ENGR 399

- Open the in-class quiz now… today, quiz questions will be distributed throughout the lecture. Quiz access code = vegan

- The asynchronous assignment this week requires going to the Cleveland Museum of Art… be sure to consider the hours the CMA is open!

Q2

The CWRU Plan C retirement benefit includes:

- direct contribution of 6% of your pay
- 50% match of your retirement contribution, up to 4% of your pay

A. How much do you need to contribute to your retirement account in order for your account to grow by 20% of your pay?

B. How much "free money" are you losing if you do not contribute to your retirement account?

CASE WESTERN RESERVE UNIVERSITY

Saving for Retirement

A correction from previous lecture...When I made this quiz question, I misinterpreted the info on CWRU benefits page...

After conferring with our HR office:
Plan C are matches 50% on first 4% contributed... so a maximum match of 2% of salary

University Matching Contributions

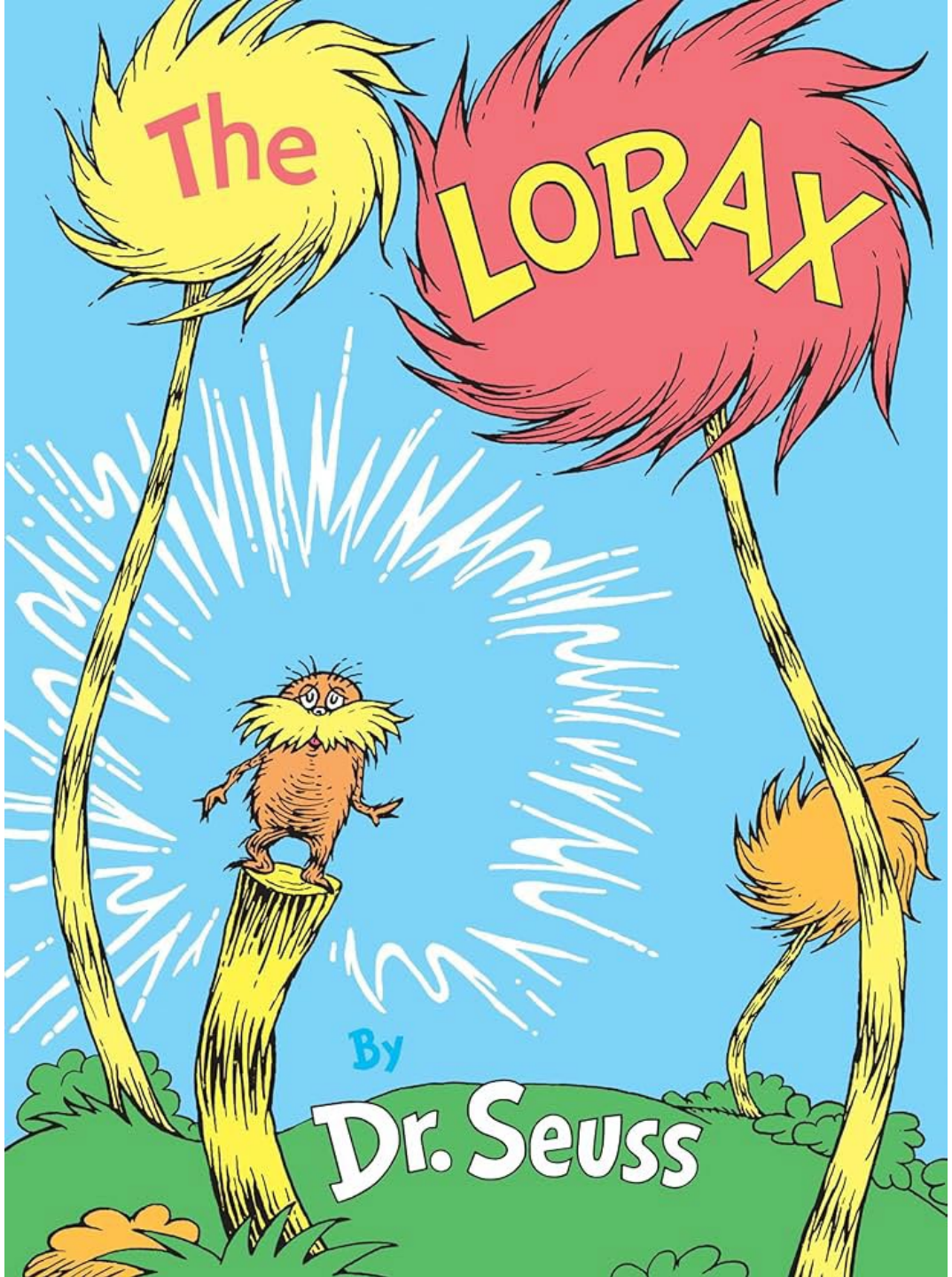
The university will make matching contributions on behalf of participants who make tax-deferred contributions to the plan. University matching contributions will be **fifty percent (50%) of participant tax-deferred contributions of up to the first four percent (4%) of the participant's compensation**. Such contributions shall be made concurrent with the participant's contributions. A separate account for university matching contributions shall be established and maintained for each participant.

Thanks to Matt Rogers for pointing this out!

This lecture… what we will cover

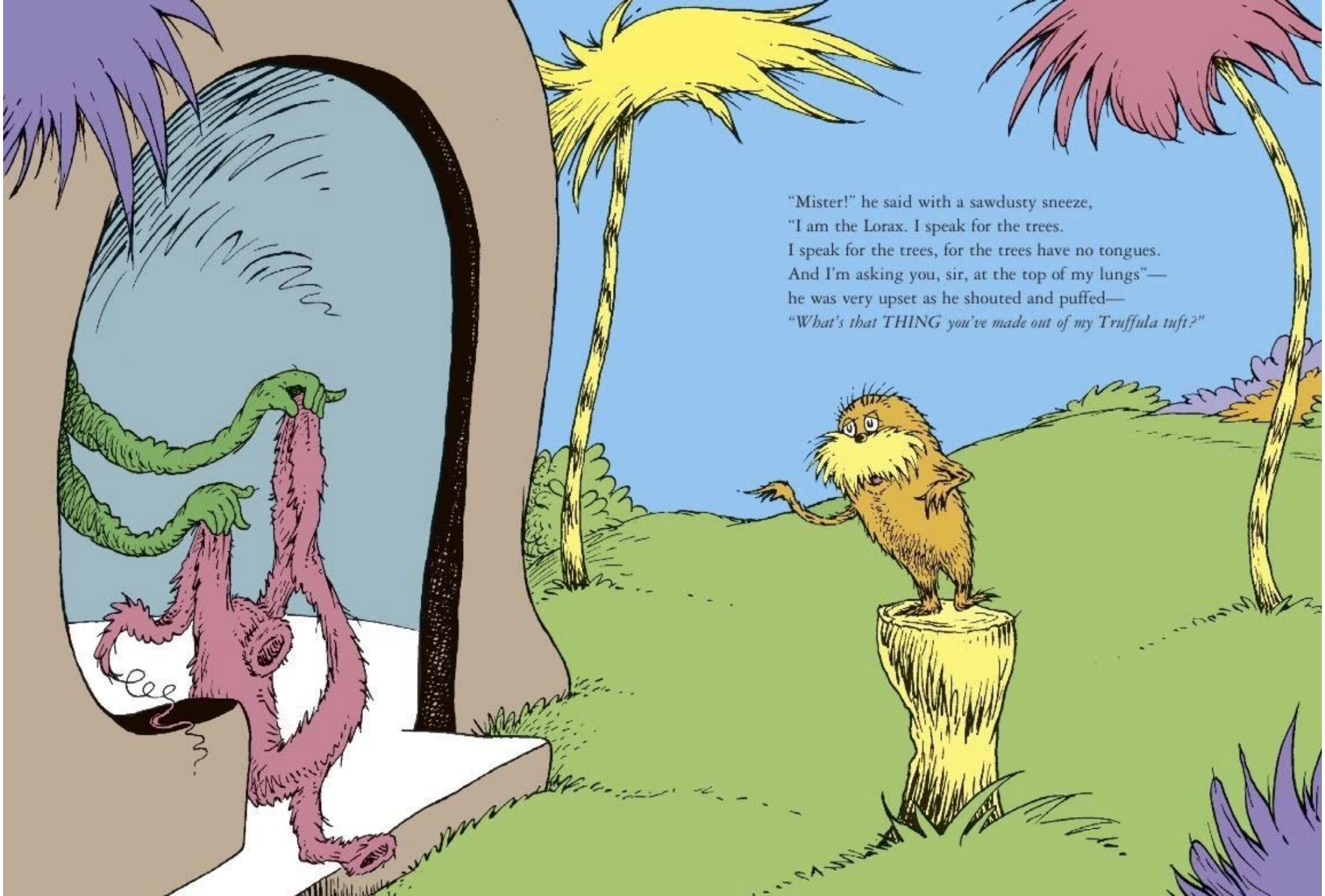
1. How did Cleveland become the key player in US environmental policy?
2. How was water pollution addressed before the Clean Water Act?
3. How is water pollution addressed with the Clean Water Act?
4. What does the Superfund act (CERCLA) address?
5. Why would volunteers pay to clean up contaminated sites?

Let’s start by looking at the most influential environmental treatise of the 20th century



From the rippulous pond
came the comfortable sound
of the Humming-Fish humming
while splashing around.

And, under the trees, I saw Brown Bar-ba-loots
frisking about in their Bar-ba-loot suits
as they played in the shade and ate Truffula Fruits.


"Mister!" he said with a sawdusty sneeze,
"I am the Lorax. I speak for the trees.
I speak for the trees, for the trees have no tongues.
And I'm asking you, sir, at the top of my lungs"—
he was very upset as he shouted and puffed—
"What's that THING you've made out of my Truffula tuft?"


"You're glumping the pond where the Humming-Fish hummed!
No more can they hum, for their gills are all gummed.
So I'm sending them off. Oh, their future is dreary.
They'll walk on their fins and get woefully weary
in search of some water that isn't so smeary.
I hear things are just as bad up in Lake Erie."

Dr. Seuss
7301 Encelia Drive
La Jolla, California 92037

January 27, 1986

Dear Claudia Melear and Margie Pless:

You must think me terribly rude for not answering your very pleasant letter of December 6. The fault, however, is not mine. It just arrived this morning, having been somewhat circuitously forwarded from New York via pony express.

Although I will be unable to accept your kind invitation to come to Cleveland, I do agree with you that my 1971 statement in the Lorax about the condition of Lake Erie needs a bit of revision. I should no longer be saying bad things about a body of water that is now, due to great civic and scientific effort, the happy home of smiling fish.

I can assure you the process of purifying my text will commence immediately. Unfortunately, the purification of texts, like that of lakes, cannot be accomplished over night. The objectionable line will be removed from future editions. But it could possibly take more than a year before the existing stock of books has moved out of the book stores.

In the meantime, thank you for your letter and for all the great Loraxian work you have been doing.

Dr. Seuss

Theodor S. Geisel

Lake Erie line was removed!!!

Laws & Regulations

History of the Clean Water Act

Before the Clean Water Act

Prior to the Clean Water Act, there were a number of laws that attempted to protect water quality, such as the Rivers and Harbors Act (1899), the Federal Water Pollution Control Act (1948), the Water Quality Act (1965), and the Refuse Act (1970).

June 1969

Oil slick catches fire on the polluted Cuyahoga River in Ohio, mobilizing public concern across the nation.

"Oil slick catches on fire on the polluted Cuyahoga River in Ohio, mobilizing public concern across the nation"

January 1970

The U.S. Environmental Protection Agency is established.

October 18, 1972 - Clean Water Act Signed Into Law

The CWA aimed to restore and maintain the chemical, physical, and biological integrity of the nation's waters. It established NPDES

To prepare for this lecture, I set out on a rigorous program of research on the burning river…

I planned to start my research by drinking a Burning River Pale Ale!

But I found out Burning River Pale Ale is discontinued!!!

I even went to the location of the picture on the beer bottle!

