

SUSTAINABLE RIVERS PROGRAM AT WORK IN USACE-WILMINGTON DISTRICT



Working Today to Build a Better Tomorrow



US Army Corps
of Engineers®

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INTRODUCTION



- Evolution of Drought Contingency Plans in USACE – Wilmington District
- Do more! **Sustainable Rivers Program**



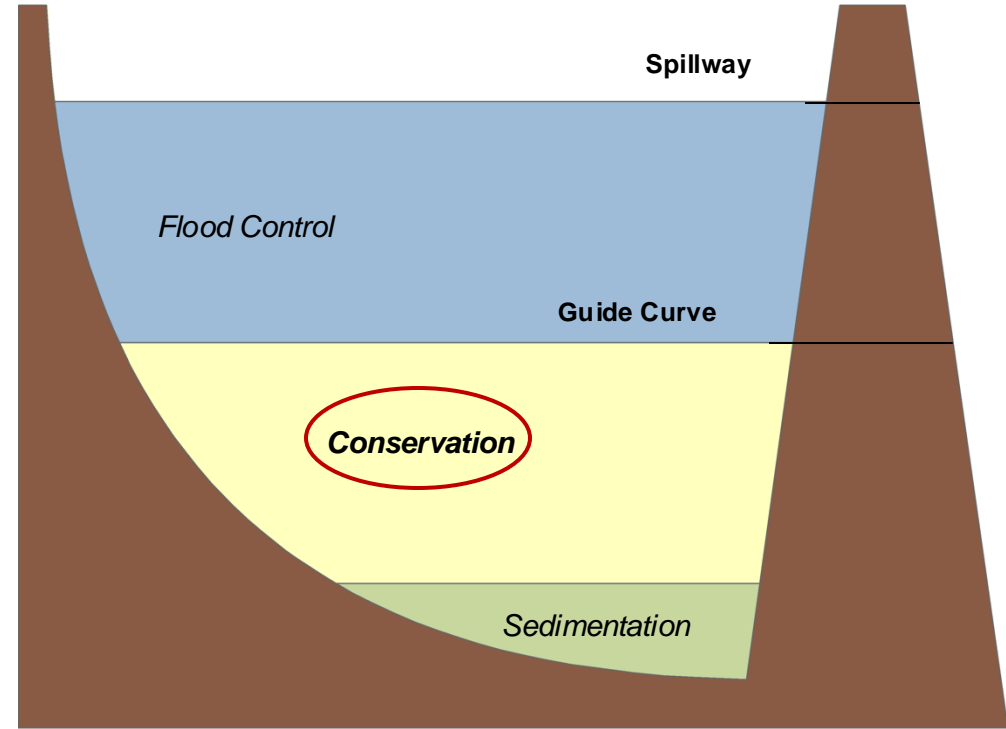
EVOLUTION OF USACE-SAW'S DROUGHT CONTINGENCY PLANS



B. Everett Jordan Reservoir (Jordan) as an example



Authorized Purposes:
Flood Risk Management
Water Quality
Water Supply
Fish and Wildlife
Recreation



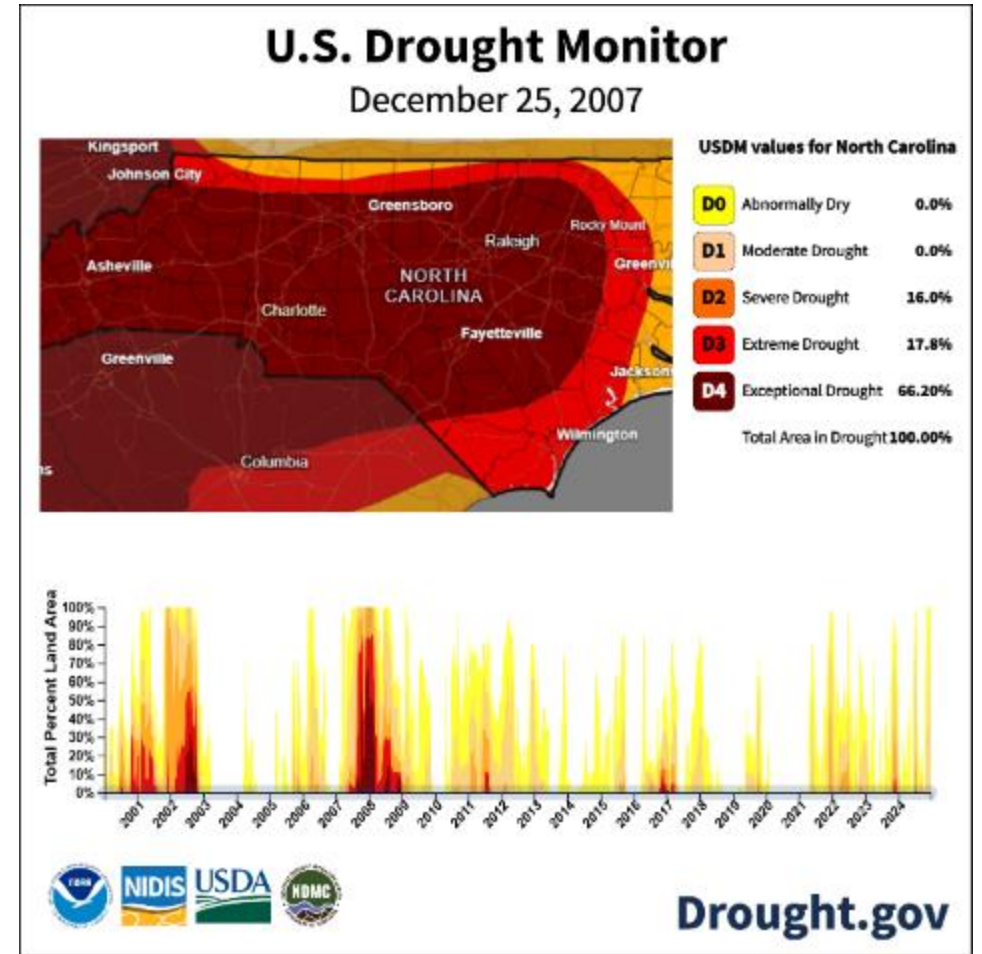
Conservation Pool:
1/3 **Water Supply** to in-lake withdrawals
2/3 **Water Quality** to downstream low-flow target at Lillington, NC



