

Can Hemp Save Soil?

How can hemp remediate soils with heavy metals in areas like the Old West End of Toledo,
Ohio?

Samantha Lorenc



Image 1: Field of Hemp

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Ohio?

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Personal Information Page

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“The Next Time That Somebody Tells You, ‘The Government Wouldn't Do That,’ Oh Yes They Would”

- Youtuber Wendigoon

"As with most consensual crimes, this prohibition of hemp is both silly and sinister."

- Peter McWilliams



Previous Course Experience:

Photo taken by Michael Everett, UC DAAP

Spring 2025, Horticulture Senior Project, Hort 4092

Stevie Famulari

Senior Capstone

- Horticulture Capstone

Fall 2024, Introduction to Hemp and Cannabis, Hort 4081

Professor Bonnie Radin

- Research in Hemp and Cannabis

Fall 2024, Horticulture Crop Physiology, Hort 4020

Professor Dan Peterson

- Research the inner workings of crops
-

Spring 2024, Soil Science Plant Nutrients, Hort 3010

Professor Tania D. Hernandez

- Research of Soil and Plant Nutrients
-

Fall 2023, Urban Landscape II Agriculture, Hort 3042

Professor Brian Grubb

- Research on Urban Farming in major cities and in lower income areas

Chapter One:

Understanding the Project

Abstract:

Toledo has been struggling with soil contaminants due to factories and improper building demolishes such as burying the remains of the building in the top 40 to 50 inches of soil instead of proper disposal of materials. This is especially notable in areas such as the Old West End where the contaminants can be found in the community gardens that feed the communities around them and have shown negative effects on their young. The City of Toledo did a study in 2019 on the levels of ground contaminants in some of the gardens and found high levels of mainly lead.

The purpose of this research is to create a protocol for using hemp (*Cannabis sativa* L.) in the form of phytoremediation, as well as shed light on the history of hemp and its other uses such as fiber, food, and oil. Currently, the laws in Ohio around growing hemp include the minimum number of acres one would need to grow hemp in Ohio $\frac{1}{4}$ of an acre.

This capstone explores a protocol that can help remove heavy metals from the soils in areas like the Old West End area of Toledo.

Keywords:

Cannabidiol (CBD) - an extract from hemp or weed that is an oil that can calm some that use it

DEA – Drug Enforcement Administration

Hemp - (*Cannabis sativa* L.) - Cannabis sativa that has 0.3% of having THC in the plants when dried and tested

HIA - Hemp Industries Association

Nutrient leaching - when water or other liquids can wash plant nutrients from the soil

ODA – Ohio Department of Agriculture

Phytoremediation - using plants to remove ground contaminants from the soil, air, and water

Phytoremediation

Why it's important?

Stringent oversight and testing are important to avoid any contaminations of toxic residue that can be found in the soil or lands near by where they can be passed along naturally with air and wind.



Our Standards

We take great measures to ensure the surrounding environment is tested and monitored closely to ensure the utmost safety to avoid any sort of contamination.



The Roots

Grow 1.5-3 ft. deep and are capable of reaching deep into the soil.

1.5 - 3 ft.

Absorbs

It inevitably absorbs toxins such as heavy metals, pesticides, or herbicides to name a few from the soil and air it's planted in.



Can be used to clean up contaminated soil or pollution from the air like they did for Chernobyl after their nuclear disaster.



If used to extract cannabinoids, terpenes, & other compounds from the plant then it can pass along unwanted toxic residue.

Figure 1: Phytoremediation with Hemp

Problem Statement

How can hemp remediate soils with heavy metals in areas such as the Old West End of Toledo, Ohio?

Project Justification

Addressing unhealthy soil has been important to me as a result of finding out about how unhealthy soil used to grow food for a community was causing young children to have lead poisoning. When health can be improved with green practices, the quality of life for the community. Hemp has been shown to remediate soil and provide healthy soil for communities to use and grow food with no harm to the young. I want to push to bounds with hemp to help heal the Earth through the soil.

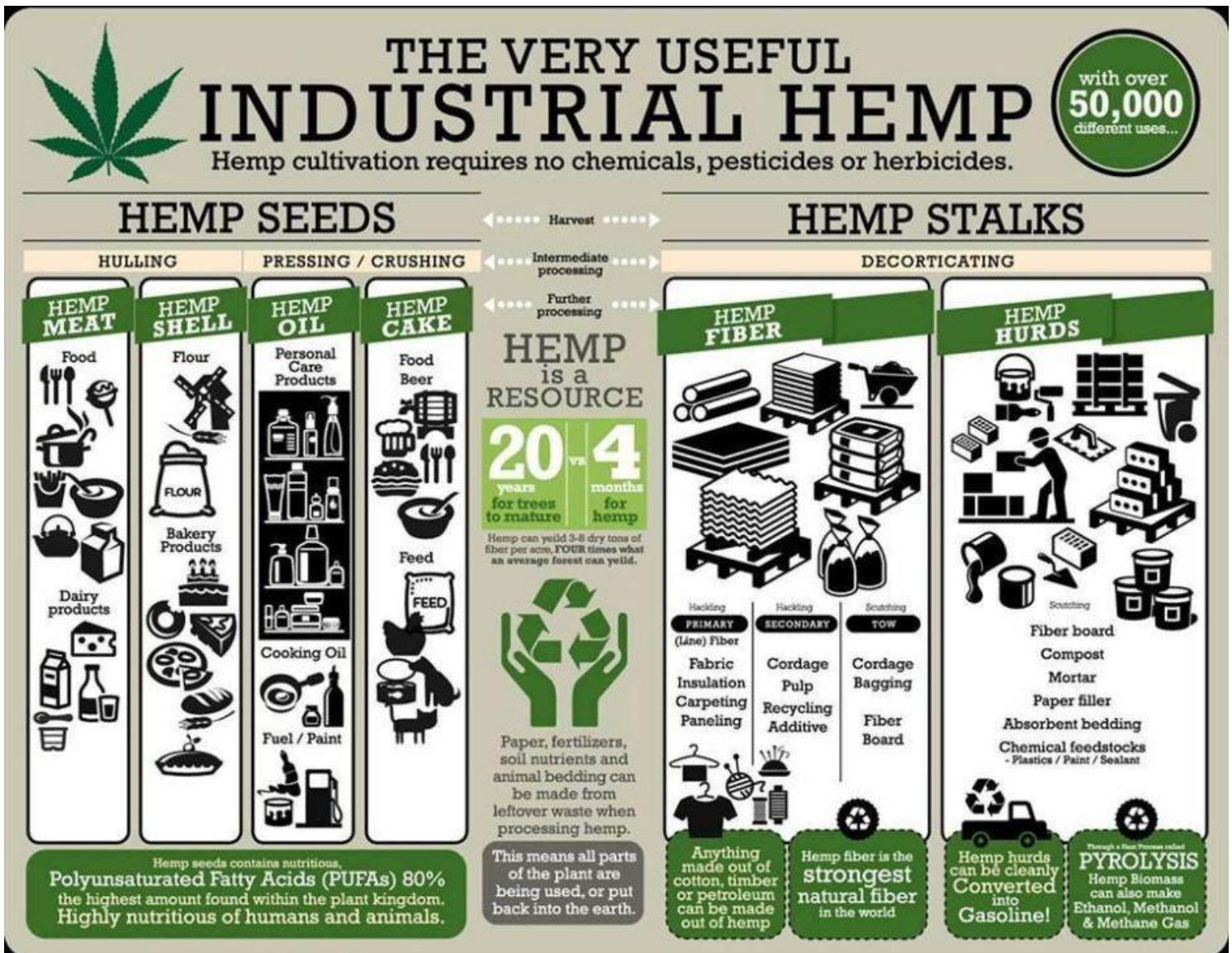


Figure 2: All the uses for Industrial Hemp

Chapter Two:

Proposal:

When growing hemp people need to have one quarter of an acre in Ohio to grow hemp legally. Also, one needs to have a hemp cultivation license from the ODA license is valid for three years. The application process includes two fees. The first fee is \$100 for applying for the license to grow hemp. The second one is \$500 per year per location for growing hemp. The application window in Ohio is between November 1st and March 31st, as well as getting your seeds from the ODA hemp seed program. After looking at the seeds that they provide the most effective one in my opinion for remediating the soil is a grain hemp plant. This variety of hemp is not as tall or too thick around to base to see the roots and stock makes it easier to check for pests. Before growing hemp plants to remediate the soil, take a soil sample to have a baseline level of contaminants by sending the soil sample to a lab for testing. This testing will be for all heavy metals.

Fertilizer for Grain Hemp plants

- Nitrogen – 100-130 lbs/per acre
 - Look out for older leaves that are turning yellow it is a sign that they need Nitrogen
- Phosphorus – 45-75 lbs/per acre
 - Look out for leaves changing colors from the outside of the leaf to the vein of the leaf, also a tie-die effect with green, yellow, and some purple
- Potassium – 35-100 lbs/per acre

- Look out for the tips of the leaves being brown and yellow in the center of the left finger. The center of the leaf is still green.

