Wildfire Data Analysis Component

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1.Component Overview

a. Component Objective

The wildfire data analysis component of the Wildfire Prediction Platform, or WPP, will provide wildfire data analysis based on the available datasets, including weather data, fire history, powerline data, satellite and remote sensing datasets. The user will be able to interact with data analysis on a GUI provided on WPP. The user should be able to navigate around the map to see wildfire history for that region.

b. Implementation Plan

The implementation of this component will be powered by Tableau. The data analysis reports are generated by Tableau and are hosted on private Tableau server on AWS. The data for analysis are stored in AWS RDS service. The tableau server will query the data on RDS when user refreshes a report. The user will be able to access the report via web interface hosted on AWS. A cron function is hosted on AWS lambda that will update the data in RDS database when dataset updates.

More details can be found under section 3.

c. Use Cases

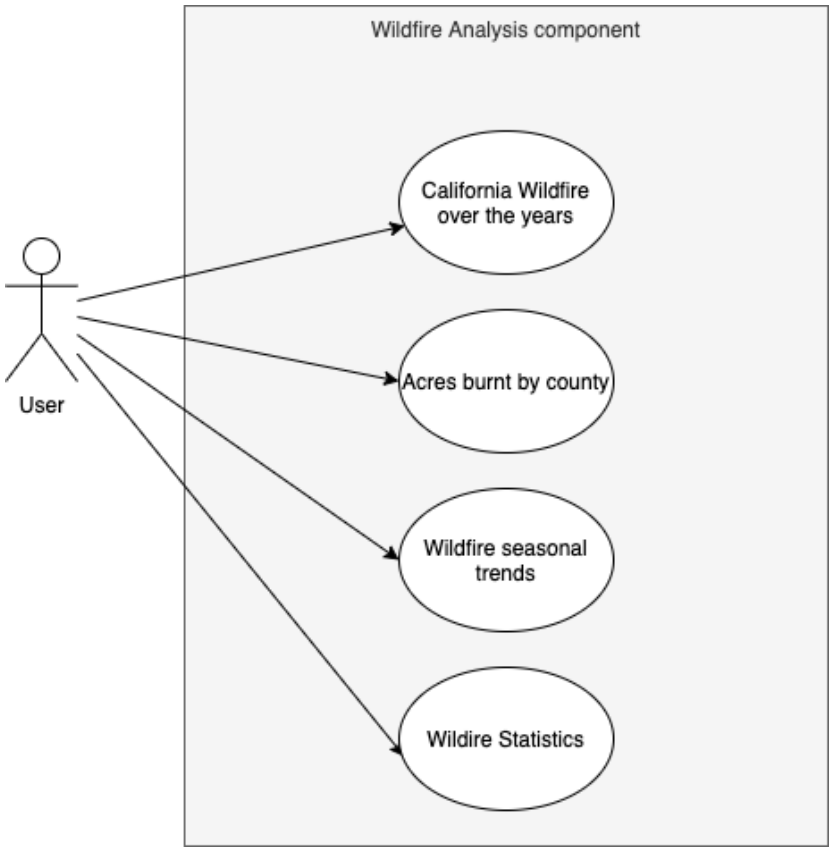


Figure 1: Use Case Diagram

d. User Stories

i. User Story - Fire Detection

As a user with the fire detection page of the WPP dashboard, **I can view** the map for active fires, **so that** I can make sure my house or other areas of concern are not on fire.

ii. User Story – Fire History

As a user with the wildfire data analytics page of the WPP dashboard, **I can search** via zip code or state, **so that** the area or county that I want to see on the map can be displayed accordingly.

ii. User Story – California topology

As a user with the wildfire data analytics page of the WPP dashboard, **I can see** topological details of California **so that** I can visualize pattern where wildfire is likely to occur.

e. Use Cases

Use case 1: Visualizing Fire history in California

Primary Actor: Public User, City User

Level: User Goal

Main Success Scenario

1. User clicks into Wildfire analytics Tab from dashboard
2. Wildfire analytics tab shows a map defaulted to a county or zone
3. Map should display Fire history over the years and intensity

