Yadkin Project (FERC No. 2197)
Yadkin River Goldenrod (*Solidago plumosa*) Survey

Final Study Plan
September 2004

Background

Alcoa Power Generating Inc. (APGI) is the licensee for the Yadkin Hydroelectric Project. The Yadkin Project is currently licensed by the Federal Energy Regulatory Commission (FERC) as Project No. 2197. This license expires in 2008 and APGI must file a new license application with FERC on or before April 30, 2006 to continue operation of the Project.

The Yadkin Project consists of four reservoirs, dams, and powerhouses (High Rock, Tuckertown, Narrows, and Falls) located on a 38-mile stretch of the Yadkin River in central North Carolina. The Project generates electricity to support the power needs of Alcoa's Badin Works, to support its other aluminum operations, or is sold on the open market.

As part of the relicensing process, APGI prepared and distributed, in September 2002, an Initial Consultation Document (ICD), which provides a general overview of the Project. Agencies, municipalities, non-governmental organizations and members of the public were given an opportunity to review the ICD and identify information and studies that are needed to address relicensing issues. To further assist in the identification of issues and data/study needs, APGI has formed several Issue Advisory Groups (IAGs) to advise APGI on resource issues throughout the relicensing process.

In a letter dated April 28, 2004, the U.S. Department of Interior, Fish and Wildlife Service (USFWS) requested as part of the FERC relicensing process that Yadkin conduct an evaluation of certain aspects of a rare plant species, Yadkin River goldenrod (*Solidago plumosa*) that is known to exist in the tailwater area of the Narrows development.

In response to this study request, in August 2004, APGI prepared and distributed a draft study plan to the Wetlands, Wildlife and Botanical IAG for review and comment. Comments on the draft study plan were received from the North Carolina Wildlife Resources Commission (8/27/04 email from Todd Ewing). NCWRC comments focused on three areas: 1) expanding the study plan to evaluate hydrologic conditions at extant as well as existing Solidago Plumosa locations; 2) clarifying assumptions that would be made regarding the steady-state reservoir elevation conditions (normal full pool) that would be assumed for all hydraulic modeling work done in the Narrows and Falls tailwater areas; and 3) clarify how the unregulated and regulated hydrologic conditions would be evaluated absent detailed knowledge about the velocity and depth conditions produced at specific plant locations under a range of flow conditions. APGI has addressed these comments in this revised final study plan.

Overview

Solidago plumosa is endemic to the Yadkin River in North Carolina. According to the USFWS, John Kunkell Small originally described the plant from the Narrows Canyon and Falls area of the Yadkin River in 1894. Subsequent to Small's original discovery of the plant the Narrows and Falls Dam were constructed in the Narrows Canyon area in 1917 and 1919, respectively. In 1994, *Solidago plumosa* was rediscovered in two locations along the shorelines and in rock shoals

below Narrows and Falls dams. These sites remain the only known locations where this species currently exists.

Solidago plumosa is currently listed by the USFWS as a Federal Species of Concern (FSC). Over the past several years, APGI, along with Progress Energy and the North Carolina Plant Conservation Program have been working to develop management guidance for this species. However, the species' requirements for seed germination and seedling establishment are not known (USFWS, 2004). According to the USFWS, the species appears to persist in areas subjected to periodic scouring of a velocity sufficient to prevent the establishment of other species without eliminating already established goldenrod plants. At the same time, the species does not appear tolerant of prolonged inundation since it does not occur in frequently flooded habitats.

Issues

In their letter of April 28, 2004, the USFWS indicated that additional information is needed in order to evaluate the status of the Yadkin River goldenrod and to assess potential impacts to the existing plant population which might result from the continued operation of the Yadkin Project. Specifically, the USFWS recommended that Yadkin conduct a study that would examine the relationship between the existing population(s) of *Solidago plumosa* and the operation of the Yadkin Project.

Objectives

Based primarily on the recommendations of the USFWS, the objectives of this study are to:

- Characterize the current hydrologic conditions at extant (existing) *Solidago plumosa* populations
- To the extent possible, compare the location of existing plants to where the plants had been located prior to construction of the Narrows and Falls dams
- Compare the current hydrologic regime at existing plant locations to Project (High Rock) inflow conditions (which would be used to represent "unregulated" river flows)
- Identify measures to improve habitat conditions for the species.

