


Accidental Urban Wetlands:
Biogeochemical Processes in Unexpected Places

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Why is nitrogen a pollutant in urban areas?

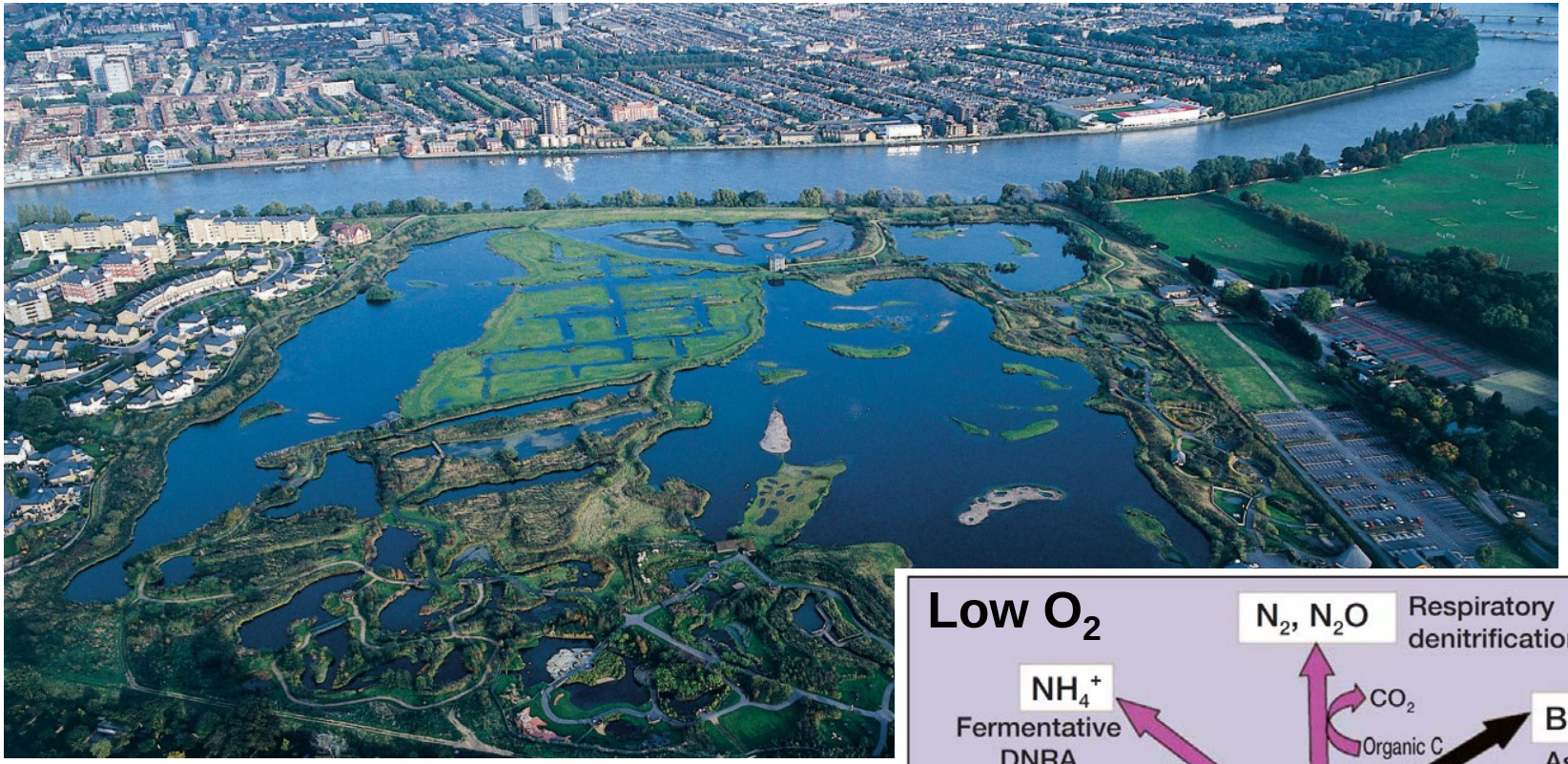
Leaky sewage pipes, septic tanks, treated wastewater

