

Leesville Lake
2011
Water Quality Monitoring Plan

Prepared By
Leesville Lake Association
And
Lynchburg College

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Background

In its Order Issuing New License dated December 15, 2009, FERC stated, in part, the following with regard to water quality monitoring:

The primary water quality issues at Smith Mountain and Leesville lakes are related to nutrients and bacteria. The final EIS found that the source of these nutrients and bacteria is not related to project operation, but rather to shoreline development around the lakes and overall watershed development. However, staff concluded that monitoring water quality on the lakes would help ensure that the changes in operation of the project under the proposed Water Management Plan do not adversely affect water quality in the lakes. To provide for water quality monitoring on the lakes, Appalachian Power proposes to contribute \$50,000 annually towards the programs on Smith Mountain and Leesville lakes (\$25,000 each). The Smith Mountain Lake Association and the Leesville Lake Association, respectively, would administer these programs. Lake sampling will help ensure any chronic water quality problems are addressed in a timely manner.

As part of the water quality monitoring plan required by this license, I am requiring that Appalachian Power develop a program to monitor lake water quality that is consistent with the Smith Mountain Association's program, and that includes DO and water temperature. Appalachian Power will ultimately be responsible for lake monitoring. However, it can implement this provision in any manner it may choose.

Leesville Lake Water Quality Monitoring

The goals of the Leesville Lake water monitoring program are to (1) assess compliance with water quality standards, (2) monitor nutrients and trophic status, and (3) supplement data collected by the Virginia DEQ. Conditions present at the inflow from the two primary water sources (Smith Mountain Lake and the Pigg River), the riverine section after confluence with the Pigg River, the transition zone, the lacustrine zone and other sites will be assessed with a water monitoring probe and water samples will be collected for laboratory analyses. The data collected at each site and the sites may change over time based on what is learned from data.

Lynchburg College Sampling/Testing

Sample Sites

- Smith Mountain Lake tailwaters
- Pigg River near its mouth
- Downstream of Toler Bridge (after confluence with Pigg River/riverine zone)
- Mile Mark 9 (mixing zone)
- Mile Mark 6 (end of mixing zone/beginning of lacustrine)
- Tri-County Marina
- Pit Stop Marina
- Near dam (end point of lacustrine)

Methods and Parameters

A combination of laboratory analyses and a water quality monitoring probe will be used to assess these water quality parameters.

- A. Oxygen and temperature profiles – provides information of overall condition of the lake. If oxygen is not present at the bottom, options should be considered to improve this condition.
- B. pH profiles– indicates the softness/hardness of the water and overall biological activity taking place. Often an excellent indicator of eutrophication and other potential problems.
- C. Conductivity profiles – indicates inflow of varied water sources – used to pinpoint flow of water through reservoir.
- D. Turbidity profiles – indicate levels of sediment pollution. Helps pinpoint the problem.
- E. ORP (oxidation-reduction potential) profiles. ORP is a measure of the potential for reactions to take place, which is a good indicator of chemical activity in reservoir and developing eutrophication.
- F. Total Phosphorus (TP) (surface and hypolimnion) – indicates amount of this nutrient in the water. Increases in TP indicate potential for future/existing algae problems.
- G. Dissolved Phosphorus (surface and hypolimnion) – indicates amount of this nutrient available immediately for use. Again, indicates potential for algae problems.
- H. Fluorescence profiles – measurement of algal growth and algae blooms in the water column. Excellent indicator of phytoplankton productivity.
- I. Integrated Chlorophyll *a* samples – levels of productivity through the photic zone
- J. Secchi Depth – indicator of light transparency and eutrophication.
- K. *E. coli* – indicator of bacteria and other potential health hazards.

Biological communities will be sampled and assessed. The following information will be gathered to assess the community structure.

- Zooplankton – a zooplankton net is pulled through the water column. Zooplankton are a good indicator of lake health and will respond to water quality changes.

The following is a list of what will be assessed by Lynchburg College at each site initially. Data collected or sites may change over time based on what is learned.