EVOLUTION OF USACE-SAW'S DROUGHT CONTINGENCY PLANS



- 1981 Jordan Complete (normal pool in 1982)
 - 1991 Original Drought Contingency Plan
 - 1998
 - 2001
 - 2002
 - 2005
 - 2006
 - 2007
 - 2008 Revised (Current) Drought Contingency Plan
- Drought Experience
* field-tested alternatives with **deviations**



collaborative adaptive management strategies and changes to the original plan were co-developed by SAW water management and key local, state and federal partners



EVOLUTION OF USACE-SAW'S DROUGHT CONTINGENCY PLANS



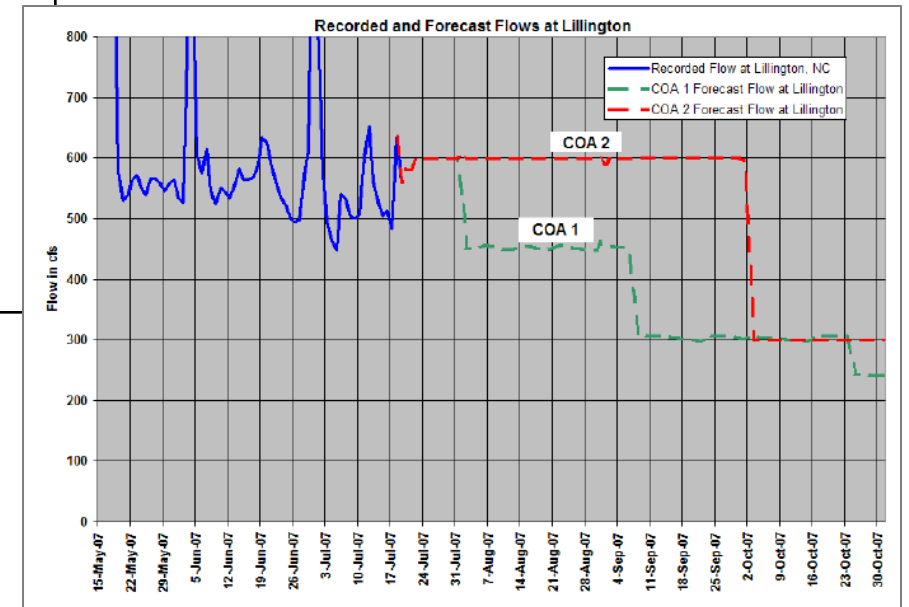
Table 5: Drought Release Schedule

Drought Level	Water Quality Storage Remaining (%)	Jordan Dam Minimum Release* (cfs)	Jordan Dam Maximum Release (cfs)	Lillington Daily Average Flow Target (cfs)
0	>= 80	40+	600	600 +/- 50
1	60 – 80	40+	Lillington target	450 - 600 +/- 50
2	40 – 60	40+	Lillington target	300 - 450 +/- 50
3	20 – 40	40+	200+ *	None**
4	0 – 20	40+	100-200+ *	None**

* Water quality release plus any required downstream water supply releases.

