



Instream Flows

Colorado / Lavaca BBASC

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Ed Oborny, BIO-WEST

Overview

- Texas Instream Flow Program (TIFP)
- Senate Bill 2 Studies
- Instream Flow Components
 - Description
 - Importance

Holistic Ecological Considerations



- Hydrology
- Biology
 - Instream aquatic assemblages
 - Riparian corridor
- Physical Processes
 - channel processes, flushing flows, etc.
- Water Quality

Instream Flow Components (TIFP)

Subsistence flows

Definition:	Infrequent, seasonal periods of low flow
Objectives:	Maintain water quality criteria

Base flows

Definition:	Normal flow conditions between storm events
Objectives:	Ensure adequate habitat conditions, including variability, to support the natural biological community

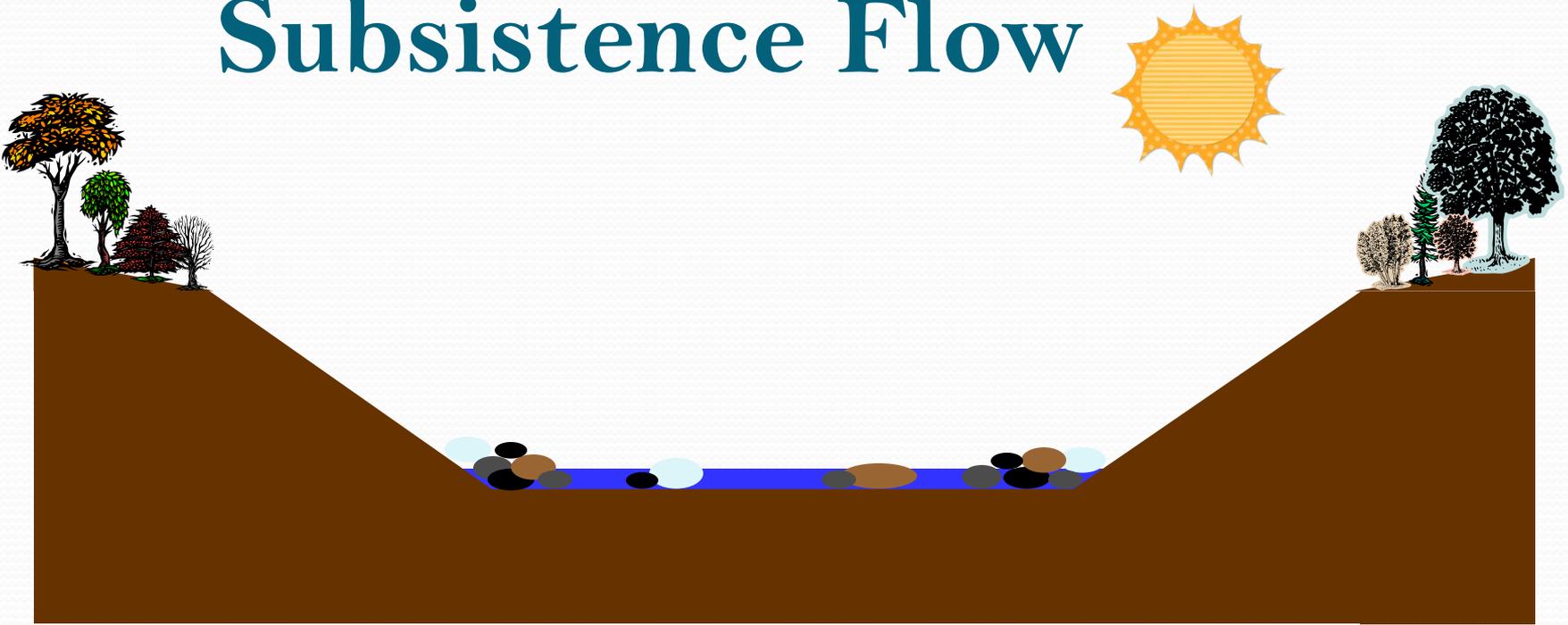
High flow pulses

Definition:	Short-duration, in-channel, high flow events following storm events
Objectives:	Maintain important physical habitat features
	Provide longitudinal connectivity along the river channel

Overbank flows

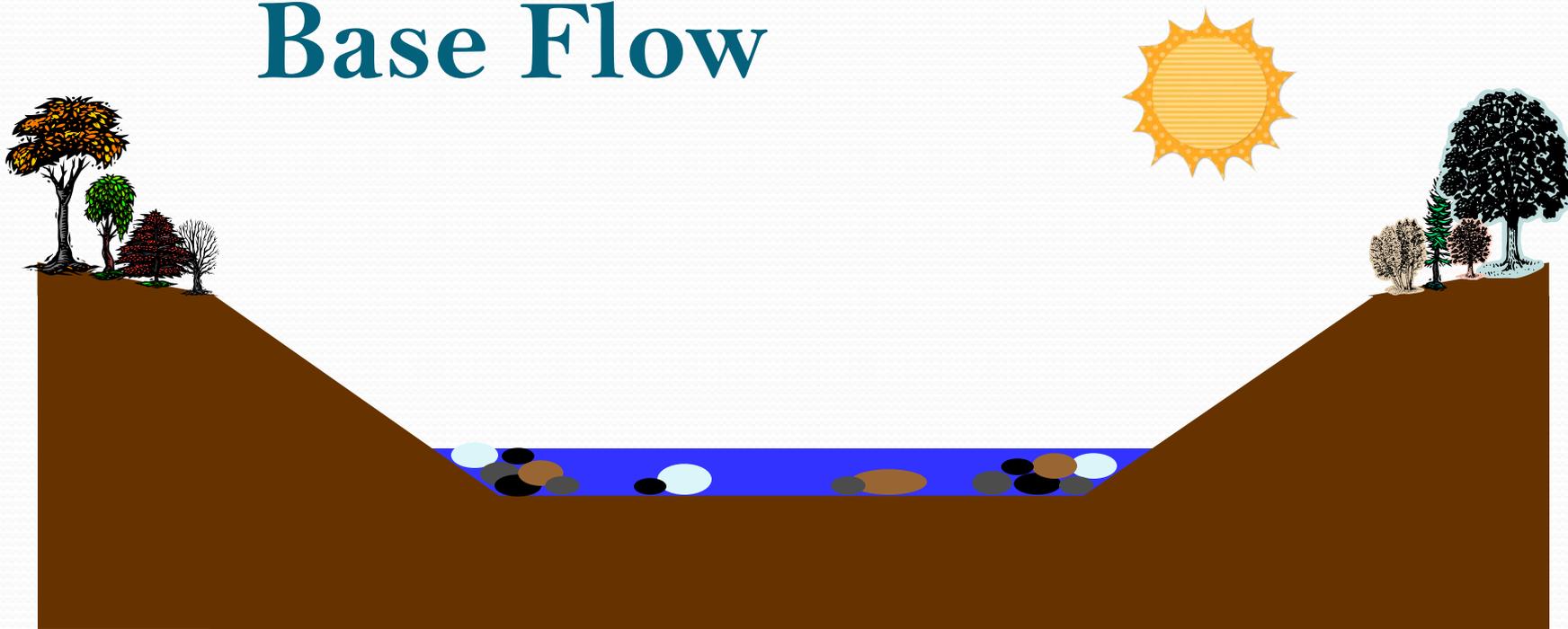
Definition:	Infrequent, high flow events that exceed the normal channel
Objectives:	Maintain riparian areas
	Provide lateral connectivity between the river channel and active floodplain

