

Who: Construction, Engineering, and Real Estate (CERE) Division in cooperation with Trout Management Program and District 2 Fisheries
When: To be completed by 2009

Strategy 2.1.3. Insure that all special regulation areas on Bull Shoals Tailwater are clearly marked.

Who: CERE Division with assistance from Trout Management Program and District 2 Fisheries
When: To be completed by 2009

Strategy 2.1.4. Post sign with Poaching Hotline number at all access areas on Bull Shoals Tailwater. This sign should include a list of pertinent information to record prior to reporting. Signs could also be located at commercial operations along the tailwaters.

Who: CERE Division with assistance from Trout Management Program and District 2 Fisheries
When: To be completed by 2009

Strategy 2.1.5. Develop a full-page layout in the Trout Guidebook that with lists the Poaching Hotline number and describes pertinent information to record prior to reporting.

Who: Communications Division and Fisheries Division
When: To be completed by January 2009

Strategy 2.1.6. Develop a fish ruler and/or other decal that lists the Poaching Hotline number and describes pertinent information to record prior to reporting. These decals would be widely distributed to the public.

Who: Communications Division and Fisheries Division
When: To be completed by 2010

Strategy 2.1.7. The Enforcement Division will maintain a visible presence on the Bull Shoals Tailwater utilizing Wildlife Officers from other counties during their slow time as appropriate.

Who: Enforcement Division
When: When possible beginning immediately

Strategy 2.1.8. Evaluate feasibility of a Guide License Program. Potential requirements may include boater safety, first aid, CPR, proof of liability insurance, and attendance at annual regulations updates.

Who: Trout Management Program in cooperation with Licensing Division, Wildlife Division, and Enforcement Division
When: To be completed by 2010

GOAL 3. **Improve angling and boating access by maximizing use at existing facilities and creating additional access as needed.**

Objective 3.1. **Create additional access for anglers and boaters.**

Strategy 3.1.1. Assess angler access needs on Bull Shoals Tailwater.

Who: District 2 Fisheries and Trout Management Program
When: To be completed by 2010

Strategy 3.1.2. Develop plans to improve existing facilities along the Bull Shoals Tailwater.

Who: District 2 Fisheries, CERE Division, and Trout Management Program
When: To be completed by 2010

Strategy 3.1.3. Develop the Bronie Yurkonis walk-in access near Wildcat Shoals.

Who: CERE Division, Trout Habitat Improvement Program, District 2 Fisheries and Trout Management Program
When: To be completed by 2010

Habitat Goals, Objectives, and Strategies

GOAL 4. **Achieve water quality sufficient to support survival, growth, and reproduction of trout in the Bull Shoals Tailwater.**

Objective 4.1. **Achieve a minimum dissolved oxygen level of 6.0 ppm in the Bull Shoals Tailwater as required by Regulation 2 of the Arkansas Pollution Control and Ecology Commission.**

Strategy 4.1.1. Work with federal and state authorities to pursue long-term remedies that will increase dissolved oxygen levels in water releases from Bull Shoals Dam to the state standard of 6.0 ppm during generation and non-generation periods.

Who: Trout Management Program and other Fisheries Division personnel in cooperation with federal and state authorities
When: Beginning immediately, although this will be an ongoing process

Strategy 4.1.2. Elevate the problem of low dissolved oxygen below Bull Shoals Dam among policy and decision-makers. Work with elected representatives to evaluate past efforts of the White River Dissolved Oxygen Committee (WRDOC) and to focus future efforts of the committee on achieving state dissolved oxygen standards.

Who: Trout Management Program and other Fisheries Division personnel
When: Beginning immediately, although this will be an ongoing process

Strategy 4.1.3. Coordinate actions with USACOE, Arkansas Department of Environmental Quality (ADEQ), and SWPA as outlined in the Low Dissolved Oxygen Season Operational Plans for Bull Shoals Tailwater.

Who: Trout Management Program
When: As needed annually during low dissolved oxygen season

Strategy 4.1.4. Monitor health of trout populations on Bull Shoals Tailwater during critical period through annual fish health assessments.

Who: Trout Management Program and Fisheries Division Fish Pathologist
When: Annually at the end of the low dissolved oxygen season

Strategy 4.1.5. Document fish kills on Bull Shoals Tailwater associated with low dissolved oxygen.

Who: Trout Management Program and District 2 Fisheries
When: As needed

Strategy 4.1.6. Examine potential impact of low dissolved oxygen events on angler satisfaction, visitation, and economic benefit of the Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 4.1.7. Promote best management practices within the watersheds of the White and the North Fork of the White Rivers to reduce sediment and nutrient input.

Who: Trout Habitat Improvement Program and Trout Management Program
When: Beginning immediately, although this will be an ongoing process

Objective 4.2 **Maintain water temperatures below a maximum of 68° F in the Bull Shoals Tailwater from Bull Shoals Dam downstream to Calico Rock.**

Strategy 4.2.1. Obtain minimum flow releases of 800 cfs and 500 cfs from Bull Shoals Dam and Norfork Dam, respectively.

Who: Minimum Flow Cooperating Partners (USCOE and SWPA)
When: **As directed by timeline for minimum flow implementation**

Objective 4.3. **Reduce the occurrence of water temperatures above 68° F in the Bull Shoals Tailwater downstream of Calico Rock.**

Strategy 4.3.1. Coordinate with USCOE and SWPA for minimum releases for temperature control during the period of May 1 – October 15.

Who: Trout Management Program
When: As needed

Strategy 4.3.2. Document fish kills on Bull Shoals Tailwater associated with high water temperature.

Who: Trout Management Program and District 2 Fisheries
When: As needed

Strategy 4.3.3. Develop an informational pamphlet that details the benefits of maintaining riparian buffers to include shading. This pamphlet would be made available to landowners, developers, real estate agents, county extension agents, etc.

Who: Trout Habitat Improvement Program
When: To be completed by 2009

Objective 4.4. **Prevent the spread of invasive species to and from the Bull Shoals Tailwater.**

Strategy 4.4.1. Conduct education and outreach effort on the presence of invasive species in Bull Shoals Tailwater, potential impacts of invasive species on trout populations, and proper techniques for cleaning angling equipment.

Who: Trout Management Program and Communications Division
When: As needed

Strategy 4.4.2. Place informational signs at all access points on the Bull Shoals Tailwater. These signs should include the information detailed in Strategy 4.4.1.

Who: Trout Management Program and CERE Division
When: To be completed by 2009

Strategy 4.4.3. Develop protocol to quantify the coverage of *Didymosphenia geminata* (Didymo) in the Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 4.4.4. Monitor the distribution of Didymo in the Bull Shoals Tailwater.

Who: Trout Management Program
When: Annually

Strategy 4.4.5. Evaluate the feasibility of placing equipment-cleaning stations at public access points on Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2009

GOAL 5. **Protect and improve physical habitat in Bull Shoals Tailwater.**

Objective 5.1. **Create a habitat protection and renovation plan for Bull Shoals Tailwater, which will be used to identify, prioritize, and plan future habitat projects. Plan will be designed and funded in cooperation with partners and will include maps, diagrams, and cost estimates**.

Strategy 5.1.1. Determine the level of resolution and habitat variables needed in an inventory and assessment of physical habitat for Bull Shoals Tailwater.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2009

Strategy 5.1.2. Assess the personnel and equipment resources needed to complete the needed inventory and assessment to determine if it can be performed in-house or needs to be contracted.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2010

Strategy 5.1.3. Conduct an inventory and assessment of fish habitat in Bull Shoals Tailwater. If contracting this work is required, then funding should be shared with partners.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2011

Strategy 5.1.4. Create a prioritized list of areas on Bull Shoals Tailwater needing physical habitat improvement. Prioritization should be based on proximity to existing access areas to create better fishing for wade and bank anglers.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2012

Strategy 5.1.5. Create a map detailing problem bank erosion areas on Bull Shoals Tailwater along with landowner contact information.

Who: Trout Habitat Improvement Program
When: To be completed by 2011

Strategy 5.1.6. Develop an informational pamphlet that details the benefits of maintaining riparian buffers. This pamphlet would be made available to landowners, developers, real estate agents, county extension agents, etc.

Who: Trout Habitat Improvement Program
When: To be completed by 2009

Objective 5.2. Obtain minimum flow releases of 800 cfs and 500 cfs from Bull Shoals and Norfork Dams, respectively.

Strategy 5.2.1. Officially sign a Project Cooperators Agreement with the USCOE to implement minimum flow below Bull Shoals and Norfork Dam.

Who: Minimum Flow Cooperating Partners
When: As directed by timeline for minimum flow implementation

Strategy 5.2.2. Re-locate lakeside facilities on Bull Shoals and Norfork Lakes impacted by minimum flow to achieve reasonable continued use of the facilities.

Who: Minimum Flow Cooperating Partners
When: As directed by timeline for minimum flow implementation

Strategy 5.2.3. Use ADYN-RQUAL model to determine optimum utilization of water allocated for minimum flow on Bull Shoals and Norfork lakes. This work may be contracted through Loginetics.

Who: Trout Management Program
When: To be completed by 2010

Strategy 5.2.4. Develop a monitoring program to assess impact of minimum flows on benthic macroinvertebrate and trout populations on Bull Shoals Tailwater. This research will likely be contracted through a university.

Who: Trout Management Program in cooperation with appropriate university
When: Dependent on implementation of minimum flow although planning for assessment for pre-minimum flow conditions should be done by 2009

Strategy 5.2.5. Evaluate potential for water quality monitoring program on Bull Shoals Tailwater. Depending on the number of sampling sites and the sampling frequency, the use of volunteer labor may be necessary.