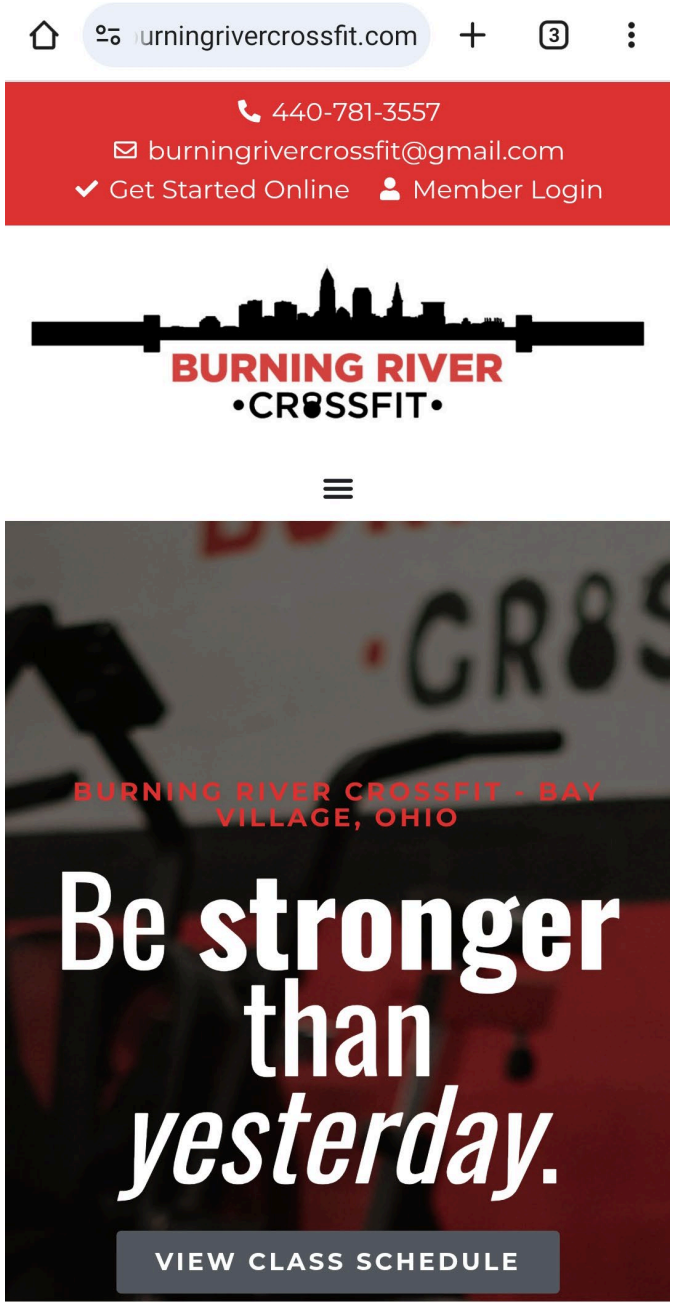
Perhaps I could get insight with a latte at Burning River Coffee!

Burning River Coffee and Cleveland Vape look like different stores... but they are the same store on the inside...

... this made me lose interest, and I didn't get my latte there!

So now I'll try Burning River Crossfit!

Crossfit didn't work out either!



Daniel - It's Katie at Burning River CrossFit, just writting to say how excited we are to meet you here tomorrow at 12:00 PM.

Here is our address in case you need it: 601 Clague Pkwy, Bay Village Ohio 44140

We are super excited to get you started and hear about your goals!...

Thursday • 4:09 PM

Hi Daniel! Do you have prior experience doing CrossFit?

No

Ok. Tomorrows workout has quite a bit of barbell movements in it and we don't usually have people start off on a barbell on their first day! Would we be able to schedule you to come on another day for a trial class?

I was thinking about trying Burning River Jiu-Jitsu…

… but it looks like you need a special outfit, and I didn't want to have to buy this

I included these Burning River examples to show how we in Cleveland have embraced the burning river as a part of our identity…

… so what was the story with the burning river?

"Almost every great city has a river..."

"... Among the worst of them all is the 80-mile-long Cuyahoga"

ENVIRONMENT

The Cities: The Price of Optimism

ALMOST every great city has a river. The poetic notion is that flowing water brings commerce, delights the eye, and cools the summer heat. But there is a more prosaic reason for the close affinity of cities and rivers. They serve as convenient, free sewers.

The Potomac reaches the nation's capital as a pleasant stream, and leaves it stinking from the 240 million gallons of wastes that are flushed into it daily. Among other horrors, while Omaha's meat packers fill the Missouri River with animal grease balls as big as oranges, St. Louis takes its drinking water from the muddy lower Missouri because the Mississippi is far filthier. Scores of U.S. rivers are severely polluted—the swift Chattahoochee, majestic Hudson and quiet Milwaukee, plus the Buffalo, Merrimack, Monongahela, [illegible] and Havasupi. Among the worst of them all is the 80-mile-long Cuyahoga, which splits Cleveland as it reaches the shores of Lake Erie.

No Visible Life. Some river! Chocolate-brown, oily, bubbling with sub-surface gases, it oozes rather than flows. "Anyone who falls into the Cuyahoga does not drown," Cleveland's citizens joke grimly. "He decays." The Federal Water Pollution Control Administration dryly notes: "The lower Cuyahoga has no visible life, not even low forms such as leeches and sludge worms that usually thrive on wastes." It is also—literally—a fire hazard. A few weeks ago, the oil-slicked river burst into flames and burned with such intensity that two railroad bridges spanning it were nearly destroyed. "What a terrible reflection on our city," said Cleveland Mayor Carl Stokes sadly.

Cleveland's great industries have lately made efforts to dump fewer noxious effluents into the Cuyahoga. If their record is still not good, the city's has been far worse. Whenever it rains hard, the archaic sanitary storm system floods the sewer mains, sending untreated household wastes into the river. Sometimes the old mains break, as recently happened on the Big Creek interceptor line. Each day for the past month, 25 million gallons of raw sewage have cascaded from a ruptured pipe, spilling a gray-green torrent into the Cuyahoga and thence into Lake Erie.

Some lake! Industrial wastes from Detroit's auto companies, Toledo's steel mills and the paper plants of Erie, Pa., have helped turn Lake Erie into a gigantic cesspool. Of 62 beaches along its U.S. shores, only three are rated completely safe for swimming. Even wading is unpleasant; as many as 30,000 sludge worms carpet each square yard of lake bottom.

Each day, Detroit, Cleveland and 120 other municipalities fill Erie with 1.5 billion gallons of inadequately treated wastes, including nitrates and phosphates. These chemicals act as fertilizer for growths of algae that suck oxygen from the lower depths and rise to the surface as odoriferous green scum. Commercial and game fish—blue pike, whitefish, sturgeon, northern pike—have nearly vanished, yielding the waters to trash fish that need less oxygen. Weeds proliferate, turning water frontage into swamp. In short, Lake Erie is in danger of dying by suffocation.

Scrub the Water. What can be done? The Federal Government has outlined a $1.1 billion program for upgrading the sewage treatment plants of Lake Erie's littoral U.S. cities. Washington has asked industry to spend another $285 million on waste-treatment equipment. But schedules are being met by only 15 of the 102 target cities and 32 of the 100 major industrial polluters. The trouble is that pollution rarely gets a high priority until profits are affected or people are killed.

Cleveland, however, shook off its apathy last year. Much of the credit goes to Ben Stefanski, a 30-year-old lawyer-turned-urbanist, whom Mayor Stokes had just appointed to be Cleveland's director of public utilities. Making up in enthusiasm what he lacked in experience, Stefanski persuaded Stokes to start a massive effort to scrub the Cuyahoga, and hence aid Lake Erie. The proposed price tag: $100 million in bonds, to improve existing facilities and build 25 miles of trunk-line sewers plus a modern sewage treatment plant.

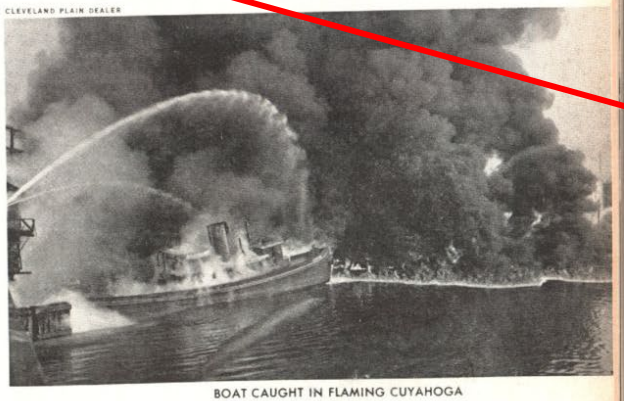
Like Apple Pie. "We have some of the lowest sewer tax rates in the country," says Stefanski. "I figured we'd double the rates to amortize our bonds." To persuade the people to pay, Stefanski enlisted newspaper support, lined up citizen groups and got 33 suburban governments to endorse the plan. "It became like apple pie and motherhood," he recalls. "No one could be against clean water." [illegible] approved the bond issue by a vote of 2 to 1, giving it more "yes" votes than any other proposal on the ballot. In five years, Cleveland should have the best sewage system in the U.S., one capable of handling even industrial wastes.

The accomplishment, huge as it is, only fixes the price of optimism. Unfortunately, water pollution knows no political boundaries. The Cuyahoga can be cleaned up in Cleveland, but as long as other cities keep dumping wastes upriver, it will remain exactly what it is today—an open sewer filling Lake Erie with scummy wavelets, sullen reminders that even a great lake can die.

J. W. MOTT

CLEVELAND'S STOKES & STEFANSKI

CLEVELAND PLAIN DEALER



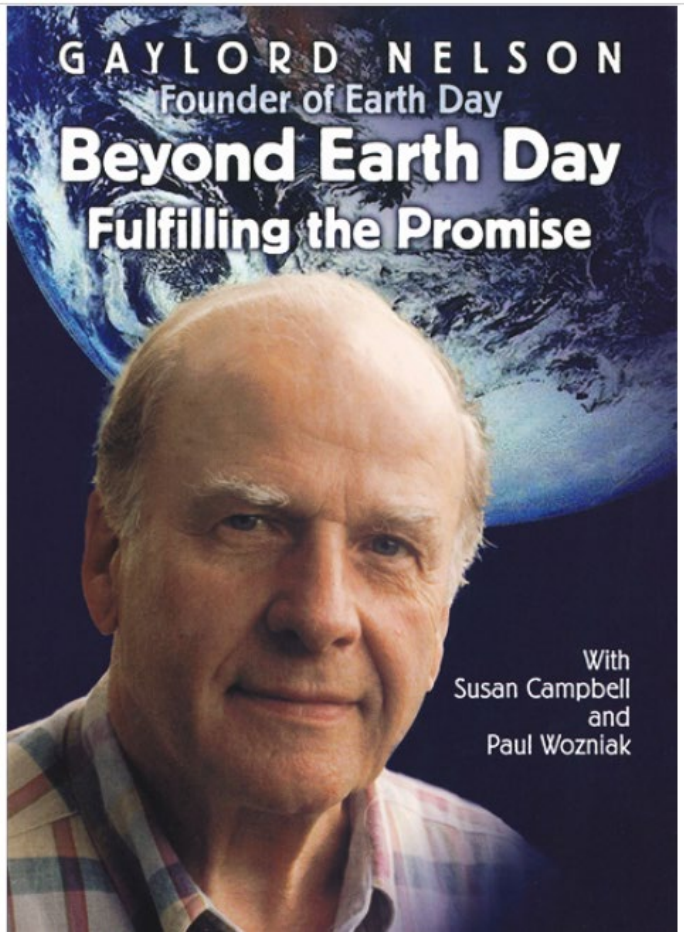
BOAT CAUGHT IN FLAMING CUYAHOGA

If you fall in, you don't drown—you decay away.

"Some River! Chocolate-brown, oily, bubbling with sub-surface gases, it oozes rather than flows"

"A few weeks ago, the oil-slicked river burst into flames and burned with such intensity..."

This article made the burning river famous (1969)



US Senator 1963-81
Founder of Earth Day

Then in June of 1969, the Cuyahoga River—slick with oil and grease and littered with debris—caught fire and shot flames high into the air in Cleveland. That image, widely circulated in the popular press, burned its way into the nation's collective memory as the poster child for the environmental atrocities of the time.

I googled "1969 Cuyahoga River fire"...

Google

1969 cuyahoga river fire

All | Images | News | Videos | Maps | Books | Shopping | More | Tools

Cleveland | Cuyahoga valley | Ohio cuyahoga | River pollution | Clean water

Smithsonian Magazine
The Cuyahoga River Caught Fire at Least...

The Allegheny Front
How a Burning River Helped Create the ...

Collaborative for Health & Environ...
The Cuyahoga River Fire of 1969...

Time
Cuyahoga River ...

