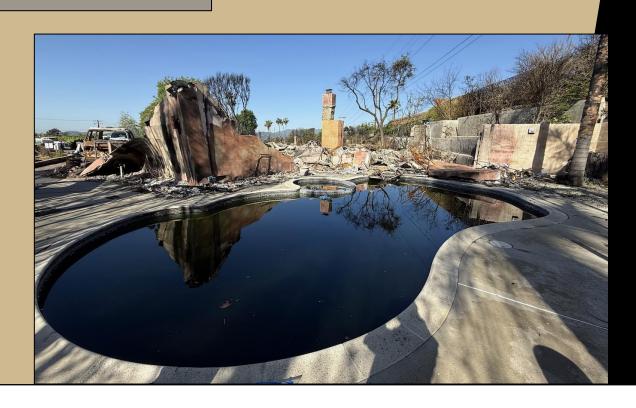
## The L.A. Pools Study: Supporting the Community after the January 2025 Wildfires

Overview and Results

Welcome

The event will begin shortly.

August 18, 2025













## Special thanks to....

- Households and business owners in the Eaton Fire and Palisades Fire impact areas who
  participated and encouraged their community to participate
- ♥ Faculty, students, and staff at participating institutions who volunteered their time
- Community groups such as Pali Strong and Eaton Fire Residents United who encouraged people to participate
- The R&S Kayne Foundation for providing funding for the team with the Community Action Project Los Angeles (CAP-LA) effort.
- Team member institutions for financial support.
- LMU for sharing our study with households connected with CAP.LA











#### General Overview

6:00 Welcome and Introductions

6:10 Incident Overview

6:30 Question and Answer Period

**6:55** Wrap Up

7:00 End

A recording of this event will be posted at <u>www.PlumbingSafety.org</u>







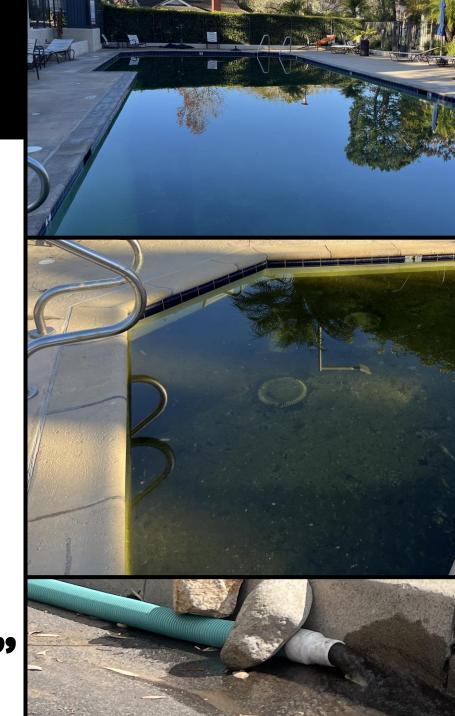




## Reconnaissance Investigation

- 1. In response to the January 7, 2025 Eaton and Palisades Fires we began assisting local and state government officials with advice about stormwater and drinking water issues.
- 2. To help households expedite their recovery, we visited the area February 7-12. During that time, we met with households and visited their properties.
- 3. Pools were a frequent topic. Households were told ...
  - 1. Do not discharge pool water into the storm sewer
  - 2. Pool remediation was not covered by insurance
  - 3. They could become a mosquito breeding ground
  - 4. The water is toxic
  - 5. It needs to be replaced
  - 6. Do not drain it

"Okay, what do I do with my pool?"



## A Truly Collaborative Team



Caitlin Proctor, PhD

Assistant Professor of
Agricultural and Biological
Engineering & Sustainability
Engineering and
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Purdue University, Indiana



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Assistant Professor of Civil and Environmental Engineering, Cal Poly San Louis Obispo, California











# The L.A. Pools Study: Supporting the Community after the January 2025 Wildfires

#### Caitlin Proctor, PhD

Assistant Professor of Agricultural and Biological Engineering & Sustainability Engineering and Environmental Engineering, Purdue University, Indiana











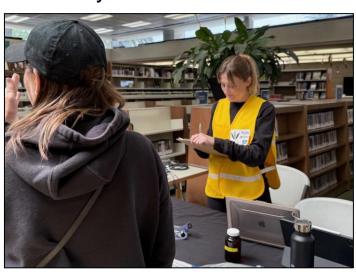


#### Team included students – critical to success

#### In and outside California

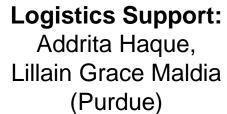
#### **Collection Team:**

Monica Palomo (Professor, CalPoly Pomona), Aliya Ehde (PhD student, Purdue), Undergraduate students from CalPoly Pomona and UCLA





















### Motivation

- 1. Pools can become damaged and "contaminated" due to wildfires. Some websites claim the water is harmful, others just encourage the pool owners "clean" it.
- Evidence to support the guidance for pool remediation after fires is sparse.
   Zero (0) studies have documented what that contamination
- Several government documents related to wildfire impacted pools exist – but no data was found to support the recommendations



#### Take Precautions. Be Safe. Protect Your Health.

The following guidelines are recommended for the maintenance of pools that were impacted by smoke and ash. Depending on how much ash, soot, or fire debris is in your pool, you may need to have a pool professional assess and evaluate your pool.



