

Developing Environmental Flow Requirements: Savannah River Case Study

River Research and Applications

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SAVING THE LAST GREAT PLACES ON EARTH

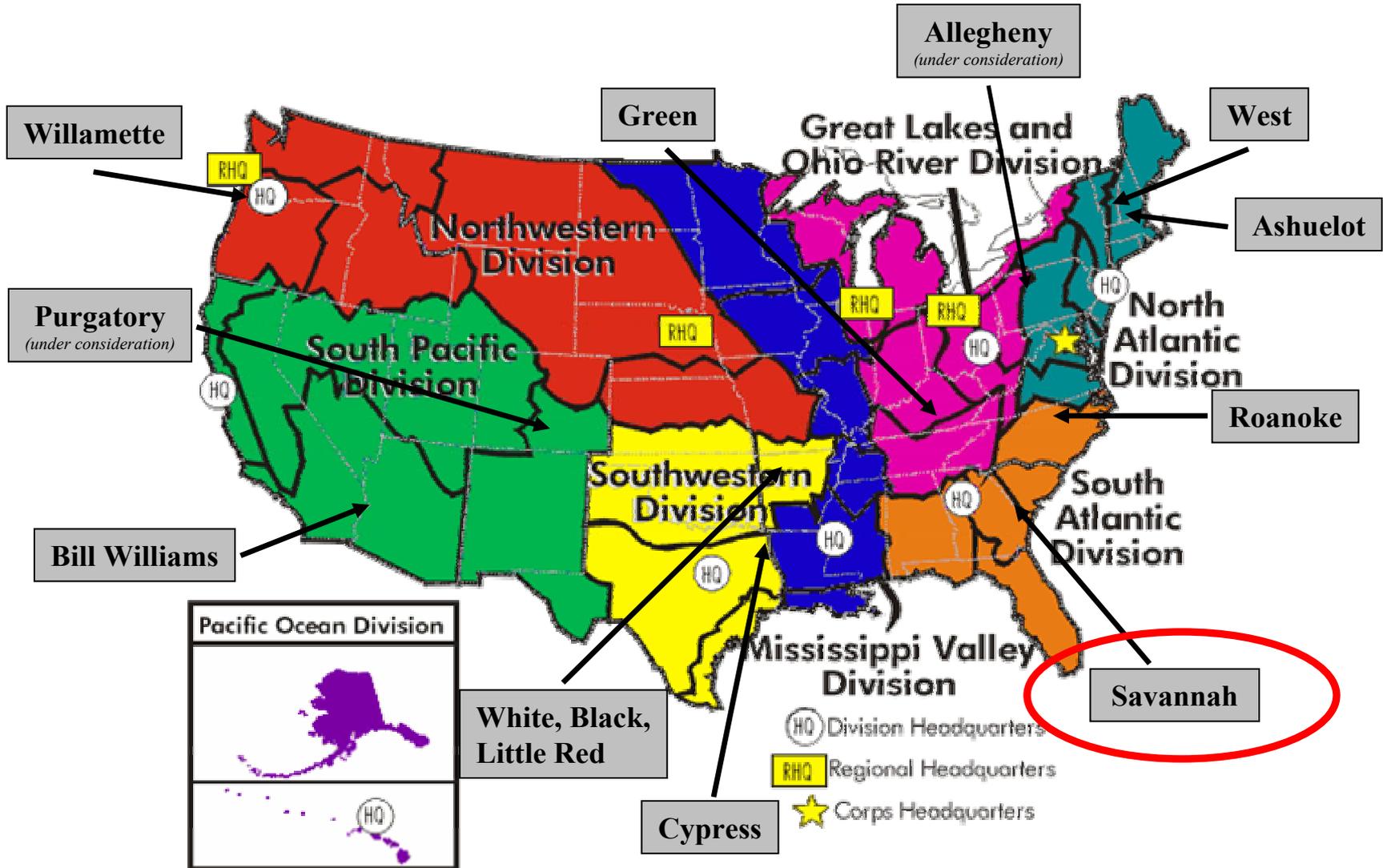
awarner@tnc.org

www.nature.org

