The Influence of Altered Flow Regimes on Aquatic Ecosystem Metabolism in an Everglades Marsh

E. Tate-Boldt[1], C. Hansen[1,2], C. J. Saunders[1], S. Newman[1], F. Sklar[1]

[1]South Florida Water Management District, West Palm Beach, FL, USA

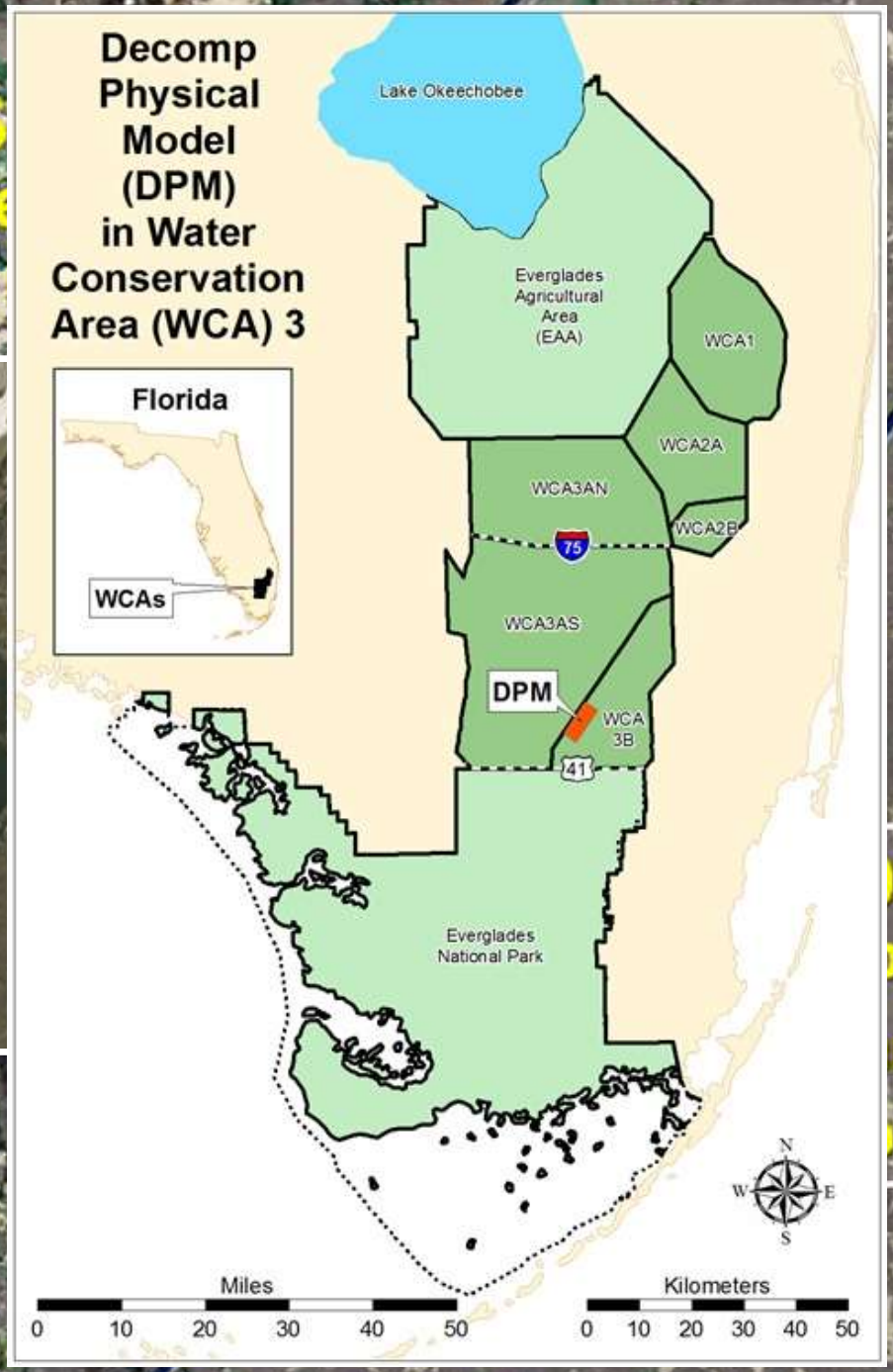
[2]Florida International Univ., Miami, FL, USA

The Influence of Altered Flow Regimes on Aquatic Ecosystem Metabolism in an Everglades Marsh

