PFAS in the Great Lakes

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What are PFASs?

Per- and polyfluoroalkyl substances ("P – fasses")

- >4,000 known PFAS chemicals
  - 3,000 PFAS chemicals found in commercial use
  - Only a very small percent of these thousands of chemicals are regulated
- Two key PFASs:
  - Perfluorooctane sulfonic acid (PFOS)
  - Perfluorooctanoic acid (PFOA)
- Many are persistent, toxic, bio-accumulative

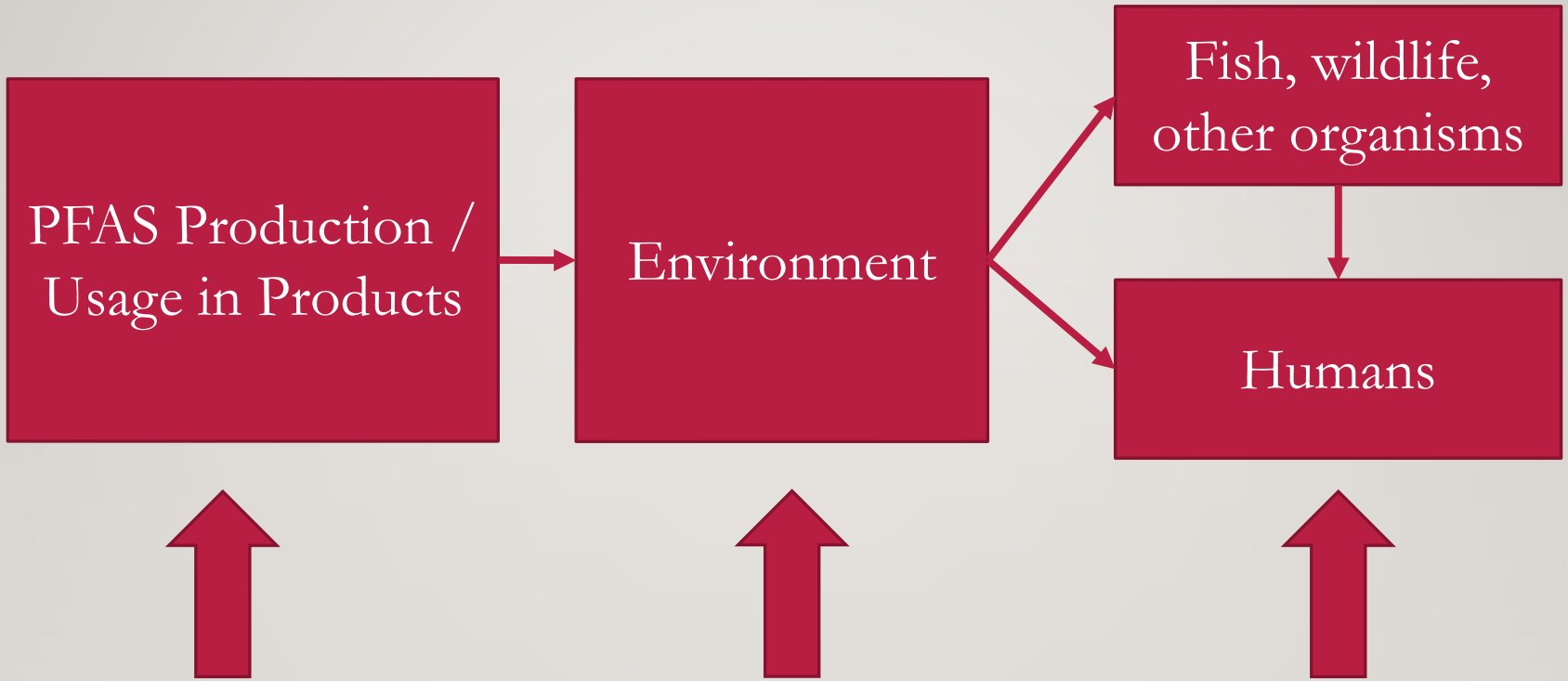
PFAS History & Uses

Image: Sixclasses.org

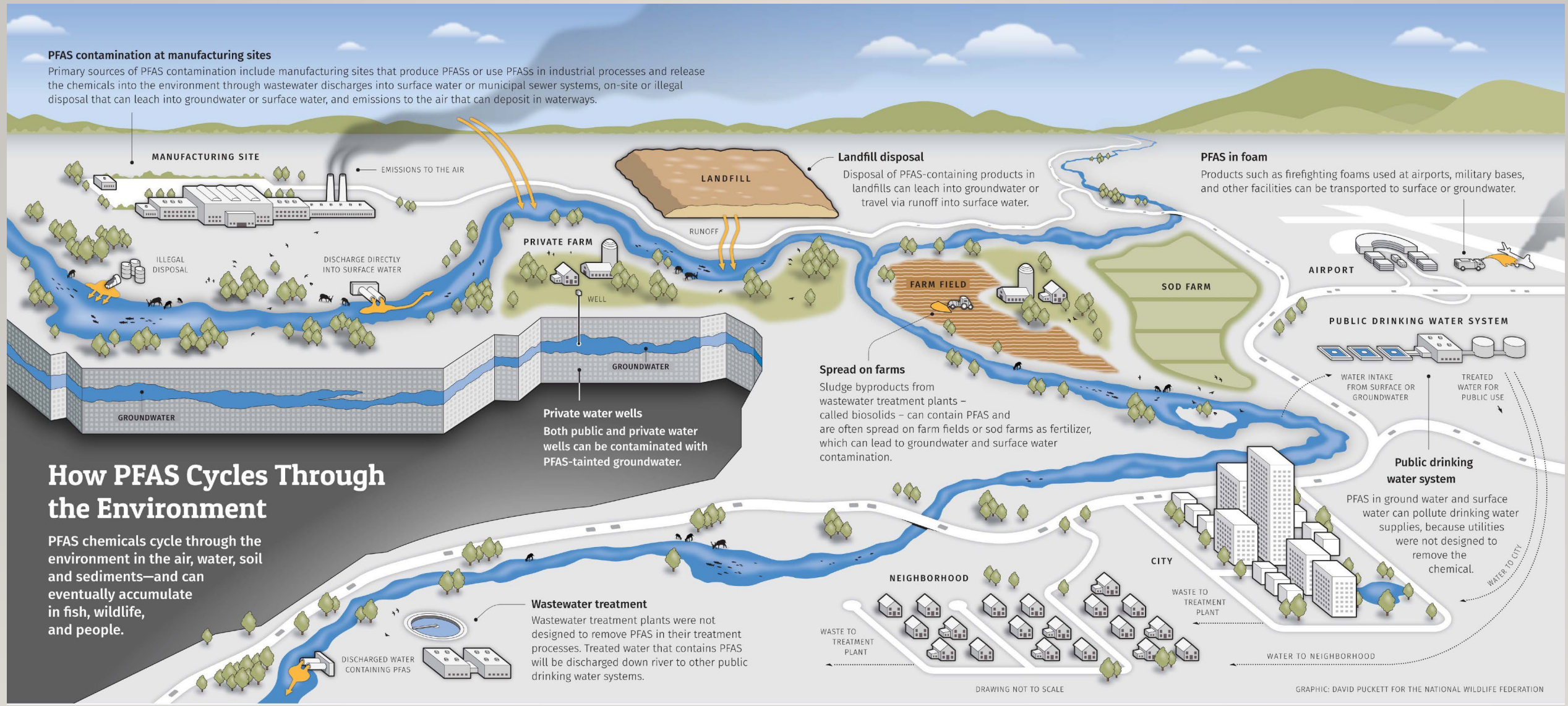
Why Should We Be Concerned?

- Many are persistent (particularly in water), toxic, bio-accumulative
- Safe exposure levels for people are extremely low
    - Current EPA drinking water standard of 70 ppt (for PFOS and PFOA) is considered not protective enough
    - Many Great Lakes states are setting standards below 20 (PFOS) to 10 (PFOA) ppt
    - Example: State of Michigan's current Surface Water Criteria is 11 ppt (PFOS); 420 ppt (PFOA)

PFAS Sources & Exposures



Varying intervention points


PFAS contamination at manufacturing sites
Primary sources of PFAS contamination include manufacturing sites that produce PFASs or use PFASs in industrial processes and release the chemicals into the environment through wastewater discharges into surface water or municipal sewer systems, on-site or illegal disposal that can leach into groundwater or surface water, and emissions to the air that can deposit in waterways.
MANUFACTURING SITE
EMISSIONS TO THE AIR
ILLEGAL DISPOSAL
DISCHARGE DIRECTLY INTO SURFACE WATER
