

Lower Sabine River Biological Indicators

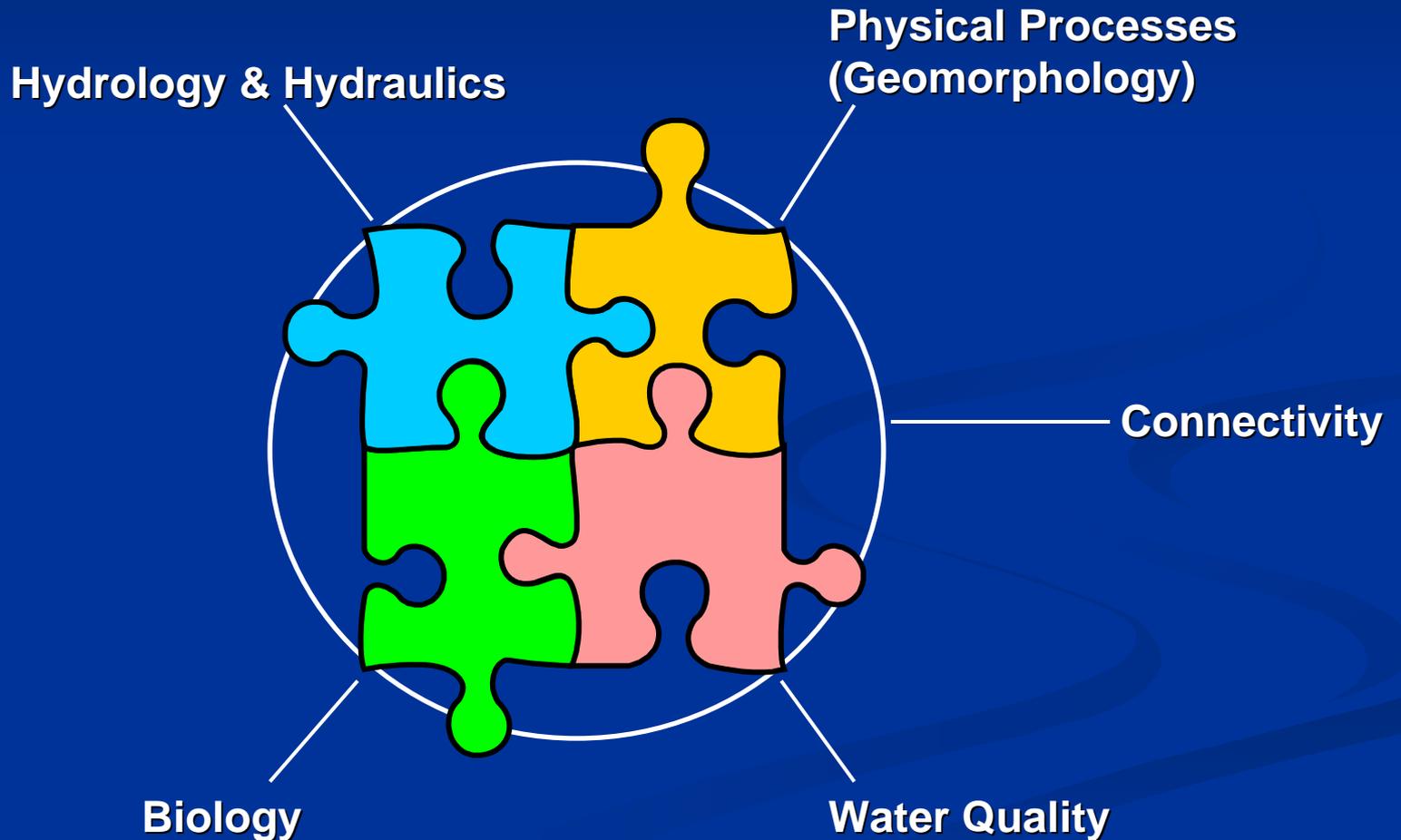
Texas Instream Flow Program

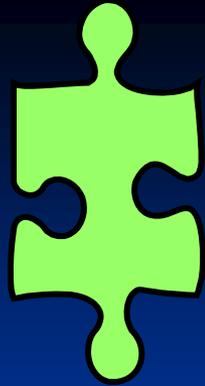
Third Stakeholder Workshop

January 6, 2009

Orange, Texas

Primary Disciplines



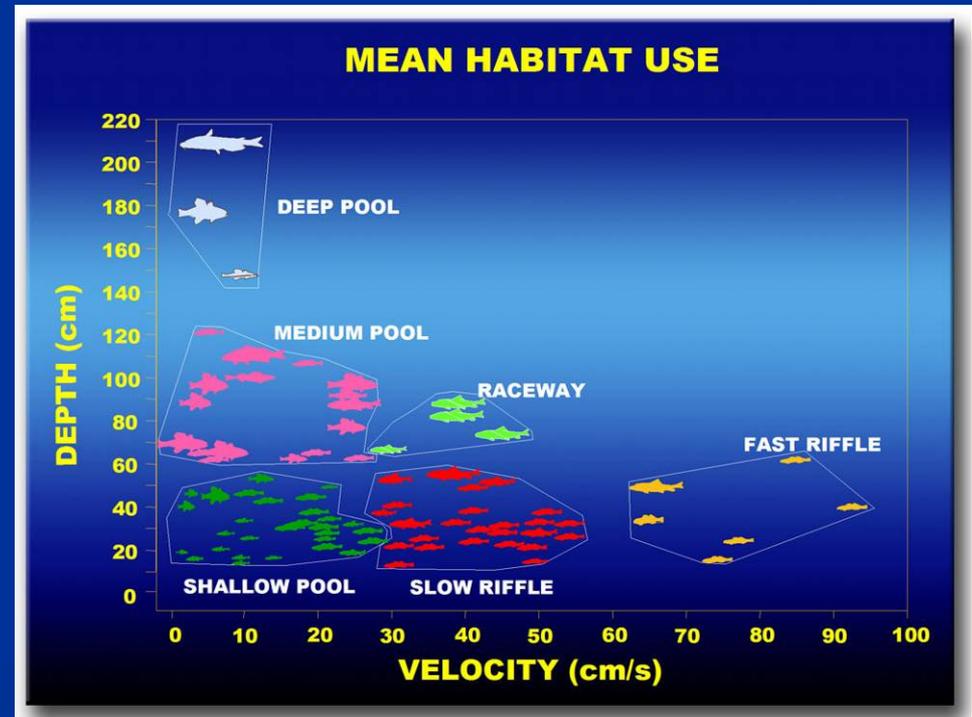


Biology

Biodiversity

