Patterns of vegetation change in Northeast Shark River Slough, 2010-2016

Jennifer Richards[1], Daniel Gann[2], Brittany Harris[1] and Jed Redwine[3]

[1]Dept. Biological Sciences and the [2]GIS/RS Center,
Florida International University
and
[3]Everglades National Park

Restoration-related Modifications in NESRS, Everglades National Park

- Seepage Barrier: July, 2012
  - 2 mi long, app. 1 m wide, 35 ft. deep
  - Increase in sheet flow through NESRS; data indicates that it is affecting hydrology in NESRS
- Tamiami Trail Bridge: Mar., 2013
  - 1 mi long, 2 lane highway
  - Water to be put under in stages (raise 7.5 to 8.5 ft in canal)

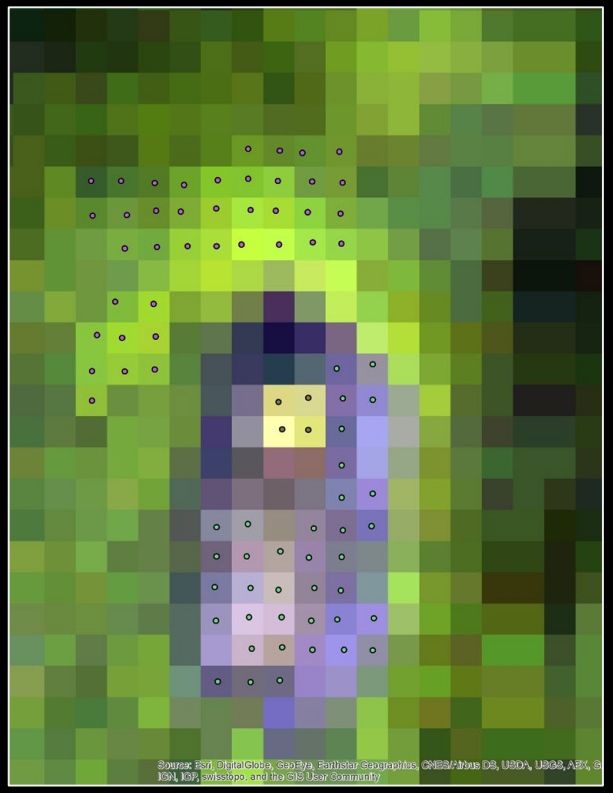
In Progress/Planned:

- Changes in canal (water level) operational schedule
- Additional 2.6 mi bridge further west

Expect vegetation change

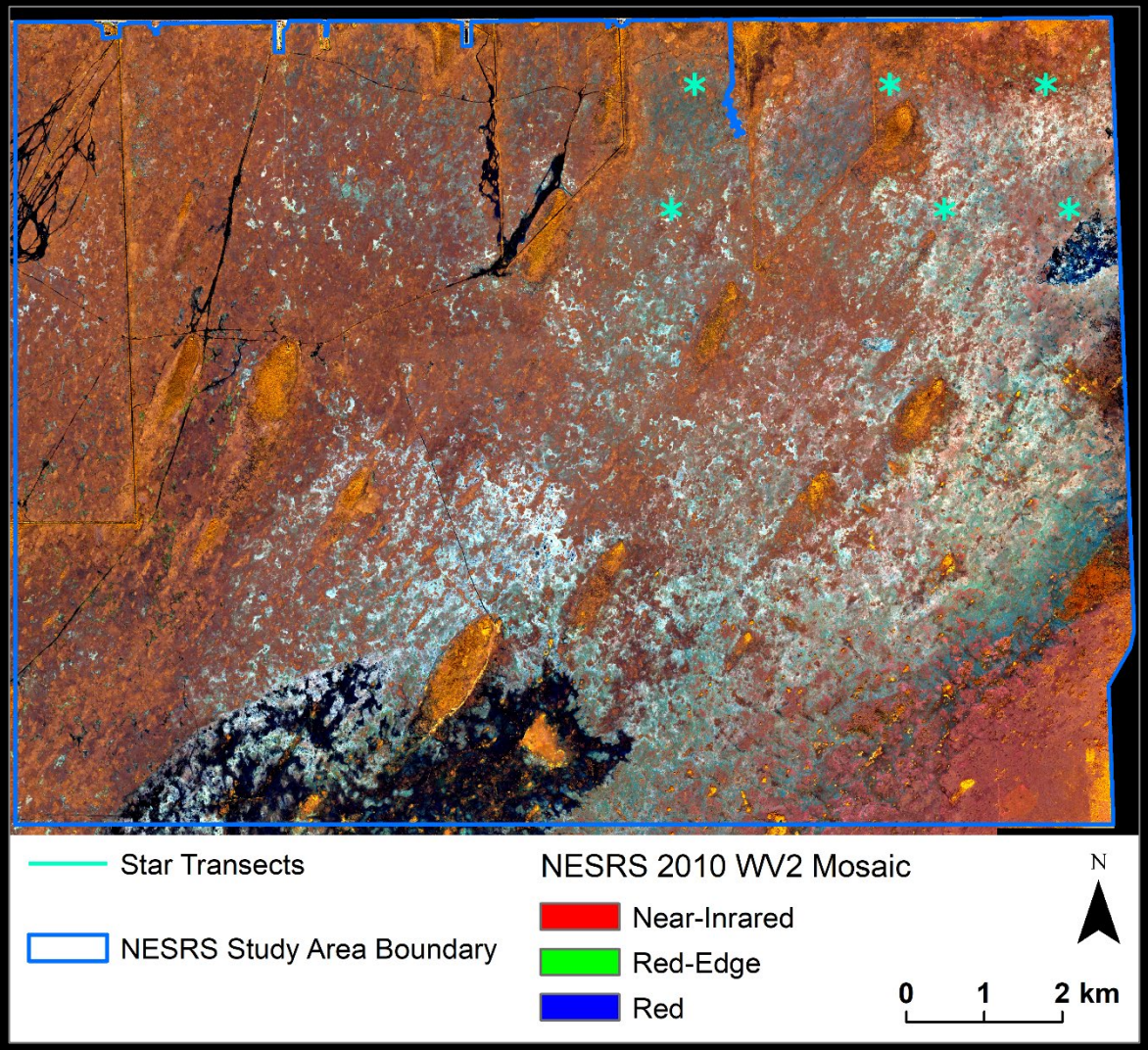
Monitoring Vegetation Change in NESRS

- Mapped vegetation in a 15.8 x 11.4 km (146 km^2) region of interest (ROI) in the northeast corner of NESRS.
- Used bi-seasonal WorldView-2 (WV2) satellite data: 2010 wet/2013 dry seasons; 2016 wet /2017 dry seasons
- Twenty-two vegetation classes mapped.
- The resulting 2010 and 2016 maps were cross-tabulated to establish type and location of vegetation changes.



