

# **COVER SHEET**

**FEDERAL ENERGY REGULATORY COMMISSION**

**FINAL ENVIRONMENTAL IMPACT STATEMENT  
FOR THE YADKIN AND YADKIN-PEE DEE RIVER  
PROJECTS**

**Docket Nos. P-2197-073 and 2206-030**

**Section 5  
Staff's Conclusions  
Pages 285 to 328  
FEIS**

## **5.0 CONCLUSIONS AND RECOMMENDATIONS**

### **5.1 COMPREHENSIVE DEVELOPMENT AND RECOMMENDED ALTERNATIVE**

Sections 4(e) and 10(a)(1) of the FPA require the Commission to give equal consideration to all uses of the waterway on which a project is located. When we review a hydropower project, recreation, fish, wildlife, and other non-developmental values of the waterway are given equal consideration with the project's electric energy and other developmental values. In deciding whether, and under what circumstances, a hydropower license should be issued, the Commission must weigh the various economic and environmental tradeoffs involved in that decision. This section contains the basis for, and a summary of, our recommendations for relicensing the Yadkin and Yadkin-Pee Dee River Projects. We weigh the costs and benefits of our recommended alternative against other proposed measures.

Based on our independent review and evaluation of the environmental and economic effects of the Proposed Actions, the Proposed Actions with staff-identified measures, and No-Action, we recommend the Proposed Actions, with staff-identified measures, as the preferred alternatives for the Yadkin and Yadkin-Pee Dee River Projects.

We recommend these alternatives because (1) issuing new licenses would allow Alcoa Generating and Progress Energy to continue operating the Projects as beneficial, dependable sources of electric energy; (2) the Projects, with a total installed capacity of 210 MW and 108.6 MW, respectively, would eliminate the need for an equivalent amount of fossil fuel-produced energy, which helps conserve these non-renewable resources and limits atmospheric pollution; (3) our recommended environmental measures would protect water quality and quantity, enhance fish and wildlife resources, protect cultural resources; and improve public use of the Projects' recreational facilities and resources; and (4) the public benefit of these measures would exceed those of the No-action Alternatives.

#### **5.1.1 Yadkin Project**

We recommend including the following environmental measures in any license issued by the Commission for the Yadkin Project.

Measures proposed by Alcoa Generating and described in section 3 of the Yadkin Settlement for inclusion in any new license issued for the Yadkin Project:

##### **Project Operations**

- Operate High Rock reservoir within 4 feet of full pond from April 1 to October 31 and within 10 feet of full pond from December 1 to March 1, except as needed to maintain flows or as provided under the Low Inflow Protocol or the Hydro Project Maintenance and Emergency Protocol.

- Operate Tuckertown, Narrows, and Falls reservoirs within 3, 5, and 4 feet of their full ponds, respectively, except as needed to maintain flows or as provided under the Low Inflow Protocol or the Hydro Project Maintenance and Emergency Protocol.
- Provide daily average seasonally adjusted minimum flows from the Falls development of 1,000 cfs from June 1 to January 31, 2,000 cfs from February 1 to May 15, and 1,500 cfs from May 16 to May 31.
- Maintain reservoir water elevations at all four developments from April 15 through May 15 of each year no lower than 1.0 foot below the elevation of each reservoir recorded on April 15 (with provision for specific exceptions).
- Develop and implement a flow and reservoir elevation monitoring and compliance plan.
- Prepare and file with the North Carolina DENR an annual flow monitoring report.

#### **Water Quality**

- Operate in accordance with the WQC.
- Conduct DO monitoring consistent with a DO monitoring plan.

#### **Aquatic Resources**

- Include a provision for periodic monitoring of freshwater mussels in the project tailwaters in the RTE species management plan.

#### **Terrestrial Resources**

- Develop and implement an RTE species management plan.
- Develop and implement a transmission line corridor management plan.

#### **Cultural Resources**

- Implement the provisions of the PA.
- Develop and file an HPMP.

#### **Recreational Resources**

- Continue to operate and maintain existing project-related recreational facilities.
- Upgrade and improve existing recreational facilities.
- Remove signage, and close the Rowan County pump station access area.
- Construct new recreational facilities on High Rock reservoir in Rowan County, and establish up to 10 dispersed campsites.

- Improve the Yadkin Project's four canoe portage trails.
- Replace the Highway 49 boat access area when necessary.
- Develop and implement a recreation plan.

### **Land Use**

- Revise and file the SMP.

Additional measures recommended by staff include:

- Develop a sedimentation and flood protection plan that includes (a) specific measures to ensure dredging of sufficient volume and frequency such that the city of Salisbury's water intake remains clear of sediments, (b) physical modifications to the facilities such as a protective dike for the pump station, improved access to the pump station with the road consistent with the city of Salisbury's design or other feasible options for achieving a mutually agreeable and cost effective resolution to flood protection (e.g., relocating the pump station or providing an alternative emergency water supply), (c) planning level capital and operation and maintenance cost estimates for all alternatives, and (d) a recommendation as to which alternative to implement.
- Develop a flood protection plan for the Grant Creek wastewater treatment plant that includes (a) protection from floods that may include maintenance dredging, physical modifications to the existing facility such as installation of a flood protection berm and roadway modifications using a berm, or other feasible options for achieving a mutually agreeable and cost effective resolution to flood protection, and (b) planning level capital and operation and maintenance cost estimates for all alternatives.
- Install equipment and implement measures designed to enhance DO conditions in the Yadkin development tailwaters.
- Operate the generating units with DO enhancement equipment added on a first-on, last-off basis from no later than May 1 through November 30 of each year, subject to review and adjustments based on monitoring.
- Develop and implement a DO monitoring plan for continuous monitoring in all four tailraces from May 1 through November 30 of each year.
- Reserve the Commission's authority to require the construction and operation of such fishways as may be prescribed by Interior or the Department of Commerce for American shad and American eel.

### **5.1.2 Yadkin-Pee Dee River Project**

We recommend including the following environmental measures in any license issued by the Commission for the Yadkin-Pee Dee River Project.

Measures proposed by Progress Energy and included in the Yadkin-Pee Dee Settlement:

### **Project Operations**

- Provide a continuous year-round minimum flow at the Tillery development of 330 cfs, except for an 8-week period beginning in March 2010 or when first American shad passage occurs at Blewett Falls dam, when a minimum flow of 725 cfs would be provided.
- Avoid skimming high temperature surface water from Lake Tillery for the purpose of meeting minimum flows if higher temperature gradients are found to occur in the uppermost 6 inches of the lake.
- Operate Lake Tillery within 3 feet of full pool from December 15 through March 1 except as needed to meet demand for electricity, and then operate within 5 feet of full pool and allow fluctuations of up to 8 feet during emergency situations except when operating under the Low Inflow Protocol.
- Maintain reservoir water elevations at the Tillery development from April 15 through May 15 of each year no lower than 1.5 feet below the elevation of the reservoir as measured on April 15, and limit reservoir water level changes to 2 feet from April 15 to May 15 at the Blewett Falls development (with provision for specific exceptions).
- Schedule maintenance drawdown of 15 feet in Lake Tillery between September 15 and December 15 once every 5 years.
- Add expected daily water level to the public messaging service, and provide an annual notice on November 1 of the drawdown limits that apply between December 15 and March 1.
- Provide a continuous, year-round minimum flow at the Blewett Falls development of 2,400 cfs from February 1 through May 15; 1,800 cfs from May 16 through May 31; and 1,200 cfs from June 1 through January 31, subject to allowable variances.
- Operate the Blewett Falls development as run-of-river when inflows are greater than 7,400 cfs, and maintain year-round water level fluctuations within 6 feet of full pool, except under the Low Inflow Protocol, and allow an additional 2 feet draw down to replace flashboards.
- Allow a minimum flow variance to just leakage flows for two 5-hour periods between October and January each year to allow for testing the black-start capability of turbines at the Blewett Falls powerhouse.
- Comply with the Low Inflow Protocol.
- Maintain a continuous flow monitoring gage downstream of Tillery dam.

- Provide flow data to the public.
- Submit annual operations reports, including hourly readings of reservoir levels at both developments.

### **Water Quality**

- Implement a DO plan that would have DO meeting state water quality standards by the end of 2011.
- Determine the final location for a water quality monitoring gage near the Highway 731 Bridge, where DO would be continuously monitored.
- Install equipment, and monitor water temperature and DO immediately downstream of the Blewett Falls tailrace.

### **Aquatic Resources**

- Operate the Blewett Falls development to enhance fish spawning conditions, and implement upramping and downramping limits.
- Construct and operate a Phase I trap, sort, and trucking (Trap) facility at Blewett Falls for the upstream passage of American shad and incidental passage of blueback herring, within 5 years of license issuance.
- By 2025, or no sooner than 2022, construct and operate a Phase II volitional fish lift with a fish exit flume and counting station, to allow direct fish passage over Blewett Falls dam; the Trap facility shall also remain in operation for the life of the license to allow trucking of shad to areas upstream of Tillery dam.
- Construct and operate a facility for upstream passage of American eel at Blewett Falls, within 5 years of license issuance, with siting studies to be conducted during the first 3 years of the license.
- Construct and operate a gulper facility, with a surface curtain, at Blewett Falls dam within 4 years of license issuance, or to coincide with the first year of upstream American shad passage, for the downstream passage of juvenile American shad; this should be followed by a period of monitoring, including the appropriate depth for the surface curtain, with the study plan prepared in consultation with state and federal fishery agencies.
- Conduct a cooperative downstream passage methods evaluation for downstream American eel passage at Blewett Falls, beginning 5 years after license issuance, with the study plan developed in consultation with the state and federal fishery agencies; within 12 years of license issuance Progress Energy should implement its proposed method for downstream eel passage, after Commission approval.

- Conduct American shad population monitoring downstream of Blewett Falls dam between the dam and U.S. Highway 74 during the spring spawning period, to begin within 1 year of license issuance, with the study plan to be filed with the Commission for approval within 9 months of license issuance.
- Participate as a member of the resource management team (Resource Team) to oversee the fish passage and restoration programs on the Yadkin-Pee Dee River and prepare annual progress reports.
- In 2025, conduct, in cooperation with the state and federal agencies on the Resource Team, a comprehensive assessment of the effectiveness and direction of the American shad and American eel passage and restoration programs; following the assessment, Progress Energy shall modify fish passage facilities and other aspects of the program as directed by the Resource Team, following Commission approval.
- Develop a written protocol no later than 2013 for handling shortnose sturgeon, other rare fish species of concern, and other diadromous species, during the operation of fish passage facilities at Blewett Falls dam.
- Implement other provisions of the Fish Passage Agreement, which was signed by Progress Energy, FWS, NMFS, North Carolina WRC, and South Carolina DNR on September 12, 2007.
- Conduct a sediment survey and gravel recruitment survey in the Blewett Falls tailwater 5 years after license issuance and again 10 years later if the results show no significant problem related to gravel recruitment.
- Conduct post-licensing monitoring of aquatic life downstream of Tillery dam, after developing a study plan in consultation with the agencies, that includes specific evaluation criteria for determining the health of the aquatic community.

### **Cultural Resources**

- Implement and enforce an HPMP at the Tillery and Blewett Falls developments.

### **Recreational Resources**

- Provide funding for 10 years to North Carolina WRC for operation and maintenance of project-related recreation facilities.
- Upgrade and improve existing recreational facilities at both developments.
- Relocate the unimproved boat access located south of the Tillery tailrace to Clarks Creek.

- Provide \$25,000 to North Carolina WRC for developing a new shoreline public fishing area in Stanly County.
- Co-fund with North Carolina WRC a joint-use boathouse and boat ramp facility for Lake Tillery near the proposed public fishing access site in Stanly County.
- Upgrade the existing canoe portage at the Blewett Falls development.
- Develop and implement a recreation plan.
- Release an additional 1,750 acre-feet (884 cfs) below the Tillery development in addition to the proposed minimum flows for recreational boating.
- On the website, provide flow information via an electronic link to the flow gages at Rockingham and downstream of Tillery dam.
- Prepare a plan for recreational flow releases.
- Provide North Carolina DENR a one-time contribution of matching funds up to \$25,000 for the enhancement/expansion of the Yadkin-Pee Dee River trail.