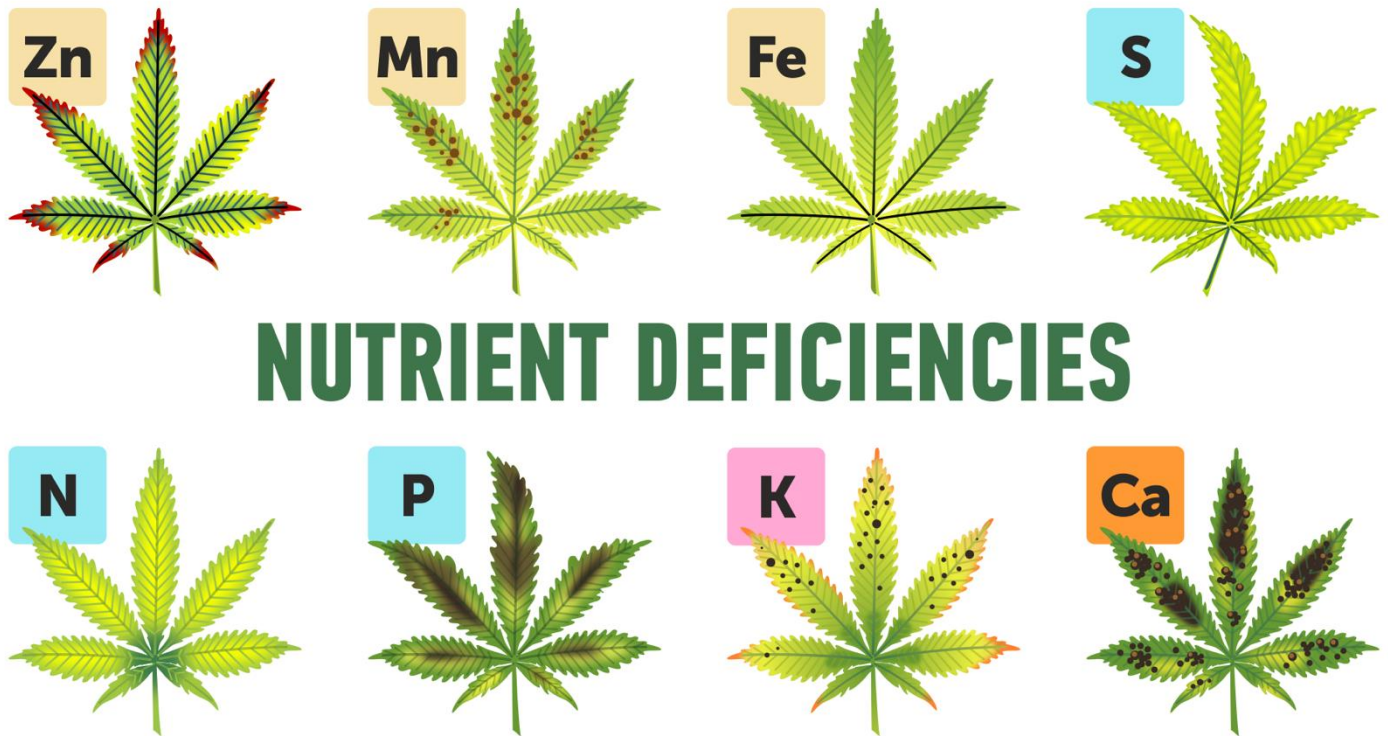


Image 2: Nutrient Deficiencies in Cannabis Sativa, Hemp

Grain Hemp Crops

Planting Time: Late-May to Late-June

Planting Method: Grain drill

Planting Density: 435,000 to 653,000 live seeds/acre (10-15 seeds/square feet)

Fertility: N: 100-130 lbs./acre, P: 45-75 lbs./acre, K: 35-100 lbs./acre

Crop Height: 4 to 8 feet tall, optimal height 5 to 6 feet

Crop Appearance: Single grain head on end of the stalk. Dioecious (male and female flowers on separate plants) or monoecious (male and female flowers on the same plant).

Harvest Time: Early-September to Early-October. The crop is harvested around 70 percent maturity (when bracts are half to mostly brown). Avoid letting bracts surrounding seeds open as this results in shattering (loss of seed from the mother plant). Harvest prior to heavy rains or strong winds to minimize shattering.

Harvest Method: Combine (preferably with draper head). Go slow through the field (2 to 3 mph) as the material will be very wet and hard on the machinery. The combine head should be adjusted to cut right below the majority of grain heads to minimize the amount of stalk material entering the combine.

Post-harvest Handling: Grain will be 12 to 18 or more percent moisture at harvest. It needs to be quickly cleaned then placed in a grain bin and dried with forced air to remove excess moisture and prevent spoilage. Grain can spoil quickly. Do not store overnight in grain wagons. Excess heat will lead to seed cracking and spoilage.

Storage: Grain is stored at 8 to 10 percent moisture. Periodic aeration is needed to mitigate moisture in grain bins.

Markets: Food companies where it is processed into food products

Comments: Monitor the combine carefully during harvest as stalks can wrap around gears and cause part failures and/or fires. As most seed is for human consumption, sanitary practices must be practiced throughout crop production and storage.



Grain hemp is planted further apart than fiber to maximize grain production.



Grain hemp is used for food production in numerous products.

Figure 3: Information provided by ODA on Grain Hemp Crops

Growing hemp, rows that are 6 feet apart, and planting seeds 5 feet apart. After three to four months and you will need to harvest the crop. Due to how long it takes to grow hemp, that means this process can only happen once a year. After harvesting the crop, take multiple samples of the soil to send to a lab to check the soil levels contaminant levels. If the levels are not within non-harmful levels for young children, do the planting of hemp again till the levels are within the non-harmful range. Hemp planting season is when the soil temperature is over 46 degrees and not over 50 degrees. So, you can start planting after the very last frost of the spring season.

The current Laws in Ohio that affect this solution and protocol. These laws are ORC 928 and OAC 901 Starting with ORC 928, ORC stands for Ohio Revised Code. Here is a brief overview of what it says. ORC allows hemp to be grown on a licensee with a permit if the site chosen is approved by the Ohio Department of Agriculture. The other bill that we are going to talk about from the State of Ohio is OAC. OAC, stands for Ohio Administration Code. In OAC 901, it goes in more detail about what can be done with hemp, how to process, seeds, sampling, background checks, and much more. The OAC 901 is to make sure that the hemp that is being grown in Ohio is safe to eat and use for human consumption.

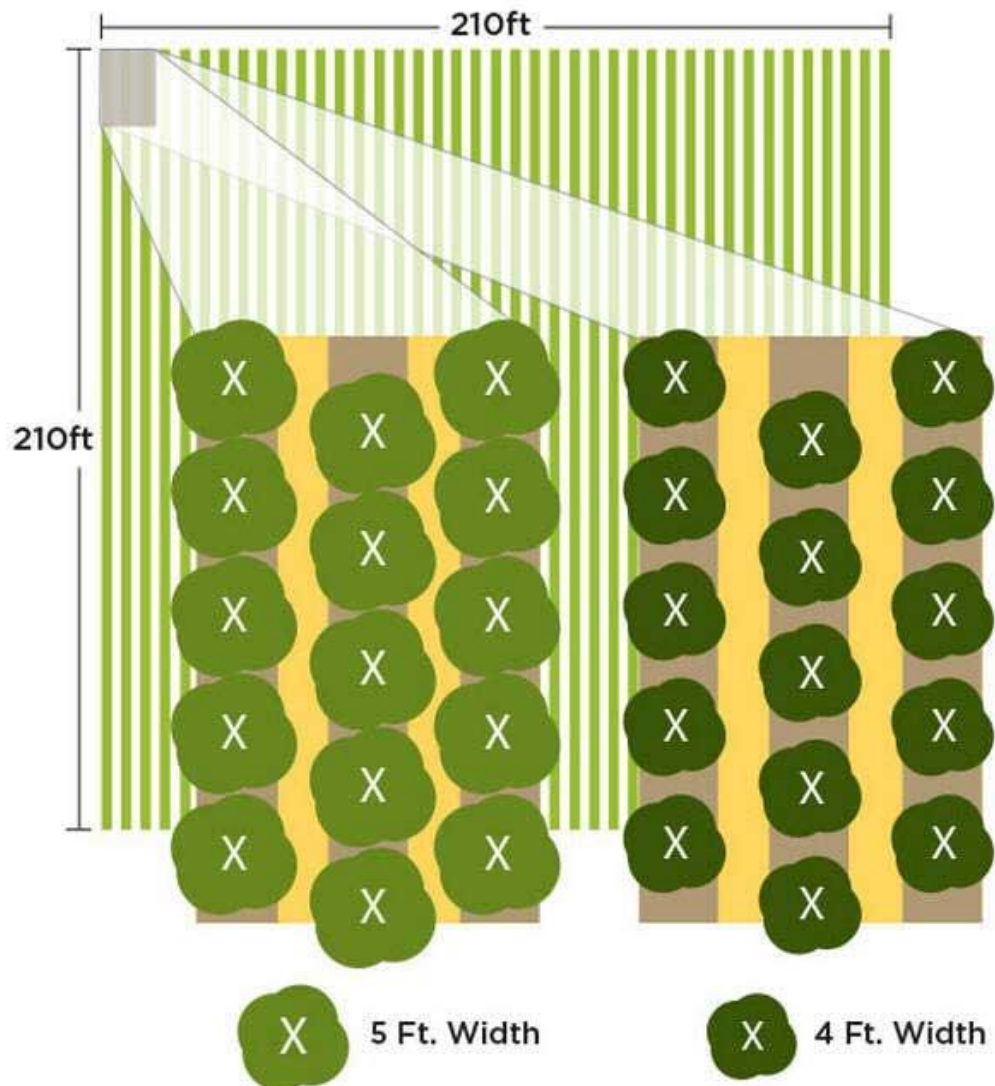
From my research, I have found that both the State of Ohio and Federal laws, say that if the hemp plant is used for any research, you can get sample data from the whole plant but then you must destroy the plant in case it can cause harm to humans. All good, but you are losing produce and products that you can make from the plant.

