

Impact of the Intermediate Operating Plan on Everglades National Park

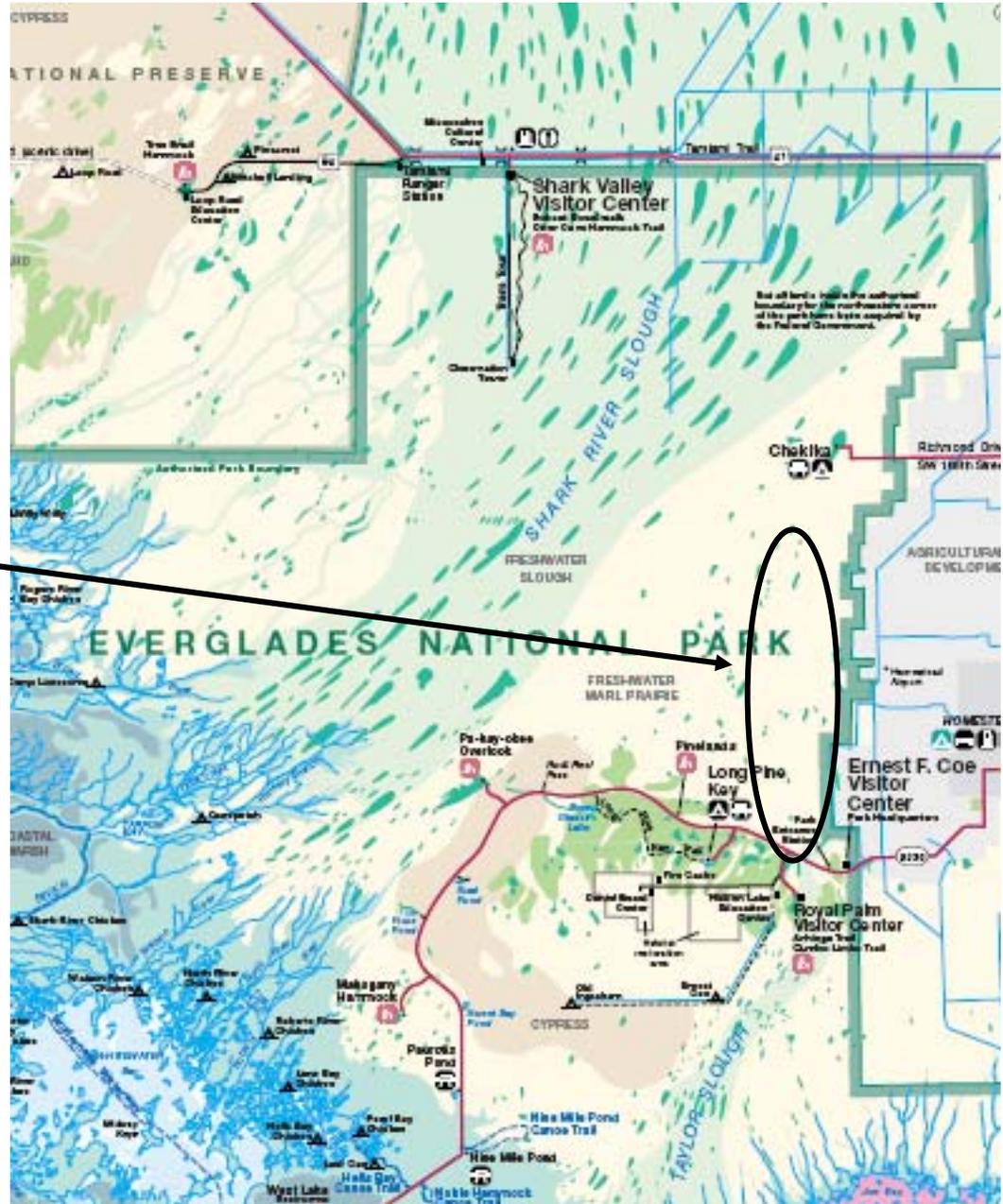
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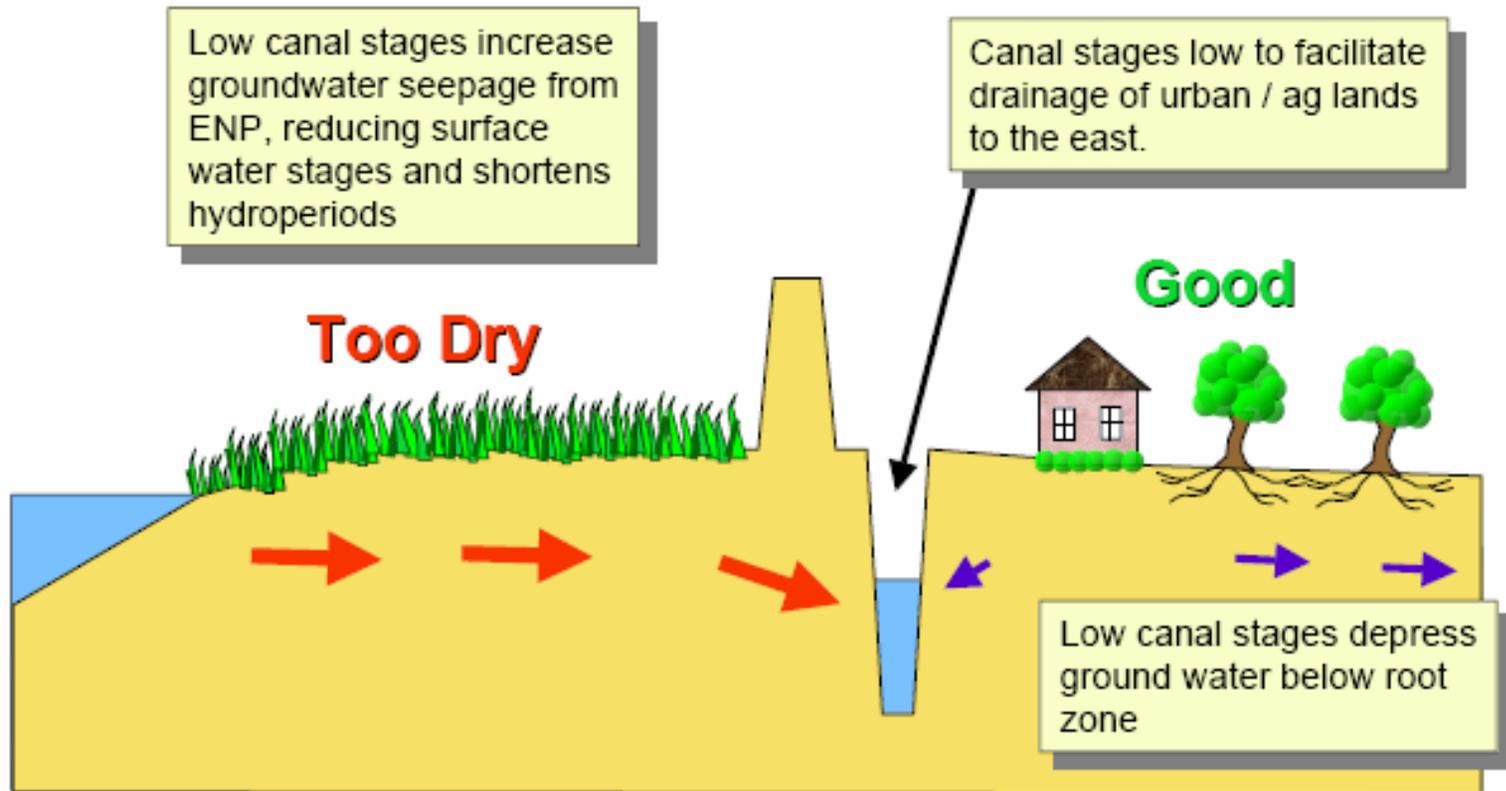
The Challenge for Management

