



Ecological Flows Assessment
Verde River Watershed

TNC/Corps of Engineers Ecological Flows Projects



Ecological Flows

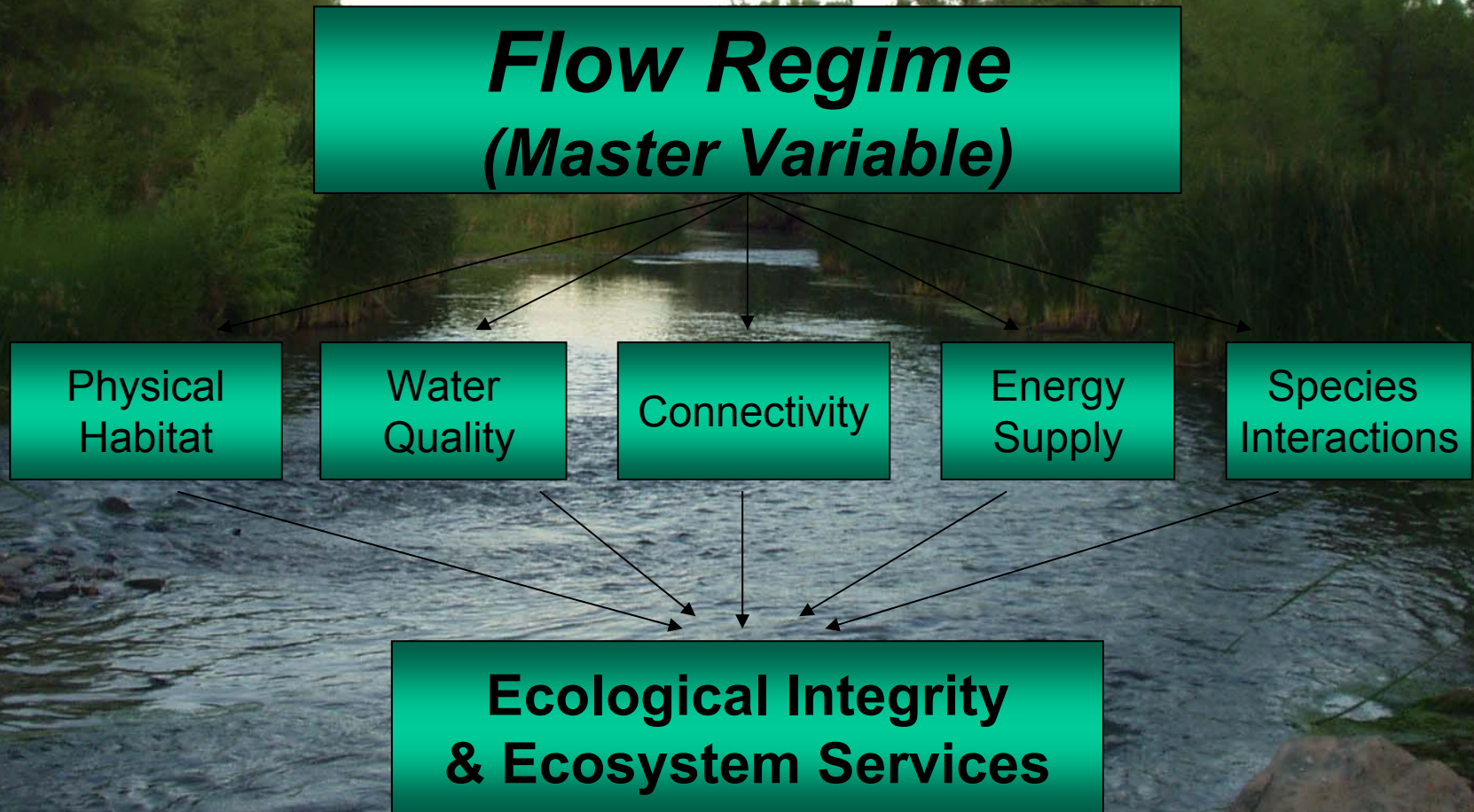
The flow of water in a river or lake that sustains healthy ecosystems and the goods and services that humans derive from them.

