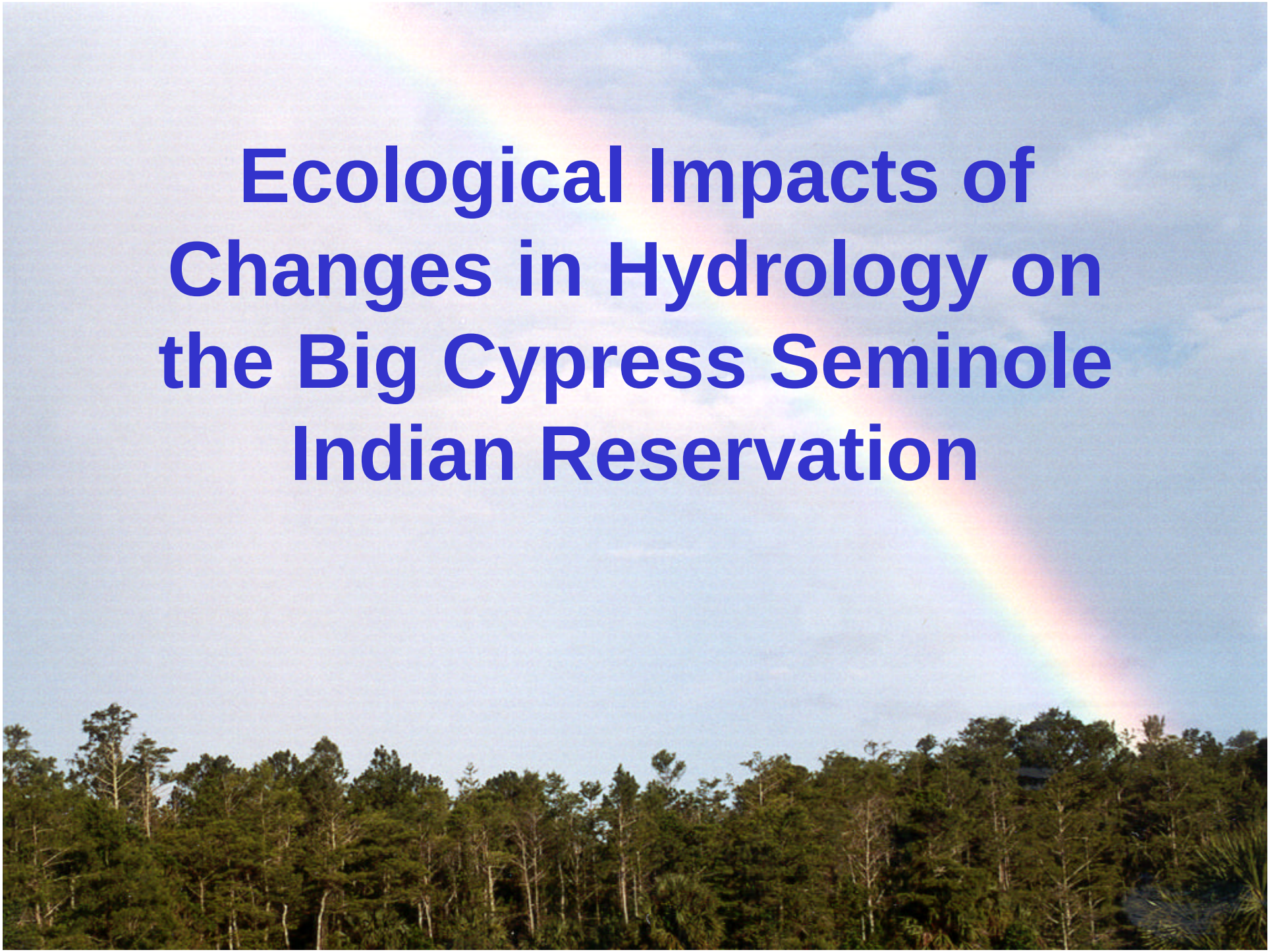
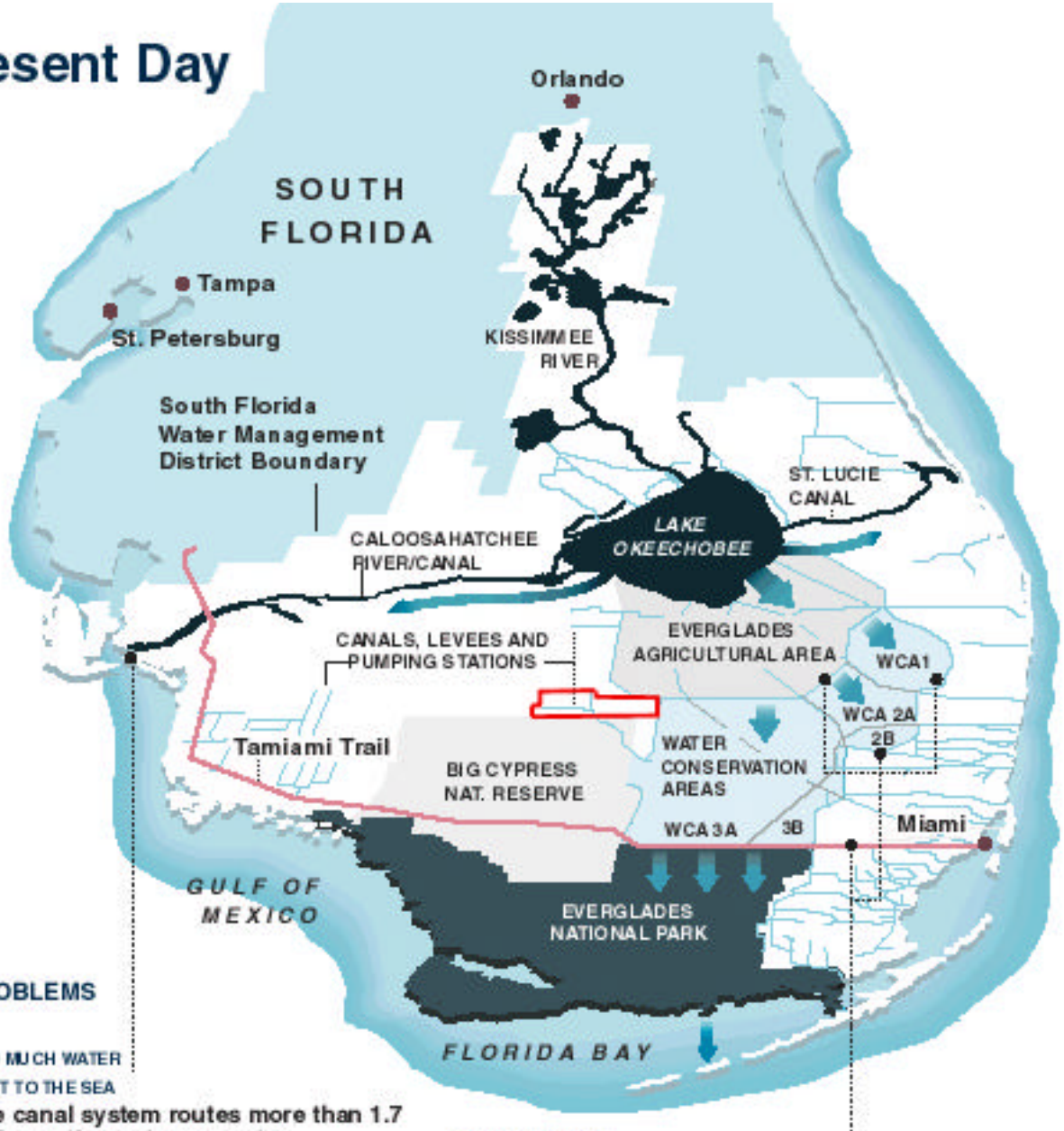
Ecological Impacts of Changes in Hydrology on the Big Cypress Seminole Indian Reservation