Geographic Extent

The study area will include the Narrows and Falls tailwater areas. For purposes of this study, the Falls tailwater area will be considered the area that is within the hydraulic influence of discharges from the Falls Powerhouse under a normal range (within 2 feet of full) of Tillery Reservoir water levels.

Methods

This study will evaluate unregulated[1] and current (regulated) hydrologic conditions in the vicinity of known locations of *Solidago plumosa.* The primary focus of the study will be on the existing

[1] For purposes of this study, unregulated hydrologic conditions will be the flow that would occur with all existing Yadkin Project developments in place, operating in a run-of-river (outflow equals inflow on a daily basis) mode.

populations, but the study will also consider the historic location of *Solidago plumose*, based on available records of historic of plant locations. APGI will contact the USFWS to obtain information that it has compiled on the historic locations of the plants. Historic plant locations will be recorded in APGI's GIS database and located on maps to be included in the study report.

APGI will also locate existing plants and select representative sites where *Solidago plumosa* is currently growing in the Narrows and Falls tailwater areas. To locate existing plants, Yadkin will enlist the assistance of a qualified botanist with the North Carolina Plant Conservation Program (NCPCP). GPS coordinates for all existing plant locations will be measured and recorded by PB Power and APGI staff and mapped on USGS quad sheets. The locations will also be incorporated into the Yadkin GIS database and located on maps in the study report.

Once the plants have been located, Yadkin and PB Power will meet on site with the NCPCP botanist and agency representatives to select up to 5 representative plant locations in each of the tailwater areas (for a maximum of 10 total). Transects will be established at each of the plant locations, and the elevation of the plants growing along each transect will be established.

After transects have been established, PB Power will develop cross-sectional data, including water depth if appropriate, for each, and will utilize the cross-sections to construct a simple hydraulic model of the Narrows and Falls tailwaters. The hydraulic model will allow PB Power to simulate changes in hydraulic conditions (water surface elevation, depth and velocity) at the representative locations under a range of discharge conditions. Hydraulic model results will be used to determine the flows at which the representative existing *Solidago plumosa* plants are inundated. Since the elevation of the reservoir downstream of the tailwater area being modeled, can affect the water surface elevation of the tailwaters, for purposes of the hydraulic modeling proposed for this study a steady state downstream reservoir elevation will be assumed. Since Falls and Tillery reservoirs normally fluctuate less than 3 feet daily and since normal full pool represents the most typical elevation that would occur during high flow events that have the greatest potential to inundate the plants, a normal full pool condition will be assumed for Tillery and Falls reservoirs for all hydraulic modeling of the Falls and Narrows tailwaters. A minimum threshold flow for inundation of the existing plants will be established for each of the representative plant locations.

Once a minimum threshold flow has been established for each of the representative plant locations, PB Power will evaluate the difference in unregulated and regulated flow conditions at those sites. Specifically, PB Power will utilize the reconstructed "unregulated" and "regulated" USGS gage based 75-year flow datasets developed for the OASIS model to consider the historic hydrologic conditions at the representative plant locations.[2] To do this an IHA (Indicators of Hydraulic Alteration) analysis of both the unregulated and regulated long-term (75 year) flow conditions will be conducted. Results of the IHA analysis will provide statistics on flow conditions in the two tailwater areas which can be used to evaluate differences in the magnitude, frequency and duration of flow conditions between the unregulated and regulated conditions on existing populations of *Solidago plumosa.*

[2] Unregulated and regulated flow datasets have been constructed for the Yadkin River utilizing historic USGS gage data. The resulting datasets will be utilized in the OASIS model.

Reporting

Results of the study will be provided in a draft study report. Once completed the draft study report will be distributed to the Wetlands, Wildlife and Botanical IAG for review and comment. IAG comments will be address and final study report prepared.

Schedule

Identification and location of *Solidago plumosa* plants and selection of representative plant sites and transects will be completed during the 2004 growing season. Hydraulic model development and IHA analysis will be completed during the fall and winter of 2004. It is anticipated that a draft report will be completed in the first quarter of 2005.