

**Yadkin Project (FERC No. 2197)
Fish and Aquatics Issue Advisory Group
April 5, 2005**

**Alcoa Conference Center
Badin, North Carolina**

Final Meeting Summary

Meeting Agenda

See Attachment 1.

Meeting Participants

See Attachment 2.

Welcome and Introductions

Wendy Bley, Long View Associates, opened the meeting with a review of the agenda and introductions. She introduced Rick Simmons, Normandeau Associates, who reviewed the Fish and Aquatic Habitat Assessment, Tailwater Fish and Aquatic Biota Habitat Assessment, and Fish Entrainment draft reports (See Attachment 3 – Meeting Presentation).

Fish and Aquatic Habitat Assessment

Rick explained that the objectives of the Fish and Aquatic Habitat Assessment were to map the existing aquatic habitat in the drawdown zones of High Rock and Narrows reservoirs and the littoral zones of Tuckertown and Falls reservoirs and to evaluate the impacts of existing fluctuating water levels on habitat. He also described the study methodologies.

Before presenting the study results, Rick explained that because of technical difficulties (Normandeau had trouble matching up the contour lines in the coves at High Rock on the GIS) that had since been fixed, some of the habitat information for High Rock Reservoir in the draft report would change. Lawrence Dorsey, NC Wildlife Resources Commission, asked if the calculations of available habitat at various reservoir drawdown levels (presented in 2-ft intervals) are correct. Rick replied yes.

Rick was asked when the ArcView files would be made available to the IAG. Wendy Bley explained that the ArcView files would be made available with the final study report.

Rick showed Table 4.2-1 from the report. He commented that the habitat in High Rock Reservoir is primarily mud/sand/clay (the default substrate). He said that a large percentage of the high quality habitat is wetlands. Rick noted again that these habitat numbers will change with the additional analysis of upper coves not previously included. Rick demonstrated the habitat

information available from the ArcView files. He was asked if the ArcView files will also include bathymetry data and he answered yes, at 2-ft intervals.

Rick showed Table 4.2-4 from the report, which describes the habitat mapped within the lower Yadkin River and its confluence with High Rock Reservoir. Rick noted that when High Rock Reservoir is drawn down 15-ft it is only down about 2-ft at the upper confluence.

Rick explained that Normandeau had also mapped significant erosion, defined as eroding areas 25-ft or longer, on the Project reservoirs. Table 4.2-27 describes the amount of erosion on High Rock Reservoir, which is a total of 5.3 acres. Larry Jones, High Rock Lake Association, asked how Normandeau had computed the acreages. Rick explained that the field crew drew polygons around the eroding areas and that Normandeau has calculations of linear feet, square feet, miles, and acres. Larry asked if areas that had been rip-rapped were included as eroding areas. Rick said no, but that rip-rapped areas had been mapped so the information is available.

Next, Rick discussed the habitat assessment at Tuckertown Reservoir, which was limited to the littoral zone. Rick noted that there was no bathymetry data available for Tuckertown. Chris Goudreau, NCWRC, asked if Normandeau could assume a slope of x to provide perspective. Rick said that he would be uncomfortable using this method for Tuckertown and Falls, but that he could do it if it were requested by the IAG.

Rick said that there is 261-ft of erosion on Tuckertown Reservoir. Larry Jones commented that the minimal erosion is a testament to the stable water levels on Tuckertown Reservoir. Todd Ewing, NCWRC, commented that there is also no shoreline development on the reservoir.

Next, Rick discussed the total habitat available (in acres and percent) within the upper 16 feet of Narrows Reservoir (Table 4.4-1 in the draft report). Generally, Narrows offers more cover than High Rock. Larry Jones commented that the numbers had surprised him because he had always thought of Narrows as a gravel pile.

Rick stated that there is less than one acre (0.92 acres) of erosion on Narrows Reservoir (Table 4.4-6).

Rick described the habitat mapped at Falls Reservoir (Table 4.5-2). He noted that there is no estimate of areas classified as low quality habitat mud/sand/clay.