#### Do not use pool until the following steps have been completed:

- Clean the skimmer baskets of debris and skim water surface of the pool with a pool net to remove floating debris.
- Brush the sides and the bottom of pool to loosen contaminants, then vacuum pool.
- Backwash and clean the filter(s). Release waste and wastewater into a municipal sanitary sewer only. If connected to a septic tank system, release the backwash to a pervious surface like gravel, lawn, or open space to allow for infiltration without erosion.

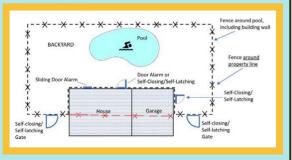
Backwashing into the storm drain system (alleys, driveways, streets, storm drains) and creeks is prohibited by law.

- Check pH and adjust level between 7.2 and 8.0.
- Check free chlorine level and adjust level to a minimum of 2.0 ppm for a pool and 3.0 ppm for a spa.
- Ensure the recirculation system is operating properly by checking filter pressure and/or the flow meter.
- Reopen pool only when pH levels are between 7.2 to 8.0 and the free chlorine is at a minimum of 2.0 ppm for a pool and 3.0 ppm for a spa.

#### **Swimming Pool Fencing**

Pool and spa enclosures can be damaged by fires. Swimming pools and spas must be enclosed with a protective fence to prevent drowning, injuries, or other risks:

- The enclosure must be at least 60 inches in height above grade.
- Gaps should not exceed 4 inches to prevent access by small children.
- Gates and entrances should be self-closing and self-latching.



Pool Recovery After a Fire: How to Clean Soot and Ash from Your Pool

Swimming Pools after a Fire











## Conflicting advice for many owners



#### Guidance For Managing Swimming Pools in Fire Impacted Areas in the Palisades

Residents should not use their swimming pool until it is cleaned properly in accordance with guidance from the Los Angeles County Department of Public Health. Debris removal steps shall be based upon whether residents participate in the Phase 2 Government Run Debris Removal Program, as identified below.

Note, if you have a septic tank or do not have a connection to the City's sewer system, hire a professional pool service company for guidance on draining and refilling your pool.

#### For residents who OPT IN to the Phase 2 Government Run Debris Removal Program:

- It is not advised to proceed with draining your pool.
- The Army Corps of Engineers will remove debris and may utilize the water in the pool for dust control
- If water remains after Phase 2 removal is complete, draining of the pool should follow the protocols below.

#### For residents who OPT OUT of the Phase 2 Government Run Debris Removal Program:

- The resident's authorized contractor is responsible for proper removal and disposal of debris from the pool.
- Draining of the pool should follow the protocols below.

#### For residents who are NOT ELIGIBLE for the Phase 2 Government Run Debris Removal Program:

- It is not advised to drain the pool if it can be properly cleaned in accordance with LA County Department of Public Health guidelines. This includes:
  - Clean the skimmer baskets of debris and skim water surface of the pool with a pool net to remove floating debris
  - Brush the sides and the bottom of pool to loosen contaminants, then vacuum pool
  - Check pH and adjust level between 7.2 and 8.0.
  - Check free chlorine level and adjust level to a minimum of 2.0 ppm for a pool and 3.0 ppm for a spa.
  - Ensure the recirculation system is operating properly by checking filter pressure and/or the flow meter
- . If it is necessary to drain the pool, follow the protocols below

Many pools were in and just outside the fire perimeters. The Eaton Area alone had 2,700 pools impacted.

- Pool owners were warned :
  - Do not discharge contaminated water to municipal sanitary sewer system.
  - Do not discharge contaminated water to the storm sewer system.
  - Pools should not allow mosquitos to breed.
- 2. The U.S. Army Corps of Engineers encouraged contractors to use pool water for dust suppression during property debris removal.
- 3. We received many questions from pool owners