Present Day



PROBLEMS

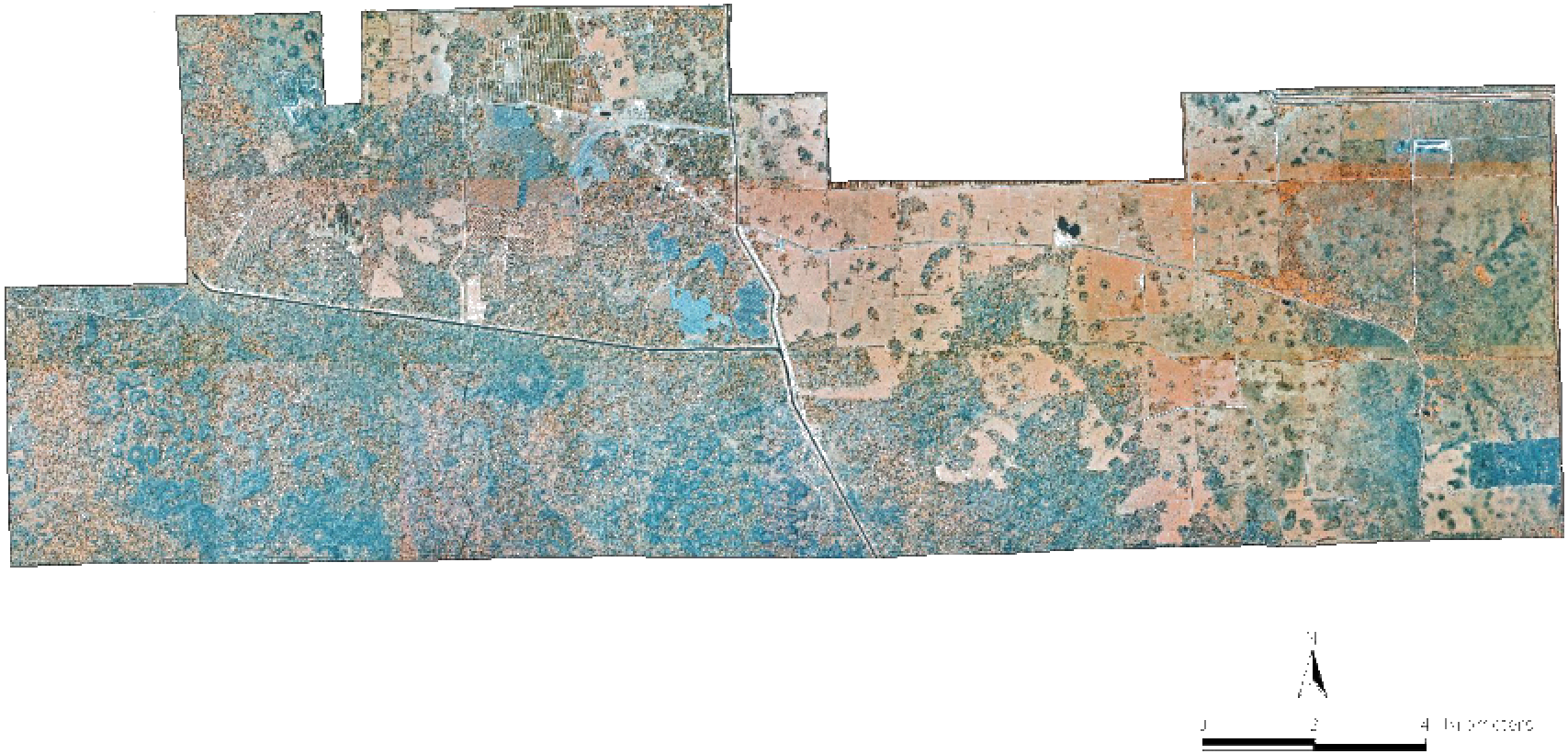
TOO MUCH WATER SENT TO THE SEA

The canal system routes more than 1.7 billion gallons of water a day

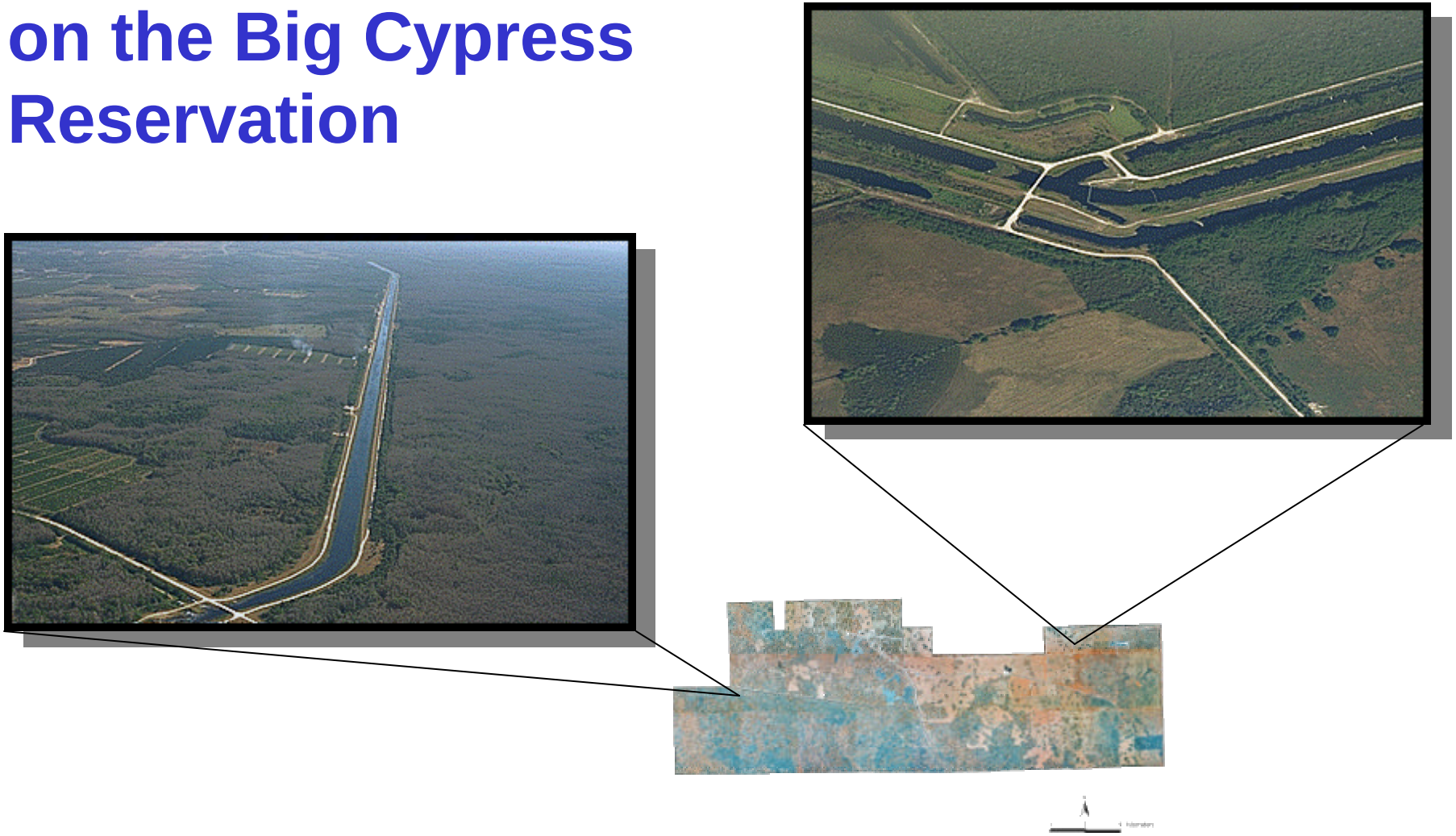
FRAGMENTATION

Canals, levees and highways divide the water flow into disconnected pools.