Rick discussed the impacts of Project operations on aquatic biota and habitat in the four Project reservoirs. He identified the following impacts to habitat in High Rock:

- fluctuating water levels, daily and seasonal, have greatest impact on habitat
- most of the high quality habitat exists in upper six foot of drawdown – 91 percent is wetland types
- fall and winter drawdown is eight months; summer has a slow 5-ft drawdown
- habitat in the lower Yadkin River section is not impacted as much by drawdowns

Rick also identified the following impacts to aquatic biota in High Rock:

- fish spawning mostly occurs in April – May in the upper 6-ft of the drawdown (He noted that APGI tries to maintain water levels during this time to prevent the dewatering of eggs)
- a 5-ft summer drawdown and fall and winter 12-ft drawdown exposes young fish to predation
- current drawdown benefits larger predators
- macroinvertebrates are adversely impacted by drawdowns

Rick said that Normandeau had evaluated the effects of three different water level scenarios on aquatic habitat and biota in High Rock Reservoir. Generally, the three alternatives were: 1) near full pond year round; maintained within 3-ft of full, 2) extended near full season; a 10-ft average drawdown, refill in March rather than April, drawdown in November rather than September, and 3) additional use of storage; drawdown of 20-ft rather than 13.5-ft, same refill and drawdown as existing schedule, but refilling to 5-ft of full pond.

Rick characterized what is anticipated to happen under each alternative:

Near Full Year Round	<ul style="list-style-type: none"> - fish and other aquatic biota have access to high quality habitats year round - results in the development of emergent wetlands and aquatic beds, which provides cover and feeding opportunities for fish and aquatic biota - sunfish spp., forage spp. (shads) and aquatic insects would all benefit – insects would provide a primary food source for many species of aquatic biota - black willow that has colonized in the upper reservoir may be eliminated but water willow could colonize some of this area – delta area may become less stable - current drawdown has benefited the larger predators and kept the sunfish and other species in check - species composition will change, but difficult to predict - potential to have an overabundance of sunfish and other undesirable fish e.g. carp
Extended Near Full Season	<ul style="list-style-type: none"> - near full pond refilled in March and drawn down 10-ft in November is an improvement compared to existing operations - improved spawning of management species (bass, crappies, shad) will result from March fill up - extending full pond to November will help increase survival rates of young fish - young fish still exposed to winter predation, but at a reduced level because they were not pulled from cover when they were most vulnerable in early summer - percent composition of current fish populations would probably remain the same because it is similar to existing drawdown - game fish (crappie, bass, bluegill) would continue to dominate catches and gizzard and thredfin shad would also do well - emergent wetlands (water willow) would likely develop and may be able to persist though a winter drawdown. Black willow in the delta may decline somewhat
Additional Use of Storage	<ul style="list-style-type: none"> - this alternative would be the most detrimental to fish and aquatic biota - refilling within 5-ft of full pond exposes most of the high quality habitat found in the upper 6-ft of the drawdown

	<ul style="list-style-type: none"> - 20-ft drawdown would cause higher mortalities during winter - detrimental to existing wetlands, including remnant in-pond wetlands around periphery of reservoir
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Rick identified the following impacts of operations on aquatic biota and habitat at Narrows Reservoir:

- fluctuations in water elevations have the greatest impact to habitat in Narrows, but minor compared to High Rock
- current drawdown averages 2-3-ft year round; exception occurred during 2002 drought when water levels were down nearly 10-ft in the summer, early fall period
- daily fluctuations average <1 ft and are rare during spring spawning season
- refilling the reservoir in March benefits spawning for many fish species
- in most years, fish and aquatic biota had access to water willow beds and other cover along the shoreline
- no prolonged drawdown and small average drawdown have allowed important wetland habitat to persist
- quality of water from Tuckertown adversely impacts aquatic biota in Narrows

Rick briefly discussed the alternative water level operating scenario at Narrows. The alternative considered at Narrows includes a winter drawdown of up to 15-ft and summer fluctuations that may become more routine and deeper (5 to 10-ft). Rick described the probable impacts to the habitat and aquatic biota in Narrows Reservoir under the alternative operating scenario:

- a greater drawdown would adversely impact existing wetlands
- water willow would be exposed to freezing and desiccation during the winter drawdown, reducing its acreage
- summer fluctuations would prevent fish from using most of the water willow beds for cover
- a combination of summer and winter drawdowns could cause water willow to decline and fish and aquatic biota would also decline

Rick identified the following impacts of operations on aquatic biota and habitat at Tuckertown Reservoir:

- fluctuations have a limited impact on habitat and biota
- water levels are stable during the peak spawning period (April-May)
- largest impact on biota is the quality of water from High Rock

Rick explained that if Tuckertown Reservoir is operated with short-term fluctuations of 3 to 5-ft rather than the current 1 to 2-ft:

- there could be negative impacts to fish that spawn in shallow water during the spring
- there could be a reduction in the diversity and extent of the aquatic beds and emergent wetlands
- water willow may expand, but at the detriment of other species that cannot withstand fluctuations.