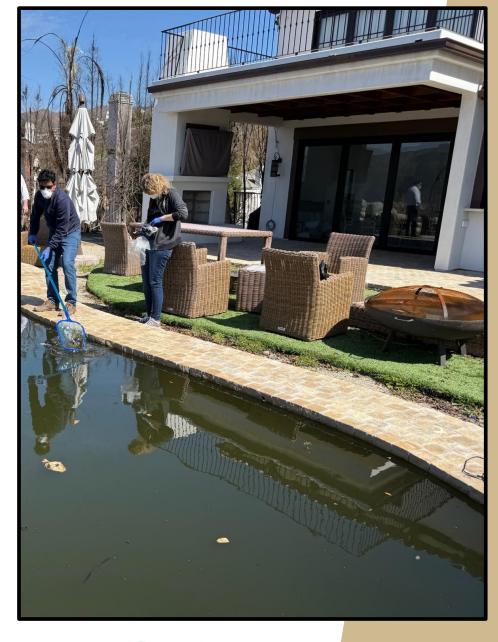






### What could be in the water?

- Organisms (e.g., dead animals, algae)
- Debris ash, fire-suppressants, and more
  - Hazardous and nonhazardous materials
  - Inorganic chemicals (e.g., heavy metals)
  - Organic chemicals (e.g., SVOCs)













## Study Goals and Approach

Goal: Better understand fires' impacts on pool water quality and potential impacts of remediation and cleaning

Analyze water samples from **100 pools** 

- 50 Eaton area
- 50 Palisades area

- Online survey to identify pool owners who wish to participate [early March]
- Field team investigation to sample affected pools with the community, [Mar]
- Continued participant sampling [Mar-Apr] with paired surveys
- Analyzed for heavy metals and SVOCs
- Results shared with pool owners [May-Jul]











# Results: Field observations

Water color (black, green, clear)

■ Pool type, size

Covers

 Treatment performed prior to sampling (some already undergoing extensive treatment, water replacement)

> Proximity to burned structures and other items















March 2025 – field collection of samples





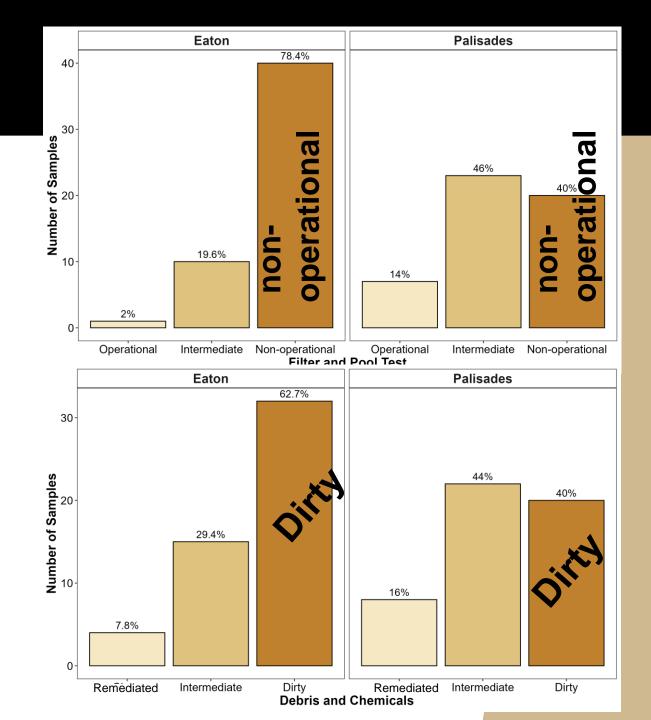




PURDUE UNIVERSITY

## Pools sampled

- We had 263 people interested
  - 224 eligible
  - 60% of these did not go through any chemical maintenance post-fire
- 100 sampled
  - Many were Non-operational: No filter operation and no pool testing/balancing
  - And were **Dirty**: Debris Present, and no Chemicals used (Post fire)
    - Some were Remediated: No Debris Present, Chemicals used
  - And were Medium depth and surface area (5.5-10' deep, 336-612ft<sup>2</sup>)
- Water taken from the top of the pool



#### Measurements

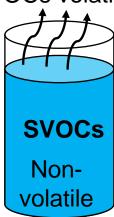
#### **Heavy Metals** (22 tested)

- Arsenic
- Aluminum
- Antimony
- Barium
- Beryllium
- Cadmium
- Chromium
- Copper
- Cobalt
- Iron
- Lead

- Lithium
- Manganese
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Tin
- Thallium
- Vanadium
- Zinc

#### SVOCs: Semi-volatile organic compounds (73 tested)

VOCs volatilize:



- 2-Chlorophenol1,2-Dichlorobenzene1,3-Dichlorobenzene1,4-Dichlorobenzene
  - o-Cresol m-Cresol

Phenol

- Bis(2-chloroethyl)ether
- hexachloroethane
- p-Cresol
- Nitrobenzene
- Isophorone
- 2-nitrophenol
- 2,4-dimethylphenol
- Bis(2
  - chloroethoxy)methane
- 2,4-dichlorophenol
- 1,3,5-trichlorobenzene
- Naphthalene
- p-chloroaniline
- Hexachlorobutadiene
- 2-tertbutylphenol
- 4-tertbutylphenol
- 1-Methylnaphthalene
- 2-Methylnaphthalene
- 4-chloro-3-methylphenol

