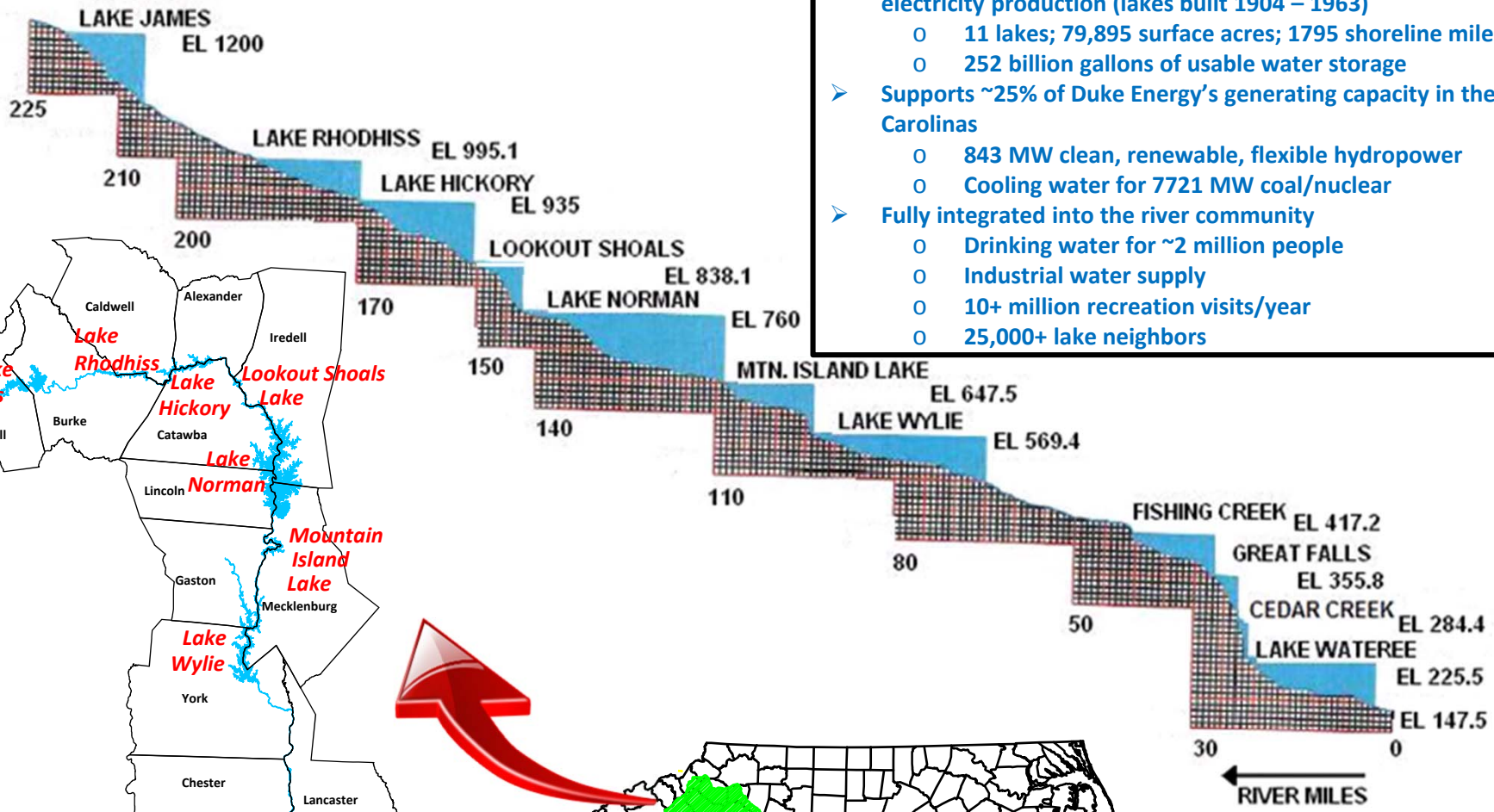
Catawba-Wateree Hydroelectric Project
Low Inflow Protocol Update

