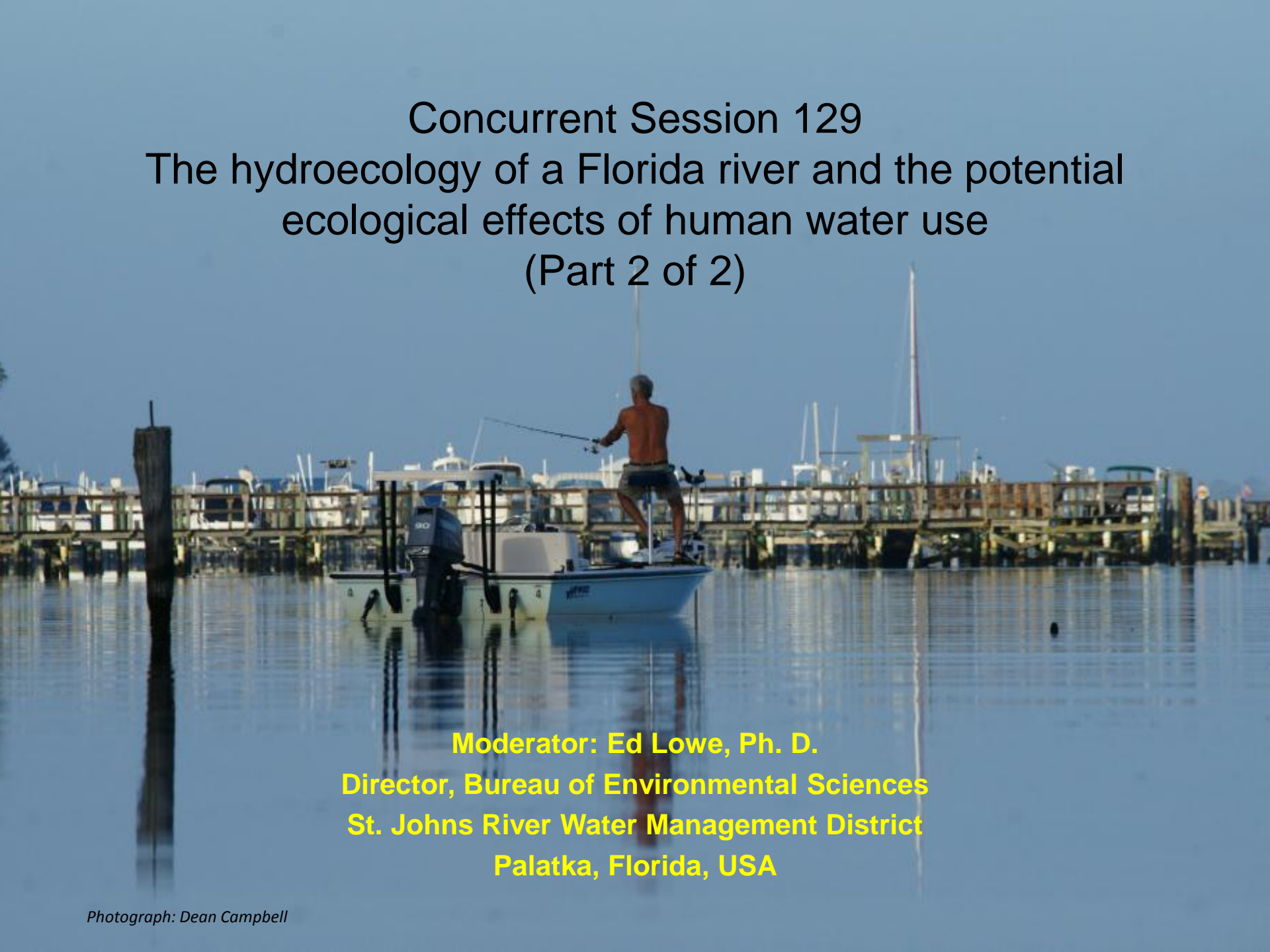


Concurrent Session 129
The hydroecology of a Florida river and the potential
ecological effects of human water use
(Part 2 of 2)

A photograph of a man fishing from a small boat in a marina. The man is shirtless and wearing shorts, standing on the boat and holding a fishing rod. The boat is white with a blue outboard motor. In the background, there are several other boats docked at a wooden pier. The water is calm and reflects the sky and the boats. The sky is a clear, light blue.