Subsistence Flow



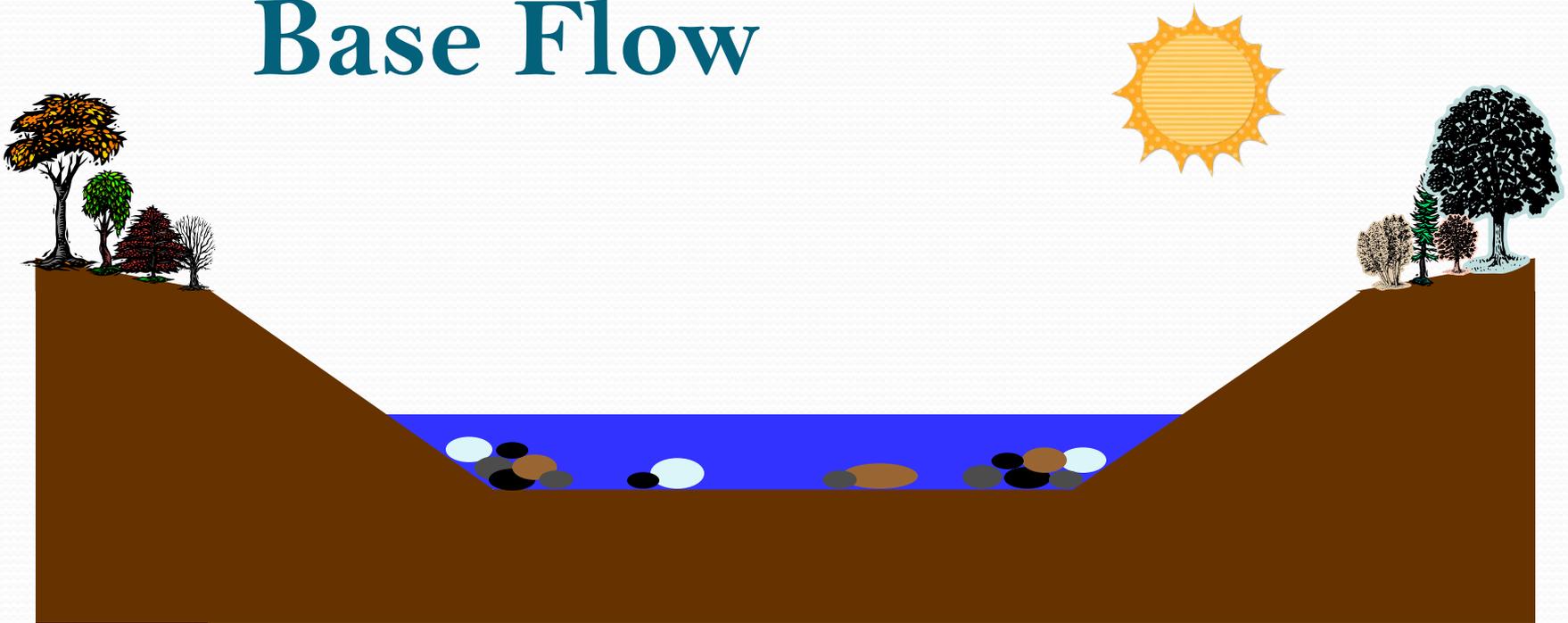
- Represents minimum conditions at which
 - water quality is maintained at acceptable levels, and
 - aquatic habitats resemble those found during extreme conditions in a natural setting

Base Flow



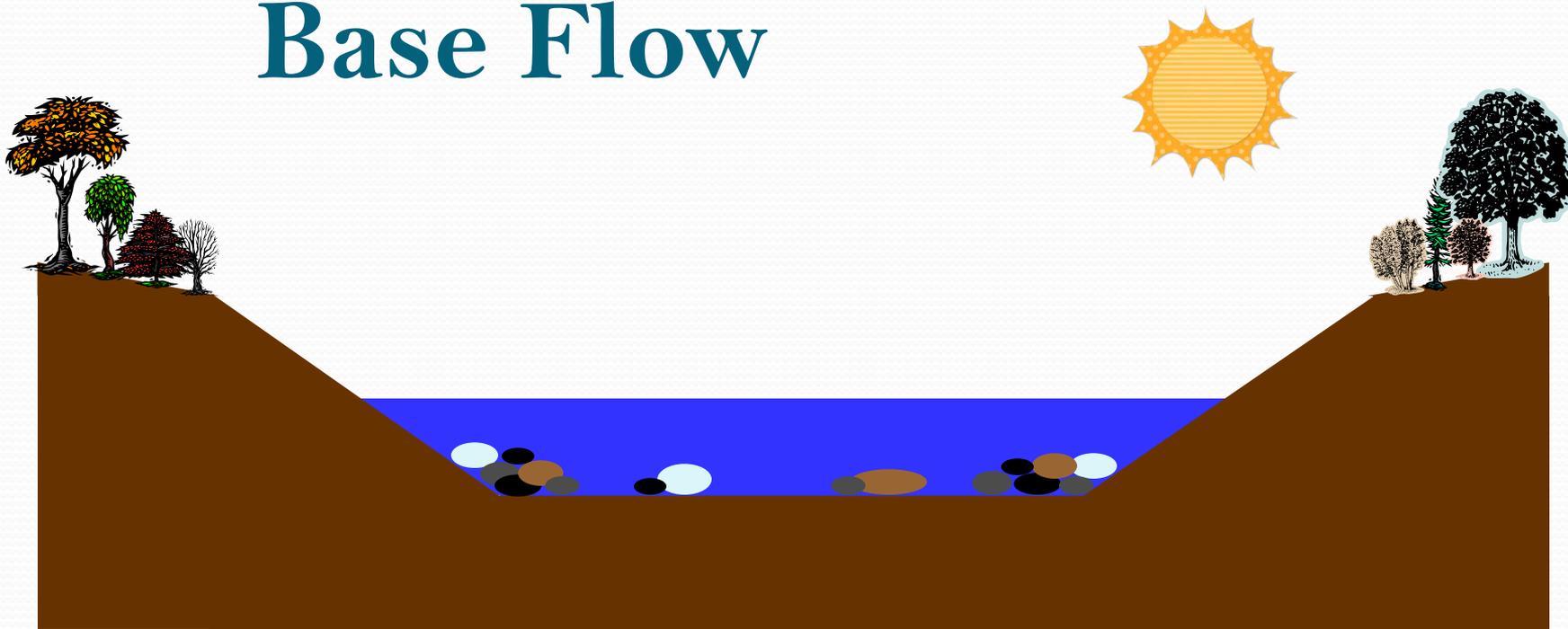
- Provides a range of suitable conditions with goal of
 - maintaining year to year variability, and
 - maintaining the ecological functions associated with this level of variability