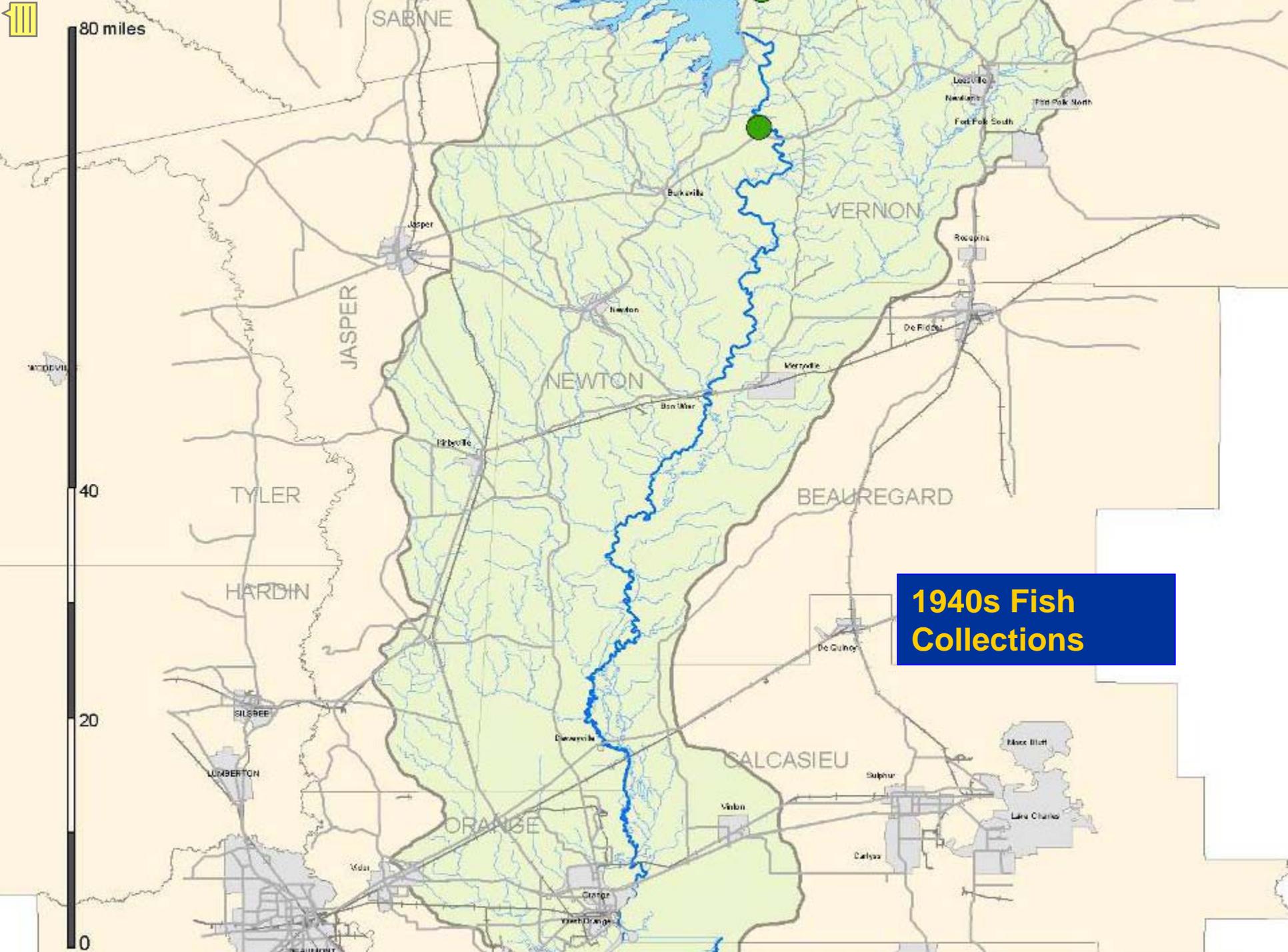


Habitat Diversity

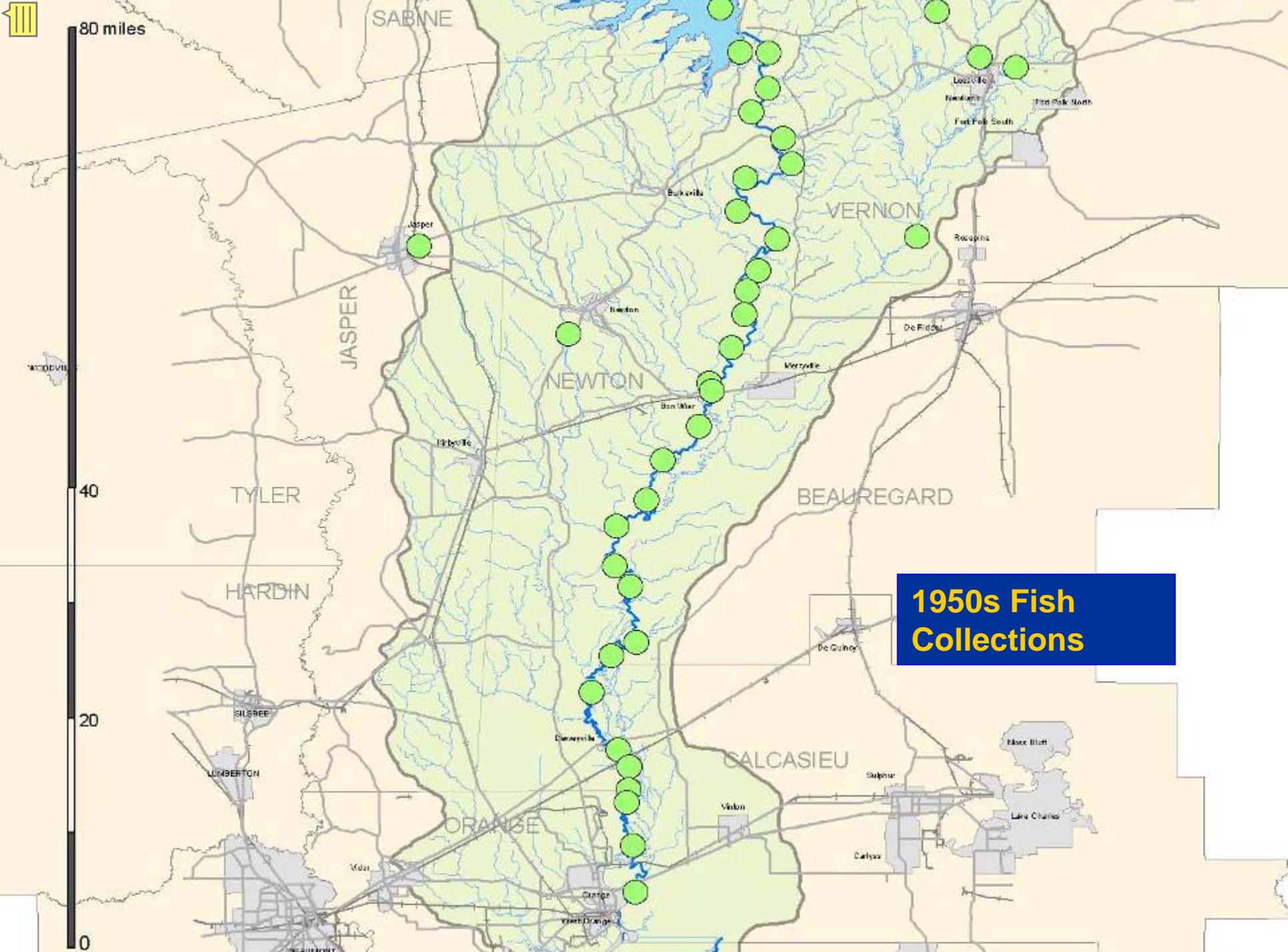


Analysis of Existing Biological Data

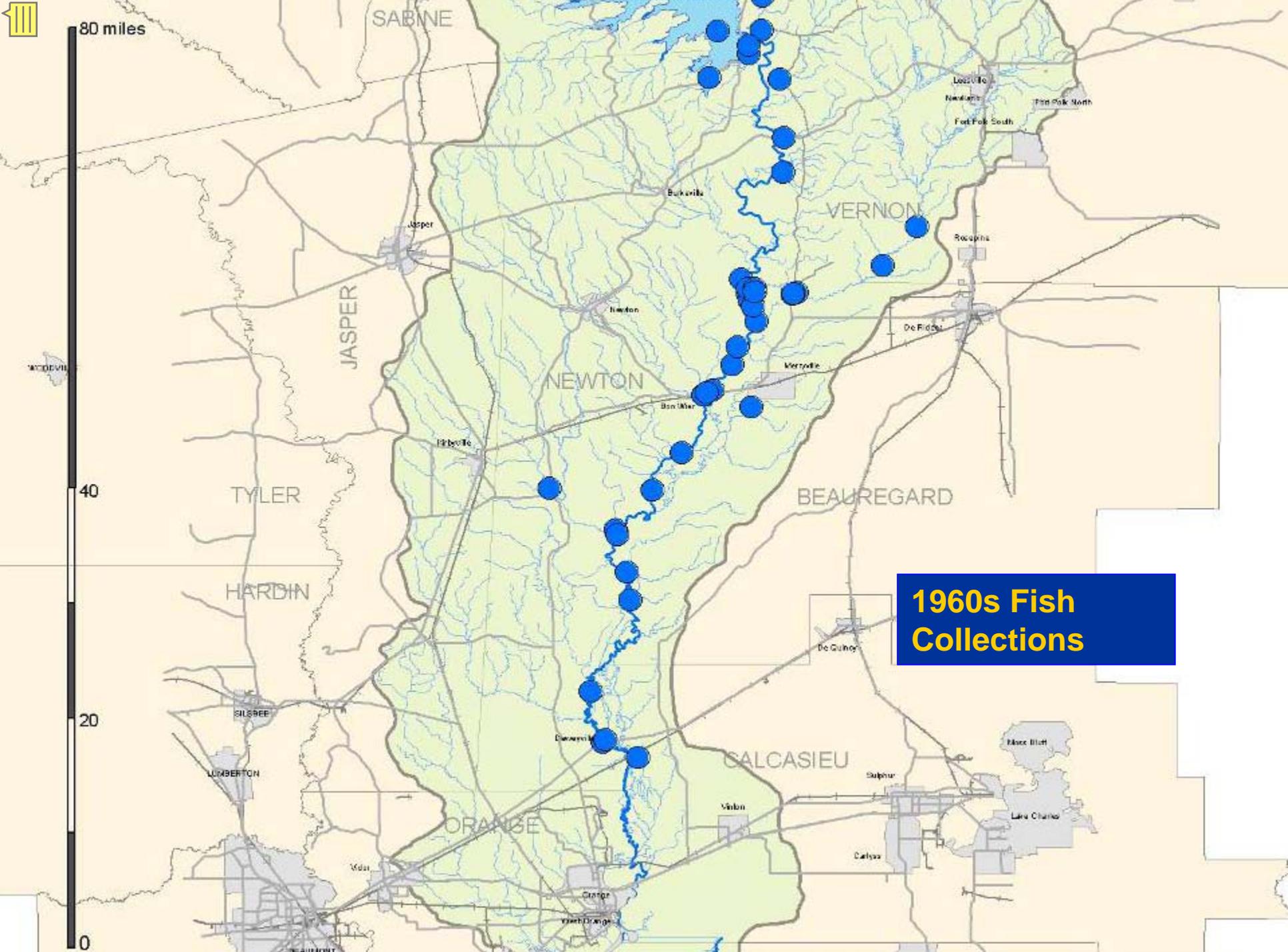
- Extensive historical fish collections available from the Sabine drainage
- Mostly housed at Tulane University
- Coverage skips the 1990s



