



NASA and LA City

Welcome to CSULA's Senior Design Expo!

Climate Change Management System

Mission Statement: Our mission is to provide the valuable resource/information to be aware of Wildfire in California.

Data Science for Climate Change Management with Focus on Drought and Wildfire in California



Team Members: Mazel Fernandez, Rayan Hyder, Victor Raj, Jennifer Serrano-Perez, Funing Yang
Project Lead: Mazel Fernandez
Academic Advisor: Mohammad Pourhomayoun
Sponsors: NASA and LA City
Grad Support: Ryan Dunning

Agenda/Table of Contents

1. Definitions
2. Causes of wildfires
3. Recent wildfires
4. Significance
5. Wildfire size predictive model
6. Goals of our project
7. Impacts
8. Achievements so far
9. Demo
10. Analytics and discovery
11. Future goals



Our Team and Project/Faculty Advisor: Dr. Mohammad Pourhomayoun

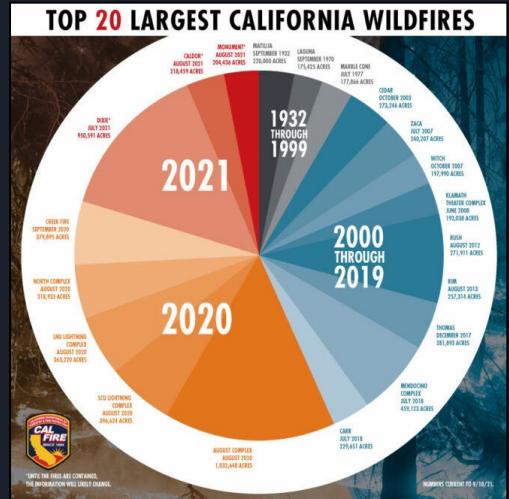


Sponsors: NASA & LA City



Definitions

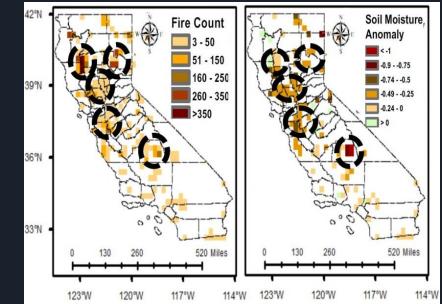
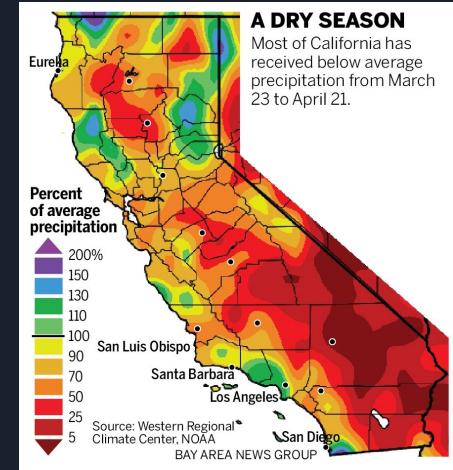
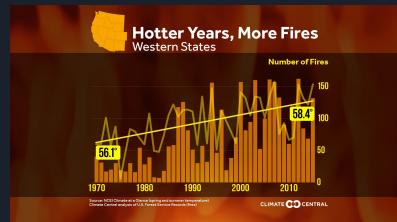
- Climate Change: a change in global or regional climate patterns, in particular a change attributed largely to the increased levels of atmospheric carbon dioxide
- Wildfire: a large, destructive fire that spreads quickly over woodland or brush
 - Factors to consider in spread of wildfires: wind, temperature, cloudiness, moisture, and air pressure



Factors that influence the spread of Wildfires



- Wind Speed
- Temperature
- Vegetation
- Soil Moisture
- Precipitation



Speaker: Mazel Fernandez

Why are wildfires hard to extinguish?

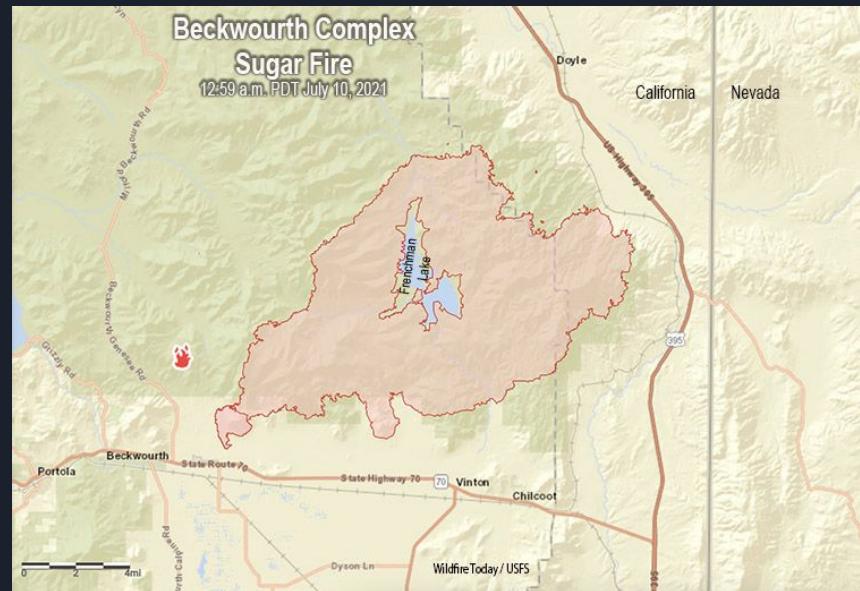


- Wildfire size makes it harder to control
- The climate in which fires start is incredibly dry (humidity is an enemy of forest fires)
- It is impossible to place firefighting crews in the middle of the blaze (think of it like a storm)



