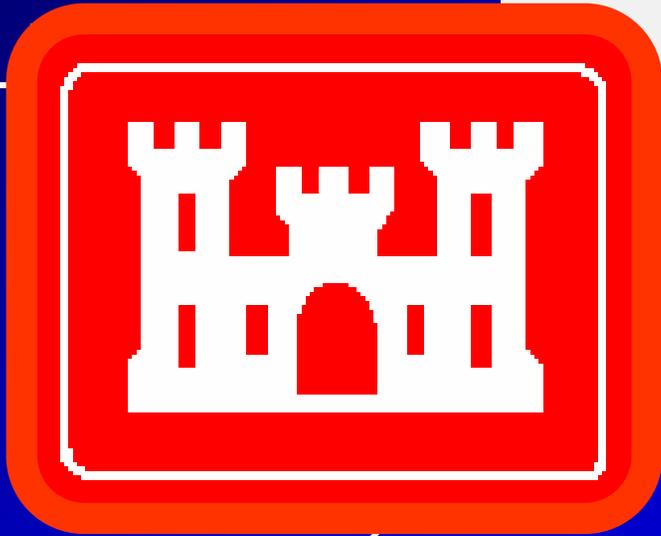


*The Nature
Conservancy*®

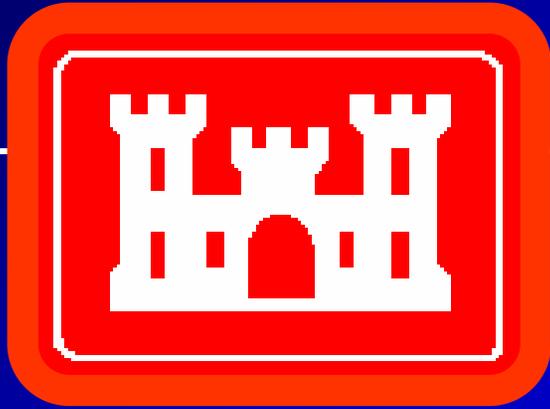


SAVING THE LAST GREAT PLACES ON EARTH



*Presentation for the
USACE TNC Partnership
Meeting
November 16-18, 2004*

***Presented by
Leroy Crosby -USACE Savannah District
and Amanda Wrona -TNC Georgia Chapter***



*Comprehensive
Water Resources Study
for the
Savannah River*



SAVING THE LAST GREAT PLACES ON EARTH



Study Need

- ◆ **More frequent severe droughts and floods**
- ◆ **More water demands by Georgia and South Carolina**
- ◆ **More need for water laws and interstate communication within the basin**