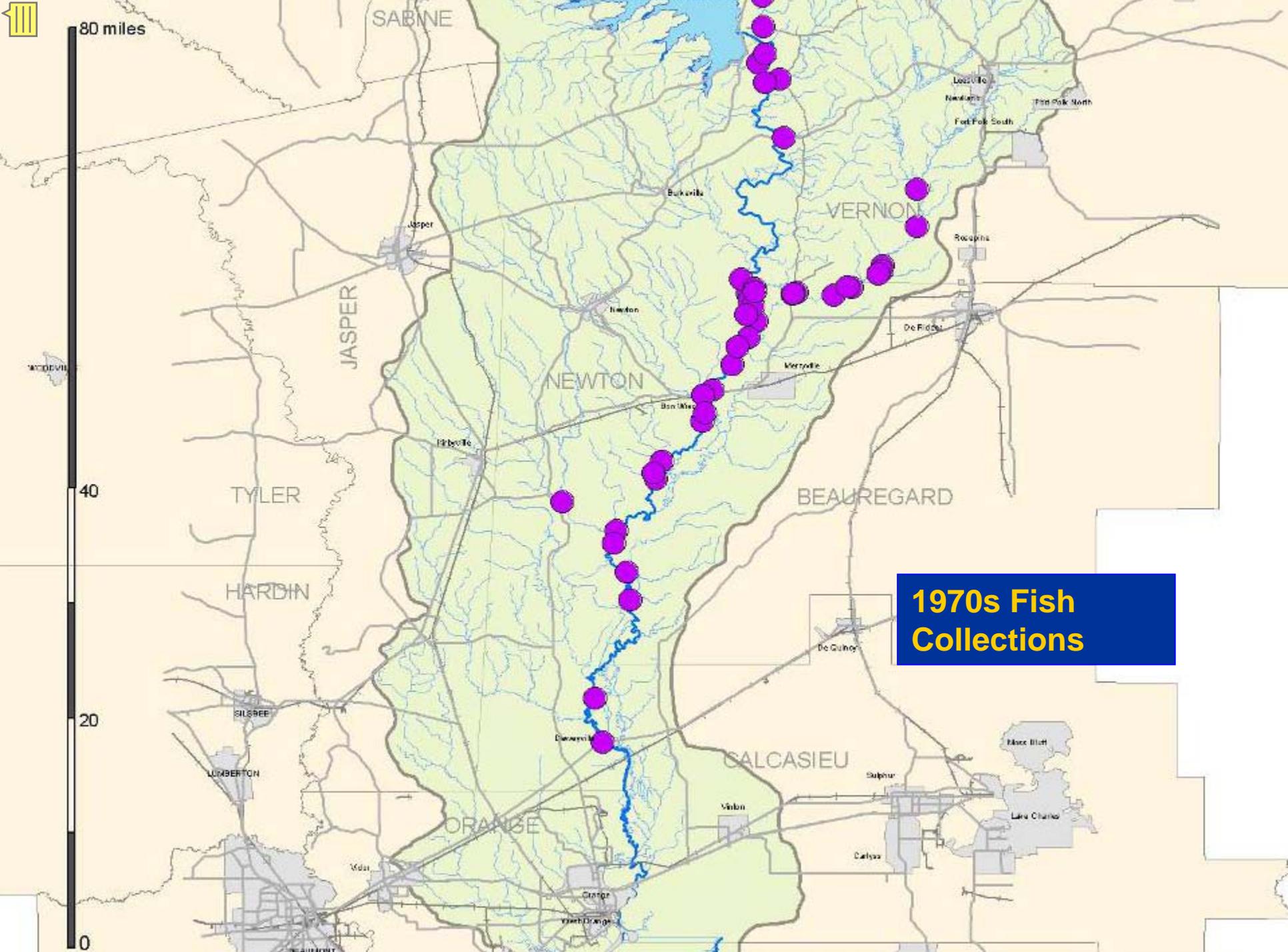
1940s Fish Collections

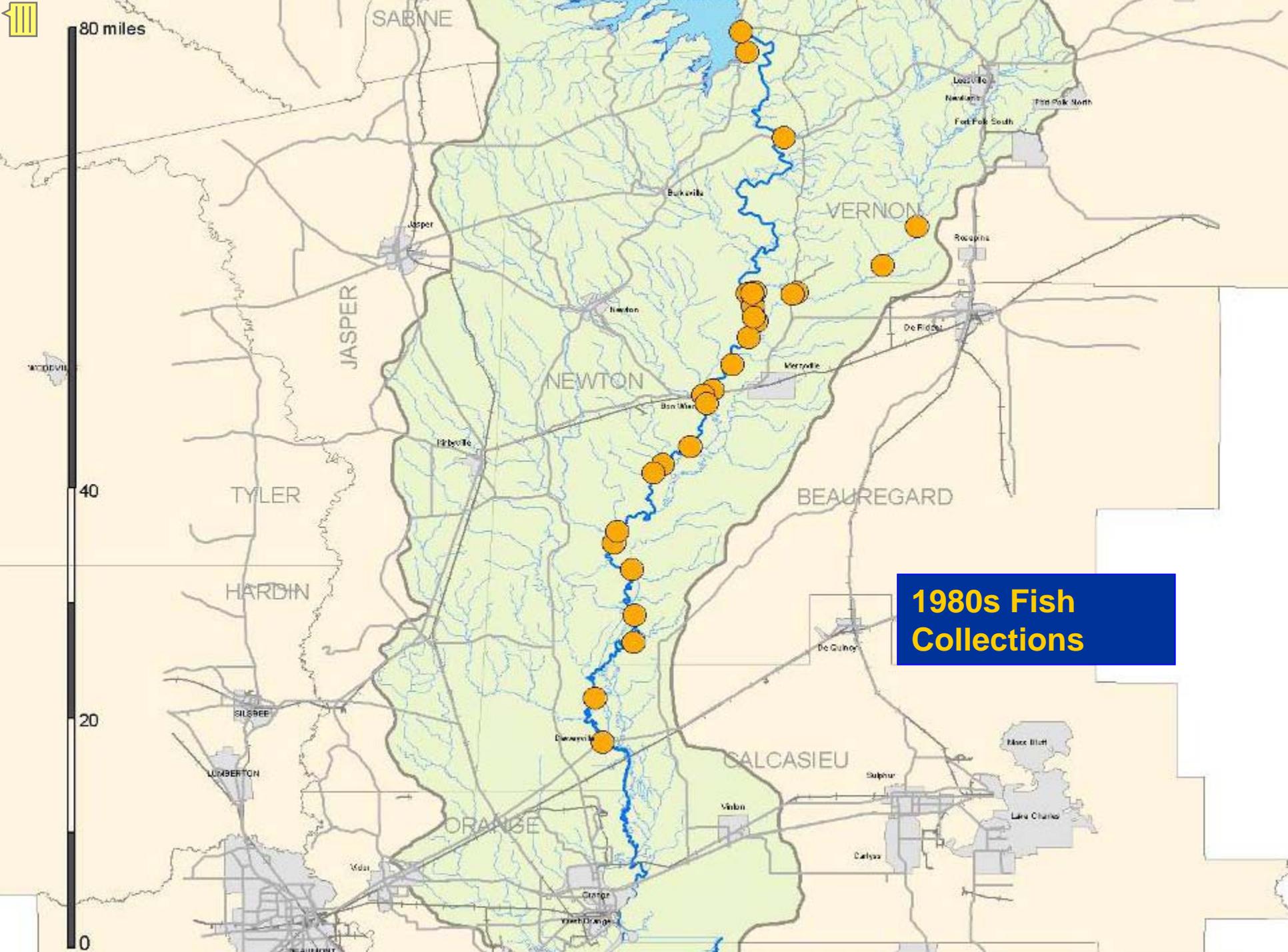


1950s Fish Collections



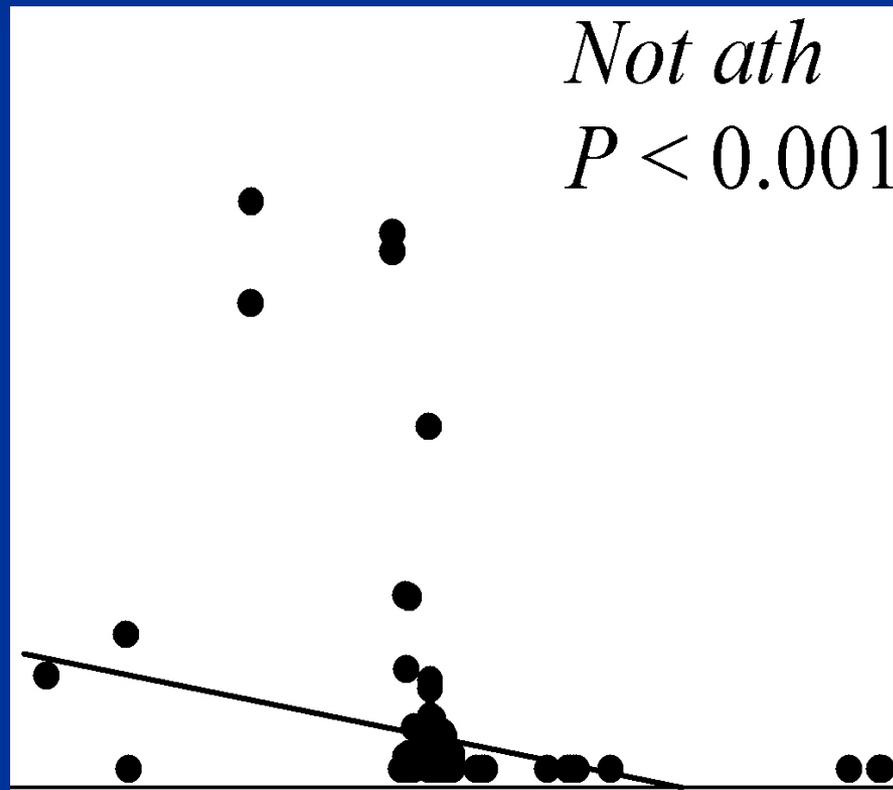
1960s Fish Collections





Analysis of Existing Fish Data

Bonner and Runyan
2007



Declining species

- Pirate perch
- Red shiner
- Western mosquitofish
- Mississippi silvery minnow
- Warmouth
- Shoal chub
- Emerald shiner