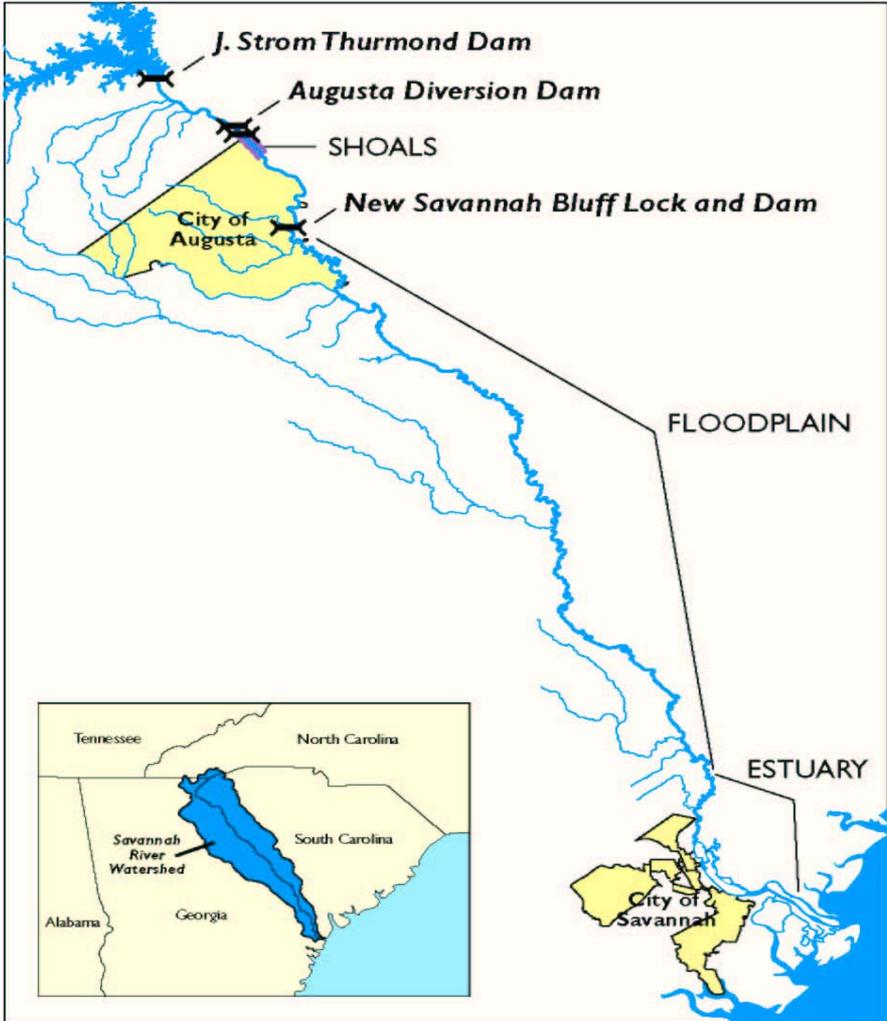
www.freshwaters.org

Sustainable Rivers Project

Current Sites

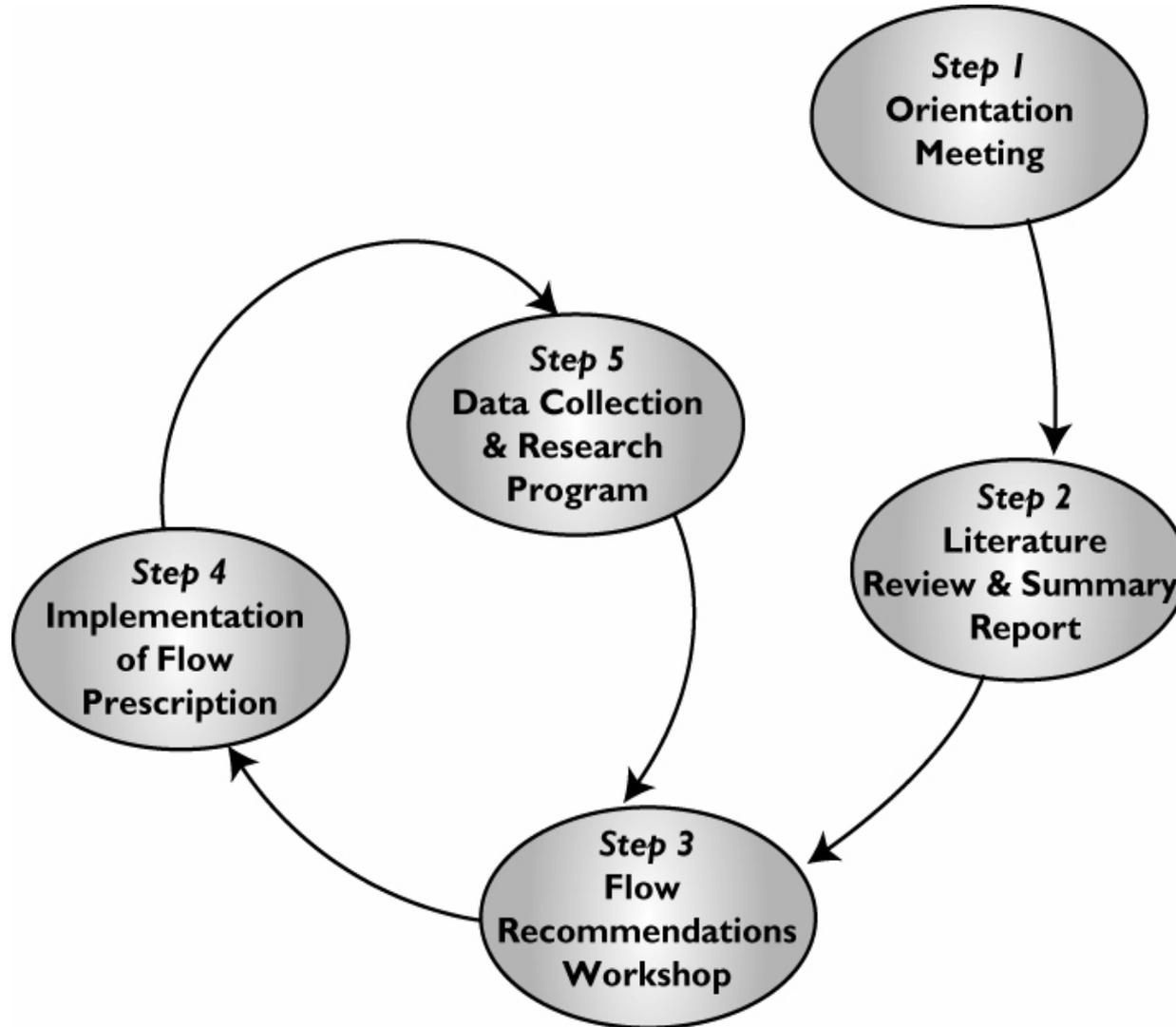


Lower Savannah River and Estuary



Developing & Implementing Environmental Flow Recommendations

Savannah River (GA/SC)



