



FINE-SCALE SPATIAL patterning of phytoplankton abundance in a coastal estuary

August 2016

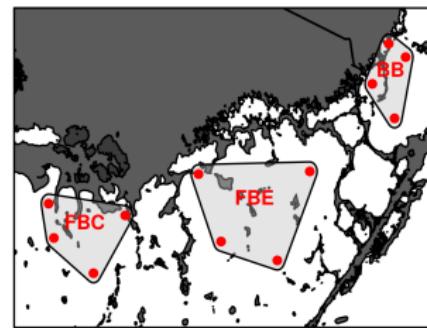
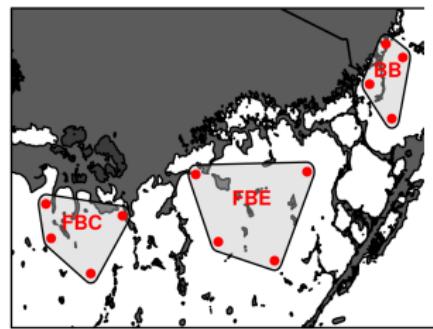
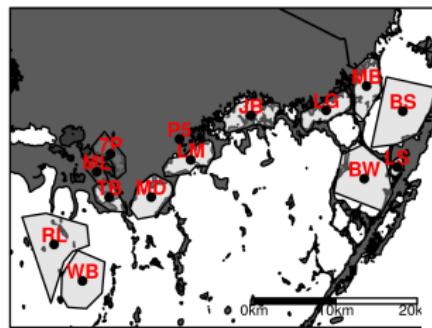
**Joseph Stachelek, Christopher Madden, Stephen P.
Kelly, Michelle Blaha**

South Florida Water Management District
Everglades Division

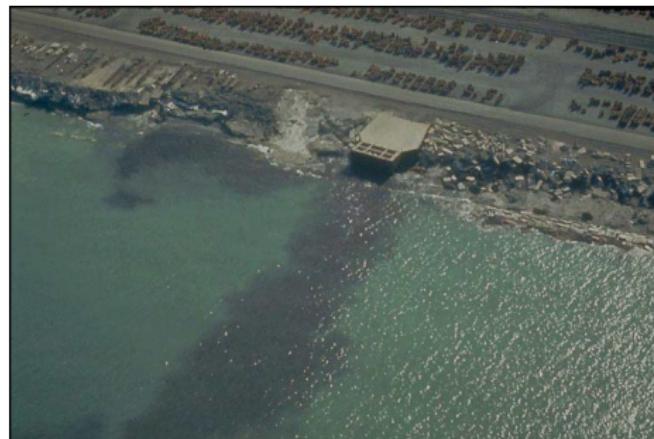
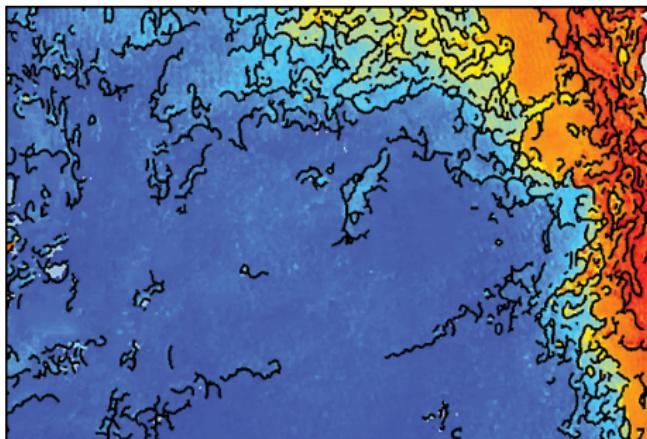
HOW CAN WE DESCRIBE PHYTOPLANKTON DISTRIBUTIONS?



THE DISCRETE APPROACH



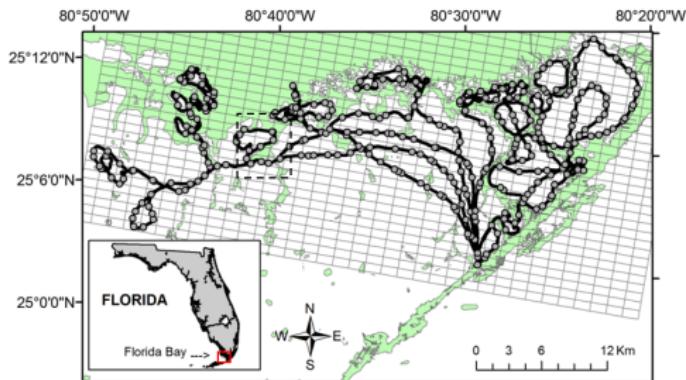
WHAT DO WE MISS WITH THE DISCRETE APPROACH?



