



# Oregon Fires

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Dataset obtained from **oregon.gov** Open Data Portal. Dataset name is *ODF Fire Occurrence Data 2000-2022*.  
<https://data.oregon.gov/Natural-Resources/ODF-Fire-Occurrence-Data-2000-2022/fbww-q84y>

Dataset contains **23.5k items** and **38 attributes**.

### **Background**

Fires are a natural occurrence throughout Oregon. Oregon has a varied geography, many different forest types, wildlife, and plant species.

Forests in Oregon cover approximately 30.5 million acres, almost half the state (2).

ODF stands for the Oregon Department of Forestry. To improve the sustainability of the environment, economy, and community, the ODF is responsible for protecting and managing the forests of Oregon (3).

### **Objectives :**

1. Fire information about each area of Oregon
2. Find the different types of fire causes
3. Categorize the fires by size
4. Find the top 20 largest fires in Oregon between the years 2000 and 2022
5. Find all Oregon fires that occurred in 2022
6. Oregon Fires by Fire Year, Category, and Size



# Data Loading

- ◆ Load the csv file
- ◆ Convert to a Pandas DataFrame

```
# Import required Libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
from matplotlib import rcParams
import seaborn as sns
import plotly.graph_objects as go
import plotly.express as px
import dash
from dash import html
from dash import dcc
from dash.dependencies import Input, Output
from jupyter_dash import JupyterDash
```

```
file = 'ODF_Fire_Occurrence_Data_2000-2022.csv'
df = pd.read_csv(file)
df.head()
```

	Serial	FireCategory	FireYear	Area	DistrictName	UnitName	FullFireNumber	FireName	Size_class	EstTotalAcres	...	Industrial_Restriction
0	58256	STAT	2000	EOA	Central Oregon	John Day	00-952011-01	Slick Ear #2	B	0.75	...	Does Not Apply - Eastern OR
1	59312	STAT	2000	EOA	Northeast Oregon	La Grande	00-971024-01	Woodley	C	80.00	...	Does Not Apply - Eastern OR
2	61657	STAT	2001	SOA	Southwest Oregon	Grants Pass	01-712133-02	QUEENS BRANCH	A	0.10	...	Lvl 3 Restricted Shutdown
3	63735	STAT	2002	NOA	West Oregon	Philomath	02-551001-03	WREN	A	0.01	...	Lvl 1 Fire Season Only
4	68019	STAT	2003	NOA	West Oregon	Dallas	03-552013-04	Ritner Creek	A	0.01	...	Lvl 3 Restricted Shutdown

Ign_DateTime	ReportDateTime	Discover_DateTime	Control_DateTime	CreationDate	ModifiedDate	DistrictCode	UnitCode	DistFireNumber
7/18/2000 19:00	7/19/2000 13:20	7/19/2000 13:15	7/20/2000 0:50	7/20/2000 9:13	11/14/2000 9:16	95	952	11
8/24/2000 5:30	8/24/2000 13:07	8/24/2000 13:07	9/1/2000 21:30	8/29/2000 15:59	12/21/2000 16:22	97	971	24
8/10/2001 17:40	8/10/2001 17:47	8/10/2001 17:45	8/10/2001 18:30	8/10/2001 18:42	8/17/2001 11:45	71	712	133
7/6/2002 13:01	7/6/2002 13:04	7/6/2002 13:02	7/6/2002 13:07	7/7/2002 9:16	7/28/2002 10:08	55	551	1
8/22/2003 4:00	8/22/2003 5:00	8/22/2003 5:00	8/22/2003 9:30	8/22/2003 16:12	9/4/2003 9:39	55	552	13

# Data Cleaning

- Drop the following attributes:
  - Serial
  - FireCategory
  - FullFireNumber
  - Twn
  - Rng
  - Sec
  - Subdiv
  - LandmarkLocation
  - RegUseZone
  - RegUseRestriction
  - Industrial\_Restriction
  - Ign\_DateTime
  - ReportDateTime
  - Discover\_DateTime
  - Control\_DateTime
  - CreationDate
  - ModifiedDate
  - DistrictCode
  - UnitCode
  - DistFireNumber
- Rename columns Lat\_DD to Latitude and Long\_DD to Longitude.

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 23490 entries, 0 to 23489
Data columns (total 38 columns):
#   Column                Non-Null Count  Dtype
---  -
0   Serial                23490 non-null  int64
1   FireCategory          23490 non-null  object
2   FireYear              23490 non-null  int64
3   Area                  23490 non-null  object
4   DistrictName          23490 non-null  object
5   UnitName              23490 non-null  object
6   FullFireNumber        23490 non-null  object
7   FireName              23490 non-null  object
8   Size_class            23490 non-null  object
9   EstTotalAcres         23411 non-null  float64
10  Protected_Acres       23490 non-null  float64
11  HumanOrLightning      23490 non-null  object
12  CauseBy               23362 non-null  object
13  GeneralCause          23490 non-null  object
14  SpecificCause         23266 non-null  object
15  Cause_Comments        9806 non-null  object
16  Lat_DD                23480 non-null  float64
17  Long_DD               23480 non-null  float64
18  LatLongDD             23480 non-null  object
19  FO_LandOwnType        23490 non-null  object
20  Twn                   23478 non-null  object
21  Rng                   23475 non-null  object
22  Sec                   23478 non-null  float64
23  Subdiv                23459 non-null  object
24  LandmarkLocation      22208 non-null  object
25  County                23490 non-null  object
26  RegUseZone            23440 non-null  object
27  RegUseRestriction     23401 non-null  object
28  Industrial_Restriction 23401 non-null  object
29  Ign_DateTime          23396 non-null  object
30  ReportDateTime        23490 non-null  object
31  Discover_DateTime     23396 non-null  object
32  Control_DateTime      23395 non-null  object
33  CreationDate          23487 non-null  object
34  ModifiedDate          23490 non-null  object
35  DistrictCode          23490 non-null  int64
36  UnitCode              23490 non-null  int64
37  DistFireNumber        23490 non-null  object
dtypes: float64(5), int64(4), object(29)
memory usage: 6.8+ MB
```