Who: Trout Management Program
When: To be completed by 2010

Fish Goals, Objectives, and Strategies

Goal 6. **Provide a diverse recreational trout fishing experience that addresses the full range of angler desires and expectations within the biological and physical capacities of Bull Shoals Tailwater.**

Objective 6.1. **Maintain a mean angler catch rate of 0.8 – 1.0 fish/hour and an exploitation rate of ≥ 50% for the put-and-take rainbow trout fishery on Bull Shoals Tailwater.**

Strategy 6.1.1. Stock approximately 1.1 million rainbow trout (mean length = 11 inches) in Bull Shoals Tailwater annually.

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.1.2. Quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing Bull Shoals Tailwater creel survey.

Who: Trout Management Program
When: Annually for duration of creel survey

Strategy 6.1.3. Develop and implement annual electrofishing sample protocol for Bull Shoals Tailwater with which to assess rainbow trout population relative abundance and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.1.4. Quantify exploitation rate of stocked rainbow trout on Bull Shoals Tailwater with a tagging study to be conducted concurrently with ongoing creel survey.

Who: Trout Management Program
When: To be completed by 2010

Strategy 6.1.5. Use creel survey and angler distribution data to optimize rainbow trout stocking and distribution on Bull Shoals tailwater.

Who: Trout Management Program, District 2 Fisheries, and Coldwater Coordinator
When: Annually

Objective 6.2. Increase the proportion of rainbow trout ≥ 16 inches in the Bull Shoals Tailwater.

Strategy 6.2.1. Continue current management strategies in the Bull Shoals Tailwater catch-and-release areas until the results of the University of Arkansas Cooperative Research Unit (UACRU) bioenergetics study are available in fall 2008.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Until strategy for quality rainbow trout management is developed (see Strategy 6.2.2)

Strategy 6.2.2. Develop a strategy for quality rainbow trout management in the Bull Shoals Tailwater. The strategy will be based on population sample data, creel survey data, and the results of the UACRU movement/mortality and bioenergetics studies. To achieve this objective, different regulations restricting harvest and the use of bait may need to be implemented in selected areas. Potential regulation changes would be proposed in spring 2009 with implementation in January 2010.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division with input from BS&NTCAC
When: Upon availability and review of results from UACRU bioenergetics study

Strategy 6.2.3. Quantify growth rates of stocked rainbow trout on Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: Dependent upon strategy developed in Strategy 6.2.2

Strategy 6.2.4. Quantify mortality rates of stocked rainbow trout Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: Dependent upon strategy developed in Strategy 6.2.2

Strategy 6.2.5. Develop sampling protocol to quantify and monitor abundance of forage species to include sculpin, crayfish, and benthic macroinvertebrates in Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 6.2.6. Develop a fish ruler and/or other decal that details recommended handling techniques for fish that are to be released. (See Strategy 2.1.6.)

Who: Trout Management Program and Communications Division
When: To be completed by 2010

Strategy 6.2.7. Evaluate the potential of circle hooks for reducing hooking mortality associated with bait fishing on Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 6.2.8. Experiment with fingerling rainbow trout stocking to achieve better growth/survival rates of rainbow trout in Bull Shoals Tailwater. Assumption – fingerlings will adapt to forage base better.

Who: Trout Management Program
When: Dependent upon availability of fingerling rainbow, but potentially as soon as Spring 2008

Strategy 6.2.9. Assess the impact of minimum flow from Bull Shoals Dam and Norfork Dams on trout growth rates in Bull Shoals Tailwater. This research will likely be contracted through a university.

Who: Trout Management Program in cooperation with appropriate university

When: Dependent on implementation of minimum flow although planning for assessment for pre-minimum flow conditions should be done by 2009

Objective 6.3. Achieve a trophy brown trout fishery in Bull Shoals Tailwater characterized by the following size-structure criteria:

Bull Shoals Dam to Cotter

- electrofishing catch rate of 140 fish/hr
- electrofishing catch rate ≥ 65 fish/hr for fish ≥ 457 mm (18 in)
- electrofishing catch rate ≥ 20 fish/hr for fish ≥ 559 mm (22 in)

Cotter to Buffalo City

- electrofishing catch rate of 70 fish/hr
- electrofishing catch rate ≥ 30 fish/hr for fish ≥ 457 mm (18 in)
- electrofishing catch rate ≥ 10 fish/hr for fish ≥ 559 mm (22 in)

Calico Rock to Guion

- electrofishing catch rate of 20 fish/hr
- electrofishing catch rate ≥ 8 fish/hr for fish ≥ 406 mm (16 in)
- electrofishing catch rate ≥ 4 fish/hr for fish ≥ 457 mm (18 in)

*** Population sampling needs to be conducted in the middle section of the Bull Shoals Tailwater to determine reasonable criteria for this area.

Strategy 6.3.1. Regulate brown trout fishery in the Bull Shoals Tailwater with a 610-mm (24-inch) minimum length limit, 1 fish/day creel limit to be implemented January 1, 2009.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Beginning January 1, 2009

Strategy 6.3.2. Develop and implement annual electrofishing sample protocol for Bull Shoals Tailwater with which to assess brown trout population relative abundance and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.3.3. Quantify size composition of brown trout catch and harvest through ongoing creel survey on Bull Shoals Tailwater.

Who: Trout Management Program
When: Annually

Strategy 6.3.4. Quantify brown trout mortality rates in Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Fall 2008

Strategy 6.3.5. Quantify brown trout growth rates in Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Fall 2008

Strategy 6.3.6. Develop sampling protocol to quantify and monitor abundance of forage species to include sculpin, crayfish, and benthic macroinvertebrates in Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 6.3.7. Assess potential impact of bait harvest on trout growth rates in special regulation areas on Bull Shoals Tailwater.

Who: Trout Management Program
When: To be completed by 2010

Strategy 6.3.8. Develop a fish ruler and/or other decal that details recommended handling techniques for fish that are to be released. (See Strategy 2.1.6.)

Who: Trout Management Program and Communications Division
When: To be completed by 2010

Strategy 6.3.9. Evaluate feasibility of implementing a trophy trout tag system that would restrict the number of trophy trout that could be harvested by an angler annually.

Who: Trout Management Program, Enforcement Division, and Licensing Division
When: To be completed by 2011

Objective 6.4. Maintain an angler success rate for brown trout of ≥ 0.1 fish/hour on Bull Shoals Tailwater.

Strategy 6.4.1. Stock approximately 100,000 brown trout (mean length = 6 inches) in Bull Shoals Tailwater annually.

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.4.2. Continue to quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing Bull Shoals and Norfork Tailwaters creel survey.

Who: Trout Management Program
When: Annually

Strategy 6.4.3 Assess the contribution of wild spawned fish to the brown trout population on Bull Shoals Tailwater through annual marking of stocked cohorts.

Who: Trout Management Program
When: First marking component of project to begin Fall 2008

Objective 6.5. Maintain an angler success rate for brook trout of ≥ 0.005 fish/hour for the section of the Bull Shoals Tailwater from Bull Shoals Dam to Cotter.

Strategy 6.5.1. Stock approximately 12,000 brook trout (mean length = 6 inches) in Bull Shoals Tailwater annually. Brook trout scheduled for Bull Shoals Tailwater will be stocked upstream of Cotter.

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.5.2. Manage the brook trout population in Bull Shoals Tailwater with a 14-inch minimum length limit, 2 fish/day creel limit.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Ongoing

Strategy 6.5.3. Quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing creel survey on Bull Shoals Tailwater.

Who: Trout Management Program
When: Annually

Strategy 6.5.4. Develop annual electrofishing sample protocol for Bull Shoals Tailwater with which to assess brook trout population distribution, relative abundance, and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.5.5. Quantify brook trout mortality and exploitation rates in Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Strategy 6.5.6. Quantify brook trout growth rates in Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Objective 6.6. Maintain an angler success rate for cutthroat trout of ≥ 0.05 fish/hour on Bull Shoals Tailwater.

Strategy 6.6.1. Stock approximately 195,000 cutthroat trout (mean length = 6 inches) in Bull Shoals Tailwater annually.

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.6.2. Manage the cutthroat trout population in Bull Shoals Tailwater with a 16-inch minimum length limit, 2 fish/day creel limit.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Ongoing

Strategy 6.6.3. Quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing creel survey on Bull Shoals Tailwater.

Who: Trout Management Program
When: Annually

Strategy 6.8.4. Develop annual electrofishing sample protocol for Bull Shoals Tailwater with which to assess cutthroat trout population relative abundance and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.6.5. Quantify cutthroat trout mortality and exploitation rates in Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Strategy 6.6.6. Quantify cutthroat trout growth rates in Bull Shoals Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Norfork Tailwater

People Goals, Objectives, and Strategies

GOAL 1. **Develop an open and transparent management environment by improving communication with stakeholders and partner agencies and providing information to the public in a timely manner.**

Objective 1.1 **Hold at least one stakeholder meeting annually to provide stakeholders with current scientific information and the status of implementation projects. The first meeting should be scheduled for January/February 2009.**

Strategy 1.1.1. Plan and host annual meetings of the Bull Shoals & Norfork Tailwaters Citizen Advisory Committee (BS&NTCAC).

Who: Trout Management Program and District 2 - Fisheries
When: Annually, beginning 2009

Strategy 1.1.2. Conduct annual informational meetings for the general public.

Who: Trout Management Program, District 2 - Fisheries, and BS&NTCAC
When: Annually, beginning 2009

Strategy 1.1.3. Conduct annual meeting aimed at outlining and discussing approved regulation changes for the upcoming year. These meetings will be scheduled for October or November.

