

Shallow Ponds and Marsh Carbon Metabolism

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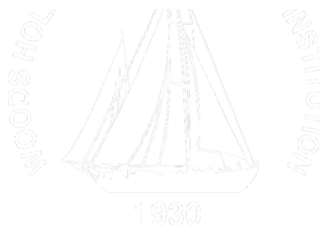
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Key Points:

- Shallow ponds can be prominent features of salt marsh landscapes but

Shallow ponds are heterogeneous habitats within a temperate salt marsh ecosystem

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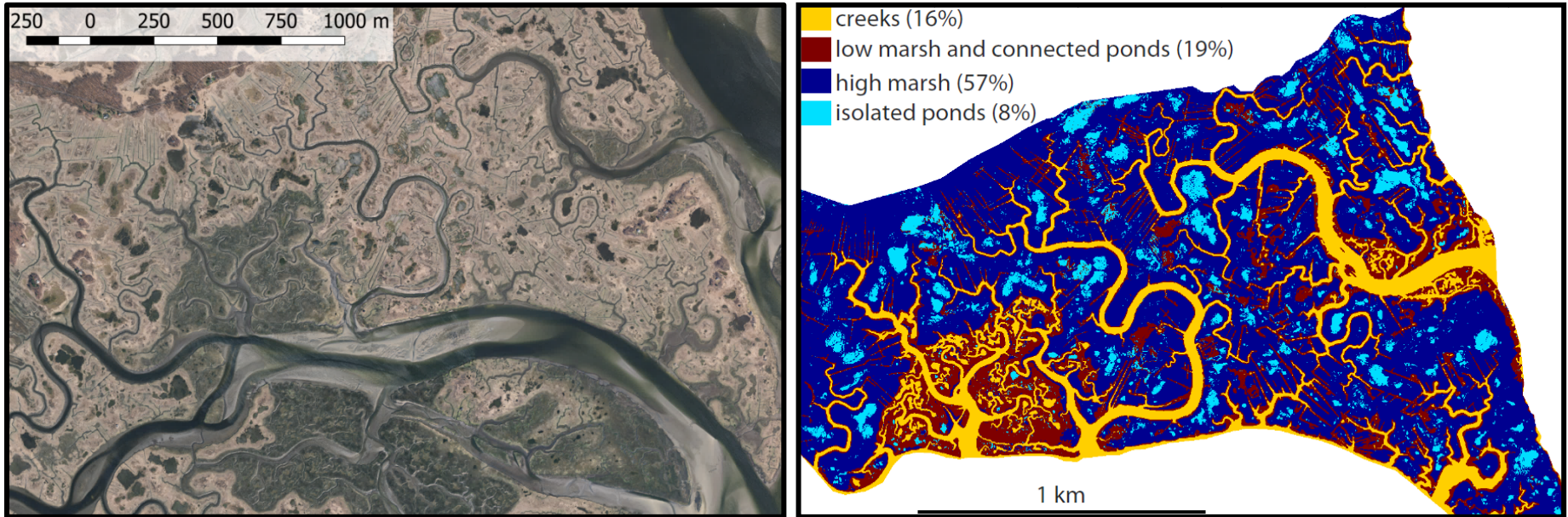
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Salt Marsh Ponds