```
# drop and rename columns in the dataframe
cleaned_df = df.drop(['Serial', 'FireCategory', 'FullFireNumber', 'Twn', 'Rng', 'Sec',
                    'Subdiv', 'LandmarkLocation', 'RegUseZone', 'RegUseRestriction', 'Industrial_Restriction',
                    'Ign_DateTime', 'ReportDateTime', 'Discover_DateTime', 'Control_DateTime',
                    'CreationDate', 'ModifiedDate', 'DistrictCode', 'UnitCode',
                    'DistFireNumber'], axis=1)
cleaned_df = cleaned_df.rename(columns={'Lat_DD': 'Latitude', 'Long_DD': 'Longitude'})
```

# Data Cleaning

	FireYear	Area	DistrictName	UnitName	FireName	Size_class	EstTotalAcres	Protected_Acres	HumanOrLightning	CauseBy	GeneralCause
0	2000	EOA	Central Oregon	John Day	Slick Ear #2	B	0.75	0.75	Lightning	Lightning	Lightning
1	2000	EOA	Northeast Oregon	La Grande	Woodley	C	80.00	80.00	Lightning	Lightning	Lightning
2	2001	SOA	Southwest Oregon	Grants Pass	QUEENS BRANCH	A	0.10	0.10	Human	Motorist	Smoking
3	2002	NOA	West Oregon	Philomath	WREN	A	0.01	0.01	Human	Motorist	Recreation
4	2003	NOA	West Oregon	Dallas	Ritner Creek	A	0.01	0.01	Lightning	Lightning	Lightning
...	...	...	...	...	...	...	...	...	...	...	...
23485	2021	EOA	Walker Range - WRFPA	Crescent	Road 2430	B	0.75	0.75	Human	Recreationist	Equipment Use
23486	2022	SOA	Western Lane	Veneta	Spruce Path	A	0.01	0.01	Human	Transient	Recreation
23487	2021	EOA	Northeast Oregon	Pendleton	Bone Canyon	C	67.43	67.43	Lightning	Lightning	Lightning
23488	2022	EOA	Northeast Oregon	Pendleton	Milepost 231	A	0.10	0.00	Human	Motorist	Equipment Use
23489	2022	EOA	Central Oregon	Sisters	That Way 774	A	0.01	0.01	Lightning	Lightning	Lightning

SpecificCause	Cause_Comments	Latitude	Longitude	LatLongDD	FO_LandOwnType	County
Lightning	NaN	44.91519	-119.28863	POINT (-119.28863 44.91519)	BLM	Grant
Lightning	NaN	45.08509	-118.33440	POINT (-118.3344 45.08509)	Other Private	Union
Other - Smoker Related	NaN	42.53671	-123.21215	POINT (-123.21215 42.53671)	BLM	Jackson
Fireworks	NaN	44.58709	-123.42779	POINT (-123.42779 44.58709)	State	Benton
Lightning	NaN	44.74026	-123.49811	POINT (-123.49811 44.74026)	Industrial	Polk
...	...	...	...	...	...	...
Heat from Vehicle Manifold or Exhaust	NaN	43.52875	-121.35672	POINT (-121.35672 43.52875)	Industrial	Klamath
Campfire Left Unattended (camp site, cooking)	Campfire left unattended spread to wildland	43.97600	-124.09933	POINT (-124.09933 43.976)	Municipal	Lane
Lightning	Lightning Struck pine	45.01056	-119.08639	POINT (-119.08639 45.01056)	BLM	Umatilla
Burning Vehicle or Equipment	Burning RV spread to wildland	45.58639	-118.46167	POINT (-118.46167 45.58639)	State	Umatilla
Lightning	Lightning Struck Juniper	44.57139	-121.38278	POINT (-121.38278 44.57139)	Rural Residential	Jefferson

23490 rows × 18 columns



# Data Cleaning

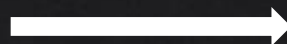
## Check NaN values for Latitude

```
# check if there are any missing values for Latitude
latitude_nan_values = cleaned_df[cleaned_df['Latitude'].isna()]
```

	FireYear	Area	DistrictName	UnitName	FireName	Size_class	EstTotalAcres	Protected_Acres	HumanOrLightning	CauseBy	GeneralCause	
	75	2003	NOA	North Cascade	Santiam	Marion Forks Move Up	A	0.0	0.00	Human	Recreationist	Smoking
	11444	2015	NOA	Forest Grove	Columbia City	Nick Thomas Rd	A	NaN	0.25	Human	NaN	Debris Burning
	15501	2019	NOA	Forest Grove	Forest Grove	Pihl Rd #1	A	NaN	0.25	Human	NaN	Debris Burning
	15657	2019	NOA	Forest Grove	Forest Grove	Tanner Creek Rd Piles	A	NaN	0.10	Human	NaN	Debris Burning
	16229	2019	NOA	Forest Grove	Forest Grove	West Slope Burn	B	NaN	1.00	Human	Other-Landowner Related	Debris Burning
	16637	2020	SOA	Douglas - DFPA	DFPA Central	Archie Creek/ Star Mtn	G	130000.0	107000.00	Under Invest	NaN	Under Invest
	18617	2017	NOA	North Cascade	Santiam	Lyons Preposition	A	NaN	0.00	Human	NaN	Miscellaneous
	20512	2017	EOA	Walker Range - WRFPA	Crescent	Job	A	NaN	0.00	Human	NaN	Debris Burning
	23069	2022	SOA	South Cascade	Eastern Lane	Pre-Po Sept East Wind	A	NaN	0.00	Under Invest	NaN	Under Invest
	23373	2022	NOA	Tillamook	Tillamook	Lost Mountain	C	90.0	90.00	Human	Timber Harvest Worker	Debris Burning

SpecificCause	Cause_Comments	Latitude	Longitude	LatLongDD	FO_LandOwnType	County
Discarded Cigarette/Tobacco	MOVE UP FOR B&B FIRE	NaN	NaN	NaN	USFS	Linn
NaN	NaN	NaN	NaN	NaN	Rural Residential	Columbia
NaN	NaN	NaN	NaN	NaN	Other Private	Washington
NaN	NaN	NaN	NaN	NaN	Other Private	Washington
Other - Burning Related	Rekindled slash	NaN	NaN	NaN	ERROR: #N/A	ERROR: #N/A
NaN	NaN	NaN	NaN	NaN	ERROR: #N/A	ERROR: #N/A
NaN	NaN	NaN	NaN	NaN	ERROR: #N/A	ERROR: #N/A
NaN	NaN	NaN	NaN	NaN	Rural Residential	Klamath
NaN	NaN	NaN	NaN	NaN	USFS	ERROR: #N/A
Industrial- Slash-Failure to Recog. Sev. of Bu...	NaN	NaN	NaN	NaN	State	Tillamook

Drop 10 rows



```
# drop null values from Latitude and Longitude
cleaned_df = cleaned_df.dropna(subset=['Latitude', 'Longitude'])
```

23480 rows × 18 columns

# Data Cleaning