Savannah River Basin Balancing Uses

Wetlands / Habitat



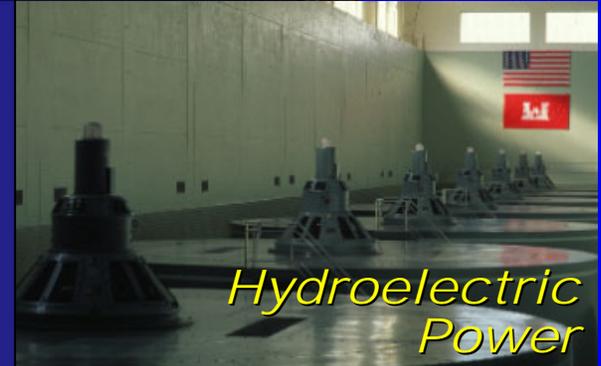
Water Supply



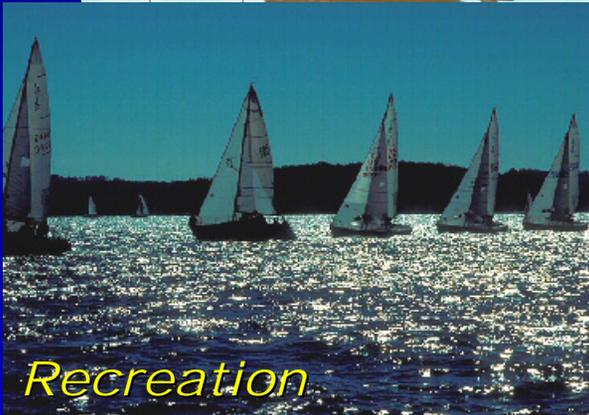
Aquatic Plant Control



Hydroelectric Power



Recreation



Flood Control

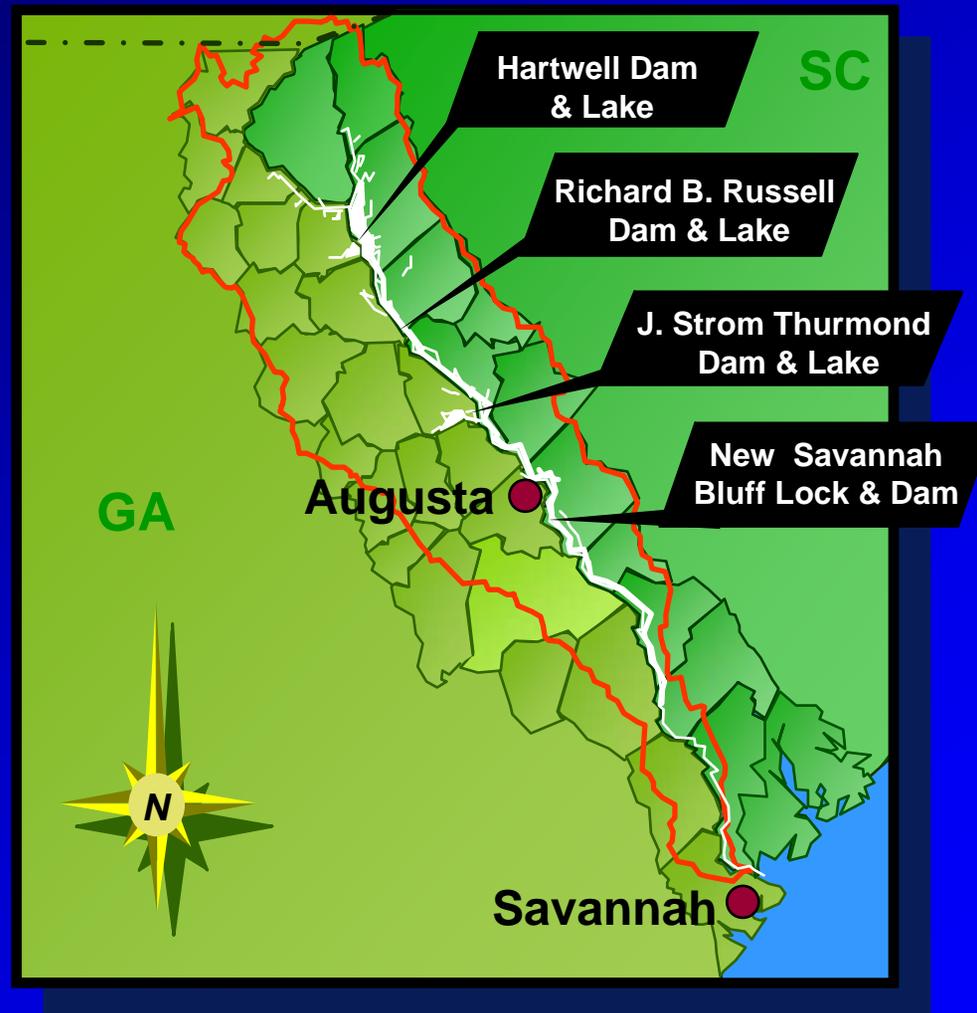


Navigation





Savannah River Basin Comprehensive





Savannah River Basin Comprehensive Water Resources Study

Pertinent Basin Data

Over 500 Major Users

44 GA & SC Counties

312 River Miles

13 Hydropower Plants

1 Lock and Dam

3 COE Dams

11,000 Square Miles



Cost Shared Requirements

- **50% Fed. 25% SC 25% GA**
- **FY04 Federal Funding = \$130,000**
to continue Phase I work.
- **SC is providing Payment & In-kind Services**
- **GA is providing In-Kind-Services**



Savannah River Basin Comp. Study

Study Direction

- ◆ **Conducting Feasibility Phase**
 - ❖ **Two Phased Effort**
 - **Preliminary Phase**
 - **Detailed Phase**



Savannah River Basin Comp. Study

Phase One – Focus On Changing Operations

- ◆ Working With Stakeholder Groups
 - ❖ Clearly define their needs - current & future
- ◆ Model Preparation
- ◆ Develop Historical Data
- ◆ Develop & Evaluate Allocation Scenarios
- ◆ Have a plan? Or, on to Phase Two



Current Status

- ◆ GA USGS is finished the 50-year inflow data set
- ◆ HEC RES SIM (basin-wide computer model)
- ◆ Zapata finished the basin-wide water use and demand surveys
 - ❖ Hydropower
 - ❖ Public Involvement (Recreation and Residential)
 - ❖ Municipal & Industrial Users
 - ❖ Agricultural Users
- ◆ Nature Conservancy in concert w/ the scientific community developed ecological flow prescriptions for fish, wildlife, and plant habitat for river between Augusta Shoals and the Atlantic Ocean

**Ecologically sustainable water management
on the Savannah River: Development,
implementation, and monitoring of ecological
flow prescriptions.**



SAVING THE LAST GREAT PLACES ON EARTH

Why are we protecting this resource?



- ❖ Freshwater mussels are also abundant in the river system, with 9 rare species documented in the basin.



- ❖ 100 species of fish one of the broadest arrays of fish species in the Southeast. (largemouths, striped bass, chain pickerel and redbreast and the endangered short nose sturgeon).



- ❖ The Savannah River Basin is home to more than 75 species of rare plants and animals, including, the robust redhorse and the globally rare shoals spiderlilly.