Beckwourth Complex Wildfires

July 3, 2021 - September 22, 2021

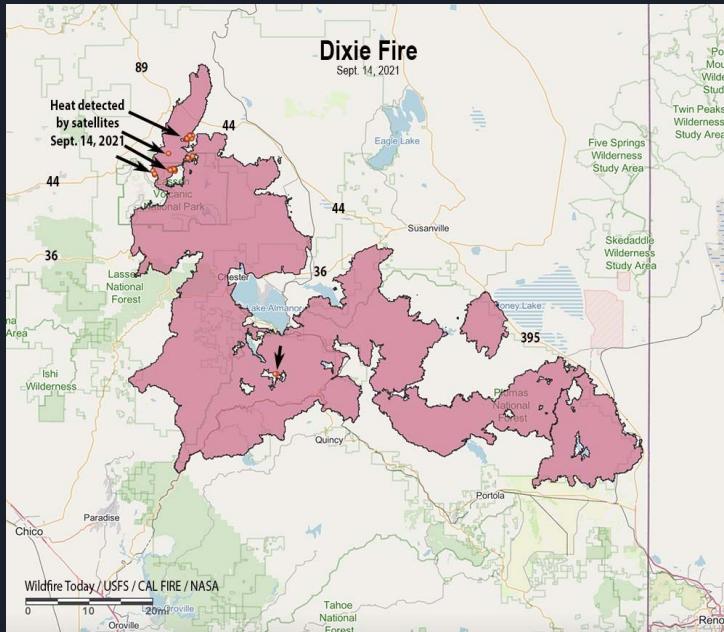


Burned: 105,670 acres

Speaker: Mazel Fernandez

Dixie Wildfire

July 13, 2021 - October 25, 2021
(LARGEST in California's history)



Burned: 963,309 acres



Speaker: Mazel

Aftermath of Wildfires



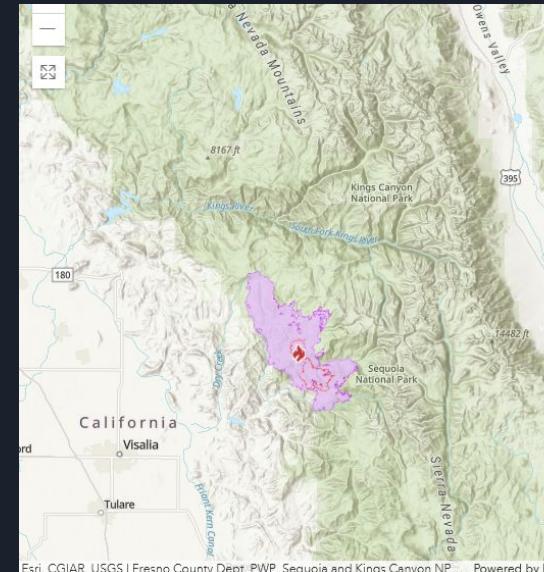
Fires destroyed an area of the Coffey Park neighborhood in Santa Rosa, Calif (2017)

Speaker: Mazel Fernandez



Significance

- KNP Complex Fire - Sequoia and Kings Canyon National Parks
- Paradise and Colony fires merged, forming the KNP Complex Fire
- 2,380 giant sequoias burned or are expected to die in a couple years



Significance

- **High Cost:** California spends an estimated \$2.5 billion a year on CAL Fire firefighting
- Money is being spent on putting out fires, not prevention
- Only putting out fires is not enough because climate change has made it difficult to put out
- **Loss of Wages:** Farmworkers in Northern California in 2020 were estimated to have lost an average of \$5,500 in wages due to fires.



Significance

- Fire seasons are starting earlier and ending later each year
- Problems with evacuation in California
 - An investigation found that only 22% of high-risk communities have evacuation plans
- Evacuating from wildfire zones is difficult
 - Difficult for people in wheelchairs, health conditions to evacuate



Speaker: Jennifer Serrano

Significance

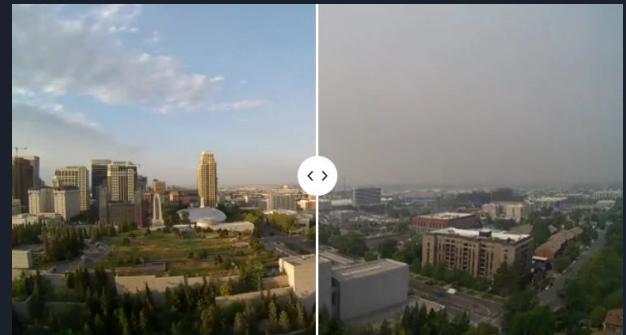
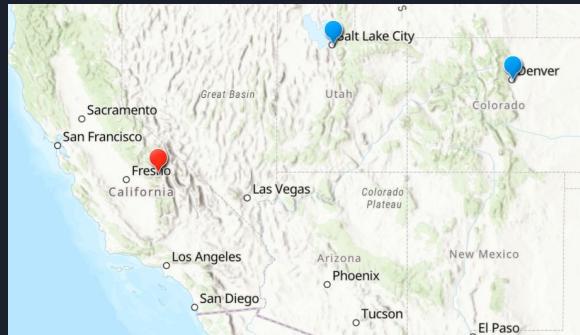
- Smoke travels very far
 - Smoke from California fires and other parts of the west reached Colorado and Utah
 - Air quality in Denver and Salt Lake City were among the worst in the world

Health Issues

- Smoke from wildfire is unhealthy and can impact children, older adults, citizens with respiratory diseases, etc.
 - Children breath more air, including air pollution
- Wildfires can trigger mental health conditions



Salt Lake City, Utah



Skyline before the
Dixie Fire.

During the Dixie fire

Wildfires in California

According to the California Department of Forestry and Fire Protection...



2,568,948
Acres Burned



8,835
Incidents



3
Fatalities

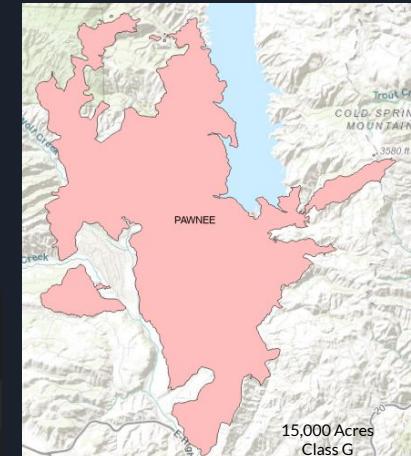
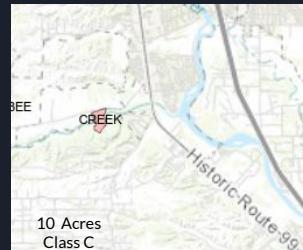


3,629
Structures
Damaged

2021 Fire Season.

Wildfire Size Predictive Model

- Can use AI + ML to monitor and control wildfires because of computational powers and a lot of wildfire-related data has been gathered over the years.
- Features used to predict wildfire size: temperature, wind speed, precipitation, acres burned, discovery date, etc.
- Random Forest & SVM
- C: 10-99.9 acres
- D: 100 -299.9 acres
- E: 300- 999 acres
- F: 1000-4999 acres
- G: 5000+ acres