Orientation Meeting

May 2002



- Purpose: Launch a collaboration to collect and apply our best knowledge on flow-ecological process relationships to water management
- Invitees: Agencies, NGO's, University Researchers, consultants (50-60 participants)
- Outcome: Designed a process and identified key contributors for defining a set of essential flow characteristics needed to sustain the integrity of the Savannah River ecosystem

Preparation of Literature Review

(Oct - Nov, 2002)



- Conduct a literature review of sources that appear useful in informing environmental flow recommendations (Savannah and similar systems)
- Focus on the whole ecosystem, including the shoals, river-floodplain, and estuary
- Review for completeness by a diverse group of leading scientists

Preparation of Summary Report

(Nov 2002 - Feb 2003)



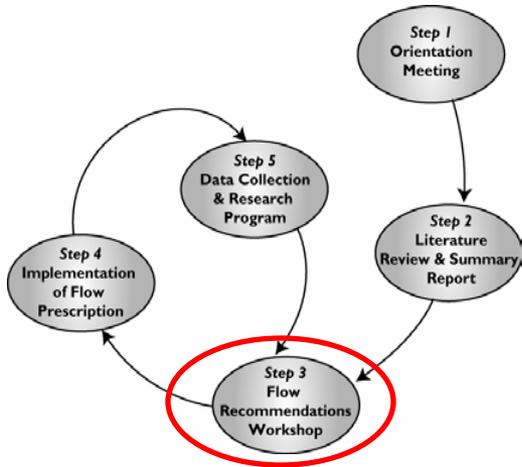
- key findings about linkage between specific ecological flow components and biotic tolerances or dependencies
- pictorial models illustrating connection between natural hydrographs and life cycles of representative species
- box-and-arrow diagrams expressing relationships between ecological flow components and biotic responses or dynamics.
- Reviewed by leading scientists, diverse areas of expertise

Environmental Flow Workshop

(April 2003)



Environmental Flow Workshop (April 2003)



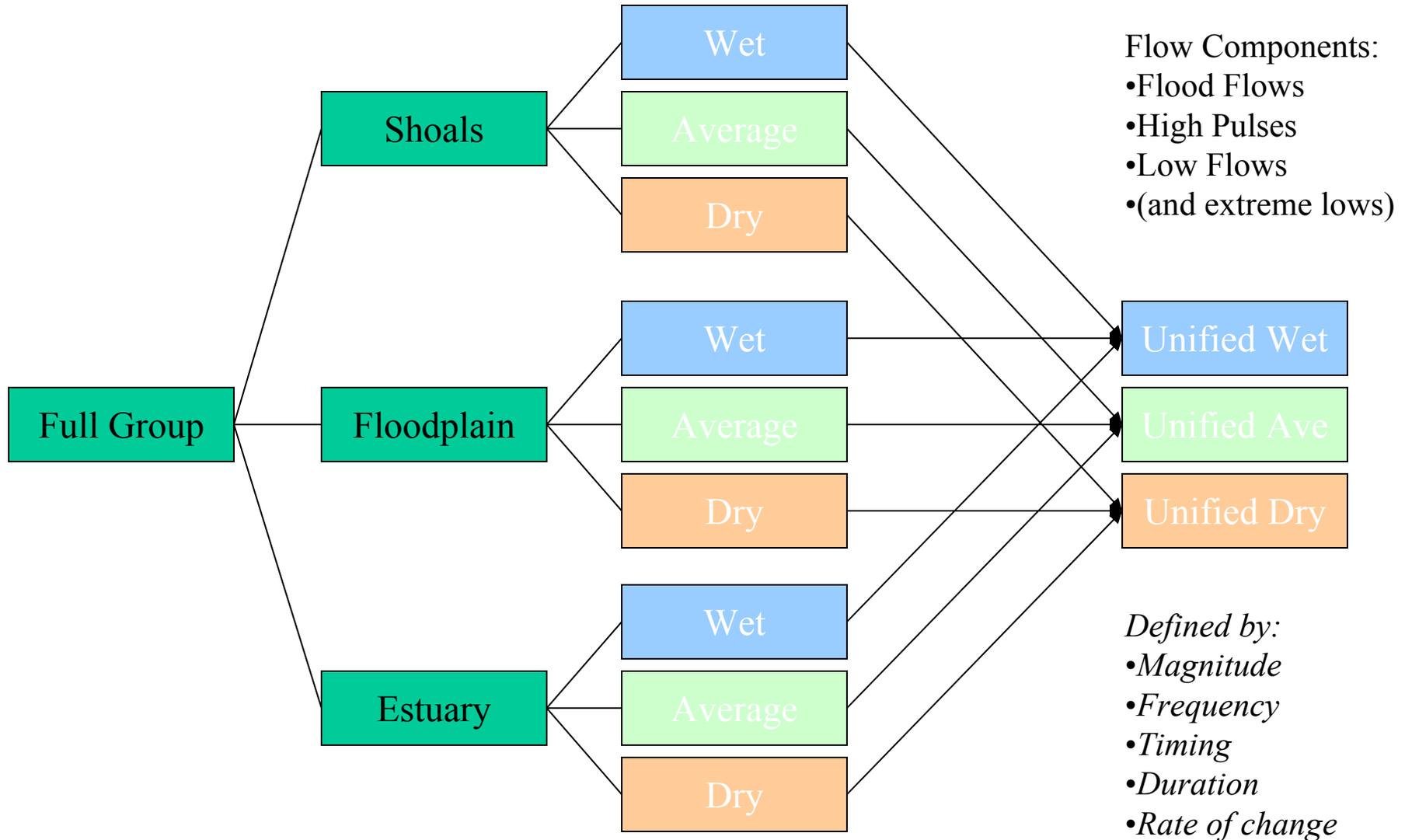
- Workshop: 2½ days, ~45 scientists (agencies, academics and NGO's)
- Three break-out groups defined ecological flow recommendations for:
 - (i) Augusta shoals;
 - (ii) river-floodplain section from Augusta shoals to estuary; and,
 - (iii) estuary

