

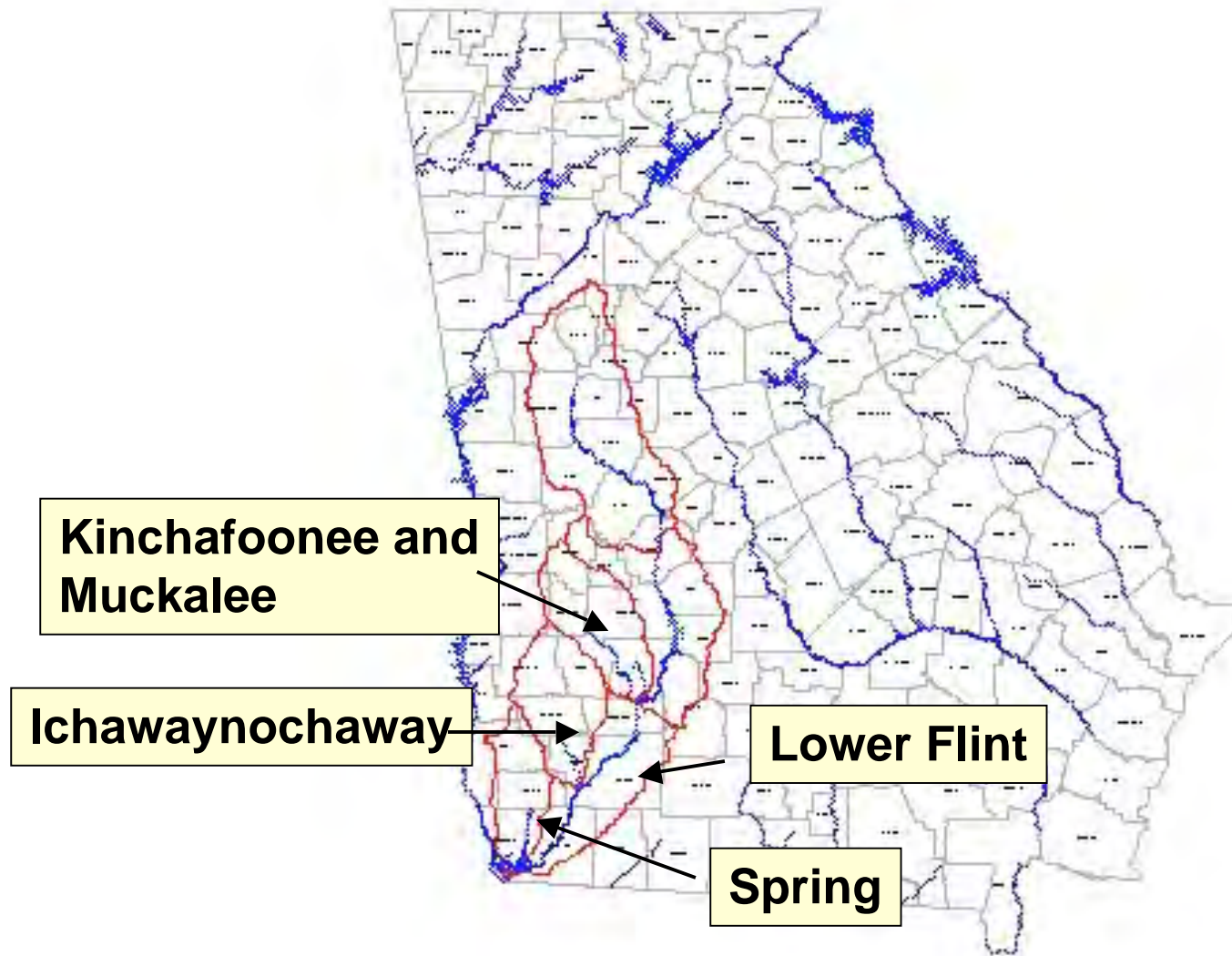
Impacts of Periodic Droughts and Water Use on Stream Flows and Freshwater Mussels in the Lower Flint River Basin, SW Georgia

S.W. Golladay, T.K. Muenz and D.W. Hicks

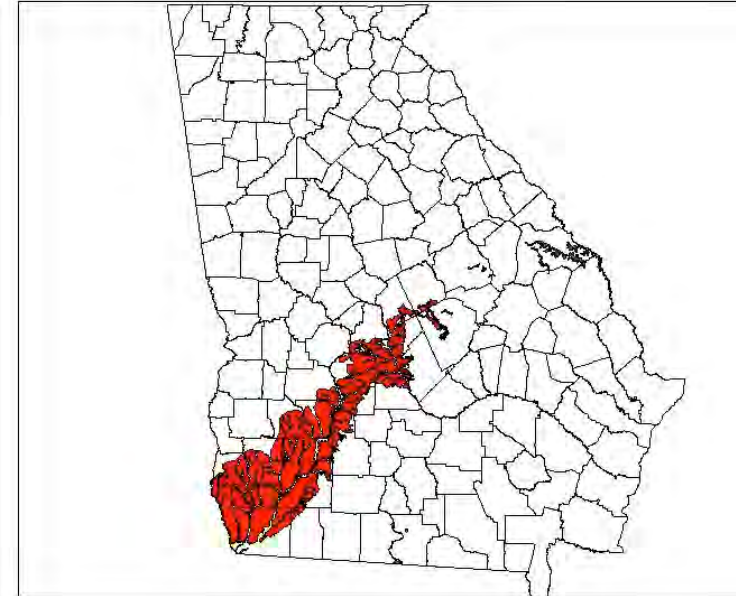
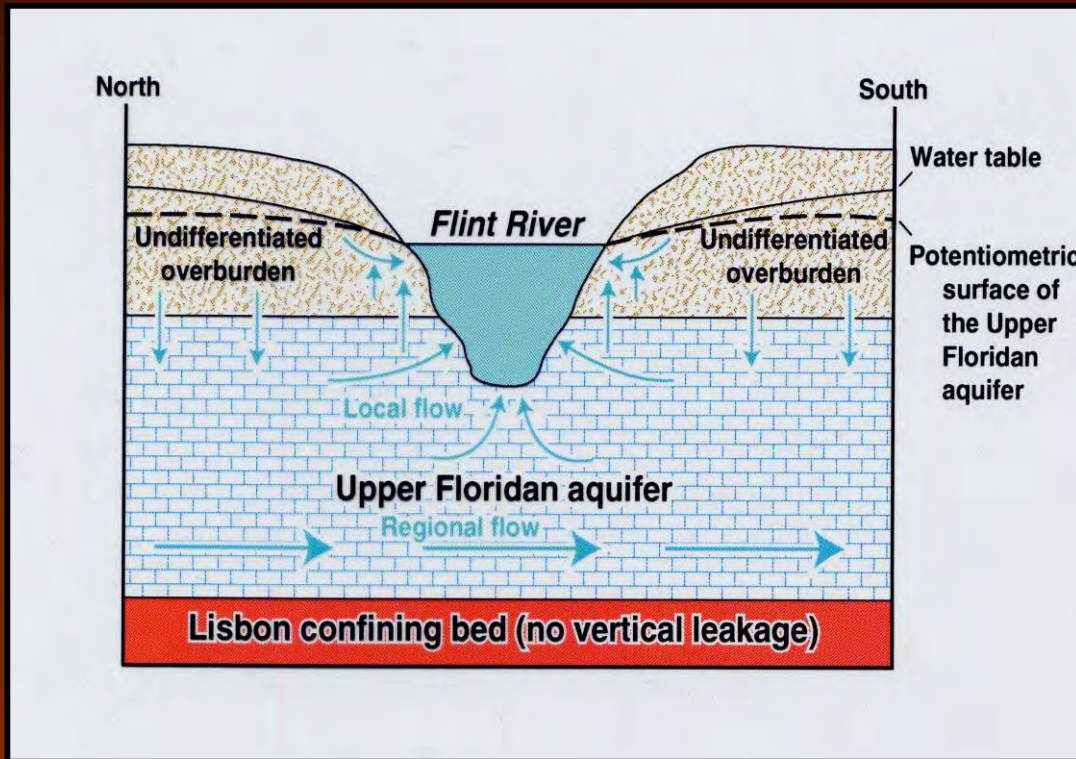
J. W. Jones Ecological Research Center, Newton GA