- Hexachlorocyclopentadien •
- 2,4,6-trichlorophenol
- 2,4,5-trichlorophenol
- 2-chloronapthalene
- o-Nitroaniline
- 2,6-Di-tert-butylphenol1,2-Dinitrobenzene
- 1,3-Dinitrobenzene
- Acenaphthylene
- Dimethylphthalate
- 1.4-Dinitrobenzene
- Acenaphthene
- m-Nitroaniline
- 2,4-Ditertbutylphenol
- 2,4-dinitrophenol
- Dibenzofuran
- 4-nitrophenol
- 2,4-Dinitrotoluene
- 2,3,4,6-Tetrachlorophenol •
- 2,3,4,6-Tetrachlorophenol
   2,3,5,6-Tetrachlorophenol
- Fluorene
- Diethylphthalate
- 4-Chlorophenyl phenyl ether
- Dinitro-o-cresol

- p-Nitroaniline
- Diphenylamine
- Azobenzene
- 4-Bromophenyl phenyl ether
- Hexachlorobenzene
- Pentachlorophenol
- Phenanthrene
- Anthracene
- Carbazole
- Di-n-butyl phthalate
- Fluoranthene
- Pvrene
- Benzyl butyl phthalate
- Bis(2-ethylhexyl)adipate
- Benz[a]anthracene
- Chyrsene
- Bis(2-ethylhexyl)phthalate
- Di-n-butyl phthalate
- Benzo[b]fluoranthene
- Benzo[k]fluoranthene
- Benzo[k]fluorantne Benzo[a]pyrene
- Indeno[1,2,3-cd]pyrene
- Dibenz[a,h]anthracene
- Benzo[g,h,i]perylene











## Metals - Comparative Thresholds

#### **Heavy Metals** (22 tested)

- Arsenic
- Aluminum
- Antimony
- Barium
- Beryllium
- Cadmium
- Chromium
- Copper
- Cobalt
- Iron
- Lead

- Lithium
- Manganese
- Mercury
- Molybdenum
- Nickel
- Selenium
- Silver
- Tin
- Thallium
- Vanadium
- Zinc

#### Recreational standards –

- Not established for all metals
- Tend to be high because exposure through skin, transfer to bloodstream slow

#### Drinking water thresholds

- Levels that could be harmful to health when drinking liters per day for a lifetime (70 years)
- MCLs maximum contaminant levels
- HA health advisories for child exposure
- SL suggested limits (not enforced)

#### RARELY EXCEEDED

NOT EXCEEDED

DO NOT
DRINK POOL
WATER











### Metals

#### From 22 metals-

- Four exceeded a drinking water standard.
  - Arsenic
  - Antimony
  - Lithium
  - Selenium
- Several could be linked to data from the utility

Metal	Threshold (ppb)	Standard	% exceeding	
Arsenic	10	MCL	~10%	
Aluminum	-	-	N/A	
Antimony	6	MCL	~10%	
Barium	2000	MCL	0	
Beryllium	4	MCL	0	
Cadmium	5	MCL	0	
Chromium	100	MCL	0	
Copper	1300	MCL	0	
Cobalt	-	-	N/A	
Iron	-	-	N/A	
Lead	10	MCL	0	
Lithium	60	SL	~40%	
Manganese	1,000	HA	0	
Mercury	2	MCL	0	
Molybdenum	80	HA	0	
Nickel	1,000	HA	0	
Selenium	<b>50</b>	MCL	~5%	
Silver	200	HA	0	
Tin	-	-	N/A	
Thallium	2	MCL	0	
Vanadium	-	-	N/A	
Zinc	6,000	HA	0	

## Arsenic (As)



- What is it?
  Heavy metal found in minerals, pesticides, and wood preservatives.
- Why is it in water?
  Natural leaching from geology; past use of arsenic-based pesticides.
- Potential wildfire source
  Burning of treated wood, old pesticides in soils.
- Limit EPA maximum contaminant level: 0.010 mg/L.
- Impact
  Skin lesions, cancer, cardiovascular issues.
- Removal
   Activated alumina, iron-based media, RO.

Arsenic exceeded the MCL in ~10% of pools



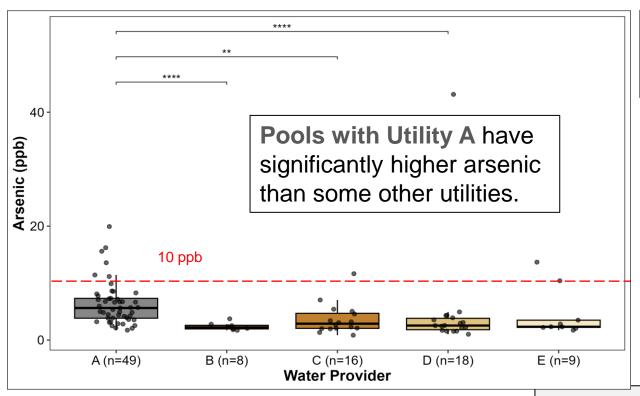








## Arsenic (As)



- Arsenic was significantly higher:
  - in the Palisades area (Utility A)
- Takeaway: likely linked to incoming water from the utility or the area
- Runoff may have contributed 

  it's naturally occurring wind-blown or from geography.

