An analysis of greenhouse gas fluxes across landscape positions in forested riparian buffers

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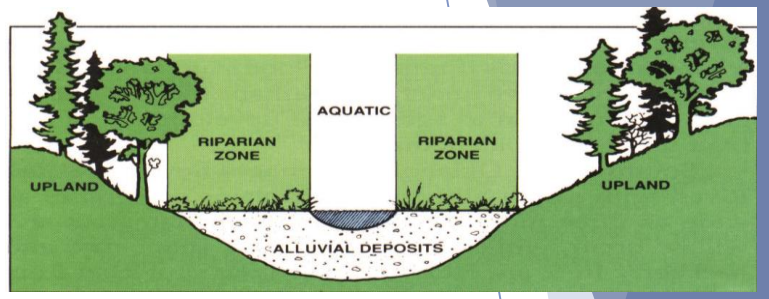
What makes Riparian zones so complex and Nitrous Oxide so important?

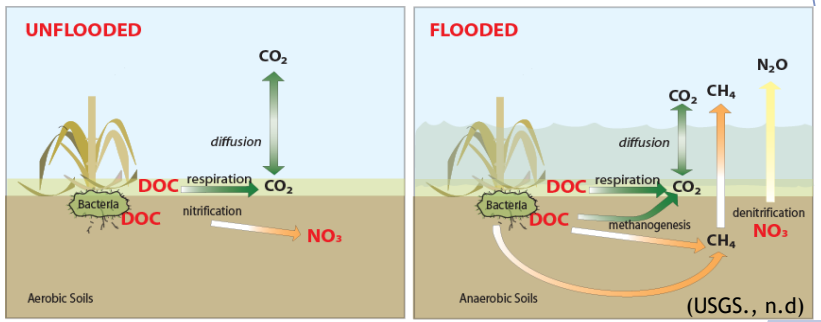


- Riparian zones play a major role in Nitrogen sequestration
  - Vulnerability
  - Storage of biomass
  - Immobilization and retention
  - Nitrification/Denitrification- removal of Nitrogen from the soil

- Nitrous Oxide (N_2O) (Klaus et al., 2013)
  - 300 global warming potential over 20 years
  - 6.24% global radiative force

What drives variability in Nitrous oxide (N2O) fluxes?

- Hot spots- greater biogeochemical activity in proximity to landscape positioning
- Hot moments- short period of time with heightened biogeochemical rates after an event (McClain et al., 2003)



Dry ambient condition

What causes this hot moment?

Physical parameters

- Oxygen concentration
- Volumetric Water Content (VWC)
- Temperature

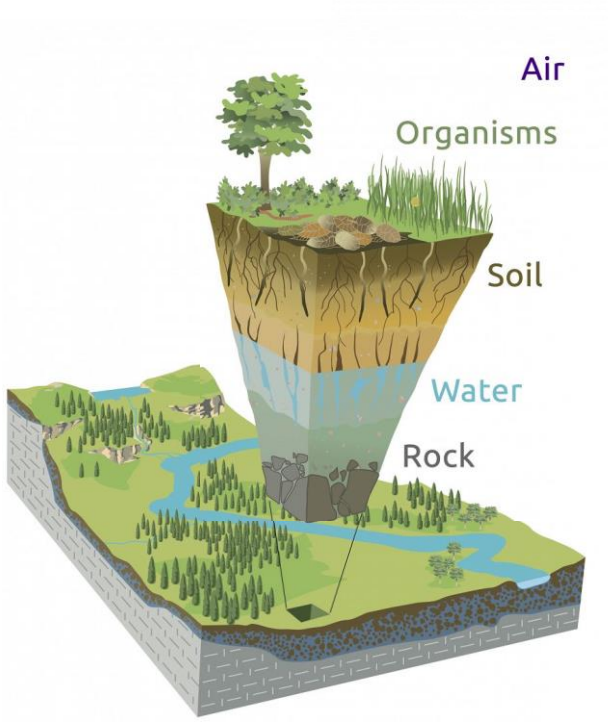
Research Question

How does N_2O vary temporally and spatially along a dry and wet riparian buffer zone in a forested environment?

