Harvesting Los Angeles: Community Based Urban Agriculture for Soil Remediation

Occidental College

Sofia Buchler
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Abstract

Los Angeles County once flourished as a center of west coast agriculture, and was home to a basin of uniquely fertile soil. The agricultural potential of LA's soil is compromised by pollution from heavy metals and other toxins, creating a public health risk that degrades both human health and ecosystems. Environmental hazards and higher levels of food insecurity are both disproportionately located in non-white communities due to a history of racist zoning policies and systemic disenfranchisement. This study argues that soil restoration for urban agriculture is the ultimate clean because it can result in clean soils, increased food and land autonomy, and added green space. Practices that benefit soil health, such as mulching and composting, also dilute toxins in soil, decreasing community exposure to pollutants. Despite the myriad benefits of urban agriculture for soil restoration, farmers and communities lack basic support from the city of Los Angeles to realize urban agriculture projects and clean soil in their neighborhoods. This study investigates the barriers to soil restoration identified by urban farmers, employees of organizations and researchers. The conclusions from the data reveal the need for funding for soil restoration and agricultural projects, as well as city-wide programs for composting and other gardening resources. These policies must channel funding to communities who have historically carried an unequal burden of contamination and food insecurity, while also streamlining the different entities who regulate and test soil to make the process of cleanup less convoluted.

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Introduction

Urban agriculture in the United States is emerging as a creative solution to soil contamination. Techniques include amending existing soil with compost or organic materials, using phytoremediation, and bringing in clean soil if existing soil is too contaminated (Schwartz et al., 2016, p. 2). The contamination of soil in cities is detrimental to the health of its inhabitants, especially for a metropolis like Los Angeles with great soil potential. (Surls and Gerber, 2016, p 86-95). Before LA experienced a population boom after the second world war, the land use of the area was primarily agricultural, and was once known for its fertile soil (Surls and Gerber, 2016, p 75). The Los Angeles of today has widespread soil contamination from factories, refineries, and toxic leaks, as well as other cumulative factors that contribute to unhealthy soil, such as runoff, and years of soil mismanagement (UC Cooperative Extension, 2013, p. 5). Environmental racism, specifically the concentration of polluting industry in Los Angeles is well documented, and results from decades of racism dictating the spatial make-up of the city (Pulido, 2000, 33) (Morello- Frosch and Shenassa, p.1150, 2006). Vacant lots and brownfields are common in Los Angeles, and are excellent candidates for urban agriculture projects. These lots, however, pose a high risk of contamination, making soil restoration imperative for healthy food growth (Campbell, 2012, p.4).

There are a number of soil restoration movements throughout Los Angeles, both through organizations and government entities such as the LA Department of Water and Power that are seeking to provide information and tools for soil restoration and urban gardening. This study examines soil contamination and food insecurity as manifestations of environmental racism in Los Angeles, and poses soil remediation for urban agriculture as a community-based solution to these issues. This study seeks to examine the questions: What are the best practices for soil remediation for urban farming in Los Angeles? And, how has soil remediation as a community-based project benefitted Los Angeles communities? The study provides Los Angeles urban farmers and community members with an accessible guide to soil remediation, which is necessary to ensure that the full benefits of community based agricultural projects

can be realized safely (EPA, 2011, p.13). While attempting to build a more equitable food chain through urban agriculture, soil contamination must be considered because of the dangers it poses to both farmers and consumers (Campbell, 2012, p.16). The existing research lacks a comprehensive, up to date, and Los Angeles specific guide for choosing and implementing remediation tactics, a gap that this study seeks to fill through connecting directly with farmers who have remediated their own soils. In answering the above research questions, this study also exposes gaps in government funding, and the lack of accessible gardening resources available to Angelinos. In addition to a best practice guide for farmers, I also pose a variety of policy solutions to address the lack of resources in Los Angeles.

Background

Urban agriculture takes many forms, including school gardens, community gardens, backyard gardens, and urban farms (UC Cooperative Extension, 2013, p. 111). Urban farms are defined as larger scale plots for food cultivation and animal husbandry, and can be privately owned, or owned and operated by organizations. Backyard gardens are located on private property, and commonly used by the property residents, while community gardens are operated by organizations or a collection of individuals and families (Wooten and Ackerman, 2011, p. 4). School gardens are located on school property and used for educational purposes (UC Cooperative Extension, 2013, p.111). Urban agriculture is the umbrella term used to describe all of the operations above, or any form urban food growth may take. Some urban farms sell to farmers markets, while others are part of community organizations or schools, and provide their produce to communities for free (Surls, 2013, p.114). Incentive policies exist to support urban agricultural initiatives, such as the urban agriculture incentive zone program, but do not exist to incentivize soil clean-up (Surls, 2016 p.10). Plots with the potential for food growth must be tested for contaminants and cleaned before communities can safely work, play, and grow food on them. Incentivizing soil clean-up is crucial for ensuring that a thorough clean can be conducted before crops are planted. Without available resources for testing and remediation, vacant properties cannot be repurposed, let alone be used for agriculture. Seizing the opportunity to remediate vacant properties for agriculture has been proven to have

multiple community benefits, such as improving affordability and access to fresh produce (Golden 2013 p.11). Remediating soil for community based urban agriculture can be a step towards food and land sovereignty (Bonacich and Alimahomad-Wilson, 2011, p.220), because it provides communities with more agency over the land use in their neighborhoods. Food sovereignty can be defined as the process by which communities can reclaim control over their food systems at every step, from growing food, to distribution, to consumption. Similarly, land sovereignty can be defined as communities taking control of, and making decisions about their own land and territories.

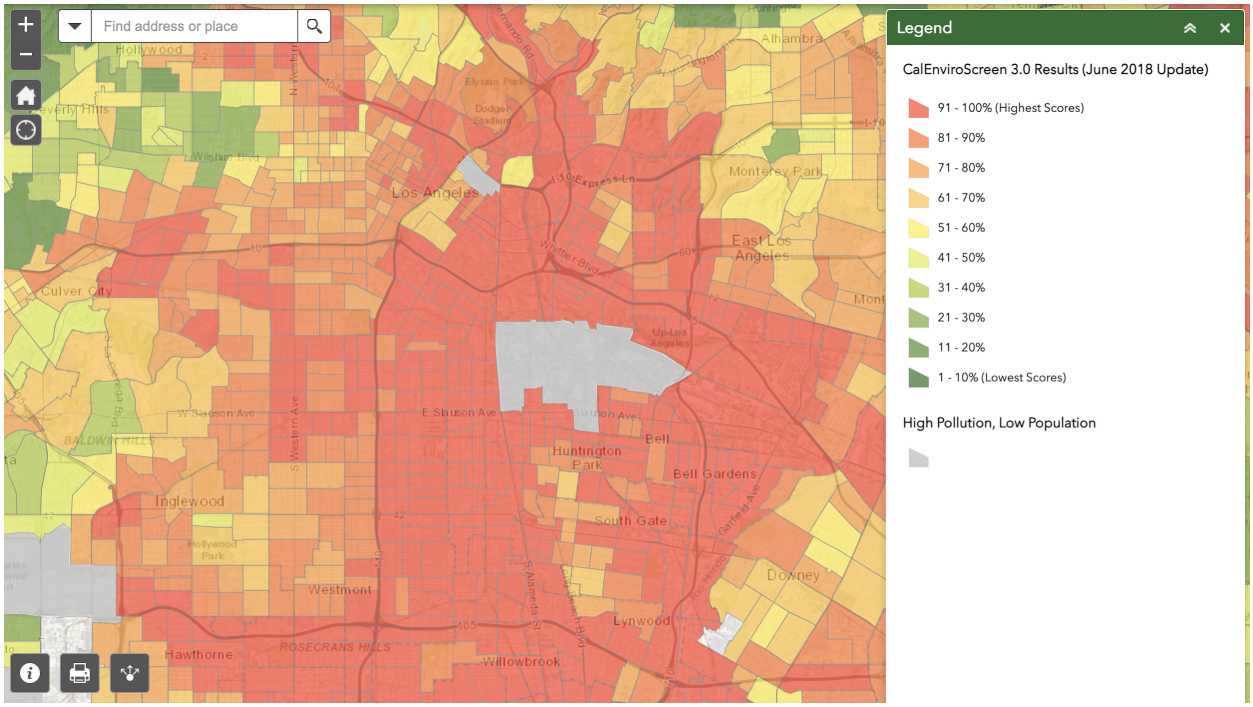
Brownfields and vacant lots can be good candidates for urban agriculture because they lack a current use, and can pose the risk of environmental hazards for nearby residents. Brownfields are idle lots that are known to be contaminated or perceived to be contaminated with toxins from prior industrial use (Campbell, 2012, p.5). Vacant lots also pose a risk of contamination, though not all vacant lots have a prior use that would have contaminated the soil (Campbell, 2012, p.4). Contaminants that are frequently found in urban soils include arsenic, cadmium, copper, zinc, other heavy metals, and persistent organic pollutants (POPs), all of which pose a danger to human and soil health (Surls, 2016, p.4). These chemicals also pose a risk of contaminating the watersheds beneath the soil by leaching into groundwater over time (Campbell, 2012, p. 7), therefore, cleaning the soil on brownfields and vacant lots benefits public health and local ecosystems through reducing community exposure to these toxins. Repurposing these plots for agriculture does not only offer the aforementioned community benefits, but it is also the ultimate method of remediation. The EPA thresholds for toxins and heavy metals in the soil are the strictest for agricultural uses (EPA, 2014, p.3), meaning that the most thorough clean-ups take place for food growth, as opposed to residential development. Therefore, the full benefits of urban agriculture can be realized through remediating contaminated soil to improve public health overall, and provide communities with the plethora of benefits that local food growth offers.

