

Yadkin-Pee Dee Hydroelectric Project No. 2206

FERC License Flow Requirements
and Reservoir Operations



Tillery Development



Blewett Falls Development

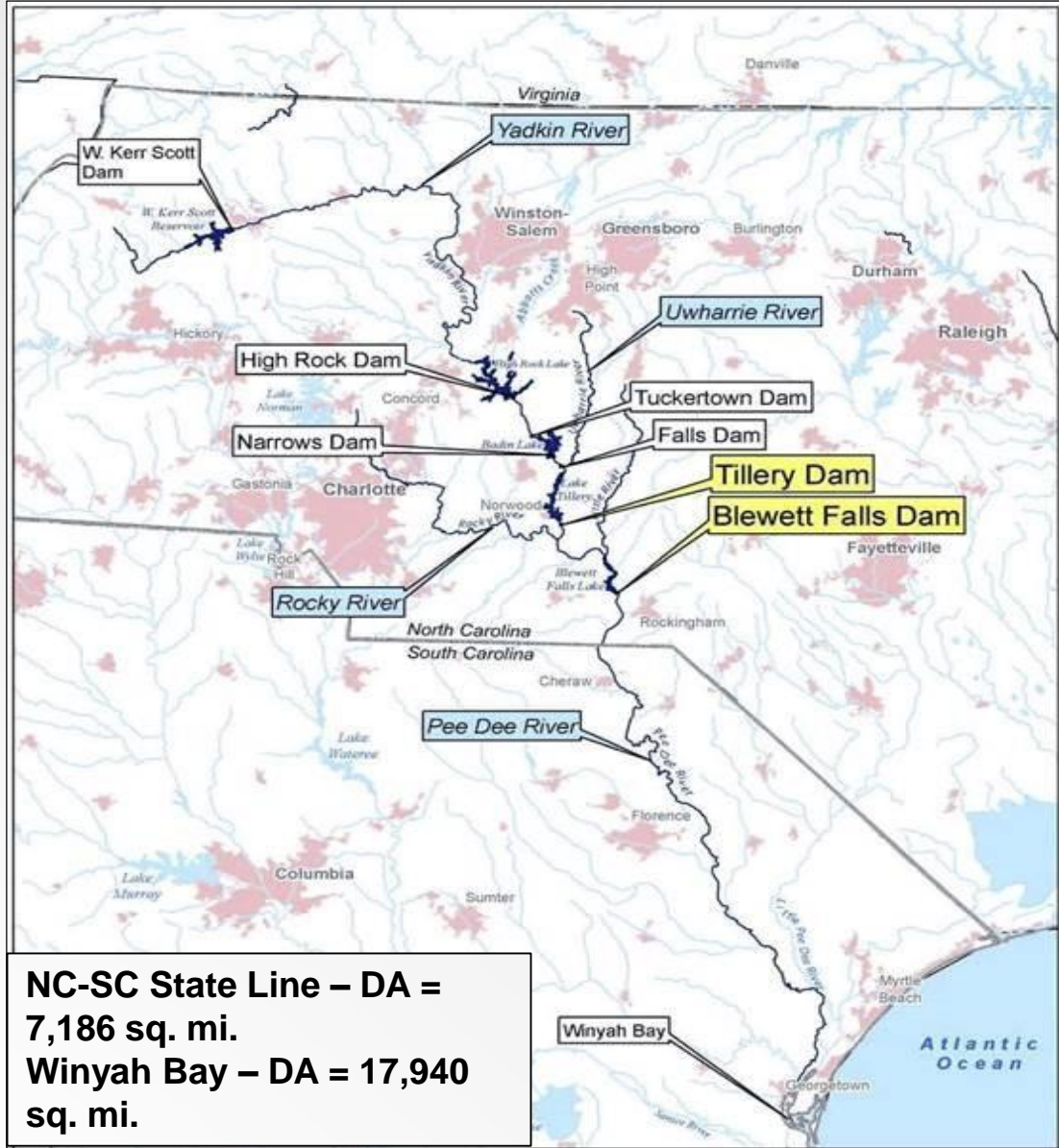
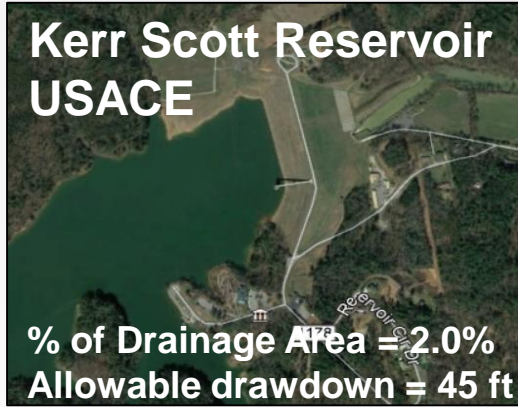