Arsenic exceeded the MCL in ~10% of pools











## Lithium (Li)



What is it?

A naturally occurring alkali metal used in batteries, ceramics, and pharmaceuticals.

Why is it in water?

Found naturally in some rocks and groundwater; can also leach from materials and industrial waste.

Potential wildfire source:

Burning of lithium-ion batteries in electric vehicles, electronics, and solar storage systems.

- Limit non-enforceable limit
   60 ppb
- Health/environment impact
   High intake can affect thyroid and kidn

High intake can affect thyroid and kidney function; aquatic toxicity at elevated levels.

Removal

Water replacement, partial draining and refill, reverse osmosis for small-scale treatment.

Lithium exceeded the nonenforced limit in ~40% of pools



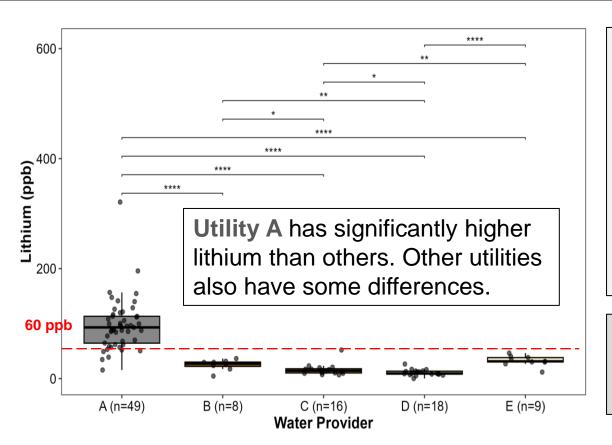








## Lithium (Li)



#### Lithium

- Lithium varies by water provider
  - Also reflected in consumer confidence report, concentrations similar to utility's values.
- Did remediation help?
  - NO
- Did EVs burning nearby contribute?
  - NO
- Takeaway: likely naturally occurring source, unrelated to fires

#### Lithium exceeded the nonenforced limit in ~40% of pools











## Antimony (Sb)



- What is it?
  - Metalloid used in flame retardants, batteries, and brake pads.
- Why is it in water?
   Industrial discharges, leaching from plumbing.
- Potential wildfire source:
   Combustion of brake linings, plastics, and treated textiles.
- Limit EPA maximum contaminant level: 0.006 mg/L.
- Impact
   Can cause nausea, vomiting, diarrhea; possible carcinogen.
- Removal
   Reverse osmosis, activated alumina, water change.

Antimony exceeded the MCL in ~10% of pools



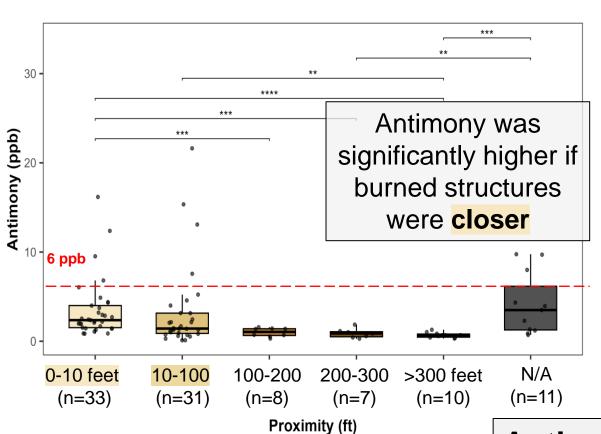








## Antimony (Sb)



Antimony was significantly higher in nonoperational pools.

Antimony was significantly higher in dirty pools (as opposed to remediated ones)

Some underlying variability by water provider.

 Takeaway: some metals may be related to burning structures and remediation efforts.

Antimony exceeded the MCL in ~10% of pools



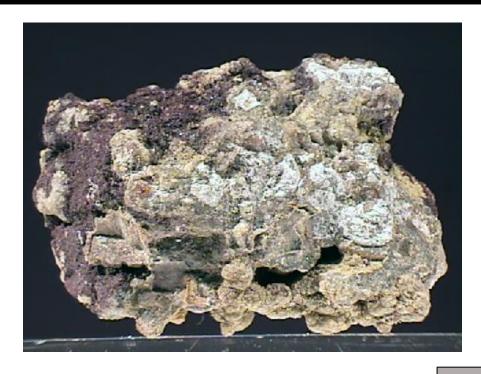








### Selenium



- What is it?
  - Essential trace element used in electronics, glass, and pigments.
- Why in water?
   Natural soils, agricultural runoff.
- Wildfire source
   Burning of electronics, pigments, certain plastics.
- Limit EPA MCL: 0.05 mg/L.
- Impact
   Hair and nail brittleness, neurological issues at high doses.
- Removal RO, coagulation/filtration.

