

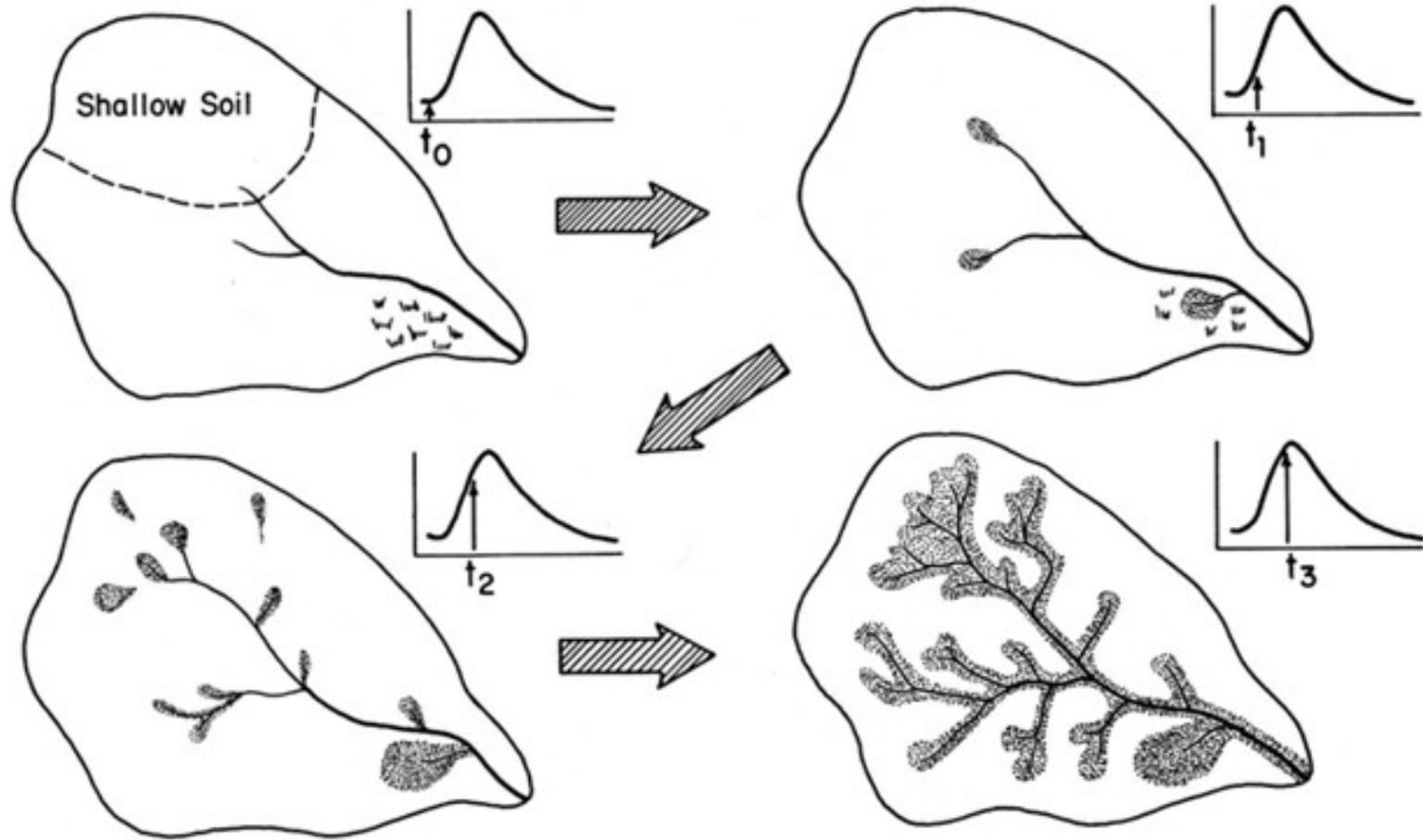
# The Flow-Pulse Concept: Spatial and Temporal Variability in Connectivity in Stream-Wetland Flow Networks



Mark Rains, Savannah Fransbergen, Kai Rains, and Geoffrey Fouad



# Variable Source Area (VSA)



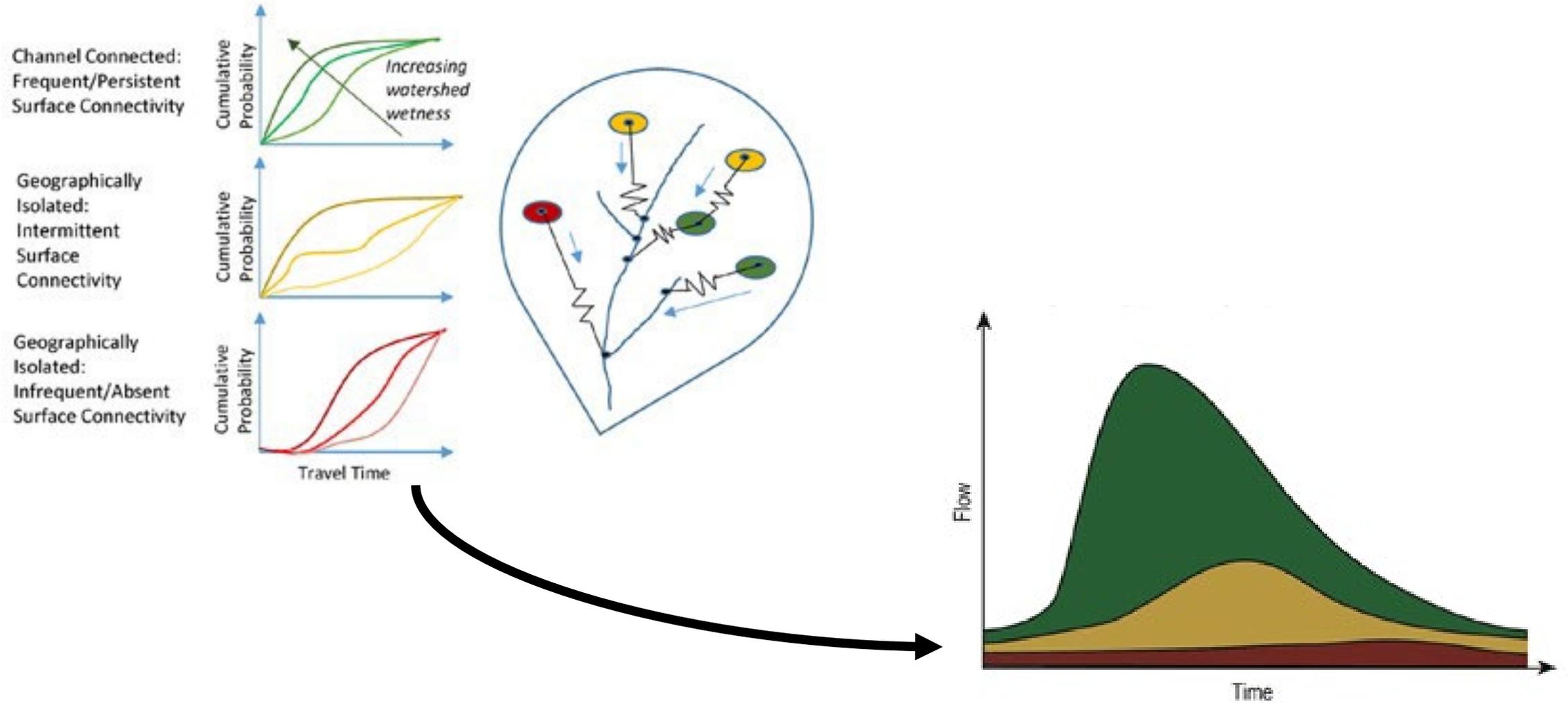
“swampy spots”

