United States Environmental Protection Agency

EPA Tools and Resources Training Webinar: Using UST Finder in Identifying UST Locations, Impacts on Drinking Water Supplies, and Climate Change Impacts

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Overview

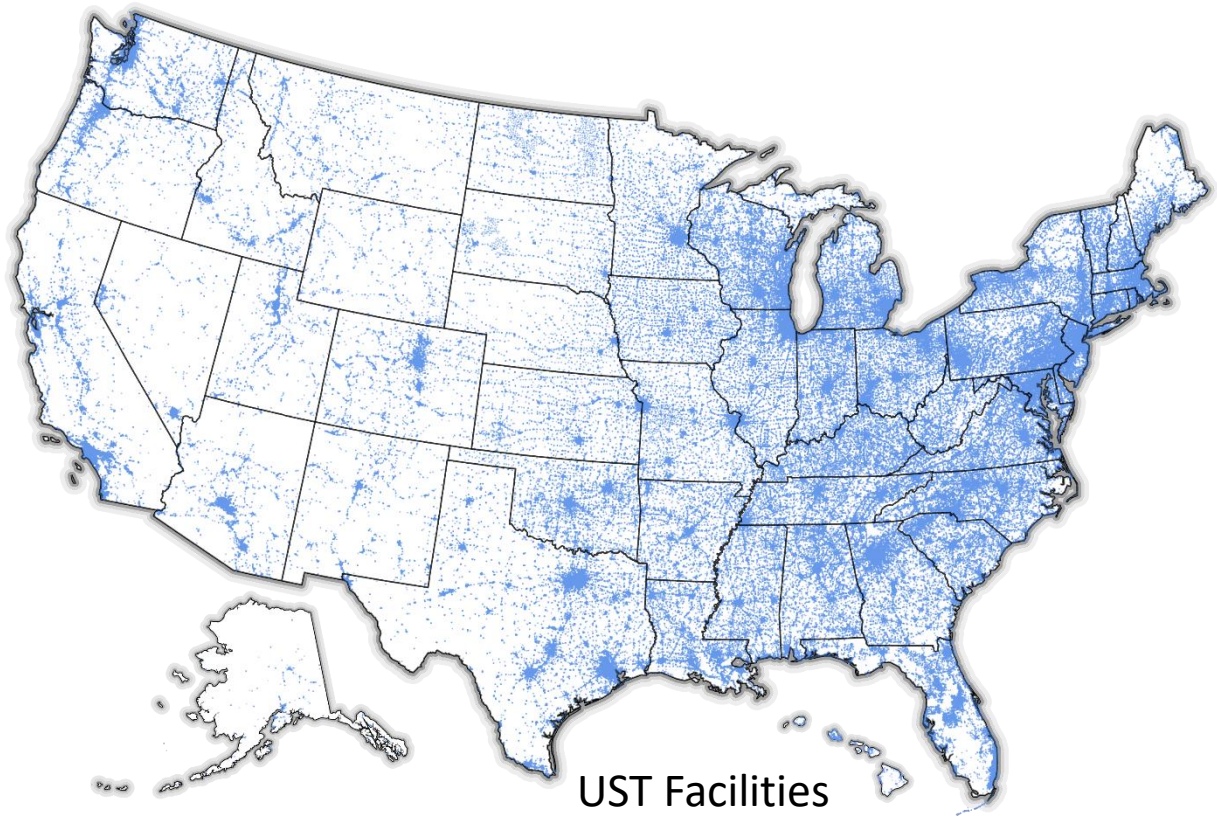
- Background on Underground Storage Tanks (USTs)
- UST potential impacts on drinking water supplies
- Extreme weather and climate change

Underground Storage Tanks in the US

- Underground storage tank universe
  - Regulated under SDWA and SARA
  - 540,000 active USTs
  - 193,000 facilities
  - Up to 6 billion gallons of fuel stored daily
  - 60,000 leaking USTs remaining to be cleaned up

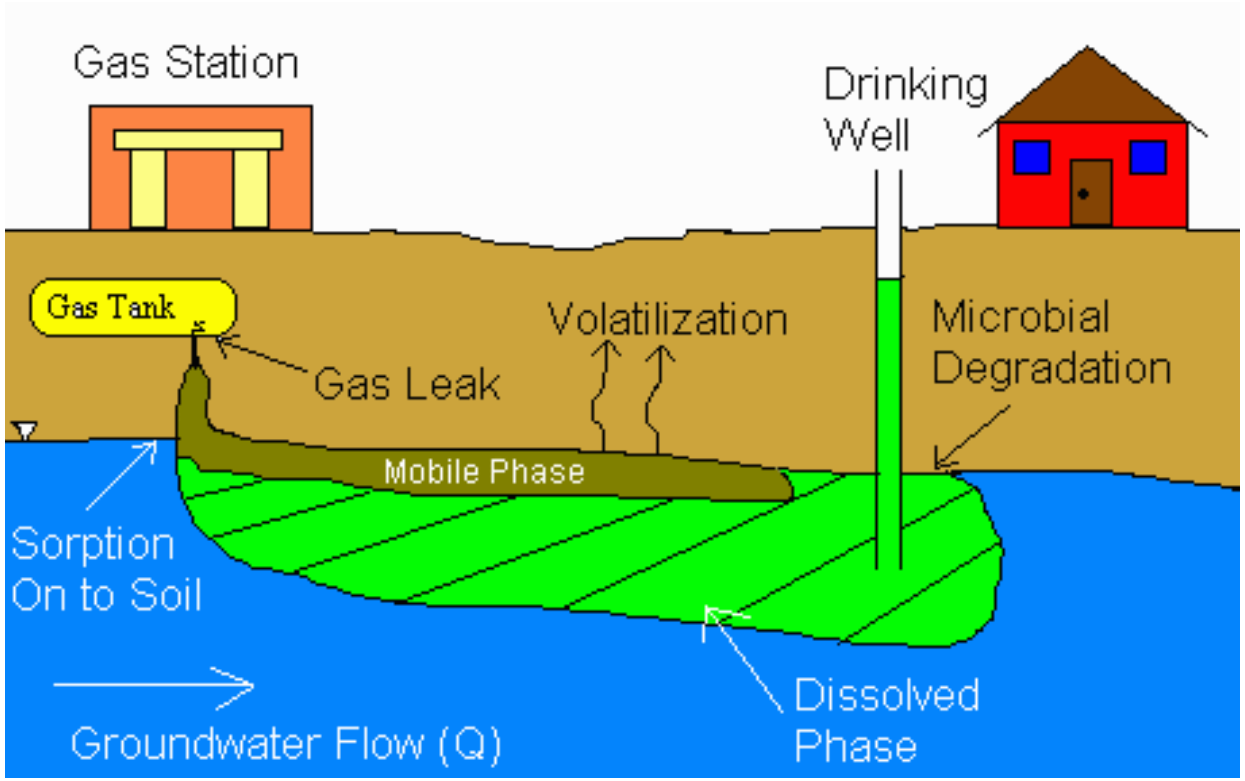
    https://www.epa.gov/ust/ust-performance-measures

- Potential impacts
  - Drinking water supplies
    - Ground water contamination principal concern
  - Petroleum vapor intrusion
- *Extreme weather conditions and climate change can increase the extent of contamination, spatially and temporally*



Underground Storage Tank Sites

- Tank releases can contaminate soil, groundwater or surface waters, and/or affect indoor air spaces
- UST releases vary considerably
  - Some are very contaminated sites where drinking water resources have been adversely impacted and may involve years of cleanup activities that can cost millions of dollars
  - Other sites may involve relatively minor or no groundwater contamination that may allow sites to be cleaned up more quickly and at less cost
- Tank leak detection
  - Detection rate generally 0.1 – 0.2 gallons/hr or 5 gal/day



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UST Finder Applications

Prevention

- Infrastructure age and type
- Fuel volumes and type
- Corrosion – water
  - Identify facilities vulnerable to corrosion
- Climate change
  - Prediction to minimize impacts
  - Quickly identify impacted areas

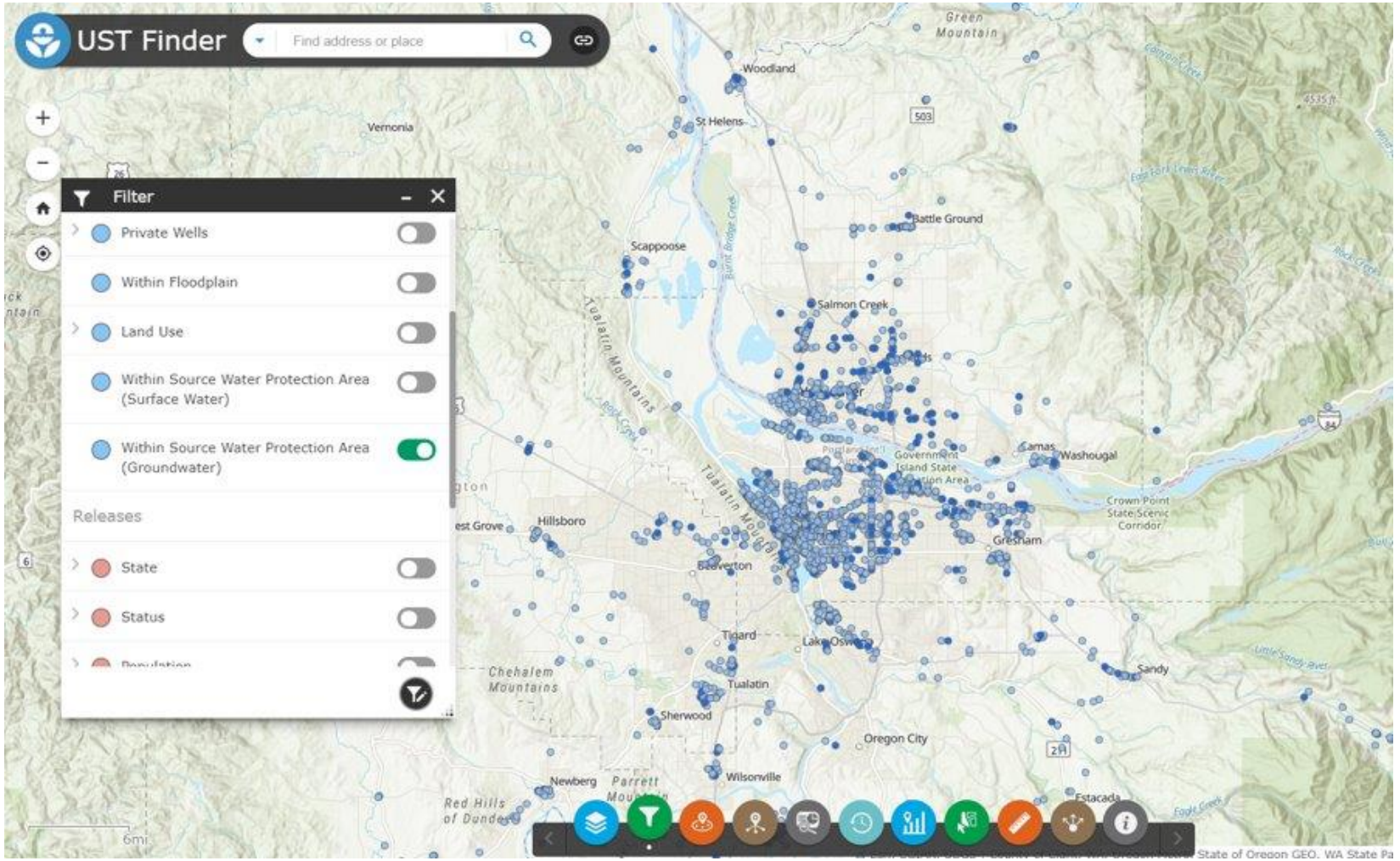
Database

Cleanup

- Triage cleanups
  - Identify drinking water sources
  - Land use – risk
  - Population impacts
- Screen technology selection
- Hazards
  - Identify facilities –
    - New releases
    - Characterize and remediate new/existing releases
    - Extreme weather impacts

