Trajectory Analysis of Everglades Diatom Community Response to Natural and Anthropogenic Influences

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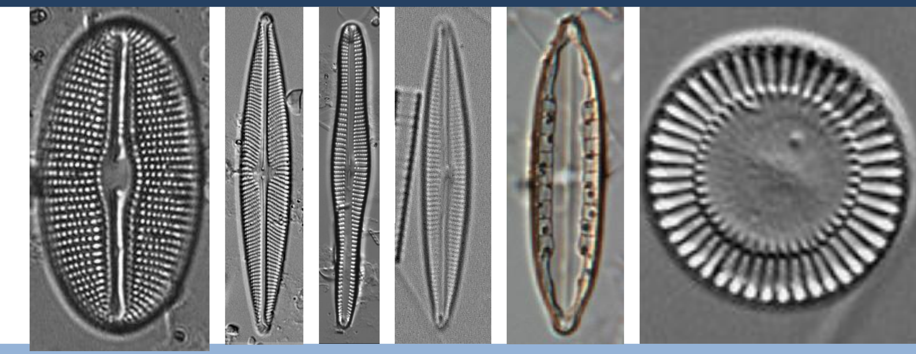
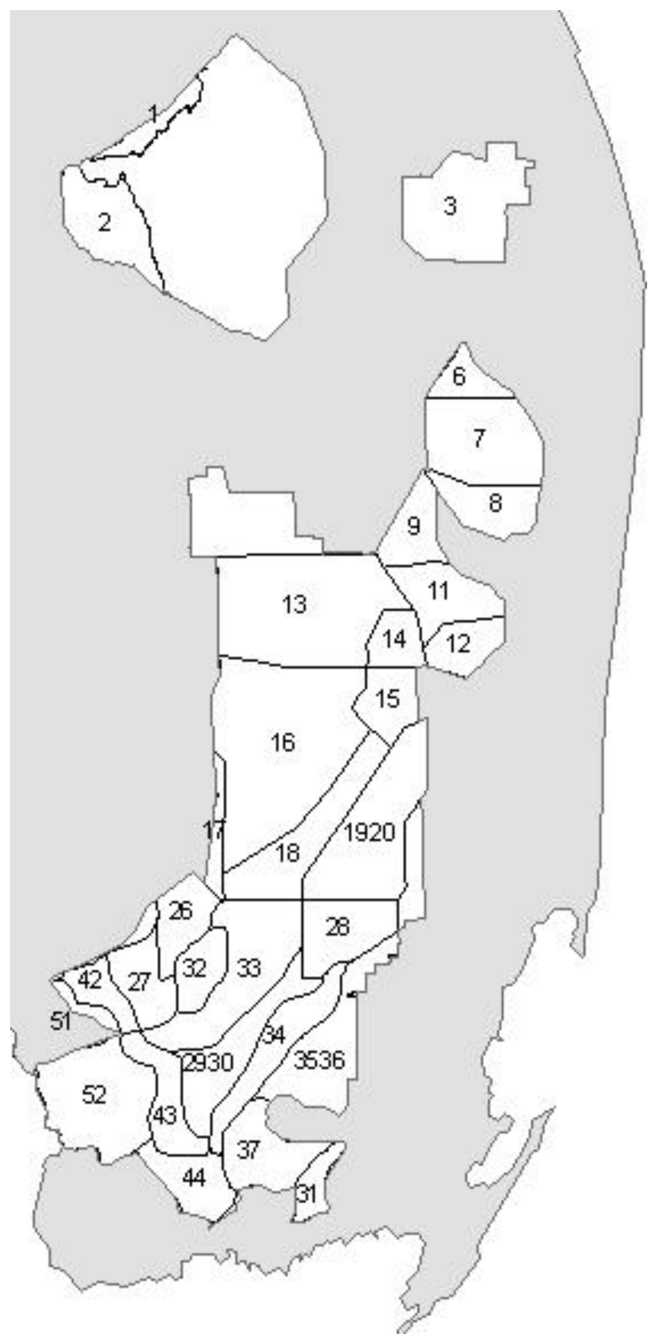


Introduction

- Everglades restoration efforts require a sound understanding of how changing environmental factors influence communities over time and space.
- Phosphorus, hydrology, and conductivity gradients are some of the important drivers of differences in communities across the Everglades.
- Natural impacts, such as hurricanes, and anthropogenic influences, such as water management, both strongly influence the spatial range and intensity of these gradients.
- Diatoms are important indicators of environmental conditions and form the base of the aquatic food web in the Everglades.
- We want to know how Everglades diatom communities have changed from 2005 to 2006 in response to these gradients to determine which regions are sensitive to change and where restoration efforts should be focused.