Big Cypress Seminole Indian Reservation



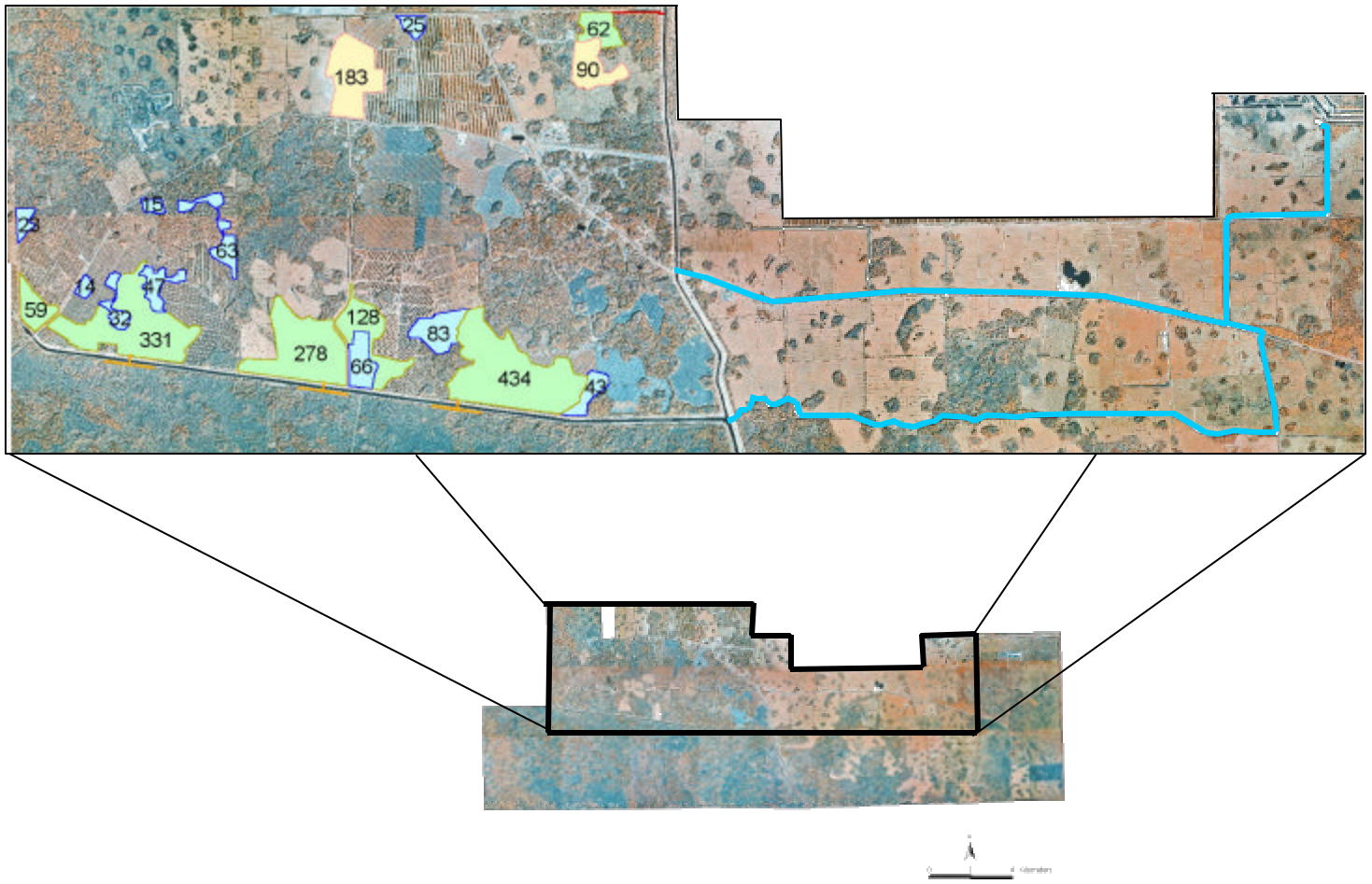
Major Canals on the Big Cypress Reservation



Goals of the Water Conservation Plan

- Convey and store irrigation water
- Improve flood control
- Re-water natural areas on and connected to the Reservation
- Remove phosphorus and other pollutants

Water Conservation Plan



Studies Associated with the Water Conservation Plan

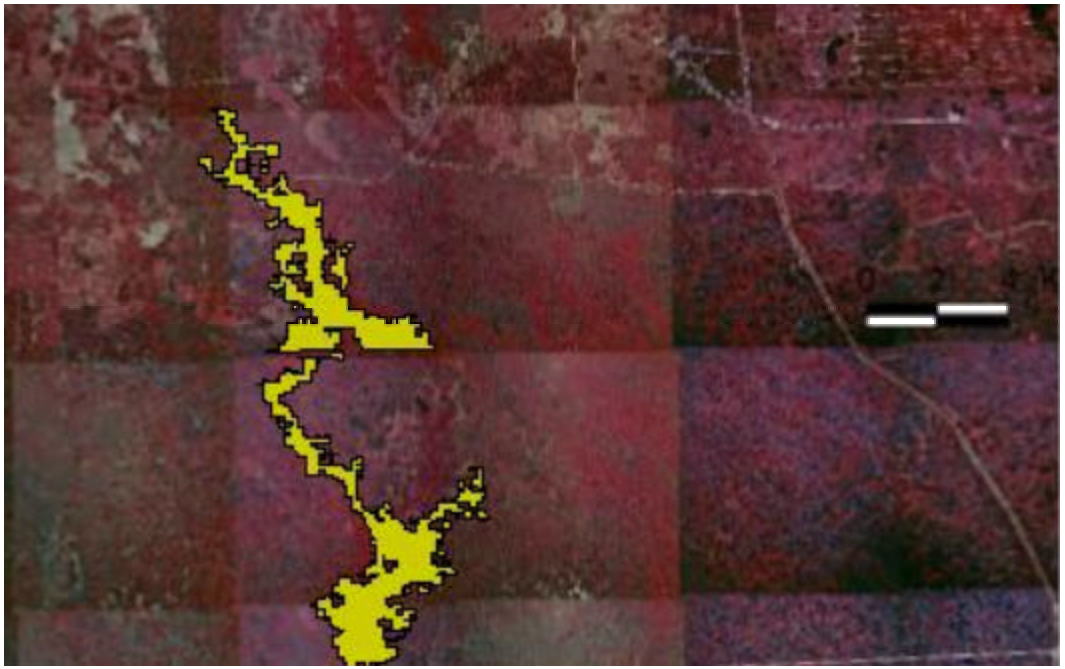
- **Water quality**
- **Biological responses**