Study Area



Regional Geology

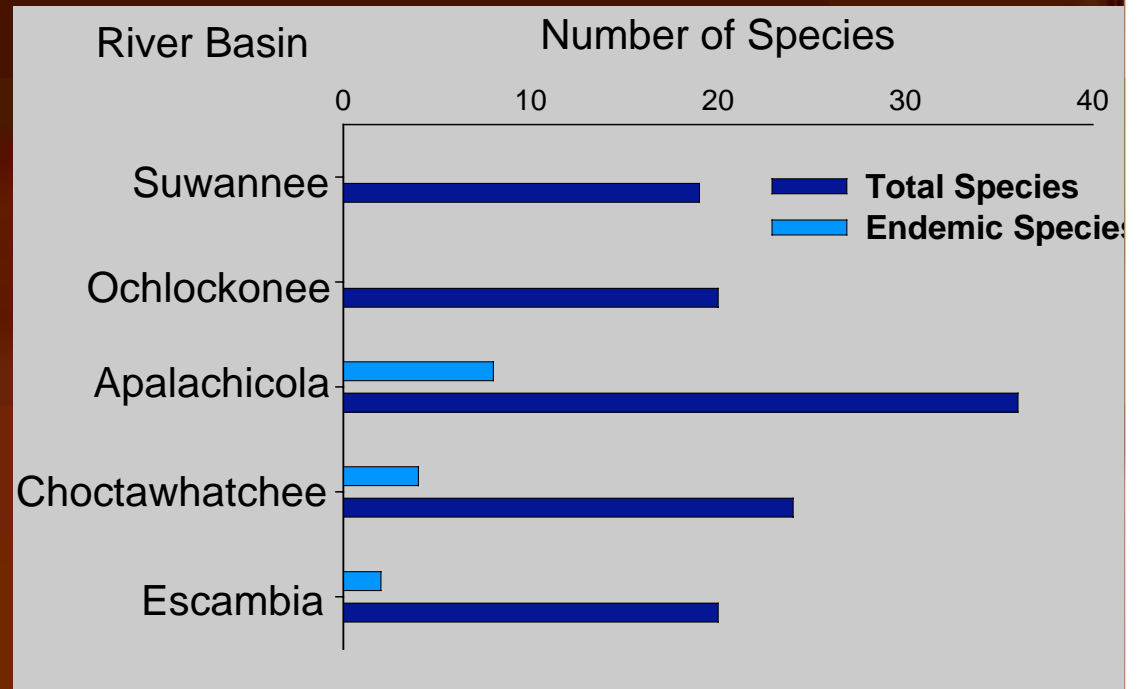
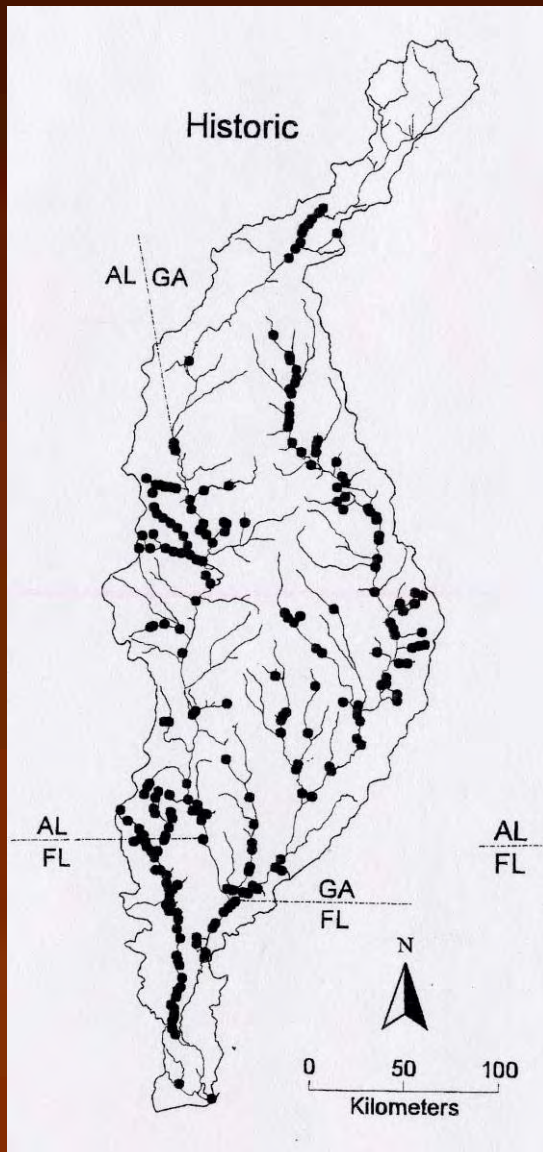


County
Floridan

Upper Floridan Aquifer

Flint River Mussel Studies 1950's

W.J. Clench and R.D. Turner



- Recognized high diversity of the Apalachicola River Basin
- Summarized localities of type specimens
- Noted declines in the Chattahoochee river

Flint River Mussel Studies 1991-1992

J. Brim Box and J.D. Williams

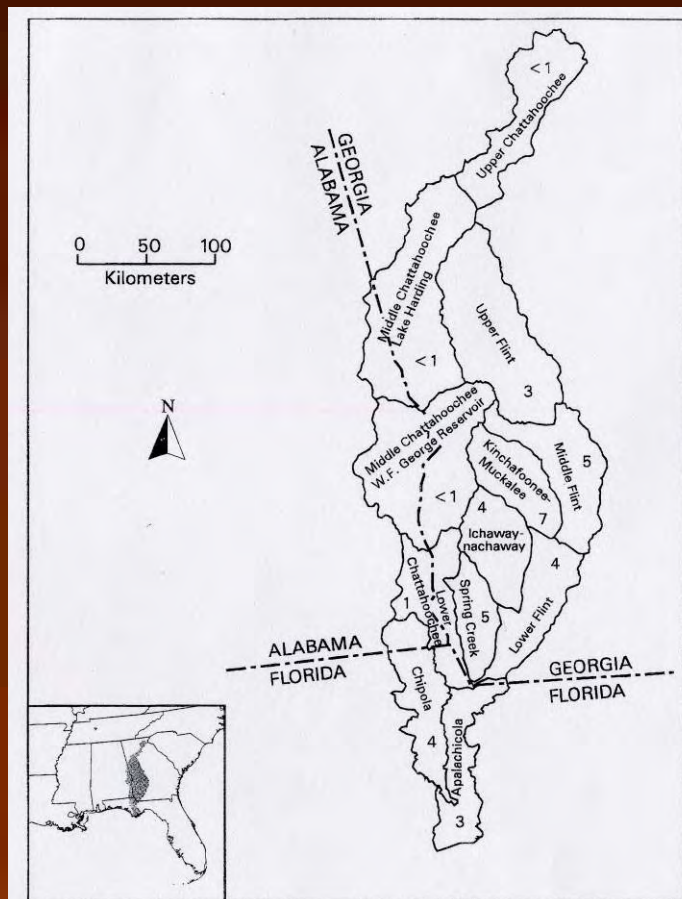


Fig. 6. Average species richness for each hydrologic unit based on the 1991-1992 survey data.

- 134 sites sampled
- 22 species observed
- Kinchafoonee, Muckalee, and Chickasawhatchee Creeks had very high mussel richness (9-16 species)
- Very few mussels observed in the Chattahoochee Basin

Jones Center Studies 1999

- 46 sites on 12 tributaries
- 14,873 mussels
- 19 species found (of 29 historical)
- 3 endangered species