Cheyenne Mountain Seed Company
Field Planting Layout

1 Acre
5 Ft. Centers

41 Rows
41 Plants Per Row

1681 Total Plants



www.cheyennemountainseedcompany.com

Figure 4: Large-scale layout for growing hemp

Topic Information:

The items in the chart are for the project before additional the use of hemp, in guidance of Ohio and Federal laws.

	Questions	No	Yes	Yes	Yes
1	Location	Under ¼ acre	¼ acre	Over ¼ acre	
2	Soil Depth	Under 40 inches	40 inches	40 to 50 inches	Over 50 inches
3	Community support	No	Yes		
4.	Money for fertilizer and program	No	Yes		
5.	License + fees	Not approved	Approved with fees paid		

This list below explains the chart/table above.

1. Location:

- a. Less than a ¼ of an acre
 - i. Required by the state of Ohio
- b. ¼ an acre is needed for the state of Ohio to allow the growing of hemp

2. Soil Depth:

- a. Under 40 inches of soil, hemp cannot grow in less than 40 inches of soil
- b. 40 inches of soil is the bare minimum of soil needed to grow hemp
- c. 40-50 inches is ideal for hemp growing because of the root structure
- d. 50 inches is the best for growing hemp

3. Community Support/ Approval:

- a. Explain the benefits of hemp with soil health and explain how it can help the community
 - i. No
 - ii. Yes
- b. Do not need to get their support but would be better to keep thieves low by educating them that hemp is not weed
 - i. Based on information form I have heard and read. There is a problem with people stealing hemp even with proper signs because they have not been taught that there is a difference between the two

4. Money for Fertilizer and program:

- a. Fertilizer will be needed and possible signs or fences to keep people informed about the housing of fertilizer on the property for emergencies
 - i. If a child gets into the fertilizer

5. License and Fees:

- a. Need approval without using hemp
- b. Approved, pay fees
 - i. \$100 for application
 - ii. \$500 per year per location

About the Site

Toledo, Ohio has daily transportation pollution and historical pollution. Historical pollution is from old buildings that were destroyed and then covered with dirt or have been left standing and abandoned for nature to take back. Buildings before 1980 used lead paint. Over 92% of the buildings in this area were built before 1980. Toledo has some areas with old factories and buried old buildings with lead paint still on the walls. These factories were left to rust away leaving contaminants behind. Older buildings that were renovated also have been shown to have lead contaminants around them in the ground. The old lead paint that chipped off and fell to the ground around the buildings was then forgotten and buried under the soil to keep contaminating over time. Based on old maps and data from city research show that these areas that were factories or old buildings have higher than normal contaminants in the soil.

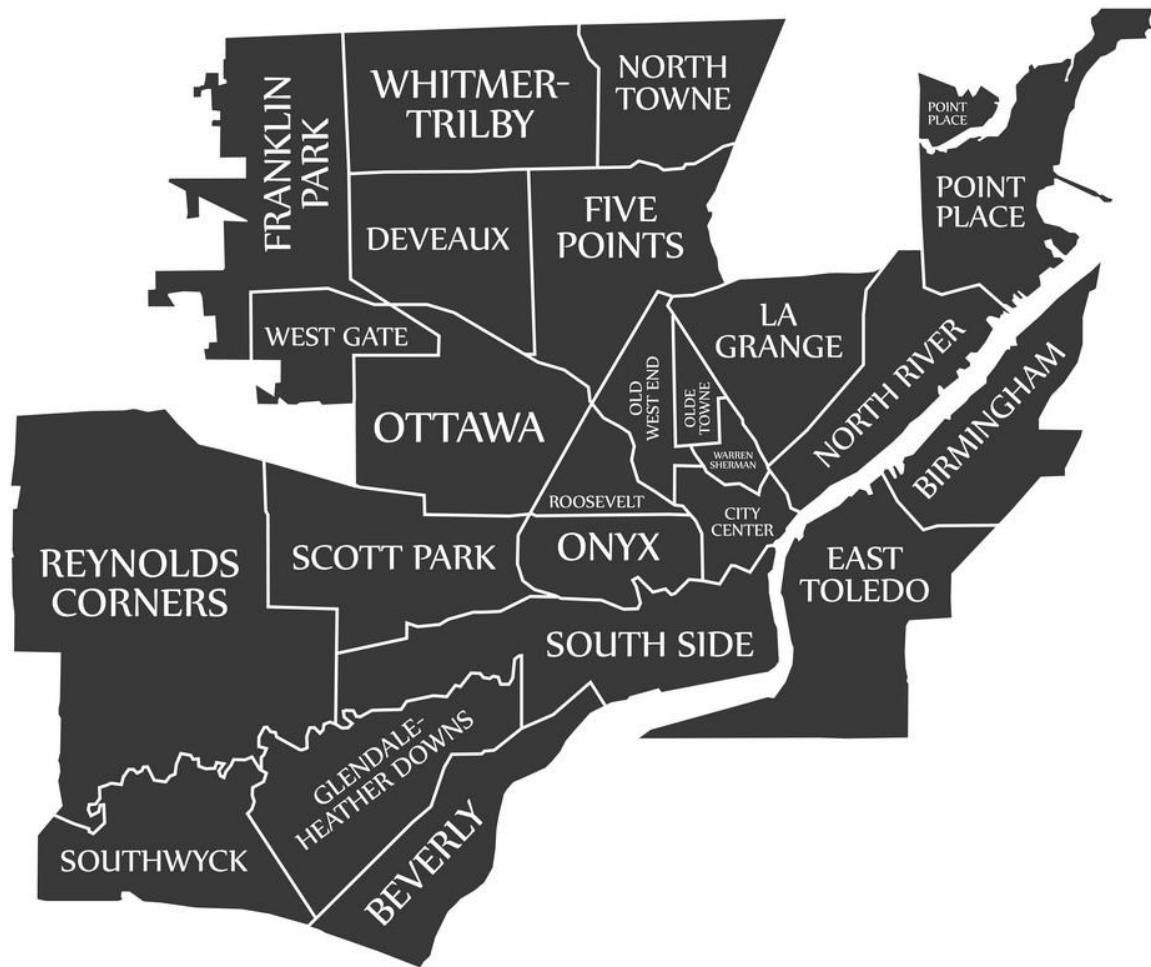


Image 2: Easy-to-read map of Toledo, Ohio

Chapter Four:

Case Studies:

Case Study 1:

Heavy Metal Soil Concentrations in the Urban Toledo, Ohio Area:

Legacy of Human Activities: May 2021

This first case study looks at heavy metals in urban Toledo this was conducted in May 2021. In May 2021, Karen R. Burris took 137 soil samples on personal properties, schools, and community gardens. The study explores which heavy metal contaminants were above EPA screening levels for arsenic, cadmium, chromium, lead, nickel, or zinc. Twenty-seven of these personal properties had gardens or were community gardens.

Karen R. Burris found out that in older homes and residential yards arsenic had a higher concentration for EPA screening levels in 73% of samples. When researchers looked at lead which was above the EPA screening levels in by 7% in the samples Karen R. Burris collected. With the researching of the heavy metal's cadmium, chromium, nickel, and zinc were above average in some samples but not but below EPA screening levels. The worst area they found with the highest heavy metal concentrations is the Old West End neighborhood.

This study helps with figuring out which heavy metals to look into when further research is done into phytoremediation threw hemp plants. As well as the locations to look into in the Toledo area.