## Selenium exceeded the MCL in ~4% of pools

- 3/4 were from Eaton
- Often: **dirty**, **non-operational** pools, <100 ft to burned property











#### Metals

- Many heavy metals were:
  - present in drinking water provided by the utility
  - could be present naturally (run-off)
- Some metals could be linked to remediation and operation
- None were concerning levels for recreational water

- Factors that were sometimes impactful:
  - Proximity to burned structures
  - Size
  - Type (salt/fresh)
  - Covers
- Takeaway: metals driven by water going in more than fire











## SVOCs (Semi-Volatile Organic Compounds)

#### SVOCs (Semi-Volatile Organic Compounds) (73 tested)

- Phenol
- 2-Chlorophenol
- 1,2-Dichlorobenzene
  - 1,3-Dichlorobenzene
  - 1,4-Dichlorobenzene
  - o-Cresol
- m-Cresol

**VOCs** volatilize

**SVOCs** 

- Bis(2-chloroethyl)ether
- hexachloroethane
- p-Cresol
- Nitrobenzene
- Isophorone
- 2-nitrophenol
- 2,4-dimethylphenol
- Bis(2-chloroethoxy)methane
- 2,4-dichlorophenol
- 1,3,5-trichlorobenzene
- Naphthalene
- p-chloroaniline
- Hexachlorobutadiene
- 2-tertbutylphenol
- 4-tertbutylphenol
- 1-Methylnaphthalene
- 2-Methylnaphthalene
- 4-chloro-3-methylphenol

- Hexachlorocyclopentadiene
- 2,4,6-trichlorophenol
- 2,4,5-trichlorophenol
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- 1,4-Dinitrobenzene
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- m-Nitroaniline
- 2,4-Ditertbutylphenol
- 2,4-dinitrophenol
- Dibenzofuran
- 4-nitrophenol
- 2,4-Dinitrotoluene
- 2,3,4,6-Tetrachlorophenol
- 2,3,5,6-Tetrachlorophenol
- Fluorene
- Diethylphthalate
- 4-Chlorophenyl phenyl ether
- · Dinitro-o-cresol
- p-Nitroaniline

- Diphenylamine
- Azobenzene
- 4-Bromophenyl phenyl ether
- Hexachlorobenzene
- Pentachlorophenol
- Phenanthrene
- Anthracene
- Carbazole
- Di-n-butyl phthalate
- Fluoranthene
- Pyrene
- Benzyl butyl phthalate
- Bis(2-ethylhexyl)adipate
- Benz[a]anthracene
- Chyrsene
- Bis(2ethylhexyl)phthalate
- Di-n-butyl phthalate
- Benzo[b]fluoranthene
- Benzo[k]fluoranthene
- Benzo[a]pyrene
- Indeno[1,2,3-cd]pyrene
- Dibenz[a,h]anthracene
- Benzo[g,h,i]perylene

Standards often unavailable, especially for recreational water

#### **Drinking water standards**

- MCL maximum contaminant level
  - enforced
- DWEL Drinking Water Equivalent Level - a health advisory, not enforced

#### **Water Quality**

 WQ- limits for Ambient Water Quality - Human Health for the consumption of water +organism.

Can I eat fish from here?



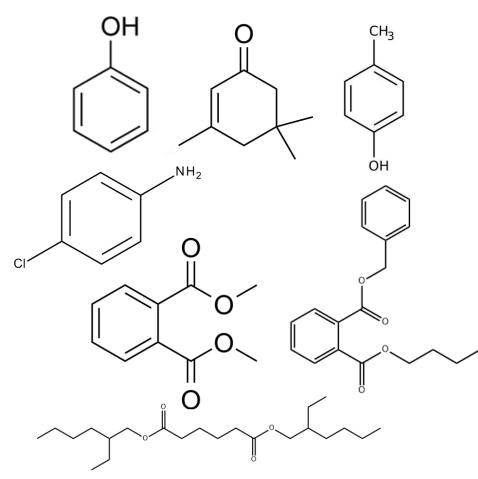








## SVOCs (Semi-Volatile Organic Compounds)



- Organic chemicals with moderate vapor pressure persist in both air and water.
- Burning synthetic materials → Plastics, rubber, resins, coatings release SVOCs
- Ash & soot deposition
- Runoff & wash-in
- Material volatilization → Paints, sealants, and roofing release SVOCs during heating, later depositing in water