- Ghost shiner
- Bullhead minnow

Increasing species

- Scaly sand darter
- Blacktail shiner
- Blackspotted topminnow
- Bluegill
- Longear sunfish
- Inland silverside
- Spotted bass
- Dusky darter

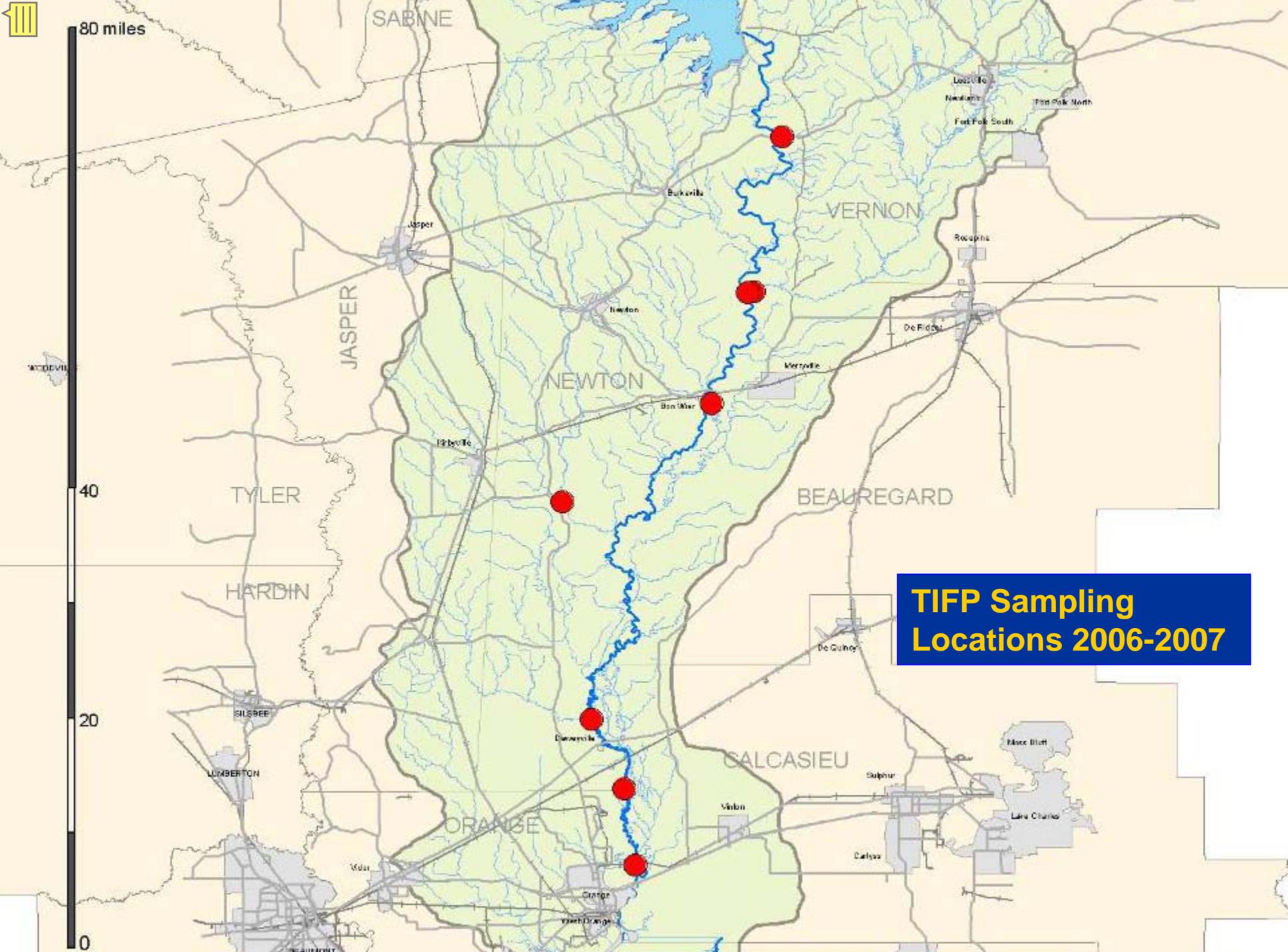
Other species assessed

- 23 species were stable in population
- More than 50 species had trends that could not be determined from available data