Lead Poisoning and Environmental Justice Population:
Confirmed Venous Puncture BLLs per 1,000 Children under 6

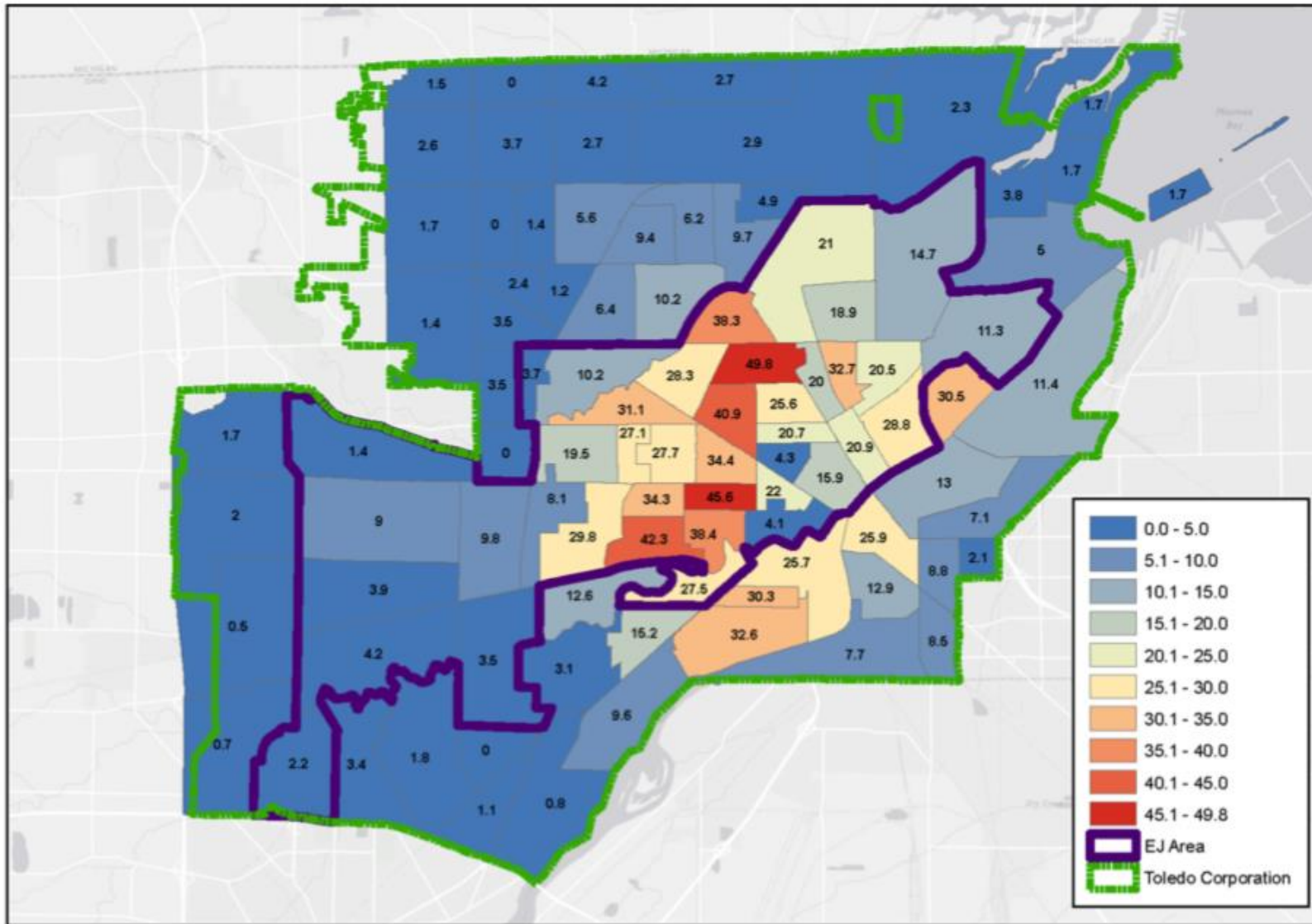


Figure 5: Lead poisoning in children report

Ohio Department of Health High-Risk ZIP Codes

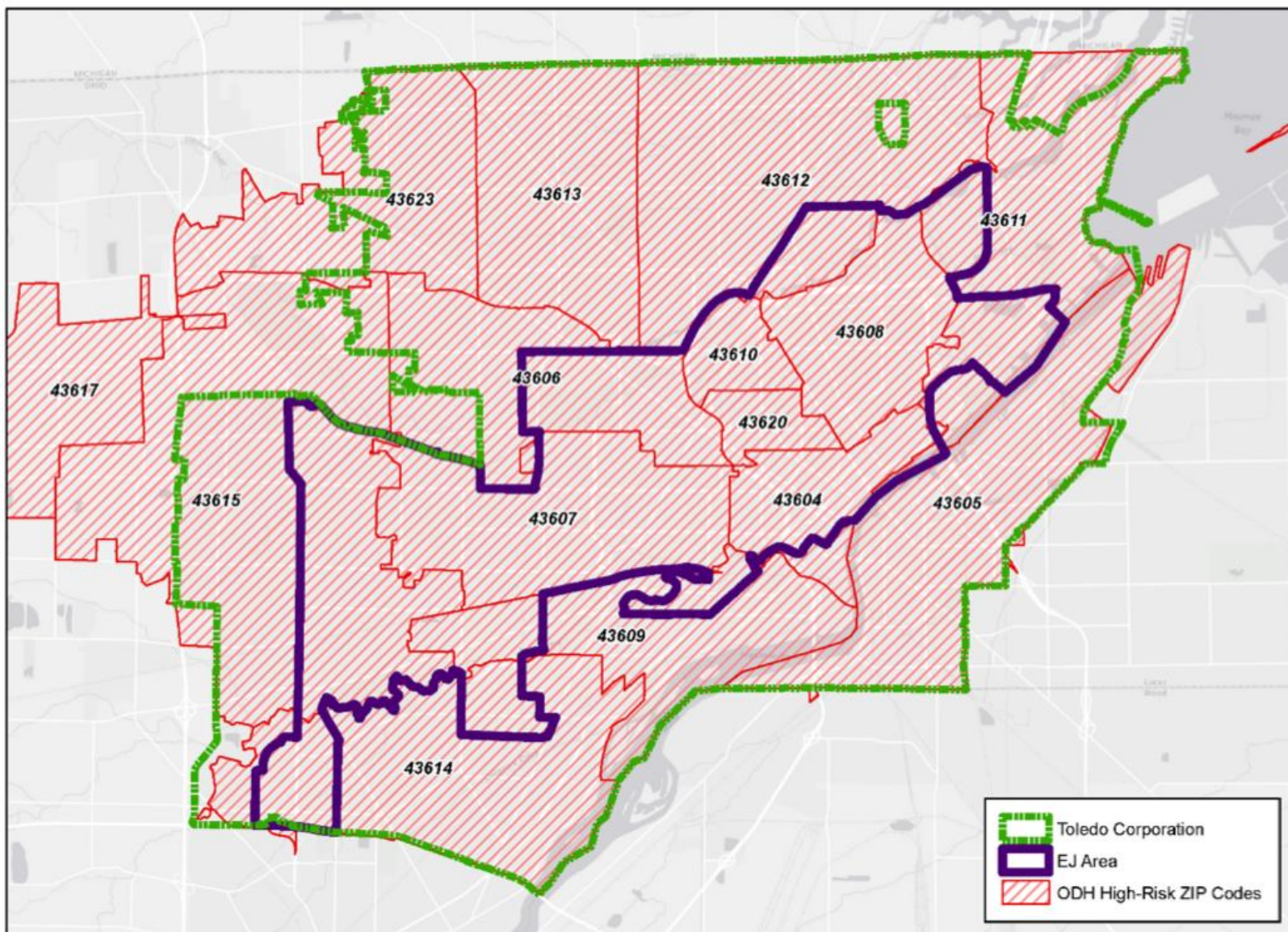


Figure 6: Zip codes with high levels of lead

Case Study 2:

Sources and Pathways of Lead Contamination in Urban Community Gardens in

Toledo, Ohio: May 2019

This case study investigates lead contamination in urban community gardens in Toledo, Ohio and the potential health risks that come with it in the soil. Brett J. Merkley found elevated blood lead levels in children as young as 2 years old and it was linked back to lead-based paint, lead gasoline, and other industrial sources such as old factories that were left to rust away. This study explains how lead can move through soil.

In May 2019, Brett J. Merkley took 399 samples in 27 community gardens, 218 of the samples were analyzed for heavy metals using an ICP-OES method for testing. Soil profiles were 40 cm in depth and were analyzed at 5 cm intervals. Brett J. Merkley used Historical Sanborn Fire Insurance maps to help identify areas that could be hotspots for soil sample collecting for testing. Brett J. Merkley was able to find factors that help with influencing soil contamination, including proximity to roads, past land use, gardening practices, and presences of drip zones (areas around buildings where lead- based paint may have contaminated the soil).