Catawba-Wateree River Basin Advisory Commission
October 30, 2015

Catawba-Wateree Hydro Project – A Hard Working River

- First river in US comprehensively planned/developed for electricity production (lakes built 1904 – 1963)
  - 11 lakes; 79,895 surface acres; 1795 shoreline miles
  - 252 billion gallons of usable water storage
- Supports ~25% of Duke Energy's generating capacity in the Carolinas
  - 843 MW clean, renewable, flexible hydropower
  - Cooling water for 7721 MW coal/nuclear
- Fully integrated into the river community
  - Drinking water for ~2 million people
  - Industrial water supply
  - 10+ million recreation visits/year
  - 25,000+ lake neighbors



* EL = Full Pond Elevation in feet Above Mean Sea Level

Rev: 9/25/2015

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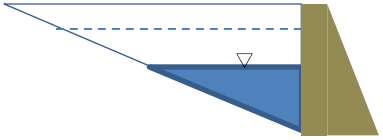
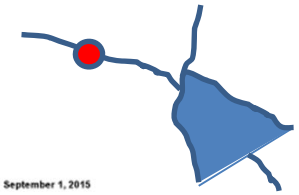
Catawba-Wateree Hydroelectric Project
Low Inflow Protocol Update

The Low Inflow Protocol (LIP) monitors three basin-specific drought triggers to determine drought status for the Catawba-Wateree River Basin:

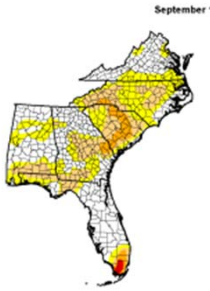
- **Remaining usable water storage in the eleven project reservoirs**



- **Four monitored tributary streamflows into the Catawba-Wateree Project**



- **The U.S. Drought Monitor (map) specific for the basin**



Catawba-Wateree Hydroelectric Project

Low Inflow Protocol Drought Update

Summary of LIP Actions

Stage	Triggers	Action Summary
0	Storage Index (SI) below Target Storage Index (TSI), but greater than 90% of TSI; or US Drought Monitor ≥ 0; or USGS Stream Gauges ≤ 85% of long term average (must have two)	***Licensee*** - Activate Catawba-Wateree Drought Management Advisory Group (CW-DMAG).
1	SI at or below 90%TSI, but greater than 75% of TSI...and US Drought Monitor ≥ 1; or USGS Stream Gauges ≤ 78% of long term average	***Licensee*** - Reduce downstream, bypass, recreation flows and Normal Minimum Elevations. ***Public Water Suppliers (PWS)*** – Voluntary water use restrictions, 2 day/wk irrigation, reduce vehicle washing; water reduction goal of 3-5%. ***Other Large Water Intake (LWI) Owners*** – Notify employees and customers and request voluntary cutbacks.
2	SI at or below 75%TSI, but greater than 57% of TSI...and US Drought Monitor ≥ 2; or USGS Stream Gauges ≤ 65% of long term average	***Licensee*** – Further reduce flows and Normal Minimum Elevations. Eliminate recreation flows. ***PWS*** – Mandatory water use restrictions, **2 day/wk irrigation**, eliminate vehicle washing; water reduction goal of 5-10%. ***Other LWI Owners*** – Notify employees and customers and request voluntary cutbacks.
3	SI at or below 57%TSI, but greater than 42% of TSI...and US Drought Monitor ≥ 3; or USGS Stream Gauges ≤ 55% of long term average	***Licensee*** - Reduce downstream and bypass flows to critical flows, and further reduce Normal Minimum Elevations. ***PWS*** – Mandatory water use restrictions, **1 day/wk irrigation**, limit other outdoor water uses; water reduction goal of 10-20%. ***Other LWI Owners*** – Notify employees and customers and request voluntary cutbacks.
4	SI at or below 42%TSI...and US Drought Monitor = 4; or USGS Stream Gauges ≤ 40% of long term average	***Licensee*** – Maintain downstream and bypass flows to critical flows, and reduce Normal Minimum Elevations to critical elevations. ***PWS*** – Restrict all outdoor water use, implement emergency restrictions; water reduction goal of 20-30%. ***Other LWI Owners*** – Notify employees and customers and request voluntary cutbacks.