Who: Trout Management Program and District 2 - Fisheries
When: Annually, beginning 2009

Objective 1.2 **Create and maintain an informational page on the AGFC website that includes the posting of recent reports and other information relating to the Norfork Tailwater.**

Strategy 1.2.1. Create and maintain an informational webpage dedicated to the Norfork Tailwater.

Who: Trout Management Program, District 2 - Fisheries, and Communications Division
When: By 2008, although the maintenance of the website will be an ongoing process

Objective 1.3 **Disseminate information pertaining to research and management on Norfork Tailwater to the public using popular media outlets.**

Strategy 1.3.1. Publish articles pertaining to research and management on Norfork Tailwater in popular media outlets.

Who: Trout Management Program
When: As possible

GOAL 2. **Achieve a high level of angler compliance with regulations to aid in achievement of management objectives.**

Objective 2.1. **Achieve a high angler compliance rate on Norfork Tailwater as measured by the number of violations encountered during creel survey interviews.**

Strategy 2.1.1. Assess current level of angler compliance with data from ongoing creel survey on Norfork Tailwater.

Who: Trout Management Program
When: To be completed by January 2009

Strategy 2.1.2. Install standardized signs at all access points on Norfork Tailwater.

Who: Construction, Engineering, and Real Estate (CERE) Division in cooperation with Trout Management Program and District 2 Fisheries
When: To be completed by 2009

Strategy 2.1.3. Insure that all special regulation areas on Norfork Tailwater are clearly marked.

Who: CERE Division with assistance from Trout Management Program and District 2 Fisheries
When: To be completed by 2009

Strategy 2.1.4. Post sign with Poaching Hotline number at all access areas on Norfork Tailwater. This sign should include a list of pertinent information to record prior to reporting. Signs could also be located at commercial operations along the tailwaters.

Who: CERE Division with assistance from Trout Management Program and District 2 Fisheries
When: To be completed by 2009

Strategy 2.1.5. Develop a full-page layout in the Trout Guidebook that with lists the Poaching Hotline number and describes pertinent information to record prior to reporting.

Who: Communications Division and Fisheries Division
When: To be completed by January 2009

Strategy 2.1.6. Develop a fish ruler and/or other decal that lists the Poaching Hotline number and describes pertinent information to record prior to reporting. These decals would be widely distributed to the public.

Who: Communications Division and Fisheries Division
When: To be completed by 2010

Strategy 2.1.7. The Enforcement Division will maintain a visible presence on Norfork Tailwater utilizing Wildlife Officers from other counties during their slow time as appropriate.

Who: Enforcement Division
When: When possible beginning immediately

Strategy 2.1.8. Evaluate feasibility of a Guide License Program. Potential requirements may include boater safety, first aid, CPR, proof of liability insurance, and attendance at annual regulations updates.

Who: Trout Management Program in cooperation with Licensing Division, Wildlife Division, and Enforcement Division
When: To be completed by 2010

GOAL 3. **Improve angling and boating access on Norfork Tailwater by maximizing use at existing facilities and creating additional access as needed.**

Objective 3.1. **Create additional access for anglers and boaters.**

Strategy 3.1.1. Assess angler access needs on Norfork Tailwater.

Who: District 2 Fisheries and Trout Management Program
When: To be completed by 2010

Strategy 3.1.2. Develop plan to improve existing facilities along the Norfork Tailwater.

Who: District 2 Fisheries, CERE Division, and Trout Management Program
When: To be completed by 2010

Strategy 3.1.3. Obtain additional angler access in the middle portion of the Norfork Tailwater.

Who: District 2 Fisheries, CERE Division, and Trout Management Program
When: As appropriate land and project funds are available, although this should be a priority project

Habitat Goals, Objectives, and Strategies

GOAL 4. **Achieve water quality sufficient to support survival growth, and reproduction of trout in the Norfork Tailwater.**

Objective 4.1. **Achieve a minimum dissolved oxygen level of 6.0 ppm in the Norfork Tailwater as required by Regulation 2 of the Arkansas Pollution Control and Ecology Commission.**

Strategy 4.1.1. Work with federal and state authorities to pursue long-term remedies that will increase dissolved oxygen levels in water releases from Norfork Dam to the state standard of 6.0 ppm during generation and non-generation periods.

Who: Trout Management Program and other Fisheries Division personnel in cooperation with federal and state authorities
When: Beginning immediately, although this will be an ongoing process

Strategy 4.1.2. Elevate the problem of low dissolved oxygen below Norfork Dam among policy and decision-makers. Work with elected representatives to evaluate past efforts of the White River Dissolved Oxygen Committee (WRDOC) and to focus future efforts of the committee on achieving state dissolved oxygen standards.

Who: Trout Management Program and other Fisheries Division personnel.
When: Beginning immediately, although this will be an ongoing process

Strategy 4.1.3. Coordinate actions with USACOE, ADEQ, and SWPA as outlined in the Low Dissolved Oxygen Season Operational Plans for Norfork Tailwater.

Who: Trout Management Program
When: As needed annually during low dissolved oxygen season

Strategy 4.1.4. Monitor health of trout populations in Norfork Tailwater during critical period through annual fish health assessments.

Who: Trout Management Program and Fisheries Division Fish Pathologist
When: Annually at the end of the low dissolved oxygen season

Strategy 4.1.5. Document fish kills on Norfork Tailwaters associated with low dissolved oxygen.

Who: Trout Management Program and District 2 Fisheries
When: As needed

Strategy 4.1.6. Examine potential impact of low dissolved oxygen events on angler satisfaction, visitation, and economic benefit of the Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 4.1.7. Promote best management practices within the watershed of the North Fork of the White River to reduce sediment and nutrient input.

Who: Trout Habitat Improvement Program and Trout Management Program
When: Beginning immediately, although this will be an ongoing process

Strategy 4.1.8. Install appropriate aeration technology as part of the minimum flow implementation below Norfork Dam.

Who: Minimum Flow Cooperating Partners
When: As directed by timeline for minimum flow implementation

Objective 4.2 **Maintain water temperatures below a maximum of 68° F in the Norfork Tailwater.**

Strategy 4.2.1. Develop an informational pamphlet that details the benefits of maintaining riparian buffers to include shading. This pamphlet would be made available to landowners, developers, real estate agents, county extension agents, etc.

Who: Trout Habitat Improvement Program
When: To be completed by 2009

Objective 4.4. **Prevent the spread of invasive species to and from the Norfork Tailwater.**

Strategy 4.4.1. Conduct education and outreach effort on the presence of invasive species in Norfork Tailwater, potential impacts of invasive species on trout populations, and proper techniques for cleaning angling equipment.

Who: Trout Management Program and Communications Division
When: As needed

Strategy 4.4.2. Place informational signs at all access points on the Norfork Tailwater. These signs should include the information detailed in Strategy 4.4.1.

Who: Trout Management Program and CERE Division
When: To be completed by 2009

Strategy 4.4.3. Develop protocol to quantify the coverage of *Didymosphenia geminata* (Didymo) in the Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 4.4.4. Monitor the distribution of Didymo in the Norfork Tailwater.

Who: Trout Management Program
When: Annually

Strategy 4.4.5. Evaluate the feasibility of placing equipment-cleaning stations at public access points on Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2009

GOAL 5. **Protect and improve physical habitat in Norfork Tailwater.**

Objective 5.1. **Create a habitat protection and renovation plan for Norfork Tailwater, which will be used to identify, prioritize, and plan future habitat projects. Plan will be designed and funded in cooperation with partners and will include maps, diagrams, and cost estimates**.

Strategy 5.1.1. Determine the level of resolution and habitat variables needed in an inventory and assessment of physical habitat in Norfork Tailwater.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2009

Strategy 5.1.2. Assess the personnel and equipment resources needed to complete the needed inventory and assessment for Norfork Tailwater to determine if it can be performed in-house or needs to be contracted.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2010

Strategy 5.1.3. Conduct an inventory and assessment of fish habitat in Norfork Tailwater. If contracting this work is required, then funding should be shared with partners.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2011

Strategy 5.1.4. Create a prioritized list of areas on Norfork tailwater needing physical habitat improvement. Prioritization should be based on proximity to existing access areas to create better fishing for wade and bank anglers.

Who: Trout Habitat Improvement Program and Trout Management Program
When: To be completed by 2012

Strategy 5.1.5. Create a map detailing problem bank erosion areas on Norfork Tailwater along with landowner contact information.

Who: Trout Habitat Improvement Program
When: By 2011

Strategy 5.1.6. Develop an informational pamphlet that details the benefits of maintaining riparian buffers. This pamphlet would be made available to landowners, developers, real estate agents, county extension agents, etc.

Who: Trout Habitat Improvement Program
When: To be completed by 2010

Objective 5.2. Obtain minimum flow release of 500 cfs from Norfork Dam.

Strategy 5.2.1. Officially sign a Project Cooperators Agreement with the USCOE to implement minimum flow below Norfork Dam.

Who: Minimum Flow Cooperating Partners
When: As directed by timeline for minimum flow implementation

Strategy 5.2.2. Re-locate lakeside facilities on Norfork Lake impacted by minimum flow to achieve reasonable continued use of the facilities.

Who: Minimum Flow Cooperating Partners
When: As directed by timeline for minimum flow implementation

Strategy 5.2.3. Use ADYN-RQUAL model to determine optimum utilization of water allocated for minimum flow from Norfork Lake. This work may be contracted through Loginetics.

Who: Trout Management Program
When: To be completed by 2010

Strategy 5.2.4. Develop a monitoring program to assess impact of minimum flows on benthic macroinvertebrate and trout populations on Norfork Tailwater. This research will likely be contracted through a university.