### **Land Use**

- Lease to the state of North Carolina lands between Morrow Mountain State Park and the Pee Dee River, including the existing boat launch area.
- Place restrictive conservation covenants on lands near the mouth of the Uwharrie River, including lands designated as Environmental/Natural in the SMP, the Grassy Islands area, and the canoe portage route at Blewett Falls.
- Implement and enforce the Lake Tillery SMP.
- Develop and implement a written shoreline management policy for Blewett Falls, prohibiting private access across project lands except at designated public access areas.

### **Additional Measures Recommended by Staff**

- Develop and implement a shoreline erosion plan for Blewett Falls reservoir.
- Prepare and implement a diadromous fish monitoring plan.
- Develop and implement a bald eagle management plan that provides for annual monitoring.
- Conduct a survey for Yadkin River goldenrod 5 years after license issuance and then every 10 years for the length of the license, and if the plant is found, prepare a Yadkin River goldenrod monitoring plan including surveys every 5 years.

- Provide additional lighting and feasibility study for developing overnight campsites at the Pee Dee access area.
- Provide additional vault toilets, trash receptacles, lighting, and feasibility study for developing overnight campsites at Grassy Islands access area.
- Provide a port-a-john at the Blewett Falls tailrace access area.
- Develop and implement a plan for an additional public access area on the west side of Blewett Falls reservoir that provides for either upgrading Informal SR 1744 access or providing a new public access area.
- Conduct a recreational boating study, and monitor boating use in the reach downstream of the Tillery dam as part of the proposed recreation flow release plan.

The following discussion describes the basis for staff-recommended measures as well as for not recommending measures recommended by other entities. Under each major issue, we discuss our recommendations for both Projects.

### **Sedimentation and Flooding**

Construction of High Rock dam altered the sediment transport regime in the Yadkin River, effectively intercepting nearly all of the bed material load and much of the wash load. Sediment accumulates in the upper reaches of High Rock reservoir and has resulted in an extensive sediment delta that causes flood waters to reach higher elevations along the shorelines.

Alcoa Generating does not propose any measures to address the ongoing effects of sedimentation in High Rock reservoir. Rowan County (2007) requests the complete removal of the sediment delta between RMs 9 and 19.4 (as measured from High Rock dam) and subsequent maintenance dredging to remove new sediment accumulation as it occurs to lower the flood elevations at the Salisbury water intake and pump station, Grant Creek wastewater treatment plant, the 3<sup>rd</sup> and 7<sup>th</sup> Street bridges, and 25 other (unidentified) structures. Rowan County states that the removal of the sediment delta would improve boating and boating safety.

About 1.46 million cubic yards of sediment enter High Rock reservoir every year (a total of about 117 million cubic yards over the 80-year life of the reservoir). About 80 percent of the sediment consists of silt and clay. Sediments are deposited throughout the entire reservoir, although the coarser particle sizes largely settle in the upper part of the reservoir and form the sediment delta. MBH (2007) estimates that about 25,000 acre-feet (40 million cubic yards) have been deposited between the Salisbury pump station at RM 19.4 and the leading edge of the sediment delta at RM 9 since 1927.

Dredging and disposal costs depend on a variety of factors such as land acquisition for a dewatering facility, dewatering basin construction, environmental mitigation and permitting, hydraulic dredging, land acquisition for disposal, hauling costs for reusable

dredged material, disposal costs for unusable dredged material, mobilization and demobilization costs, and engineering and permitting. Other factors include proximity of the disposal site and potential contaminants in the sediment. Furthermore, many of the more mature sections of the sediment delta are now wetlands that would require special permits from regulatory agencies to remove these wetlands. These permits could be difficult to obtain. Given the volume of sediment involved, it is clear to us that the costs associated with the initial removal of the sediment delta and annual dredging thereafter would be prohibitive.

The city of Salisbury has documented the effects of sedimentation on its municipal water intake and suggests several measures to keep the water intake clear of sediment.<sup>62</sup> Specifically the city wants a channel extending 1,000 feet upstream and downstream of the water intake along with an area within a 100-foot radius of the water intake completely dredged and then annually dredged. Currently the dredging operation by Carolina Sand, Inc. is being done at no cost because the sand is being sold. This dredging maintains the operational status of the water intake for the city of Salisbury, thus avoiding the replacement of the intake structure. In the unlikely event that the construction aggregate market changes and the dredged sand from the Yadkin River near the pumping station cannot be sold anymore, costs for dredging and disposal would accrue. We assumed a range for dredging and disposal cost of \$15 to \$35, which again is a function of a variety of parameters discussed above. We further assumed an annual volume of 50,000 cubic yards<sup>63</sup> to be removed to ensure uninterrupted water supply at the intake. The resulting annual dredging costs would be \$0.7 to \$1.8 million/year.

Future sedimentation patterns in the Yadkin River could affect the supply of potable water to the city of Salisbury, and dredging may be required or the construction of a new intake structure may need to be considered. If needed, a new structure should be located and designed in a manner that it can accommodate the variability in flow in the Yadkin River as well as future sediment aggradation with High Rock dam in place.

In addition to dredging at the water intake, the city of Salisbury wants its pump station to be relocated in response to the increased flooding potential resulting from

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<sup>62</sup>The city of Salisbury points to a 1927 agreement between the Tallassee Power Company and its successors that requires the licensee to ensure that construction of High Rock dam would not interrupt the supply of potable water for Rowan County and the city of Salisbury.

<sup>63</sup>MBH (2007) reported annual dredging at the location of 50,000 tons per year. During the site visit on January 23, 2007, we were informed that the dredged volume was 50,000 cubic yards per year (rather than tons per years) (FERC, 2007a). It is also not known if MBH (2007) refers to wet volume or dry volume which would need to be known for a weight to volume conversion. We therefore used the more conservative volume for the determination of the dredging and disposal costs.

sedimentation in High Rock reservoir. Our analysis shows that the mechanical and electrical systems of the pump station would flood at elevation 643 feet. The 100-year floodplain has changed as a result of the sedimentation buildup in High Rock reservoir, and the equipment in the pump station is now within the 100-year floodplain. The estimated cost for relocating the pump station, based on design specifications submitted by the city of Salisbury, would be about \$14,000,000 or about \$1,400,000 annually. The cost of protecting the current pump station with a flood wall would be about \$6,300,000 or about \$604,670 annually. Improvements to the access road, which floods frequently, to provide vehicle access to the current pump station, would be about \$3,660,000 or \$322,490 annually. In addition, Alcoa Generating states that it owns flood rights up to an elevation 648.9 feet in the area of the access road. Finally, analyses provided by Salisbury indicate that, even without the dam in place, the access road would flood by about 3 feet during a 10-year flood and 5 feet during a 100-year flood.

The city of Salisbury also requests the removal of the sand bar in front of Grant Street, to which it attributes increased risk of flooding of Grant Creek wastewater treatment plant, which would flood at elevation 634 feet. The wastewater treatment plant was constructed in 1963, approximately 36 years after the construction of High Rock dam. Our analysis shows that there was a 6-foot rise in the 100-year floodplain between 1920 and 1963 at this location. The estimated cost to remove the sand bar in front of the Grant Creek wastewater treatment plant would range from \$4,500,000 to \$10,700,000 or from \$1,500,000 to \$3,500,000 annually.

To address the concerns about potential disruption of the municipal water supply and the potential flooding of municipal water supply facilities, we recommend that Alcoa Generating develop a sedimentation and flood protection plan for the Salisbury pump station. The plan would include (a) specific measures to ensure dredging of sufficient volume and frequency such that the city of Salisbury's water intake remains clear of sediments, (b) physical modifications to the facilities such as a protective dike for the pump station, improved access to the pump station with the road consistent with the city of Salisbury's design specifications, or other feasible options for achieving the same benefits (e.g. relocating the pump station or providing an alternative emergency water supply), (c) planning level capital and operation and maintenance cost estimates for all alternatives, and (d) a recommendation as to which alternative to implement. This plan is to be developed in consultation with the city of Salisbury, Rowan County, and North Carolina DWQ and filed with the Commission within 6 months of license issuance.

The preliminary cost of completing and implementing a plan that would protect the water intake and pump station on balance is estimated to be \$11,410,000 in capital costs and \$1,250,000 annually for maintenance dredging, for an annualized cost of \$1,907,640. The final cost would be dependent on the alternative selected.

To address potential flooding at the wastewater treatment plant, we recommend that Alcoa Generating develop a flood protection plan for the Grant Creek wastewater treatment plant that includes (a) protection from floods that may include maintenance

dredging, physical modifications to the existing facility such as installation of a flood protection berm and roadway modifications or other feasible options for achieving the same benefits; and (b) planning level capital and operation and maintenance cost estimates for all alternatives. This plan is to be developed in consultation with the city of Salisbury, Rowan County, and North Carolina DWQ and filed with the Commission within 6 months of license issuance. We have established a preliminary cost for development and implementation of the plan that is comparable to the cost of constructing a flood protection berm and roadway modifications to protect up to elevation 648.8. The cost is estimated to be \$6,838,670, for an annualized cost of \$656,380.

Given Alcoa's responsibility to mitigate for the effects of sediment deposition in the High Rock reservoir and concerns related to the adequacy of the initial design of the wastewater treatment facility to account for future sediment deposition, it would be beneficial for Alcoa Generating and Salisbury-Rowan Utilities to seek a mutually-agreeable and cost-effective resolution to this issue.

### **Shoreline Erosion Plan for Blewett Falls Reservoir**

Erosion has been identified in at least one location along the shoreline of Blewett Falls that may be affecting project shoreline lands that are not owned by Progress Energy adjacent to the project boundary. The identified shoreline erosion on Blewett Falls reservoir may be the result of normal water flow actions, wind action, project operations related to reservoir level fluctuations, and/or a variety of other factors.

We recommend that Progress Energy develop and implement a shoreline erosion plan to address any project-related shoreline erosion that is occurring, or may occur in the future, along the shoreline of the Blewett Falls reservoir. The soil erosion plan would include the following measures: (1) an erosion site inventory, including identification of the location and assessment of the cause of the erosion; (2) proposed measures to control soil erosion and to prevent slope instability for all identified project-related erosion sites; (3) functional design drawings of all soil erosion control or remediation measures; (4) a specific implementation schedule and details for monitoring; (5) a mechanism to identify and, if necessary, control future project-related soil erosion; and (6) measures for consultation with North Carolina DENR, North Carolina WRC, and interested stakeholders in the development and implementation of the plan.

The plan would include an initial shoreline erosion survey and assessment of the erosion that is occurring along the shoreline that Progress Energy would undertake for the entire Blewett Falls reservoir. The survey and assessment would establish a baseline for existing erosion and provide a point of reference for future monitoring. The survey would include the location of the site on existing project mapping, physical dimensions of the erosion area, photographic documentation of each site, and a general description of each erosion site and its condition.

Based on the survey, Progress Energy would determine the location of the erosion in relation to the project boundary and in relation to lands that are not owned by Progress

Energy adjacent to the project boundary. Progress Energy would conduct an investigation to determine the cause(s) of the erosion. If the erosion is determined to be caused by, or affected by, project operations or activities Progress Energy would identify measures to remediate the erosion and/or provide protection from further erosion. The shoreline erosion plan would include provisions for annual monitoring of the shoreline of the Blewett Falls reservoir to determine if new erosion sites develop, and would include provisions to conduct additional root cause investigations if either case arises in the future.

Progress Energy would be required to file the soil erosion control plan with the Commission for review and approval within 1 year after license issuance. Annual monitoring would continue throughout the license term, and Progress Energy would report its findings to the Commission upon completion of the annual monitoring. The annual reports should include any remediation measures, if such measures are warranted. We estimate that the development and implementation of a shoreline erosion plan for the Blewett Falls reservoir would cost \$18,750 annually. This would not include the cost of remediation or other action, if warranted. The cost of remediation would depend on the number of affected sites, the size and configuration of each site, and the method of remediation implemented.