Improving Prevention, Cleanups and Emergency Preparedness and Response across State Boundaries

- UST programs are state delegated programs
- Many state boundaries are divided by major waterways—amplifying the importance of interstate analyses of potential risks and need for an integrated response



Fuel Composition and Drinking Water Standards

Component	MCL (mg/L)	Gasoline Fuel Composition (mg/L)	Ratio of fuel composition/MCL
benzene	0.005	6140	1,228,000
toluene	1	15,400	15,400
ethylbenzene	0.7	3080	4,400
xylene	10	13,730	1373

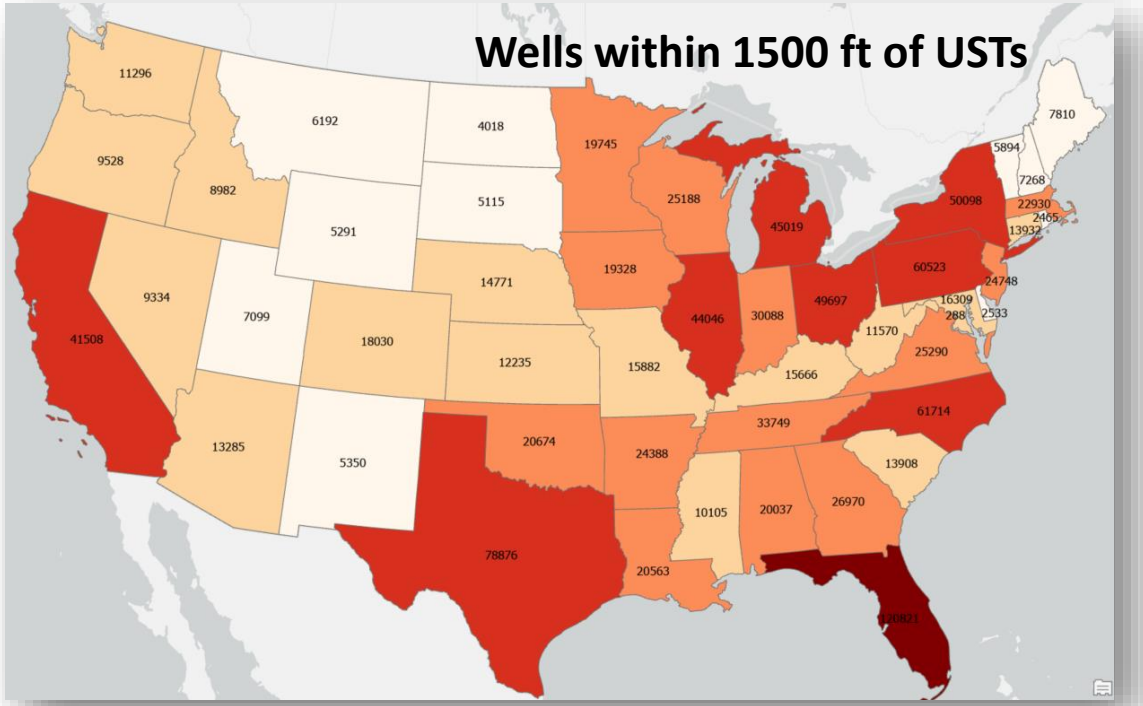
Benzene odor threshold – 60 ppm
Benzene taste threshold – 0.6 to 4.5 ppm
https://www.atsdr.cdc.gov/sites/toxzine/benzene_toxzine.html

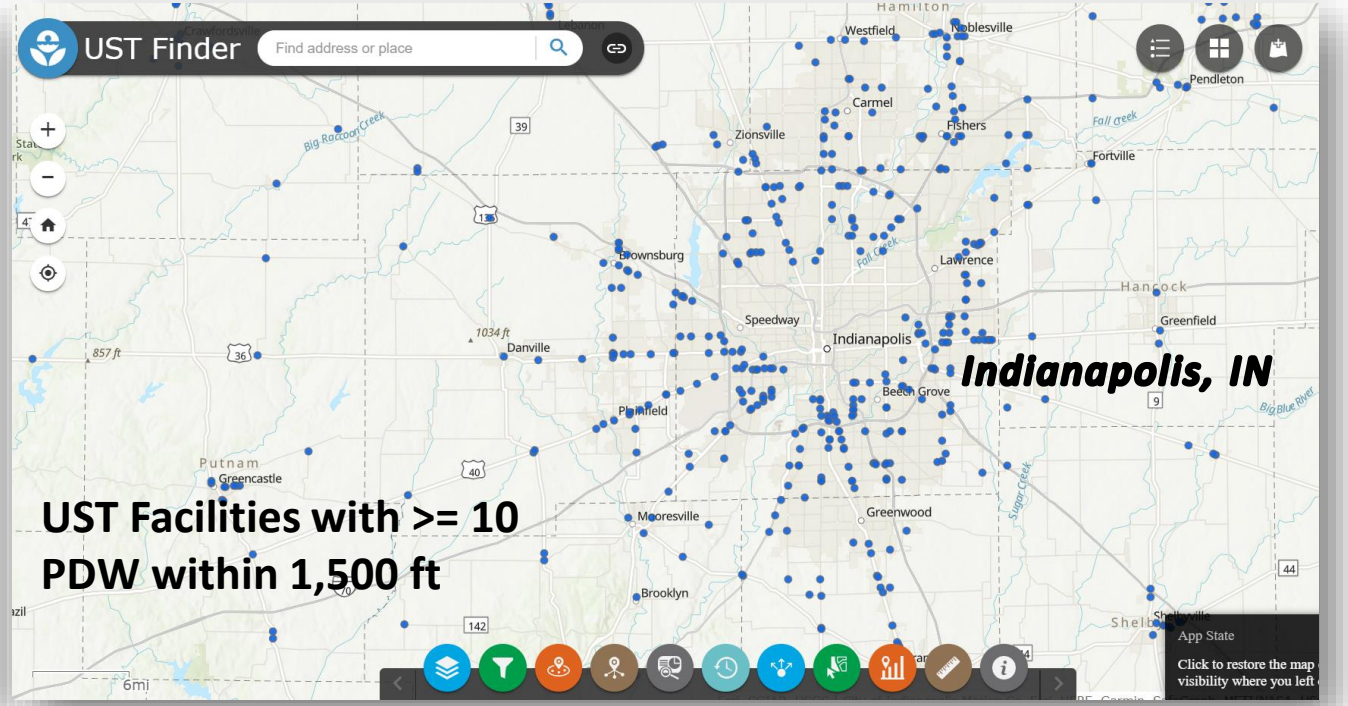
Ethylene dibromide
- MCL 0.05 ug/L
- Fuel additive in leaded gasoline
  - Historical use of leaded gas
  - Avgas in use today

https://nepis.epa.gov/Exe/ZyPURL.cgi?Dockey=9100PO3Q.TXT

MTBE
- USEPA - no MCL
- Example state action levels
  - DE 10 ug/L
  - NH 13 ug/L
  - CA 13 ug/L

UST Proximity to Private Domestic Wells



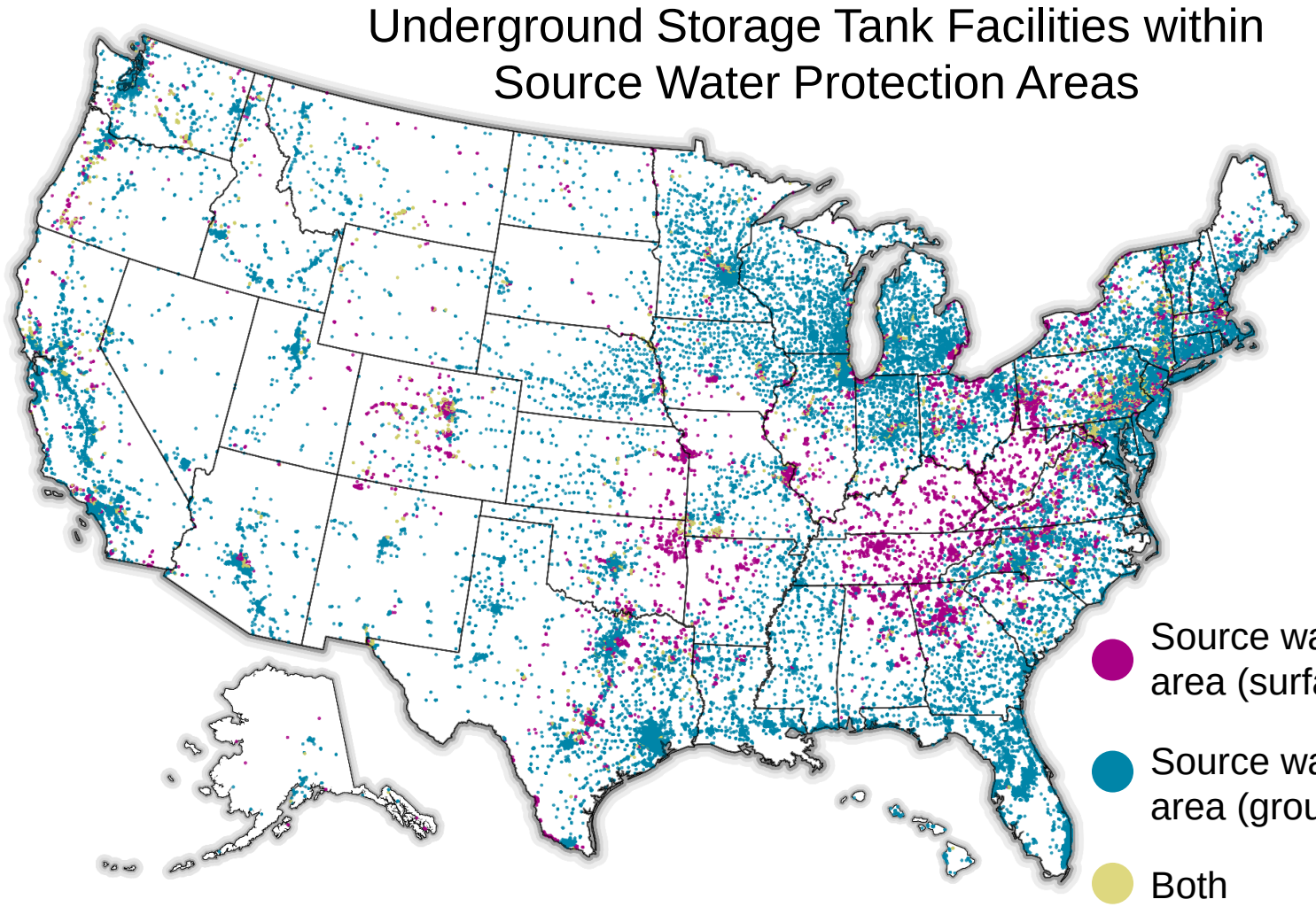


- Estimated **1,124,305** private domestic wells within 1,500 feet of all **active UST**
- Estimated **390,000** private domestic wells within 1,500 feet of all active UST **releases**