Water Quality Studies

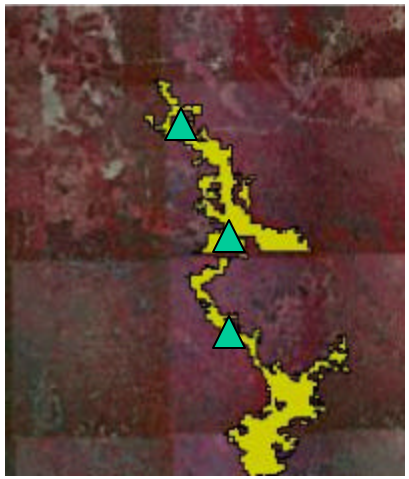
- **Low agricultural input**
  Kissimmee Billie Slough
- **High agricultural input**
  ANA Impounded Wetland
- **Mixed-source inputs**
  North and West Feeder Canals

Low agricultural input

Kissimmee Billie Slough



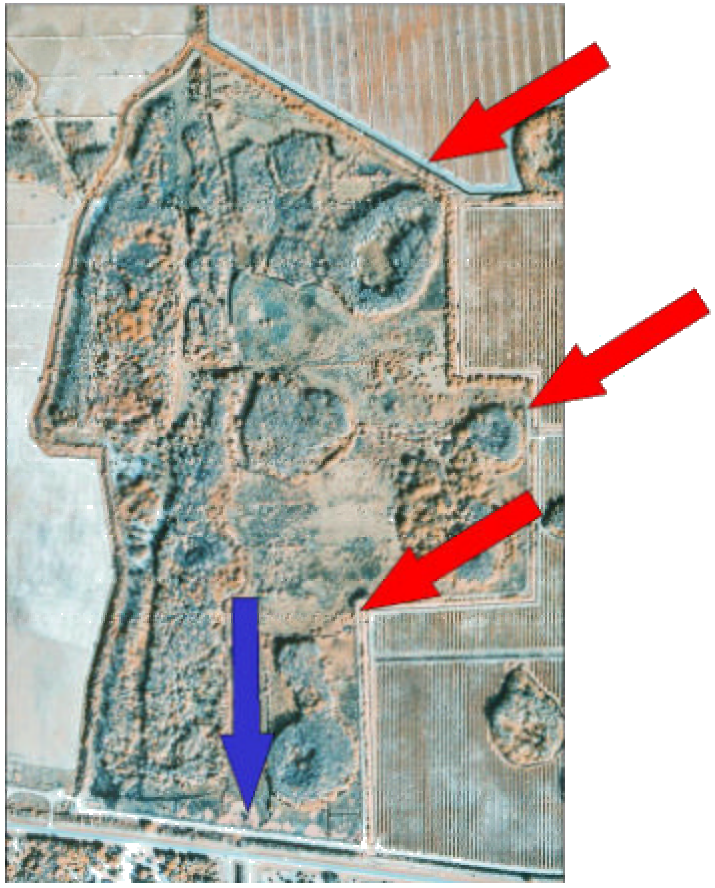
Nutrient levels in the Kissimmee Billie Slough



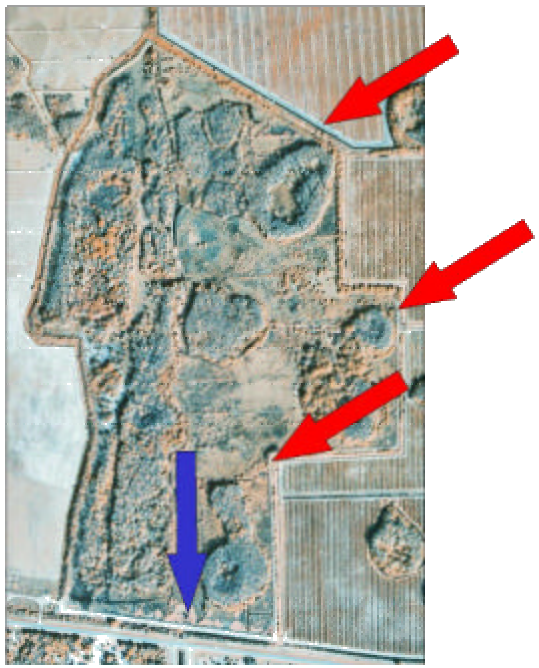
Concentration (mg L^{-1})	TKN	TP	K
North	0.86(0.08)	0.026(0.03)	0.68(0.08)
Middle	0.88(0.09)	0.030(0.03)	0.50(0.06)
South	0.79(0.08)	0.021(0.02)	0.56(0.06)

High agricultural input

ANA impounded wetland



Nutrient levels in the ANA wetland



Concentration (mg L^{-1})	TKN	TP	K
Inflow	1.42(0.13)	0.142(0.02)	2.99(0.4)
Interior	1.09(0.10)	0.070(0.01)	2.80(0.4)
Outflow	1.43(0.12)	0.097(0.01)	3.10(0.4)

Mixed-source inputs

- **Statistical analysis of 11 years of biweekly water quality sampling data**
- **Development of a quantitative model of phosphorus concentrations**