## **Reservoir Level Management**

### *High Rock Reservoir*

Settlement parties and other stakeholders are in agreement with the proposed water level regimes at all Yadkin and Yadkin-Pee Dee River Project reservoirs with the exception of High Rock. Drawdown restrictions on High Rock reservoir would limit available water, especially during low inflow, that Alcoa Generating could use to meet minimum flow requirements downstream at the Falls development. However, our modeling results show that the combination of proposed restrictions on drawdown and minimum flow requirements would almost always be achievable. The exceptions are only during drought conditions, during which operations would be covered under the proposed Low Inflow Protocol, also part of the settlement agreements.

The proposed minimum flow for the Yadkin Project also would be achievable under the two alternative drawdown regimes suggested by SaveHighRock.org and Mr. Martin. However, these two alternatives would reduce flood storage capacity at High Rock reservoir and diminish the ability to use High Rock reservoir to attenuate incoming flood events. Many of the severe flood events in the Yadkin and Pee Dee river basins are the result of summer or early fall tropical storms and hurricanes, during which the storage at High Rock reservoir does not play a substantial role in flood control. Therefore, the loss of storage capacity would be noticeable in November through February and during small to medium flood events. Also, at a higher lake level, some additional flow over the spillway would be lost from potential generation at the High Rock powerhouse. Finally, because High Rock reservoir is the primary storage reservoir in the Yadkin Project, and

the downstream powerhouses have maximum hydraulic capacities similar to that of the High Rock powerhouse, additional generation losses would occur at all three Yadkin developments under the 6-foot winter drawdown as compared to the 10-foot drawdown.

Because the four Yadkin Project reservoirs have been experiencing similar (or greater) drawdowns for many years and continue to support excellent sport fisheries, we conclude that the proposed drawdown restrictions would adequately protect fishery resources throughout the year. Because drawdown restrictions during the spring spawning period are tied to the elevation of the reservoir in April, the beneficial effects on shoreline nest-building fish species would be the same under the proposed and alternative drawdowns.

The proposed and alternative operating regimes would result in changes in the distribution of wetland types including the loss of black willow wetlands on the delta sediment bars that would likely be replaced by emergent vegetation over time. Water willow would likely expand within High Rock reservoir and emergent vegetation would likely expand around the reservoir shoreline, increasing the amount of fish and wildlife habitat available. Limiting the winter drawdown to 10 feet would protect a greater portion of the reservoir from freezing and desiccation, limiting adverse effects on overwintering reptiles and amphibians. A year-round 2-foot drawdown alternative would result in the greatest loss of forested and scrub-shrub black willow wetlands because the majority of them would be inundated permanently. This alternative would result in the loss of a large majority of fish spawning habitat associated with the black willow wetlands; however, emergent marsh and aquatic bed wetlands would increase throughout the reservoir because of the stable water elevations, which would increase the amount of fish and wildlife habitat available.

Summertime water levels would be higher at High Rock reservoir than under existing conditions for both the proposed and two alternative water level regimes. While the two alternative water level regimes would allow private dock owners greater access to the water during the winter months, only 13 percent of the recreational boating occurs during the winter months. Also, under the Proposed Action, 5 of the 7 public boat ramps would be accessible at the 10-foot winter drawdown. Therefore, the proposed water level regime would enhance recreational boating during the summer when demand is the highest and would slightly improve boating access to High Rock reservoir during the winter months over existing conditions when usage is considerably less.

In summary, the proposed water level regime at High Rock reservoir would provide slightly more flood storage capacity than existing conditions during the winter months, allow for more generation than the two alternative proposals also during the winter months, expand the amount of shoreline fish and wildlife habitat, reduce adverse effects on overwintering reptiles and amphibians, and extend the summer recreation boating season by 3 months during the time of highest public use and benefit the local economy. These benefits would be worth the estimated annual cost of Alcoa Generating's proposed water level and minimum flow regime under the Yadkin

Settlement of \$308,530, and would be attained at far less cost than the two alternative water level and minimum flow regimes that would cost \$434,670 with a winter water level within 6 feet of full pond and \$7,632,610 with a year-round water level within 2 feet of full pond.

## **Minimum Flows and Low Flow Measures**

### *Minimum Flows*

Flow releases from operating hydroelectric developments affect aquatic habitat by regulating the volume and timing of flows downstream of the development, often modifying the normal seasonal periodicity that would occur in an unregulated river. For the Projects, Alcoa Generating and Progress Energy and other stakeholders focused their concerns related to instream flows on the two major free-flowing reaches downstream of the Tillery development and downstream of the Blewett Falls development. There appears to be no major issue related to the proposed minimum flows from the Yadkin Project, and we conclude that the benefits of the increased minimum flows downstream of the Falls development, which would be provided on a daily average basis, outweigh the estimated cost, which is included in the \$308,530 cost for the water level and minimum flow provisions of the Yadkin Settlement.

Under the Yadkin-Pee Dee Settlement, Progress Energy proposes a minimum flow from the Tillery development of 330 cfs year-round, with an increase to 725 cfs for 8 weeks for American shad spawning, once they are passed upstream over the Blewett Falls development as part of the diadromous fish restoration program. FWS and American Rivers do not agree with the Yadkin-Pee Dee Settlement provisions and recommend higher continuous minimum flows from the Tillery development of 800 to 1,000 cfs year-round, and 1,500 to 1,800 cfs during the spring spawning season.

We analyzed the results of Progress Energy's instream flow study to assess an appropriate flow for the reach downstream of Tillery. This analysis indicates that the Progress Energy proposed minimum flows would substantially improve aquatic habitat in the reach over existing conditions, and that the greatest improvement would be seen in the 5-mile reach immediately below Tillery dam (which receives no major tributary inflow), with some additional improvement in habitat in two of the subreaches with the FWS/American Rivers' recommended flows. Overall, however, there does not appear to be a large difference in the percentage of the maximum habitat that would be made available at the proposed flows and at the FWS/American Rivers' recommended flows. Although there were some differences among species and life stages, for the three study reaches downstream of Tillery during the spring period, the proposed flows would provide 75 percent of maximum habitat (all species/life stages/study reaches combined), compared to 52 percent of maximum habitat for existing conditions, and 73 percent of maximum habitat for the FWS/American Rivers' recommended flows. During the rest of the year, the proposed flows would provide 65 percent of maximum habitat, compared to 48 percent for existing conditions, and 80 percent for the FWS/American Rivers'

recommended flows. Details of this analysis are found in section 3.3.3.2, *Aquatic Resources, Environmental Effects*.

We also consider the degraded water quality in much of the Reach 3 downstream of Tillery dam, which is a result of poor water quality in the Rocky River, a larger tributary that enters the Pee Dee River about 5 miles downstream of Tillery dam. At the December 5, 2007, 10(j) meeting, Commission and FWS staff discussed the relationship of discharges from Tillery dam and from the Rocky River, which drains the Charlotte suburbs. Commission staff mentioned that poor quality water from Rocky River could impair the Tillery reach to the point that the reach would be less valuable as habitat, arguing against releasing more water from Tillery dam. FWS staff pointed out, however, that the release of higher quality water from Tillery dam could dilute the Rocky River flows and improve habitat in the reach downstream of Rocky River. While some improvement in water quality could occur if the quality of Tillery flow releases was to substantially exceed the water quality in the Rocky River, we currently do not have adequate data in the record to conduct a quantitative analysis of the potential dilution effect of additional Tillery flow releases. Although higher instream flows may act to somewhat improve water quality, the FWS/American Rivers' recommended flows would only be 570 to 925 cfs higher than the proposed flows, depending on season, and may not substantially improve water quality in the reach (see section 3.3.3.2).

There is an important heronry immediately below Tillery dam, and the effects of higher flows on that heronry also should be considered. FWS's recommended minimum flows between 800 and 1,800 cfs would still result in average depths in the Tillery tailrace that are within the great blue heron's preferred foraging habitat depth (1.6 feet). However, at these higher flows, more areas within the tailrace would be deeper than 1.6 feet, making some portions of the tailrace no longer suitable for heron foraging. The proposed flows (330 to 725 cfs) would result in shallower depths, with more of the area suitable for heron foraging.

Another aspect that should be considered is that both the Progress Energy and FWS/American Rivers flows for the spring period are for a species (American shad) that does not yet occur in the reach below Tillery. Although our analysis showed that the higher FWS flows would provide more shad spawning habitat than Progress Energy's proposed flows, it is unlikely that during the initial fish passage operations at Blewett Falls all the spawning area below Tillery would be saturated with shad spawners. It may take many years for the shad populations to increase to the point that all spawning area below Tillery would be required. As shad runs increase in the future, FWS and other agencies could revisit shad spawning flows through our standard reopener provisions of the license. We expect, however, that any required shad spawning flows would not exceed the upper range of flows recommended by FWS/American Rivers.

In summary, there does not appear to be a strong case for selecting the FWS/American Rivers flows over Progress Energy's proposed flows. Both minimum flows would provide enhanced habitat conditions over current project operations, but we

see no great advantages from a habitat perspective to justify adopting the FWS/American Rivers recommended flows for the reach below the Tillery dam. Increasing the flows downstream of the Tillery development, consistent with the Yadkin-Pee Dee Settlement, would cost an estimated \$535,000 annually, and the benefits to the downstream habitat would be worth the cost. However, the greater annual cost of \$1,227,500 for the higher flows recommended by FWS/American Rivers would not be worth the minor incremental improvement to downstream aquatic habitat.

#### *Aquatic Life Monitoring*

The Yadkin-Pee Dee Settlement includes a provision for aquatic life monitoring downstream of the Tillery development (section 2.3.3.5), in accordance with the WQC. That section states that the purpose is to document the condition of the aquatic community, presumably to ensure that the required minimum flows are adequately protecting the aquatic community. Because there is disagreement on the level of minimum flow to be provided below Tillery, such a monitoring program would provide a means to ensure that the appropriate minimum flows are being provided. This plan could also include gathering data and performing analyses required to complete a dilution model of the relationship between Rocky River and releases from Tillery. The Yadkin-Pee Dee Settlement does not include any criteria for judging when the condition of the aquatic community would be considered inadequate, nor does it indicate what corrective measures should be implemented if that conclusion is reached. We recommended in the draft EIS that an aquatic life monitoring program be developed in consultation with the agencies, and that specific evaluation criteria be identified in the plan. Progress Energy did not agree with this recommendation to include evaluation criteria and suggested that this monitoring should target benthic macroinvertebrates. We agree that macroinvertebrates would be appropriate for monitoring, but maintain that some evaluation criteria need to be established. The benefit derived from monitoring to ensure that the staff-recommended minimum flows are protective of the aquatic community downstream of Tillery dam would be worth the estimated annual cost of \$20,000.

#### *Low Inflow Protocols*

Operation of the Projects could affect the salinity levels in the Lower Pee Dee River near the Atlantic Ocean. During drought conditions, releases from the Blewett Falls development provide the majority of flow in the Pee Dee River through South Carolina and to the Atlantic. Between 1998 and 2002, low flows in the Pee Dee River that were due to drought conditions, combined with above-average tidal levels that resulted from unusual meteorological conditions, led to saltwater intrusion that adversely affected municipal water supplies in the lower river. To address the drought conditions, Alcoa Generating received several temporary variances that allowed it to reduce outflows from the project during the summer of 2002 (during drought conditions) to 900 cfs. South Carolina Department of Health and Environmental Control reported that the 900-cfs target flows implemented in 2002 resulted in saltwater intrusion at the Grand Strand intake, forcing Georgetown County to suspend its withdrawal from the intake.

