

The Ecological Imperative for Ecosystem Flow Guideline Development

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U.S. Fish & Wildlife Service

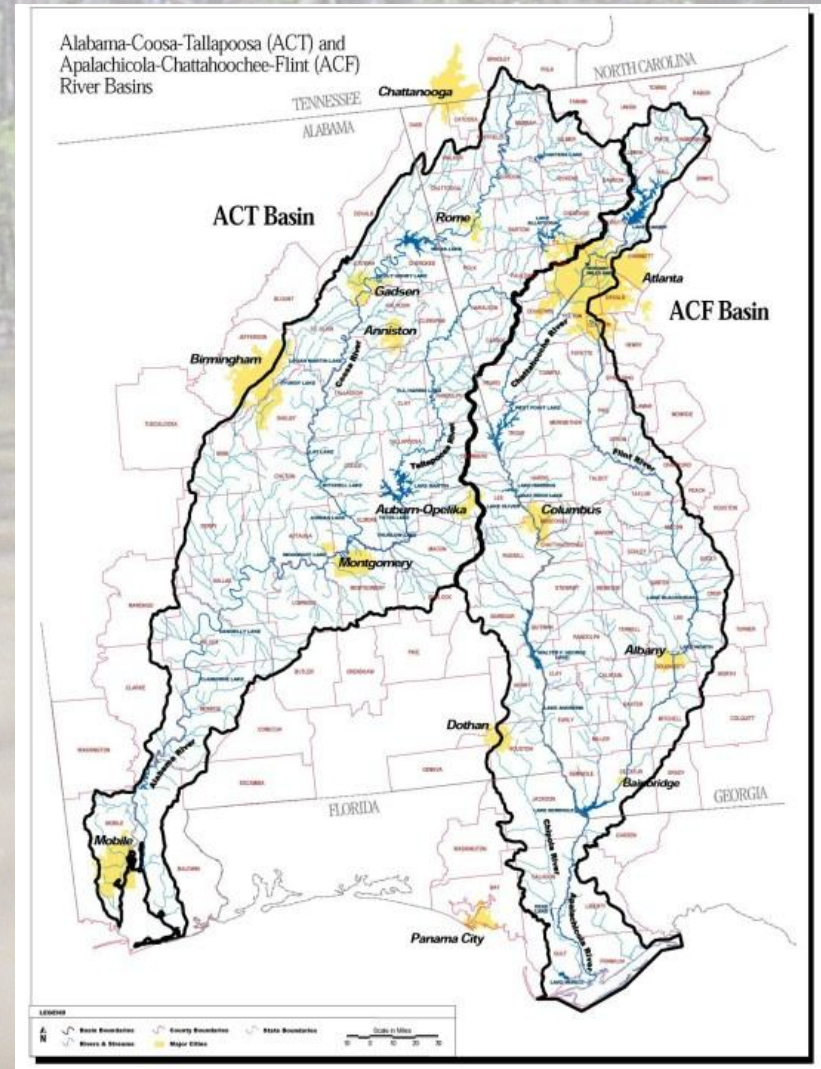
May 18, 2011



U.S. Army Corps of Engineers Water Control Manual Update

Purpose

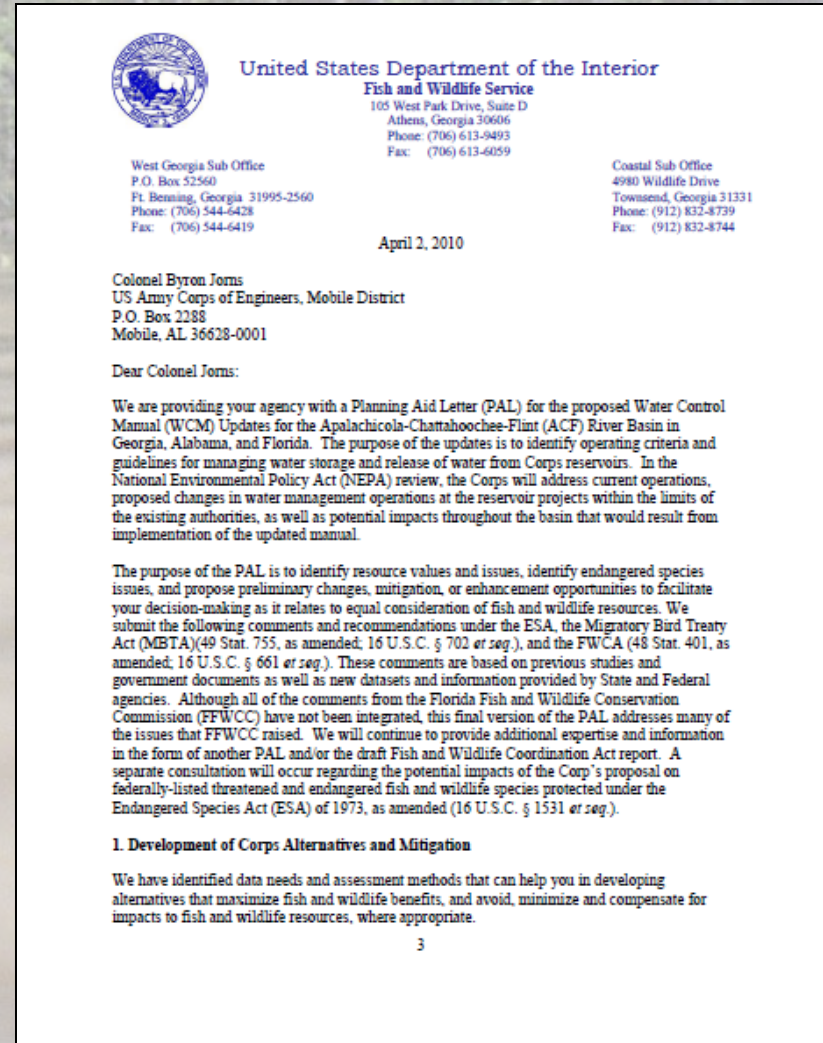
To update the ACF WCM and appendices to include current project operations under the existing congressional authorizations taking into account changes in basin hydrology and consumptive demands due to years of growth and development; new/rehabilitated structural features; and environmental issues and to develop the required NEPA documentation necessary to make a final decision.



Planning Aid Letter

The purpose of the PAL is to identify resource values and issues, identify endangered species issues, and propose preliminary changes, mitigation, or enhancement opportunities to facilitate your decision-making as it relates to equal consideration of fish and wildlife resources.