Fossil fuel combustion

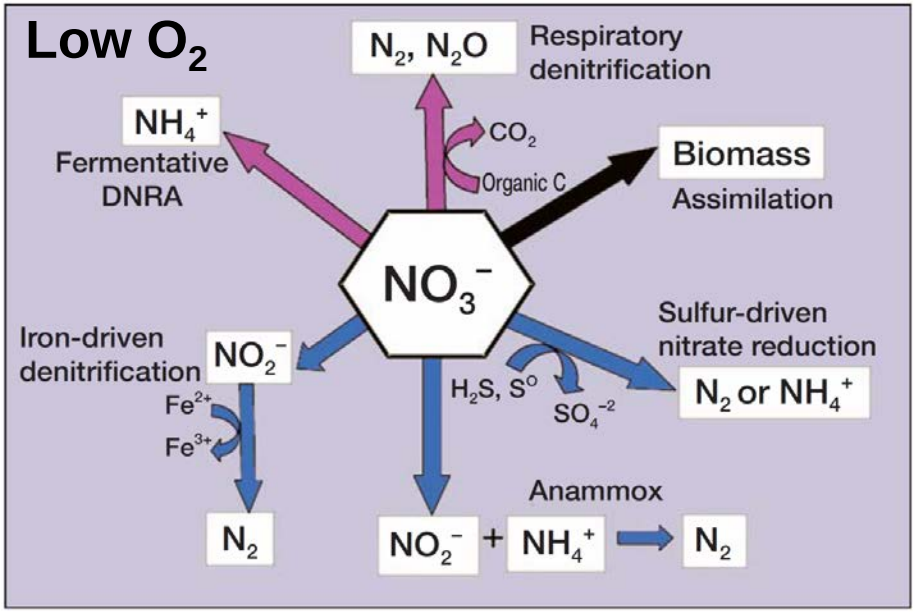
Fertilizer Application

Leaves from street trees

Can wetlands help?

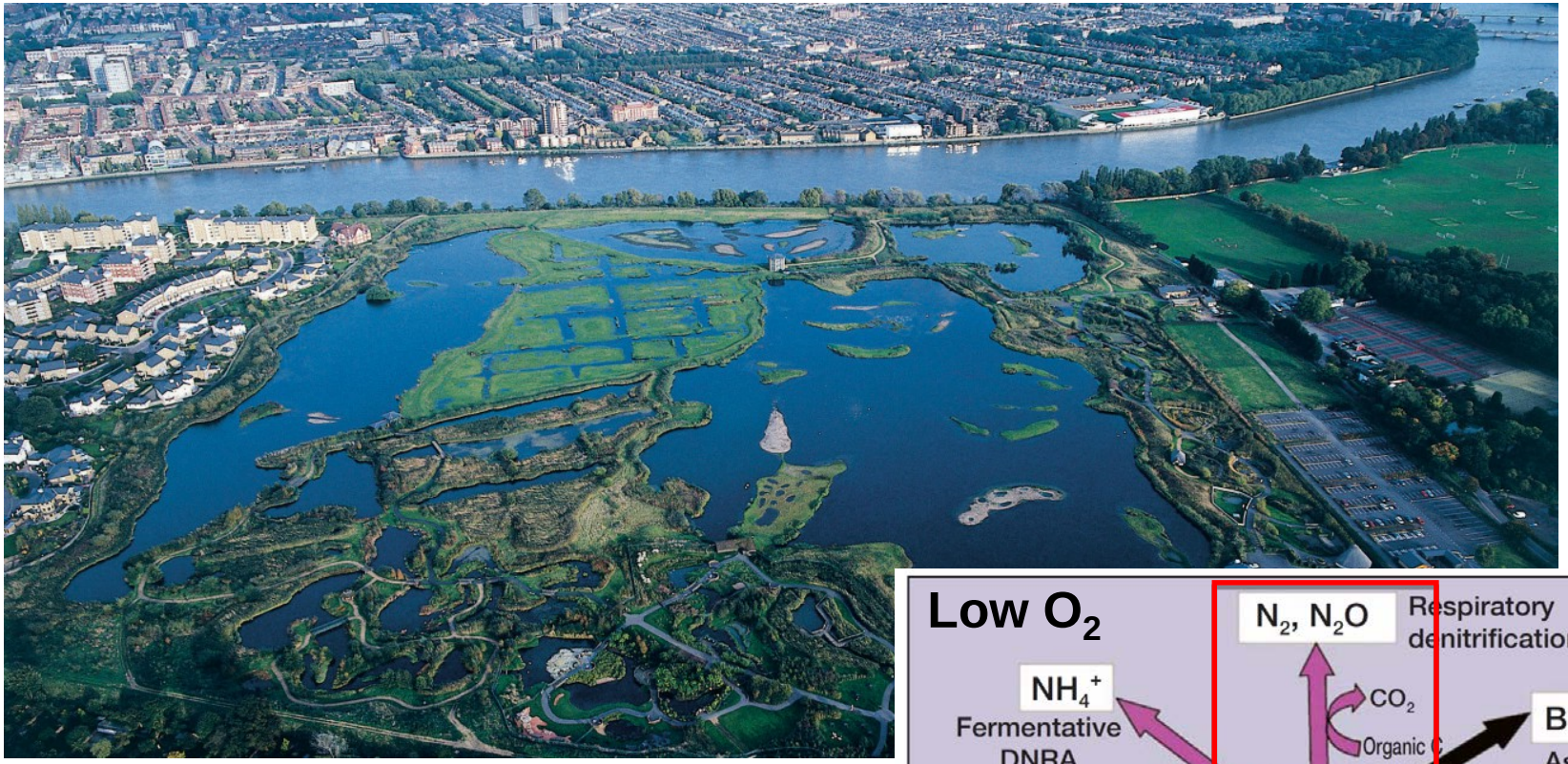


http://www.urbangreenbluegrids.com/measures/urban-wetlands/



Burgin & Hamilton (2007)

Can wetlands help?