“wetted areas”

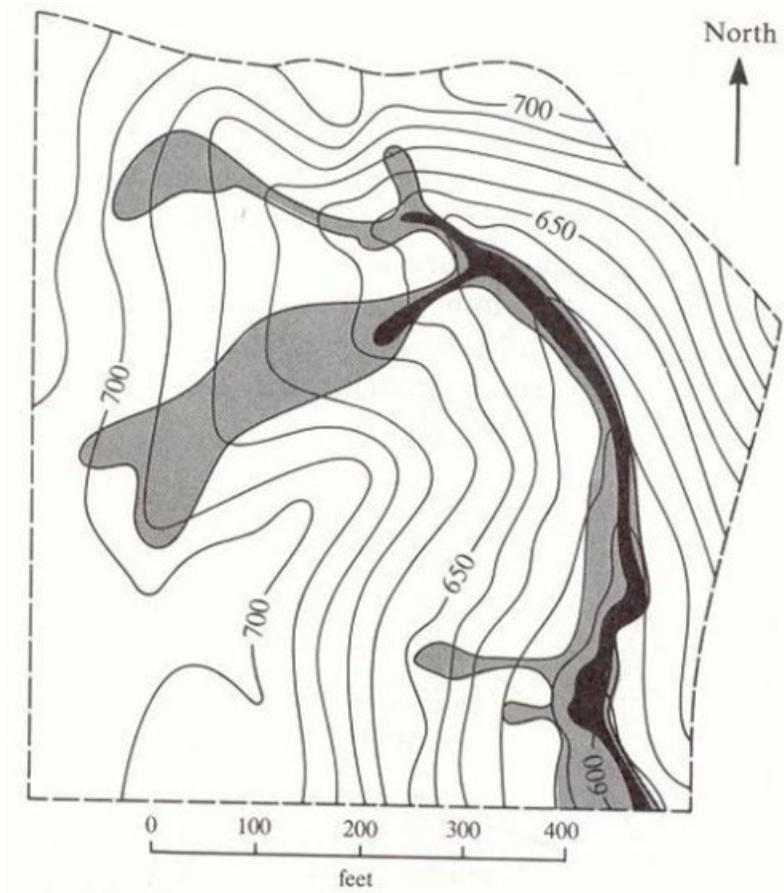
“zones of low storage capacity”

“intermittent channels”

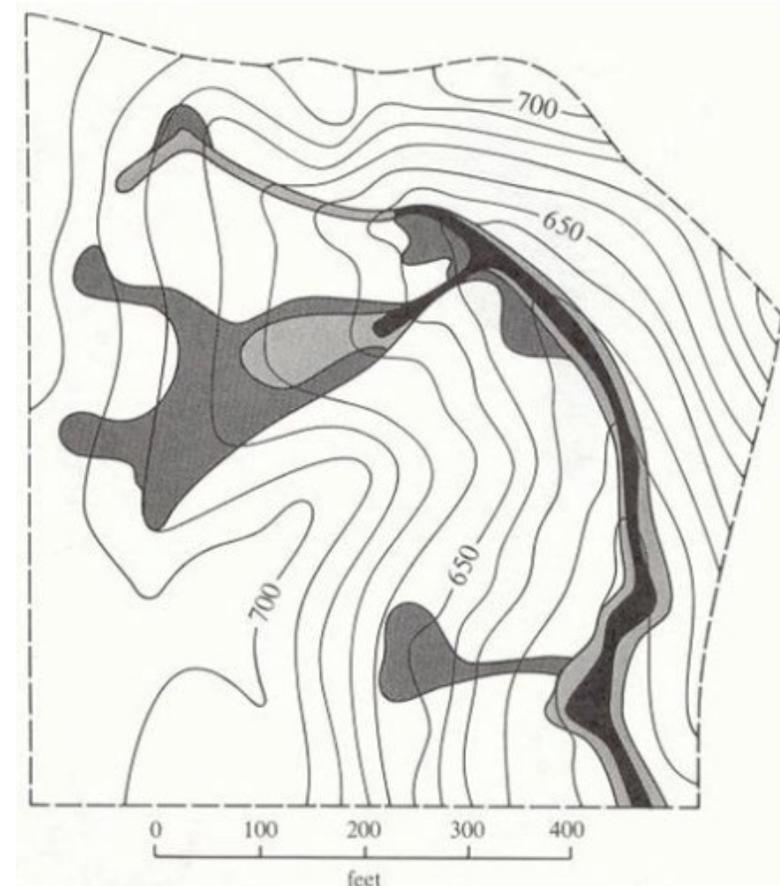
# Literally, 46 years later....



