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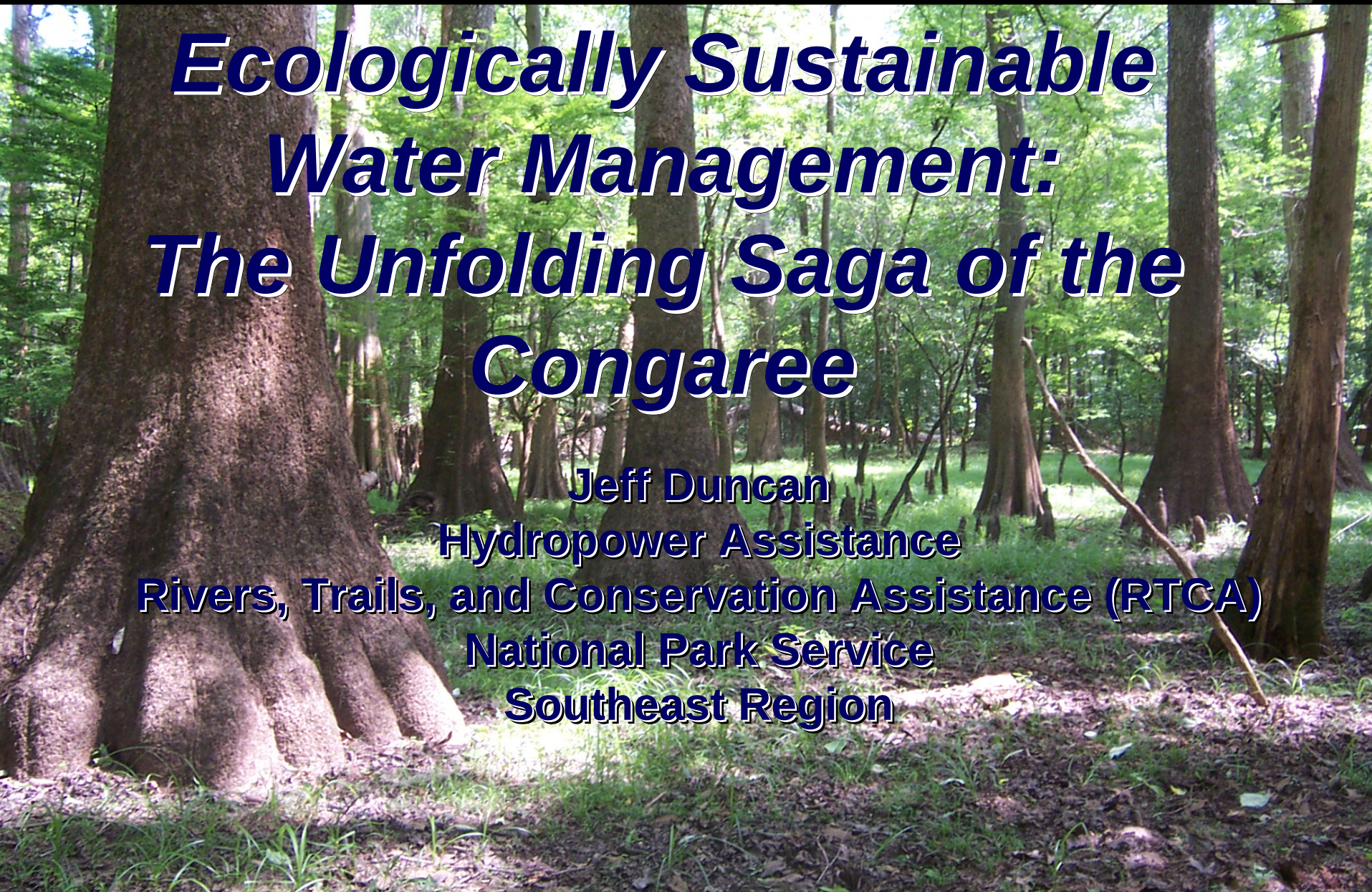

Ecologically Sustainable Water Management: The Unfolding Saga of the Congaree

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Objectives of Today's Presentation…

- Overview of Ecologically Sustainable Water Management ("ESWM") process developed by TNC
- A brief overview of FERC licensing/relicensing
- How ESWM is being applied to address flow allocation at CONG, within a FERC context
- Some key principles to successfully integrating science and diverse stakeholders to achieve sound results.