Moderator: Ed Lowe, Ph. D.
Director, Bureau of Environmental Sciences
St. Johns River Water Management District
Palatka, Florida, USA

Session Overview



Photograph: R. Burks

Florida



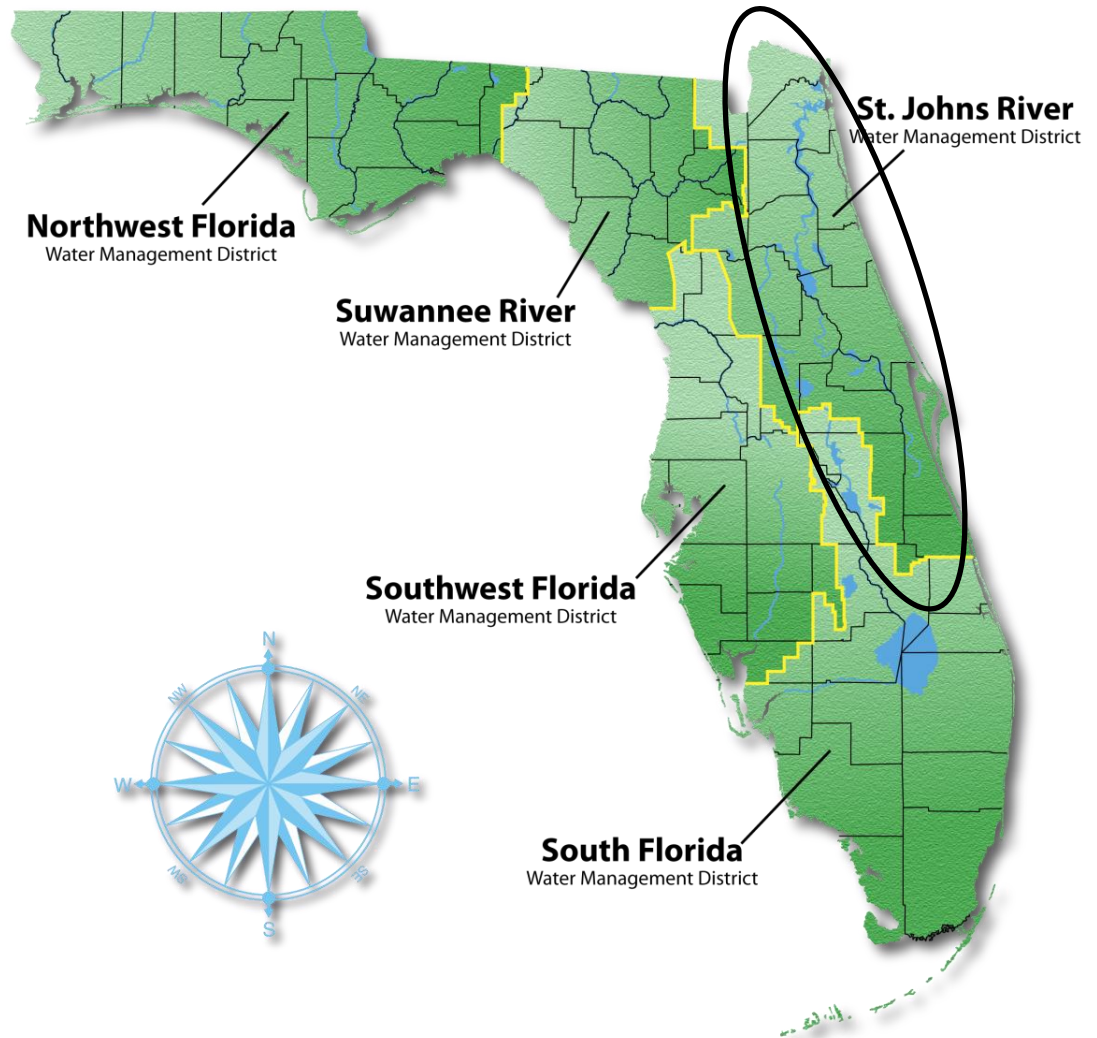
- Avg. Rainfall ca. 135 cm y⁻¹
- 7,800 lakes
- 1,700 rivers and streams
- > 700 artesian springs
- Vast areas of fw wetlands
- Extensive coastal wetlands
- Lagoons, Bays, Estuaries
- 3.8 trillion m³ fresh groundwater
- 2005 Human water use ca. 13 % of total combined flow of all major rivers

High rates of evapotranspiration, high water requirements for natural systems, growing human population