This study contends with the unequal distribution of soil contamination, and argues that communities at the frontlines of environmental hazards should be prioritized for soil restoration projects. Los Angeles has a long legacy of racist zoning policies and disenfranchisement in non-white

communities, which has lead to disproportionate pattern of environmental hazards across the city (Pastor, M., Sadd, J., & Hipp, J., 2001, p.19). Perhaps the most poignant example of unequal distribution of environmental risk in Los Angeles is the Exide disaster. Exide was a battery recycling plant which leaked lead into the residential properties surrounding the plant since the 1970s, and went severely under regulated by the Department of Toxic Substance Control (DTSC) (Johnston, J. E., & Hricko, A, 2017). The Exide disaster continues to affect communities years after clean-up began, and is further discussed in the data analysis to expose the need for better regulation and funding for soil remediation. The scope of Exide's soil contamination spans nearly two miles from the facility, reaching Boyle Heights, Commerce, Maywood, and Huntington Park, among other neighborhoods (Johnston, J. E., & Hricko, A, 2017). According to the 2010 census, the neighborhoods affected are between 94 and 98 percent Latinx, (*Population and Race of Neighborhoods of the City of Los Angeles, California*. 2010) (*US Census Bureau,* 2010). Below is pollution mapping from CalEnviroScreen which provides data of the pollution burden faced by these neighborhoods. Pictured on the map are the aforementioned cities, coded in red and orange to show that they suffer from the highest pollution burden. This pollution burden data, coupled with the racial makeup of the affected neighborhoods from the Exide disaster, provides context for Los Angeles's landscape of environmental racism. To further highlight the racial gap in the pattern of environmental hazards, the upper left-hand corner shows Beverly Hills, coded in green and yellow to indicate a lower pollution burden. Beverly Hills is 81.9 percent white (*US Census Bureau,* 2010).

Map 1

Pollution Burden Map of East and South East Los Angeles



Source: (OEHAA, (June 2018), *CalEnviroScreen 3.0 Results* [Map]. Retrieved from https://oehha.ca.gov/calenviroscreen/maps-data).

Southern California has a complex matrix of regulatory agencies with overlapping responsibilities. This complicates finding which agency can support soil clean-up initiatives, especially when past regulatory failures like Exide are taken into consideration, because these failures can diminish trust between agencies and communities. Table 1 shows the variety of agencies responsible for regulation and clean-up in Southern California. These agencies report to the California Environmental Protection Agency, which in turn reports to the national Environmental Protection Agency. Grants for clean-up of brownfields are available through the Department of Toxic Substance Control and the US Environmental Protection agency (CalEPA, 2000, p.10), (EPA, 2020, p.1). Because grant funding is the only option for brownfield remediation, individuals and organizations must apply for funding at each individual site. This places responsibility on communities with contaminated soils to apply for funding to garden safely, despite the source of contamination often being the regulatory failures of those agencies to begin with.

Additionally, if the site in question is not a brownfield or a cleanup site that Cal/EPA is responsible for, farmers are responsible for conducting their own testing and cleanup (Surls, 2016, p.3). The matrix of different agencies in Southern California is difficult to understand, especially for the layperson looking to start an urban agriculture project. The individuals interviewed for this study have contended with soil contamination in unincorporated areas of Los Angeles, meaning that there are also multiple local governments at play, with different policies for clean-up and zoning, which further complicates these silos of agencies.

Table 1

Southern California Agencies Responsible for Soil Regulation

Regulatory Responsibilities	**Agencies**
Overseer of southern california agencies	California Environmental Protection Agency* (CalEPA, 2000, p. 1).
Conducting site investigations and cleanup discussions	Department of Toxic Substance Control (DTSC), State Water Resource Control Board (SWRC), Regional Water Quality Control Board (RWQCB)*
Funding brownfield clean-up for reuse	DTSC*, US Environmental Protection Agency (EPA)+ (EPA, 2020, p.1).
Setting contamination thresholds for heavy metals and other pollutants	CalEPA*, EPA+

Source:

*CalEPA, 2000, p.1, CalEPA, 2000, p.10
+EPA, 2020, p.1

Literature Review

Soil restoration for urban agriculture is essential for the social and economic benefits it can provide to communities. These benefits include addressing vacant lots, cleaning contaminated backyard soils and brownfields, and providing accessible fresh produce. The literature provides context for the importance of community led soil restoration projects for urban agriculture, as well as details the safety practices that must be adopted to ensure that farmers and community members are protected from contaminants. The literature review examines the conditions of environmental racism present in

communities, and argues that these conditions can be mitigated through community led urban agriculture projects. Community efforts to clean soil for agriculture, however, have the potential to cause communities to ingest more toxins if proper precautions are not taken (EPA, 2011, p.13). Extensive research has examined correlations between race and environmental hazards in Los Angeles (Pulido, 2000, p. 20). Spatial data show that toxic waste sites, air pollution, toxic spills (Pulido, 2000, p. 20), and food deserts (Bonacich and Alimahomad-Wilson, 2011, 220), are concentrated in communities of color in Los Angeles. These conditions continue to be crafted by racist policies, and historically have come about as a result of white flight from urban areas, white privilege dictating land use (Pulido, 2000, 33), and legacies of racial segregation in cities (Morello- Frosch and Shenassa, p.1151, 2006).

Food swamps in Los Angeles are indicators of a systemic lack of investment into non-white and low income communities. A food swamp can be defined as a neighborhood that lacks access to fresh, healthy produce. Communities with lower access to fresh produce are also the targets of "spatial patterns of industrialization" (Morello- Frosch and Shenassa, p.1150, 2006), and thus are put at a higher risk for pollution and soil contamination. Urban agriculture projects pose a solution that cleans polluted soil and shortens the food gap, and therefore could be a powerful strategy in neighborhoods that have been targeted with both issues. This conclusion from the literature proves that the necessity for urban soil restoration for urban agriculture goes beyond simply greening communities. Community driven agriculture projects have the potential to improve food access and "provide educational, youth development, job training, and community building opportunities" (Golden, 2013, p.5). Community control over soil restoration and community gardening projects creates a connection between local residents and their food systems, an essential step towards food and land sovereignty, as well as improved affordability of produce (Golden 2013, p. 10). These projects also pose creative solutions to broken food systems as a multifaceted issue, because they address soil contamination, food insecurity, and pose a community solution to a systemic issue (Bonacich and Alimahomad-Wilson, 2011, 219). It is important for soil restoration projects for urban agriculture to be community driven so that the full benefits of these projects can be realized. Self reliance, community determination, and increased activism (Bonacich and

Alimahomad-Wilson, 2011, p.220), as well as improvements in general mood and self esteem (Golden, 2013, p.9), are all benefits that have been proven to arise from community gardens.

Brownfields and Cleanup Opportunities

The presence of brownfields in communities are also cause for concern, as they pose health risks for communities (Campbell, 2012, p.4). The health risks posed emerge from toxins that remain in the soil from prior use, such as lead, cadmium, barium, and persistent organic pollutants (POPs), which pose a risk to neighbors living near the sites (Mcbride et al. 2014, p.16). Cleanup of these sites removes the toxins from neighborhoods, and also removes other dangers such as dilapidated buildings. Cleanup of neglected sites has been proven to reduce crime and positively affect social cohesion (Campbell, 2014, p.4). Repurposing these sites as gardens can have a doubly positive effect on communities, through removing hazards and providing an outlet for community building. These compounding benefits make brownfields and vacant lots some of the most desireable lots for urban agriculture, and also reveal the importance of cleanup protocols. Working in soils contaminated with heavy metals such as lead poses a significant risk to farmers, who could inhale toxins, or track them into their houses (EPA, 2011, p.13). In addition, heavy community involvement in gardening poses the risk of exposing children to toxins, who are more likely to expose themselves to contaminated soil directly through touching the face and mouth (EPA 2014, p.23). In addition, some edible plants are especially susceptible to toxin uptake, specifically root vegetables (McBride et al. 2014, p.1), meaning that sufficient soil remediation is necessary to protect not only farmers and their families, but all community members who are consuming food from the garden.