Globally Rare Species

- ◆ 2 Amphibians
- ◆ 5 Birds
- ◆ 4 Fish
- ◆ 1 Invertebrate
- ◆ 4 Mussels
- ◆ 21 Plants
- ◆ 2 Reptiles
- ◆ 89 Species listed by
the GA & SC Heritage
Programs



Critical Threats



**Incompatible
Forestry and
Agricultural
Practices**

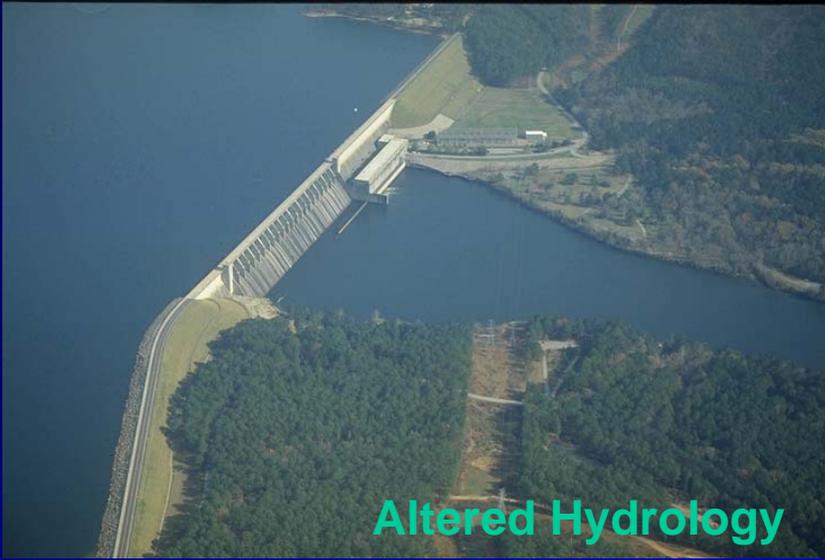


Harbor Modification



Municipal water use

Critical Threats



Designing Ecological Flow Prescription

◆ **Orientation Meeting**

- ❖ **More than 50 individuals attended an orientation meeting in May 2002**
- ❖ **Reviewed background information (there's lots already out there)**
- ❖ **Developed team to write report**

◆ **Literature Review and Summary Report**

- ❖ **Four lead researchers, representing various disciplines, and a team of graduate assistants developed an annotated literature review**
www.rivercenter.uga.edu/pdfs/ecosystem2.pdf
- ❖ **More than 375 sources were identified and reviewed**