** Lillington flow will be total of Jordan Dam release plus local inflow.

*** INCREASED PROACTIVITY**





NOT THE END OF THE STORY...LEARN AND ADAPT



Jordan Authorized Purposes: Flood Risk Management – Water Quality – Water Supply – Fish and Wildlife - Recreation

- CFR was listed as one of North America's top 10 most endangered rivers in 2017 by American Rivers
- Historic industrial use in the upper basin...working river
- Rapidly expanding urban development in the middle basin – Research Triangle Park
- Current pollution - Chemours
- Animal feeding operations in the middle to lower basin
- USACE Locks and Dams impede diadromous fish from reaching their historic spawning grounds and slow the flow of the river, resulting in water quality issues
- USACE Jordan Dam flood operations reduce the natural variability vital for floodplain health

Sustainable Rivers Program allows us to look at opportunities to improve conditions on the CFR



Flooded animal farm after hurricane— photo courtesy of CFRW



NCWRC electrofishing, shad and striped bass below LD3 – photo courtesy TNC



blue-green algal bloom on Cape Fear – photo courtesy of NCDENR

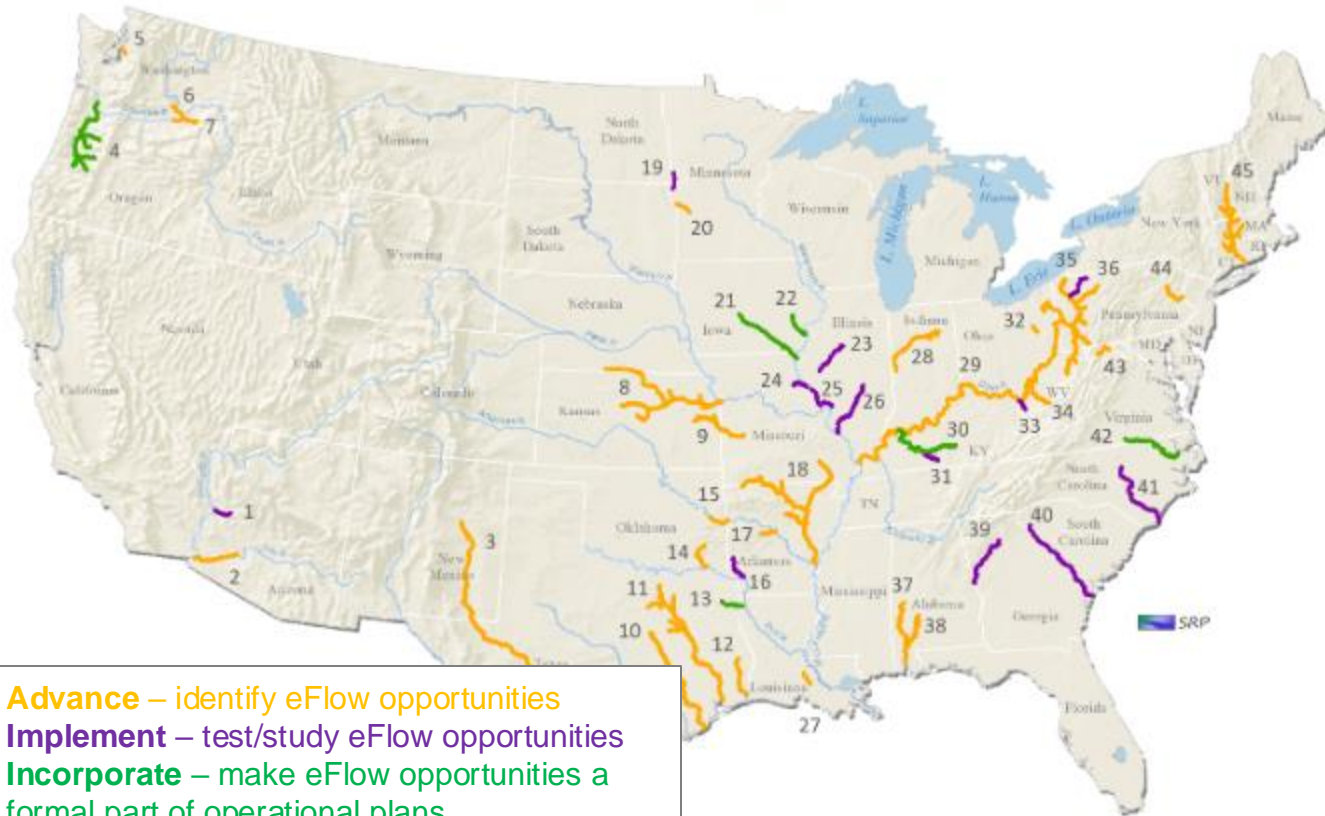
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SUSTAINABLE RIVERS PROGRAM (SRP)