I. Decompartmentalization Physical Model (DPM)
II. Aquatic ecosystem metabolism
III. Flow effects on aquatic metabolism

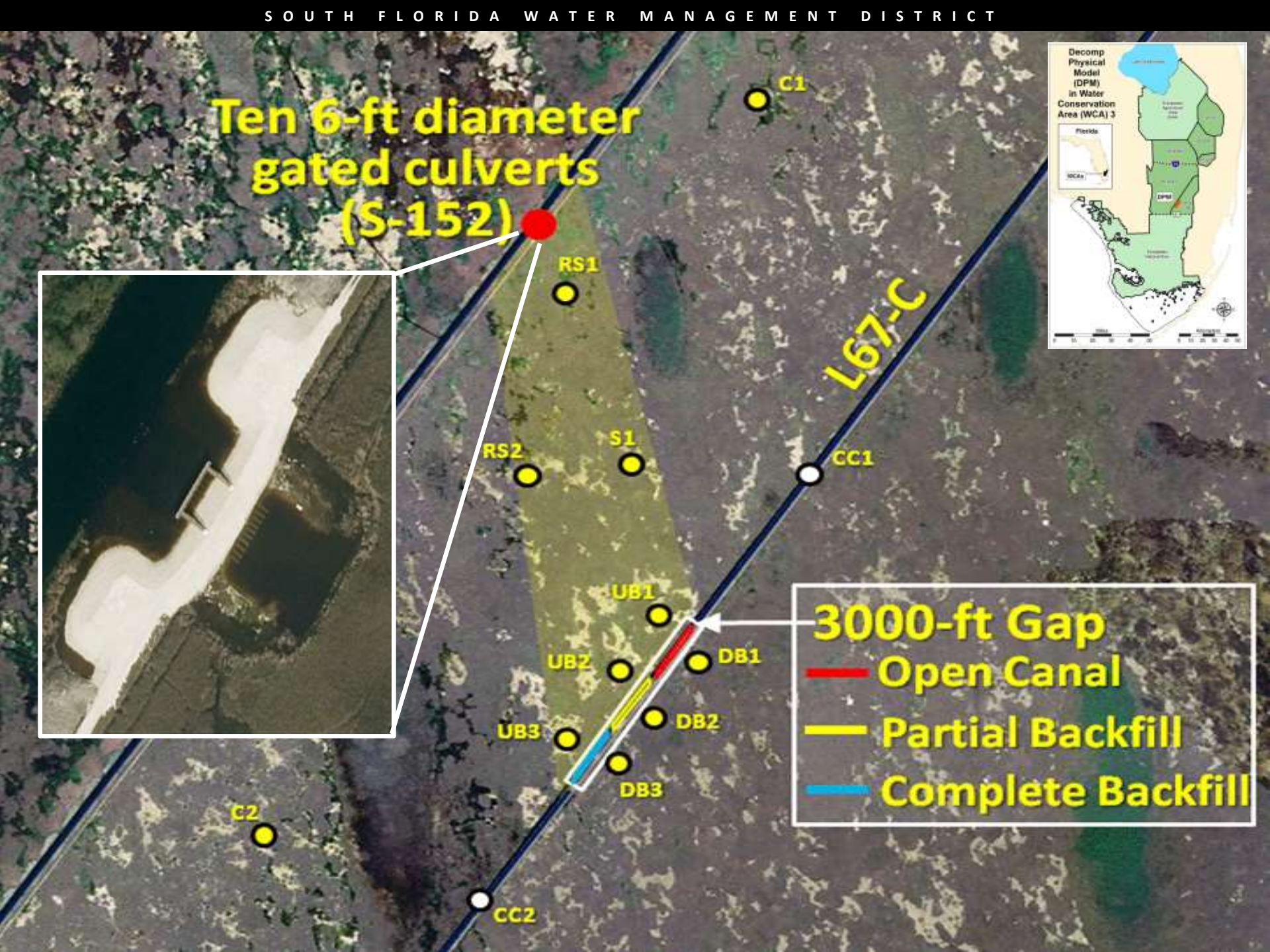

Ten 6
gate

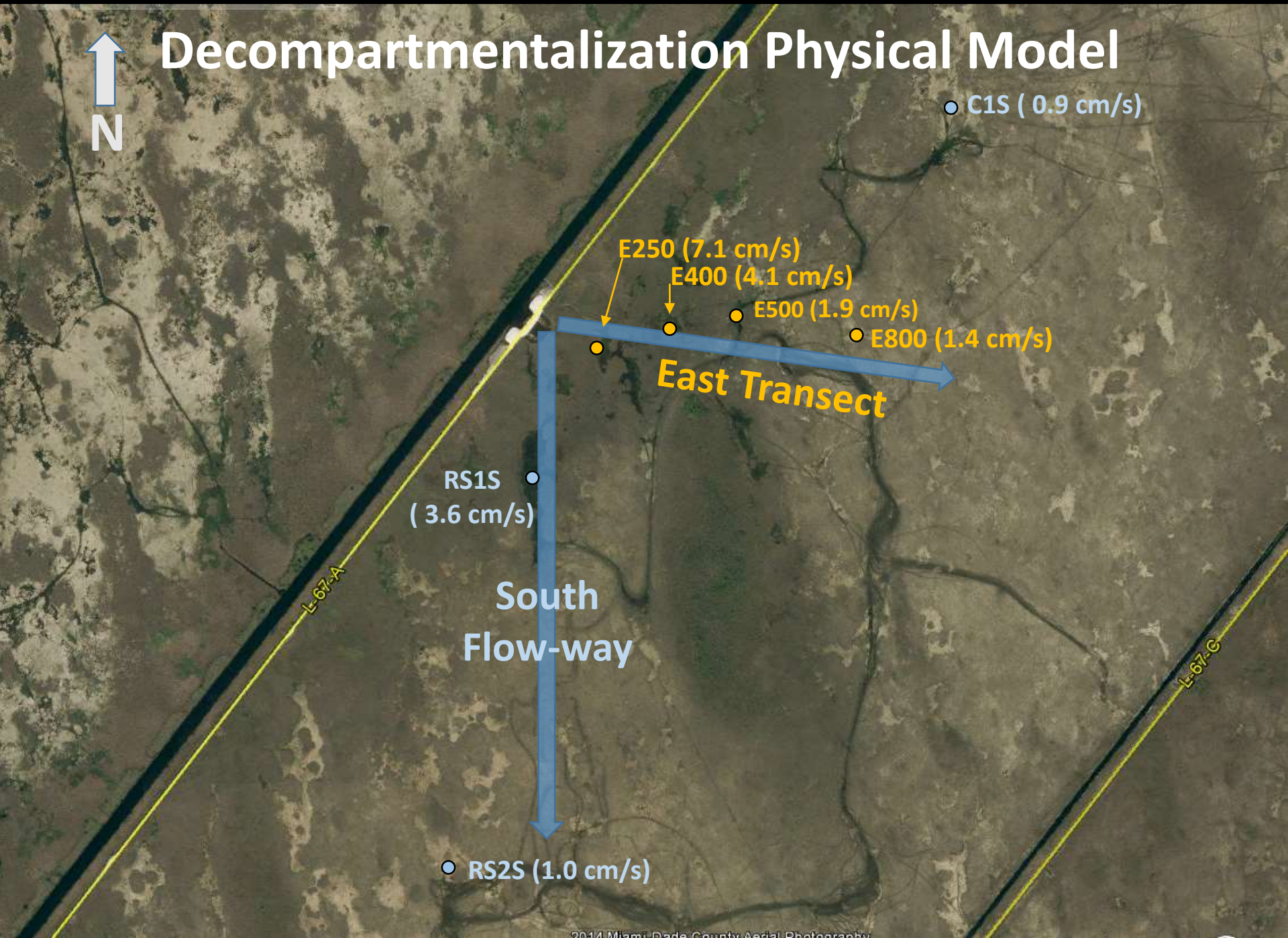

C2

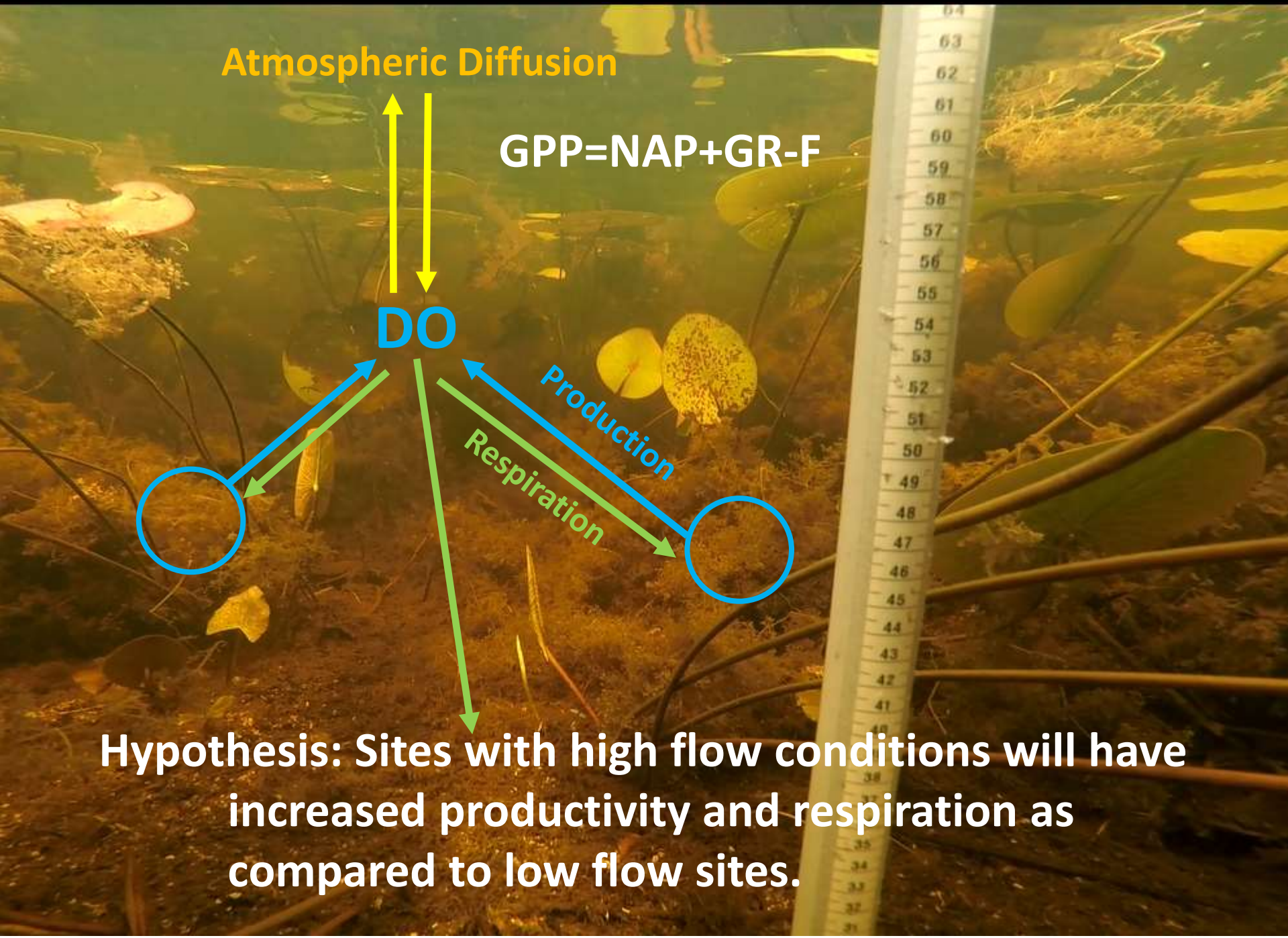

Decomp Physical Model (DPM) in Water Conservation Area (WCA) 3
Lake Okeechobee
Everglades Agricultural Area (EAA)
WCA1
WCA2A
WCA3AN
WCA2B
75
WCA3AS
DPM
WCA 3B
41
Everglades National Park
Florida
WCAs
N
W
E
S
Miles
0 10 20 30 40 50
Kilometers
0 10 20 30 40 50