Yadkin-Pee Dee Project Description

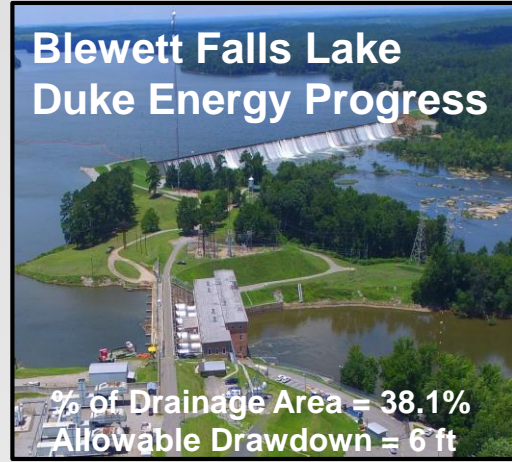
- **Yadkin-Pee Dee Hydroelectric Project consists of the Tillery and Blewett Falls Developments.**
 - Located on Yadkin-Pee Dee River in central North Carolina
 - 105.4 MW of generation capacity (Tillery—81.3 MW and Blewett Falls—24.1 MW)
 - Blewett Falls constructed in 1912; Tillery constructed in 1928
 - Tillery is a peaking and load following facility
 - Blewett Falls is operated as block-loaded and peaking facility
 - Both plants have black start capability
 - Project minimum flow requirements are met through FERC-approved Headwater Benefits Agreement with Cube Hydro Carolinas



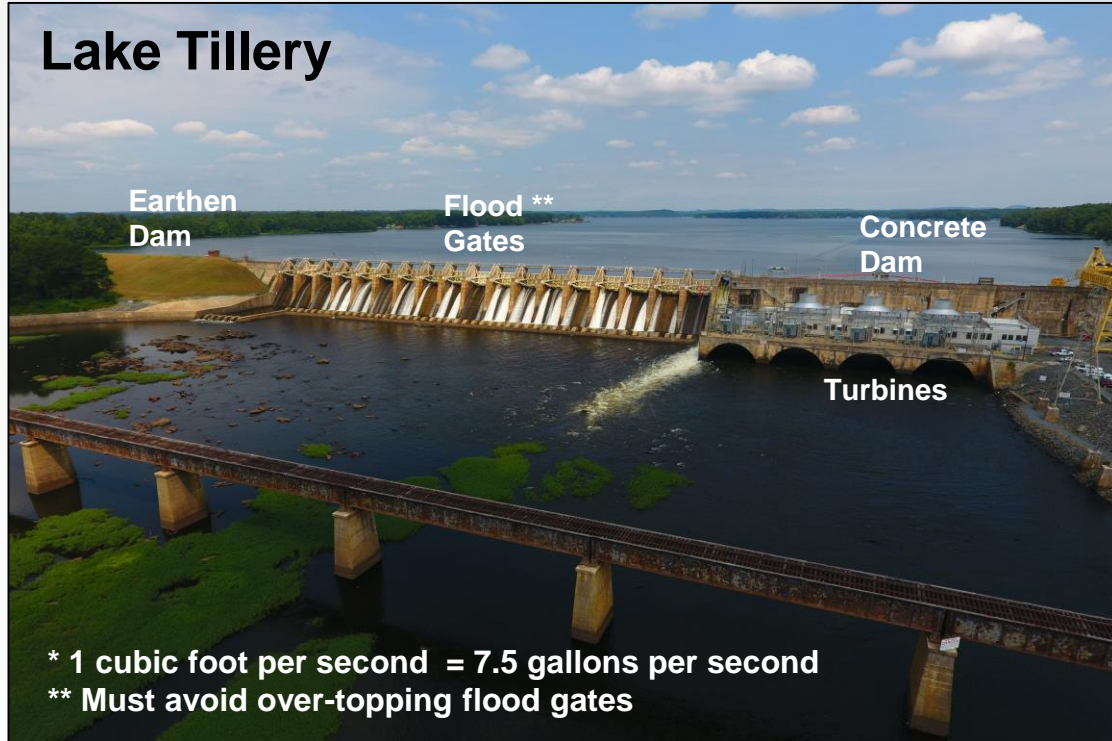
Yadkin-Pee Dee River Basin



- Largest river basin in the Carolinas
- 188 river miles from Blewett Falls Dam to Winyah Bay
- Drainage area (DA) is approximately 40% to NC-SC state line and approximately 60% from state line to Winyah Bay
- River flow travel time is 10-14 days from Blewett Falls Dam to Great Pee Dee River confluence with Waccamaw River, depending upon river inflow conditions