LANDFILL
Landfill disposal
Disposal of PFAS-containing products in landfills can leach into groundwater or travel via runoff into surface water.
RUNOFF
PRIVATE FARM
WELL
GROUNDWATER
GROUNDWATER
Private water wells
Both public and private water wells can be contaminated with PFAS-tainted groundwater.
PFAS in foam
Products such as firefighting foams used at airports, military bases, and other facilities can be transported to surface or groundwater.
AIRPORT
FARM FIELD
SOD FARM
Spread on farms
Sludge byproducts from wastewater treatment plants – called biosolids – can contain PFAS and are often spread on farm fields or sod farms as fertilizer, which can lead to groundwater and surface water contamination.
PUBLIC DRINKING WATER SYSTEM
WATER INTAKE FROM SURFACE OR GROUNDWATER
TREATED WATER FOR PUBLIC USE
How PFAS Cycles Through the Environment
PFAS chemicals cycle through the environment in the air, water, soil and sediments—and can eventually accumulate in fish, wildlife, and people.
Public drinking water system
PFAS in ground water and surface water can pollute drinking water supplies, because utilities were not designed to remove the chemical.
CITY
NEIGHBORHOOD
WASTE TO TREATMENT PLANT
WASTE TO TREATMENT PLANT
WATER TO CITY
WATER TO NEIGHBORHOOD
DISCHARGED WATER CONTAINING PFAS
Wastewater treatment
Wastewater treatment plants were not designed to remove PFAS in their treatment processes. Treated water that contains PFAS will be discharged down river to other public drinking water systems.
DRAWING NOT TO SCALE
GRAPHIC: DAVID PUCKETT FOR THE NATIONAL WILDLIFE FEDERATION