Decomp Physical Model (DPM) in Water Conservation Area (WCA) 3
Florida
WCAs
DPM

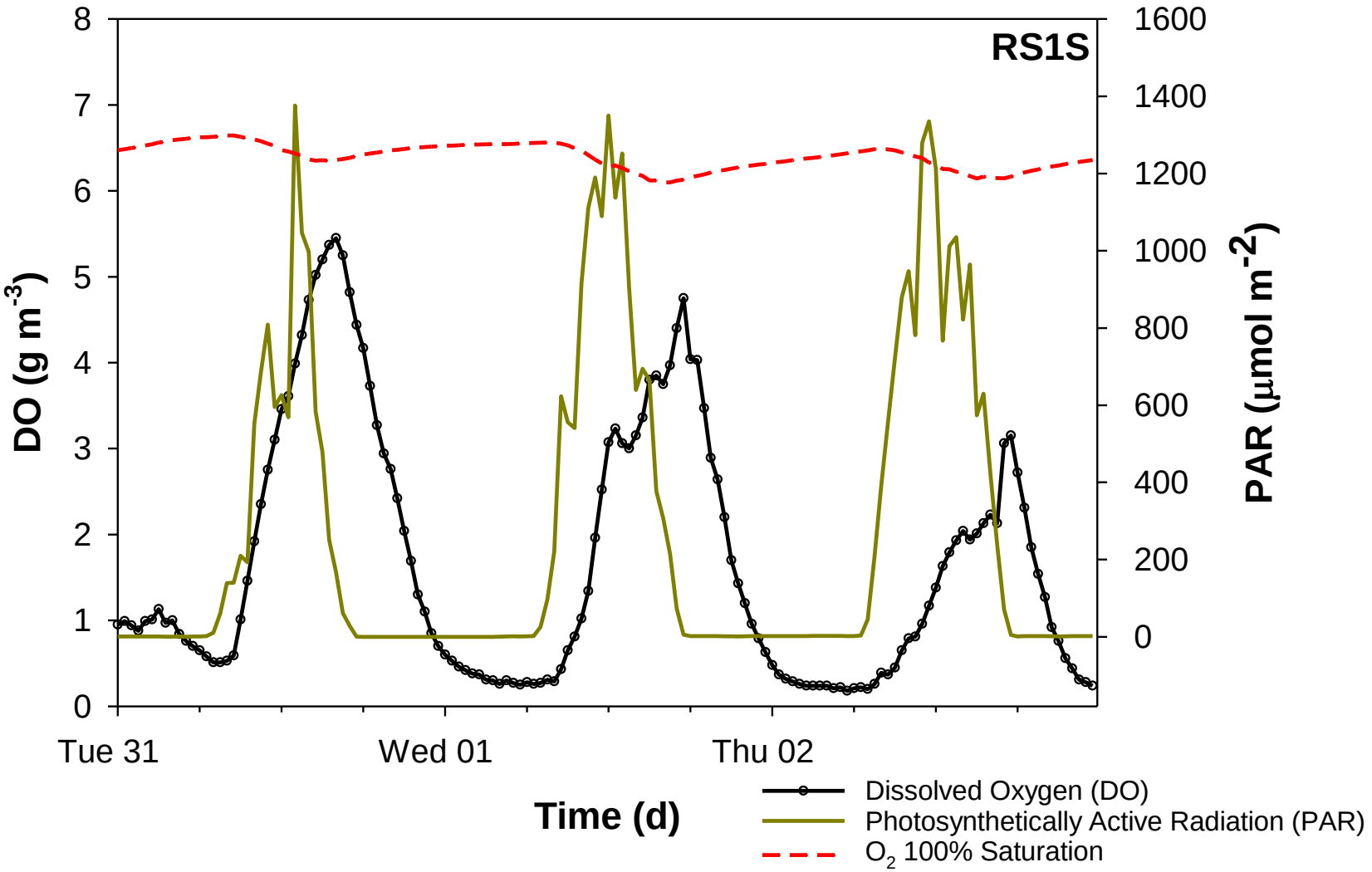

-ft Gap
pen Canal
rtial Backfill
mplete Backfill

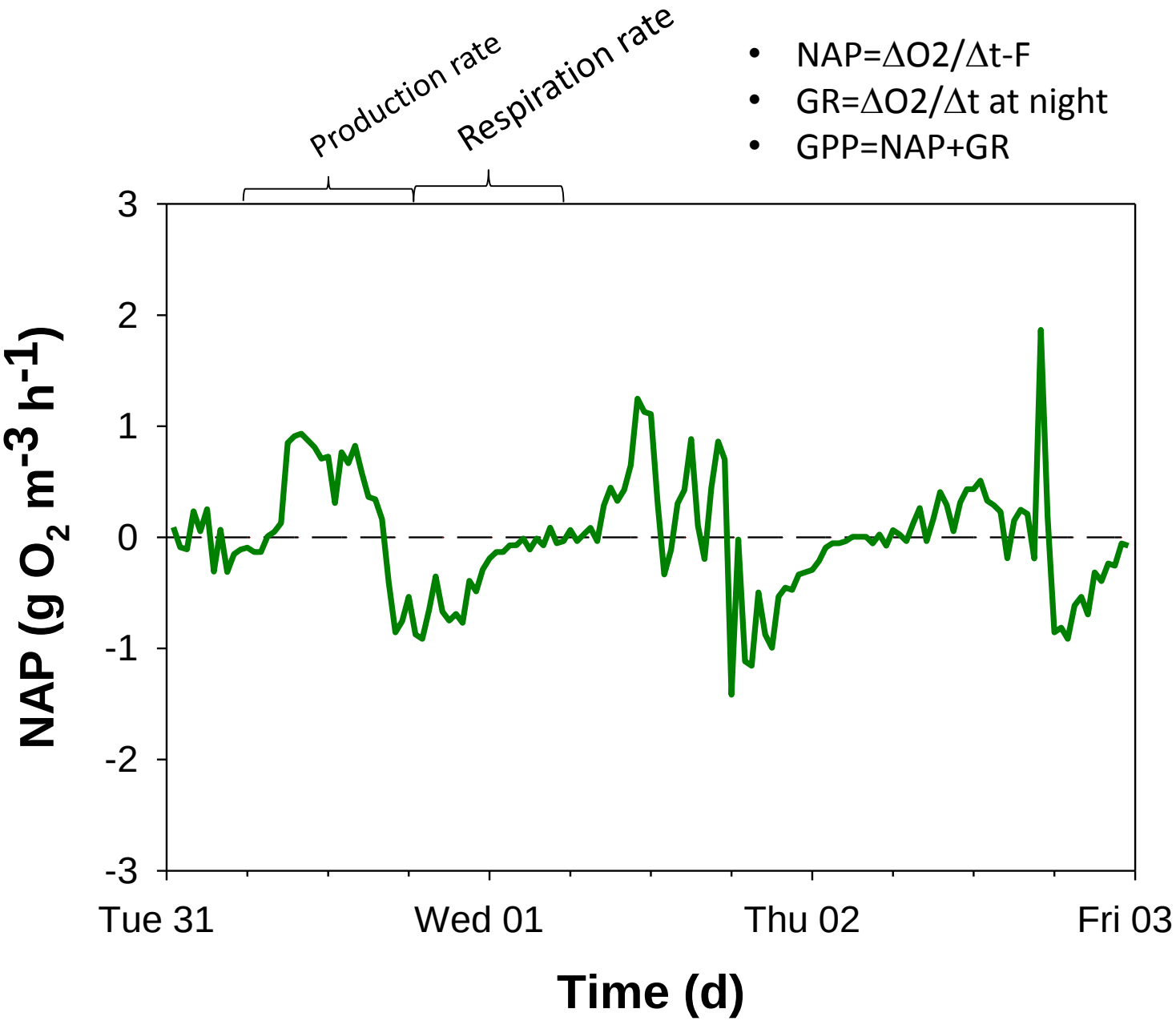

Ten 6-ft diameter gated culverts (S-152)
C1
RS1
L67-C
RS2
S1
CC1
UB1
UB2
DB1
UB3
DB2
DB3
C2
CC2
3000-ft Gap
Open Canal
Partial Backfill
Complete Backfill
Decomp Physical Model (DPM) in Water Conservation Area (WCA) 3
Florida
WCAs
DPM


Decompartmentalization Physical Model
N
C1S (0.9 cm/s)
E250 (7.1 cm/s)
E400 (4.1 cm/s)
E500 (1.9 cm/s)
E800 (1.4 cm/s)
East Transect
RS1S
(3.6 cm/s)
South
Flow-way
RS2S (1.0 cm/s)
L-67-A
L-67-C
2014 Miami-Dade County Aerial Photography



Hypothesis: Sites with high flow conditions will have increased productivity and respiration as compared to low flow sites.