The proposed Low Inflow Protocol sets target flows of as low as 950 cfs for stage 2 droughts and 770 cfs for stage 3 droughts. Under these flow regimes, saltwater intrusion is expected to extend up the river far enough to limit use of the Grand Strand water intake in stage 3 and stage 4 droughts, and may limit use of the intake during at least some stage 2 droughts. In stage 3 and stage 4 droughts, there also would be potential for saltwater intrusion to limit the use of the Myrtle Beach intake. Under stage 4 droughts, consensus among Alcoa Generating, Progress Energy, and state agencies would determine any additional measures to be implemented. Although the proposed operations would not always prevent saltwater intrusion from stopping river withdrawals at some water supply facilities in South Carolina, such operations would balance storing water in project reservoirs while providing releases for downstream users. The Low Inflow Protocol would allow Alcoa Generating and Progress Energy, in concert with resource agencies and stakeholder groups, to design and implement specific operational changes in an adaptive management framework to changing drought conditions. Alcoa Generating's management of storage within High Rock reservoir in the fall of 2007 (during drought conditions) is an example of the good use practice that would result under the implementation of the Low Inflow Protocol. The Low Inflow Protocol can be implemented at essentially no cost. Therefore, we recommend including the Low Inflow Protocol in any new licenses issued for the Projects.

#### *Flow Adjustments, Ramping Rates, and Black-start Testing*

The Yadkin-Pee Dee Settlement provides for a flow adjustment period during the spring months (February 1 to May 15) to enhance fish spawning. Progress Energy and resource agencies would determine how best to operate the project during periods of changing project operations, and propose a minimum of 30 minutes from off-line to full gate for upramping, and a specific sequence of timing for shutting down the units during downramping. FWS and American Rivers support this provision of the Yadkin-Pee Dee Settlement, which they call the flow naturalization plan, but FWS also recommends an interim downramping rate of no more than 1 foot per hour change in water surface elevation, until specific downramping rates are determined by the parties.

It is not clear to us that this additional downramping requirement is necessary. The proposed sequence of shutdowns may already result in a downramping rate similar to that recommended by FWS. Further, we would expect that the flow adjustment provisions would include an appropriate hydraulics investigation to verify that appropriate downramping rates are provided by the proposed shutdown scenario during the spring spawning period. For these reasons, we do not recommend including FWS's recommended downramping rate in any new license issued for the Yadkin-Pee Dee River Project. The additional provision for a minimum flow variance in the Yadkin-Pee Dee Settlement would allow Progress Energy to test the black-start capabilities at the Blewett Falls powerhouse and would be scheduled between October and January to avoid both low inflow conditions and effects on fish spawning. The ability to black-start the turbines at the Blewett Falls powerhouse is an important capability to meet energy

demands during power emergencies. Both the flow adjustment periods and the testing for black-start capabilities can be provided at no cost. Therefore, we recommend inclusion of both of these provisions in any new license for the project.

### *Maintenance and Emergency Drawdowns*

Some temporary drawdowns of the Yadkin and Yadkin-Pee Dee reservoirs for dam repair and maintenance are inevitable. If conditions warrant, Alcoa Generating proposes, as part of the Yadkin Settlement, to operate the project in accordance with the Hydro Project Maintenance and Emergency Protocol. Progress Energy proposes, as part of the Yadkin-Pee Dee Settlement, to draw down Lake Tillery up to 15 feet once every 5 years to perform routine periodic maintenance and gate testing. Both proposals represent reasonable provisions for ensuring proper maintenance of project dams, and the costs would be included in the routine operation and maintenance costs for the Projects. Thus, we recommend inclusion of these measures in any new licenses.

### **Compliance Monitoring**

Flow and water level gages are in place on many project-affected reaches and reservoirs. Alcoa Generating monitors and records the water levels at all four of its reservoirs and the discharge from its developments on an hourly basis. Progress Energy similarly measures and records hourly reservoir levels and discharge from the Tillery and Blewett Falls developments.

Under the Yadkin Settlement, Alcoa Generating would maintain its water level gages on all four reservoirs and provide compliance monitoring for releases from the High Rock and Narrows developments. Under the Yadkin-Pee Dee Settlement, Progress Energy would include (a) hourly readings on Tillery and Blewett Falls reservoirs and add to its public messaging service a projection of the expected daily water level for the day; (b) construct a real-time instream flow gage about 0.5 mile downstream of the Tillery development near the Route 731 Bridge; and (c) continue using the Rockingham USGS gage as the compliance point for releases from the Blewett Falls development. Progress Energy also plans to continue to fund the operation and maintenance of USGS gage no. 02126000 Rocky River near Norwood, North Carolina. Continuing the existing hourly monitoring for reservoir levels would be sufficient to ensure compliance with the proposed drawdown restrictions at both Projects. Alcoa Generating proposes to measure flow near the tailrace of the upstream Narrows development. We find this option sufficient based on the limited storage (720 acre-feet) within the proposed 4-foot operational range at Falls reservoir. We consider it appropriate that the public have a mechanism to confirm compliance with licensed minimum flows and water levels at the Projects. The annual cost of \$67,600 for monitoring and \$4,990 for the compliance plan for the Yadkin Project, and \$40,040 for compliance monitoring for the Yadkin-Pee Dee River Project are warranted.

The installation of these new flow gaging stations below the Narrows and Tillery developments would have environmental consequences associated with the construction,

access requirements, and provision of electricity to operate the gaging stations instrumentation. We therefore recommend that Alcoa Generating's proposed flow and reservoir elevation monitoring and compliance plan include specifics on the location and installation of the new gage downstream of Falls development in the upper reaches of Tillery reservoir near Morrow Mountain State Park. We also recommend that Progress Energy file specifications for the installation of the gage downstream of the Tillery development. We do not anticipate that providing such details for the new gages would result in any substantial new costs.

## **Water Quality**

### *Dissolved Oxygen*

Construction and operation of the Yadkin Project has affected DO levels in reaches downstream of the developments. To address low DO levels, Alcoa Generating proposes to monitor DO pursuant to a DO monitoring plan approved by North Carolina DWQ as part of any WQC issued by that agency. The Yadkin Settlement includes other DO enhancement measures that stakeholders do not propose for inclusion in a new license. These other enhancements include installing aeration facilities at Narrows and High Rock in 2008 through 2012, evaluation of the need for additional aeration facilities in 2011 to 2015, implementing additional aeration technologies at Falls and Tuckertown, as needed, in 2014 to 2016, and installing aeration systems at the High Rock development, and if necessary, at the Tuckertown development.

We conclude that Alcoa Generating's plan to install aeration systems at the Narrows development, and if necessary at the Falls development, and then to install aeration systems at the High Rock development, and if necessary, at the Tuckertown development would meet the state water quality standards for DO in a reasonable period and avoid ineffective and/or unnecessary enhancements. Because the low DO levels are a direct effect of project operations, we recommend that these additional DO enhancement measures be included in any license issued for the project. We estimate the annual cost of the proposed DO monitoring measures to be \$568,090, but protection and enhancement of DO levels downstream of the developments would be worth the cost. The monitoring plan should be filed with the Commission for approval.

Progress Energy's proposed DO implementation plan includes installation of permanent DO enhancement equipment and facilities at Blewett Falls and Tillery in 2010 and 2011, respectively. Progress Energy would monitor DO in the tailwaters of both developments to document the effectiveness of aeration measures that are implemented, and consult with North Carolina DWQ to plan and implement corrective measures if DO standards are not met. We conclude that Progress Energy's planned approach to enhance DO conditions in the tailwaters of the Tillery and Blewett Falls developments, at an estimated annual cost of \$551,100, provides reasonable assurance that it would meet the state water quality standards for DO in a timely manner. The monitoring plan should be filed with the Commission for approval.

### *Temperature*

The significantly warmer water releases that were measured in the Tillery tailrace are likely due to drafting more near-surface water into the turbines when operating at higher flows. Under the proposed operations, agreed upon in the Yadkin-Pee Dee Settlement, Progress Energy would meet its minimum flow requirements, 330 cfs normally in the summer for Tillery, in a manner that would avoid skimming high temperature water from the surface of Lake Tillery, if high temperature gradients are found to occur in the upper 6 inches of the reservoir. We conclude that implementation of this proposal would help Progress Energy avoid drafting the warmest water from the surface of the impoundment and, thereby, reduce the likelihood of exceeding the 32°C state water quality standards for temperature to protect fisheries in the downstream reach, at no additional cost.

### *TMDL Studies*

Portions of High Rock reservoir, the upper portion of Tuckertown reservoir, and the Pee Dee River downstream of Tillery and Blewett Falls dams are designated by the state as water-quality limited reaches on the 2004 303(d) list. The water impairments are not caused by the project. Under the Yadkin Settlement, in measures not to be included in any license issued for the project, Alcoa Generating would participate in the TMDL process for High Rock reservoir initiated by the state of North Carolina in 2005. Alcoa Generating also would contribute up to \$50,000 in matching in-kind services for planned water quality sampling efforts. Under the Yadkin-Pee Dee Settlement, Progress Energy would participate in any TMDL processes required for the Yadkin and/or Pee Dee rivers (or their tributaries) within the project boundary of the Yadkin-Pee Dee River Project, or on the Pee Dee River immediately downstream of either Tillery or Blewett Falls reservoirs over the term of any new license.

We conclude that it would be beneficial for the licensees to participate in any TMDL processes initiated for water bodies that are part of the project and within their respective project boundaries, including High Rock reservoir, and water reaches immediately downstream of their dams. However, because the nature, extent, and timing of their involvement would be subject to an agenda established by the state of North Carolina, we do not recommend inclusion of these provisions in new licenses for the Projects.

### **Fish Passage and Fisheries Enhancement Measures**

The Pee Dee River currently supports several diadromous species downstream of Blewett Falls. Historically some of these species migrated nearly 500 miles up the Yadkin and Pee Dee rivers. Both NMFS and FWS filed preliminary fishway prescriptions pursuant to section 18 of the FPA. On June 11, 2007, Progress Energy filed copies of its Requests for Trial-Type Hearing and Submission of Proposed Alternative Prescriptions with NMFS and FWS, in accordance with EPAAct provisions. However, on September 12, 2007, Progress Energy, FWS, NMFS, North Carolina WRC, and South

Carolina DNR signed the Yadkin-Pee Dee River Diadromous Fish Passage Plan Agreement (Fish Passage Agreement). Progress Energy then withdrew its Requests for Trial-Type Hearing and Submission of Proposed Alternative Prescriptions with NMFS and FWS. We consider the Fish Passage Agreement to be Progress Energy's current proposal for fish passage at the Yadkin-Pee Dee River Project.

### *Upstream Fish Passage*

No specific fish passage facilities have been prescribed or recommended for the Yadkin Project, but both NMFS and FWS reserve their authority to later prescribe fish passage facilities pursuant to section 18 of the FPA. The only involvement that the Yadkin Project would have with fish passage on the river is that fish may in the future be trucked from Blewett Falls to upstream of Falls dam, once the trap and truck facility at Blewett Falls is placed into operation.

The Blewett Falls development is located at the current extreme upstream limit of diadromous fish migration, and the existing fish populations have adapted to this available range of habitat. Stakeholders recognize that attempts to restore passage at Blewett Falls may initially be met with limited success with relatively low numbers of fish available to pass upstream. Therefore, the Fish Passage Agreement provides for a phased fish passage program, with future passage measures depending on the success of the initial measures, which would be a reasonable approach.

For upstream American shad passage, the Fish Passage Agreement calls for the development of fish passage facilities in the Blewett Falls tailrace in two phases. Phase I would be the construction of a trap, sort, and truck facility (Trap facility) by year 4 of the license (no sooner than 2012), with operation of that facility for upstream passage by year 5 of the license, or no sooner than 2013. Fish would be trucked to upstream of both Blewett Falls and Tillery dams for a minimum of 8 years, during which time Progress Energy would monitor passage and assess the reproductive and outmigrant recruitment success of each reach. Phase II would entail the modification of the Trap facility and addition of a fish exit flume and counting station, which would allow fish to be passed directly over Blewett Falls dam into the forebay where they could continue "volitional" upstream migration. Phase II would be implemented by 2025, or as early as 2022, if determined by the Resource Team. The Trap facility also would remain functional during Phase II operations to allow continued trucking of fish to upstream of Tillery dam.

We agree with the phased approach for providing upstream fish passage at the Yadkin-Pee Dee River Project, because the initial years of operation of a trap and truck facility may not result in the capture of large numbers of target species, and achievement of ultimate population goals may take several years. This phased program should be made a requirement of the license, but we have some concerns regarding the conceptual designs of fish passage facilities proposed for Phase I and II. Phase I and II fish facility designs would require additional development in consultation with NMFS, FWS, North

Carolina WRC, and South Carolina DNR, and the designs filed with the Commission for approval, so that potential design deficiencies are eliminated prior to construction.