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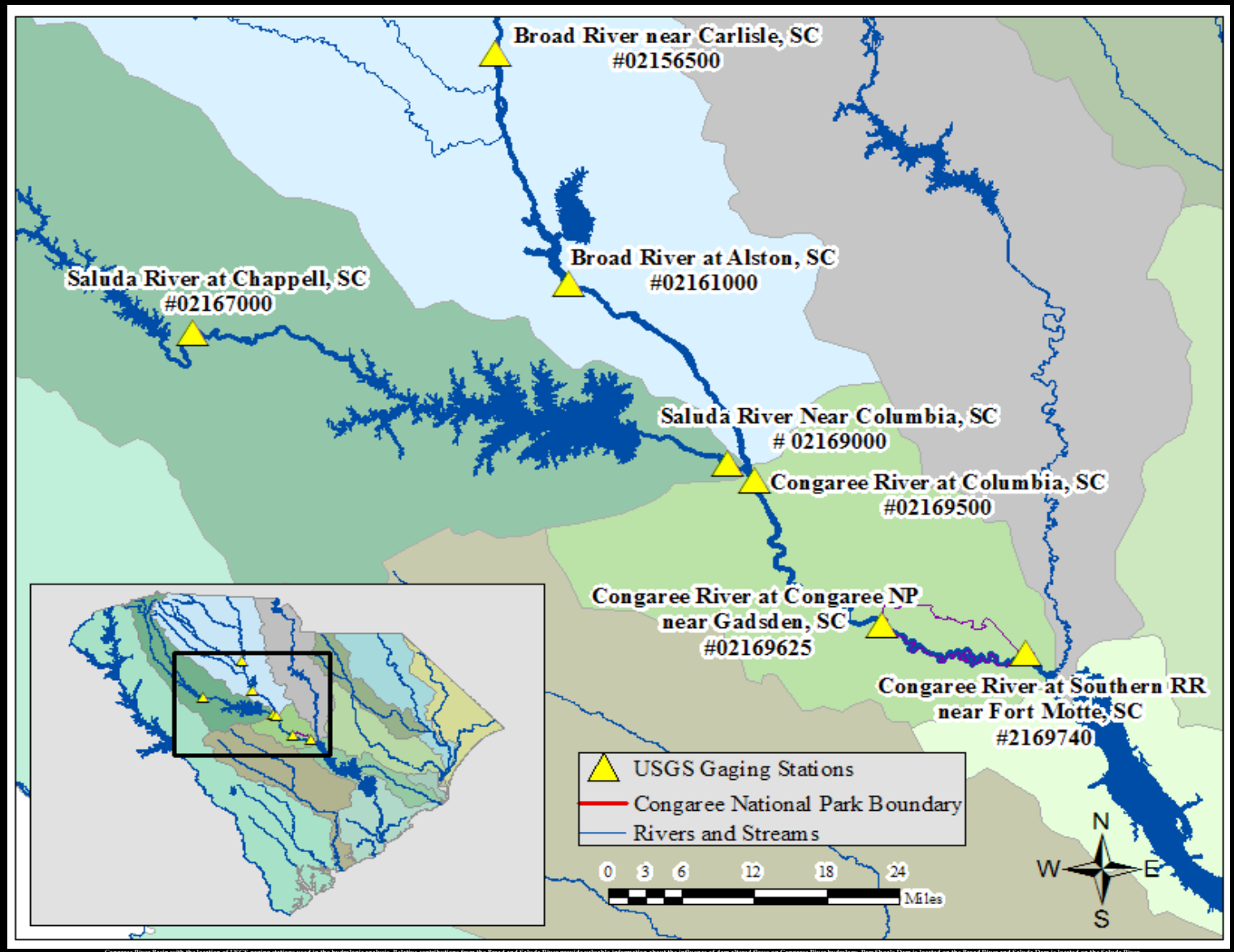
Geographic context…



Congaree River Basin with the location of USGS gaging stations used in the hydrologic analysis. Relative contributions from the Broad and Saluda River provide valuable information about the influence of dam altered flows on Congaree River hydrology. Parr Shoals Dam is located on the Broad River and Saluda Dam is located on the Saluda River.

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The Dam Facts…

- Completed in 1930, the dam is
- 213 ft high and 1.5 miles in length
- Owned and operated by SC Electric and Gas for reserve power to meet regional agreement (VICAR)
- Reservoir area of ~80mi^2 with over 2.2 million acre-feet of storage
- Generation capacity is 202 MW @ 18,000 cfs
- Mean annual flow of the Saluda River is 2595 cfs.

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Saluda Dam and Lake Murray

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Congaree National Park

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- **Located near the confluence of Congaree and Wateree rivers**
- **35 miles downstream of Saluda Dam/Lake Murray**
- **25 miles downstream of Saluda/Broad Confluence**
- **Protects more than 25,000 acres of old growth bottom land hardwood forest, the largest remnant tract in the United States**
- **Designated as a unit of the National Park System in 1976**
- **The park's floodplain ecosystem is a product of co-evolution with the fluctuating hydrology of the Congaree River**
- **The park regularly floods several times each year.**

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FERC Relicensing

- All non-federal hydropower dams are licensed by the Federal Energy Regulatory Commission
- 30-50 year license terms
- Licensing/relicensing generally 5-7 year process, NEPA based process
- NPS has a relicensing staff of 8 people part-time
- All license applicants much consult with NPS regarding recreation and natural resource conservation--park or no park
- FERC views baseline as current condition
- FERC requires a direct and measurable nexus to project operations
- Nexus often difficult to prove and/or demonstrate.