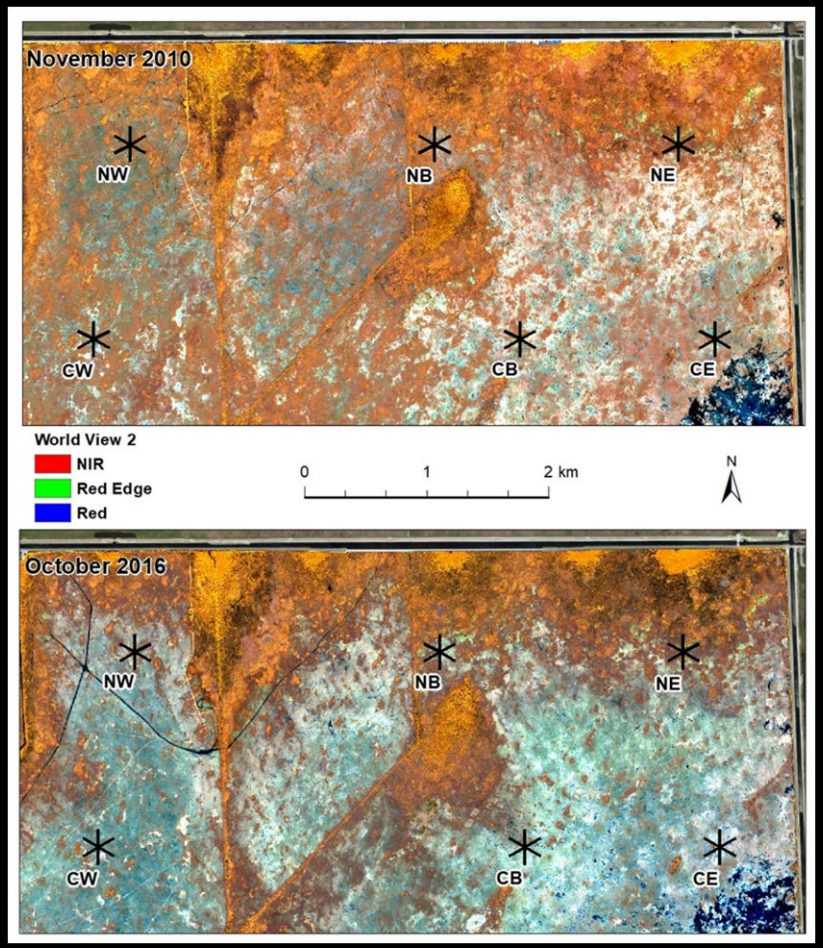
WV2 image with 3 spectral bands displayed:
Red = b8, NIR2
Green = b6, Red edge
Blue = b5, Red

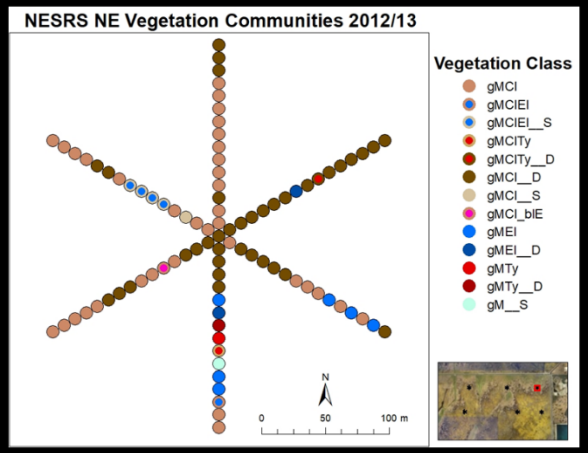
NE Shark River Slough in NE Corner of Everglades National Park

