GEER 2017

Greater Everglades Ecosystem Restoration

Advancing Science, Restoring the Everglades

Session # 39

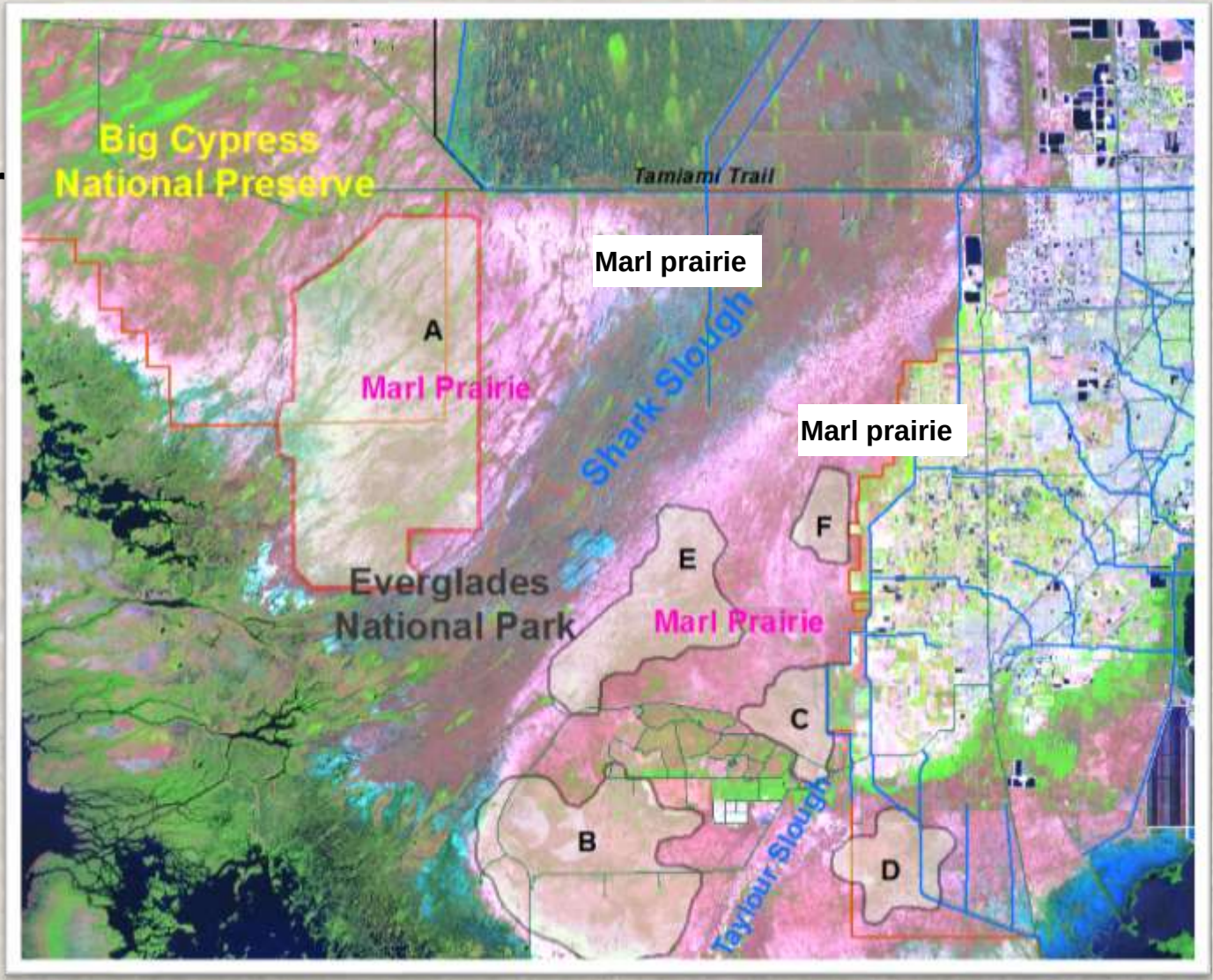
Marl Prairie Landscape: Its Ecology and Importance in Everglades Restoration

April 20, 2017
(1:20 – 3:00 PM)

Organizers:
Jay P. Sah
Jesse Blanchard

Session # 39: Marl Prairies Landscape

- **Flank both sides of Shark River and Taylor Sloughs**
- **Short to moderate hydroperiod**
- **Have thin calcitic soils underlain by limestone bedrock**



Habitat of Cape Sable seaside sparrow (CSSS) (*Ammodramus maritimus mirabilis*): a federally listed endangered species.

Session # 39: Marl Prairies Landscape

Digitaria pauciflora

Muhly grass

Periphyton mat

Sinkhole

Fire & flooding

Session # 39: Marl Prairies Ecology

Jay Sah - Marl Prairie Landscape as the Cape Sable seaside sparrow Habitat: the Pivot of Hydrologic Restoration in Southern Everglades

James Snyder - The Response of Muhly Grass (*Muhlenbergia capillaris* var. *filipes*) , a Prairie Dominant, to Fire and Flooding

Thomas Virzi - Next Steps Towards Recovery of the Cape Sable Seaside Sparrow

Jesse Blanchard - Fish in Marl Prairies: Disturbance Severity, Invasions, Traits and Emergent Community Structure

Jimi Sadle - Someone has to Watch the Crabgrass Grow: A Survey of Potential Effects of Hydrologic Restoration on Marl Prairie Plant Species

MARL PRAIRIE LANDSCAPE AS THE CAPE SABLE SEASIDE SPARROW HABITAT: THE PIVOT OF WATER MANAGEMENT ACTIVITIES IN SOUTHERN EVERGLADES

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(Retired)
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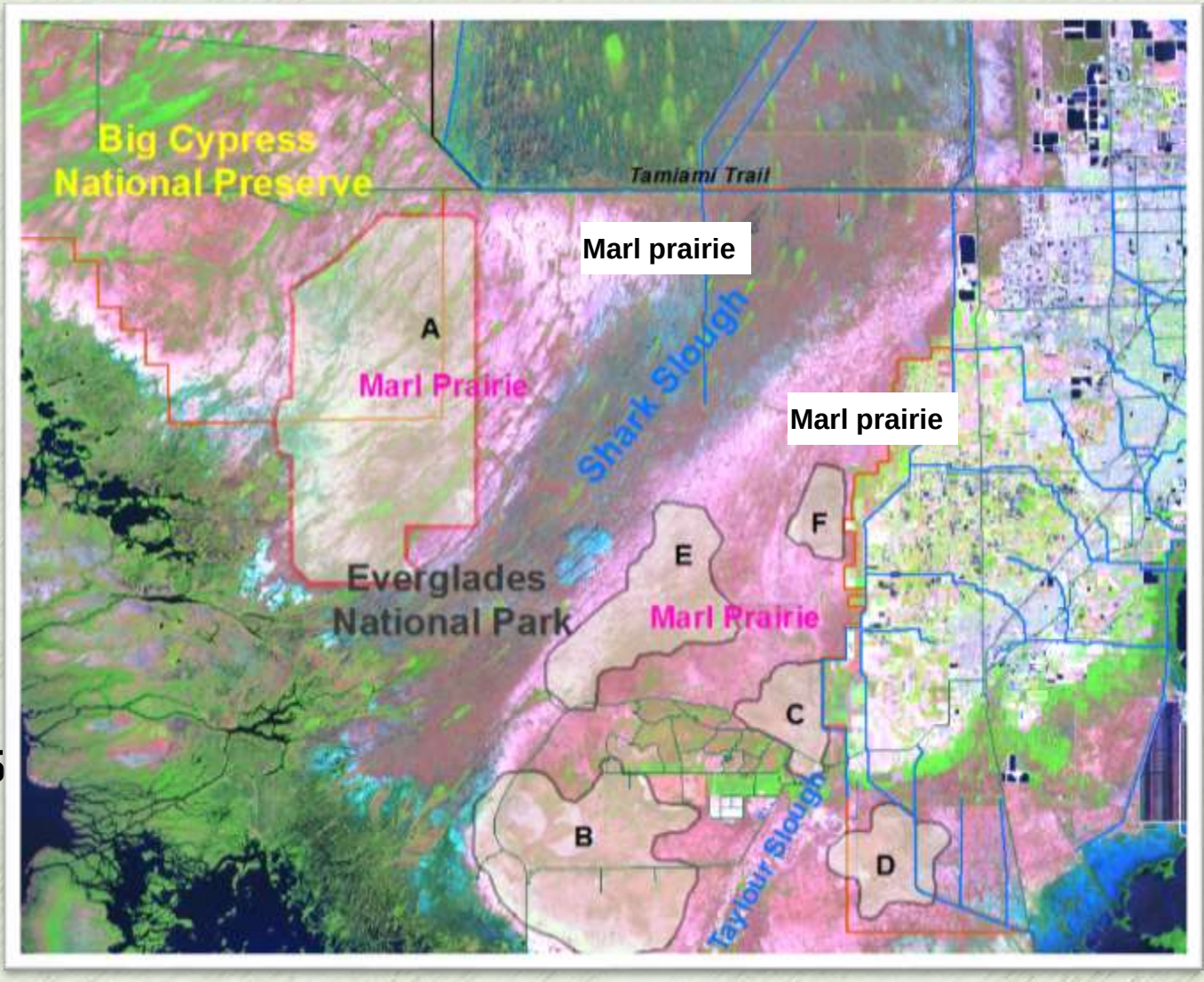
Marl prairie landscape

- Both sides of Shark River and Taylor Sloughs
- Short to moderate hydroperiod
- Have thin calcitic soils underlain by limestone bedrock
- Vegetation primarily of grasses and sedges from 0.5 to 1.5 m in height