```
# check if there are any missing values for EstTotalAcres
EstTotalAcres_nulls = cleaned_df[cleaned_df['EstTotalAcres'].isna()]
```

Check NaN values for EstTotalAcres

	FireYear	Area	DistrictName	UnitName	FireName	Size_class	EstTotalAcres	Protected_Acres	HumanOrLightning	CauseBy	GeneralCause
26	2013	EOA	Central Oregon	Sisters	Park Fire	B	NaN	1.50	Human	NaN	Recreation
48	2018	EOA	Central Oregon	Sisters	Ponderosa Way 1207	A	NaN	0.10	Human	NaN	Miscellaneous
57	2021	EOA	Klamath-Lake	Klamath	Old Fort Road 359	A	NaN	0.10	Human	NaN	Miscellaneous
146	2022	EOA	Walker Range - WRFPA	Crescent	Hay Fire	A	NaN	0.20	Human	NaN	Miscellaneous
3335	2000	SOA	Southwest Oregon	Medford	Lovely	A	NaN	0.00	Human	NaN	Recreation
...	...	...	...	...	...	...	...	...	...	...	...
23402	2022	SOA	Coos - CFPA	Gold Beach	Crystal Creek	A	NaN	0.25	Human	Other Forest Mgt. Worker	Debris Burning
23416	2022	EOA	Central Oregon	Sisters	Penny Ct. 1043 OD	A	NaN	0.10	Human	NaN	Debris Burning
23443	2022	SOA	Coos - CFPA	Bridge	Table Rock	B	NaN	1.50	Human	NaN	Equipment Use
23446	2022	EOA	Walker Range - WRFPA	Crescent	COC692	A	NaN	0.10	Lightning	NaN	Lightning
23482	2022	EOA	Klamath-Lake	Klamath	Lobert 336	B	NaN	4.10	Under Invest	NaN	Under Invest

Group each fire into their size class

Fill NaN values with the mean of each class size

```
# using the mean of each size class to fill in the estimated total acres for NaN values in each size class
cleaned_df['EstTotalAcres'] = cleaned_df.groupby('Size_class')['EstTotalAcres'].transform(lambda x: x.fillna(x.mean()))
```

# Information About Each Area Of Oregon

1. How many total fires occurred in each area?
2. What area has experienced the greatest number of fires?
3. What are the total estimated total acres burned in each area?
4. What area has had the greatest number of acres burned?

EOA: East  
NOA: North  
SOA: South

Total Fires	
NOA	3695
EOA	7662
SOA	12123

	Area	EstTotalAcres
0	NOA	603821.77
1	SOA	2359516.90
2	EOA	3246420.68

```
# sum of the estimated total acres of fires occurred in each area of Oregon
areas_of_oregon_sums = cleaned_df.groupby('Area')['EstTotalAcres'].sum().sort_values()
# convert to dataframe
areas_of_oregon_sums = areas_of_oregon_sums.to_frame().reset_index()
```

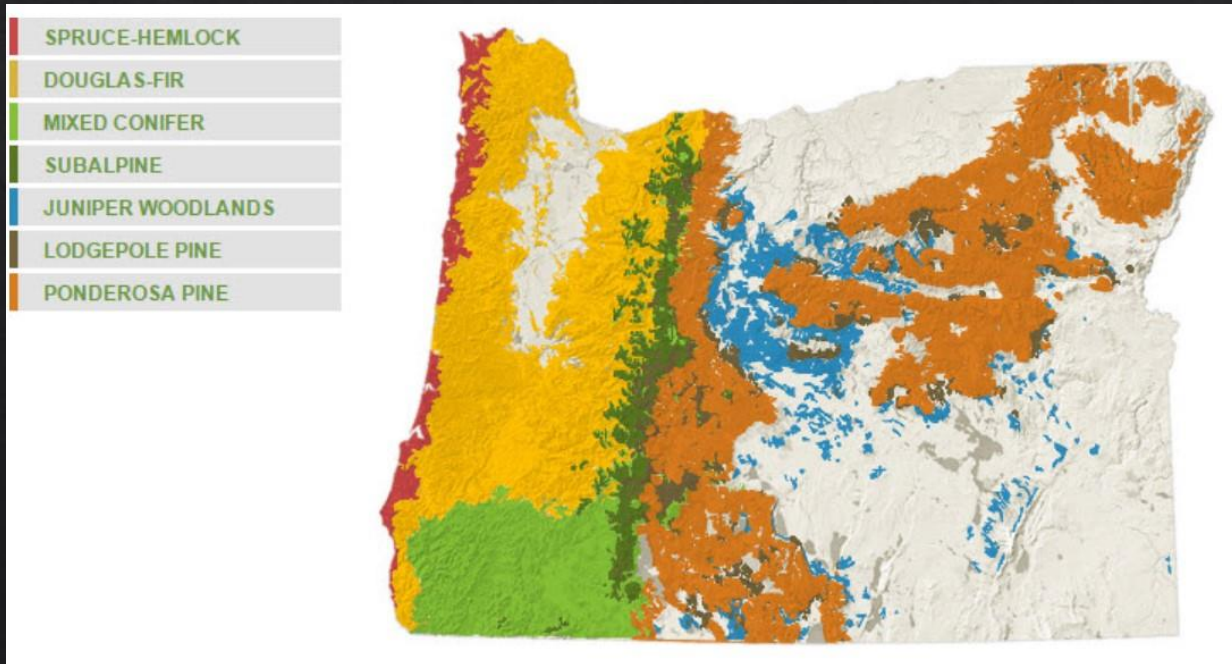
```
# sum of the estimated total acres of fires occurred in each area of Oregon
areas_of_oregon_sums = cleaned_df.groupby('Area')['EstTotalAcres'].sum().sort_values()
# convert to dataframe
areas_of_oregon_sums = areas_of_oregon_sums.to_frame().reset_index()
# make acres only to 2 decimal places
pd.options.display.float_format = '{:,.2f}'.format
```



# Information About Each Area Of Oregon

Total Fires	
NOA	3695
EOA	7662
SOA	12123

Area	EstTotalAcres
0 NOA	603821.77
1 SOA	2359516.90
2 EOA	3246420.68

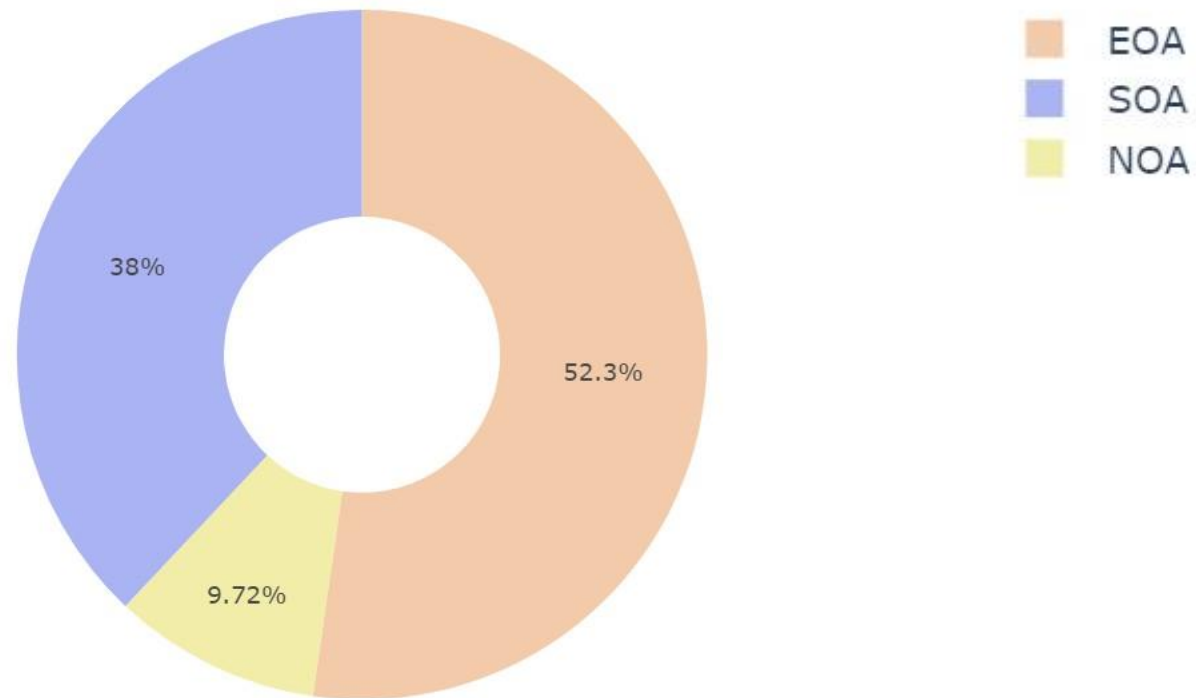


EOA: Eastern Oregon  
Area  
NOA: Northern Oregon  
Area  
SOA: Southern Oregon  
Area

# Information About Each Area Of Oregon