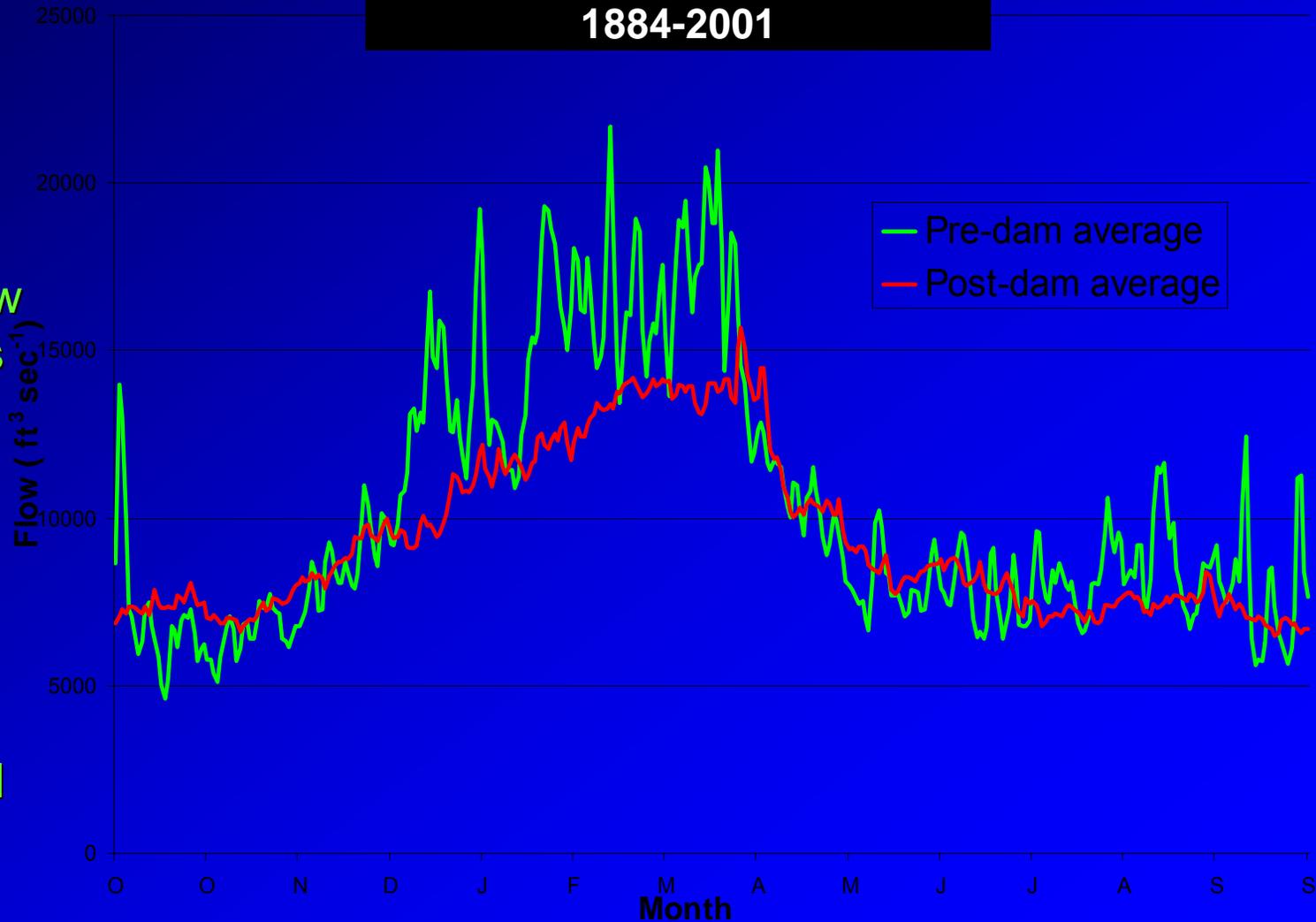
◆ **Flow Recommendations Workshop**

Savannah River Ecosystem Flow Workshop

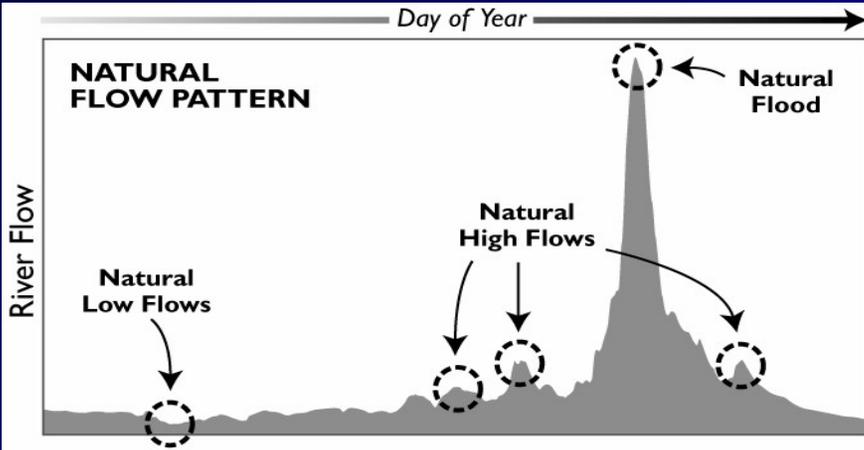
- ◆ ***Purpose:*** collaborative process to gain understanding of the influence of hydrologic processes on river ecology
- ◆ ***Contributors:*** The Nature Conservancy, USACE - Savannah District, USFWS - Charleston, University of Georgia River Science and Policy Center
- ◆ ***Outcome:*** designed a process to determine a set of essential flow characteristics to sustain the ecological integrity of the Savannah River ecosystem

Key Post-Dam Changes in the Savannah River Hydrograph

**Savannah River Flow at Augusta
1884-2001**

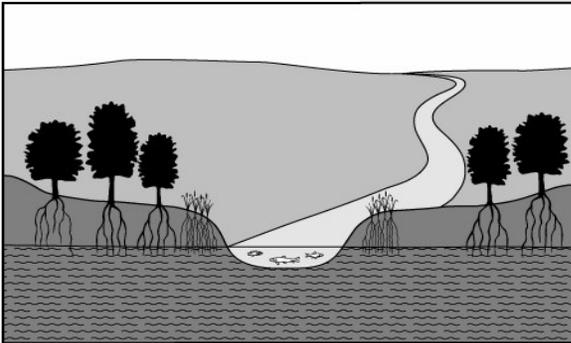


- ◆ Removal of natural variability in the hydrograph
- ◆ Increased low flow volumes
- ◆ Reduction in peak flow volumes and frequency
- ◆ Reduction in mean annual flow



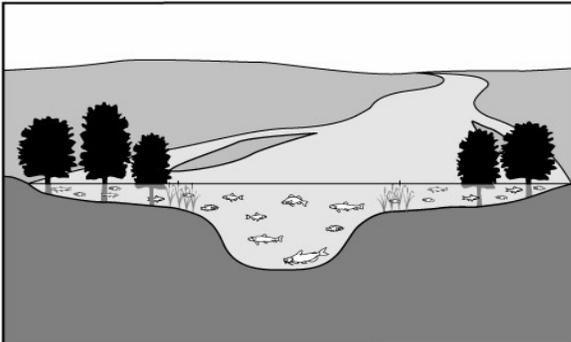
Natural Low Flow

-  Fish have adequate oxygen and can move up- or downstream to feed
-  Riparian vegetation sustained by shallow ground water table
-  Insects feed on organic material carried downstream
-  Birds supported by healthy riparian vegetation and aquatic prey