Often referred to as Environmental Flows



Verde River looking upstream from Cottonwood Ditch Diversion

The Natural Flow Paradigm



Ecological Flows - Basic Concepts

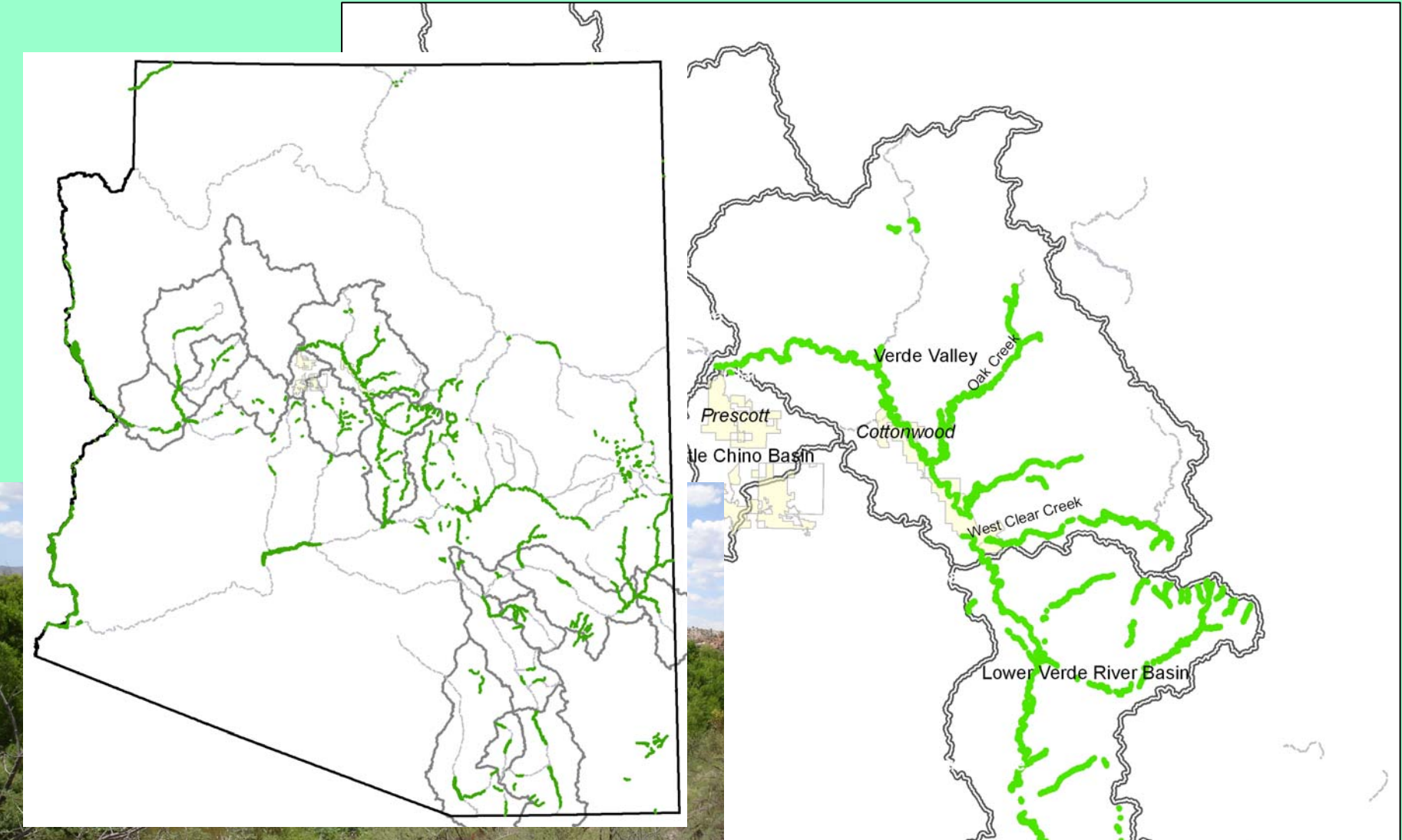
- River Health varies - “excellent” to “poor”
- Departures from the natural flow regime = ecosystem changes
- Ecological flow specifications - based on long-term ecosystem health
- River health - basis for management goals in a watershed