Private Domestic Well Map

https://onlinelibrary.wiley.com/doi/10.1111/1752-1688.12937

Integrating Decisions on Contaminant Sources and Drinking Water Impacts

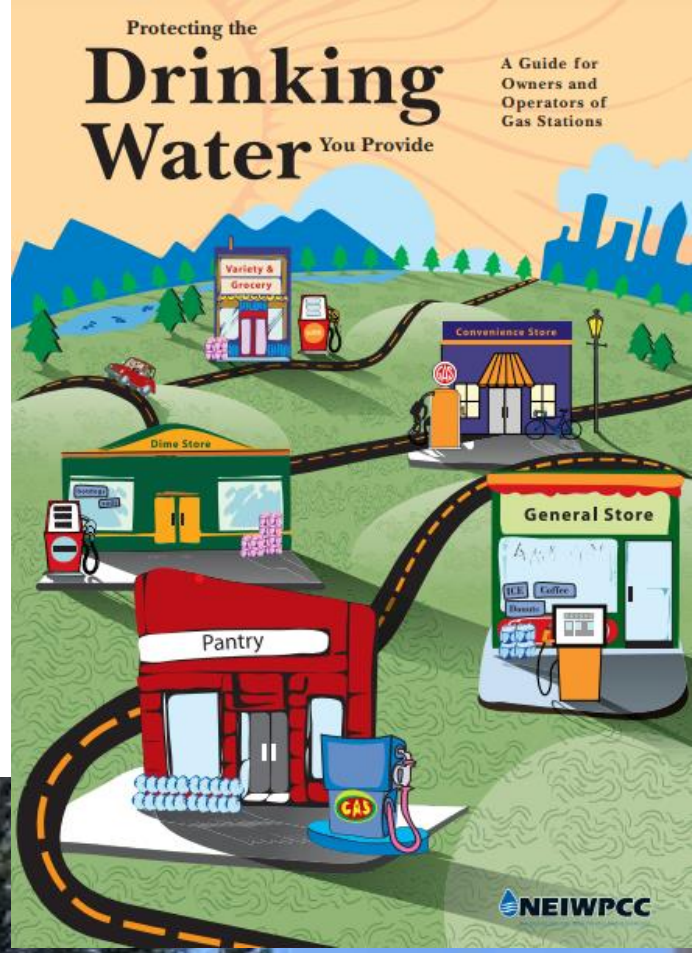


- 210k active USTs are within a source water protection area
- 64k USTs within surface water protection areas
- 163k USTs within groundwater protection areas

50% of USTs and Leaking USTs (LUSTs) are within a source water protection area

Public Drinking Water Supplies

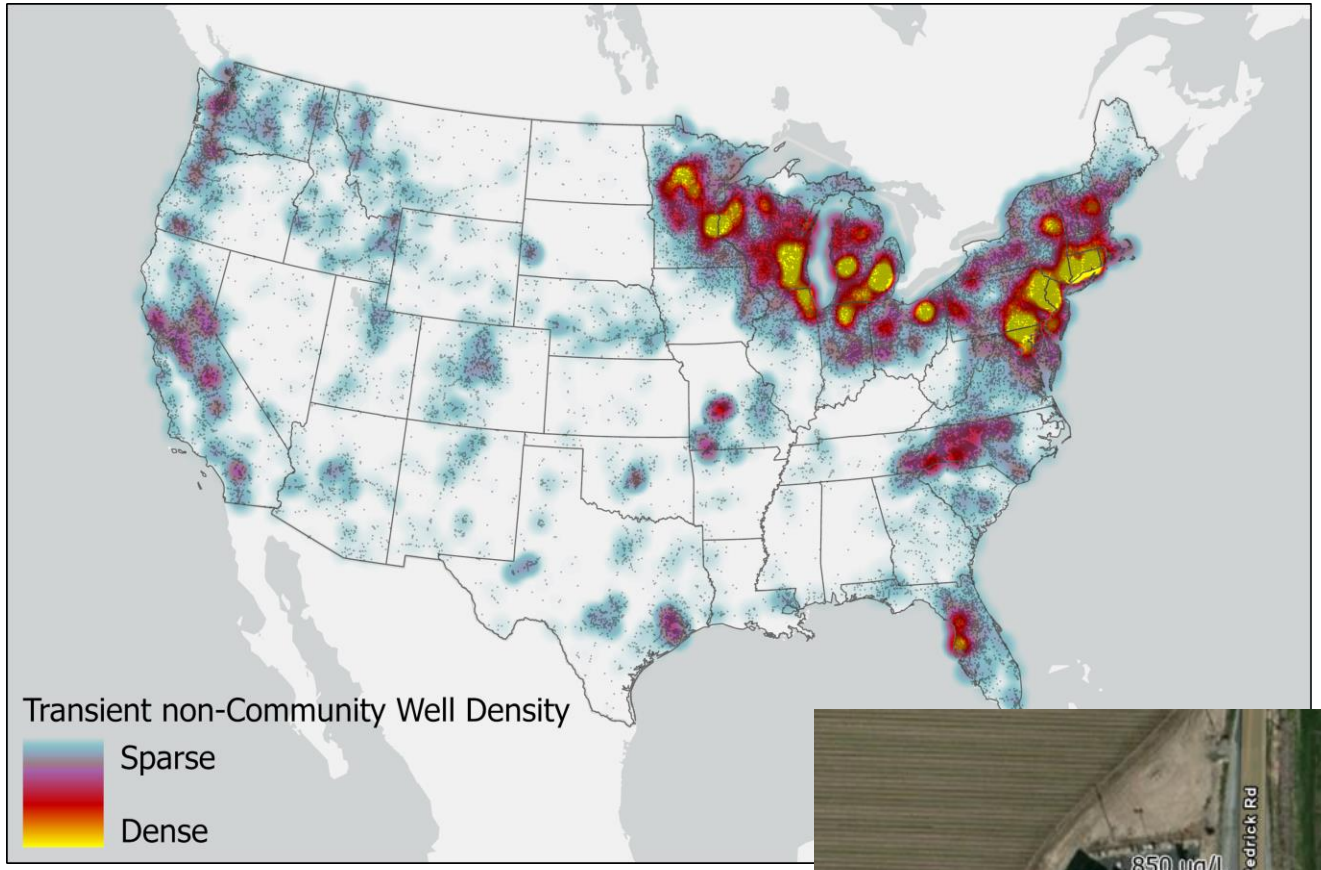
- The larger the water system, the better its financial profile and monitoring record
- Small water systems more than 3X the per capita infrastructure investment needs of large water systems
- The smallest water systems had the greatest percentage of monitoring and reporting violations
- Small systems do not have as robust monitoring systems, concerns about unmeasured water quality violations
- Few small systems participate in wellhead or source water protection programs



US Environmental Protection Agency (USEPA), National Drinking Water Advisory Council Small Systems Implementation Working Group. 1999. National Characteristics of Drinking Water Systems serving Populations under 10,000. EPA 816-R-99-010. Washington, DC.

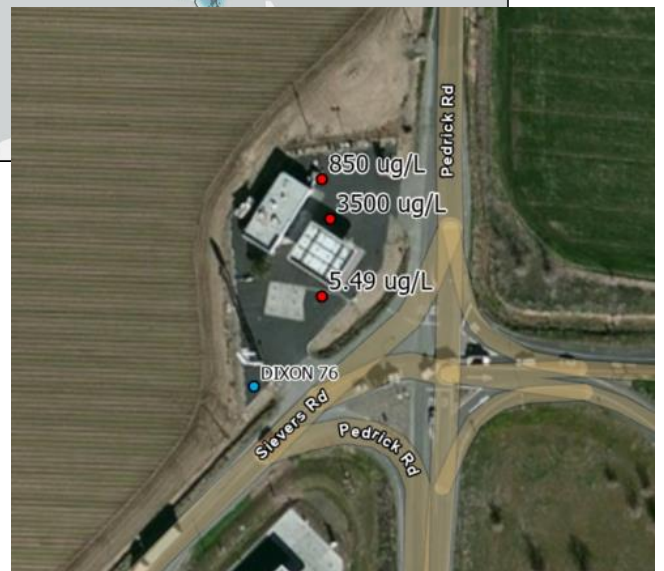
Transient Non-Community (TNC) Wells in the US

- 80,000 TNCs in the US
- TNCs provide water to 25+ people/day but not necessarily same people every day, for > 60 days/yr
- 1 in 20 TNCs within 300 M of an active UST
- As an example, one state with 324 sites with TNCs, median maximum measured benzene concentration near the TNC well was 52 ug/L



Top 10 States with Most TNCs near a UST Facility

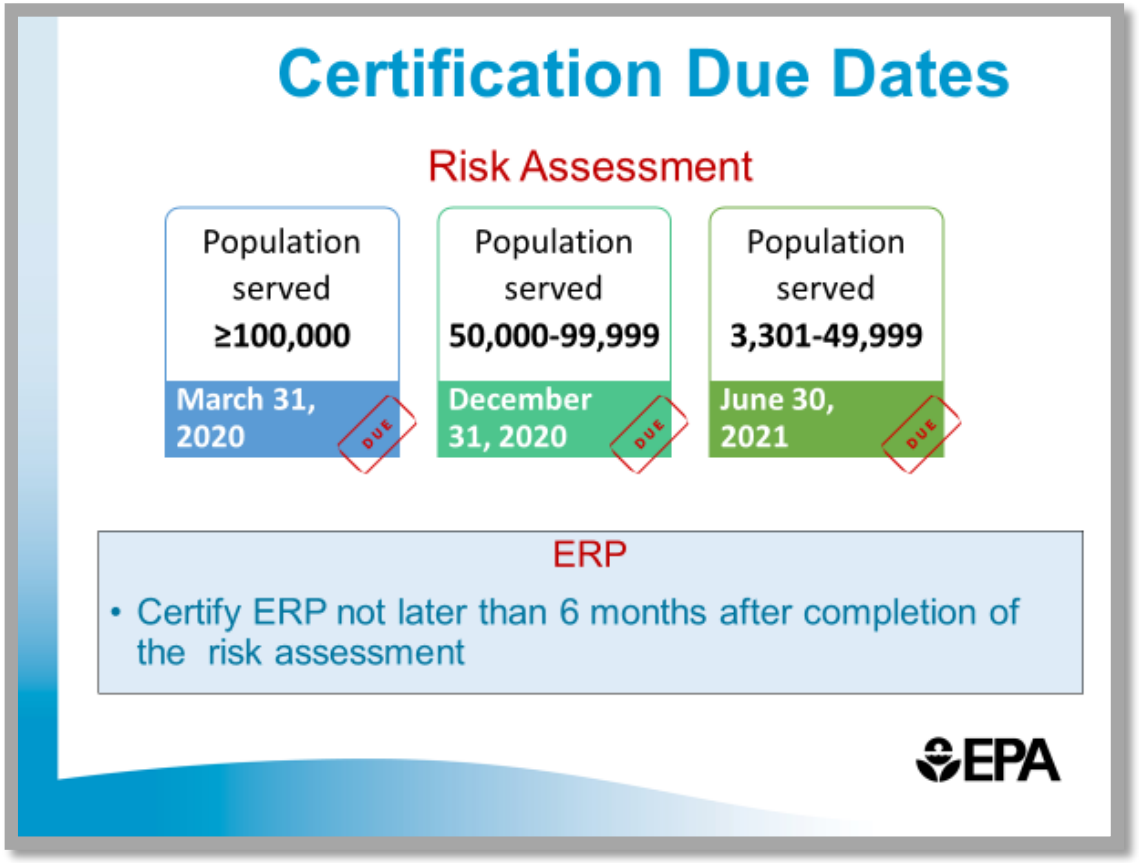
State	Number of TNCs	Daily Population Served
Wisconsin	422	39401
New York	395	32296
Pennsylvania	363	NA
Florida	348	24285
Michigan	272	47793
Texas	213	36842
Indiana	174	40638
California	154	18219
North Carolina	136	9461
New Hampshire	130	22064



https://www3.epa.gov/region1/eco/drinkwater/pdfs/SamplingGuideOperatorsVerySmallWaterSystems.pdf