Site Status - Advance - Implement - Incorporate

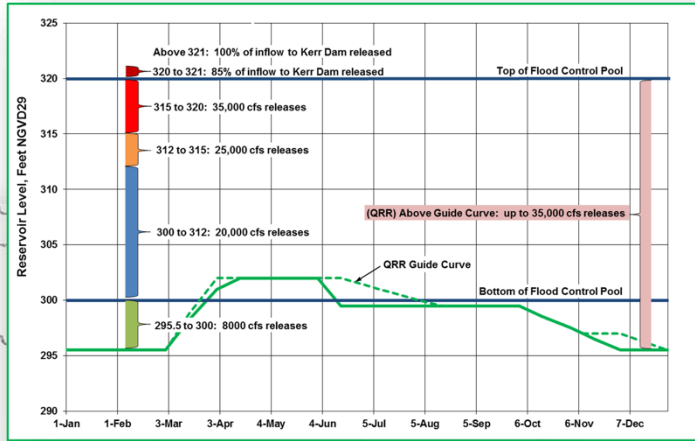
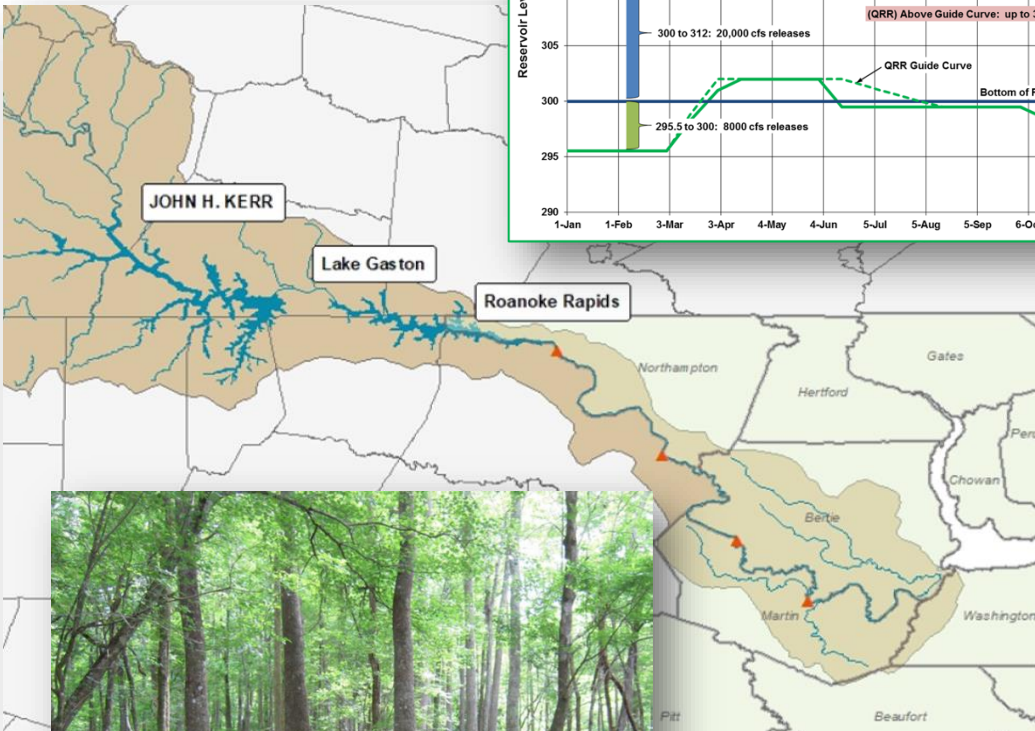


Advance – identify eFlow opportunities
Implement – test/study eFlow opportunities
Incorporate – make eFlow opportunities a formal part of operational plans

- SRP is a formal agreement between USACE and The Nature Conservancy
- Established in 2002
- ***The goal of SRP is to identify, refine, and implement environmental strategies at Corps water infrastructure***
- **SAW has 3 rivers in the program:**
 - The Roanoke was one of the original rivers
 - The Cape Fear was added in 2016
 - The Neuse was added in 2023
- The Cape Fear and Roanoke are “Learning Watersheds” for the country



SRP IN THE ROANOKE RIVER BASIN



- **John H. Kerr Reservoir Authorized Purposes**
Flood Risk Management – Hydropower – Water Supply
Low Flow Augmentation – Recreation – Fish and Wildlife
- **Changed Flood Operations in 2016**
 - Previous ops – protracted inundating releases
 - **“Quasi-Run of River – QRR”**
 - Releases now more closely mimic natural inflows
 - ~weekly releases = weekly inflow
- Section 216 Study → Water Control Plan Revision

SRP’s role on the Roanoke

- Validate operational expectations
- Share science and benefits gained from change of ops
- Add to climate change research
- Identify Adaptive Management opportunities through research
- collaborators doing their part also – floodplain connectivity, restoration, easements, etc.