↙ Low Flows, High Flow Pulses, Floods
- Full group integrated flow recommendations across the 3 river reaches
- Report generated; reviewed by all workshop participants

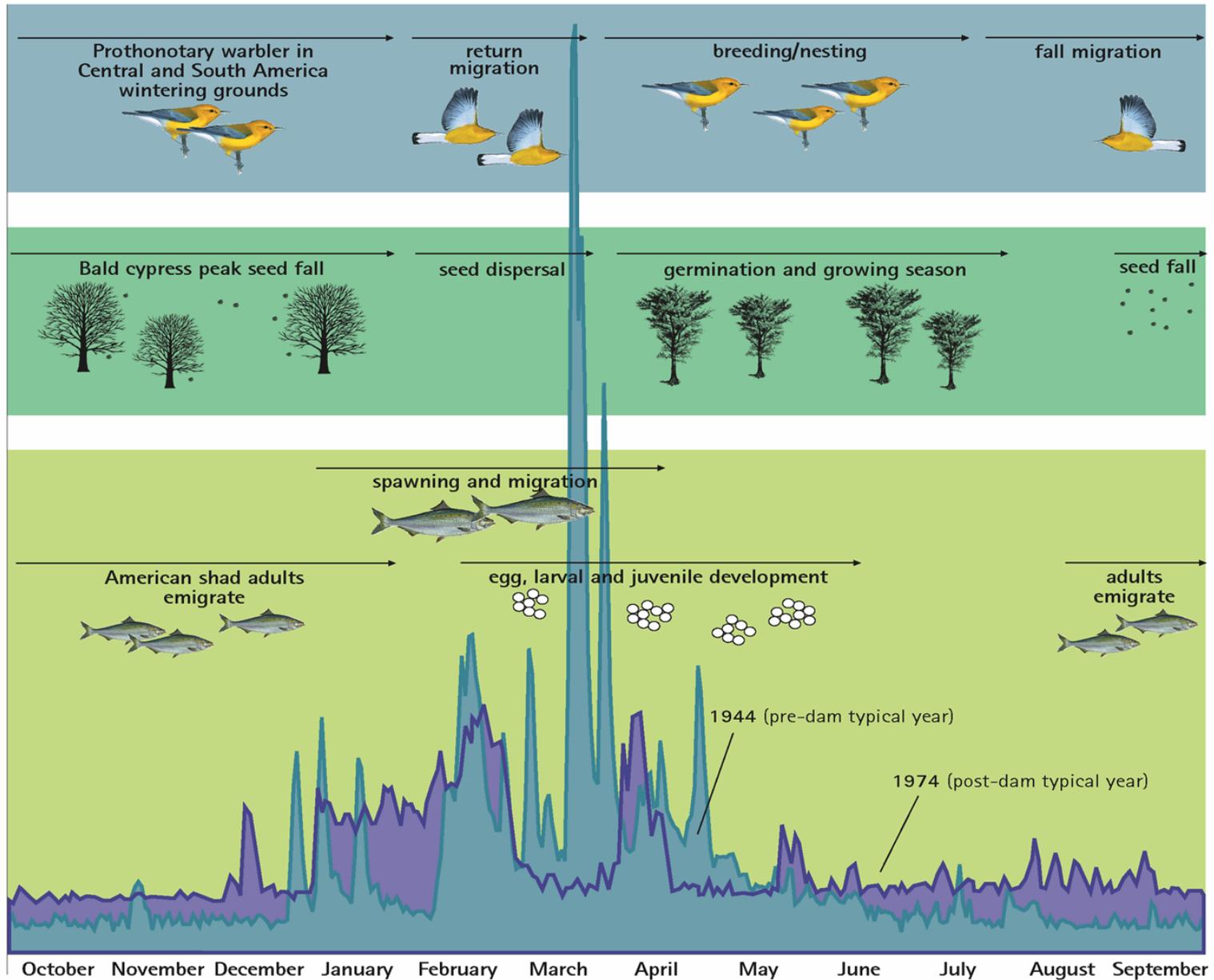
The goal was *not* to create optimal conditions for all species all of the time;

↳ we wanted to create adequate conditions for all native species *enough* of the time.