- **Average % reduction in [TP] was 17%**

(from 0.133 to 110 mg L^{-1})

Biological Responses to Changes in Hydrology

- Vegetation assemblages

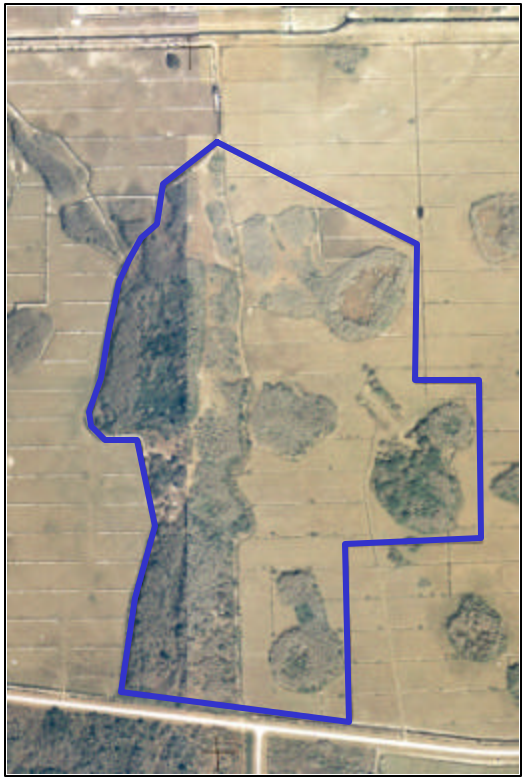
- Invasive non-indigenous fish
- Bird assemblages

Vegetation Assemblages

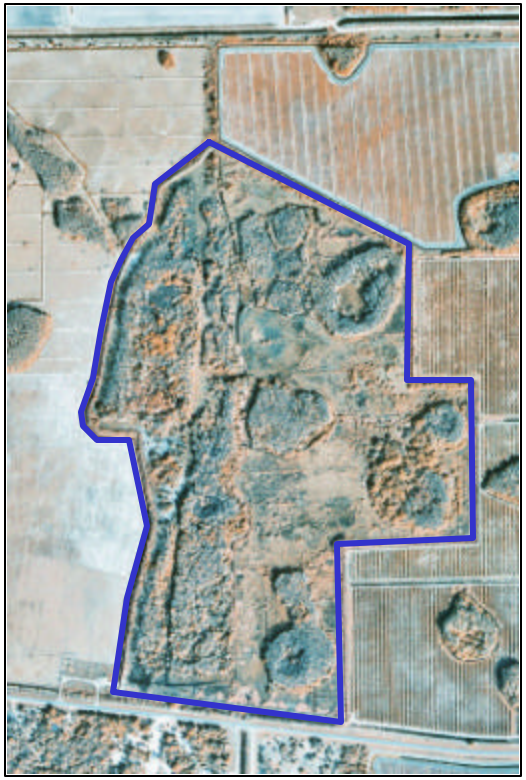
- Vegetation responses to desiccation and re-hydration in the ANA impounded wetland
- Cypress encroachment as a consequence of regional desiccation
- Assessment of forested wetland response to re-hydration