Lower Sabine River Instream Flow – TIFP Fish Collection

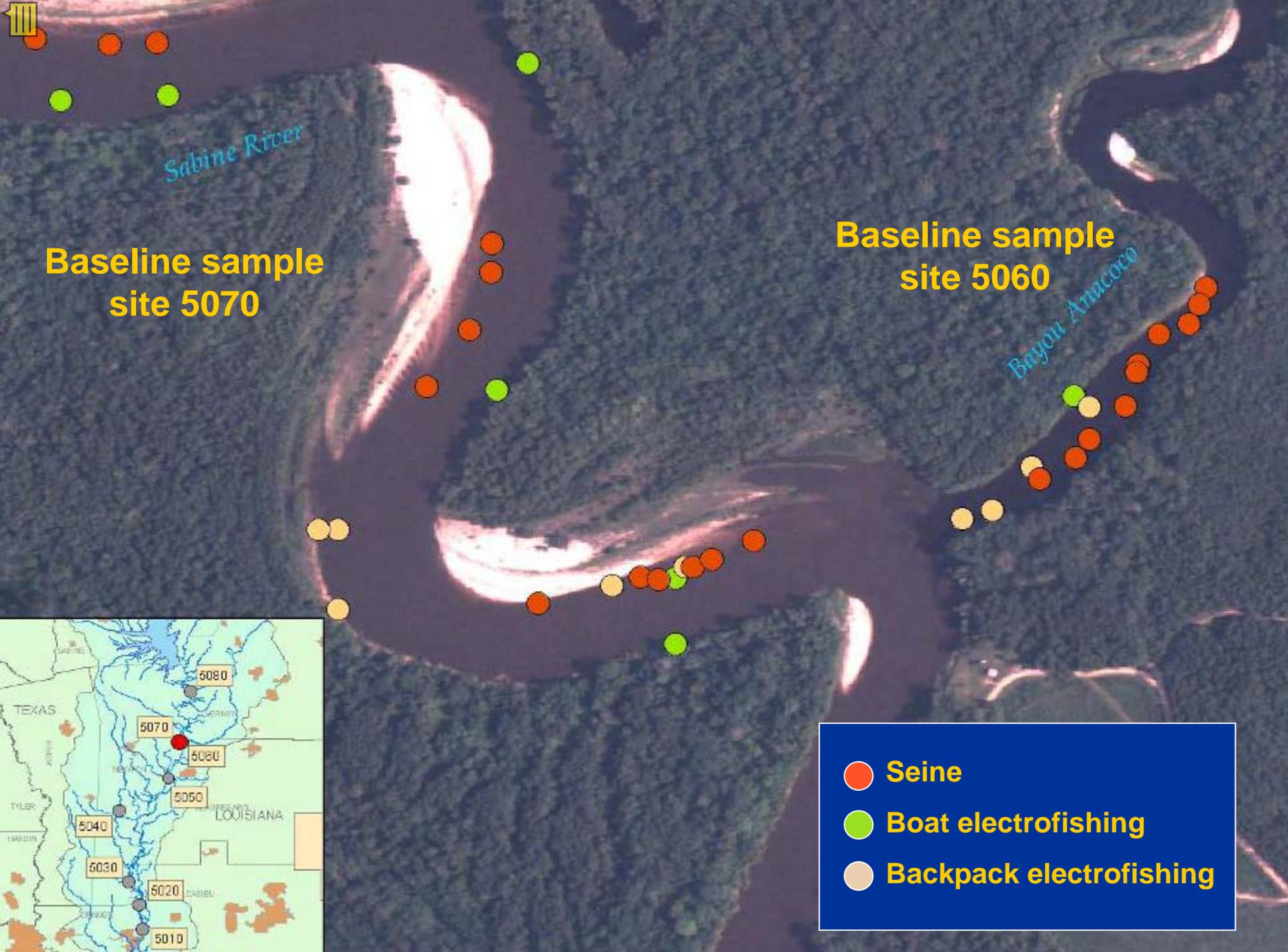
2006-2007





TIFP Sampling Locations 2006-2007





Summary

- Lower Sabine River – 64 species comprising more than 15,000 individuals.
- State threatened blue sucker collected.



Mussel Surveys



Mussels



Lower Sabine River Biological Objectives

- **Maintain and/or improve sustainable native biological communities/habitats**
- **Control invasive and non-native species that threaten the function of the aquatic and terrestrial ecosystems**

Potential Indicators

Native Species Richness - the number of species or taxa

Relative Abundance – the number of organisms of a particular species as a percentage of the total community

Taxa

Fishes

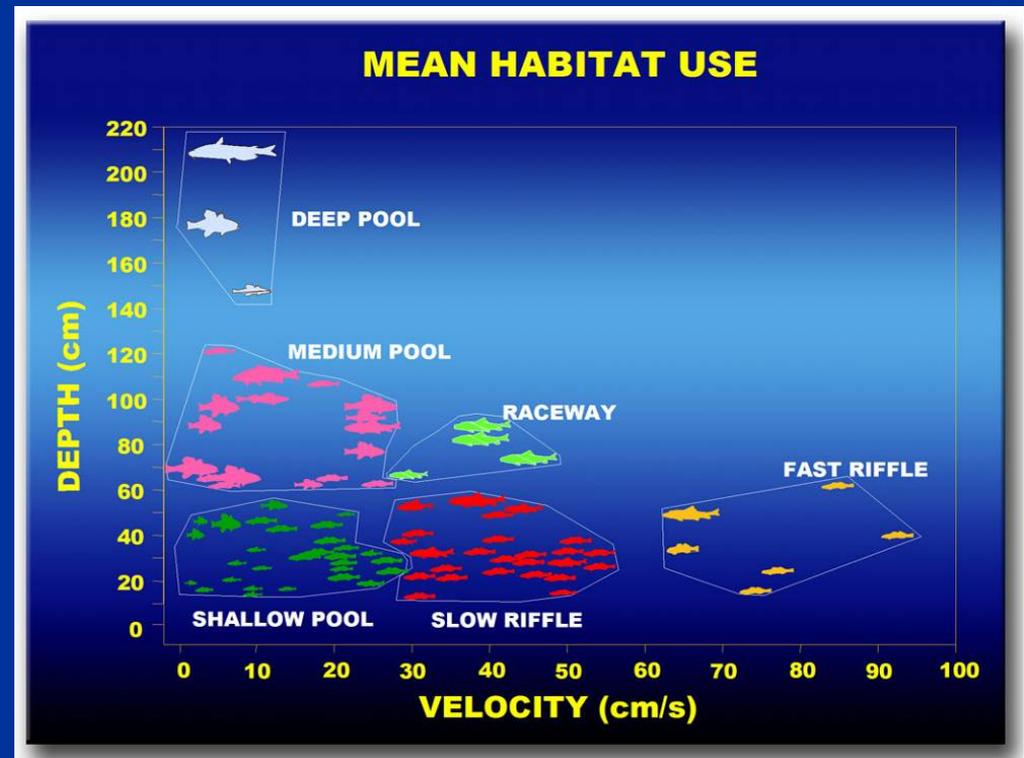
- Flow sensitive species
- Sport fishes
- Prey species
- Imperiled species
- Intolerant species

Other Taxa

- **Benthic invertebrates**
- **River prawn**
- **Mussels**
- **River and riparian plants**
- **Other vertebrates**

Instream Habitat

- Habitat Quality and Quantity for Key Species
- Mesohabitat Area and Diversity



Riparian Habitat

Vegetation

- Age class distribution of riparian plant species
- Riparian species richness and diversity
- Density
- % Canopy cover

