

Appalachian Power Company
Claytor Project
FERC No. 739

Freshwater Mussel Adaptive Monitoring Plan

June 2009 Plan
Revised to Reflect Revisions Required by
Order Issuing New License (12/27/11) Article 407
And
VWPP 09-0892, E.5
Submitted to FERC for Approval May 16, 2012

SUMMARY

The Claytor Project (No. 739) is licensed to Appalachian Power Company (Appalachian) and is a conventional hydroelectrical project located on the New River in Pulaski County, Virginia.

The purpose of this Freshwater Mussel Adaptive Monitoring Plan (Plan) is to provide a framework for long-term monitoring of freshwater mussels in the New River downstream of the Claytor Project Dam under a new license term for the Project. The Plan is being submitted to the Federal Energy Regulatory Commission (FERC) as part of the license application and reflects the measures that Appalachian will be responsible for as the licensee.

1.0 INTRODUCTION

The Claytor Project is located on the New River in Pulaski County, Virginia. The Claytor Project has four generating units, with a combined generating capacity of 75 MW. The reservoir behind Claytor dam has a surface area of 4,360 acres at an operating pool elevation of 1846 feet National Geodetic Vertical Datum 1929 (NGVD) and 100 miles of shoreline. The Project boundary for the Claytor Project is generally the 1850' contour NGVD within Claytor Lake and extends approximately 2,000 feet downstream of the dam in the New River. During normal operations of the Project, the reservoir can fluctuate up to 2 feet over a week.

In 2007, Appalachian retained Thomas R. Payne & Associates (TRPA), Devine Tarbell & Associates (DTA), and Normandeau Associates (Normandeau) to conduct an Instream Flow Needs (IFN) Study, Aquatic Resources Assessment and a Water Quality Study, respectively, as part of Appalachian's relicensing efforts for the Project. The IFN Study report provides information on various aquatic resource habitat responses with changes in flow regimes downstream, as well as development of a downstream temperature model. The Aquatic Resources Assessment included the results of freshwater mussel surveys conducted in 2007 and 2008 above and below the Project. The Water Quality Study report provides information regarding water quality downstream, including temperature and dissolved oxygen.

As part of the consultation process for relicensing, it was determined that a Freshwater Mussel Adaptive Monitoring Plan (Plan) should be prepared to determine if flow, temperature and/or occasionally depressed dissolved oxygen are effecting freshwater mussels downstream over the term of the new license. The plan described herein was prepared pursuant to this request. This Plan, which has been prepared in consultation with agencies and stakeholders, will be filed as part of the application for a new license for the Claytor Project.

It should be noted that factors potentially influencing mussel communities in the New River are not well understood. While it has been theorized that water temperature conditions influenced by project operations may have an effect, other factors such as habitat, other water quality parameters, and host species influences may be influencing mussel communities. This monitoring plan is intended to provide information that can be used to aid in the understanding of project operations on the mussel community. As such, as information is obtained and reviewed, revision of this Plan may be warranted.

2.0 PLAN PURPOSE AND OBJECTIVES

The purpose of this Freshwater Mussel Adaptive Monitoring Plan (Plan) is to provide a framework for long-term monitoring of freshwater mussels in the New River downstream of the Claytor Project Dam under a new license term for the Project. Primary objectives that will be implemented to achieve the stated purpose are as follows:

- Compile baseline data regarding mussel distribution and abundance in order to identify sites for long-term monitoring;
- Evaluate long-term trends in mussel fauna downstream of the Project, including species richness, abundance, growth and recruitment ; and
- Evaluate potential influence of water quality of Project releases on mussel fauna downstream of the Project, with particular focus on water temperature and dissolved oxygen.