	LATITUDE	LONGITUDE_X	SensorID	FIRE_NAME	FIRE_SIZE	Started	ETo (in)0	Precip (in)0	Sol Rad (Ly/day)0	Avg Vap Pres (mBars)0	Avg Air Temp (F)0	Avg Rel Hum (%)0	Avg Wind Speed (mph)0	Wind Run (miles)0	Avg Soil Temp (F)0
0	34.482800	-119.632160	107	Gibraltar Fire	21.0	2015-10-29T05:30:00Z	0.13	0.0	344	10.1	69.2	41	3.4	80.5	68.5
1	35.248889	-118.673056	125	BITTER IC C/L12 T/TAC3	200.0	2006-07-15T00:00:00Z	0.28	0.0	615	15.3	84.6	38	3.1	74.6	88.1
2	34.121111	-117.302778	44	LITTLE MOUNTAIN	136.0	2008-10-14T04:40:00Z	0.18	0.0	418	3.9	69.4	16	4.0	96.5	60.0

Goals of Our Project

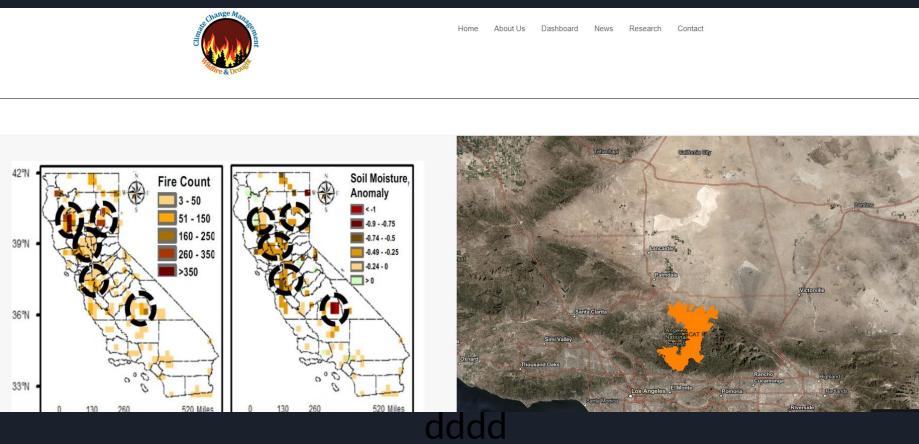
- Goals:

- The KISS principle ("Keep it simple stupid!")
- The Software has a mandatory delivery date that must be met.
- Emphasis on speed versus memory use
- The product should work, look, or "feel" like an existing product
- The data gathered from ArcGIS's Living Atlas should be accurate
- The GUI should be user-friendly
- The application should be able to effectively extract knowledge of climate change and wildfire data for users
- To create a dashboard with data analytics models includes data science models in the back end to correlate the cause and effect of wildfires

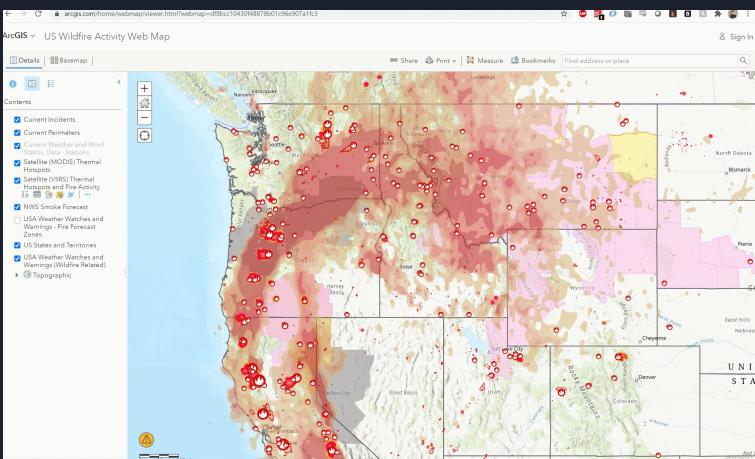


Purpose of our project

- To create a user-friendly dashboard with data analytics models to help understand the cause and effect of wildfires, thus bringing more awareness to fire readiness, and other factors such as climate change.
- Illustrate prescient models or administrations that will give the fundamental data around fire climate, fire danger/fuels, an intelligence/resource status data that fire directors got to expect critical fierce blaze movement and decide where to position firefighters, motors, air ship and other rapidly spreading fire concealment resources to reply to it.



dddd



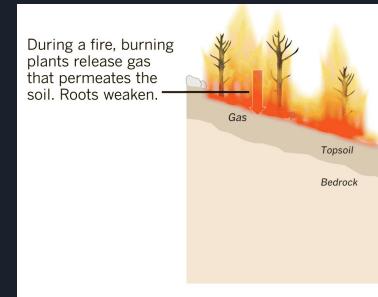
Impact on Ecosystem

- Some scientists claim that intrusive weeds and grasses might surpass local plants and bushes, making soil disintegration more likely which may lead to indeed more visit fierce blazes within the future, concurring to CBS.
- The effect on creatures will depend on the species. Littler creatures, such as rabbits and a few birds, might have inconvenience surviving within the confront of the misfortune of local vegetation on which they depend, according to CBS piece said.
- Depending on the environment, different process, such as extended lodging advancements and the utilities they require, fire exclusion/firefighting, and timber gathering, within the past a few decades have made it easier for fires to urge out of control, concurring to the USFS.



Impact on health

- The poisonous smoke has as of now caused air quality to fall to unsafe levels in California, Oregon and Washington in addition to poisonous air, there is also debris and ash that covers some neighbourhoods toxic to humans and animals alike.
- Another enormous concern for inhabitants is the danger of avalanches. Fierce blazes can char soil and enliven the probability of disintegration, which when matched with an attack of flooding precipitation makes however another catastrophe inhabitants must confront. When fire burns up vegetation, it annihilates what keeps soil steady. At that point when it downpours intensely, the water washes all of that soil absent with ease