Assessment of Literature on Soil Restoration Best Practices

The table below lists the recommended steps for soil cleanup synthesized from the literature. The literature supports the claims made on the importance of soil remediation for both farmers and surrounding communities, and asserts that the health of soil cannot be understood without proper testing (EPA, 2011, p.13). Although there are quick tests that farmers can perform to get an idea of the soil fertility (Surls, 2016, p.2), the literature is consistent in recommending a lab test. The analysis of the

benefits of community involvement in urban agriculture supports the most thorough steps to soil clean-up, because in order for garden projects to realize their full benefits, they must be community driven, and therefore should be open to neighbors for gardening and gathering. Ensuring that community gardens can be a safe gathering place means ensuring that soil is clean. While farmers should know safety guidelines to prevent ingesting toxins, there is no guarantee that every community member who uses the space will.

Table 2

Steps to Test and Remediate Soil for Urban Agriculture, Compiled from the Literature

Step	**Considerations**
Determine prior use	An initial visual scan of the soil can give farmers an idea of soil health. If there are weeds growing, this is a sign of soil health, and alternatively the absence of weeds could signal soil degradation*. Researching the plot is also necessary to determine if the plot had an industrial or residential past. Research however, does not stand in for soil testing +.
Test soil	Soil testing is always recommended for urban agriculture*. The UC Cooperative extension does not offer soil testing, although cooperative extensions in other states often do +.
Analyze findings	Each contaminant has a different threshold for urban agriculture. For example, the threshold for lead contamination for agricultural use is 80ppm⊙. The recommendations for urban agriculture in Los Angeles are consistent with this threshold +. Labs who offer soil testing will help urban farmers to interpret test results.
Chose remediation tactic	There are a plethora of soil remediation tactics to choose from, and choice will depend on budget and the severity of soil contamination*. Amending soil with compost can help dilute the concentrations of heavy metals in soil, and can decrease their bioavailability to plants •. Other methods include importing clean soil to the site and disposing of contaminated soil, building raised beds, and phytoremediation. Some literature suggests that importing soil is the most effective way to ensure clean soil*, while others recommend raised beds +.

Source:

*(EPA, 2011, p. 13) (EPA, 2011, p. 24)
+(Surls, 2016, p. 2). (Surls, 2016, p. 3) (Surls, 2016, p. 8).\ (Surls, 2016, p. 9)
⊙(EPA, 2014, p. 3)
• (Campbell, 2012, p. 16)

Existing Policies and Programs That Incentivize Soil Cleanup and Soil Health

The existing programs in Los Angeles to support and incentivize both soil cleanup and soil health are lacking compared to other US cities. This section of the literature provides examples of existing state funded programs that provide resources for testing soil, remediating soil, and maintaining soil quality for urban agriculture. Examples of state funded composting programs, some of which provide affordable compost, exist in New York City, and San Francisco. These examples show that better waste management frameworks exist, and programs can be streamlined to provide farmers and gardeners with free or low-cost resources. Los Angeles does currently provide free mulch through LA sanitation, with the option of self service pick up or home delivery. They do not however provide a state funded composting service, and at the moment no options for accessing compost exist through the city, so farmers must rely on non-profits like LA Compost for their composting needs.

New York City is an example of both a waste management program that includes composting, and streamlined resources for urban farmers and gardeners. New York has a composting program run through their sanitation department, which offers both curbside composting, and drop-off composting (DSNY, 2021). New York City also offers a unique program called PureSoilNYC, a clean soil bank that repurposes soil from construction sites of farming and gardening. This resource is publicly accessible to organizations and individuals (*PUREsoil NYC - OER*2021). San Francisco similarly offers curbside composting, as well as an urban agriculture program which offers urban farmers free mulch, compost, seeds, plant starts and composting worms (SF Recreation and Parks, 2021). The state funded resources available to farmers and gardeners in both New York City and San Francisco show that programs that

streamline these resources are possible. In addition, stronger waste management policies which incentivize or require composting are necessary in Los Angeles, as these programs are widespread across the United States already. The implementation of these programs would make abiding by best practices for soil clean-up and farming more cost effective and accessible for farmers across the city.

Gaps in the Literature

The sources analyzed offer a variety of tactics that farmers can use to remediate soil, however lacks consistency in recommendations. In some cases, removing contaminated soil completely and importing clean soil is recommended (EPA, 2011, p.24), while in others, planting in existing soil and remediating through soil amendments is a better option (Surls, 2016 p.6). Building raised beds is also an option, however some root vegetables penetrate deeper than raised beds (Hendrickson and Porth, 2012, p.20). The analysis of the literature on remediation tactics shows that choosing a tactic is highly dependent on contaminants, prior use, and even soil pH (Campbell, 2012, p.42). The literature reveals that specific guidelines for Los Angeles are necessary to provide communities and farmers relevant information on costs, barriers, and knowledge from farmers who know the landscape of Los Angeles farming. The literature on environmental racism in Los Angeles provides context for the importance of soil restoration and gardening projects in communities of color, both as projects that have social-emotional and health benefits, and as a solution to soil contamination. The guide that this study produces further discusses how community efforts towards soil remediation benefit Los Angeles communities, using the experiences of farmers. Despite the assertion that community gardens have these benefits, the literature lacks a specific review of how soil remediation as an independent practice can benefit the social-emotional wellbeing of a community.

Methods

Data Collection

Three groups of individuals were sought out for this project: urban farmers, community organizations, and researchers/soil scientists. Urban farmers and organization employees were chosen to

collect information about the methods of soil remediation they use at their respective projects. Soil scientists and researchers were interviewed to collect information about the considerations for each remediation method in regards to bioavailability of toxins to crops. Using all three groups allowed for this study to examine both the practicality of soil cleanup methods in practice, and the recommendations from scientists and researchers. In addition, all three groups have encountered prohibitive policies at different steps in the process of remediating soil and growing food. Each perspective was essential for this study to analyze the policy landscape and make recommendations. Initial interviewees were contacted via instagram, or through text. Additional interviewees were found using the snowball sampling method. This variation across interview subjects allows for an analysis of barriers of soil restoration faced by different entities, as well as theorize the consideration of solutions to those barriers based on input from all three groups. Interviews were conducted over zoom, and recorded and transcribed using zoom's transcription software. The interviews were recorded with the subject's consent, and each subject was asked to sign an informed consent form, in which they indicated if they wanted to remain anonymous. The subjects who chose to remain anonymous are referred to by a different name, and their specific affiliations are not mentioned.

Each interviewee was asked to share what barriers to soil remediation they had encountered, which methods for soil remediation were considered best practice, and what their opinions were on the community benefits for soil remediation (see appendix A for interview questions). The interviewees who were affiliated with organizations or independent farms were asked what technical support they needed to make their projects more successful. Researchers and soil scientists were not asked this question, as it is less relevant to their work. Each interview varied slightly in the follow-up questions that were asked, which could affect the validity of the findings.

Analyzing Interview Content

Qualitative data analysis was used to analyze and examine common themes, convergences and divergences across the interviewees. The transcripts from interviews were analyzed to find common threads in participants' opinions of community benefits, barriers to soil remediation, best practices, and

possible solutions to barriers. The common threads from the interviews were used to create policy solutions to LA-specific barriers faced by urban farmers, community organizations, soil scientists, and researchers, and then compiled into a best practice guide for aspiring farmers in Los Angeles. The interviewees are initially mapped out in table 1, based on their affiliations with soil restoration and urban agriculture.

Creating a Best Practice Guide

Each interviewee was asked to share the steps they have taken to remediate their plot, or the steps that they recommend to farmers. Interviewees were also asked to share policy barriers for soil remediation, and to list resources in LA that have helped them in the process of cleaning soil for urban agriculture. In the data analysis section, the recommendations for best practices are compiled in the section titled "best practices for clean-up." The findings from this section, as well as findings from the literature review and external research on LA specific resources were used to compile the best practice guide. The best practice guide is publicly available and has been distributed to participants who expressed interest in obtaining copies. This guide is available in English (see Appendix B), and Spanish (See Appendix C). Occidental College's language tutors assisted me in translating this guide during free tutoring sessions offered by the college's language department.