America's Water Infrastructure Act 2018 Overview

- Applies to all community water systems serving more than 3,300 people
- Conduct Risk and Resilience Assessments and update Emergency Response Plans (ERPs)
- Submit **certifications to EPA** by specified deadlines
- Review risk assessments and ERPs every 5 years
- Coordinate with local emergency planning committees
- Maintain records

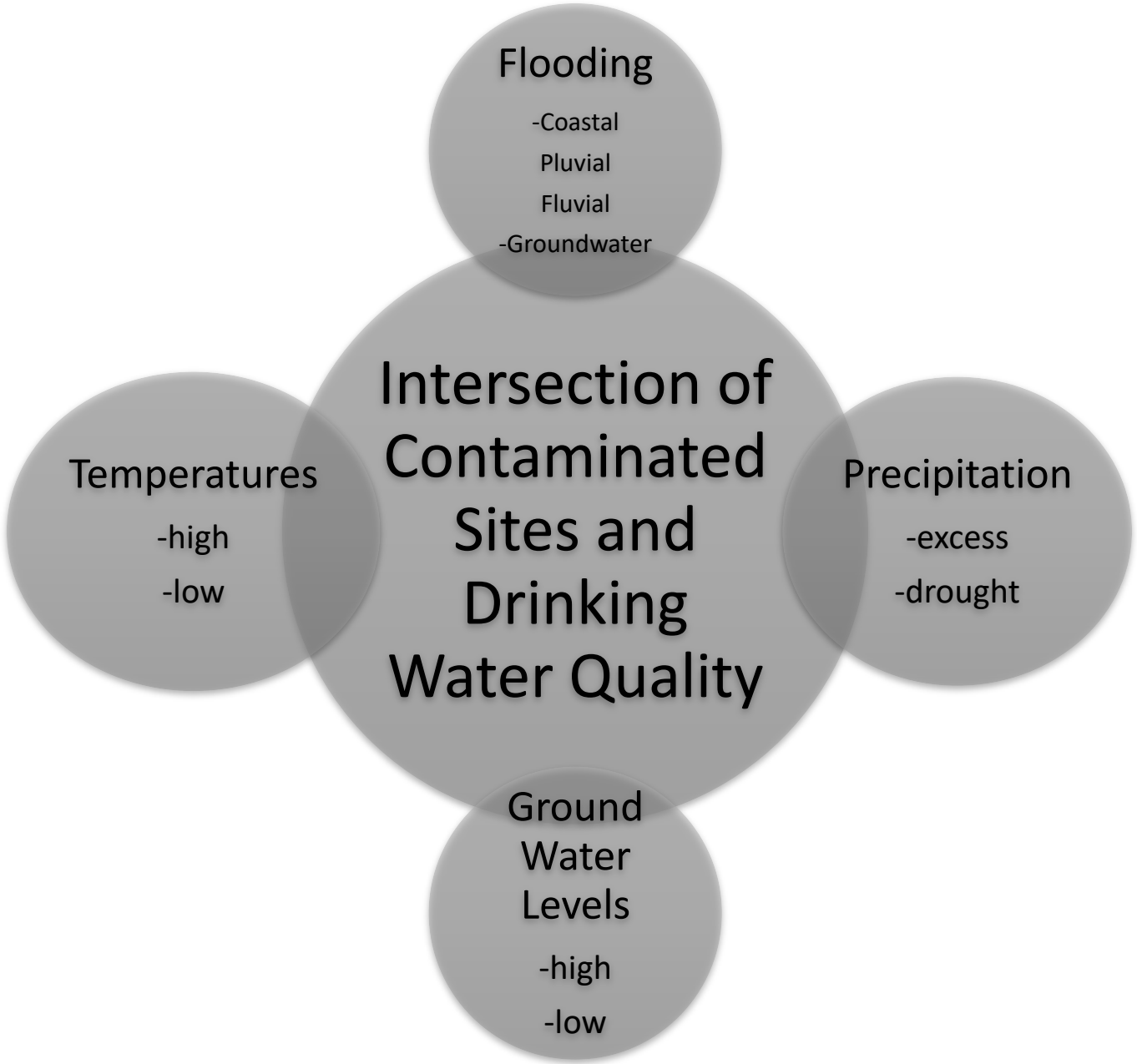


Fueling Stations are Critical in Disaster Response

- 4 critical elements in emergencies –
  - Food, medicine, water and fuel
- USTs and water supplies are vital
- Systematically assess the storm risk and identifying protection strategies to “harden” facilities against damage for each location
- Essential in preparedness and response for providing
  - Adequate fuel for evacuees
  - Assistance for first responders
    - After Hurricane Harvey, responders found a convenience store on higher ground

    “…every one of the roughly 120 fueling pumps had an emergency response vehicle stationed at it”
      - “Eye of the Storm, Report of the Governor’s Commission to Rebuild Texas,” 2018

Climate Change – USTs and Drinking Water Supplies



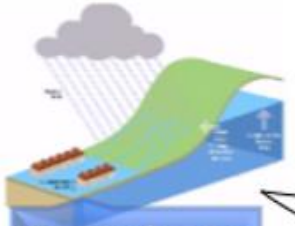
Effects of Flooding on Fuels Infrastructure Integrity and Water Supply Impacts