```
# plot a pie chart of the estimated total acres per area of Oregon
colors = ['#F3CBAA', '#AAB3F3', '#F3EDAA']
fig = px.pie(areas_of_oregon_sums, values='EstTotalAcres', names='Area',
             title='Estimated Total Acres Burned Per Oregon Area', color_discrete_sequence=colors, hole=0.4)
fig.show()
```

Estimated Total Acres Burned Per Oregon Area



**Figure 1.** The pie chart represents the three areas of Oregon. Eastern Oregon area has experienced the greatest estimated total acres burned, with approximately 52.3%.

# Types of Fire Causes

# Categories

	Count
Human	17189
Lightning	6266
Under Invest	25

1. What are the types of categories for fire causes?
2. How many fires have occurred for each category from 2000 to 2022?
3. What are the general causes of Oregon fires and how many fires have occurred for each?

## General causes

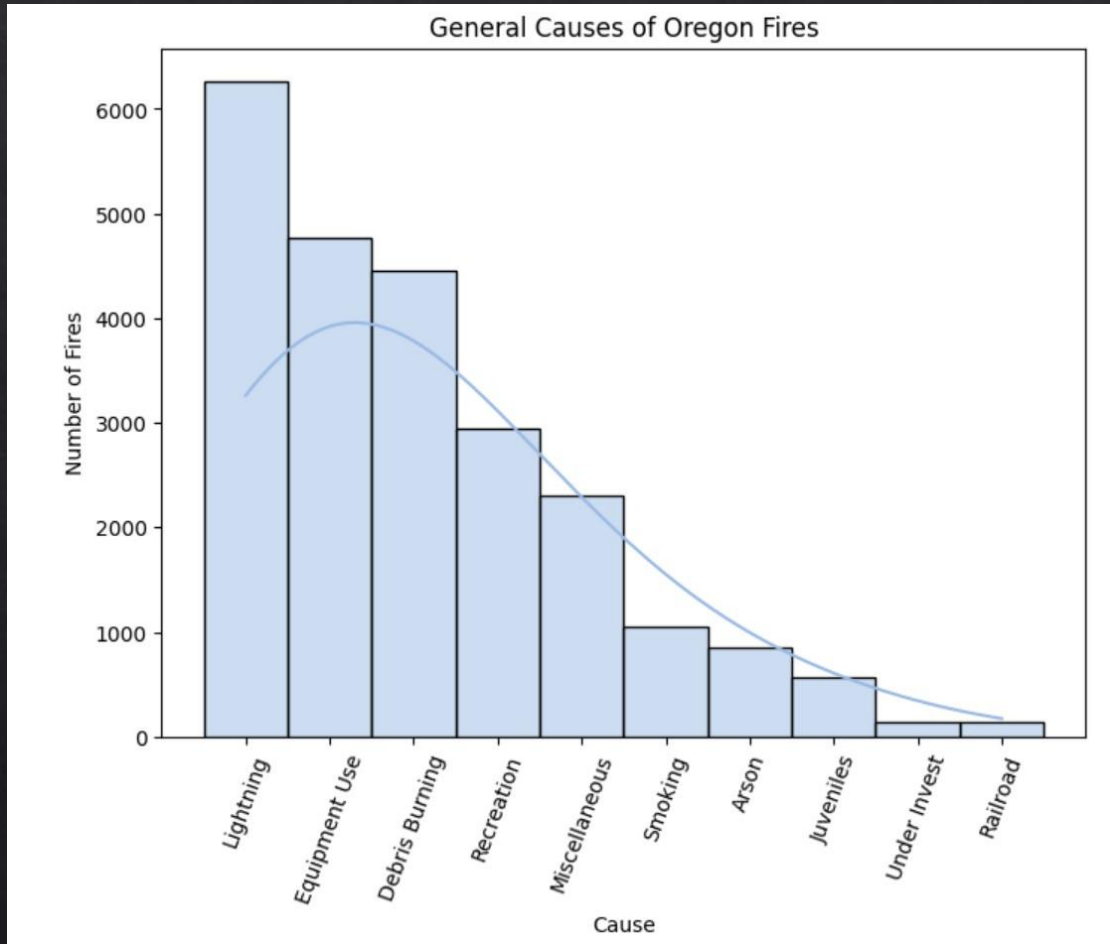
	<b>Cause</b>	<b>Count</b>
0	Lightning	6266
1	Equipment Use	4768
2	Debris Burning	4460
3	Recreation	2950
4	Miscellaneous	2300
5	Smoking	1046
6	Arson	846
7	Juveniles	570
8	Under Invest	138
9	Railroad	136

```
# find how many causes for human, lightning, or under investigation
cause_by = cleaned_df['HumanOrLightning'].value_counts()
# convert to dataframe
cause_by = cause_by.to_frame()
# rename column
cause_by = cause_by.rename(columns={'HumanOrLightning': 'Count'})
```

[illegible]



# Types of Fire Causes



```
# plot a histogram using seaborn of the general causes
# set kde to True to plot the density
hist = sns.histplot(data=general_causes, x='Cause', weights='Count', kde=True, color='#9ABAE5')
hist.set_title('General Causes of Oregon Fires')
hist.set_xticks(hist.get_xticks())
hist.set_xticklabels(hist.get_xticklabels(), rotation=70)
hist.set_ylabel('Number of Fires')
```

**Figure 2.** The general causes and the number of fires that have occurred are plotted in the histogram. The density curve shows the overall distribution shape. Out of the general causes, lightning has caused the most fires and railroad incidents have caused the least number of fires.

# Fire Class Sizes

A

B

C

D

E

F

G

1. What class size of fire has occurred the most over the years?
2. What are the differences for class A and class G fires?