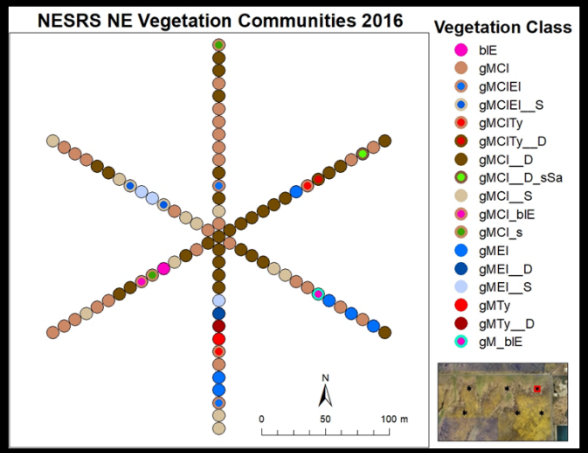


Ground Reference Data

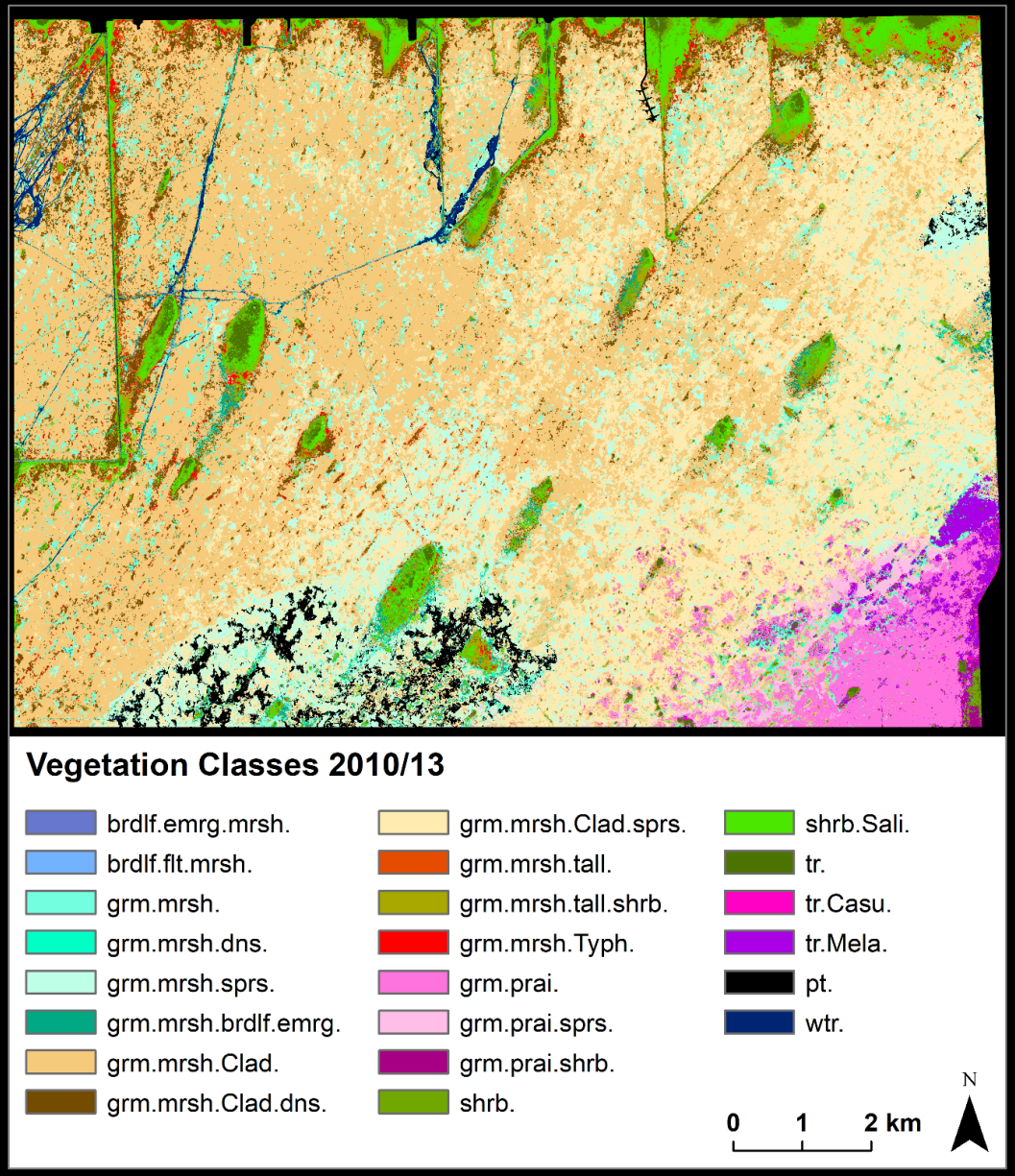
- Also monitored vegetation in the field at six sites, each with six radially-arranged 150 m transects; vegetation classes were recorded every 10 m along the transects. These sites were established and sampled in 2012/13, then resampled in 2016.