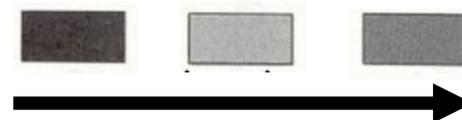
# We can visualize and quantify this on the hillslope scale...



Storm



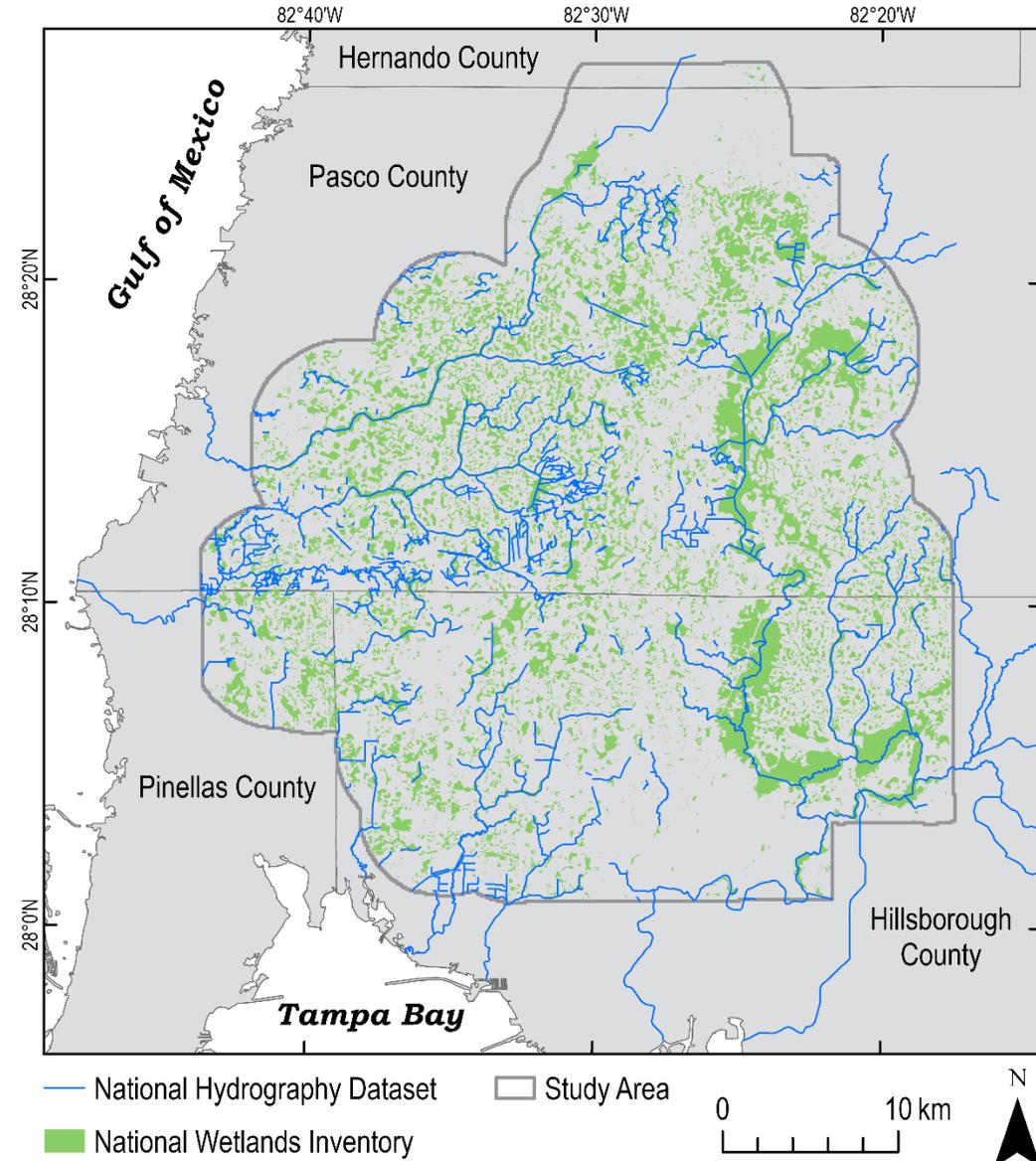
Season



Increasing wetness

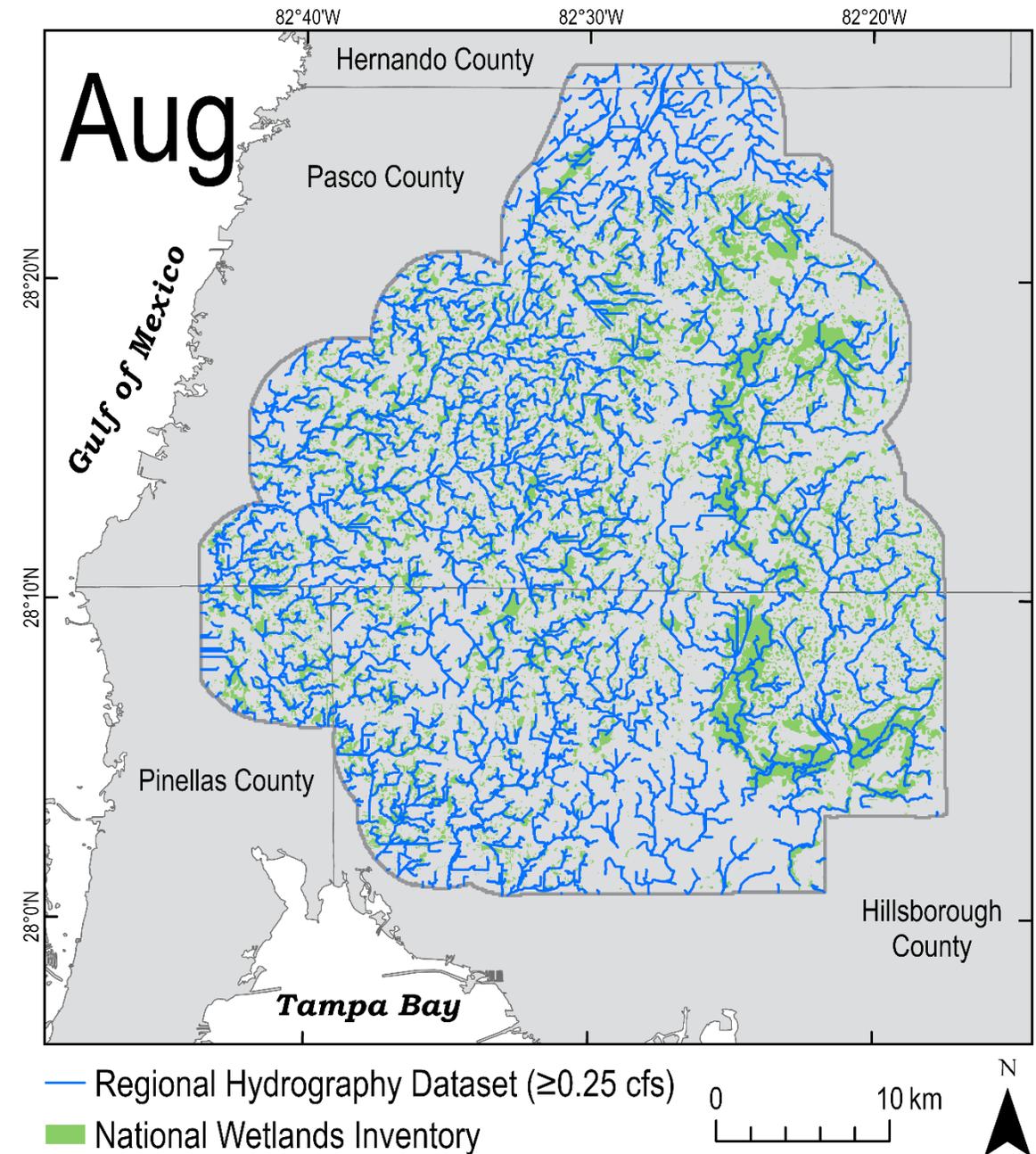
Modified from Dunne and Leopold 1978

# But can we visualize and quantify this at a regional scale?

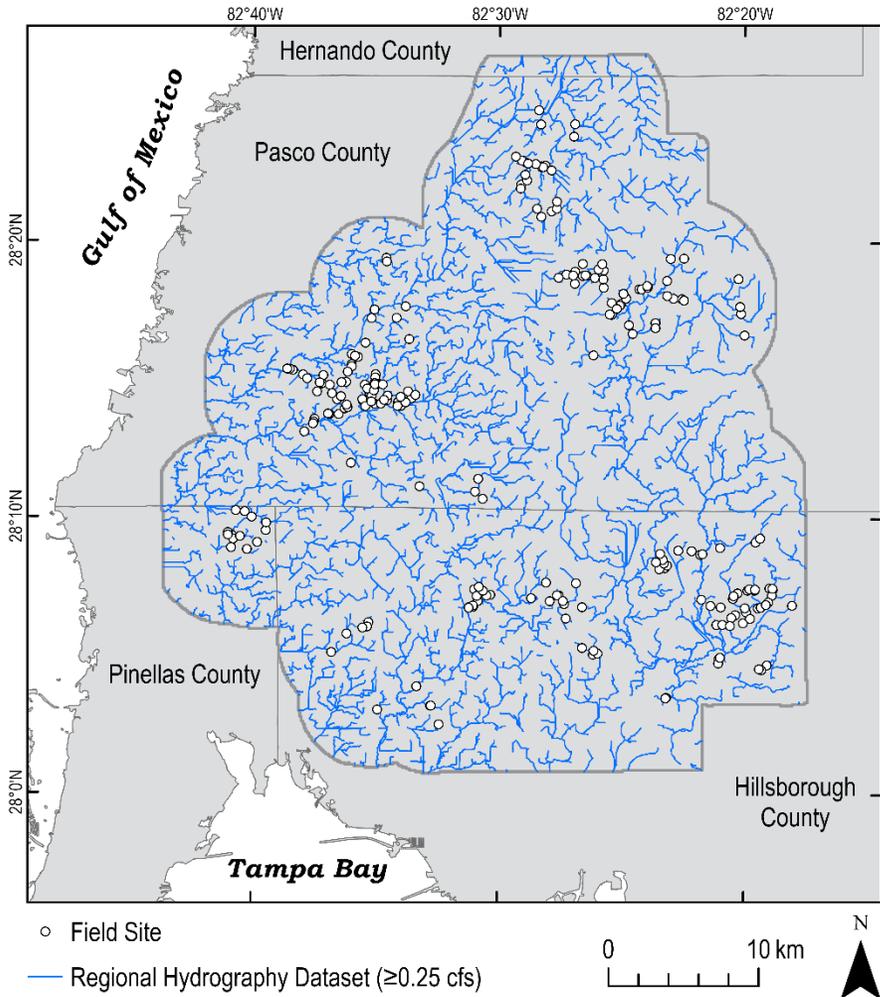


# Hydrography

- Potential Streamlines
  - Airborne LiDAR
  - 0.76 m x 0.76 m grid size
  - Calculate potential streamlines
- Realized Streamlines
  - Acquire monthly runoff depth/unit area (HUC8)
  - Calculate upslope grid cells required to generate observed monthly stream flow
  - Calibrate to flows at 21 stream gages
- Regional Hydrography Dataset (RHD)
  - Calculate realized streamlines on monthly timesteps
  - Overlay realized streamlines on wetlands from NWI