SRP IN THE NEUSE RIVER BASIN



SRP Goals at Falls for the Neuse River

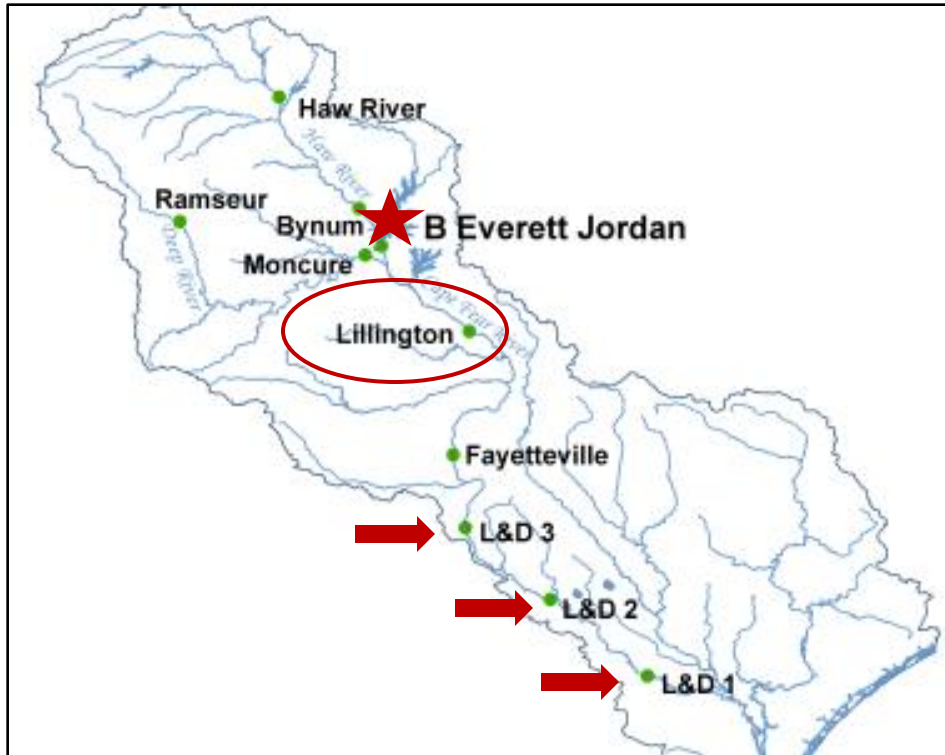
- The Neuse River was added Fall of 2023
- The Corps, TNC, NCWRC, USFWS and others are working together in this first year to identify opportunities for Falls Dam to support spawning success in the Neuse River
- **Stay tuned!!!**



SRP IN THE CAPE FEAR RIVER BASIN INFLUENCING 135+ MILES OF RIVER WITH THE DAM



Jordan Authorized Purposes: Flood Risk Management – Water Quality – Water Supply – Fish and Wildlife - Recreation



SRP Goals at Jordan for the Cape Fear River

- Leverage Jordan operations (**eFlows**) to mitigate issues caused by the lock and dam structures downstream
- **Fish** are trying to get past Lillington to spawn. The **locks and dams are barriers**.
- **Harmful algal blooms** happen throughout the river, but are notable **above locks and dams**, especially LD1 (135 miles from Jordan)



SRP IN THE CAPE FEAR RIVER BASIN



The Cape Fear using an established SRP process:

ADVANCE

IMPLEMENT

INCORPORATE



2017

2019

2020

2021

2022-2024

2025

- Launch Meeting

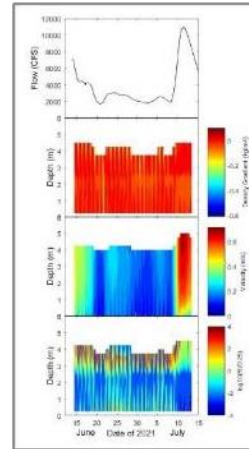
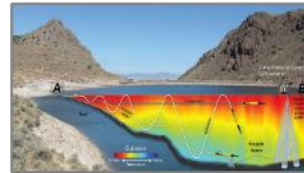
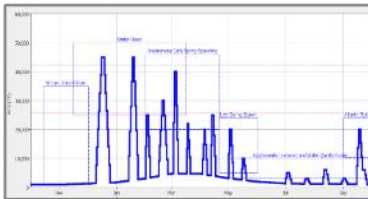
- Literature Review
- eFlows Workshop

- Develop/Implement
Monitoring Plan

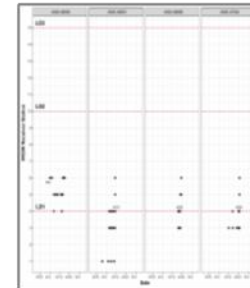
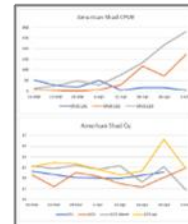
- Continued/expanded
eFlows and monitoring

