An Assessment of PFAS Exposure in Ecological Receptors at Clark's Marsh

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INTRODUCTION & OBJECTIVES

- Previous studies have demonstrated extensive PFAS contamination of ground and surface water at Clark's Marsh
- Accumulation of PFAS has been demonstrated in some species at Clark's Marsh, including insectivorous birds, fish, and crustaceans(1), (2)
- PFAS exposure in less commonly studied species such as reptiles is unclear
- This poster presents a synthesis of several independent research efforts at Clark's Marsh measuring PFAS in abiotic media and ecological receptors including aquatic reptiles, birds, and invertebrates

Fig. 1 Foam present in Van Etten Lake (top) and Clark's Marsh health advisory (bottom)

METHODS & STUDY SPECIES

- Sampling of abiotic media including soil, sediment, surface water was conducted in summer 2023 (Fig 2).
- Invertebrate prey items, house wren and tree swallow nestlings collected in summer 2023 (Fig 3).
- Reptiles including painted turtle, common snapping turtle, northern watersnake, and garter snake (Fig 3, collected in 2021 and 2022, with plasma, liver, and muscle analyzed for PFAS

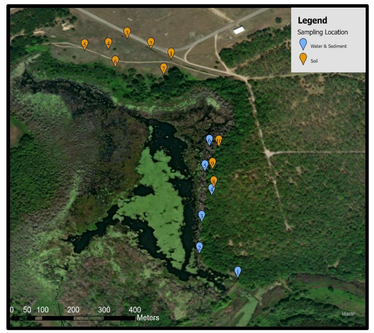

Fig. 2 Location of abiotic sample collections in 2023. Soil, surface water, and sediment are indicated.

Fig. 3 Study species collected from Clark's Marsh and analyzed for PFAS.

PFAS IN ABIOTIC MEDIA

- Large spatial gradients in total PFAS concentrations were observed in soil (3.68 – 184 ppb dry weight) and sediment (7.46 – 1,555 ppb dry weight)
- PFOS surface water concentrations at all sites exceeded ecological screening value of 0.117 ppb for aquatic-dependent mammals from Grippo et al. (3) (Fig 4).
- PFOS concentrations in soil (2/10 sites) exceeded screening value of 8.7 ppb for terrestrial mammals from Grippo et al. (3)

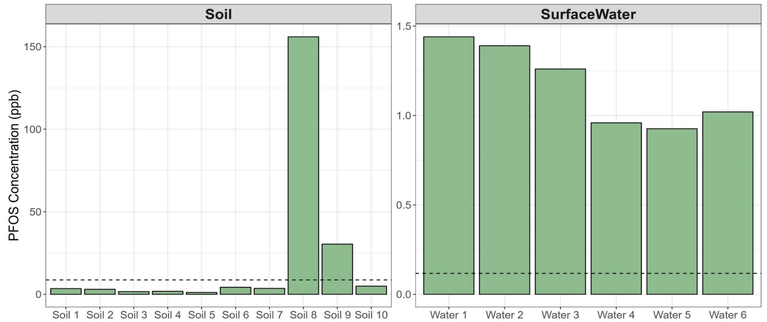

Fig 4. Comparison of PFOS concentrations in soil (dry weight basis) and surface water at Clark's Marsh to screening values from Grippo et al. (3), represented by the dashed line.

PFAS IN INVERTEBRATES & INSECTIVOROUS BIRDS

- Total PFAS concentrations were higher in emergent aquatic invertebrates compared to terrestrial (Fig 5).
- House Wren and Tree Swallow nestlings had total PFAS concentrations in whole carcasses ranging from 53.4 – 103 ng/g wet weight, lower than previously reported concentrations for tree swallows at Clark's Marsh(1)
- PFOS (88-94% of total), PFOSA (0-14% of total), and PFHxS (4.4-18% of total) were the dominant compounds in bird and invertebrate tissue

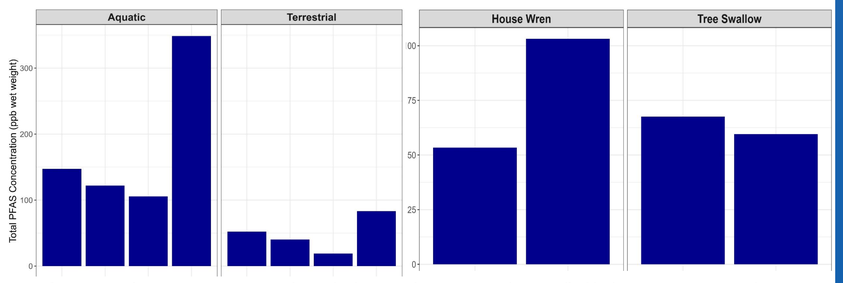

Fig. 5 Total PFAS concentrations in invertebrate prey items (left), house wren, and tree swallow nestling whole carcasses (right). All concentrations are on a wet weight basis.

PFAS IN REPTILES

- PFOS was consistently the most prevalent PFAS in reptiles. Painted turtles had different PFAS profiles relative to obligate carnivores (**Fig. 6**)
- Snapping turtles and watersnakes had the highest total plasma PFAS among all species (**Fig. 7**)
- Markedly high PFAS concentrations relative to other fauna at the site

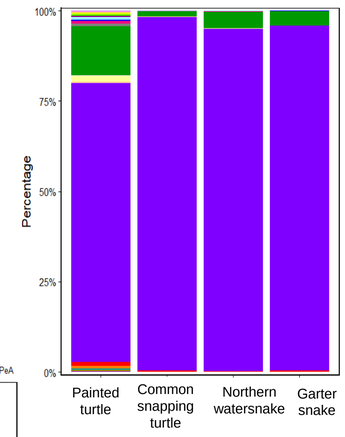

Figure 6 (above): PFAS profiles (% contribution) in reptiles sampled from Clark's Marsh.

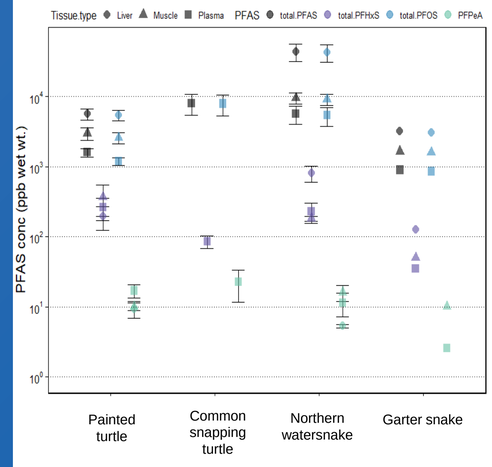

Figure 7 (left): Average PFAS concentrations (ppb, wet weight) in liver, muscle, and plasma collected from reptiles at Clark's Marsh.

Additional samples from reptiles (n = 22) collected in 2022 will be analyzed in FY25-FY26 for PFAS.

SUMMARY

- PFOS concentrations in soil and surface water at Clark's Marsh exceeded screening levels for terrestrial and aquatic-dependent mammals
- Emergent aquatic invertebrates had elevated PFAS concentrations compared to terrestrial invertebrates
- Snapping turtles and watersnakes had the highest concentrations of PFAS among tested reptiles, comparable to levels linked to immunological effects in American alligators(4)

REFERENCES & ACKNOWLEDGEMENTS

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