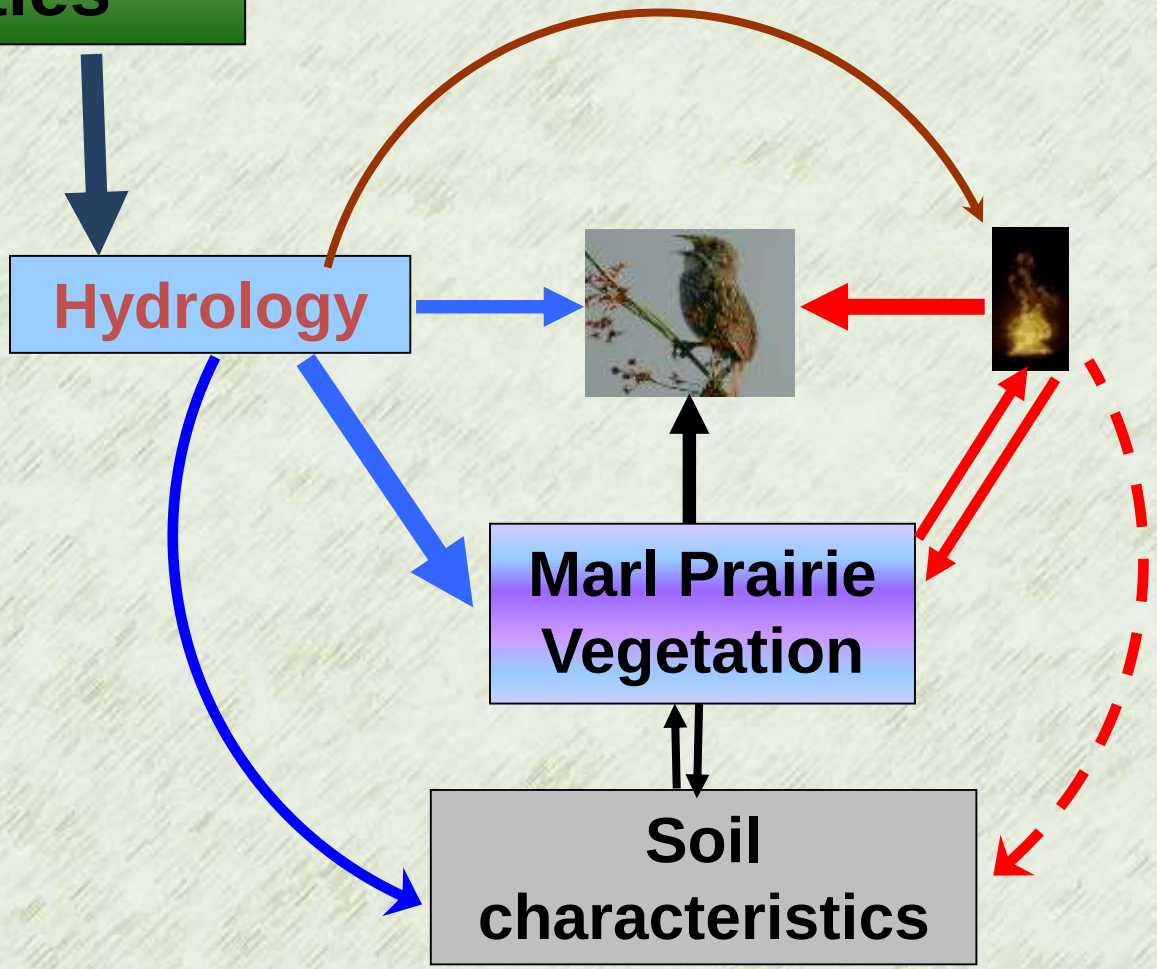


Habitat of Cape Sable seaside sparrow (CSSS) (*Ammodramus maritimus mirabilis*): a federally listed endangered species.

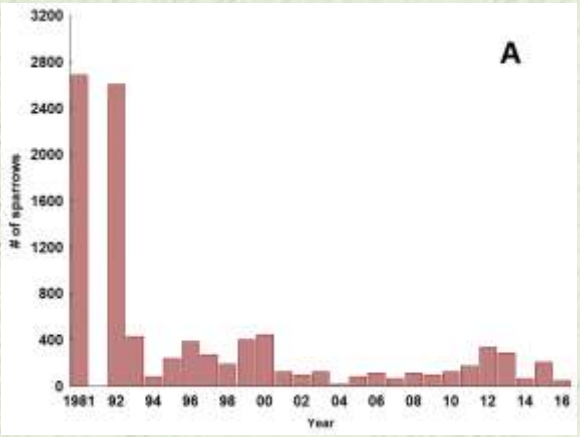
CSSS habitat & Water management activities

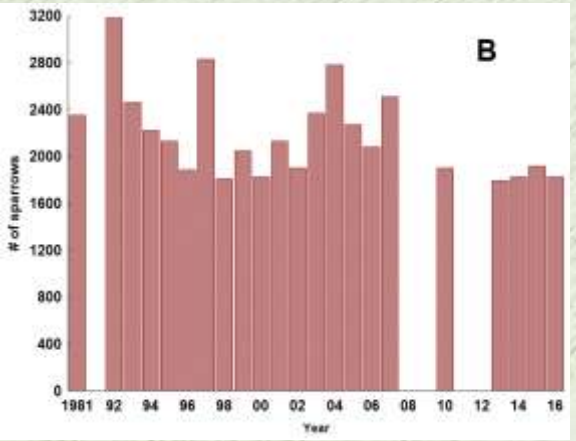
Management/ Restoration Activities

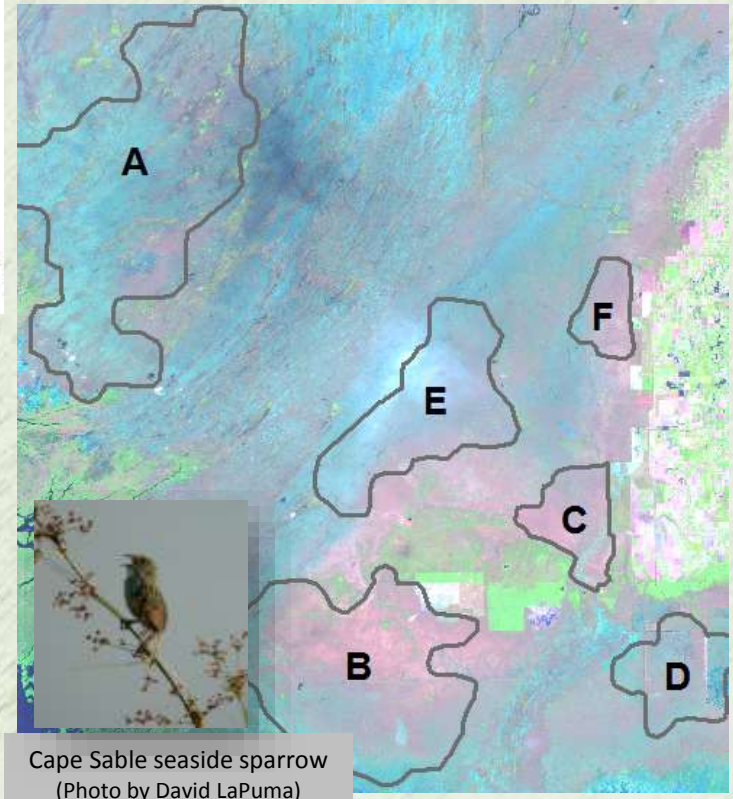
CSSS in its habitat



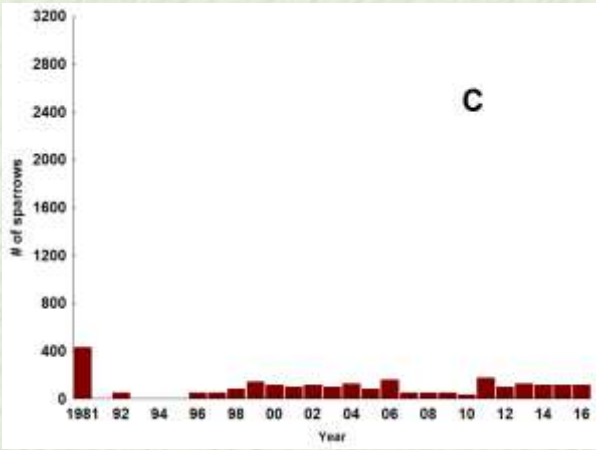
Cape Sable seaside sparrow sub-populations

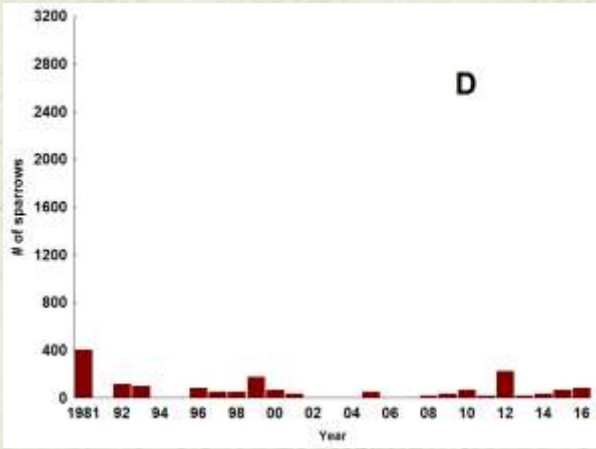


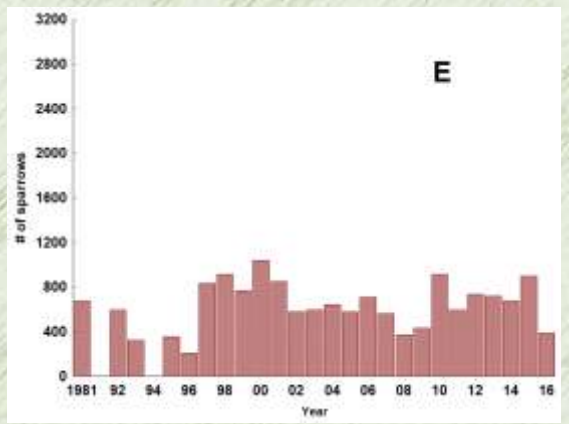


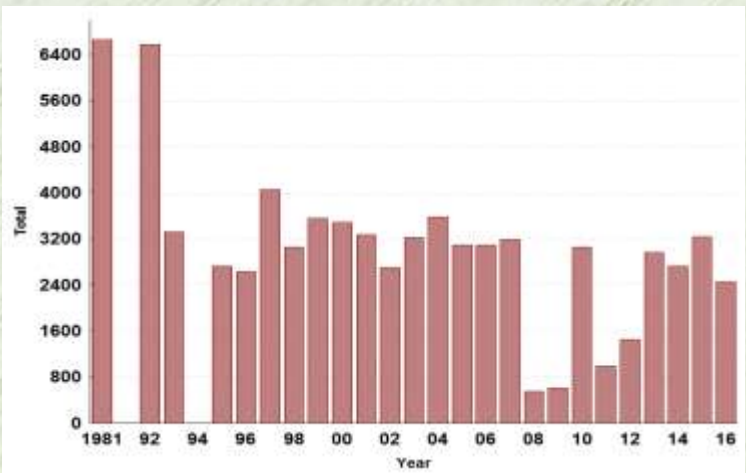


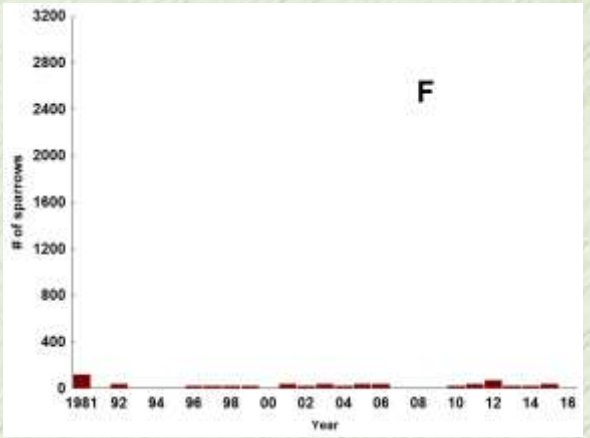
Cape Sable seaside sparrow
(Photo by David LaPuma)