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Sink or ESWM…

- Relicensing has several limitations or inadequacies
- Process driven by licensee (SCE&G) and FERC
- Broadly perceived as biased, adversarial, dysfunctional
- FERCs integrated licensing process leaves little time for longer term studies/monitoring
- Resistance to looking beyond immediate project area
- Park units generally lack authority in FERC proceedings
- CONG not being addressed in evaluation of impacts
- Opportunity to jumpstart scientific investigation of park ecosystem
- Opportunity to foster new partnerships and coalesce a diverse group of stakeholders (NGOs, scientists, government agencies, AND SCE&G) around a park-centered consensus-based process.

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So, what exactly is ESWM?

A Five Step Process

- **Developed by TNC's Freshwater Initiative for work with COE dams**
- **Science-based, stakeholder inclusive, balances human and ecological needs**
- **NOT explicitly developed for work in the FERC arena**

Steps Include:

1) Orientation workshop involving multiple stakeholders

2) Comprehensive lit review, study report

3) Technical workshop

4) Implementation of flow prescription

5) Adaptive management

- **Monitoring, research, feedback.**

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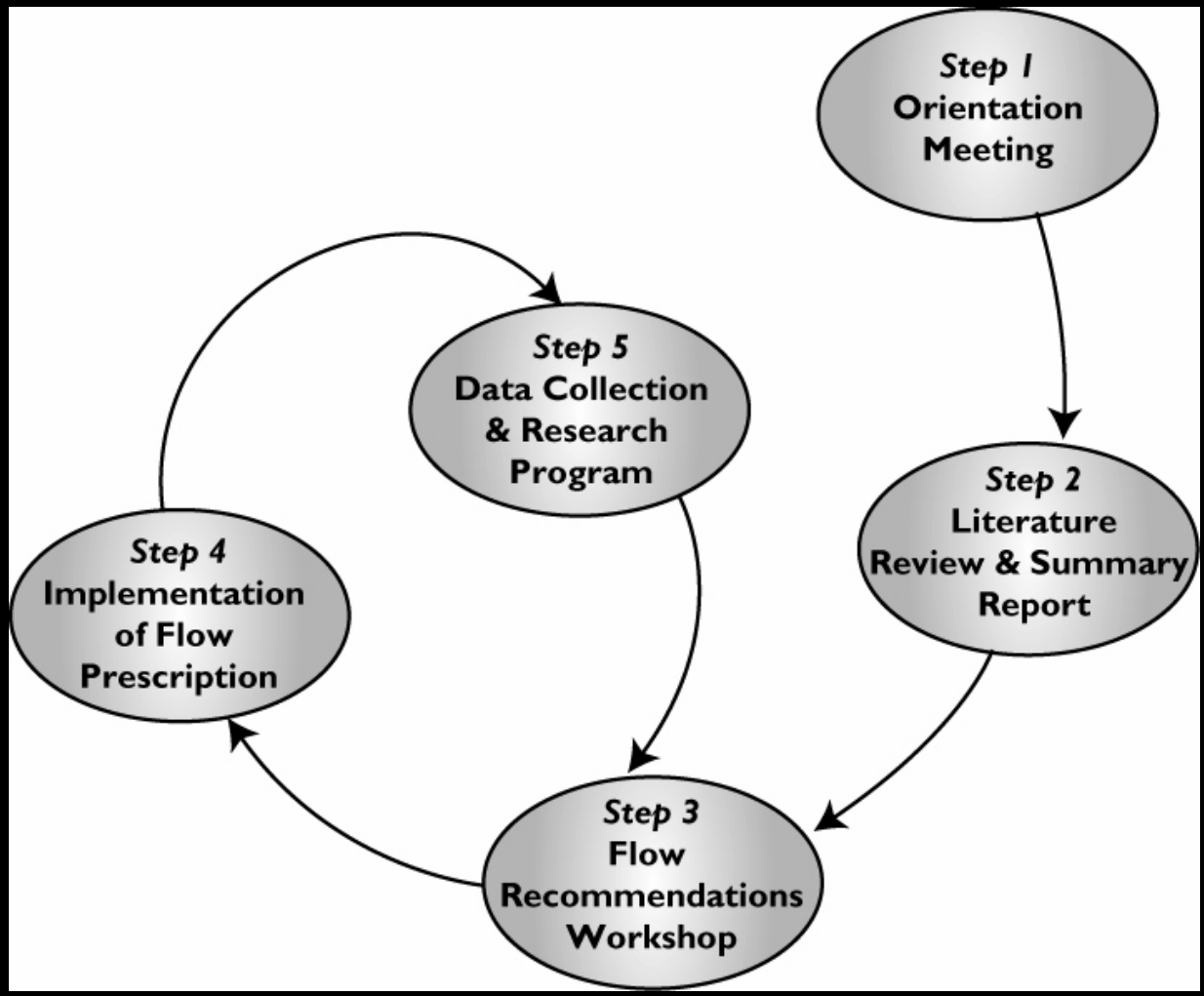
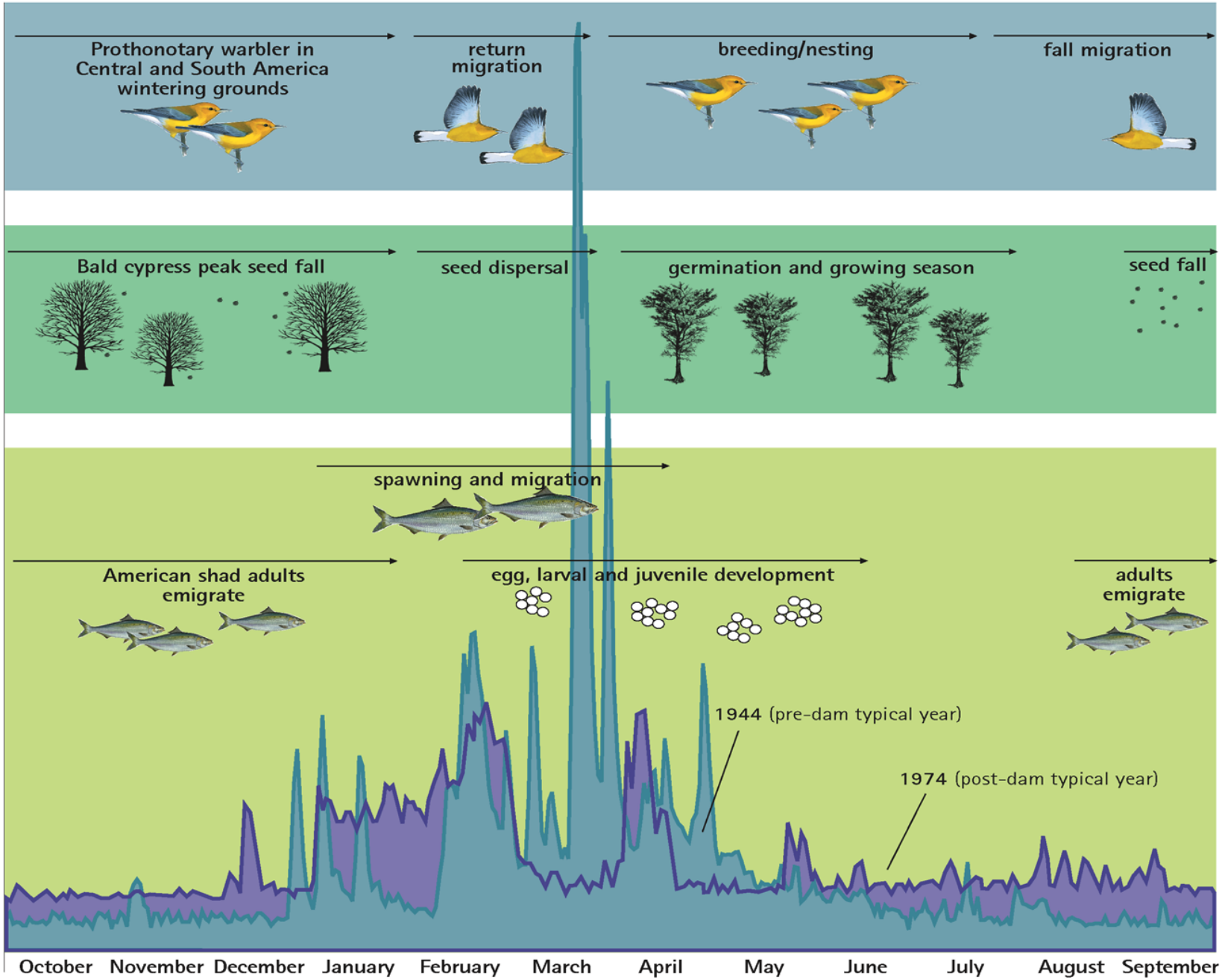
The ESWM Process…



Courtesy TNC Freshwater Initiative

Ecological Model of the Savannah River



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What we (thought) knew about CONG…

- Flood frequency, timing, and duration decreased since 1930 when the dam was completed
  - *A 2-year event is now a 4.5 year event, etc*
- Pre-dam hydrological record limited only 3 years
- On average 1/3 of Congaree flow is from Saluda (2/3 from the relatively unregulated Broad)
- Flood plain community undergoing change in composition, particularly decreased recruitment on bald cypress
- On average, park floods to some degree a couple of times per year.