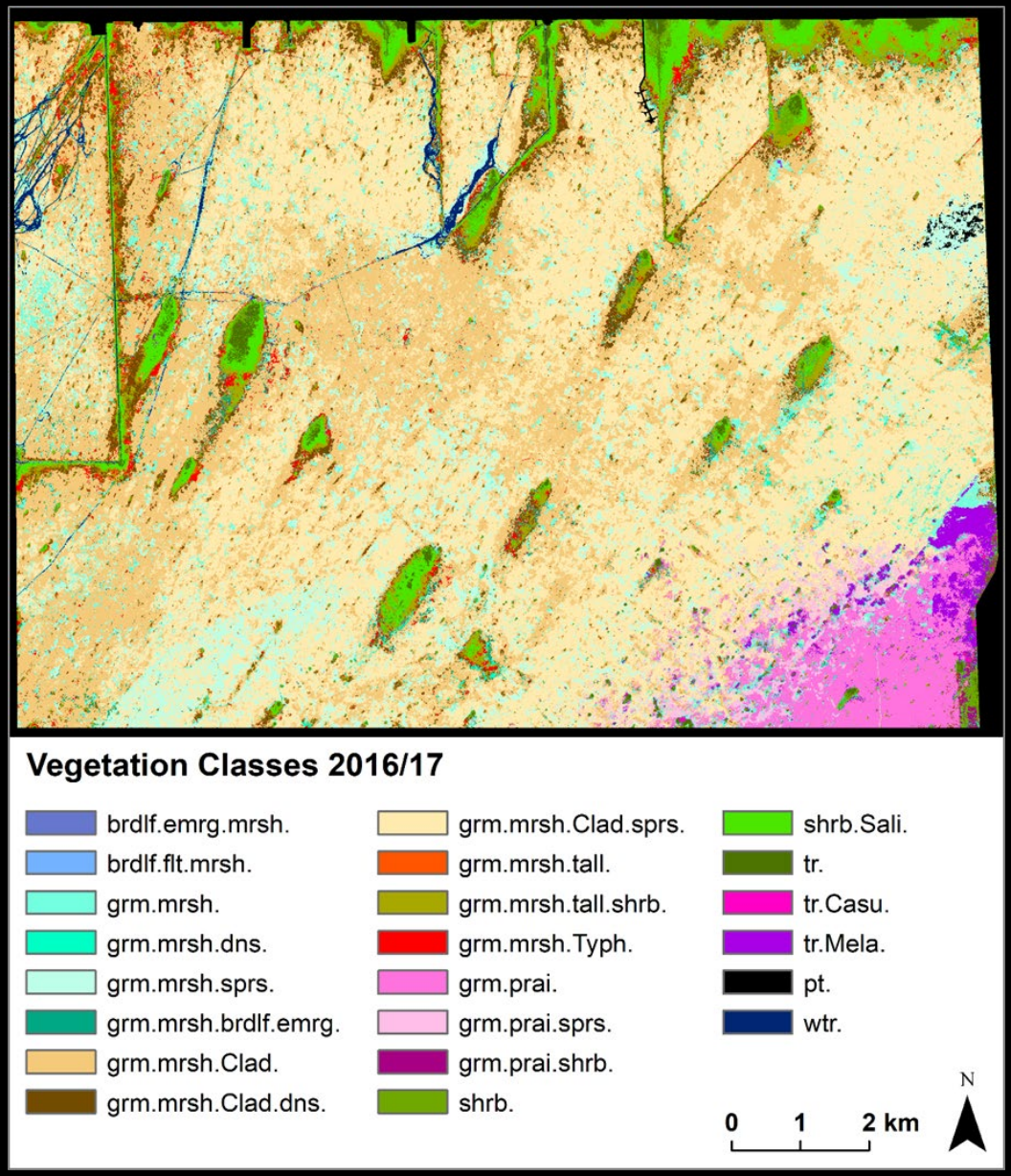


Vegetation Abundance, 2010/13

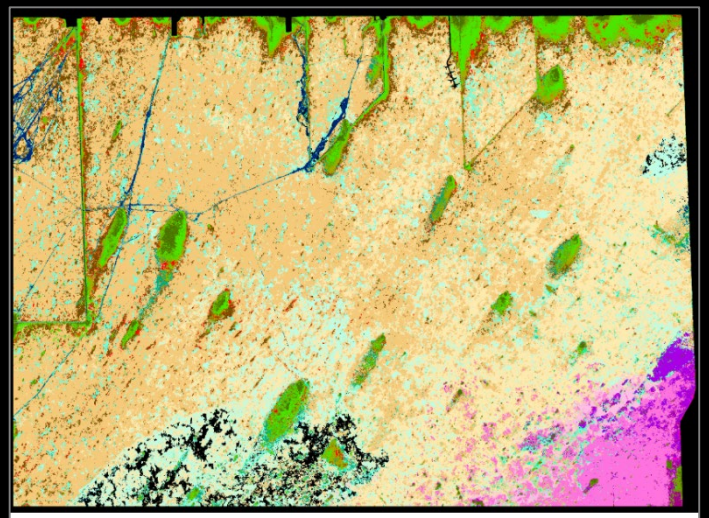


Class Name	Area (%)	Area (ha)
brdlv.emrg.mrsh.	0.01%	0.9
brdlv.flt.mrsh.	0.13%	18.9
grm.mrsh.	**5.14%**	**749.3**
grm.mrsh.dns.	**0.17%**	**25.2**
grm.mrsh.sprs.	**7.22%**	**1,051.6**
grm.mrsh.brdlf.emrg.	1.18%	172.7
grm.mrsh.Clad.	**42.43%**	**6,184.1**
grm.mrsh.Clad.dns.	**4.50%**	**656.5**
grm.mrsh.Clad.sprs.	**23.82%**	**3,471.5**
grm.mrsh.tall	0.51%	74.1
grm.mrsh.tall.shrb.	2.22%	323.4
grm.mrsh.Typh.	0.60%	86.8
grm.prai.	3.34%	486.1
grm.prai.sprs.	1.04%	151.7
grm.prai.shrb.	0.23%	33.5
shrb.	0.97%	142.1
shrb.Sali.	2.52%	367.2
tr.	0.71%	103.0
tr.Casu.	0.06%	8.3
tr.Mela.	0.81%	117.9
peat	1.74%	253.4
water	0.66%	95.7

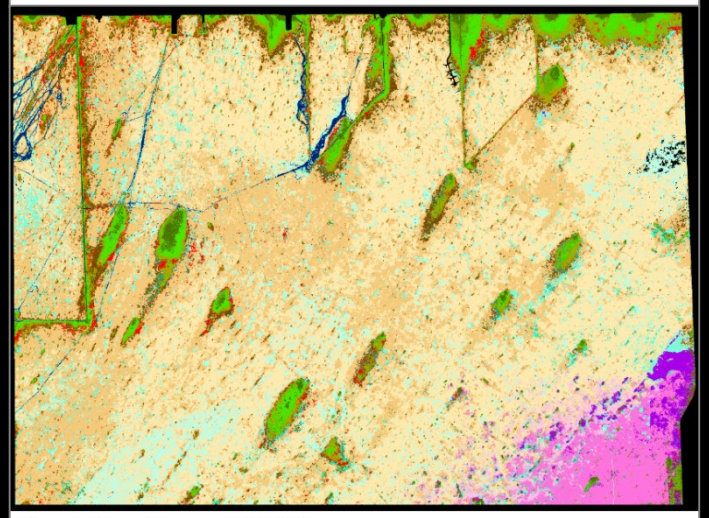
Vegetation Abundance, 2016/17



Class Name	Area (%)	Area (ha)
brdlv.emrg.mrsh.	0.02%	2.4
brdlv.flt.mrsh.	0.01%	2.1
grm.mrsh.	**4.26%**	**620.3**
grm.mrsh.dns.	**0.26%**	**38.6**
grm.mrsh.sprs.	**6.54%**	**951.6**
grm.mrsh.brdlf.emrg.	0.85%	123.0
grm.mrsh.Clad.	**31.65%**	**4,605.3**
grm.mrsh.Clad.dns.	**3.55%**	**516.8**
grm.mrsh.Clad.sprs.	**37.90%**	**5,514.0**
grm.mrsh.tall	0.37%	54.3
grm.mrsh.tall.shrb.	3.31%	482.2
grm.mrsh.Typh.	0.99%	144.6
grm.prai.	3.41%	496.8
grm.prai.sprs.	1.21%	176.7
grm.prai.shrb.	0.09%	13.6
shrb.	0.85%	123.9
shrb.Sali.	2.31%	336.1
tr.	0.69%	100.2
tr.Casu.	0.05%	7.3
tr.Mela.	0.82%	119.5
peat	0.12%	17.6
water	0.71%	103.4



Vegetation Classes 2010/13



Vegetation Classes 2016/17

brdlf.emrg.mrsh.
brdlf.flt.mrsh.
grm.mrsh.
grm.mrsh.dns.
grm.mrsh.sprs.
grm.mrsh.brdlf.emrg.
grm.mrsh.Clad.
grm.mrsh.Clad.dns.
grm.mrsh.Clad.sprs.
grm.mrsh.tall.
grm.mrsh.tall.shrb.
grm.mrsh.Typh.
grm.prai.
grm.prai.sprs.
grm.prai.shrb.
shrb.
shrb.Sali.
tr.
tr.Casu.
tr.Mela.
pt.
wtr.