- Endangered Species Act
- Migratory Bird Treaty Act
- Fish and Wildlife Coordination Act



What are the ecological flow needs for an entire basin?



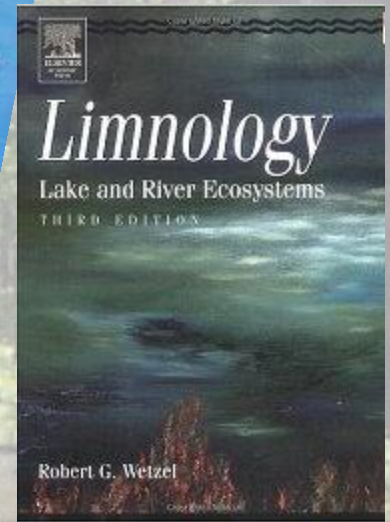
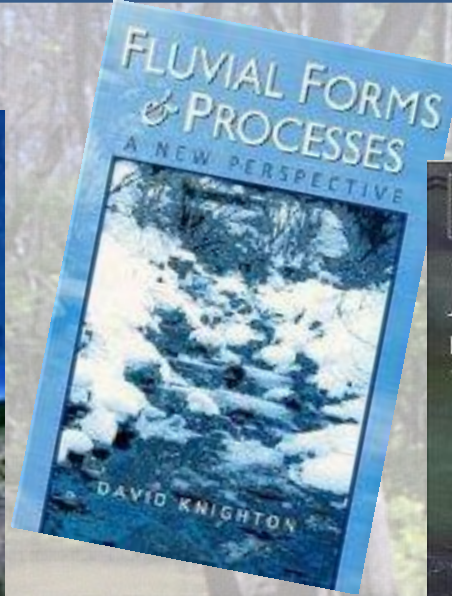
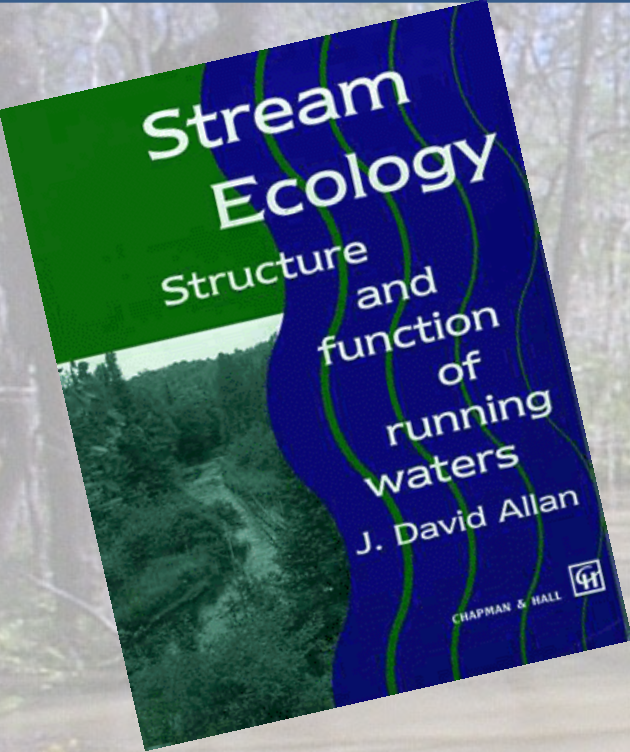
Shoals



Floodplain



Estuary



A wealth of accumulated knowledge



An abundance of examples of eco-flow implementation



- “Accumulated ecological knowledge illustrates that a narrow focus on minimum flow as the basis for riverine management is inadequate.”
 - LeRoy Poff, Colorado State University, AFS 1999
- “We recommend using available biological data in conjunction with hydrologic data to develop adaptive management regimes for regulated southeastern rivers.”
 - Irwin et al. 1999



HEC-RPT 1.1

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Indicators of
Hydrologic Alteration

Environmental Flow
Components

Planning Aid Letter Analysis

“Reliance on pre-regulation datasets to derive ecosystem flows is particularly useful for locations where empirically derived ecology-flow relationships are scant” – PAL Apr 2010

–the Chattahoochee River.

p. 4 paragraph 3. “Explicit magnitude, frequency, duration, timing, and rate of change guidelines are provided to illustrate the types of flow modifications that are likely to benefit the ecosystem and to help inform the development of Corps flow alternatives. However, should the magnitude of a flow guideline be deemed unattainable, we request that the Corps identify a flow magnitude that is attainable or recommend an attainable frequency for the recommended flow magnitude.”

A guiding principal: Ecosystems evolved as a response to the natural flow regime

Stable periods of spring flow- for reproduction

Low flows- for foraging; suspension of eggs in water column

High flows- migrations for reproduction

Flood flows- for maintaining and creating habitats, floodplain access

...and many, many more examples!



Protecting nature. Preserving life.™

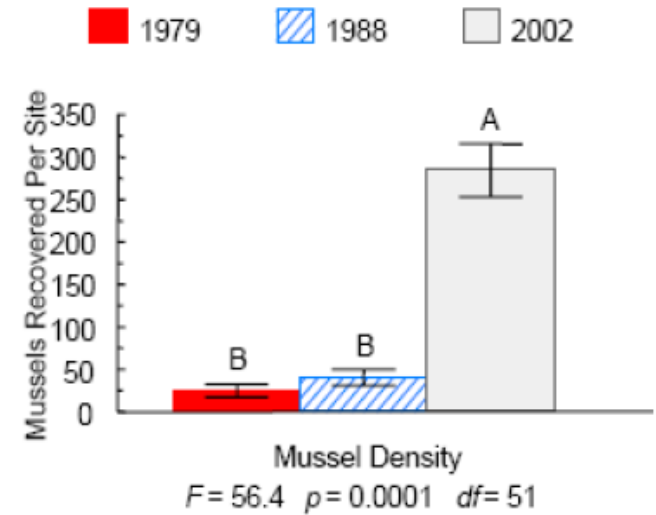
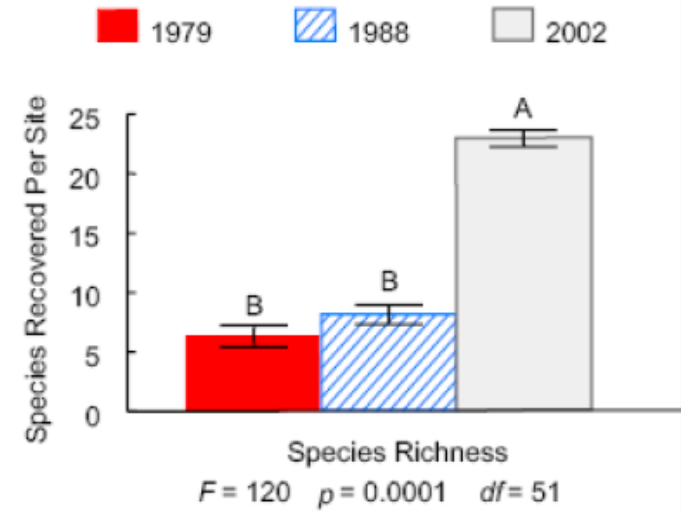
Indicators of
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Restoration of some natural flow regime components could have a minor effect on flows and lakes, but a major benefit to the ecosystem.



