Wetland Restoration as an Act of Stewardship – a Seminole Perspective

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SEMINOLE TRIBE OF FLORIDA
Tribal Council
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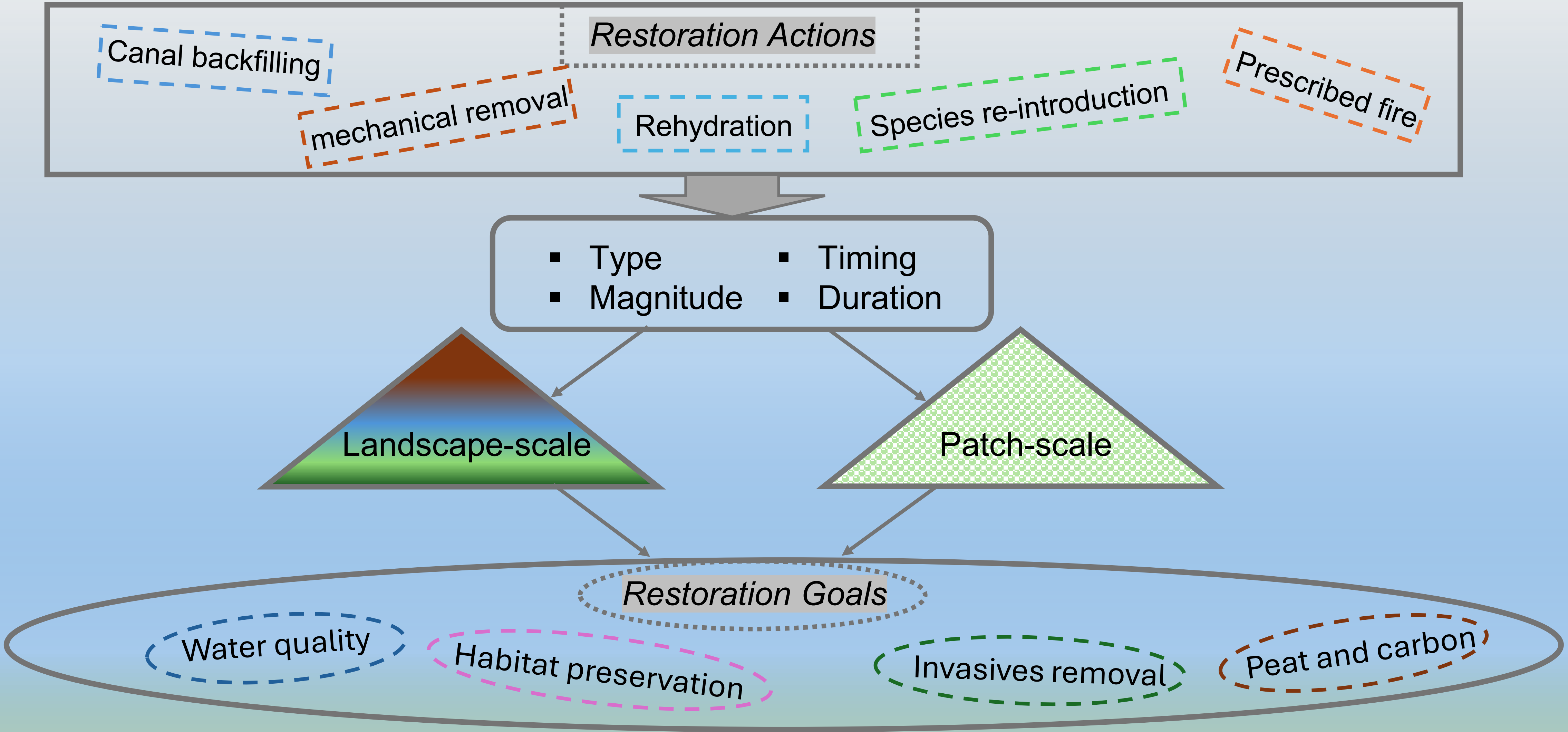
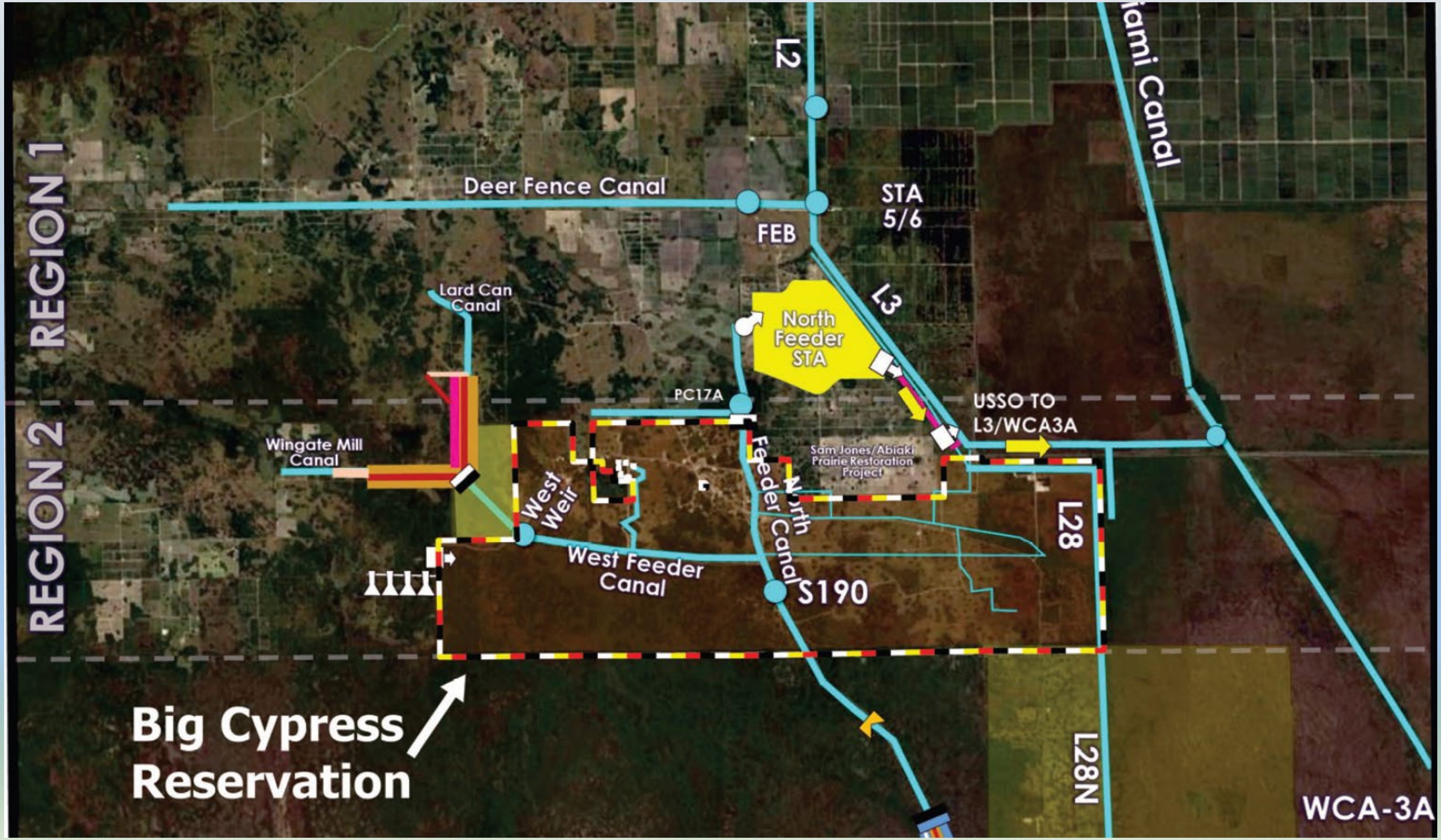
ENVIRONMENTAL PROTECTION OFFICE

