Sampling Protocol Guide

Soil Testing

Thank you for volunteering with this community research initiative at this sensitive time. As a citizen science project, this study depends on you, and in return, we are committed to staying in touch with you about the results from this study and next steps we can take as a community.

In order for our results to be useful, we need to have a standardized way of taking all of our samples. We will be training volunteers in these standardized methods during volunteer orientations. Reach out to the sampling coordinator for times and locations.

Contents:

Overview:

For this round of follow-up produce testing, we are taking **soil samples** to assess for persistent pollutants from the fire. We will be sampling from the 5 sites that were chosen for preliminary analysis.

References:

Soil sampling procedure was created based on recommendations from Karl Hans, Environmental Health and Safety Specialist, UC Berkeley; Joshua Arnold, Environmental Science, Policy and Management PhD Candidate, UC Berkeley; Sarick Madsen, Environmental Science, Policy and Management PhD Candidate, UC Berkeley; and from the EPA reference text, “Soil sampling” (2014) https://www.epa.gov/sites/production/files/2015-06/documents/Soil-Sampling.pdf

SAMPLING PROTOCOL

Materials and Preparation for sampling:

- Site Information Sheet
- Sampling Consent Form & Background Information Sheet for site host
- Random number generator / device that can access the internet
- Powderless nitrile gloves
- 3x Hand auger (or 1 per volunteer)
- 3x Screwdriver (for removing soil from auger, enough for 1 per volunteer)
- 6x 5-Gallon bucket (3 for collecting soil, 3 for cleaning with screen)
- 3x lid for 5-Gallon bucket
- Screen for cleaning soil
- Tape Measure 100 ft (or longer than your longest garden bed length)
- Surveying flags, 4 colors, 30 each
- Colored tape, 3 colors, with colors matching three of the survey flag colors
- Ziploc bags, 1-Gallon
- Sharpie

Before Sampling:

- Ask site point-person to sign the sampling consent form
- Give them a copy of the consent form, including sampling coordinator contact information.
- Fill out “Site Information Sheet” with personal information for all volunteers
- **Stake out the field (see Site Preparation instructions below)**
- Use the 3 rolls of colored tape to color-code augers to match buckets
    - Place tape around auger, 6 inches from the base

Sampling Method Overview:

We will be randomizing our samples using a random number generator to increase the likelihood that the areas we sample are representative of the entire field. We will only be sampling from beds where food is currently being grown.

We will be sampling using 30 increments, the minimum recommended for soil sampling. All increments are combined into 1 sample that gets sent to the lab. We are taking three replicates (aka “triplicate”) at each of these increments. Replication helps us estimate

the experimental error. **This means that in total, we will be digging 90 holes per site.**

Site Preparation:

Each site is different, and will have different constraints. Please adapt this as you need to for your site, and write all updates - *in detail* - on the site information sheet.

1. Determine which area of site will be sampled. We are focusing on areas where food is currently being grown, and excluding other parts of sites, like picnic tables, processing areas, pathways, and perennial beds.
2. Determine the number of increments per bed
    - Count the number of beds in your sampling area
    - Divide 30 by the number of beds
    - This is the number of increments that need to come from each bed.
    - If you have remainders, please allocate the remainders to other beds by using the random number generator
    - Eg: if your site has 7 beds, then 30/7 = 4.28, which represents 4 increments in each bed, and 2 remaining. You would then figure out which beds will get *5 increments* (the remainders), by setting your random number generator to 1-7 (representing each bed), and running off 2 random numbers.
3. Determine the sampling locations within each bed
    - Walk the length of the beds using the measuring tape. Leave the measuring tape outstretched for step 4.
    - Set your random number generator to output numbers between 1 and the total number of feet in your bed.
    - Run off the number of increments you need for each bed (from our example above, you would run off either 4 or 5 numbers).
        - Dismiss any numbers that are within 2 feet of another number
4. Mark the field for all sampling locations
    - Walk the field to place a white flag survey marker at the point in the row that corresponds with the random number generator output
        - Eg: If your bed was 72 feet long, and your number generator ran off 52, 12, 35, 5, you would place a flag in the middle of the bed at the 52ft marker on your outstretched measuring tape, etc.
    - Place three different colored flags in a triangle around the initial white flag marker, each about a 1-2ft apart. These are our “triplicates”. The soil from

the red flag will be mixed with all other red flags, blue flags with other blue flags, etc. The white markers will not be sampled.

Soil sampling:

- Begin with new nitrile gloves & clean equipment (bucket and shovel)
    - To avoid cross-contamination, different equipment must be used between each replicate (represented by the different flag colors). If using a single set of equipment, complete sampling for an entire set of 1 flag color, and then clean your equipment before you change replicates.
- For each hole:
    - Remove vegetation, debris, or gravel that covers the soil
    - Dig a 6-inch-deep hole using an auger
    - Empty the auger in a clean bucket
- Combine the soil from all 30 increments into a bucket and mix together thoroughly as you go along.
    - Remember: each color flag represents a replicate. All soil from a red flag will be mixed in a bucket with all other red flags.
- Remove debris and large clumps: Position a screen over a clean bucket and pour contents of sampled soil through screen into new bucket.
- Mix the increments in the bucket using a clean hand-trowel or other tool until you have a fine, well-mixed sample
- Place lid on bucket and label both lid and bucket with