#### Why it matters

- Can be harmful to health, and difficult to remove
- Linked to skin/eye irritation, endocrine disruption, and long-term health risks











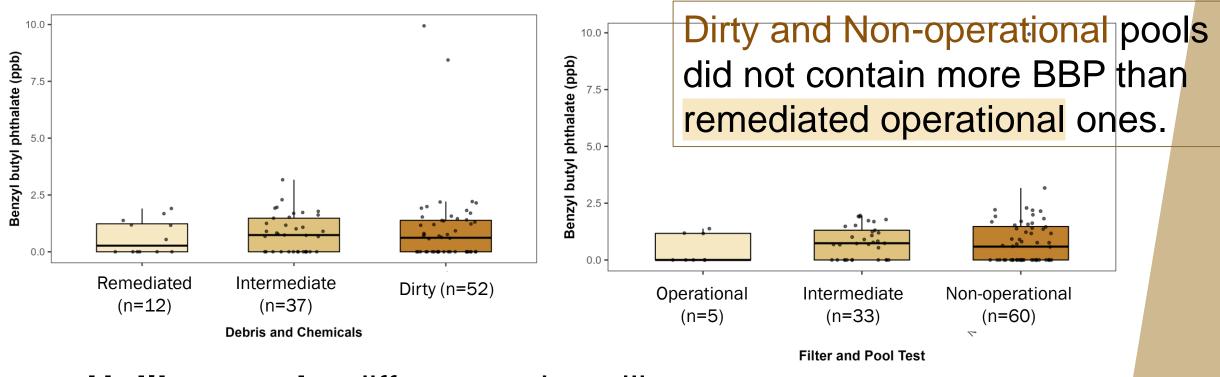
### **SVOCs**

Of 73 SVOCs,
Only **7 SVOCs**were detected in
10 or more pools

None exceeded a drinking water limit

SVOC	Also known as	Water Limit (ppb)	Limit Type	number higher than limit	% of pools w/ quantifiable amounts
Benzyl butyl phthalate	BBP .	7,000	DWEL	0	59
Delizyi butyi piitiialate		0.1	WQ	59	
Bis(2-ethylhexyl)adipate	DEHA; DOA; Di(2- ethylhexyl)adipa te	400	MCL (and MCLG)	0	55
Phenol		11,000	DWEL	0	39
FIIGHOI		4,000	WQ	0	39
Dimethylphthalate	DMP	2,000	WQ	0	25
p-chloroaniline	4-chloroaniline	1		N/A	23
Isophorone		7,000	DWEL	0	13
ізорногоне		34	WQ	0	
p-Cresol	4-methylphenol			N/A	10

## Benzyl butyl phthalate (BBP)



 Unlike metals, differences by utility not apparent – nor are effects of remediation within a water provider











#### **SVOCs**

- SVOCs did not vary by utility like metals
- Most SVOCs not detected in most pools.
- Only one limit was exceeded which meant "don't eat the fish" from this pool.
   No drinking water limits exceeded.

- Difficult to draw conclusions with limited number of detects.
- Patterns of cooccurrence unclear.

 Takeaway: SVOCs mostly not present in our samples (surface, months after fire)











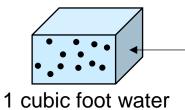
## Why were concentrations generally low? dilution

Soil – test the top – deposition is not diluted

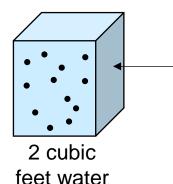
#### **Example** – dropping sugar cubes



Let's say 12 sugar cubes fall here
And this measures **120 ppb** 



If those same 12 sugar cubes fall on a pool 1' deep [and **dissolve**]
This would measure **10 ppb** 



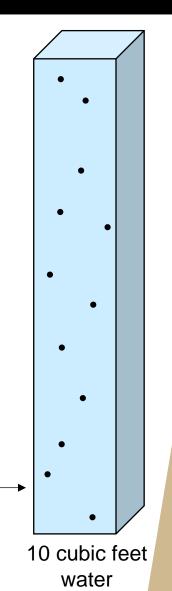
If those same 12 sugar cubes fall in a pool 2 feet deep
This would measure **5 ppb** 

Takeaway: When contaminant deposition is equal by surface area – pools dilute concentrations