Fig 1. Sampling regions of CERP-MAP



Methods

- Periphyton was collected as part of the food web component of CERP-MAP (Fig. 1) and analyzed for diatom community composition.
- Trajectory analysis - a statistical method available in the DECODA program that tracks communities through time and evaluates whether they are progressing toward or away from restoration goals.

DECODA

Database for Ecological COmmunity DAta

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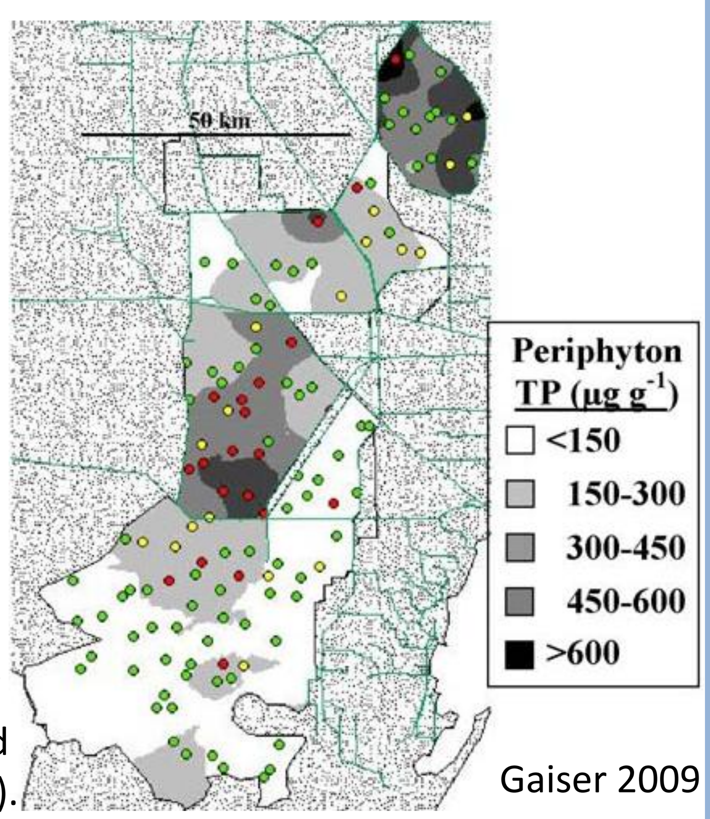
- The results of trajectory analysis will be visually represented on a GIS map using color gradients.
- Color gradients will be based on the baselines determined by Gaiser et al. 2006 and the stoplight system by Gaiser 2009.