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Cuyahoga River Fire - The Blaze Th...

Ideastream Public Media
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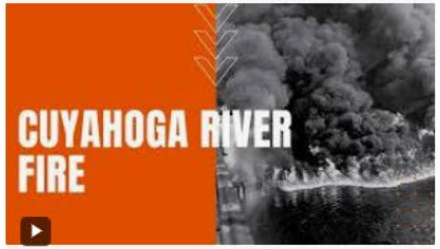

YouTube
Cuyahoga River Fire: Cleveland's ...

X
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Reddit
The 1969 Cuyahoga River Fire: The Event ...

CASE WESTERN RESERVE UNIVERSITY

School of Law

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Jonathan H. Adler, JD

Johan Verheij Memorial Professor of Law, School of Law

Director, Coleman P. Burke Center for Environmental Law, School of Law

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Email:

FABLES OF THE CUYAHOGA: RECONSTRUCTING A HISTORY OF ENVIRONMENTAL PROTECTION

Jonathan H. Adler[*]

"The fire was so quick that by the time local photographers arrived, the flames were out...

...much of the Cuyahoga story is a fable... a fictitious narrative that nonetheless conveys an important truth"

The Cities: The Price of Optimism

ALMOST every great city has a river. The poetic notion is that flowing water brings commerce, delights the eye, and cools the summer heat. But there is a more prosaic reason for the close affinity of cities and rivers. They serve as convenient, free sewers.

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CLEVELAND PLAIN DEALER

BOAT CAUGHT IN FLAMING CUYAHOGA

If you fall in, you don't drown—you decay away.

This article made the burning river famous (1969)

"A few weeks ago, the oil-slicked river burst into flames and burned with such intensity..."

But this picture is NOT that fire!!!!

This is a Cuyahoga fire in 1952!

I googled "1969 Cuyahoga River fire"...

Google

1969 cuyahoga river fire

All | Images | News | Videos | Maps | Books | Shopping | More | Tools

Cleveland | Cuyahoga valley | Ohio cuyahoga | River pollution | Clean water

Smithsonian Magazine
The Cuyahoga River Caught Fire at Least...

The Allegheny Front
How a Burning River Helped Create the ...

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Cuyahoga [illegible]

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Reddit
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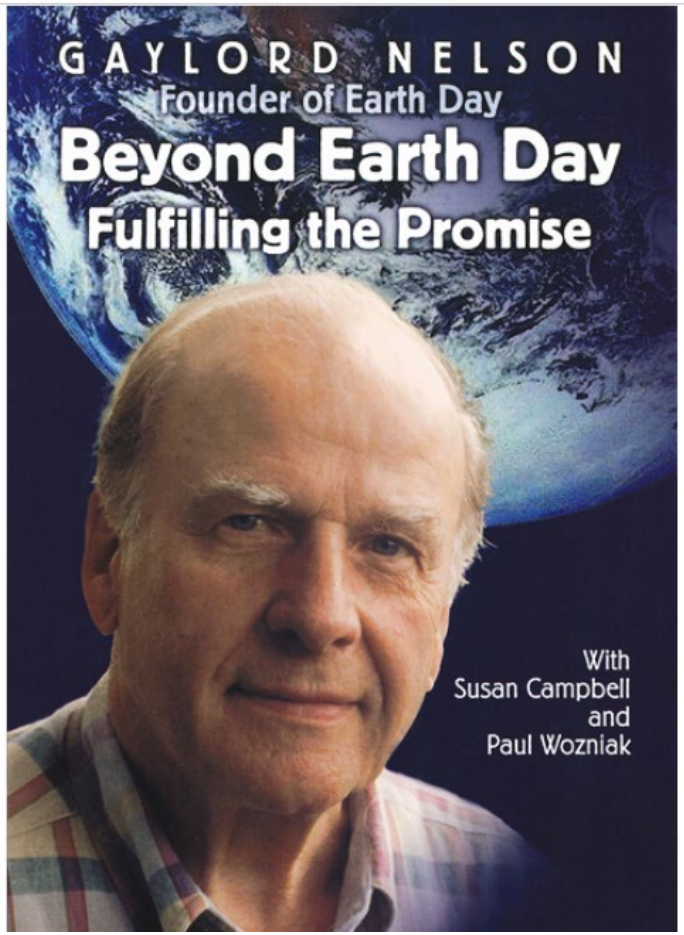
These are NOT pictures of the 1969 fire!!! These are the 1952 fire!



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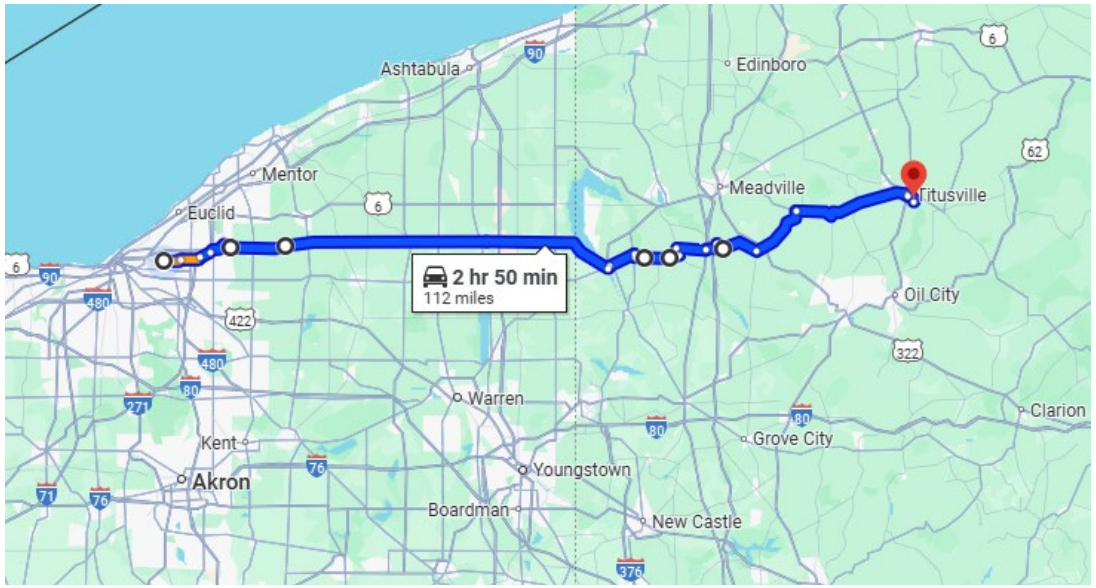
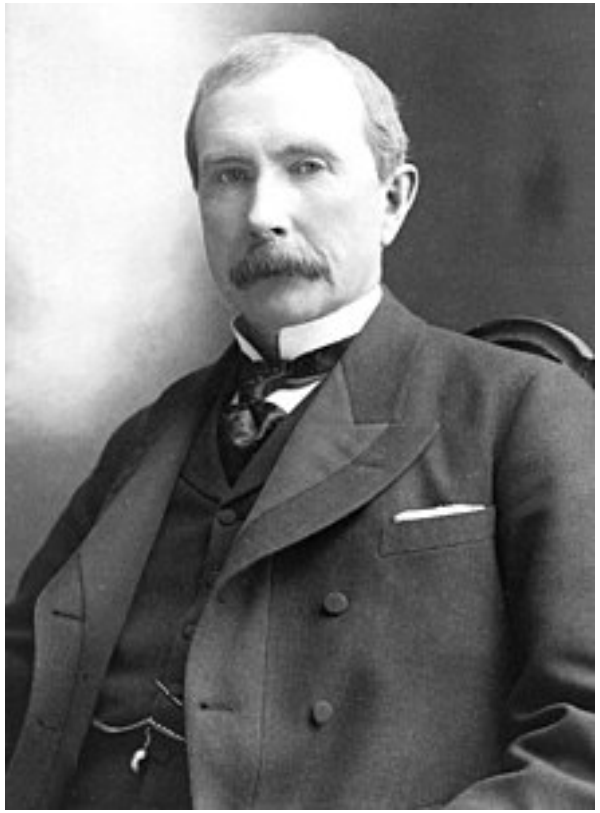
An INCORRECT image became the "poster child for environmental atrocities"!!!

Start from the beginning…

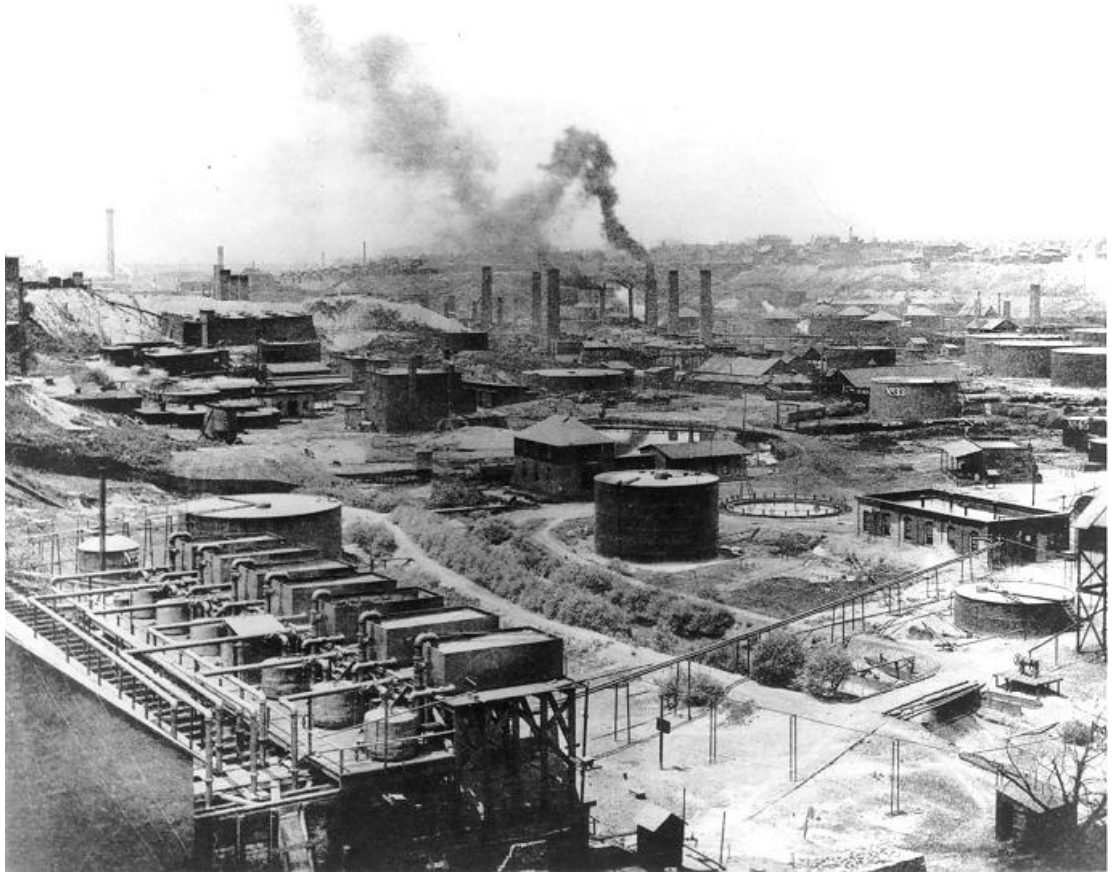
1859: Oil boom starts with Drake well in Western Pennsylvania





John D. Rockefeller, oil refining, and Cleveland

- 1863: Chemical engineer Samuel Andrews convinces Cleveland vegetable wholesaler John D. Rockefeller to team up in oil refining business, and they open their first refinery on the Cuyahoga
- By 1872, Rockefeller's Standard Oil had 21 refineries in Cleveland



Refineries led to pollution. As per Rockefeller:
"thousands and hundreds of thousands of barrels of [gasoline] floated down the creeks and rivers, and the ground was saturated with it, in the constant effort to get rid of it."

Chernow, Ron. Titan: The Life of John D. Rockefeller, Sr. (p. 101).

1912

"five men were burned to death yesterday afternoon when the gasoline-covered surface of the Cuyahoga River burst into flames"

(the gasoline was leaking from a Standard Oil barge)

LOCAL WEATHER.
Fair; moderate winds, mostly south; Friday showers and cooler.

CLEVELAND PLAIN DEALER.

To appear in the Plain Dealer the subsequent week day, classified want ads must be in this office before 10 o'clock P. M.