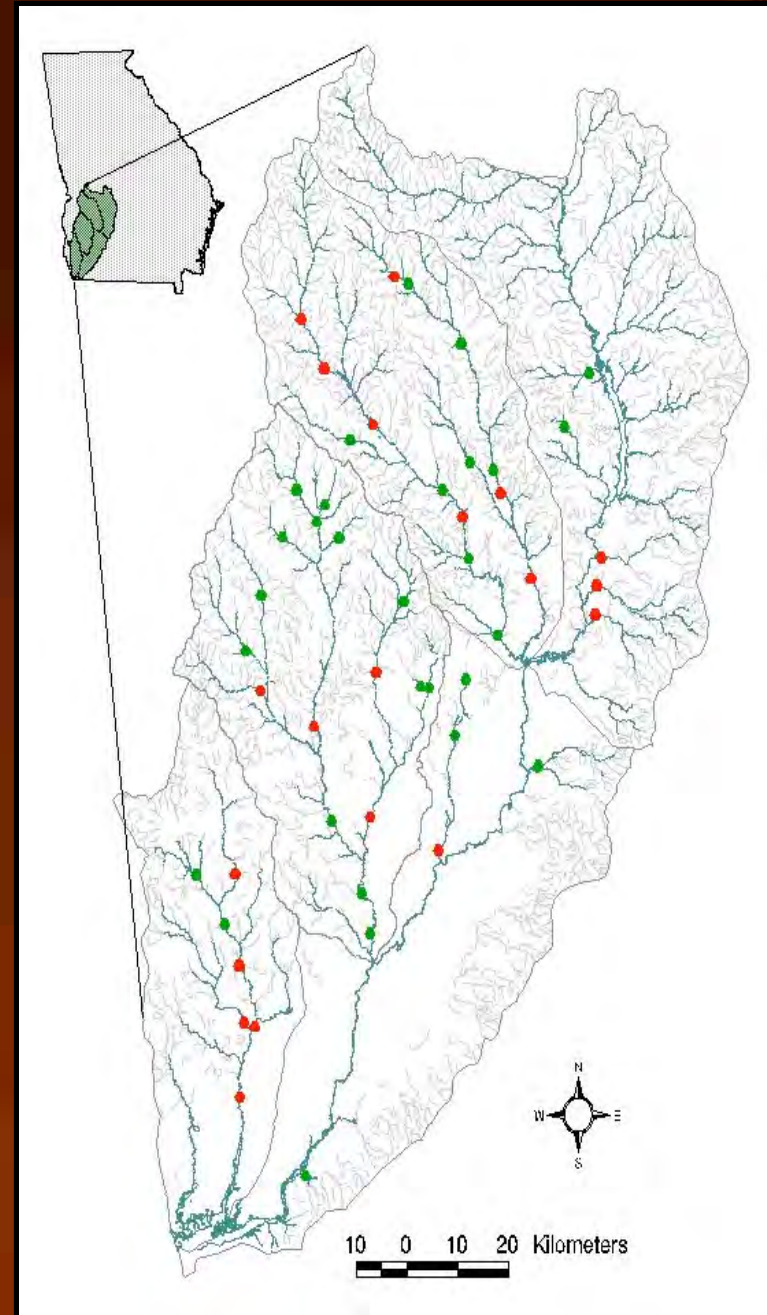
Gulf
Moccasinshell



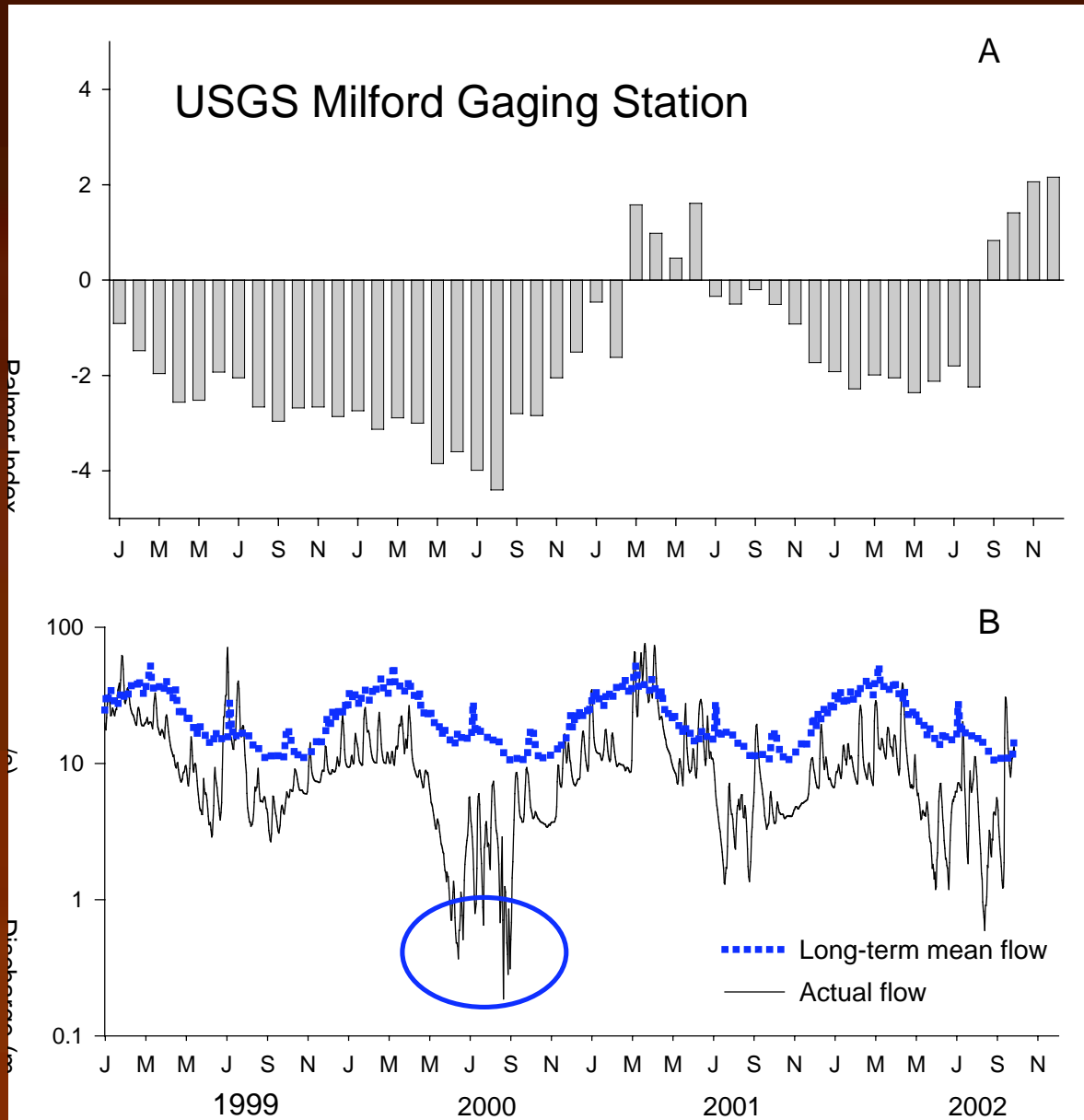
Oval pigtoe



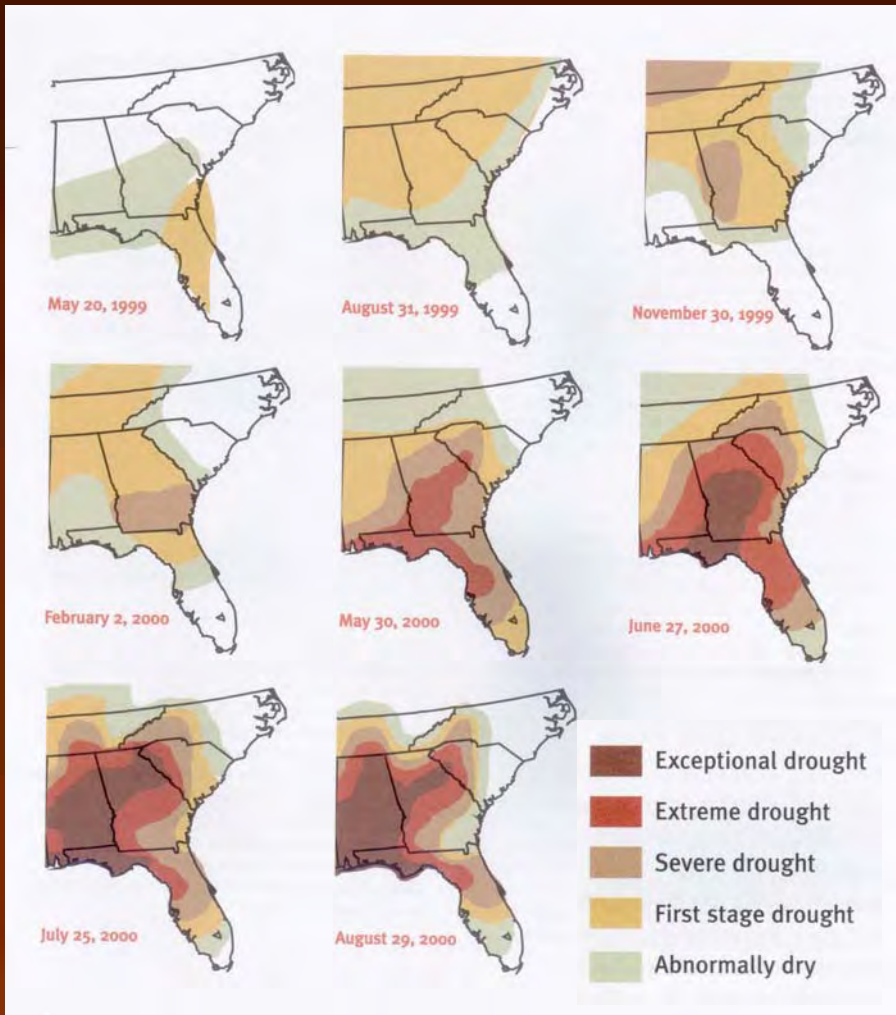
Shiny-rayed
Pocketbook



Southwest Georgia Hydrology – 1999-2002



Summer 2000 Drought Severity



Dewatered stream



Anoxic stream

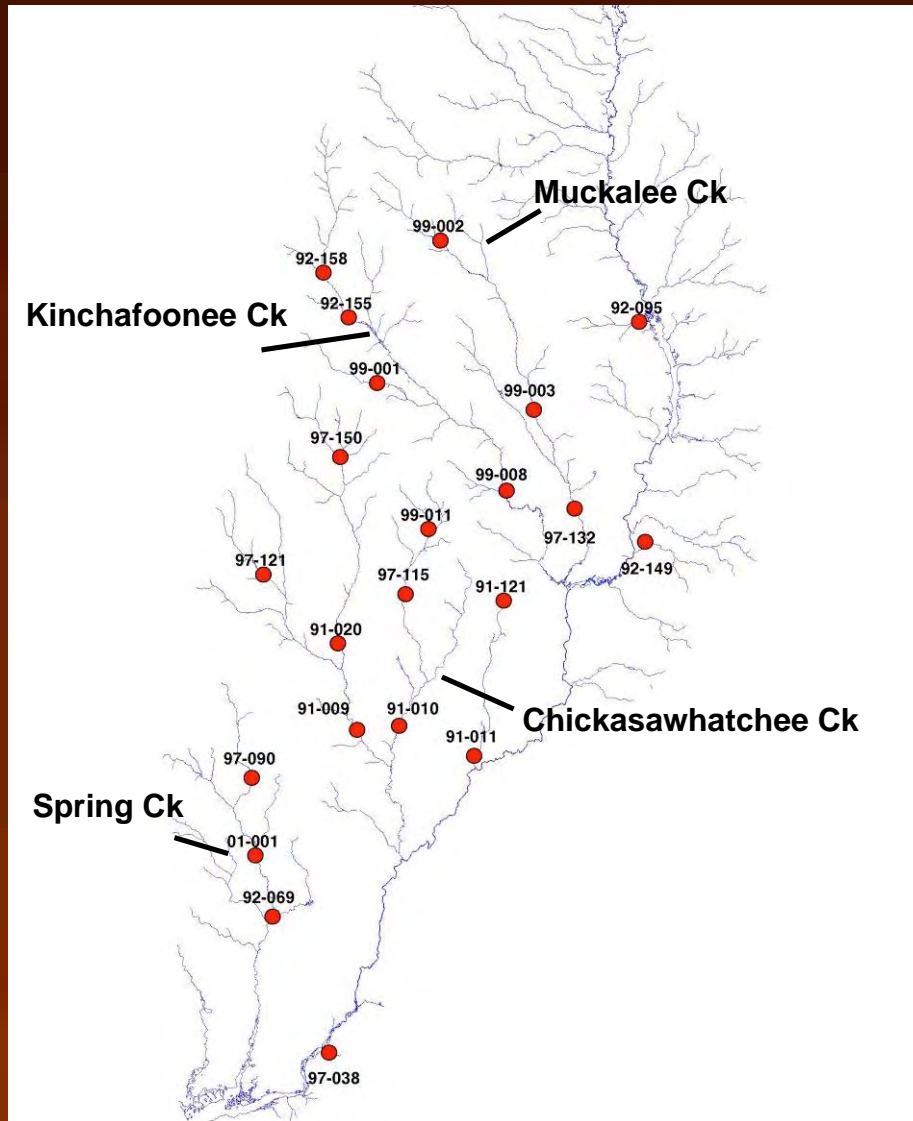