1 Floods Affecting UST Infrastructure and Water Facilities

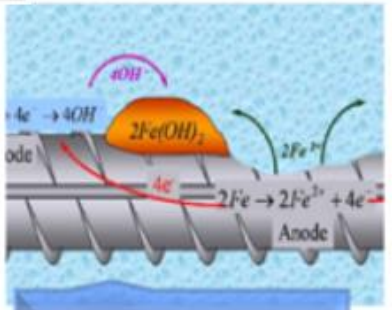

Coastal


Fluvial


Pluvial


Groundwater

2 Effect on UST Infrastructure



Saltwater Corrosion


Corrosion Induced Leak

3 Contamination Pathways


Petroleum Vapor Intrusion


Public Water Utility

Domestic Well

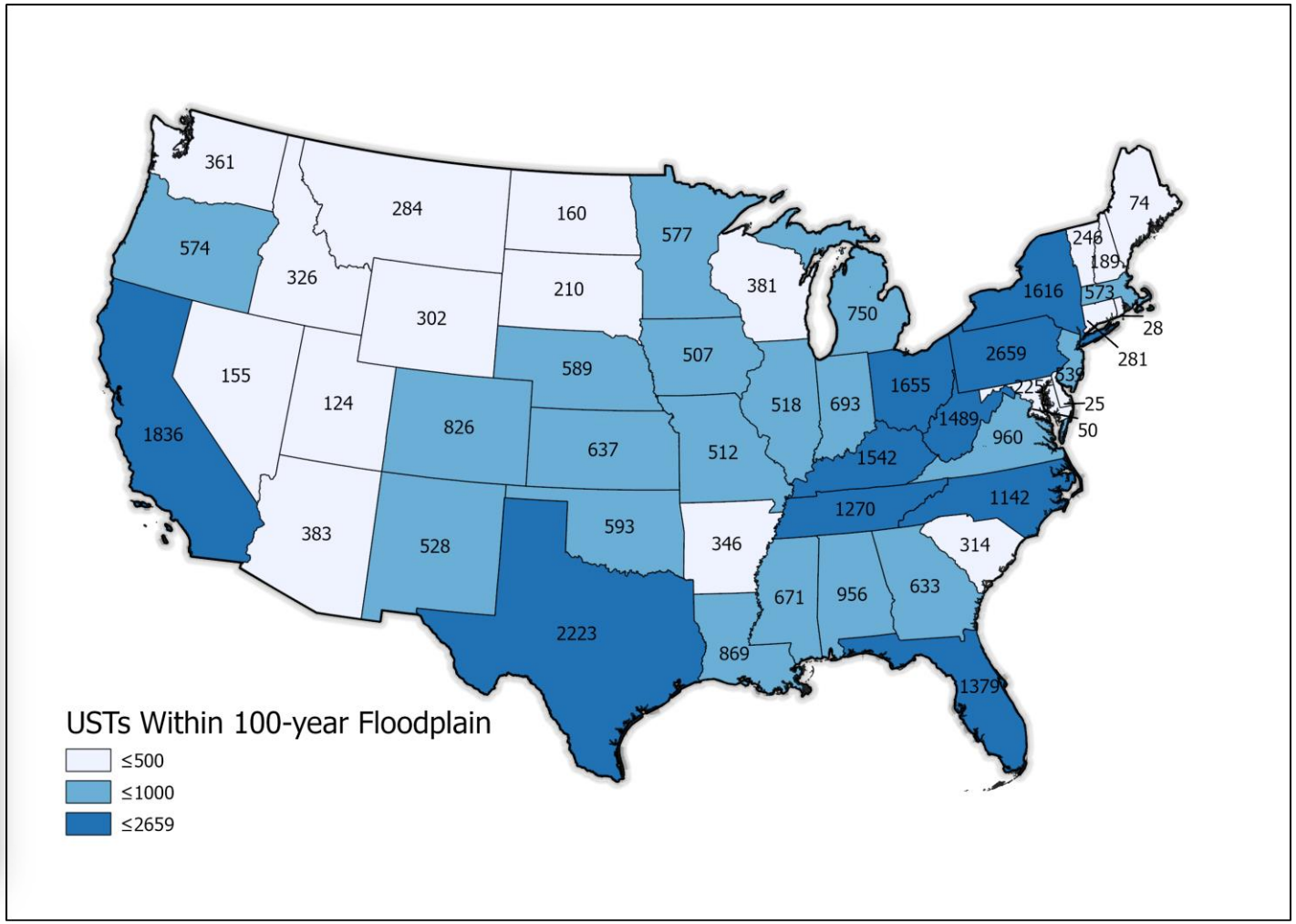

Spread of Product


Dislodging

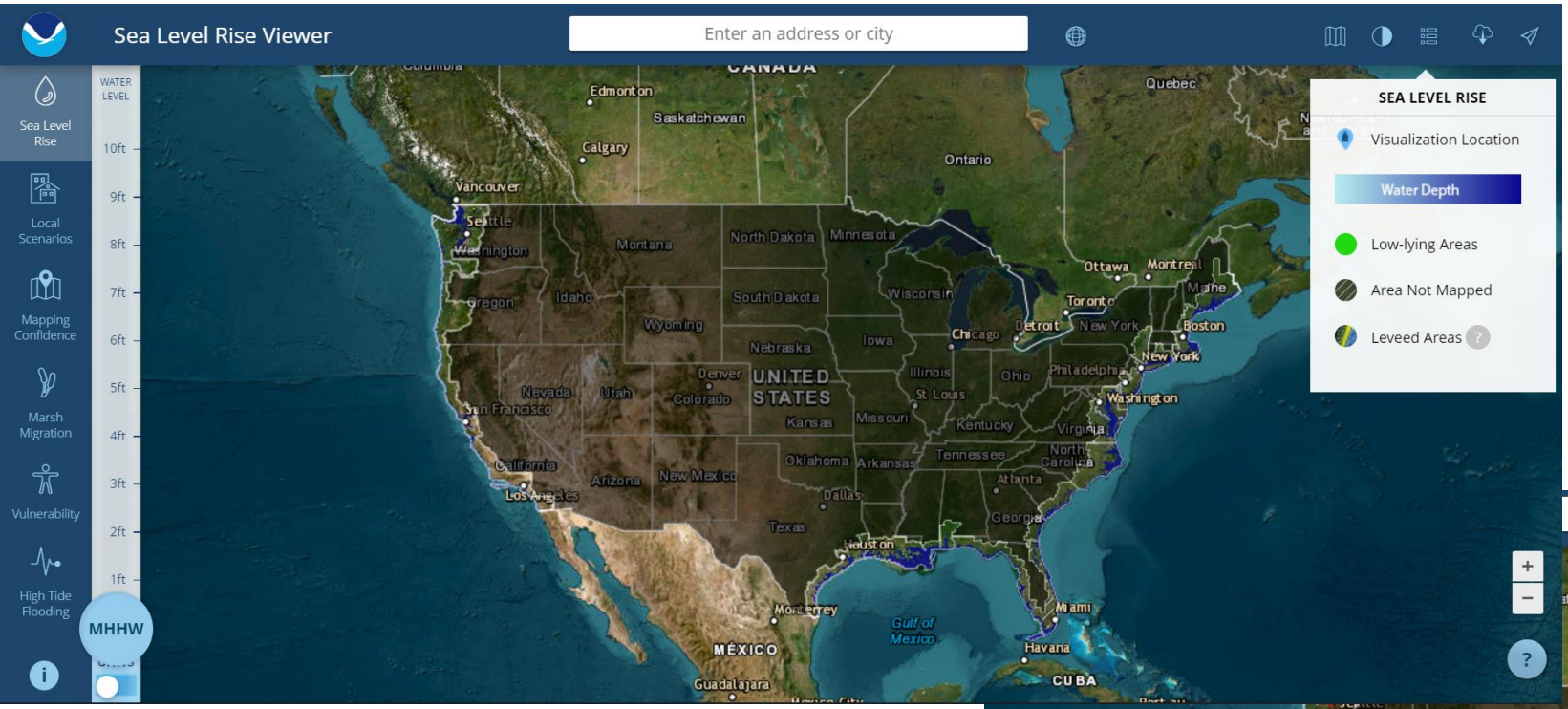
Fluvial Flooding: National UST Flood Vulnerability

- ~33,000 USTs within FEMA's estimated 100 yr. floodplain
- Totaling a potential of 250 million gallons of fuel/hazardous substance
- With an average UST age of 25 years
- Testing TNCs and PDWs in proximity to USTs for VOCs after flooding event

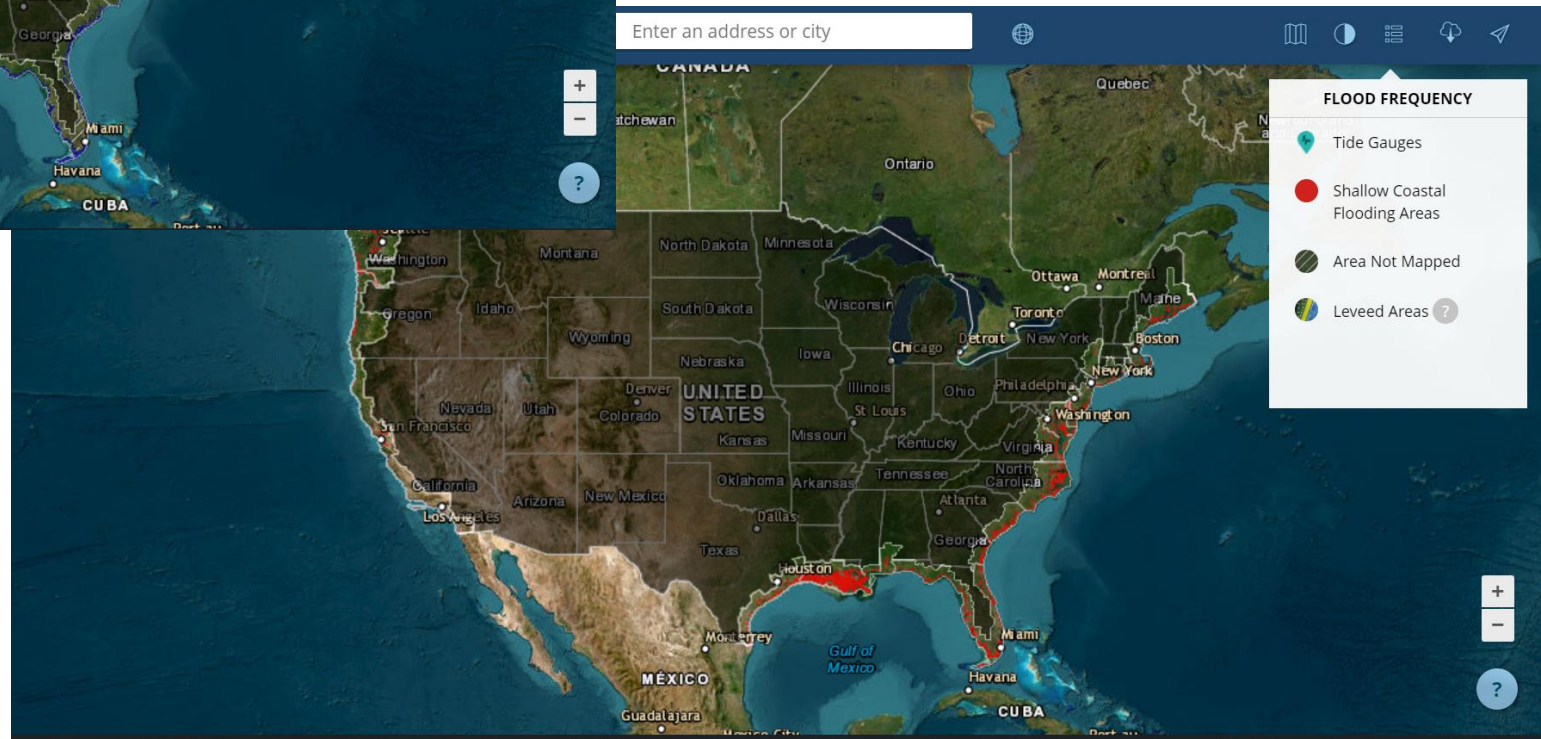
COUNT OF OPEN USTs WITHIN EPA ESTIMATED 100 YR FLOODPLAIN—BY STATE*



Coastal Flooding – Sea Level Rise and High Tide

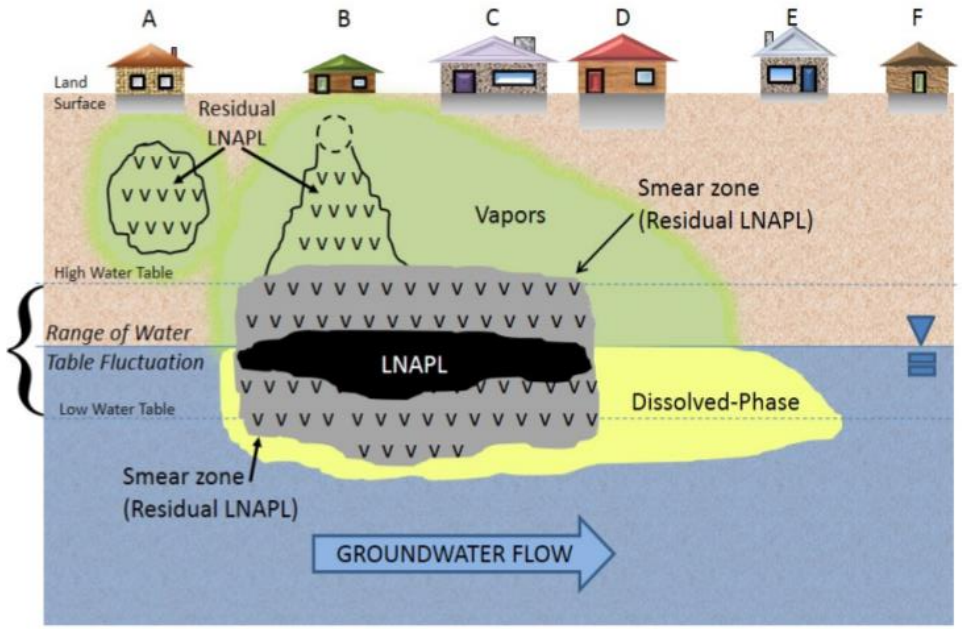


Some of the highest densities of USTs are located in coastal areas with high population and high water demands, increasing vulnerability