Who: Trout Management Program in cooperation with appropriate university.
When: Dependent on implementation of minimum flow although planning for assessment for pre-minimum flow conditions should be done by 2009

Strategy 5.2.5. Evaluate potential for water quality monitoring program on Norfork Tailwater. Depending on the number of sampling sites and the sampling frequency, the use of volunteer labor may be necessary.

Who: Trout Management Program
When: To be completed by 2010

Fish Goals, Objectives, and Strategies

Goal 6. **Provide a diverse recreational trout fishing experience that addresses the full range of angler desires and expectations within the biological and physical capacity of Norfork Tailwater.**

Objective 6.1. **Maintain a mean angler catch rate of ≈ 0.8 fish/hour and an exploitation rate of ≥ 50% for the put-and-take rainbow trout fishery on Norfork Tailwater.**

Strategy 6.1.1. Stock approximately 92,000 rainbow trout in Norfork Tailwater annually (mean length = 11 inches).

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.1.2. Quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing Bull Shoals and Norfork Tailwaters creel survey.

Who: Trout Management Program
When: Annually for duration of creel survey

Strategy 6.1.3. Develop annual electrofishing sample protocol for Norfork Tailwater with which to assess rainbow trout population relative abundance and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.1.4. Quantify exploitation rate of stocked rainbow trout in Norfork Tailwater with a tagging study to be conducted concurrently with ongoing creel survey.

Who: Trout Management Program
When: To be completed by 2010

Strategy 6.1.5. Use creel survey and angler distribution data to optimize rainbow trout stocking and distribution on Norfork Tailwater.

Who: Trout Management Program, District 2 Fisheries, and Coldwater Coordinator
When: Annually

Objective 6.2. Increase the proportion of rainbow trout ≥ 16 inches in the Norfork Tailwater.

Strategy 6.2.1. Continue current management strategies in the Norfork catch-and-release area until the results of the University of Arkansas Cooperative Research Unit (UACRU) bioenergetics study are available in Fall 2008.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division

When: Until strategy for quality rainbow trout management is developed (see Strategy 6.2.2)

Strategy 6.2.2. The TMP, with input from the BS&NTCAC, will develop a strategy for quality rainbow trout management over a large portion of the Norfork Tailwater. The strategy will be based on the population sample data, creel survey data, and the results of the UACRU movement/mortality and bioenergetics studies. To achieve this objective, regulations restricting harvest and the use of bait may need to be implemented. Potential regulation changes would be proposed in Spring 2009 with implementation in January 2010.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division with input from BS&NTCAC

When: Upon availability and review of results from UACRU bioenergetics study

Strategy 6.2.3. Quantify growth rates of stocked rainbow trout in Norfork Tailwater with mark-recapture study.

Who: Trout Management Program
When: Dependent upon strategy developed in Strategy 6.2.2

Strategy 6.2.4. Quantify mortality rates of stocked rainbow trout in Norfork Tailwater with mark-recapture study.

Who: Trout Management Program
When: Dependent upon strategy developed in Strategy 6.2.2

Strategy 6.2.5. Develop sampling protocol to quantify and monitor abundance of forage species to include sculpin, crayfish, and benthic macroinvertebrates in Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 6.2.6. Develop a fish ruler and/or other decal that details recommended handling techniques for fish that are to be released. This may be done in conjunction with Strategy 2.1.6.

Who: Trout Management Program and Communications Division
When: To be completed by 2010

Strategy 6.2.7. Evaluate the potential of circle hooks for reducing hooking mortality associated with bait fishing on Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 6.2.8. Experiment with fingerling rainbow trout stocking to achieve better growth/survival rates in rainbow trout in Norfork Tailwater. Assumption – fingerlings will adapt to forage base better.

Who: Trout Management Program
When: Dependent upon availability of fingerling rainbow, but potentially as soon as Spring 2008

Strategy 6.2.9. Assess the impact of minimum flow from Norfork Dam on trout growth rates. This research will likely be contracted through a university.

Who: Trout Management Program in cooperation with appropriate university
When: Dependent on implementation of minimum flow although planning for assessment for pre-minimum flow conditions should be done by 2009

Objective 6.3. Achieve a trophy brown trout fishery in Norfork Tailwaters characterized by the following size-structure criteria:

Norfork Tailwater
- electrofishing catch rate of 280 fish/hr
- electrofishing catch rate ≥ 30 fish/hr for fish ≥ 457 mm (18 in)
- electrofishing catch rate ≥ 10 fish/hr for fish ≥ 559 mm (22 in)

Strategy 6.3.1. Regulate brown trout fishery in the Norfork Tailwater with a 610-mm (24-inch) minimum length limit, 1 fish/day creel limit to be implemented January 1, 2009.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Beginning January 1, 2009

Strategy 6.3.2. Develop and implement annual electrofishing sample protocol with which to assess brown trout population relative abundance and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.3.3. Quantify size composition of brown trout catch and harvest through ongoing creel survey on Norfork Tailwater.

Who: Trout Management Program
When: Annually

Strategy 6.3.4. Quantify brown trout mortality rates in Norfork Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Fall 2008

Strategy 6.3.5. Quantify brown trout growth rates in Norfork Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Fall 2008

Strategy 6.3.6. Develop sampling protocol to quantify and monitor abundance of forage species to include sculpin, crayfish, and benthic macroinvertebrates in Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2009

Strategy 6.3.7. Assess potential impact of bait harvest on trout growth rates in special regulation areas on Norfork Tailwater.

Who: Trout Management Program
When: To be completed by 2010

Strategy 6.3.8. Develop a fish ruler and/or other decal that details recommended handling techniques for fish that are to be released. This may be done in conjunction with Strategy 2.1.6.

Who: Trout Management Program and Communications Division
When: To be completed by 2010

Strategy 6.3.9. Evaluate feasibility of implementing a trophy trout tag system that would restrict the number of trophy trout that could be harvested by an angler annually.

Who: Trout Management Program, Enforcement Division, and Licensing Division
When: To be completed by 2011

Objective 6.4. Maintain an angler success rate for brown trout of ≥ 0.2 fish/hour on Norfork Tailwater.

Strategy 6.4.1. Stock approximately 10,000 brown trout in Norfork Tailwater annually (mean length = 6 inches).

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.4.2. Continue to quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing Norfork Tailwater creel survey.

Who: Trout Management Program
When: Annually

Objective 6.5. **Maintain an angler success rate for brook trout of ≥ 0.04 fish/hour on the Norfork Tailwater.**

Strategy 6.5.1. Stock approximately 18,000 brook trout in Norfork Tailwater annually (mean length = 6 inches).

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.5.2. Manage brook trout in Norfork Tailwater with a 14-inch minimum length limit, 2 fish/day creel limit.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Ongoing

Strategy 6.5.3. Quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing creel survey on Norfork Tailwater.

Who: Trout Management Program
When: Annually

Strategy 6.5.4. Develop annual electrofishing sample protocol with which to assess brook trout population distribution, relative abundance, and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.5.5. Quantify brook trout mortality and exploitation rates in Norfork Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Strategy 6.5.6. Quantify brook trout growth rates in Norfork Tailwater with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Objective 6.6. Maintain an angler success rate for cutthroat trout of ≥ 0.1 fish/hour on Norfork Tailwater.

Strategy 6.6.1. Stock approximately 25,000 cutthroat trout in Norfork Tailwater annually (mean length = 6 inches).

Who: Fisheries Division in cooperation with U.S. Fish and Wildlife Service
When: Annually

Strategy 6.6.2. Manage cutthroat trout in Norfork Tailwater with a 16-inch minimum length limit, 2 fish/day creel limit.

Who: Trout Management Program, District 2 Fisheries, and Enforcement Division
When: Ongoing

Strategy 6.6.3. Quantify angling effort, catch rates, harvest rates, and angler satisfaction through ongoing creel survey on Norfork Tailwater.

Who: Trout Management Program
When: Annually

Strategy 6.6.4. Develop annual electrofishing sample protocol with which to assess cutthroat trout population relative abundance and size structure.

Who: Trout Management Program
When: To be completed by the end of 2008

Strategy 6.6.5. Quantify cutthroat trout mortality and exploitation rates with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

Strategy 6.6.6. Quantify cutthroat trout growth rates with mark-recapture study.