- This region of Everglades National Park is too dry (Rocky Glades)
- Current hydroperiod is typically a few months each year
- Models and historical anecdotes indicate that it was much wetter before drainage
- Habitat quality for wildlife is compromised
- But, can this be done without generating nutrient impacts?



South Dade Conveyance System

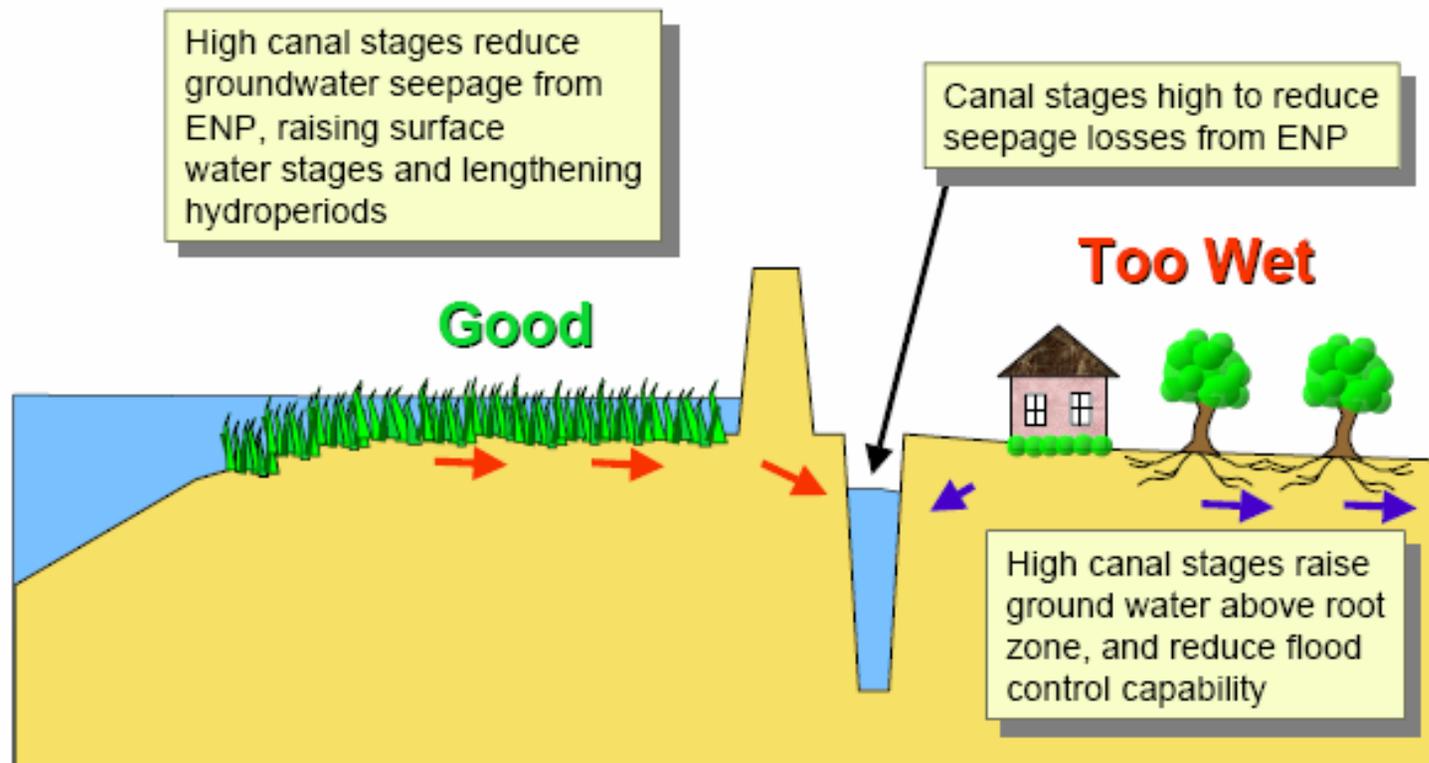
Flood Control Operations



ENP figure

South Dade Conveyance System

Restoration Operations

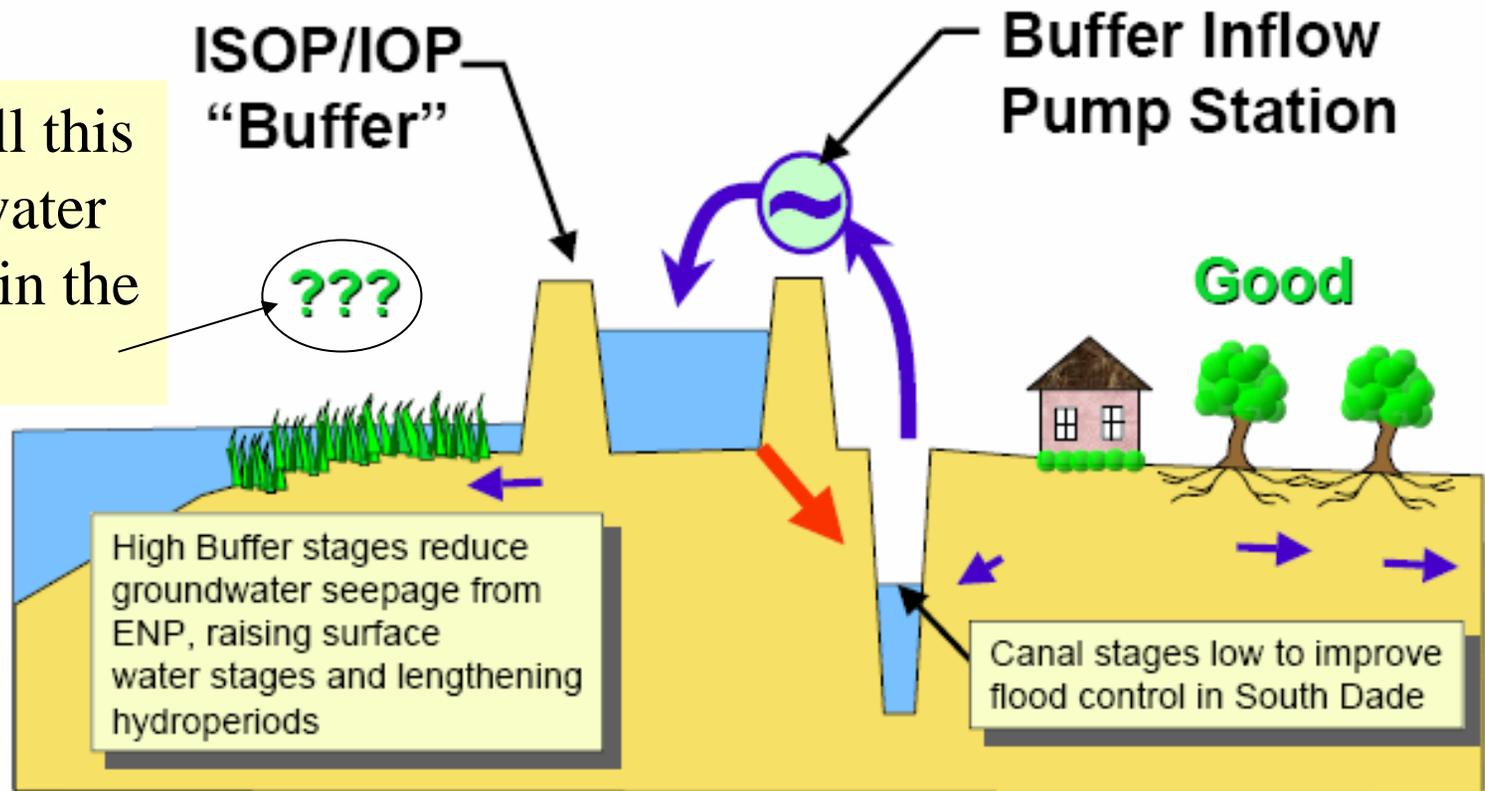


ENP figure

South Dade Conveyance System

ISOP / IOP Operations

But, will this affect water quality in the marsh?