Base Flow



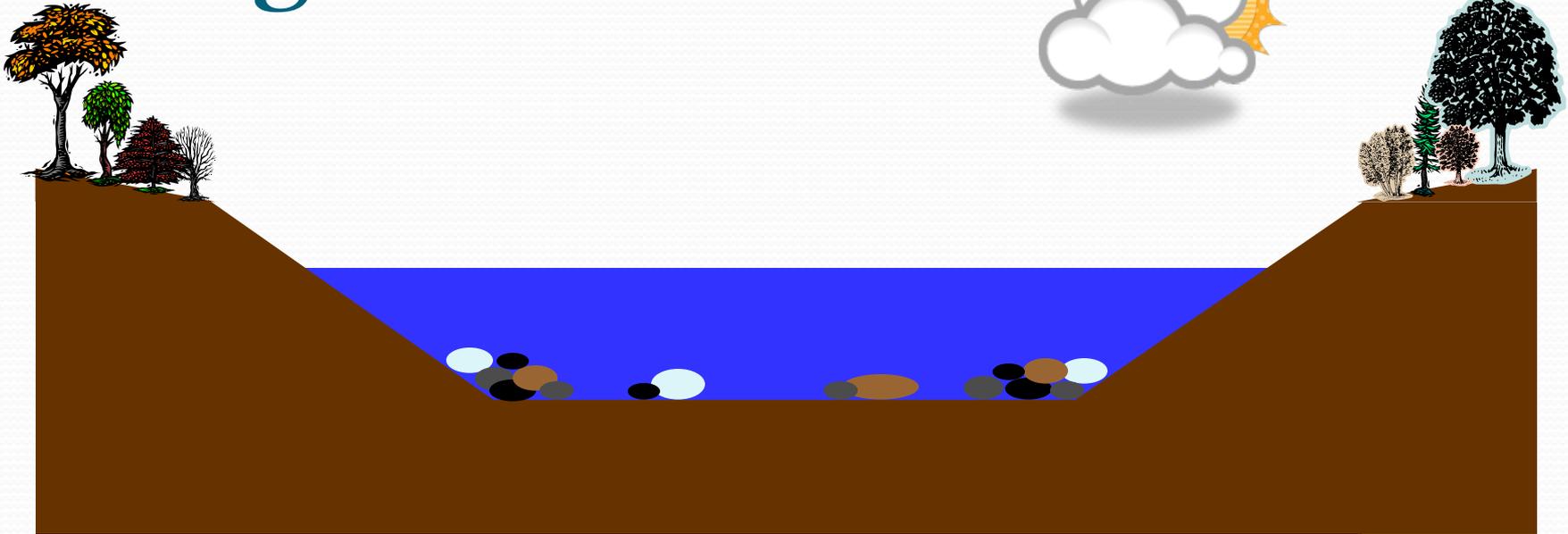
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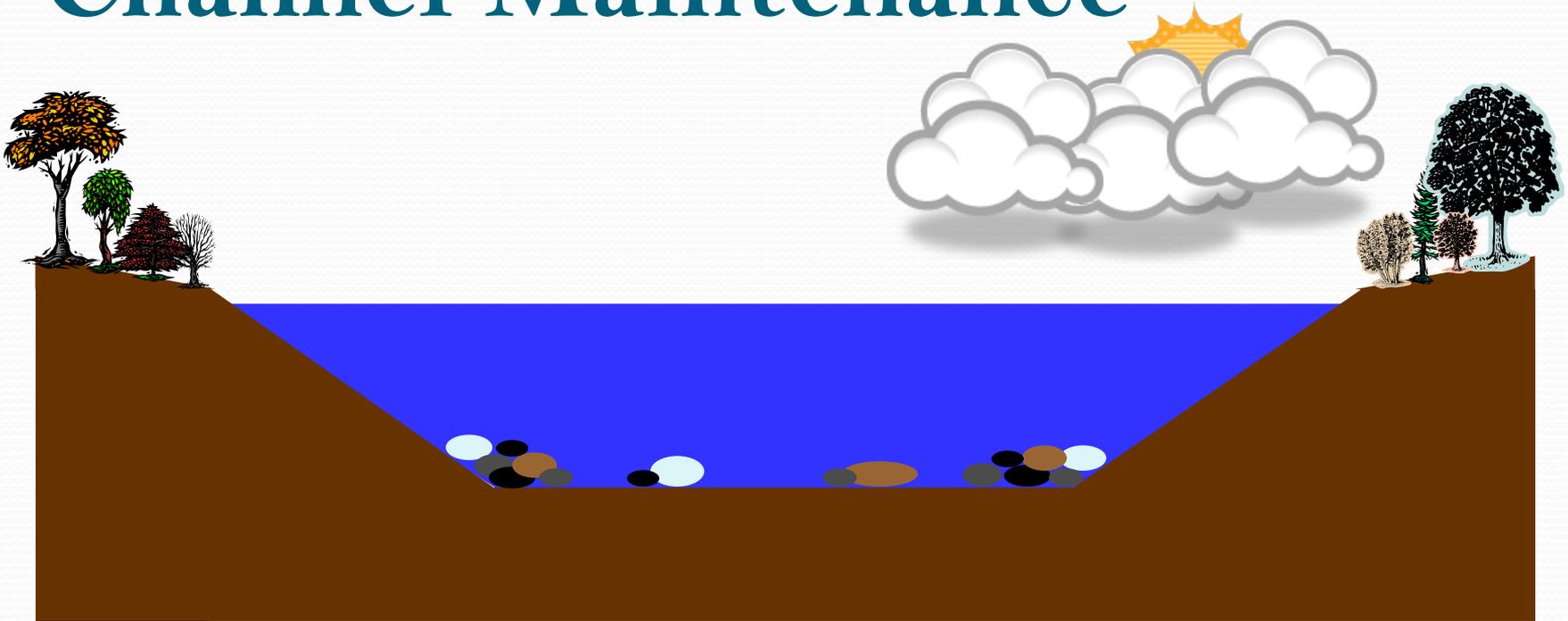
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High Flow Pulses