Data Analysis

Interview Subjects

Each subject interviewed is listed in the table below. The first group of interview subjects, presented in this paragraph, are employees of community organizations and nonprofits. Jonathan and Lynn both work for LA Compost, a non-profit organization who run compost hubs, and provide compost for farmers and gardeners across LA. LA Compost fills a gap left by LA city, which has no public composting programs or infrastructure. Jonathan runs a program at LA Compost called the Soil Farmer program, which is working with community members in Watts to clean backyard soil for gardens. Lynn is LA Compost's soil and compost ecology consultant, and also does soil consulting outside of LA

Compost. Janet works at East Yard Communities for Environmental Justice (EYCEJ), a community organization serving frontline communities in South East LA and Long Beach. Before COVID-19, she was the staff member running La Cosecha Collectiva, EYCEJ's decentralized gardening program. Although she is still employed at EYCEJ, during COVID-19 she participates in La Cosecha as a member, not an employee. The gardening program seeks to address food insecurity, as well as foster land and food autonomy for EYCEJ members. I was introduced to EYCEJ through Occidental College's internship program in the fall of 2019, where I met and worked with Janet. Janet falls into both the urban farmer category and the community organization category, however she is grouped with community organizations and non-profits because her primary affiliation is at EYCEJ. EYCEJ is also at the forefront of organizing for justice for communities affected by the Exide disaster. Ignacio is the Coordinator for Technical Assistance for Brownfield Remediation at the Center for Creative Land Recycling (CCLR). He has worked to remediate brownfields both for gardens and parks in Los Angeles.

The next group of subjects are urban farmers. Adan is a farmer at the Growing Experience, an urban farm in Long Beach. The Growing Experience is owned by the Los Angeles Housing Authority, and is located in the Carmelitos Housing Development. The farm's mission is to provide affordable produce to Carmelitos Residents. Adan is one of two full time farmers at the farm, who I worked with through a summer internship in the summer of 2020. Elliot is a farmer at Cottonwood Urban Farm, a farm located in Studio City. He privately owns the land, and runs a CSA program called Market Zero.

Leigh has worked at Metabolic Studios, an artist's collective working on regenerative agriculture and soil restoration. Leigh's main affiliation at the time of the interview was the Crescent Farm, a project to demonstrate regenerative practices for healthy soil, located in the Los Angeles Arboretum. Leigh experiments with cutting edge strategies for soil restoration and water harvesting. Kirsten is an Urban Ecologist at the University of California Los Angeles. Kirsten is the associate professor of Urban Planning and Environmental Health and has studied green space and soil-lead distribution across the United States before her position at UCLA. Caroline is a researcher and soil scientist at a California

University. She studies soil carbon, and the impacts of agriculture on soil health. Her name has been changed to maintain anonymity.

Table 3

Research Participants and Affiliations

Name	**Affiliation**	**Relevant Projects**
Jonathan	LA Compost	Compost hub manager and working on a community soil cleanup program in Watts
Lynn	LA Compost and Metabolic Studios	Consultant on soil and compost ecology
Adan	The Growing Experience	Urban farmer
Leigh	The Crescent Farm at the LA Arboretum	Soil scientist and creator of the crescent farm, a regenerative project for healthy soil
Kirsten	Urban Ecologist at UCLA Luskin	Associate professor of Urban Planning and Environmental Health Services. Authored the study "Growing Gardens in Shrinking Cities: A Solution to the Soil Lead problem?"
Janet	East Yard Communities for Environmental Justice (EYCEJ)	Former staff member for La Cosecha Colectiva, EYCEJ's decentralized gardening program
Ignacio	The Center for Creative Land Recycling (CCLR)	Coordinator of technical assistance for brownfield remediation at CCLR
Elliot	Cottonwood Urban Farm	Urban farmer
Caroline	Researcher/Soil Scientist	Studying soil carbon and agriculture at a California University

Barriers to Soil Cleanup and Soil Health Best Practices

Participants gave a variety of answers when asked about barriers to soil clean-up and maintaining soil health. Cost barriers caused by a lack of funding and support from government agencies emerged as

common threads throughout the data. The lack of support and funding is discussed in each subsection below, and is indicative of a failure on the part of the city of Los Angeles to provide adequate support for these projects. As is discussed in the literature review, other cities in the United States have managed to provide their residents with materials such as compost and mulch to promote soil health and dilute toxins (DSNY, 2021) (SF Recreation and Parks, 2021). In addition, the city of Los Angeles does not provide a composting program for residents, forcing farmers to rely on the support of nonprofits such as LA Compost, or to create their own composting sites. These regulatory failures are highlighted in the city's cleanup program for houses affected by the Exide disaster, discussed in the section titled *Concerns Over Cross Contamination and Recontamination After Cleanup.*

Cost of Soil Testing Prohibits Information for Cleanup

Eight out of nine participants in this study cited cost as a main barrier for conducting soil testing. Elliot mentioned that he sent his soil out of state, to the University of Amherst in Boston. His explanation from sending soil out of that was that the University of Boston's soil testing program is more "affordable" and "reasonable." Caroline also voiced her frustration about the cost barriers to soil testing specific to California. She noted that "there are some states where, if you start an urban farm, you can send a sample of your soil to one of the land grant universities and you can get a free soil test, *we don't have that*." This quote from Caroline reveals that accessibility to soil testing can be addressed by creating a more centralized testing option, which is plausible as it already exists in other states. Also in regards to soil testing, Janet said that at EYCEJ "we don't have capacity to do any." She shared that they instead refer to the original testing that DTSC did in the Exide contamination radius. Janet mentioned, "we're partnering with Oxy and USC to do some retesting at the homes that have remediated." Through partnering with Oxy and USC, EYCEJ can get access to the institutional testing that Caroline had mentioned is lacking in Los Angeles. This institutional testing, though necessary, is insufficient and does not take the place of a centralized and/or free option. Lynn said, "I think cost is a major barrier, and people not really understanding or valuing the kind of indicators in lab tests, or feeling afraid of thinking about the scientific or technical details about the lab test." Lynn brings up both an issue of cost and access to

knowledge. She provides assessments of soil tests as a consultant, however, as she mentioned, the science can be daunting to farmers who do not understand soil science.

Adan was the only interviewee who did not cite cost as a barrier for testing because when land was originally developed for agriculture, preliminary testing was conducted through LACDA. Now Adan tests the soil annually with a take-home kit. He said that since the initial tests, "we haven't really done any formal testing, more like informal test kits. But at this point, we know just by working with the soil, like what's in it, and what the tests tell us what's deficient in it, so far we haven't done much for testing, like past initial phase." Lynn discussed with me the cost of soil testing in Los Angeles, if a farmer were to test soil as she recommends, with a test for heavy metals and organic matter,

> before you build out your site do those two tests that's like $300 and then a year after you've built your soil do those two tests against like another few hundred dollars so it's like if you're going to test once a year that's like a $300 cost annually.

There is variation in price between different labs, and there is the option to send soil samples out of state like Elliot did, however, Lynn notes that "it gets to be expensive, especially if you want to track changes over time." Beyond funding, Kirsten noted, "the biggest barrier is whether or not people are incentivized by policy to even find out if there's a potential contamination issue." This expands on Caroline's point about the lack of state support for soil testing, bringing the issue of policy incentives into conversation. The data from interviewees in this section reveals that it is not only lack of funding for testing, but the absence of centralized testing that prevents farmers from testing soil.

Concerns Over Cross Contamination and Recontamination After Cleanup

Both Janet and Jonathan mentioned the issue of cross contamination from contaminated parkways in the neighborhoods they work in. Janet said that even after clean-up of lead contaminated areas, wind can blow dust from parkways carrying contaminants into plots, "all that dust, all of it, gets on your leaves gets on your plants." Jonathan is working on a project through LA compost to green parkways by "replanting native" with flowers and other native plants. The parkways are a concern not just for pedestrians and children, but also for bringing contamination into homes and contaminating gardens that have already been deemed "clean", either by DTSC in regards to the Exide cleanup, or with the soil

cleanup program through LA Compost. Janet expanded on the dangers of parkway contamination, "people still have parkways and those are not getting cleaned up with the residential properties. So if your dog goes and plays in that and comes back, or you know, your kids play in the parkways, it's not the most efficient way to treat a soil cleanup." Not only is there a risk of contamination blowing from parkways into neighboring yards that may have already been screened for toxins, but people who are walking and children who are playing in parkways pose the risk of bringing soil contamination back into their homes.

Jonathan and Janet also had similar opinions on contamination thresholds for lead. When asked about the threshold, Jonathan said, "USDA threshold, it's high," alluding to the fact that the threshold is not conservative enough. Both subjects took issue with thresholds, noting that they are too high, not conservative enough for food growth. Janet spoke on this issue as well, noting that the regulatory agencies that set the *thresholds for contamination* are only considering human health, not the entire ecosystem.