Lake Tillery and Blewett Falls Lake — Flow Management



Moving Water

- **Powerhouse** - 4 hydro turbines at **18,000 cubic feet per second (cfs)*** total
- **Spillway** - 18 flood gates pass all inflow above powerhouse flow capacity when the lake approaches full pond elevation
- **Lake operating levels are regulated by FERC license requirements**



Moving Water

- **Powerhouse** - 6 hydro turbines at **9,200 cubic feet per second (cfs)*** total
- **Spillway** – Obermeyer gate dam spillway passes all inflow above powerhouse flow capacity when the lake reaches full pond elevation
- **Lake operating levels are regulated by FERC license requirements**

Yadkin-Pee Dee Project Relicensing Issues

- **Instream Flow Requirements**
 - Continuous minimum flows (IFIM Study)
 - Flow stabilization periods (below Blewett Falls Plant)
 - Low Inflow Protocol
- **Power Production**
- **Migratory Fish Passage**
 - American shad
 - American eel
 - Blueback herring
- **Water Quality (Dissolved Oxygen)**
- **Lake Level Management**
- **Recreation and Shoreline Management Needs**
- **Rare, Threatened, and Endangered Species**
 - Shortnose sturgeon
 - Atlantic sturgeon
 - Robust redhorse
 - Native mussel species
 - Bald eagle
 - Yadkin River goldenrod
- **Cultural Resources**
- **Other Protection, Mitigation and Enhancement Issues**
 - Conservation of riparian lands and wetlands
 - Tailwaters habitat quality assessment
 - Blewett Falls sedimentation and shoreline erosion

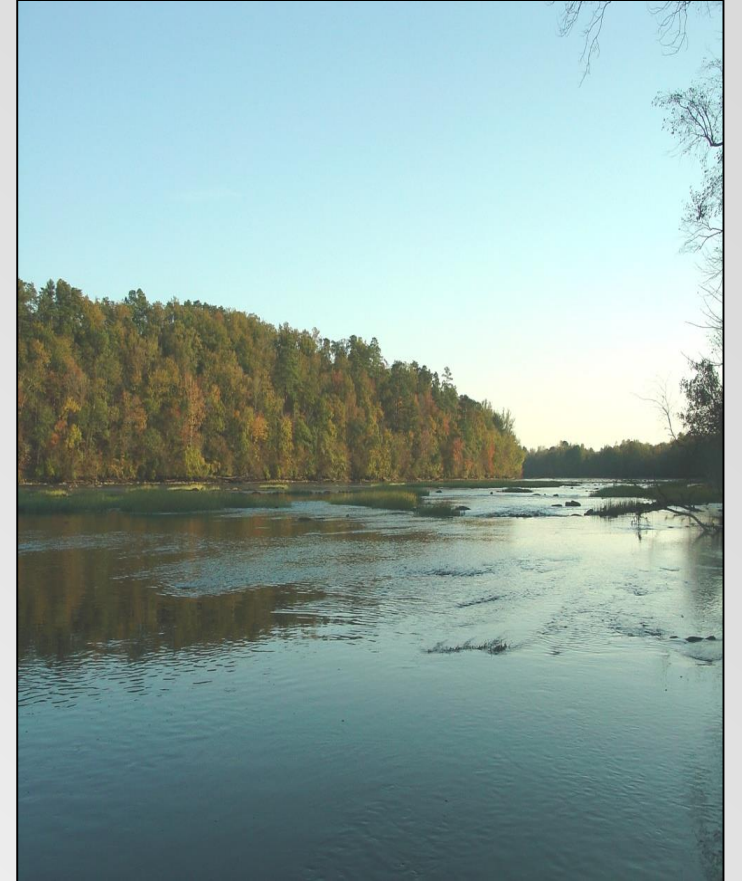
Yadkin-Pee Dee Project — Minimum Flow Requirements

- **Tillery**

- 330 cfs year round
- 725 cfs spring spawning flow for 8 weeks beginning in March with American Shad passage
- Recreation flows – 800/1000 cfs (May-Sep)

- **Blewett Falls**

- Seasonal flow regime
 - 2400 cfs Feb 1-May 15
 - 1800 cfs May 16-May 31
 - 1200 cfs Jun 1-Jan 31
- Flow adjustment periods required at Blewett Falls during spring fish spawning
 - From Feb 1 to May 15 (one 10-day and one 14-day period or five 5-day periods)
 - Situational up ramping and down ramping hydro unit operations
- Low Inflow Protocol (LIP) flow releases during drought periods (reduces Blewett Falls minimum flows)