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eFlows and monitoring

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eFlows and monitoring



- Re-engage
Stakeholders

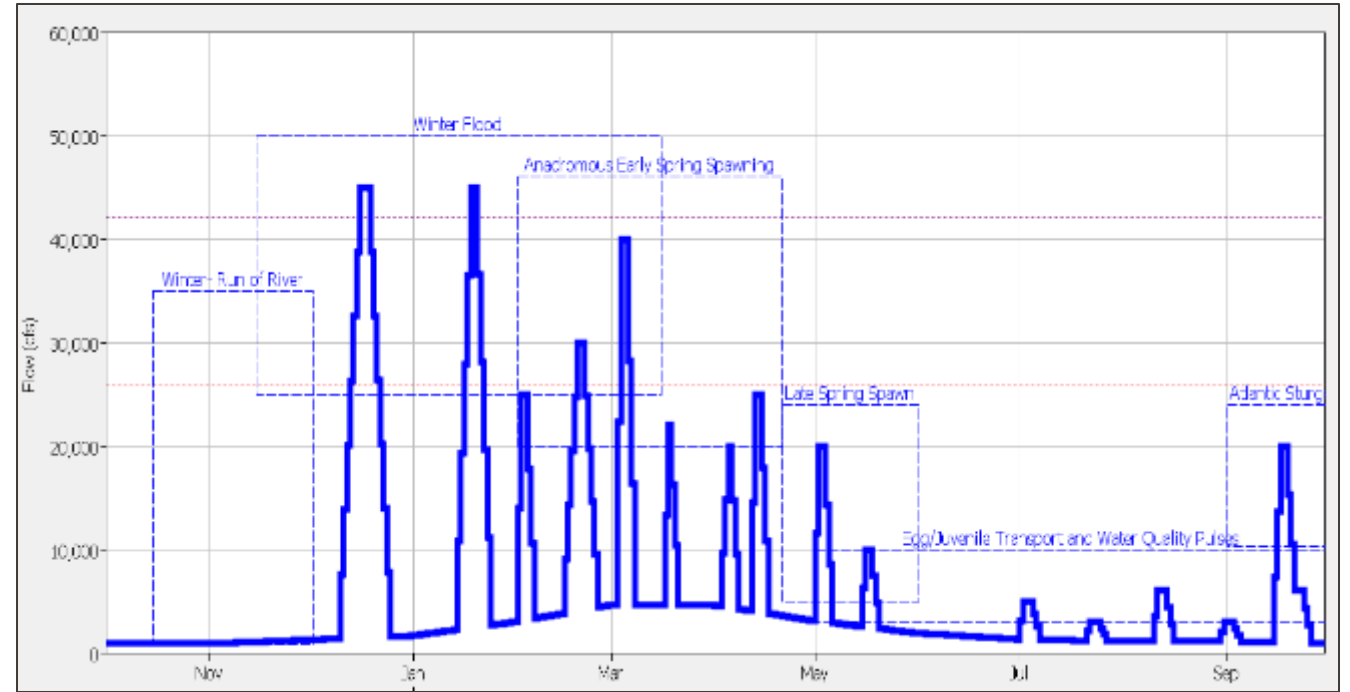
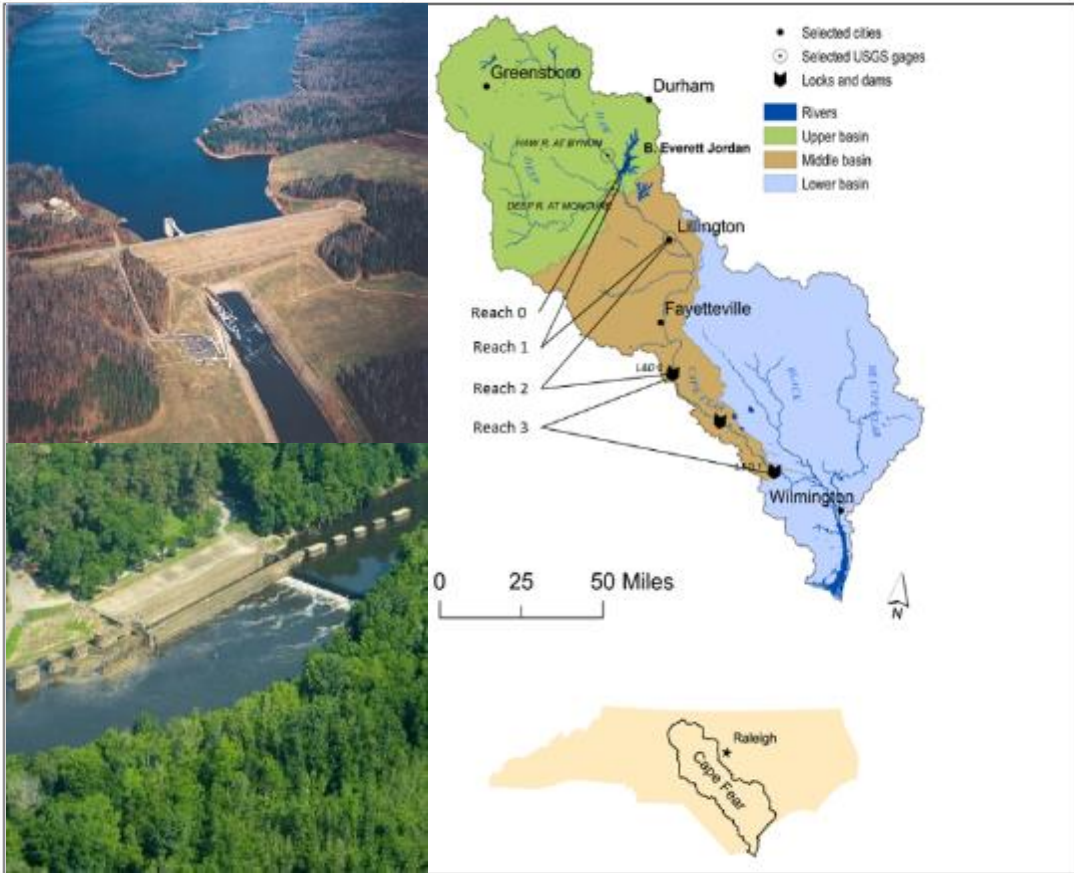