Natural Flood

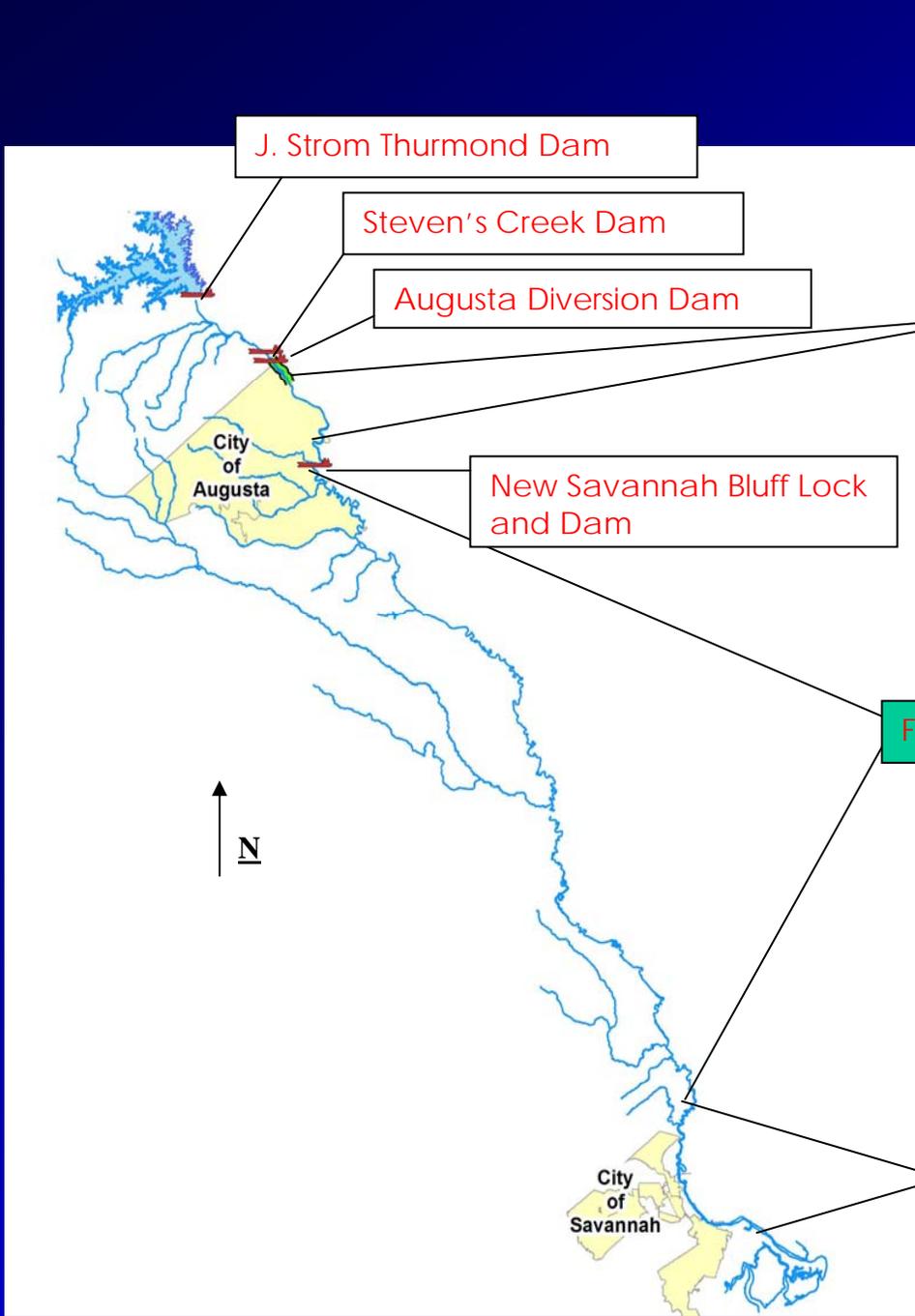
-  Fish are able to feed and spawn in floodplain areas
-  Riparian plant seeds germinate on flood-deposited sediments
-  Insects emerge from water to complete their lifecycle
-  Wading birds and waterfowl feed on fish and plants in shallow flooded areas



Savannah River Ecosystem Flow Workshop Participants



The goal was not to create optimal conditions for all species all of the time; rather, we wanted to create adequate conditions for all native species enough of the time.