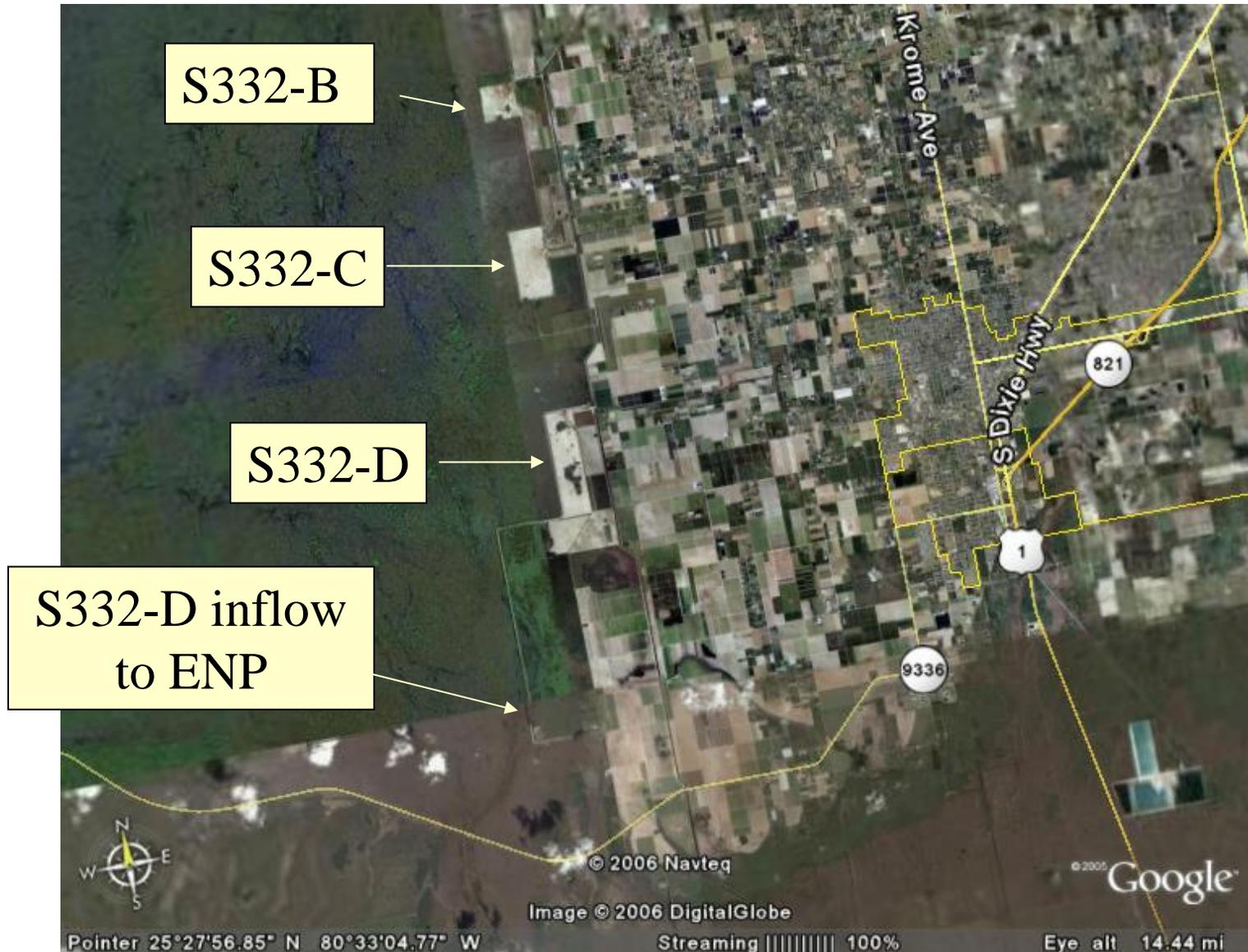
ENP figure

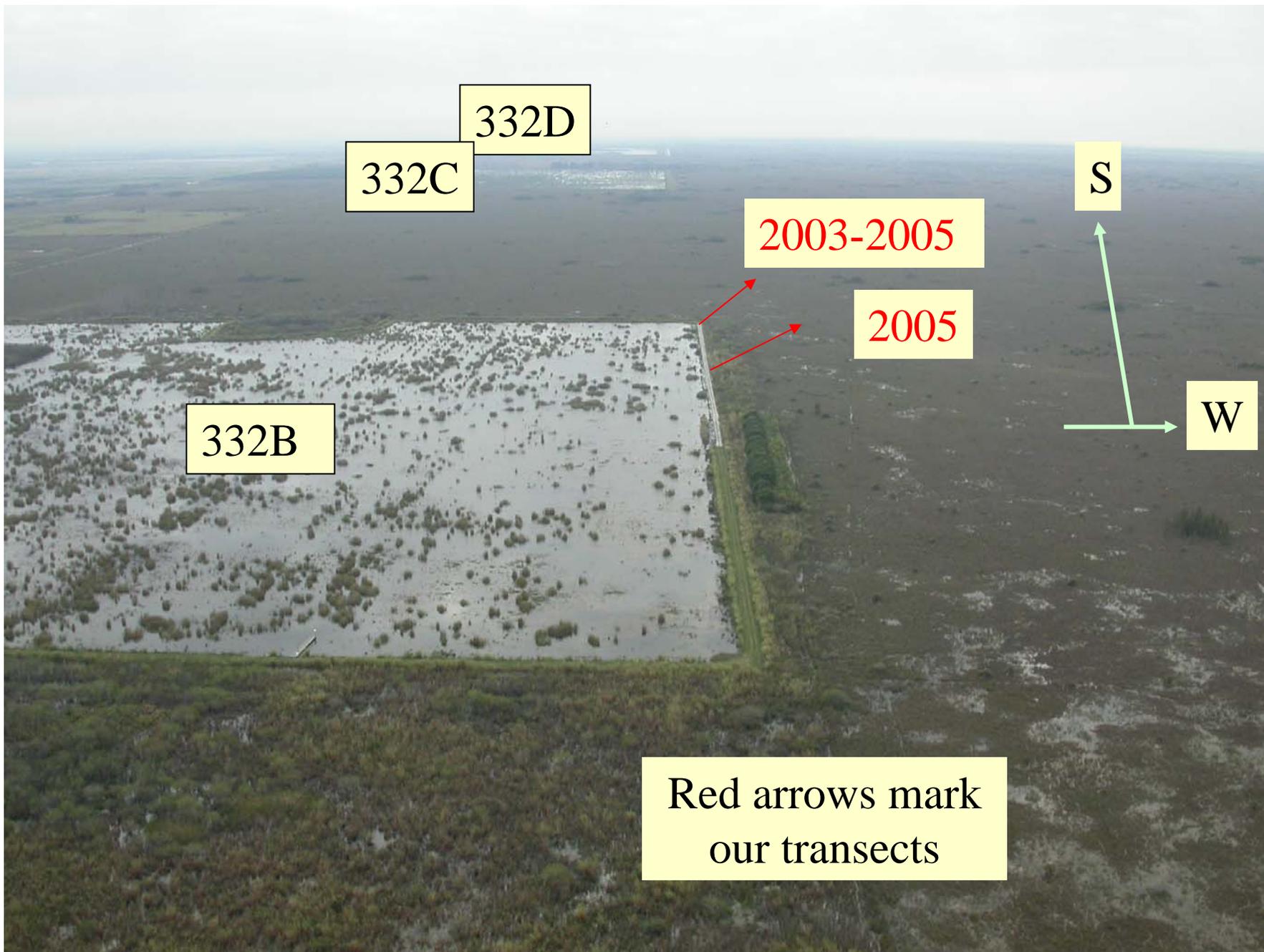
Monitoring for Nutrient Impacts

Periphyton is a sensitive indicator

- We sampled periphyton in transects starting at the S-332B, C, and D structures or inflows and extending west. Samples were taken at 20m intervals from the edge to 100m from the edge. Starting in 2004, we also sampled two reference transects between the structures to document 'edge' effects, if present.
- Three samples were haphazardly gathered from each point in December of 2003, 2004, and 2005. These areas are inundated for 3 to 4 months each year, and December is near the end of that period.
- Samples are returned to the lab on ice, where they are frozen prior to processing. Tissue TP (ug/g), organic carbon (%), chlorophyll a (ug/g AFDM), and species composition are recorded.