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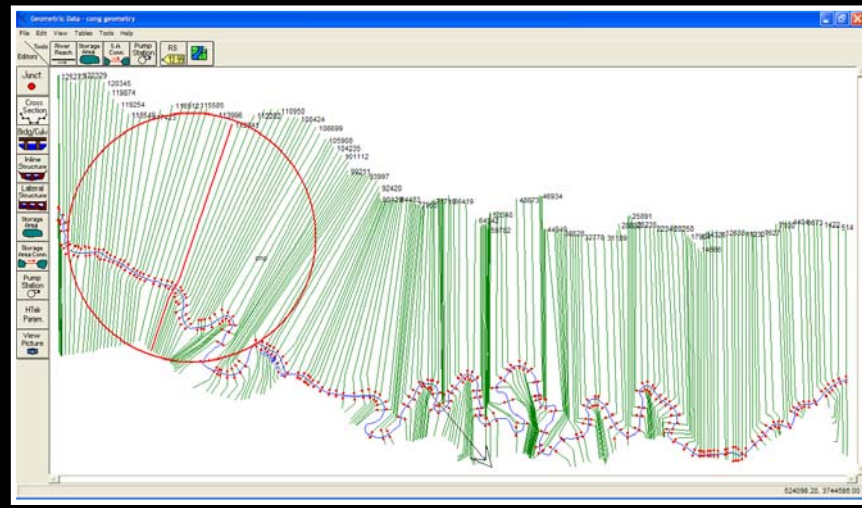
Case Study of the Congaree ESWM

First…

- Assemble partners (FWS, American Rivers, TNC, Carolina Coastal Conservation League, SCE&G, and others)
- Identify funding (Challenge Cost Share, park funds, hydro funds, foundations, etc…)
- Contracted with USC to conduct a comprehensive literature review, produce a study report
- Contracted with USC to develop a floodplain inundation model using LIDAR and vegetation data
- Contracted with a professional facilitator.



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Orientation Workshop

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- **Set the context for all stakeholders**
- **Sought buy-in on the process of developing a flow recommendation**
- **Defined a vision for the group**
- **Developed roadmap**
- **Broadly accepted with approximately 50 stakeholders attending.**

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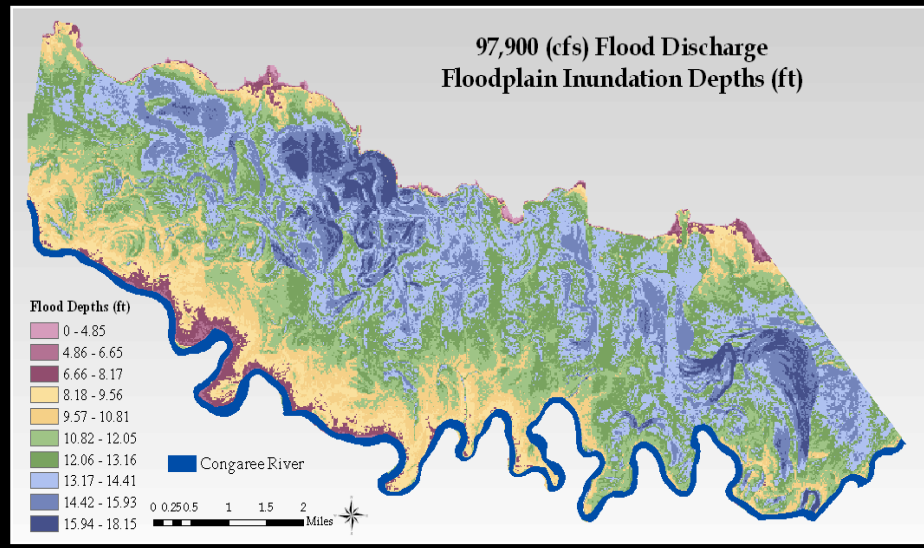
Then, we went back to work…

- Refined inundation model
- Develop list of possible indicator species/life history info (dependence on flows/inundation, available life history literature, 17 species) .



Wood Duck	J	F	M	A	M	J	J	A	S	O	N	D
Reproduction (spawning or nesting)	--Timing and success of reproduction/nesting depends on timing of flooding for nest establishment and to reduce predation.[2] --Laying females depend upon feeding on invertebrates in shallow water for egg formation.[3]											
Growth (for juvenile stages)		Fledging of offspring.[1]										
Maintenance (foraging, prey avoidance, competition with other sp.)		Peak flooding aides in reduced floodplain nest predation.[2]										

1. Hepp, G.R., R.A. Kennamer, and W.F. Harvey. 1989. Recruitment and Natal Philopatry of Wood Ducks. *Ecology* 70:897-903.