Riparian Habitat

Soils

- Riparian soil types

Hydrology

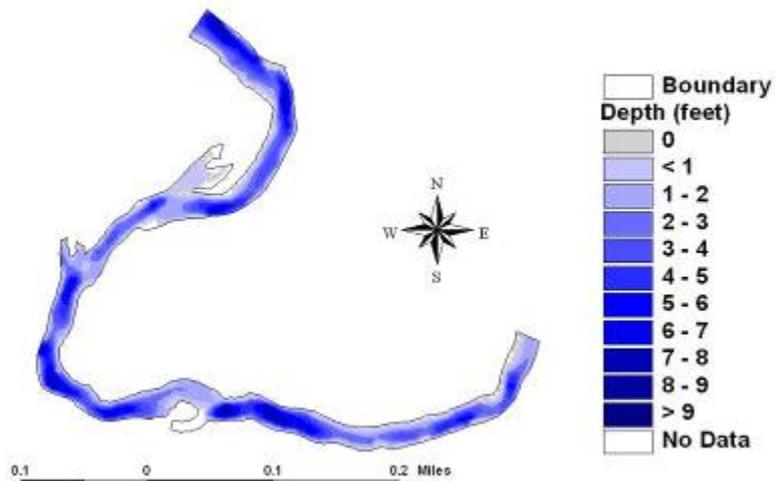
- Gradient of inundation
- Base flow levels

Lower Sabine River Biological Objectives

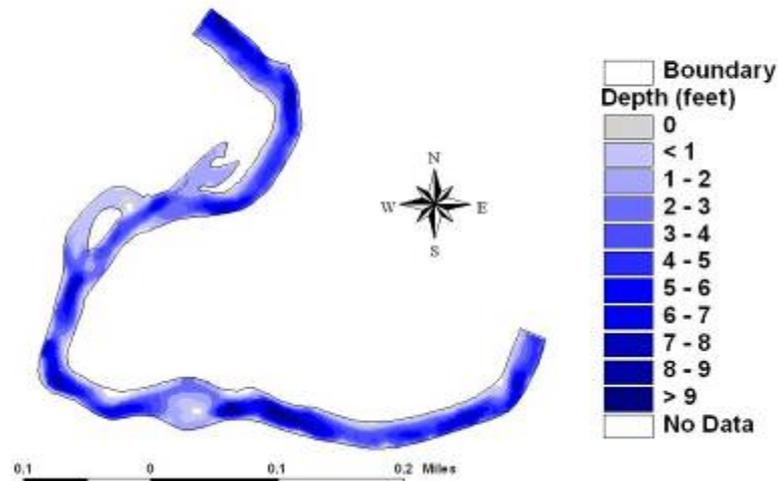
- **Maintain and/or improve sustainable native biological communities/habitats**
- **Control invasive and non-native species that threaten the function of the aquatic and terrestrial ecosystems**