Use case 2: Visualizing topological data of California

Primary Actor: Public User, City User

Level: User Goal

Main Success Scenario

1. User clicks into Wildfire analytics Tab from dashboard
2. Wildfire analytics tab shows a map defaulted to a county or zone
3. Map should display topological properties of California distributed into tiles

Use case 3: Visualizing Wildfire statistics

Primary Actor: Public User, City User

Level: User Goal

Main Success Scenario

1. User clicks into Wildfire analytics Tab from dashboard
2. Wildfire analytics tab shows statistics of Wildfires in United States

2.Application Interface Design and Analysis

a. API interfaces and Descriptions

Tableau Javascript API is used to embed the Tableau workbook in web interface.

```
<div id="vizContainer"></div>
  <script src="https://us-east-
1.online.tableau.com/javascripts/api/tableau-2.min.js"></script>
  <script>
   var viz
   function initViz() {
    var containerDiv = document.getElementById("vizContainer"),
    url =
"https://100.26.132.221/https://public.tableau.com/views/CaliforniaWil
dfire_16059024651270/Story1?:language=en&:retry=yes&:display_count
=y&publish=yes&:origin=viz_share_link";

    viz = new tableau.Viz(containerDiv, url);
   }
   initViz();
 </script>
```

b. Map API

The precursor for this component and this project is that we have a way of displaying the map and a way of overlaying the active fire points onto said map. For map visualization Mapbox API is used. A custom Mapbox style is created in Mapbox Studio and is embedded in Tableau Visualizations.

https://api.mapbox.com/styles/v1/vatsa13/ckhqbz2d70wju19qqrgn
v59xx.html?title=true&access_token=pk.eyJ1IjoidmF0c2ExMyIsImE
iOiJja2hxYXR1cncxajB6MzJteHRybGltcnd1In0.yI9SmlOzVlCOCra_eycO
Xg#5.1/36.826418/-113.185843/0

Mapbox Tiling Service:

To display topological properties of California divided into tiles, Mapbox's tiling service is used.

c. Datasets

1.) Cal Fire Wildfires Incident API

The California Department of Forestry and Fire Protection (CAL FIRE) responds to all types of emergencies. When the Department responds to a major CAL FIRE jurisdiction incident, the Department will post incident details to the web site. The dataset provides a summary of all incidents, including those managed by CAL FIRE and other partner agencies.

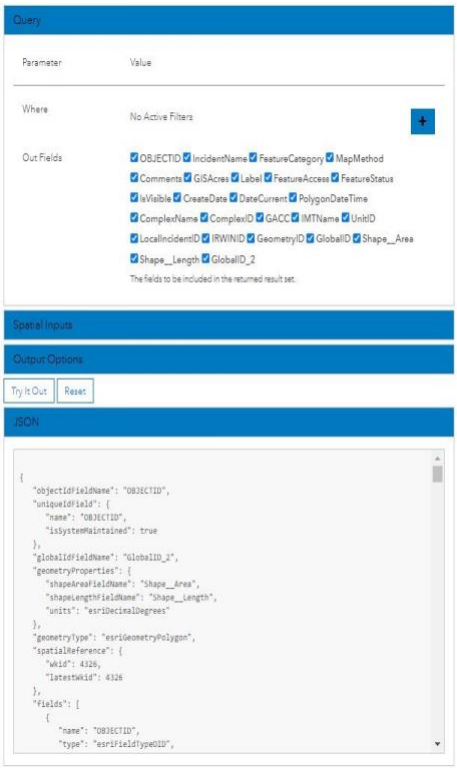
API: https://www.fire.ca.gov/umbraco/api/IncidentApi/List?year=xxxx

2.) NASA Earth Observatory Natural Event Tracker

EONET is a repository of metadata about natural events. It provides data about active wildfires in a GeoJSON format.

3.) Wildfire Perimeter API

This is an additional feature to retrieve data sets if we do not have any new data from the machine learning processed data. We can retrieve data from the National Interagency Fire Center using Rest API. Their website listed below. This website keeps track of wildfire perimeters and provides up to date information as well as legacy information on fire data.



https://data-nifc.opendata.arcgis.com/datasets/wildfire-perimeters, November 02, 2020.