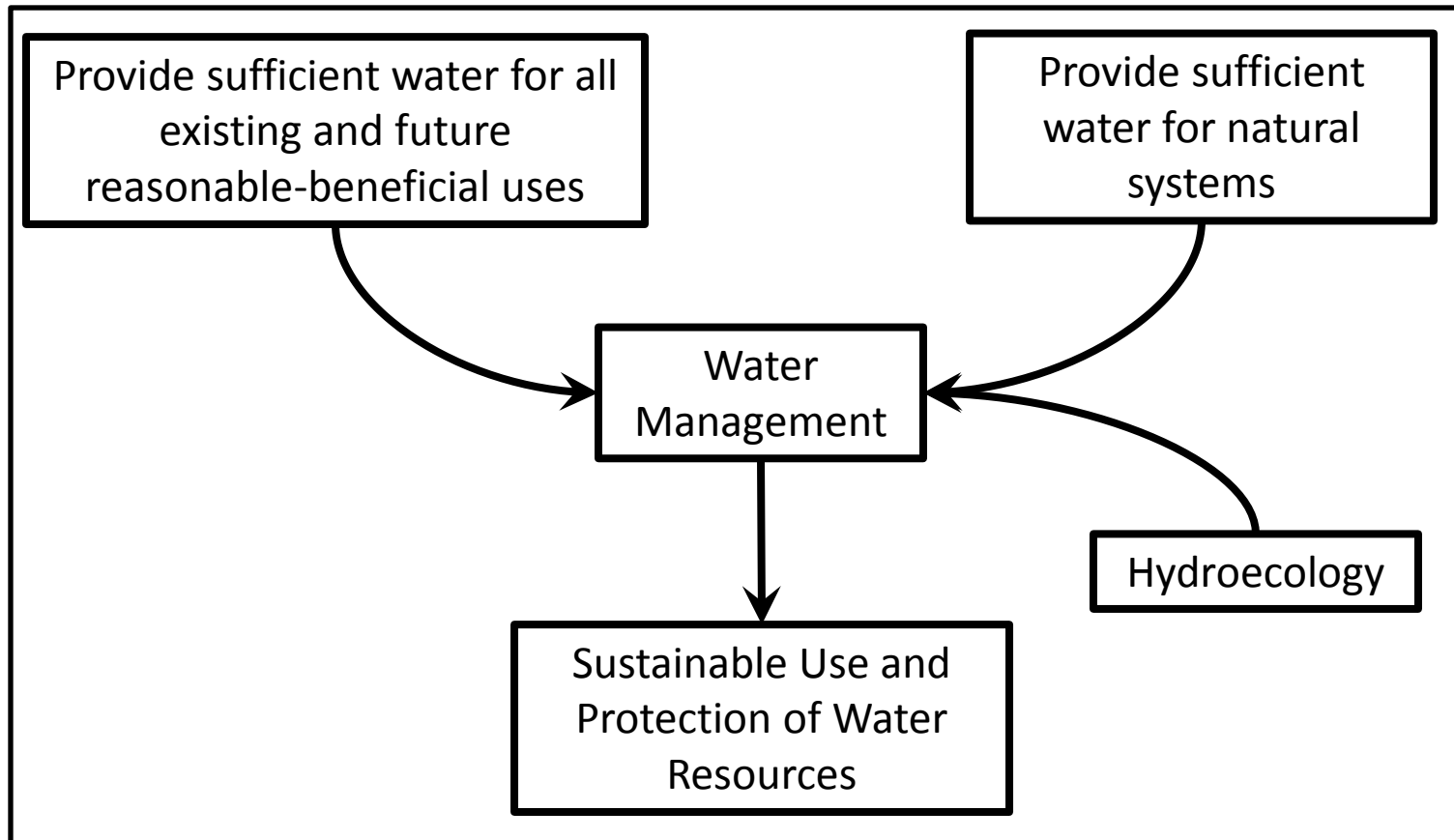
Water Management in Florida - The St. Johns River Water Management District (SJRWMD) is one of five WMDs in Florida, each delineated by a major drainage basin.