2001 Post Drought Survey



Objectives:

- 1) Determine the extent of regional changes in mussel assemblages due to the drought
- 2) Determine stream reaches likely to be adversely affected drought

Site Selection

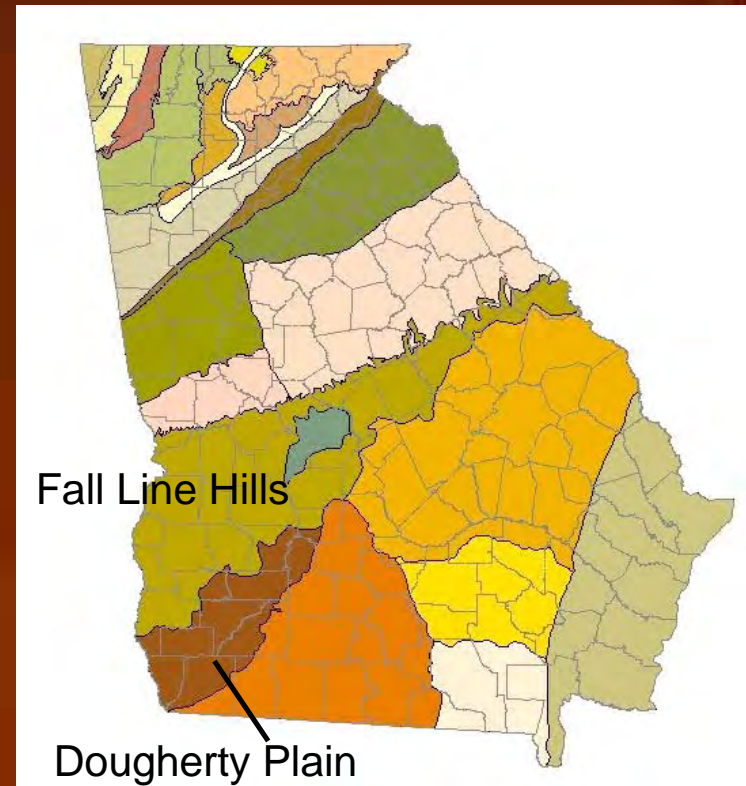
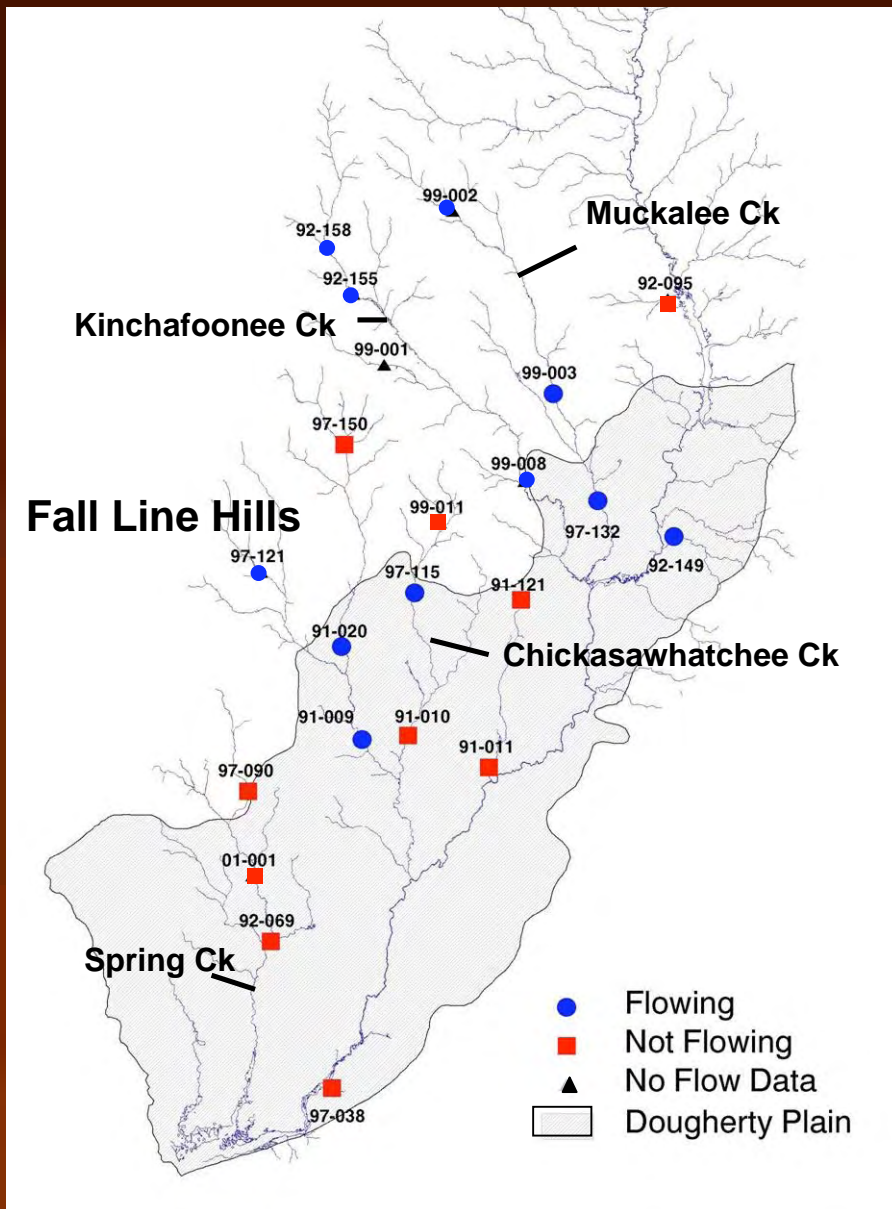