```
# find how many fires occurred in each class size
size_of_fires = cleaned_df['Size_class'].value_counts().sort_values(ascending=False)
# convert to dataframe
size_of_fires = size_of_fires.to_frame()
# rename column
size_of_fires = size_of_fires.rename(columns = {'Size_class': 'Count'})
```

	Count
A	17006
B	5124
C	855
D	189
G	123
E	104
F	79

# Class A Fires



```
# get only the size class A data
class_a = cleaned_df[cleaned_df['Size_class']=='A']
rcParams['figure.figsize'] = 8,6
# create a violin plot
ax = sns.violinplot(x="Size_class", y="EstTotalAcres", hue='HumanOrLightning', data=class_a, palette='Set3')
ax.set_title('Acres Burned for Class Size A Fires')
ax.set_xlabel('Class Size')
ax.set_ylabel('Estimated Total Acres')
ax.legend(fontsize=9)
```

```
# use the describe method to retrieve information about class size A, including the median
class_a_median = class_a.groupby('HumanOrLightning')['EstTotalAcres'].median()
class_a_info = class_a.groupby('HumanOrLightning')['EstTotalAcres'].describe()
class_a_info = pd.concat([class_a_info, class_a_median], axis=1).rename(columns={'EstTotalAcres': 'median'})
```

	count	mean	std	min	25%	50%	75%	max	median
HumanOrLightning									
Human	12444.0	0.069285	0.082416	0.00	0.010000	0.010000	0.100000	0.25	0.010000
Lightning	4555.0	0.091077	0.078586	0.00	0.010000	0.100000	0.100000	0.25	0.100000
Under Invest	7.0	0.069373	0.027774	0.01	0.075122	0.075122	0.075122	0.10	0.075122

**Figure 3.** The three violin plots represent the estimated total acres burned for class size A categorized by cause. The causes include human, lightning, or under investigation. The distributions for human and lightning causes are similar and both contain some outliers. Most of the fires under investigation are approximately similar in terms of acres burned.

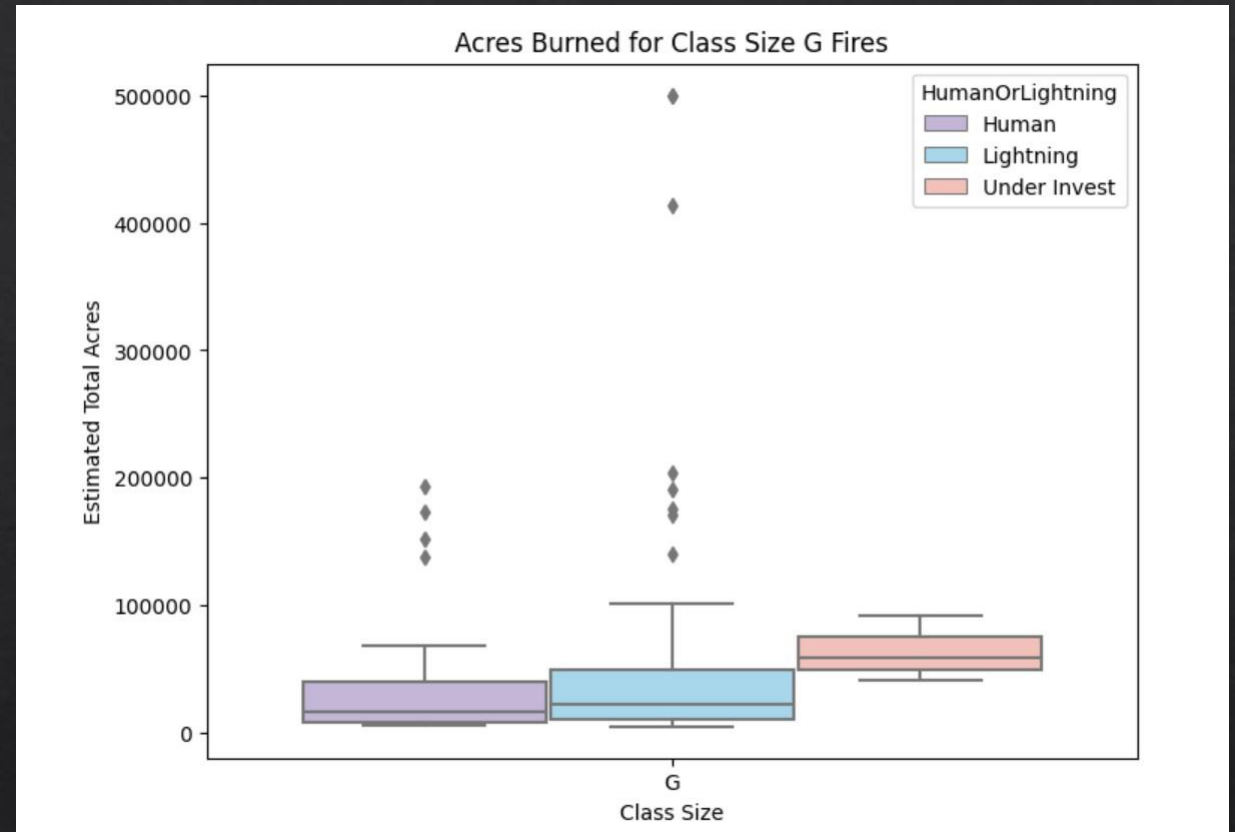


# Class G Fires

```
# get only the class G data
class_g = cleaned_df[cleaned_df['Size_class']=='G']
# specific colors in a color palette
my_palette = sns.color_palette(["#C481DB", "#9DDAF6", "#FBBCB1"])
# create a box plot
ax = sns.boxplot(x="Size_class", y="EstTotalAcres", hue='HumanOrLightning', data=class_g, palette=my_palette)
ax.set_title('Acres Burned for Class Size G Fires')
ax.set_xlabel('Class Size')
ax.set_ylabel('Estimated Total Acres')
```

```
class_g_median = class_g.groupby('HumanOrLightning')['EstTotalAcres'].median()
class_g_info = class_g.groupby('HumanOrLightning')['EstTotalAcres'].describe()
class_g_info = pd.concat([class_g_info, class_g_median], axis=1).rename(columns={'EstTotalAcres': 'median'})
```

	count	mean	std	min	25%	50%	75%	max	median
HumanOrLightning									
Human	32.0	38192.275938	51415.840290	5521.0	7937.38	16418.000	39973.25	193566.0	16418.000
Lightning	88.0	50836.808295	89850.194546	5237.0	10562.00	23163.355	49427.25	499945.0	23163.355
Under Invest	3.0	64063.000000	25431.225275	41706.0	50229.50	58753.000	75241.50	91730.0	58753.000



**Figure 4.** Class G fires are plotted in the box plot, categorized by the type of fire cause: human, lightning, or under investigation. It is shown that the human and lightning plots have outliers, whereas under investigation plot does not. For the lightning category, the estimated total acres burned is very high and has very far outliers with the greatest number of acres burned.

# Top 20 Largest Fires 2000-2022

1. What was the largest fire over the years?

- What was the fire name?
- How many total acres was the fire?
- What year was the fire and what was the general cause of the fire?

2. What year had the greatest number of largest fires?