SJRWMD

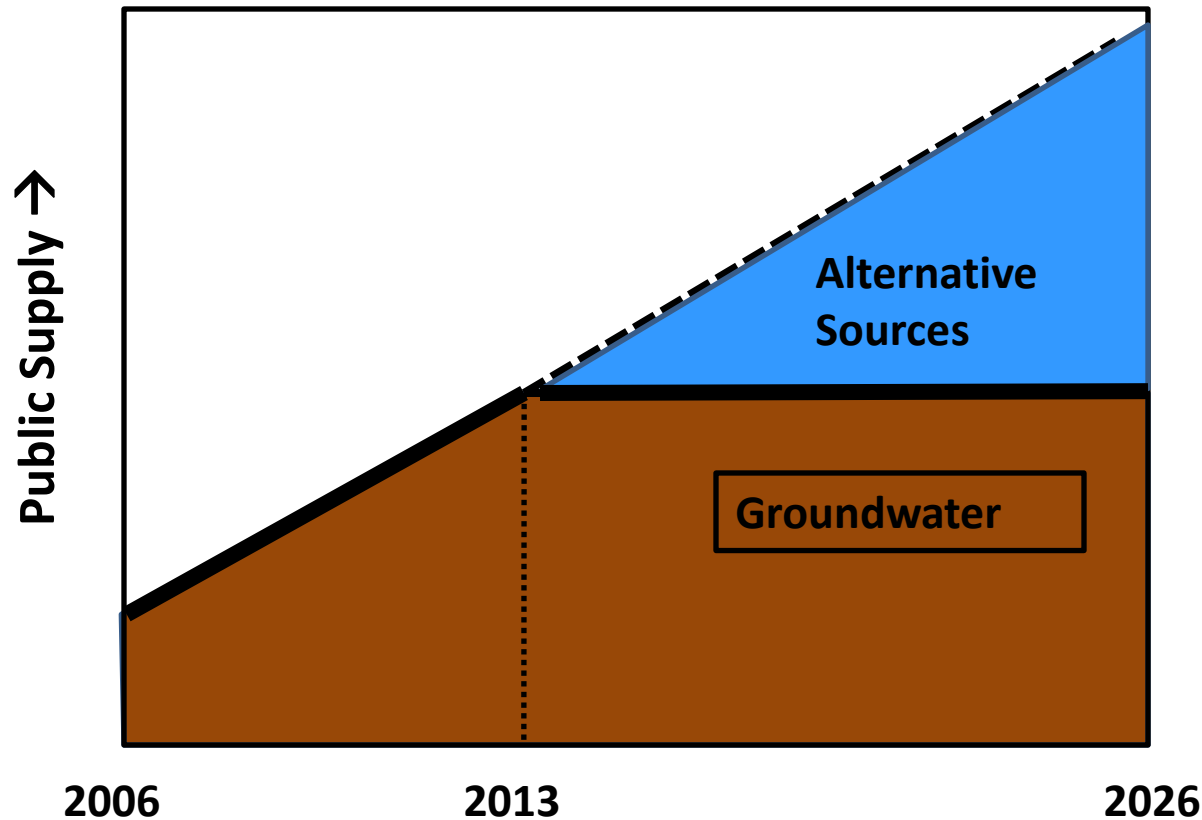
- 12,283 square miles
- Covers all or part of 18 counties in northeast and east-central Florida



Florida's water policy -- provide sufficient water for all reasonable-beneficial uses and for natural systems. Hydroecological understanding is required to ensure sustainable use of water resources and to balance direct benefits (consumptive uses) and indirect benefits (goods and services of provided by natural systems) of water resources.