RS1S
DO (g m-3)
PAR (µmol m-2)
0
1
2
3
4
5
6
7
8
0
200
400
600
800
1000
1200
1400
1600
Tue 31
Wed 01
Thu 02
Time (d)
Dissolved Oxygen (DO)
Photosynthetically Active Radiation (PAR)
O2 100% Saturation



Staehr et al. 2010

	RS1S	C1S	RS2S
Mean DO	3.55	4.72	7.73
Max. DO	4.52	6.84	6.97
Min. DO	2.97	2.83	2.85

N

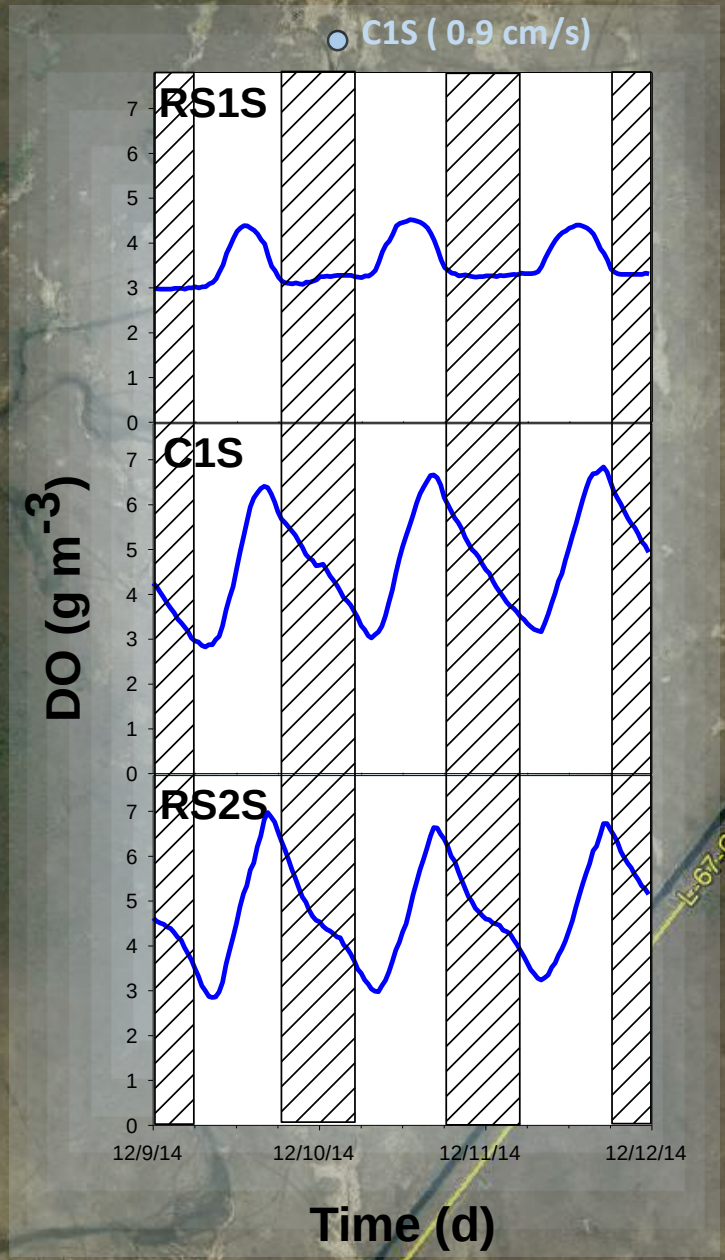
RS1S
(3.6 cm/s)

South
Flow-way

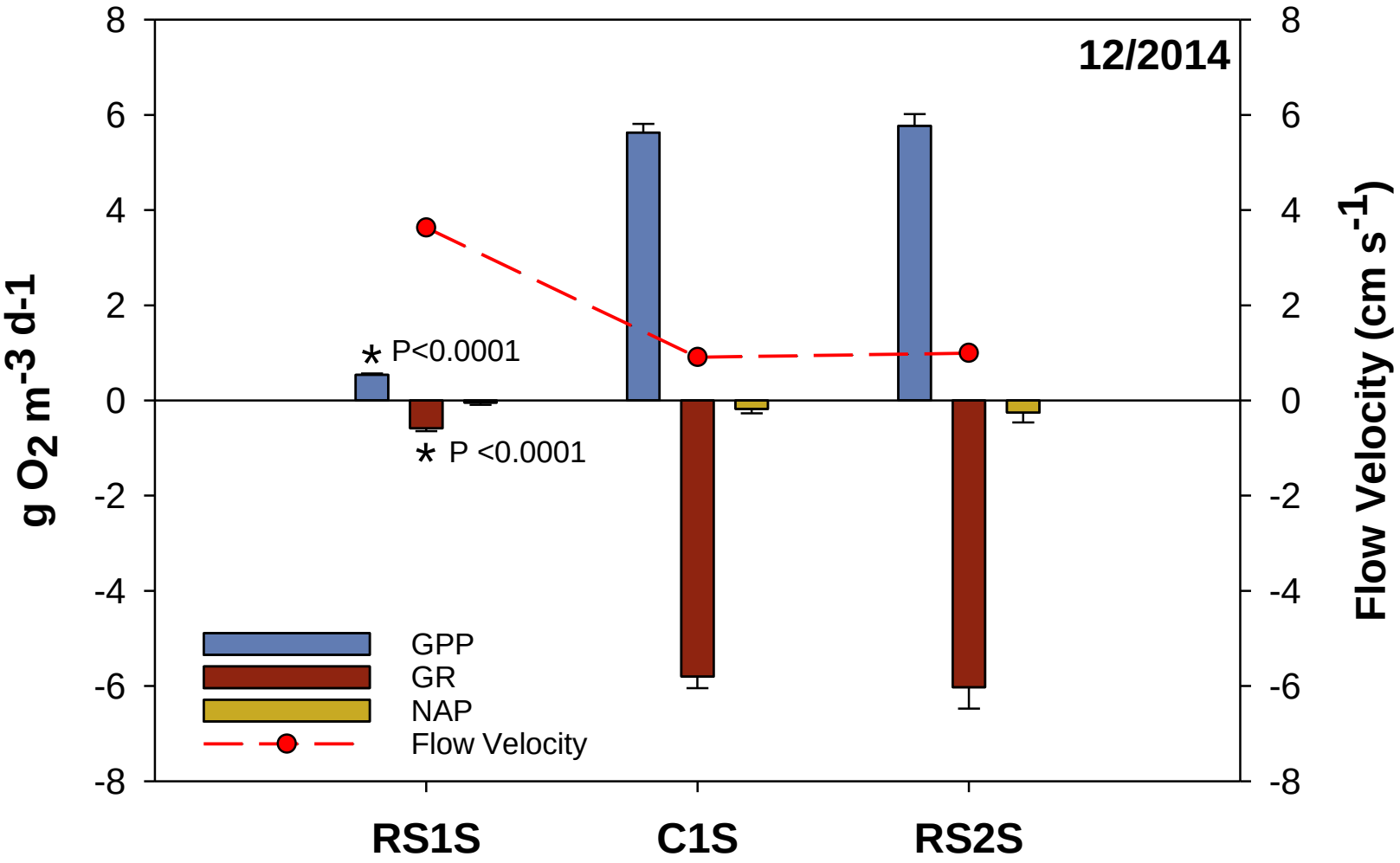
RS2S (1.0 cm/s)