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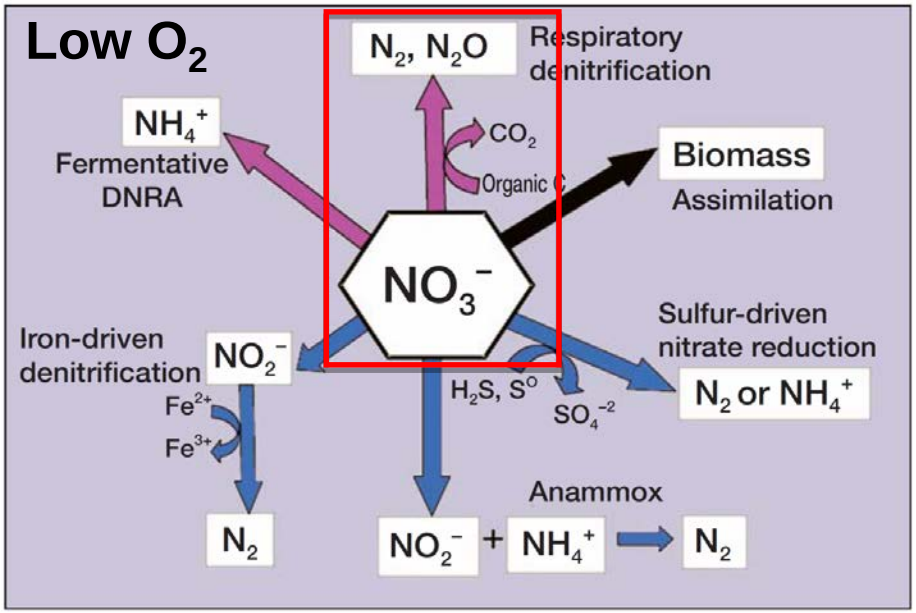
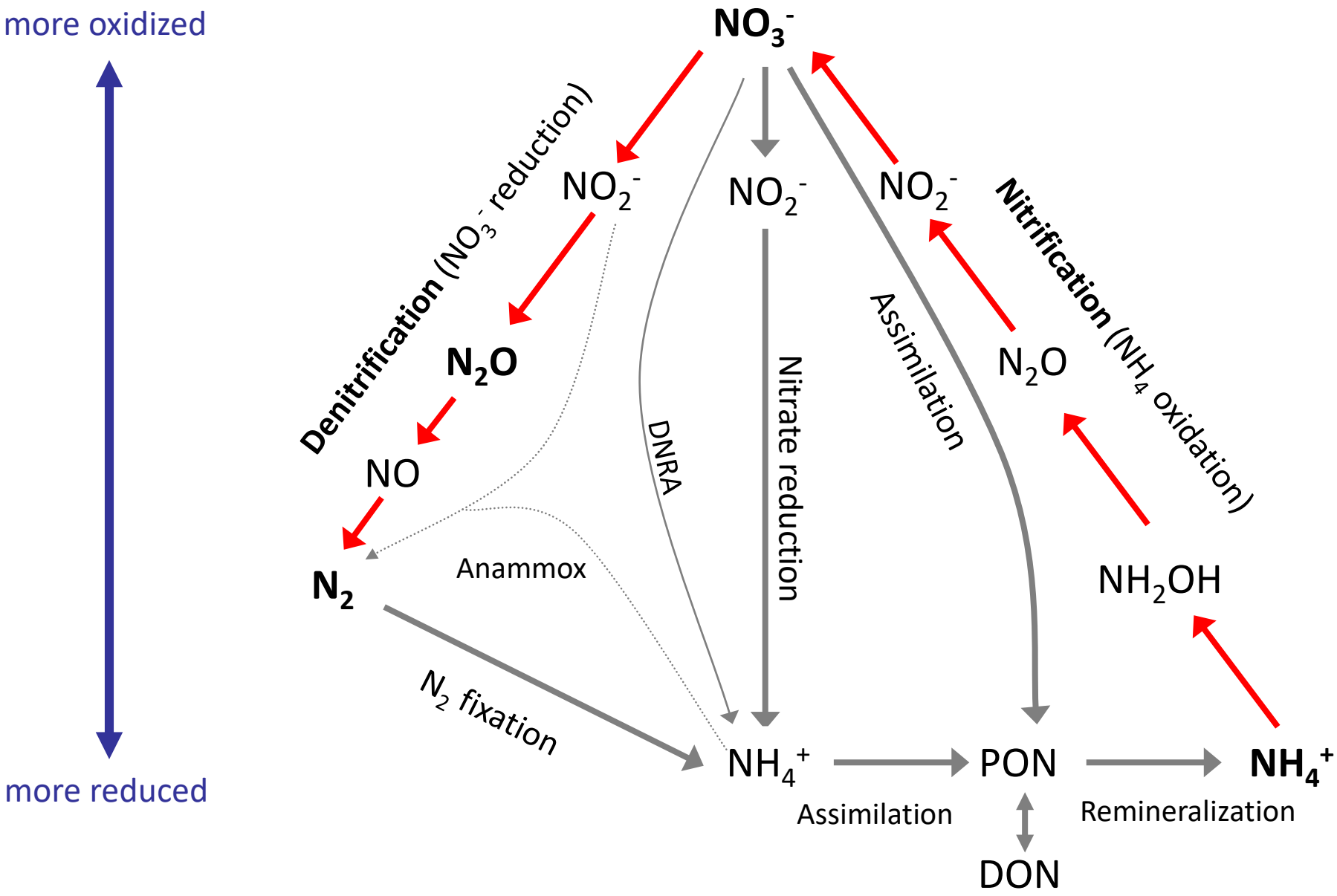