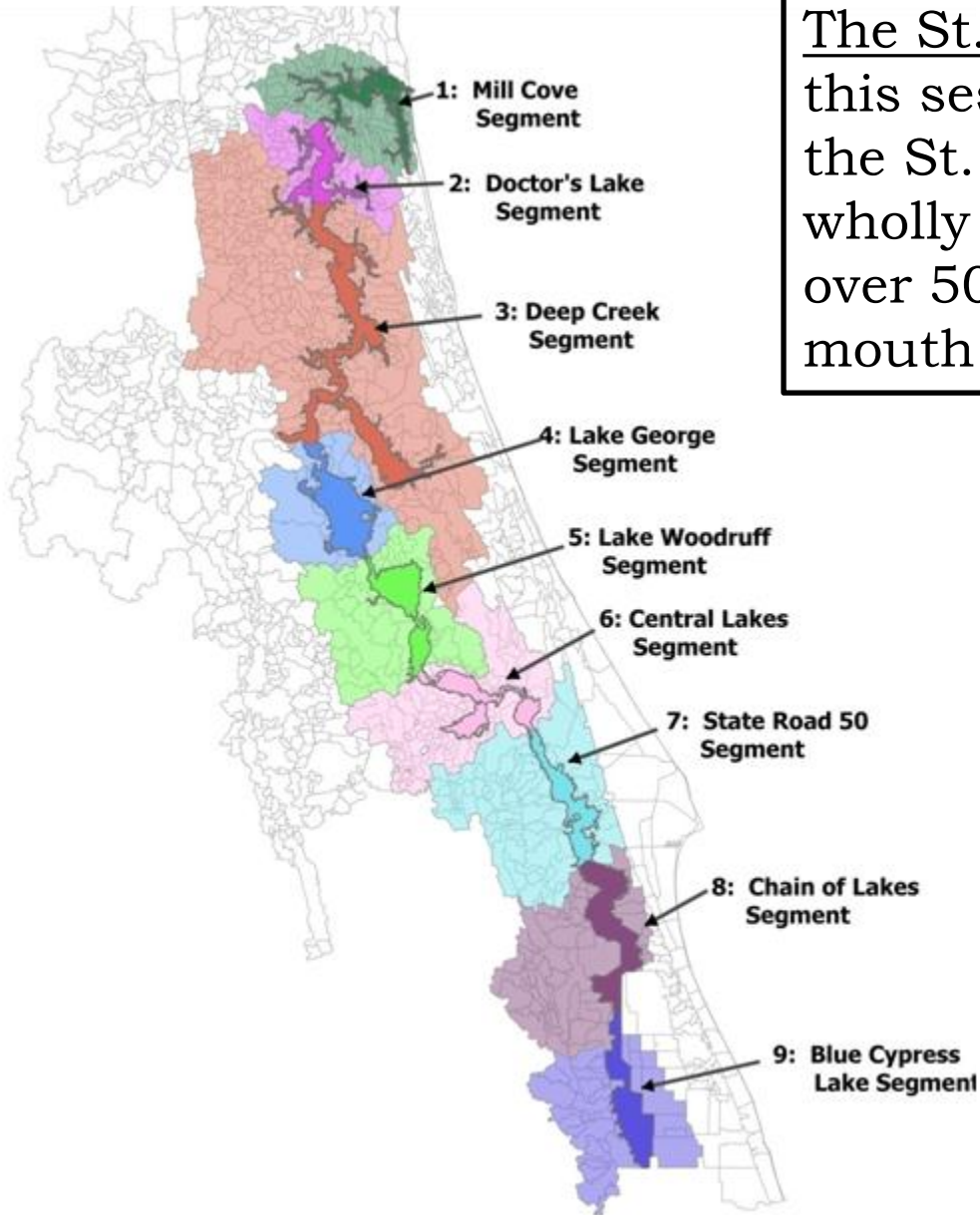


Fresh groundwater has been the major source of water for Florida but this source is reaching its sustainable limit. In central Florida, the water management districts recognized that in the near future alternative water sources would be needed to avoid harm to wetlands, lakes, and springs.