```
# retrieve top 20 largest fires
top_20_fires = cleaned_df.nlargest(21, 'EstTotalAcres')
top_20_fires
```

*Note: The top 21 fires were found because the first two are the same fire.*

```
# create a pivot table
top_20_fires1 = pd.pivot_table(top_20_fires,
                                values='EstTotalAcres',
                                index=['FireYear', 'FireName', 'DistrictName']).sort_values(by=['EstTotalAcres'],
                                                                                             ascending=False)
```

FireYear	FireName	DistrictName	EstTotalAcres
2002	Biscuit Private	Coos - CFPA	499945.0
	ODF / BISCUIT	Southwest Oregon	499945.0
2021	Bootleg 321	Klamath-Lake	413744.0
2020	Lionshead	North Cascade	204469.0
	Beachie	North Cascade	193566.0
2017	Chetco Bar	Coos - CFPA	190590.0
2018	Klondike	Coos - CFPA	175258.0
2020	Holiday Farm	South Cascade	173393.0
2022	Double Creek	Northeast Oregon	171312.0
2020	Illinois Valley Support	Southwest Oregon	152270.0
2007	Egley Complex	Central Oregon	140360.0
2020	Riverside (ODF)	North Cascade	138054.0
2015	Berry Creek	Central Oregon	101028.0
2012	Barry Point (680)	Klamath-Lake	93071.0
2021	Cougar Peak 452	Klamath-Lake	91730.0
2003	Booth Fire	Central Oregon	90376.0
2007	Battle Creek Complex	Northeast Oregon	79299.0
2015	Grizzly	Northeast Oregon	75529.6
2012	Cache Creek	Northeast Oregon	73500.0
2017	Nena Springs	Central Oregon	68135.0
2014	Murderers Creek South	Central Oregon	66174.0

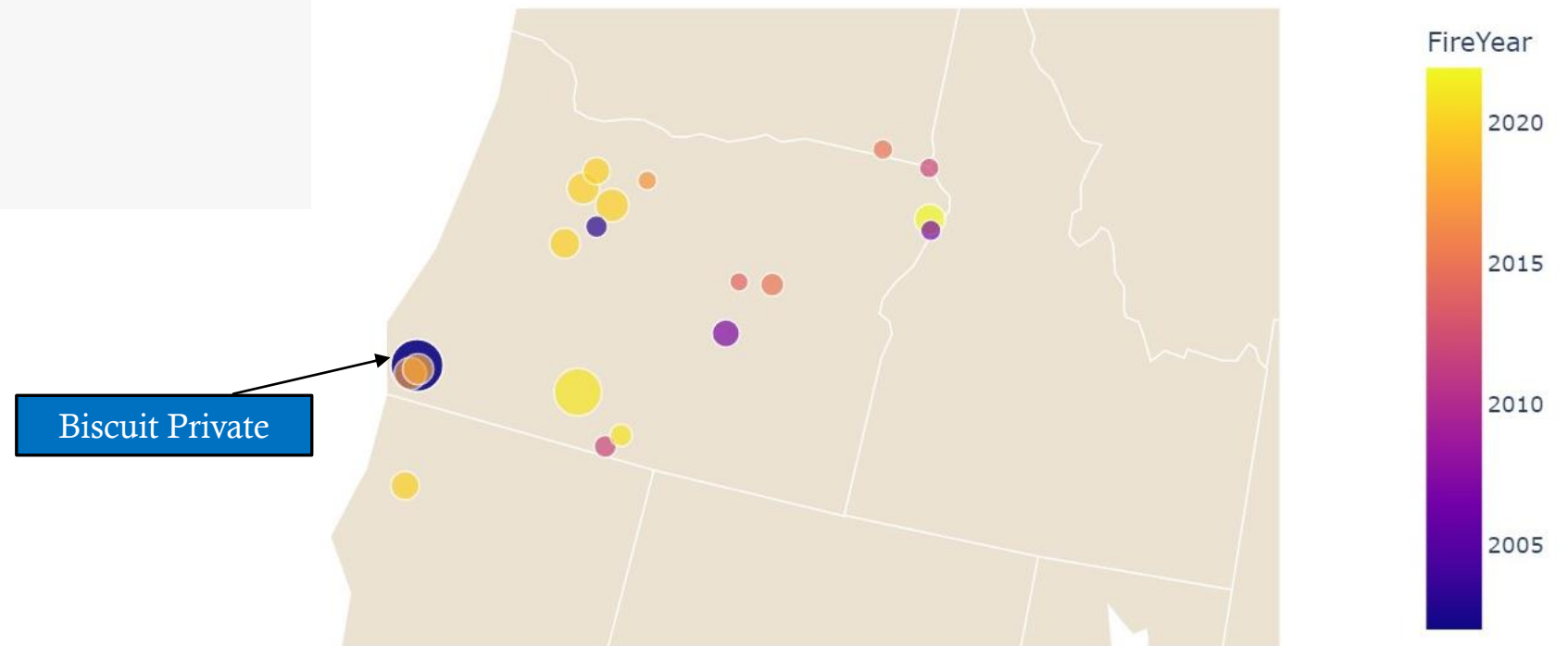
# Top 20 Largest Fires 2000-2022

```
# plot a bubble map of the top 20 fires
fig = px.scatter_geo(top_20_fires, lat='Latitude', lon='Longitude',
                    hover_name='FireName',
                    hover_data=['FireYear', 'DistrictName', 'CauseBy'],
                    title='Top 20 Largest Fires Throughout 2000-2022',
                    # for map of united states
                    projection='albers usa',
                    size = 'EstTotalAcres',
                    color='FireYear')