Vegetation response to desiccation and re-hydration

1953

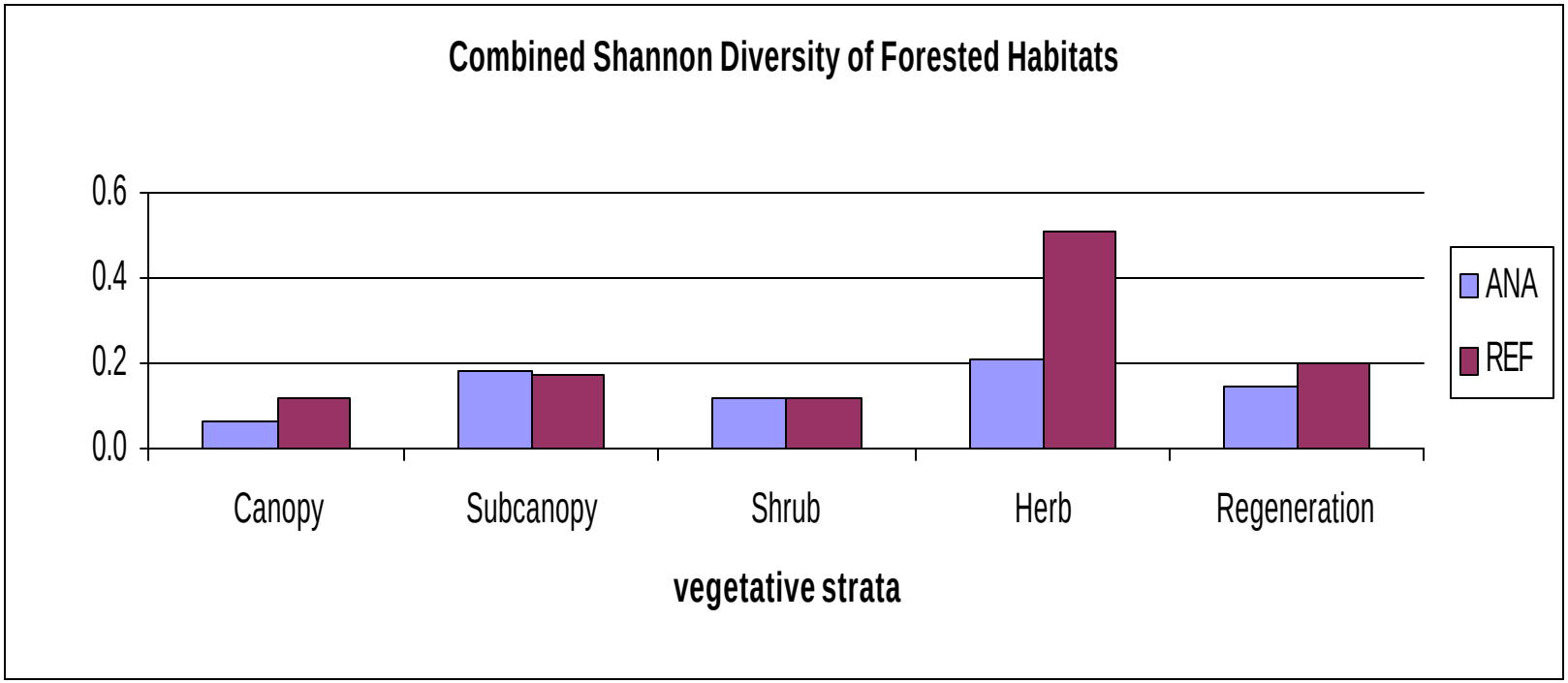


1988



1998

Comparison of desiccated and re-hydrated wetlands



Canopy Layer: Decline of laurel oak

- Desiccated cypress strands are invaded by laurel oak
- Impounded area experiences short, deep annual hydroperiod
- *Ganoderma lucidum* infests laurel oaks
- Root rot spreads to base of tree
- Trees are blown down by high winds during storms

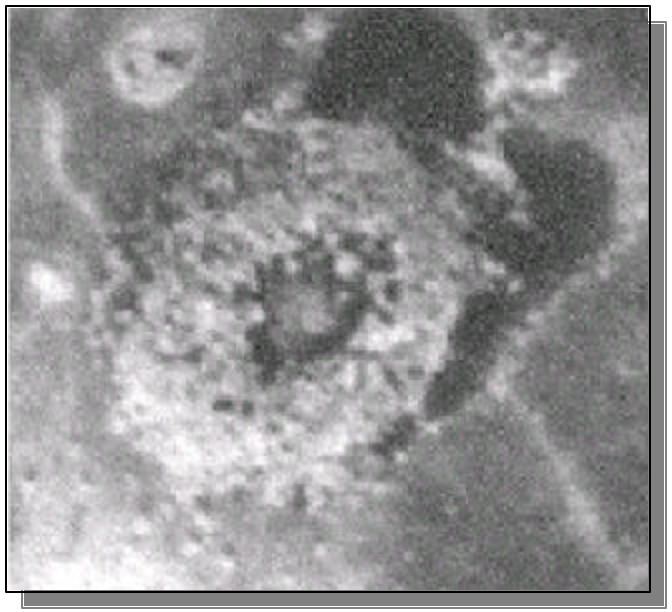
Herbaceous layer: Invasion by atypical species

- *Parietaria floridana* Florida pellitory