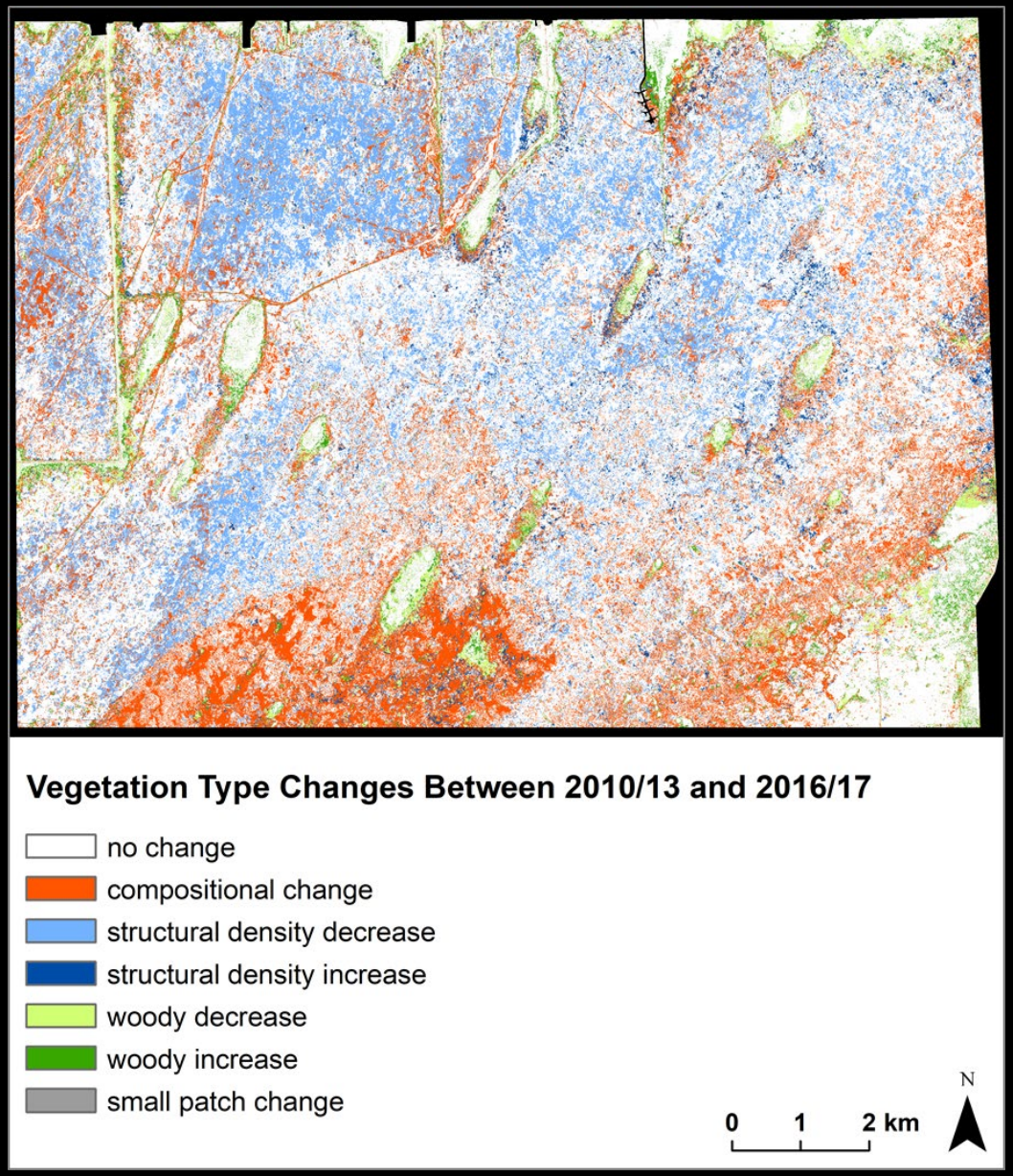
0 1 2 km

N

Vegetation Change Summary

Class:	2010/13	2016/17
sawgrass classes	71%	73%
graminoid marsh classes	13%	11%
woody vegetation	2%	3%
Structural changes:		
sawgrass decrease	43%	37%
sparse sawgrass increase	23%	38%

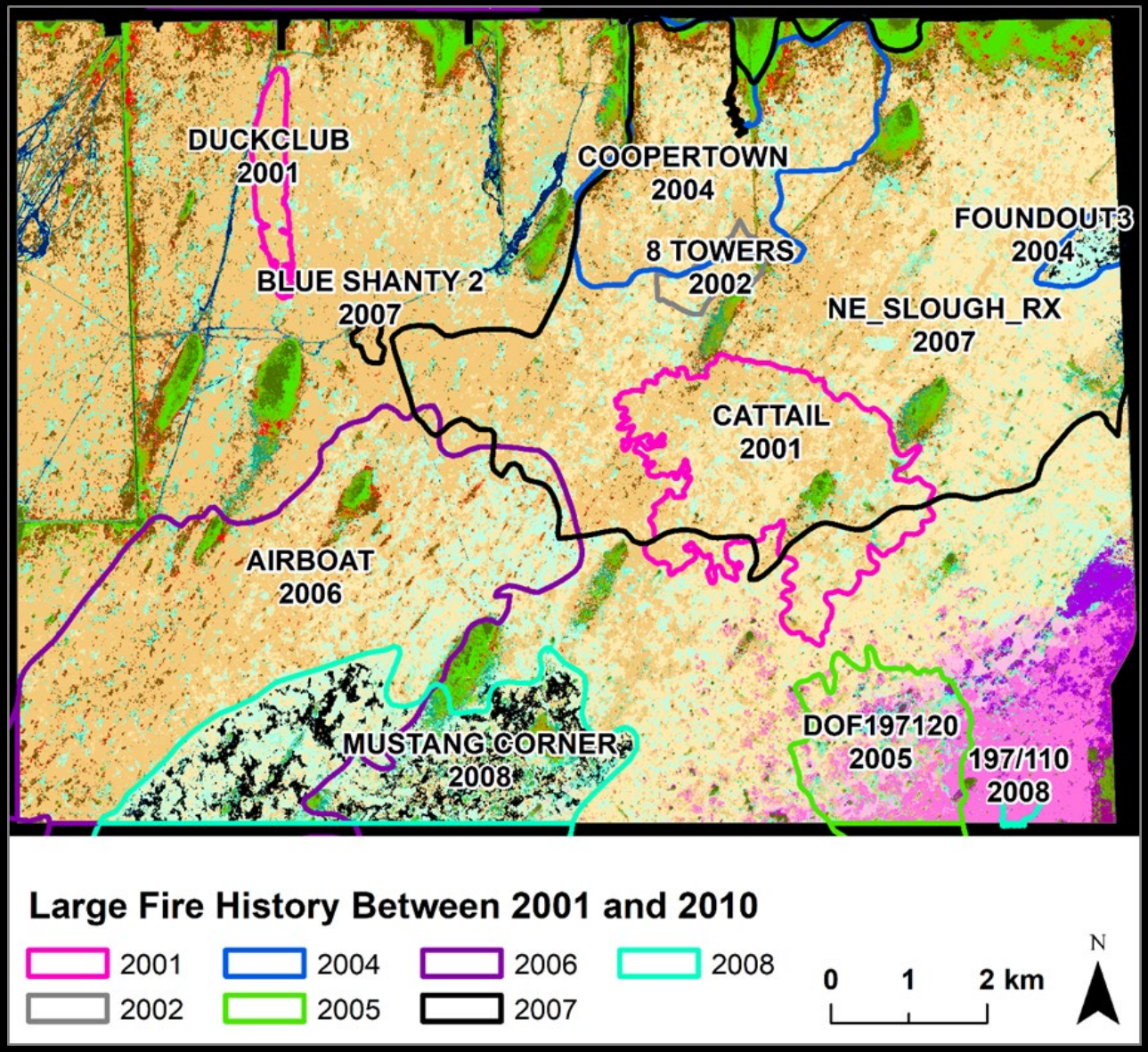
Vegetation Change, 2010/17



Class Name	Area (%)	Area (ha)
No Change	61.4%	8,475.9
Compositional Change	16.3%	2,253.7
Density Decrease	15.4%	2,120.2
Density Increase	3.3%	458.1
Woodiness Decrease	1.7%	230.8
Woodiness Increase	1.9%	265.4