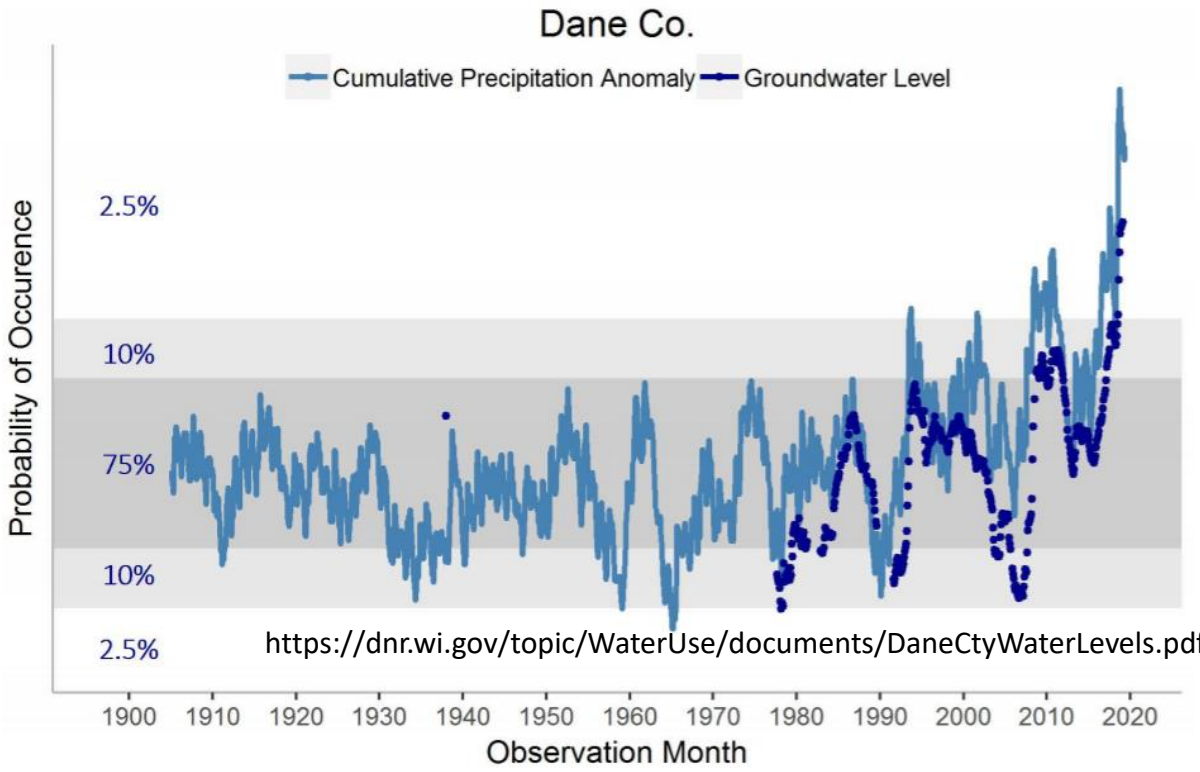


https://coast.noaa.gov/digitalcoast/tools/slr.html

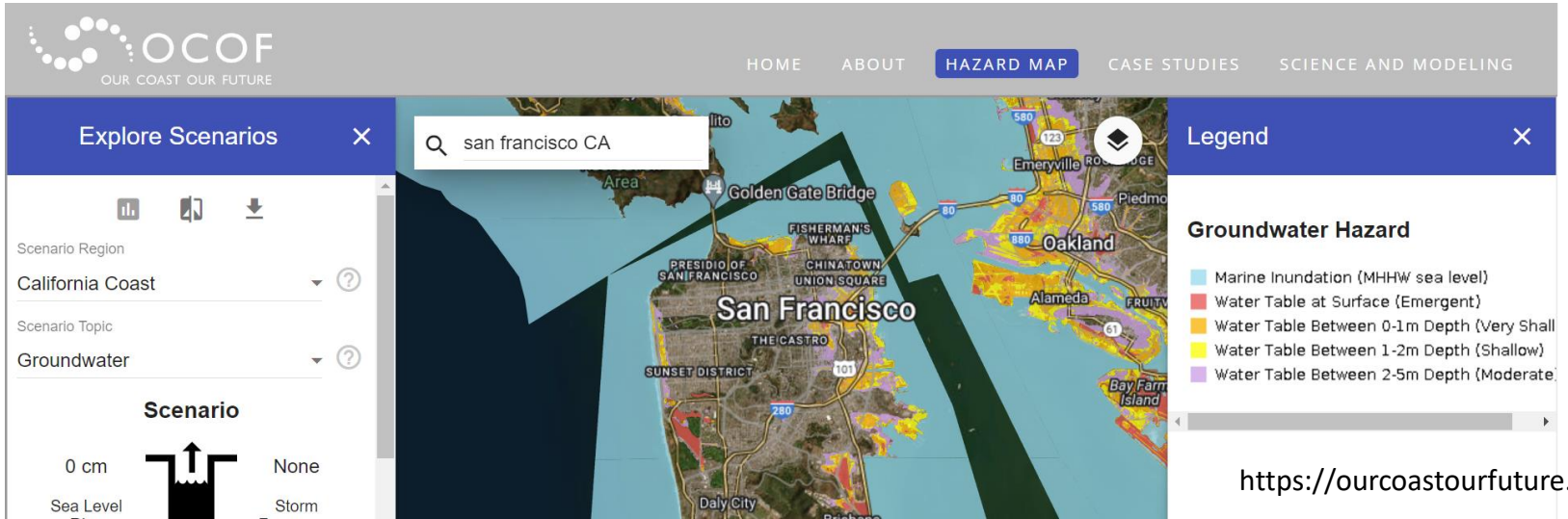
Flooding – Groundwater



Wisconsin above average precipitation



https://dnr.wi.gov/topic/WaterUse/documents/DaneCtyWaterLevels.pdf



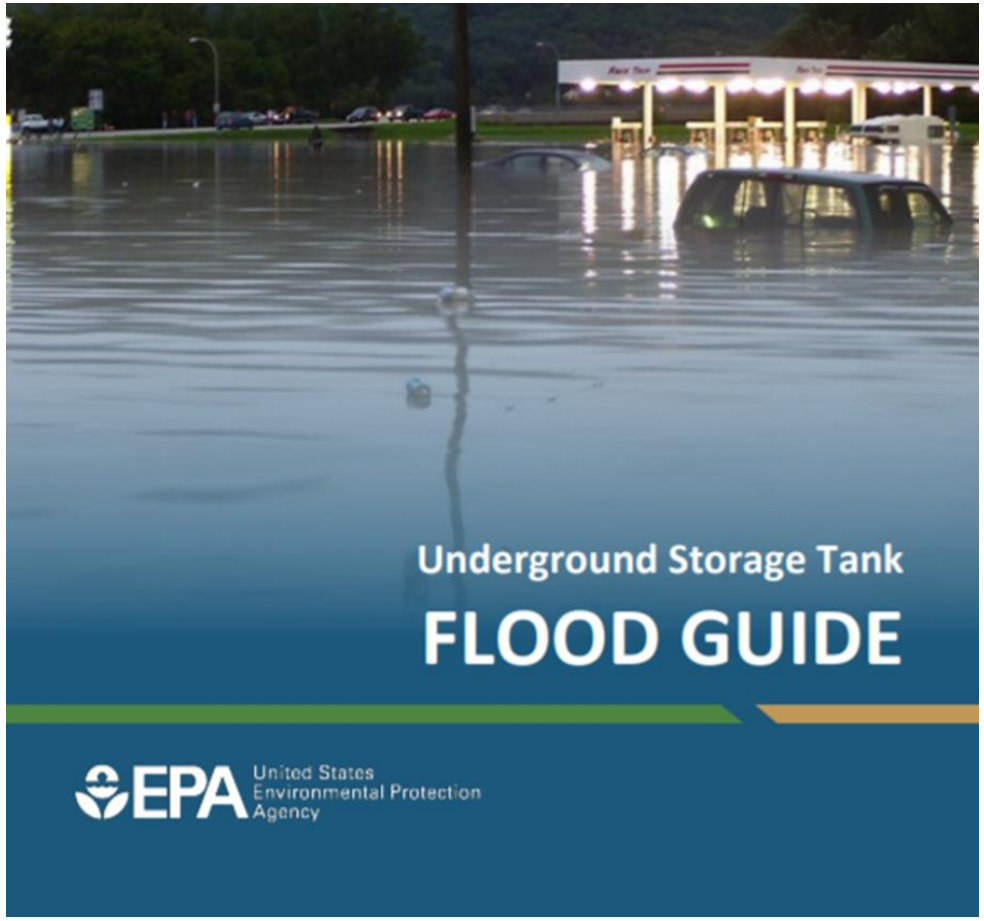
- Midwest and northeast above average precipitation in recent years
- Increasing water levels can release contaminants in smear zone

https://ourcoastourfuture.org/hazard-map/

EPA Office of Underground Storage Tanks Flood Guide

Provides information on:

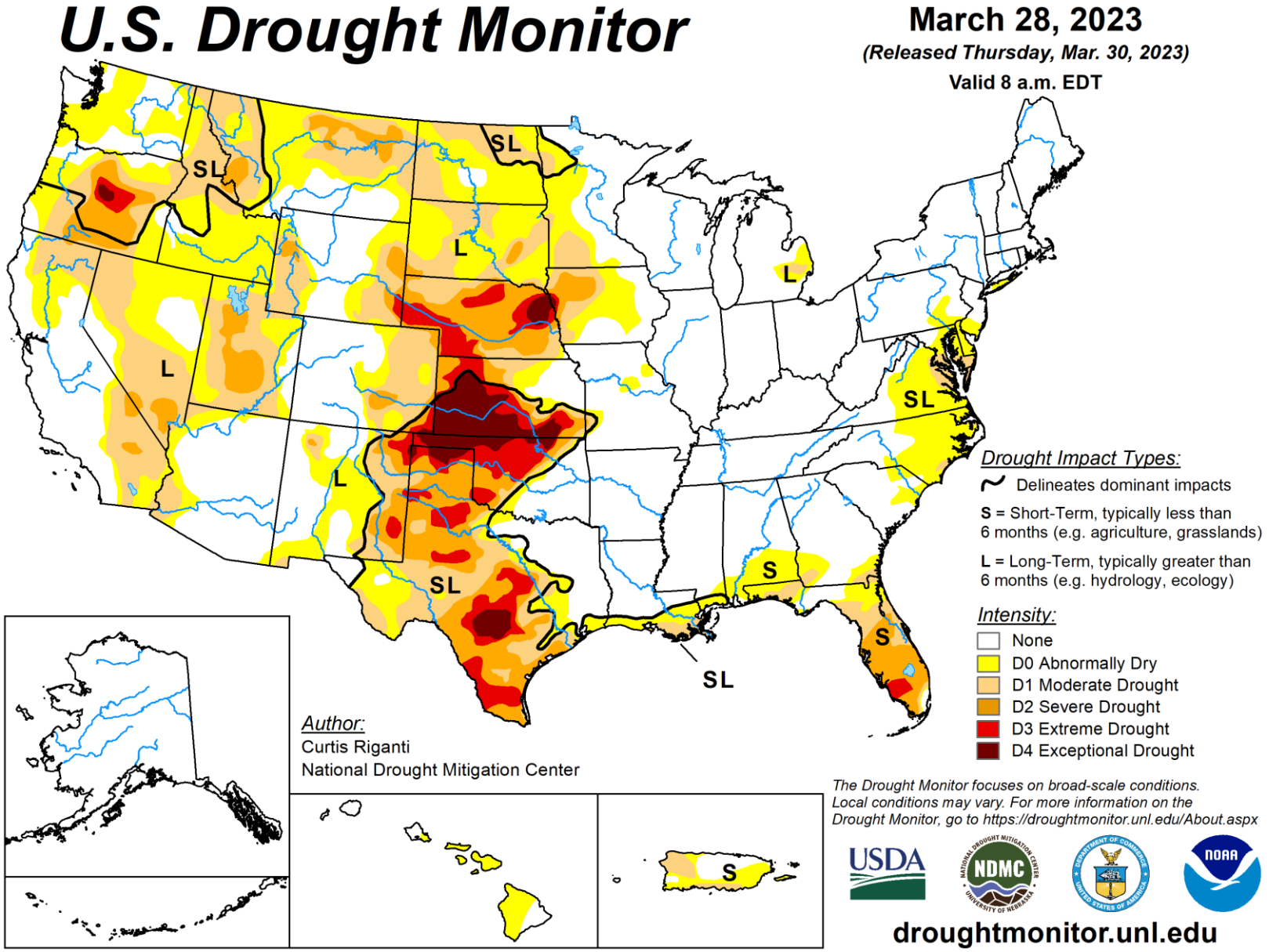
- Preparing for a flood
- Important actions after the disaster strikes
- Information on financial assistance
- Consolidates information from various federal, state, nongovernmental, and UST industry resources



https://www.epa.gov/sites/production/files/2014-03/documents/ustfloodguide.pdf

Climate Change – Assessing Drought Conditions

- Drought map developed using number of factors including precipitation, soil moisture, vegetation health, snowpack
- Does not account for groundwater levels



Reassessing drought conditions

- California's 2nd largest reservoir levels recently increased from record lows to nearly ¾ full after recent precipitation
- However, groundwater levels remain critical in California

https://www.nature.com/articles/s41467-022-35582-x

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Climate Change – Subsidence

- Gradual settling or sudden sinking of land surface due to removal or displacement of subsurface earth materials
- Key causes
  - aquifer-system compaction associated with groundwater withdrawals (80%)
  - drainage of organic soils
  - underground mining
  - natural compaction or collapse, such as with sinkholes or thawing permafrost
- Increase in population, economic growth and droughts will further affect subsidence
- More than 17,000 square miles in 45 states have been directly affected by subsidence