Who: Trout Management Program
When: First marking component of project to begin Winter 2009

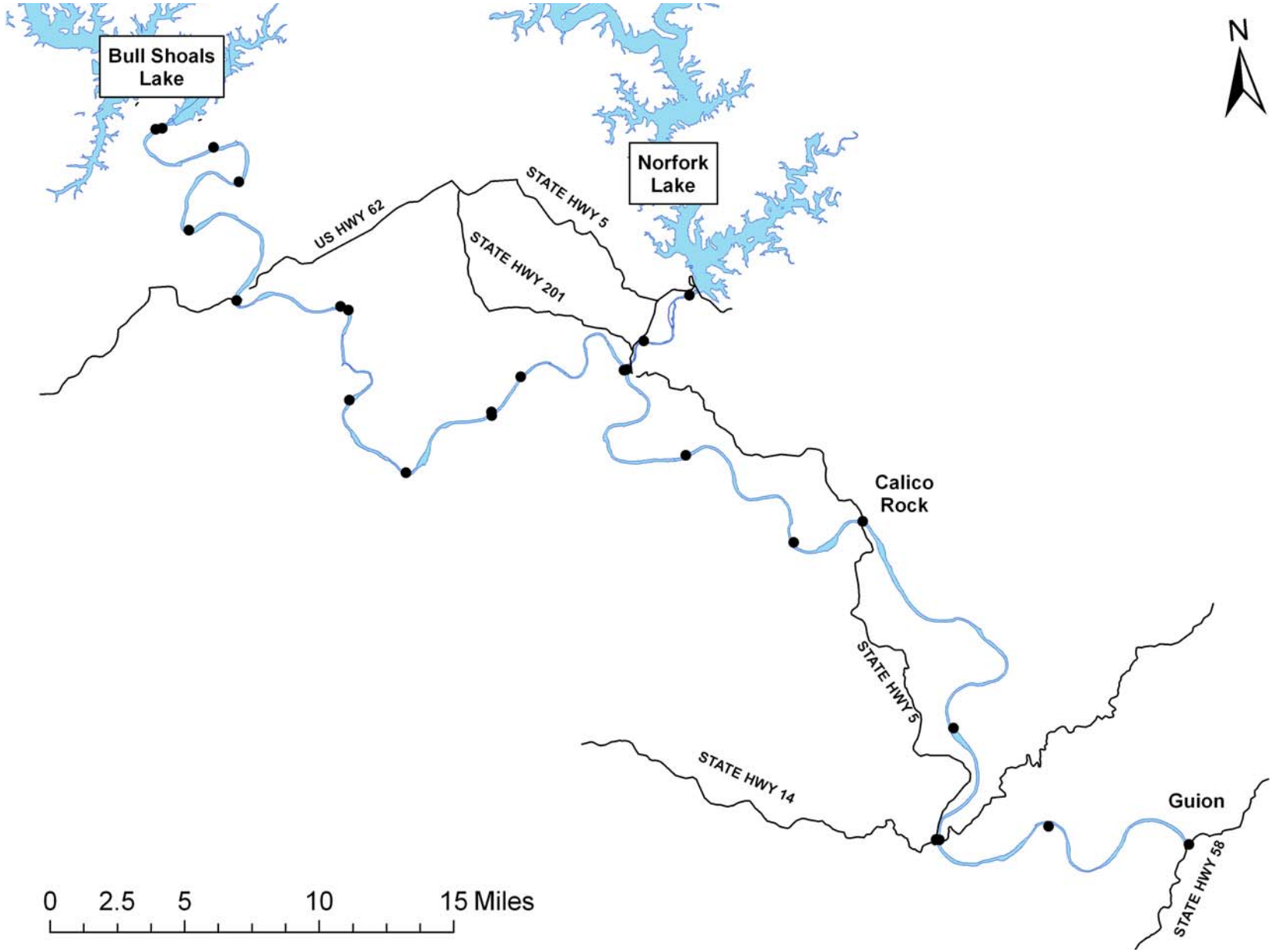

Figure 1. Map depicting the Bull Shoals and Norfork Tailwaters.

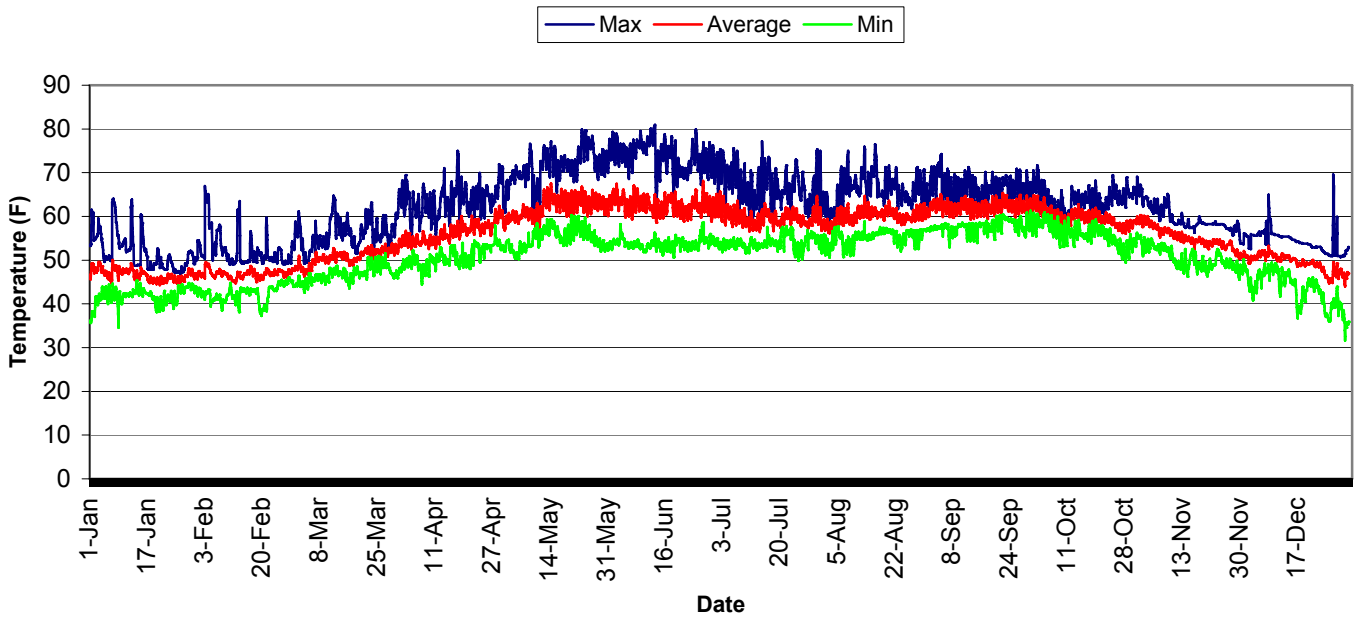

Figure 2. Daily water temperature readings taken at Calico Rock during 2006.

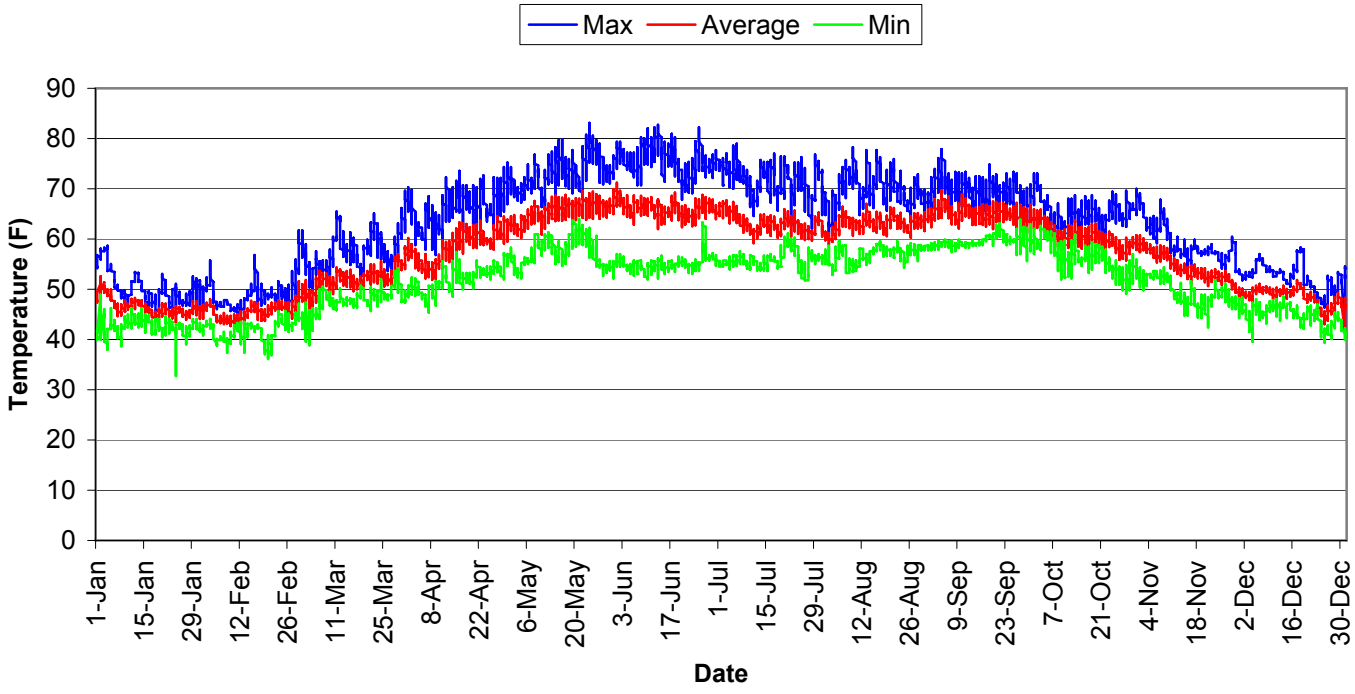

Figure 3. Daily water temperature readings taken at Sylamore during 2006.