Developing Ecosystem Flows



Ecological Model of the Savannah River



Environmental 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

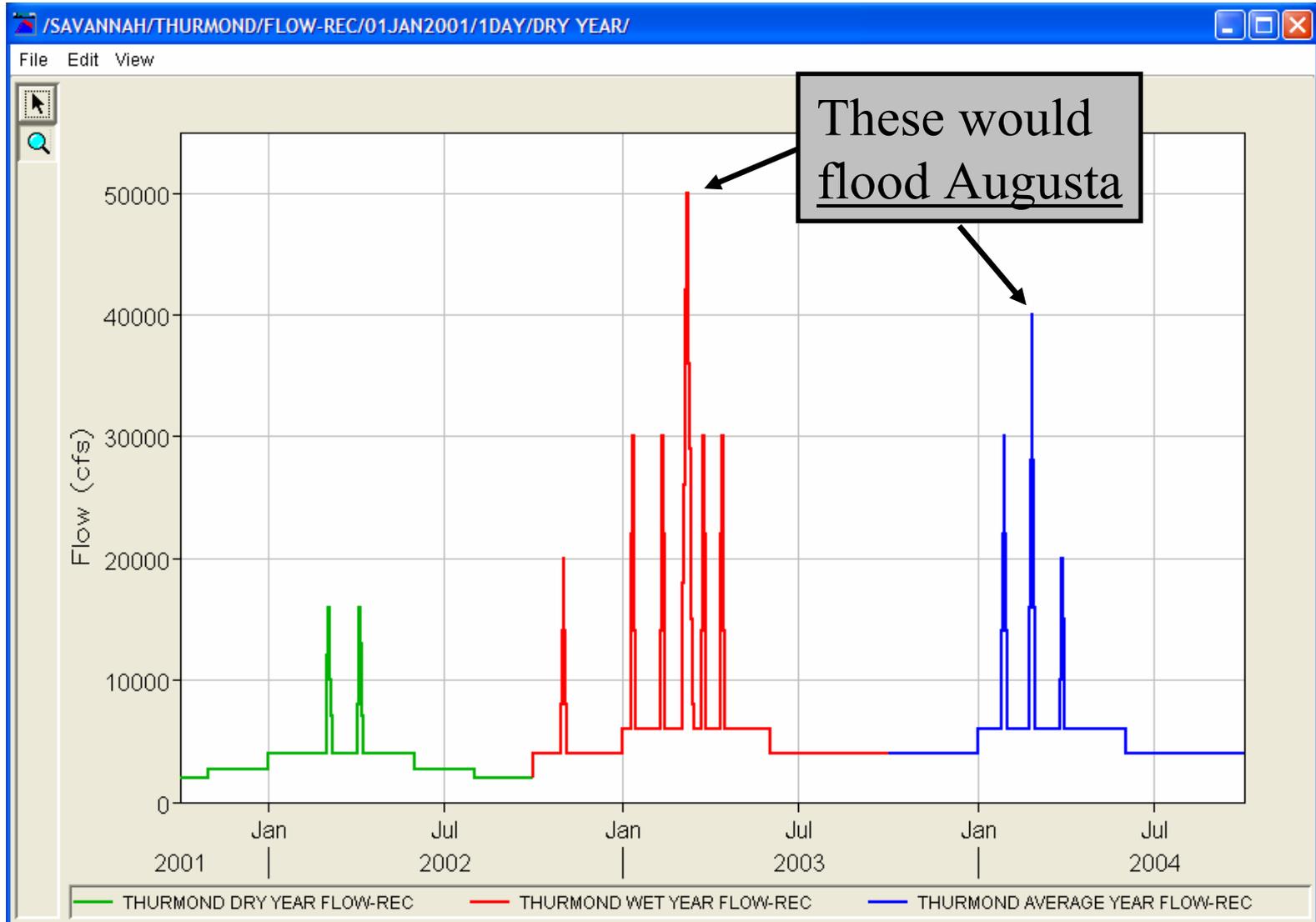
- Floodplain tree recruitment

Key

- Wet Year
- Avg Year
- Dry Year

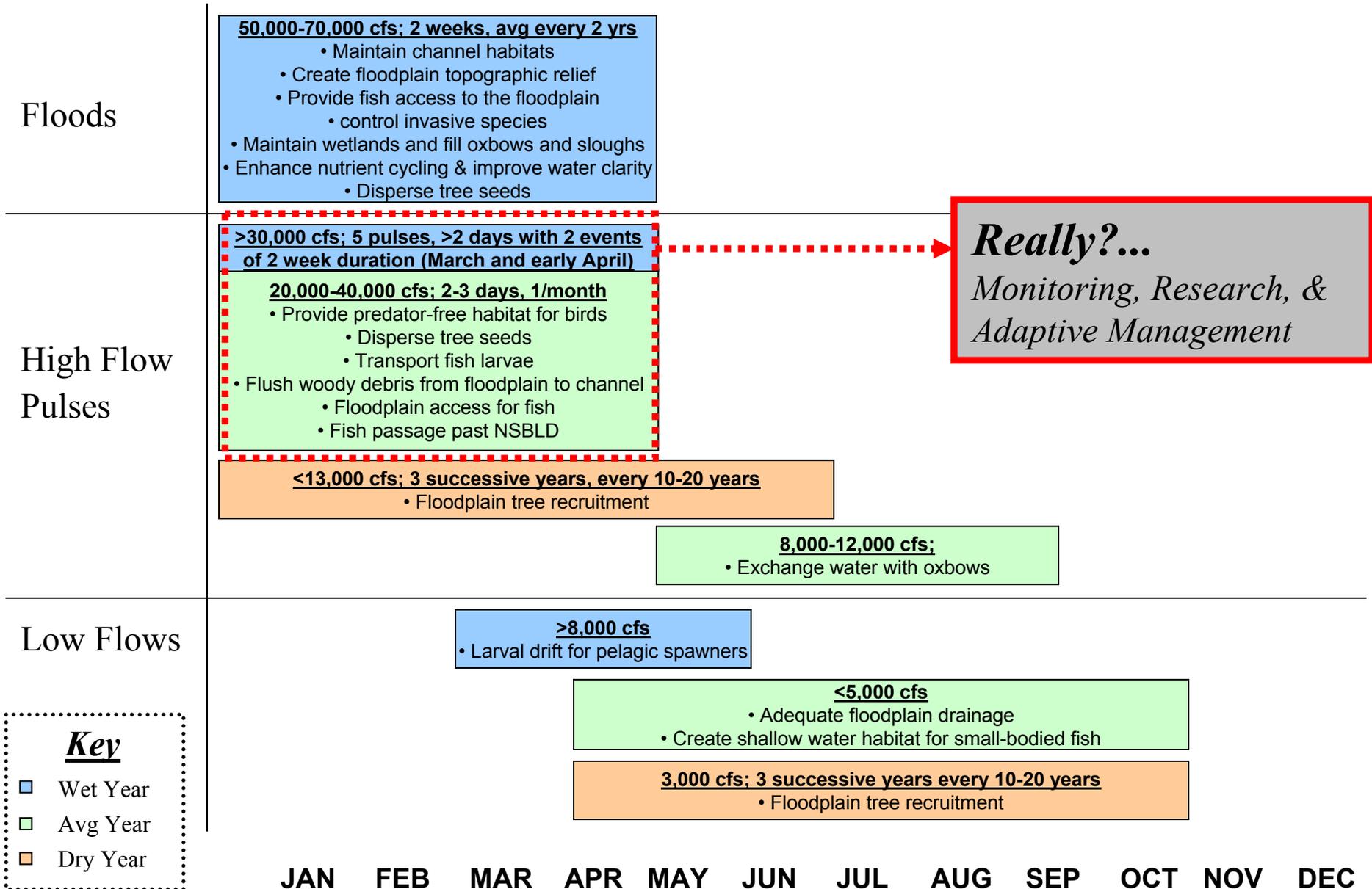