2. Nielsen, C.L.R. and R.J. Gates. 2007. Reduced Nest Predation of Cavity-Nesting Wood Ducks During Flooding in a Bottomland Hardwood Forest. *The Condor* 109:210-215.

3. Ryan, D.C., R.J. Kawula, and R.J. Gates. 1998. Breeding Biology of Wood Ducks using Natural Cavities in Southern Illinois. *Journal of Wildlife Management* 62(1):112-123.

Koman, T. M. 2003. The hydrologic effects of dams on the Saluda River, South Carolina. Masters Thesis in

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Examples of Indicator species

- In channel (e.g., striped bass, yellowlamp mussel)
- Floodplain aquatic (e.g., redfin pickerel, yellow-crowned night heron)
- Floodplain terrestrial (e.g., bald cypress, prothonotary warbler)
- Input on indicator species was solicited from interested stakeholders and outside experts.

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The Technical Workshop

- Invited “ologists”
- Encouraged other stakeholders to attend with the caveat that this would be very technical in nature
- Goal was to develop a flow recommendation, including inter-annual variability as a starting point to an adaptive management plan.

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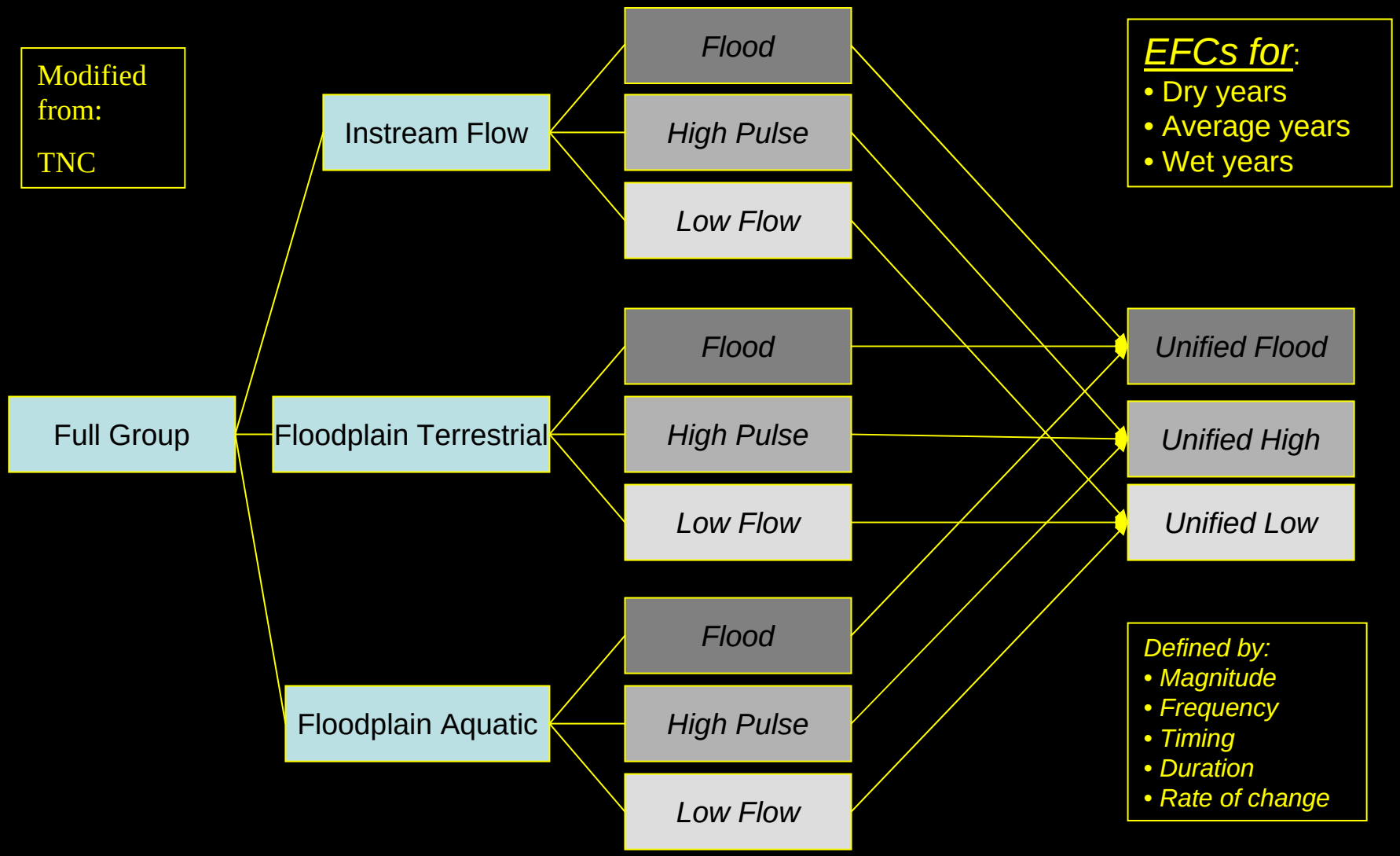
Breakout structure of Technical Workshop…