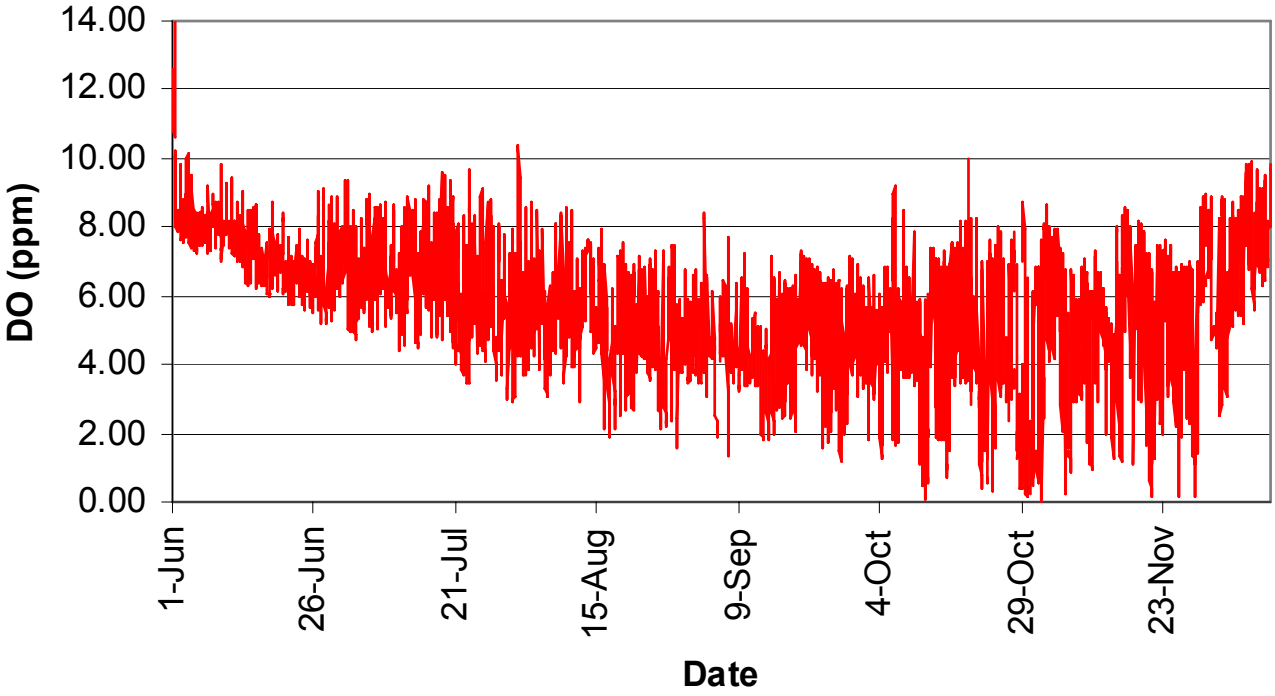

Figure 4. Dissolved oxygen (DO) gauge readings below Norfork Dam between June 1, 2006 and December 12, 2006. The state standard for trout waters is 6 parts per million (ppm).

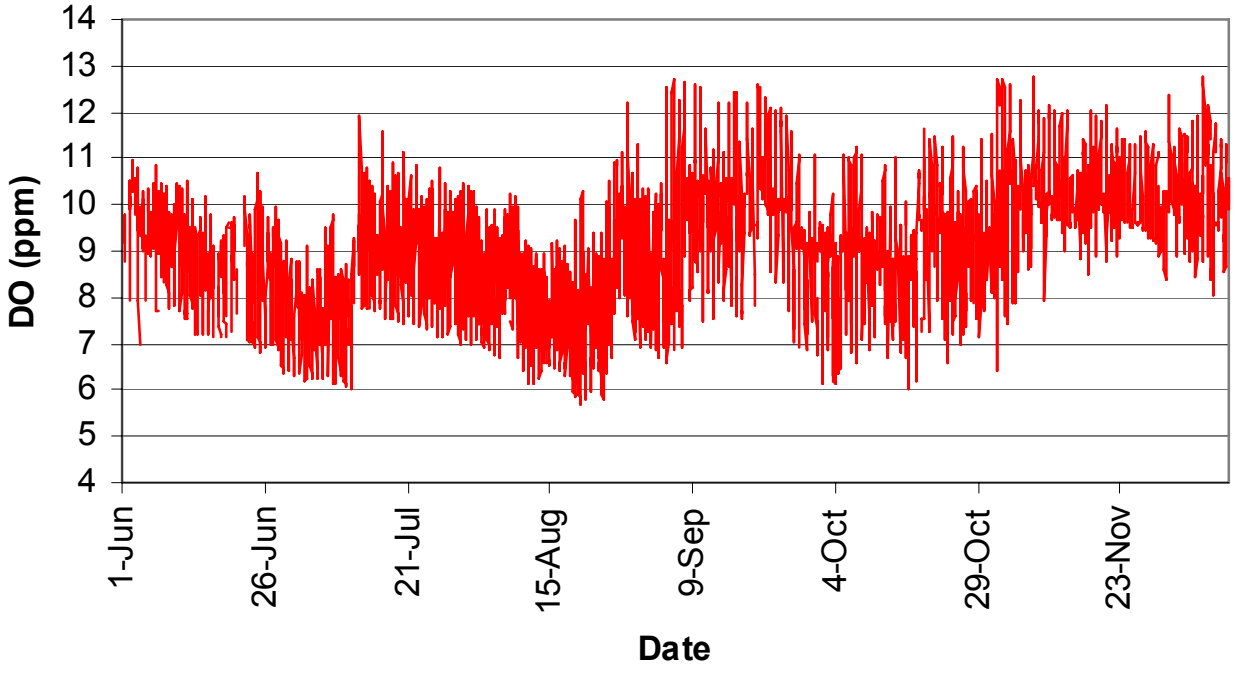

Figure 5. Dissolved oxygen (DO) gauge readings below Bull Shoals Dam between June 1, 2006 and December 12, 2006. The state standard for trout waters is 6 parts per million (ppm).

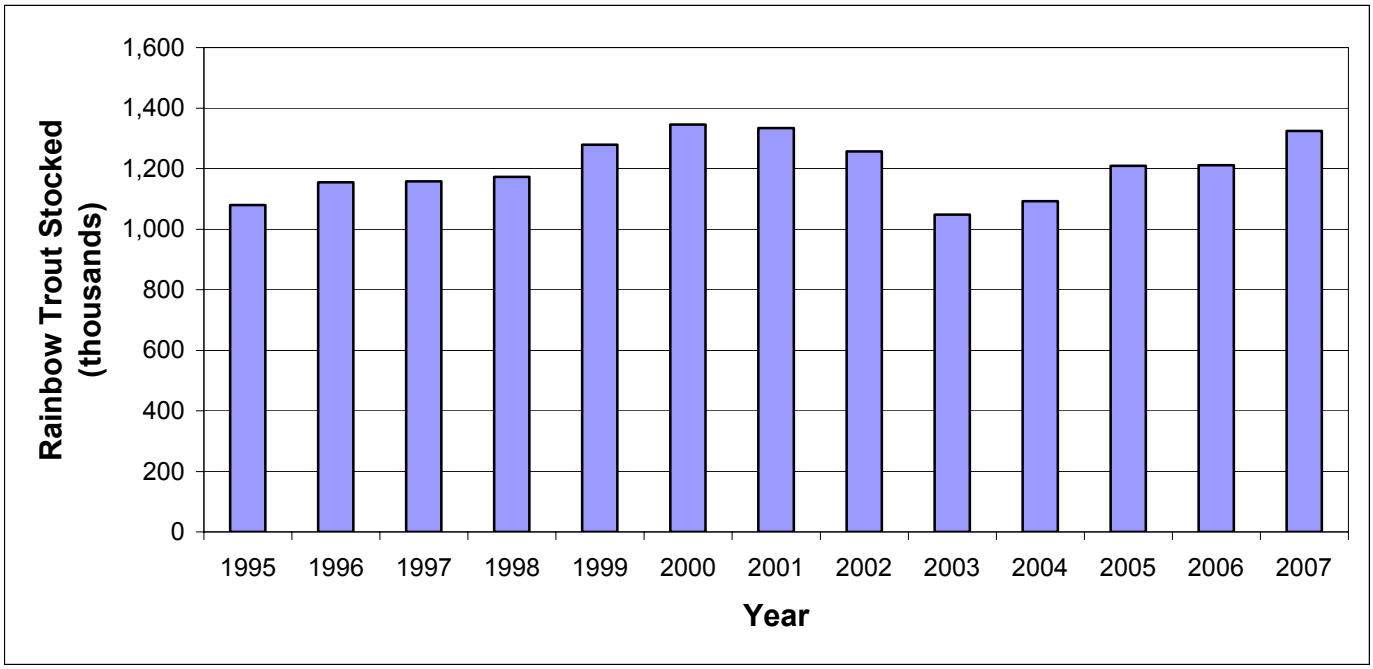

Figure 6. Annual stocking of rainbow trout in Bull Shoals Tailwater from 1995 to 2007.