Rick concluded his presentation with a discussion of the impacts to habitat and aquatic biota in Falls Reservoir:

- water level fluctuations have a limited impact on habitat and biota
- potential impacts to spring spawning
- quality of water from Narrows adversely impacts the fish and aquatic biota in Falls

After presenting the results of the study, Rick solicited any questions or comments. John Ellis, US Fish and Wildlife Service, commented that there are other species, for example birds that also benefit from fuller reservoirs. John also asked about erosion on Tuckertown Reservoir (limited to only 261-ft). Rick stated that it is possible that the wetlands on Tuckertown buffer the wave action on the reservoir and reduce erosion. Lawrence Dorsey noted that there is also more boulder/rock at Tuckertown.

Chris Goudreau asked about the differences in study methodologies on Tuckertown and Falls as opposed to High Rock and Narrows. Rick explained that Normandeau assessed the drawdown zones at High Rock and Narrows and the littoral zones (about 2 to 3-ft down) at Tuckertown and Falls. Rick added that the field crews mapped habitat at Tuckertown and Falls down into the water as far as they could see. Chris also asked that the final report include a summary table for each 2-ft drop in elevation at all four Project reservoirs that shows the number of exposed acres for each habitat type.

Tailwater Fish and Aquatic Biota Assessment

After a break, Rick explained that the objectives of the Tailwater Fish and Aquatic Biota Assessment were to describe the tailwater habitats at the Project; inventory and assess the resident fish community in the tailwaters seasonally – spring, summer, and fall/early winter to develop baseline data; and evaluate impacts of existing operations on the tailwater fish communities. The assessment also included searches for rare, threatened, and endangered fish and mussel species.

Rick summarized the results of the assessment:

High Rock tailwater	<ul style="list-style-type: none"> - 10 most abundant species represent 85 percent of the total catch from all three seasons sampled - 3 most abundant species (bluegill, white perch, channel catfish) represent 40 percent of the total catch - bluegill was the most abundant species captured during all three seasons combined - greatest species richness during the spring sampling period - dramatic increase in numbers of quillback during the spring sample versus summer and fall seasons - common carp among 10 most abundant species in High Rock tailwater
Tuckertown tailwater	<ul style="list-style-type: none"> - 10 most abundant species represent 84 percent of total catch from all three seasons sampled - 3 most abundant species (bluegill, gizzard shad, white perch) represent 50 percent of total catch

	<ul style="list-style-type: none"> - bluegill was most abundant species captured during all three seasons combined - greatest species richness during the fall period
Narrows tailwater	<ul style="list-style-type: none"> - 10 most abundant species represent 91 percent of total catch from all three seasons sampled - 3 most abundant species (white perch, gizzard shad, bluegill) represent 53 percent of total catch - white perch was the most abundant species captured during all three seasons sampled - greatest species richness during the spring period - blueback herring among ten most abundant species during the three season sampled
Falls tailwater	<ul style="list-style-type: none"> - 10 most abundant species represent 84 percent of total catch from all three seasons sampled - 3 most abundant species (gizzard shad, redbreast sunfish, bluegill) represent 40 percent of the total catch - gizzard shad was the most abundant species captured during all three seasons combined - greatest species richness during the spring period - shorthead and silver redhorses were more abundant in the Falls tailwater than an of the other three tailwaters

Rick also described the proportional and relative stock densities and the relative weight values for selected species within each of the four tailwaters.

Rick noted that small numbers of striped bass were present in the High Rock tailwater during all three sampling periods. Lawrence Dorsey commented that the NCWRC stocks the same density of striped bass in Tuckertown and Narrows reservoirs (the High Rock and Tuckertown tailwaters respectively). Lawrence noted that the striped bass are tolerating higher temperatures up to 29°C.