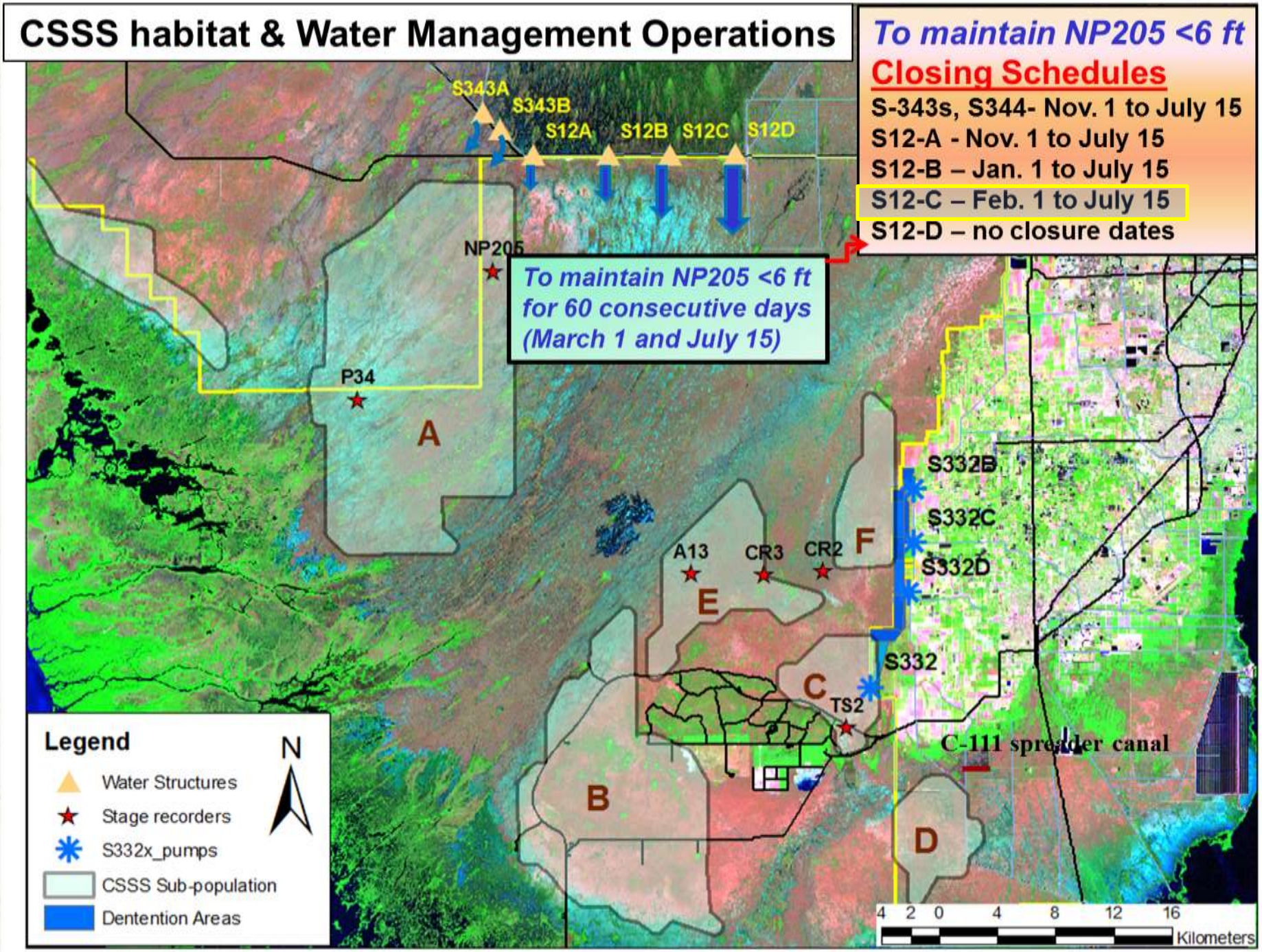




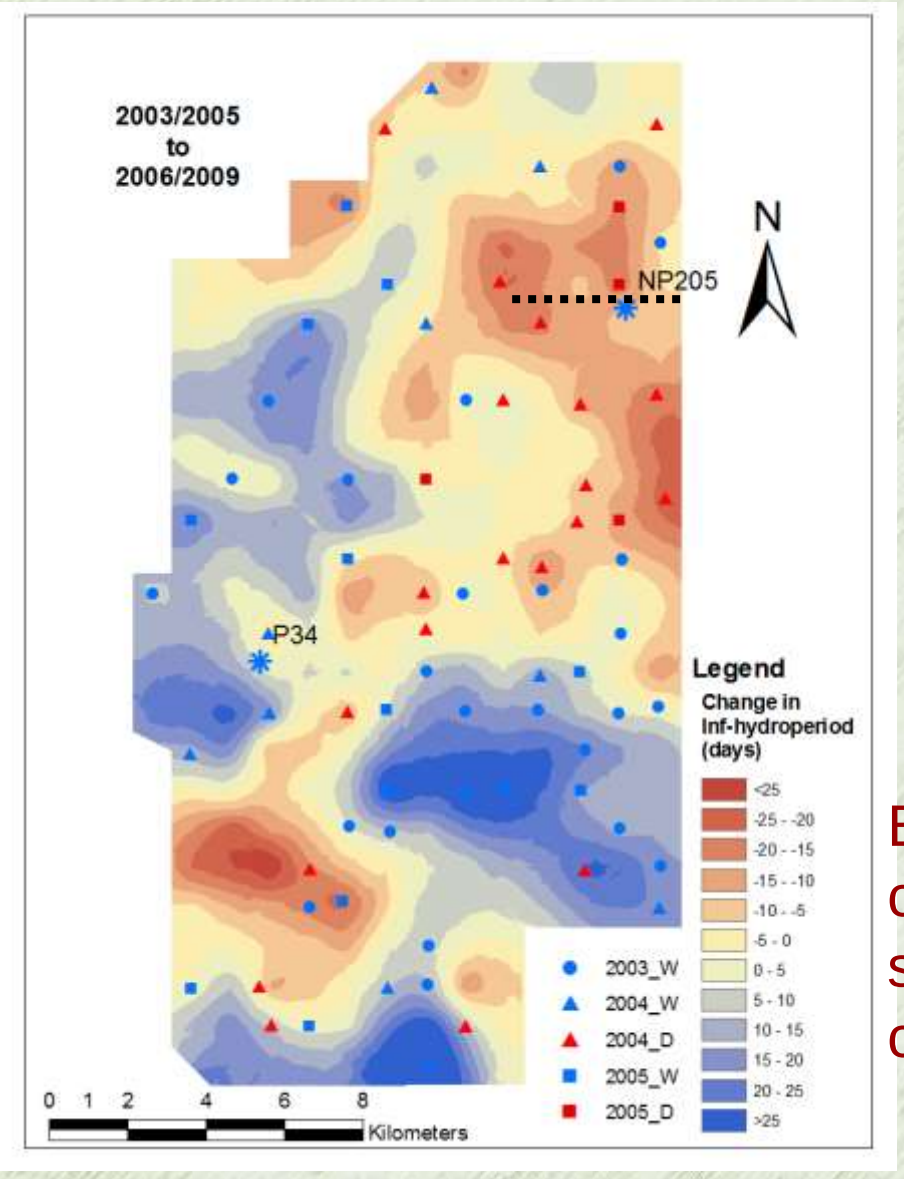


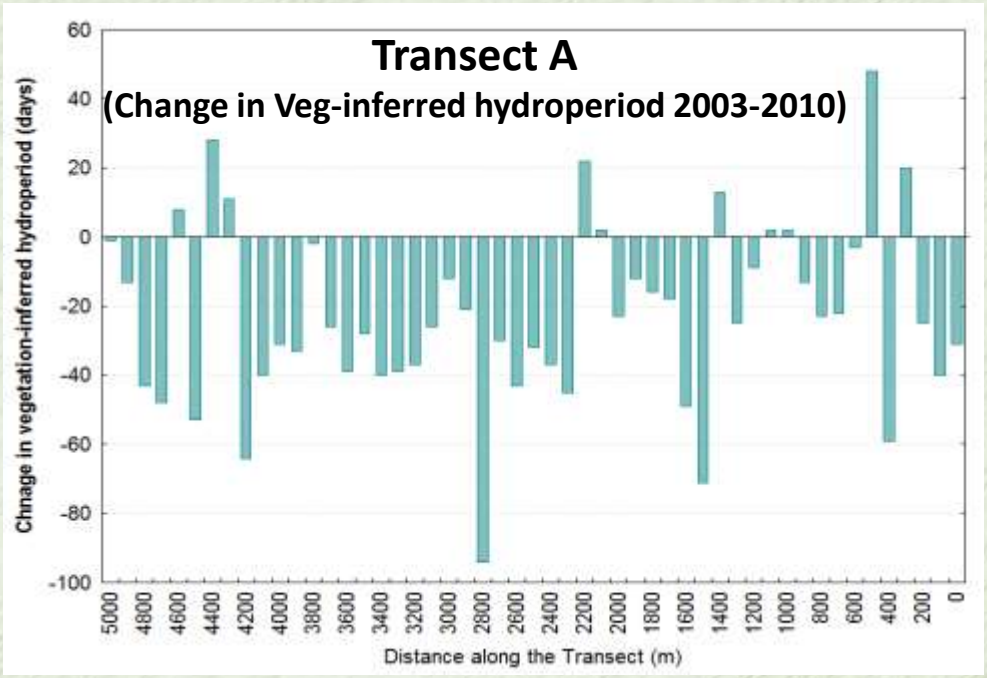




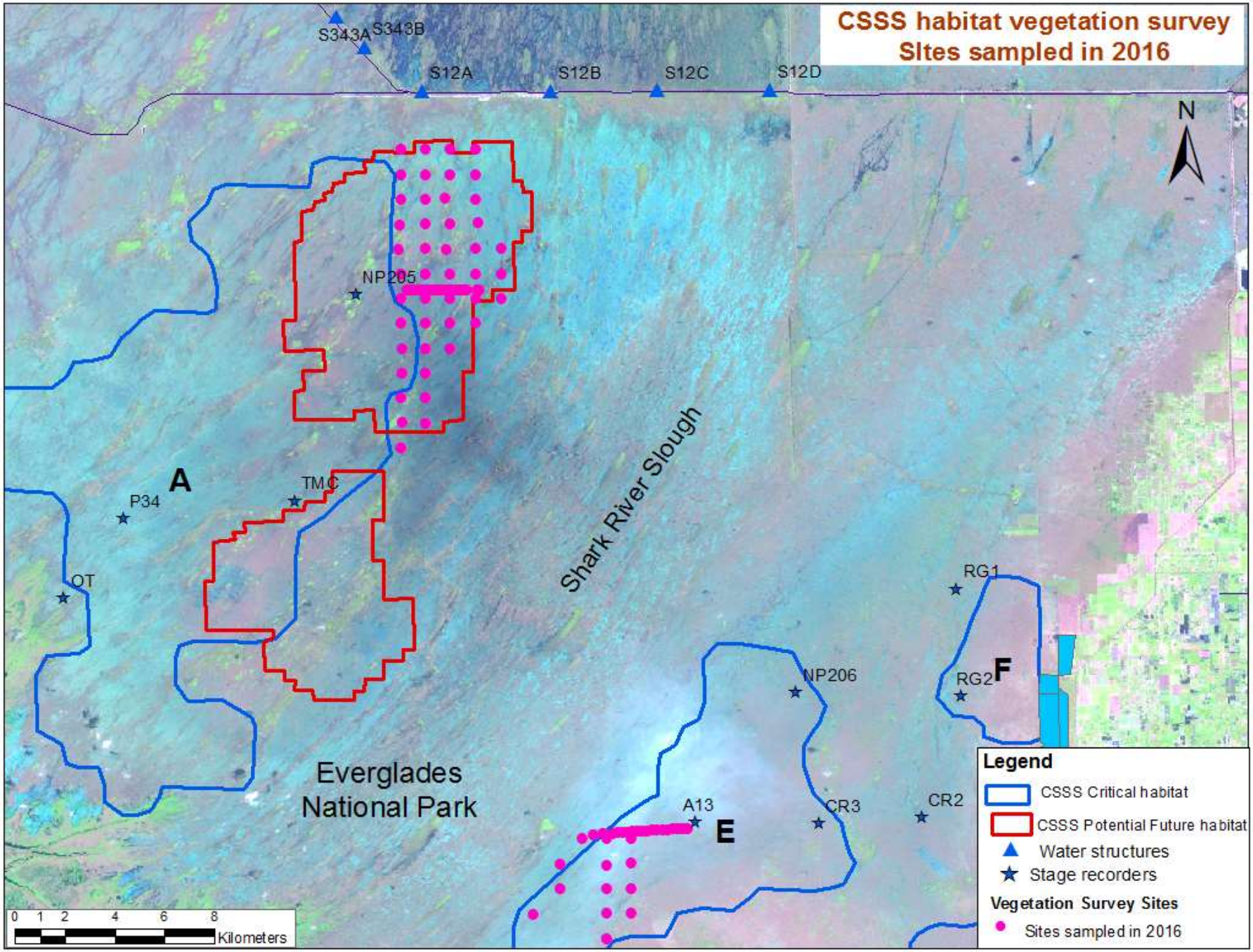

CSSS habitat & Water Management Operations
To maintain NP205 <6 ft
Closing Schedules
S-343s, S344- Nov. 1 to July 15
S12-A - Nov. 1 to July 15
S12-B – Jan. 1 to July 15
S12-C – Feb. 1 to July 15
S12-D – no closure dates
S343A
S343B
S12A
S12B
S12C
S12D
NP205
To maintain NP205 <6 ft
for 60 consecutive days
(March 1 and July 15)
P34
A
S332B
S332C
S332D
A13
CR3
CR2
F
E
S332
C
TS2
C-111 spreader canal
B
D
Legend
N
Water Structures
Stage recorders