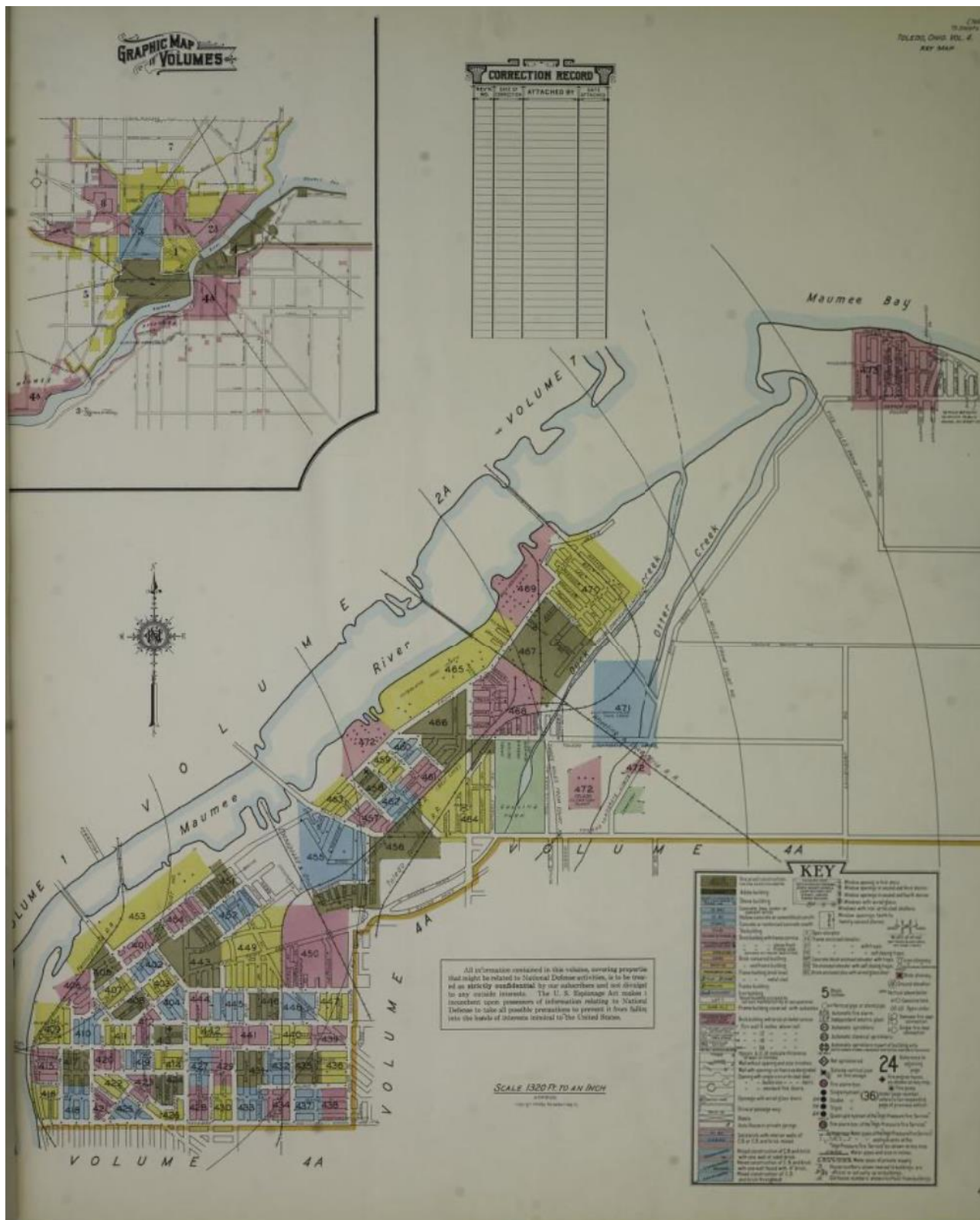


Image 3: Historical Sanborn Fire Insurance Map from Toledo, Ohio

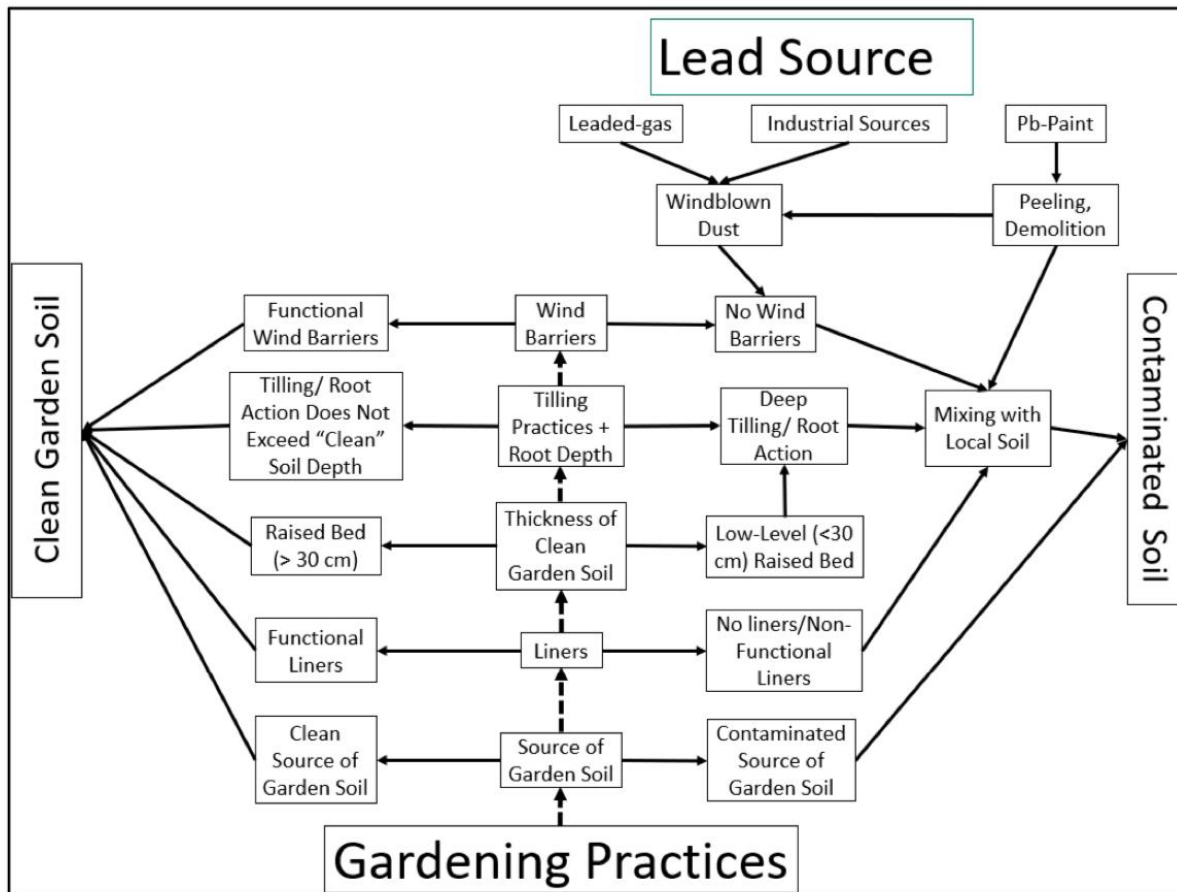


Image 4: How lead got into the soil and how is it still moving through the soil

This case study was used to see which areas would benefit the best from growing hemp to remediate the soil. The soil samples Brett J. Merkley took in May 2019, were of the depth of over 40 inches. This helped with showing the soil is of the proper depth to grow hemp. This study shows that you could grow hemp in Toledo and that there is enough soil to grow it in the communities of Toledo, Ohio.

Case Study 3:

Industrial Hemp (*Cannabis Sativa* L.) Can Utilize and Remediate Soil Strongly

Contaminated with Cu, As, Cd, and Pb by Phyto Attenuation: April 2024

The study explores the potential of hemp to remediate soil contaminated with heavy metals like copper, arsenic, cadmium, and lead using a method called phyto attenuation. Unlike phyto accumulators that absorb metals into their shoots, hemp retains most heavy metals in its roots, making it a safer alternative for contaminated land use. This allows the plants to still be used as food and not affect people.