Criteria for Selection

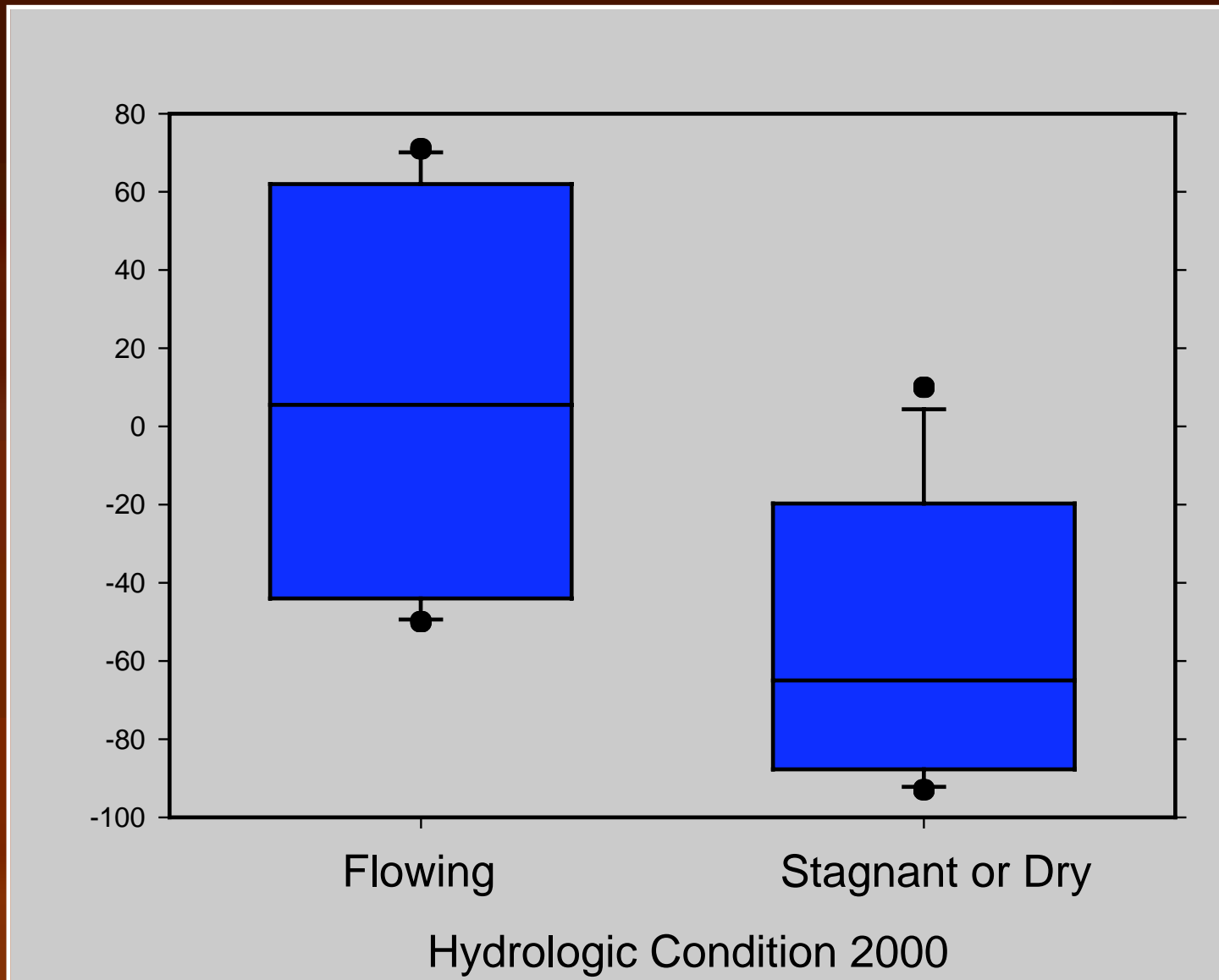
- 20 sites surveyed
- Previously surveyed in 1999
- Previously supported diverse or abundant mussel populations
- Represent a range of stream size