S332x_pumps
CSSS Sub-population
Dentention Areas
4 2 0 4 8 12 16
Kilometers

Vegetation change in Sub-population A



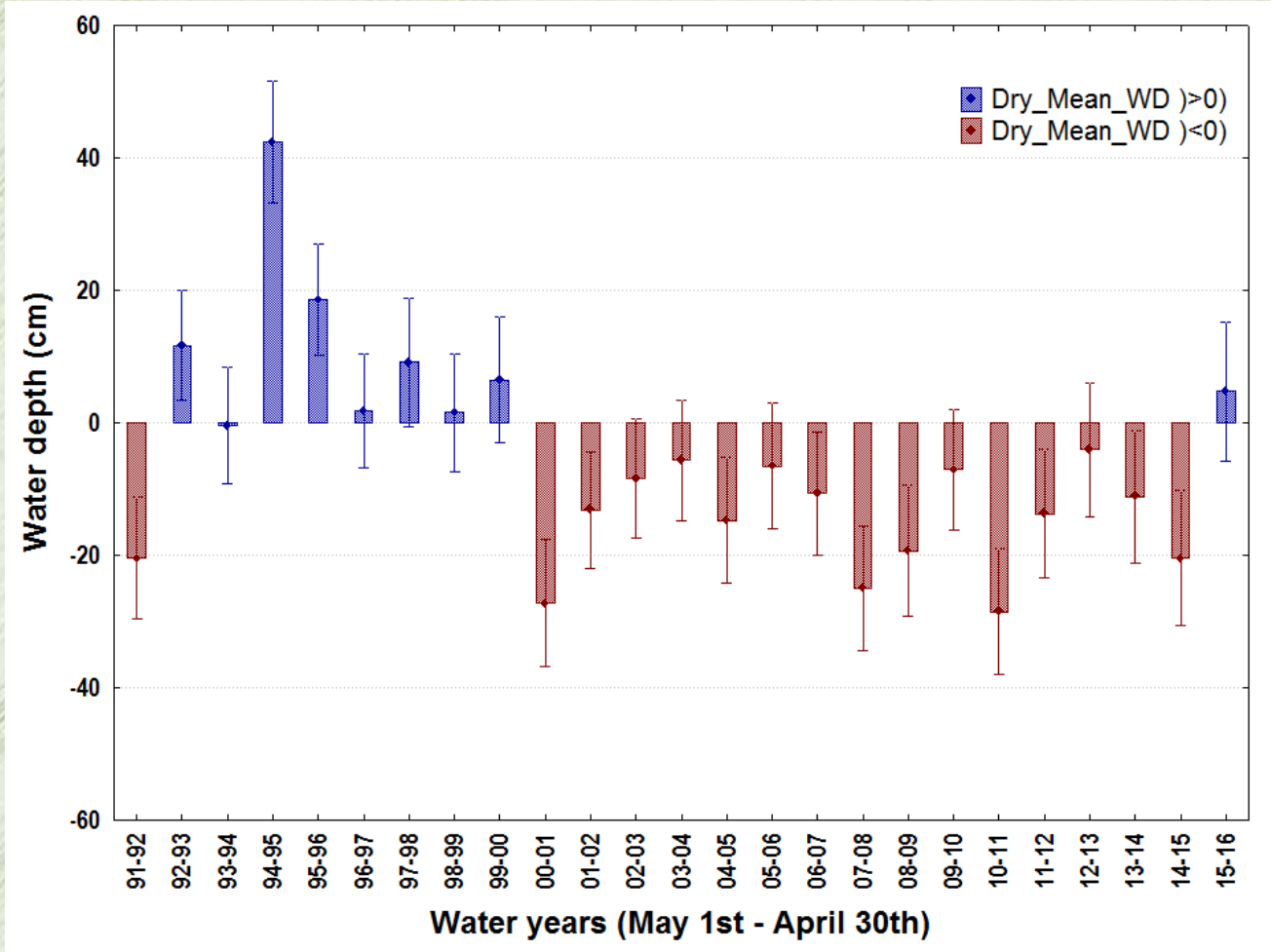


Between 2003 & 2009, vegetation change in Sub-population A was spatially differentiated responding to changes in hydrology


CSSS habitat vegetation survey
SIte sampled in 2016
S343A
S343B
S12A
S12B
S12C
S12D
N
NP205
A
TMC
P34
OT
Shark River Slough
RG1
RG2
F
NP206
Everglades
National Park
A13
E
CR3
CR2
0 1 2 4 6 8
Kilometers
Legend
CSSS Critical habitat
CSSS Potential Future habitat
Water structures
Stage recorders
Vegetation Survey Sites
Sites sampled in 2016