SEVENTY-FIRST YEAR | SIXTEEN PAGES | CLEVELAND, THURSDAY MORNING, MAY 2, 1912. | PRICE—One Cent. | NO. 123.

GASOLINE FIRE KILLS FIVE CAUGHT IN TRAP AT WORK

Fluid Leaking From Barge Being Filled, and Covering River, Bursts Into Flames Fatal to Mechanics Repairing Boat.

Three Companions of Victims Make Sensational Escape Through Blaze While Firemen Battle Against Explosions.

Five Tugs, Three Drydocks and One Yacht Are Ruined in Spectacle, While Standard Oil Boat Almost Escapes.

DEAD.

Louis Gale, 73, 2198 W. 104th-st.
Frank Gale, 50, son of Louis, 2198 W. 104th-st.
Nelson LeVere, 55, 6404 Lorain-av.
Felix Boucher, 58, 2098 W. 48th-st.
Alex Derosia, 50, 2514 Bridge-av N. W.

CLEVELAND.—Partly cloudy today. Cloudy with a few showers this evening. High yesterday 70, low 46. See Page 16-C.

CLEVELAND PLAIN DEALER

ACCURATE financial, industrial and market news comes to you daily in the Plain Dealer.

111TH YEAR—NO. 307 Entered as Second Class Matter Post Office, under Act of March 3, 1879. * * CLEVELAND, SUNDAY MORNING, NOVEMBER 2, 1952 298 PAGES—SECTION A MAin 1-4500 TWENTY CENTS

OIL SLICK FIRE RUINS FLATS SHIPYARD

This is the 1952 Cuyahoga fire... which had the famous pictures!

WEATHER
Mostly cloudy with occasional thundershowers. High near 80. Low tonight in the 60s.
Details on Page 19-C

THE PLAIN DEALER

FINAL
Complete
Weekend Sports

OHIO'S LARGEST NEWSPAPER

128TH YEAR—NO. 174 * * * * CLEVELAND, MONDAY, JUNE 23, 1969 104 PAGES 10 CENTS

The famous 1969 Cuyahoga fire!

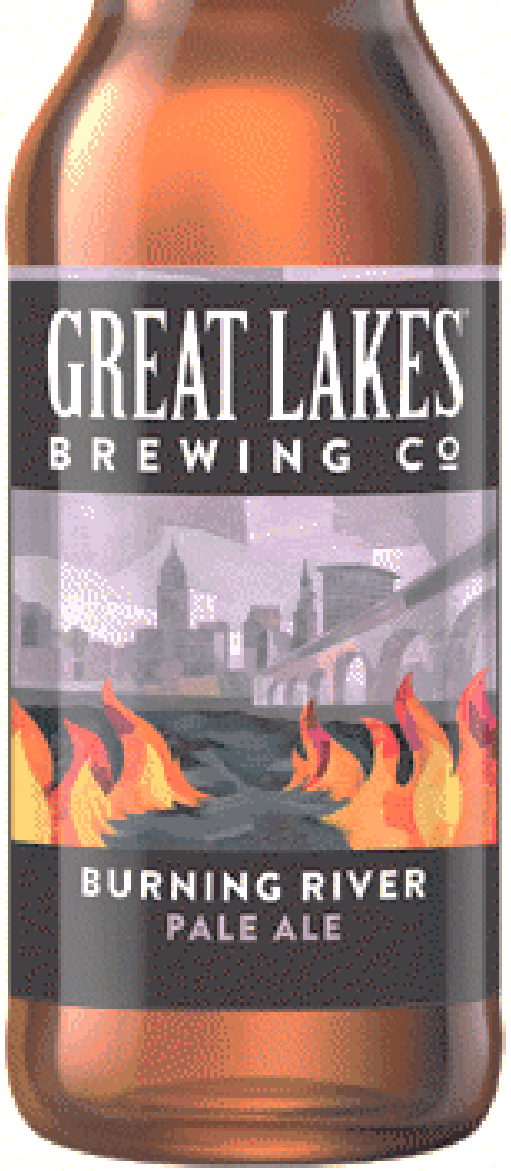
"The burning slick floated under the wooden bridges and set them on fire"

"the fire was reported at 11:56 am and was under control by 12:20 pm"

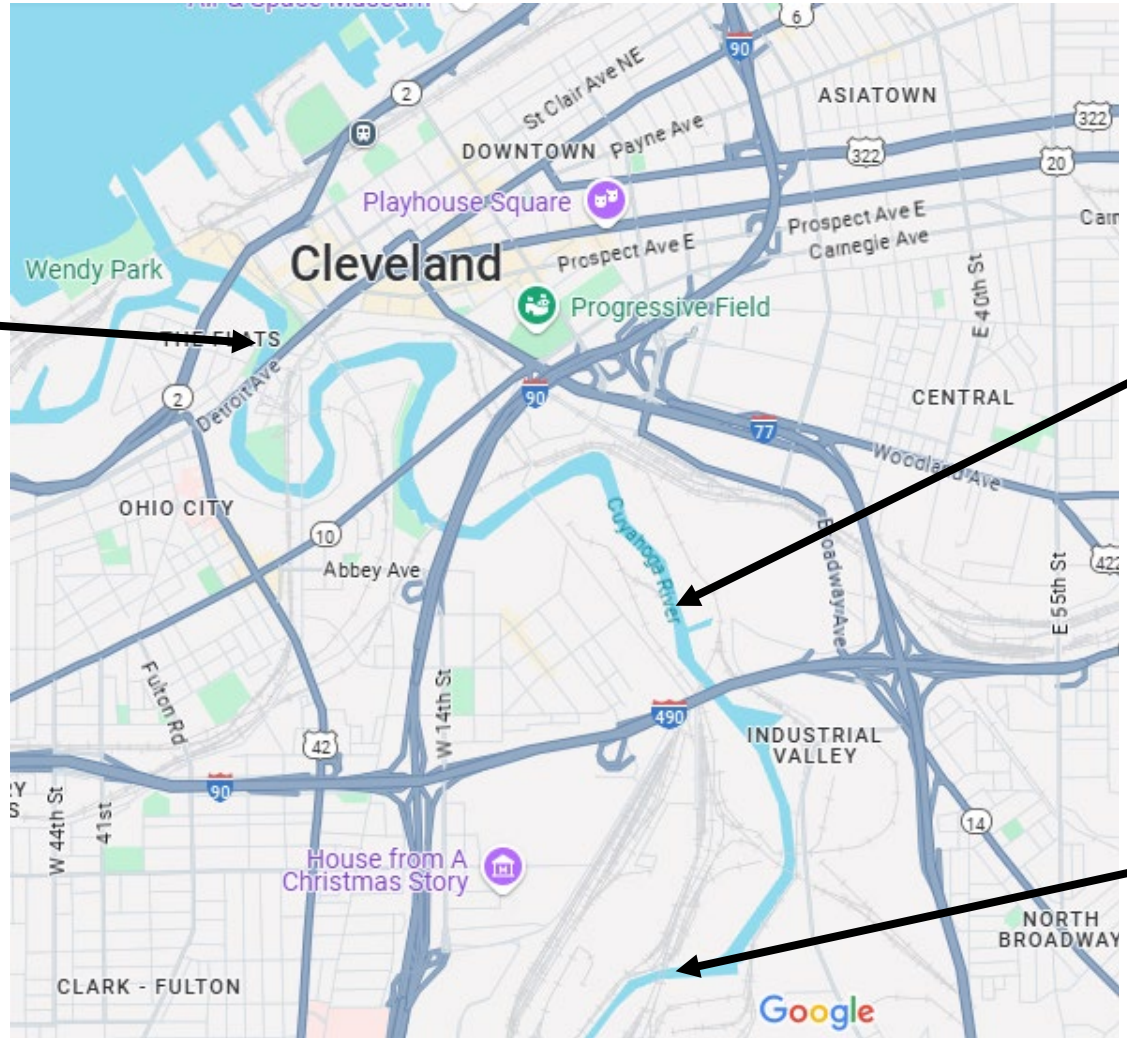
Oil Slick Fire Damages 2 River Spans

An burning oil slick floating on Cuyahoga River caused $50,000 damage to two key railroad trestles at the foot of Campbell Road Hill S.E about noon yesterday, closing one to traffic.

Battalion 7 Fire Chief Bernard E. Campbell said the fire was reported at 11:56 a.m. and was under control by 12:20 p.m. The burning slick floated under the wooden bridges and set them on fire. Cause of the blaze was undetermined, said Campbell.



Where were the fires?



site of 1912, 1952 fires

site of 1969 fire

Moral of the story:
Beer bottles are not reputable sources of info!

CASE WESTERN RESERVE UNIVERSITY

School of Law

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Email:

FABLES OF THE CUYAHOGA: RECONSTRUCTING A HISTORY OF ENVIRONMENTAL PROTECTION

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"The 1969 fire was a catalyst for change because it was the right event at the right time. It was neither an impressive fire, nor one with a significant ecological impact"

Laws & Regulations

History of the Clean Water Act

Before the Clean Water Act

Prior to the Clean Water Act, there were a number of laws that attempted to protect water quality, such as the Rivers and Harbors Act (1899), the Federal Water Pollution Control Act (1948), the Water Quality Act (1965), and the Refuse Act (1970).

June 1969

Oil slick catches fire on the polluted Cuyahoga River in Ohio, mobilizing public concern across the nation.

January 1970

The U.S. Environmental Protection Agency is established.

October 18, 1972 - Clean Water Act Signed Into Law

The CWA aimed to restore and maintain the chemical, physical, and biological integrity of the nation's waters. It established NPDES

Clean Water Act in 1972

- how was pollution addressed before this?
- how is pollution addressed with this act?

Before 1972: Nuisance lawsuits used to stop pollution

Private nuisance: legal activities that interference with use, enjoyment of private land

Public nuisance: legal activities that interference with a right common to the public

Another recent nuisance lawsuit ...

LOCAL

Newport taken to court over pickleball at Hunter Park. Why residents have had enough

Savana Dunning
Newport Daily News

Published 5:28 a.m. ET March 6, 2024

"seeking declaratory judgements from the Superior Court that the use of the courts for pickleball constitutes both a public and private nuisance"

Before 1972: Nuisance lawsuits used to stop pollution

Private nuisance: legal activities that interference with use, enjoyment of private land

Public nuisance: legal activities that interference with a right common to the public

But it didn't work so well…

Problems with fighting with private nuisance lawsuits

- Plaintiff harm must be different from harm suffered by the public generally
- Must show the harm caused by particular polluter… difficult if pollution is from multiple sources

Problems with fighting with public nuisance lawsuits

- Ohio law pre-1972: facilities with state permit for discharge can't be sued for public nuisance for that discharge

Clean Water Act (1972)

33 U.S. Code § 1311 - Effluent limitations

Except as in compliance with this section and sections 1312, 1316, 1317, 1328, **1342**, and 1344 of this title, the **discharge of any pollutant by any person shall be unlawful**

Now there is a criminal law against discharging pollutants... not just nuisance lawsuits!

33 U.S. Code § 1342 - National pollutant discharge elimination system

(1) ... [the EPA may] **issue a permit for the discharge of any pollutant**... upon condition that such **discharge will meet all applicable requirements** under sections 1311, 1312...

(2) [the EPA] shall **prescribe conditions for such permits to assure compliance** with the requirements of paragraph (1) of this subsection, including conditions on data and information collection, reporting, and such other requirements as he deems appropriate.

Facilities discharging water must obtain permit, which specifyies limitations on chemicals in discharge and monitoring/reporting requirements

Permits are publically accessible... here's the permit for the Marathon Petroleum Refinery in Canton, OH

Ohio EPA Permit No.: 3IG00000*OD
Application No: OH0005657

Action Date: March 3, 2025
Effective Date: April 1, 2025
Expiration Date: March 31, 2030

Ohio Environmental Protection Agency
Authorization to Discharge Under the
National Pollutant Discharge Elimination System

In compliance with the provisions of the Federal Water Pollution Control Act, as amended (33 U.S.C. 1251 et. seq., hereinafter referred to as the "Act"), and the Ohio Water Pollution Control Act (Ohio Revised Code Section 6111),

Marathon Petroleum Company LP - Canton Refinery

is authorized by the Ohio Environmental Protection Agency, hereinafter referred to as "Ohio EPA," to discharge from the Marathon Canton Refinery, located at 2408 Gambrinus Avenue SW, Canton, Ohio, Stark County, and discharging to the Tuscarawas River at River Mile 80.51 and Hurford Run at River Mile 1.9 in accordance with the conditions specified in Parts I, II, III, IV, V, and VI of this permit.