Research implications

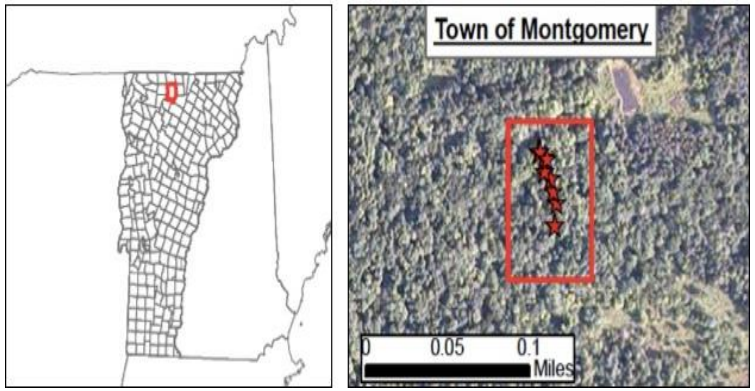
- What are major drivers of N_2O fluxes
- Hot spots vs. Hot moments and what occurs more frequently
- Understanding soil microbial processes

How this fits into Basin Resiliency



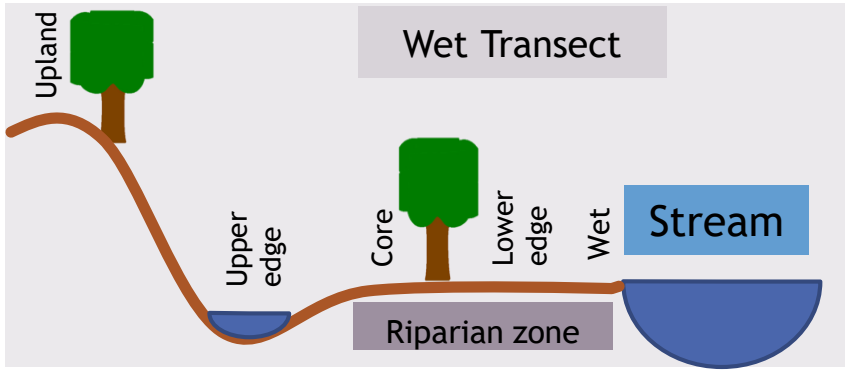
- Resiliency of the Lake Champlain Basin
- Soil biogeochemistry processes
- Baseline riparian zone data

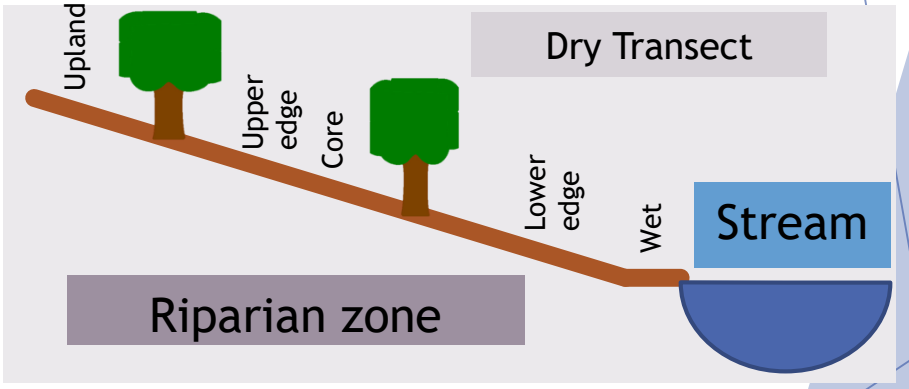
The process



Study Site

- Forested riparian zone perpendicular to a stream located in Lake Champlain Missisquoi Watershed
- Samples were taken at two different locations an upland site (dry) and wetland site (wet)
- Both sites had the same features: Upland, Upper edge, Core, Lower edge and Wet