Wetland Ecosystems Restoration



- Type, magnitude, timing, and duration of restoration actions should be patch-dependent (Bedford, 1999; Newman et al., 2017)
- Type, magnitude, timing, and duration of restoration actions" X "degraded condition" → time to pass critical thresholds of restoration goals (Craft et al., 1999; Zweig and Kitchens, 2008; Sah et al., 2014)

Western Everglades Restoration Project (WERP)



- WERP is planning to: i) increase the proportion of surface water overland flow compared to canal flow, and ii) increase the proportion of land used to filter and clean surface water through biological processes (STAs)

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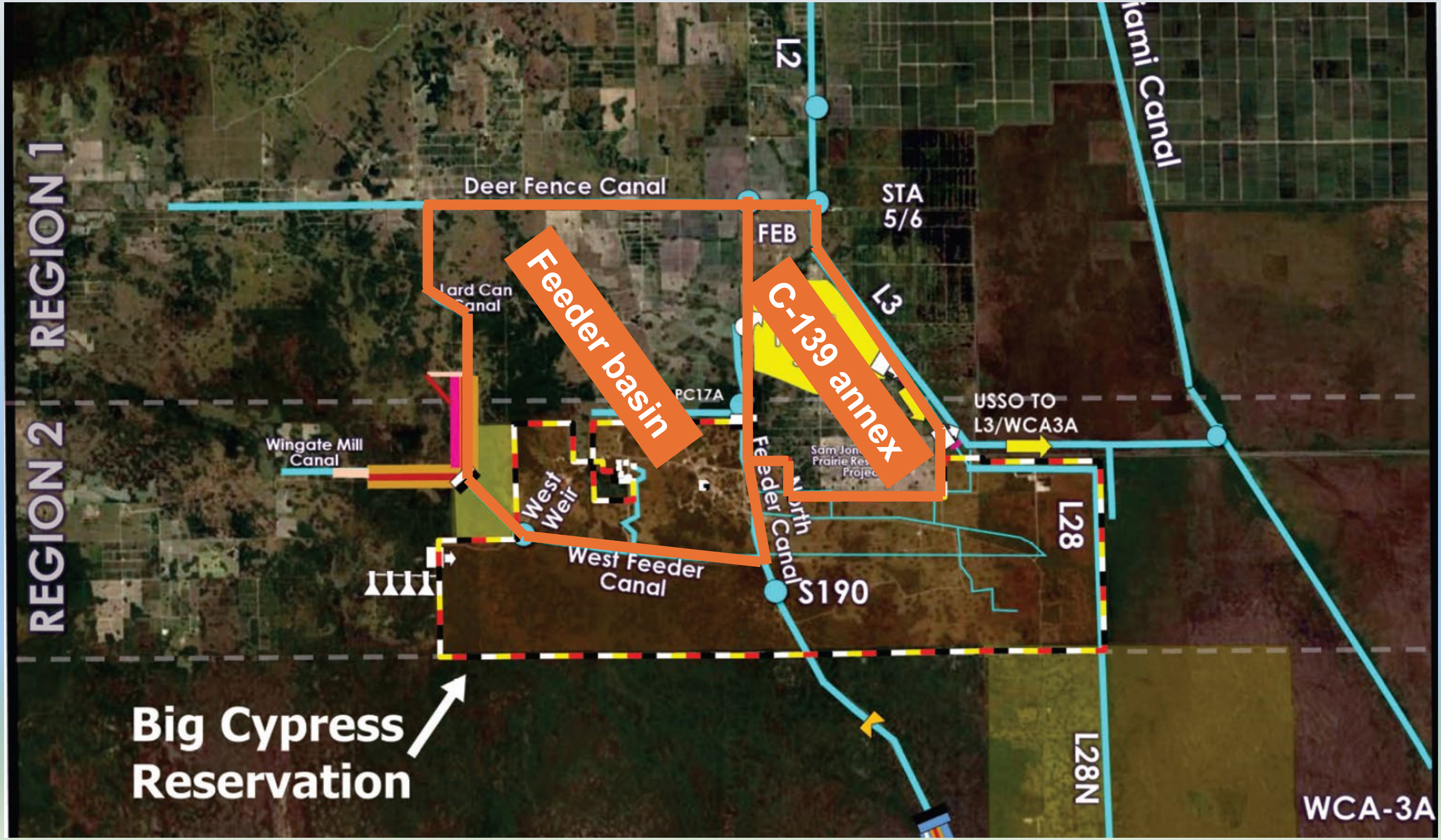

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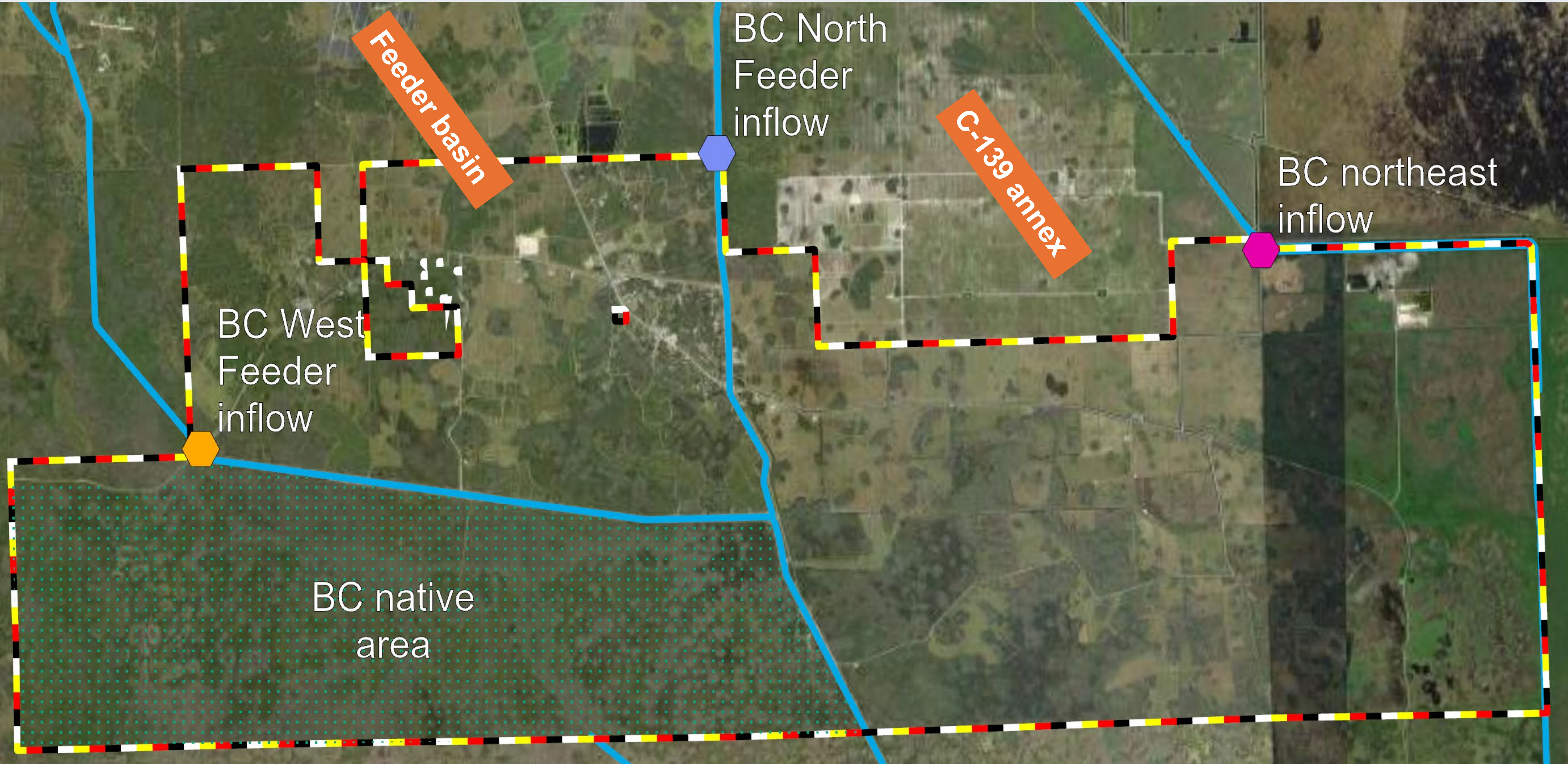
WERP Preliminary Data – Seminole