- *Eupatorium capillifolium* Dog fennel
- *Erechtites hieracifolia* Fire weed
- *Commelina diffusa* Day flower
- *Ptilimnium capillaceum* Mock bishopweed
- *Rivina humilis* Rouge plant
- *Senecio glabellus* Butterweed

Vegetation Assemblages

- Vegetation responses to desiccation and re-hydration in the ANA impounded wetland
- **Cypress encroachment as a consequence of regional desiccation**
- Assessment of forested wetland response to re-hydration

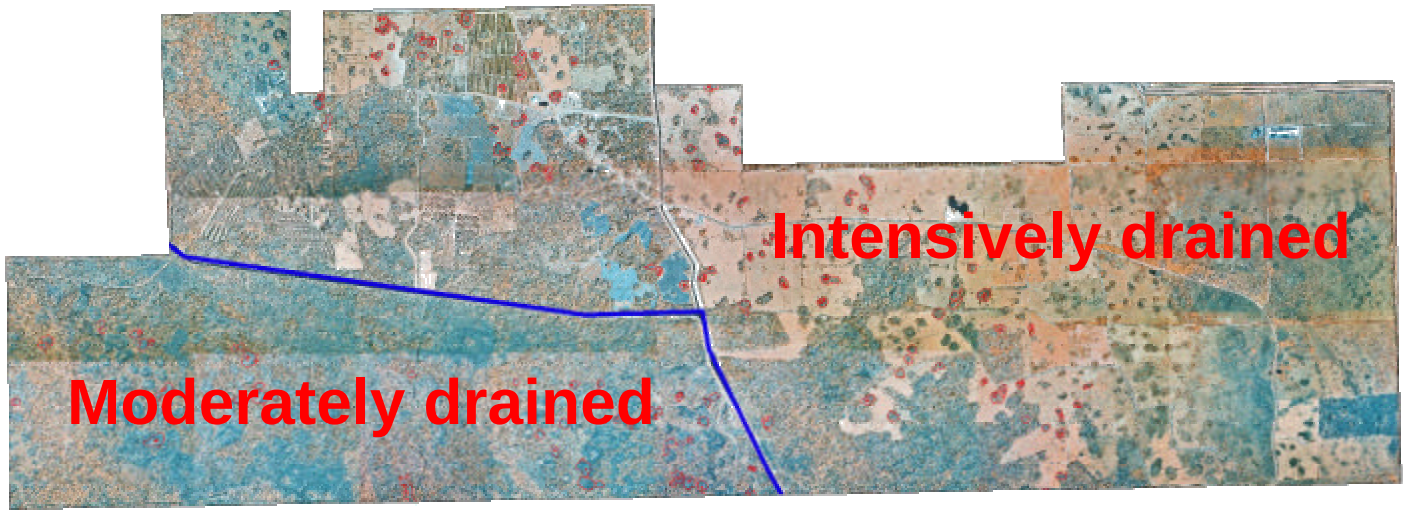
Cypress invades center of desiccated domes