We estimate that the annual cost of the Phase I Trap facility at Blewett Falls dam would be \$463,320, which would be a reasonable cost for the initial American shad upstream passage facilities. Based on experience on other rivers, the initial years of operation of a trap and truck facility may not result in the capture of large numbers of target species, and success is not guaranteed. Many years of operation may be required before increasing numbers of American shad are collected in the Phase I facility at Blewett Falls, requiring installation of the Phase II facilities (although the Fish Passage Agreement requires the Phase II facilities by 2025). At this stage we have not estimated the cost for a Phase II facility, because the ultimate design is not known at this time.

The Fish Passage Agreement calls for upstream American eel passage at Blewett Falls dam, but no passage above Tillery dam until after a comprehensive review of the results of eel passage in 2025. Eel passage facilities would not be installed at Blewett Falls dam until year 5 of the license or by 2013, and after completion of a 3-year monitoring survey below the dam to determine the best location for an eel fishway. The survey would begin within 1 year of license issuance. The survey would begin within 1 year of license issuance and would study the placement of standard eel ramps and traps for monitoring size, seasonality, and location of juvenile eels at the base of the dam and in the tailrace areas. The decision on whether to provide eel passage at Tillery dam in 2025 would be based on a study to be conducted from 2022 to 2024 on eel habitat utilization in the river, and whether additional eel habitat should be made available.

We conclude that upstream eel passage should be provided at the Blewett Falls development using the eel lift proposed by the Fish Passage Agreement. We estimate the annual cost for upstream eel passage at Blewett Falls to be \$110, 570. Deferral of the decision on eel passage at Tillery until 2025 is reasonable, because the success of passage at Blewett Falls would not be known until after several years of operation.

#### *Downstream Passage*

The Fish Passage Agreement calls for the installation of a gulper facility at Blewett Falls dam for downstream passage of juvenile American shad by 2012, or in the same year that upstream shad passage occurs. This facility would also include a surface curtain leading to a new spillway gate for downstream passage. For downstream passage of American eel the Fish Passage Agreement calls for a cooperative downstream passage methods evaluation with the agencies to determine appropriate measures for downstream eel passage after consideration of all available research findings. The evaluation would begin 5 years after license issuance, and a recommendation on which passage option should be implemented would be due within 12 years of license issuance.

We agree that a gulper facility with a surface curtain would be a reasonable alternative for downstream shad passage, but that some period of testing would be required to refine its operation, including experimenting with different depths for the

surface curtain (the Fish Passage Agreement calls for a depth between 5 and 9 feet). Although testing of the gulper, along with different depths for the surface curtain, may reveal that some eel passage could occur with the gulper, other methods also may be appropriate for testing, as proposed by Progress Energy. Some of these methods, such as the use of behavioral devices like lights or sound generators, may also be appropriate for testing in conjunction with the gulper to improve its efficiency. Therefore, we recommend the cooperative downstream eel passage methods evaluation, which would be conducted in cooperation with the agencies.

No downstream passage is proposed by Progress Energy at the Tillery development, although the Fish Passage Agreement states that whatever downstream eel passage measure is developed at Blewett Falls may also be appropriate for Tillery once upstream eel passage occurs at Tillery. We agree that it is premature to develop plans for downstream passage at Tillery, at this time, and do not recommend such a measure.

### *Fish Entrainment*

Continued operation of the Projects would result in the entrainment of both diadromous (if passed upstream) and resident fish species, resulting in some injury and mortality to entrained fish. Neither Alcoa Generating nor Progress Energy proposes any specific measures to prevent fish entrainment, except for the measures previously described for the diadromous species (gulper). FWS, however, recommends that all the project developments install trashracks with spacing no greater than 2.5 inches, which would prevent many adult fishes from being entrained.

Trashrack spacing at Progress Energy's developments is currently 1.6 inches at Blewett Falls and 2.6 inches at Tillery, already nearly meeting or exceeding FWS's recommendation. Trashrack spacing at Alcoa Generating's developments is larger, ranging from 4.125 to 5.625 inches.

Trashracks with narrower spacing would theoretically prevent some fish from entering the turbine generators. However, there is also no indication that entrainment is having significant adverse effects on the resident fish populations, because the project reservoirs and riverine reaches support robust fish populations and an excellent sport fishery. Once diadromous species are introduced above Blewett Falls, they would also be exposed to entrainment, although the trashrack spacing at Blewett Falls is only 1.6 inches, which is smaller than FWS criteria. Although the trashrack spacing at the Yadkin Project developments is wider, diadromous fishes would not be released above those developments until well into the future, if at all. Thus, there appears to be little basis for requiring a change to narrower spaced trashracks at either project at this time. The benefits to fisheries would not be worth the annual cost of \$55,190 and \$119,060 for installation of new trashracks that conform to FWS's recommendations at the Yadkin Project and Yadkin-Pee Dee River Project, respectively.

### *Freshwater Mussels*

Changes in minimum flows released into the tailraces could affect mussel populations within the project tailraces. The Yadkin Settlement provides for periodic monitoring of native freshwater mussels in the Yadkin Project tailwaters as part of an RTE species management plan. Under the Yadkin Settlement in measures not to be included in any license issued for the project, Alcoa Generating states that it intends to complete the monitoring within the first 10 years of the effective date of any new license and to limit the total cost of the monitoring to \$50,000 (in 2008 dollars). It further provides that, if mussel recruitment below the Falls tailrace is not sufficient to justify continued management efforts in this location, it would contribute \$50,000 to North Carolina WRC for mussel management efforts elsewhere in the basin.

The proposed flow regime below the Falls development would likely provide somewhat more stable and enhanced aquatic habitat conditions downstream, compared to current operations, and should result in some improvements to freshwater mussel populations in the reach. We conclude that periodic monitoring during the first 10 years of the license would be necessary to document the effects of the new flow regime on mussel populations. We recommend monitoring as part of the RTE species management plan, which would have an estimated annual cost of \$2,010.

The Yadkin Settlement contains a provision for Alcoa Generating to contribute funding to North Carolina WRC for management efforts elsewhere in the basin, if monitoring shows that mussel recruitment is poor downstream of the Falls development; this provision does not appear to have an appropriate nexus to the project. Instead we would recommend that Alcoa Generating include a provision in the proposed RTE species management plan to consult with North Carolina WRC and FWS after the completion of the 10-year monitoring period to determine the need for protection measures for implementation downstream of the Falls development. We conclude that this would be a more appropriate approach to address any project-related effects.

Two invasive exotic species have been documented to occur within the Yadkin Project developments, the Asian clam and the Chinese mystery snail. The Asian clam is common in the Yadkin Project area, and may also occur within the Yadkin-Pee Dee River Project area, although Progress Energy did not report the presence of the species. The Chinese mystery snail has only been reported from one location in High Rock reservoir. Although both species are common in the southeastern United States and in other parts of the country, the presence of the reservoirs may provide favorable habitat conditions for these species, particularly for the Chinese mystery snail, which prefers slow-moving waters over a mud/silt bottom. The Yadkin Settlement provides for a monitoring program for these exotic species, and should they reach a level where the North Carolina agencies begin implementation of control measures, Alcoa Generating would contribute funding of up to \$25,000 annually, on a 50 percent cost-share basis, to assist with these control efforts. We conclude that this would be a reasonable program to

maintain surveillance of exotic species in the Yadkin Project area, and recommend that this settlement provision be made a requirement of the license.

### **Terrestrial Resources**

Several rare plant and wildlife species occur within the project areas. Some, such as the Yadkin River goldenrod, the Schweinitz's sunflower, and the bald eagle, have the potential to be affected by project operations, maintenance, or project-related activities. Alcoa Generating proposes to prepare an RTE species management plan. FWS recommends several separate plans for specific species. Alcoa Generating, in response to FWS's recommendations states that it believes that a single RTE species management plan is all that is necessary to efficiently and properly address the species-management issues. FWS recommends Progress Energy develop a BEMP and a Yadkin River goldenrod species management plan, similar to those recommended for the Yadkin Project. Progress Energy in its response to FWS's recommendations disagrees with FWS's recommendations for a BEMP and for a Yadkin River goldenrod species management plan and restates its proposal to provide aerial surveys every 3 years to monitor bald eagles within the entire project.

An RTE species management plan, as proposed by Alcoa Generating, that addresses the effects of the project on the Yadkin River goldenrod would allow population monitoring and resulting actions as specific threats are identified. The benefits of such a plan would outweigh the estimated annual cost of \$16,480. The measures recommended by FWS, if incorporated as part of the proposed RTE species management plan, would allow Alcoa Generating to continue gathering information on the effects of project operation on this species and to compare it to the baseline information in the Yadkin River goldenrod survey report. We conclude that a separate Yadkin River goldenrod management plan apart from the RTE species management plan is unnecessary to achieve these results.

Although potential Yadkin River goldenrod habitat exists within the Yadkin-Pee Dee River Project boundary, the most suitable habitat is located just downstream of Falls dam in an area that is not affected by project operations. Because the Yadkin-Pee Dee River Project does not affect the Yadkin River goldenrod, the measures recommended by FWS would not be necessary to protect this species from project operations. Progress Energy's proposal in its comment letter on the draft EIS to conduct a Yadkin River goldenrod survey 5 years after license issuance then to conduct a periodic survey on the same schedule for filing the updated Tillery SMP with the Commission (every 10 years) would identify any new populations that could become established in the project boundary. Additionally, if the plant is located within the project boundary, Progress Energy proposes to develop and implement a Yadkin River goldenrod monitoring plan with surveys conducted every 5 years for the length of the license. Increasing the monitoring frequency if the plant is found within the project boundary would ensure that

any project-related effects are identified in a timely manner. The benefits of conducting these surveys would outweigh the annual cost of \$510.

Bald eagles successfully nest in both project areas. Although existing populations are nesting successfully, increased recreation and shoreline development could affect future nesting success. Alcoa Generating's proposal to include the bald eagle in an RTE species management plan would consolidate project-wide bald eagle information, monitoring results, and management and protection guidelines for the term of the new license. The proposed RTE species management plan would be consistent with FWS's recommendation for Alcoa Generating to conduct annual bald eagle monitoring and provide management provisions for the entire project for the term of the new license. Creating a separate plan, however, as opposed to including the provisions in an RTE species management plan would be unnecessary for the protection of the bald eagle.

Progress Energy's proposed shoreline management policies would protect bald eagles because development could cause increased human disturbance around nest sites or the cutting of nest, perch, or roost trees. The bald eagle management guidelines, Lake Tillery SMP, Blewett Falls shoreline management policy, and triennial bald eagle surveys proposed by Progress Energy would all be beneficial to the protection of bald eagles. However, incorporating all these aspects into one BEMP and continuing annual monitoring surveys even if the bald eagle is delisted from the state endangered species list, as recommended by FWS, would provide more complete protection for the length of the new license. The benefits of preparing a BEMP would outweigh the estimated annual cost of \$10,530.

Two rare plants, Heller's trefoil and Pursh's wild petunia, and one rare animal, timber rattlesnake, are known to occur within the Yadkin Project transmission line corridor. Currently, Alcoa Generating does not have a formal written vegetation management plan for the two transmission line corridors. Vegetation management is done on an as-needed basis. The proposed transmission line corridor management plan would establish objectives for vegetation and wetland management. The benefit of managing the transmission line corridors to protect known rare species locations and habitat would benefit rare species within the Yadkin Project, and would be worth the estimated annual cost of \$1,000.