Chris Goudreau said that he was surprised that bluegill were so abundant in the Tuckertown tailwater while the numbers of redbreast sunfish were so low. Rick said that redbreast sunfish are abundant in the Falls tailwater where there is much better water quality. Rick added that the bluegill is a good generalist.

Continuing, Rick said that in a response to a question posed by Gerrit Jobsis, SC Coastal Conservation League and American Rivers, Normandeau evaluated the impact of low DO water on the fish community. He explained that there were two dates when Normandeau sampled (electrofished) for fish when dissolved oxygen (DO) concentrations changed at least 2 mg/l or greater within a 24 hour period in the Narrows tailwater (August 30 - September 1, 2003 and November 7-8, 2003). During the August/September 2003 sampling, Rick concluded that there is no significant difference ($p=0.0502$) in the number of fish species using the tailwater during low (in this case 1.6 to 1.7 mg/l) and normal (in this case 5.2 to 6.0 mg/l) DO conditions. Rick said that of the 18 species captured, 15 had fewer individuals captured during the low DO period. He said that it is not known if the fish moved out of the tailwater are or slowed/ceased their movements making them less likely to be captured. Chris Goudreau noted that there is a typographical error on page 43 which reads $p=0.5017$. Chris also asked what kind of statistical test was run since the report did not describe it in the methods section. He said that he was

surprised that 15 of the 18 species showed a change and the test was considered not significant. Lawrence Dorsey added that many field studies use $P=0.10$ as a level of significance.

During the November 7-8, 2003 electrofishing, there was a significant difference in the number of species captured during the normal (6.5 to 6.7 mg/l) and low (3.3 to 3.4 mg/l) DO periods $p=0.0195$. Rick said of the 21 species captured, 12 had fewer individuals collected during the low DO sample period. Again, Rick said that it is not known if the fish moved out of the tailwater area or slowed/ceased their movements. Lawrence Dorsey asked about the sequence of the samples. Rick explained that the electrofishing was conducted first then Normandeau went back and looked at the monitors and available data and chose the dates and times to evaluate.

Rick commented that the Project has shaped the fish population. Chris Goudreau asked that it be stated explicitly in Section 5.6 of the report that activity definitely slows down during times of low DO.

Regarding the searches for the RTE fish species, Rick said that no robust or Carolina redbreast species were captured in the Project area despite intense searches of preferred habitat types in the Falls tailwater during the spring spawning period. Lawrence Dorsey commented that he does not think the robust redbreast will be found above Blewett Falls.

Todd Ewing asked that graphs showing the percent composition of each species for each tailwater and sampling season be included in the final report.

Next, Rick discussed the inventory and assessment of macroinvertebrates and mussels in the Project tailwaters. Macroinvertebrates were sampled in September and November 2003 and June 2004. A total of 6 phyla, 24 orders, and 41 families were represented by 90 species collected in the four tailwaters. The Falls and Narrows tailwater benthic fauna collections both ranked poor during the spring and fair during the summer and fall sampling while the High Rock and Tuckertown tailwater benthic fauna ranked poor in all three seasons.

Rick described the mussels found in the Project tailwaters. No federally listed mussel species were collected in the Project area, but the alewife floater and eastern lamp mussel (considered threatened by NC), the Pee Dee lance (considered endangered by NC), and the eastern creekshell (considered significantly rare by the NC Heritage Program) were found. Todd Ewing asked that length information for the mussels be included in the final report. Rick said that Normandeau had collected this information and could include it in the final report.

In conclusion, Rick identified some impacts of Project operations on the fish and aquatic biota in the Project tailwaters:

- low DO levels in the tailwaters are considered the greatest impact to aquatic life
- project peaking operations also impact aquatic life in the tailwaters by interrupting flows, feeding cycles, spawning, and causing rapid changes in water quality
- stranding due to peaking operation was not evident at any of the four tailwaters
- studies have reported that when low tailwater DO was increased, a steady improvement in the fish community (diversity) was documented over time (Scott 1999)

- the macroinvertebrate rankings at High Rock and Tuckertown (poor for all three seasons) is related to the poor water quality in these tailwaters. At Narrows and Falls two of the three seasons ranked fair due to the better water quality
- similar water quality impacts were noted for the mussel species – most of the mussel species were found at Falls and Narrows

Chris Goudreau questioned the timing of the fish sampling at Narrows, which was not conducted during the maximum drawdown possible. He asked if fish stranding might have occurred during the winter. Gene Ellis, APCI Yadkin Division, stated that there is no seasonal drawdown of Narrows Reservoir. Narrows Reservoir can fluctuate 1 to 3-ft over the entire year and Yadkin could draw Narrows Reservoir down 6.6-ft for maintenance purposes. Chris said that if it is proposed that Narrows is operated differently in the future, stranding may occur. Larry Jones commented that the mainstem reservoir and the reservoir arms remained connected during the December 2003 drawdown. Chris asked that a note specific to this issue be added in Section 5.7.