This is the Marathon refinery in Canton

I chose this example because we had ECHE capstone projects with the refinery

from the permit for Marathon Petroleum Refinery

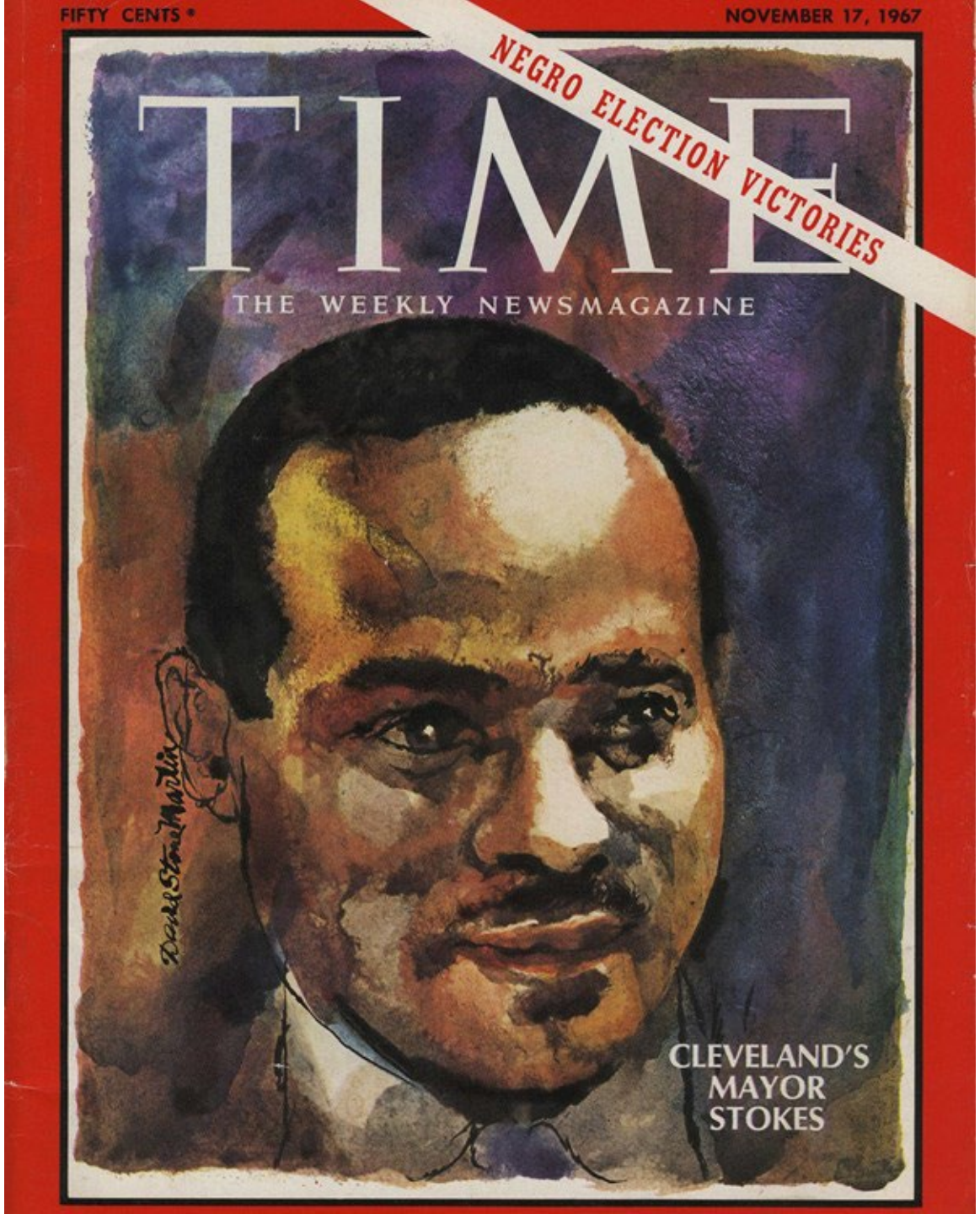
Effluent Characteristic	Discharge Limitations							Monitoring Requirements		
Parameter	Concentration Specified Units				Loading* kg/day			Measuring Frequency	Sampling Type	Monitoring Months
	Maximum	Minimum	Weekly	Monthly	Daily	Weekly	Monthly			
00010 - Water Temperature - C	-	-	-	-	-	-	-	1/Day	Maximum Indicating Thermometer	All
00045 - Total Precipitation - Inches	-	-	-	-	-	-	-	1/Day	Total	All
00300 - Dissolved Oxygen - mg/l	-	-	-	-	-	-	-	3/Week	Grab	All
00310 - Biochemical Oxygen Demand, 5 Day - mg/l	55	-	-	29	354	-	187	3/Week	Composite	All
00335 - Chemical Oxygen Demand (Low Level) - mg/l	382	-	-	191	2458	-	1229	3/Week	Composite	All
00530 - Total Suspended Solids - mg/l	38	-	-	24	245	-	154	3/Week	Composite	All
00552 - Oil and Grease, Hexane Extr Method - mg/l	13	-	-	9	84	-	58	3/Week	Grab	All
00610 - Nitrogen, Ammonia (NH3) - mg/l	25.2	-	-	3.6	162	-	23	3/Week	Composite	Summer
00610 - Nitrogen, Ammonia (NH3) - mg/l	26.4	-	-	-	170	-	-	3/Week	Composite	Winter
00665 - Phosphorus, Total (P) - mg/l	-	-	-	-	-	-	-	1/Month	Composite	All
00745 - Sulfide, Total - mg/l	0.29	-	-	0.13	1.9	-	0.8	1/Month	Composite	All
00940 - Chloride, Total - mg/l	-	-	-	-	-	-	-	1/Quarter	Composite	Quarterly - Alt.
00951 - Fluoride, Total (F) - mg/l	-	-	-	-	-	-	-	1/Quarter	Composite	Quarterly - Alt.
00981 - Selenium, Total Recoverable - ug/l	-	-	-	-	-	-	-	1/Quarter	Composite	Quarterly - Alt.
01118 - Chromium, Total Recoverable - ug/l	650	-	-	77	4.2	-	0.5	1/Month	Composite	All
01220 - Chromium, Dissolved Hexavalent - ug/l	11	-	-	9	0.07	-	0.06	1/Month	Grab	All
32730 - Phenolic 4AAP, Total - ug/l	216	-	-	108	1.4	-	0.7	1/Month	Composite	All
50050 - Flow Rate - MGD	-	-	-	-	-	-	-	Continuous	24hr Total	All

- facility must self-monitor, and report data to Ohio EPA every month
- if no discharge limitation listed, must still monitor and report for these chemicals
- penalties for non-compliance

Q1:

A. What was the legal means of fighting water pollution before 1972, and what was a problem with this approach?

B. The Clean Water Act does not strictly prohibit any discharge of pollutants into rivers and streams. What is the mechanism by which the Clean Water Act ensures these waters remain clean?



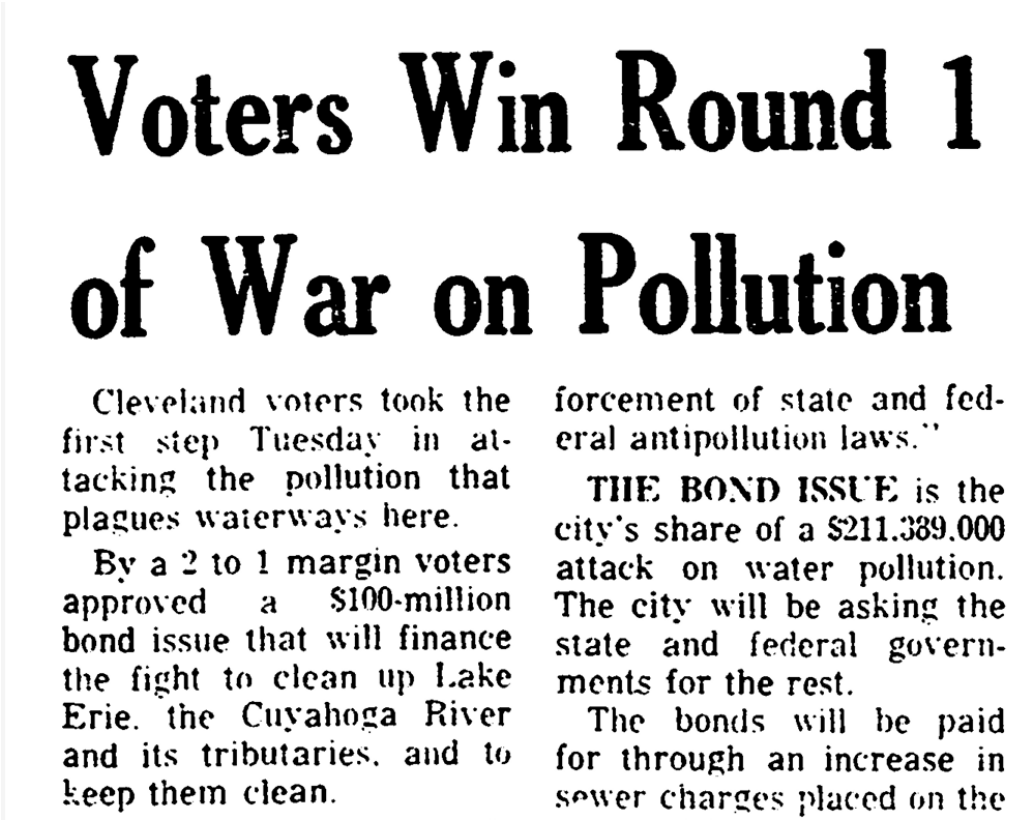
Carl Stokes was elected Mayor in 1967

First Black mayor of major US city

A leader in environmental movement in US
... even before the Cuyahoga River fire

and a connection to a previous lecture... its officially the "Carl and Louis Stokes Opportunity Corridor"!

Mayor Stokes began Cuyahoga cleanup even before fire!



Voters Win Round 1 of War on Pollution

Cleveland voters took the first step Tuesday in attacking the pollution that plagues waterways here.

By a 2 to 1 margin voters approved a $100-million bond issue that will finance the fight to clean up Lake Erie, the Cuyahoga River and its tributaries, and to keep them clean.

forcement of state and federal antipollution laws."

THE BOND ISSUE is the city's share of a $211,389,000 attack on water pollution. The city will be asking the state and federal governments for the rest.

The bonds will be paid for through an increase in sewer charges placed on the

November 7, 1968 | Cleveland Plain Dealer

:

"By a 2 to 1 margin, voters approved a $100-million bond issue that will finance the fight to clean up Lake Erie, the Cuyahoga River and its tributaries, and to keep them clean"

(about $1 billion in today's dollars)

Mayor Stokes forthrightly declared that, as Mayor, he "face[d] many more serious crises which affect the lives of my constituents to a greater degree than air and water pollution. . . . These include housing, jobs, food, clothing and the ability to live in a society free of racial hatred."[130] Mayor Stokes expressed his "hope that the amount of concern over the environmental crisis will not overshadow these more basic and in many ways more difficult social problems."[131]

"more serious crises… housing, jobs, food, clothing and the ability to live in a society free of racial hatred"

Today, the Cuyahoga River is clean!

But what about the "more serious crises… housing, jobs, food, clothing and the ability to live in a society free of racial hatred"?