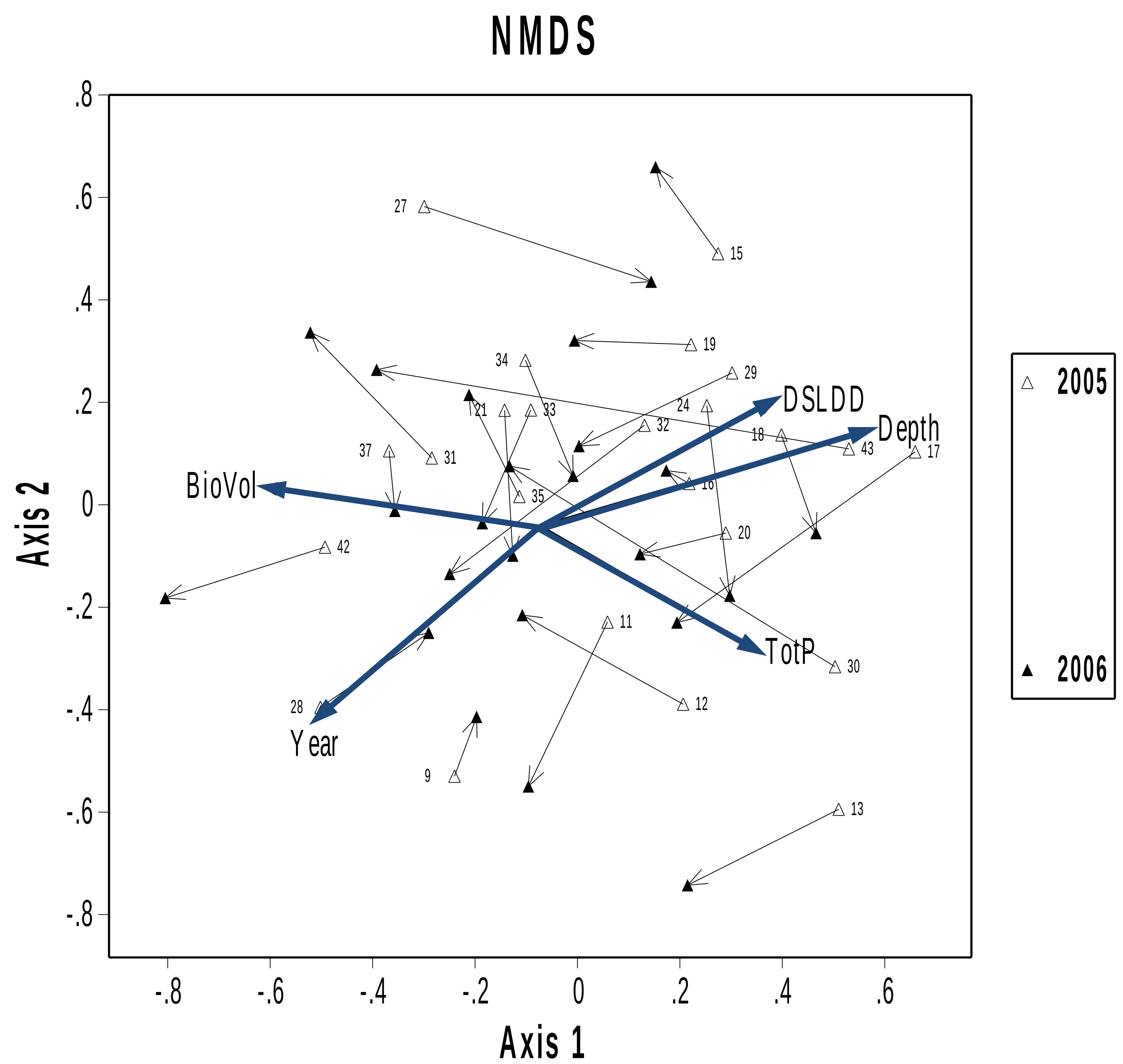


>>Fig 2. Expected background values of periphyton total P (gray scale) and measured deviations (red, yellow, green points).