> What is good for soil health is regenerative agriculture, and so when we're thinking about mulching, or when we're thinking about planting food, when we're thinking about how to make our communities better, right, it's in places where these industries have no idea that people are growing food. Those are things that agencies are not taking into account and they're not because they set that standard at 80 parts per million, and so they denied the fact that there's any agriculture.

Lynn also commented on EPA thresholds, "the limits of heavy metals is kind of, in that sense, determined based on the context of the project and the target so generally like human health, community well being… there's different categories of thresholds based on context." She noted that "there are thresholds set by different agencies, like the EPA", however these thresholds differ at the state and federal level.

Access to Mulch and Compost/ Innovations in Composting

Janet, Caroline, Elliot, Jonathan, Leigh, and Adan all noted that better access to mulch and compost is essential for healthy food growth. Leigh, a soil scientist and farmer at the Los Angeles Arboretum, discussed the efficiency of mulch and compost as a solution to soil contamination,"mulch creates humic acid and humic acid breaks down compounds." Leigh is experimenting with a method of soil remediation called hugelkultures, a mound of wood, soil, and mulch, which has proven to be effective at remediating brownfields. "I'm experimenting with planter boxes with hugel logs inside them and then

soil on top. And the difference is dramatic, it is absolutely dramatic because the plants are creating their own soil out of those logs they're getting exactly what they want from them." Leigh and Lynn are both using creative combinations of mulch and compost to remediate heavy metal contaminants out of soils. Leigh has even had success growing fava beans on a former plot belonging to Chevron oil. She tested the fava beans after they grew, and her experiment with hugelkultur proved to be a success. The fava beans were free of contaminants, "we had the beans tested and We grew 550 pounds of Fava beans, with no contamination at all." This remarkable experiment is a testament to the power of composting and mulch for soil remediation.

With the importance of access to these materials for soil remediation in mind, the interview subjects who are farmers shared how they access these resources. Elliot's farm is home to an LA compost hub, which produces compost for both his farm and farmers who are interested in purchasing it. Adan's farm is also home to a self run compost hub. Adan sources food from local restaurants to create compost, "for the most part we make our own compost from restaurant food waste that is brought over to us. The biggest limiting factor has actually been the availability of mulch." The way that both farmers access mulch is casual. Adan shared that "we don't have a set source, we generally reach out to local landscaping and tree trimming companies to let them know they can drop mulch off with us for free, and see who comes." Elliot has the same strategy, "if you've been to our site everything's mulched and that's just from a tree trimmer in the area. It benefits him, he doesn't have to pay to take it to the dump and pay to dump it. Benefits me because I get all this freshly chopped wood that's really active." Jonathan's remediation project has access to compost because he is the regional coordinator for compost hubs in South LA. However many sites at LA compost are closed systems, meaning that all of the compost produced goes back into the soil onsite. Elliot's compost hub is unique, in that it produces enough compost to be sold to the surrounding community.

Perceived Best Practices for Clean-up, and Ensuring Soil Health for Agriculture

Participant's opinions on best practices for soil cleanup and for maintaining soil health for urban agriculture were consistent with the literature. Interviewees were consistent in recognizing soil testing as a helpful tool for choosing cleanup methods, however many interviewees also noted the lack of policies and programs that incentivize soil testing. This section lists the different considerations that farmers must make when beginning to clean soil. The subsections are listed in order from first to last steps. Farmers should begin with lab testing to understand the extent of contamination, then move to assessing the possibility of using phytoremediation as a clean-up method. Next, considerations for in-ground versus raised bed planting are discussed. Considering phytoremediation and in-ground versus raised bed planting are interchangeable, as farmers will likely be considering a combination of these options based on their soil test. Lastly, compost is discussed as a tool to both remediate soil and maintain soil health.

Recommendations for Testing Soil for Heavy Metals and other Pollutants:

Interviewees were consistent in recommending lab testing for soil contamination, however a handful of subjects had not had access to soil testing. Lynn recommends to test in the same lab and test consistently. She notes that in order to get the most accurate results, farmers need to be testing soil before starting to garden, and then again after cleanup has been done to ensure that the soil is cleaned-up. Lynn also recommends researching prior land use, "it is a good idea to research a land use history, and I haven't done that specifically, mostly I have just tested for heavy metal." This sentiment was a common thread throughout subjects, none of whom had done a full test of all possible contaminants. Although testing for all contaminants is the safest way to assess soil health, Lynn mentions, "it's not as accessible of a test for folks to do that kind of more accomplished sense of pollution analysis." She notes that it is much more expensive to test for fuel contaminants, pesticides, hydrocarbons, and other pollution, and running those tests can get complicated, especially when farmers do not have access to a consultant. Elliot also mentioned that testing for heavy metals was his first priority, "really, what you are concerned with are heavy metals."

Considerations for Phytoremediation as a Clean-up Method:

Lynn and Leigh both mentioned that fungal remediation is a cutting-edge solution for soil clean-up. As mentioned in the Access to Mulch and Compost section, these methods of clean-up are still experimental, however they are proving to be incredibly effective. Phytoremediation was recommended in combination with other clean-up methods when possible. Ignacio mentioned that in their brownfield clean-up they mostly excavate the soil and import clean soil. This was inconsistent with Leigh's method of phytoremediation and hugelkulturs on brownfields, which shows the novelty of brownfield remediation for food growth. As was mentioned in the section on lab testing, Lynn stressed the importance of prior use when testing for contaminants, and the same is true for choosing a clean-up method. Leigh warned against growing crops that are known phytoremediators in possibly contaminated soil. She noted that "corn is the best phytoremediator," and when people grow corn in "industrial corridors, it can be just devastating." Growing plants that take up toxins easily with the intention of consuming the plant can be extremely dangerous. Lynn and Leigh both recommend doing a round of phytoremediation before planting crops in the soil while also heavily amending soil with compost. Lynn recommends for farmers to "remove the plant and put it in green waste or hazardous waste" after it has finished growing. Jonathan echoed this point, stressing the importance of properly disposing of phytoremediators once they have absorbed contaminants. Lynn also recommends working with the soil in the ground if possible, "I try to avoid taking out the soil as much as possible, so there are ways to kind of pull up the heavy metals using plants, native plants, especially mycelium and compost. So I would generally recommend like a season of bioremediation planting."

Raised beds vs. in ground planting, and deciding when to excavate soil:

Deciding whether or not to excavate soil depends on prior use and soil test results. For sites that require heavy remediation, raised beds, or excavating soil can be helpful methods for lowering the risk of crop contamination. As mentioned in the literature review, in ground planting generally requires more time, as amending with compost and phytoremediation can take many seasons (EPA, 2011, p. 20). There are a plethora of considerations that farmers must make to decide on the remediation method, and

interviewees were asked to share their preferences for different contamination scenarios. For remediating brownfields, interviewees had different opinions on best practices. Ignacio says that he mostly excavates soil while Leigh is experimenting with phytoremediation on brownfields. Because Leigh's methods for remediation on brownfields are still experimental, if farmers were to choose this route, they would need to heavily consult with soil scientists, and perform frequent lab testing to ensure that phytoremediation was successful. Because the resources for testing and consulting are costly, many organizations or farmers may not be able to use this method on a site with heavy contamination like a brownfield, and should opt for excavation. Farmers like Jonathan and Janet who are working on multiple sites use raised beds. Lynn however shared, "I tend to prefer less infrastructure over more, so sheet mulching in place or lasagna mulching I think is a really great way to build soil for a food production." As discussed in the literature, the recommendation for raised beds versus in the ground planting depends on the severity of contamination, and the resources that the farmer has at their disposal. If the city of LA provided free testing, farmers could focus their costs into remediation tactics or building raised beds, instead of splitting their resources between the two.

Importance of Composting and Mulching

Each interviewee understood the importance of composting, and had different methods of acquiring compost. Lynn shared, "organic matter will help to sequester and bind to the heavy metals, so that plants don't take them up as easily and they don't move around, or mobilize, or leech as easily." This reveals how necessary composting is for remediating heavy metals out of soil, and ensuring that edible plants do not absorb harmful contaminants. Jonathan similarly shared, "There are studies that have been found that the microbiol life present in compost actually sequesters a lot of minerals that are toxic in the soil." The most basic best practices for food growth recommend amending soil with compost and mulch, and the plethora of ways that interviewees access the necessary materials reveals the gap in resources provided by the city.

Community Developed Innovations to Gaps in Regulatory Programs and Support

Communities innovate in multiple ways to fill the gaps in regulatory and government support. This section demonstrates that there is significant community innovation, but these innovations are not a sufficient replacement for regulation and government funding. The data shows that cost and lack of centralized testing and mulch and compost resources limit farming practices, and force farmers to find these resources in unique ways across LA, when they could be provided by the city. As was discussed in the literature review, cities such as New York City and San Francisco have already implemented programs to aid farmers in following best practices. Below, community developed innovations are discussed to serve as prefigurative programs for policy proposals.