3.0 PROGRAM FOR IMPLEMENTING OBJECTIVES

The mechanisms governing mussel distributions downstream of the Claytor Project remain unclear at this time. Potential factors influencing downstream mussel distributions likely include biotic factors, such as presence and abundance of suitable host fish, and abiotic environmental factors such as water temperature and dissolved oxygen. Due to these uncertainties, Appalachian proposes to employ an adaptive strategy for mussel monitoring efforts in the New River downstream of the Project dam. Specifically, Appalachian proposes implementation of the following after issuance of a new FERC license for the Project:

3.1 FRESHWATER MUSSEL TECHNICAL REVIEW COMMITTEE

Appalachian will coordinate formation of a Freshwater Mussel Technical Review Committee (TRC) to provide technical expertise and guidance for mussel monitoring efforts on the New River downstream of the Project dam. The TRC will include Appalachian staff as well as representatives from Virginia Department of Game and Inland Fisheries (VDGIF), Virginia Department of Environmental Quality (VADEQ), Virginia Department of Conservation and Recreation (VDCR), and other interested stakeholders. The TRC will meet at least annually to review relevant data, evaluate effectiveness of monitoring efforts to date, and to refine goals and objectives for the coming year. Minutes will be prepared for all meetings and filed with the FERC as part of the annual report (See Section 4.0).

There will be an initial meeting of the TRC prior to beginning any work identified in this Plan. The purpose of the meeting will be to review the planned activities and for participants to identify any potential changes to the Plan in order to meet the Plan's goals and objectives, or any potential impediments to concluding the plan activities as described in the Plan and in accordance with these Virginia Water Protection Permit (VWPP) conditions. The scope of any necessary changes or revisions will pertain to the goals and objectives of the Plan over the term of this permit. The conclusions reached during this meeting will be documented, and any necessary revisions to the Plan will be submitted to DEQ and FERC within 60 days of the meeting. At a minimum, the Plan will be revised to address the requirements of the VWPP, Part I.E.5.²

3.2 BASELINE CHARACTERIZATION OF MUSSEL FAUNA

Under direction of the TRC, Appalachian will gather baseline data to characterize mussel assemblages in the New River immediately upstream and downstream of the Project to the U.S. 460 bridge at Glen Lyn, Virginia. The purpose of this data will be to determine the status of freshwater mussels in the reach prior to implementation of the new instream flow regime being proposed pursuant to the Water Management Plan for the Project license and to identify locations for long-term monitoring.

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Mussel fauna of the New River will be characterized through compilation of existing data from research projects conducted on the New River in recent years. Additional targeted field surveys may be conducted as deemed necessary in consultation with the TRC in order to identify locations for long-term monitoring.

Methodology for additional baseline surveys, if deemed necessary, will be consistent with the qualitative surveys conducted as part of the 2008 relicensing study (Alderman, 2008). Qualitative surveys will consist of timed searches of appropriate habitat using SCUBA, tactile methods (probing into substrate) and visual methods (snorkeling and/or bathoscope inspections in shallow water and visual shoreline searches). All live mussels encountered will be identified to species, enumerated, measured to the nearest millimeter (mm), and returned to the point of collection. Any juvenile mussels encountered will be documented for purposes of assessing recruitment. General habitat conditions, such as dominant substrate, approximate slope of bank, extent of shoreline vegetative cover, presence of submerged aquatic vegetation, and depth range of population, will be documented. Survey times may vary based on the quality and quantity of available habitat, time available for the surveys, and health and safety considerations, such as boat traffic, water quality, and presence of deep sediments or snags posing risks to divers.

Baseline mussel fauna data collection will include, at a minimum, qualitative field surveys for mussel individuals and populations within the study area identified. Baseline field survey locations shall be identified in consultation with the TRC in order to meet the specific goals and objectives of the Plan. Baseline qualitative surveys will be conducted immediately upstream of the project and downstream of the project to at least the Route 11 Bridge crossing. The necessity of further field survey locations downstream of the Route 11 Bridge to the Route 460 Bridge will be determined in consultation with the TRC. Existing data from research conducted in the subject areas will be accepted as supplemental information to in-the-field survey results.²

3.3 LONG-TERM FRESHWATER MUSSEL MONITORING

Long-term mussel fauna data collection will include, at a minimum, quantitative field surveys at locations determined through consultation with the TRC, as deemed necessary and appropriate to meet the specific goals and objectives of the Plan.² Quantitative mussel surveys will be conducted every other year for a period of ten years at four pre-determined survey plots located in the reach of the New River extending from the Project dam to U.S. 460 bridge at Glen Lyn, as well as in one reference location located upstream of the Project Dam. If feasible, surveys will be conducted during for the time of year when gravid females could be observed. By conducting surveys over a ten year period, it is more likely that changes to the community could be observed based on the range of environmental conditions that are likely to occur.