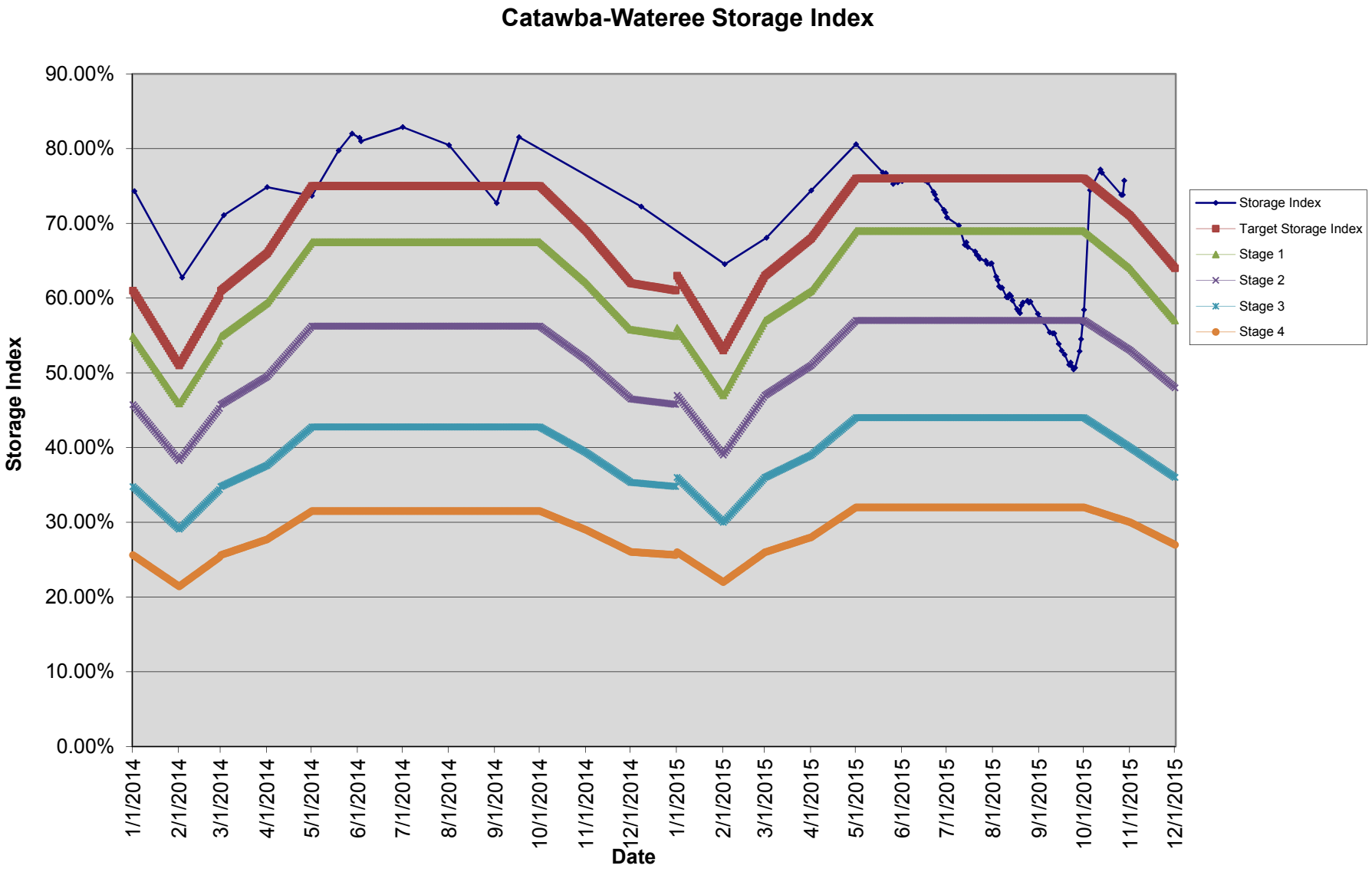
The LIP reached:

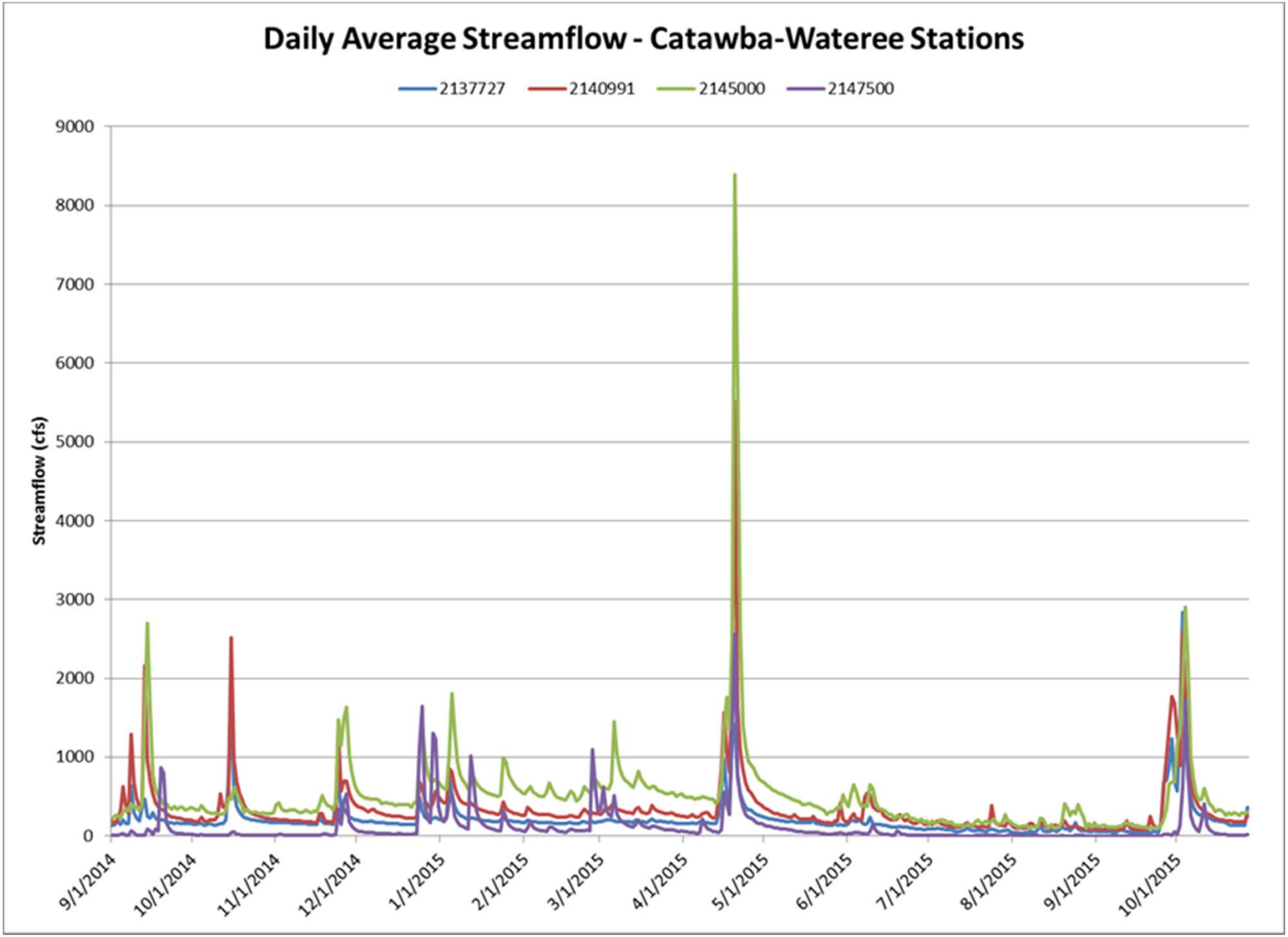
- Stage 0 on July 1, 2015
- Stage 1 on July 20, 2015