Stillman Lake, Verde River headwaters

Cottonwood Ditch Diversion





VERDE RIVER WATERSHED

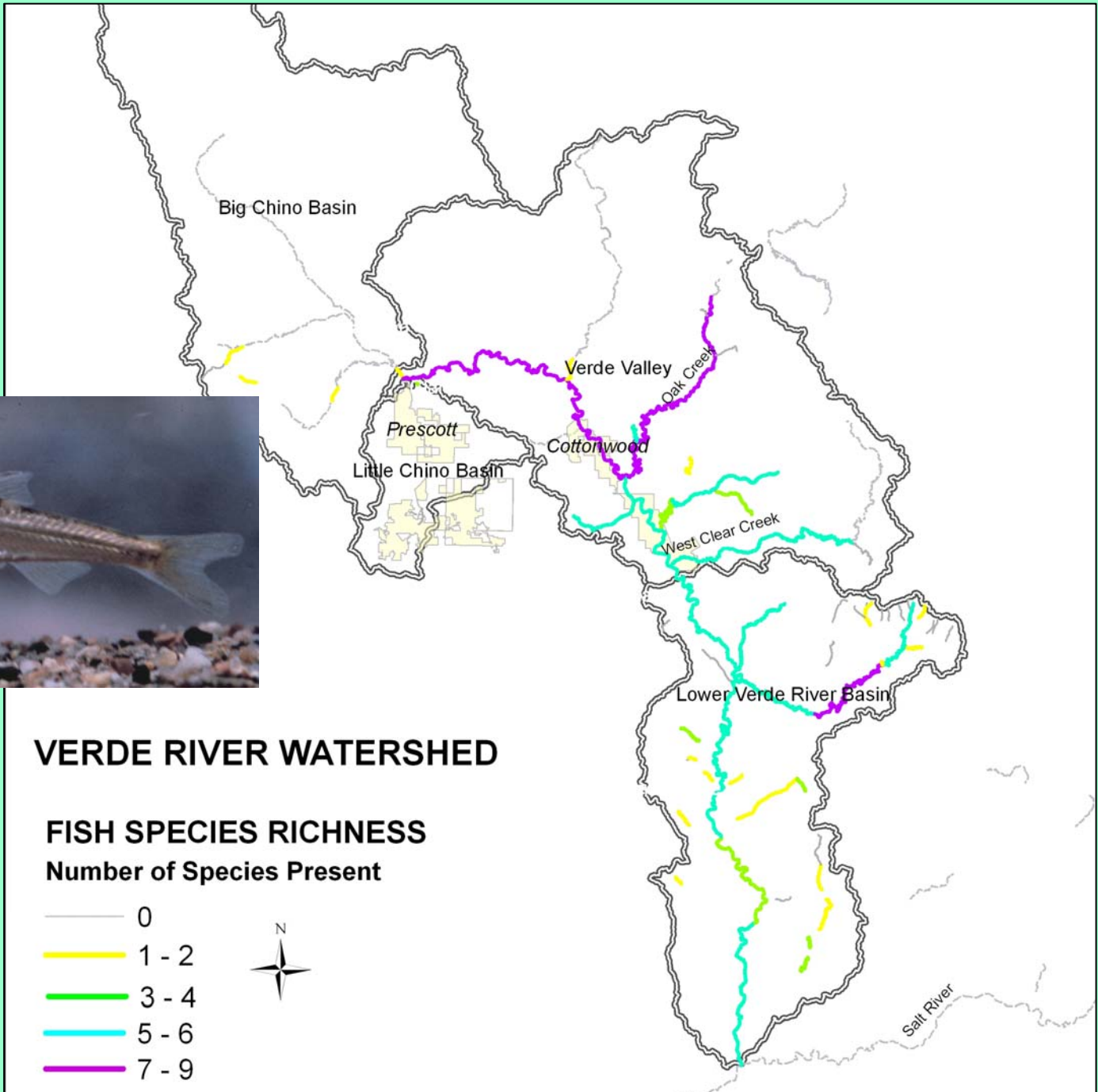
 Riparian Vegetation

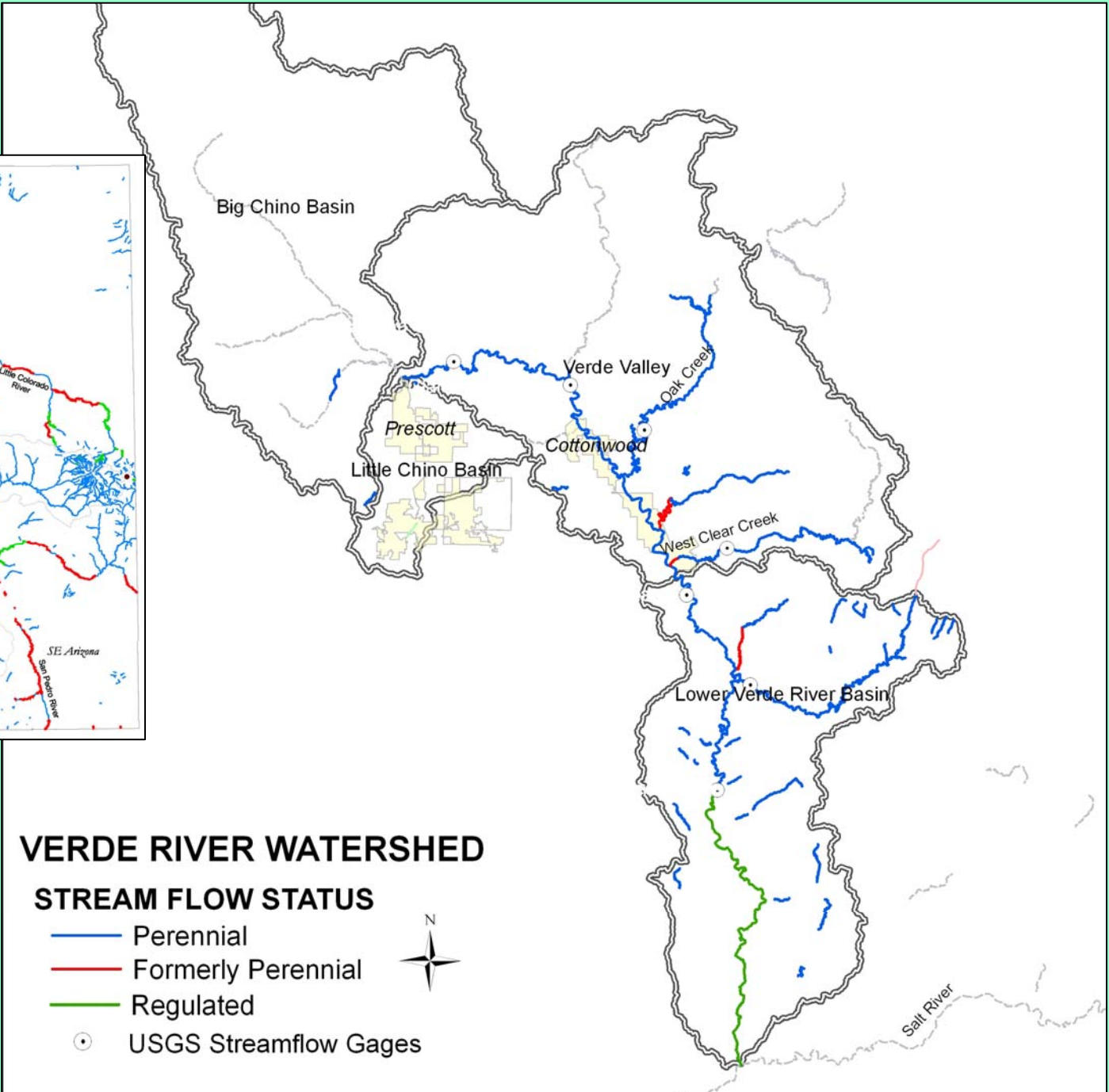
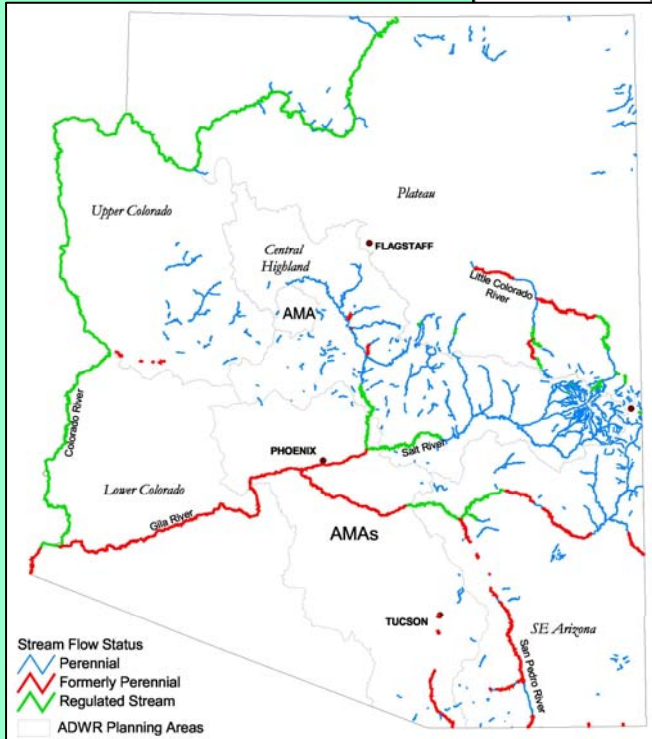


