Citizen Science for Monitoring Climate Change and Air Quality

Grass sample collection packet

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About the project

Purpose: To estimate changes in air quality and fossil fuel consumption in California during the COVID-19 pandemic

Team: The research groups of Dr. Claudia Czimczik at UC Irvine and Dr. Francesca Hopkins at UC Riverside

Description:

California's Stay-at-Home order and its aftermath led to drastic changes in people's lifestyles. With reduced commuter traffic as many people shifted to working from home, many studies saw reduced levels of air pollutants and greenhouse gases.

A powerful way to quantify fossil fuel CO_2 levels is using the isotopic content of plants. During photosynthesis, plants fix carbon from the atmosphere into their tissue and passively record a fingerprint of the fossil fuel content in the local atmosphere. **Annual grasses** (such as the oat shown to the right) are particularly useful monitors of fossil fuels.

To study the impact of COVID on gases important for air quality and climate change, scientists at UC Irvine and UC Riverside are recruiting citizen scientists to help collect annual grasses from all over California. Citizen scientists were a huge help in collecting grass samples in 2020, and now we need help again to collect grasses from the 2021 growing season to compare to last year.

What kind of samples?

For this analysis, we are interested in winter annual grasses such as oats (*Avena fatua, Avena barbata*), ripgut (*Bromus diandrus)*, cheatgrass (*Bromus tectorum)*, and barley (*Hordeum murinum*). These are all invasive grass species that can be found almost anywhere in California. You might find them on hiking trails, parking lots, or even your backyard. The patch of ripguts shown to the left was found near the Rose Bowl in Pasadena. Almost anywhere

where you see an unmanaged patch of grass, there is a high chance annual grasses are there!

We would prefer if you collected samples as far away from freeways as possible. Both green and senesced (dry/brown) plants are extremely helpful. Oftentimes, you will find a green plant and a senesced plant right next to each other, as is shown on the picture to the right. In this case, please send a sample of both!

If you are worried about your ability to identify the plant species, fear not! There are helpful apps that do a decent job at identifying plants, such as *iNaturalist* and *PictureThis*. You simply take a picture of the plant and the apps algorithm will tell you the species.

Where to collect samples

Samples from all over the state of California are greatly appreciated!

The map to the left shows the locations of samples collected in 2020. It would be especially helpful to collect samples in the same locations as last year so we can directly compare year-to-year changes. A table with the GPS coordinates to all the 2020 samples is available on page 4 of this document.

You can use Google Maps to find these locations by typing the latitude and longitude into the search bar separated by a space.

How to Send Samples

For a visual example on how to collect plant samples, check out this YouTube video:
https://www.youtube.com/watch?v=Jqf0vDV1LcI

Step 1: Collect annual grasses in your neighborhood

Clip the plant at the base, making sure to include flowers in your sample.

Plants may be green or senesced as long as they are identifiable.

If you are not sure you can identify the grass species, don't worry! You can use a plant identification app such as iNaturalist or PictureThis

Please include flowers in your sample! It makes it easier for us to identify the species in the lab

**Step 2: Write down information about your sample**

On a piece of paper (e.g., a sticky note) write down the following information:

- Date of collection
- Location (latitude/longitude or nearest street address)
- Name of the plant species (or your best guess)

We also encourage you to include your email address if you would like to stay informed on the project!

Step 3: Mail your sample and notes in a _paper_ envelope

Please do not use plastic envelopes as they will cause the plant to mold. Mail to:
KCCAMS/ESS
c/o C. Czimczik
2222B Croul Hall
University of California, Irvine
Irvine, CA 92697-3100
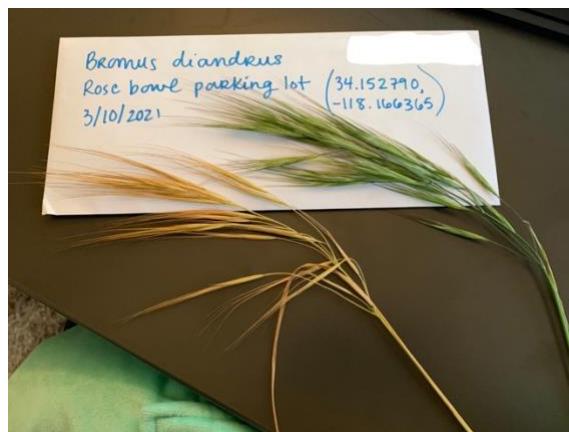
2020 Sample Locations