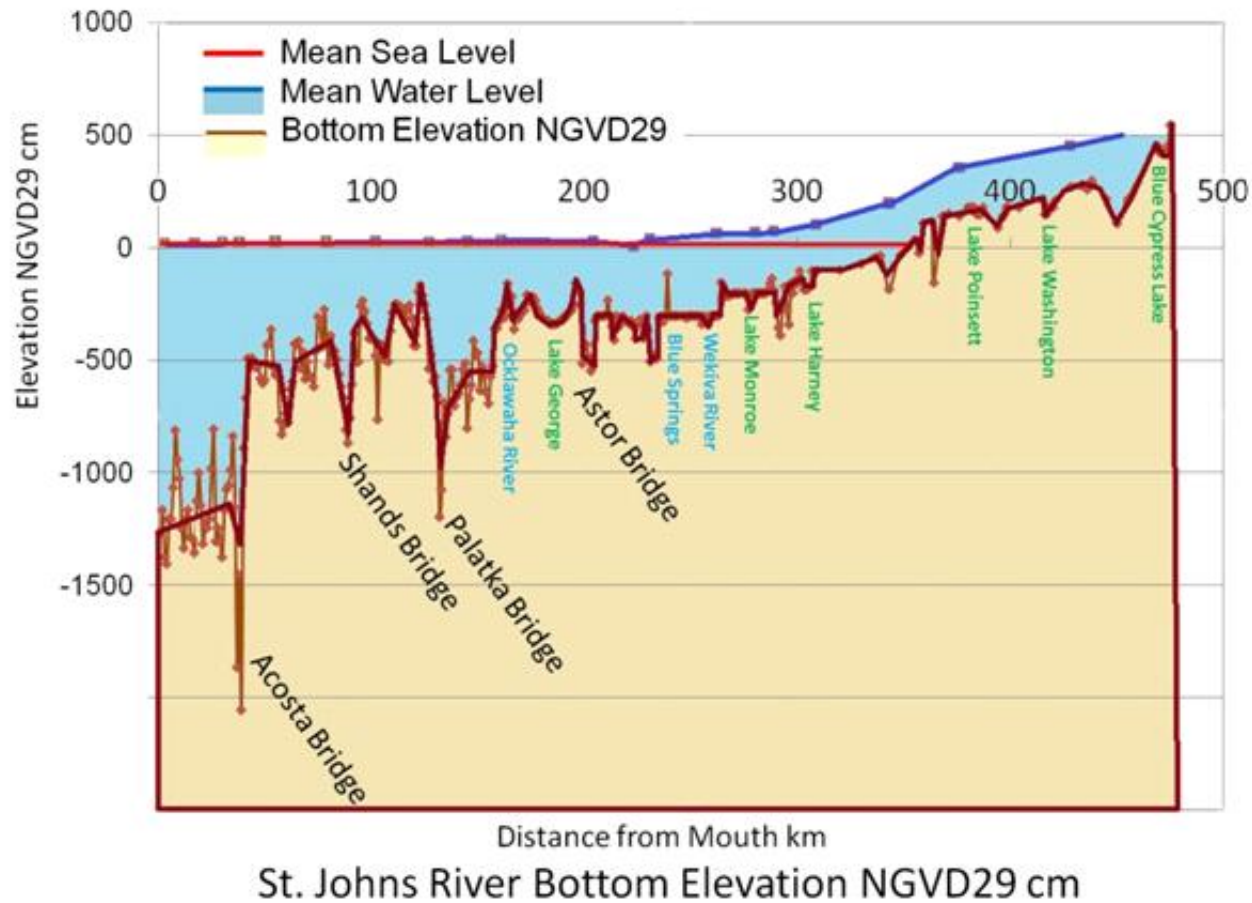


The Districts agreed that groundwater use would be capped at the 2013 demand. Alternative sources would be needed.

The St. Johns River - The subject of this session is the hydroecology of the St. Johns River, the longest river wholly within Florida, stretching over 500 km from headwaters to mouth in northeast Florida.



The St. Johns River is a low-gradient system with a fall in mean water level of only about 7 m over its 500 km length. It is tidally influenced far upstream.



The work reported here stems from a comprehensive study to assess the potential ecological effects of increased use of surface water. We examined the potential effects of withdrawals from four points totaling up to $11.48 \text{ m}^3 \text{ s}^{-1}$.