Shoals



Flood plain



Estuary



Ecosystem Flow Recommendations

Savannah River, below Thurmond Dam (*Augusta Shoals*)

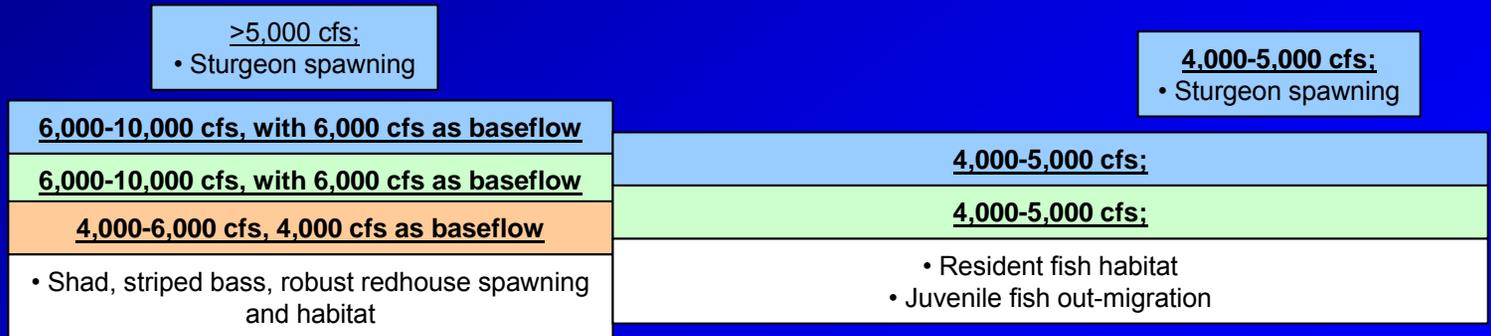
Floods

No flood flow recommendations provided for the Shoals

High Flow Pulses

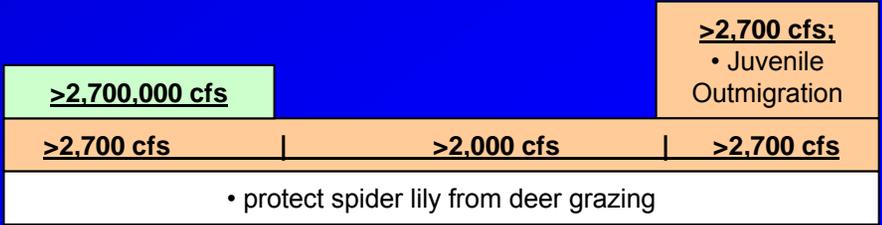


Low Flows



Key

- Wet Year
- Avg Year
- Dry Year



JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Ecological Benefits of Implementation



- ◆ **Decreased predation on Shoals Spider Lily**
- ◆ **Increased spawning habitat for anadromous species**

Pulses for fish passage:

- ◆ At least 16,000 cfs for 5 days in March
- ◆ At least 16,000 cfs for 5 days in April



Ecosystem Flow Recommendations

Savannah River, below Thurmond Dam (*River-Floodplain*)

Floods

50,000-70,000 cfs; 2 weeks, avg every 2 yrs

- Maintain channel habitats
- Create floodplain topographic relief
- Provide fish access to the floodplain
 - control invasive species
- Maintain wetlands and fill oxbows and sloughs
- Enhance nutrient cycling & improve water clarity
 - Disperse tree seeds

High Flow Pulses

>30,000 cfs; 5 pulses, >2 days with 2 events of 2 week duration (March and early April)

20,000-40,000 cfs; 2-3 days, 1/month

- Provide predator-free habitat for birds
 - Disperse tree seeds
 - Transport fish larvae
- Flush woody debris from floodplain to channel
 - Floodplain access for fish
 - Fish passage past NSBLD

<13,000 cfs; 3 successive years, every 10-20 years

- Floodplain tree recruitment

8,000-12,000 cfs;

- Exchange water with oxbows

Low Flows

>8,000 cfs

- Larval drift for pelagic spawners

<5,000 cfs

- Adequate floodplain drainage
- Create shallow water habitat for small-bodied fish