JAN FEB MAR APR MAY JUN JUL AUG SEP OCT NOV DEC

Savannah Flow Recommendations

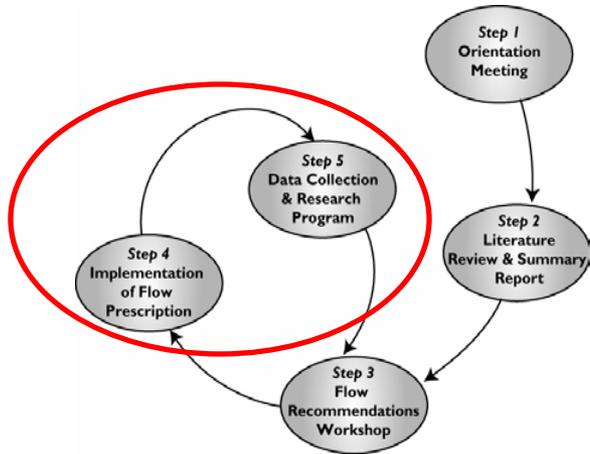


Environmental Flow Recommendations

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



Assess & Implement Flows, Monitoring and Adaptive Management

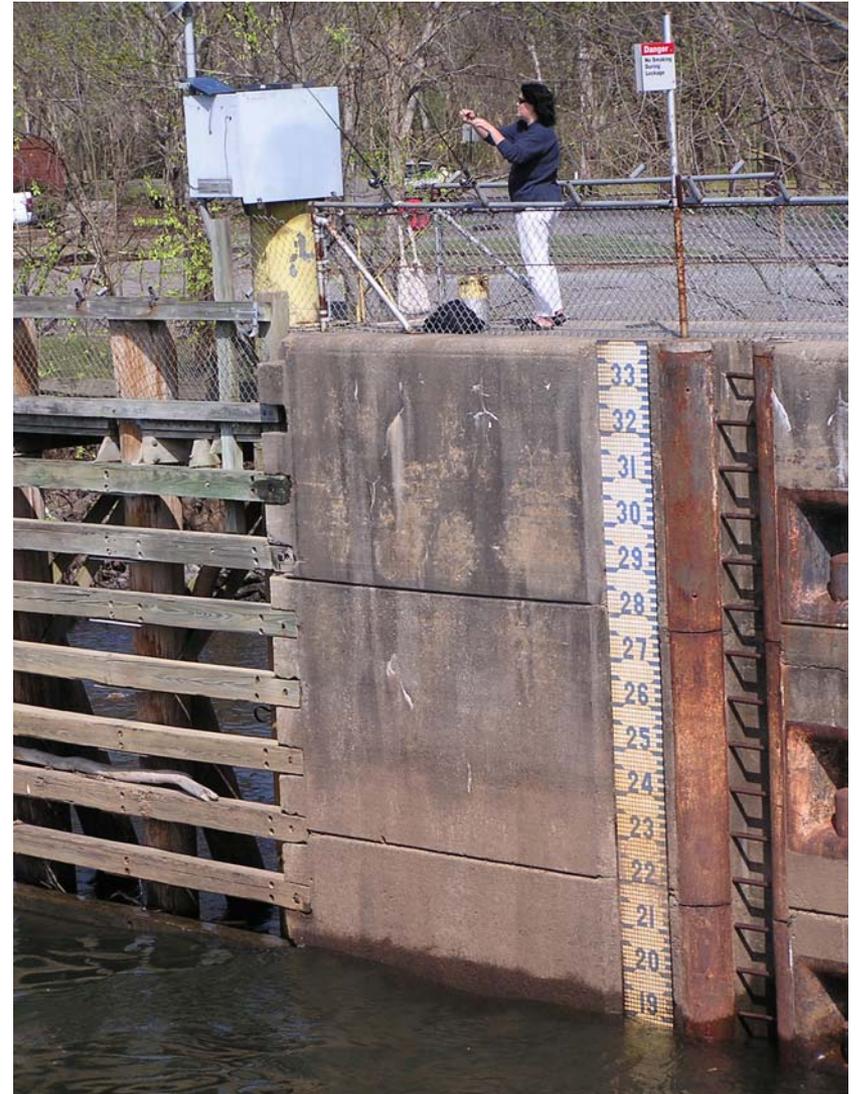