Hydraulic Modeling

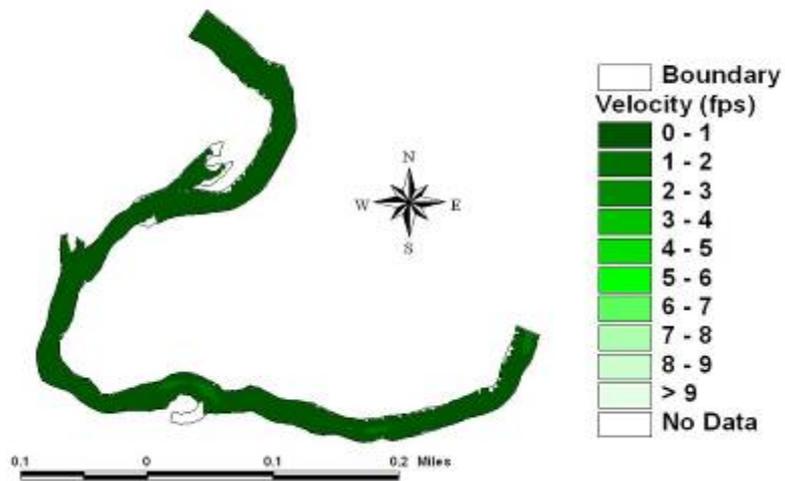
Depth at Rainwater Ranch at Q=100cfs



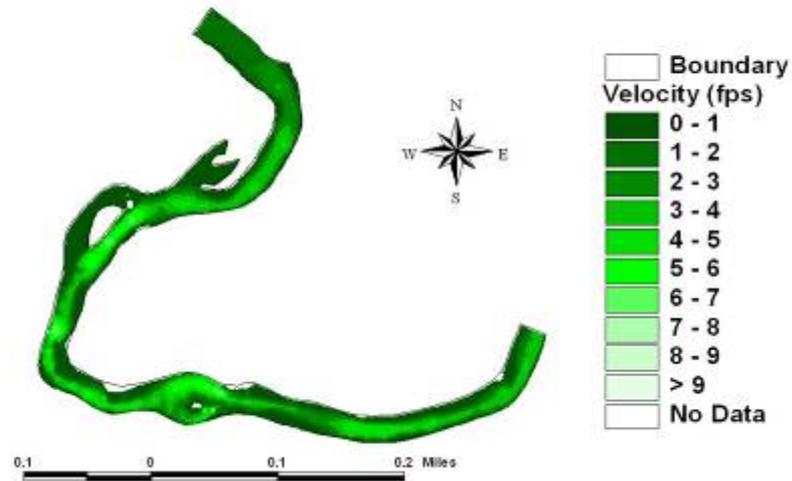
Depth at Rainwater Ranch at Q=1000cfs

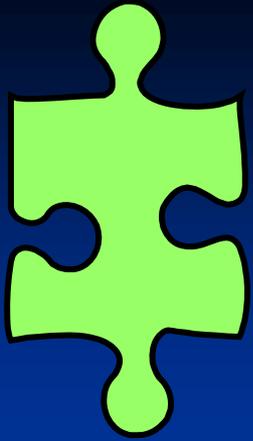


Velocity at Rainwater Ranch at Q=100cfs



Velocity at Rainwater Ranch at Q=1000cfs



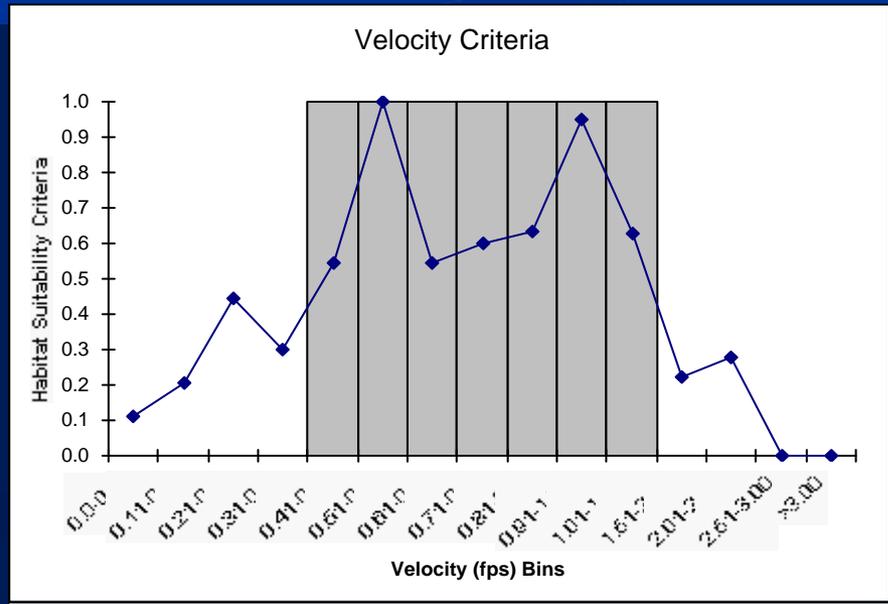


Biology

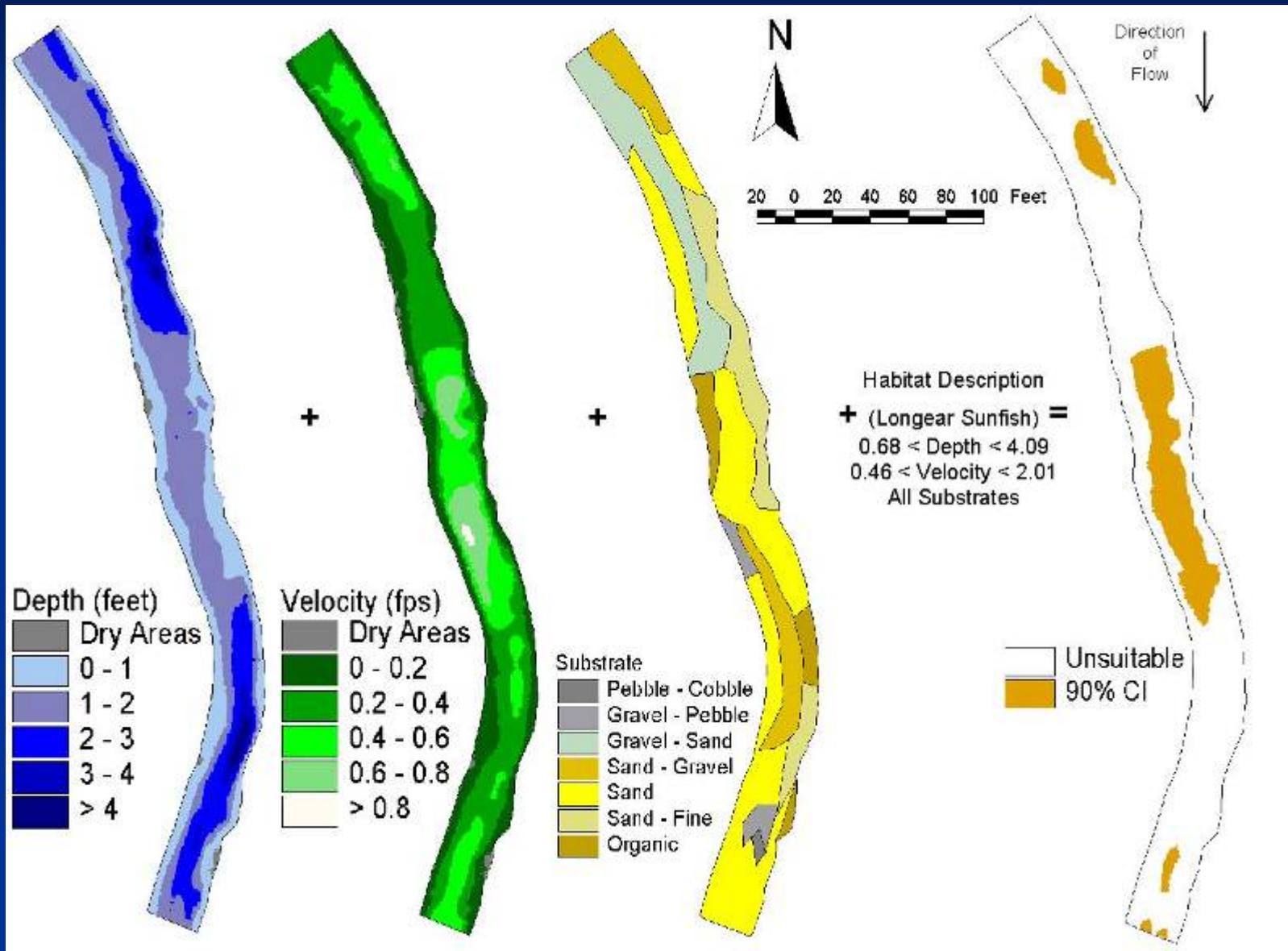
- **Examine integrity of biological community**
- **Examine biodiversity within ecosystem**
- **Assess habitat-flow relationships**

Suitability Criteria for Habitat Modeling

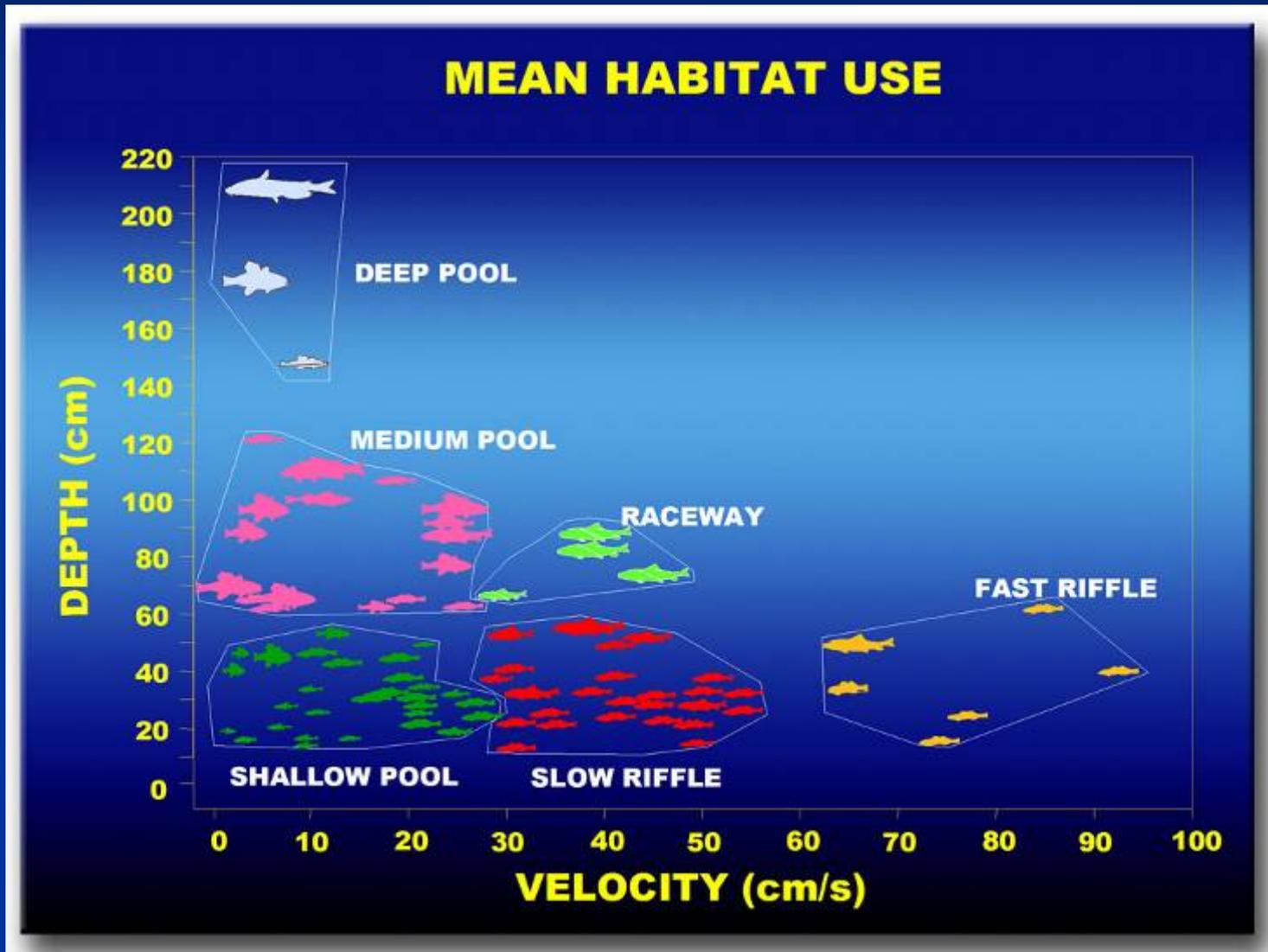
Velocity Bin	TWR freq	Univ freq	hsi	normal factor	std hsi	binary hsi
0.0-0.1	14	611	0.023	4.737	0.109	0
0.11-0.2	16	364	0.044	4.737	0.208	0
0.21-0.3	21	225	0.093	4.737	0.442	0
0.31-0.4	13	207	0.063	4.737	0.297	0
0.41-0.5	19	165	0.115	4.737	0.545	1
0.51-0.6	19	90	0.211	4.737	1.000	1
0.61-0.7	10	87	0.115	4.737	0.544	1
0.71-0.8	9	71	0.127	4.737	0.600	1
0.81-0.9	6	45	0.133	4.737	0.632	1
0.91-1.00	5	25	0.200	4.737	0.947	1
1.01-1.50	11	83	0.133	4.737	0.628	1
1.51-2.00	2	43	0.047	4.737	0.220	0
2.01-2.50	1	17	0.059	4.737	0.279	0
2.51-3.00	0	14	0.000	4.737	0.000	0
>3.00	0	8	0.000	4.737	0.000	0
N =	146	2055				