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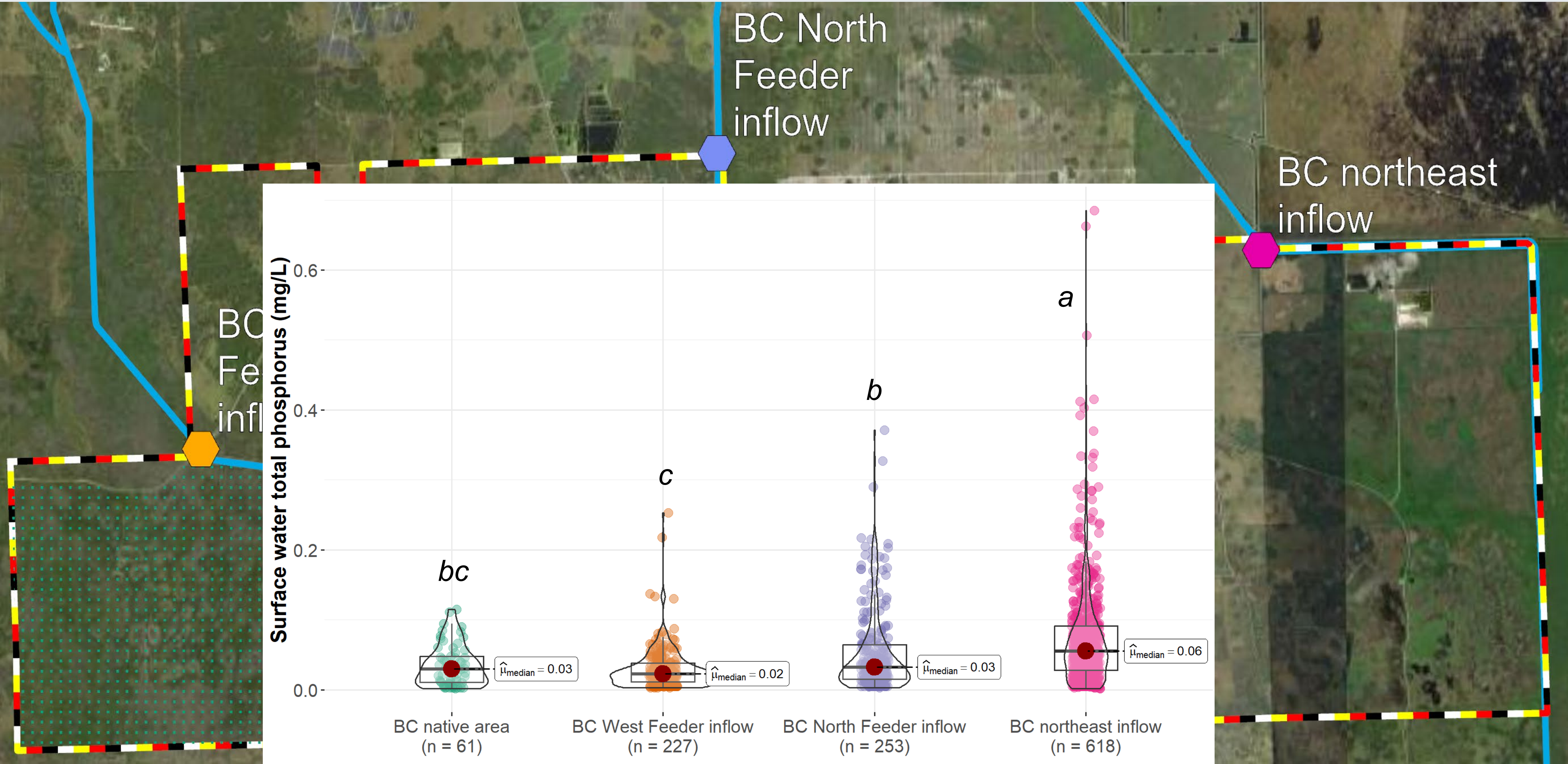

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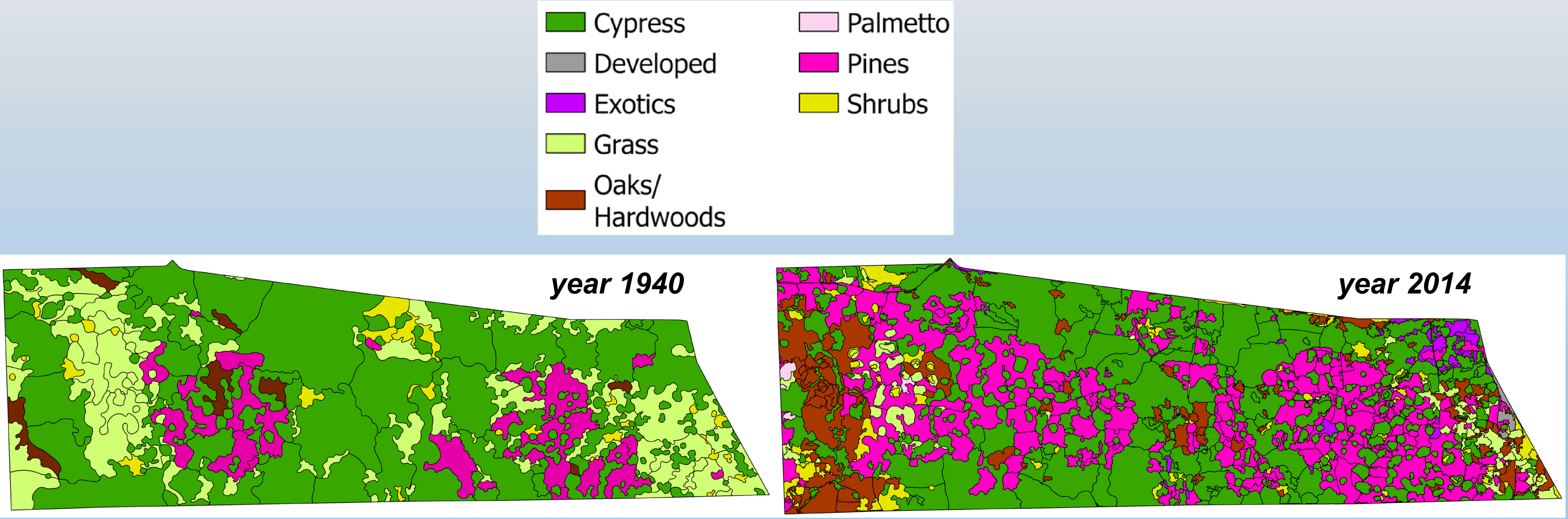