4.) NOAA Weather Dataset

NOAA Weather API v2 provides time series data from various stations in California for Air temperatures, Wind speed, Wind gust and Relative humidity. All very important to predict Wildfire prone areas.

https://www.ncdc.noaa.gov/cdo-web/webservices/v2

3.Functional Design and Behavior Analysis

a. Architecture of Component

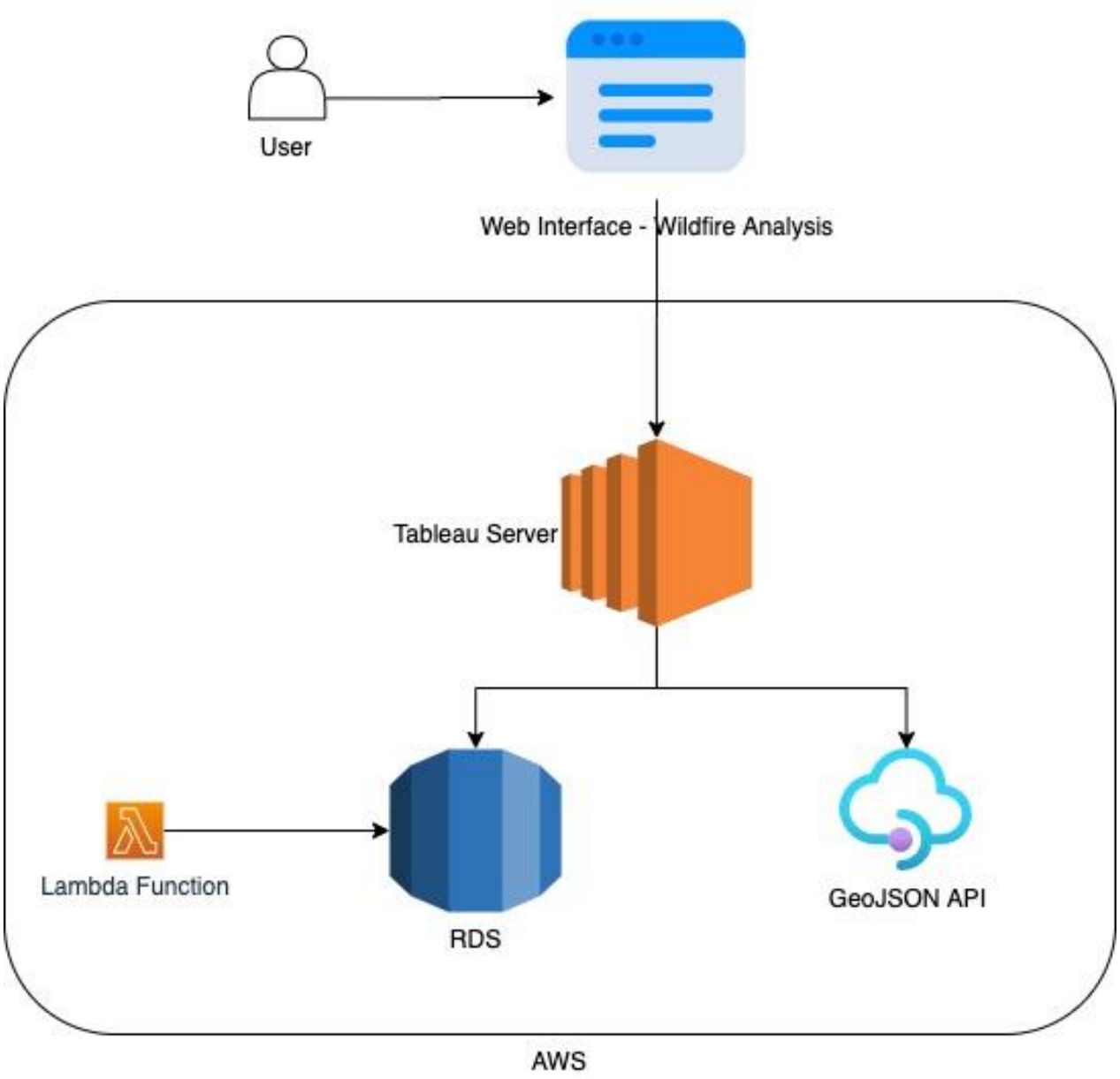


Figure 3: Wildfire Analytics Component Architecture

User would be able to access the Wildfire analytics via a web interface on public web. The web interface will be hosted via Google App engine. The analytics and visualization data for web interface will be fetched from a private Tableau server hosted on EC2. The Tableau server will fetch data from a RDS instance for Cal Fire history and NOAA weather data and the data for

active wildfires will be fetched from NASA GeoJSON API. There is also a lambda function hosted to update the data in RDS database when an updated dataset is available.