# RHD Validation



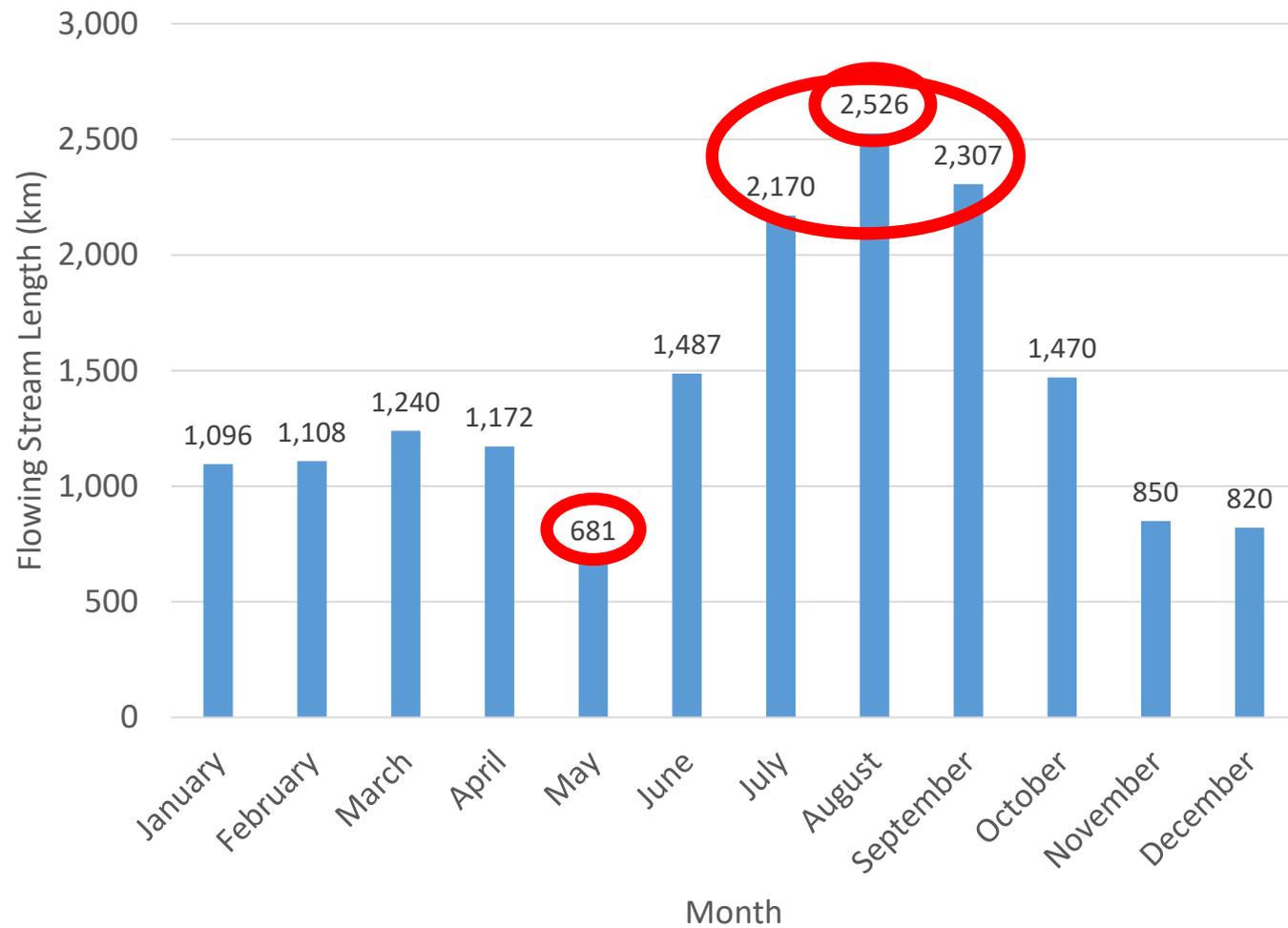
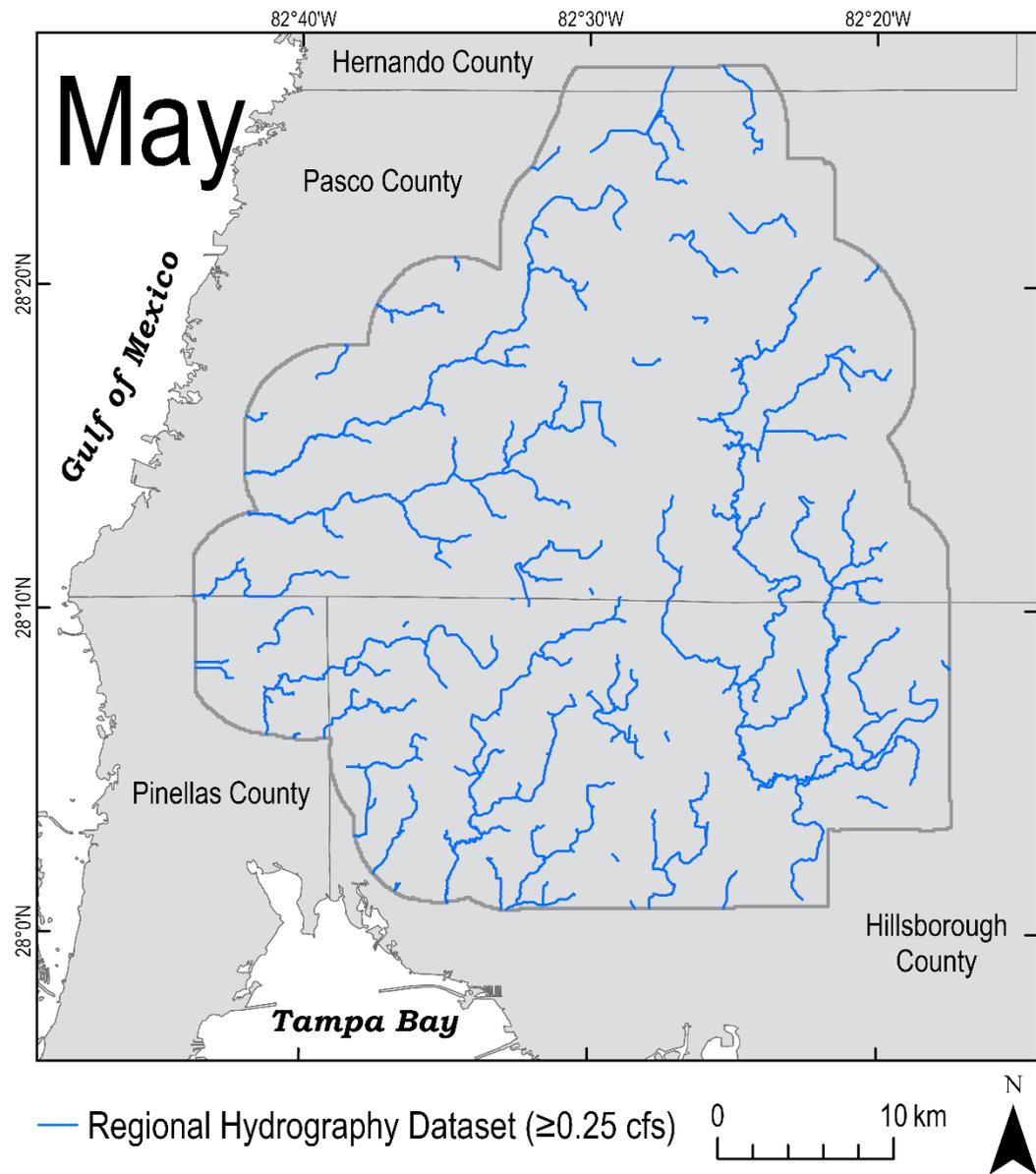
241 sites in two wet seasons (e.g., ~Aug)  
 5% resampled in dry season (e.g., ~May)  
 Positives, Negatives