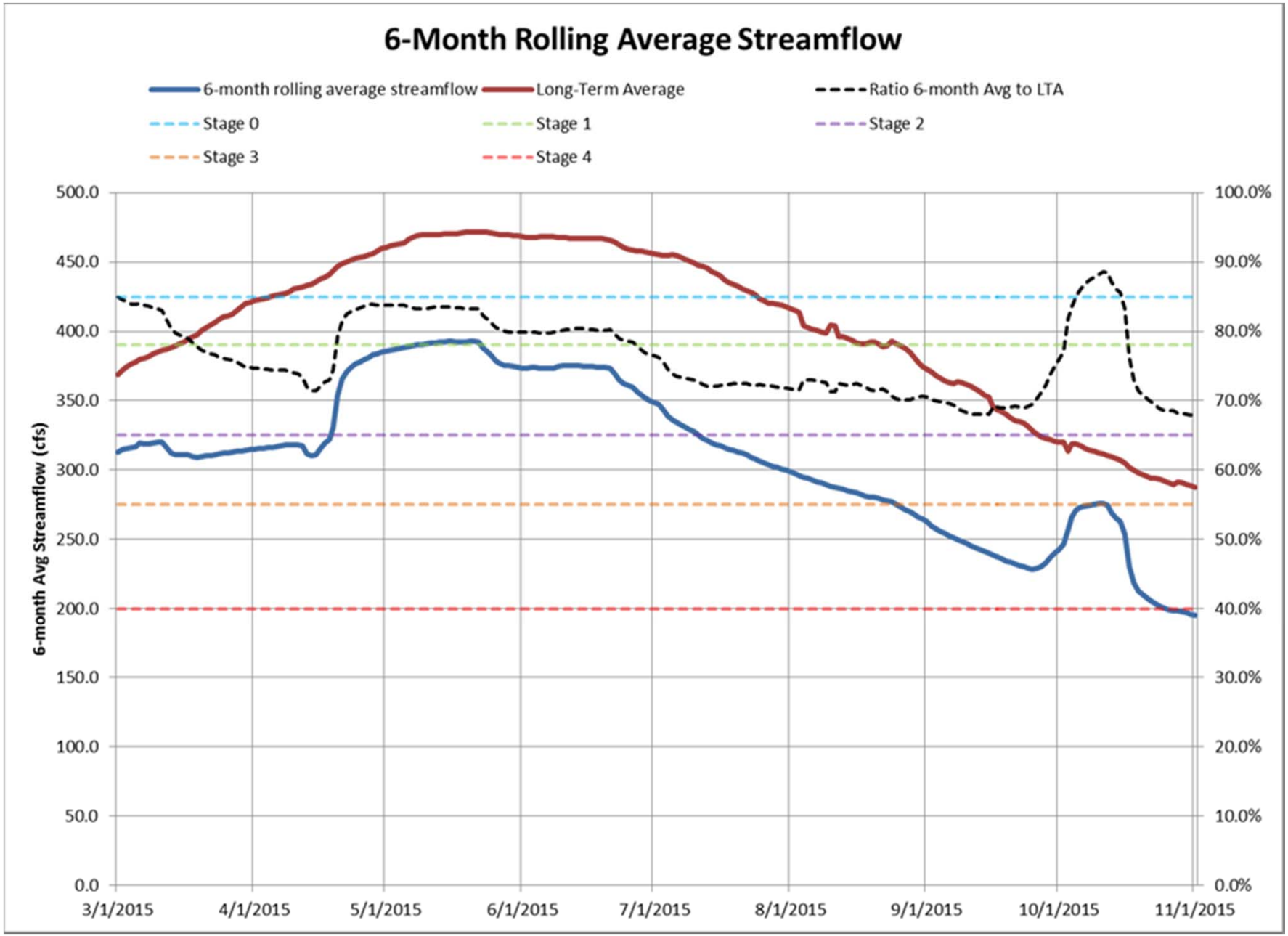
Catawba-Wateree LIP Trigger Status Summary for 10/01/15 and Changes Compared to 09/01/15

	Reservoir Storage as % of Target	% of 6-Month Long-Term Avg Streamflow	3-Month Avg of US Drought Monitor	Groundwater Levels
Normal	>=100%	>85%	<0	Glen Alpine
LIP Stage 0	>90%	<=85%	>=0	
Oct 1, 2015 → LIP Stage 1	>75% 76.3%	75.0% <=78%	>=1 1.67	Langtree
LIP Stage 2	>57%	<=65%	>=2	
LIP Stage 3	>42%	<=55%	>=3	
LIP Stage 4	<=42%	<=40%	4	

To recover to a less restrictive LIP Stage, all four triggers must support that Stage or lower.
However at this time Groundwater Levels are being treated as advisory only.