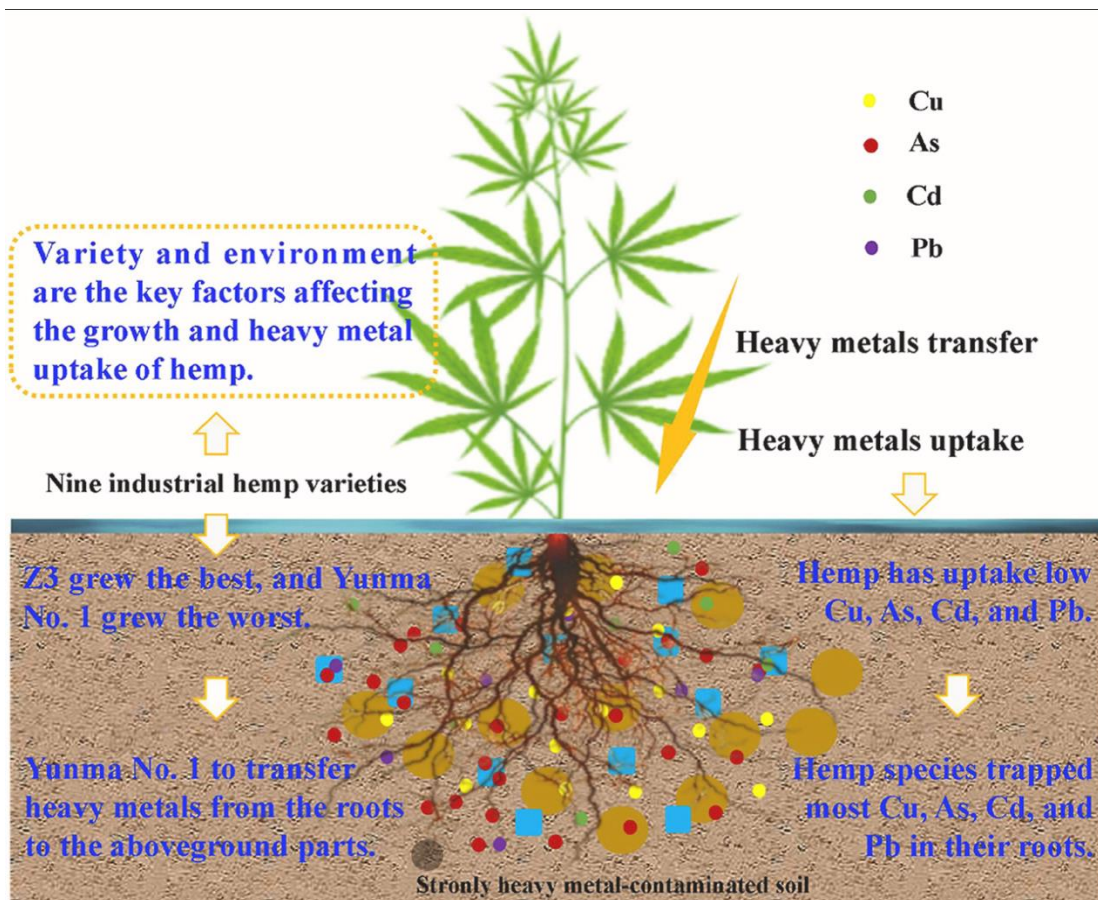


Image 5: Explanation of phytoremediation in hemp plants

Yuan Guo, Lan Wen, Xinlin Zhao, Chen Xing, and Rong Huaug found out that hemp grows well in highly contaminated soils even with high levels of copper, arsenic, cadmium and lead. After testing 9 different types of industrial hemp they tried and found out that there was a type that worked better for creating more biomass than the rest. There are three varieties of hemp that remove heavy metals form the soil better then others. The varieties of hemp are Futura 75, Felina, and USO 31.

This study helped me figure out which hemp are the most helpful with removing heavy metals form the soil, seeing that shorter hemp plants remove more then taller varieties.

Case Study 4:

Potential of Industrial Hemp for Phytoremediation of Heavy Metals: February 2022

In this study Dante F. Placido and Charles C. Lee looks at the potential of using hemp for removing heavy metals from the soil and if so how does it do this. The study looks into the heavy metals because they can not be degraded in the soil as organic materials. Can the hemp plant use a process called phytoremediation where the plant can be used to remove bad contaminants from the soil and make it better.

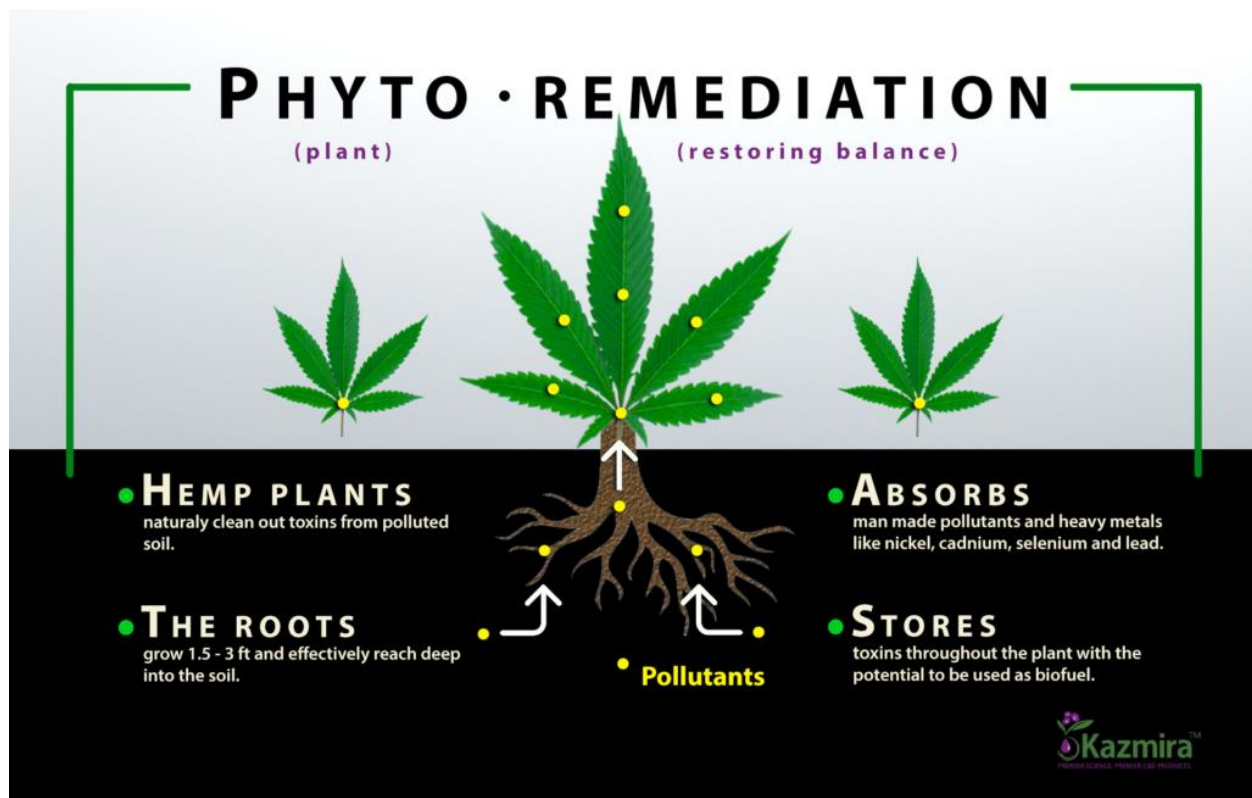


Image 6: Basic graphic of hemp with phytoremediation

This study also looks at all the different benefits to planting hemp in areas. Such as metal extraction, erosion prevention, reduces nutrient leaching and added organic mass to the soil through losing leaves while growing. This study shows that hemp is able and works well with remediating soils.

Project Goals:

1. Showing hemp can remove contaminants soils
2. Explaining phytoremediation with hemp
3. Creating a program for remediating soils with hemp

Programmatic Requirement:

With the research I have gathered you need to have the following items in-order to even start the following project.

- Land that is at least $\frac{1}{4}$ acre lot or more
 - As well as records of the land to find the old buildings
 - Locations of old drip zones
 - Records of past businesses
- Tools to maintain and plant the hemp plants
 - Drill, Seed Drill attachment, Hemp seeds from the Ohio hemp seed program
 - Shovel, Pruners
 - Insect sticky papers one for each plant to keep an eye on the good and bad bugs
- Fertilizer
 - Have the fertilizers separate by there elements not mixed. So, if it is only needed one you can just give it that one mineral/element
- Pesticides
 - Can be a natural or unnatural

- If going the chemical route, make sure to look at the EPA guidelines and follow to keep everyone safe
- Education material for the community to explain the different between cannabis and hemp
 - Explain the difference between the two
 - One is a drug in the eyes of the federal government
 - One can be used to many things and now legal by the government
 - Maybe create informational documents for parents and others that may use the produces

History of Hemp in the United States:

Hemp has been around in written text since 2700 B.C. in China, used for trade, food, clothes, and other types of uses for hemp. Hemp was grown and used in the early republic of the United States, by President Washington and President Jefferson. Hemp was also used as a paper to draft the constitution before the final version was made. So one could say that hemp played a big part in making the United States what it is today.

In the 1930's, farmers were growing hemp and used it in daily life as well for rope, clothes, and food. In 1937, a bill was passed called the "Marihuana Act". This bill required farmers to have a license to grow hemp, however obtaining these licenses very hard for farmers, and hemp slowly disappeared. There was one voice in the crowd that was pushing for the ban on Cannabis, head promoter of the bill, Harry Anslinger. Harry Anslinger also was the leader of pushing *anti-marihuana** legislation around the world calling for a ban on the plant too.

**Anti-marihuana – was the spelling used to create negativity around the Spanish speaking communities. The policy makers that did this were spelling how is sound and put an "h" instead of "j" to do this.*



Image 7: Propaganda made with misspellings to promote the bill to pass

There were two main groups that supported banning marjiauna after the end of the prohibition of alcohol in 1933. One, the law enforcement officials could not find who to be exact. Wanted to criminalize something else after alcohol was legalized and cannabis was what they chose. Two, the large corporations also lobbied for the bill. The politicians that supported the bill to pass wanted “cannabis” to be called “marijuana”, a term that was only really used in the Spanish speaking communities. When lobbyists started to lobby the public for the bill to pass miss spelled the writing of “marhijauna” because they did it based on how it sounded instead of how it was written.