Providing Better Access to Mulch and Composting

Leigh concluded her discussion of experimental soil remediation tactics with "we need to reassess our ways of valuing resources." This sentiment exposes the frustrations of many of the interview subjects. Solutions that seek to re-evaluate how Los Angeles manages waste and contamination, like Leigh's use of wood from trees that would have otherwise gone to landfill, were popular among the farmers and soil scientists interviewed. Adan and Elliot's solution to mulch scarcity is reaching out to local tree trimming and landscaping companies to arrange free mulch pick-ups. Elliot is aware that other farmers have trouble accessing mulch, and posed a possible solution, "you should employ people to act as drop sites for tree trimmers." This would provide a more streamlined approach for farmers to access mulch in their area. As mentioned above, access to compost is also challenging because most LA Compost hubs are closed systems.

Ignacio's proposed solution imagines a more streamlined approach to compost access, "Some states, they actually do have a database, sort of like craigslist, for clean soil." This approach, similar to Elliot's idea for a mulch drop-site, consolidates resources for farmers, and cuts through the dense processes of accessing free resources. While resources do exist in Los Angeles for free home delivery for mulch through LA Sanitation, most of the interviewees were not aware of this program. This is indicative

of another access issue: dissemination of information. A proposed solution from Kirsten for accessing clean soil is based off of an existing program in New York City, "New York City has a program where they try to take clean sale from construction sites and redistribute that clean soil within the city, instead of taking clean soil to a landfill. And so in LA right now I am thinking about what are those kinds of projects that we can have, can we do a clean soil bank?" Sourcing clean soil from construction sites meets the goal of reimaging resources we treat as waste, as well as streamlines the process of connecting farmers with construction companies.

Janet's suggestions are consistent with the proposed solutions mentioned above. She suggested, "the county can open up more mulching sites, so that people can watch their yards and open up more composting hubs and make the prices for composting cheaper if you were part of the Exide." Offering a discount to farmers whose soil has been impacted by industrial pollution would lift some of the cost burdens off of frontline communities, and to go further, a free program for testing and clean-up for those communities would also eliminate the cost barrier for testing that so many of the interviewees cited. Ignacio shared his opinions on the cost barriers in general for soil remediation projects. He said, "many public agencies do not have sufficient funding so they'll rely on the grant to cover everything so normally they don't use other funds, unless they have other funds that they have access to." Across the group of subjects, everyone mentioned grants as the only existing solution to funding. This sentiment is especially relevant with subjects who work for organizations. Ignacio, Janet, and Jonathan all rely on grant funding.

Connecting Farmers, Organizations, and Government Agencies

Caroline suggested connecting researchers with people looking to test their soil, "you have researchers, people like me… who need research projects, you know who need experiments to be able to track… why not, like, double down on those efforts and *connect researchers with cooperative extension* agents and people trying to start urban farms." This approach addresses both cost barriers, and proposes a soil testing program that California is currently lacking through public universities. Caroline also addresses the disconnect between connecting farmers with state employees who have site-specific information about soil clean-up and gardening. She suggested, "providing and bringing together people

from cooperative extension, there's already a huge network of folks across the state which … have received federal and state investment to understand what grows well where and what sort of issues you might have given the region." Again, the suggestion to bring together different state entities with farmers and organizations streamlines the process for the people looking to remediate their soil. Caroline went on to talk about the issue of scaling up when coming up with policy solutions, "there are unifying metrics but one of the things I'm really interested in, and I think the conversation is finally shifting towards, is how to be more place and context based." *To provide communities with contextually relevant information*, Caroline and Janet both expressed the need for *a best practices guide for soil remediatio*n, specific to Los Angeles. Janet expressed this frustration by suggesting that the county send out guides to community members who have had their soil cleaned, "just by the county sending out a flyer, sending out an email, having a guide of what to do, okay your soil has been cleaned up, now what? Okay, your soil didn't get cleaned up, now what?" Janet expressed interest in distributing the best practice guide that this study produced to EYCEJ members. The data demonstrates that there is insufficient funding and support for cleanup, as well as insufficient dissemination of information to frontline communities who are dealing with soil cleanup. Dissemination of information, however, is not helpful without incorporating ample funding for cleanup efforts.

Perceived Benefits of Urban Agriculture Projects and Soil Cleanup

Urban Agriculture Provides Participants with Land Autonomy and Increased Food Access

Jonathan mentioned that community clean-up projects for urban agriculture help people feel that they have autonomy over their land. He shared his opinion on how participants in his soil clean-up project feel, "I think this project really allows them to access what they need, to feel like 'this is my space, and now I can grow my food.'" Janet said that La Cosecha allows the community to "grow more intentional to food work." Janet shared the story that prompted the founding of La Cosecha, which exemplifies the sense of land autonomy members can glean from the program. The program was founded when EYCEJ became aware of plans to build a Walmart in the city of Commerce. "I was prompted in response to

ongoing environmental racism that's rooted in the development projects that we have in our Community. One development project, specifically that, no pun intended, uprooted local city members, was Walmart." Janet said that while Walmart would address the issue of food insecurity in Commerce, it would also create more industrial pollution in an area already saturated with it. Janet said that the community response was "let's do it ourselves." Thus, La Cosecha was founded with its roots in addressing environmental racism, and allowing residents to create a community based solution to a structural issue. Adan also spoke on addressing food deserts in his neighborhood of North Long Beach, and described how the farm has not only provided fresh produce for the community, but also is directly connecting residents to where their food is grown:

> They can know where it's grown and how it's grown because they can see it as well….because this area, which is actually considered a food desert, has gotten a little better in the last couple years, there weren't any like grocery stores, nearby in this area, you'd have to travel up like five miles, or like to the nearest one, and you know for like people who couldn't easily travel down walking, they'd actually take public transit, or walk after a really long business day to buy their basic food supplies

Adan runs a farm stand every Friday for residents of the Carmelitos public housing project, which is on the same property as the farm. Here, he echoes the sentiments of both Janet and Jonathan, noting that the farm stand functions as both a *food source for communities living in food deserts*, and a way for a community to participate more actively in their food chain.

Soil Cleanup and Increased Green Space Improves Physical and Mental Health of Community Members

Each subject shared either a mental health or community benefit that they have witnessed as the outcomes of soil restoration projects. Caroline said that her research involves "expanding the conversation beyond carbon and climate change to like, multiple ecosystem benefits and including like we're saying here a lot of these social and cultural elements." Ignacio, the coordinator of technical assistance for brownfield remediation at the Center for Creative Land Recycling, spoke on community feedback he has received from green spaces, "even people who don't like parks to begin with, when they end up realizing that it's an asset, and they turn around very quickly, I mean once they see the first few days of excitement in the park. They suddenly forget that, you know, children are making noise, because you know, it's

actually nice to hear kids." The sentiment that urban agriculture projects can function as community gathering spaces was also shared by Janet, who illustrated this point with an anecdote from Seasoning the Seasons, La Cosecha's quad-annual community cooking class.

> I asked 'who has grinded corn?' And a lot of people are like 'i've never grinded corn' you know, a lot of brown people up in that meeting, you know, hardcore brown people… and then you know Mark said 'i've seen my mom do it, or, I haven't seen my mom ever grind corn or my grandma and now the first time that I do, it is with my daughters, like my daughters are doing it right here,' and so I think it has truly benefited that intent.

Providing space for culturally relevant gardening and farming in tandem with community events, like EYCEJ is doing, provides context for Caroline's point about bringing together and benefiting multiple ecosystems. Janet's anecdote connects to Jonathan's point about land autonomy, which he expands on in his discussion of the first generation immigrants he works with in South LA:

> Our first generation immigrants are coming from Central America, Mexico, and growing food is rendered in *those cultures* coming from the motherland, so, you know, coming into another land, and in having access to land, and having access to the resources makes it hard, right. I think this project really allows them to access, well, what they need.

The examples from Janet and Jonathan exemplify the different ecosystems at play in Los Angeles, the obvious ecosystems in the soil, and the ecosystem of communities, who can connect to themselves and each other through the language of home-grown produce.

Crime reduction was another community benefit brought up by Lynn. She mentioned crime reduction as a community benefit to soil restoration, and greening neighborhoods in general. She said that gardens in Pomona have been part of a community effort to reduce crime, "there is some gang violence in Pomona and people have been advocating for gardens as a positive green space for people to connect and to experience positive impacts from those spaces." Lead exposure is correlated with violence and crime, so remediating soil for urban agriculture both removes the contaminant exacerbating violence, and provides a space for community connection. Lynn shared that building gardens can be a therapeutic experience, "people struggling with depression, or grief, or loss, maybe chronic health issues, can really find a lot of healing and nurturing in the garden, so I feel like that makes a very powerful impact on individual lives." The narratives given by interviewees on the impact on both individual mental health, and general community health, provides further motivation for soil remediation for agricultural projects.