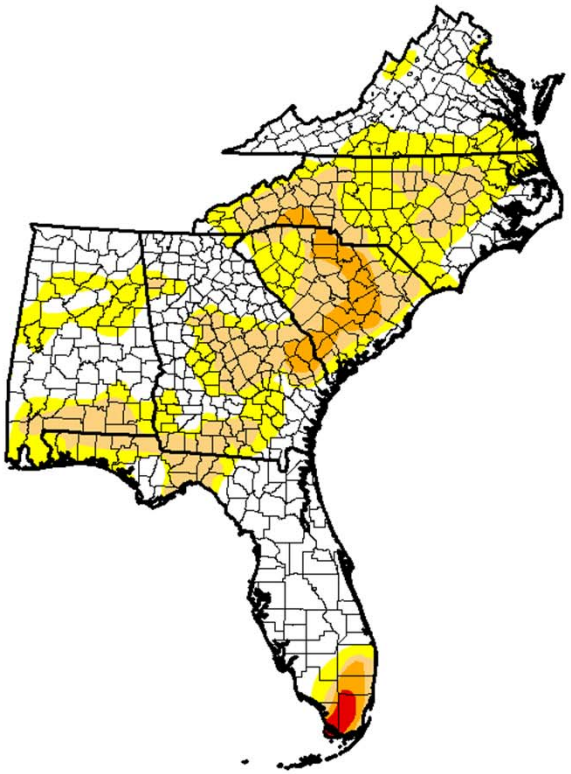

Catawba-Wateree Storage Index
Storage Index
90.00%
80.00%
70.00%
60.00%
50.00%
40.00%
30.00%
20.00%
10.00%
0.00%
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
9/1/2014
10/1/2014
11/1/2014
12/1/2014
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
10/1/2015
11/1/2015
12/1/2015
Date
Storage Index
Target Storage Index
Stage 1
Stage 2
Stage 3
Stage 4


Daily Average Streamflow - Catawba-Wateree Stations
2137727
2140991
2145000
2147500
Streamflow (cfs)
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
9/1/2014
10/1/2014
11/1/2014
12/1/2014
1/1/2015
2/1/2015
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
10/1/2015

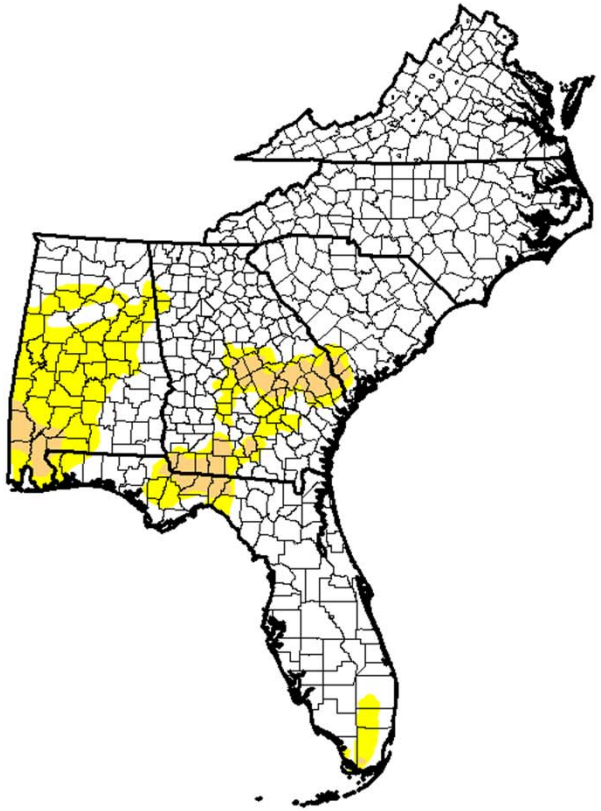

6-Month Rolling Average Streamflow
6-month rolling average streamflow
Long-Term Average
Ratio 6-month Avg to LTA
Stage 0
Stage 1
Stage 2
Stage 3
Stage 4
6-month Avg Streamflow (cfs)
500.0
450.0
400.0
350.0
300.0
250.0
200.0
150.0
100.0
50.0
0.0
100.0%
90.0%
80.0%
70.0%
60.0%
50.0%
40.0%
30.0%
20.0%
10.0%
0.0%
3/1/2015
4/1/2015
5/1/2015
6/1/2015
7/1/2015
8/1/2015
9/1/2015
10/1/2015
11/1/2015

U. S. Drought Monitor

September 1, 2015



October 6, 2015



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Summary:

- The Storage Trigger has recovered to Normal Conditions due to the October rainfall.
- The six-month average Streamflow Trigger is still in Stage 1 condition but should improve over the next two months with continued rainfall.
- The three-month average U.S. Drought Monitor for the Catawba-Wateree is improving and should return to normal by the end of November.

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Questions?