Yadkin-Pee Dee Hydro Project — Low Inflow Protocol

- **Stages 0-4**
- **Based on three criteria**
 - High Rock Reservoir Elevation (Normal Minimum Elevation)– https://www.alcoa.com/yadkin/en/info_page/reservoir_data.asp
 - US Drought Monitor - <http://droughtmonitor.unl.edu/>
 - Stream Gage Three Month Rolling Average –
 - Calculated at the following USGS Gages
 - Yadkin River at Yadkin College (02116500)
 - South Yadkin River near Mocksville (02118000)
 - Abbotts Creek at Lexington (02121500)
 - Rocky River near Norwood (02126000)
- **YPD-DMAG assists Cube Hydro Carolinas, Duke Energy and NCDWR in implementing the LIP**
- **Monthly LIP status reports posted**
 - <https://www.duke-energy.com/community/lakes/drought-management-advisory/yadkin-pee-dee-dmag>

Yadkin-Pee Dee Hydro Project — Low Inflow Triggers and Flow Requirements

Table 5. Summary of LIP Triggers

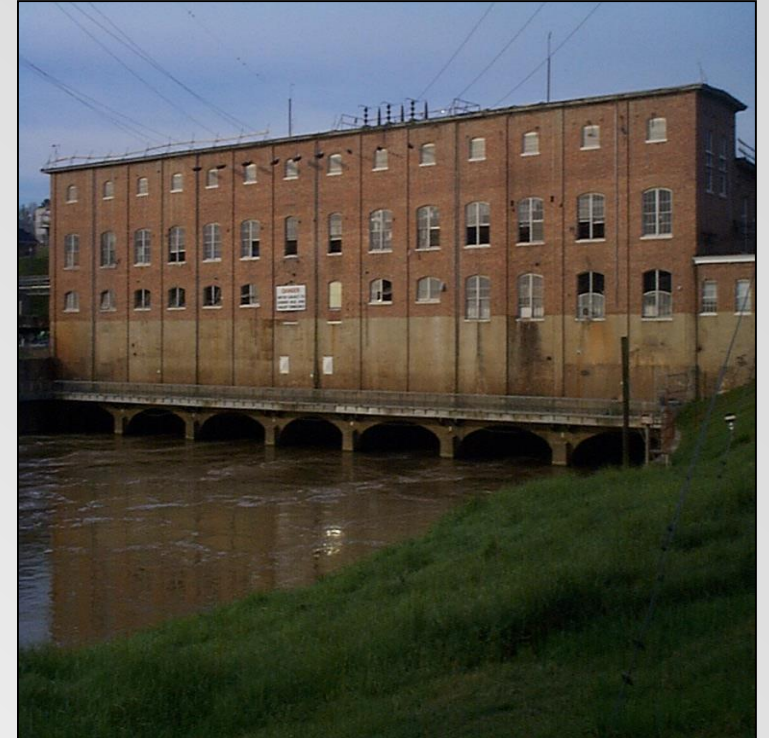
Stage	High Rock Reservoir Elevation		US Drought Monitor Three-Month Numeric Average		Stream Gage Three-Month Rolling Average as a percent of the Historical Average
0	< NME minus 0.5 ft	and	any	or	any
	OR				
	< NME	and either	≥ 0	or	< 48 %
1	< NME minus 1 ft	and either	≥ 1	or	< 41 %
2	< NME minus 2 ft	and either	≥ 2	or	< 35 %
3	< NME minus 3 ft	and either	≥ 3	or	< 30 %
4	< ½ of (NME minus Critical Reservoir Water Elevation)	and either	≥ 4	or	< 30 %

Table 6. LIP Flows⁽¹⁾, cfs

Stage	High Rock (daily average maximum flow target)			Falls ⁽²⁾ (daily average flow target)			Blewett Falls ⁽²⁾ (continuous flow target ⁽³⁾)		
	Feb 1– May 15	May 16– 31	Jun 1– Jan 31	Feb 1– May 15	May 16– 31	Jun 1– Jan 31	Feb 1– May 15	May 16– 31	Jun 1– Jan 31
0	2000	1500	1000	2000	1500	1000	2400	1800	1200
1	1450	1170	900	1450	1170	900	1750	1400	1080
2	1080	950	830	1080	950	830	1300	1150	1000
3	770	770	770	770	770	770	925	925	925
4	Additional measures may be determined by consensus of the Licensees and State Agencies. FERC approval of any additional measures may be required.								

Why Can't Duke Energy Just Release More Water Downstream?

- **Factors to consider in Duke Energy's ability to provide more water downstream**
 - Lake level license requirements for recreation, fish spawning and shoreline management
 - Municipal water intakes
 - Ability to operate the power plants in an efficient manner
 - Limited storage capacity of project reservoirs
 - Upstream hydro project releases, storage capacity, and lake level license requirements





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