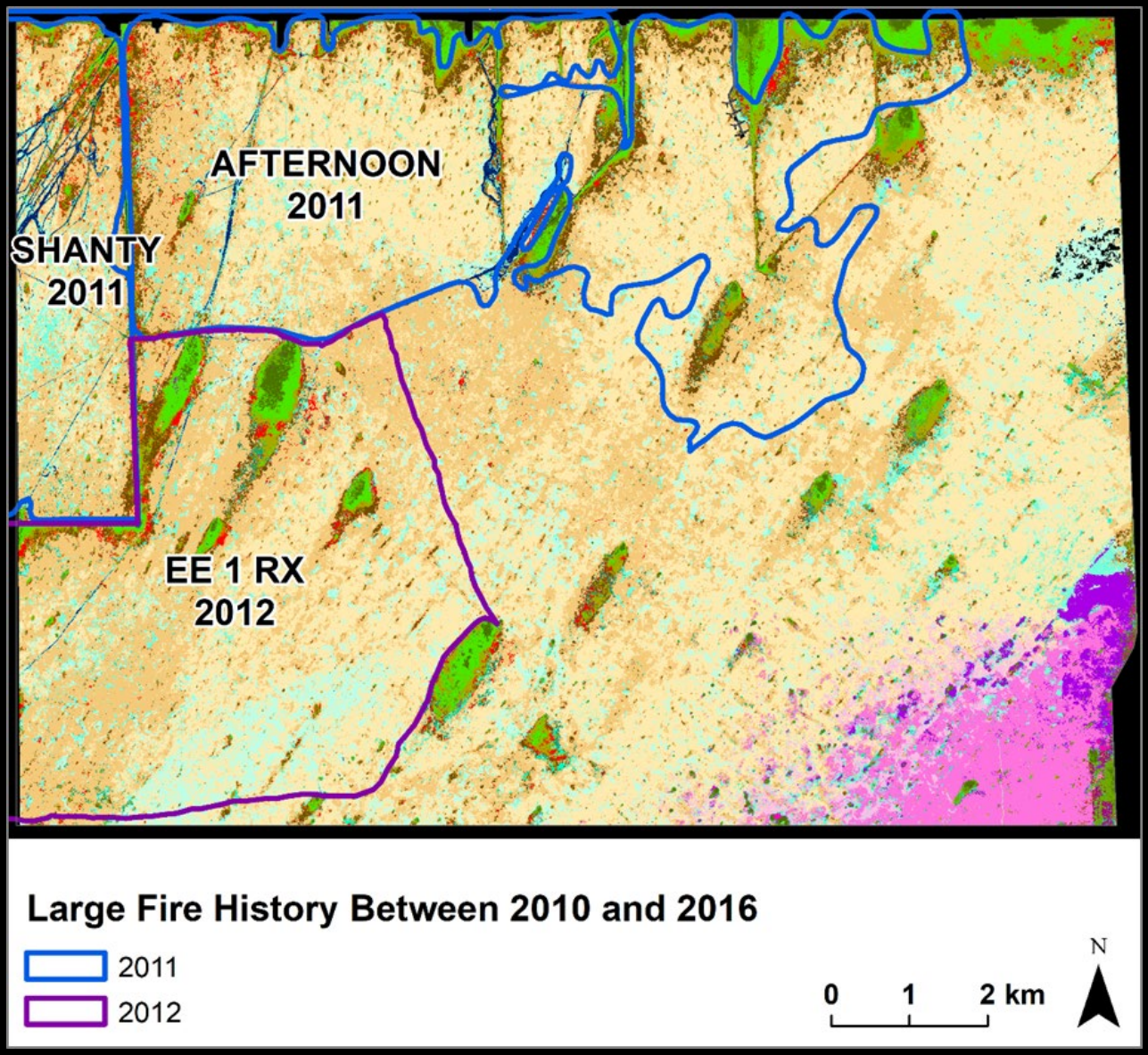
Unplanned and Prescribed Fires, 2001-2010

(Everglades National Park fire database)