Model	Accuracy	Error of Omission
RHD	68%	34%
NHD*	37%	76%

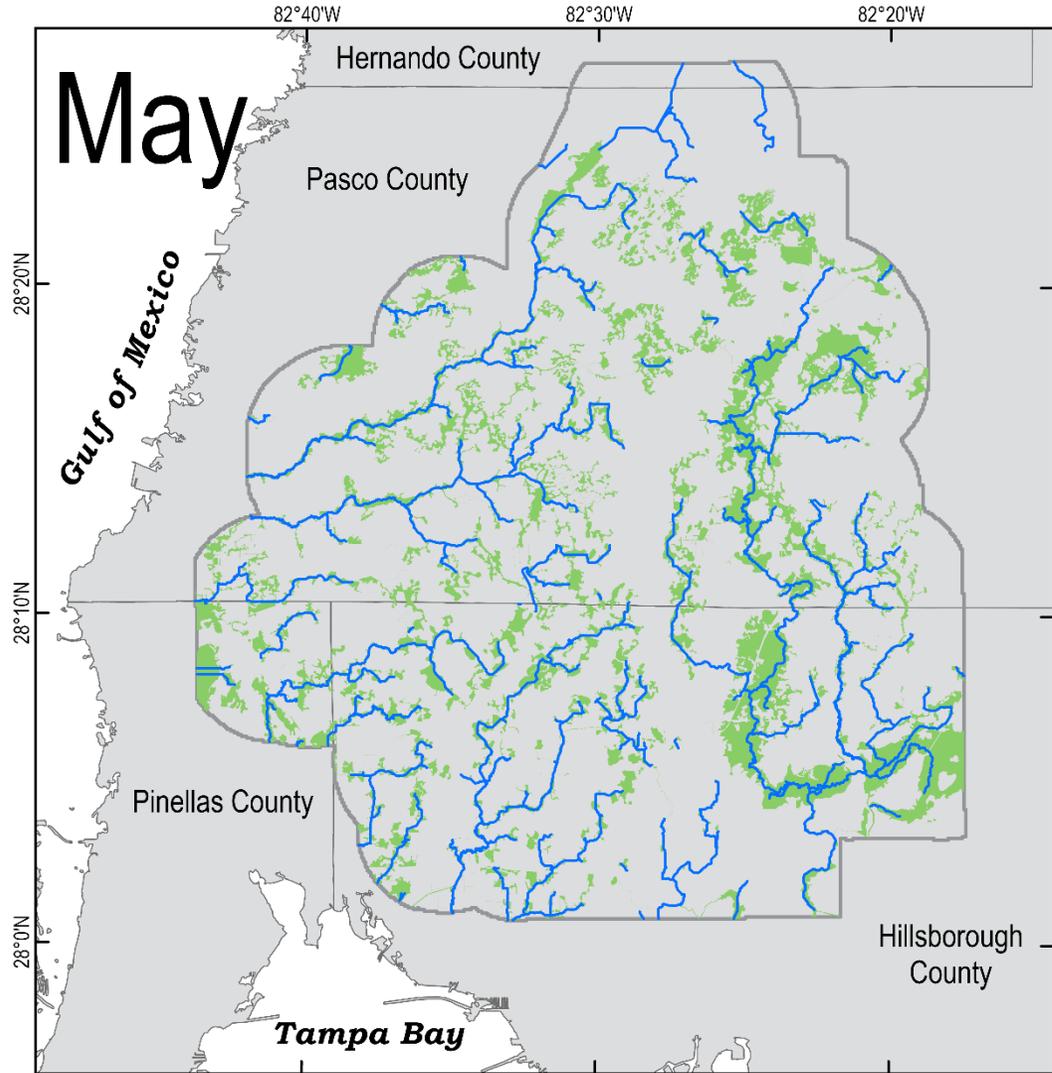
\*NHDPlus performs worse  
 \*Have not tested 3DHP