- Smith Mountain Lake tailwaters
 - Total phosphorus (TP)
- Pigg River near its mouth
 - Bacteria (*E. coli*), DO, TP and Secchi depth
- Downstream of Toler Bridge (after confluence with Pigg River/riverine zone)
 - Temperature, DO, pH, conductivity, turbidity, ORP, *E. coli*, chlorophyll *a*, TP, fluorescence, Secchi depth, zooplankton

- Mile Mark 9 (mixing zone)
 - Bacteria (E. coli), Secchi depth
- Mile Mark 6 (end of mixing zone/beginning of lacustrine)
 - Temperature, DO, pH, conductivity, turbidity, ORP, E. coli, chlorophyll a, TP, fluorescence, Secchi depth, zooplankton
- Tri-County Marina
 - Bacteria (E. coli), Secchi depth
- Pit Stop Marina (near mouth of Old Woman's Creek)
 - Bacteria (E. coli), TP, Secchi depth
- Near dam (end point of lacustrine)
 - Temperature, DO, pH, conductivity, turbidity, ORP, E. coli, chlorophyll a, TP, fluorescence, Secchi depth, zooplankton

In addition to the above testing, dissolved phosphorus will be determined at three sites (Toler Bridge, MM6 and near dam) once each year to determine the ratio of dissolved phosphorus to total phosphorus.

Leesville Lake Association Volunteer Sampling/Testing

In addition to the above sampling/testing by Lynchburg College, Lake Association volunteers will collect water samples for E. coli testing and collect Secchi depth data at the seven sites listed below under Sampling Dates and Frequency. The Association will use Coliscan Easygel® test kits or equivalent to measure E. coli levels in water samples.

Sampling Dates and Frequency

Monitoring will be focused primarily during the summer when productivity is high. Monitoring of Smith Mountain Lake by Ferrum College has shown that there is little variability in the data during winter months, so winter monitoring may not necessary. However, Leesville may be different than Smith Mountain Lake, so monitoring during the winter may be done occasionally. The primary sampling dates are as follows:

- Lynchburg College:
 - Monthly from April to October for a total of 7 sampling dates.
- Leesville Lake Association
 - Lake Association volunteers will collect water samples for E. coli testing and Secchi depth data biweekly from mid-May through mid-September 15 at the sites listed below. In addition, the Association will periodically collect water samples on the same date & time as Lynchburg College to compare E. coli results from Coliscan Easygel® test kits with laboratory analyses. Data collected or sites may change over time based on what is learned.
 - A. Pigg River near its mouth
 - B. Downstream of Toler Bridge
 - C. Mile Mark 9

- D. Tri-County Marina
- E. Pit Stop Marina
- F. Mile Mark 2
- G. Mile Mark 1/Near Dam Picnic & Beach Area

Water Quality Standards

The water quality monitoring will assess compliance with the following water quality standards:

- Dissolved Oxygen
- pH
- Temperature
- Bacteria (E. coli)

Sampling and Laboratory Testing Protocols

Lynchburg College (LC) will work with VDEQ to ensure that its field sampling and laboratory testing protocols are approved by VDEQ or VDEQ approved accrediting authority. LC will obtain a VDEQ approved Ambient Water Quality Monitoring Project Plan and Standard Operating Procedures. LC will provide calibration and quality control associated information to VDEQ when submitting data. This information would meet the specific criteria stated in the Ambient Water Quality Monitoring Project Plan and SOP.

Reporting

Data will be made available to all interested parties and stakeholders and uploaded to the appropriate VDEQ database. If requested by a stakeholder, data would be made available on a monthly basis. Otherwise, data will be made available on an annual basis and uploaded annually to the appropriate VDEQ database.

An annual report will be prepared by Lynchburg College. The report prepared by Lynchburg College will include data collected by the Leesville Lake Association. The annual report will contain data tables, charts of the data collected, a section on quality assurance/quality control, an assessment of compliance with water quality standards, general comments and observations and recommendations for future monitoring.

If the water monitoring tests indicate that water samples exceed the Water Quality Standards for bacteria, that information will be reported to the Virginia Department of Health as soon as possible.

Costs Per Collection Event

a. Water Quality Assessments by Lynchburg College

Per Collection Event	Cost	Total
Personnel - Collection of data and use of collection equipment (4 hours)	\$200 per hour	\$800
Travel – Truck	\$65	\$95
Boat	\$95	\$130
Laboratory Analysis and QA/QC (Chl a, E. coli, Nutrients and Zooplankton)	\$25 per sample	\$1500
Data Analysis and Administration (5 hours)	\$125 per hour	\$625
Total		\$3150

b. Water Quality Assessments by Lake Association

\$100/event (includes equipment, supplies, Coliscan® test kits and fuel reimbursement)

Annual Cost Estimate

Lynchburg College

Activity	Cost	Total
Annual Report (10 hours)	\$125 per hour	\$1250 each year
Management Implementation (meetings with Association and management work)	\$85-125 per hour	Variable (\$1000 estimate)
Work with Government Agencies	No costs associated	
Annual monitoring (7 events)		\$22,050
Total		\$24,300

Leesville Lake Association

10 events x \$100/event: \$1,000

Grand Total: \$25,300