Geography of Impoundments on Eastern Boundary of ENP





332C

332D

332B

2003-2005

2005

S

W

Red arrows mark
our transects

S332C



Red arrow
marks our
transect



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Pointer 25°30'44.73" N 80°34'20.08" W

Streaming 100%

Eye alt 7424 ft

S-332D Impoundment and L-31W



S-332D

ENP

L-31W

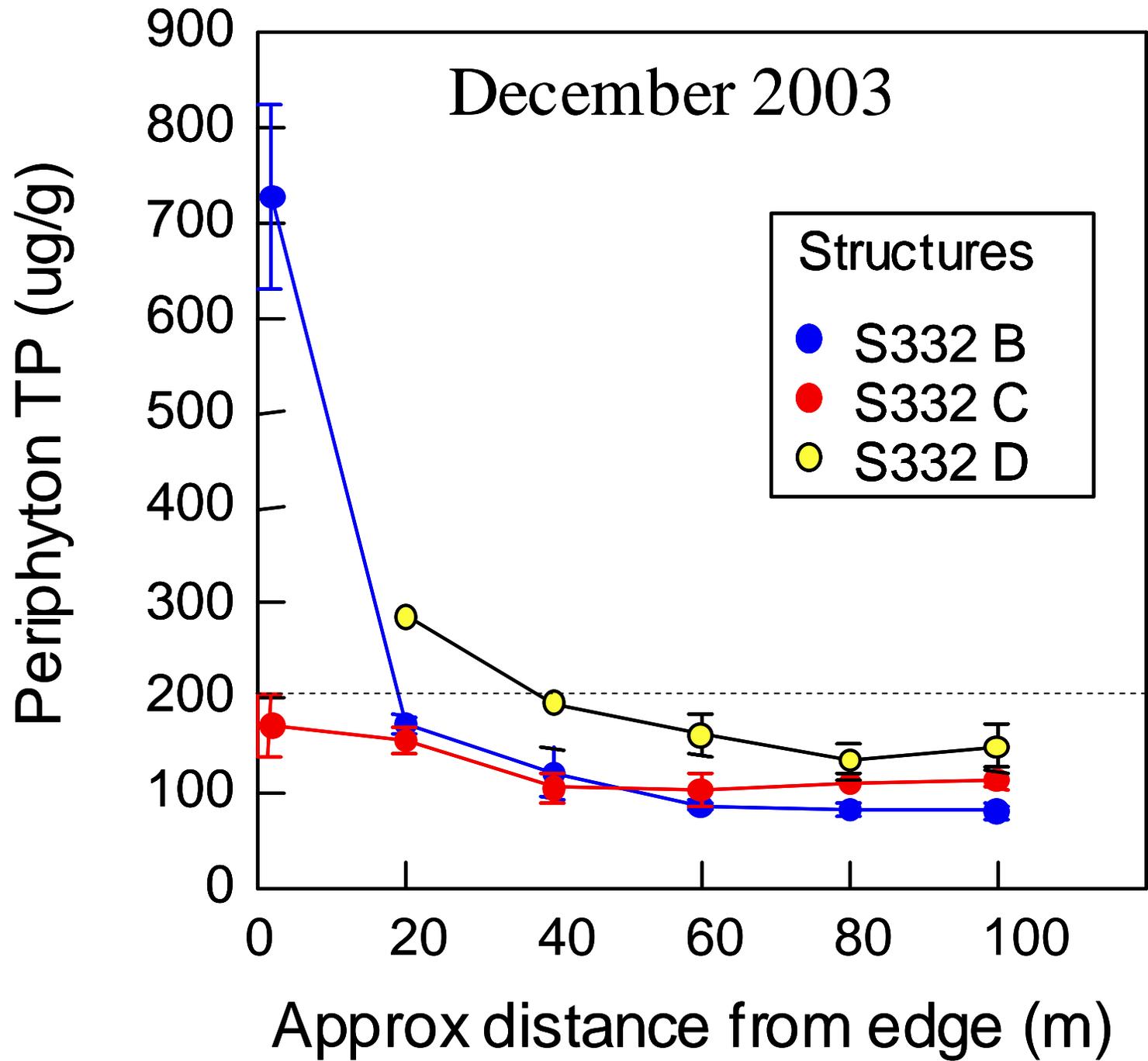