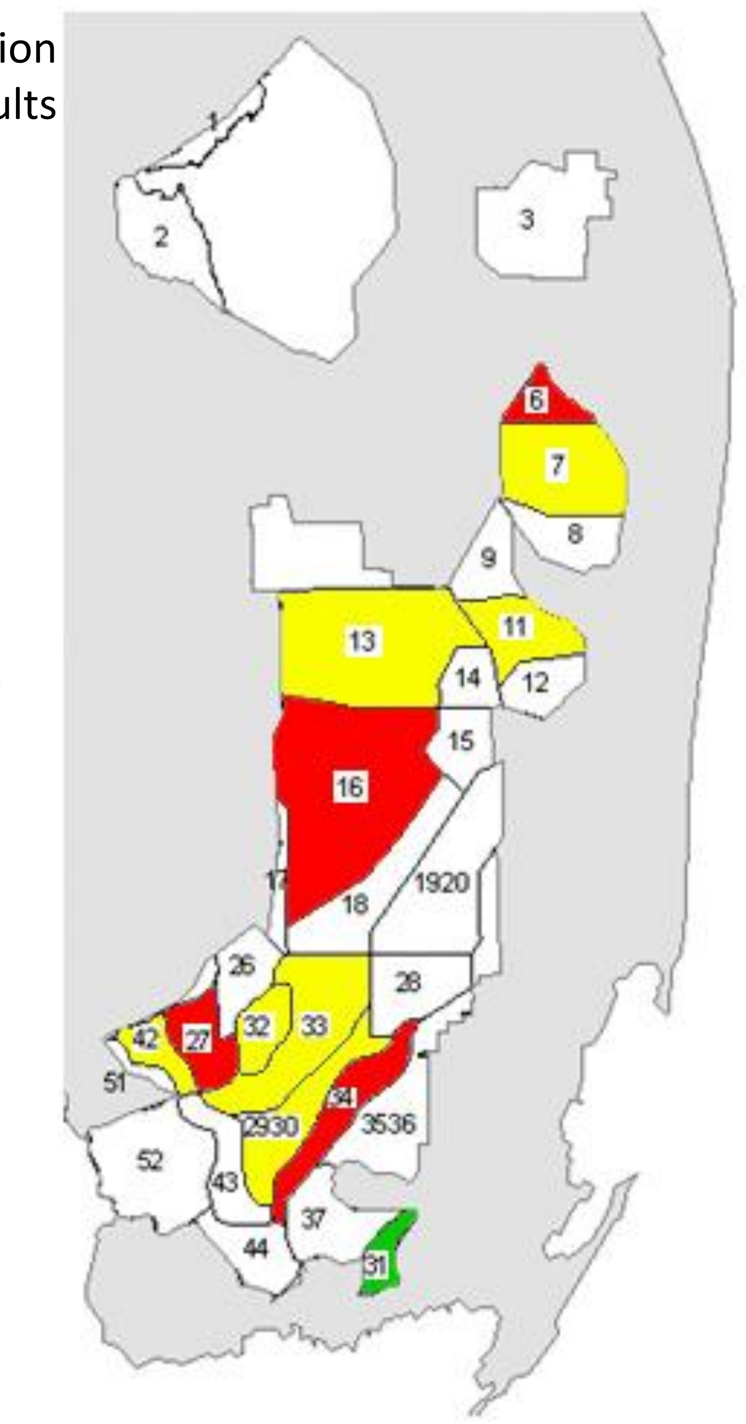
Gaiser 2009

Results

Fig 3. NMDS of 2005-2006 diatom community composition data with trajectory analysis



>>Fig 4. Visual representation of trajectory analysis results



- Red regions represent communities with significant trajectories toward increasing TP.
- Yellow regions represent communities with significant trajectories toward decreasing water depth.
- Green region represents communities with significant trajectories toward decreasing TP.

Discussion

- Diatom community composition data provides high resolution information about how the Everglades is changing.
- Increasing total phosphorus could be a result of both anthropogenic inputs and natural disturbance of the water column and benthic zone due to hurricane activity.
- The significance of water depth could be due to water management practices as well as the fact that 2005 and 2006 were years of low precipitation.
- Maps representing changes in communities across the Everglades could provide environmental managers with a useful tool for capturing the history and present state of the ecosystem.
- We aim to develop maps that will ultimately help guide managers focus their restoration efforts in regions of the Everglades that are most vulnerable.

Future work

- Incorporate 2007 and 2008 diatom community composition data.
- Apply GIS map-making tools and geostatistical analyses.
- Develop understanding of Everglades diatom community assembly and dispersal ability.

References

- Gaiser EE, Childers DL, Jones RD, Richards JH, Scinto LJ, Trexler JC (2006) Periphyton responses to eutrophication in the Florida Everglades: Cross-system patterns of structural and compositional change. Limnology and Oceanography 51:617-630.
- Gaiser E (2009) Periphyton as an indicator of restoration in the Florida Everglades. Ecological Indicators 9:S37-S45.

Acknowledgements

EVERGLADES FOUNDATION

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