- Establishment of the regional canal system created under the Central and Southern Florida Project (C&SF) has dried the area and isolated wetland systems, causing transitions in vegetated habitats from cypress (-17 %) or marsh and prairie (-85 %) communities to pine (+192 %) or oaks and other hardwood tree (+397 %) communities.

Rehydration of NESRS – monitoring

- Long-term monitoring of NESRS started in 2006 and it is still ongoing through a collaboration between ENP and Florida International University (FIU)

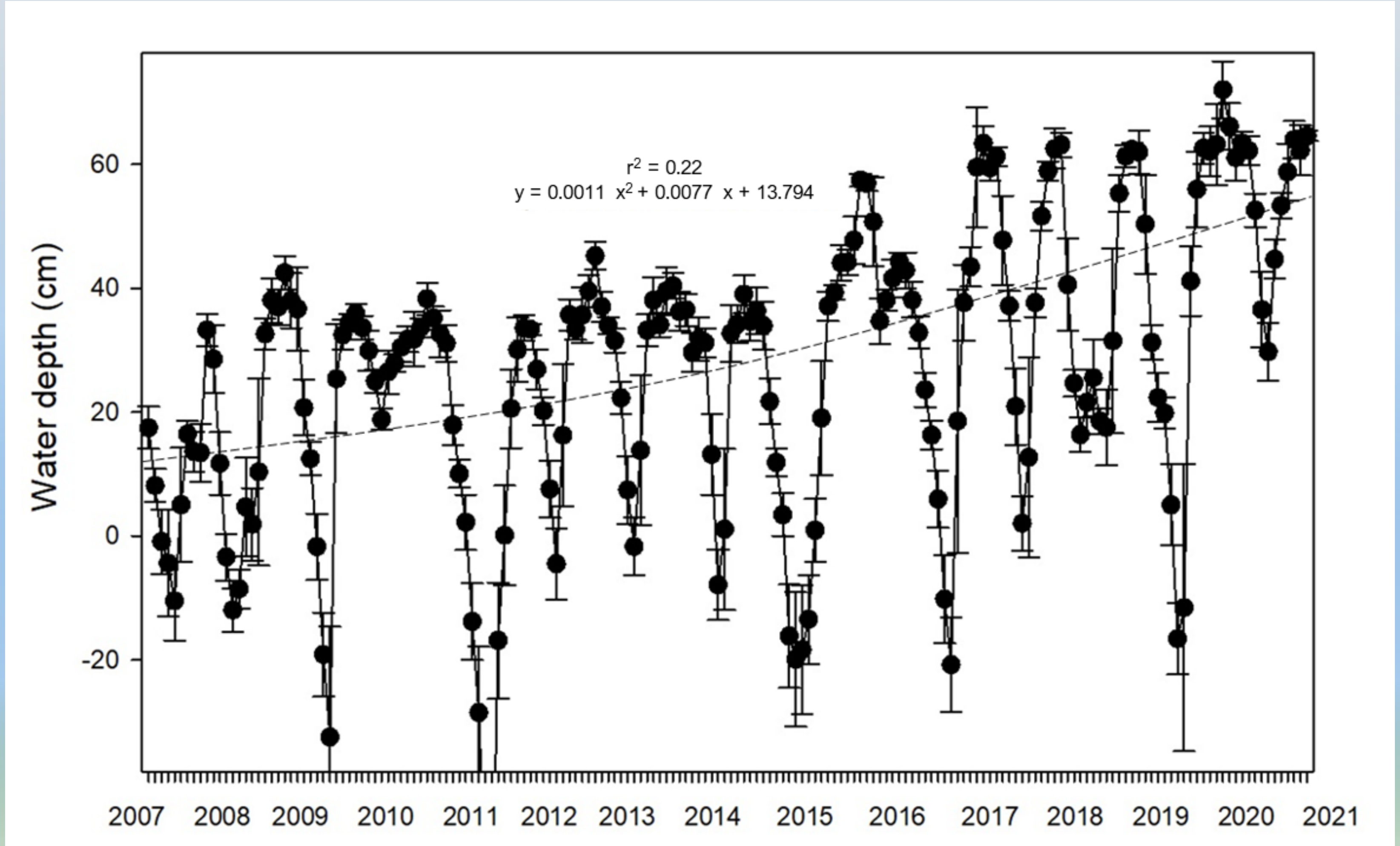
- For the following analysis, we used *n* = 65 sites, consistently sampled in 2015, 2018, and 2021 (Nocentini et al., 2024)

- Data collected: surface water, periphyton, flocculent detrital material (floc), and soil C, N, and P concentrations; macrophyte species composition and density