S-332D Inflow

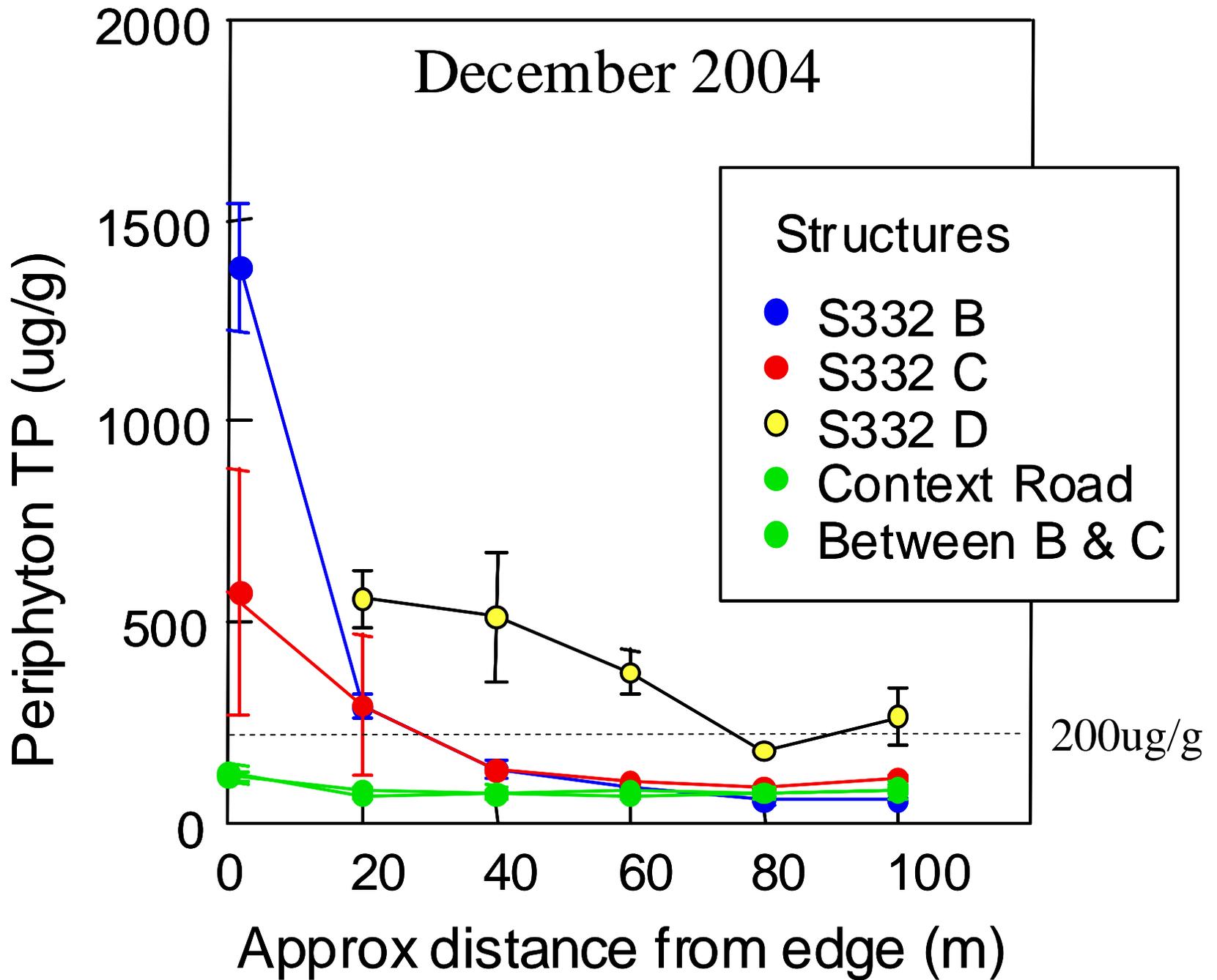
- Inflow at S-332D is on the west side of L-31W, while the impoundment is on the east side.
- ‘Sheetflow’ has been created from canal into the marsh on a small scale
- This creates a different situation from S332B and C, where flow effects are absent... flow has lengthened the hydroperiod of this marsh compared to the northern two sites