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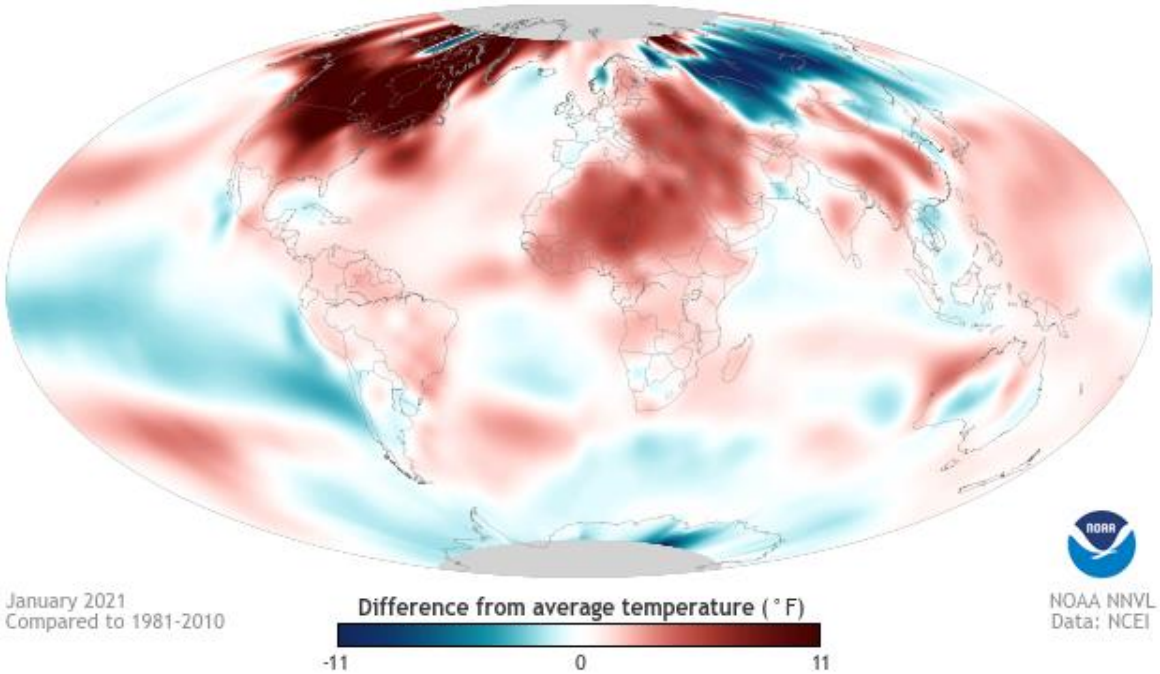
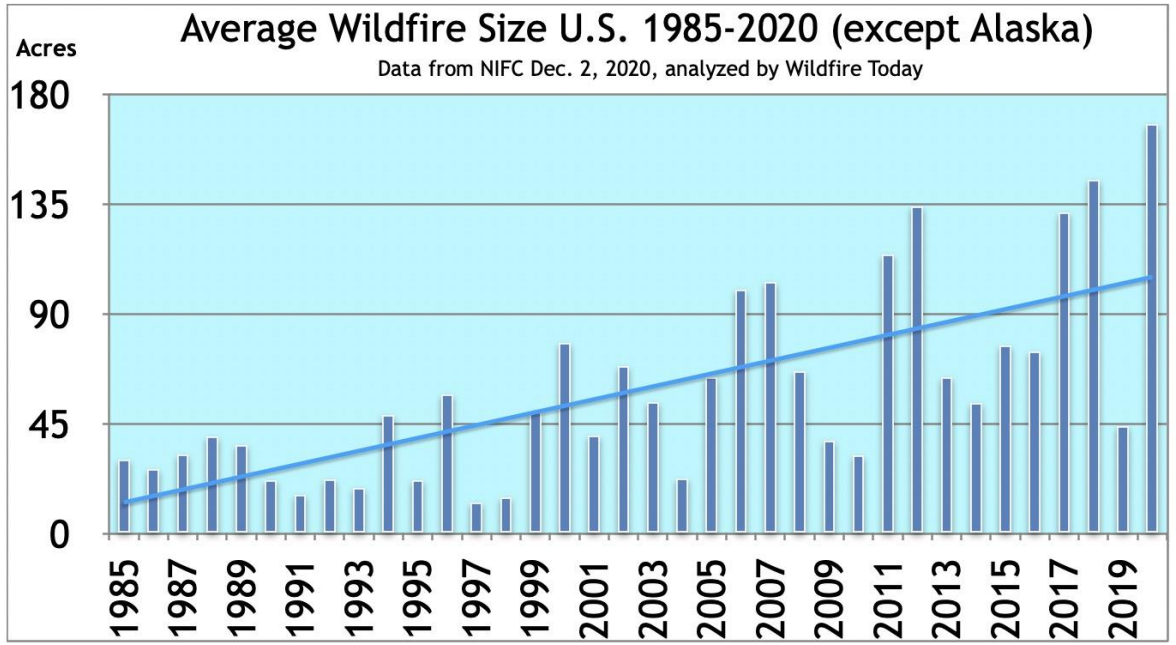
Climate Change – Wildfires

- Northern climates greatest increase in temperature

- Alaska 2019 Fire Season
  - 700+ wildfires burned >2 M acres
  - 3-fold increased risk of fire in recent decades

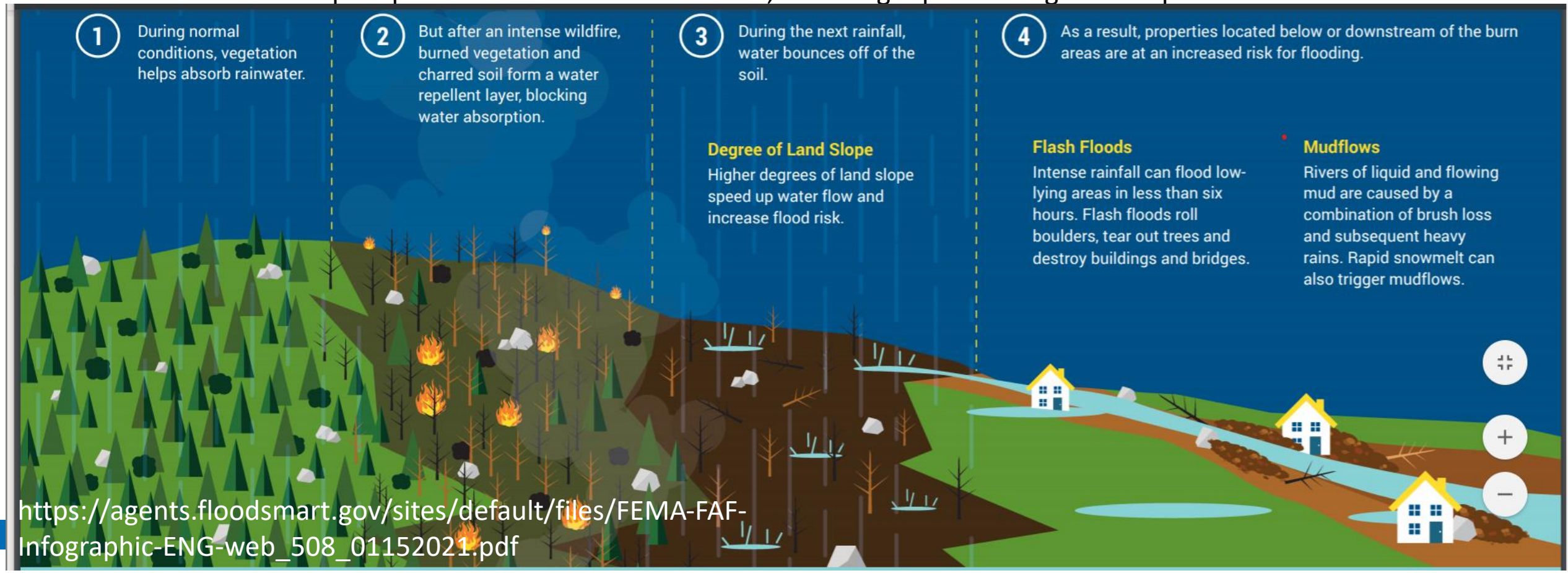




https://www.climate.gov/maps-data/data-snapshots/tempanomaly-monthly-nnvl-2021-01-00?theme=Temperature

Debris Flow Fields – Post-Wildfires and Precipitation

- Wildfires can significantly alter the hydrologic response in watershed, even moderate rainstorms can produce dangerous flash floods and debris flows
- Wildfires leave soil charred, barren and unable to absorb water, creating conditions for flash flooding and debris flow (mudflow)
- Flood risk remains significantly higher until vegetation is restored—up to 5 years after a wildfire
- Excessive precipitation can result in landslides, including rapid melting of snowpack



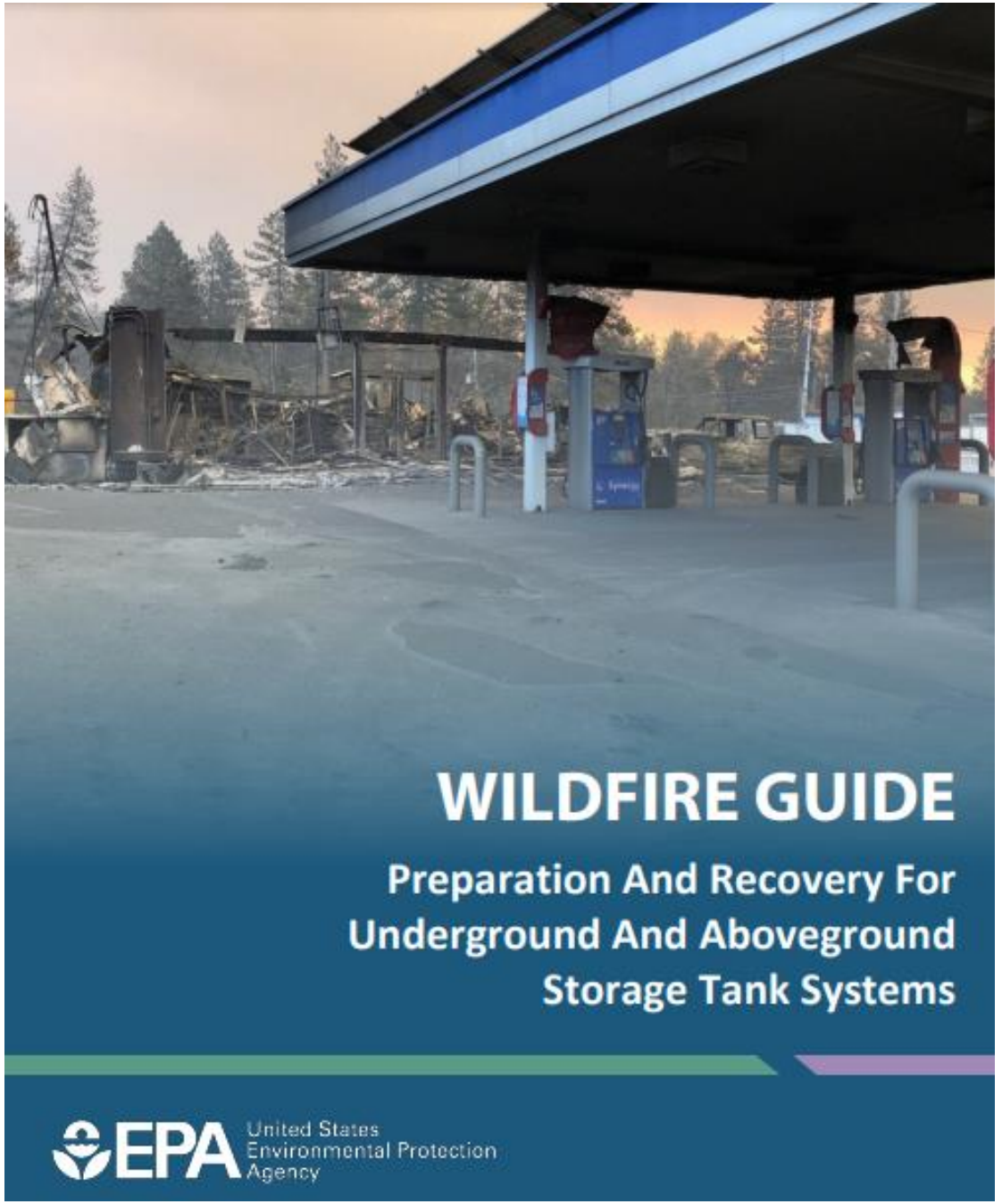
https://agents.floodsmart.gov/sites/default/files/FEMA-FAF-Infographic-ENG-web_508_01152021.pdf