In the 1940's, when the United States Navy was buying it's hemp ropes from the Philippines, the policy pushers supported to criminalize. They did not factor the use of hemp in the Navy's or the military's for holding ships in harbor threw hemp rope. In 1942, the Philippines were attacked by Japan causing the supply of the military's hemp and the Navy's cut off of hemp. This was right before Japan attacked Pearl Harbor. There was a campaign by the military to grow hemp again called "Hemp for Victory" which lasted 3 years then discontinued after the war.

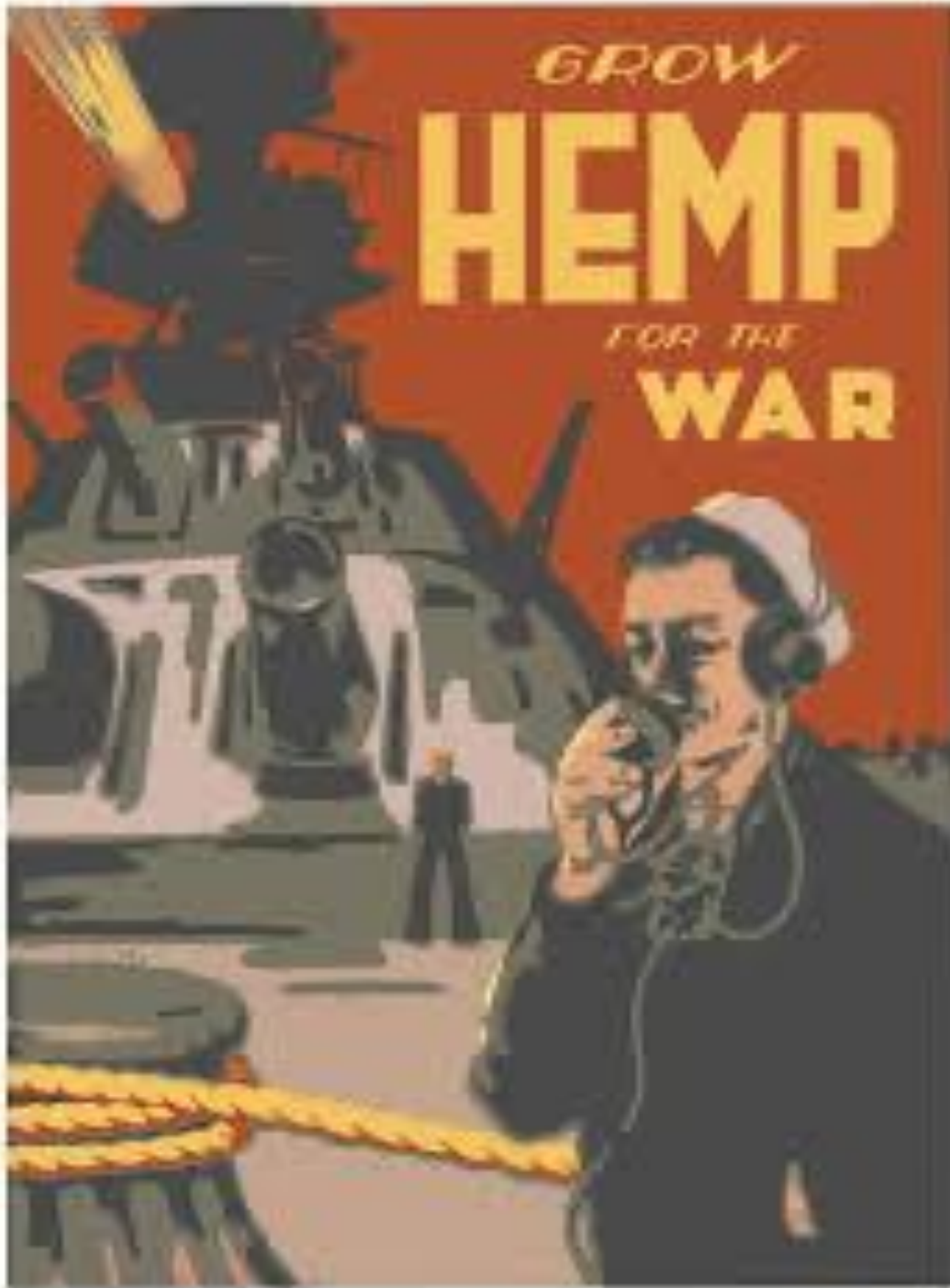


Image 8: One of the “Hemp for Victory” Poster

In the 1960's before the Vietnam War, cannabis was being used illegally in large cities for medication and recreational uses but not really outside of major cities. After the war was over the 1960's soldiers brought cannabis to home. After that every corner of the United States heard about Cannabis. Young men found Cannabis overseas in Vietnam and when they returned they found that most of their friends know about cannabis too. In 1968, President Nixon was in his first term had two political enemies that used cannabis, the Black Panther movement and the anti-war movement. Nixon created the DEA, and passed the Control Substance Act (CSA) (1970) to set cannabis as schedule 1. Schedule one allows police and other law enforcement to arrest peaceful citizens with cannabis in their possession. In 1986, under President Reagan administration he made laws on THC testing mandates for working in the government that are still in the books today. This means if you test positive your terminated for using cannabis which is federally illegal to use and grow.

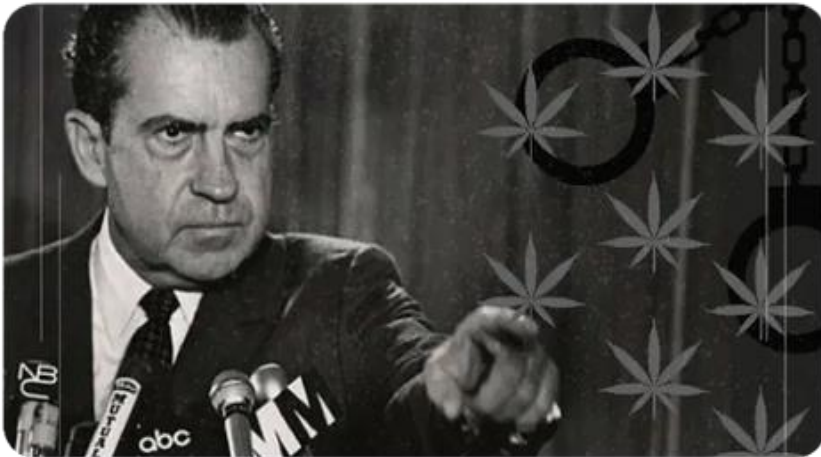


Image 9: Funny image of Nixon pointing at “his” problem cannabis that he “fixed” with the DEA

In 1970, CSA created five different levels of schedule for drugs in the United States and here are what they are. Schedule 1 drugs, seen as highly addictive and are not accepted for any medical use. Schedule 2 drugs, seen as highly addictive with severe psychological or physical dependence, but you could use them for medical use if prescribed by a doctor. Schedule 3, seen as intermediate addiction potential, used as medication. Schedule 4, seen less addictive properties and used as medication. Schedule 5, least addictive and is a controlled substance still due to some side effects that may happen. Hemp as grouped with Cannabis under schedule 1 making it illegal to have and use in the eyes of the DEA and federal government.

In 1994-1996, the HIA (Hemp Industries Association) was created by 45 U.S. hemp industry companies and the cannabis activist Chris Conrad served as the first president. The HIA only had a little over 200 members when it was started. Further, California passed the Compassionate Use Act for cannabis use for medical use only in response to the AIDS crisis. After California did this was next New England to medical use only for a time.



Image 10: This is the HIA logo

In the 2000-2004, the HIA filed a case against the DEA to court over adding more restrictions to hemp especially with the first court case that the HIA won this court case was about restriction and regulating hemp that only has 0.07% THC at most. The new restriction that the DEA wanted to impose was on hemp seeds and oil. As well as any produce that contained even trace amounts of THC. When the DEA did the ruling the HIA made an “urgent motion to stay” to stop it and wait for a court to pick it up. In March of 2002 the ninth circuit court picked the case up and ruled that the DEA could not do this because it is similar banning the trade of poppy seeds for having trace amounts of opioids. After the DEA lost this case, they decided to push a different law stating that if anyone who is trying to sell hemp or have hemp on them will get criminal charges. HIA did another appeal and won.

In the 2010's, the first of two Farm Bills were passed to help get hemp back to the United States. This first Farm Bill allowed and created pilot programs for hemp cultivation with THC testing showing the crop with below 0.3 percent in the dry weight of the crop. Afterwards CBD was able to come into the picture. The second Farm Bill was in 2018 when hemp was permanently legalized with 0.3% THC when tested. This was done in President Trump's first term and is presently still legal.

Federal Laws and Acts that affected Hemp

The Marihuana Tax Act of 1937

The Act caused all farmers that were farming hemp at that time to get registered with the federal government as well as paying extra taxes. This was the cause of the decline in growing and processing of hemp. This law was to target marijuana without distinction between hemp and marijuana. They purposely misspelled marijuana with an “h” for the “j” to influence the public into negative thoughts to the Spanish community who used this term marijuana for cannabis when talking to other about cannabis.