3,000 cfs; 3 successive years every 10-20 years

- Floodplain tree recruitment

Key

- Wet Year
- Avg Year
- Dry Year

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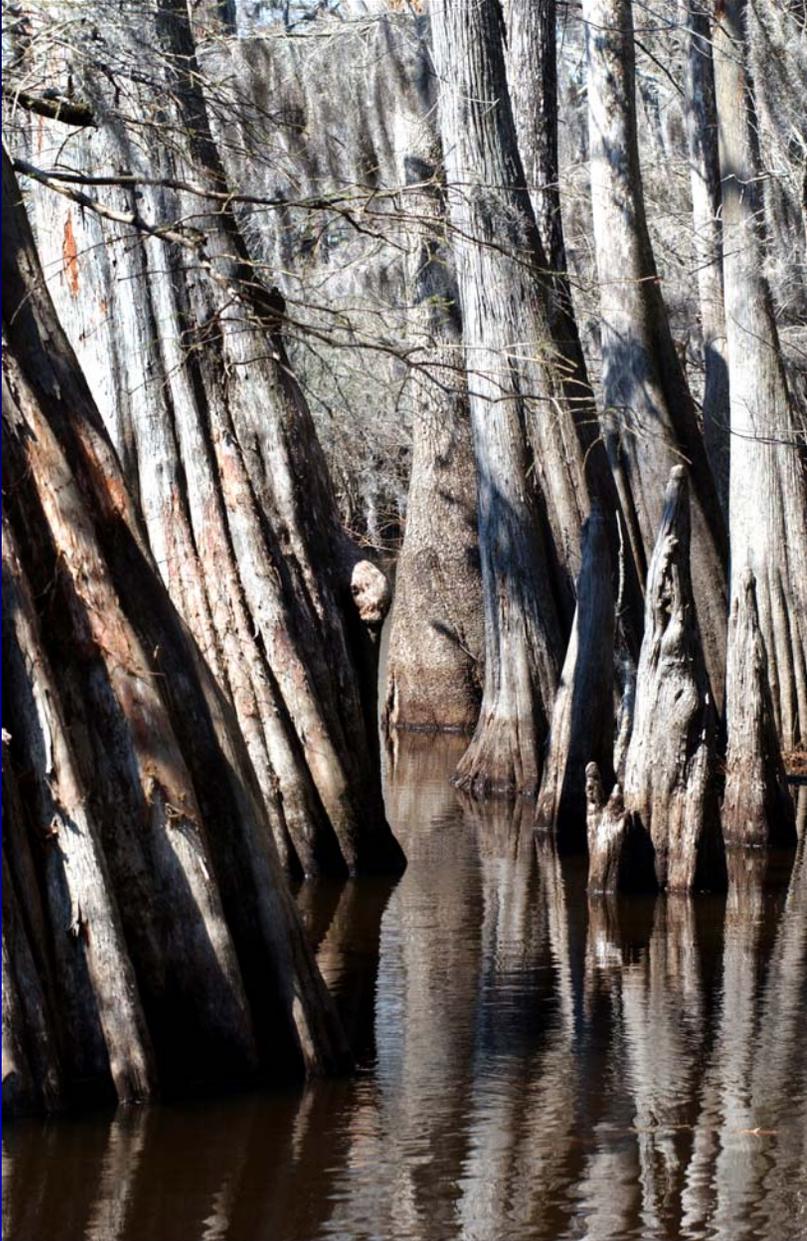
Ecological Benefits of Implementation



Low flows will facilitate:

- ◆ **Germination and establishment of bottomland hardwood species**
- ◆ **Growth of adult trees**
- ◆ **Juvenile fish survival**
- ◆ **Spawning in gravel shoals**

Ecological Benefits of Implementation



Pulses will facilitate:

- ◆ **Seed dispersal**
- ◆ **Floodplain access for fish spawning and foraging**
- ◆ **Nutrient replenishment to floodplain soils**
- ◆ **Nesting habitat for birds**

Ecosystem Flow Recommendations

Savannah River, below Thurmond Dam (*Estuary*)

Floods

50,000 cfs; 4 weeks,
1 pulse every 5 years

- Fisheries productivity boost
 - Species mixing
 - Sediment & nutrient replenishment
- Improved bird habitat & forage

High Flow Pulses

<u>4,000-5,000 cfs; 2 weeks,</u> <u>1 pulse</u>
<u>4,000-5,000 cfs; 2 weeks,</u> <u>1 pulse</u>
<u>4,000-5,000 cfs; 2 weeks,</u> <u>1 pulse</u>
<ul style="list-style-type: none"> • increase nutrient inputs • increase seed dispersal • control oyster and blue crab parasites

Low Flows

<u>10,000 cfs (monthly); 6,000 cfs (instantaneous)</u>	
<ul style="list-style-type: none"> • More extensive seed dispersal across freshwater tidal marsh • enhanced nutrient cycling and invertebrate productivity • inter-annual spatial variability of salinity gradient and associated fish distributions 	
<u>8,000 cfs (monthly); 6,000 cfs (instantaneous)</u>	
<u>8,000 cfs (monthly); 5,000 cfs (instantaneous)</u>	<u>6,000 cfs (monthly); 5,000 cfs (instantaneous)</u>
<ul style="list-style-type: none"> • Maintain tidal freshwater marsh • Maintain salinity gradient (0.5 PSU for fish access to tidal marsh habitat) 	