Wildfires

Office of Underground Storage Tanks Wildfire Guide

- Assist UST and oil Aboveground Storage Tank (AST) owners and operators prepare for/ respond to the catastrophic effects from partially or fully burned UST systems or oil ASTs and associated piping and appurtenances
- Information to help owners and operators return their facilities to service
- Assist state, tribal and local UST and oil AST program implementers

Photo courtesy of Oregon DEQ



Climate Change and Environmental Justice:
Communities of Color and Low Income Disproportionately Burdened by USTs/ LUSTs

- The top 90th percentile minority communities have 16X the density than the bottom 10th percentile based on medians
- Low-income communities and communities of color bear a disproportionate burden of environmental problems, especially in areas subject to climate change
  - https://oaktrust.library.tamu.edu/handle/1969.1/161342
- Tanks data incorporated in EJ Screen

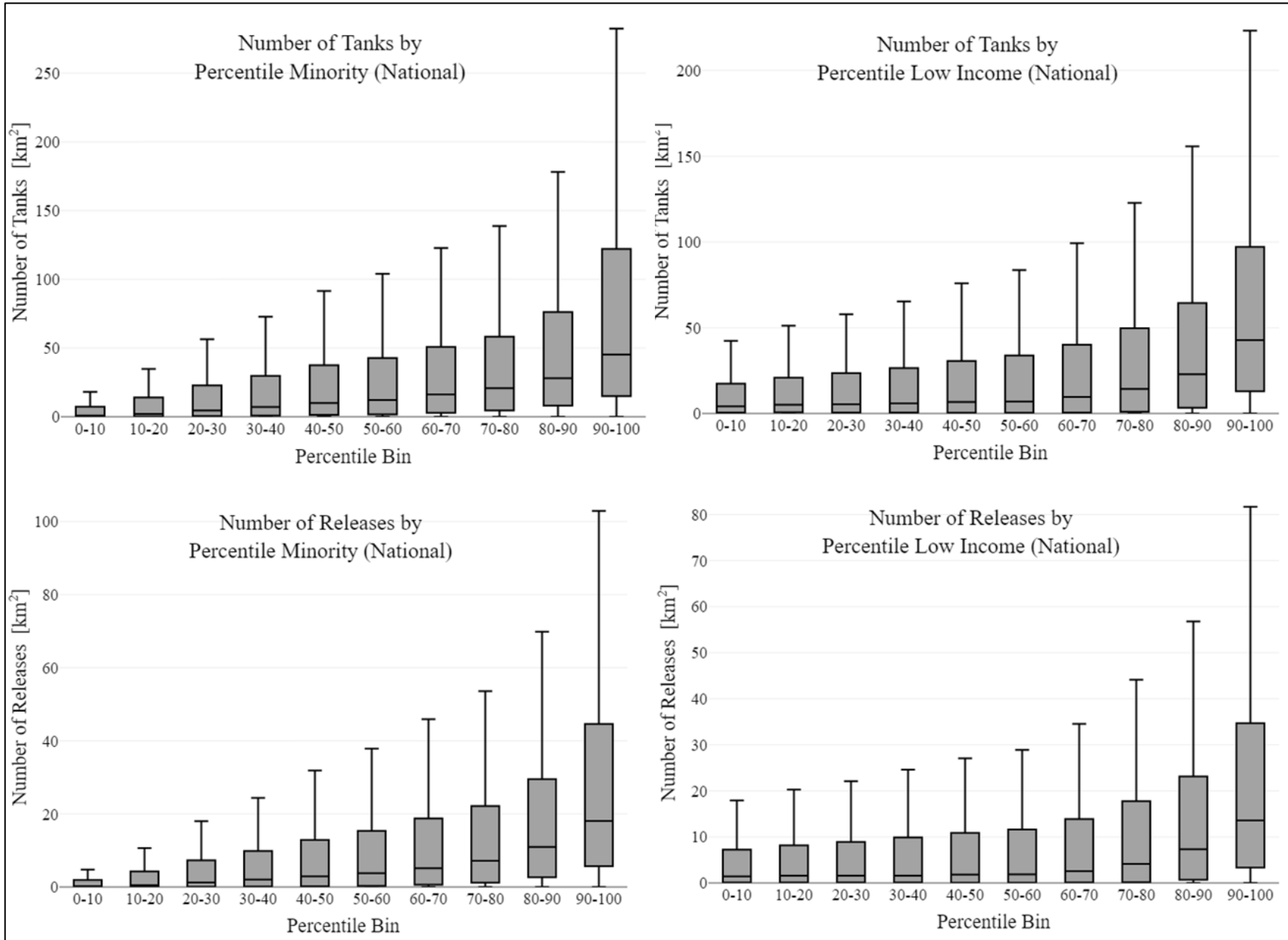
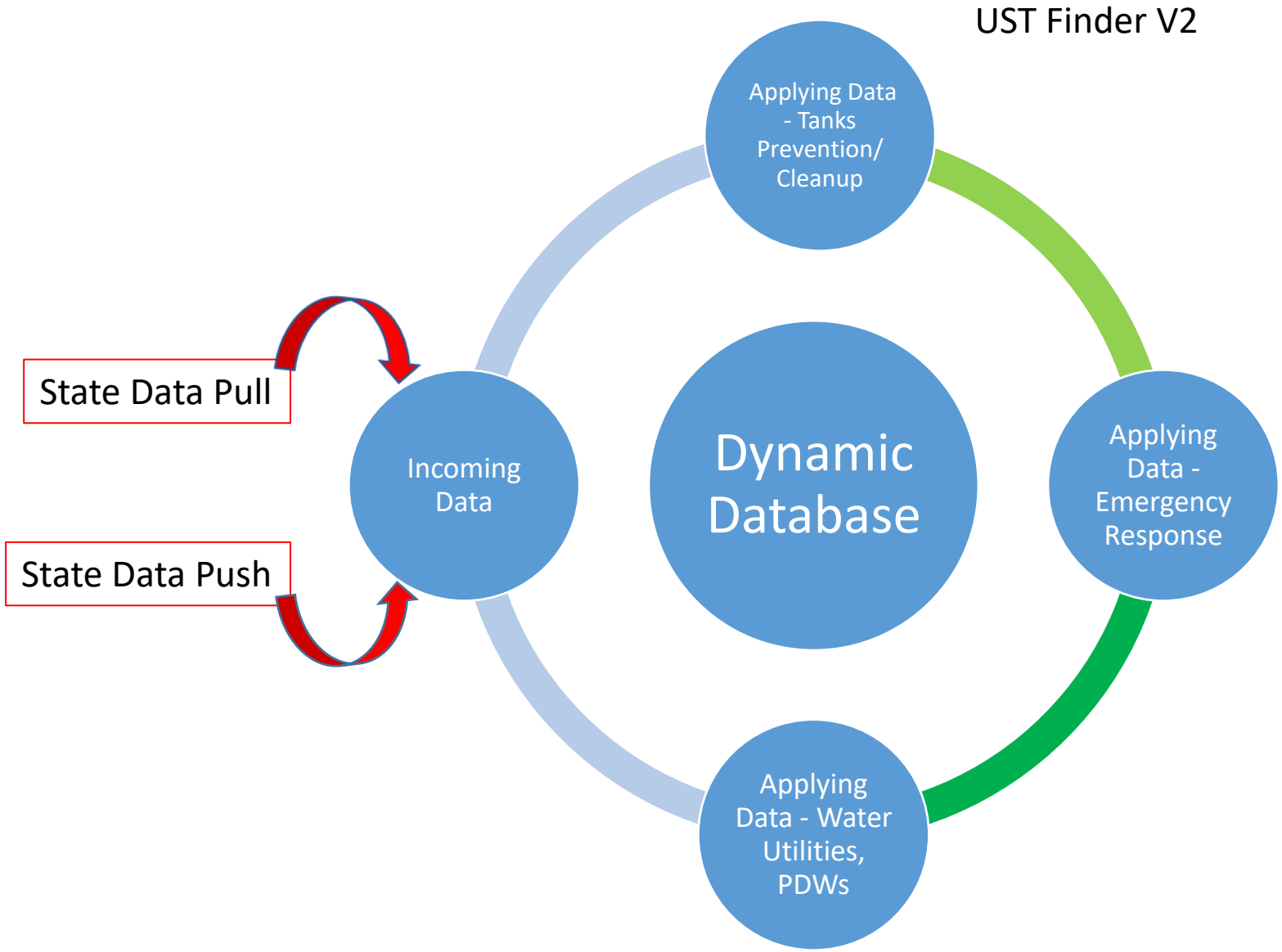


Figure 1: Box plot illustrating block groups binned by percentile minority and percentile low-income and tank and release density.

Next Steps

- UST Finder version 2
- Groundwater vulnerability
- Groundwater levels
- Climate change metrics to determine vulnerability



Summary

- EPA's UST Finder provides the first national data on USTs, critical geospatial data in protecting drinking water resources
- Time is of the essence in planning and preparing to respond to address extreme weather and climate change given impacts on underground storage tanks and consequent water supply impacts
  - Protect infrastructure
  - Protect fuel supply chain
  - Protect drinking water supplies
  - Protect public health

"We are colliding with a future of extremes. We base all our choices about risk management on what's occurred in the past, and that is no longer a safe guide."

— Alice Hill, Former Senior Director for Resilience Policy in the National Security Council

Contacts and Information

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Association of State and Territorial Solid Waste Management Officials (USTs)

- Gina Miranda – ginam@astswmo.org

NEIWPCC - regional commission that helps the states to preserve and advance water quality and supports the National Tanks Conference

- Christina Stringer - cstringer@neiwpcc.org
- Lillian Zemba – lzemba@neiwpcc.org

Further Information

- Tanks
  - UST Finder
  - https://www.epa.gov/ust
- Private Domestic Wells
  - Private Domestic Well Map
  - https://onlinelibrary.wiley.com/doi/10.1111/1752-1688.12937
  - https://www.epa.gov/privatewells
- TNCs
  - http://neiwpcc.org/wp-content/uploads/2020/08/GasStationTNCGuide.pdf
  - https://www3.epa.gov/region1/eco/drinkwater/pdfs/SamplingGuide.pdf
- National Primary Drinking Water Regulations - 141.24 Relevant to BTEX and ethylene dibromide
  - https://www.epa.gov/sites/default/files/2019-03/documents/cfr-2011-title40-vol23-part141.pdf