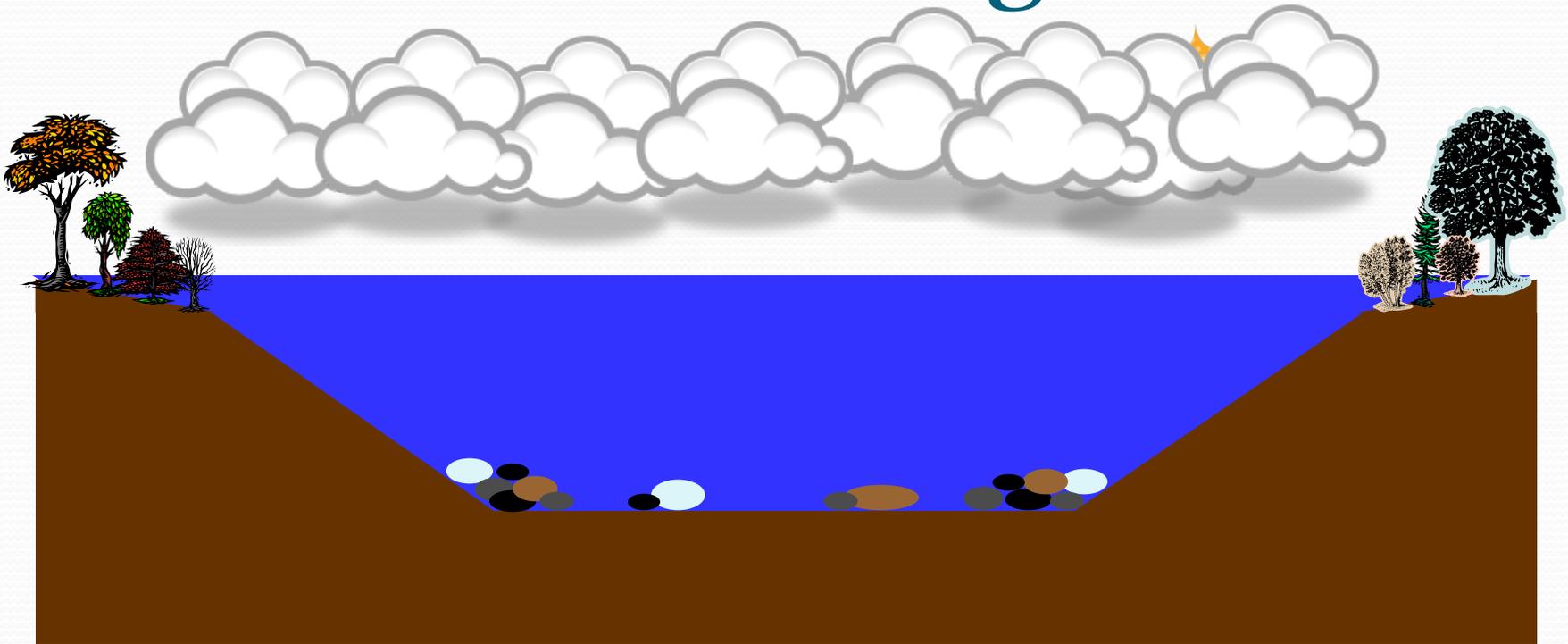
- Provides a myriad of ecological functions including:
 - nutrient and organic matter exchange
 - limited channel maintenance
 - flushing
 - vegetation scouring
 - seed dispersal

Channel Maintenance



- Provides for:
 - maintenance of channel capacity
 - flushing of fine sediments from gravel bar and riffle habitats
 - scouring of accumulated sediments from pool habitats

Overbanking



- Inundates low floodplain areas adjacent to the river for:
 - lateral floodplain and riparian connectivity
 - floodplain maintenance and nutrient deposition
 - recruitment of organic material and woody debris

Sound Ecological Environment

- TIFP definition

“a functioning ecosystem characterized by intact, natural processes, resilience, and a balanced, integrated, and adaptive community of organisms comparable to that of the natural habitat of a region.”