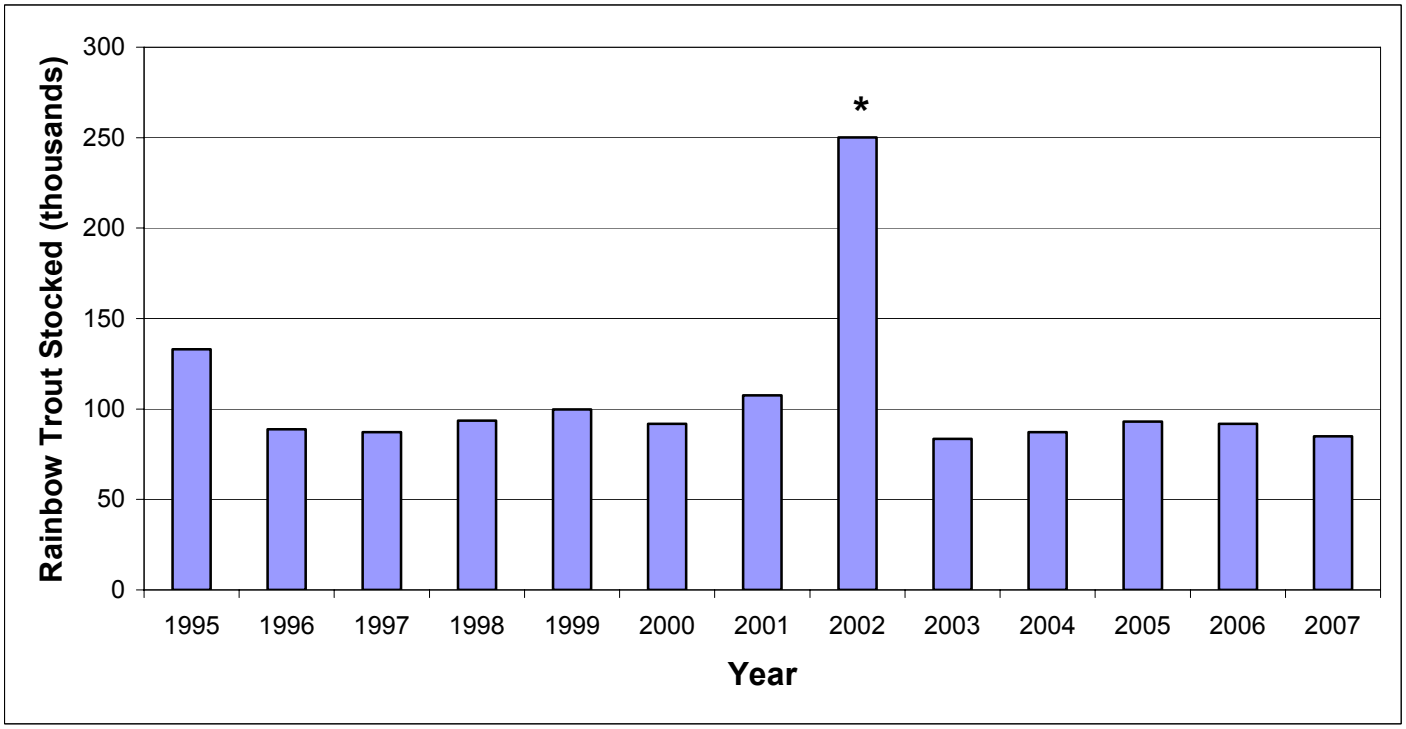

Figure 7. Annual stocking of rainbow trout in Norfork Tailwater from 1995 to 2007. * Value includes approximately 150,000 fingerling rainbow trout stocked.

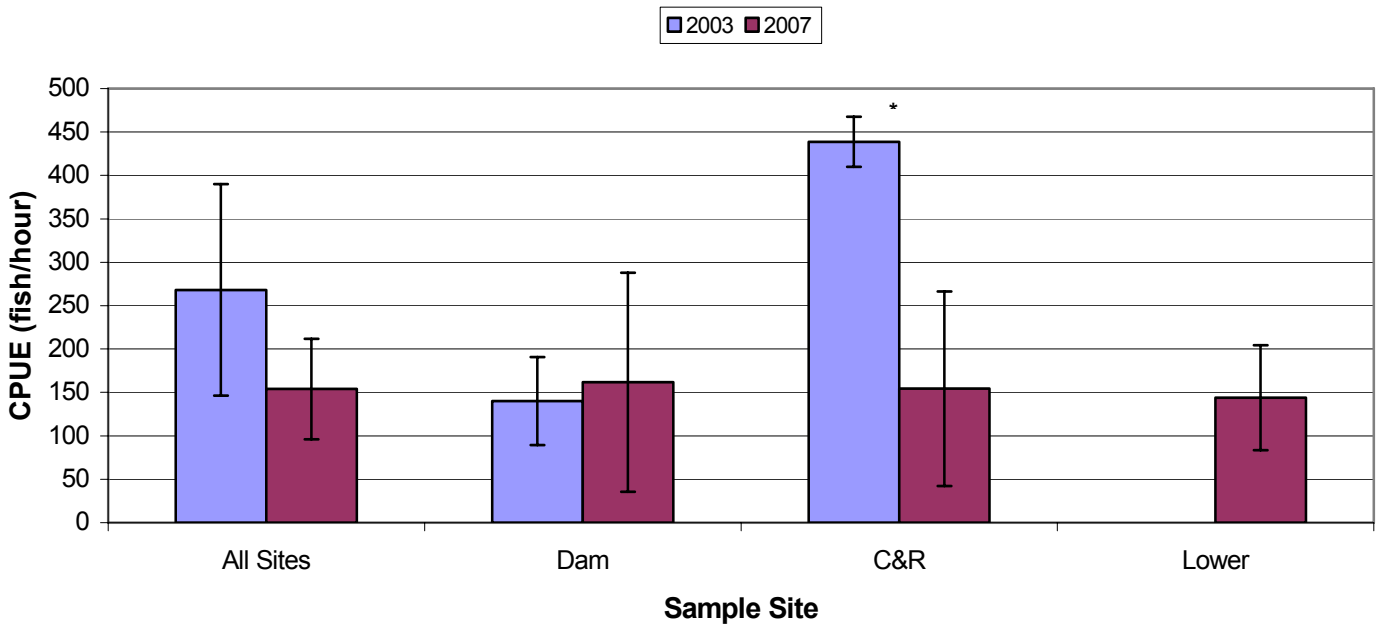

Figure 8. Catch per unit effort (CPUE) of rainbow trout from population samples conducted on the Norfork Tailwater in 2003 and 2007. Note: the lower site was not sampled in 2003.

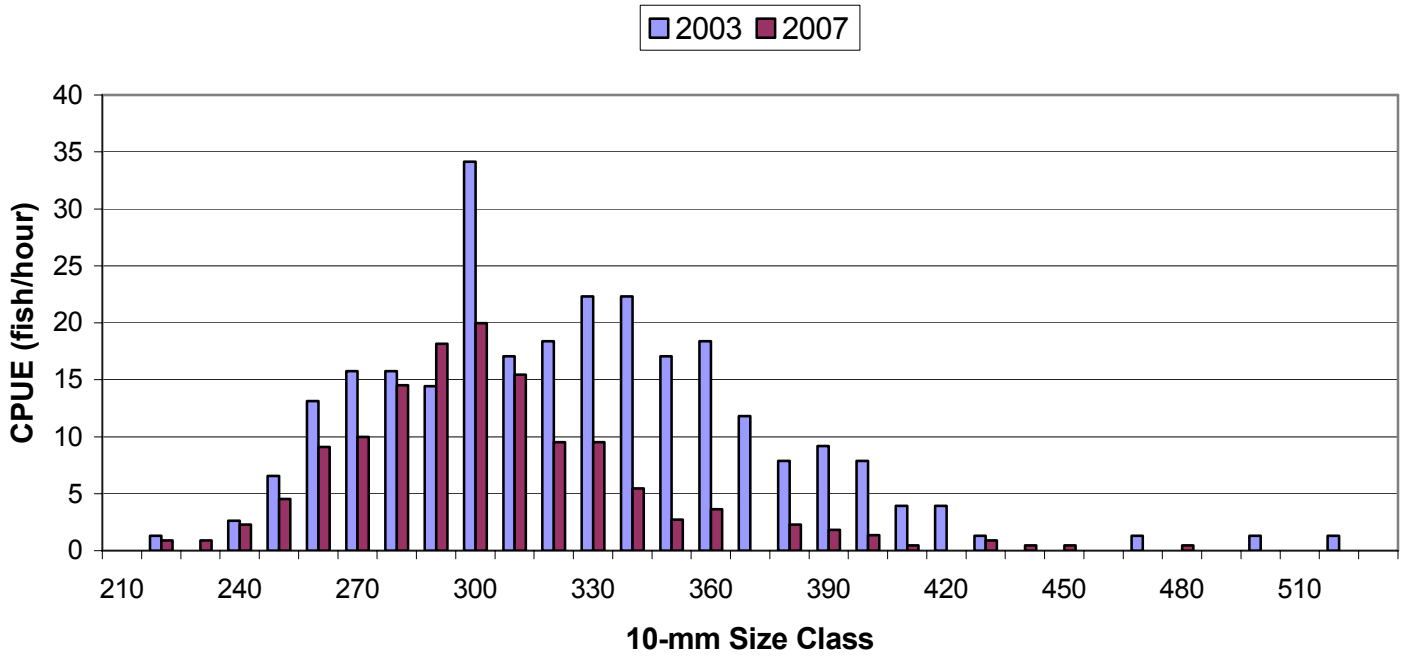

Figure 9. Length distribution of rainbow trout observed during population samples conducted on the Norfork Tailwater in 2003 and 2007.