1953

1998

Extent of cypress invasion correlates with degree of desiccation



	#domes	invasion ft^2 - ft^{-1}
Intensively drained	69	**32.6**(0.97)
Moderately drained	38	**22.4**(1.34)

Vegetation Assemblages

- Vegetation responses to desiccation and re-hydration in the ANA impounded wetland
- Cypress encroachment as a consequence of regional desiccation
- **Assessment of forested wetland response to re-hydration**

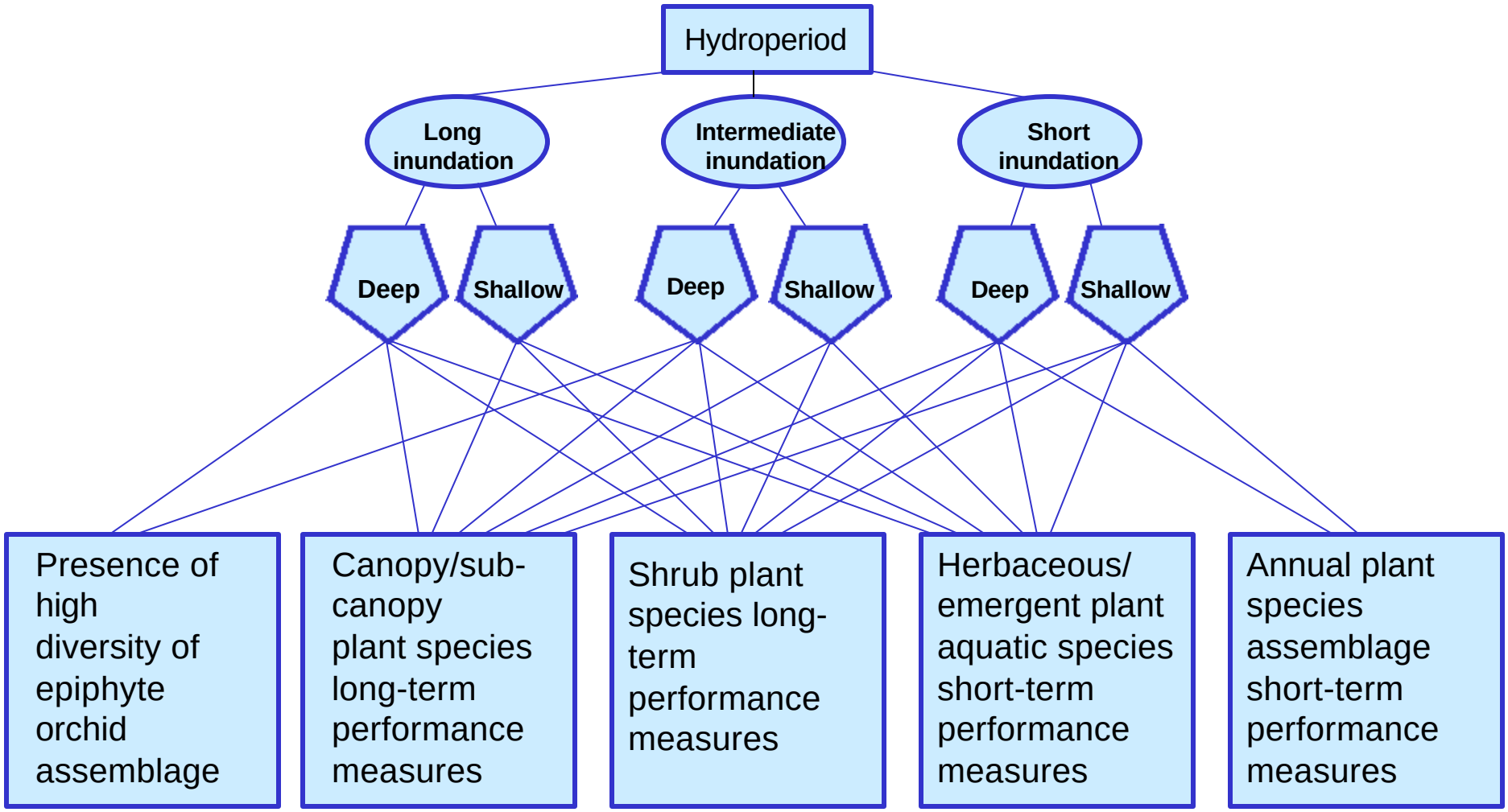
Bioindicators of forested wetland hydroperiod

- Within each vegetation stratum or layer, an assemblage of plant species are chosen to represent a three-step gradient of tolerance to inundation
- By examining present vegetation, a relative value for hydroperiod of a site can be assigned

Tolerance to inundation

Strata/Layer	High	Intermediate	Low
Canopy/sub	**Salix caroliniana**	**Acer rubrum**	**Quercus virginiana**
Shrub	**Itea virginica**	**Myrica cerifera**	**Serenoa repens**
Herb/ emergent	**Thalia geniculata**	**Blechnum serrulatum**	**Nephrolepsis spps.**
Other depth Indicators	**Cypress knee height**	**Moss line height**	**Lichen line height**

Plant assemblage bioindicators of forested wetland hydrology

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