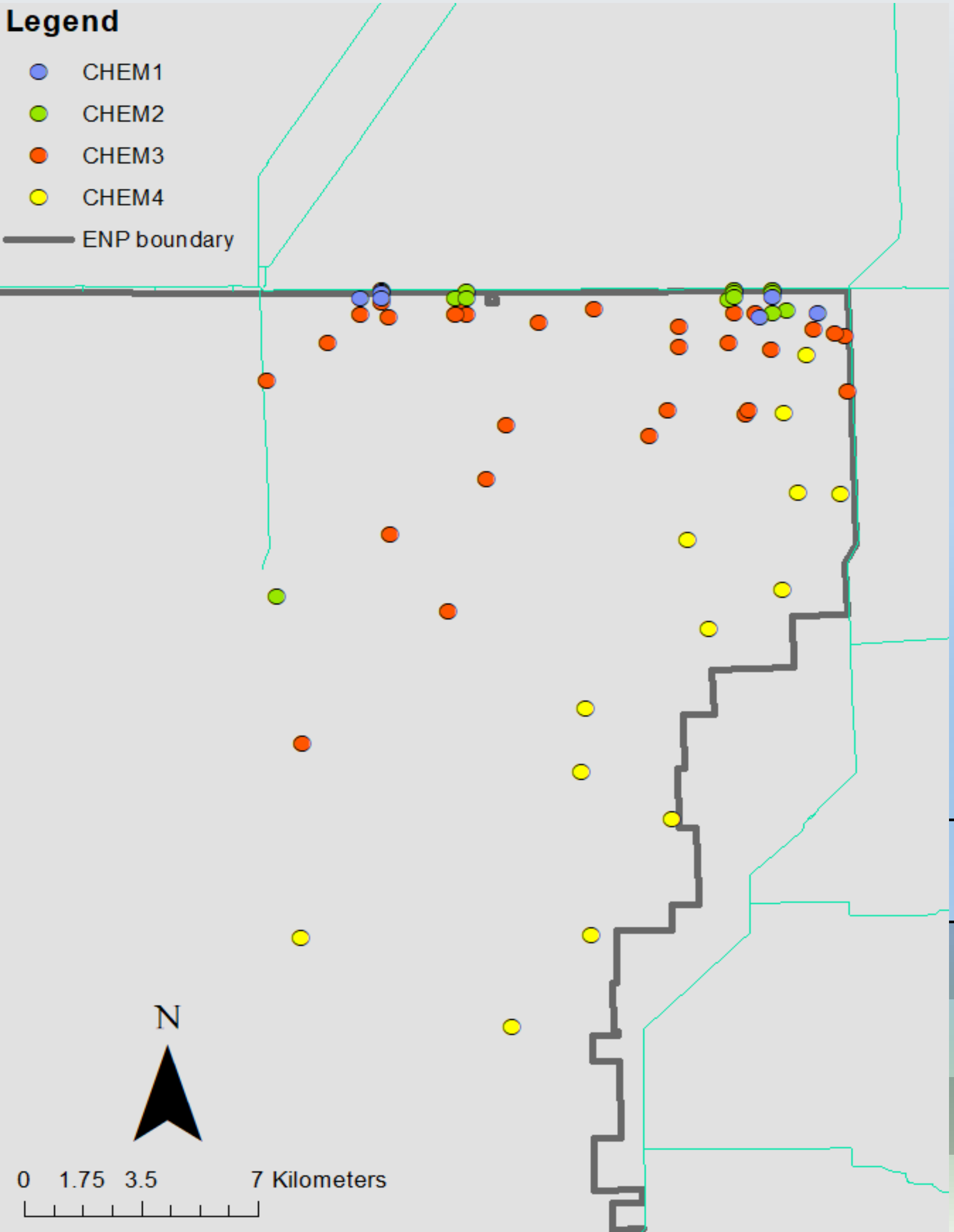
Rehydration of NESRS – hydrology

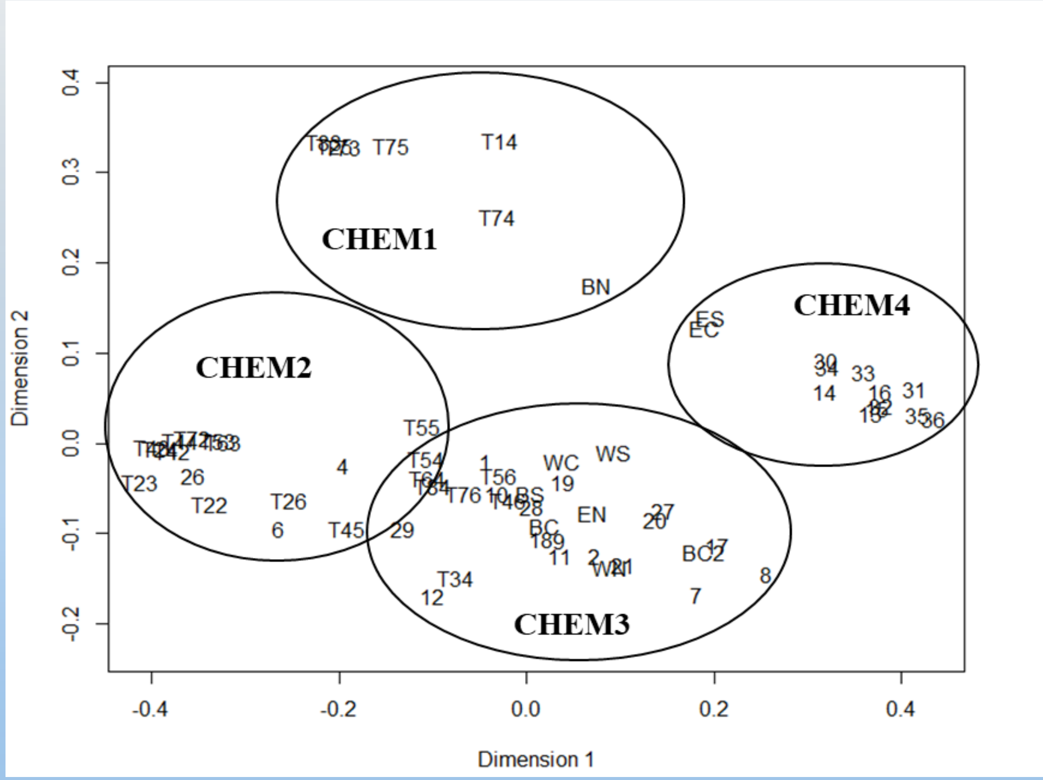
Between 2015 and 2021:

- Mean **hydroperiod** increased from 292 to 344 days (+17%)
- Mean **days since dry-down** increased from 165 to 465 days (+182%)
- Mean **dry-down duration** decreased from 113 to 44 days (-61%)
- Mean **water depth** increased from 14 to 55 cm (+293%)