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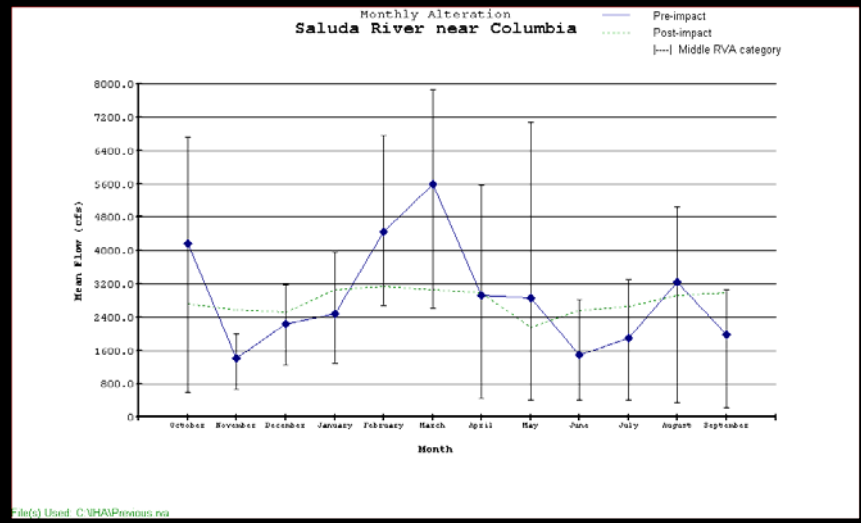
Outcome of Technical Workshop

- An initial hydrograph for each indicator species
- Added some indicators, deleted others
- Identified data gaps (e.g., groundwater)
- Uncovered new information (e.g., USGS report)
- Identified addition model runs needed
- Concluded that the nexus of Saluda operations is likely greater with respect to lower pulse flows than high flow events (<2yr recurrence).



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Summary of Model Results to date…

- Mean annual flow in Congaree ~ 9,000 cfs
- Filling of swamp creeks and guts begins at ~8,000cfs
- Filling of back swamp areas and connecting oxbows at ~11,000-12,000 cfs
- Levees topped at ~30,000 cfs
- 2-year event ~70,000 cfs
- Stage-discharge relationship begins to break down ~40,000cfs
- At high flows, flows are driven in greater proportion by Broad River.

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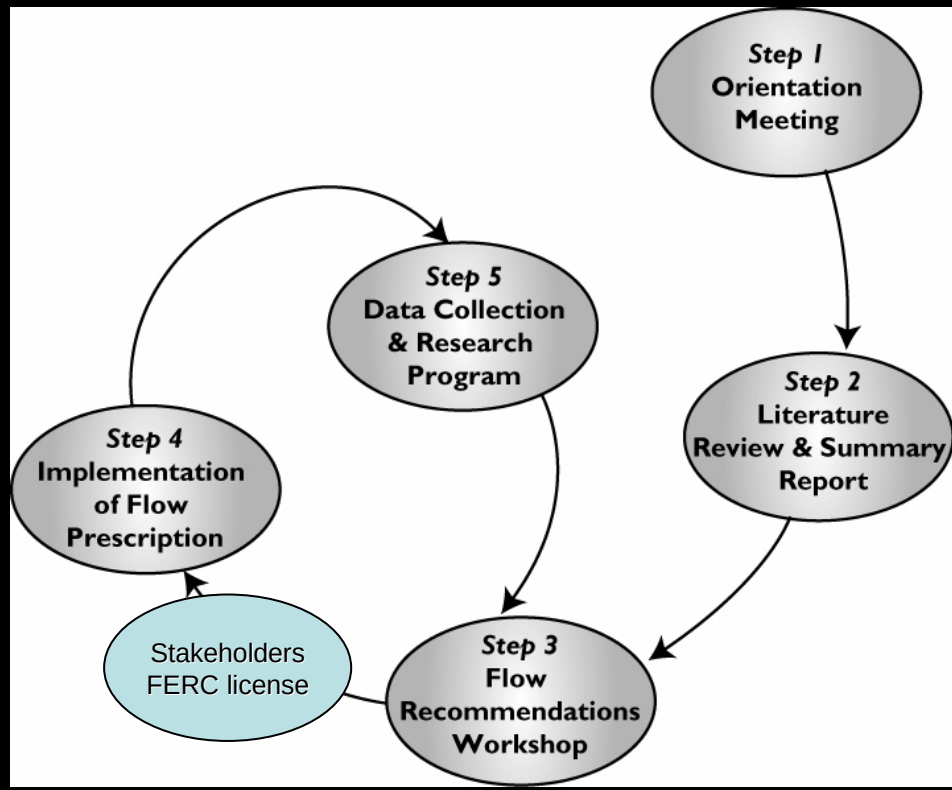
What's next?