c. Class Sequence Diagrams

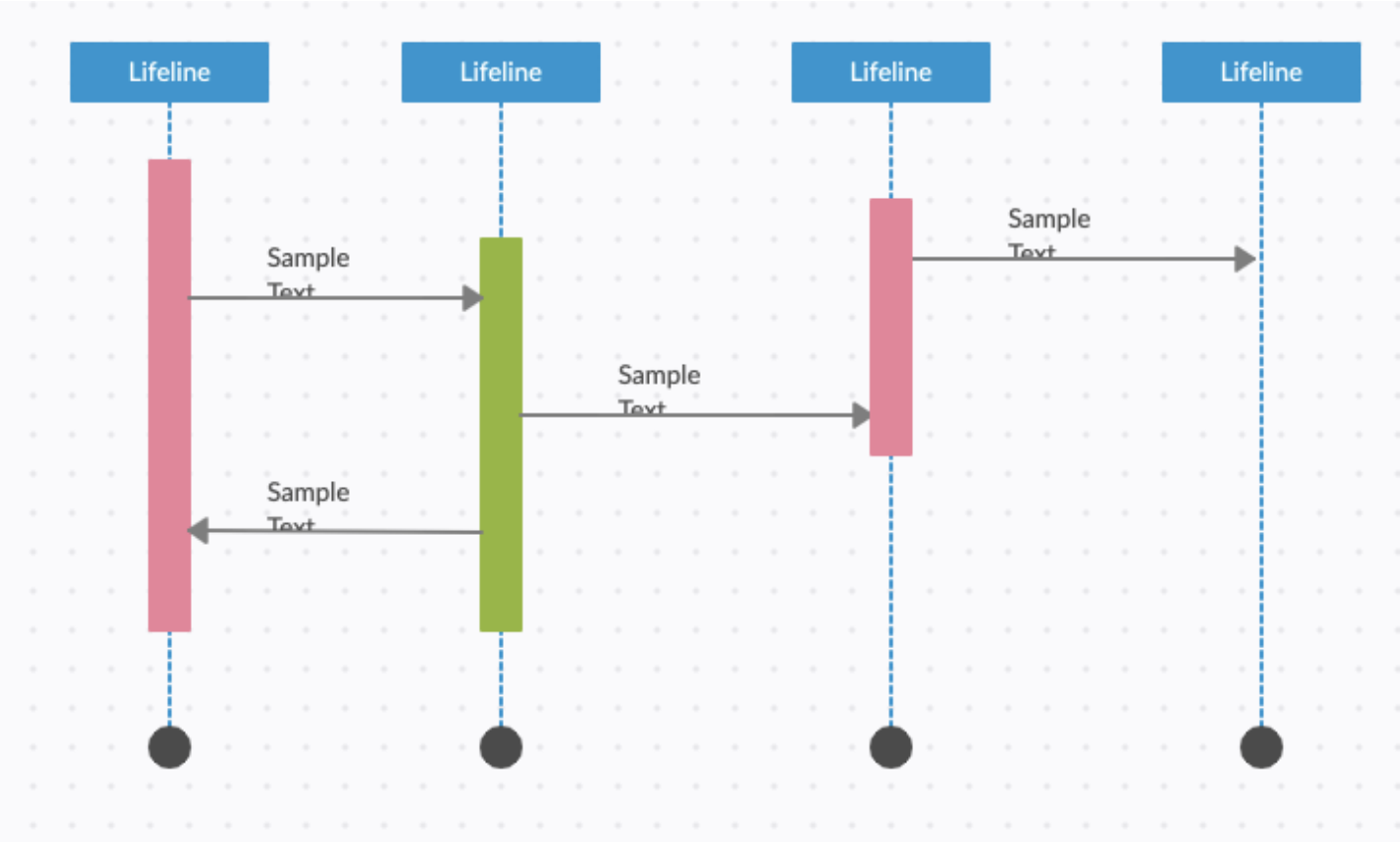