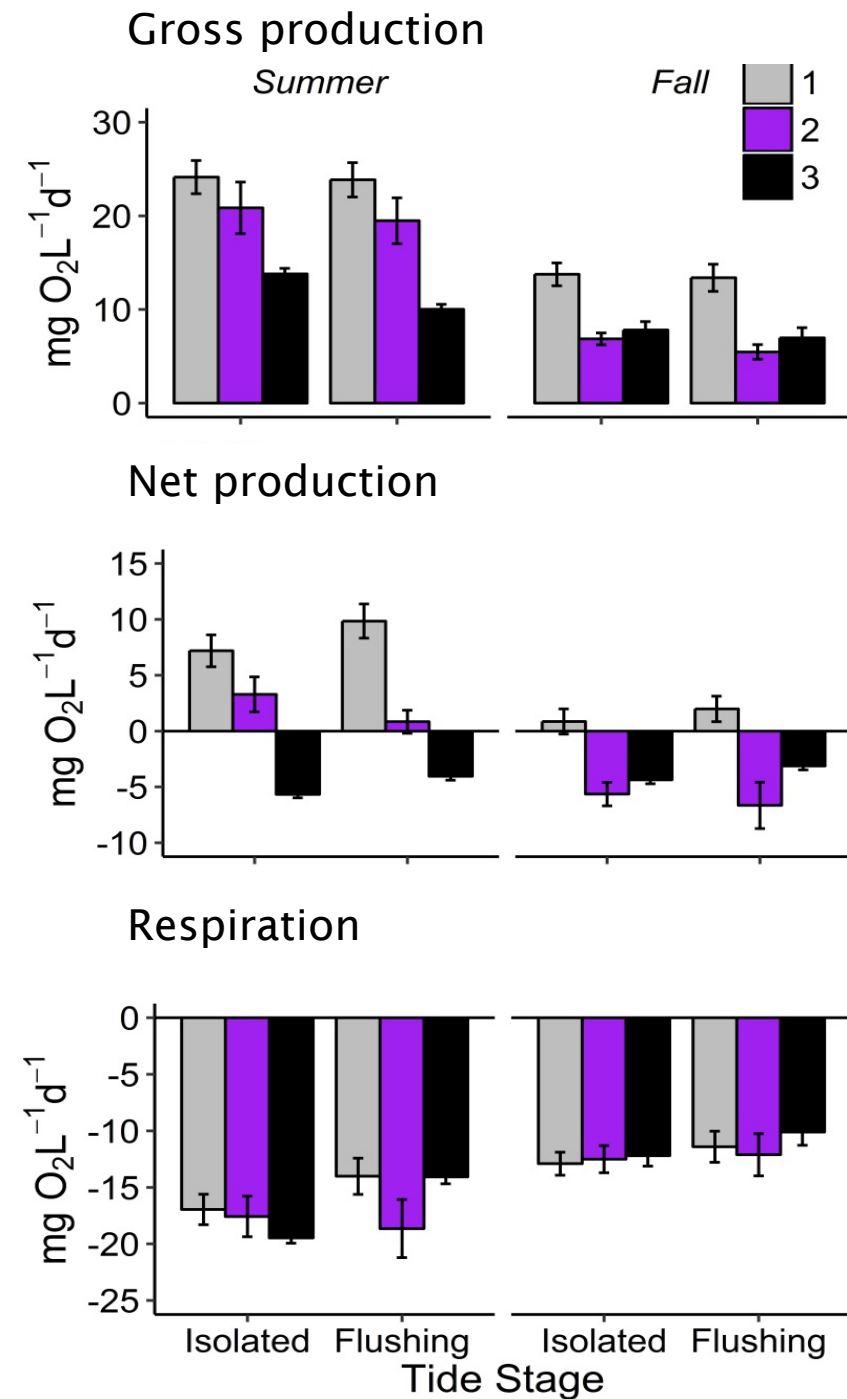
Can be prominent features of salt marsh landscapes



... but are rarely incorporated into assessments of ecosystem-level functioning!