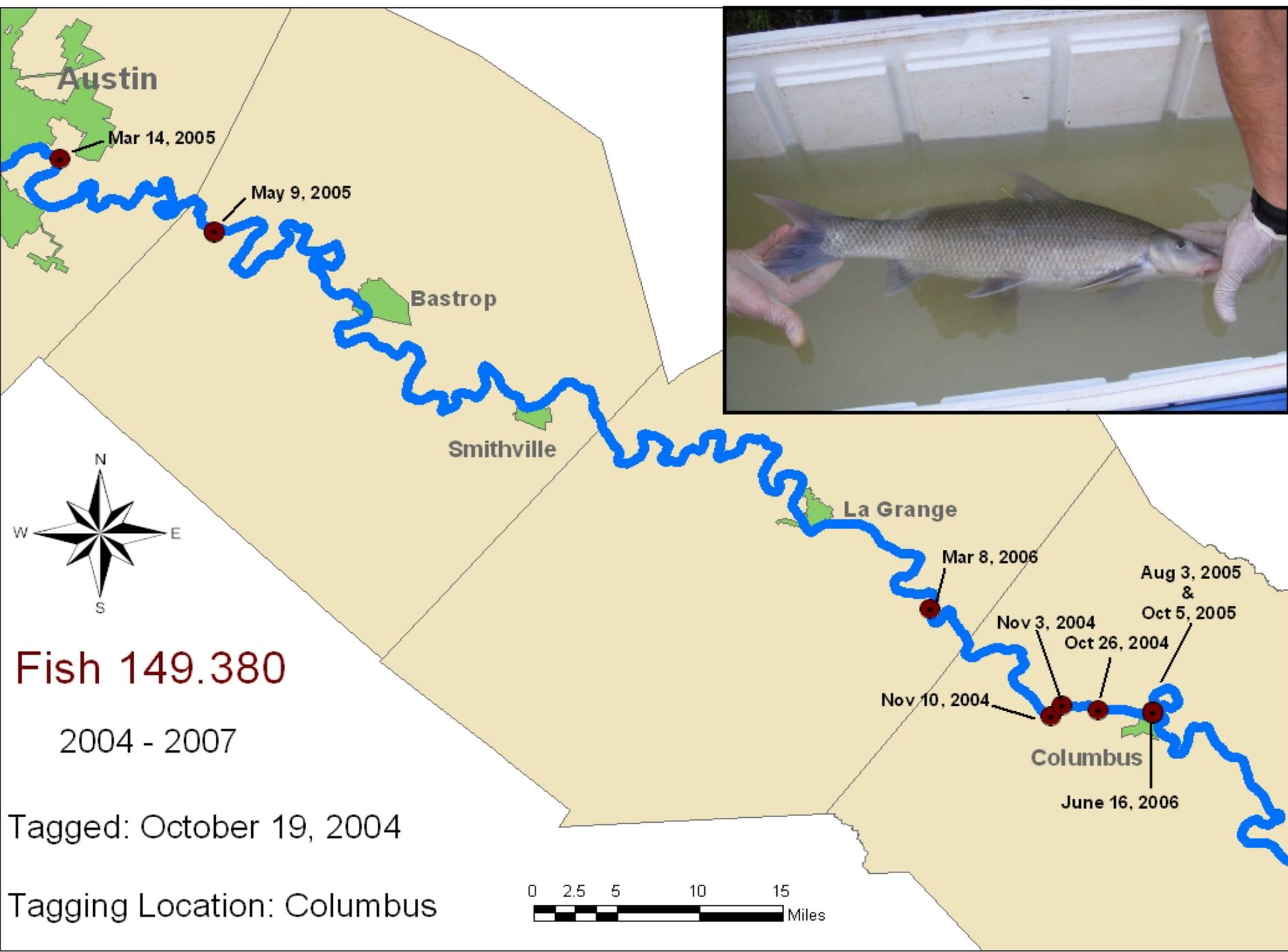
Subsistence Flows

- Water Quality
 - Water temperature, dissolved oxygen, etc.
- Connectivity
 - Migration



Migration





Migration - People

- Recreation
 - TB = HB = ☹️
 - TB = tuber's backside
 - HB = hits bottom
 - DYK/C > 10 feet = ☹️
 - DYK/C = Drag Your Kayak/Canoe



Base Flows

- Water Quality
 - Water temperature, dissolved oxygen, etc.
- Aquatic Habitat
- Connectivity
 - In channel



Warmwater Fish Communities

● Riffles

- *Percina sciera*
- *Percina carbonaria*
- *Ictalurus punctatus* (<180 mm)
- *Phenacobius mirabilis*
- *Etheostoma spectabile*
- *Campostoma anomalum*
- *Macrhybopsis* spp.



● Shallow runs

- *Cyprinella lutrensis*
- *Cyprinella venusta*
- *Pimephales vigilax*
- *Notropis volucellus*
- *Micropterus treculi* (< 170 mm)



● Deep Pools

- *Ictiobus bubalus*
- *Cyprinus carpio*

Deep Runs

- *Pylodictis olivaris*
- *Ictalurus punctatus* (>180 mm)
- *Moxostoma congestum*
- *Micropterus treculii* (> 170 mm)
- *Carpoides carpio*
- *Dorosoma cepedianum*



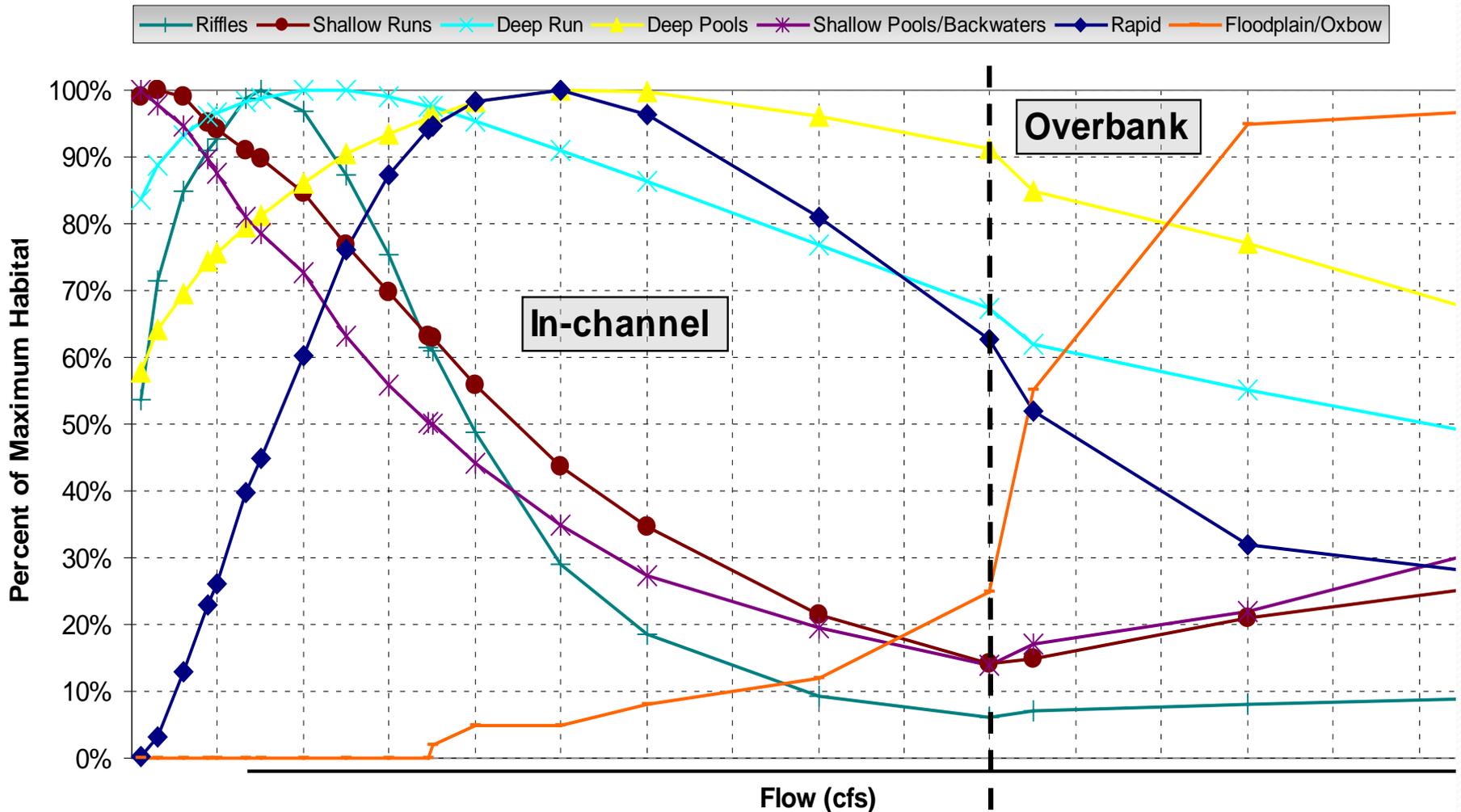
Shallow Pools / Edge / Backwaters

- *Micropterus salmoides*
- *Lepomis megalotis*
- *Lepomis macrochirus*
- *Lepomis cyanellus*
- *Cichlasoma cyanoguttatum*
- *Gambusia affinis*
- *Poecilia latipinna*
- *Fundulus notatus*