Cleveland
2020

Mayor Stokes forthrightly declared that, as Mayor, he "face[d] many more serious crises which affect the lives of my constituents to a greater degree than air and water pollution. . . . These include housing, jobs, food, clothing and the ability to live in a society free of racial hatred."[130] Mayor Stokes expressed his "hope that the amount of concern over the environmental crisis will not overshadow these more basic and in many ways more difficult social problems."[131]

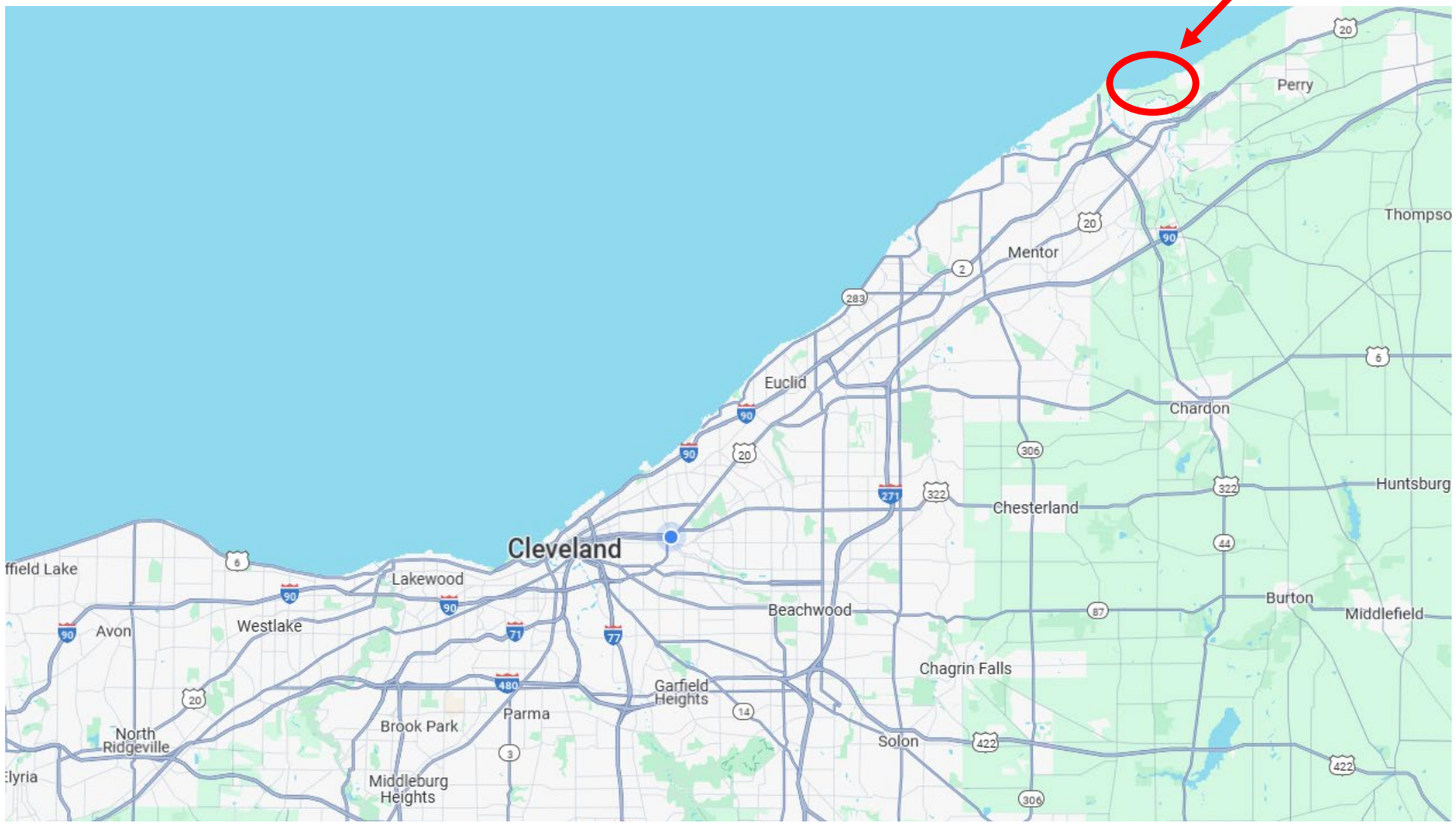
We have finite resources to solve problems like housing, inequality, institutional racism, environmental degradation, and so on. The question then is how to prioritize different, competing causes—that is: how should we allocate our finite resources, given that funding one cause necessarily means fewer resources to support other causes?

Q2:What was the gist of Mayor Stokes' concerns on the environmental crisis overshadowing other crises, and what is your opinion on this matter?

Now we'll move on to a different story…

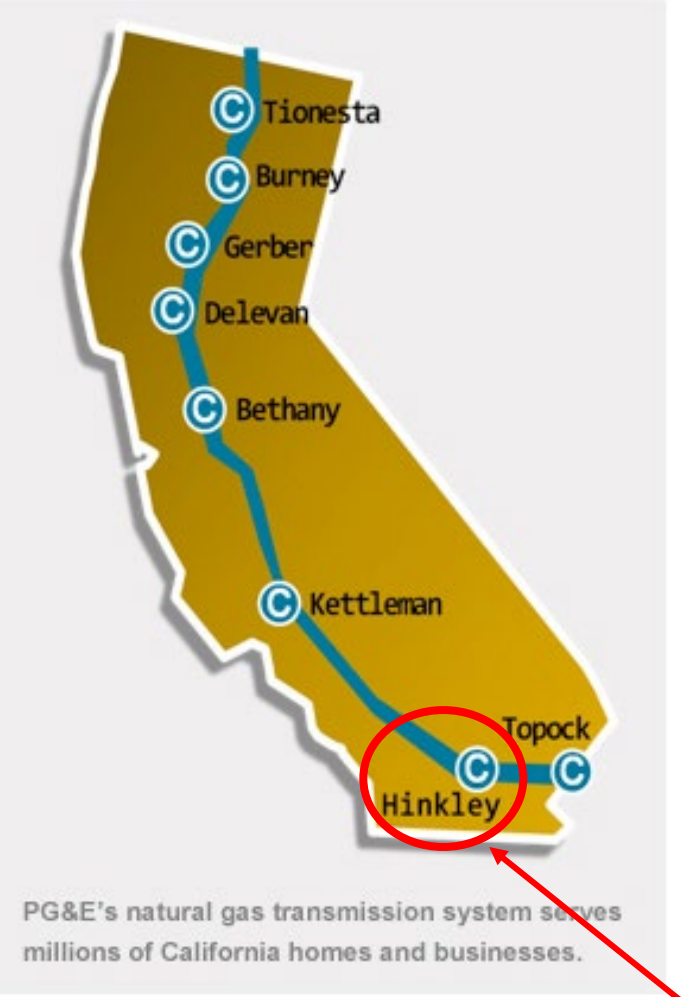
Would you buy a home in this beautiful place?

The beautiful place is here!



Before we continue this story, a detour…

Pacific Gas & Electric is a utility company serving 16 million people



50,000 miles of natural gas pipelines

Compressor stations pressurize natural gas to move it along the pipeline

Pressurizing the gas heats it up! $\frac{T_2}{T_1} = \left(\frac{p_2}{p_1}\right)^{R/C_p}$

The heat is removed from natural gas in cooling towers, with water as coolant

An issue: rusting in steel cooling towers

- 1952 - 1966: K_2CrO_4 added to cooling water to inhibit rust
- CrO_4 undergoes redox rxn to form Cr_2O_3 surface layer over the steel
- "self-healing process" — Cr_2O_3 layers reform if cracks occur
- note the Cr_2O_3 surface layer same thing that makes stainless steel "work"

the events in the movie took place near this compressor station

What's so bad about chromium?!?
People take it as a supplement!

MAYO CLINIC

Request appointment | Log in

< Drugs & Supplements

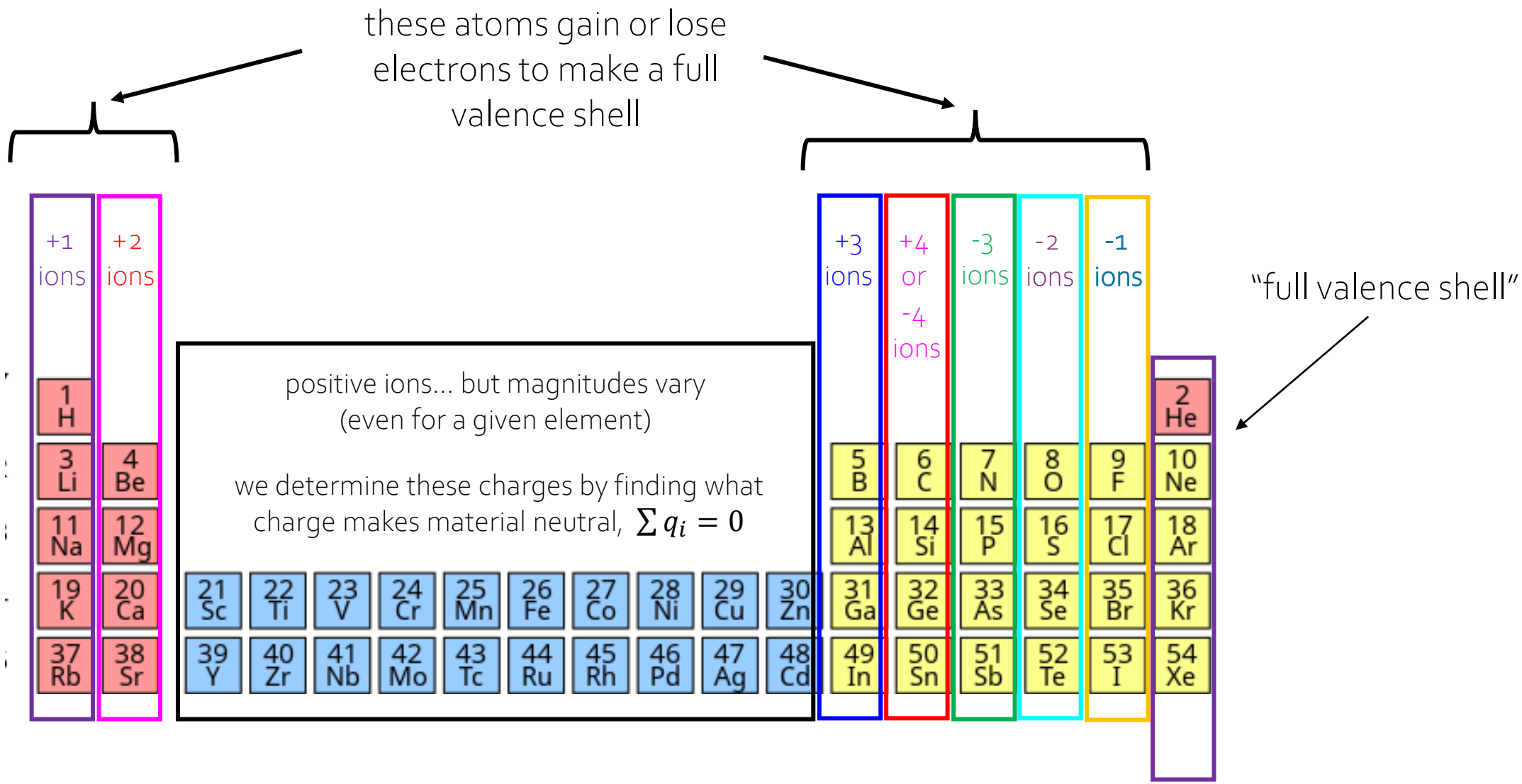
Chromium supplement (oral route, parenteral route)

The body needs chromium for normal growth and health. For patients who are unable to get enough chromium in their regular diet or who have a need for more chromium, chromium supplements may be necessary. They are generally taken by mouth but some patients may have to receive them by injection. Chromium helps your body use sugar properly. It is also needed for the breakdown of proteins and fats.

Lack of chromium may lead to nerve problems and may decrease the body's ability to use sugar properly.

From my ENGR 145 lecture!

What ions do atoms form?



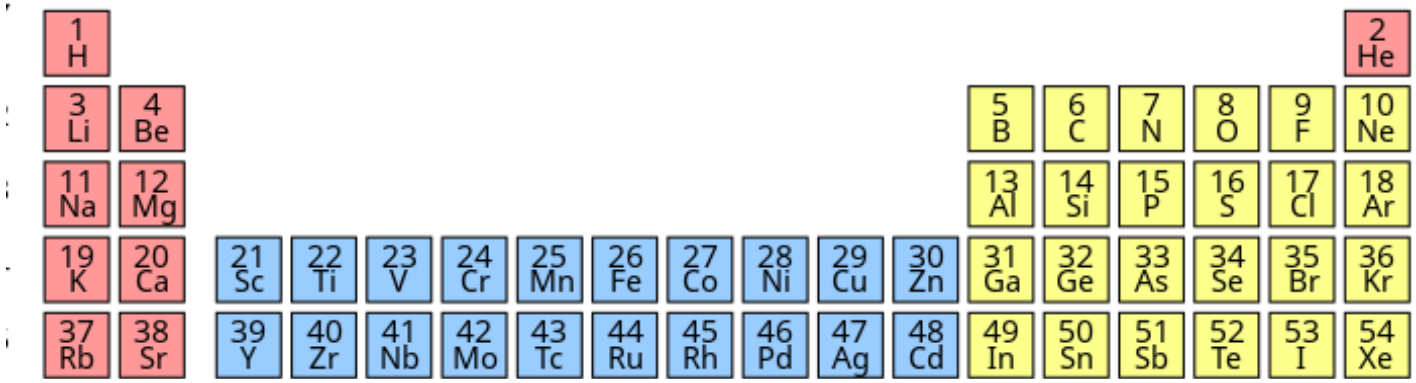
From my ENGR 145 lecture!