Whole-Pond Oxygen Metabolism

Metabolism rates range from net autotrophic to net heterotrophic



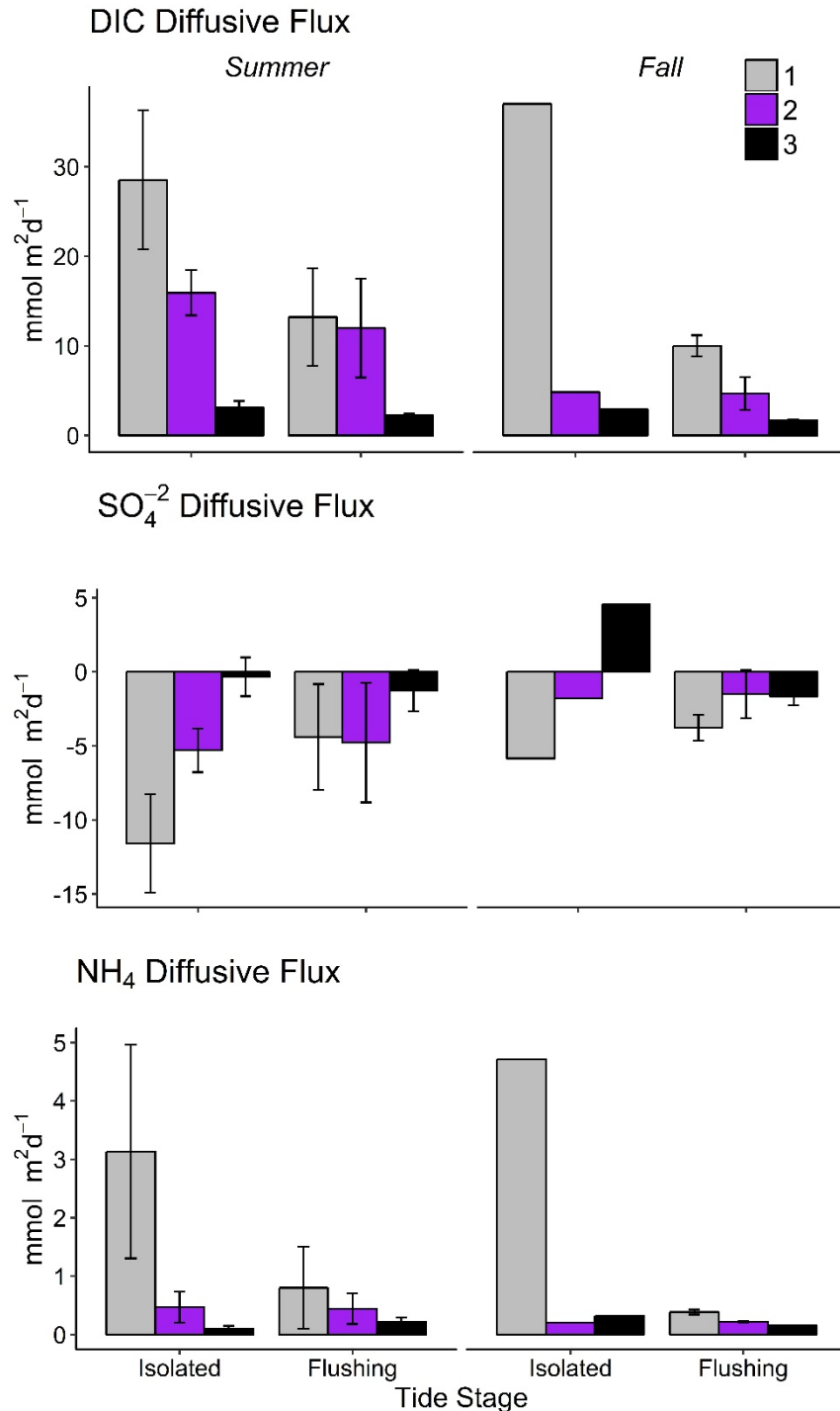
Sediment Metabolism

Benthic fluxes varied across ponds
but not seasons

DIC fluxes were faster during
isolated tides

SR accounted for ~70% of DIC flux

‘Cryptic’ cycling of e- acceptors is
likely important!



Respiration Can Account for Pond Formation & Expansion

^{137}Cs (mm y^{-1})

P1 0.70

P2 0.30

P3 0.29

^{210}Pb (mm y^{-1} ; CIC)

P1 0.36

P2 0.37

P3 1.31

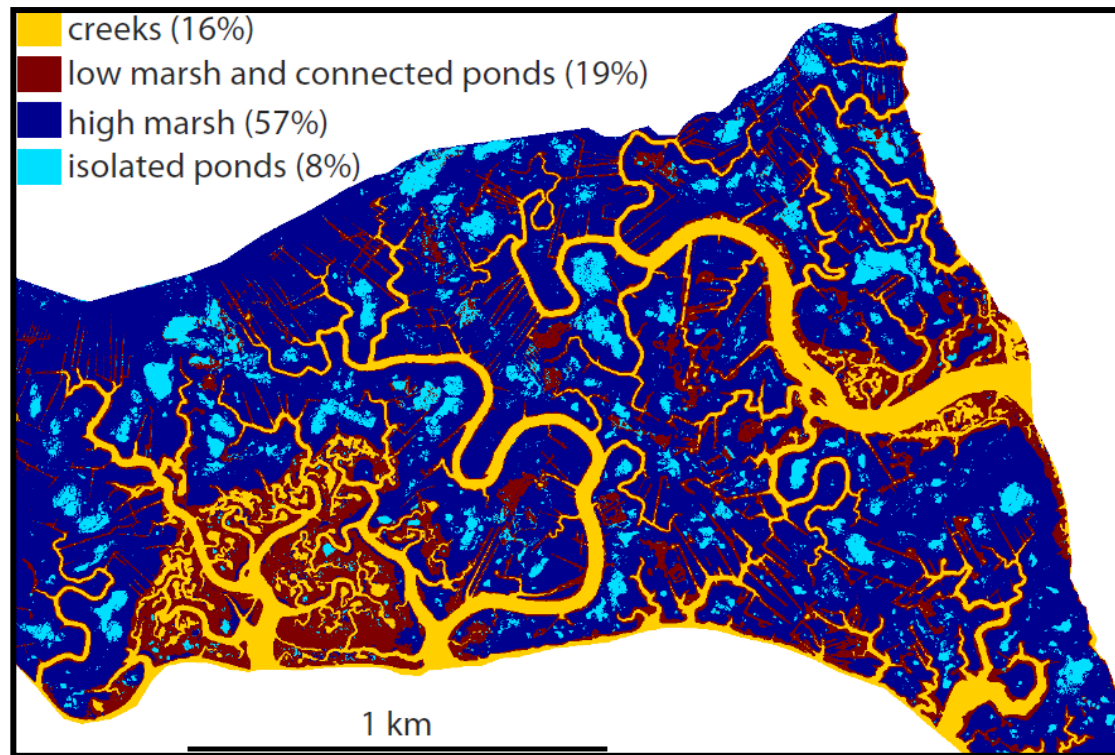
Marsh 2.5 mm y⁻¹

Calculated 8–19 mmol C m⁻² d⁻¹

≤ Measured 16–39 mmol C m⁻² d⁻¹ (SW)

≈ Measured 2–21 mmol C m⁻² d⁻¹ (DIC Efflux)

How do Ponds affect Marsh Metabolism?



Emergent Grass/Soil + Pond Metabolisms based on land cover:

Ecosystem Net Production: Summer -8.1 – -11.9%, Fall -9.4 – -15.7%

Ecosystem Respiration: Summer: -5.1 – -5.9%; Fall: -2.9 – -10%

Accounting for Ponds ↓ ***Estimates of Ecosystem Production & Respiration***

Conclusions

- Ponds are heterogeneous and biogeochemically distinct habitats
- OM decomposition and marsh accretion are likely the main mechanisms for pond formation and expansion
- Pond expansion will likely have a larger, negative impact on Marsh NEP than R, and will reduce OM Burial and Storage