# Expanding-Contracting Stream Network



Stream length varies by 3.7x annually,  
but 86% of stream length is seasonal

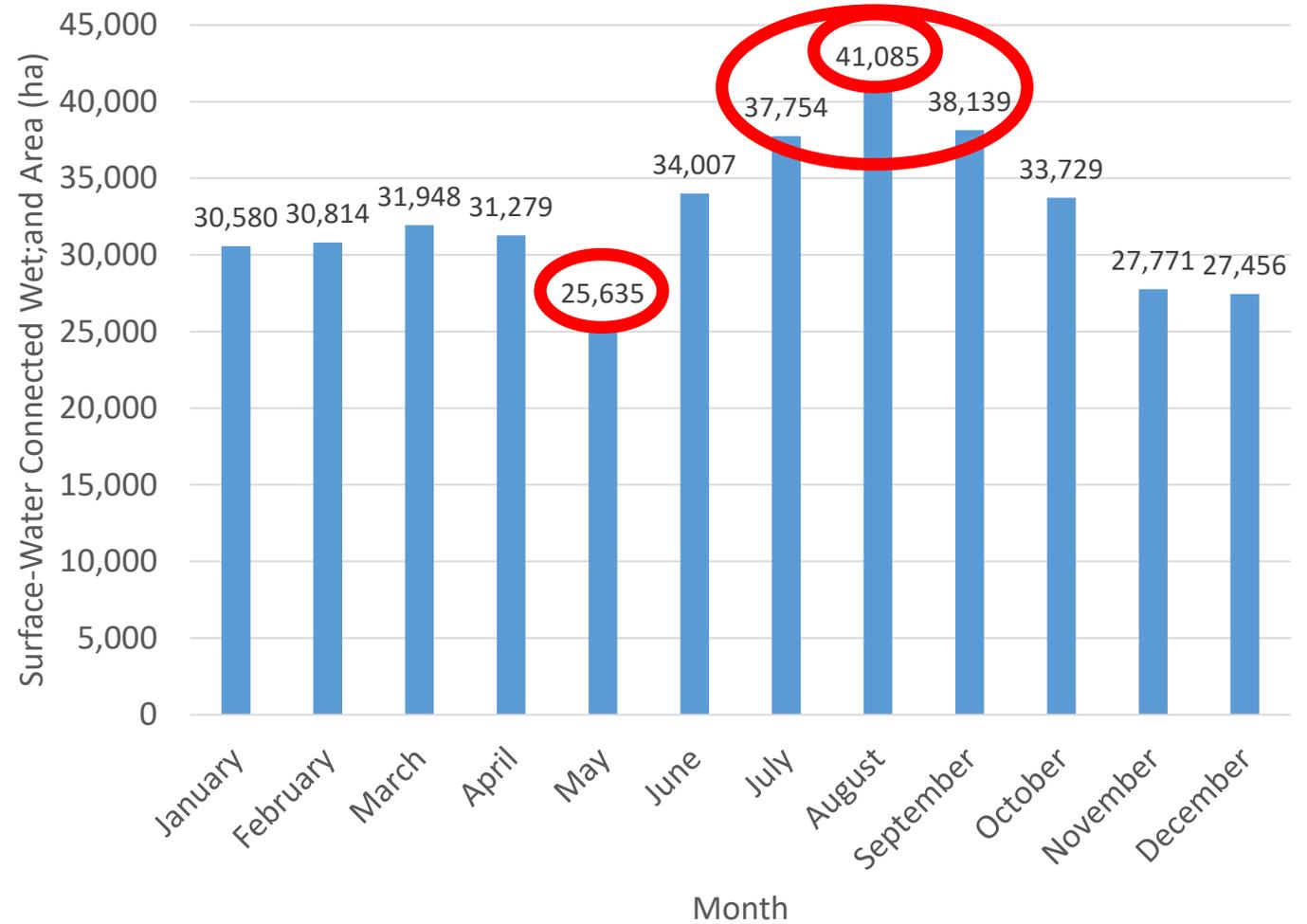
# Expanding-Contracting Stream-Wetland Network



— Regional Hydrography Dataset ( $\geq 0.25$  cfs)

■ Connected Wetland

0 10 km



Connected wetland area varies by 1.6x annually, but 92% of wetlands connected seasonally

# Wrapping it Up....

- Floodplains connect in 4-d (Ward 1989)
  - Lateral
  - Vertical
  - Longitudinal
  - Through time
- Conceptual model
  - Flood-pulse concept (Junk et al. 1989, Tockner et al. 2000)
    - Lateral and vertical exchange between channels-floodplains on a reach
  - Flow-pulse concept?
    - Longitudinal exchange between channels-floodplains in a network
- Sidebar on the Sackett and WOTUS...
  - 86% of stream length is seasonal
  - 92% of wetlands connected seasonally