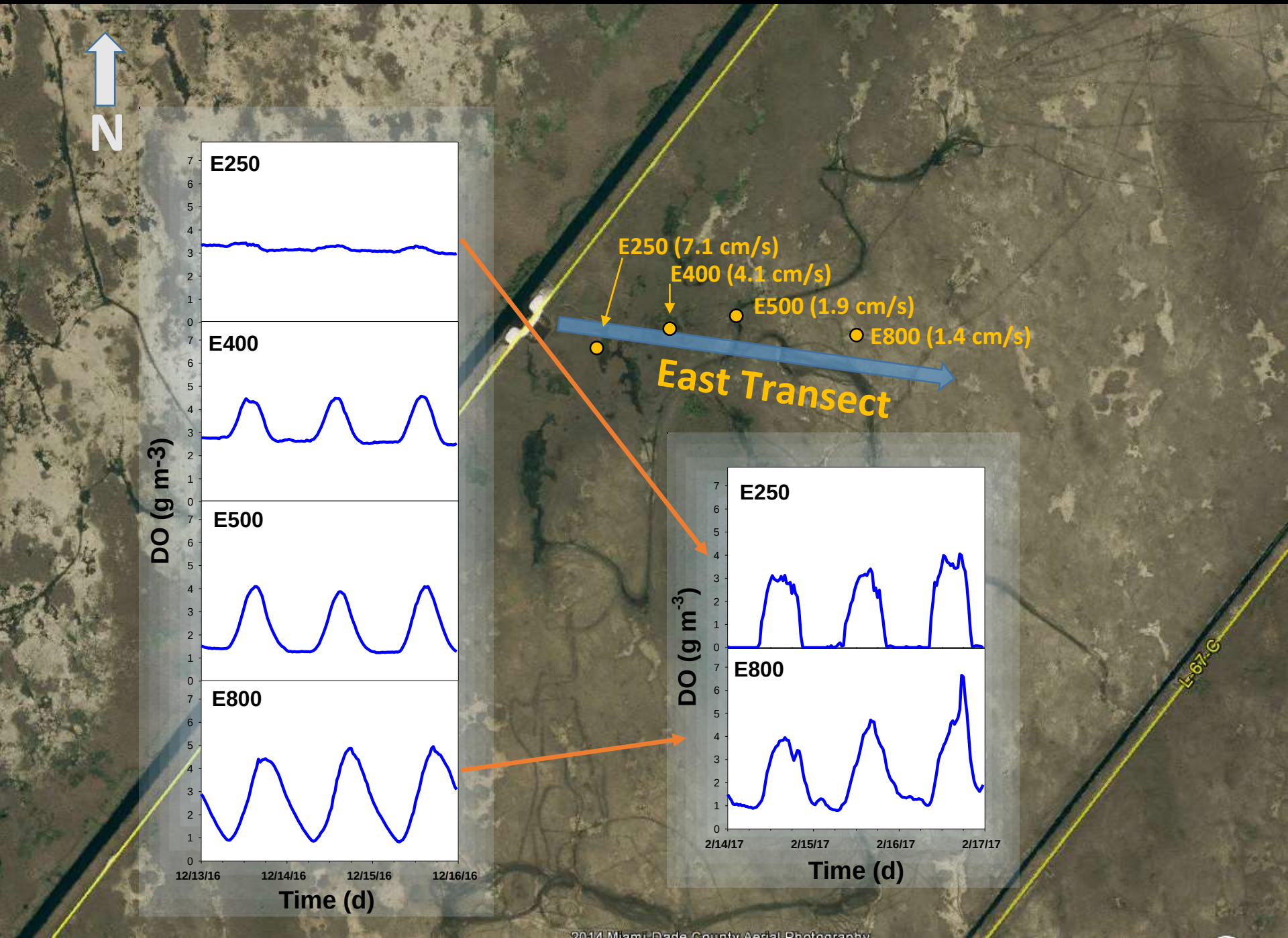
L-67-A

L-67-C

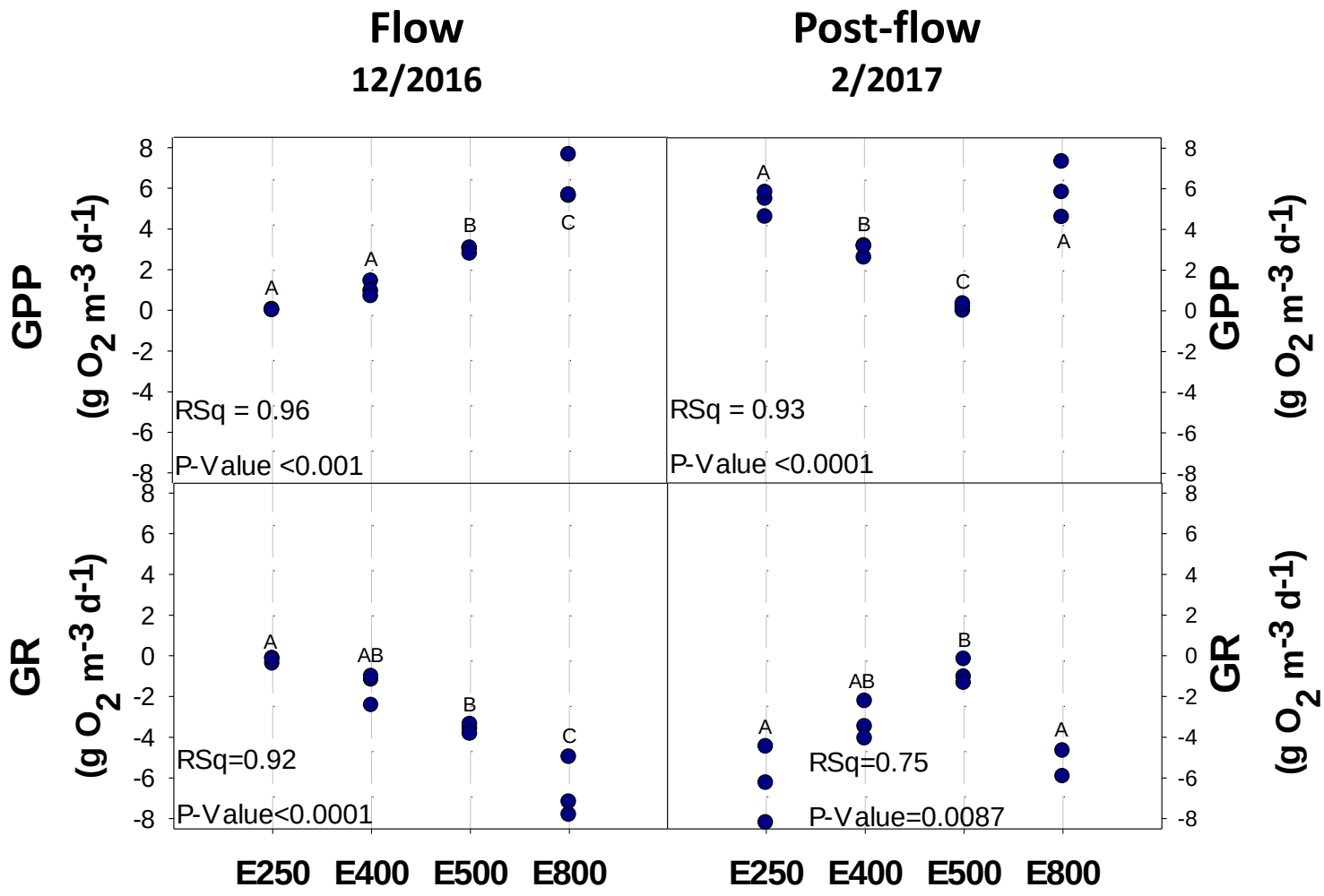


South Flow-way




N
E250
E400
E500
E800
DO (g m-3)
12/13/16
12/14/16
12/15/16
12/16/16
Time (d)
E250 (7.1 cm/s)
E400 (4.1 cm/s)
E500 (1.9 cm/s)
E800 (1.4 cm/s)
East Transect
E250
E800
DO (g m-3)
2/14/17
2/15/17
2/16/17
2/17/17
Time (d)
L-67-C
2014 Miami-Dade County Aerial Photography

East Transect



Summary

- Productivity was net heterotrophic
  - (McCormick et al 1997, Hagerthy et al. 2010)
- GPP and GR decreased in response to flow
  - This may be do to “slough clearing”…
    - Loss and transport of periphyton community
    - Bed sediment scouring
  - Higher flows reduced DO diurnal variation
    - Result of increased water column mixing
- GPP and GR increased the further a site was from the S152 structure
- Post-flow GPP and GR at low and high flow sites did not differ

Acknowledgements

- Claus Hansen, Garren Mezza, Michelle Blaha, Fabiola Santamaria, Christa Zweig, and Michael Manna
- USACE, USGS, ENP, USFWS, FDEP, SFWMD
- Univ. Hawaii, Florida International University, ...

Next Steps

- Researching flow paradigms in the Everglades
- Lateral flow inputs
- Slough's porous boundaries
- Reduction in DO diel variation