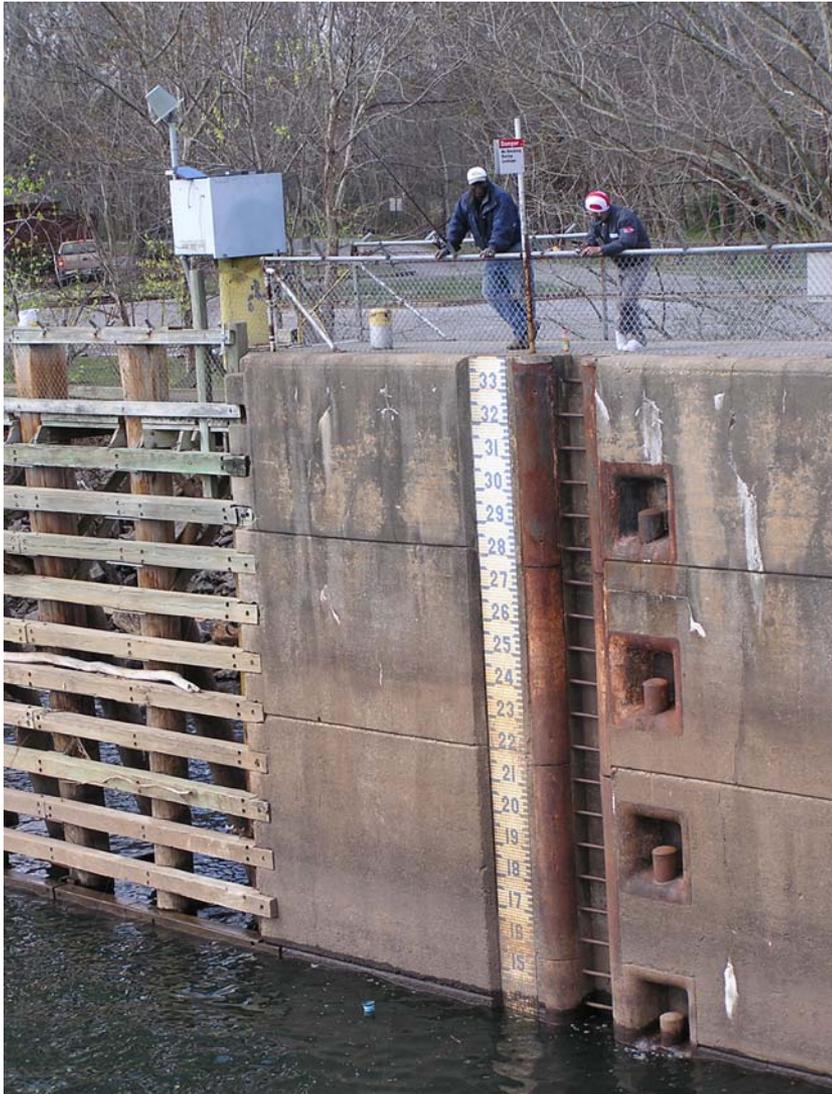


- Assessing flow recommendations (modeling)
- Implementing Flows (initial):
 - (i) March 2004
 - (ii) October 2004

↳ *with some monitoring*
- Developing a strategic monitoring plan

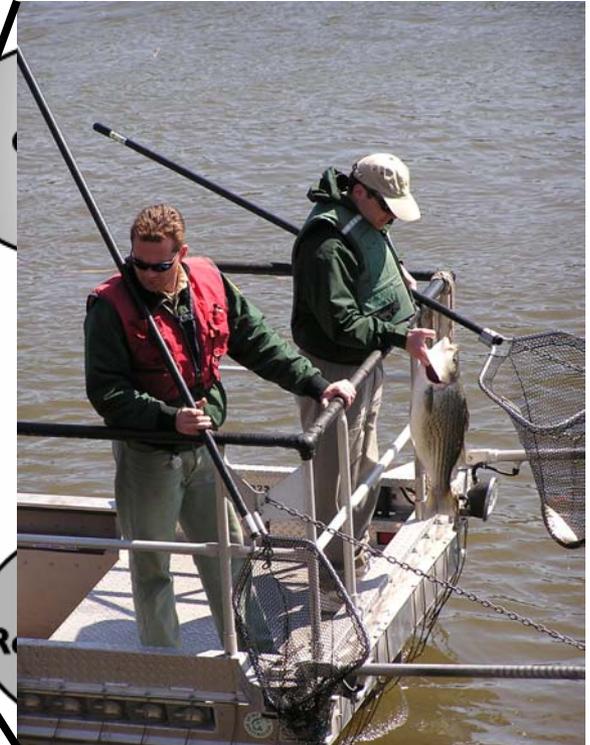
High Pulse Release

(March 2004)