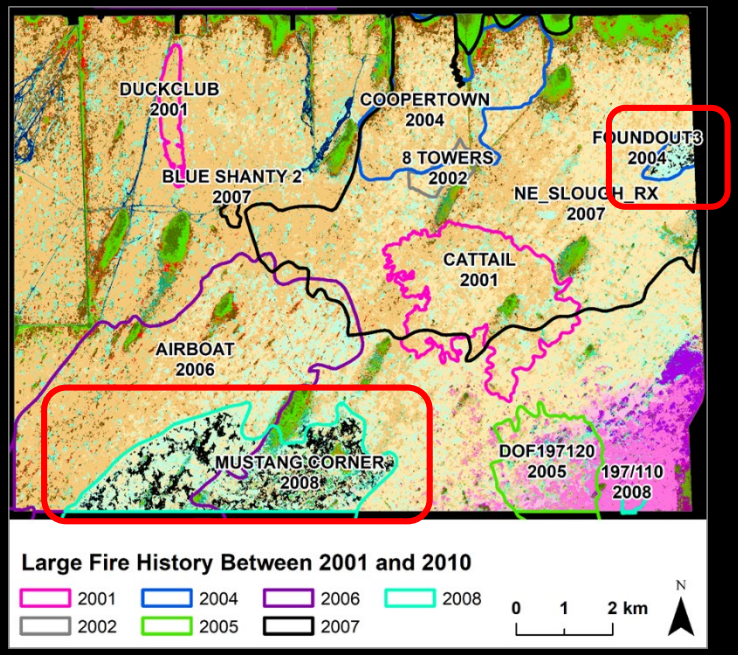


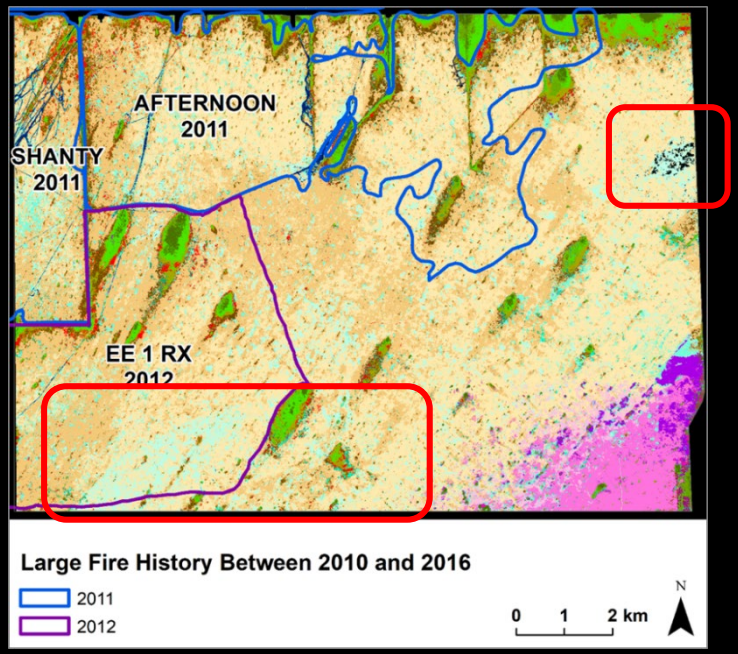
Unplanned and Prescribed Fires, 2010-2016

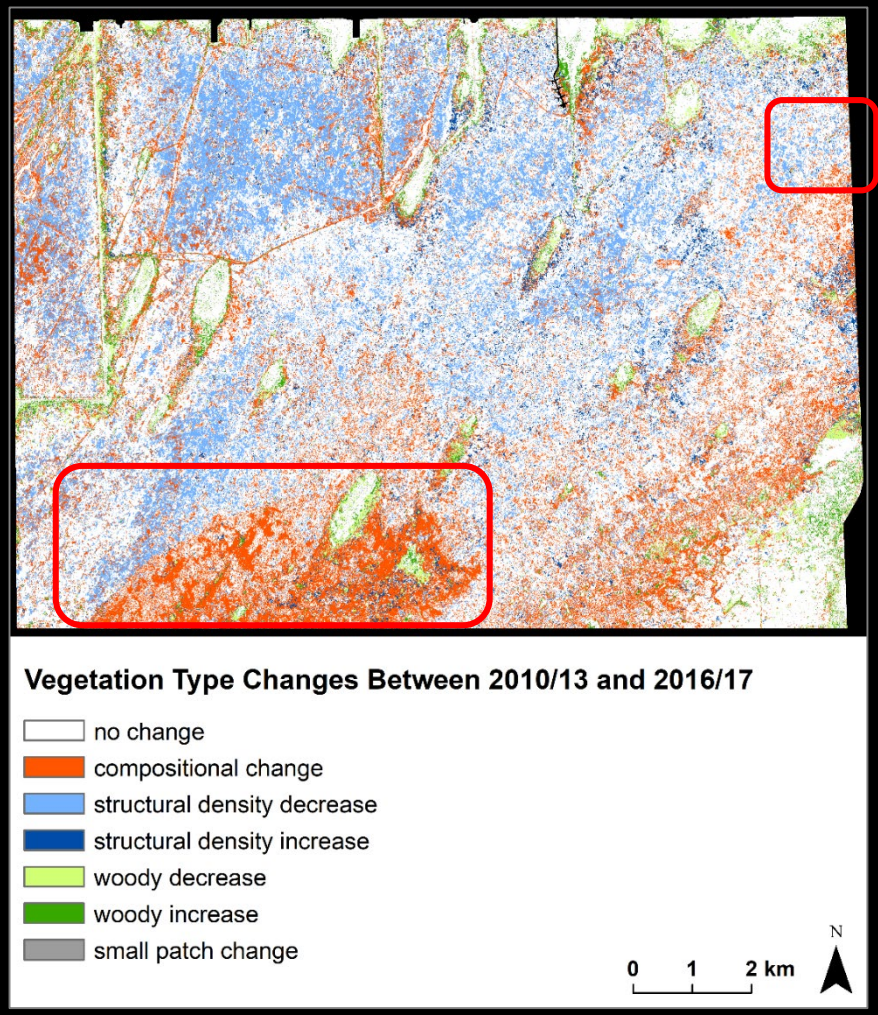
(Everglades National Park fire database)