# Thank You



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**SOUTH FLORIDA**

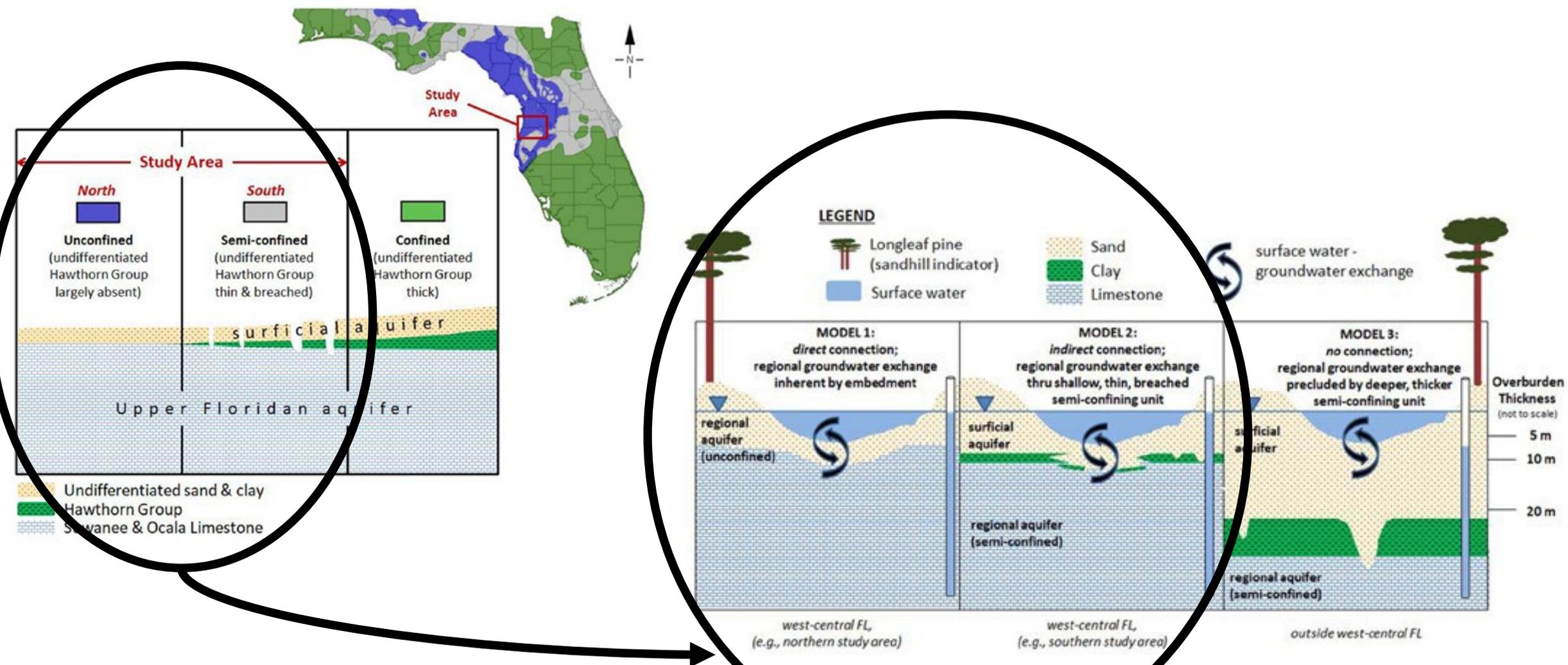


Water  
Institute

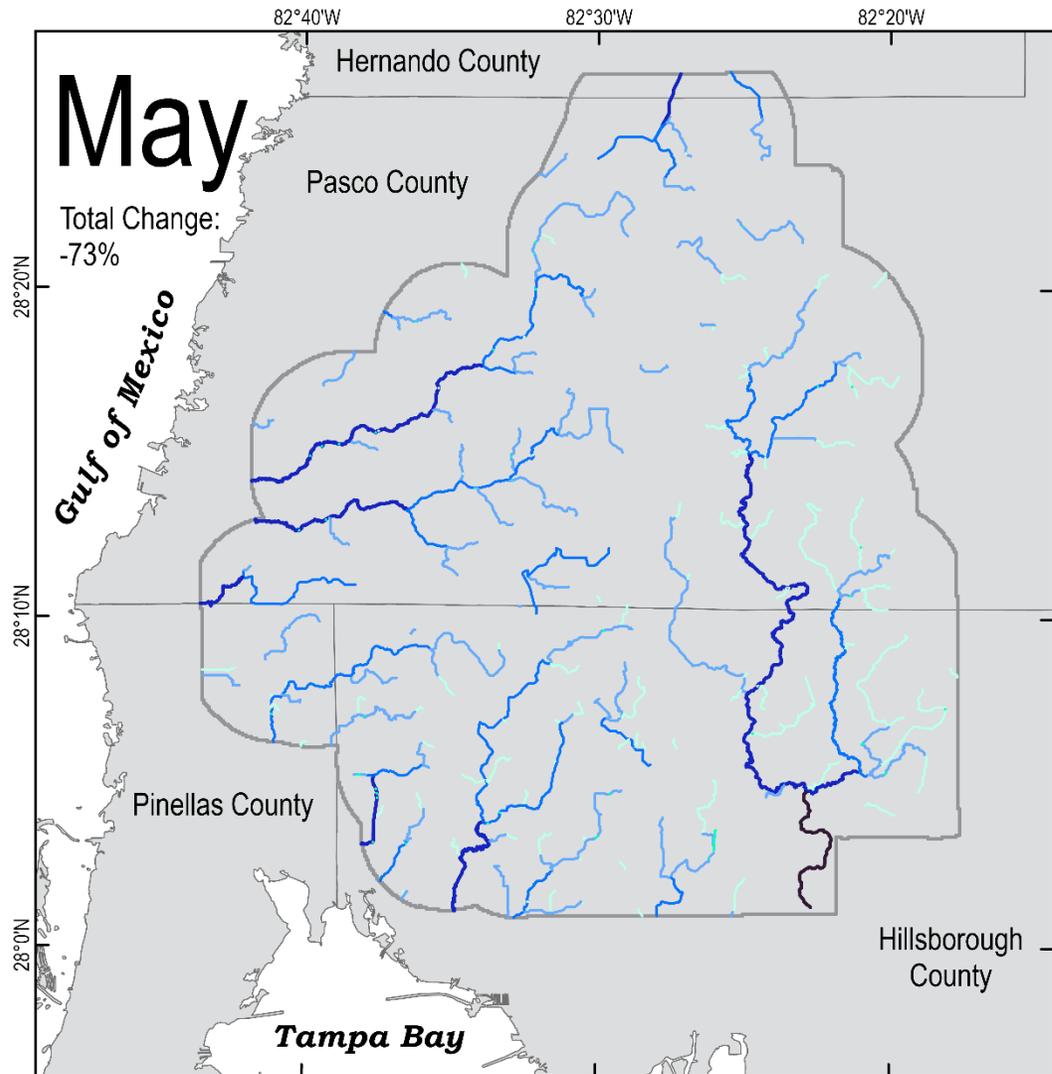


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# Study Area Location and Physiography



# Expanding-Contracting Stream Network



Stream Order	Change
1	-99.7%
2	-77.5%
3	-27.6%
4	-0.5%
5	0%
6	0%
<b>Total</b>	<b>73%</b>

Stream Order (% change)

1 (-99.8%)	4 (-0.5%)
2 (-77.7%)	5 (0%)
3 (-27.7%)	6 (0%)

0 10 km