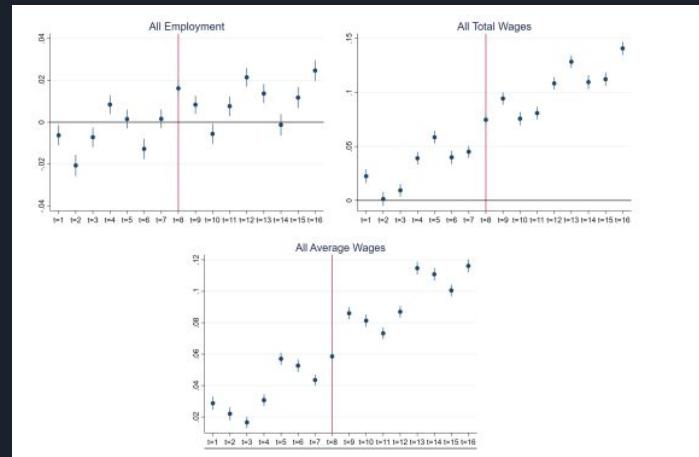
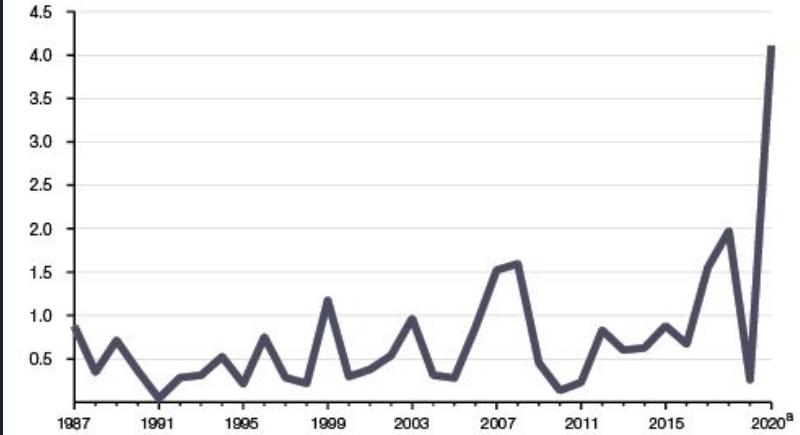


Impact on Economy

- In 2020, for example, a team of researchers studied the nationwide impact of California's 2018 wildfire season, and estimated that its economic damage totaled \$148.5 billion.
- As rapidly spreading fires gotten to be a more noteworthy chance around the world, it's imperative to consider the ways that fires and fire season influence the economy. An financial think about has assessed that each extra day of smoke presentation from a rapidly spreading fire diminishes profit in a community by around 0.04% over two a long time

Over 4 Million Acres Burned in California Wildfires in 2020

(In Millions)



Technologies Used



HTML



CSS



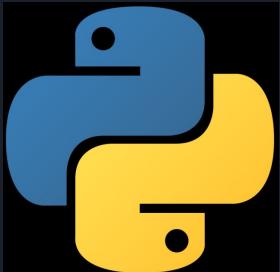
JS



ArcGIS



pandas





Achievements So Far

A user-friendly dashboard :

- Main map for wildfires
- Detailed research maps
- Correlated the causes and effects of wildfires through case study and analytic models
- Up-to-date News

Home Page

The screenshot shows the homepage of the Climate Change Management website. At the top left is a logo featuring a circular design with the text "Climate Change Management" at the top and "Wildfire & Drought" at the bottom, with a stylized fire and trees in the center. At the top right is a navigation menu with links to Home, About Us, Dashboard, News, Research, and Contact. The main content area features a large photograph of a wildfire scene with firefighters. Overlaid on the photo is the text "BRINGING YOU THE LATEST UPDATES IN CALIFORNIA'S CLIMATE!" and a "DASHBOARD" button. A horizontal navigation bar with left and right arrows is visible at the bottom of the image.

Climate Change Management

Wildfire & Drought

Home About Us Dashboard News Research Contact

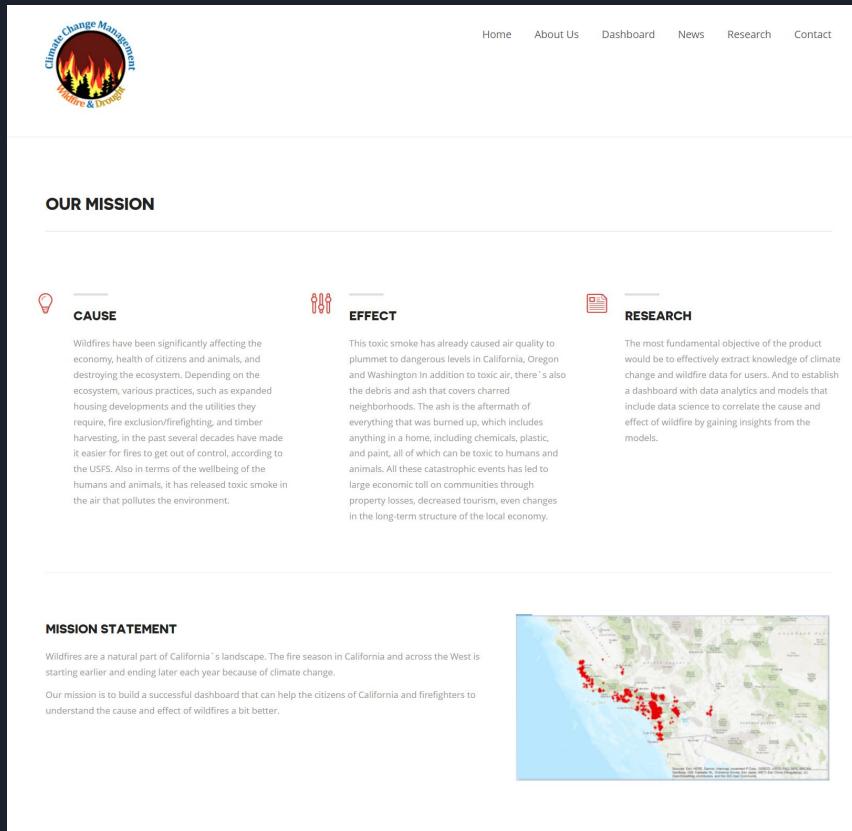
BRINGING YOU THE LATEST UPDATES
IN CALIFORNIA'S CLIMATE!

DASHBOARD

← →

Speaker: Funing Yang

Our Mission



The screenshot shows a website for "Climate Change Management" with a logo featuring a circular design with flames and the text "Climate Change Management" and "Wildfire & Drought". The navigation bar includes links for Home, About Us, Dashboard, News, Research, and Contact.

OUR MISSION

CAUSE

Wildfires have been significantly affecting the economy, health of citizens and animals, and destroying the ecosystem. Depending on the ecosystem, various practices, such as expanded housing developments and the utilities they require, fire exclusion/firefighting, and timber harvesting, in the past several decades have made it easier for fires to get out of control, according to the USFS. Also in terms of the wellbeing of the humans and animals, it has released toxic smoke in the air that pollutes the environment.