Burgin & Hamilton (2007)

Denitrification and oxygen dynamics



Urban Wetlands Result from Different Levels of Human Intervention and Design

Remnant Wetland — Accidental Wetland — Restored Wetland — Constructed Wetland

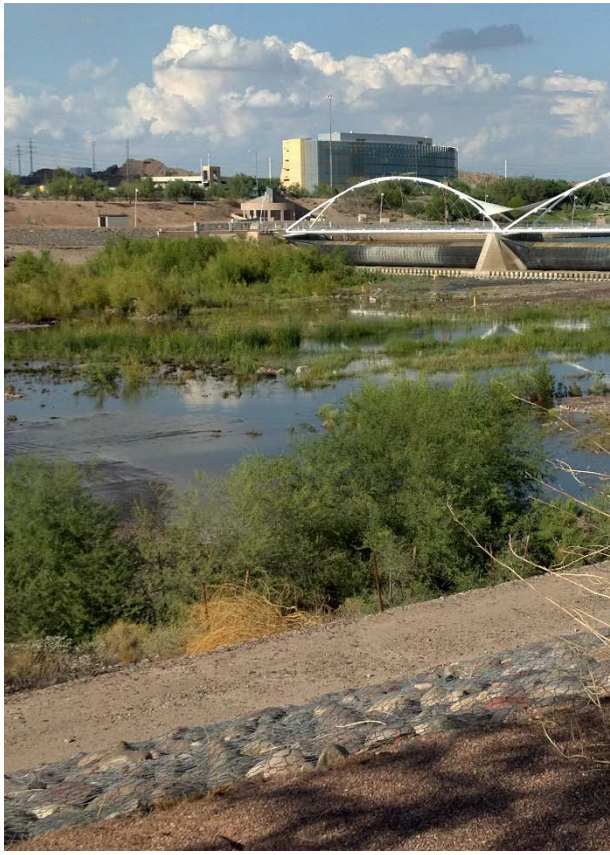