Determine formal charges ("oxidation states") of the atoms in these materials

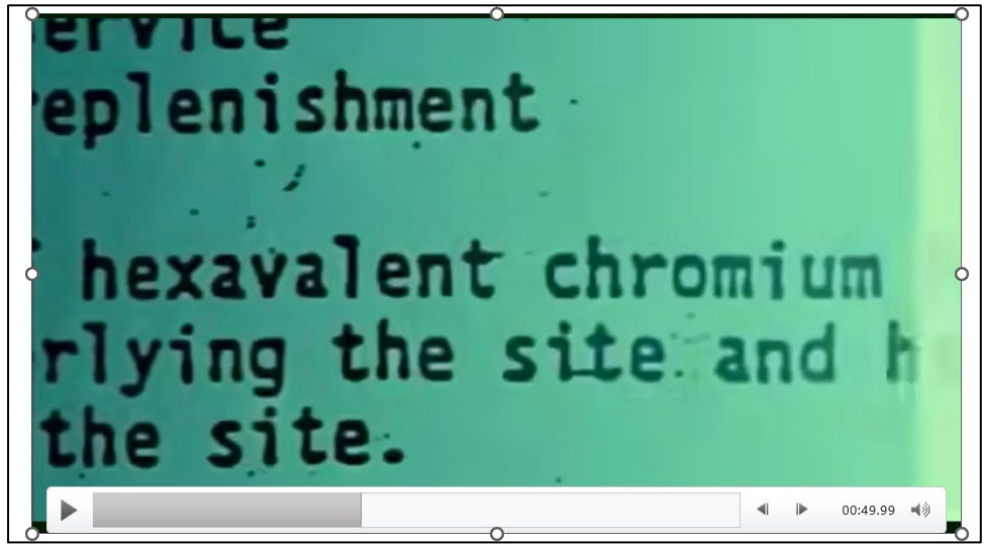
Material	q (determined directly)	q (determined by $\sum q_i = 0$)	check $\sum q_i$
Cr_2O_3	O^{-2}	Cr^{+3}	2*3 +3*(-2) =0
K_2CrO_4	O^{-2}; K^{+}	Cr^{+6}	2*1 + 6 + 4*(-2) =0
$K_2Cr_2O_7$	O^{-2}; K^{+}	Cr^{+6}	2*1 + 2*6 + 7*(-2) =0

"trivalent chromium"

"hexavalent chromium"



from the Erin Brokovich movie...



hexavalent = Cr^{6+}

Cr^{6+} highly reactive... thus toxic
but also technologically useful

trivalent = Cr^{3+}

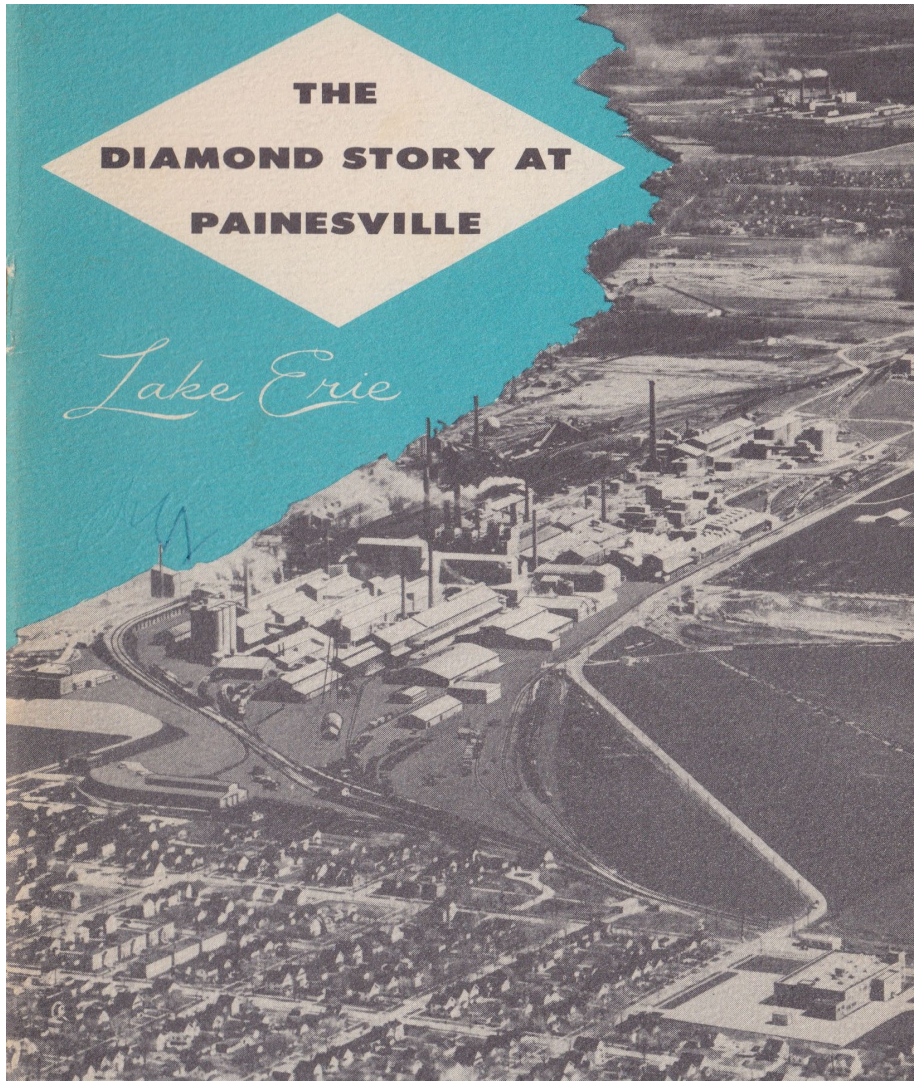
Cr^{3+} very stable... thus safe but not
so technologically useful

and back to the main story…

Would you buy a home in this beautiful place?

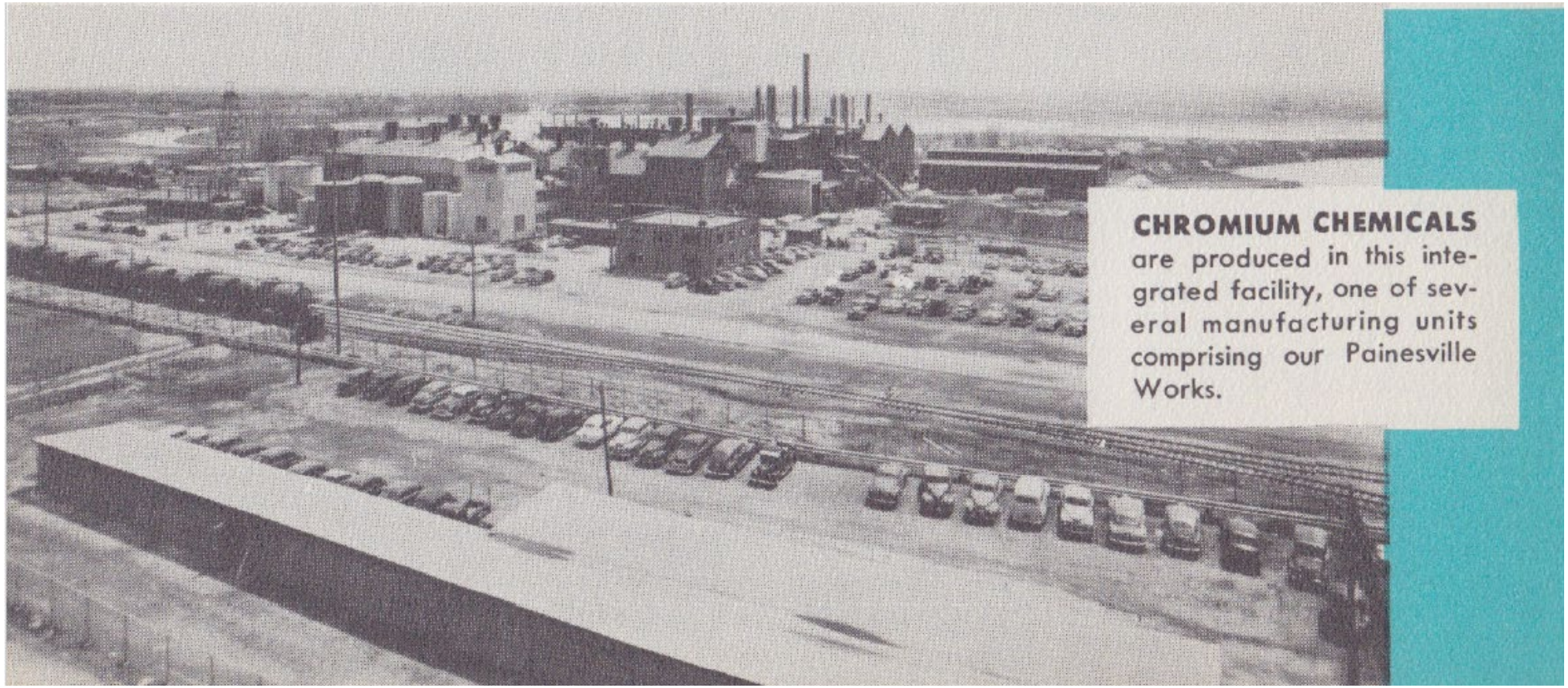
This is what the site used to look like…

Diamond Shamrock chemical plant, 1912-1976



we make more than 100 chemicals, which can be classified for simplicity's sake into these 14 principal products or product groups:

1. Soda Ash
2. Caustic Soda
3. Chlorine
4. Chlorinated Methanes
5. Bicarbonate of Soda
6. Sodium Silicates
7. Calcium Carbonates
8. Chromates
9. Specialized Chemicals
10. Organic Chemicals
11. Plastics
12. Agricultural Chemicals
13. Cement
14. Coke and Coke By-Products



The Chromate Plant at Painesville, one of the largest bichromate-producing facilities in America, has been completely rebuilt in recent years. It now incorporates processing equipment of the latest design, together with facilities providing vastly improved working conditions.

"one of the largest bichromate processing facilities in America..."

bichromate is $Cr_2O_7^{2-}$ ... what is the oxidation state?

The plant shuts down in 1976… site is fenced off and just sits

Isn't there a law to make them clean it up?!?

"authority to respond to releases or threatened releases of hazardous substances"

MENU

Superfund Liability

The Superfund law (officially the Comprehensive Environmental Response, Compensation and Liability Act, (CERCLA)) imposes liability on parties responsible for, in whole or in part, the presence of hazardous substances at a site.

Superfund Liability is:

- **Retroactive** - Parties may be held liable for acts that happened before Superfund's enactment in 1980.
- **Joint and Several** - Any one potentially responsible party (PRP) may be held liable for the entire cleanup of the site (when the harm caused by multiple parties cannot be separated).
- **Strict** - A PRP cannot simply say that it was not negligent or that it was operating according to industry standards. If a PRP sent some amount of the hazardous waste found at the site, that party is liable.

There are four classes of Superfund liable parties:

- Current owners and operators of a facility,
- Past owners and operators of a facility at the time hazardous wastes were disposed,
- Generators and parties that arranged for the disposal or transport of the hazardous substances, and
- Transporters of hazardous waste that selected the site where the hazardous substances were brought.

you are liable even if waste was put there before the law was enacted...

you might have to pay for full cleanup even if others also caused damage

you are liable even if actions were accepted industry standards

current owners are liable... even if they had nothing to do with the waste and didn't even know it was there

EPA United States Environmental Protection Agency

Environmental Topics | Laws & Regulations | About EPA | Sea

Superfund Site:

- Superfund Home
- **This Site's Home Page**
- Site Contacts
- Cleanup Activities
- Health & Environment
- Redevelopment
- Site Documents & Data
- View Site on Map

DIAMOND SHAMROCK CORP. (PAINESVILLE WORKS) PAINESVILLE, OH

Background

The Diamond Shamrock Corp. (Painesville Works) site is an 1,100-acre former chemical manufacturing facility in Lake County, Ohio. The Diamond Shamrock Painesville Works facility operated from 1912 through 1977. It made a variety of products, including soda ash, baking soda, chromium compounds, carbon tetrachloride, hydrochloric and sulfuric acids, chlorinated wax and coke. Facility operations contaminated soil, sediment and surface water with hazardous chemicals. Site cleanup is ongoing.