Salt River



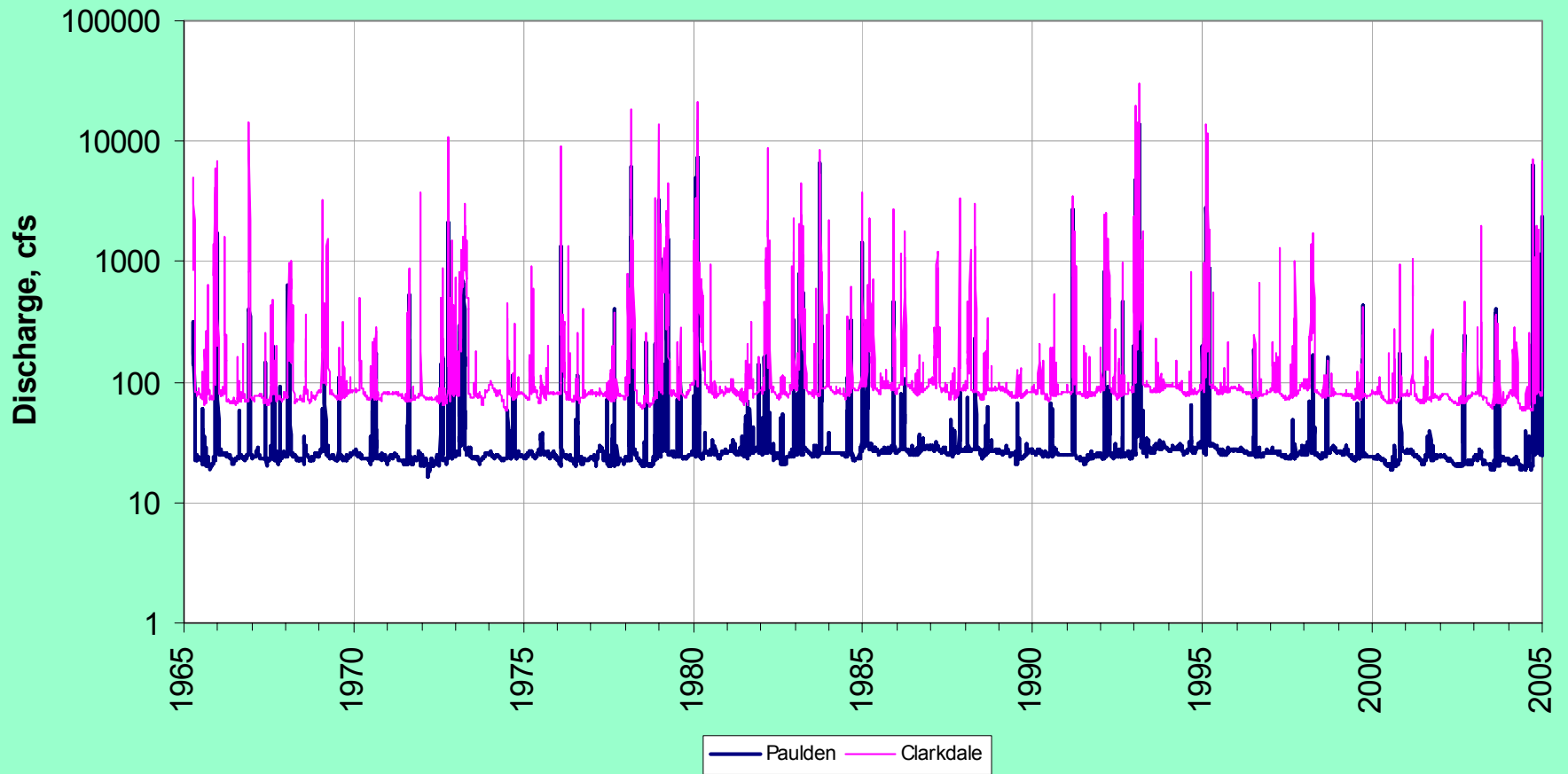
Spikedace





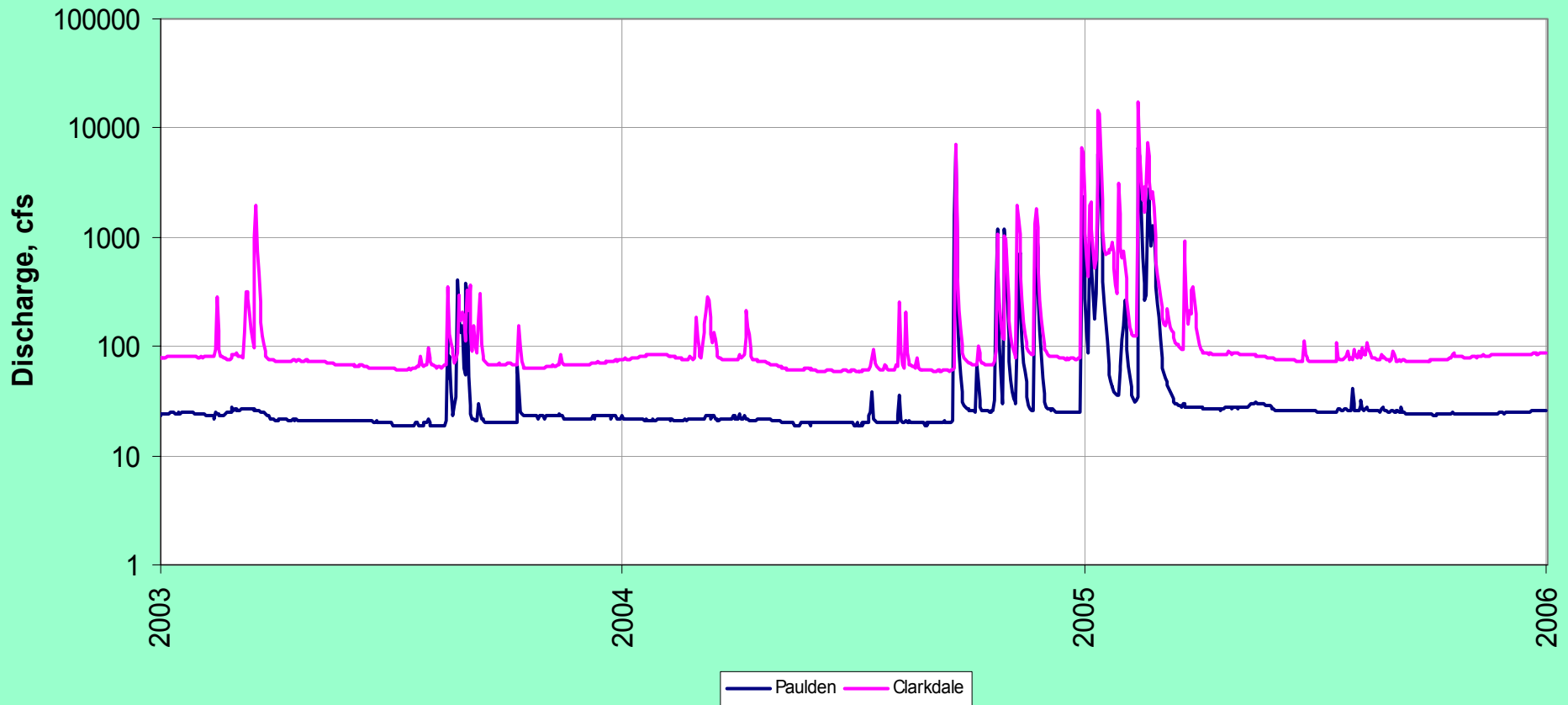