### **Cultural Resources**

To ensure that adverse effects on known and potential historic properties and to any as-yet unidentified archaeological resources are satisfactorily resolved over the term of any licenses issued, the Commission plans to execute PAs with the North Carolina SHPO for the Projects. Alcoa Generating, the Forest Service, Catawba Indian Nation, Badin Historic Museum, Inc., and Trading Ford Historic District Preservation Association would be invited to be concurring parties to the Yadkin Project PA. Similarly, Progress Energy and the Catawba Indian Nation would be invited to be concurring parties to the PA for the Yadkin-Pee Dee River Project. The PAs would

require Alcoa Generating and Progress Energy to file their proposed HPMPs within one year of the effective date of the license. Alcoa Generating's and Progress Energy's proposed HPMPs would contain the principles and procedures necessary to address the continued use and protection of historic properties, mitigation of unavoidable adverse effects, compliance with laws and regulations governing human remains, and the discovery of previously unidentified resources over the terms of any licenses issued. Therefore, we conclude that, with the execution of the PAs and the implementation of the HPMPs, no known historic properties within the Projects' APEs would be adversely affected by any new license issued. In addition, we conclude that any unknown historic properties or archaeological resources within the Projects' APEs would not be adversely affected. The protection afforded to historic properties justifies the annual estimated cost of \$4,490 for the Yadkin Project HPMP and \$8,760 for the Lake Tillery and Blewett Falls HPMPs.

## **Recreation Measures**

### *Existing and New Recreation Facilities*

Both Alcoa Generating and Progress Energy propose upgrades at existing recreation facilities and the provision of new recreation sites to meet increased demand for recreational use and access at the Projects. The city of Salisbury and Stanly County, citing safety concerns, ask that Alcoa Generating close the Rowan County pump station access area immediately. We conclude that Alcoa Generating's proposed upgrades at the existing project-related recreational facilities and improvements to the tailwater fishing areas, along with the new swimming area and beach in Rowan County, the proposed new 10 campsites, and the relocation of the boat launch off Highway 49 would address the increased demand for recreation on project lands and waters and serve the public in the surrounding communities. We agree that the Rowan County pump station access site, which is located in proximity to the municipal water intake, poses safety and security concerns and recommend that it be closed as soon as possible after the issuance of any new license for the Yadkin Project. The estimated annual cost of \$83,040 for the proposed recreational enhancements at the Yadkin Project would provide needed recreational opportunities at the project.

Progress Energy's proposals to upgrade existing recreational facilities and canoe portage at Blewett Falls, to relocate and formalize the Clarks Creek boat access site, and to provide funds to enhance the Yadkin-Pee Dee Trail would help to meet increased demand for recreation on project lands and waters. These measures would benefit the recreational visitors in the surrounding counties, and justify the estimated annual cost of \$166,420.

As recommended by the city of Rockingham, the additional picnic tables and lighting at the Anson County access area as well as the additional vault toilets, trash receptacles, and lighting at the Mountain Creek (Grassy Islands) access areas are consistent with the needs identified during the recreational use survey. We conclude that

the additional estimated annual cost \$7,010 is minor relative to the expected benefit to those who use these access areas. The American Rivers and city of Rockingham's recommended study to establish public boating access between the Highway 109 landing and the Grassy Islands access area would enhance access to this river reach. However, we conclude that demand is not sufficient to warrant additional access at this time. We also conclude in the *Recreation Facility Enhancement* analysis in section 3.3.7.2 that improved access to the western shore of Blewett Falls reservoir is needed to meet current and future recreation demand. The benefit to recreational boating on Blewett Falls reservoir would be worth the annual cost of \$7,000 to develop and implement a plan to provide an improved or new access area on the western shoreline.

Finally, we conclude that the provision of a port-a-john at the Blewett Falls tailrace would be worth the relatively minor annual cost of \$1,750 at this increasingly popular location for angling.

### *Recreation Plans*

Both Alcoa Generating and Progress Energy propose to develop recreation plans and schedules for implementing proposed recreational enhancements. Recreation plans would allow Alcoa Generating and Progress Energy to implement facility improvements and install new facilities in a coordinated manner, and would ensure that the proposed recreational facility enhancements meet the intended purposes. However, neither of the proposed plans includes a specific provision for reviewing and updating the plans over the terms of any licenses issued. Progress Energy would meet with Stanly and Montgomery counties to review recreation needs and issues. The city of Rockingham recommends that Progress Energy include (a) drawings and specifications for facility construction that resist vandalism and protect public health and safety; (b) performance standards for facilities maintenance; (c) estimates of expected use and triggers for improvements to facilities based on use expectations; and (d) schedules to inspect and maintain facilities on at least a weekly basis. The city of Rockingham also recommends the creation of a recreation management committee.

We conclude that some of the city of Rockingham's recommendations are warranted. We recommend that the recreation management plans for both projects include measures to provide for periodic monitoring, as well as review and consultation, with resource agencies, counties, and other interested stakeholders in the project area, such as North Carolina WRC, North Carolina DWR, the North Carolina Department of Parks and Recreation, Stanly County, Montgomery County, Richmond County, and the city of Rockingham.

In addition, Progress Energy's recreation plan should include (a) construction drawings and specifications for the proposed and staff-recommended recreation facilities; (b) an implementation schedule for the proposed facilities; (c) a description of the entity(s) responsible for the maintenance and management of the facilities; (d) a description of safety measures and signage associated with the facilities; and (e) measures

for periodic monitoring, review and consultation, to help ensure future recreational demand and adequate provision of public access to project waters is maintained over the term of a new license. The estimated annual costs would be \$10,830 and \$13,170 for the Yadkin and Yadkin-Pee Dee plans, respectively. We conclude that these costs would be worth the substantial benefits that would be derived from implementing the plans. Since we would expect that the plan and schedule proposed by Progress Energy would include the above described measures, we do not assess additional costs for plan preparation.

We conclude that Progress Energy should not provide for law enforcement, as recommended by the city of Rockingham. There is no evidence that the project (and the lands adjacent to the reservoirs) is creating any additional burden on local law enforcement. Further, Progress Energy proposes to cost-share a joint boathouse and boat ramp facility that would be used by North Carolina WRC for law enforcement on Lake Tillery and by Progress Energy for lake management purposes. The benefit to recreational boaters of Progress Energy's proposal to share the cost and use of a new boathouse and boat ramp with North Carolina WRC would be worth the one-time cost of \$25,000.

#### *Recreational Boating Flows*

Navigation in the reach below Tillery dam is difficult under existing conditions. Progress Energy's proposed base flow of 330 cfs would be an improvement over existing conditions. Progress Energy's proposed additional releases above the proposed minimum flow for recreational boating flows of up to 1,750 acre-feet per year (884 cfs over a 24-hour period) or up to 1,950 acre-feet per year (985 cfs over a 24-hour period) below Tillery dam would further enhance boating opportunities in the reach below Tillery dam. However, Progress Energy does not specify the duration or frequency of the additional recreational boating flows.

The city of Rockingham, American Rivers, and many individuals find the proposed base flows and additional recreational flows to be inadequate and question the conclusions of the navigational boating study. In comments on the draft EIS, Interior notes that paddle sports are currently one of the fastest growing recreational activities in the United States and support the communities adjacent to the Tillery reach who seek a reevaluation of minimum flows necessary to support public uses of the river, including boating, paddling, ecotourism, bird watching, and fishing. We reviewed Progress Energy's navigational boating study results and conclude (see recreational flows discussion in our analysis in section 3.3.7.2) that the base flow of 330 cfs would not be sufficient to allow downstream passage of jon boats in the reach between Tillery dam and the Highway 109 access, which was a stated goal of the navigational boating studies. For instance, we found that 671 cfs would be needed at RM 211 to allow jon boats to navigate downstream. We also conclude that the additional recreational boating flows proposed by Progress Energy would provide boatable flows of 8-hour day releases of sufficient amount to allow jon boats to safely navigate downstream for about 20 days of the recreation season.

On the other hand, the city of Rockingham's recommended recreational boating flows of 1,200 cfs during daylight on every weekend and on holidays during the recreation season would require 33,560 acre-feet per year. Boatable flows of 671 cfs for the same number of days as recommended by the city of Rockingham would require 25,000 acre-feet. We do not find that the current and projected use warrants boatable flows every weekend and holiday during the entire recreation season, given the relatively low use of this reach and the additional annual cost of \$129,000 to implement the 1,200 cfs alternative and \$18,000 to implement the minimal boatable flow of 671 cfs for every weekend.

Given that the proposed additional releases would provide minimal boatable flows and that recreational use is projected to increase, we agree with the city of Rockingham and American Rivers that an additional boating study is needed to determine if the amount, timing, and extent of the proposed additional recreational flows would provide sufficient flows to ensure downstream navigation at least every other weekend and holidays during the recreation season (May 15 through September 15). Therefore, we recommend that Progress Energy implement its proposed additional recreational boating flows during the first recreation season after the issuance of any new license. At the same time, we recommend that Progress Energy conduct an additional recreational boating study of the reach downstream of Tillery dam downstream to the Highway 109 access area during the first year following any new license for the project and include the results of this study in its proposed recreation release plan. Progress Energy should develop the recreational boating flow study plan in consultation with Interior, North Carolina DENR, North Carolina WRC, the city of Rockingham, and Anson County and incorporate the results in its proposed recreation release plan. We recommend that the focus of the flow study and the recreation release plan be on the provision of recreational opportunities for paddling non-motorized watercraft.

We would expect that the proposed recreation release plan would include the following components: (a) protocols and rationale for the provision of the boating flows, such as rate (cfs), timing (i.e., time of year, number of days, day of week, and time of day), and duration (hours); (b) measures to monitor flows via the proposed stream gage; (c) measures for notifying the public of the timing of the releases; (d) measures for review and update of the recreation release plan; and (e) measures for consultation with Interior, North Carolina DENR, North Carolina WRC, and the city of Rockingham. Given our assumptions about the frequency of flow necessary to meet current and future user demand, the recreation release plan also should provide for recreational use monitoring of the reach downstream of Tillery dam during the first 5 years after any new license and then every 6 years consistent with the Commission's required filing of recreational facility and use information.

The reach downstream of Tillery dam contains a heron rookery. We conclude in section 3.3.4.2 that the higher flows between 800 and 1,800 cfs recommended by FWS would result in a reduction in optimal foraging habitat for the great blue heron. Therefore, the recreation release plan should also take into account the potential effects

on higher seasonal recreational boating flows on great blue heron habitat. The estimated annual cost for an additional recreational boating flow study and use monitoring would add about \$9,000 to Progress Energy's proposed recreation flow release plan for a total of \$14,010. The cost would be justified by the need to determine the amount of flow necessary to allow the downstream navigation of jon boats relative to the projected use.

### **Shoreline Management**

Shoreline residents have stated that the provisions of the current Yadkin Project SMP are too restrictive and prevent or heavily restrict use of their piers. Through a collaborative process, Alcoa Generating developed a series of specific revisions to address concerns of shoreline residents while maintaining provisions to protect aquatic habitat and shoreline environmental resources.

Alcoa Generating proposes to submit a revised Yadkin SMP within 2 years of the effective date of a new license. Changes undertaken would be designed to continue the current level of protection to the shoreline and reservoirs, while providing adjoining property owners and Alcoa Generating more flexibility in considering and approving specific shoreline development proposals and requests. We conclude that the additional flexibility afforded shoreline property owners would be worth the estimated annual cost of \$11,670 to revise the SMP.

Progress Energy proposes to develop a written shoreline management policy for Blewett Falls reservoir concerning its proposed management of project lands surrounding the reservoir. The policy would prohibit private access, except normal foot access, to the reservoir across Progress Energy-owned lands except at designated public access areas. The policy would focus on natural resource protection to preserve the undisturbed nature of the Blewett Falls development. Measures for consultation in the development of this policy and provisions for periodic review and update of this policy would help ensure that these shoreline management policies would provide long-term protection of the shoreline resources over the term of a new license. Therefore, we recommend that Progress Energy develop the shoreline management policy for Blewett Falls in consultation with resource agencies and stakeholders, and that this policy be submitted to the Commission for review and approval within 6 months of license issuance. In addition, the shoreline management policy should include provisions for future periodic review and update of the policy and measures for coordination with the staff-recommended shoreline erosion plan for Blewett Falls. The implementation of a shoreline management policy for Blewett Falls would have beneficial environmental effects on land use, management, and visual aesthetics by ensuring that the natural resources and undeveloped character of Blewett Falls reservoir are protected. We estimate this measure to cost \$5,250 annually.