Impacts to People

- Effects include testicular, kidney cancers; elevated cholesterol; lowered immune system response
- Tied to reproductive health problems, chronic heart and liver disease, ADHD, among other things
- Equity & environmental justice issues

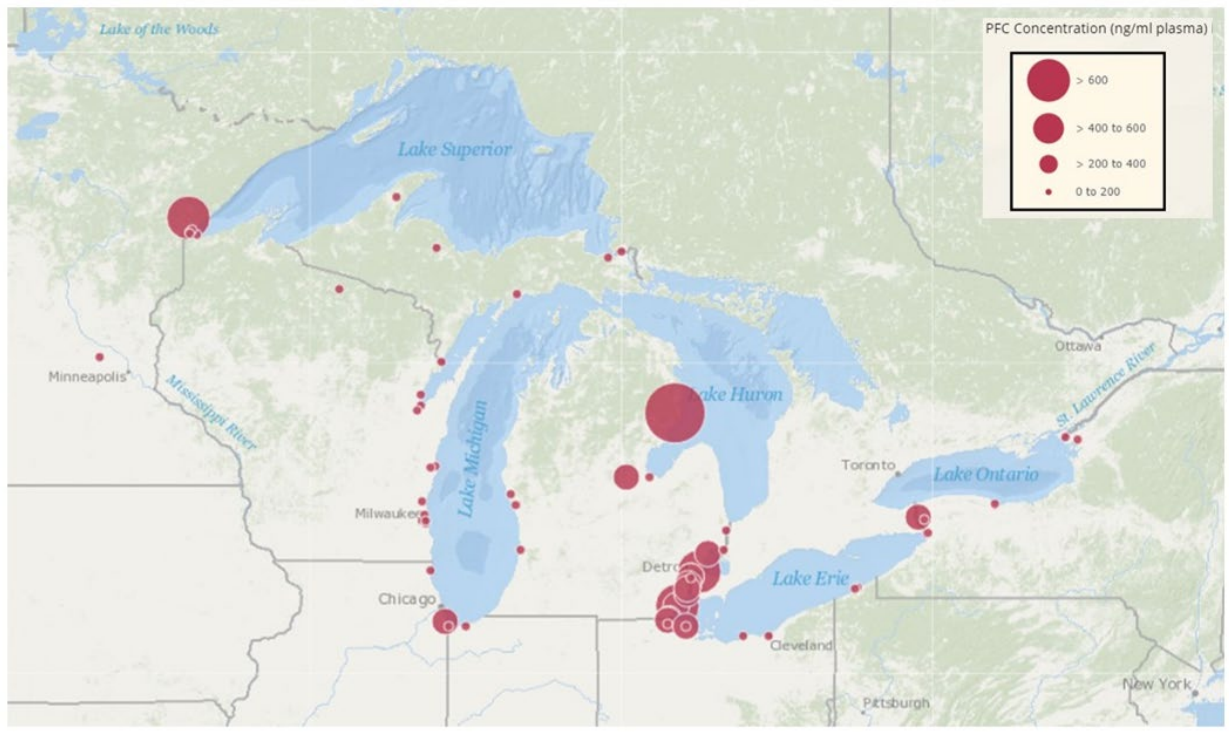
Impacts to Wildlife

- PFAS found in fish, bald eagles, snapping turtles, green frogs, others in GL region
- biomagnification
- Effects range from decreased reproductive success (in birds) to reduced body size and egg viability (in fish)

Image: FWS

Impacts to Wildlife

PFASs in Tree Swallows



Custer et al. 2017

Image: FWS

- Source areas important
- <u>Effects</u> – reproduction, e.g. reduced hatching success

