Comprehensive Monitoring Program for American Shad In the Lower Roanoke River Basin

Prepared by the
Diadromous Fish Restoration Technical Advisory Committee

for the

Roanoke Rapids and Gaston Hydropower Project
Dominion North Carolina Power
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Introduction

This Comprehensive Monitoring Program (CMP) was prepared to satisfy the requirements of Article 401 (*Diadromous Fish Restoration*) of the Order Approving Offer of Settlement, Amending License, and Denying Rehearing issued by the Federal Energy Regulatory Commission (Commission) on March 4, 2005. Components of the CMP are identified in Section 4.1.1.1 of Article FS-2 of the Technical Settlement Agreement filed with the Commission on July 15, 2003, contained within Appendix A of the March 4, 2005 Order.

Need for the CMP

Specific requirements for monitoring the Roanoke River American shad stock are necessary to evaluate success at intervals throughout the restoration process. The requirement for a CMP for American shad was included in the Technical Settlement Agreement to assure coordination between the Licensee and the state and federal natural resource agencies who will partner in American shad restoration efforts.

The Phased Approach to American Shad Restoration

American shad restoration will be undertaken in three phases described in Article FS-2, Sections 4.0-4.4 of the Technical Settlement Agreement. The phased approach was agreed upon by the Licensee and the natural resource agencies to ensure that American shad restoration objectives would be accomplished in a manner that was biologically and economically defensible to both the Licensee and the natural resource agencies.

Components and Methodologies of the CMP

Annual Baseline Population Estimate – Per Article 4.1.1.1 of the Technical Settlement Agreement, the agencies will initiate an annual baseline population estimate for American shad in the Roanoke River. Previous attempts to use standard mark/recapture population estimation methods in 1998 and 2001 proved unsuccessful due to low numbers of shad captured and recaptured. This was very likely a reflection of the diminished size of the American shad spawning stock. In 2004, the North Carolina Wildlife Resources Commission (WRC) contracted North Carolina State University (NSCU) to study the feasibility of using hydroacoustic technology to estimate the numbers of American shad in the spawning stock. Hydroacoustic equipment transmits a sonic beam horizontally through the river water column and fish passing through the beam reflect a signal that is captured and recorded on a computer. Software analyses of the fish "traces" indicate whether the fish is moving upstream or downstream and where in the water column the trace originated. Concurrent fish sampling with gill nets

and electrofishing gear yields fish species composition at the site of the hydroacoustic gear. To estimate the numbers of American shad moving upstream, the fraction of American shad seen in the gill net and electrofishing samples is applied to the total number of upstream fish traces. The hydroacoustic technology work was continued by NCSU in 2005 and will extend through 2007.

Because the American shad spawning stock size is still believed to be very small, and because several assumptions of mark/recapture models could be violated in this situation, the use of mark/recapture methods to accomplish the annual baseline population estimate does not appear to be feasible. The Diadromous Fish Restoration Technical Advisory Committee (DFRTAC) therefore plans to use hydroacoustic technology to accomplish the annual baseline population estimate. New advances in hydroacoustic technology show promise in refined estimates of both numbers of fish passing a particular point and of species identification.

Annual Spawning Stock Assessment – Per Article 4.1.1.1 of the Technical Settlement Agreement, the agencies will initiate an annual spawning stock assessment. As mandated by the Atlantic States Marine Fisheries Commission (ASMFC) WRC began annual spawning stock assessments in 2000. The spawning stock assessment involves collecting adult American shad from the Roanoke River near Weldon and Roanoke Rapids (the spawning grounds areas) with boat-mounted electrofishing gear. WRC personnel will collect at least 200 adult American shad each spring. Total length (mm) and sex will be recorded for each fish. Scales or otoliths will be removed from a subsample of these fish to estimate age composition of the spawning stock. Coordinated sampling for American shad between WRC and Dominion will occur as opportunities arise. WRC will analyze length, age and sex composition data for the Roanoke River American shad spawning stock each year and will submit the data to ASMFC through the N.C. Division of Marine Fisheries (DMF).

Annual Outmigrating Juvenile Monitoring and Hatchery Production – American shad fry produced at WRC's Watha Hatchery and USFWS's Edenton National Fish Hatchery and marked with oxytetracycline (OTC) have been stocked into the Roanoke River since 1998. Since 1998, up to 3 million fry have been stocked annually and agency goals are to stock approximately 7 million fry each year with a portion dispersed among Kerr Reservoir tributaries and the remainder stocked below Roanoke Rapids Dam.

WRC will use electrofishing or other appropriate collection methods to monitor annual juvenile American shad out-migration. Sampling may be conducted within Kerr Reservoir, Lake Gaston or Roanoke Rapids Lake to examine temporal patterns of outmigration. Sampling will be conducted in the lower

Roanoke River beginning in late summer. Otoliths will be removed from the collected juveniles and will be microscopically examined for OTC marks to estimate the contribution of hatchery-reared fry and stocking location.

Annual Monitoring of Returning Adults – During WRC's annual spawning stock assessment, a subsample of adult American shad will be retained and dissected for removal of otoliths. Otoliths will be microscopically examined for OTC marks to estimate the contribution of hatchery-reared fry and stocking location.