"In 1982, Diamond Shamrock completed closure of the area....

...The closure consisted of installing sheet piling along the Grand River and an impermeable clay cap placed over all the waste areas."

Q3:

a. What specifically does the Superfund law authorize in regard to hazardous substances?

b. What was the reason given in lecture for why some people don't agree with the "joint and several liability" provision in the Superfund law?

The plant shuts down in 1976… site is fenced off and just sits

Superfund law only covers release of hazardous substances…

… so if no threat of hazardous substance release, nothing compels site clean up

Need a volunteer to step up and clean the site!!!

Let's look at what happened here…

Everett, Massachusetts
(Boston suburb)

Was a Monsanto chemical plant
1929-1992

"It was a filthy hole…There were big sulfur piles that would blow everywhere.
If you ever took a deep breath, you would choke."
- Boston Globe, Nov 9, 2014

2015

2025

Ohio Environmental Protection Agency

Stay Compliant | Get Involved | Monitor Pollution | Get Funding | Find Regu

Ohio EPA / Divisions & Offices / Environmental Response & Revitalization / Programs / Voluntary Action Program

- Welcome
- Announcements
- Contacts
- About DERR
- Programs
- Cleanup & Investigation
- Guides & Manuals

Voluntary Action Program

The Voluntary Action Program (VAP) gives individuals a way to investigate possible environmental contamination, clean it up if necessary and receive a promise from the State of Ohio that no more cleanup is needed.

The VAP minimizes governmental red tape and maximizes resources and expertise in the private sector. If someone wants to clean up a piece of property, it may be done following specific standards developed by Ohio EPA.

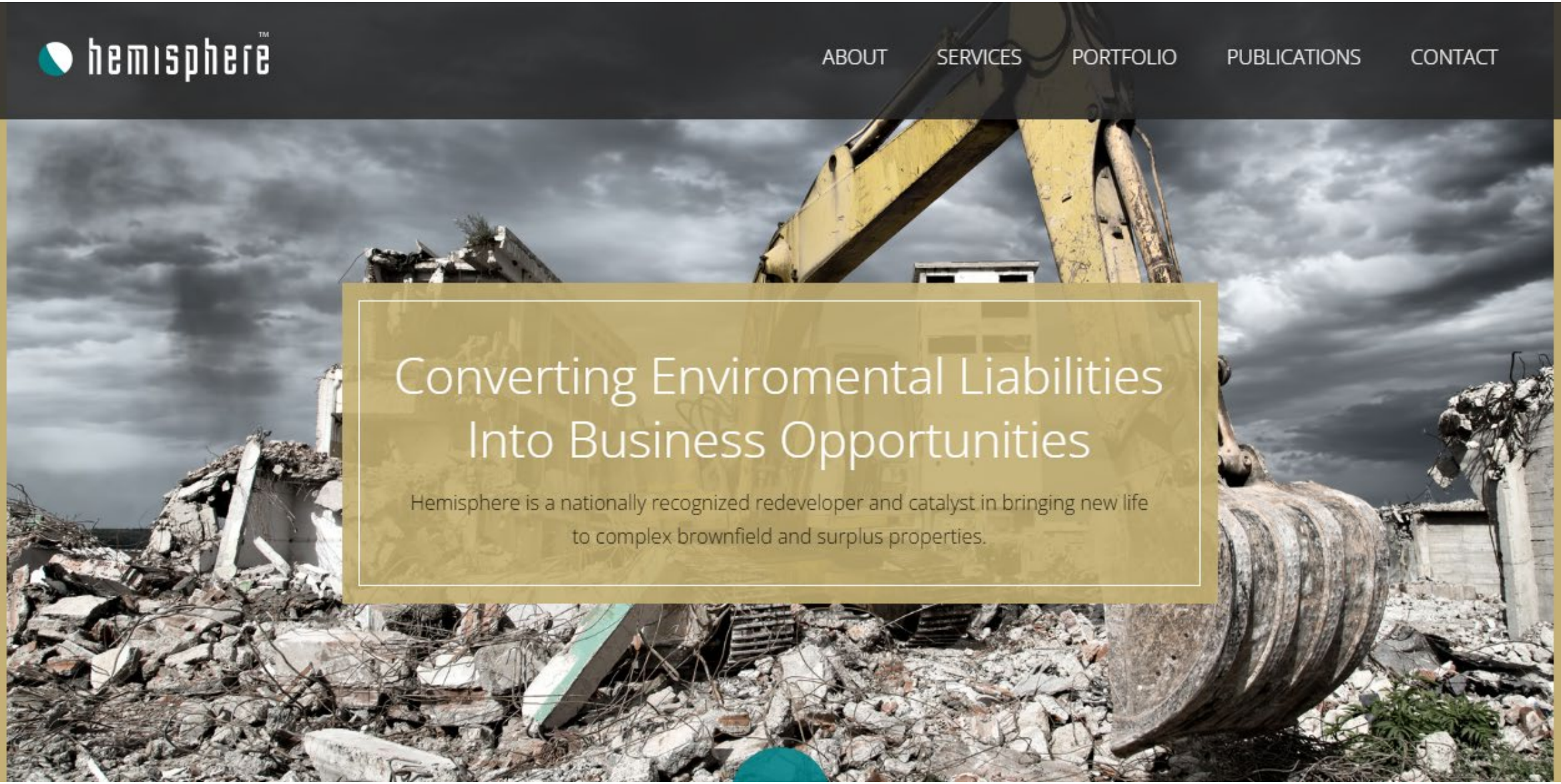
When cleanup requirements are met, the director of Ohio EPA issues a covenant not to sue. This covenant protects the property owner or operator and future owners from being legally responsible to the State of Ohio for further investigation and cleanup. This protection applies only when the property is used and maintained in the same manner as when the covenant was issued.

"When cleanup requirements are met, the EPA issues a covenant not to sue.

This covenant protects the property owner or operator and future owners from being legally responsible to the State of Ohio for further investigation and cleanup."

hemisphere™

ABOUT SERVICES PORTFOLIO PUBLICATIONS CONTACT



Converting Enviromental Liabilities Into Business Opportunities

Hemisphere is a nationally recognized redeveloper and catalyst in bringing new life to complex brownfield and surplus properties.

Lakeview Bluffs

I obtained info from these EPA documents

DECISION DOCUMENT

FOR THE REMEDIATION OF OPERABLE UNIT 15
DIAMOND SHAMROCK PAINESVILLE WORKS SITE
PAINESVILLE TOWNSHIP, LAKE COUNTY, OHIO

Ohio Environmental Protection Agency
Division of Environmental Response and Revitalization
Northeast District Office
June 2015

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.

By: Date: 7-21-15

Ohio EPA 5/11/2022
Entered Directors Journal

I certify this to be a true and accurate copy of the official documents as filed in the records of the Ohio Environmental Protection Agency.

By: Date: 5/11/2022

Ohio Environmental Protection Agency

DECISION DOCUMENT

FOR THE REMEDIATION OF THE
DIAMOND SHAMROCK PAINESVILLE WORKS SITE:
OPERABLE UNIT 4
PAINESVILLE, LAKE COUNTY, OHIO

Division of Environmental Response and Revitalization
Northeast District Office

April 2022

Some of the remediation actions

2.3 Interim or Removal Actions Taken to Date

As previously mentioned, the Lake County Board of Commissioners and Lakeview Bluffs, LLC received a $3 million grant from the State of Ohio's Clean Ohio Revitalization Fund (CORF) on February 27, 2003. The purpose of the grant was to assist the Site developer, Lakeview Bluffs, LLC, in upgrading the end use of the Site from industrial to a mixture of commercial, recreational and residential. The work was performed as a voluntary IA under the existing Orders.

The initial objective for clean-up was based on industrial use because of historical and proposed future uses of the Site. However, in February 2001, Chemical Land Holdings, Inc. (now known as Tierra Solutions, Inc.) entered into a 99 year lease agreement with Lakeview Bluffs, LLC, which changed the planned end use of the Site to a combination of commercial, recreational and residential. Under a voluntary IA, Chemical Land Holdings, Inc. (now Tierra Solutions, Inc.) paid to remediate the Site to industrial use and Lakeview Bluffs, Inc. used the CORF grant money in combination with other funding to upgrade the remediation to meet commercial, recreational and residential risk-based standards.

During the voluntary IA, 16 of the 19 areas of contamination listed in Table 2, Areas of Concern within OU15 (pre-interim action), were remediated through a combination of excavation and relocation or disposal of soils and placement of clean soils[3]. Commercial and recreational areas were required to meet a 2' minimum point of compliance (i.e., a minimum of 2' of clean soils must be present above area of contamination). Residential areas were required to meet a minimum 4' point of compliance.

"changed the planned end use of the Site to a combination of commercial, recreational and residential... [will] upgrade the remediation to meet commercial, recreational and residential risk-based standards"

"commercial and recreational areas were required to meet a 2' minimum point of compliance (i.e., a minimum of 2' of clean soils must be present above area of contamination). Residential areas were required to meet a minimum 4' of compliance"

EPA analysis of the remediation actions

2.4.1 Risks to Human Health

Cumulative Receptor Exposures – Pre-Interim Action (before remediation)

Receptor*	ELCR (cancer)	HI (non-cancer)	Exceedences?
Construction/Excavation Worker	$5x10^{-5}$	10	Yes – Both
Golf Course Worker	$4.62x10^{-4}$	1.10	Yes – Both
Long-Term Maintenance Worker	$7.6x10^{-6}$	30	Yes – Both
Adult-Recreational	$7.6x10^{-5}$	0.92	Yes – ELCR
Child-Recreational	$1.7x10^{-4}$	7.9	Yes – Both
Adult-Resident	$5.4x10^{-2}$	33.4	Yes – Both
Child-Resident	$5.5x10^{-2}$	49.2	Yes – Both

- ELCR = excess lifetime cancer risk. Less than 10^{-5} deemed "acceptable"
- HI = health index. Less than 1 is "acceptable"

Cumulative Receptor Exposures – Post-Interim Action

Receptor	ELCR (cancer)	HI (non-cancer)	Exceedances?*
Child-Recreational	$8.8x10^{-7}$	0.21	No
Child-Resident	$2.2x10^{-6}$	0.72	No

*Assuming minimum applicable POCs have been established.

EPA determined that after remediation the site meets acceptable risk

Public Forum, July 2008

Community Member Comment:

It is beyond our comprehension why anyone would build a home on the contaminated waste dump known as Diamond Shamrock.

Ohio EPA Response:

Upon completion of remediation under a future Remedial Design/Remedial Action Order, OU15 will meet residential and commercial/recreational standards. Compliance with these risk based standards will rely, in part, on an Environmental Covenant to restrict land and ground water use, as well as maintain minimum points of compliance. The Environmental Covenant will contan an annual reporting requirement to ensure that the minimum applicabe points of compliance are maintained.

Public Forum, Jan 2022

Community Member Comment:

Why leave the source waste in place? Especially something as toxic as hexavalent chromium? Why was excavation of soils containing hex chrome not considered? Why not consider transforming it to the less toxic trivalent form?

Ohio EPA Response:

Although hexavalent chromium was detected, the maximum concentration detected (10 mg/kg) was well below the single-chemical standard (63 mg/kg) for the anticipated land use…. Excavation of hexavalent chromium was not necessary to meet the OU_4 risk goal which is protective of human health and the environment… In media such as soil, hexavalent chromium is reduced to the less toxic trivalent form by natural chemical processes. The levels of hexavalent chromium detected in OU_4 soils were not high enough to require removal or treatment to the trivalent form..

Would you like to buy a home in this beautiful place?

Is it ethical to build homes at Lakeview Bluffs, if the land is remediated to the standards and satisfaction of the EPA?

Would you buy a house there?

- If you wouldn't, why not?
- If the very best science that we have tells you that it's safe, is there any rational reason to object?
- If you do reject the scientific consensus on the safety of living on a former superfund site, what does that say about your general trust in science?

Q4: What is the issue in regard to building homes at Lakeview Bluffs, and what is the role that you think science and the EPA should play in this regard?