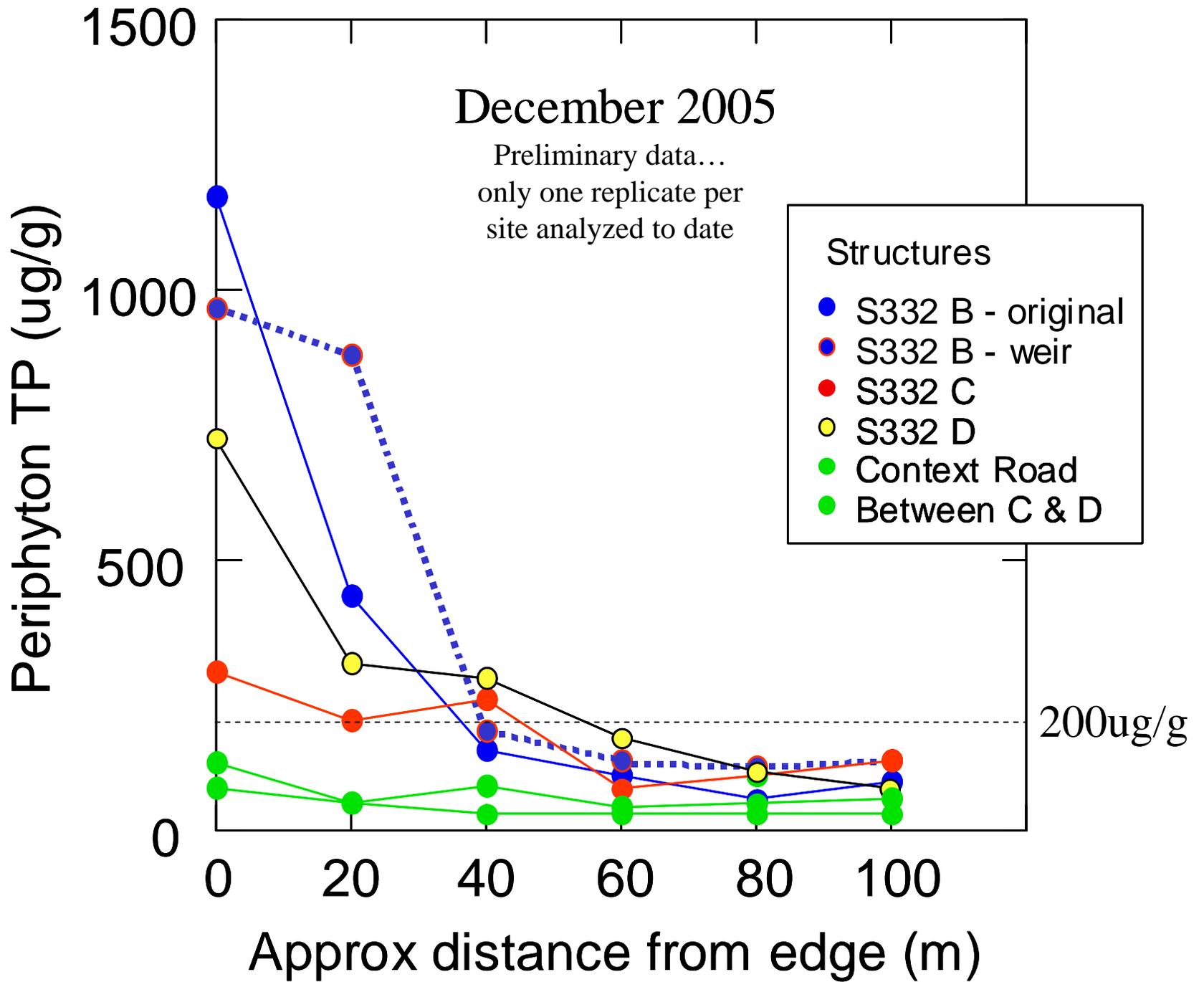
Red arrow
marks our
transect

S-332D inflow
to ENP



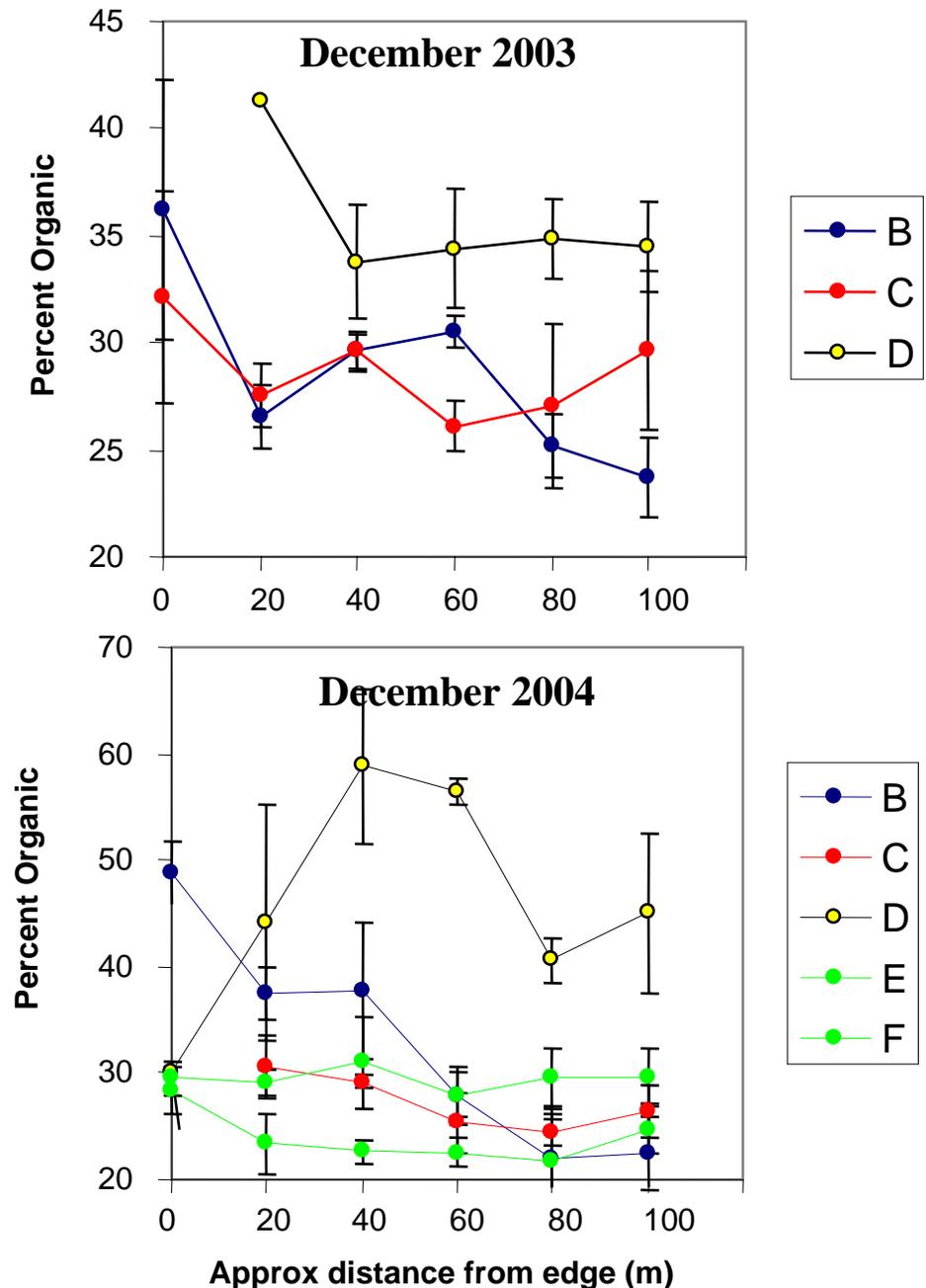






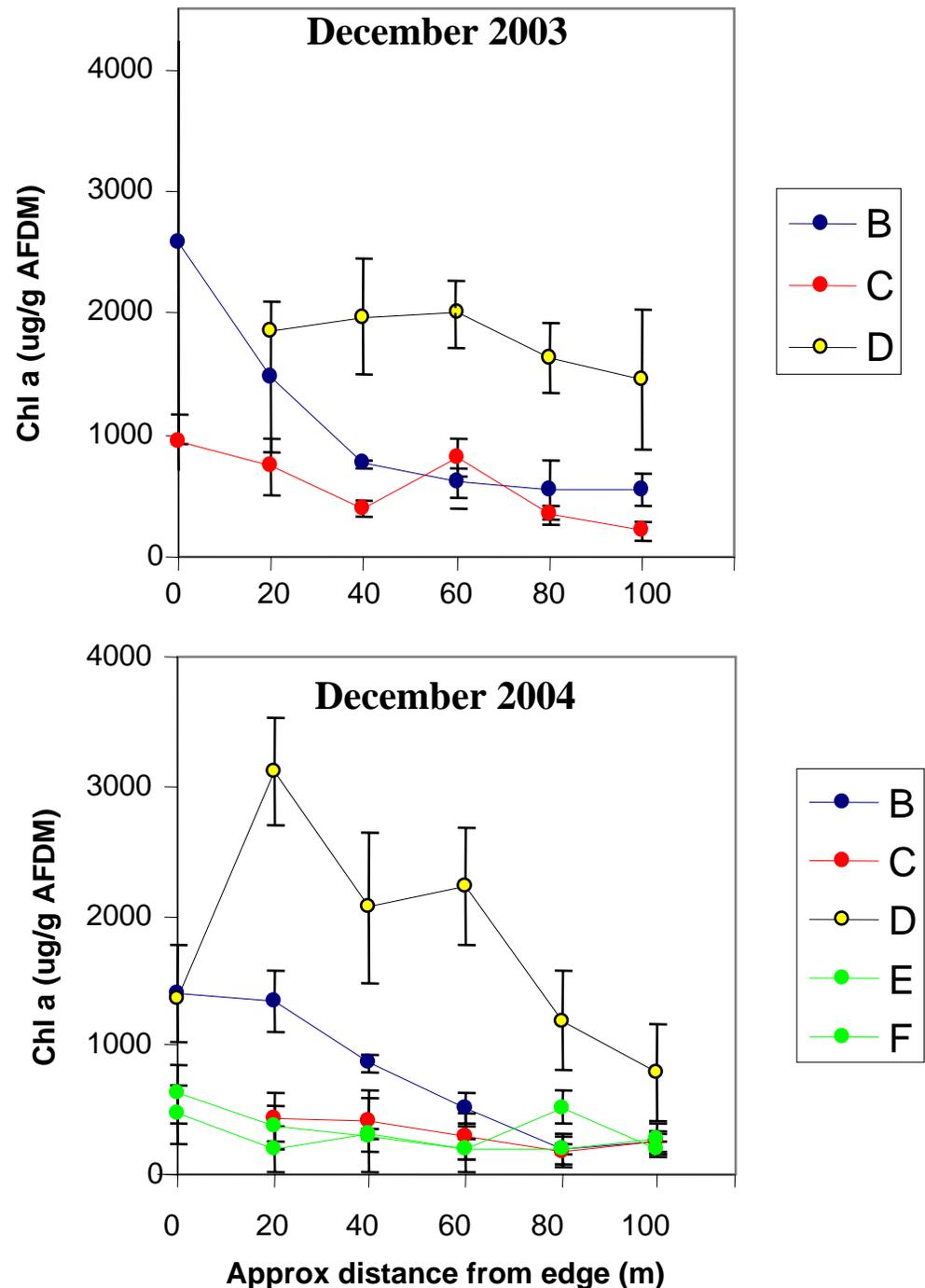
Periphyton Organic Content

- Organic content of periphyton increases with P enrichment
- Organic content is also higher in mats typical of longer hydroperiods
- Note B transect decreases with distance, possibly a nutrient effect
- In contrast, D is generally higher... could be a hydroperiod effect