# fit the map view based on the areas of Oregon fires
fig.update_geos(fitbounds='locations')

# change color of map
fig.update_layout(
    geo=dict(
        landcolor='#ECE2D2'
    )
)

fig.show()
```



**Figure 5.** The bubble map represents the top twenty largest fires in Oregon. Each bubble represents a fire, where the fire name, estimated total acres, latitude, longitude, the year of occurrence, and the cause by is available. Fires outside of Oregon could be due to a spread of fire.



# Oregon Fires 2022

- 1.What area of Oregon has had the greatest number of fires in 2022?
- 2.What area of Oregon has had the least number of fires in 2022?

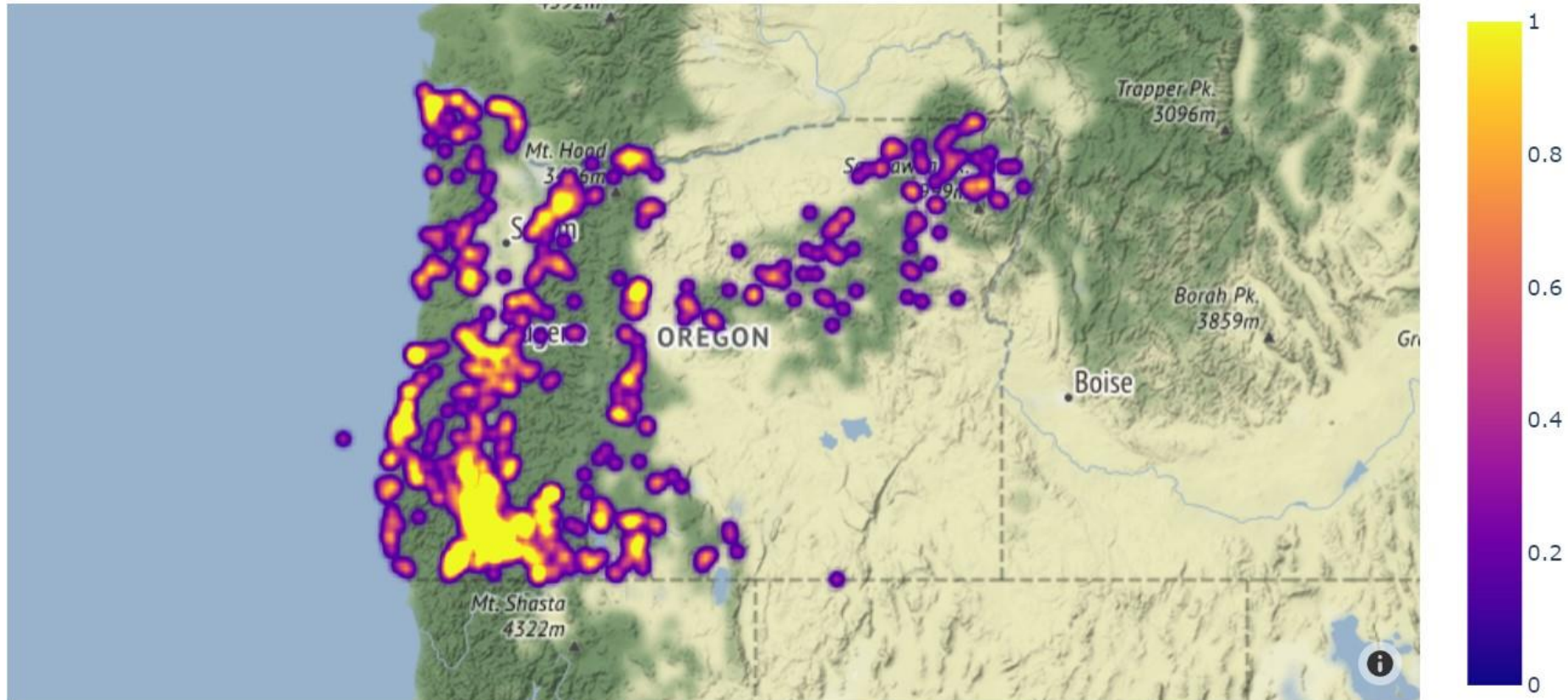
```
# retrieve the following columns and then retrieve only those with a fire in year 2022
fire_data_2022 = cleaned_df[['Area', 'FireName', 'EstTotalAcres', 'Latitude', 'Longitude',
                             'FireYear', 'Size_class']].loc[(cleaned_df['FireYear']==2022)]
```

	Area	FireName	EstTotalAcres	Latitude	Longitude	FireYear	Size_class
59	EOA	Yankee Sawmill	0.10	44.92	-118.11	2022	A
146	EOA	Hay Fire	0.08	43.59	-121.49	2022	A
22371	SOA	West side Rd 2205	0.01	42.18	-123.67	2022	A
22372	SOA	Beach Road	0.25	43.86	-123.11	2022	A
22374	EOA	Double Creek	171312.00	45.43	-116.74	2022	G
...	...	...	...	...	...	...	...
23483	NOA	Marmot Rd Pile	9.00	45.41	-122.16	2022	B
23484	SOA	Bagley Creek	0.01	42.77	-124.47	2022	A
23486	SOA	Spruce Path	0.01	43.98	-124.10	2022	A
23488	EOA	Milepost 231	0.10	45.59	-118.46	2022	A
23489	EOA	That Way 774	0.01	44.57	-121.38	2022	A

# Oregon Fires 2022

```
# plot a density map of all fires in Oregon throughout 2022
plt = px.density_mapbox(fire_data_2022, lat='Latitude', lon='Longitude', radius=7,
                        center=dict(lat=44.000000, lon=-120.500000), zoom=5,
                        mapbox_style='stamen-terrain', hover_name='FireName',
                        hover_data={'Size_class': True,
                                   'EstTotalAcres': True})

plt.show()
```



**Figure 6.** A density map representing the fires in Oregon throughout 2022. The southwest region of Oregon has experienced the greatest number of fires, whereas the southeast has experienced the least.

# Oregon Fires by Fire Year, Category, and Size

```
# group the fires and sum up the estimated total acres for each fire
grouped_fires = cleaned_df.groupby(['FireName', 'FireYear', 'HumanOrLightning',  
                                   'Size_class'])['EstTotalAcres'].sum().reset_index()
```

	FireName	FireYear	HumanOrLightning	Size_class	EstTotalAcres
0	"G" STREET	2001	Human	A	0.01
1	"R" Central Fire	2011	Human	A	0.01
2	"S" Bridge Fire	2000	Human	A	0.01
3	#243	2002	Human	A	0.01
4	#244	2002	Human	A	0.01
...	...	...	...	...	...
23358	sunforest	2015	Human	A	0.01
23359	sunforest	2018	Human	A	0.00
23360	table rock rd 8700	2021	Lightning	A	0.10
23361	vehicle #2	2005	Human	A	0.00
23362	war eagle	2021	Lightning	A	0.10





# Oregon Fires by Fire Year, Category, and Size

```
# create a jupyter dash application
app = JupyterDash(__name__)

# using dash_core_components library with outer and inner divs
app.layout = html.Div([
    html.Div([
        html.Div([
            # create a dropdown for class sizes A-G
            dcc.Dropdown(
                id='class_size',
                # options are shown in alphabetical order of class size
                options=[{'label': i, 'value': i} for i in grouped_fires.sort_values(['Size_class'])['Size_class'].unique()],
                value='Class Size'
            ),
            # create a second dropdown for selecting which category of causes
            dcc.Dropdown(
                id='cause',
                options=[{'label': i, 'value': i} for i in grouped_fires['HumanOrLightning'].unique()],
                value='Causes'
            )
        ],
        style={'width': '48%', 'display': 'inline-block'}),
        dcc.Graph(id='graph'),
    ],
    # create a slider for all the fire years
    dcc.Slider(
        id='year-slider',
        # specify the min and max years on the slider
        min=grouped_fires['FireYear'].min(),
        max=grouped_fires['FireYear'].max(),
        value=grouped_fires['FireYear'].min(),
        # select the tick marks displayed on the slider
        marks={str(FireYear): str(FireYear) for FireYear in grouped_fires['FireYear'].unique()},
        # step set to None (slider can take on any value between min and max values)
        step=None
    )
),
# create a function to update the data and graph based on the parameters chosen
def update_graph(class_size, cause_name, selected_year):
    selected_fires = grouped_fires[(grouped_fires['Size_class'] == class_size) &
    (grouped_fires['HumanOrLightning'] == cause_name) &
    (grouped_fires['FireYear'] == selected_year)]
    fires_grouped = selected_fires.groupby(['Size_class', 'FireYear',
    'HumanOrLightning', 'FireName'], as_index=False)['EstTotalAcres'].sum()