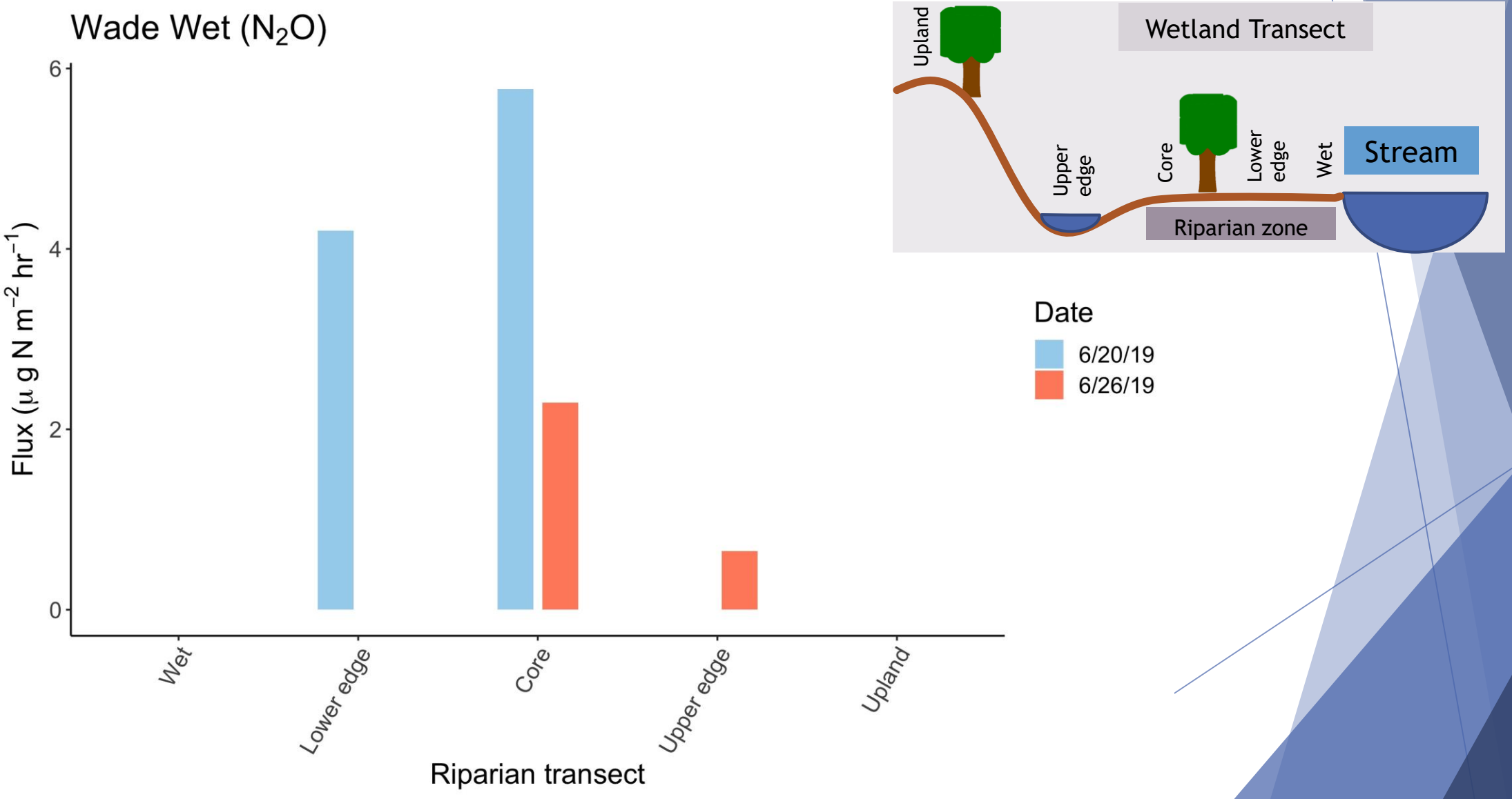


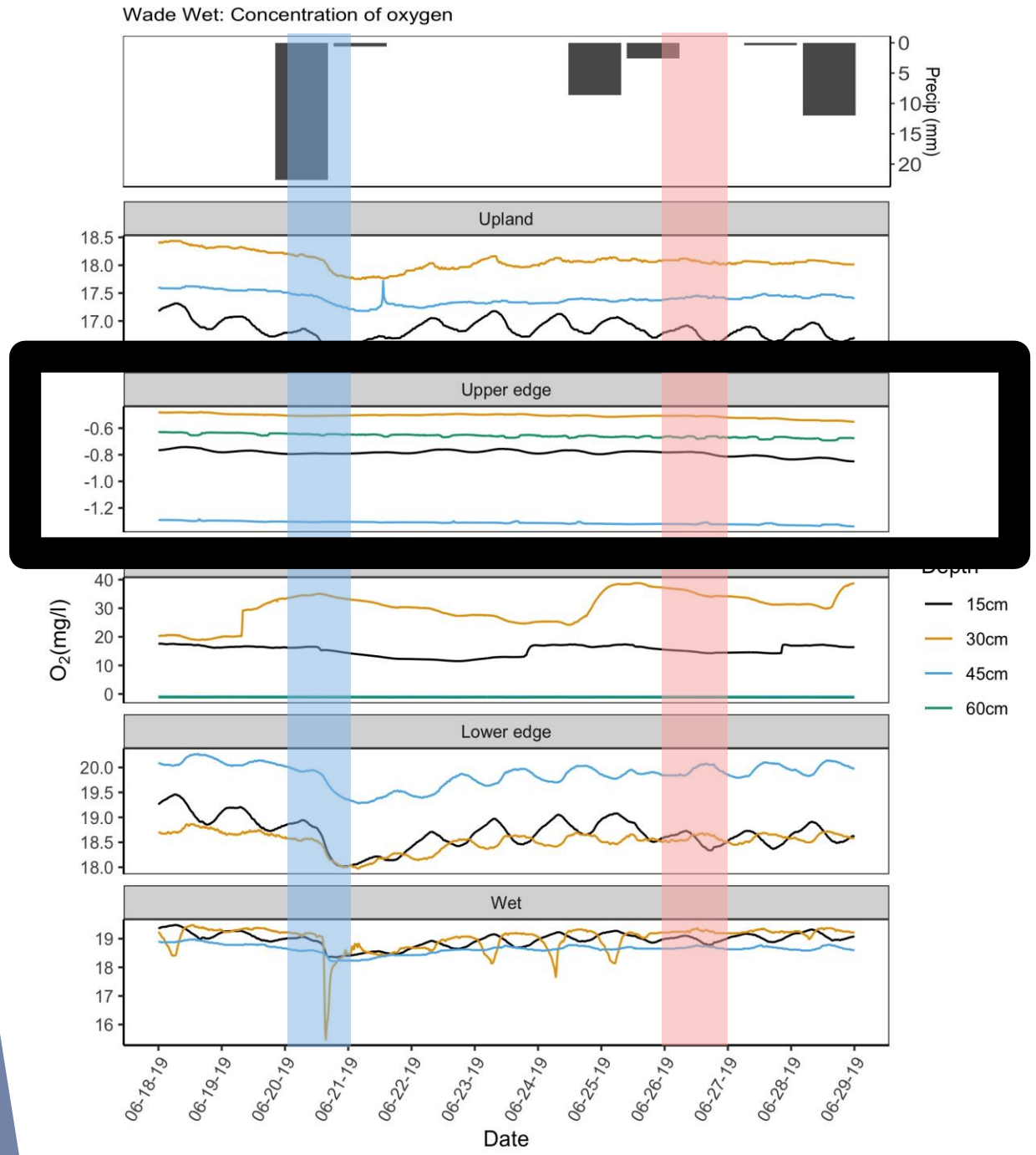


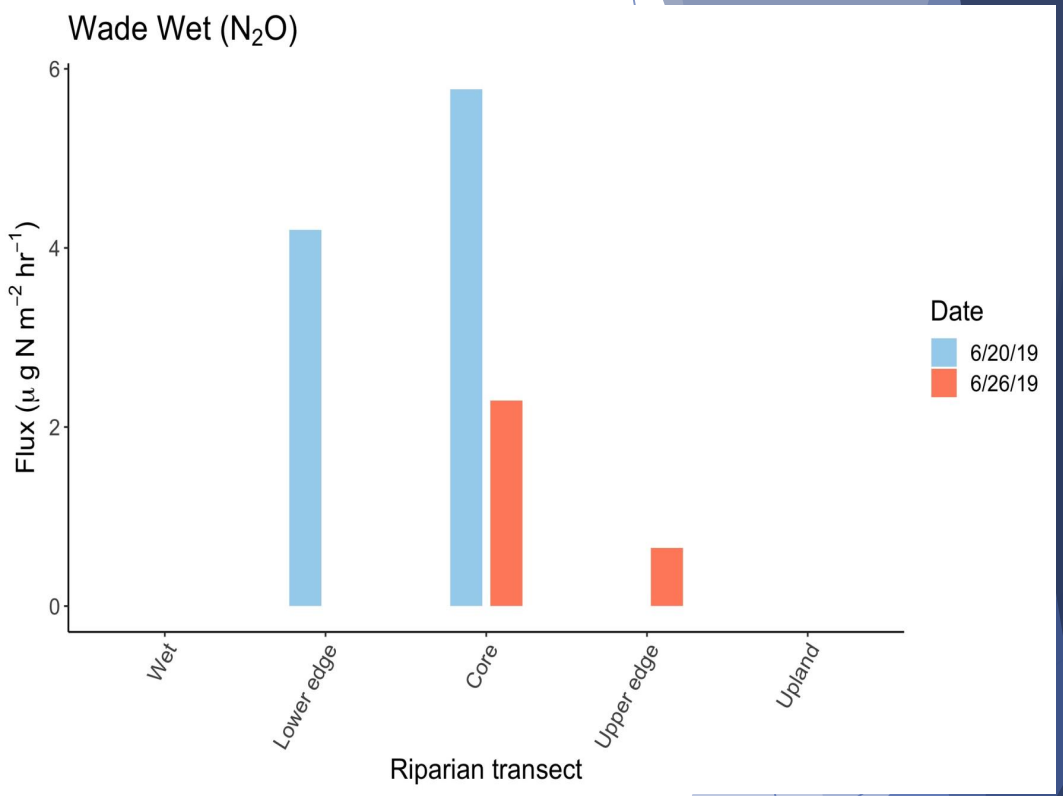
Field procedures

- High Frequency soil sensor provided O2, VWC, and temperature at different depths (15cm, 30cm, 45cm, 60cm)
- A gas chamber was used to capture greenhouse gas emissions from the soil
- Samples was taken every 15 minutes for 45 minutes and transferred to evacuated vials