Rehydration of NESRS – site clustering





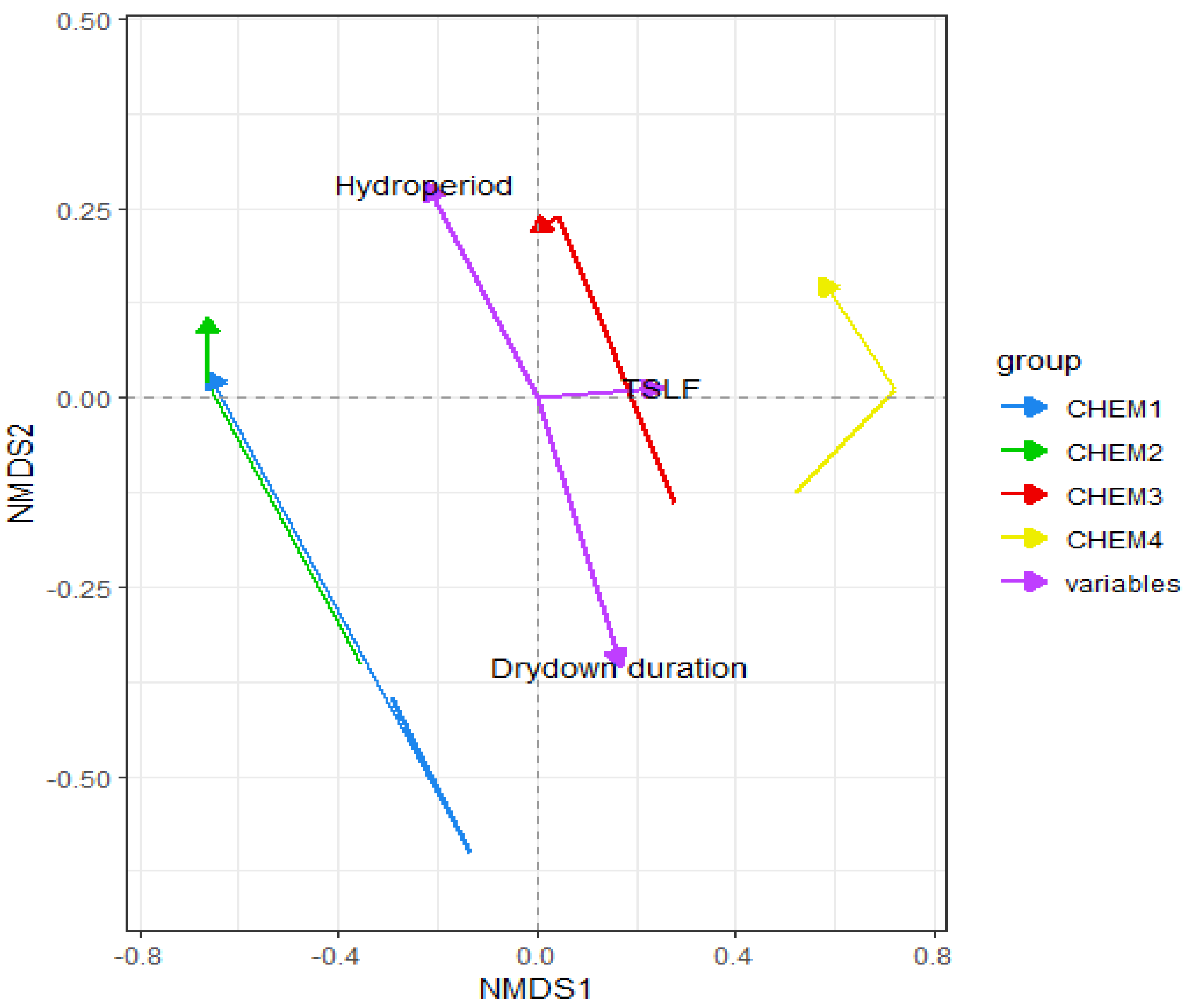
Site Group	Distance from inflow (km)
CHEM1	0.40 ± 0.33
CHEM2	0.31 ± 0.31
CHEM3	2.86 ± 3.15
CHEM4	12.02 ± 6.76

Rehydration of NESRS – biogeochemistry

- Non-metric multidimensional scaling (NMDS) ordination (2015 > 2018 > 2021)

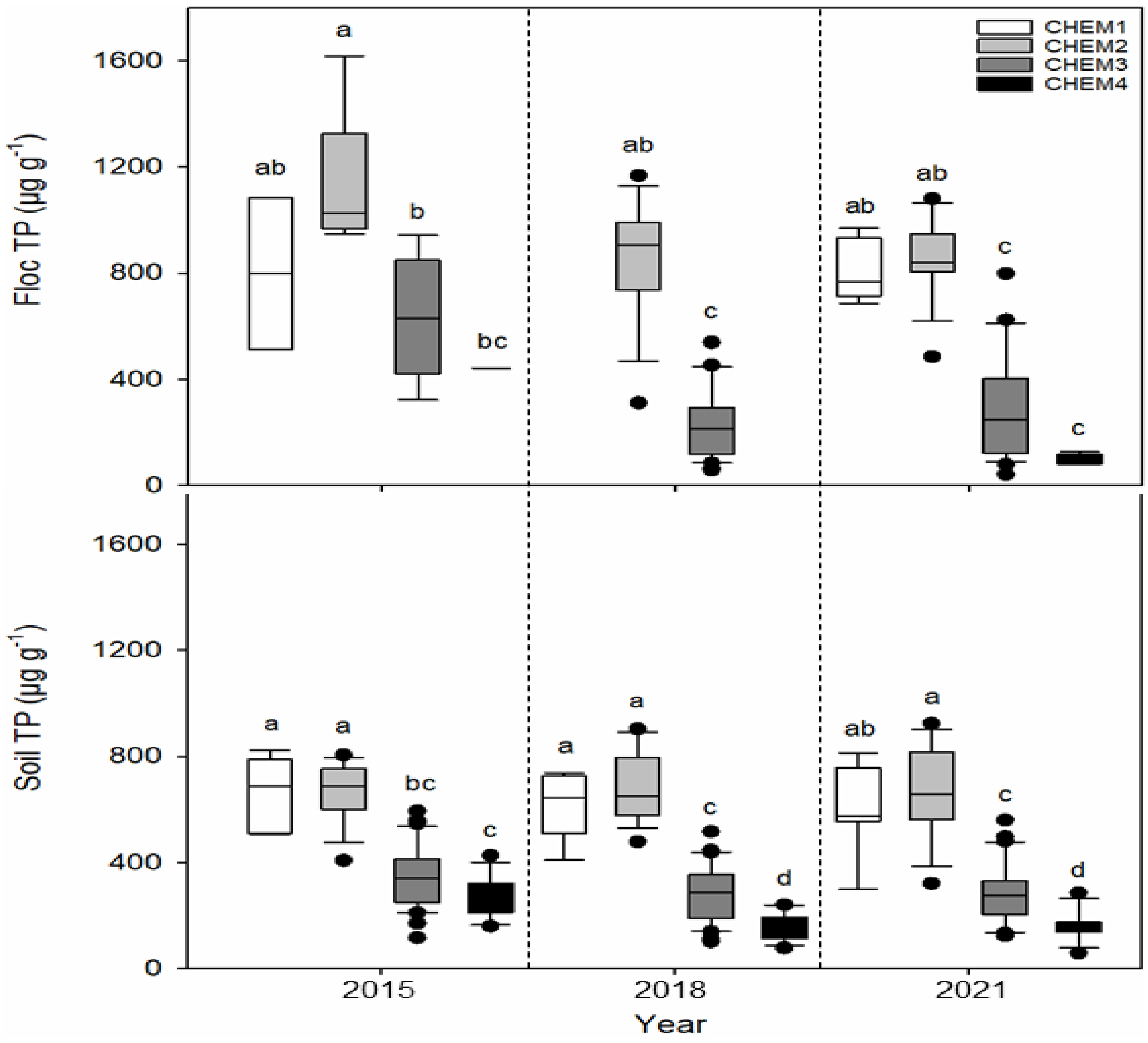
- TC, TN, and TP concentrations in the soil, floc, and periphyton were used for biogeochemical characterization

- Biogeochemistry of all four groups shifted in the direction of increasing hydroperiod and of decreasing dry-down duration