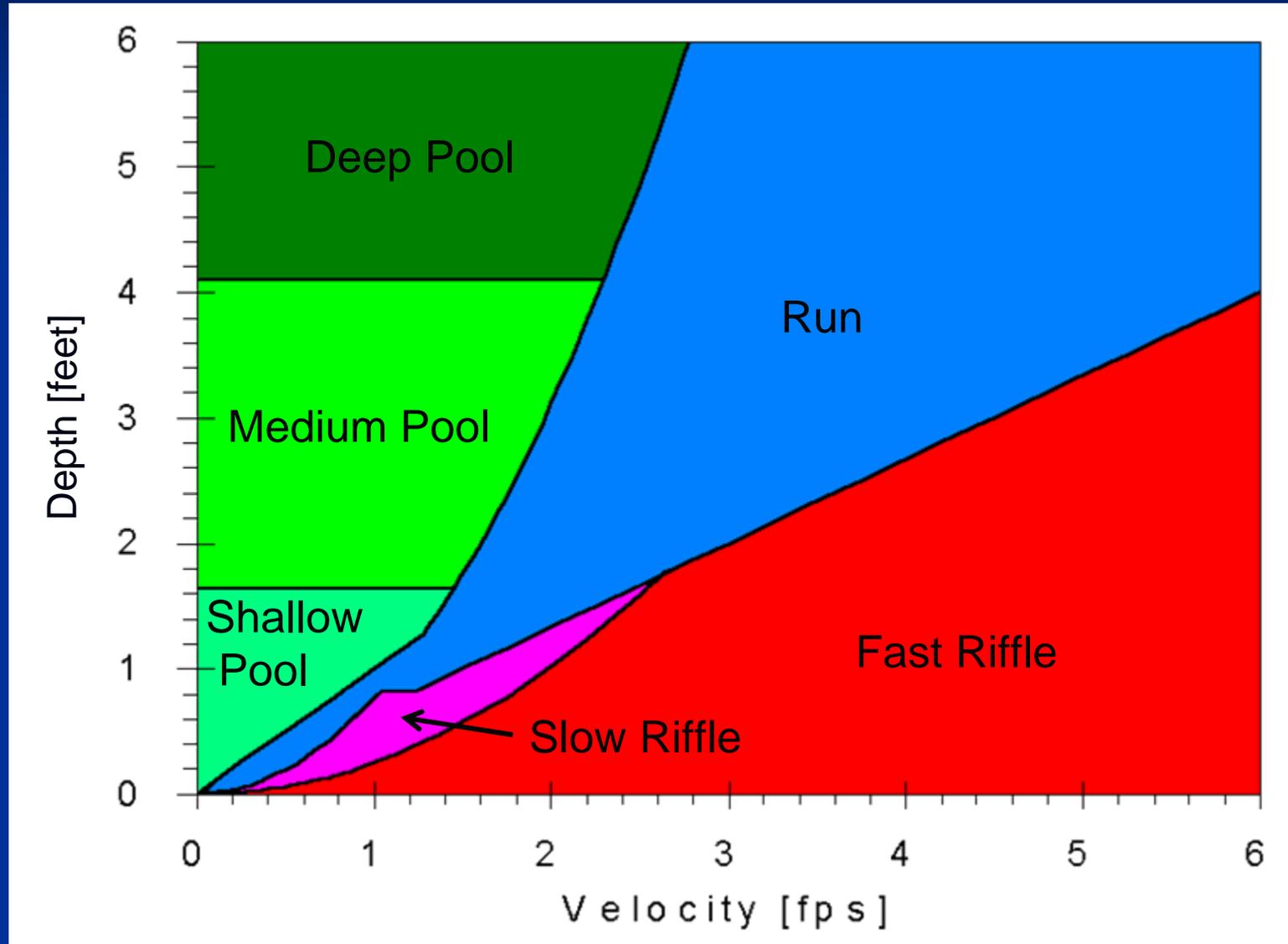
2-D Microhabitat Modeling



Use of Habitat Guilds for Mesohabitat Modeling



Hydraulically-defined Mesohabitats



2-D Mesohabitat Modeling



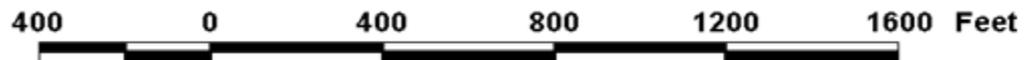
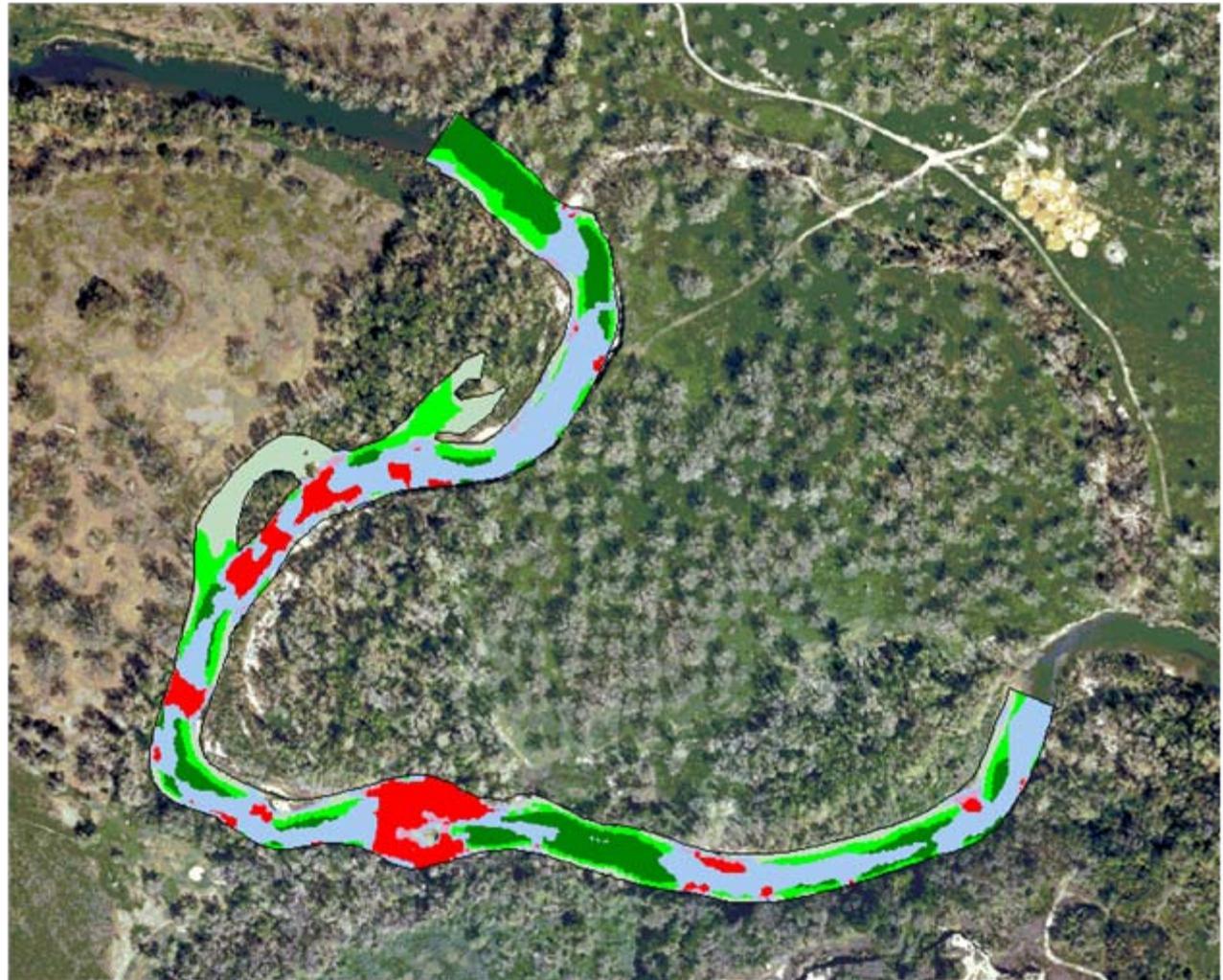
**Flow =
100 cfs**



2-D Mesohabitat Modeling



**Flow =
1,000 cfs**



Mesohabitat Area vs. Flow (cfs)