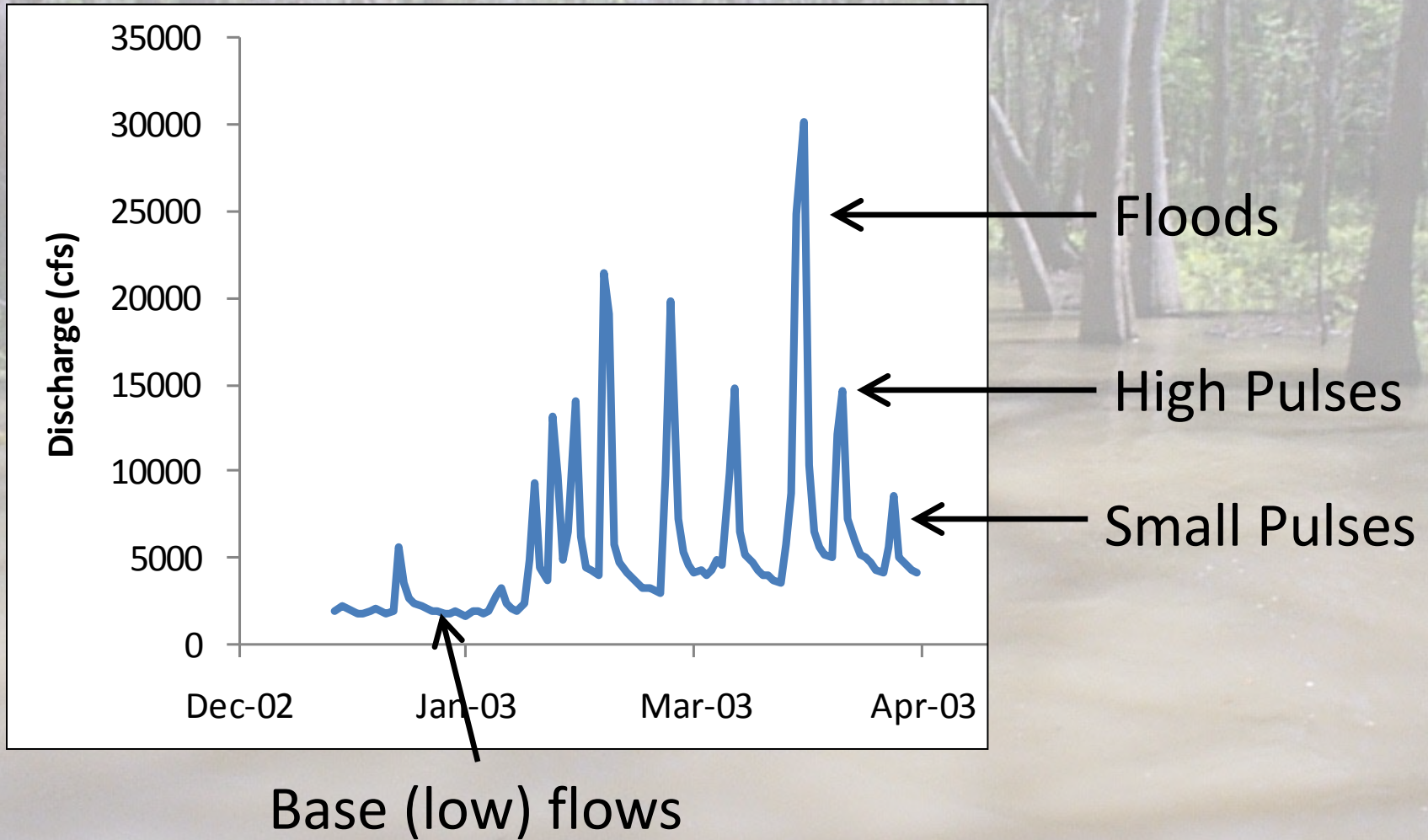
Normandy Dam: Duck River Case Study



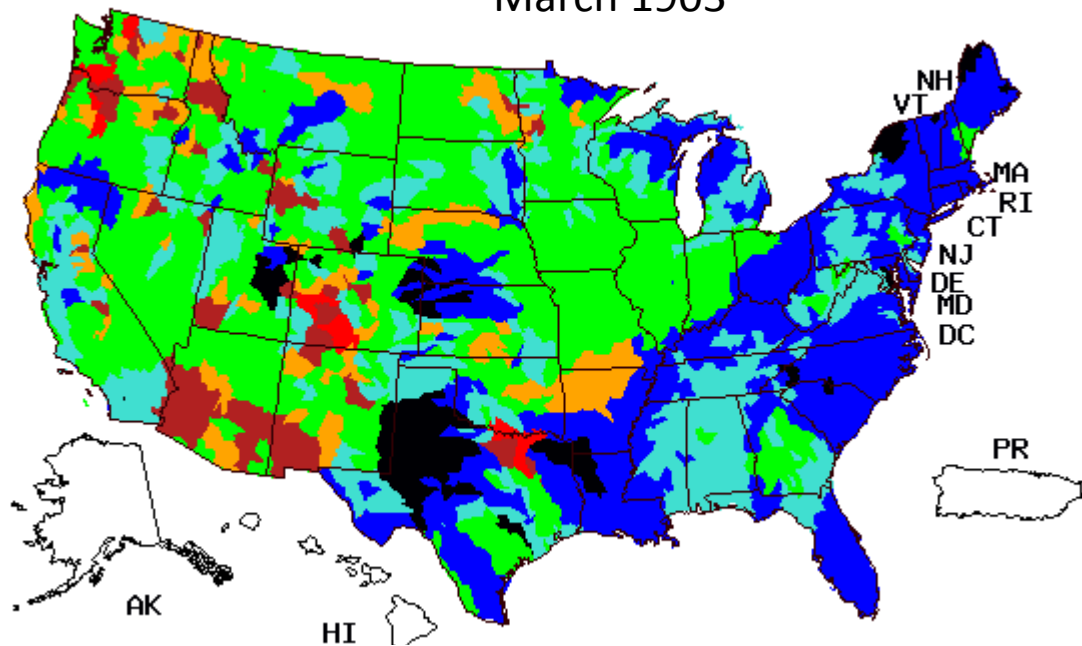
- These concepts are successfully applied everywhere
- Solutions have been found in numerous other contentious flow issues
- ACF is not an exception