Temporary Deviation?
Water Control Plan?
Drought Contingency Plan?



CFR SRP

STAKEHOLDER WORKSHOP ---> E-FLOW PRESCRIPTION



From the prescription, the Corps determined they can conduct pulses out of the reservoir to assist diadromous fish and to reduce the potential for algal blooms.



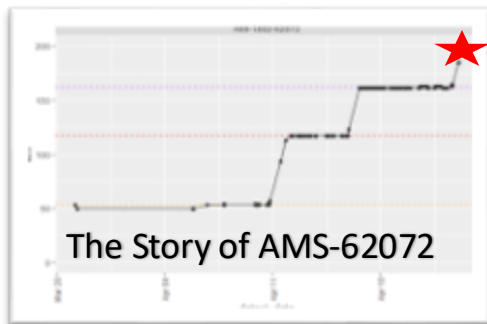
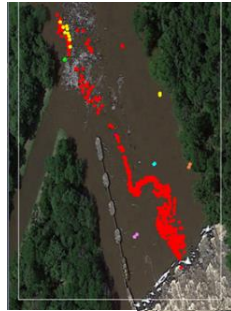
CFR SRP – FISH PASSAGE MARCH TO JUNE

QUESTION: What conditions support fish passage over ALL LDs to their native spawning habitats?

- Our fish can't jump – need to submerge our LDs
 - Median flows ~3-5k; Need ~15k or more
- Acoustic telemetry, eDNA, and traditional electrofishing are used to study shad, striped bass, sturgeon, and flathead catfish

Results/Findings:

- Better understanding of river hydrology
- Potential to pass fish at flows lower than we thought!
- **E-flow pulse events supported 100% of passage events at LD2, LD3 during 2022-2023 and improved passage at LD1 rapids**



LD3 with low impassable flow



LD3 fully "submerged"



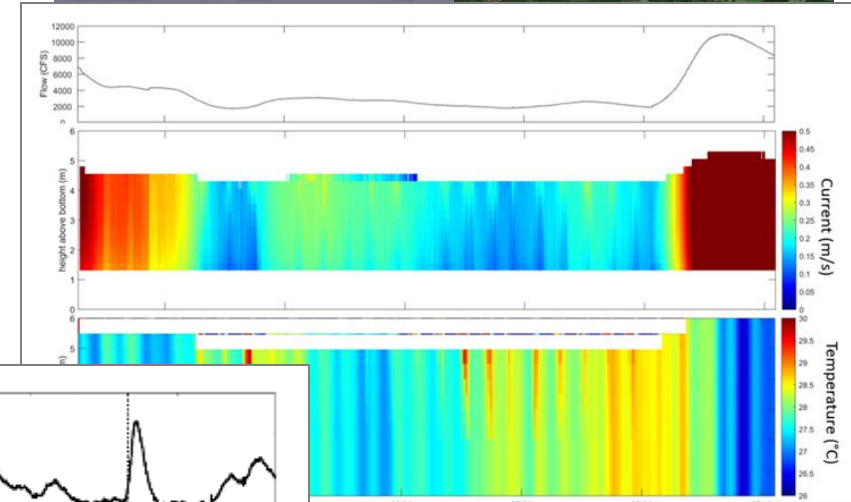
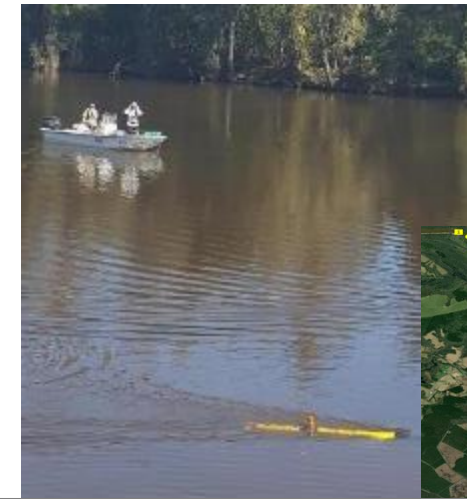