Results

Hydrologic and Geologic Classifica



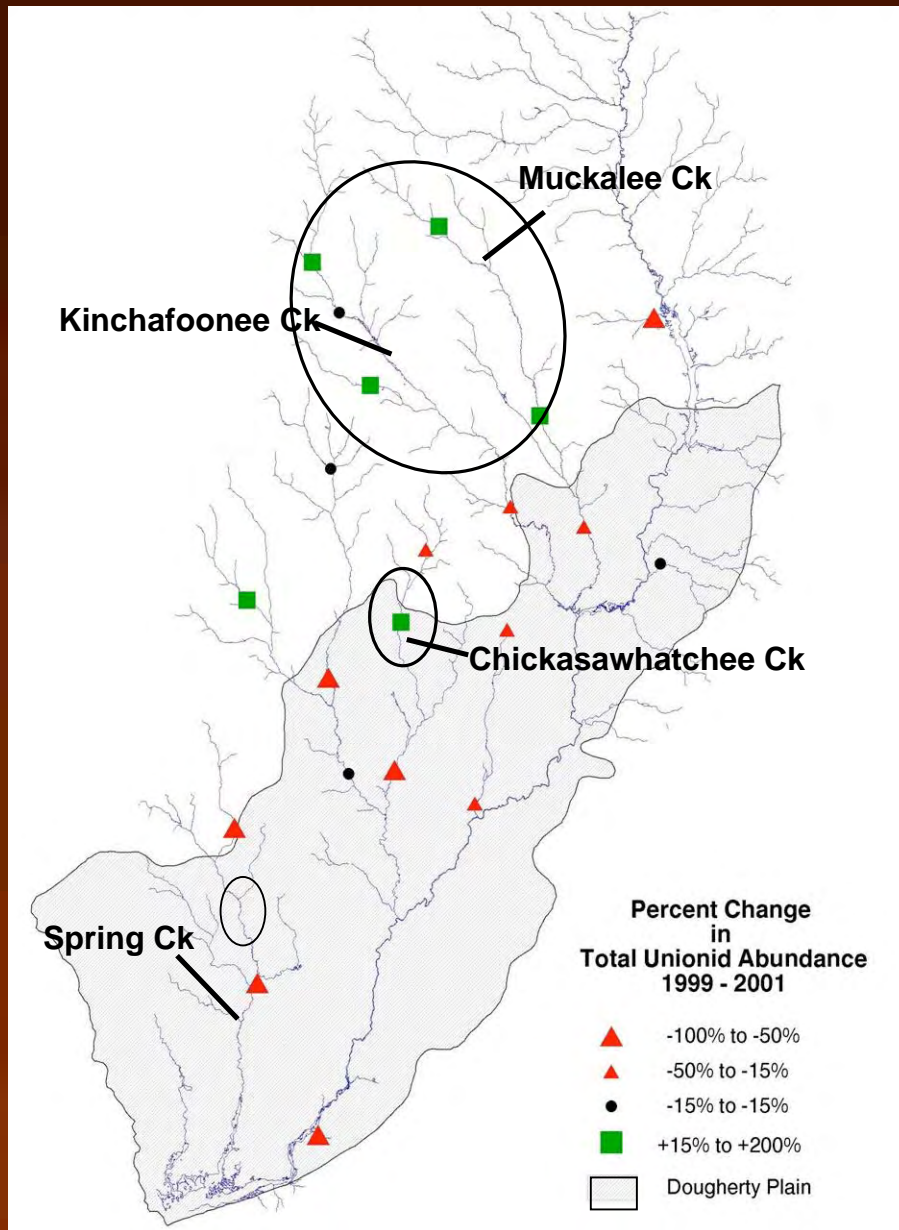
Box Plot of Mussel Abundance



Mann-Whitney Rank Sum Test $p=0.05$

Changes in Mussel Abundance

1999 to 2001



Status of Mussels 1999 to 2001

Common Species



Elliptio complanata



Unio merus carolinianus



Elliptio crassidens



Villosa vibex



Toxolasma pumila

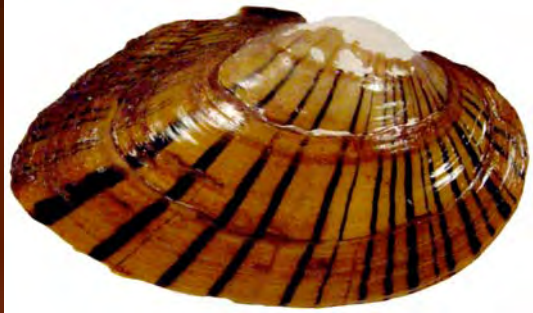


Villosa liorata

	1999 (#/site)	2001 (#/site)	
Flowing	226	314	p=0.02
Non-Flowing	181	71	p=0.01

Status of Mussels 1999 to 2001

Endangered Species



Lampsilis subangulata
Sites 11/7



Medionidus pencillatus
Sites 2/1

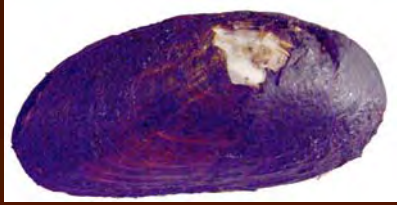


Pleurobema pyrif
Sites 5/6

	1999 (#/site)	2001 (#/site)	
Flowing	3	6	p=0.2
Non-Flowing	27	2	p=0.1

Status of Mussels 1999 to 2001

Special Concern Species



Elliptio purpurella



Lampsilis claibornensis



Villosa villosa



Quincuncina



Strophitus subvexus

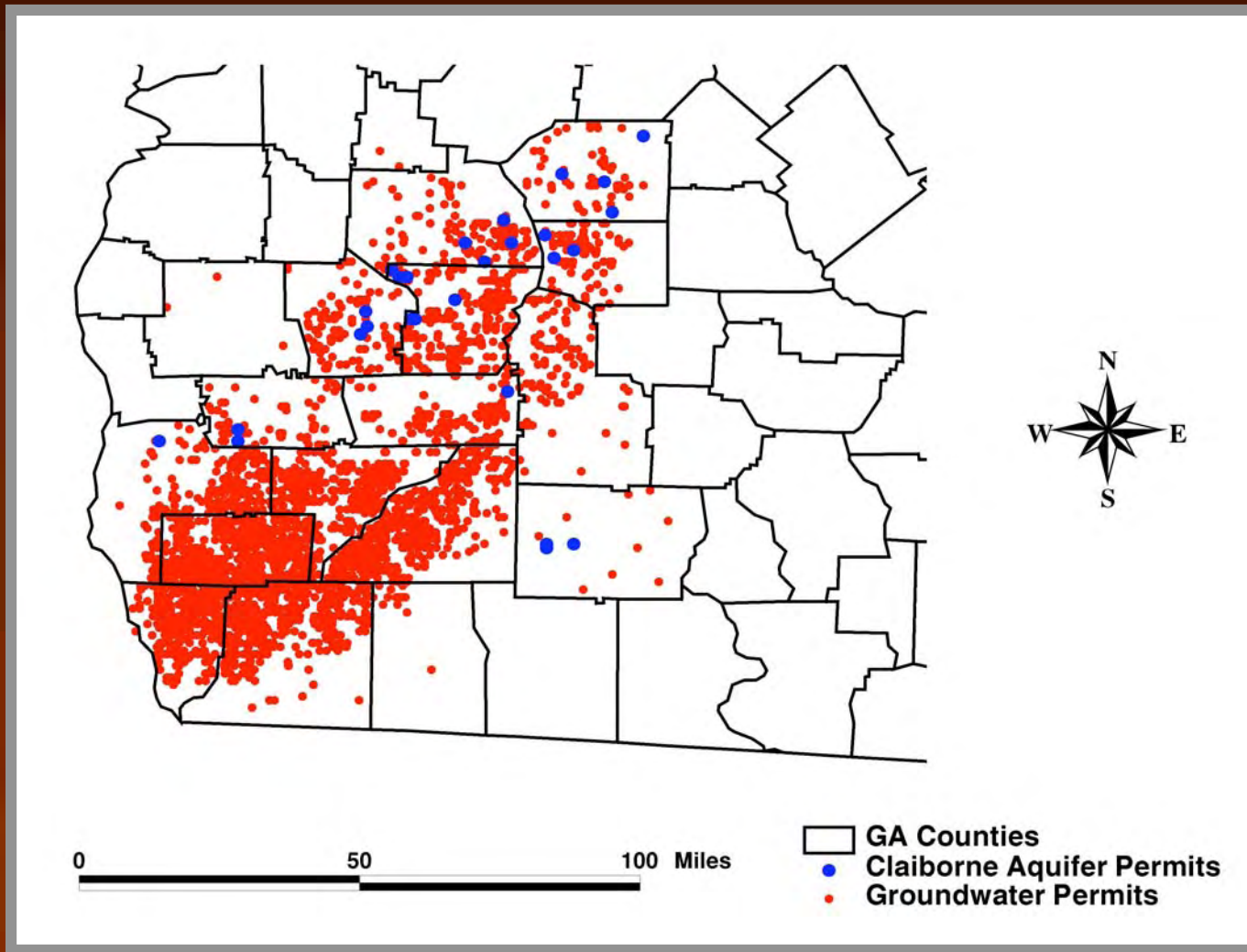
	1999 (#/site)	2001 (#/site)	
Flowing	20	22	p=0.6
Non-Flowing	3	1	p=0.7

Potential Human Impacts



Regional land-use
50-60% agriculture
and mostly irrigated

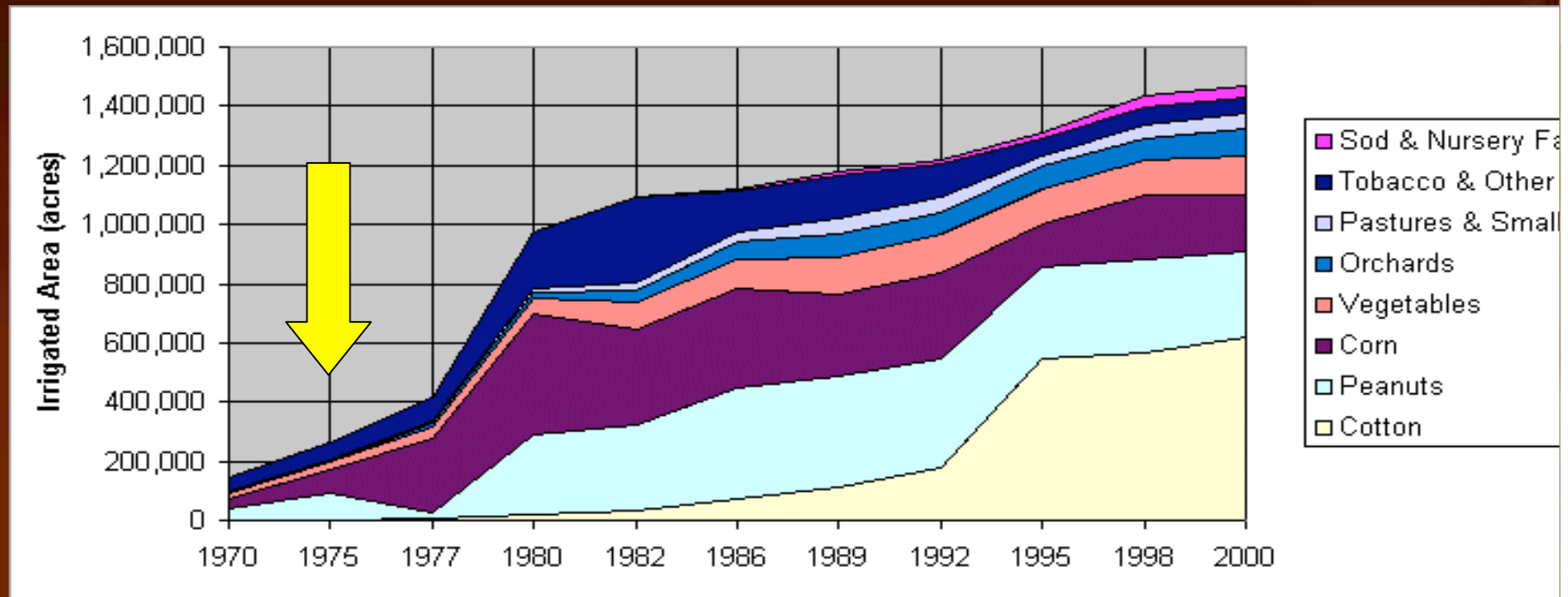
Groundwater Permits



Total permit
9.3 bgd

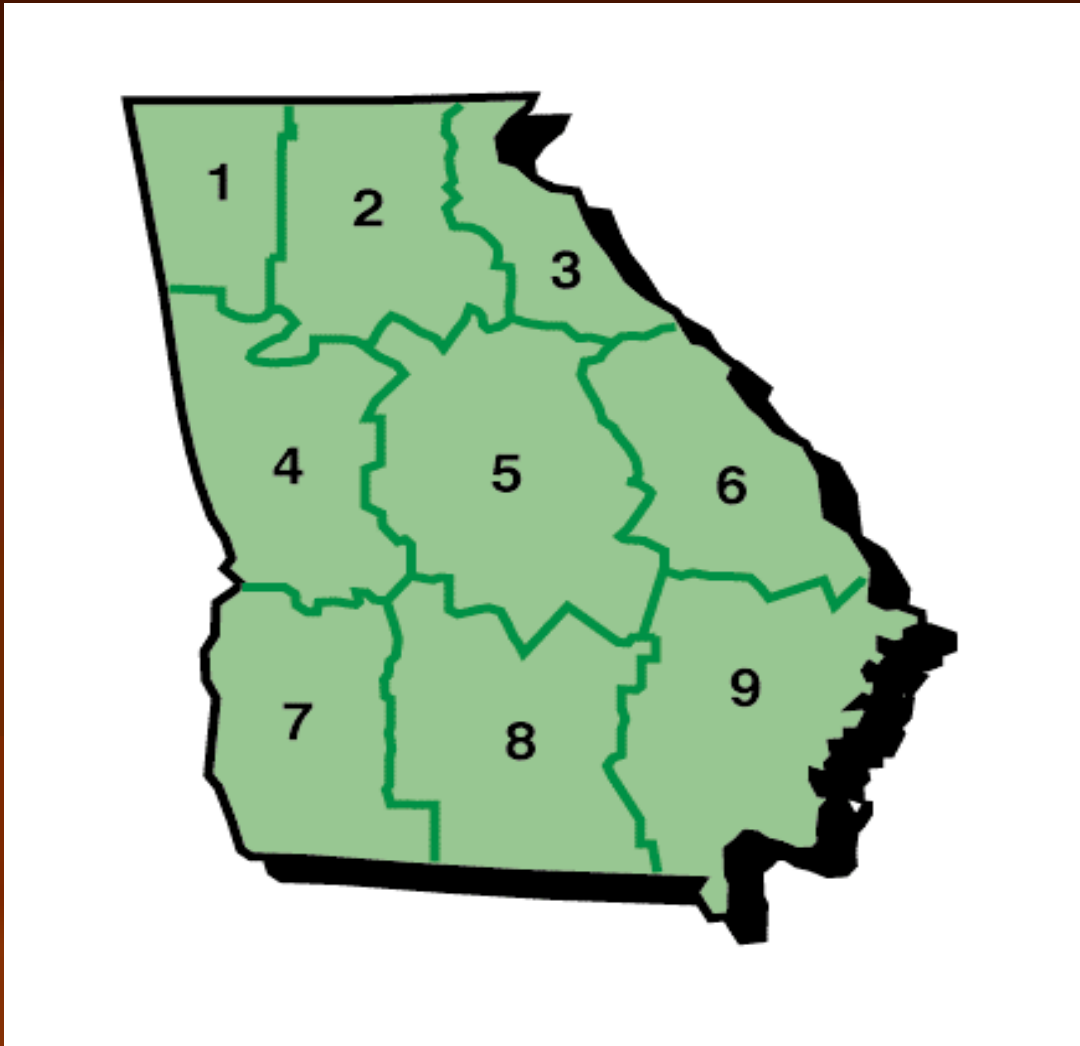
Actual use
?????