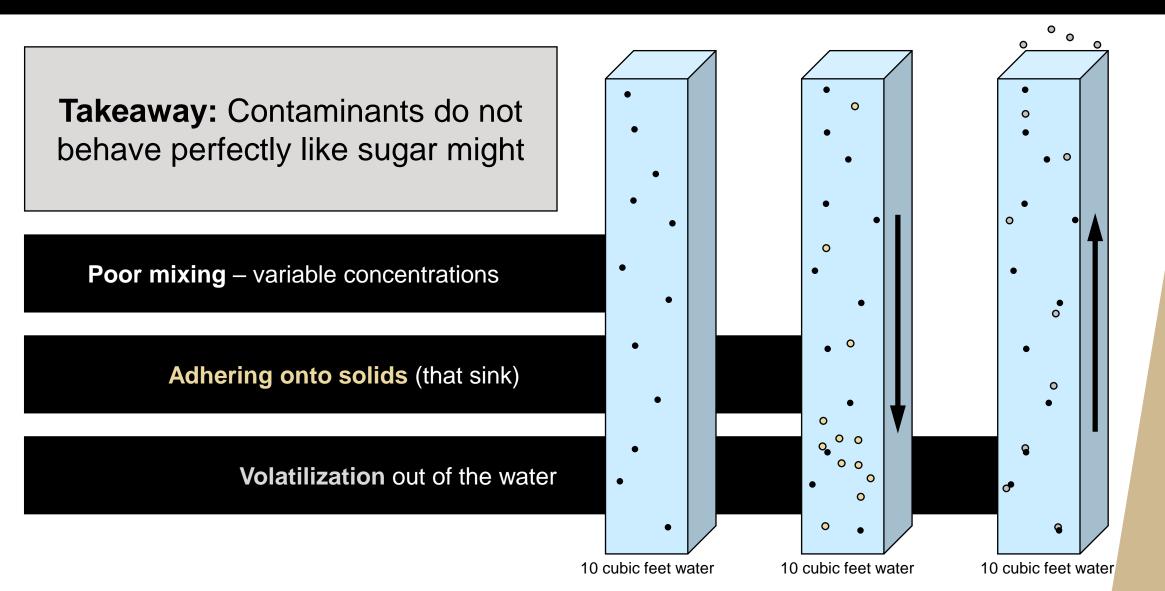
120 ppb in soil could be = 1 ppb in a 10-foot pool

If those same 12 sugar cubes fall in a pool 10 feet deep

This would measure **1 ppb** 



## Why were concentrations generally low? contaminant behavior



#### Should I be worried?

Average we saw was ~0.1 ppb

Maximum we saw was ~4 ppb

But even with 10 ppb lead

(a drinking water threshold)

This is 1.4 mg of lead per square foot.

That's **566 mg** in a 20 ft x 10 ft pool (400 sq ft).

That's ~1/8<sup>th</sup> of a sugar cube worth of lead in the entire pool.

Our measurements are **sensitive** and still low

For metals like lead – skin is a minimal risk route of exposure

**Takeaway:** Do not DRINK or eat fish from these pools.

## Working Conclusions

#### Why were concentrations lower than expected?

- 1. Dilution (natural and rainfall influenced)
- 2. Chemical sorption to particulates settled at the bottom of the pool as debris
- 3. Volatilization, chemicals transferred from the water to the air

#### What should I do when the pool is impacted?

Seek advice of your insurance carrier AND...

Is it heavily contaminated (oils, fire retardant, structure debris, dead animals, etc.)? If YES, seek the advice of pool fire remediation professionals. They will need to protect their workers (and you) from the hazards as they remediate it.











## Working Conclusions: General Remediation Approach

- 1. Wear correct safety gear. Watch for sharps, hazmat, animals, etc.
- 2. Have an electrician check electrical connections.
- 3. Remove debris from the top and bottom of the pool and pool deck.
- 4. Maintain and/or replace pool water filters.
- 5. Remove particulates and discoloration from the pool walls and deck. Scrubbing with safe surfactants may be helpful. This may require pool draining. The water refill may cost \$100s to \$100s of dollars.

  If pool draining --- with explicit APPROVAL from a wastewater utility, discharge pool water to their sanitary sewer (NOT storm sewer).
- 6. Run filters to remove particulates.
- Disinfect the pool and achieve proper water pH to help reduce microbial growth. Maintain water quality within proper ranges. This helps limit mosquito populations.











#### Thank You

#### Special attention is needed

- If high particle loading, you may ruin your filters. Remove debris first.
- Adding large amounts of bleach to the pool produces chemical reaction byproducts and a chemical exposure hazard.
- Overdosing chemicals or having too high/too low water pH can excessively corrode stainless steel
- Discharging pool water to the sanitary sewer without approval may cause sewer backups into nearby buildings. Get approval first.
- Do not discharge pool water into a septic tank. You can plug and ruin the leaching field and tank.

Pool remediation actions will vary based on how impacted the pool is. Not all pools will be treated the same for the same fire.











## The L.A. Pools Study Panel Question and Answers



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# The L.A. Pools Study: Supporting the Community after the January 2025 Wildfires

This event has ended

## Thank you

A recording of this event will be posted at www.PlumbingSafety.org

Questions about this event can be directed to Professor Proctor, <u>LAPoolStudy@gmail.com</u> Professor Andrew Whelton, <u>awhelton@purdue.edu</u>