EFFECT

This toxic smoke has already caused air quality to plummet to dangerous levels in California, Oregon and Washington. In addition to toxic air, there's also the debris and ash that covers charred neighborhoods. The ash is the aftermath of everything that was burned up, which includes anything in a home, including chemicals, plastic, and paint, all of which can be toxic to humans and animals. All these catastrophic events has led to large economic toll on communities through property losses, decreased tourism, even changes in the long-term structure of the local economy.

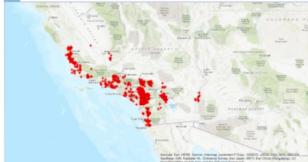
RESEARCH

The most fundamental objective of the product would be to effectively extract knowledge of climate change and wildfire data for users. And to establish a dashboard with data analytics and models that include data science to correlate the cause and effect of wildfire by gaining insights from the models.

MISSION STATEMENT

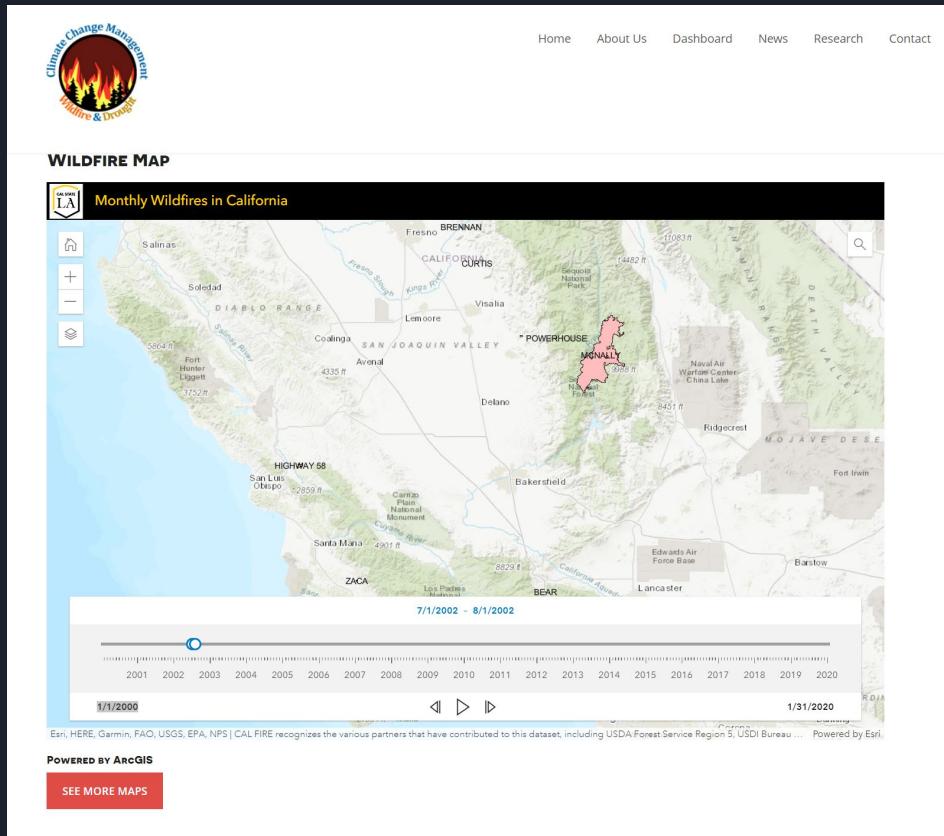
Wildfires are a natural part of California's landscape. The fire season in California and across the West is starting earlier and ending later each year because of climate change.

Our mission is to build a successful dashboard that can help the citizens of California and firefighters to understand the cause and effect of wildfires a bit better.



Speaker: Funing Yang

Dashboard



Speaker: Funing Yang

News Page

The screenshot shows a news page with a dark header featuring a blue and green decorative bar on the left. The header includes a logo for "Climate Change Management" with "Wildfire & Drought" below it, and a navigation menu with links to Home, About Us, Dashboard, News, Research, and Contact.

wildfire california

The main content area displays a horizontal scrollable grid of six news articles:

- Pacific Gas and Electric seeks to float \$7.5 billion to recover 2017 wildfire damages
- San Bruno's Crestmoor Canyon preps for wildfires
- Wildfire outlook for the Lake Tahoe Basin
- South Lake Tahoe Fire Rescue to host Wildfire Safety Expo
- Sonoma Co. PG&E Settlement Gives Wildfire Victims A Chance To Prepare For Fire Season
- 4 Poems About Wildfire, Climate Change and Loss

Speaker: Funing Yang

Analytics and Knowledge Discovery Page

Home About Us Dashboard News Research Contact

Climate Change Management
Wildfire & Drought

RESEARCH MAP/CASE STUDY

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus, Powered by Esri
Vegetation Map (Monthly) Zoomed

Based on the Vegetation map above, .

02 / 06

Wildfires can burn in vegetation located both in and above the soil. Ground fires typically ignite in soil thick with organic matter that can feed the flames, like plant

Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USGS, USDA FS, USGS 10m Bio-GRD, IGM, Esri, and the GIS User Community. © 2018 Esri. All rights reserved. Esri, the Esri logo, the double esri esmark logo, ArcGIS, the "diamond" logo, CityEngine, Collector, FeatureEngineer, NetworkEngine, Pay-as-You-Go, and other trademarks and/or service marks of Esri are either registered in the U.S. Patent and Trademark Office or used under license. Other companies and products mentioned herein may be trademarks of their respective owners.

Speaker: Funing Yang

Contact

Climate Change Management
Wildfire & Drought

Home About Us Dashboard News Research Contact

result from campfires left unattended, the burning of debris, downed power lines, negligently discarded cigarettes and intentional acts of arson. The remaining 10 percent are started by lightning or lava. "

- Information insurance institute -

● ● ●

CONTACT US

Name

Email

Our Office

The organization is researched by California State University of Los Angeles, Computer Science Department (E&T A-322).