CFR SRP - WATER QUALITY: JUNE TO SEPT



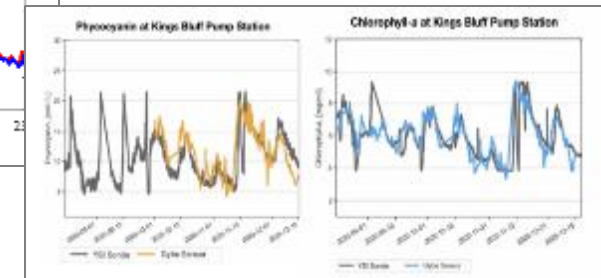
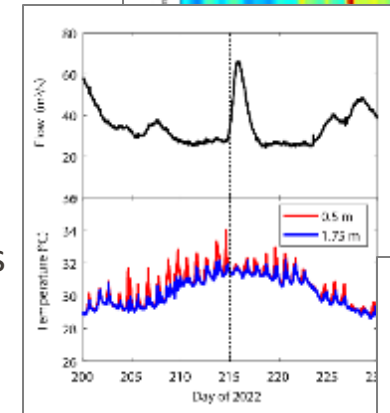
QUESTION: Can releases from Jordan sufficiently mix the water column above each LD and reduce potential for harmful algal blooms?

- Blooms documented at low flows (<1800 cfs, especially below 1000 cfs) when temperatures are warm
- In extreme low-flow conditions, we consider a “pulse” if blooms are reported
- Release 1500-3000 cfs for ~36 hours (with ramp up and down) to mix the water column
- **Weigh the benefit with drought risk**
- Monitoring WQ parameters with real-time sensors at LD1 (surface and depth), autonomous underwater vehicle (AUV) event monitoring, remote sensing, water quality measurements added at gages, water supply utilities support



Results/Findings

- We are able to mix the water column above the LDs
- **Success with less water than we anticipated** (less than the eFlow recommendation from workshop) to mix the water even at LD1
- Continue to learn more about the River hydraulics – mixing occurred at LD1 twice as fast as expected



Collaborators: Corps, TNC, USGS, Gybe technologies, UNC-Ch, Brunswick County Public Utilities, Middle Cape Fear River Basin Association

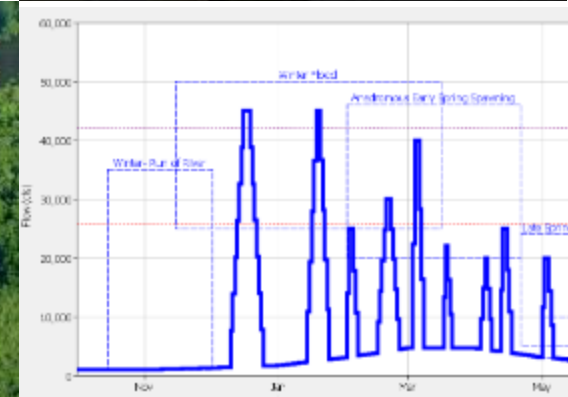
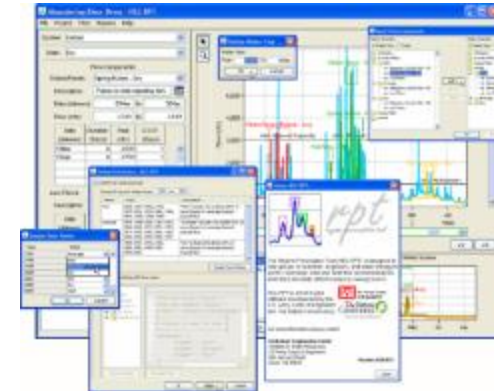
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CFR - NEXT STEPS



- Continue to evaluate pulse effectiveness, refine pulses and protocols
- Re-engage stakeholders to share results
- Examine risk profiles
- Ultimate goal: Find a way to **incorporate** e-flows into the normal operations





Thank You

Questions?

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