Agricultural projects can provide not solely opportunities for contamination clean-up, but also new green spaces that will benefit communities in a myriad of ways.

Policy Proposal

The proposed policies seek to address the gaps in funding and programs for soil restoration and soil best practices in Los Angeles. The gaps include: limited access to mulch, compost, and clean soil, cost barriers to testing and clean-up, and access to best-practice information. All of these gaps are connected by the central issue of funding, which is limited, and only available to specific projects. The policy proposals are county-wide because they must also benefit unincorporated cities in Los Angeles like Commerce, and other cities affected by the Exide disaster. These proposals address the common concerns voiced by interviewees, and seek to promote soil health in Los Angeles for the ultimate goal of food growth. These programs are needed to improve public health through cleaning up toxins, and to promote urban agriculture as a solution to both soil contamination and food insecurity. The central issue in the current policy landscape is funding. The funding available to soil remediation projects is almost exclusively through grants, unless an egregious leak occurs, in which case DTSC provides clean-up. Grant funding is unsustainable and limited, which in turn limits clean-up to community organizations and individuals who are awarded these grants. The data analysis also revealed that because of the lack of a centralized testing program in Los Angeles, farmers are forced to seek out testing elsewhere, or omit it from their remediation process. This gap in programs necessary for promoting soil health is again due to a lack of necessary funding, and puts farmers and consumers at risk of ingesting toxins through food or soil. Soil testing programs specifically can only be funded by state governments, as the data prove community innovations insufficient at filling funding gaps. While many of the farmers interviewed have been able to innovate solutions to the other gaps, it is well within reach for LA county to provide alternative policies and programs that are universally accessible.

County-wide Program for Clean Soil, Mulch, and Compost

The first proposed solution uses the city of San Francisco's urban agriculture program, discussed in the literature review, as an example for Los Angeles to follow. San Francisco distributes resources for farming through Garden Resource Days, hosted every 6 weeks (SF Recreation and Parks, 2021). Because the city of San Francisco is much smaller than Los Angeles, a better method for distributing resources in LA could take shape as a number of hubs across the county, where farmers can access clean soil, mulch and compost. Similar to New York City's soil bank, also discussed in the literature review, these hubs could offer pick-up or delivery services. In order to provide compost to farmers, Los Angeles must adopt waste management policies that fund a county-wide compost program. Providing compost to farmers would not only provide farmers with resources to clean and maintain their soil, but also divert food waste from landfills. Creating a closed system of composting and urban food growth with hubs across the country is the ultimate solution for farmers, who are already collaborating with non-profits and local restaurants to implement composting. Adopting a waste management program that also funnels greenwaste like mulch, and clean soil from construction sites into an array of hubs across the county would streamline resources, prevent waste, and aid farmers in accessing these resources through a single program. These resources can be provided for free, as shown in San Francisco and New York City, however if Los Angeles is unable or unwilling to provide these services for free, frontline communities must be offered these resources for free or at a significantly reduced cost.

County-wide Program for Streamlined Soil Testing

The second policy that is lacking in Los Angeles is a streamlined, free program for soil testing. The data analysis discusses how cost is a main barrier to farmers looking to test their soil. Both the data analysis and the literature review confirm that soil testing is considered a best practice when repurposing land for urban agriculture. Thus, Los Angeles must offer free and accessible testing in tandem with providing resources to farmers. If the city is unwilling to provide free testing, testing must be offered to frontline communities at a reduced cost or no cost at all. Regulatory agencies are responsible for preventing soil contamination events like Exide, and the rampant soil contamination in Los Angeles is indicative of how ineffective the regulatory structure is. The lack of a testing program puts the cost

burden on communities who have been failed by regulatory agencies, and the city must compensate accordingly with funding to impacted communities. The data analysis section discussed the possibility of streamlining agencies to connect farmers to soil scientists and other experts through the UC Cooperative extension program. Connecting soil scientists, experts, farmers, and community members would also close the knowledge gap mentioned in the data analysis. With soil scientists at their disposal, community organizations and farmers could receive site-specific advice about how to best remediate their plot.

Government Funding for Remediation Strategies and Gardening Costs

Though the data show that farmers have been able to successfully remediate soil with strategies such as garden beds, soil excavation, and phytoremediation, government funding for more costly projects could significantly relieve the cost burden for farmers. This program should be directed at organizations or individuals who propose food justice oriented community gardens in neighborhoods identified as food swamps either currently, or in the past 10 years. This funding should extend to areas that have been identified as food swamps 10 years back, because although they may not qualify as food swamps anymore, the neighborhood may continue to struggle with food access. Providing a specific funding program is necessary for farmers who rely on grant funding to ensure the vitality of the garden from year to year. This program would function as a food justice fund for communities who have been systematically targeted by the conditions that cause food swamps. The creation of a food justice fund would address the scenarios similar to the one Janet described in her story of the inspiration for La Cosecha Collectiva. Offering an avenue for food access that does not include increased pollution and industry is imperative for the future of LA's food system. The food justice fund would supply gardeners with the money to buy supplies such as gardening tools, fertilizer, seeds, and materials for raised beds, as well as pay for excavation if the existing soil is too contaminated. This program could be funded partially by taxing the owners of vacant properties, or funneling in tax revenue from neighborhoods that are greenspace rich, with better access to food.

Discussion and Conclusion

Soil contamination is a public health issue, an environmental racism issue, and a food access issue. Soil remediation for urban agriculture can function as a tool to improve public health and mental health, address food insecurity, and return LA's soil to its historic fertility. Together these benefits paint a compelling picture for the possibilities created by improved regulation and funding. Funding and improved regulation is not only possible, but necessary for frontline communities who have endured the unequal distribution of pollution for decades. Frontline communities are owed more than access to resources alone, they also require funding and support from the city to transform contaminated land through self-determined projects. Implementing the proposed policies must be done in tandem with communities on the ground to avoid the disconnect and regulatory failures present today. The proposed solutions from interviewees consistently call for streamlining the process of soil testing, accessing mulch, compost and clean soil. The gaps in funding for soil restoration projects and urban agriculture can only be filled by funding from the government, as grant funding is limited and unsustainable. Accesses to increased funding, coupled with connecting agencies, farmers, and researchers, would dramatically improve the landscape of urban agriculture and soil policy.

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Appendices

Appendix A

Interview Questions

1. Tell me about (insert name of farm or project), what prompted its founding?
2. What are the main goals of the farm/project?
3. When preparing the farm/project for growing food, what steps do you take to ensure that the soil is clean?
4. Did you test your soil?
5. What were the main barriers to testing and remediating your soil (policy, price, labor etc)?
6. What methods have been used for remediation?
7. What policies or programs supported starting the farm?
8. What kind of crops do you grow, and how do you decide on them? Do you avoid certain crops that are known to be good at absorbing heavy metals?
9. How does the community participate on the farm?
10. What kind of community feedback have you received about the farm?
11. What resources/technical supports do you need to better support soil health at the farm?
12. Is there anything else you would like to share with me?
13. Is there anyone else you think I should contact?

Appendix B

"Harvesting Los Angeles: A Best Practice Guide For Soil Restoration for Urban Agriculture" English Copy

Harvesting Los Angeles

A best practice guide for soil restoration
for urban agriculture

Today we sit on land which was stolen from the Gabrielino-Tongva through the 18 lost treaties, land which continues to be illegally occupied and colonized.

This guide is designed to inform gardeners, urban farmers, and soil enthusiasts on soil restoration in Los Angeles. Publicly funded resources are scarce in LA, so this guide compiles a list of strategies and resources that farmers can employ to ensure their soil is healthy and clean. Los Angeles sits on fertile soil, much of which has been contaminated by decades of pollution and misuse.
We have the power to clean our soil!

Keep reading to learn more about how to ensure your soil is safe for growing.

Where do I start?

Before planting food, it is important to learn about your soil.
Soil in any city, including Los Angeles, has a risk of contamination from heavy metals or other pollutants. Soil scientists recommend that you send your soil to be tested in a lab.
Check out these labs in Los Angeles!