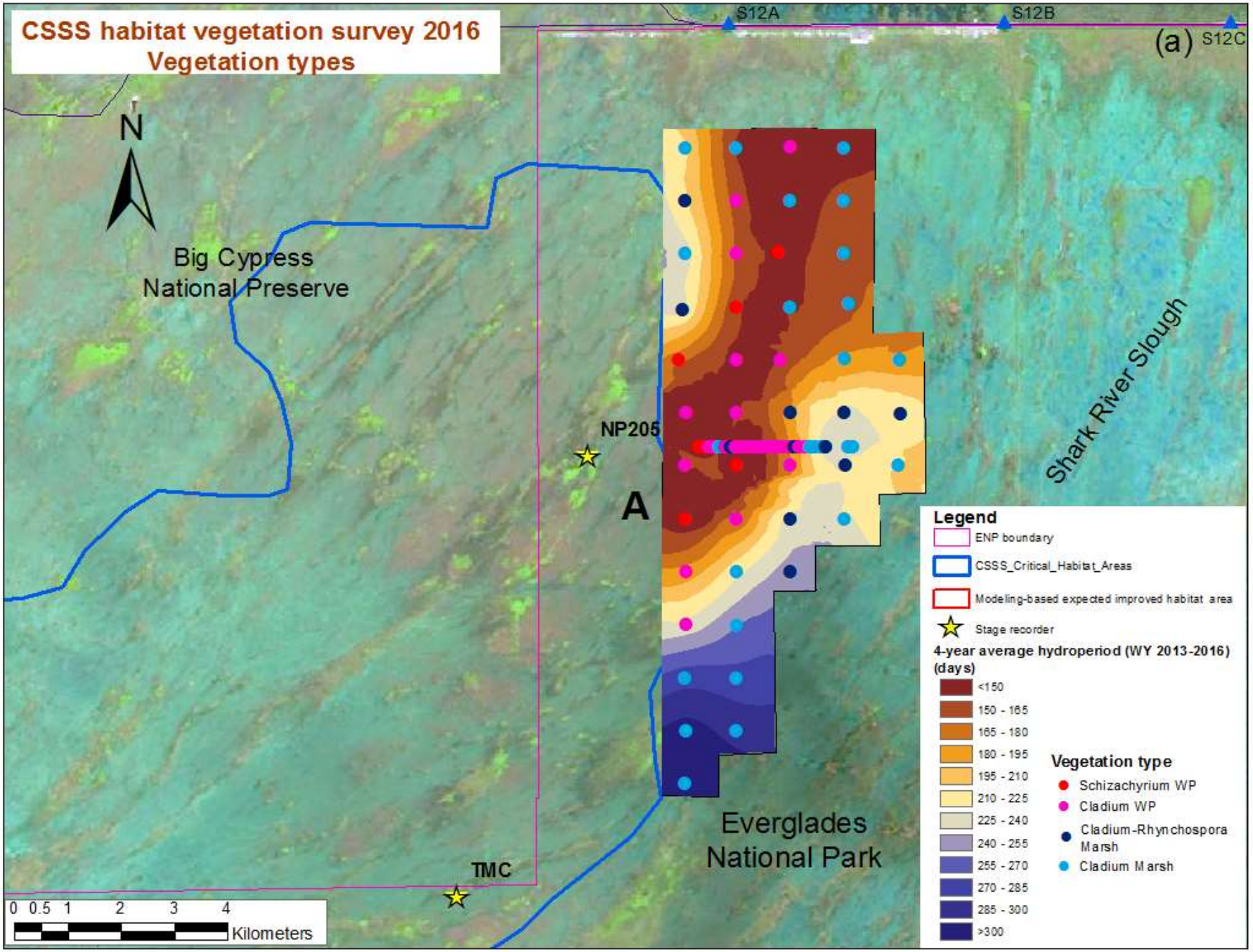
Hydrologic conditions

Mean water depth (cm)	Water management period		p-value
	WY 1992-2002	WY 2003-2016	
Annual	8.4 (± 8.7)	-3.2 (± 9.0)	<0.001
Wet Season	15.8 (± 8.6)	9.9 (± 8.6)	<0.001
Dry Season	2.8 (± 8.8)	-33.4 (± 8.9)	<0.001

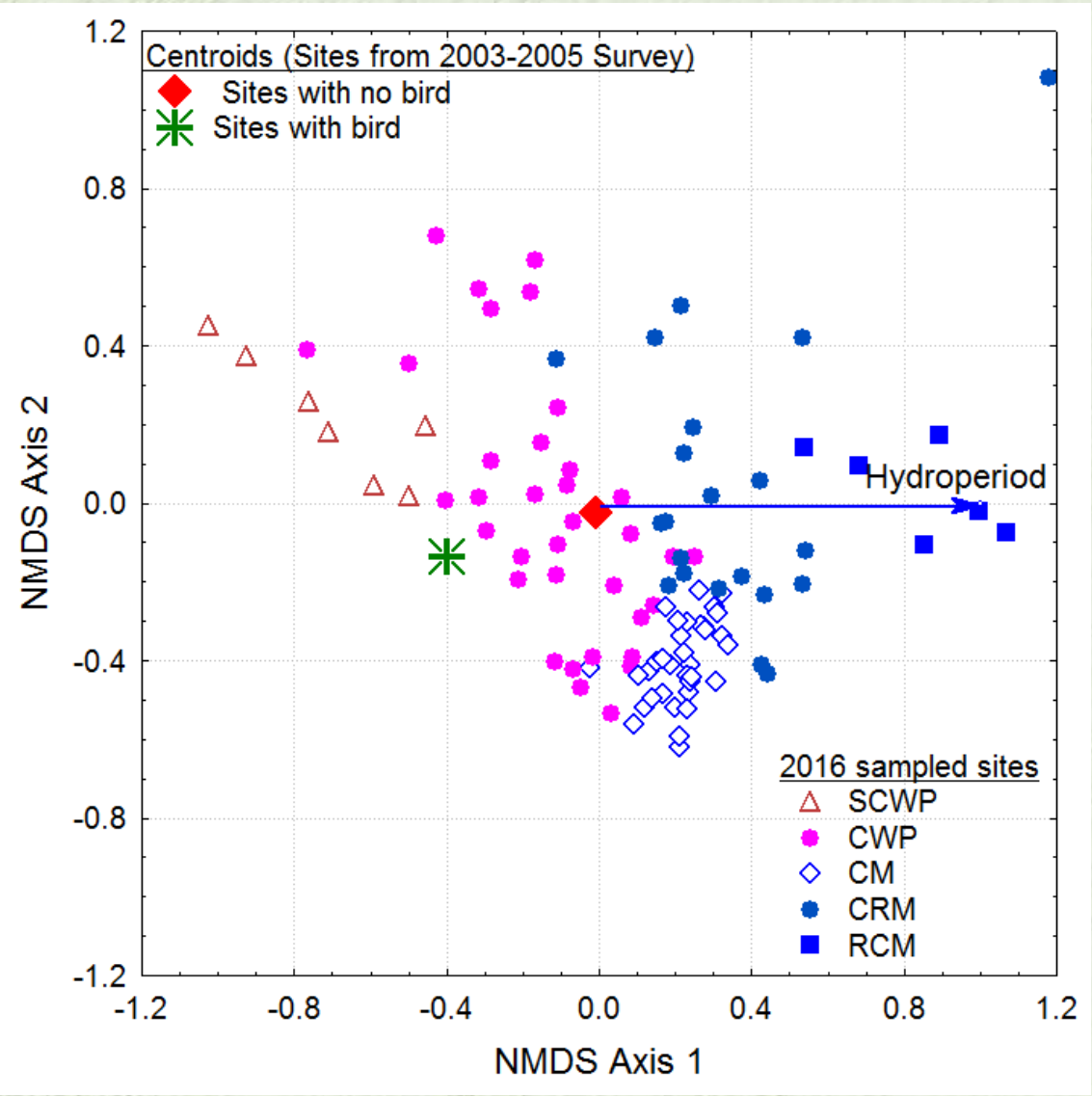


Mean annual as well as dry and wet season water depth was consistently low in recent years than in 1990s.

Dry season water level was lower mainly due to restriction on water delivery through S343s S344, & S12s.


CSSS habitat vegetation survey 2016
Vegetation types
S12A
S12B
S12C
(a)
N
Big Cypress
National Preserve
NP205
A
Shark River Slough
Everglades
National Park
TMC
0 0.5 1 2 3 4
Kilometers
Legend
ENP boundary
CSSS_Critical_Habitat_Areas
Modeling-based expected improved habitat area
Stage recorder
4-year average hydroperiod (WY 2013-2016) (days)
<150
150 - 165
165 - 180
180 - 195
195 - 210
210 - 225
225 - 240
240 - 255
255 - 270
270 - 285
285 - 300
>300
Vegetation type
Schizachyrium WP
Cladium WP
Cladium-Rhynchospora Marsh
Cladium Marsh

Vegetation Composition- based Habitat Suitability Index (VHSI)



Bray-Curtis (BC) similarity matrix calculated.

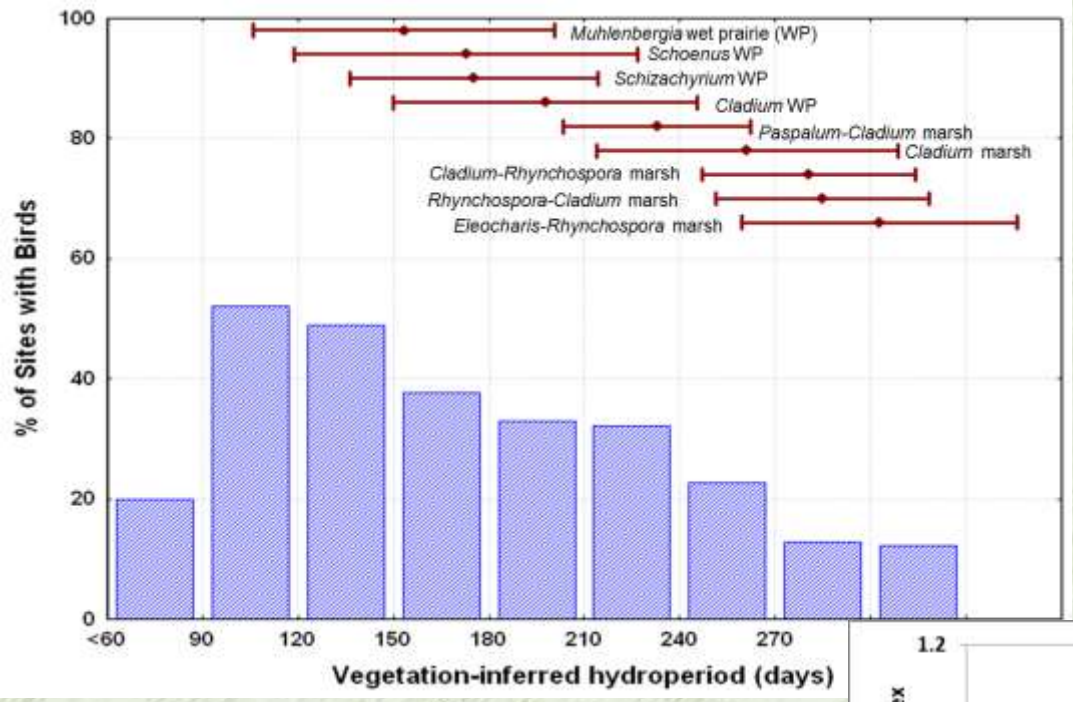
The 2003-2005 census sites classified into two groups: 1) CSSS-P and 2) CSSS-0 sites.

BC similarity between a 2016-Census site and 2003-2005 sites was averaged separately for CSSS-P and CSSS-0 sites.

Mean difference in similarity of a 2016-site with CSSS-P and CSSS-0 sites calculated.