### **Land Transfers**

The Yadkin Settlement includes proposed land conveyances for 2,310 acres of non-project lands adjacent to High Rock reservoir; 2,420 acres of non-project lands adjacent to Tuckertown reservoir, and 1,085 acres of non-projects lands at Morrow

Mountain State Park. In addition, Alcoa Generating would donate to Rowan County 63 acres of non-project lands currently being leased to Rowan County as part of the Eagle Point Preserve; 270 acres of non-project lands located adjacent to the Narrows and Falls reservoirs to the Forest Service for inclusion in the Uwharrie National Forest; and 14 acres adjacent to the existing Badin Boat launch access area to the town of Badin for development as a public park. We reviewed the location and use of these parcels and concluded that none of these lands, which are currently not within the project boundary, are needed for project purposes and would not require Commission oversight or inclusion in any new license (see section 3.3.8, *Land Use and Aesthetics*). These land transfers would occur outside the scope of any new license issued for the Yadkin Project.

The riparian habitat along the Pee-Dee River supports fish and wildlife and is not afforded any protection under the existing license. Under the Yadkin-Pee Dee Settlement, Progress Energy proposes to place restrictive covenants on project lands along the Uwharrie River confluence, on lands in the Grassy Islands area, and to lease lands between the Morrow Mountain State Park and Pee Dee River, including the existing boat launch, to the state of North Carolina. Based on our review, the lands are necessary for project purposes as they would help to protect vegetated habitat for diadromous fish and preserve the natural aesthetic of the reservoir (see section 3.3.4, *Terrestrial Resources*). We recommend that these lands remain within the project boundary in any new license issued.

Progress Energy also proposes to place restrictive covenants on Diggs Tract and to donate to the state of North Carolina 300 acres of riparian habitat extending four miles from the Highway 731 Bridge below Tillery dam on the eastern bank of the Pee Dee River and about 1,600 acres of non-project lands along the Pee Dee River below Blewett Falls dam. Progress Energy also would establish a 100-foot minimum buffer zone along 15,867 feet of shoreline 4 miles south of Highway 74, under which activities would be limited to (a) selective clearing and controlled burning in accordance with a forest management plan approved by the North Carolina DENR, (b) unimproved foot trails not exceeding 4 feet in width, and (c) a single boat access point to the river. Based on our review, these non-project lands are downstream of Blewett Falls dam well outside of the existing project boundary and are not needed for project purposes (see section 3.3.8, *Land Use and Aesthetics*). Therefore, these land use provisions would not require Commission oversight, and we do not recommend including them in any new license.

### **Project Boundaries**

The recreational enhancements proposed by Alcoa Generating and Progress Energy under the Yadkin and Yadkin-Pee Dee Settlements include new facilities that would provide long-term public access to areas currently outside of project boundaries. The Commission would not have jurisdiction over these areas if they are located outside of the project boundary and would not have the means to ensure use at these areas over the term of any new licenses issued for the Projects. Commission regulations require that all lands necessary for the operation and maintenance of the Projects and for other

purposes, such as recreation, be included in the project boundary. If licensed, the Yadkin and Yadkin-Pee Dee River Project boundaries would need to include all of Alcoa Generating and Progress Energy's existing or new recreation facilities.

## **5.2 CONSISTENCY WITH THE RECOMMENDATIONS OF THE FISH AND WILDLIFE AGENCIES**

Section 10(j) of the FPA requires the Commission to include license conditions, based on recommendations provided by federal and state fish and wildlife agencies for the protection, mitigation, and enhancement of fish and wildlife resources affected by the project. Section 10(j) of the FPA states that, whenever the Commission believes that any fish and wildlife agency recommendation is inconsistent with the purposes and the requirements of the FPA or other applicable law, the Commission and the agency shall attempt to resolve any such inconsistency, giving due weight to the recommendations, expertise, and statutory responsibilities of the agency. If the Commission still does not adopt a recommendation, it must explain how the recommendation is inconsistent with Part I of the FPA, or other applicable law and how the conditions imposed by the Commission adequately and equitably protect, mitigate damages to, and enhance fish and wildlife resources.

In response to the Commission's ready for environmental analysis notice, issued March 13, 2007, Interior, NMFS, North Carolina WRC, and South Carolina DNR filed letters providing comments and terms and conditions for the Yadkin and Yadkin-Pee Dee River Projects, pursuant to section 10(j).<sup>64</sup> Table 59 summarizes the agency recommendations made under section 10(j) for both Projects, as well as our analysis of those recommendations and whether to adopt the measures as part of the Staff Alternative. We make a preliminary determination that one measure recommended by FWS at the Yadkin Project (trashracks with bar spacing not exceeding 2.5 inches at all developments) and four measures recommended by FWS at the Yadkin-Pee Dee Project (trashracks with bar spacing not exceeding 2.5 inches at both developments, minimum flows downstream of Tillery dam, a sluice gate at Tillery dam, and downramp rates downstream of the Blewett Falls development) may conflict with the public interest and comprehensive planning standard of sections 4(e) and 10(a) of the FPA. These measures are discussed following table 59.

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<sup>64</sup>The Interior, North Carolina WRC, and South Carolina DNR letters were filed May 11, 2007, and the NMFS letters were filed May 12, 2007.

Table 59. Analysis of fish and wildlife agency section 10(j) recommendations for the Yadkin and Yadkin-Pee Dee River Projects. (Source: Staff)

<b>Recommendation</b>	<b>Agency<sup>a</sup></b>	<b>Within Scope of 10(j)?</b>	<b>Annual Cost</b>	<b>Staff Recommending?</b>
<b>Yadkin Hydroelectric Project (No. 2197)</b>				
1. Release daily average flow of 1,000 cfs from June 1 through January 31, 2,000 cfs from February 1 through May 15, and 1,500 cfs from May 16 through May 31 below the Falls development beginning no later than 6 months following license issuance. <sup>b</sup>	FWS NMFS	Yes	\$308,530	Yes
2. Modify trashracks so that bar spacing does not exceed 2.5 inches in front of turbine intakes at all project developments by next license term.	FWS	Yes	\$55,190	No
3. Prepare bald eagle management plan including annual monitoring within 2 years following license issuance.	FWS	Yes	\$0	Yes, as part of the RTE management plan
4. Develop an RTE species management plan including Yadkin River goldenrod including mitigating actions, implementation timeline, and monitoring. Specifically:	FWS	No, not a specific measure to protect fish and wildlife. (10[a])	\$16,480	Yes
<ul style="list-style-type: none"> <li>• Address encroaching vegetation;</li> <li>• Characterize habitat requirements and compare to pre-impoundment hydrologic conditions; evaluate operations to</li> </ul>				

<b>Recommendation</b>	<b>Agency<sup>a</sup></b>	<b>Within Scope of 10(j)?</b>	<b>Annual Cost</b>	<b>Staff Recommending?</b>
approximate pre-impoundment conditions; <ul style="list-style-type: none"> <li>• Evaluate project effects on distribution of sediments, woody debris, and nutrients; and</li> <li>• Evaluate options for creating additional habitat in currently unoccupied but potentially suitable areas.</li> </ul>				
5. Develop protection mechanisms and maintenance protocols for maintaining transmission line corridors; exclude pesticide use and other detrimental practices.	FWS	Yes	\$1,000	Yes, consistent with the transmission line corridor management plan
6. Maintain traditional level of tailwater access that the public has enjoyed in the past.	FWS	No not a specific measure to protect fish & wildlife. (10[a])	\$0	Yes

**Yadkin-Pee Dee River Hydroelectric Project (No. 2206)**

1. Release a minimum flow below the Tillery development of 330 cfs from May 16 to January 31 and 725 cfs for a period of 8 weeks from February 1 to May 15 (to be set by agency team) within one year of license issuance. <sup>c</sup>	NMFS	Yes	\$535,000	Yes
2. Release a minimum flow below the Tillery development in the range of	FWS	Yes	\$1,227,500	No

<b>Recommendation</b>	<b>Agency<sup>a</sup></b>	<b>Within Scope of 10(j)?</b>	<b>Annual Cost</b>	<b>Staff Recommending?</b>
800 cfs to 1,000 cfs except during the spring spawning season for aquatic species when flows should be in the range of 1,500 cfs to 1,800 cfs.				
3. Provide recommended minimum flows for the Tillery development through the existing sluice gate or via turbine upgrades and refurbishments, if flows cannot be provided through other means. If future turbine upgrades are required, turbines capable of providing minimum flows of 800 to 1,000 cfs should be installed.	FWS	Yes	\$0	No, Progress Energy already has the capability to release up to 1,000 cfs through the existing sluice gate
4. Develop a temporary means of releasing the minimum flows from the Tillery development if a permanent mechanism for release of flows through turbine operations cannot be constructed or established within 1 year of license issuance.	NMFS	Yes	\$0	No, Progress Energy already has the capability to release up to 1,000 cfs through the existing sluice gate
5. Release a minimum flow from the Blewett Falls development of 1,200 cfs from June 1 through January 31, 2,400 cfs from February 1 to May 15, and 1,800 cfs from May 16 to May 31 within one year following license issuance.	FWS NMFS	Yes	\$105,000	Yes

<b>Recommendation</b>	<b>Agency<sup>a</sup></b>	<b>Within Scope of 10(j)?</b>	<b>Annual Cost</b>	<b>Staff Recommending?</b>
6. Implement maximum ramp down rate of 1 foot per hour from Blewett Falls dam during critical spawning periods as an interim measure until specific ramping down schedule is developed.	FWS	Yes	\$0	No, the ramping protocol proposed in the Yadkin Settlement would achieve the same objectives
7. Prepare and submit an Instream Flow and Habitat Protection, Mitigation, and Enhancement Plan to implement flow regimes within 1 year of license issuance.	NMFS	No, not a specific measure to protect fish & wildlife. (10[a])	\$0	No
8. Develop a Drought Contingency Plan for Tillery and Blewett Falls developments if the comprehensive settlement agreement is not signed or the Low Inflow Protocol is not completed.	NMFS	Yes, because the plan provides for the protection of fish.	\$0	Yes
9. Implement adaptive management approach for instream flows - implement, evaluate, and revise flows following outline by Richter et al., 2006.	NMFS	No, not a specific measure to protect fish & wildlife. (10[a])		No
10. Install trashracks with bar spacing not exceeding 2.5 inches in front of the turbine intakes at the Tillery and Blewett Falls developments.	FWS	Yes	\$119,060	No, existing bar spacing at the two developments already meets the FWS criteria
11. File a Diadromous Fish Monitoring Plan including protocols to characterize populations of diadromous	NMFS	Yes	\$8,750	Yes

Recommendation	Agency <sup>a</sup>	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
target species returning to Blewett Falls dam, estimation of target species (initially shad) passing downstream at Blewett Falls, and monitoring of American eel population dynamics and movements at the Tillery and Blewett Falls dams. Should also monitor response of target diadromous and resident species to instream flows.				
12. Adopt the Fish Passage Agreement for the Yadkin-Pee Dee River and Yadkin Projects, draft of 4/4/07.	South Carolina DNR	Yes	\$0	Yes, we are recommending the main provisions of this agreement
13. Prepare a bald eagle management plan including annual monitoring within 2 years following license issuance.	FWS	Yes	\$10,530	Yes
14. Develop an RTE species management plan for the Yadkin River goldenrod including mitigating actions, implementation timeline, and monitoring. Specifically:	FWS	No, not a specific measure to protect fish and wildlife. (10[a])	\$8,960	No, this species is not located within the project boundary
<ul style="list-style-type: none"> <li>• Address encroaching vegetation;</li> <li>• Characterize habitat requirements and compare to pre-impoundment hydrologic conditions; evaluate operations to approximate pre-impoundment conditions;</li> </ul>				

Recommendation	Agency <sup>a</sup>	Within Scope of 10(j)?	Annual Cost	Staff Recommending?
<ul style="list-style-type: none"> <li>Evaluate project effects on distribution of sediments, woody debris, and nutrients; and</li> <li>Evaluate options for creating additional habitat in currently unoccupied but potentially suitable areas.</li> </ul>				
15. Maintain traditional level of tailwater access that the public has enjoyed in the past.	FWS	No, not a specific measure to protect fish and wildlife. (10[a])	\$0	Yes

<sup>a</sup> In lieu of specific 10(j) measures, North Carolina WRC and South Carolina DNR are signatories of the settlement agreements, which they state in their letters is protective of their fish and wildlife interests.