River	Flow restoration component	Purpose
Trinity River, CA	Peak flows	Gravel input; riparian succession
Truckee River, CA	Peak flows	Riparian trees
Owens River, CA	Baseflows, overbank flows	Riparian veg, fishes, trout
Rush Creek, CA	Channel maintenance	Waterfowl, fishes, riparian
Oldman River, Canada	Increase lower flows and reduce stage decline rates	Riparian, trout
San Juan, UT, NM	Peak flows and winter base flows	Endangered fishes
Green River, UT, CO	Peak and non peak flows	Recovery of Endangered fishes
Rio Grande, NM	Floodplain inundation	Ecosystem processes (e.g. nitrogen flux)
Pecos River, NM	Minimum flows/irrigation	Habitat for T&E species

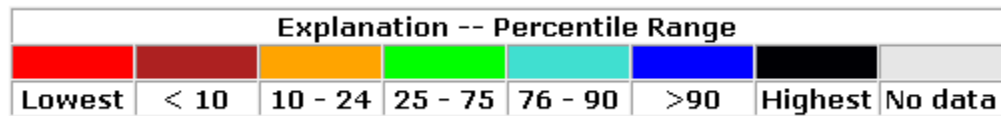
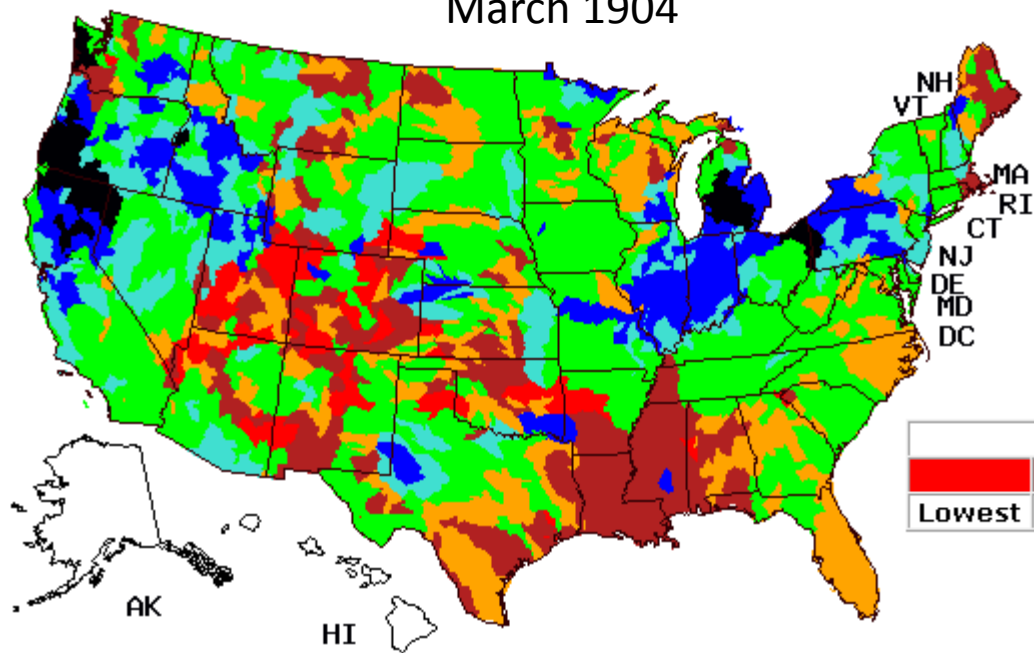
What are components of the flow regime?