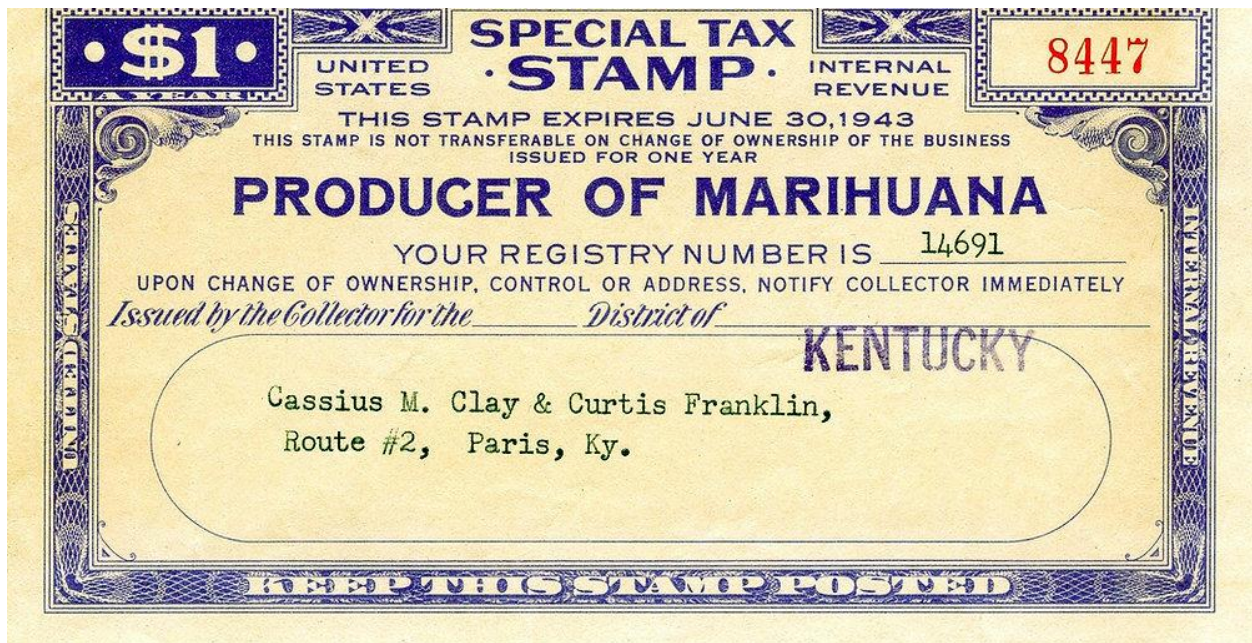


Image 11: A Special Tax Stamp for a Producer of Marihuana

The Controlled Substances Act of 1970

This bill made hemp and marijuana a schedule one drug making it illegal to have and grow the plants. Which lead to many people, farmers and doctors to be arrested.

MED SHADOW Balancing the risks & benefits of medicines DRUG CLASSIFICATION SCHEDULE		
SCHEDULE	DESCRIPTION	EXAMPLES
I	Substances have no currently accepted medical use in the United States, a lack of accepted safety for use under medical supervision and a high potential for abuse.	heroin, LSD, marijuana (cannabis), peyote (mescaline), methaqualone (Quaalude), 3,4-methylenedioxymethamphetamine ("ecstasy") and "bath salts."
II	Substances in this schedule have a high potential for abuse which may lead to severe psychological or physical dependence.	NARCOTIC: hydromorphone (Dilaudid), methadone (Dolophine), meperidine (Demerol), oxycodone (OxyContin, Percocet), and fentanyl (Sublimaze). NON-NARCOTIC: amphetamine (Dexedrine, Adderall), methamphetamine (Desoxyn), and methylphenidate (Ritalin).
III	Substances in this schedule have a potential for abuse less than substances in Schedules I or II and abuse may lead to moderate or low physical dependence or high psychological dependence.	NARCOTIC: combination products containing less than 15 mgs of hydrocodone per dosage unit (Vicodin), products containing not more than 90 mgs of codeine per dosage unit (Tylenol with codeine), and buprenorphine (Suboxone). NON-NARCOTIC: benzphetamine (Didrex), phendimetrazine, ketamine, and anabolic steroids such as Depo-Testosterone.
IV	Substances in this schedule have a low potential for abuse relative to substances in Schedule III.	alprazolam (Xanax), carisoprodol (Soma), clonazepam (Klonopin), clorazepate (Tranxene), diazepam (Valium), lorazepam (Ativan), midazolam (Versed), temazepam (Restoril), and triazolam (Halcion).
V	Substances in this schedule have a low potential for abuse relative to substances listed in Schedule IV and consist primarily of preparations containing limited quantities of certain narcotics.	cough preparations containing not more than 200 milligrams of codeine per 100 milliliters or per 100 grams (Robitussin AC, Phenergan with Codeine), and ezogabine.

Source: <https://www.dea.gov/drug-scheduling>

Image 12: CSA Schedule

Agricultural Act of 2014

The bill is referred to the 2014 farm bill and here is what it did for hemp in short. This bill opened to doors for universities and state agriculture departments to start growing hemp and allowing the study of the plant. Even though it is still called a schedule one drug, research with granted exemptions is allowed. Finally, the bill defined Industrial hemp as *Cannabis sativa L.* with less than 0.3% THC when tested in a lab. Separating the two from each other. DEA still had control over hemp, farmers needed approval from their state agriculture departments and had to follow very strict guidelines to grow hemp.

Hemp vs Marijuana

Hemp	Marijuana
Psychoactive Content: Trace amounts 0.2-0.3%	Psychoactive Content: Yes, in varying quantities.
Estimated levels of THC: Low THC (<0.3%)	Estimated levels of THC: High THC (4%-35%)
Uses: Building materials, skin care, clothing, construction, amongst many other areas of industry.	Uses: Marijuana is generally grown for flower production, which are commonly used for either recreational or medical purposes.
Legality: The plant is generally considered legal if the THC content is below 0.3% in the US and below 0.2% for european standards.	Legality: Each country (or state in the US) will have varying laws, but is considered illegal across the majority of the globe.



ENDOCA

Image 13: Explains the difference between Hemp and Marijuana

Agriculture Improvement Act of 2018

This farm bill removed hemp as a schedule one drug and made it fully legalized industrial hemp at the federal level. Hemp was made a legal agricultural commodity if the plant had less than 0.3% THC, allows farmers to grow hemp, process, sell, trade and transport hemp across state lines. Which was previously restricted in the previous, farm bill of 2014.

Hemp is regulated under the USDA, not the DEA anymore, eliminating the many legal barriers that the DEA tried to put up in the past with hemp allowing State governments and Native American tribes could regulate hemp production with their own say. Farmers much comply with the state-approved hemp programs overseen by USDA, allowing the expansion of research and funding for the research on hemp in these programs. Farmers who grow hemp can now get crop insurance, as well as federal grants.

HEMP

Taller and have
skinnier leaves

Used for industrial
purposes, such as
textiles and paper

Legal to grow in many
countries, including
the United States

Low THC content
(less than 0.3%) and
high CBD content

Potential health benefits, including
reducing inflammation and anxiety



VS

MARIJUANA

Plants are shorter and
have broader leaves

Primarily used for
recreational or
medicinal purposes

Illegal in many
countries, including
the United States

High THC content
(5-20%) and low
CBD content

Psychoactive effects and can
cause altered perception



Image 14: Hemp vs. Marijuana

Chapter 5

Process Documentation:

For this to work you need to educate the public and community. As well as having the laws around growing Industrial Hemp on location to allow the possibility for high school to teach Industrial Hemp if they have what to and teach the history on it was well.

Project Solution:

To heal the soil, we need to have more options for the people to use to remediate their own soils. Apart of my solution is to write to my law makers in Ohio to allow the people to grow a historical crop again with less restrictions. In hope, that they will be interseted in showing the history of the plant in high school education if the school decides to. As well as to inform the public of the difference between Hemp and Cannabis. Explain how Industrial Hemp is different and how it was used in the past. How can be used today, clothes, ropes, food, fuel, oil etc.

In order to educate the public and community on Industrial Hemp, they need to be involved in the process. Hold community events for clearing a field or area for planting of hemp and turning it into a education lesson as well. Showing the public and community the products that Industrial Hemp can be used for as well as informing on how the plant helps the soil as well. Have posters and demonstrations on how to do it yourself at home if you grow your own.

Currently, the State of Ohio's laws around growing hemp are strict on where you can grow hemp here are some of the guideline they have in place on growing Industrial Hemp in Ohio. When growing Industrial Hemp the plants have to be at least 500 feet away form the following building and other property lines: schools, public parks, or a not approved sites by the Ohio Department of Agriculture. When looking at a city center it is very hard to find a location

that is the right size and location to be allowed by the State to grow in that area. If you do find a location that meets the criteria you still need approval from Ohio Department of Agriculture. As well as jump through all the hoops they throw up.

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