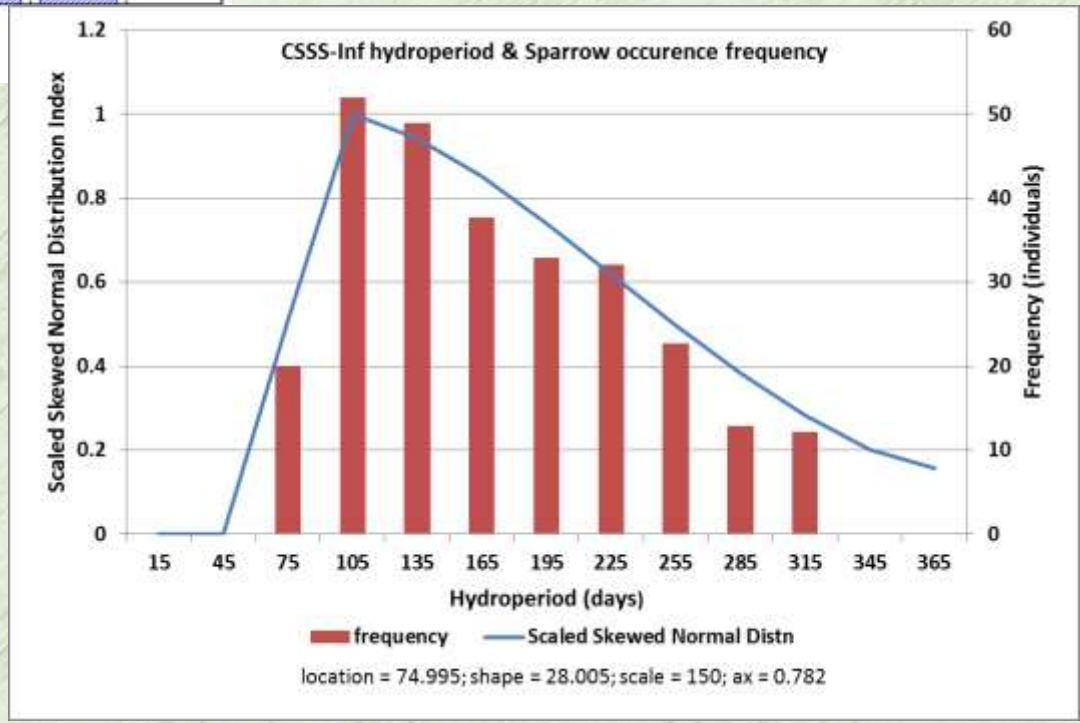
The difference valued standardized by the range of the differences and multiplied by 100.

Marl prairie vegetation & CSSS occurrence

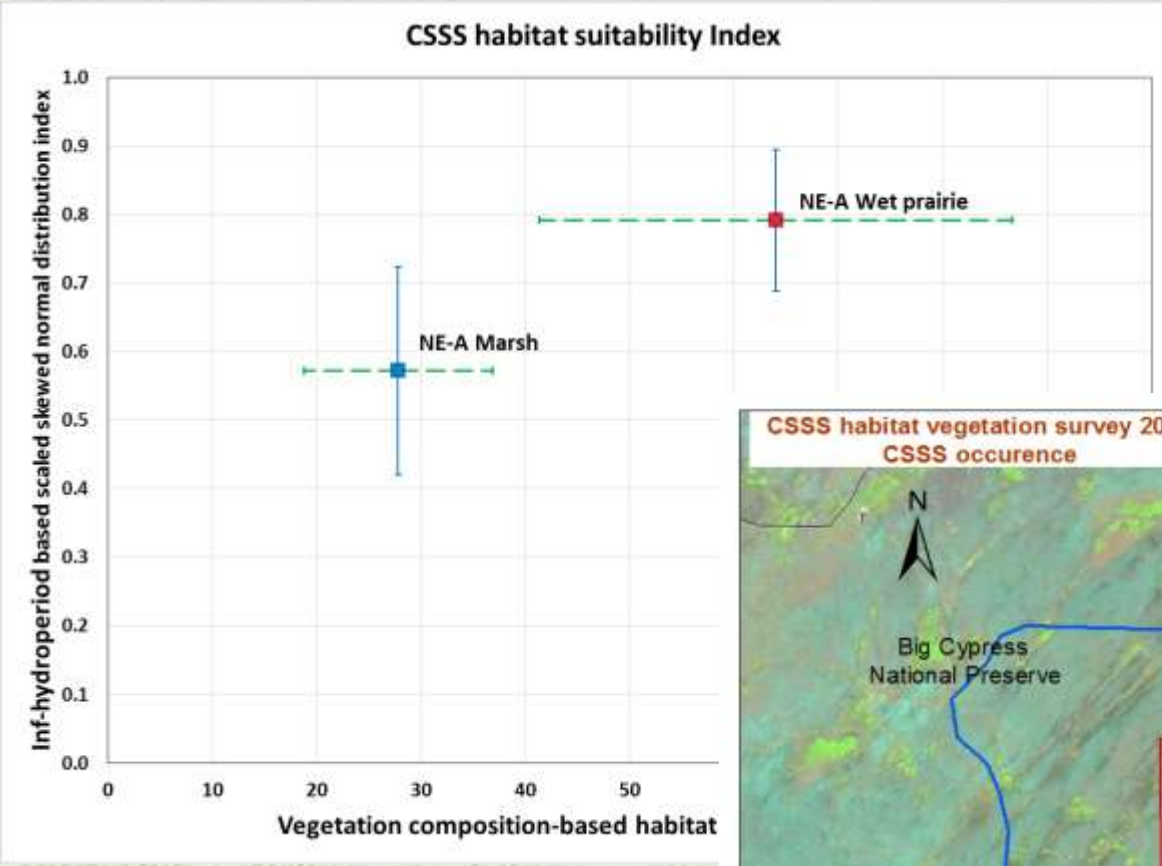


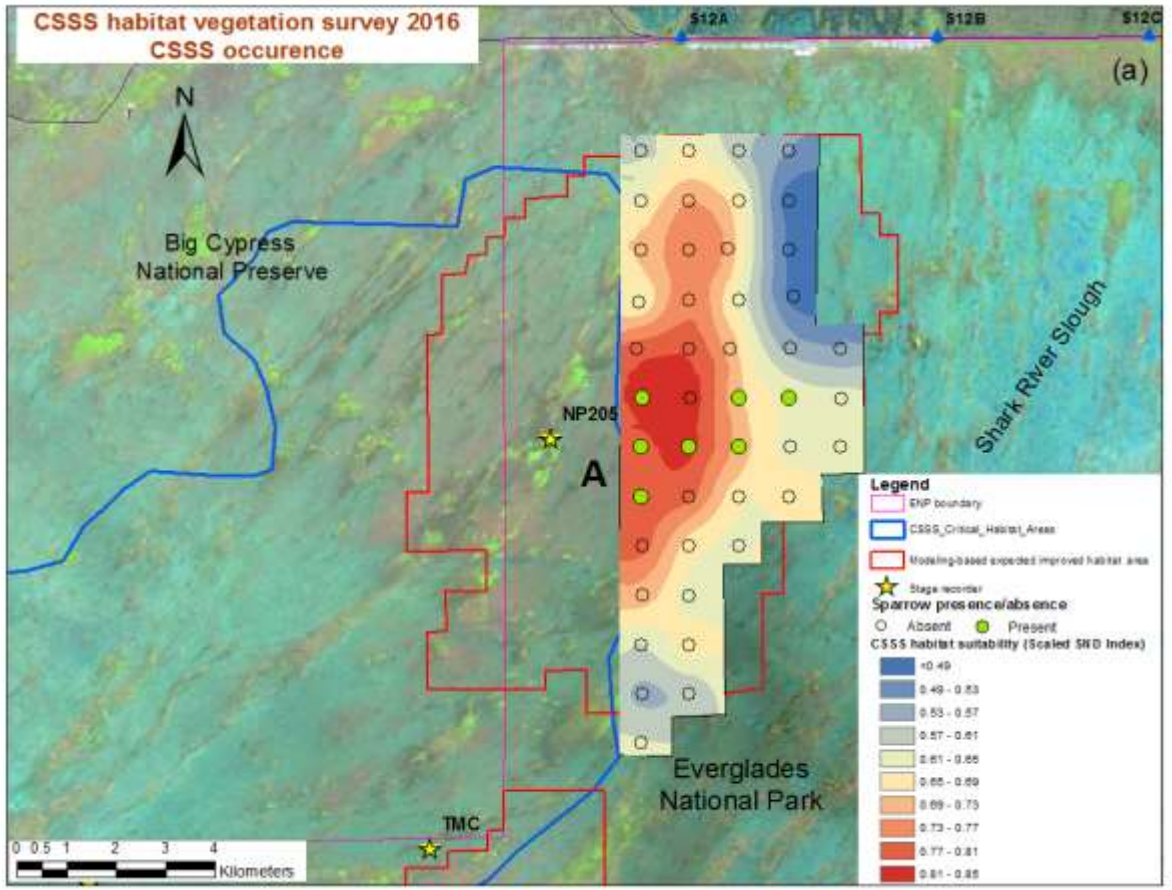
Scaled Skewed Normal Distribution (SND) Index

CSSS occupies the sites that are mostly dominated by Marl Wet Prairie vegetation with hydroperiod ranging between 90 and 240 days.



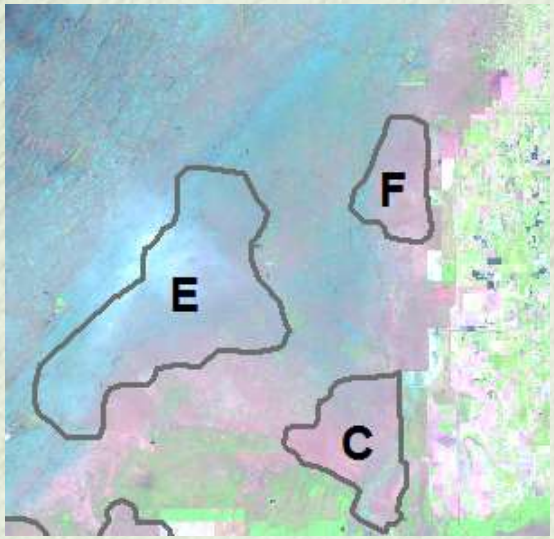
CSSS habitat suitability Index & CSSS occurrence after 2010