Message

Contact Details

5151 State University Dr, Los Angeles, CA-900032

(323) 343-6690

cs@calstatela.edu

SEND MESSAGE

Speaker: Funing Yang



DEMO

Speaker: Funing Yang



ANALYTICS & DISCOVERY

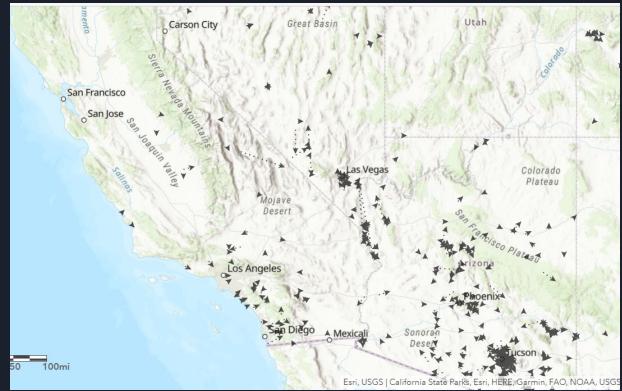
Speaker: Mazel Fernandez



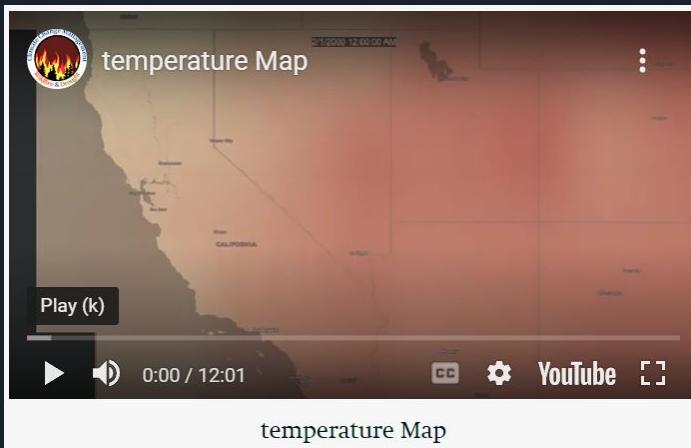
Vegetation Map (Monthly) Zoomed



Soil Moisture Zoomed



Precipitation 2000-Current Zoomed



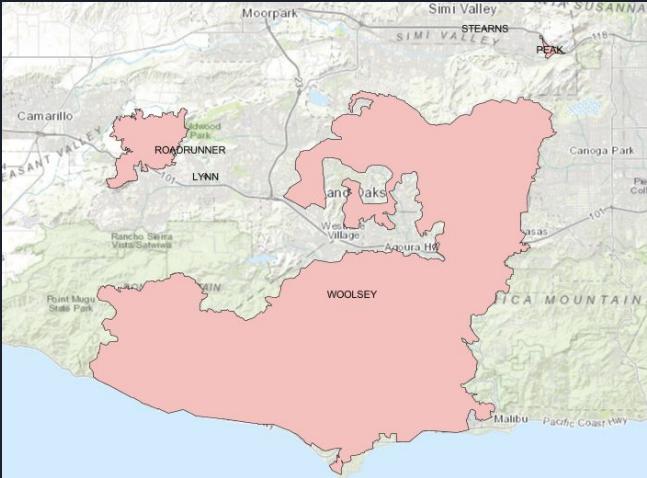
temperature Map

Speaker: Mazel Fernandez



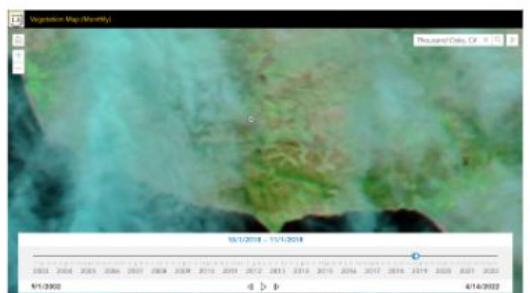
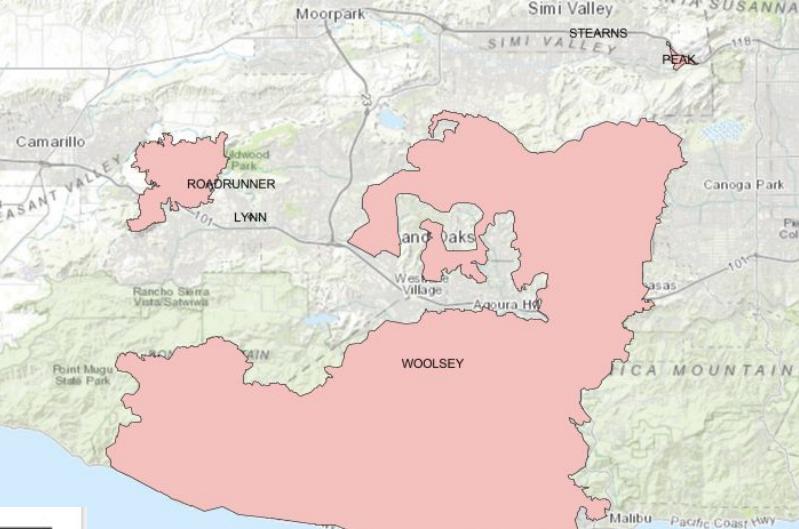
Woolsey Fire

- **Location:** Los Angeles and Ventura Counties of California
- **Burned:** 96,949 acres
- **Date(s):** November 8-21, 2018
- **Non-fatal injuries:** 2 civilians; 3 firefighters

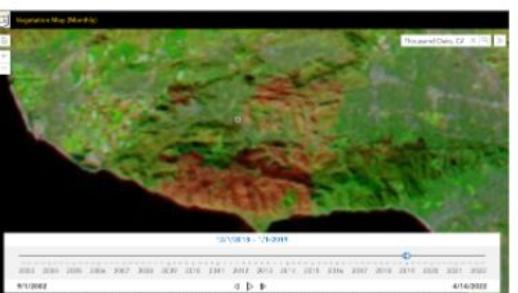


Speaker: Mazel Fernandez

Vegetation



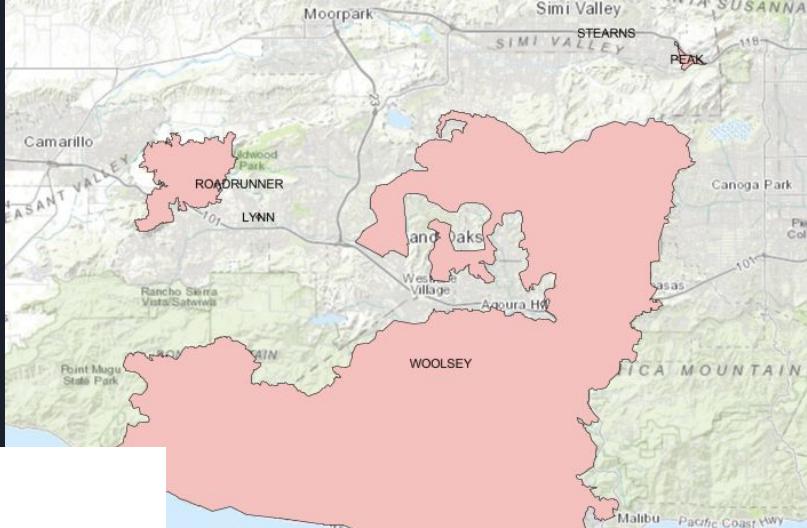
Vegetation **BEFORE** the Woolsey Fire, notice the greenery + some dry areas. Dry areas are very flammable, which results in high wildfire hazard.