Specific sites for long-term monitoring will be selected based on results of the baseline survey described Section 3.2 and on consultation with the TRC. Establishment of multiple sites downstream of the Project will allow for evaluation of mussel assemblages along the gradient of potential project operational effects extending downstream from the dam.

Quantitative methodology will follow the quadrat method utilized in the 2008 relicensing Study (Alderman 2008). As with the qualitative surveys, all mussels encountered will be identified to species, enumerated, and measured to the nearest mm. Any juvenile mussels encountered will be enumerated for purposes of assessing recruitment. Shells encountered will also be identified to species and enumerated. A subset of female mussels from each site will be inspected for presence of glochidia using non-lethal means.

If available, fresh-dead shells (that have not eroded significantly) will be collected for age structure determination. Shells will be thin sectioned in the laboratory, polished and age estimated according to methods described in Neves and Moyer (1988). Thin section age data, combined with the field aging of live specimens and lengths measurements described above, will be used for development of age-length curves for the population. Age data combined length will be used to estimate growth of mussels.

The methodology, protocols and specific objectives of the long-term monitoring phase may be further refined in consultation with the TRC.

The data collected during the term of the Plan will be adapted as necessary in consultation with the TRC to directly assess how depressed dissolved oxygen and temperature may affect mussel fauna. To meet the specific goals and objectives of the plan, additional or alternative collection and analysis methods may be deemed necessary, such as but not limited to, mussel tissue sampling and analysis, extended or additional water quality parameter monitoring, and partnering with others who are currently conducting or planning to conduct such studies, research, or analyses. Appalachian may conduct such data collection through partnerships with other groups or organizations, or through other Appalachian studies, provided that those efforts address the goals and objectives of this Plan and assess potential effects on mussels from direct or indirect project operations. In addition to the direct data collection detailed in this Plan, information from a literature review will be acceptable as supporting documentation to the studies and analyses required by this permit.²

3.4 EVALUATION OF POTENTIAL WATER QUALITY INFLUENCES AND LITERATURE REVIEW

A literature review will be conducted to gather information regarding water temperature and DO parameters for freshwater mussels, with particular focus on

species native to the New River. This review will also include other pertinent life history information and results of similar studies conducted at other locations. While there may not be a robust amount of information available for the species of interest, information for similar species should be included. This information will be summarized and included in the first annual report submitted to the TRC (See Section 4.2).

Temperature and DO monitoring devices¹ will be deployed at each of the long-term mussel monitoring sites. Loggers will be deployed for a period of one year and will gather data on an hourly basis, at a minimum. A description of the equipment for monitoring water quality at the long-term mussel monitoring sites, how the equipment will be calibrated, and how the data will be stored will be provided to the TRC at the initial meeting for their review and comment.¹

In addition to the site-specific temperature data, water quality data deemed relevant in consultation with the TRC will be compiled and assessed relative to mussel monitoring data gathered to date and known thresholds identified during the literature review. Potential sources of relevant water quality data include, but are not limited to, Appalachian Power's tailrace monitoring outline in the Water Quality Monitoring Plan, as well as VDGIF and VADEQ sampling stations, and water temperature modeling conducted during the relicensing process. To the extent feasible, correlations between water quality data and the long-term mussel monitoring data described above in Section 3.3 will be analyzed. Appalachian will consult with the TRC to outline appropriate analytical objectives and analyses considering the data available at the time and the need to collect additional water quality data during subsequent years corresponding to mussel surveys.

4.0 CONSULTATION AND REPORTING

The purpose of this section of the Plan is to outline how the plan will be monitored and the process for consultation with the state agencies and other interested stakeholders.

4.1 Consultation

The TRC will meet at least once per year to review the data collected and recommend changes to the overall plan as needed. Additional meetings will be held on an as-needed basis.

4.2 Reporting

Appalachian will prepare an annual report outlining the results of the information collected as described above. The annual reports will include at a minimum, the raw data, an analysis summarizing the data, and recommendations for changes to the Plan, project operations, or additional mitigation measures, if necessary.¹ After the report has been reviewed by the TRC and comments submitted, support documents indicating consultation with the TRC, and a summary of the

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annual report findings as described above will be submitted to the Federal Energy Regulatory Commission.