Fire History and Vegetation Change, 2001-2016

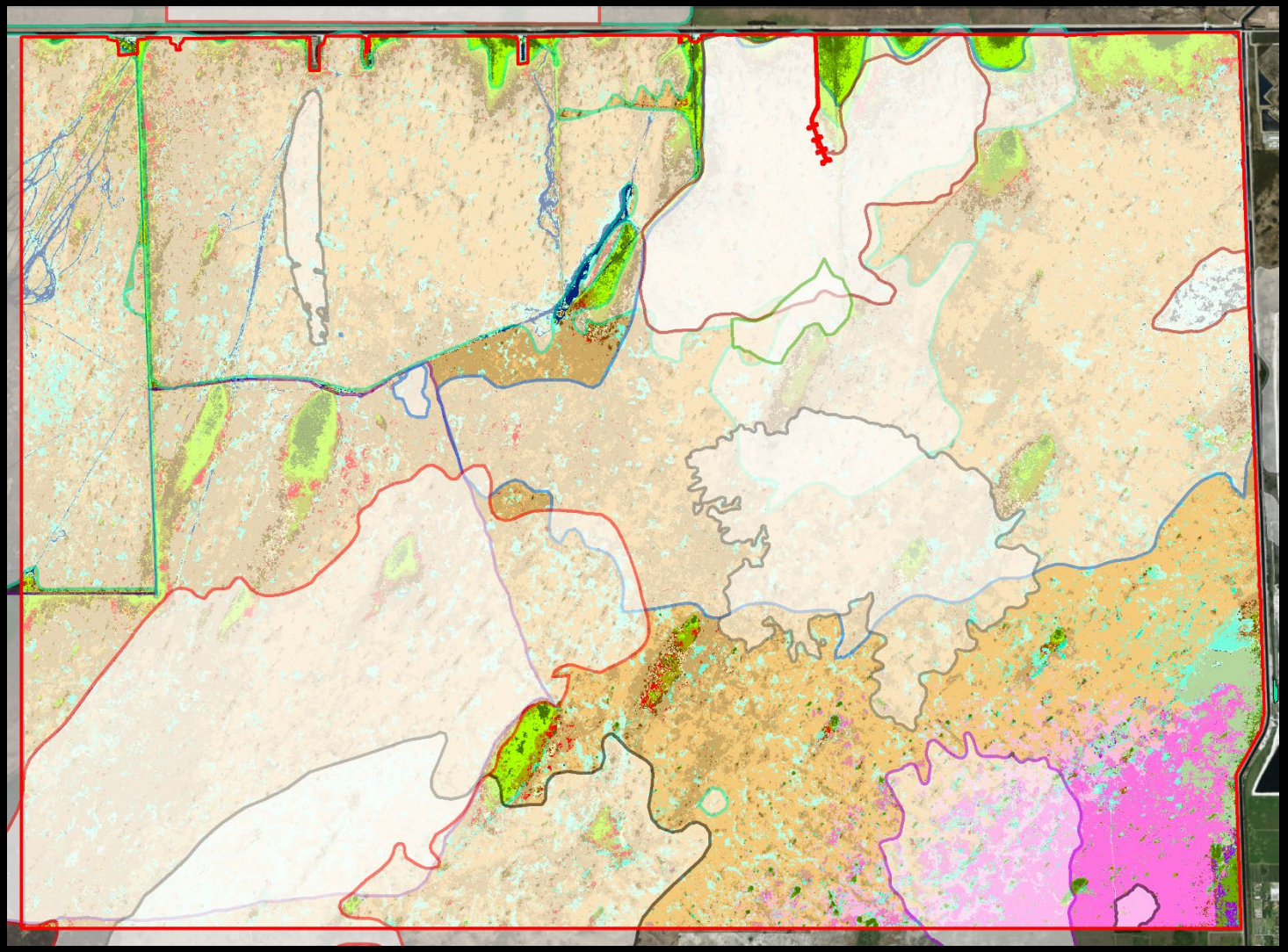






Unplanned and Prescribed Fires, 2001-2016

(Everglades National Park fire database, 2010 map)

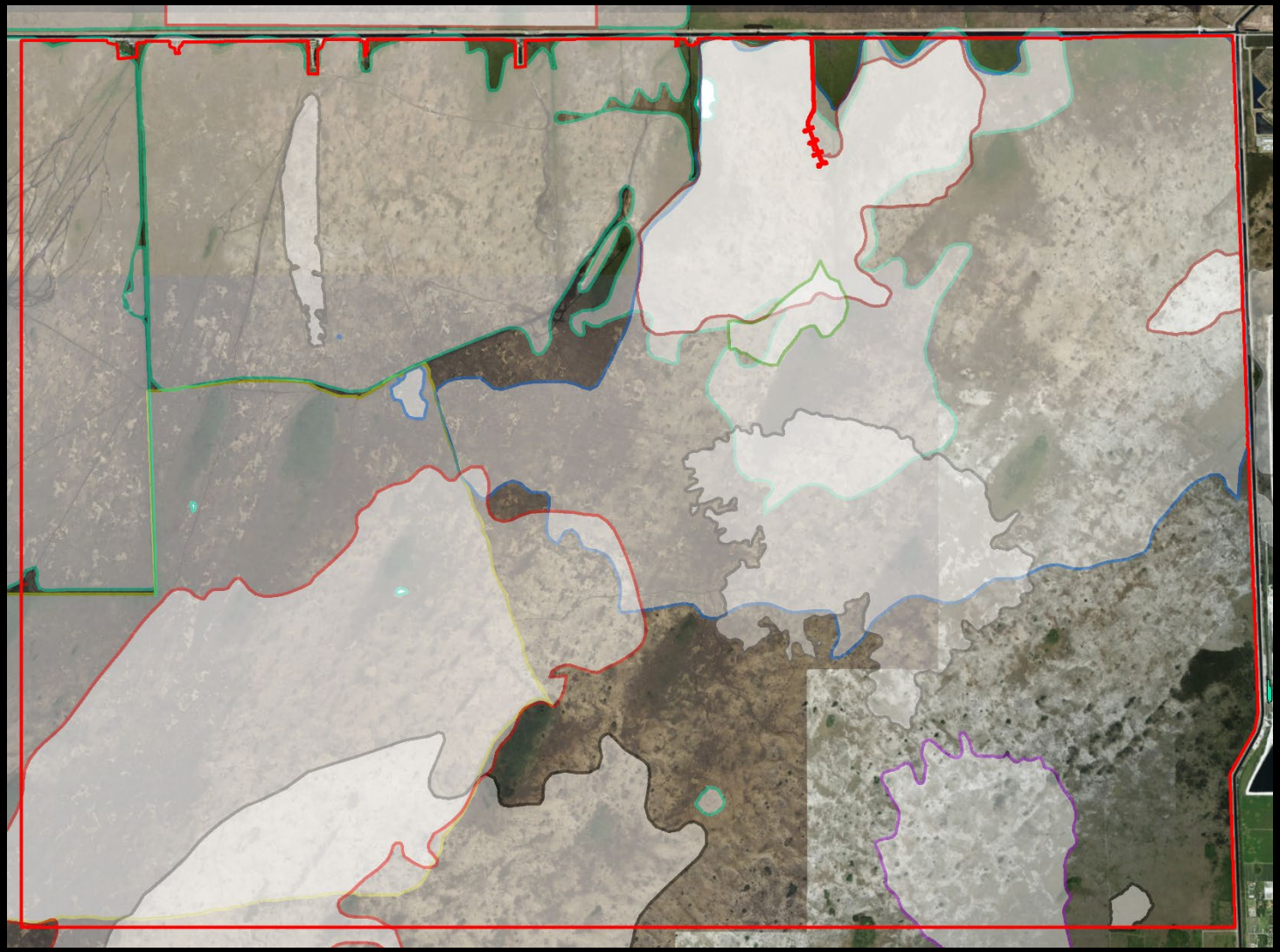


Summary

- Can see landscape-scale changes over a 6-year time period; app. 61% of the landscape did not change over that time
- Changes were both compositional and structural
- Changes were correlated with fires, and outcome differed among fires
- Eastern side of NESRS saw less fire over the 6-year period but still had a decrease in density; this may be a response to hydrologic changes
- With this approach, we can begin to predict vegetation changes in response to fire, hydrology, and their interaction

Unplanned and Prescribed Fires, 2001-2016

(Everglades National Park fire database)



Summary

- Can see landscape-scale changes over a 6-year time period; app. 61% of the landscape did not change over that time
- Changes were both compositional and structural
- Changes were correlated with fires, and outcome differed among fires
- **Recovery time and type varied among fires; variables of interest include timing of fires, intervals between fires, hydrology, and soil type**
- Eastern side of NESRS saw less fire over the 6-year period but still had a decrease in density; this may be a response to hydrologic changes
- With this approach, we can begin to predict vegetation changes in response to fire, hydrology, and their interaction