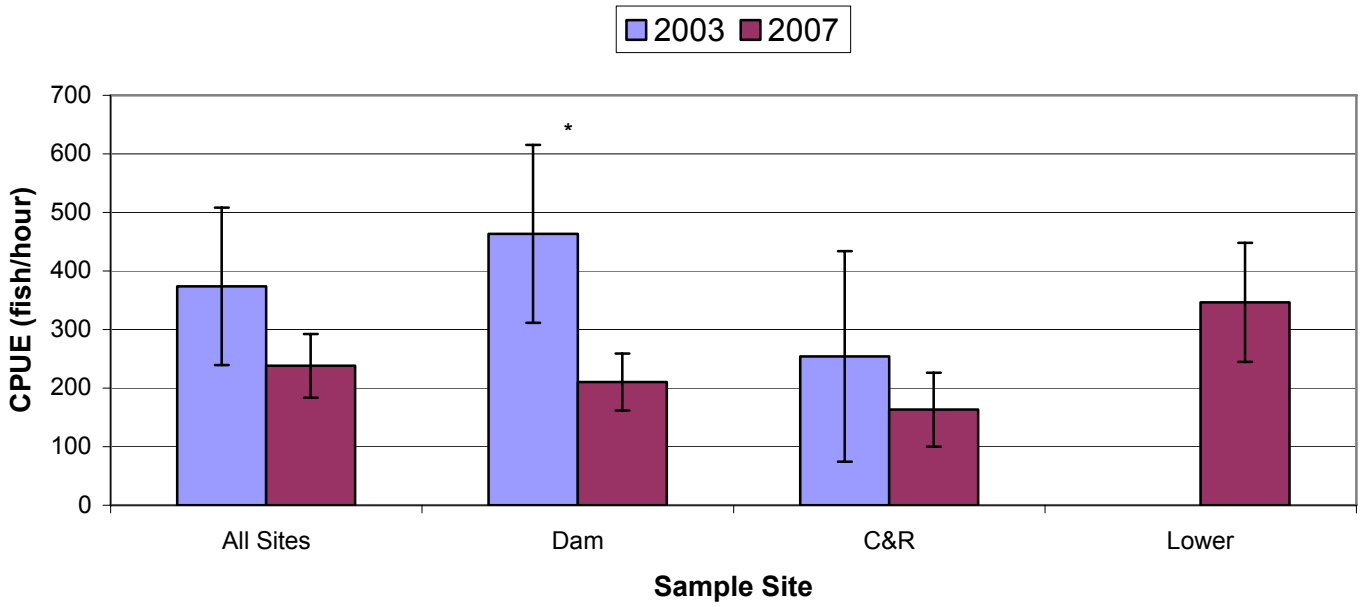

Figure 10. Catch per unit effort (CPUE) of brown trout from population samples conducted on the Norfork Tailwater in 2003 and 2007. Note: the lower site was not sampled in 2003.

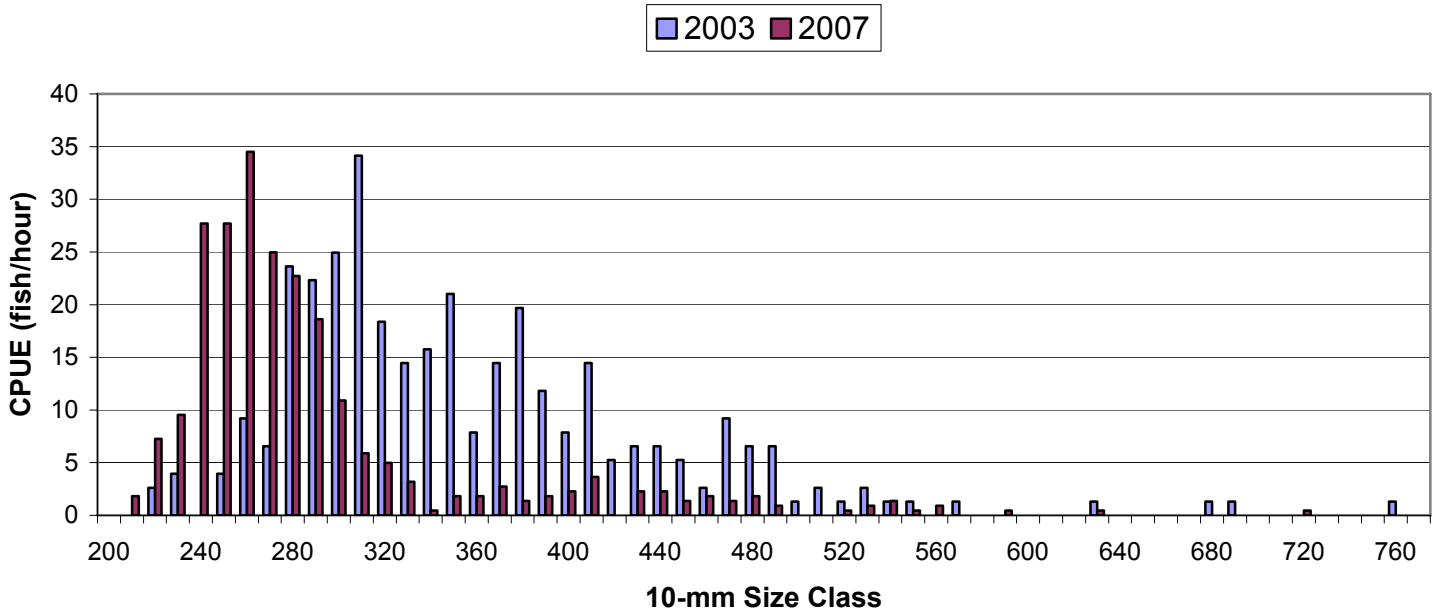

Figure 11. Length distribution of brown trout observed during population samples conducted on the Norfork Tailwater in 2003 and 2007.

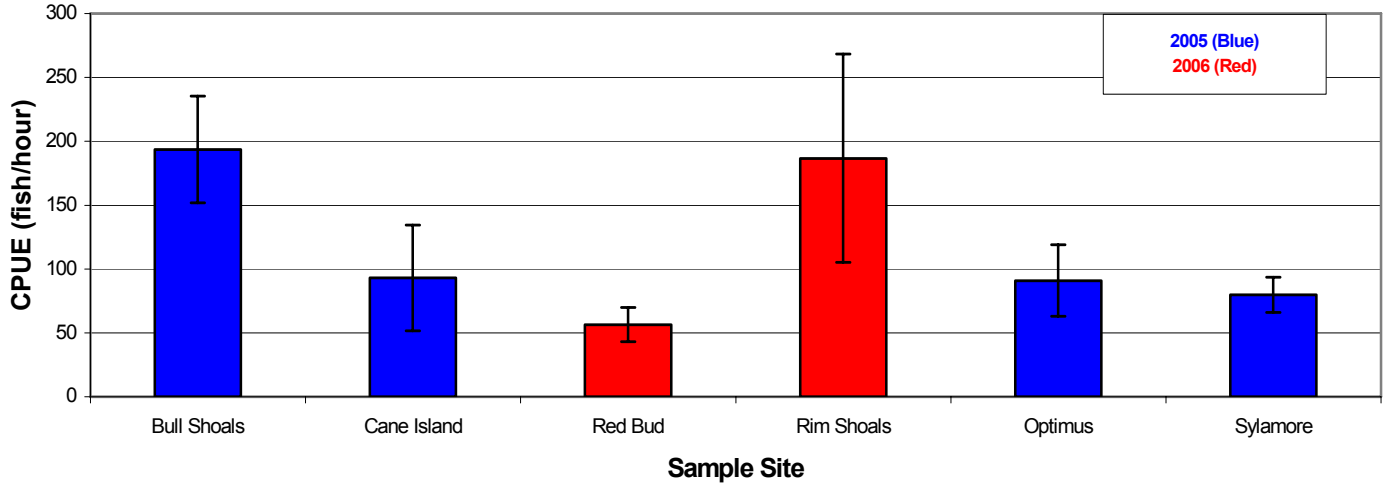

Figure 12. Catch per unit effort (CPUE) of rainbow trout from population samples conducted on Bull Shoals Tailwater in 2005 and 2006.

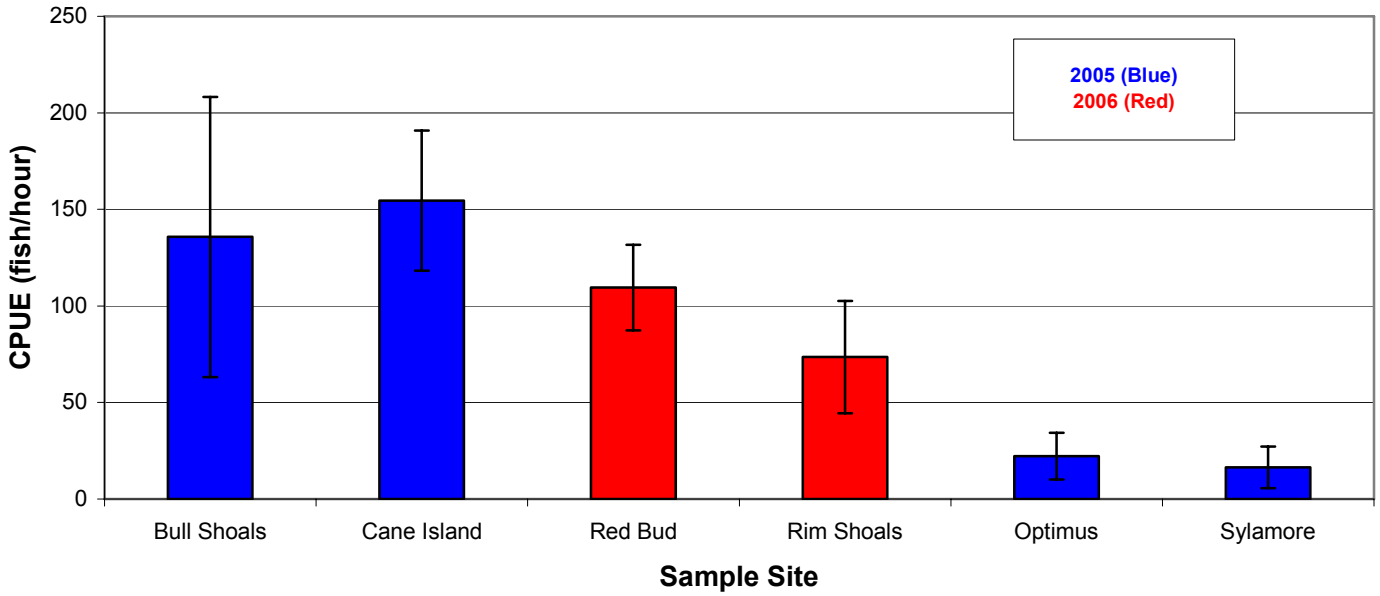

Figure 13. Catch per unit effort (CPUE) of brown trout from population samples conducted on Bull Shoals Tailwater in 2005 and 2006.