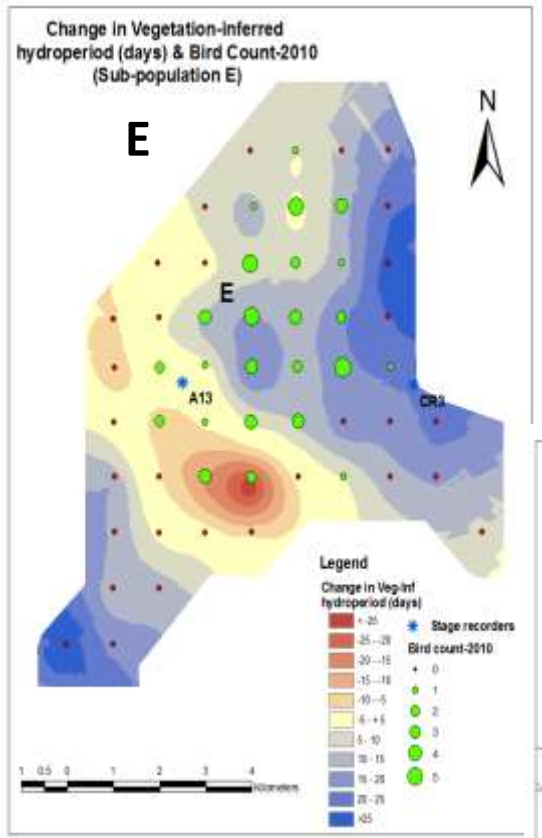


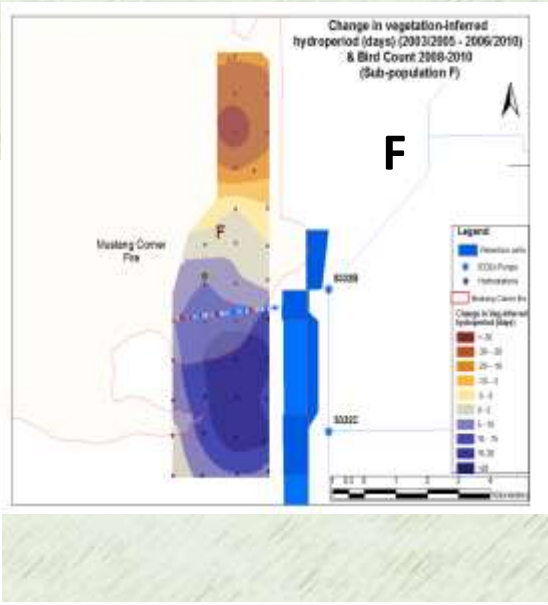


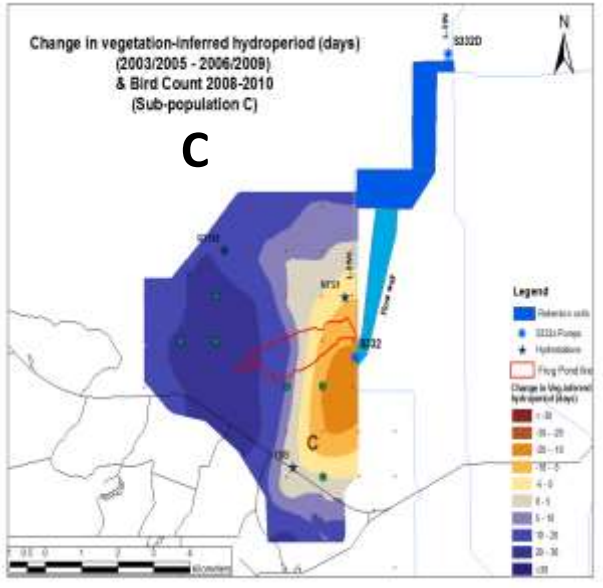
After 2010, in NE portion of sub-population A Sparrows were frequently recorded at wet-prairie sites with high Scaled SND Index.

Vegetation change in Sub-population C, E & F





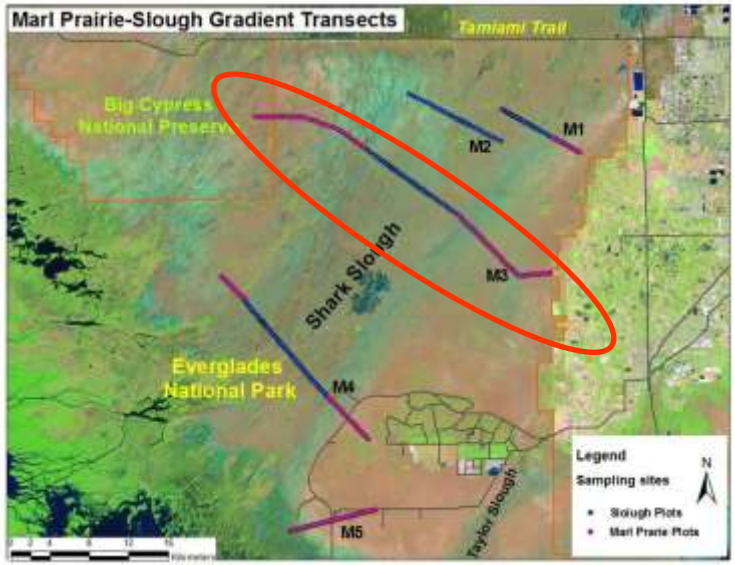




Between 2003 and 2010, vegetation change, as indicated by inferred hydroperiod, in three eastern sub-populations (C, E & F) was spatially differentiated responding to changes in hydrology - possibly impacted by retention ponds.

Change in vegetation-inferred hydroperiod (2007-2013)

MP-S Gradient transect – M3



Relatively wet vegetation

Change in vegetation-inferred hydroperiod (days)

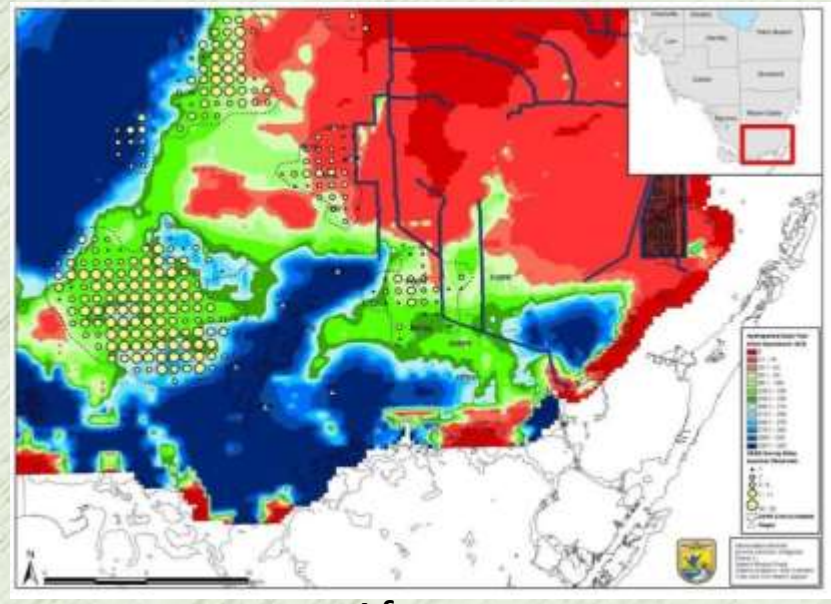
120
100
80
60
40
20
0
-20
-40
-60

35800
34000
32200
30000
27000
24000
21500
20300
19000
17300
15800
13000
10800
9000
7200
5400
3600
1800
0

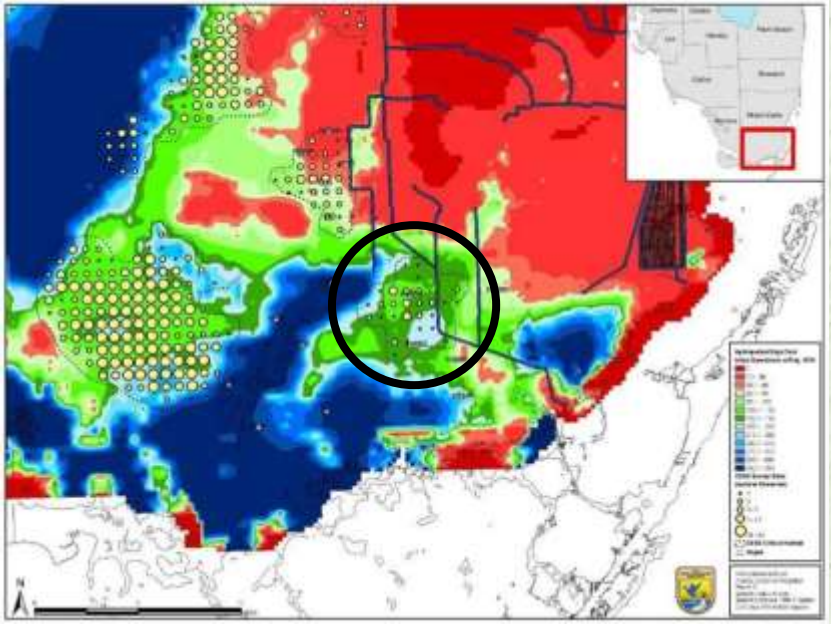
Plots (Distance along transect, m)

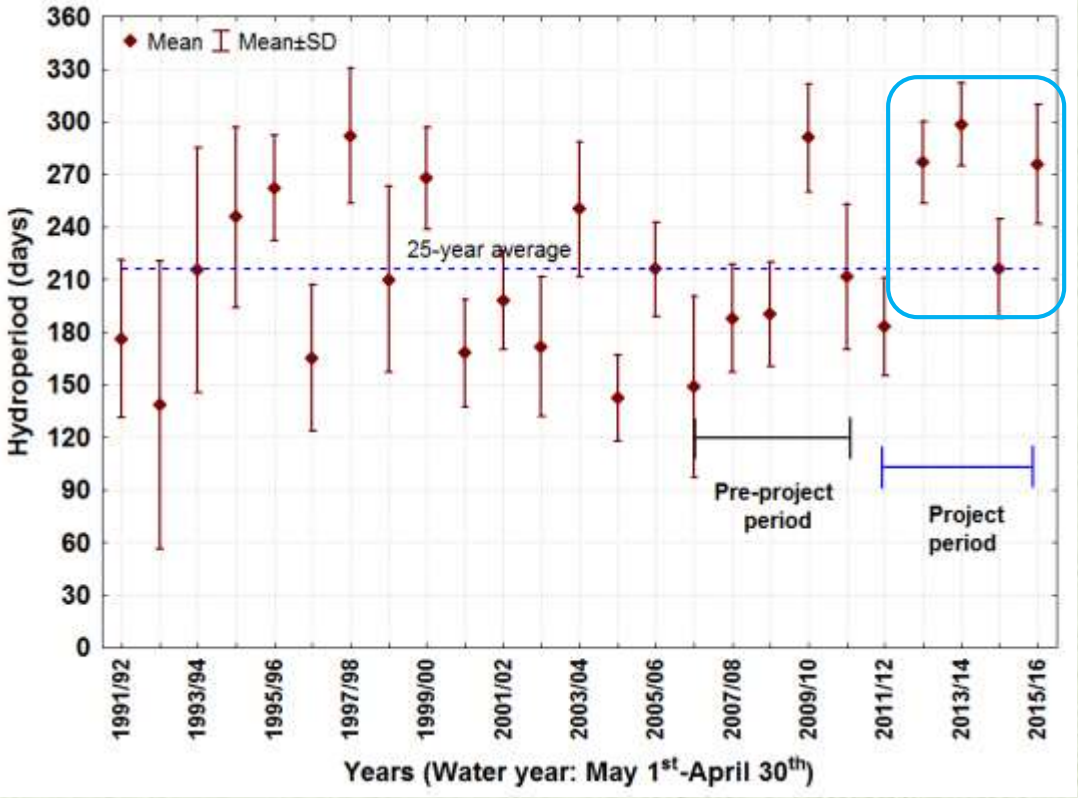
C111 Spreader Canal Project & CSSS habitat