Wallace Laboratories (Agriculture, Soil, Water, Plants)
365 Coral Circle, El Segundo, CA 90245 310-615-0116
http://www.bettersoils.com info@wlabs.com

Timberleaf Soil Testing (Crops, Soil)
39648 Old Spring Rd., Murrieta, CA 92563 951-677-7510
http://www.timberleafsoiltesting.com/ tmbrlfsoiltest@verizon.net

XRF Research, Inc. (Elemental Analysis)
9921 Carmel Mountain Rd. #326, San Diego,
CA 92129 800-613-6064 http://www.xrfresearch.com info@xrfresearch.com

MACS Lab, Inc. (Materials Analysis)
431 Crown Point Circle, Ste. 120, Grass Valley, CA 95945 800-622-7522
http://www.macslab.com/ info@macslab.com

CLS Labs (Soil, Water, Environmental)
3249 Fitzgerald Road, Rancho Cordova, CA 95742 800-638-7301
http://www.californialab.com/ info@californialab.com

Soil & Plant Laboratory (Soil, Plants, Crops, Horticulture)
1101 S. Winchester Blvd., Ste. G-173, San Jose, CA 95128 408-727-0330
http://www.soilandplantlaboratory.com
soilab@soilandplantlaboratory.com
Calscience
7440 Lincoln Way, Garden Grove, CA 92841 714-895-5494

Source: County of Los Angeles Public Health, (n.d.), Soil and Water Testing Guidelines for Home and Community Gardens. Retrieved from: http://publichealth.lacounty.gov/eh/docs/ab1990_soilwatertestingguidelines.pdf

If lab testing is inaccessible for your project,
there are other methods to ensure that you are growing safe, clean food in your garden!

How do I clean my soil?

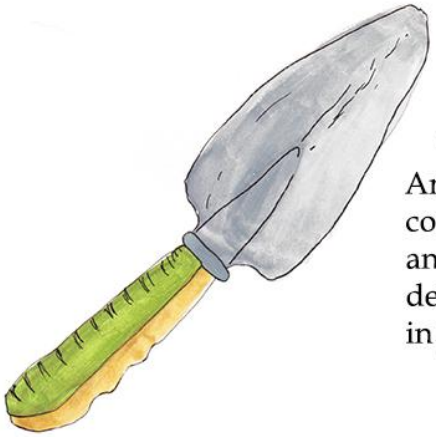
There are many methods for soil clean-up. Farmers can choose one method, or use a combination of many.

Option 1:

Remove contaminated soil. If your soil is heavily contaminated, you can remove it and import clean soil. Unfortunately, Los Angeles does not provide farmers with free soil. Soil can be purchased at your local garden store.

Option 2:

Build raised beds. Building raised beds can reduce the risk of crop contamination in your garden, because roots will not penetrate the existing soil. This method is less labor intensive than excavating and importing all new soil.



Option 3:

Amend! Amending soil is the process of adding compost and mulch to your soil to improve soil health, and dilute toxins. LA sanitation offers free mulch delivery and pick up. You can also contact tree trimmers in your area to acquire mulch.

LA Compost, an LA-based organization, offers compost pick up and workshops at some of their hub locations. Check out their website to find a location near you: https://www.lacompost.org/start-composting

What should I plant?

It is always a good idea to test your soil again after you have cleaned it up. Soil scientists recommend you use the same lab to do all your testing to ensure consistency. If you are still worried about heavy metal contamination like lead, avoid crops that absorb them easily. Lead, a common contaminant in Los Angeles, is absorbed easily by corn and plants in the mustard family such as broccoli and cabbage.

Keep you and your family safe!

Always wear gloves when gardening.
Remove boots and gloves before entering the house.
Wash all of your crops, and wash your hands after gardening.
Avoid putting your hands in your mouth, nose, and eyes while gardening. Take the steps mentioned above to clean your soil before letting children play in the dirt!
Happy Gardening!

Appendix C

"Cosechando Los Ángeles: Una Guía de Mejores Practicas de Restauración del Suelo para la Agricultura Urbano" Spanish Copy

Cosechando Los Angeles

Una guía de mejores practicas de restauración del suelo para la agricultura urbano

Hoy nos sentamos en la tierra que fue robada de los Gabrielino-Tongva desde los 18 tratados perdidos, tierra que continúa siendo ocupada ilegalmente y colonizada.

Esta guía está diseñada para informar a los granjeros, agricultores urbanos y entusiastas del suelo, en la restauración del suelo en Los Ángeles. En LA, los recursos públicos son escasos, así que esta guía da una lista de los estrategias y recursos para los granjeros. Usa los recursos para asegurar que tu suelo esté limpio y sano. Los Ángeles tiene tierra fértil, pero mucho de que fue contaminado por décadas del mal uso y la polución.
¡Tenemos el poder de limpiar nuestro suelo!

Continua a leer para aprender cómo puedes asegurar que tu suelo sea seguro para cosechar.

¿Cómo empiezo?

Antes de cultivar alimentos, es importante aprender sobre tu suelo. Suelo en cada ciudad, incluyendo Los Ángeles, tiene el riesgo de contaminación del plomo y otros tóxicos. Científicos del suelo recomiendan que mandes tu suelo a un laboratorio para que lo analicen.
¡Abajo hay una lista de laboratorios en Los Ángeles!

Wallace Laboratories (Agricultura, Suelo, Agua, Plantas)
365 Coral Circle, El Segundo, CA 90245 310-615-0116
http://www.bettersoils.com info@wlabs.com

Timberleaf Soil Testing (Cultivos, Suelo)
39648 Old Spring Rd., Murrieta, CA 92563 951-677-7510
http://www.timberleafsoiltesting.com/ tmbrlfsoiltest@verizon.net

XRF Research, Inc. (Análisis Elemental)
9921 Carmel Mountain Rd. #326, San Diego, CA 92129 800-613-6064
http://www.xrfresearch.com info@xrfresearch.com

MACS Lab, Inc. (Análisis Material) 431
Crown Point Circle, Ste. 120, Grass Valley, CA 95945 800-622-7522
http://www.macslab.com/ info@macslab.com

CLS Labs (Suelo, Agua, Medioambiente)
3249 Fitzgerald Road, Rancho Cordova, CA 95742 800-638-7301
http://www.californialab.com/ info@californialab.com

Soil & Plant Laboratory (Suelo, Plantas, Cultivos, Horticultura)
1101 S. Winchester Blvd., Ste. G-173, San Jose, CA 95128 408-727-0330
http://www.soilandplantlaboratory.com
soilab@soilandplantlaboratory.com

Calscience
7440 Lincoln Way, Garden Grove, CA 92841 714-895-5494

Source: County of Los Angeles Public Health, (n.d.), Soil and Water Testing Guidelines for Home and Community Gardens.
Retrieved from: http://publichealth.lacounty.gov/eh/docs/ab1990_soilwatertestingguidelines.pdf

Si pruebas de laboratorio son inaccesible para tu proyecto, hay otros métodos para asegurarte que estás cultivando alimentos seguros y sanos en tu jardín!

¿Cómo puedo limpiar mi suelo?

Hay muchos métodos para limpiar tu suelo.
Puedes usar un método, o una combinación de varios.

Opción 1:

Descarte el suelo contaminado. Si el suelo está muy contaminado, lo puedes descartar e importar suelo limpio. Desafortunadamente, Los Ángeles no provee a los agricultores con el suelo gratis. El suelo está disponible en su tienda de jardín local.

Opción 2:

Construir camas de jardín elevadas. Las camas elevadas pueden reducir el riesgo de contaminación de los cultivos, porque las raíces no penetran el suelo existente. Este método requiere menos trabajo que descartar el suelo contaminado, y puede ser más económico.

Opción 3:

¡Enmendar! Enmendar el suelo es el proceso de añadir el compost y el mantillo a tu jardín para mejorar la salud del suelo y para diluir los tóxicos. LA Sanitation ofrece el mantillo gratis para entregar a la casa o recoger. También, puedes contactar con podadores de árboles en tu área para acceder al mantillo gratis.

LA Compost, una organización en LA, tiene varios centros para recoger el compost y tiene talleres educativos sobre el compost. Visita el sitio web: https://www.lacompost.org/start-composting

¿Qué debo plantar?

Siempre es una buena idea probar tu suelo después de limpiarlo. Los científicos de suelo recomiendan que uses el mismo laboratorio cada vez que analices el suelo para mantener constancia.

Si todavía estás preocupado con la contaminación de los tóxicos, evita los cultivos que los absorben fácilmente. Por ejemplo, el maíz y otros cultivos en la familia mostaza, como el brócoli y el repollo, absorben fácilmente el plomo.

¡Lee estas precauciones!

Siempre lleva guantes cuando trabajas en el jardín.
Quitarse las botas y guantes cuando entras a tu casa.
Lava todos tus cultivos y lava las manos después de trabajar en el jardín.
Evita poner las manos en la boca, la nariz y los ojos cuando trabajas en el jardín.
Toma precauciones en esta guía para limpiar tu suelo antes de que tus niños jueguen en el jardín.