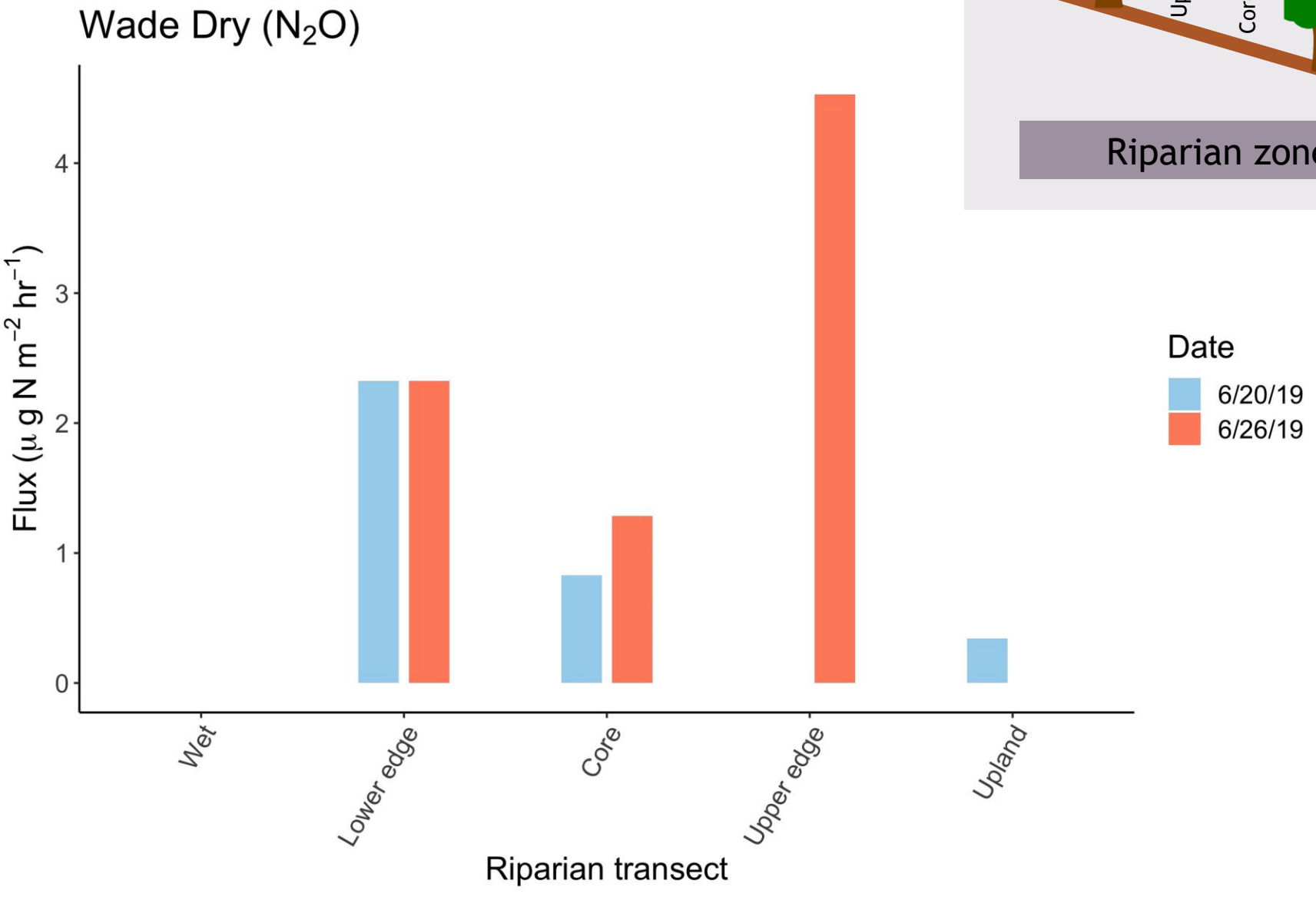
The wet sites have high N2O fluxes

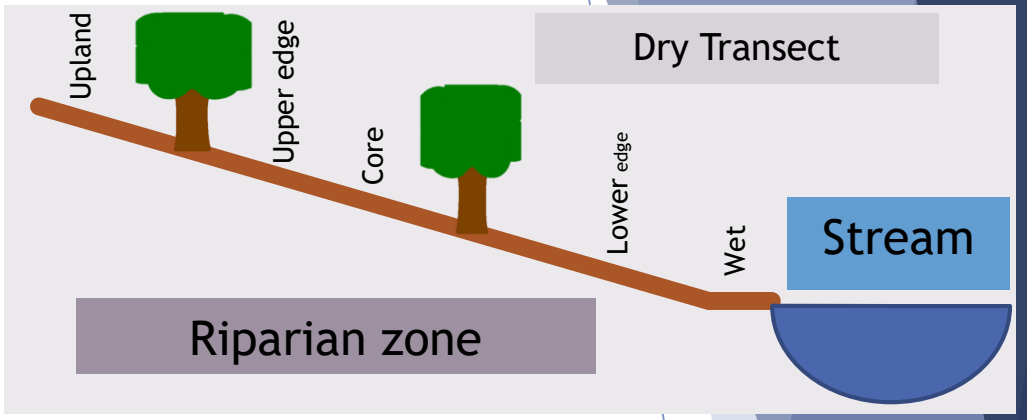


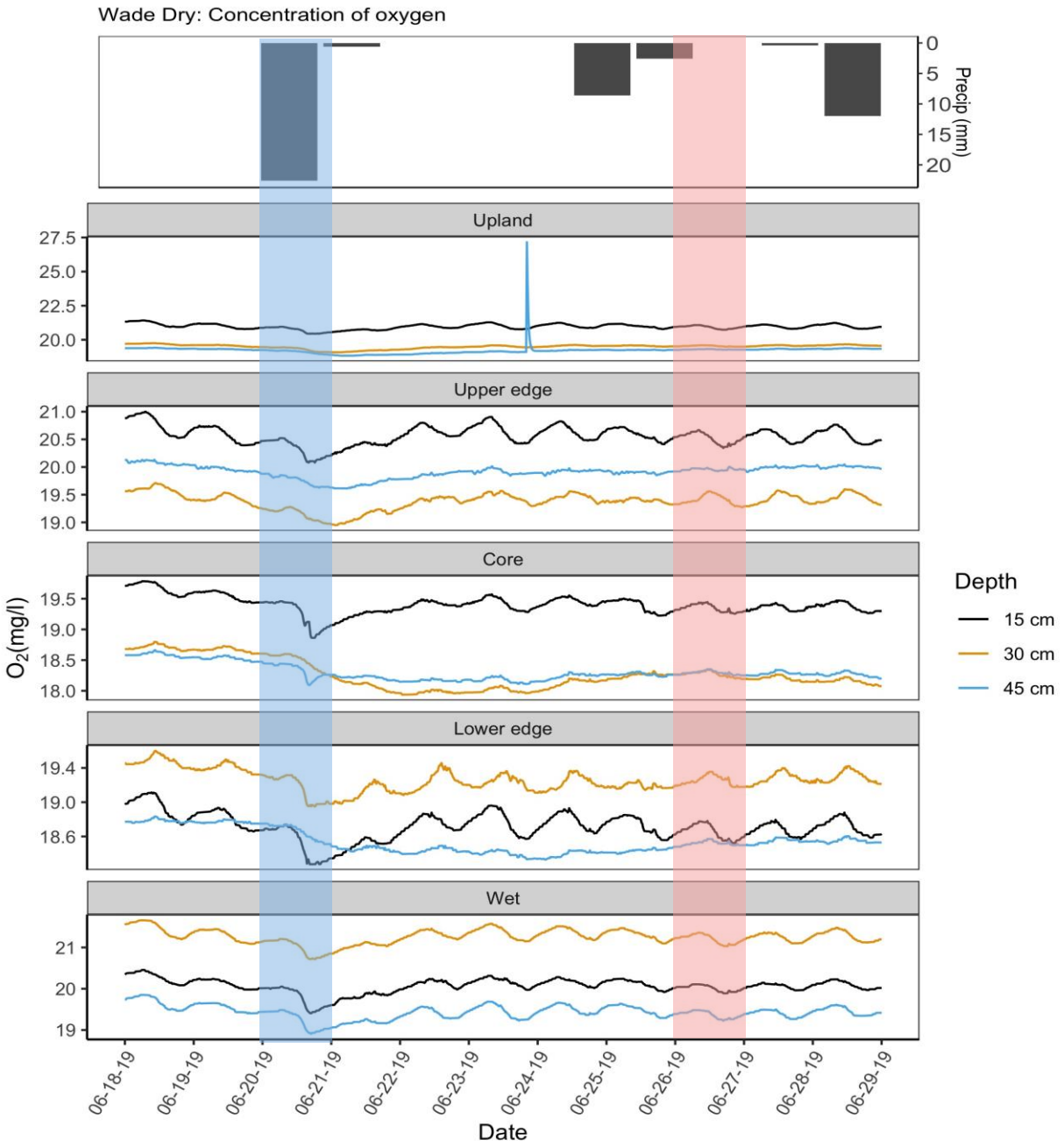

Wade Wet: Concentration of oxygen
Precip (mm)
Upland
Upper edge
Lower edge
Wet
O2(mg/l)
Depth
15cm
30cm
45cm
60cm
Date


Wade Wet (N2O)
Flux (μ g N m-2 hr-1)
Date
6/20/19
6/26/19
Wet
Lower edge
Core
Upper edge
Upland
Riparian transect