Steps for Developing Ecosystem Flow Recommendations

Savannah River (GA/SC)



*March and
Oct 2004
(initial)*

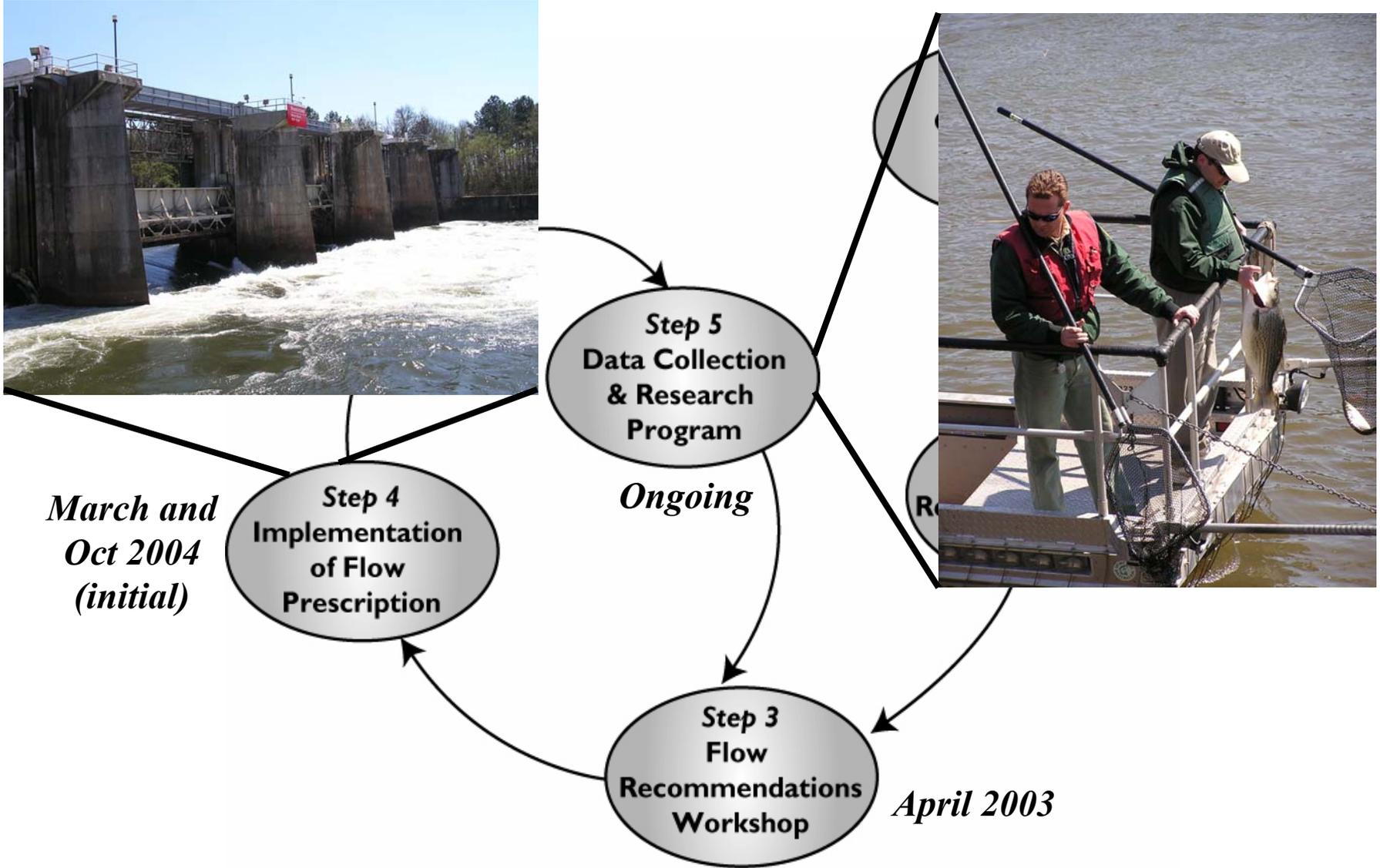
**Step 4
Implementation
of Flow
Prescription**

**Step 5
Data Collection
& Research
Program**

Ongoing

**Step 3
Flow
Recommendations
Workshop**

April 2003



Savannah River

Case Study Summary

- Collaborated to define ecosystem flows:
 - *done for the whole system (shoals, river-floodplain, estuary)*
 - *applied best **available** science*
 - *completed in one year, for \$90K*
- Identified & prioritized knowledge gaps and research needs
- Developing a strategic monitoring plan to assess dam re-operation and inform future management
- Modeling to assess multiple future scenarios