- ▶ Spatial Gradients
- ▶ Point Source Extent

AN ALTERNATIVE - THE UNDERWAY APPROACH

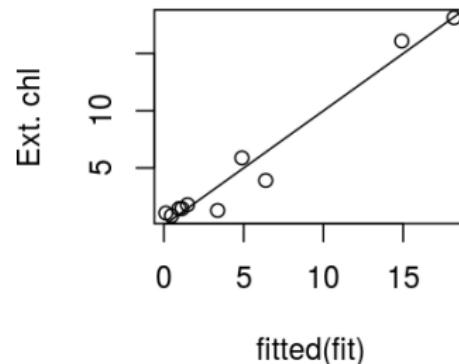
- ▶ Quarterly surveys
- ▶ Measurements every 50m
- ▶ Emphasis on freshwater discharge



CHLOROPHYLL MODELLING^{1,2}

1 to 1 line

Instrument Package	Parameter
Optical 1	CDOM
...	Chlorophyll
Optical 2	CDOM
...	Chlorophyll
...	Phycocyanin
...	Phycoerytherin



```
DataflowR:::chlcoef(201509, corcut = 0.75)
> Initial correlation matrix
> MLR with all variables...
> Checking for redundancy in variables pairs
> Generate AIC for candidates
> Checking VIF...
```

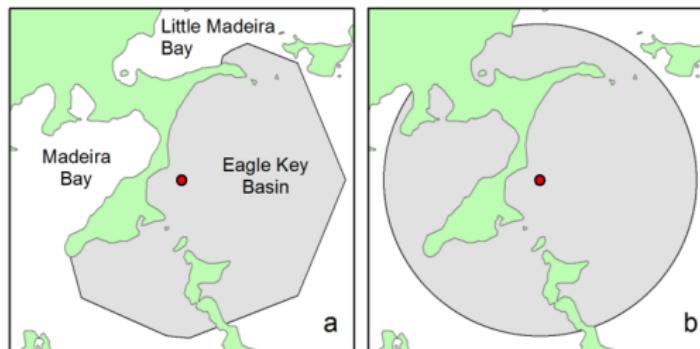
¹Seppälä et al. 2007 ²Venables and Ripley 2002

SPATIAL MODELLING

Inverse Path Distance Weighting (IPDW)

- * A non-model based machine-learning approach focused on out-of-sample prediction skill

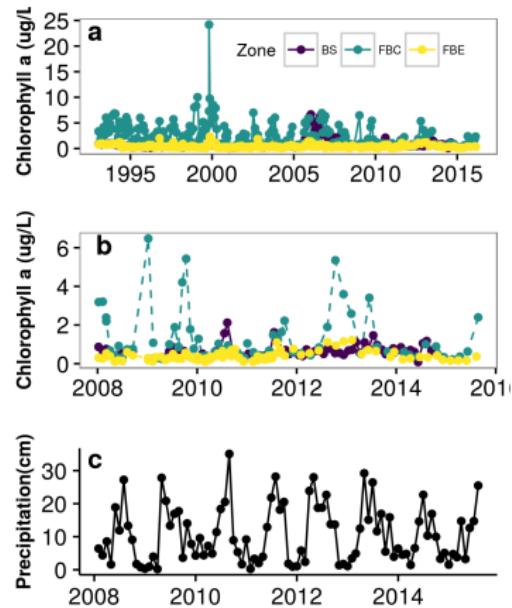
As the crow flies or as the fish swims?²³



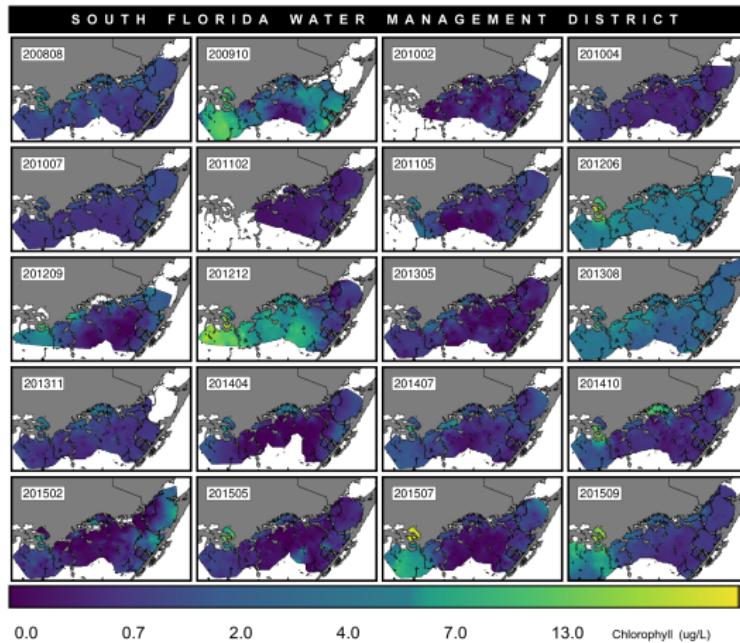
²Little et al. 1997

³Suominen et al. 2010

RESULTS



RESULTS



RESOURCES

<http://cran.r-project.org/package=ipdw>

- ❑ Stachelek J.,C. J. Madden,S. P. Kelly,M. Blaha (submitted).
Fine-scale relationships between phytoplankton abundance
and environmental drivers in Florida Bay, USA.
»Estuaries and Coasts«
- ❑ Stachelek J.,C. J. Madden. 2015. Application of Inverse
Path Distance Weighting for high-density spatial mapping
of coastal water quality patterns
»Int. J. Geographical Information Science«
- ▶ **jstachel@sfwmd.gov stachel2@msu.edu**