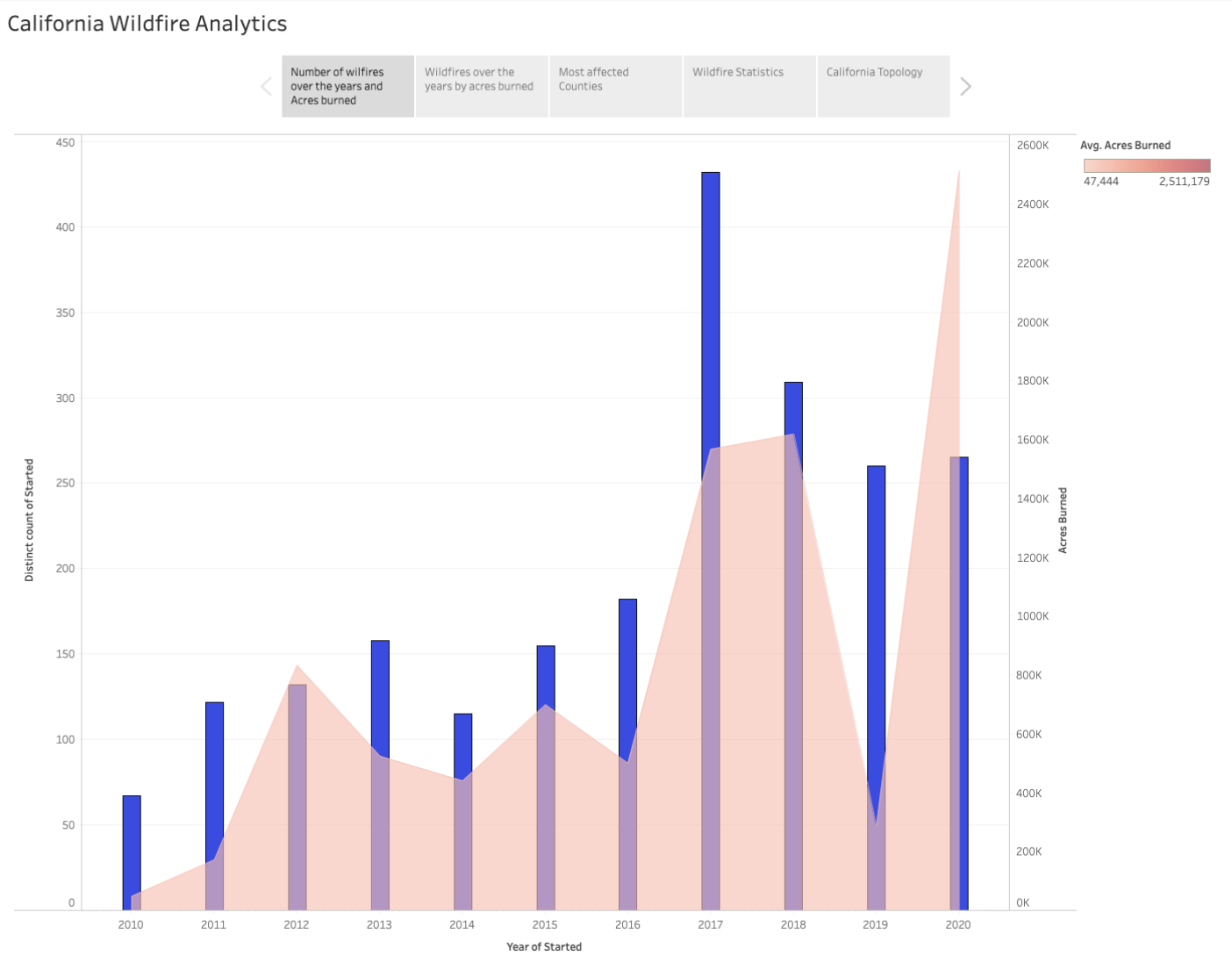