Key

- Wet Year
- Avg Year
- Dry Year

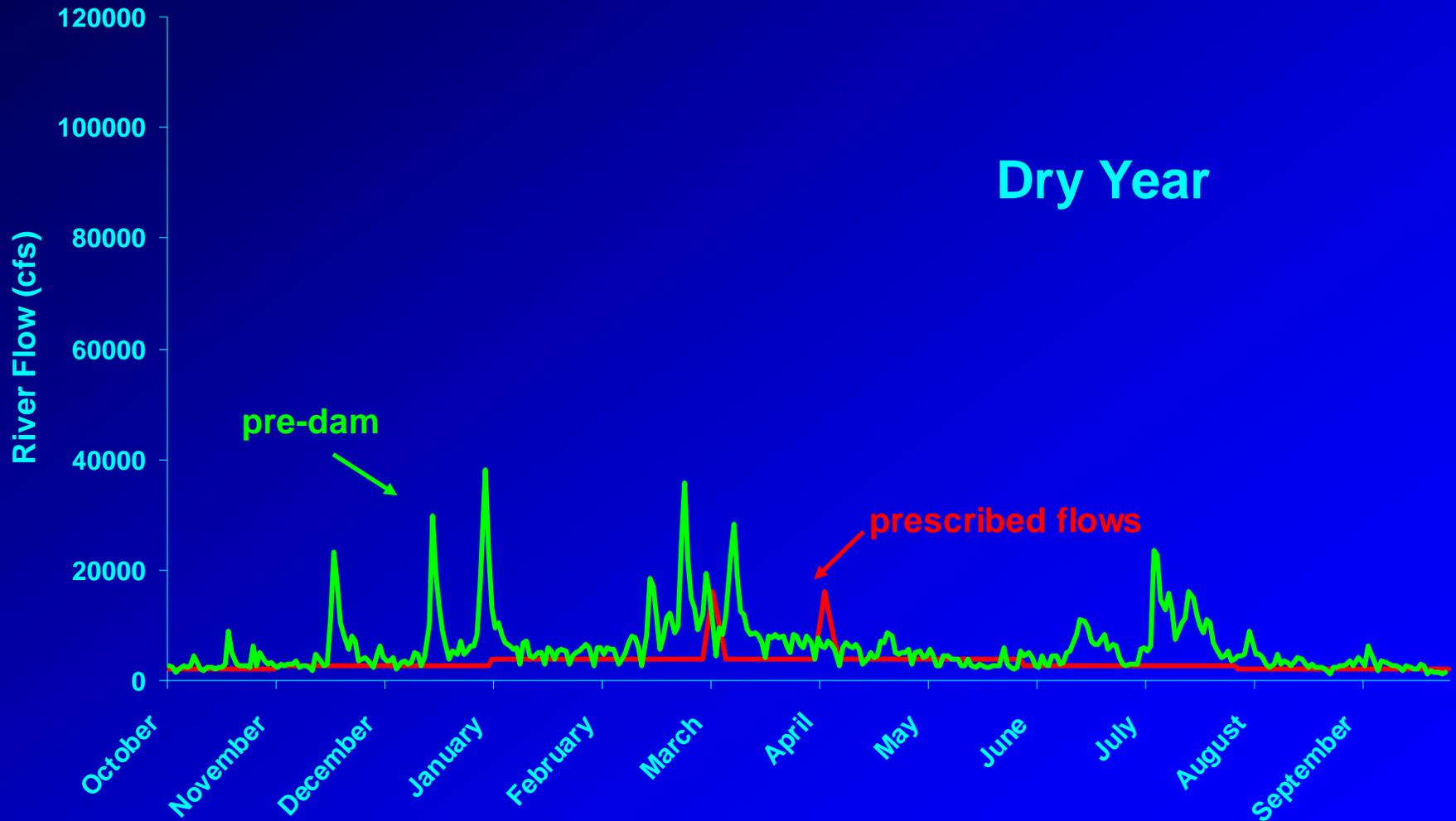
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Ecological Benefits of Implementation

Pulses will facilitate:

- ◆ Reduced parasitism of oysters and blue crabs
- ◆ Nutrient cycling
- ◆ Invertebrate productivity
- ◆ Seed dispersal
- ◆ Fish habitat utilization

Savannah Flow Prescription



Controlled Flood for Fish Passage





Pulse Release 'Controlled Flood'



Electrofishing













Current "Work"



- ◆ **Monitoring plan for the Ecological Flow Prescriptions**
- ◆ **Looking for study sites**
- ◆ **Implementation of flow restoration (Release Part II)**
- ◆ **Education and Outreach**





Savannah River Basin Comp. Study – Operational Scenarios

- ◆ ***Drought Plan Changes***
- ◆ ***Storage Changes***
- ◆ ***Flow Changes***
 - ❖ ***TNC Downstream Springtime Flow Pulses***
 - ❖ ***TNC High Flow Downstream Pulses***
 - Up to 50,000 cfs
 - ❖ ***Compare 15,000 cfs and 30,000 cfs JST releases.***
- ◆ ***Operational Rules Changes***

Goal of Phase I



- ◆ **Can we meet present and future demands?**
 - ❖ **YES? Good**
 - ❖ **NO? What steps can be taken?**
- ◆ **Make final recommendations, including conflicts of interest**
- ◆ **Decision to enter Phase II ?**



Coordination / Communication



www.sas.usace.army.mil/srbstudy.htm

www.rivercenter.uga.edu/pdfs/summaryreport.pdf