San Francisco Bay Area

Latitude	Longitude	Nearest city
37.44063	-122.2021	West Menlo Park
37.44334	-122.2076	West Menlo Park
37.47334	-122.2782	Emerald Hills
37.51627	-122.299	Belmont
37.55856	-122.2715	Foster City
37.57027	-122.3066	San Mateo
37.64935	-122.4927	San Francisco
37.6905	-122.4604	San Francisco
37.6912	-122.4588	San Francisco
37.71898	-122.4575	San Francisco
37.71906	-122.414	San Francisco
37.73514	-122.444	San Francisco
37.74041	-122.4753	San Francisco
37.74332	-122.4178	San Francisco
37.74465	-122.4187	San Francisco
37.74659	-122.3761	San Francisco
37.75855	-122.4415	San Francisco
37.75921	-122.506	San Francisco
37.77481	-122.4442	San Francisco
37.79411	-122.4542	San Francisco
37.79707	-122.4495	San Francisco
37.84023	-122.2713	Emeryville
37.85828	-122.2575	Berkeley
37.85889	-122.2576	Berkeley
37.89221	-122.5371	Mill Valley
37.89341	-122.5048	Strawberry
37.89778	-122.5521	Mill Valley
37.90151	-122.5312	Mill Valley
37.90156	-122.5588	Mill Valley
37.92289	-122.5284	Corte Madera
37.92406	-122.5265	Corte Madera
37.92815	-122.3901	Richmond
37.92865	-122.525	Corte Madera
37.93576	-122.3477	Richmond
37.94316	-122.3116	Richmond
37.96665	-122.2647	El Sobrante
37.96759	-122.3096	El Sobrante
37.96806	-122.2647	El Sobrante
37.97164	-122.3103	El Sobrante
37.98863	-122.5915	Fairfax
37.99972	-122.4611	China Camp
38.02904	-122.6659	Nicasio
38.0295	-122.666	Nicasio
38.0884	-122.1676	Benicia
38.22778	-122.5922	Petaluma
38.31917	-122.6981	Rohnert Park
38.34417	-122.6447	Rohnert Park
38.36028	-122.6944	Rohnert Park
38.3623	-122.6859	Rohnert Park
38.36917	-122.6822	Rohnert Park
38.36944	-122.6944	Rohnert Park
38.45295	-122.713	Santa Rosa
38.465	-122.6364	Santa Rosa

Central Coast

Latitude	Longitude	Nearest city
34.63631	-118.4502	Lake Hughes
34.541	-119.847	Goleta
35.10753	-119.5981	Carrizo Plain
35.54552	-120.9162	Harmony
35.57408	-120.6791	Templeton
35.84094	-121.4009	Gorda
36.139	-121.651	Slates Hot Springs
36.16949	-121.6847	Slates Hot Springs

San Joaquin Valley

Latitude	Longitude	Nearest city
36.32815	-119.2309	Visalia
36.23638	-119.3274	Visalia
36.36026	-119.3081	Visalia
36.32464	-119.3145	Visalia
36.31206	-119.1934	Visalia
36.3078	-119.1941	Visalia
36.31869	-119.2071	Visalia
36.29599	-119.0979	Visalia
36.34111	-119.2791	Visalia
36.31286	-119.2433	Visalia
37.06109	-119.3974	Visalia

Inland Deserts

Latitude	Longitude	Nearest city
32.99362	-115.0788	Glamis
32.96318	-115.0968	Glamis
33.62908	-116.2763	La Quinta
33.35744	-116.3995	Anza Borrego
34.04556	-116.9472	Oak Glen
34.1625	-116.9108	Seven Oaks

North Coast

Latitude	Longitude	Nearest city
39.2852	-123.7937	Mendocino
39.13777	-123.1996	Ukiah
39.48706	-123.0812	Potter Valley

Sacramento Valley

Latitude	Longitude	Nearest city
38.56963	-121.3522	La Riviera
38.62777	-120.7373	Outingdale
38.84906	-120.8103	Meadow Brook
38.63344	-121.2277	Gold River
38.63442	-121.2277	Gold River
38.70511	-121.4103	Rio Linda
39.43443	-121.54	Palermo
38.91437	-121.0255	Auburn
40.52444	-122.3822	Redding

Sierra Nevadas

Latitude	Longitude	Nearest city
38.91861	-119.9697	South Lake Tahoe

Los Angeles Basin

Latitude	Longitude	Nearest city
33.62	-117.68	Mission Viejo
33.62108	-117.8027	Irvine
33.68731	-117.4565	Lake Elsinore
33.69001	-117.4631	Lake Elsinore
33.6901	-117.4631	Lake Elsinore
33.69326	-117.4666	Lake Elsinore
33.6972	-117.4723	Lake Elsinore
33.71563	-118.3139	Palos Verdes
33.72568	-118.0311	Seal Beach
33.7332	-118.3181	Palos Verdes
33.73848	-117.8262	Tustin
33.74547	-117.8326	Tustin
33.74608	-117.8266	Tustin
33.88373	-117.9118	Fullerton
33.92578	-117.3183	Riverside
33.92611	-117.32	Riverside
33.92889	-117.33	Riverside
33.92972	-117.3331	Riverside
33.93077	-116.9322	Beaumont
33.93611	-117.3479	Riverside
33.9547	-116.9697	Beaumont
33.9743	-116.9568	Beaumont
33.99321	-117.3724	Riverside
34.15528	-118.1689	Pasadena
34.17167	-118.7578	Thousand Oaks
34.1781	-118.7686	Thousand Oaks
34.36227	-118.4919	Santa Clarita
33.62	-117.68	Mission Viejo
33.62108	-117.8027	Irvine
33.68731	-117.4565	Lake Elsinore
33.69001	-117.4631	Lake Elsinore
33.6901	-117.4631	Lake Elsinore
33.69326	-117.4666	Lake Elsinore
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