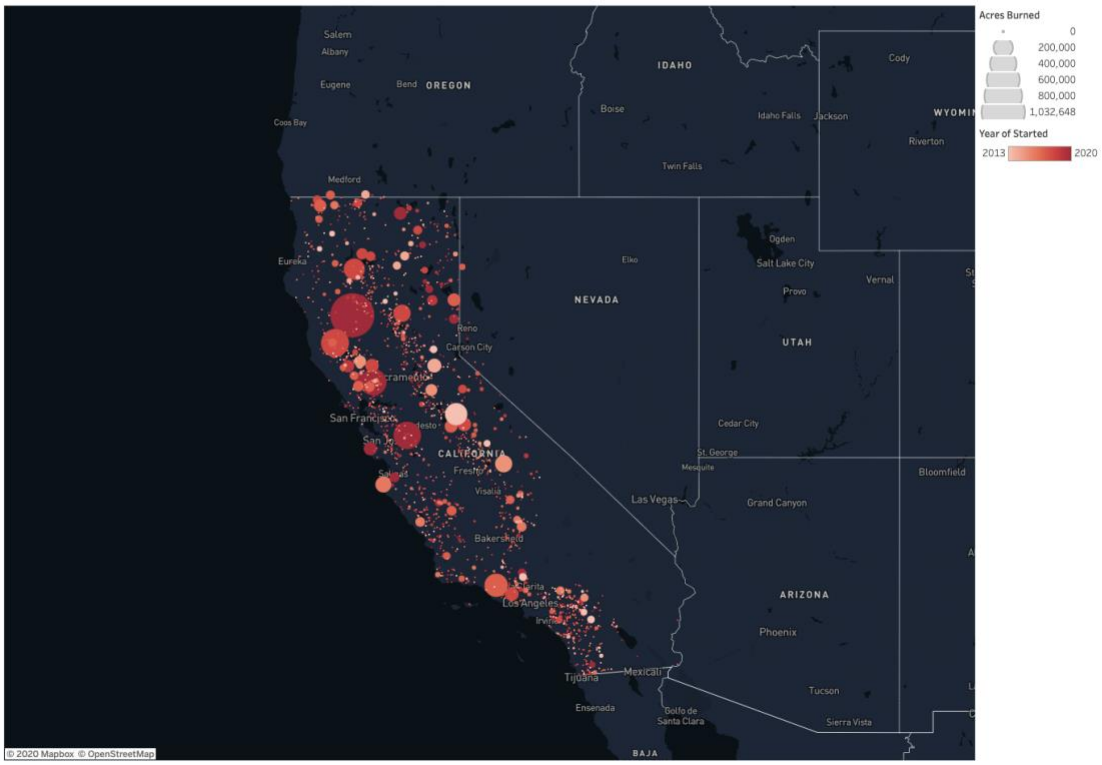
Figure 5: Sequence Diagram for Displaying the map

4.Graphic User Interface Design



California Wildfire Analytics

Number of wilfires over the years and Acres burned | Wildfires over the years by acres burned | Most affected Counties | Wildfire Statistics | California Topology