<sup>b</sup> FWS did not specify that these minimum flows should be released on a daily average basis, and that they should be provided within 6 months of license issuance.

<sup>c</sup> We assume that NMFS intended the 725 cfs for American shad spawning to be implemented after American shad are present in the reach downstream of Tillery dam, consistent with the Yadkin-Pee Dee Settlement. NMFS also notes that higher spring flows would be provided for an 8 week period as determined by an agency team which is also consistent with the intent of the Yadkin-Pee Dee Settlement.

### Trashracks

We do not recommend installation of trashracks with bar spacing not exceeding 2.5 inches as recommended by FWS because there is no indication that entrainment is having significant adverse effects on the resident fish populations. The Project reservoirs and riverine reaches support robust fish populations, and there is an excellent sport fishery. Alcoa Generating's developments have wider trashrack spacing that would theoretically allow more fish to enter the turbine generators, but Alcoa Generating's desktop entrainment analysis concludes that the potential for adverse effects on fish populations at the four Yadkin Project developments is low. Based on the species composition, the intake configurations, and the type of turbine generators (generally large, slow-speed units), we conclude that the potential effects on fish populations at the Yadkin Project developments would be minor, and there appears to be little basis for requiring a change to narrower spaced trashracks at this time. The trashrack spacing is

currently 2.6 inches at Tillery and 1.6 inches at Blewett Falls, and this essentially already meets or exceeds FWS's recommendation. We estimate that replacing the trashracks at the six developments would have a capital cost of \$1,255,000 and an annualized cost of \$174,250. These are relatively high costs to the Projects for measures that appear to have little biological basis. For these reasons, we made a preliminary determination in the draft EIS that these recommendations are inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard of section 10(a) of the FPA.

On December 5, 2007, Commission staff and FWS staff (representing the U.S. Department of the Interior), conducted a teleconference on 10(j) matters concerning the Yadkin and Yadkin-Pee Dee River Projects. After discussion, FWS staff agreed with Commission staff's conclusion reached in the draft EIS that the current trashracks do not need to be replaced with trashracks having a clear-bar spacing of 2.5 inches. This issue is resolved.

### **Minimum Flows**

We recommend the seasonally adjusted minimum flows downstream of the Tillery development included in the Yadkin-Pee Dee Settlement and as recommended by NMFS. Our recommendation differs from that recommended by FWS and other parties.

Our analysis indicates that our recommended minimum flow would substantially improve aquatic habitat downstream of Tillery, compared to existing conditions, and would provide similar habitat value as the minimum flows recommended by FWS, for the species and habitat types examined. For shad spawning, which is a stated objective for higher minimum flows in this reach (although shad do not currently spawn in the reach), the Yadkin-Pee Dee Settlement flows would provide a relatively high percentage of maximum habitat in most of the riverine reach downstream of Tillery, but a somewhat lower percentage in the 5-mile subreach immediately below Tillery dam. The FWS flows would provide a somewhat higher percentage of maximum habitat in subreaches 1 and 2, and substantially greater habitat in subreach 3. For golden redhorse adults and juveniles, which were used as a surrogate evaluation species for the uncommon Carolina redhorse, a federal species of concern, the FWS flows would generally provide somewhat more habitat than the Yadkin-Pee Dee Settlement flows, although in some subreaches the Yadkin-Pee Dee Settlement flows would provide greater habitat. Although a few Carolina redhorse have been collected downstream of Tillery, the species is not a major component of the fish community in the reach. For all species/life stages/study reaches combined, the proposed flows would provide 75 percent of maximum habitat, compared to 52 percent of maximum habitat for existing conditions, and 73 percent of maximum habitat for the FWS/American Rivers flows. During the rest of the year, the proposed flows would provide 65 percent of maximum habitat, compared to 48 percent for existing conditions, and 80 percent for the FWS/American Rivers flows.

Implementing FWS's recommended flow would cost \$1,227,500 per year, while our recommended flow would cost \$535,000 per year or about \$692,500 less per year.

Both the proposed and the FWS alternative minimum flows would provide enhanced habitat conditions over current project operations. However, we see no great advantages from a habitat perspective of the FWS recommended flows for the reach below Tillery dam. We conclude that the potential environmental benefits would not outweigh the cost of implementing FWS's recommended flows. For these reasons, we made a preliminary determination in the draft EIS that this recommendation is inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard of section 10(a) of the FPA.

This issue was discussed in the December 5, 2007, teleconference between Commission and FWS staff, but both Commission and FWS staff maintained their earlier recommendations, and this issue was not resolved.

### **Sluice Gate**

We do not recommend installation of additional measures or turbine modifications capable of providing 800 to 1,000 cfs continuous year-round minimum flow below Tillery dam as recommended by FWS and NMFS. Progress Energy already has the capability to release up to 1,000 cfs through an existing trash gate, and it proposes to release the Tillery minimum flow through this gate. Although costs were not estimated for installation of other measures (additional gates) or for turbine modifications, these costs would be unnecessary, because Progress Energy already has the capability to release minimum flows through an existing gate. For these reasons, we made a preliminary determination in the draft EIS that this recommendation is inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard of section 10(a) of the FPA.

This issue was discussed in the December 5, 2007, teleconference between Commission and FWS staff, and FWS now concludes that a combination of flows could be released by the existing sluice gate and by generation flows that would be capable of providing its recommended minimum flows below Tillery dam. This issue is resolved.

### **Ramping Rate**

We recommend adopting the downramping procedures described in the Yadkin-Pee Dee Settlement. These procedures provide a sequence for taking units off-line as follows: (1) after the first generating unit is taken off line, the second unit may not be taken off line until 2 hours after the first unit; (2) after the second generating unit is taken off line, the third unit may not be taken off line until 4 hours after the second unit; and (3) after the third generating unit is taken off line, the fourth unit may not be taken off line until 6 hours after the third unit.

We do not recommend adopting FWS's interim downramping rate of no more than 1-foot-per-hour change in water surface elevation, until specific downramping rates are determined by the parties. It is not clear to us that this additional downramping requirement is necessary, as the proposed sequence of shutdowns may already result in a

downramping rate similar to that recommended by FWS. Although further hydraulic analysis of this shutdown sequence would be required at specific locations downstream of Blewett Falls, this would be an appropriate investigation to include under the flow adjustment provision of the Yadkin-Pee Dee Settlement, which would address appropriate ramping rates during the spring spawning period. For this reason, we made a preliminary determination in the draft EIS that this recommendation is inconsistent with the public interest standard of section 4(e) and the comprehensive planning standard of section 10(a) of the FPA.

This issue was discussed in the December 5, 2007, teleconference between Commission and FWS staff, and FWS agreed with staff's conclusions reached in the draft EIS that the proposed project operation (i.e., sequence of turbine shutdowns) would (1) approximate the downramping rate recommended by FWS, (2) be field tested by testing specific downstream sites, and (3) ensure that FWS's active planning and participation on the Spawning Flow Management Team would verify the ramping rate is appropriate to enhance fish spawning conditions downstream from Blewett Falls dam. This issue is resolved.

### **Recommendations under Section 10(a) of the FPA**

We have analyzed recommendations filed by FWS and NMFS that we consider outside the scope of section 10(j) under section 10(a) of the FPA. Table 59 identifies the two measures for the Yadkin Project and the four measures for the Yadkin-Pee Dee River Project that we consider under section 10(a). These measures are addressed in the specific resource sections of this document. Five of the measures considered under 10(a) were recommended for implementation by staff. Staff did not recommend under 10(a) that an RTE plan be developed for the Yadkin River Goldenrod at the Yadkin-Pee Dee River Project because the goldenrod is not known to exist within the project boundary.

## **5.3 CONSISTENCY WITH COMPREHENSIVE PLANS**

Section 10(a)(2) of the FPA requires the Commission to consider the extent to which a project is consistent with federal and state comprehensive plans for improving, developing, and conserving waterways affected by a project. Under this section, federal and state agencies filed a total of 44 qualifying comprehensive plans, of which we identified 9 North Carolina and 8 federal that are applicable to the Projects. The continued operation of the Yadkin and Yadkin-Pee Dee River Projects as recommended in this EIS is consistent with the 17 state and federal plans listed below that are applicable to the Projects.

### **North Carolina**

North Carolina Department of Environment, Health & Natural Resources. 2002.  
Basinwide assessment report: Yadkin River Basin. Raleigh, NC. June 2002.

- North Carolina Department of Environment, Health & Natural Resources. 2000. Subchapter 2B-Surface water and wetland standards. Raleigh, NC. August 1. 107 pp.
- North Carolina Department of Environment, Health & Natural Resources. 2003. Yadkin-Pee Dee River Basinwide water quality management plan. Raleigh, NC. February.
- North Carolina Department of Environment, Health & Natural Resources. 2004. Yadkin-Pee Dee River Basin (Classifications and Water Quality Standards). Raleigh, NC. August 1.
- North Carolina Department of Environment, Health & Natural Resources. 2000. Water Quality Progress in North Carolina 1998-1999 305(b) Report. Raleigh, NC. April.
- North Carolina Department of Environment and Natural Resources. 1995. North Carolina Outdoor Recreation Plan, 1995 - 2000. Raleigh, North Carolina. September.
- North Carolina Wildlife Resources Commission. 2005. Fisheries and wildlife plan for the Yadkin River basin. Raleigh, NC.
- North Carolina Wildlife Resources Commission. 2005. North Carolina Wildlife action plan. Raleigh, NC.
- Southern Appalachian Forest Coalition and Pacific Rivers Council. No date. Protection of aquatic biodiversity in the Southern Appalachian National Forests and their watersheds. 27 pp.

### **United States**

- Atlantic States Marine Fisheries Commission. 1998. Interstate fishery management plan for Atlantic striped bass. (Report No. 34). January.
- Forest Service. No date. Cherokee National Forest land and resource management plan. Department of Agriculture, Cleveland, TN. 193 pp. and appendices.
- National Marine Fisheries Service. 2000. Fishery Management Report No. 36 of the Atlantic States Marine Fisheries Commission: Interstate Fishery Management Plan for American eel (*Anguilla rostrata*). Prepared by the American Eel Plan Development Team. April. 78 pages.
- National Marine Fisheries Service. 1999. Fishery Management Report No. 35 of the Atlantic States Marine Fisheries Commission: Shad and river herring [includes alewife (*Alosa pseudoharengus*), blueback herring (*Alosa aestivalis*), Alabama shad (*Alosa alabamae*), American shad (*Alosa sapidissima*), and Hickory shad (*Alosa mediocris*)] - Amendment 1 to the Interstate Fishery Management Plan for shad and river herring. April. 77 pages.

National Marine Fisheries Service. 2000. Technical Addendum 1 to Amendment 1 of the Interstate Fishery Management Plan for shad and river herring. February 9. 6 pages.

National Park Service. 1982. The nationwide rivers inventory. Department of the Interior, Washington, DC. January.

U.S. Fish and Wildlife Service. Canadian Wildlife Service. 1986. North American waterfowl management plan. Department of the Interior. Environment Canada. May.

U.S. Fish and Wildlife Service. No date. Fisheries USA: the recreational fisheries policy of the U.S. Fish and Wildlife Service. Washington, DC. 11 pp.

We also consider other relevant plans including:

U.S. Fish and Wildlife Service, National Marine Fisheries Service, North Carolina Wildlife Resources Commission, and South Carolina Department of Natural Resources. 2006. Restoration plan for the diadromous fishes of the Yadkin-Pee Dee River basin, North Carolina and South Carolina.

U.S. Forest Service. 1986-2000. Croatan and Uwharrie National Forests Land and Resource Management Plan. Department of Agriculture, Montgomery County, North Carolina. May 1986.