Low — Gradient of Intervention — High

Palta et al. 2017, *Frontiers in Ecology & the Environment*

Wetland Delineation

PLANTS

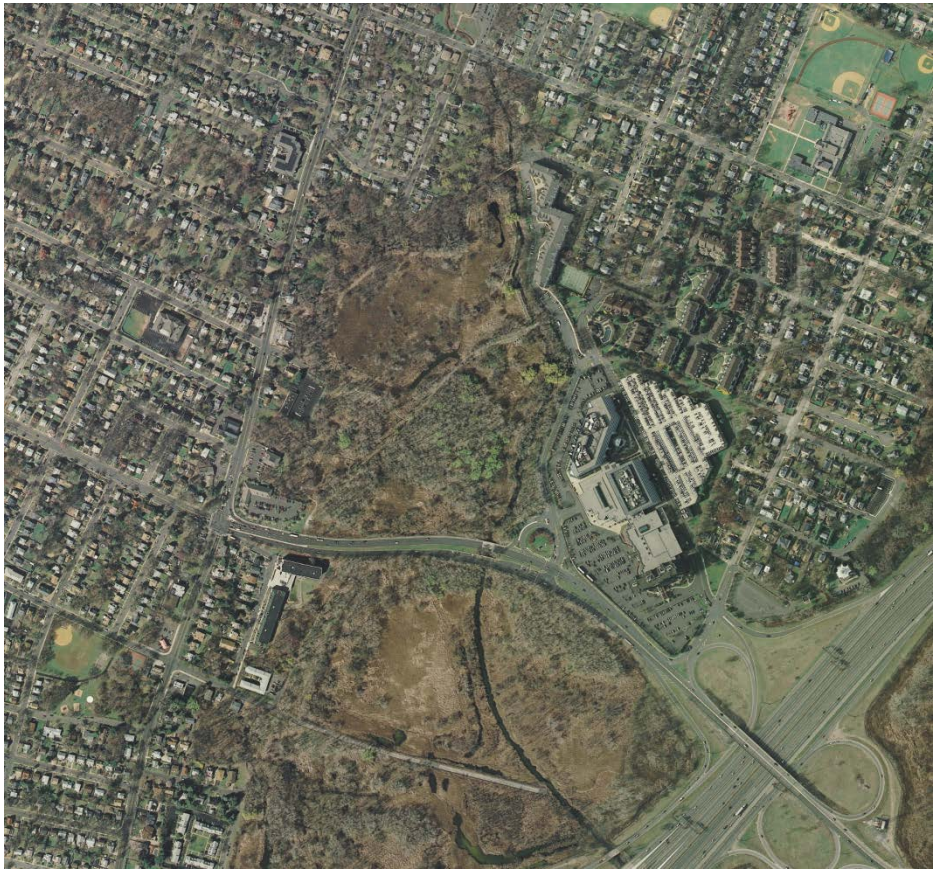
SOILS



HYDROLOGY

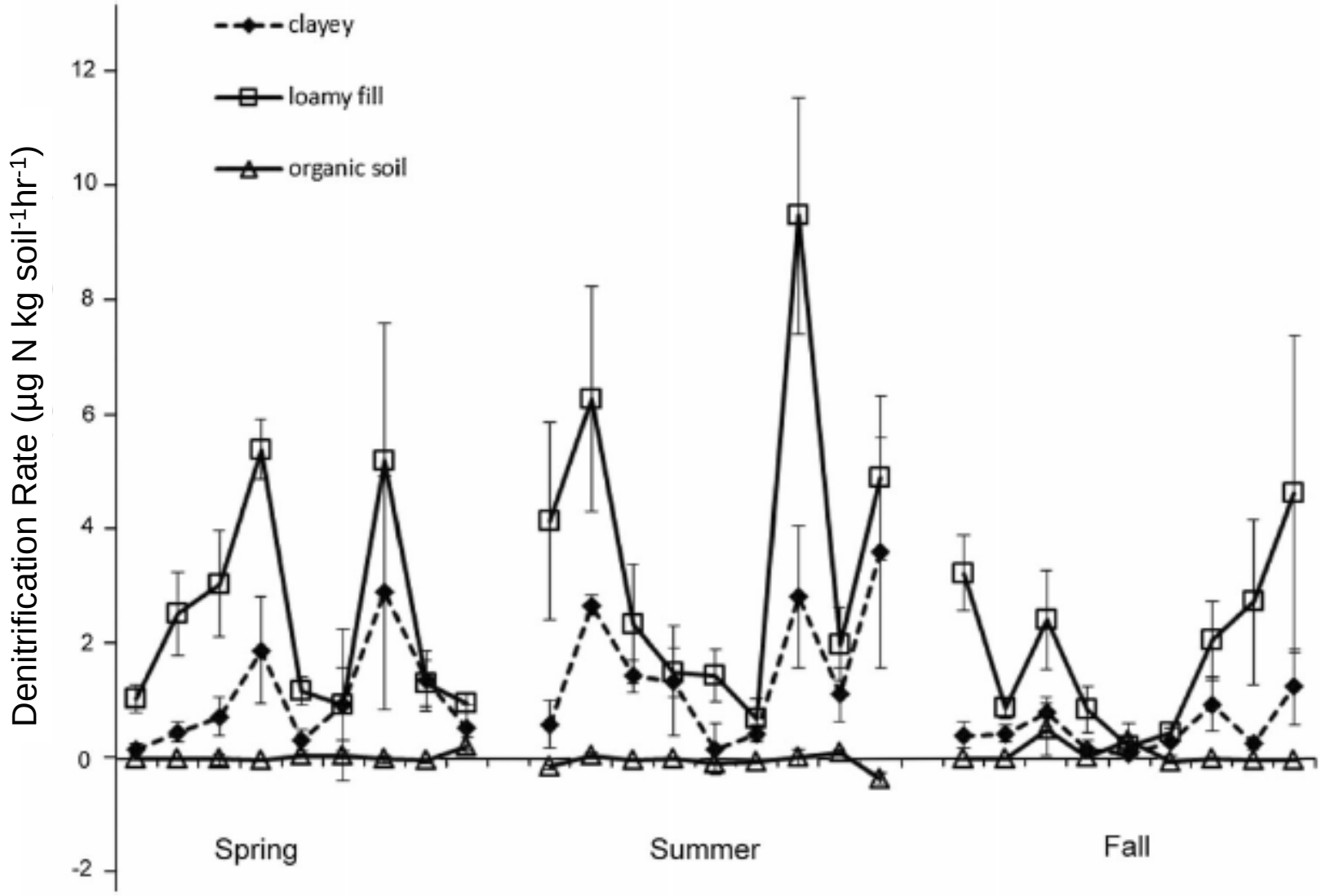
Teaneck Creek Conservancy, NJ

1966



2007