    # set the x and y values for the bar chart
    fig = go.Figure(data=[go.Bar(
        x=fires_grouped['FireName'],
        y=fires_grouped['EstTotalAcres']
    )])

    # update the appearance of the bar chart
    fig.update_layout(
        xaxis_title="Fire Name",
        yaxis_title="Estimated Total Acres",
        # set the title to change based on the parameters chosen
        title={
            'text': f'Oregon Class Size {class_size} Fires in {selected_year} (Cause: {cause_name})',
            'y':0.95,
            'x':0.5,
            'xanchor': 'center',
            'yanchor': 'top'
        })

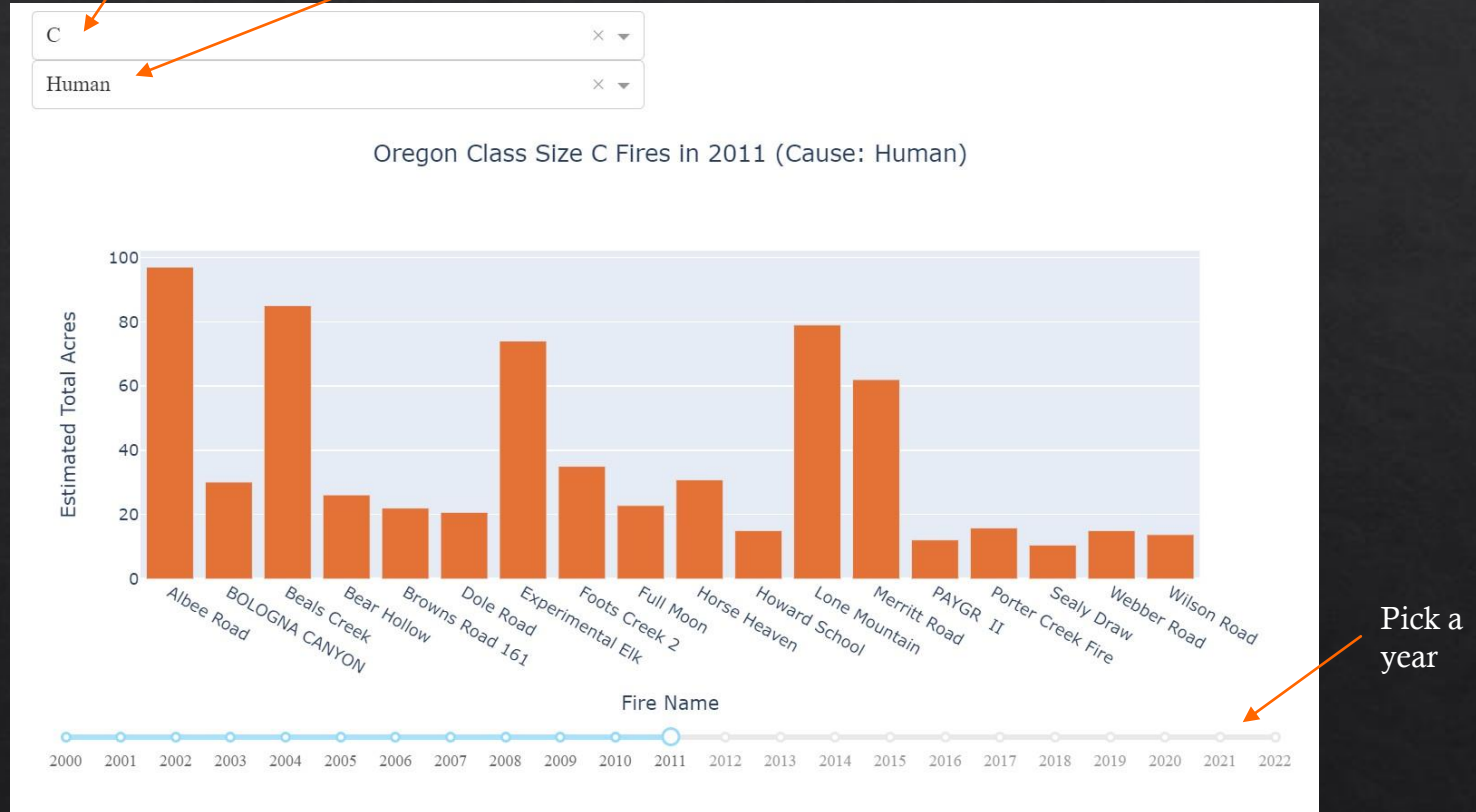
    # set the color of the bars
    fig.update_traces(marker_color='#E47136')

    return fig

# run the app
if __name__ == '__main__':
    app.run_server(mode="inline", port=9302, debug=True)
```

Pick a class size

Pick a fire cause



**Figure 7.** A Jupyter dash application with two dropdown menus and a slider. The user selects a class size and category of cause (human, lightning or under investigation) and uses the slider to choose the specific fire year from 2000 to 2022. Based on the attributes selected, the corresponding fire names and their estimated total acres are plotted.

# Summary

## Areas of Oregon

- NOA: North
  - 3,695 fires
- 603,821.77 acres burned
- EOA: East
  - 7,662 fires
- 3,246,420.68 acres burned
- SOA: South
  - 12,123 fires
- 2,359,516.90 acres burned

## Fire Causes

- Human
  - Caused 17,189 fires
- Lightning
  - Caused 6,266 fires
- Under Investigation
  - 25 fires

## Fire Class Sizes

- Class A
  - 17,006 fires
- Max acres burned: 0.25
- Class B
  - 5,124 fires
- Class C
  - 855 fires
- Class D
  - 189 fires
- Class E
  - 104 fires
- Class F
  - 79 fires
- Class G
  - 123 fires
- Max acres burned: 499,945

## Largest Fire

Fire Name (District):  
Biscuit Private (Coos)  
ODF / BISCUIT (Southwest Oregon)

Fire Year: 2002

Total Acres: 499,945  
*Class G Fire*

# References

- 1.ODF, TzA @. “ODF Fire Occurrence Data 2000-2022.” Oregon.gov, 19 Jan. 2023, <https://data.oregon.gov/Natural-Resources/ODF-Fire-Occurrence-Data-2000-2022/fbwv-q84y>.
- 2.About Oregon's forests. Oregon Department of Forestry : About Oregon's forests : Forest benefits : State of Oregon. (n.d.). Retrieved April 24, 2023, from <https://www.oregon.gov/odf/forestbenefits/pages/aboutforests.aspx>
- 3.About Us. Oregon Department of Forestry : About us : About ODF : State of Oregon. (n.d.). Retrieved April 25, 2023, from <https://www.oregon.gov/odf/aboutodf/pages/default.aspx>



Questions?