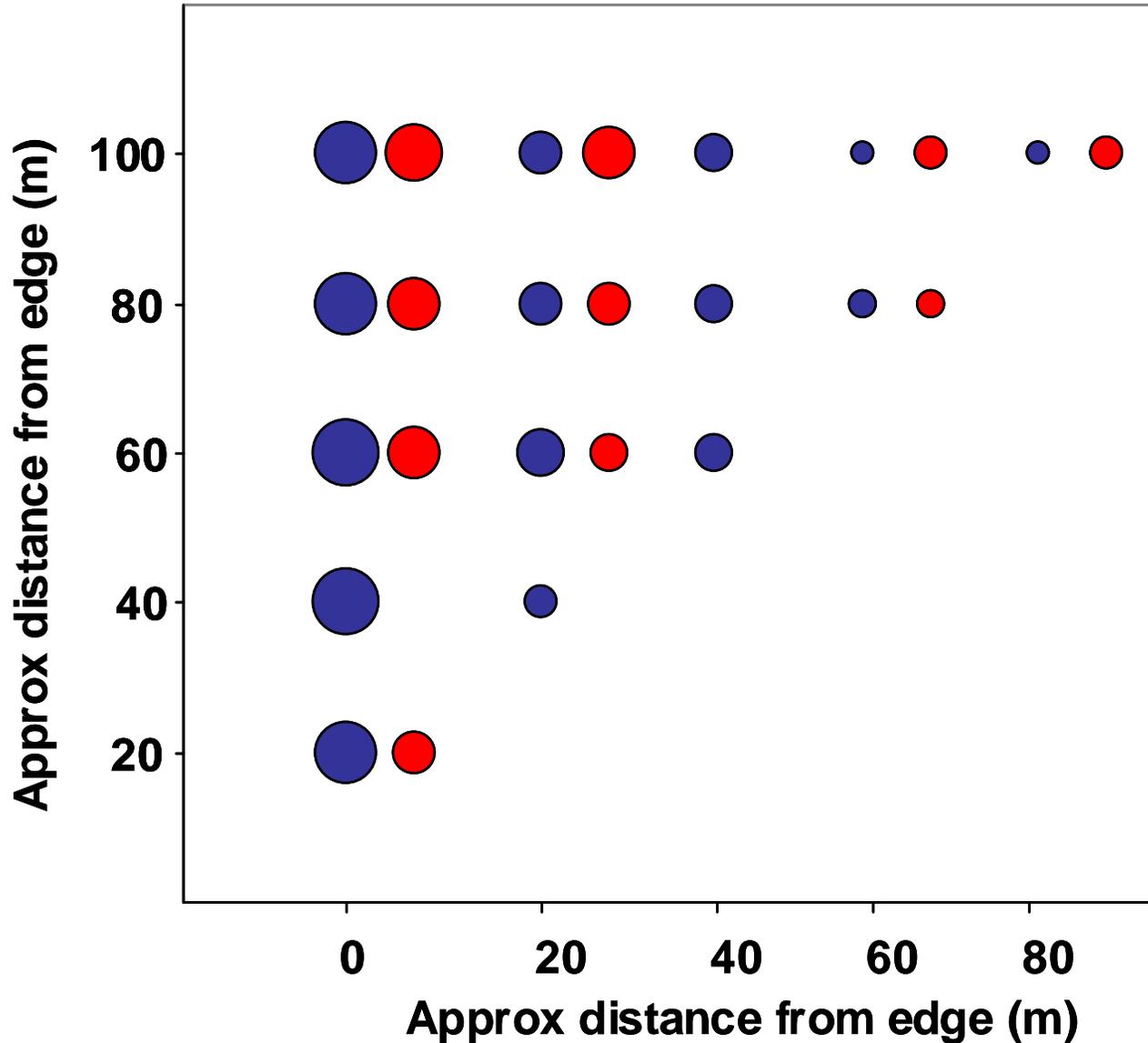
Chlorophyll a

- Chlorophyll a of periphyton increases with P enrichment
- Chlorophyll a may also be modestly higher in long-hydroperiod mats compared to short-hydroperiod ones
- Note B and C transects decrease with distance, possibly a nutrient effect



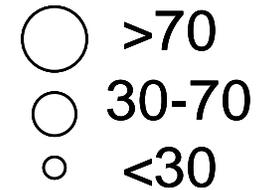
Diatom Composition

December 2003

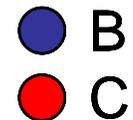


- Periphyton composition at both B and C are more similar at distant sites

% Difference



Transect



Conclusions

- There is evidence of persistent and increasing nutrient enrichment at S332-B. Pattern is consistent with nutrient flow from groundwater seepage.
- Enrichment at S332-C is less than at B, and is not apparently increasing
- S-332D may be experiencing enrichment as well, though confounding with flow effects requires cautious interpretation
- Continued monitoring is required



Acknowledgement



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References supporting our use of periphyton as an indicator:

- Gaiser, E. E., D. L. Childers, R. D. Jones, J. H. Richards, L. J. Scinto and J. C. Trexler. 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. E., J. C. Trexler, J. H. Richards, D. L. Childers, D. Lee, A. L. Edwards, L. J. Scinto, K. Jayachandran, G. B. Noe, R. D. Jones. 2005. Exposure to above-ambient phosphorus causes ecosystem state change in the Everglades. *Journal of Environmental Quality* 34: 717-72
- Gaiser, E. E., L. J. Scinto, J. H. Richards, K. Jayachandran, D. L. Childers, J. C. Trexler, and R. D. Jones. 2004. Phosphorus in periphyton mats provides best metric for detecting low-level P enrichment in an oligotrophic wetland. *Water Research* 38:507-516