The Natural Flow Paradigm

Verde River Mean Daily Flow



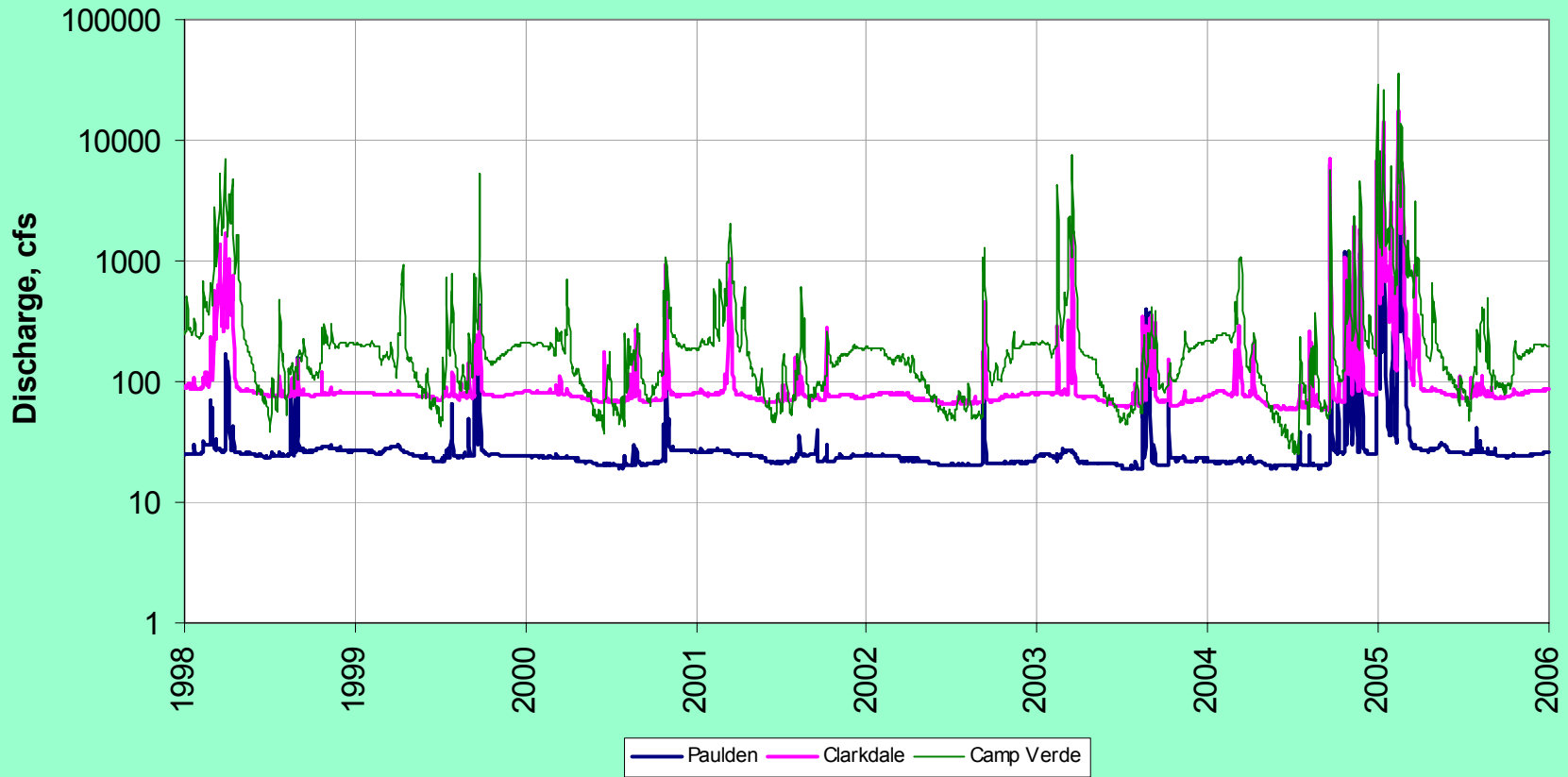