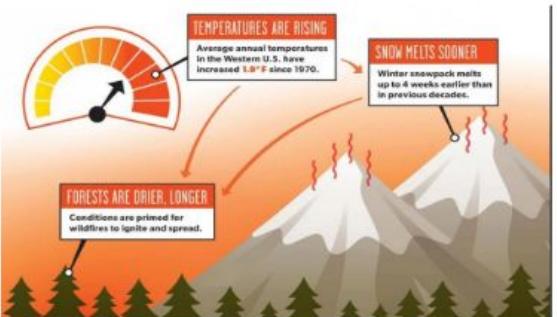
Vegetation **AFTER** the Woolsey Fire, red shows heavily burned areas

Speaker: Mazel Fernandez

Temperature



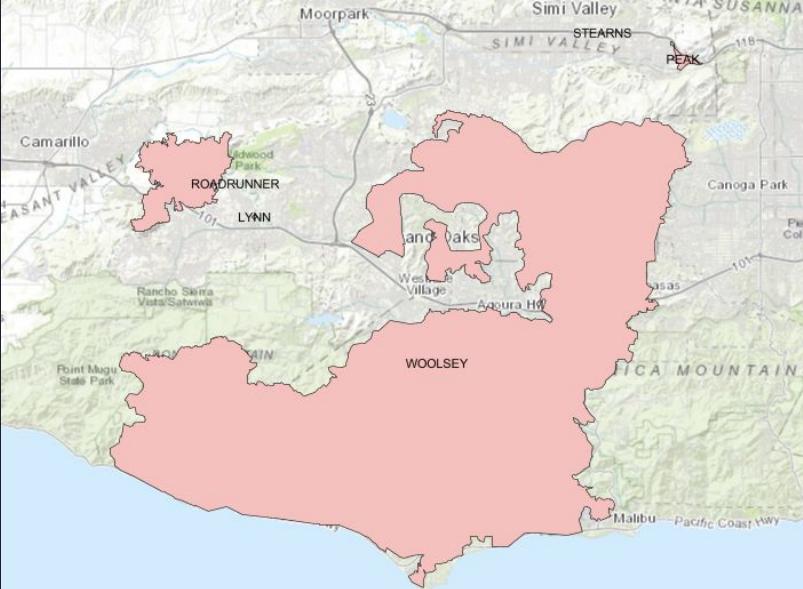
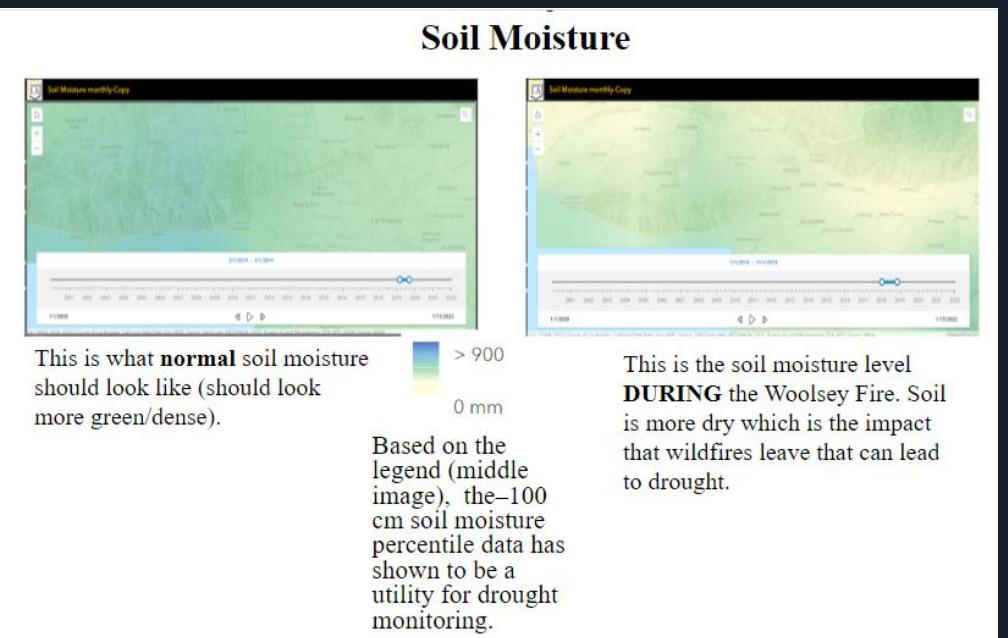
Temperature



It was a sunny day when the Woolsey fire began with temperature in the mid 70's. Rising temperatures can be an indicator of climate change and can evaporate moisture from the ground, which dries soil, and makes vegetation more flammable.

Speaker: Mazel Fernandez

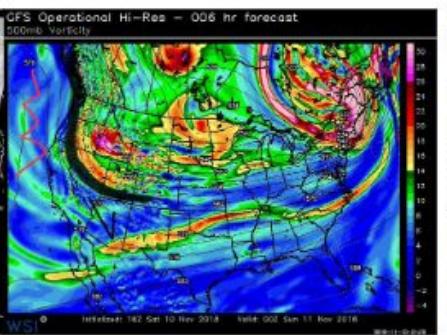
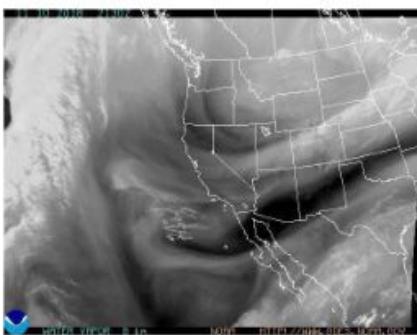
Soil Moisture