Todd Ewing recommended that the qualitative descriptions of water quality based on the NCIBI not be used when describing the tailwaters. He said that the Project tailwaters are lentic and the NCIBI ratings are based on lotic conditions. Todd suggested that it is okay to keep the quantitative scores in the final report, as long as it is noted that the scores should not be compared to riverine habitats.

Fish Entrainment

Rick explained that the objectives of the Fish Entrainment Evaluation Issues were to evaluate the potential for entrainment of resident fishes (largemouth bass, striped bass, crappies, and sunfish) at the developments and to evaluate the potential for entrainment of diadromous fish species (American shad, eel, and river herring) that may be reintroduced. Rick briefly described the study methodologies.

Rick reviewed the physical and hydraulic characteristics of the turbines at the Yadkin Project. He said that generally about 94 percent of the fish entrained are less than 8 inches. Generally, there are few adult fish that go through the turbines. Entrainment typically occurs when there are high flow events that sweep young fish downstream. Specific to diadromous species, Rick noted that eels have a higher survival rate with Francis turbines (about 84 percent up from 71 percent with Kaplan turbines) – see Table 3-5 in the report.

John Ellis asked if the movements of American Shad are keyed on rain events. Rick explained that it is typically temperature (recognizing that rain can cause a drop in temperature) that signals movement. Based on his experiences, Rick described the difficulties with fish passage. He commented that trap and truck is a good option for the passage of American shad.

Rick stated that while the risk of entrainment is high to moderate-high at each of the four developments the risk of mortality is low (Table 4-1).

In conclusion, Rick discussed the cumulative survival rate of juvenile alosids (shad and river herring) and adult American eels at the Project (Table 4-2). He described a cumulative loss as the

species move downstream through the Project developments. The IAG discussed various passage options. John Ellis commented that nighttime shutdowns are a relatively low cost option for passage of eels. Spills were another option discussed. Rick added that sometimes bottom gates are opened slightly to provide passage, but it proves difficult to then close the gates (there are no bottom gates at the Yadkin Project). It was noted that the USFWS and National Marine Fisheries Service had been petitioned to list the American eel. Rick stated that it is much harder to get eels upstream than it is to get them downstream. He thought the most effective way to move eels downstream was via trap and truck.

Wrap-up and Next Steps

Wendy Bley asked that any additional comments on the three draft study reports be submitted in writing by May 5, 2005.

Attachment 1 – Meeting Agenda

**Yadkin Project
(FERC No. 2197)
Communications Enhanced Three-Stage Relicensing Process**

**Fish and Aquatics
Issue Advisory Group Meeting**

**Tuesday April 5, 2005
Alcoa Conference Center
Badin, North Carolina**

1:00 PM – 5:00 PM

Preliminary Agenda

1. Introductions, Review Agenda
2. Review and Discuss Reservoir Fish and Aquatic Habitat Assessment Draft Report
3. Review and Discuss Tailwater Fish and Aquatic Biota Assessment Draft Report
4. Fish Entrainment Study Draft Report
5. Wrap-up and Next Steps

Attachment 2 – Meeting Participants

Name	Agency/Organization
Chris Goudreau	NC Wildlife Resources Commission
Chris Nelson	NC Wildlife Resources Commission
Don Kretchmer	Normandeau Associates
Donley Hill	US Forest Service
Gene Ellis	APGI, Yadkin Division
Jim Melton	SaveHighRockLake.org
Jody Cason	Long View Associates
John Ellis	US Fish and Wildlife Service
Larry Jones	High Rock Lake Association
Lawrence Dorsey	NC Wildlife Resources Commission
Rick Simmons	Normandeau Associates
Todd Ewing	NC Wildlife Resources Commission
Wendy Bley	Long View Associates

Attachment 3 – Meeting Presentation