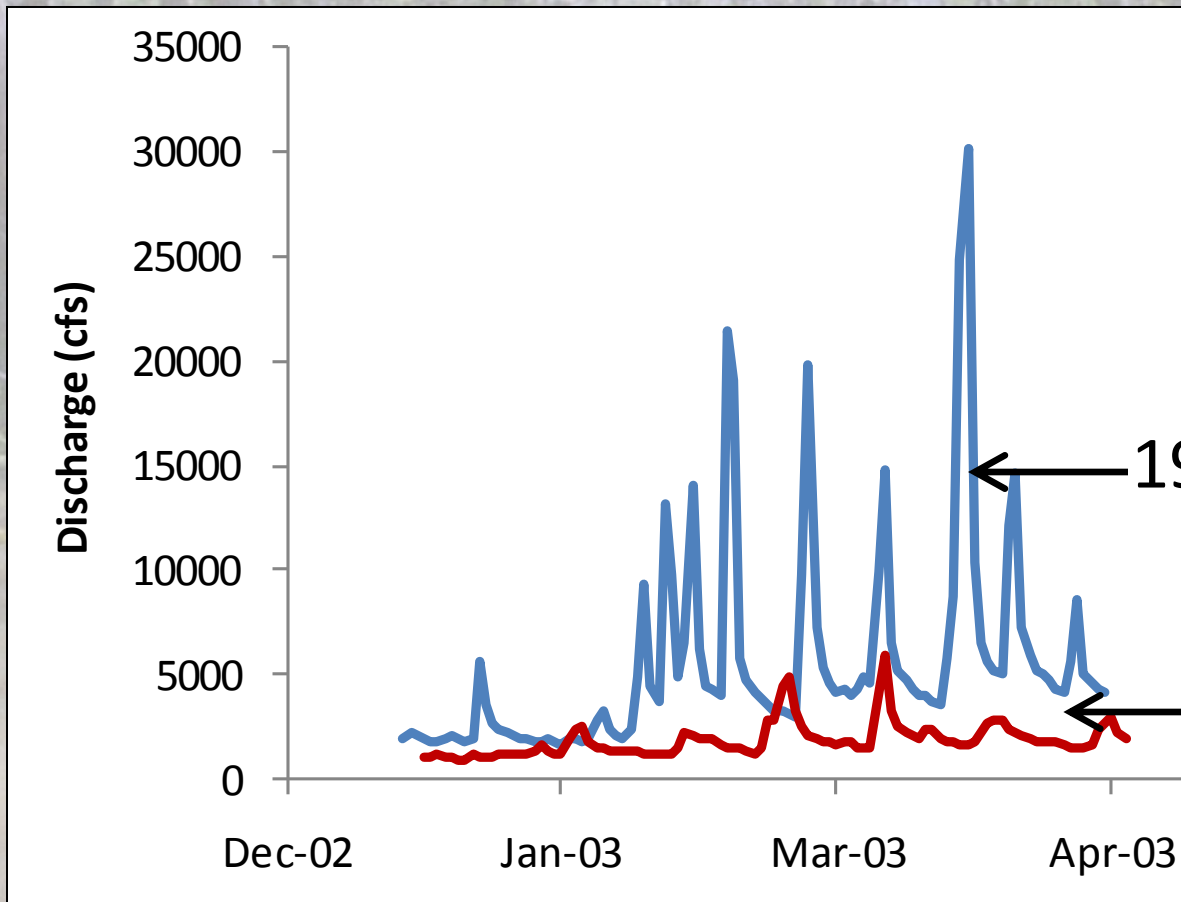
March 1903



March 1904



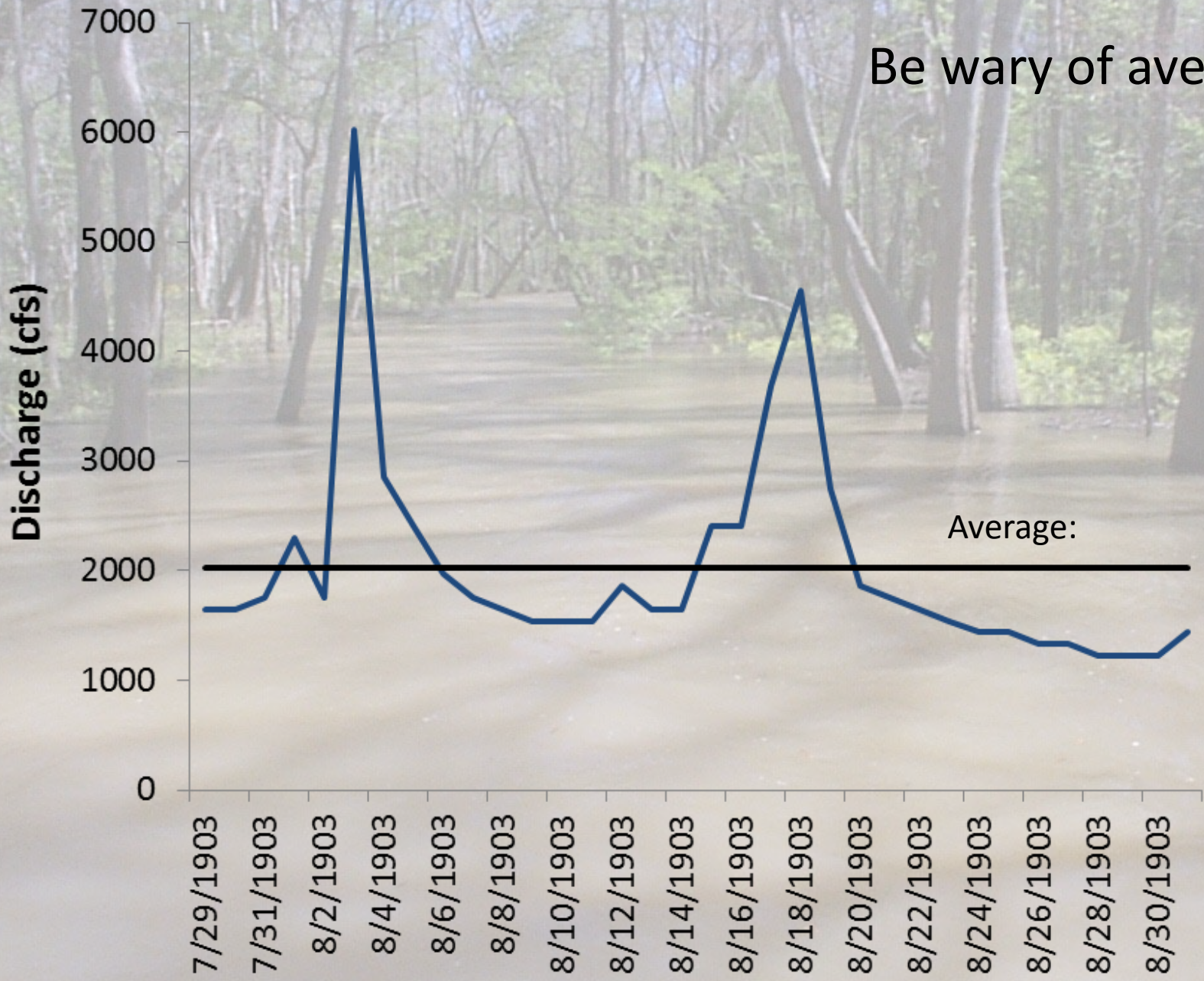
What are components of the flow regime?