Before



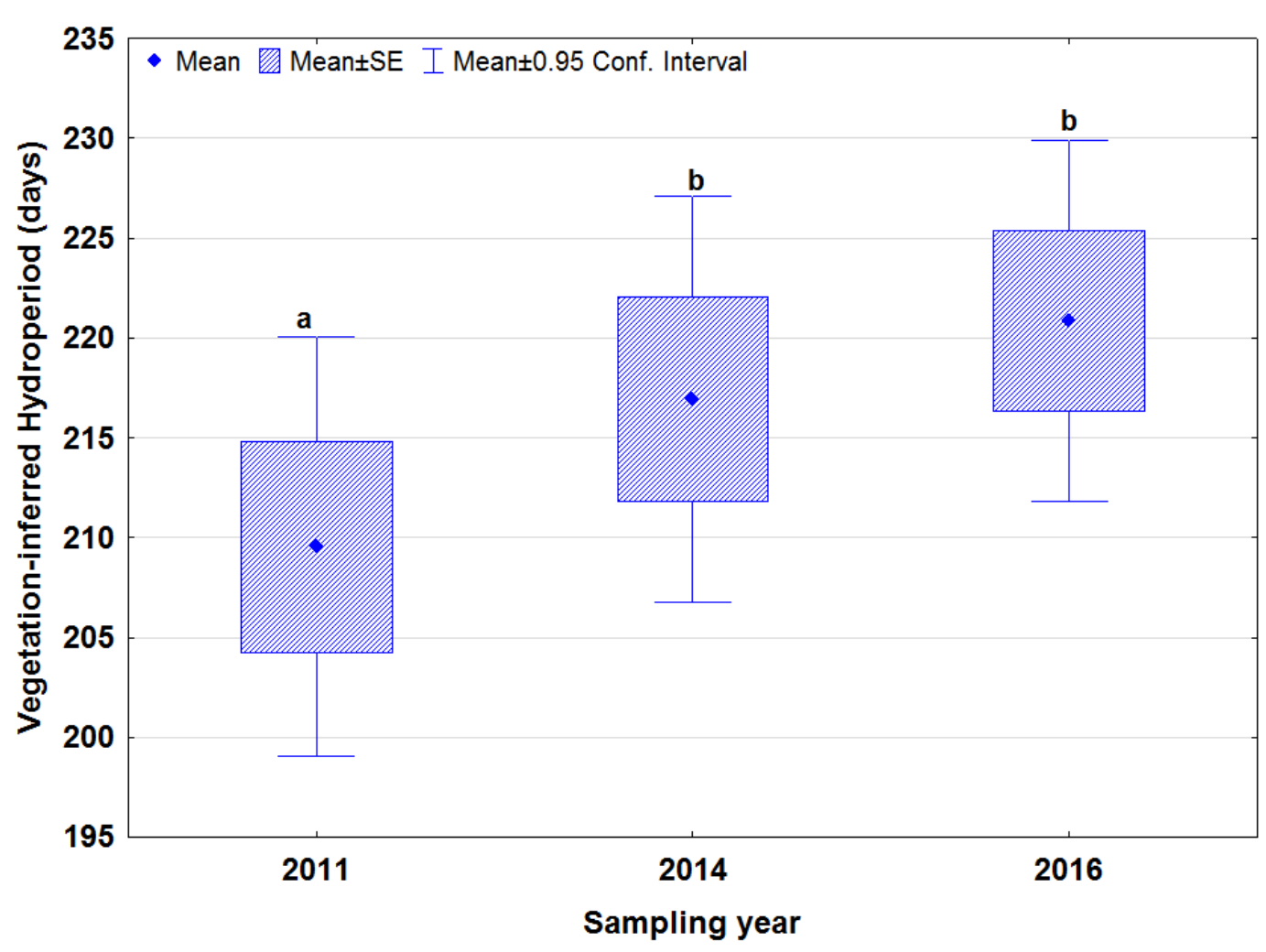
After





In Project Period, sites within the CSSS habitat (sub-population D) were wetter than in Pre-Project Period.

C111 Spreader Canal Project & CSSS habitat



Since 2011, i.e. in Project Period, vegetation change was marked by a shift in species composition toward a vegetation type characteristic of wetter conditions.

Marl Prairie landscape & Fire

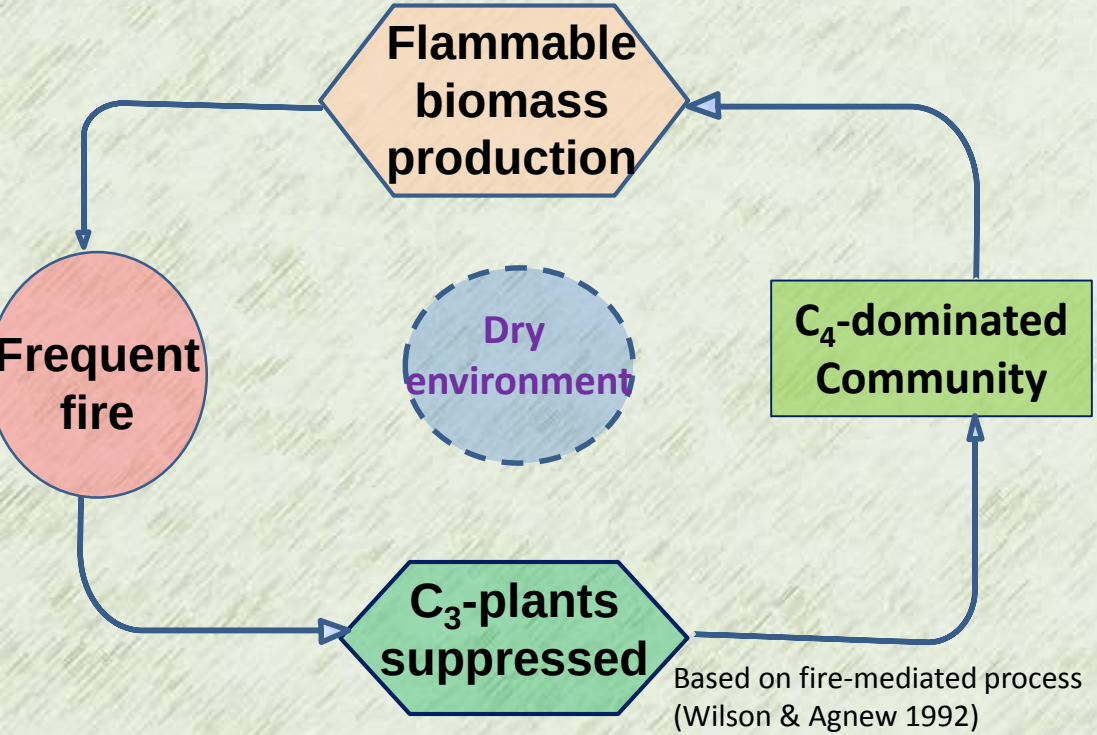
High proportion of C_4 plants:

- Muhly grass (*Muhlenbergia capillaris* var. *fillipes*),
- Blue stem (*Schizachyrium rhizomatum)*,
- Bluejoint Panicgrass *(Panicum tenerum)*

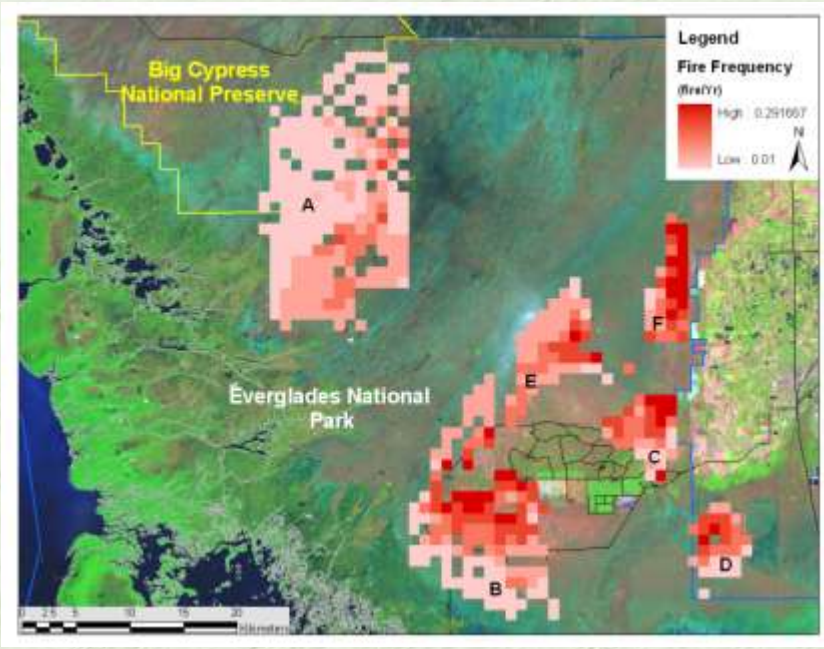
Dominant C_3 species:

- Sawgrass (*Cladium jamaicense)*
- Black top sedge *(Schoenus* nigricans)

- A matrix of pyrogenic vegetation
- Fire frequency **up to** 3-4 fires/decade



Based on fire-mediated process (Wilson & Agnew 1992)



Conclusions

- Vegetation in CSSS habitat tracks the spatial variation in changes in hydrologic conditions.
- In eastern part of sub-population A, change toward drier habitat conditions indicated an improvement in habitat suitability in recent years.
- Water management through the use of retention ponds is likely to cause vegetation in the eastern sub-populations (C, E and F) to be relatively wet – an improvement in over-dried habitat conditions.
- Changes in habitat conditions in response to restoration activities. Improvement – will sparrow occupy the improved area?

Acknowledgments

- **US Army Corps of Engineers (U.S. Army Engineer Research & Development Center).**
- **National Park Service, Everglades National Park**

- **SOFTEL lab mates**

David T. Jones, Hillary Cooley, Rafael Travieso, Franco Tobias, Nate Colbert, Lawrence Lopez, Brooke Shamblin, Mike Kline, T. J. Hilton, David Jones, Nilesh Timilsina, Rafael Travieso, Beyte Barrios, Erin Hanah, Jesus Blanco, Junnio Freixa, Allison Jirout, Zenia Bravo, Rosario Vidales


Thank you