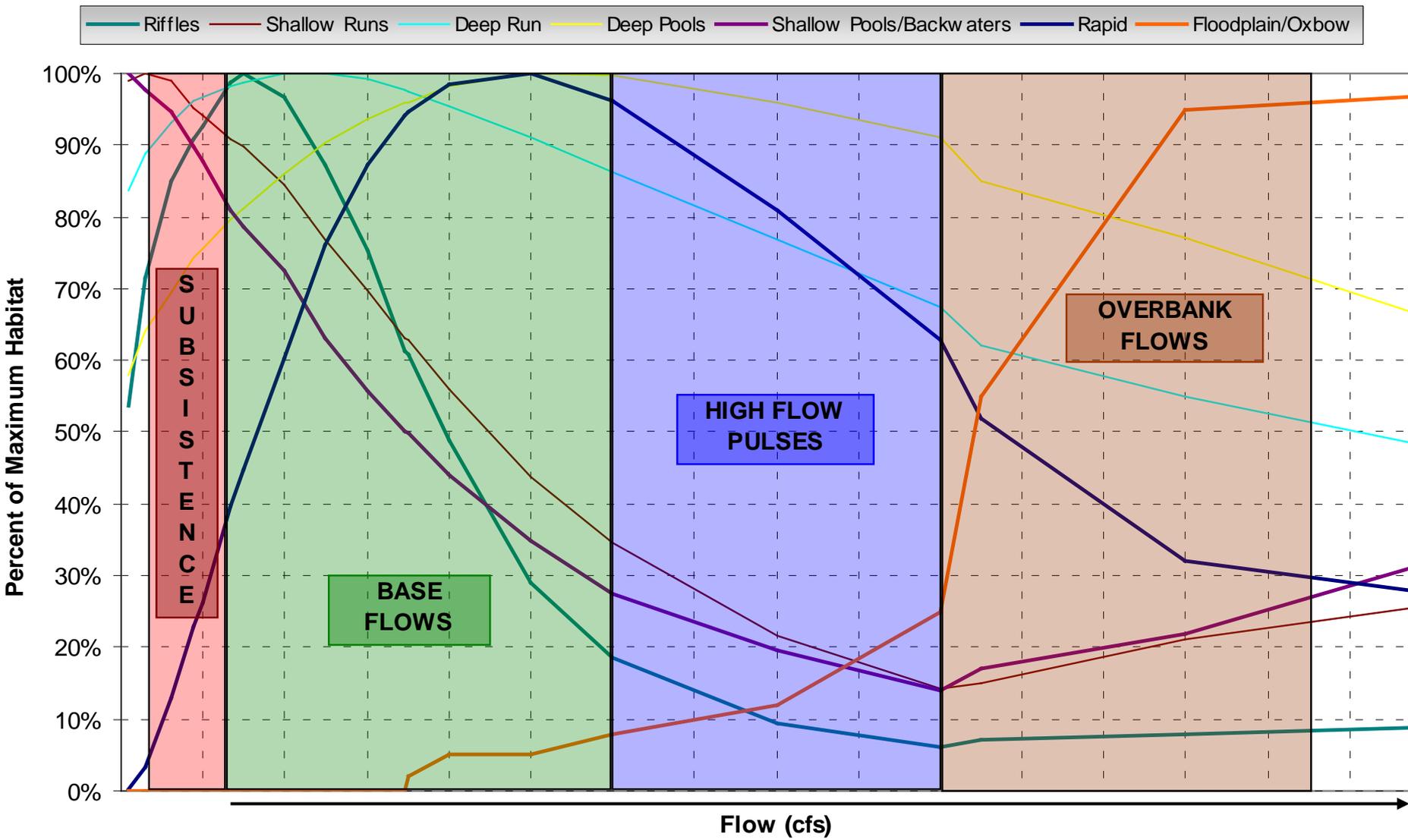


Multiple Species

Example -
Percent of Maximum In-Channel and Overbank Habitat versus Flow

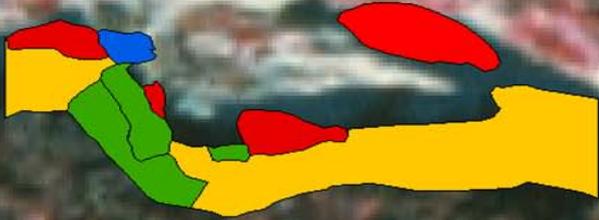


Texas Instream Flow Program - Instream Flow Categories Overlay



In Channel Connectivity

159 cfs



299 cfs



418 cfs



592 cfs



868 cfs



High flow pulses and Overbank Flows

- Lateral Connectivity
 - Side channels, oxbows
- Channel maintenance
 - Flushing flows, Deep pool scouring, Sand bar re-working and distribution
- Riparian Recruitment
 - Floodplain connectivity

High Flow Pulses - Connectivity

150 cfs

407 cfs

Legend

Riffles - Suitability

- ◆ 0.0
- ◆ 0.0 to 0.2
- ◆ 0.2 to 0.4
- ◆ 0.4 to 0.6
- ◆ 0.6 to 0.8
- ◆ 0.8 to 0.99
- ◆ 0.99 to 1.00

Legend

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- ◆ 0.99 to 1.00

0 375 750 1,500 2,250 3,000 Feet

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1,000 cfs

1,930 cfs

Legend

Riffles - Suitability

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Legend

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High Flow Pulses and Channel Maintenance