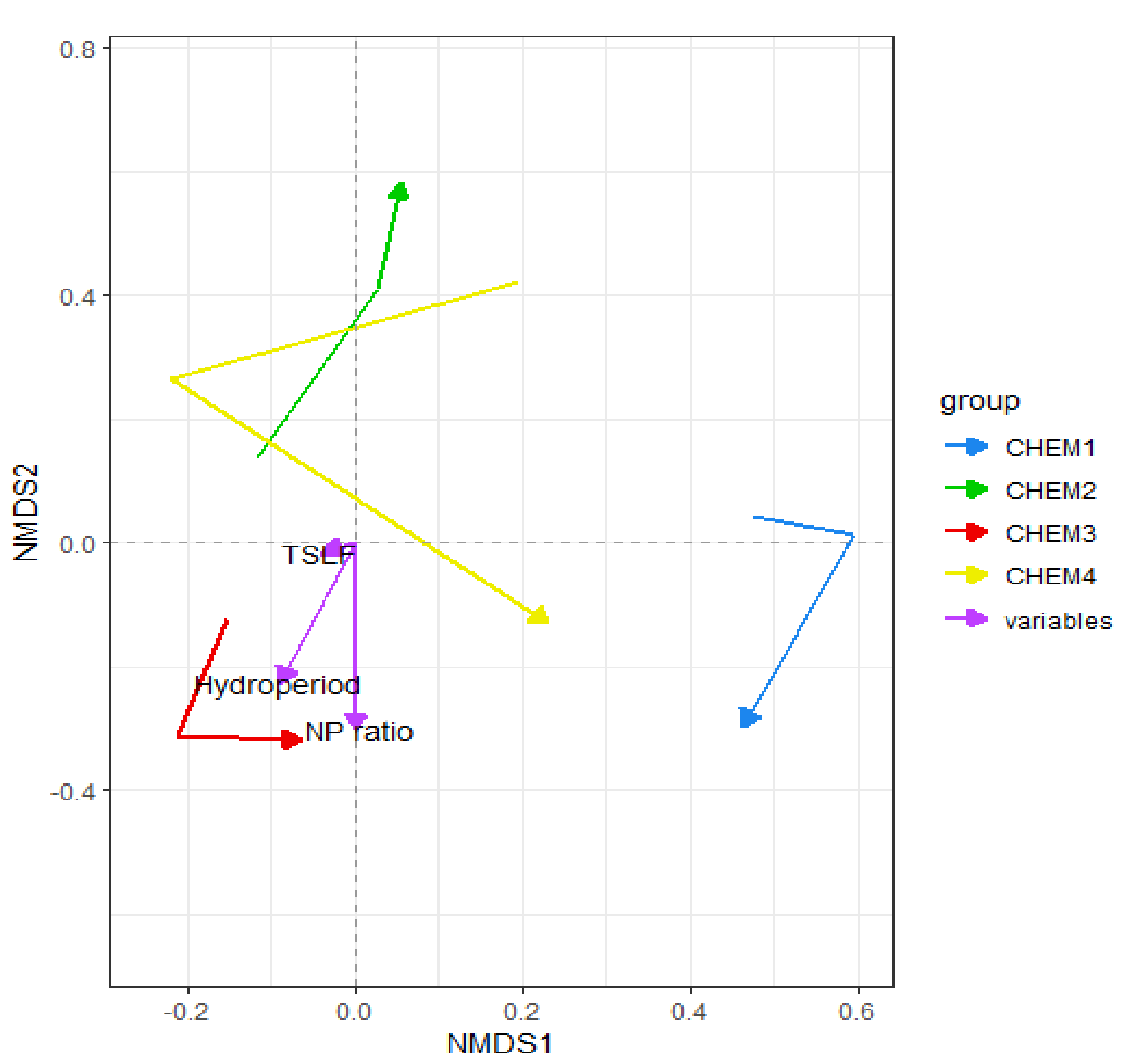
Rehydration of NESRS – biogeochemistry

- Floc and soil TP remained stable at sites in proximity of the water inflow source (L-29 canal)
- Floc and soil TP decreased at sites further away from the water inflow source (L-29 canal)
- The decrease in soil TP resulted in increased soil C:P and N:P ratios



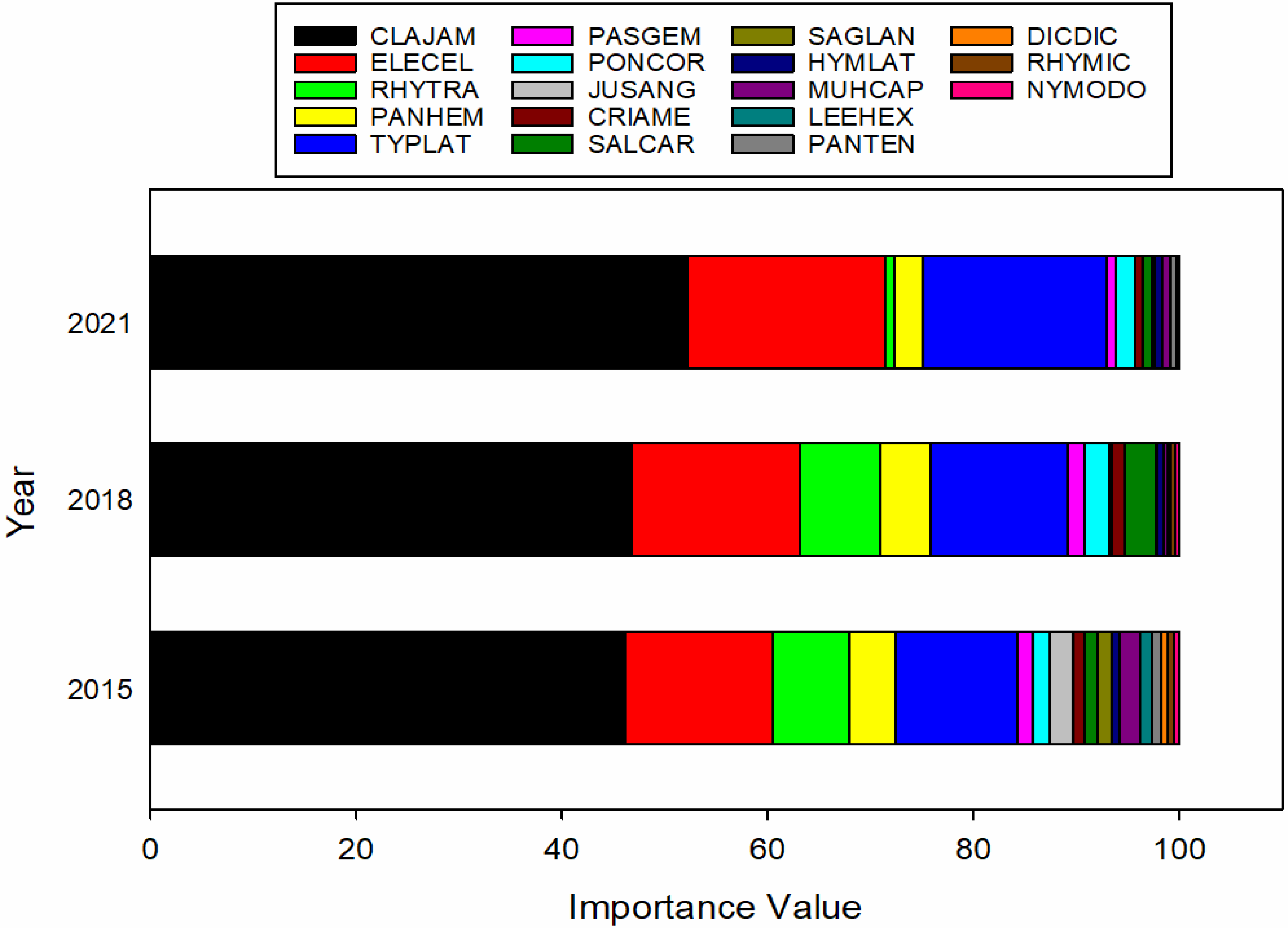
Rehydration of NESRS – vegetation changes