- Currently drafting an integrated flow recommendation based on technical workshop
- Periods of stable flows/inundation (e.g., Red-breast sunfish)
- Periods of desiccation are likely to be part of the mix (e.g., bald cypress)
- Reconvening stakeholders in March to solicit modifications and consensus on flow prescription
- SCE&G must submit its draft license application to FERC by fall.



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Has ESWM proven effective?

At a minimum we have…

- Established a science-based, stakeholder supported administrative record
- Inserted park interests into the forefront of the relicensing and river management
- We pushed the forward the state of scientific knowledge re Congaree
- Developed an adaptive management flow regime that is supported by science, understood and supported by stakeholders
- Engaged dialogue and partnership amongst diverse stakeholders around a park-based issue.

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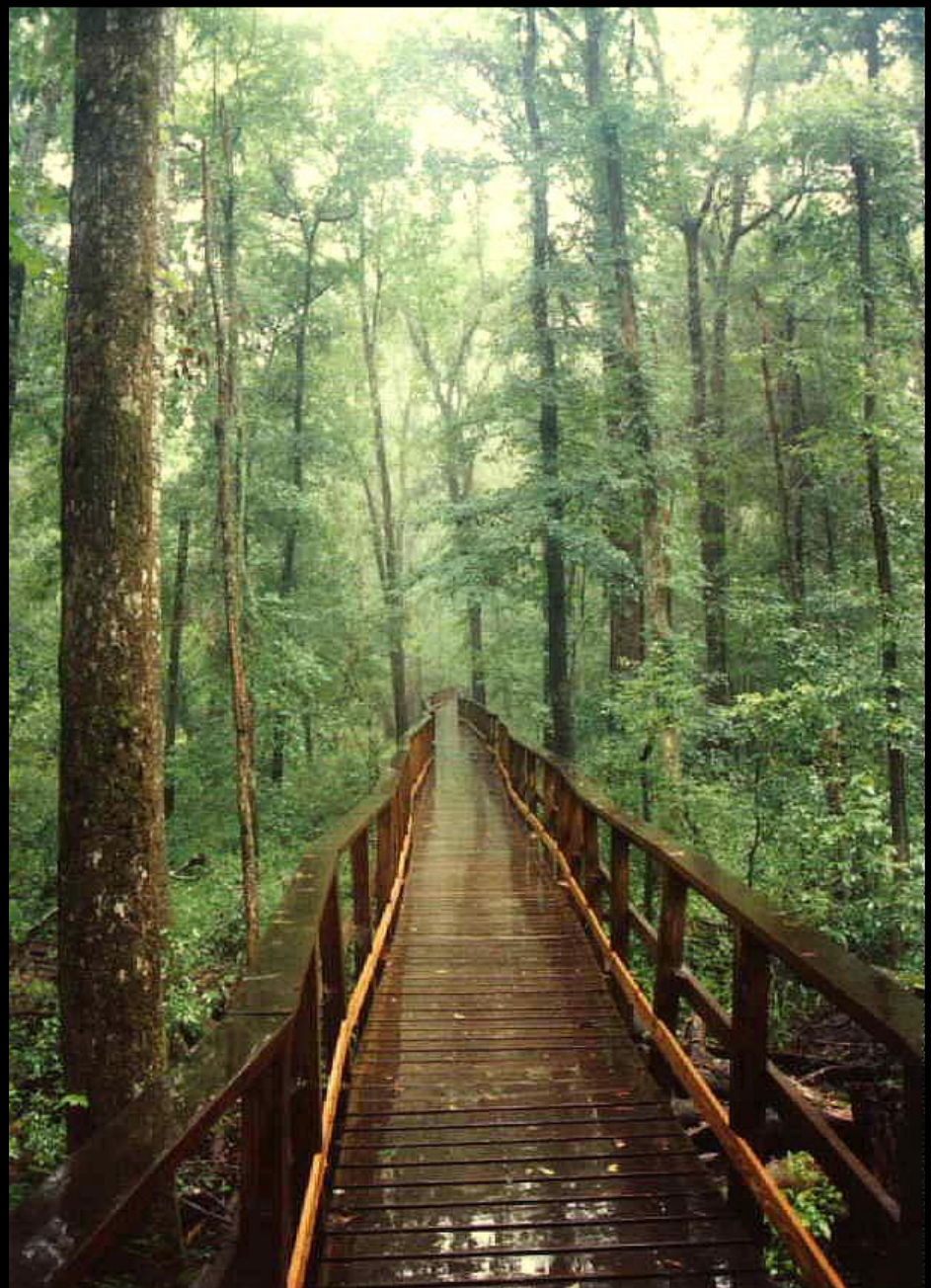

Questions?

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