Overbanking Flows

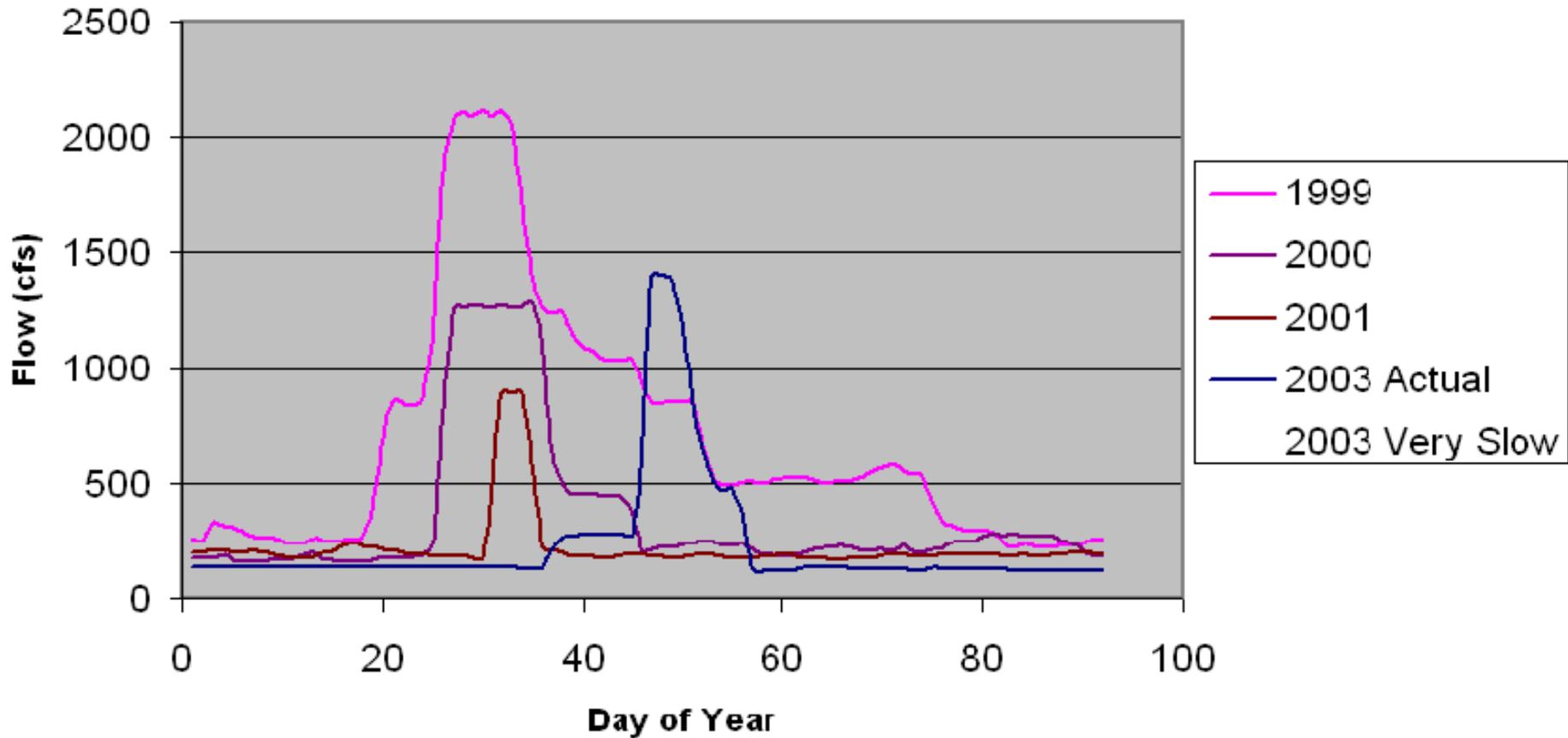
Water Depth



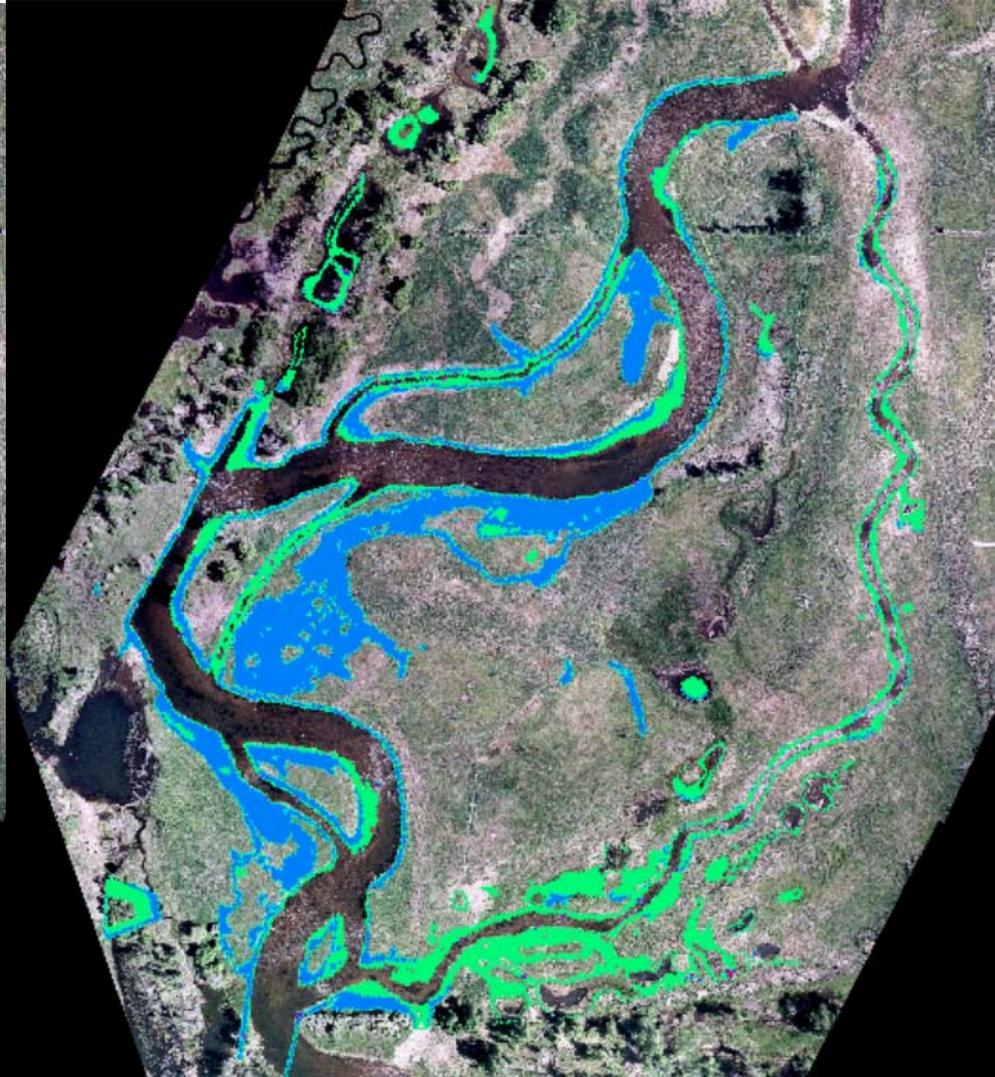
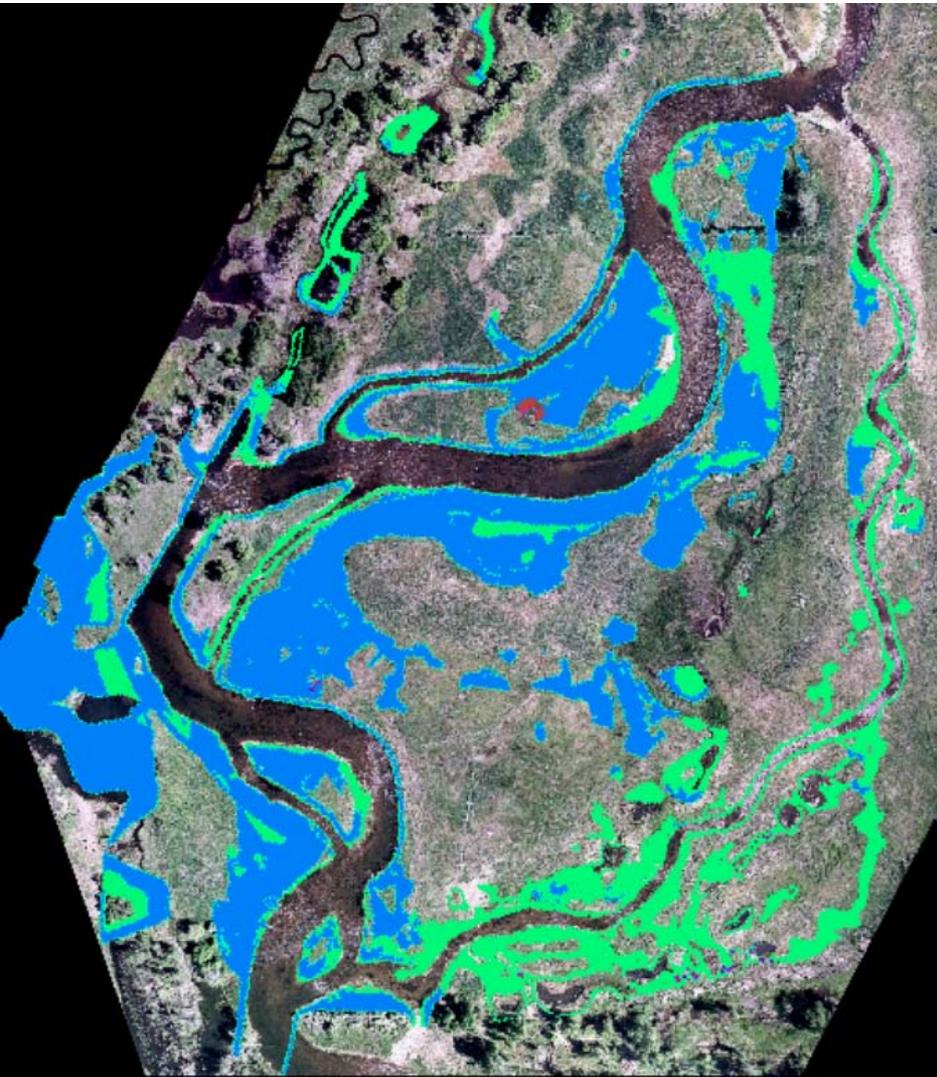
1999