- Non-metric multidimensional scaling (NMDS) ordination (2015 > 2018 > 2021)
- Importance values of 18 macrophyte species were used to characterize the vegetation communities
- Vegetation in CHEM1 and CHEM3 shifted in the direction of increasing hydroperiod
- Vegetation in CHEM2 shifted in the direction of decreasing soil N:P ratios and decreasing TSLF
- Vegetation in CHEM4 sites underwent a strong change, driven by increasing hydroperiod and increasing soil N:P ratios



Rehydration of NESRS – vegetation changes

- Short-hydroperiod species (e.g., *M. capillaris*) abundance decreased substantially
- Intermediate-hydroperiod species (e.g., *R. tracyi*), after initially shifting away from canal inflow, underwent a strong reduction
- Long-hydroperiod species (e.g., *C. jamaicense*, *E. cellulosa*, and *Typha*) abundance increased
- *E. cellulosa* steadily expanded at sites further away from canal inflow



Rehydration of NESRS – observations

- Changes in water deliveries to NESRS have expanded the proportion of the landscape experiencing high water depths and long hydroperiods.

- The increases in soil C:P and N:P ratios, together with decreases in soil TP concentrations, may indicate re-initiation of peat accretion in the areas further away from canal inflow.

- After six years of hydrologic restoration, apart from some areas in proximity of inflow points where fire occurrence interacted with pre-existing degraded conditions, favoring the expansion of invasive vegetation, in general, native, long-hydroperiod macrophyte species expanded and replaced short- and intermediate-hydroperiod species.

- Although water deliveries to NESRS were in several instances above the limit established to prevent eutrophication, the natural landscape demonstrated great assimilation capacity and resiliency by showing reduced rather than increased eutrophic conditions and expansion of native, hydric communities in most of the region.

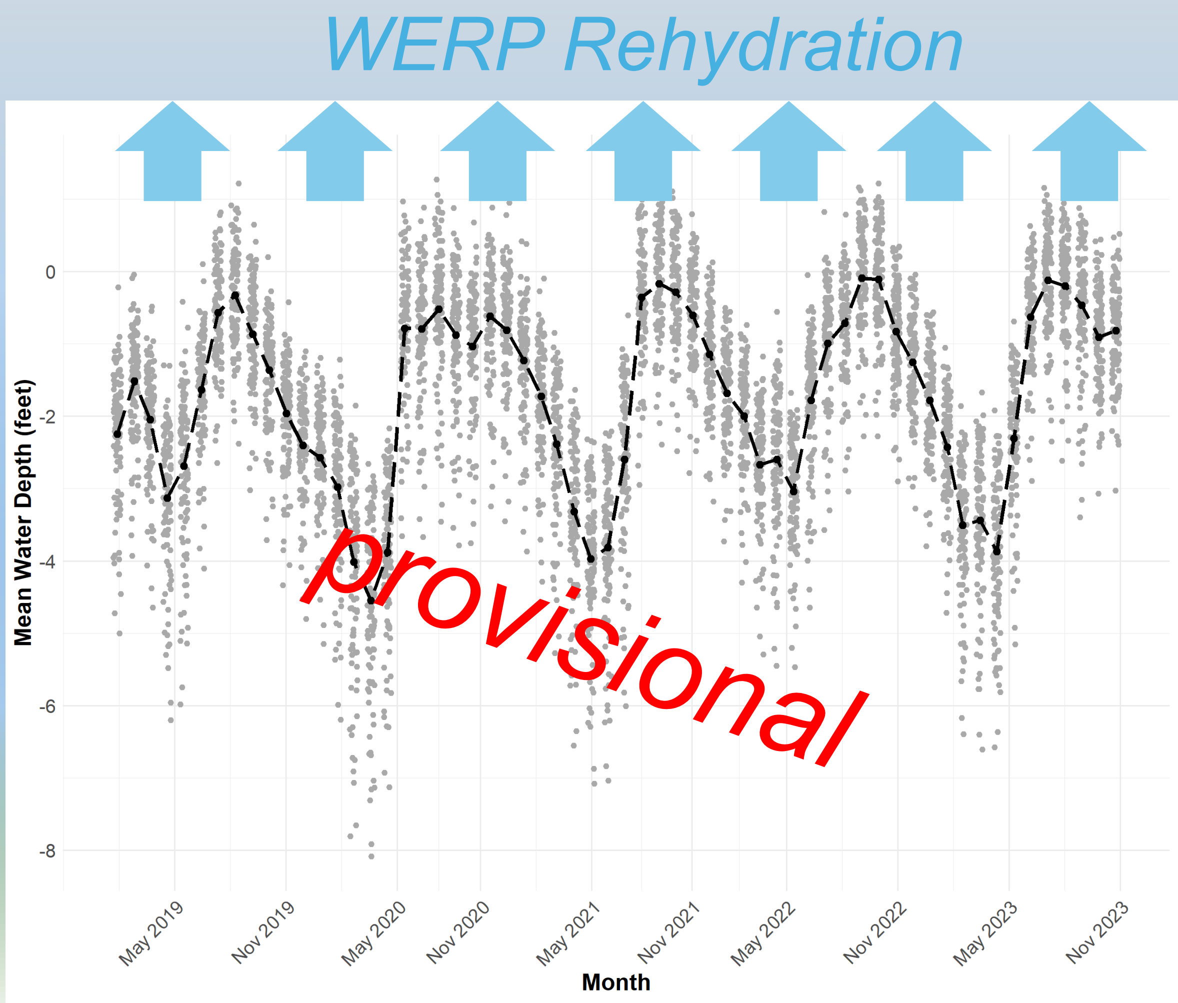
before rehydration

after rehydration

WERP Hypothesis – Seminole

Based on the NESRS observations and following rehydration of the Big Cypress native area, we expect:

- An extension of hydroperiods and higher water depths throughout the landscape
- A shift of vegetation back to a higher proportion of cypress and marsh communities
- Accumulation of carbon at the landscape scale, diluting the nutrient signals



Restoration Stewardship to Build Resiliency

What we **learned** to help build a restored, resilient ecosystem:

- Patch-scale actions are important but, in general, rather than micromanage the system, we should trust the natural dynamics and landscape processes to work out and unfold
- Good water quality is important, but allowing some flexibility in water quality limits to prioritize rehydration seem to be within the ecosystem assimilative capacity and resiliency

What we **hope** to help build a restored, resilient ecosystem:

- Holistic insights that inform management strategies and that transcend boundaries
- Effective array of management tools that can be applied at landscape- and patch-scales to support ecosystem natural dynamics
- Connection with the community, their history, and sense of the future

We are ready to walk into the marshes together, led by the youth,
informed by expertise, and under the gaze of our elders and ancestors

Thank you for attending

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