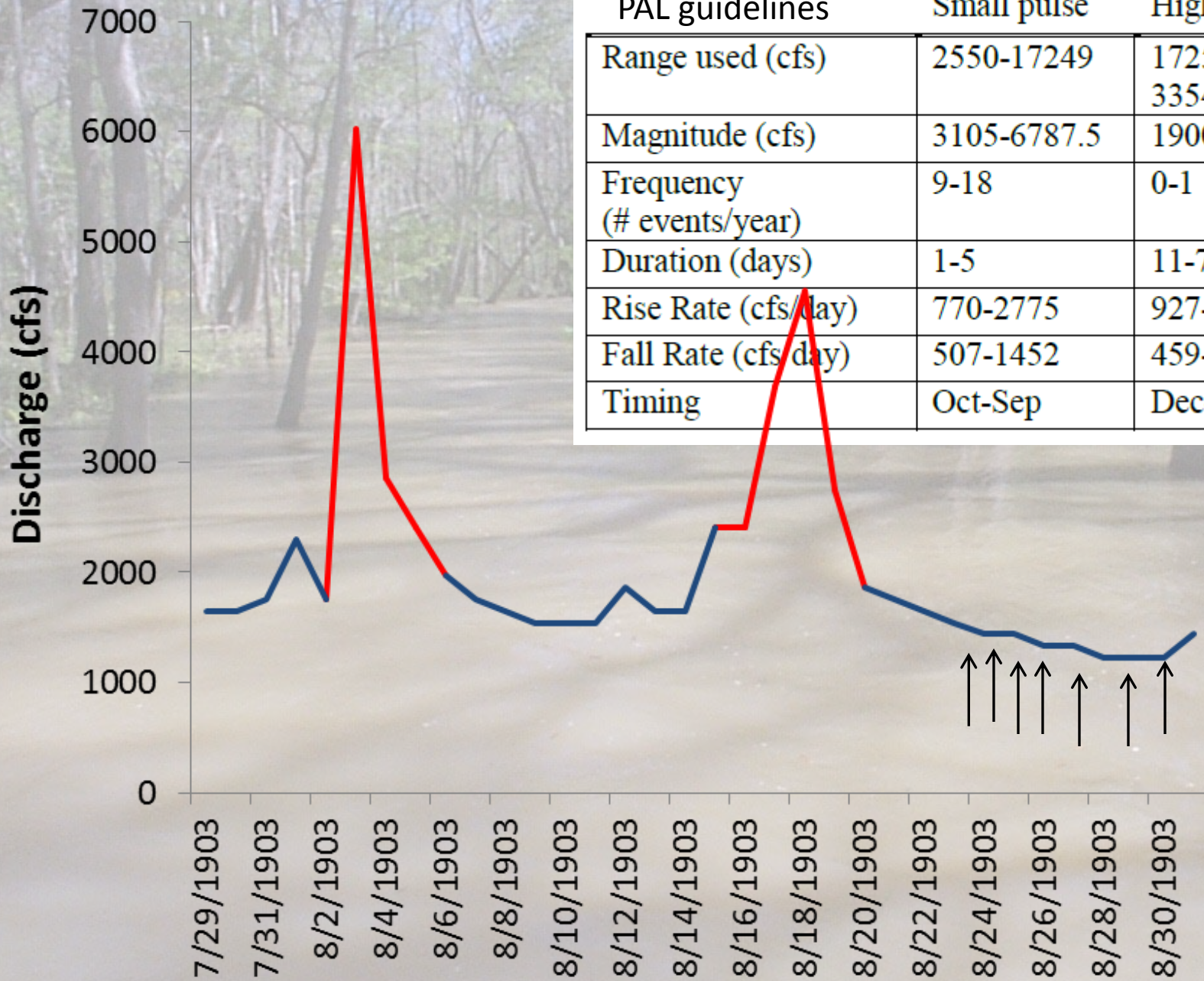


Was 1903 a good year to spawn?

Interannual variation!