Overbanking Flows

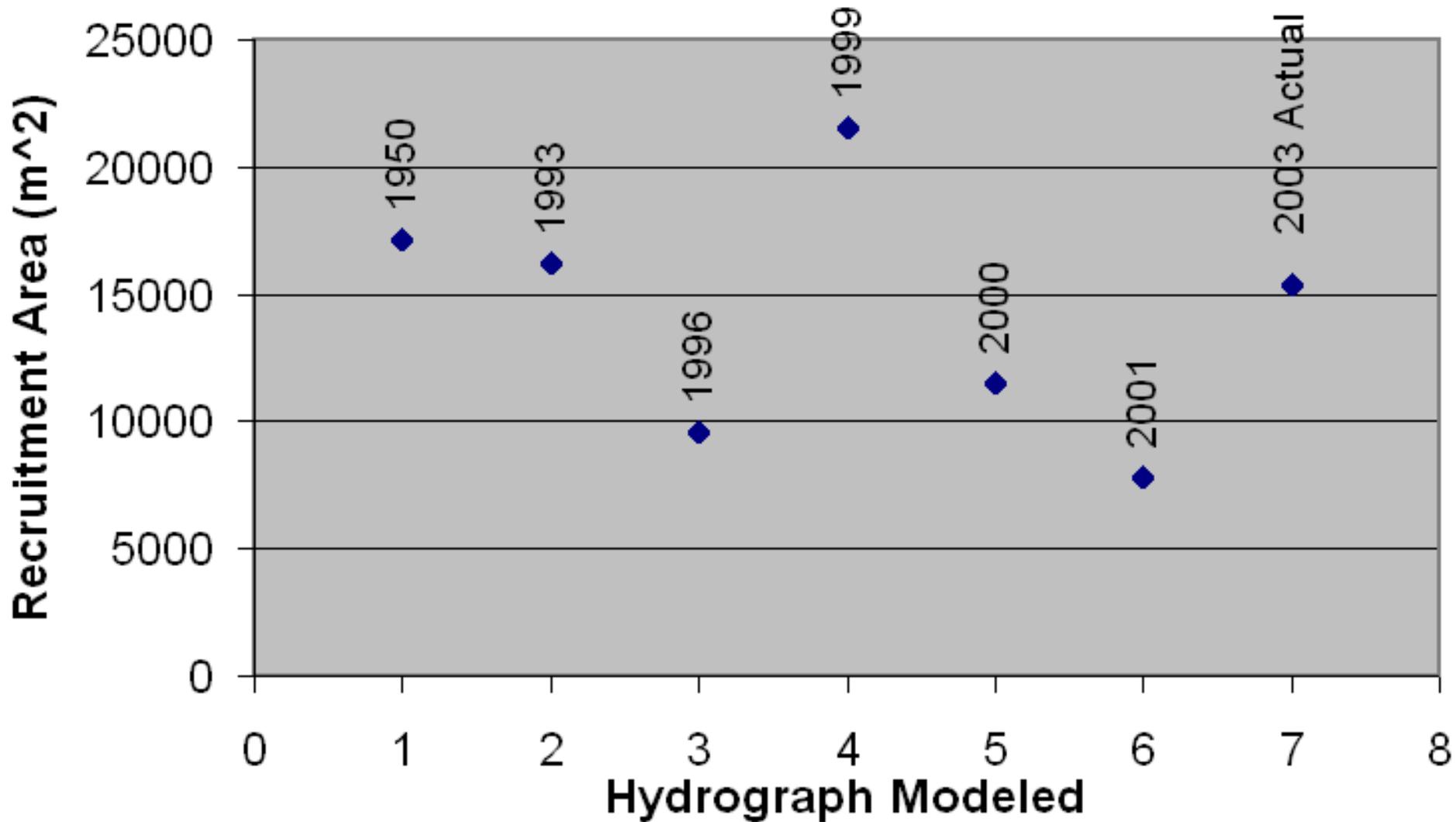
2003



1999 Overbanking Flows 2003



Overbanking Flows



Summary

- Variable Flow Components are important to maintaining a “sound ecological environment”
- Which components are necessary?
 - System dependent
 - Land use, management goals, endangered species, etc.
- Magnitude, Duration and Timing
 - Key aspects for consideration

Questions