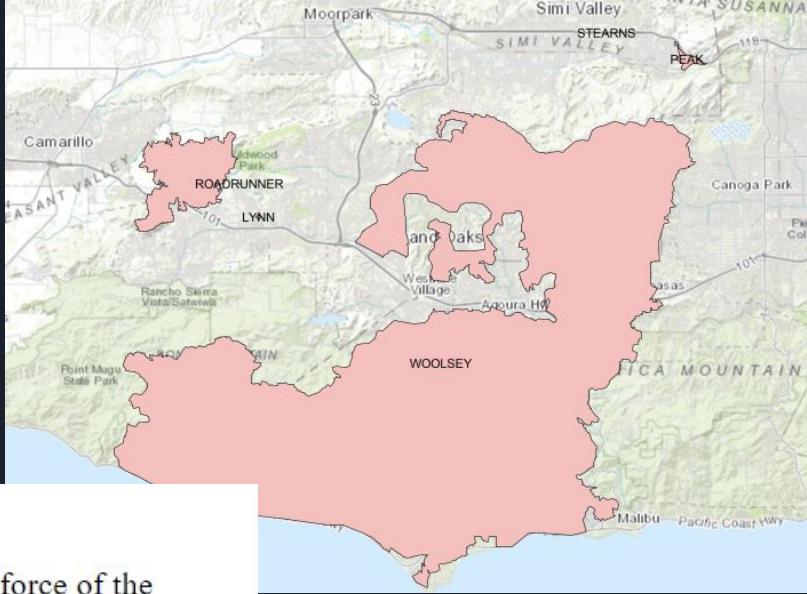
Speaker: Mazel Fernandez

Wind

Wind

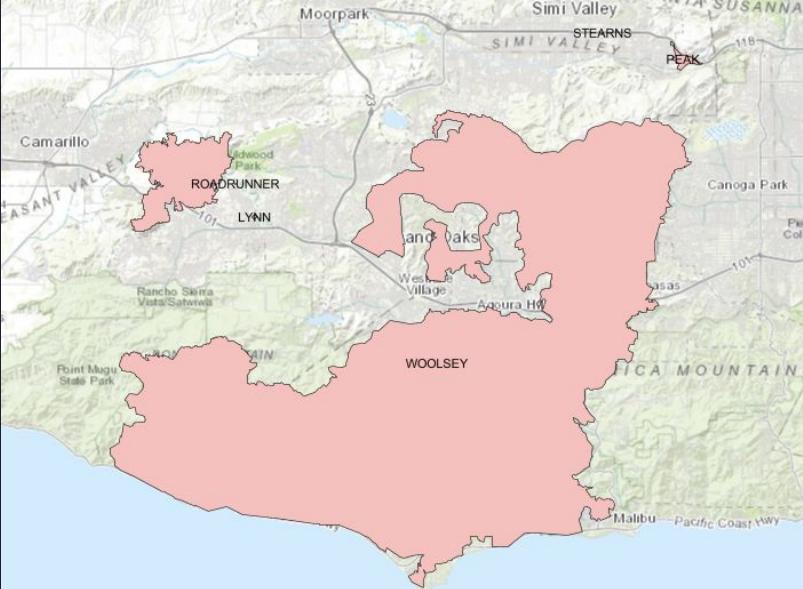
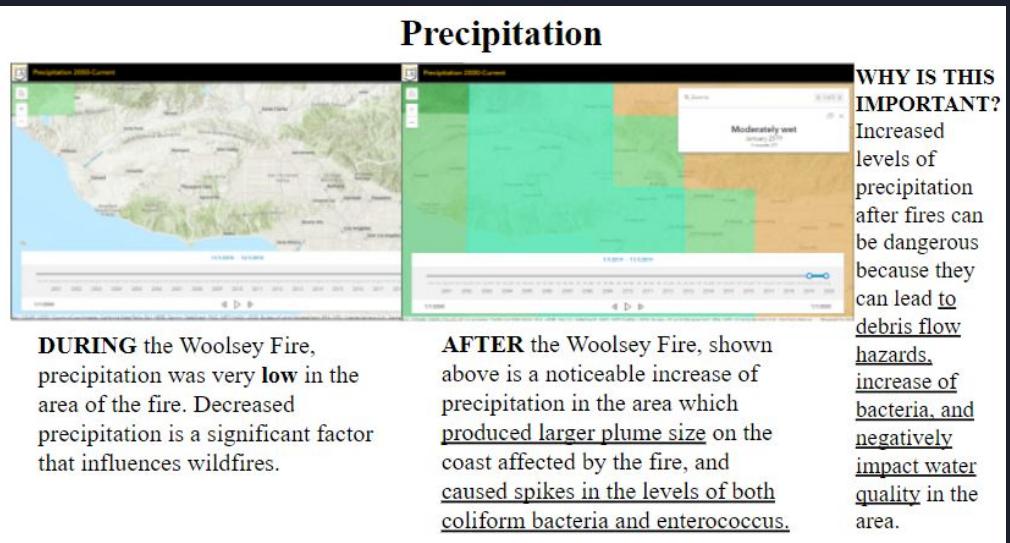


The driving force of the **Woolsey Fire** has been extreme wind—gusts of up to 60 miles per hour, perhaps even 70 in the hills of Southern California—blowing through the state. Wind further desiccates already dry vegetation and pushes the fires along with incredible speed.



Speaker: Mazel Fernandez

Precipitation



Speaker: Mazel Fernandez

Future Goals (Dashboard)

- Add more data
 - More detail
 - More live data
- Air quality
 - Live data
 - Prediction data
- Predictive Models
 - High Accuracy
 - Usefulness



Future Goals (Project - Long Term)

- Add More GUI Elements:
 - Side by side comparisons
 - In depth information of specific points
- Mobile Application





Links/Works Cited

- <https://codesandbox.io/s/wildfire-map-koeg7>
- <https://idahofirewise.org/fire-ecology-and-management/wildfire-ignition-behavior-and-effects/>
- <https://earthobservatory.nasa.gov/images/148789/climate-change-pushes-fires-to-higher-ground>
- <https://www.c2es.org/content/wildfires-and-climate-change/>
- [Wildfire Watchers website](#)

Contact Info

Name	Role	Email
Mohammad Pourhamayoun	Faculty Advisor	mpourho@calstatela.edu
Mazel Fernandez	Project Lead	mferna79@calstatela.edu
Rayan Hyder	Demo & Presentation Lead	rhyder@calstatela.edu
Jennifer Serrano-Perez	QA Lead	jserra83@calstatela.edu
Victor Raj	Documentation Lead	vraj2@calstatela.edu
Funing Yang	Design & Development Lead	fyang15@calstatela.edu



THANK YOU!





Q/A