Expansion of Irrigation



Data from: Harrison, K.A. and A.W. Tyson. 2001. Irrigation survey for Georgia. Proceedings of Georgia Water Resource Conference.

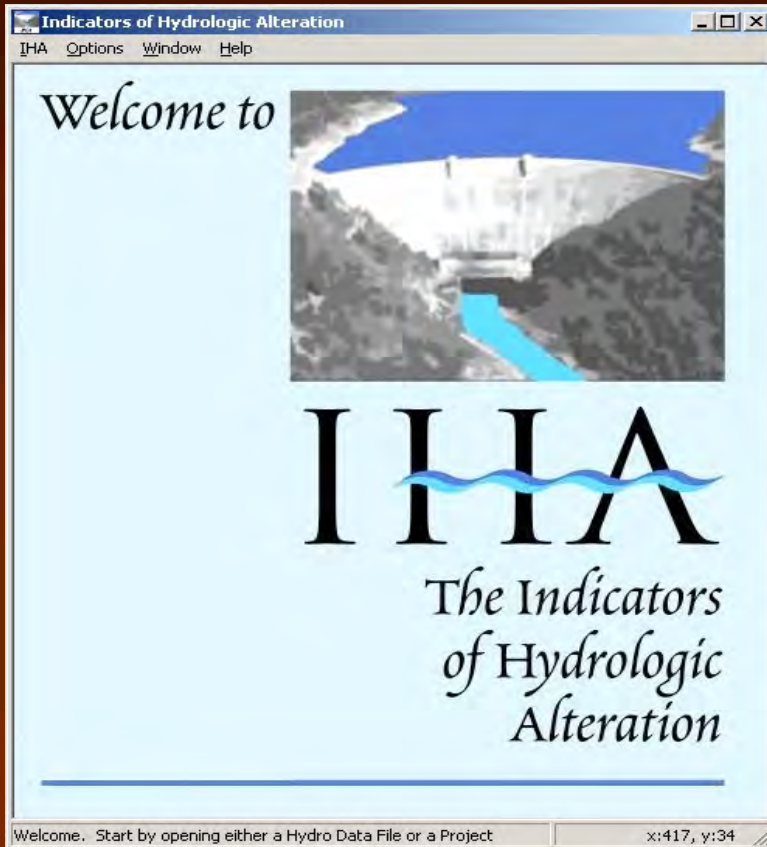
Climate Analysis



- monthly rainfall from NCDC region 7
- compared pre- and post irrigation annual and seasonal rainfall
- 10 yr running averages for season

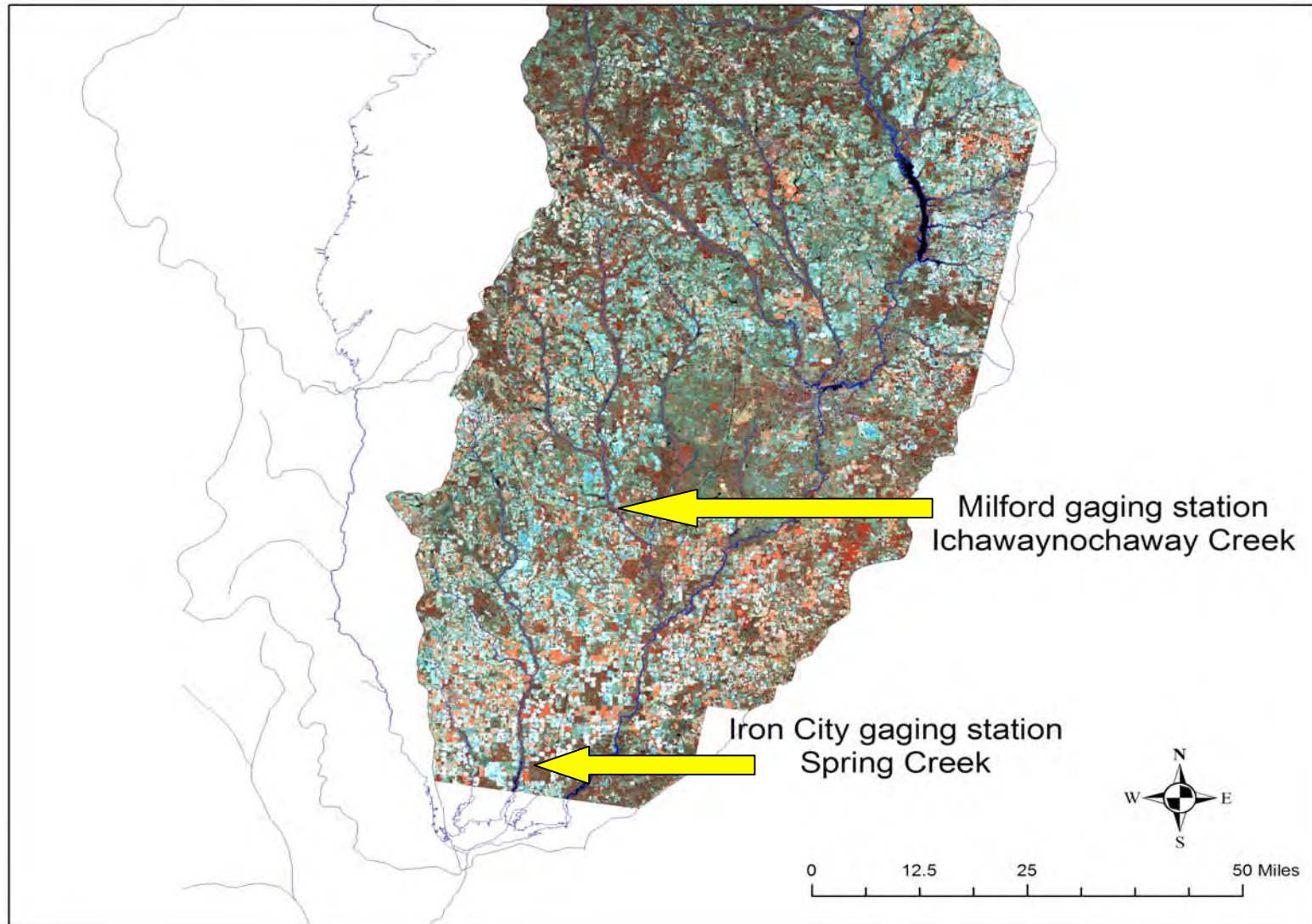
Hydrologic Analysis

- compared pre- and post irrigation flows (using 1975 as the beginning of irrigation)
- 1, 7, 30 day minimum flows