The Natural Flow Paradigm

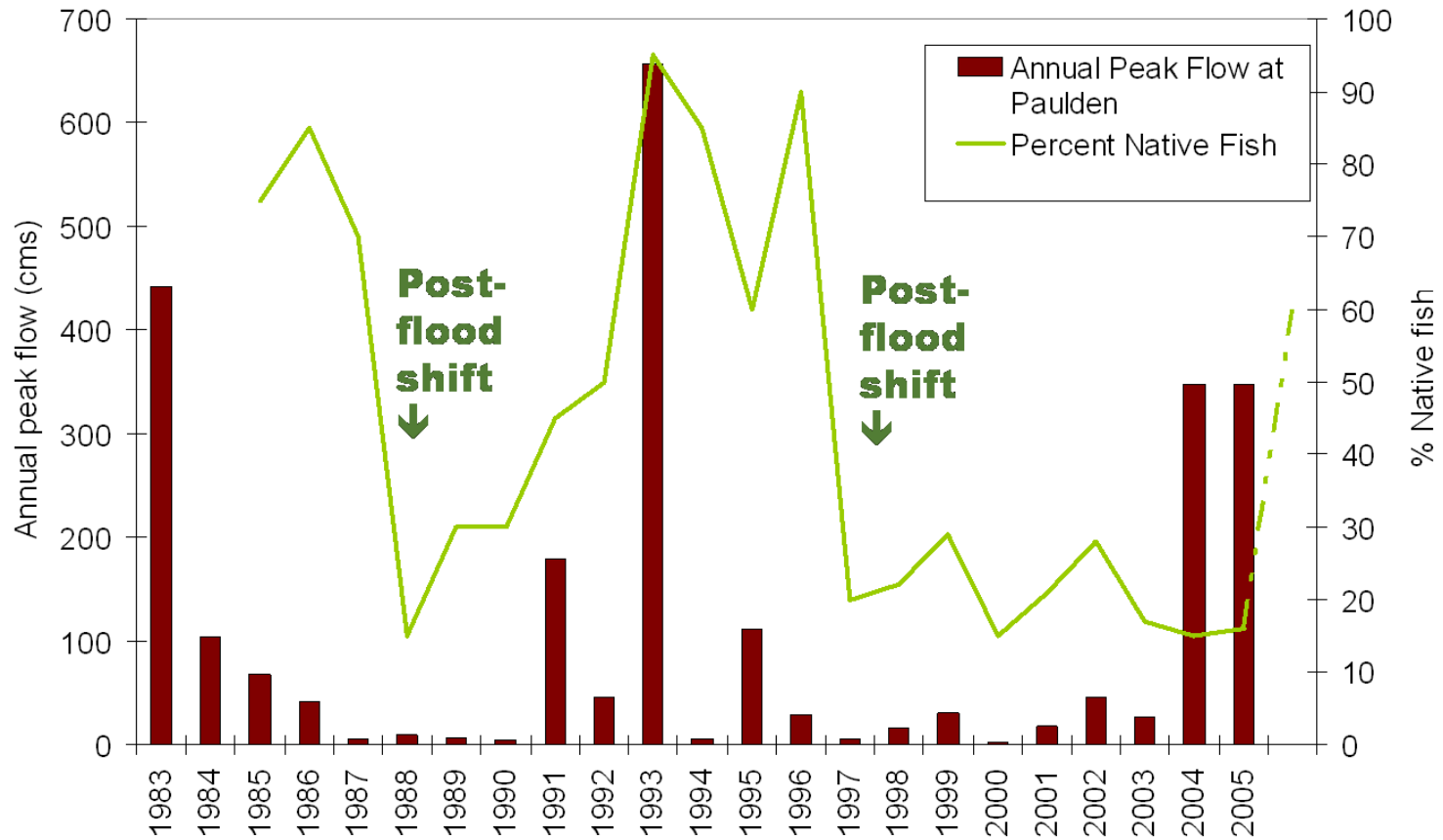
Verde River at Paulden and Clarkdale Gages