“Garbage” soils can demonstrate high rates of denitrification



Palta et al. 2014, *Ecosystems*

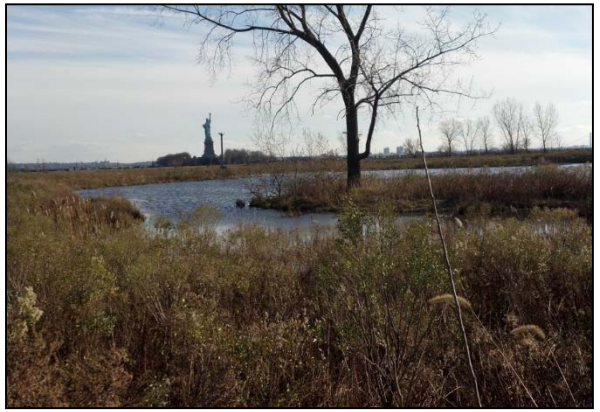
Liberty State Park, NJ

1930

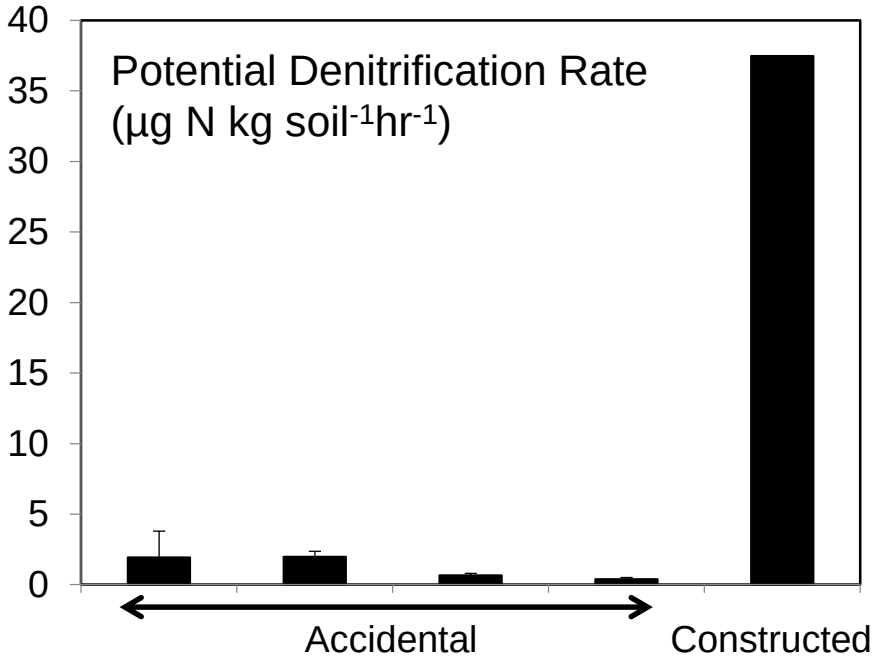
2007

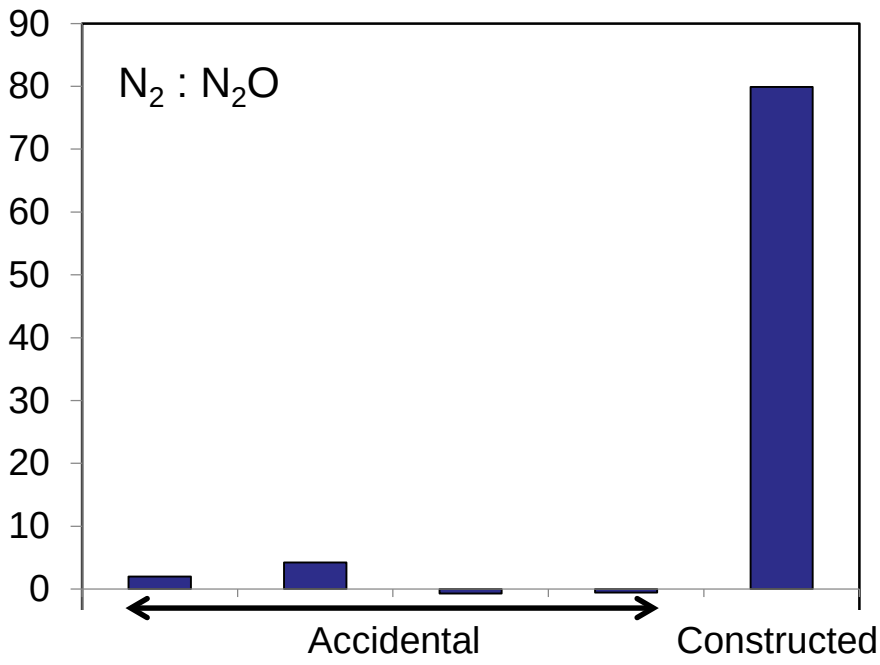
Accidental Wetlands Can Produce Greenhouse Gases