conserveonline.org

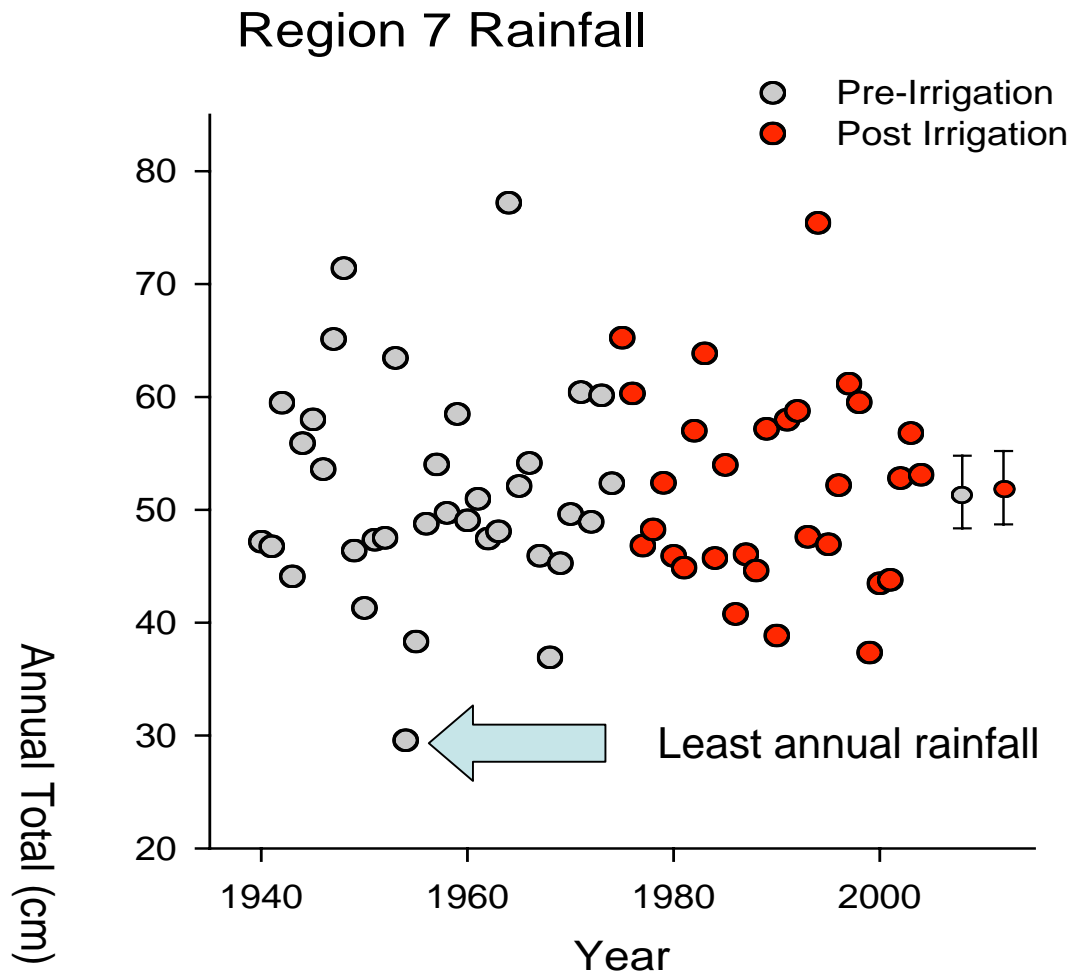
Long Term Gauging Stations



Rainfall Trends



Regional Rainfall -- Annual



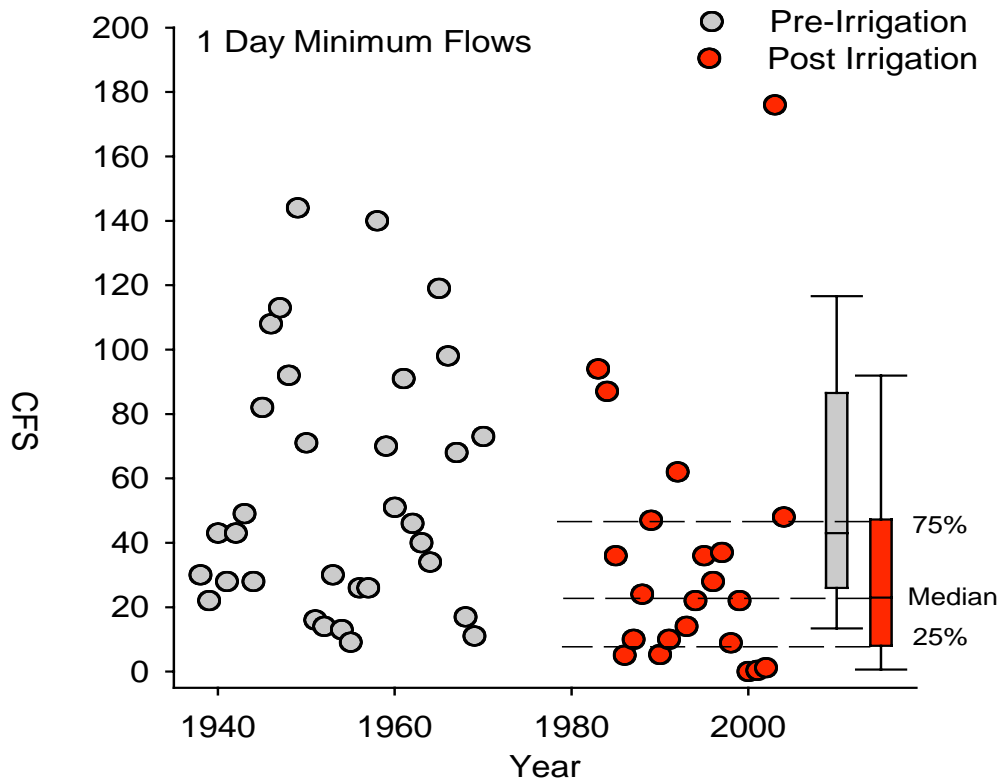
Seasonality

- more winter
- less summer
- rain

Streamflow Trends



Spring Creek

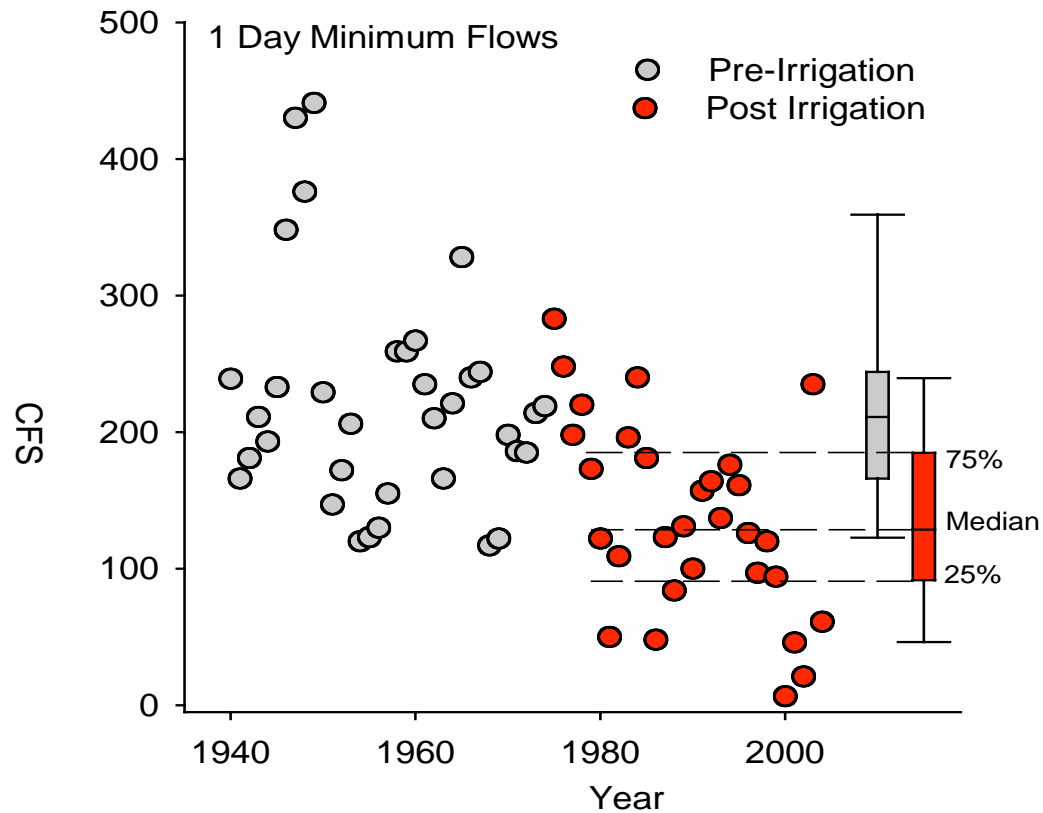


- 46% decline in 1
minimum flows

- 39% decline in 7
minimum flows

- 42% decline in 3
day minimum flow

Ichawaynochaway Creek



- 40% decline in 1 day minimum flows
- 31% decline in 7 day minimum flows
- 9% decline in 30 day minimum flows

Changes in the lower Flint River Basin

- Declining mussel populations
- Increasing isolation of some populations
- Declining minimum daily flows
- Altered seasonality of flows



Questions



“If the biota, in the course of eons, have built something like but do not understand, then who but a fool would discard seemingly useless parts? To keep every cog and wheel is the sign of an intelligent tinkerer.”

Aldo Leopold.

Acknowledgements

Funding – R.W. Woodruff Foundation, J.W. Jones Center, and Georgia EPD.

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