Background

Per-/polyfluoroalkyl substances (PFAS)
- Widely distributed due to many industrial and consumer applications (Fig. 1)
- Compounds readily accumulate in humans and wildlife

Possible effects on humans and wildlife
- Reduced growth and development
- Impaired endocrine/immune function

Clark’s Marsh ( Oscoda, MI)
- Extensive PFAS contamination
- Unique opportunity to assess the behavior of PFAS in aquatic food webs

The Problem

Extensive knowledge gaps concerning PFAS:
1. Uncertainty of which PFAS are of greatest concern (>7,000 unique chemicals)
2. Lack of data needed to estimate risk to native wildlife
3. Little known about bioaccumulation and transfer of PFAS in aquatic food webs

Preliminary Field Results

1. Among all compartments, PFOS was consistently the most prevalent PFAS (Fig. 2)
2. Fish and leeches exhibited the highest PFAS burdens relative to other sampled taxa; PFHxS and PFBA showed interesting patterns in various compartments (Fig. 2)
3. Mean PFOS and δ15N values support biomagnification in freshwater systems (Fig. 3)

Incorporating Experimental Studies

1. In mesocosm studies, accumulation of PFOS, but not PFOA, in amphibian larvae mirrored patterns and concentrations observed at Clark’s Marsh (Fig. 4A)
2. Relevant concentrations of PFOA and PFOS caused significant delays in metamorphosis (Fig. 4B)
3. Exposure to PFOA and PFOS led to significant decreases in dopamine in amphibian larvae (Fig. 4C)

Where Do We Go From Here?

PFAs and trophic position
- Develop quantitative food web model to better understand PFAS exposure risk at Clark’s Marsh (Fig. 5)

Effects in non-model species
- Testing common PFAS in reptiles at concentrations found in prey at Clark’s Marsh
- Conserved effects among vertebrates?
- Risk for reptiles?

Continuing field research
- Collection of biota at higher trophic levels, such as reptiles, will provide invaluable data for risk assessors (Fig. 6)
- Assessment of physiological impacts of PFAS in the field

Acknowledgements

Projects are funded by Michigan Department of Natural Resources, the DoD’s Strategic Environmental Research and Development Program, and Purdue’s Center for the Environment. We would also like to thank Melissa Lech, Matt Hamilton, Mike Iacchetta, Sarah Abenomoto, Gary Hoover, Mike Chistock, Chloé de Perre, and many researchers that have contributed to these interdisciplinary projects.