Accidental Wetlands



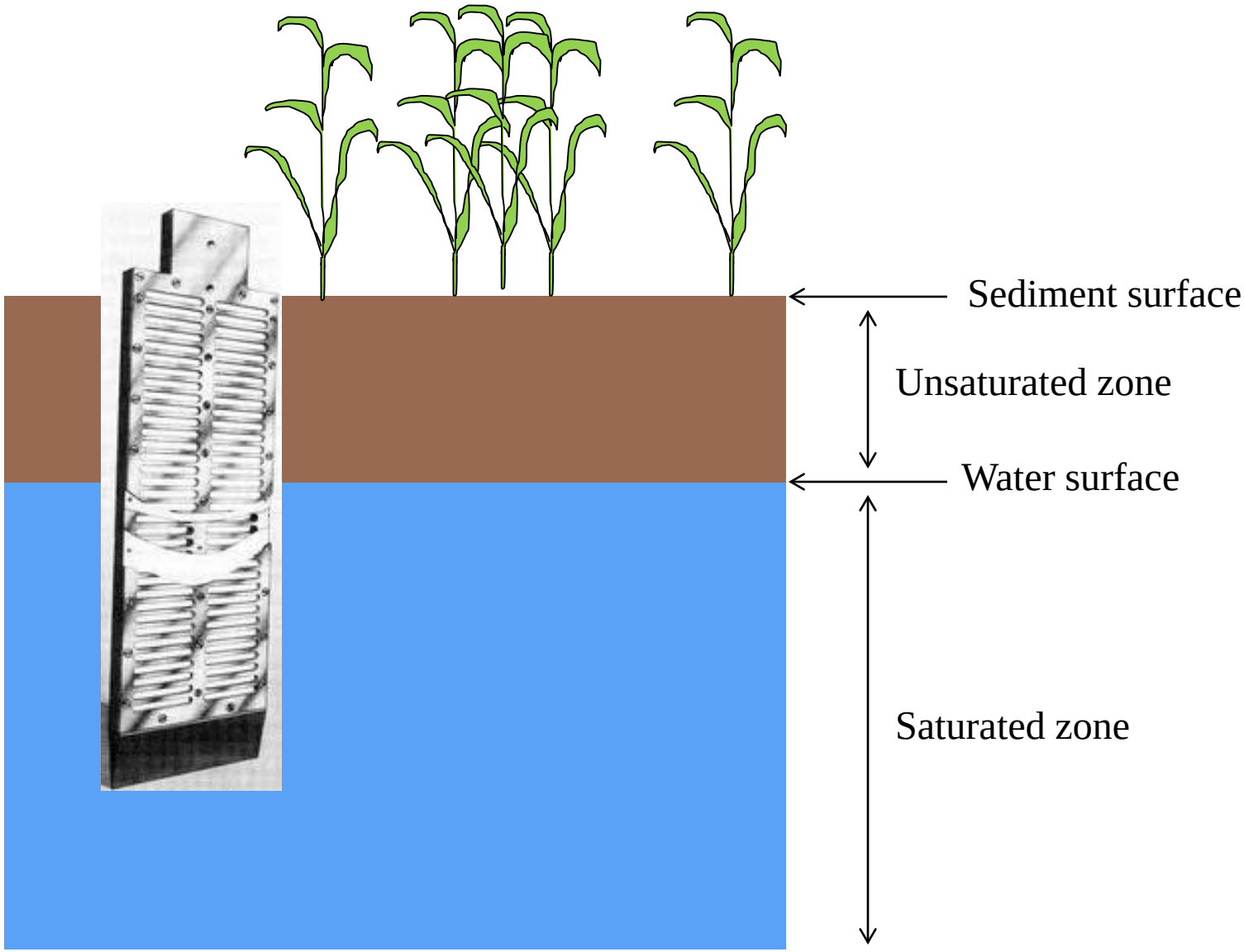
Constructed Wetland



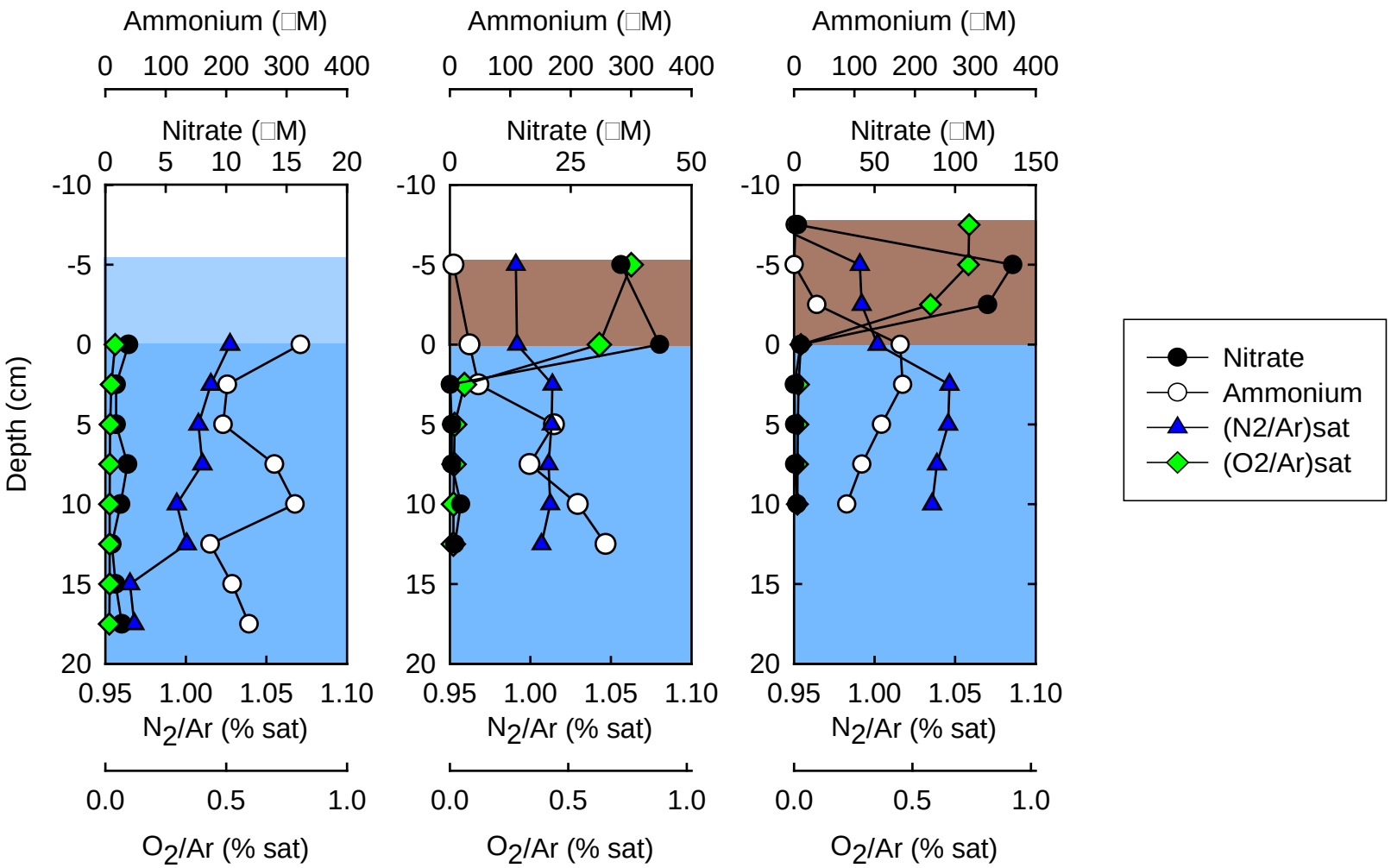


Palta et al. 2013, *JEQ*

How do water table fluctuations mediate denitrification?



N_2 production relies on NO_3^- production in the saturated zone



Palta et al., *In Prep*

What have we learned?

- Urban wetlands can remove excess NO_3^- in the urban environment
- Soil-water dynamics in the pore matrix drive coupled nitrification-denitrification in urban soil
- Hydrologic dynamics mediate O_2, and therefore coupled nitrification-denitrification and NO_3^- removal
- Urban soils may demonstrate a tradeoff between NO_3^- removal and N_2O production, but this can be mitigated

Implications of Research

- Restoring elements of soils and/or hydrology in urban wetlands may further augment capacity for ecosystem service provision
- Even without restoration or design, “accidental” urban wetlands may have the potential to mimic natural wetland processes
- Building sustainable cities and mitigating pollutants should involve capitalizing on natural environments in cities

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Publications:
https://www.researchgate.net/profile/Monica_Palta/publications