PFASs in Great Lakes

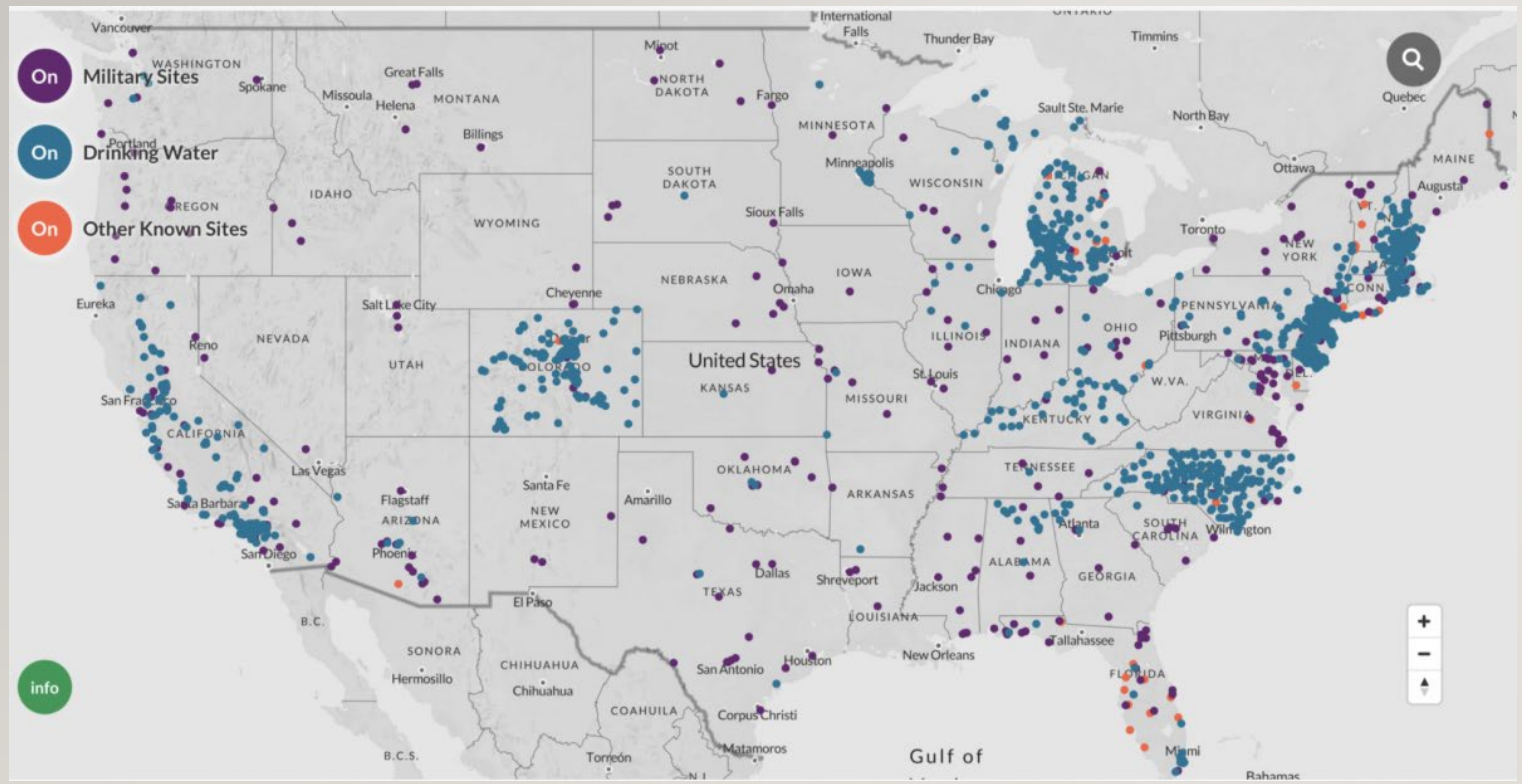


Image: EWG Interactive PFAS Contamination Map

- PFAS measured in water, sediments, soil, air, rain, fish, and wildlife
- Elevated groundwater contamination near certain facilities
- Systematic monitoring only recently underway in region

PFASs and Wildlife – Consumption Concerns

- Great Lakes States Fish Consumption Advisories
  - Indiana, Michigan, Minnesota, New York, Wisconsin (and Ontario)
  - PFAS Are Contaminating Our Fish – What This Means and What We Should Do About It (NWF Blog, July 2021)
- January 2021 Lake Superior Smelt Advisory (Wisconsin)
- Do Not Eat Venison Advisory – updated 2021 (Michigan)
- All aquatic and semi-aquatic animal advisory 2019 (Michigan)

What more needs to be addressed around PFAS in the Great Lakes?

Solutions for Reducing Exposures in People and Wildlife

- Phase out of manufacture and use of PFASs
- Product bans
- Clean up of existing known sources/ contaminated sites
- Removal from wastewater and drinking water via treatment
- Updating and issuing public health advisories, including for fish and game and PFAS forming foam

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