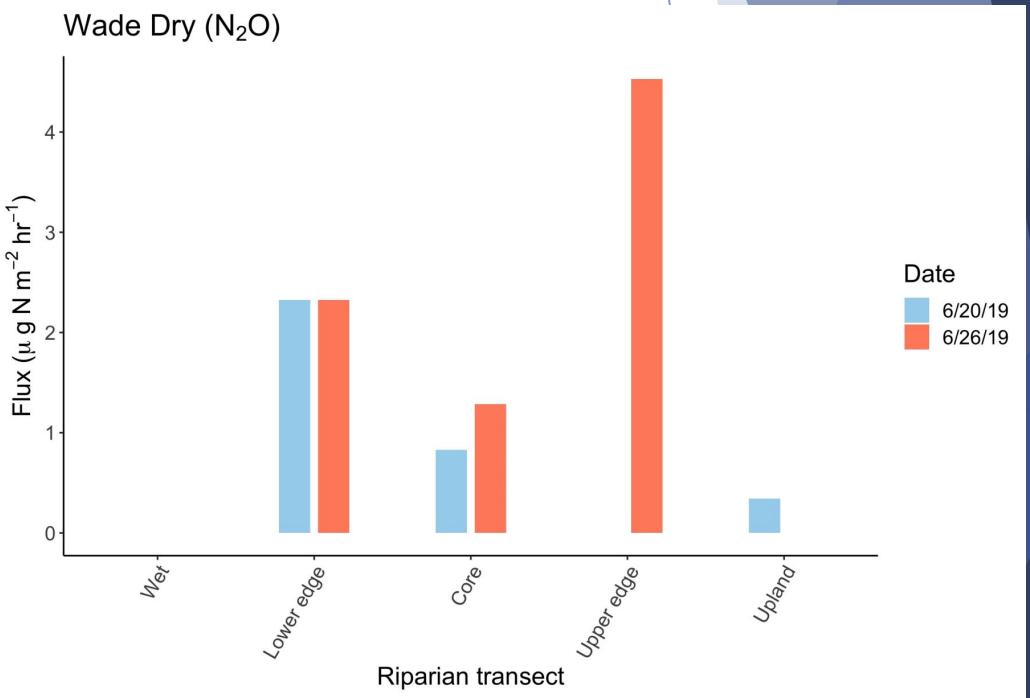
The dry sites drivers….







Pretty consistent oxygen concentrations throughout the pits

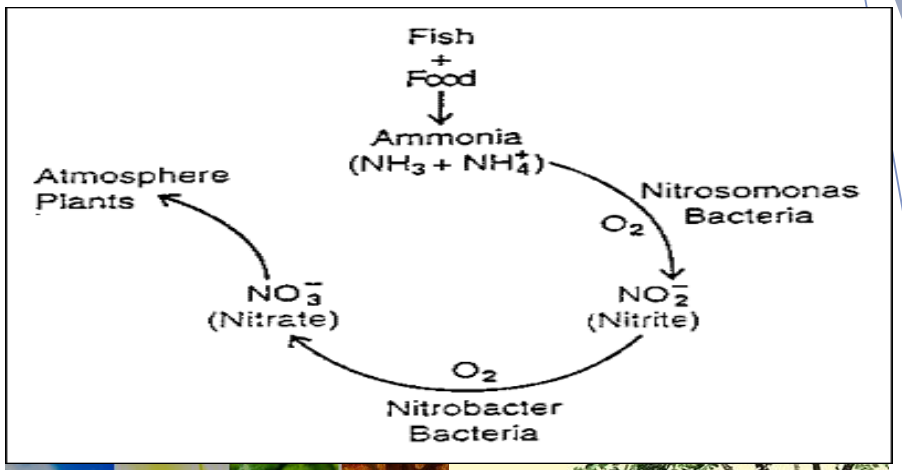


Take home points

- There are higher N_2O fluxes in the wetter pits
- Zero fluxes at the upland and wet sites
- Temporal variation suggests that there may be ‘hot moments’ of N_2O production

Further Research

- Nitrate and Ammonia
- Seasonal variability
- Plant communities
- Soil carbon and nitrogen



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Thank you so much!

Questions?