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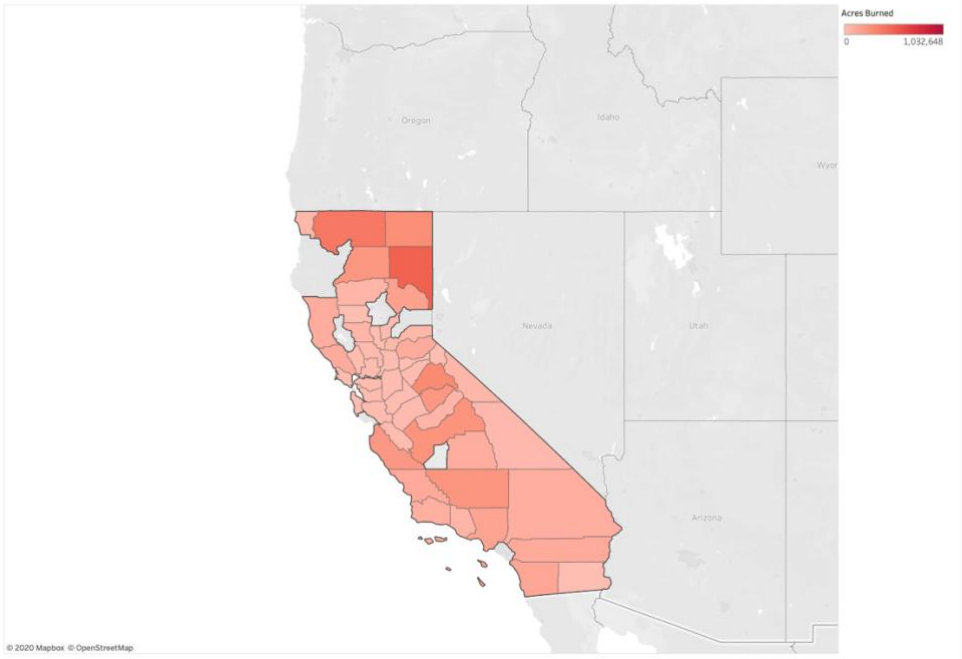

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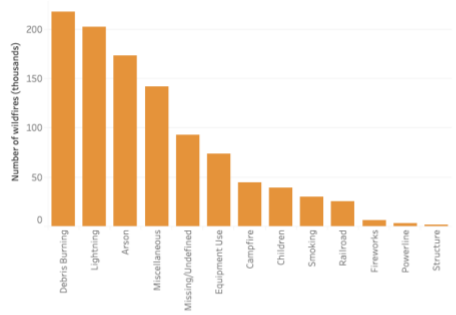
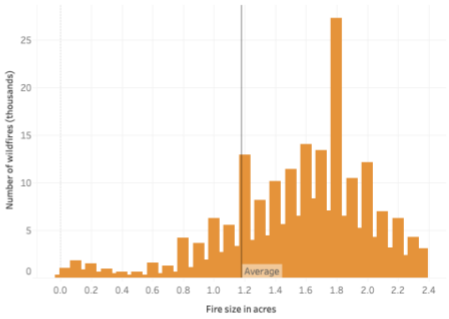
Cause of wildfires

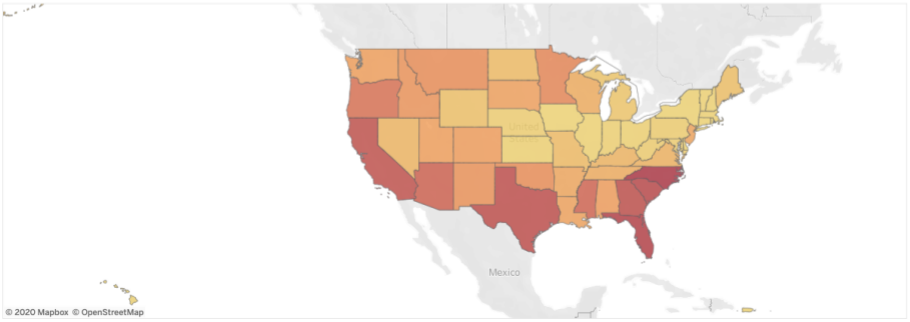


Fires by acres



Number of Records
2 77,097
Number of Records
2 77,097

Wildfires by state



California Wildfire Analytics

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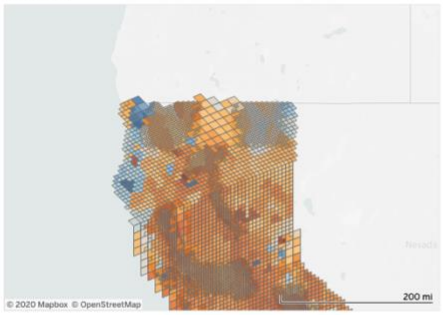
Humidity



Wind Speed

Precipitation Daily
0 2,340
Minimum Relative Humid...
0.30 100.00
Average Wind Speed
0.00 74.65
Air Temperature Daily M...
-35.56 53.89

Precipitation

Temperature

6.References

Arcgis REST API documentation https://developers.arcgis.com/rest/services-reference/query-feature-service-layer-.htm