After sampling:

- Finish end of “volunteer information sheet”
- When you are sure that all increments have been taken for all three replicates, remove the remaining white flags.
- Smooth out the soil in the beds as you go along so that the holes are not noticeable. Walk the field again at the end to ensure the site is how we found it.
- **Dry the soil**
    - Store your bucket in a cool and dry environment
    - Open the lid, and let stand 24-72 hours, stirring soil occasionally for even drying
- Fill out the labels on the ziplock bags, including:
    - Site ID, Date, Sample number (1, 2, or 3)
- Pour dried soil into corresponding ziplock bag
- Place ziplock bag in freezer until samples sent to lab

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SITE INFORMATION SHEET

When completed, please scan or take a picture of this sheet
and send it to sampling coordinator.

Volunteer Information

Name: _____

Email: _____

Phone number: _____

If there are other volunteers with you, please record their names and contact information in the notes on the back of this sheet

Site Information

Site Name: _____

Address: _____

▢ Site Manager Signed the Consent Form

Site History (more space on back)

How is the site irrigated: _____

_____

How many times since the fire have they amended the soil: _____

_____

What soil amendments do they use at the site: _____

_____

Sampling Information:

Date of sampling: _____

Start Time: _____

End Time: _____

Describe where the soil was stored to dry: _____

_____

When were samples bagged and put into freezer: _____

_____

Notes from Sampling: *Use this space to take notes on anything from your sampling time, including anything that differed from the standard method or did not go as planned. You can also use this space for more details from the site history.*

When finished, please read and sign the following statement:
These samples were taken using the method described in the "sampling protocol" given to me during orientation, and followed to the best of my ability. Any discrepancies or difficulties have been marked in the "notes" above.

Volunteer Signature Date

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SAMPLING CONSENT FORM - Copy for sampling records

Please note that this is a community-initiated and community-driven citizen science project, and as such, this consent form has not gone through an Institutional Review Board (IRB) for approval. It was created by and for community members to help better provide information and gain clear consent for sampling.

Information for making informed consent:

- *Testing:* We have funding to test soil from 5 sites in Sonoma County for heavy metals and dioxins. We will be storing some soil for more tests in the future.
- *Confidentiality*: We will be using your GPS location to mark your site on a map displaying all samples and their distance from the fires, but we will keep your farm's name and contact information confidential.
- *Follow-Up*: We will follow-up and engage with you to share our results, and to collaborate on any next steps that are needed based on results.
- *Timeline*: We currently have funding to analyze 5 sites and report on findings by Fall 2018. We encourage you to contact UC Cooperative Extension for your region for more comprehensive advice for the immediate future.

When finished, please read and sign the following statement:

I have read the above information about this citizen science research project. I was provided with a background information sheet and a copy of this consent form, including contact information for the citizen science coordinator. I consent to having plant tissues taken from my land and tested for the above stated purposes.

Name of farm or garden: _____

Name: _____

Title : _____

Signature: _____

Date: _____

SAMPLING CONSENT FORM - Copy for site host

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BACKGROUND INFORMATION SHEET

Urbal Wildfire and Potential Contamination

The fires that spread through Northern California in October 2017 burned over 160,000 acres of wildland, suburban, urban and industrial areas, creating dangerous air quality conditions for the region that lasted long beyond the fires themselves. The wildfire smoke likely included high concentrations of toxic air contaminants. Following the fires, the Food and Drug Administration wrote a letter to the California Department of Food and Agriculture and the California Department of Public Health, stating that "toxic elements, firefighting chemicals, and combustion products such as polycyclic aromatic hydrocarbons (PAHs) and dioxins are of greatest concern." There are well-known human health impacts from the *inhalation* of these contaminants. Additionally, plants have the potential to absorb air pollutants directly through their leaves, but little research has been done on the risk to human health from *ingesting* contaminants from smoke and ash on produce grown near a burn site.

Impact on Local Farms and Gardens

Local farms and gardens played a significant role in food relief efforts immediately following the fires, contributing produce to shelters and kitchens. Many farmers, gardeners, and community members have been concerned about how the fire-related air pollution might impact locally-grown produce. Farmers have been unsure of the potential health impacts of the fire on themselves, their workers, and their consumers. School gardens, community gardens, and home gardeners have been concerned about the potential health impact on children and other vulnerable groups.

Citizen Science Initiative

In the weeks following the Sonoma County fires, concerned community members came together to launch the Produce Safety after Urban Wildfire Citizen Science Initiative. Sonoma County residents and members of the UC Master Gardener Program of Sonoma County collaborated to take samples from over 25 sites across the region using a sampling protocol created under advisement by Environmental Health and Food Safety Specialists. Samples included washed and unwashed produce, each in triplicate, to determine if contaminants are present and whether contaminants can be easily washed off produce. Volunteers focused on leafy greens with large surface area directly exposed to air pollution: kale, collards, chard, and lettuce. In total, over 200 samples were taken and frozen for subsequent laboratory analysis.

Soil contamination is also a concern for the community. Community-led soil sampling will be initiated in June 2018 to test for persistent chemicals at 7 months following the fires.

For questions, please contact: Vanessa Raditz, MPH - vraditz@gmail.com