4.3 Coordination with Other Adaptive Monitoring Plans

To the extent practical, the Freshwater Mussel Adaptive Monitoring Plan will be coordinated with the Water Quality Monitoring Plan and the Water Management Plan.

4.4 Estimated Costs

The estimated cost for implementing this plan is \$600,000 over the course of the ten year plan outline above.

5.0 LITERATURE CITED

Alderman, J.M. 2008. Freshwater Mussel and Crayfish Surveys for Appalachian Power Company Claytor Lake Relicensing. Prepared for Devine, Tarbell and Associates. December 15, 2008. 179 pp.

Neves, R.J. and S.N. Moyer. 1988. Evaluation of techniques for age determination of freshwater mussels (Unionidae). American Malacological Bulletin. Vol. 6, no. 2, pp. 179-188.

APPENDIX A
VIRGINIA WATER PROTECTION PERMIT
ISSUED PURSUANT TO THE STATE WATER CONTROL LAW
AND SECTION 401 OF THE CLEAN WATER ACT

VWP Individual Permit Issuance Number 09-0892

Effective Date: [Date that Federal Energy Regulatory License is effective for the Claytor
Hydroelectric Project, FERC Project P-739]

Expiration Date: [15 years after the effective date of this permit]

E. Monitoring, Notification, and Reporting

Monitoring:

5. The permittee shall implement the June 2009 Freshwater Mussel Adaptive Monitoring Plan (mussel plan), as approved by the Federal Energy Regulatory Commission (FERC), except that DEQ shall require the following revisions:
 - a. The plan shall provide for an initial meeting of the Freshwater Mussel Technical Review Committee (TRC) prior to beginning any work identified in the mussel plan. The purpose of the meeting will be to review the planned activities and for participants to identify any potential changes to the plan in order to meet the plan's goals and objectives, or any potential impediments to conducting the plan activities, as described in the plan and in accordance with these permit conditions. The scope of any necessary changes or revisions shall pertain to the goals and objectives of the mussel plan over the term of this permit. The conclusions reached during this meeting shall be documented, and any necessary revisions to the mussel plan shall be submitted to DEQ and FERC within 60 days of the meeting. At a minimum, the mussel plan shall be revised to address the requirements of this permit in Part I.E.5.
 - b. Baseline mussel fauna data collection shall include, at a minimum, qualitative field surveys for mussel individuals and populations within the study area identified on the New River in the mussel plan. Baseline field survey locations shall be identified in consultation with the Freshwater Mussel Technical Review Committee (TRC) in

order to meet the specific goals and objectives of the mussel plan. Baseline qualitative surveys shall be conducted immediately upstream of the project and downstream of the project to at least the Route 11 bridge crossing. The necessity of further field survey locations downstream of the Route 11 Bridge to the Route 460 Bridge shall be determined in consultation with the Freshwater Mussel Technical Review Committee (TRC). Existing data from research conducted in the subject areas shall be accepted as supplemental information to in-the-field survey results.

- c. Long-term mussel fauna data collection shall include, at a minimum, quantitative field surveys at locations determined through consultation with the Freshwater Mussel Technical Review Committee (TRC), as deemed necessary and appropriate to meet the specific goals and objectives of the mussel plan.
- d. The data collected during the term of the mussel plan shall be adapted as necessary in consultation with the TRC to directly assess how depressed dissolved oxygen and temperature may affect mussel fauna. To meet the specific goals and objectives of the plan, additional or alternative collection and analysis methods may be deemed necessary, such as but not limited to, mussel tissue sampling and analysis, extended or additional water quality parameter monitoring, and partnering with others who are currently conducting or planning to conduct such studies, research, or analyses. The permittee may conduct such data collection through partnerships with other groups or organizations, or through other permittee studies, provided that those efforts address the goals and objectives of the mussel plan and assess potential effects on mussels from direct or indirect project operations. In addition to the direct data collection detailed in the mussel plan, information from a literature review shall be acceptable as supporting documentation to the studies and analyses required by this permit.