Annual Average Withdrawal

$\leq 4.69 \text{ m}^3 \text{ s}^{-1}$

$\leq 4.38 \text{ m}^3 \text{ s}^{-1}$

$\leq 2.41 \text{ m}^3 \text{ s}^{-1}$

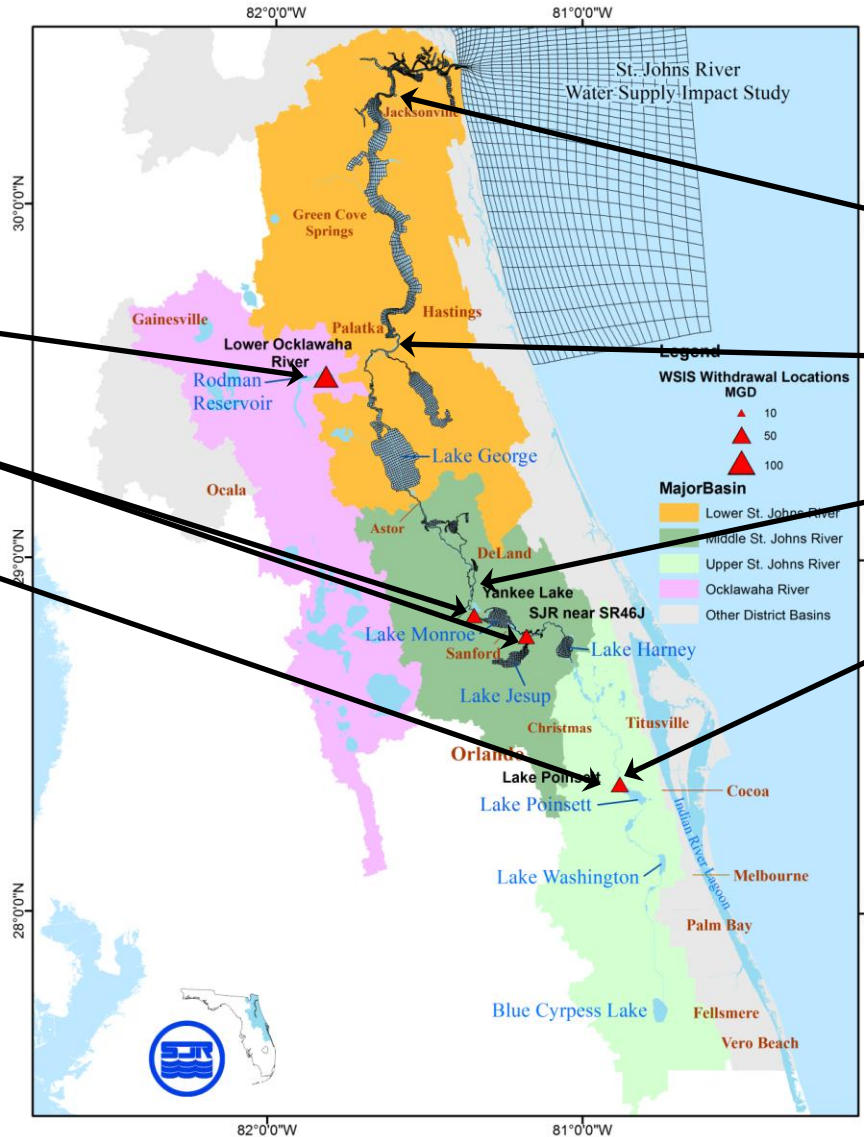
Average Discharge

$241.5 \text{ m}^3 \text{ s}^{-1}$

$146.1 \text{ m}^3 \text{ s}^{-1}$

$40.3 \text{ m}^3 \text{ s}^{-1}$

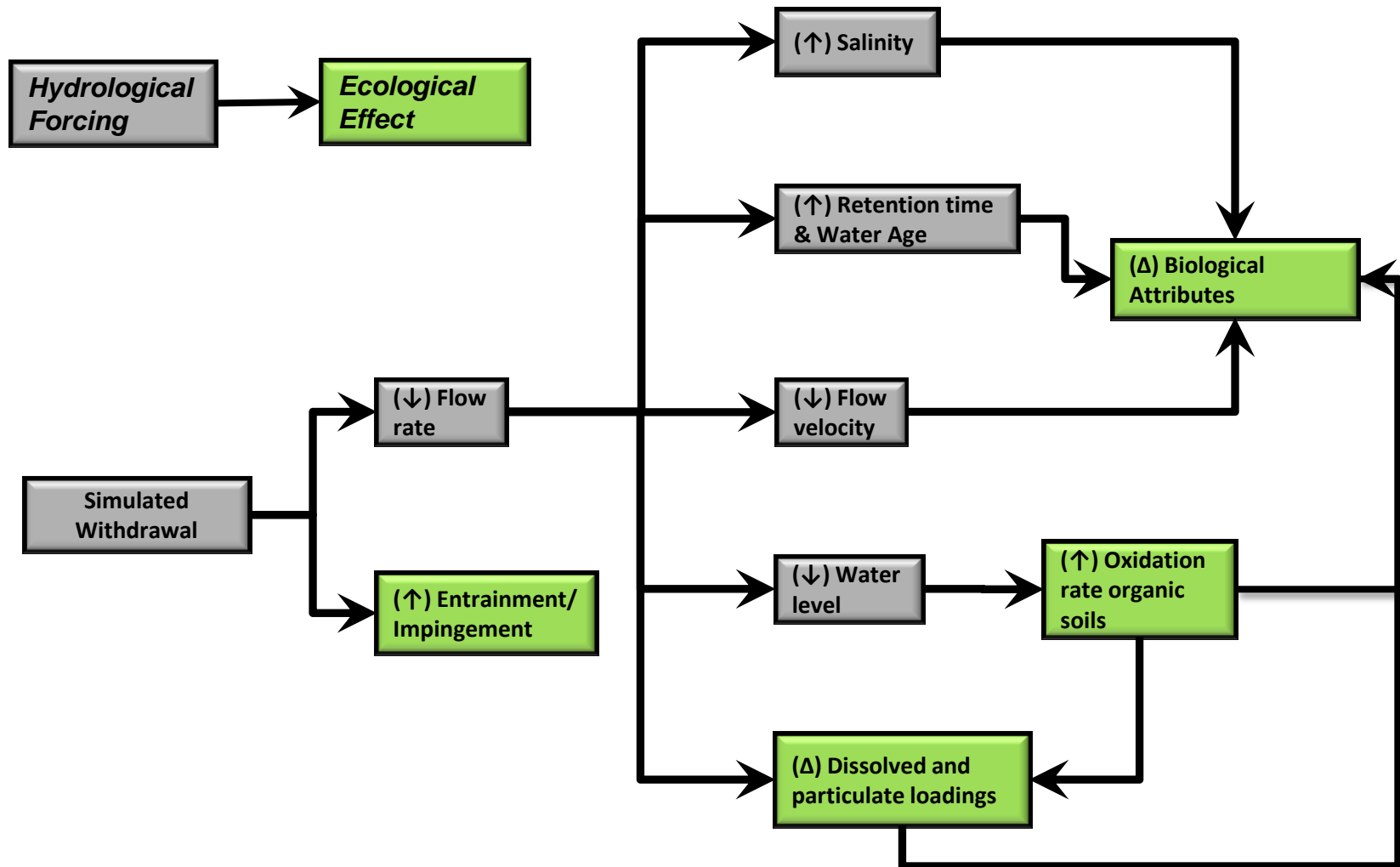
$12.0 \text{ m}^3 \text{ s}^{-1}$



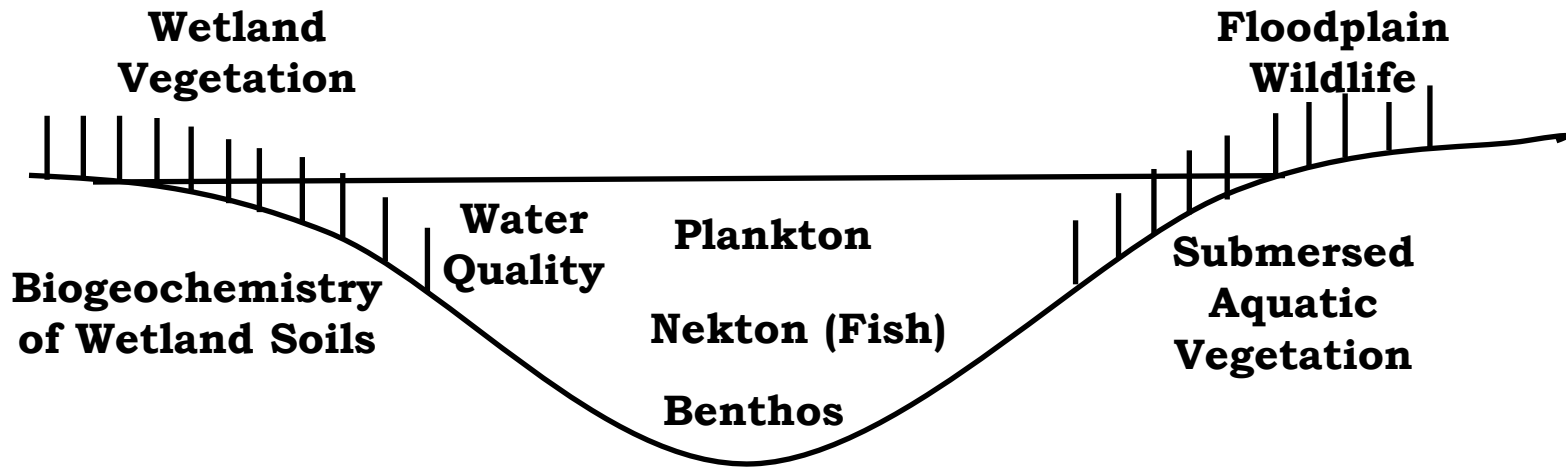
Primary Hydroecological Drivers

Driver	Definition	Key Ecological Attributes Potentially Affected
Discharge	Flow rate as volume per unit time (m ³ /s or mgd)	Populations of fish, benthic macroinvertebrates, and wildlife in the estuary
Residence Time	Days required for a parcel of water to traverse a portion of the river – we used water age as a more specific metric for residence time (days)	Phytoplankton blooms – longer residence time increases blooms by increasing the growing time
Water Level	Elevation of the water surface above sea level (m) – important derivatives of water level are hydroperiod (days), depth (m), frequency of inundation	Wetland vegetation and wildlife, submersed aquatic vegetation, benthic macroinvertebrates, nutrient releases from floodplain soils
Salinity	Concentration of dissolved salts as practical salinity units (psu) – roughly, parts per thousand	Populations of fish, benthic macroinvertebrates, and wildlife in the estuary; submersed aquatic vegetation in the estuary

Withdrawal of surface water for human use affects a suite of hydrologic and hydrodynamic drivers and elicit changes in other abiotic drivers. These changes, in turn, influence the states of biological attributes.



Hydrologic and hydrodynamic changes can influence of the state of ecological attributes of all major ecosystem components.



The hydroecology of a Florida river and the potential ecological effects of human water use

Part 2 of 2

- **Rob Mattson**, St. Johns River Water Management District, Palatka, Florida – *Responses of estuarine benthic macroinvertebrates to changing river flows in the St. Johns River estuary, Florida, USA*
- **Palmer Kinser**, St. Johns River Water Management District, Palatka, Florida – *Hydrology and the distribution of floodplain plant communities of the upper St. Johns River, Florida*
- **Steve Miller**, St. Johns River Water Management District, Palatka, Florida – *Predicting freshwater inflow effects on estuarine fishes in the St. Johns River, Florida*