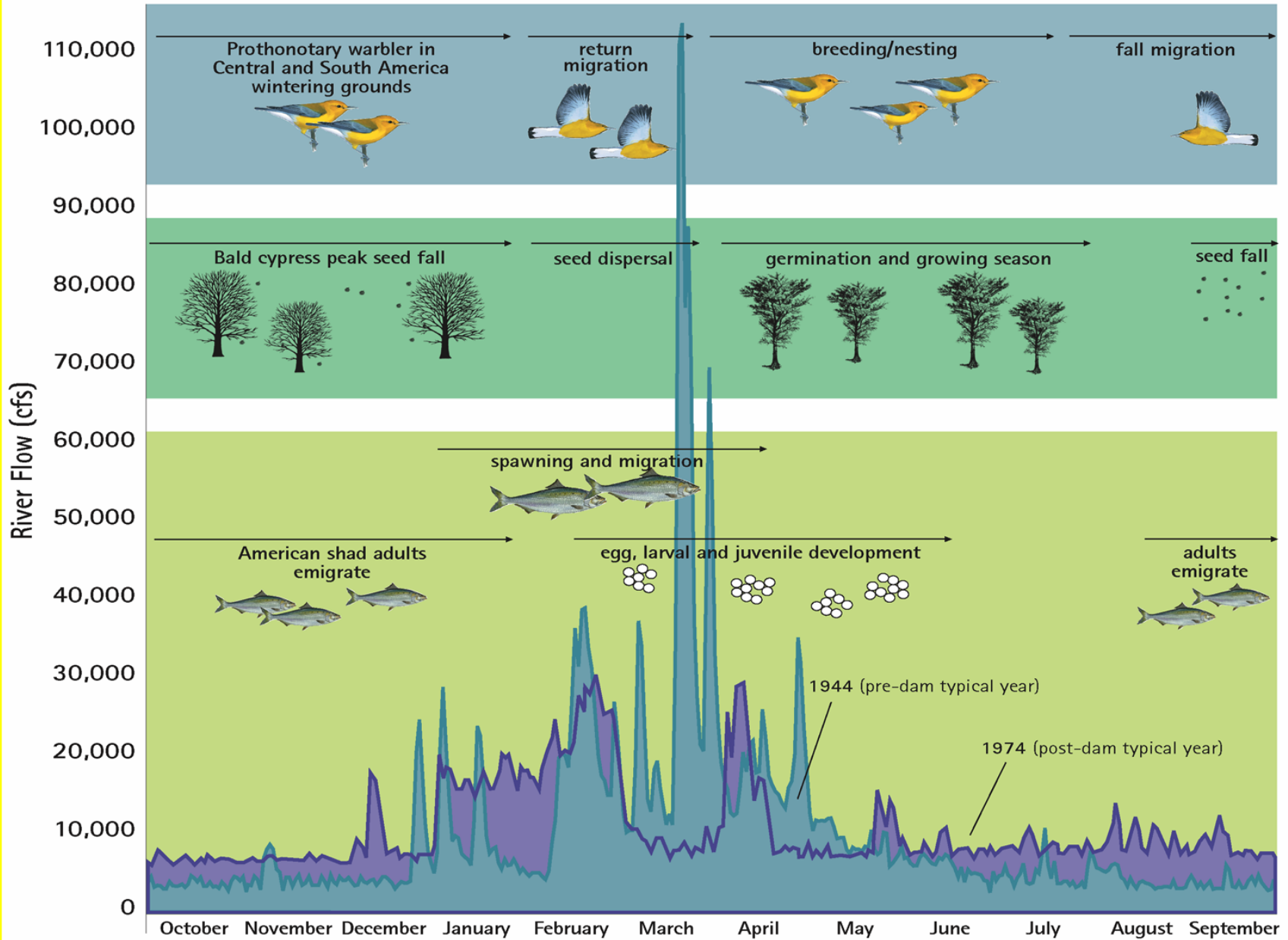
The Natural Flow Paradigm

Verde River Mean Daily Flow



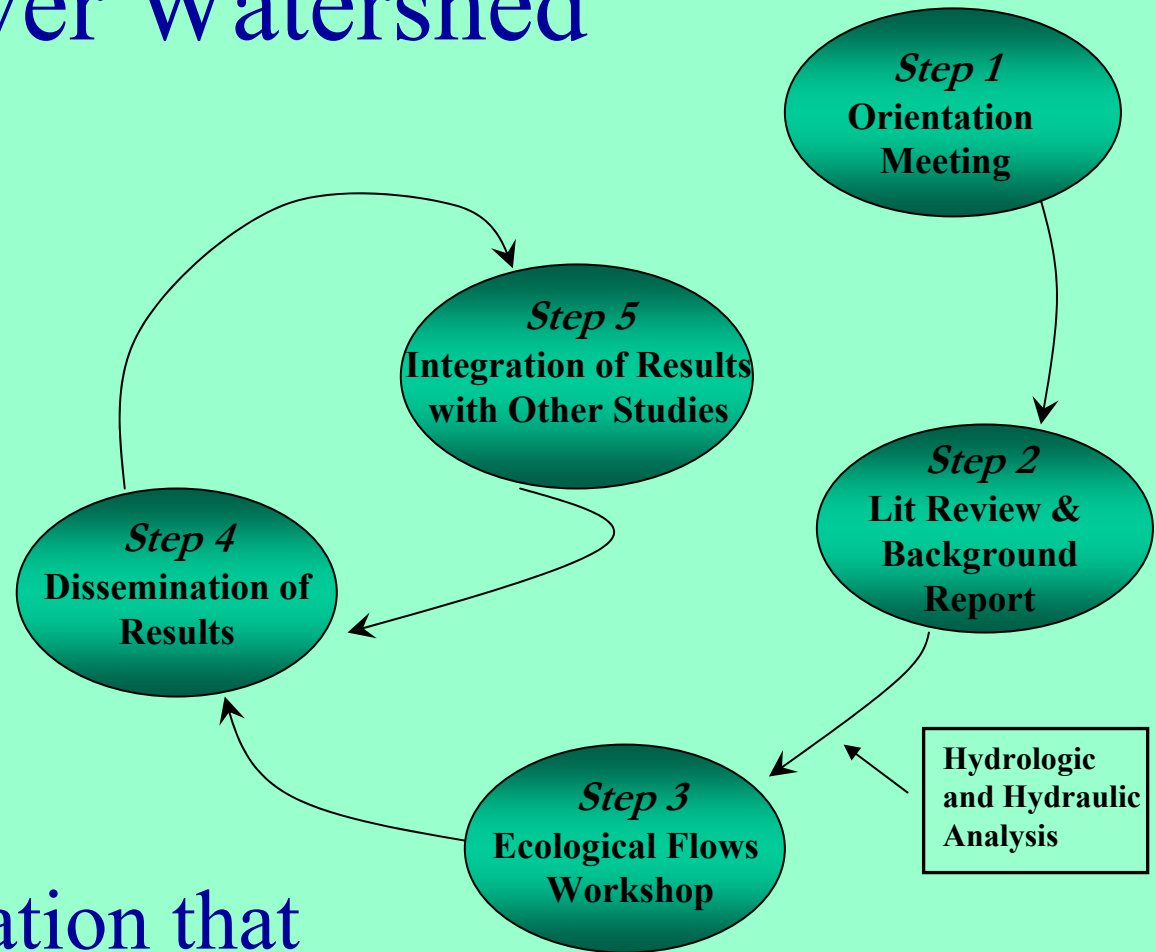


Ecological Model of the Savannah River



Defining Ecological Flows Verde River Watershed

- Collaborative
- Science-based
- Expert led
- Adaptive



Result – Information that leads to informed decision making.

A photograph of a river or stream flowing through a lush, green landscape. The water is calm, reflecting the surrounding foliage. In the foreground, there are tall, thin reeds and large, broad green leaves. The background is filled with dense trees and bushes, creating a sense of a secluded, natural environment. The lighting is bright, suggesting a sunny day.

**The best way to predict the future
is to invent it.**

Alan Kay

Ecological Flow Assessment

- Step 1 – Orientation Meeting – October 3
- Step 2 – Literature compilation and background report – AWI academic lead
- Step 3 – Two-day flow-ecology workshop
- Step 4 – Dissemination of Results
- Step 5 - Integration of results into other studies

Step 1 = Orientation Meeting

VWA Mini-seminar October 3, 2006

- Purpose: Launch a collaborative process
- Invitees: Federal and state agencies, NGO's, university researchers, local governments
- Outcome: Design a process and identify key contributors for defining a set of essential flow characteristics needed to sustain a healthy river



Verde River upstream from Clarkdale

Step 2 = Literature Review and Background Report

- Conduct a literature review - AWI academic lead
- Determine flow requirements of key species and communities
- Identify links between flow regimes and ecological/ hydrologic processes
- Develop conceptual ecological models
- Review for completeness



Paulden Gage

Step 3 = Ecological Flows Workshop

- Sponsored by Verde River Basin Partnership TAG committee
- Interdisciplinary experts
- Develop flow-biota relationships
- Evaluate water use scenarios



Brewer's Tunnel Diversion

Steps 4 and 5

- Dissemination of results
- Integration of flow-ecology relationships into other studies and reports



Considerations in Delineating Ecological Flows

- Geomorphic and hydrologic processes
- Native riparian vegetation
- Native and non-native fish
- Amphibians, invertebrates, birds, mammals
- Floodplain wetlands



Verde River near Perkinsville Bridge



QUESTIONS?

Verde River below Perkinsville Bridge