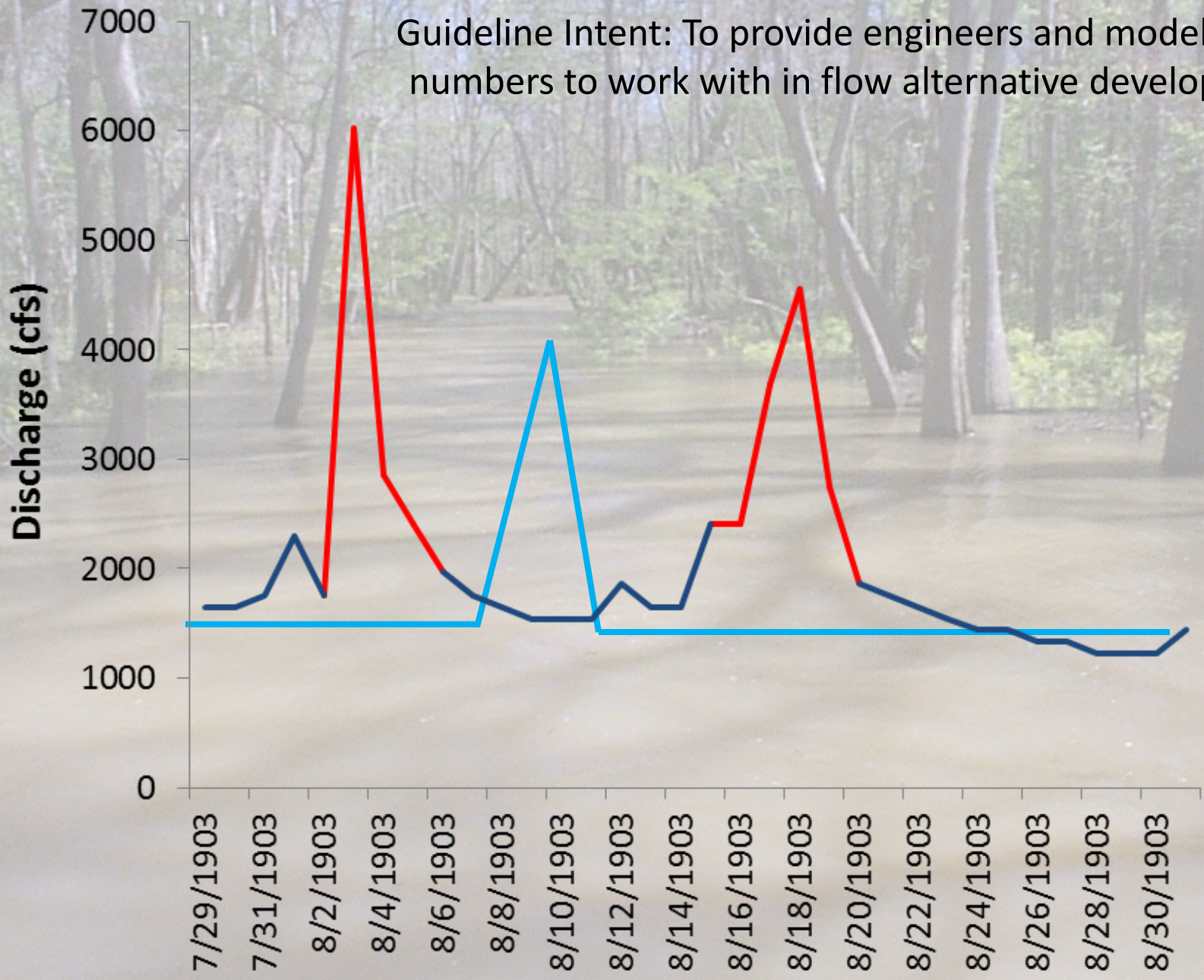
Be wary of averages

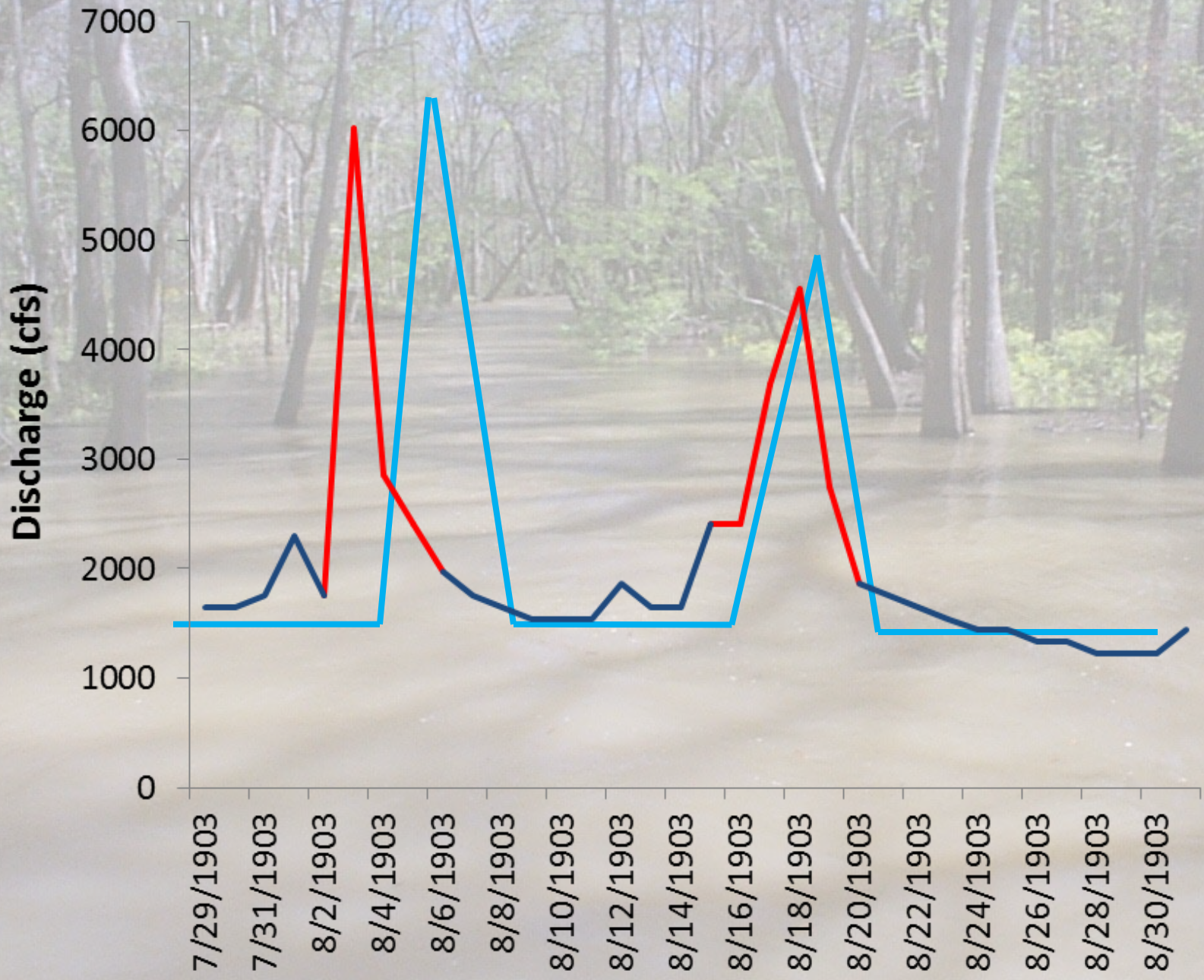


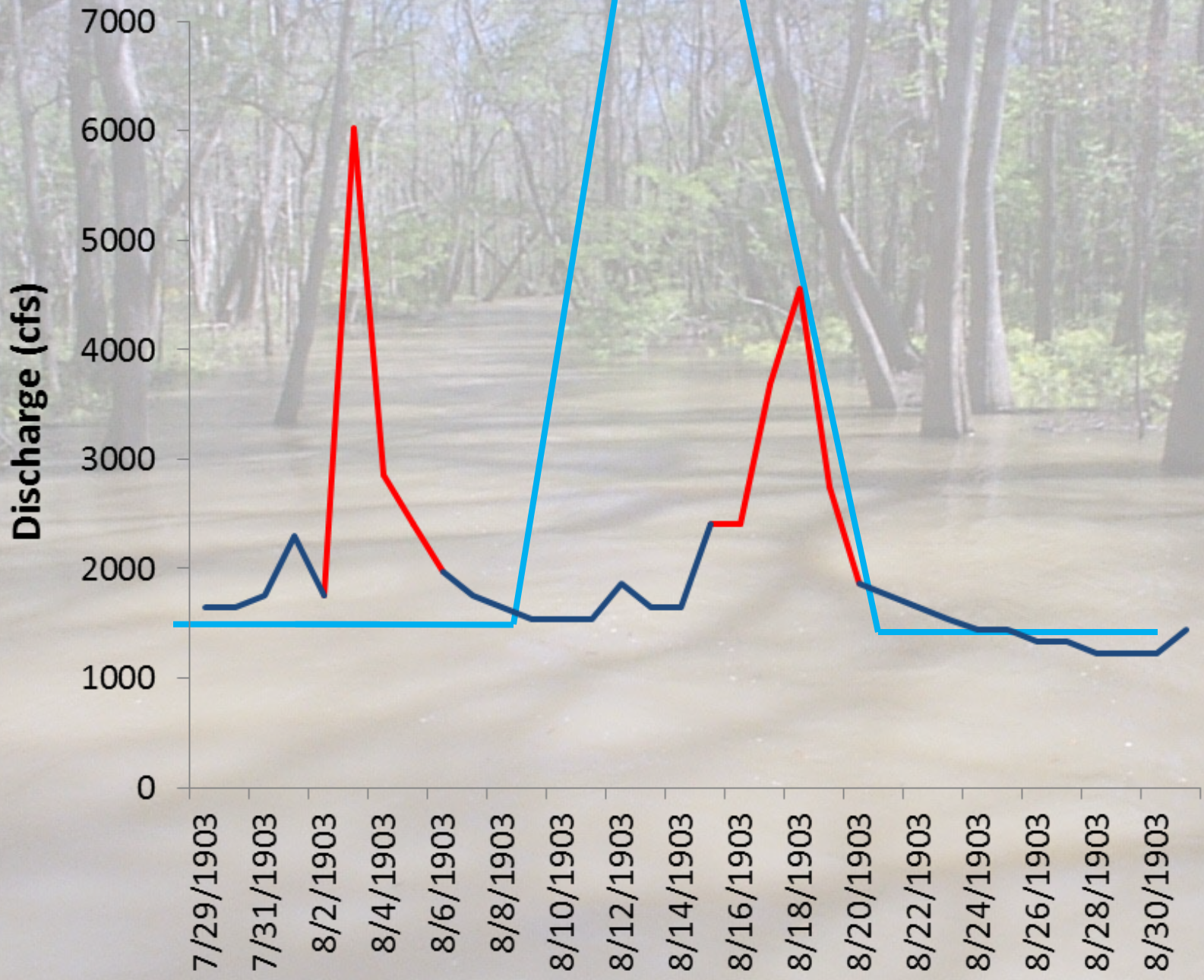


PAL guidelines	Small pulse	High Pulse
Range used (cfs)	2550-17249	17250-33549
Magnitude (cfs)	3105-6787.5	19000-28900
Frequency (# events/year)	9-18	0-1
Duration (days)	1-5	11-72
Rise Rate (cfs/day)	770-2775	927-7830
Fall Rate (cfs/day)	507-1452	459-2193
Timing	Oct-Sep	Dec- Mar

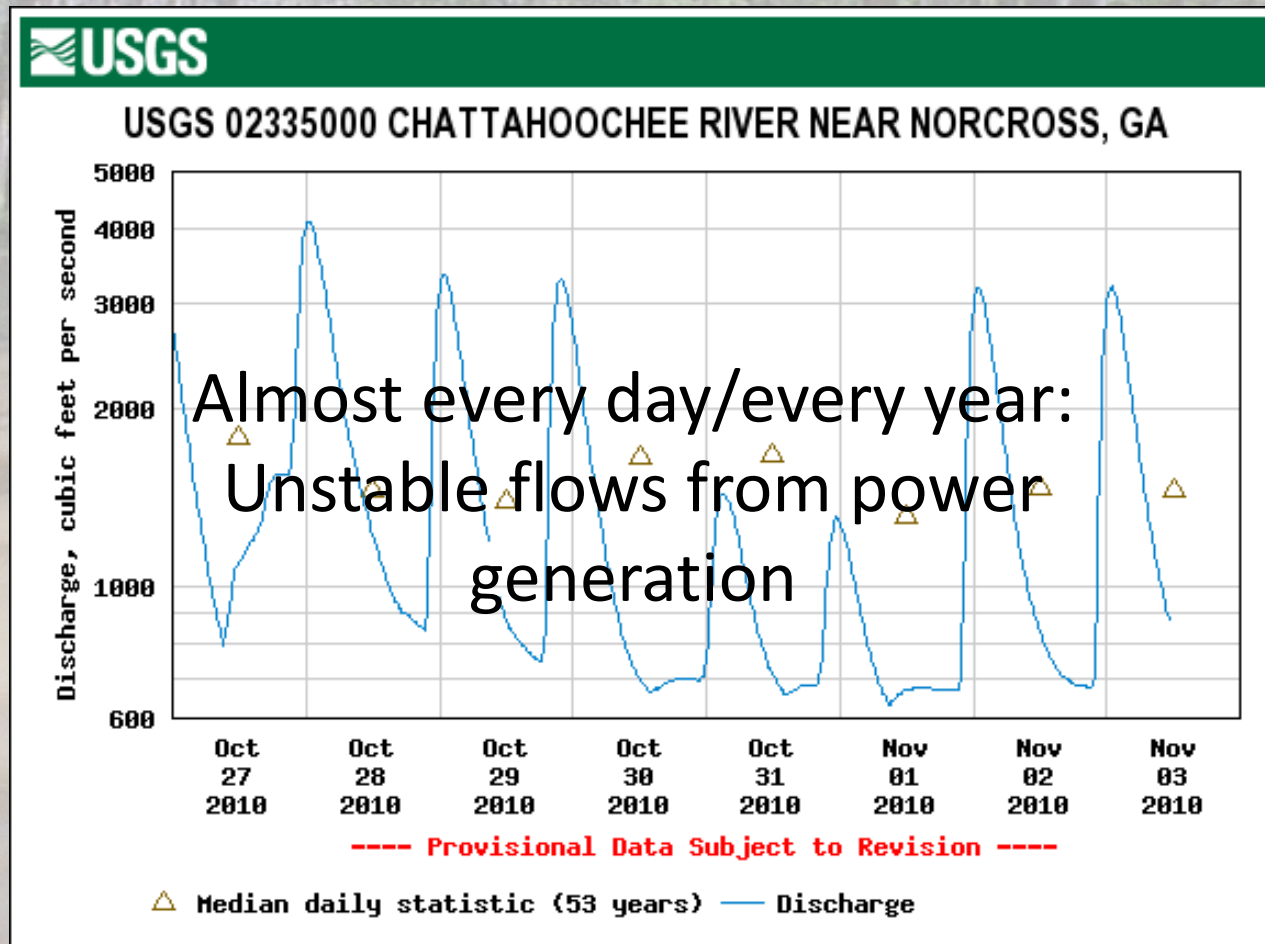
Guideline Intent: To provide engineers and modelers real numbers to work with in flow alternative development.







We live in a modified world, not a “natural” one.



Concept: “Stable flow windows” (Freeman et al. 2001)

We live in a modified world, not a “natural” one.

Can any of these be achieved?
Which ones?

1. Floods
2. High Pulses
3. Base (low) flows
4. Seasonal variation
5. Interannual variation
6. Stable flow windows



Photo courtesy of destinatoin360.com



Photo courtesy of russianriverkeeper.org

Questions?

