In [1]:
```
import pandas as pd
import glob
import os


complaints_subcategory = pd.read_csv("complaints-by-subcategory.csv")
iata_icao = pd.read_csv("iata-icao.csv")
complaints_category = pd.read_csv("complaints-by-category.csv")
complaints_airport = pd.read_csv("complaints-by-airport.csv")
```

In [2]:
```
complaints_subcategory.head(5)
```

Out[2]:

	pdf_report_date	airport	category	subcategory	year_month	count	clean_cat	clean_subcat	c
0	2019-02	ABE	Hazardous Materials Safety	General	2015-01	0	Hazardous Materials Safety	General	
1	2019-02	ABE	Mishandling of Passenger Property	Damaged/Missing Items--Checked Baggage	2015-01	0	Mishandling of Passenger Property	*Damaged/Missing Items--Checked Baggage	
2	2019-02	ABE	Hazardous Materials Safety	General	2015-02	0	Hazardous Materials Safety	General	
3	2019-02	ABE	Mishandling of Passenger Property	Damaged/Missing Items--Checked Baggage	2015-02	0	Mishandling of Passenger Property	*Damaged/Missing Items--Checked Baggage	
4	2019-02	ABE	Hazardous Materials Safety	General	2015-03	0	Hazardous Materials Safety	General	

In [3]:
```
complaints_subcategory.isnull().sum()
```

Out[3]:
```
pdf_report_date                 0
airport                     13464
category                        0
subcategory                     0
year_month                      0
count                           0
clean_cat                       0
clean_subcat                    0
clean_cat_status                0
clean_subcat_status             0
is_category_prefix_removed      0
dtype: int64
```

In [4]:
```
complaints_subcategory = complaints_subcategory.dropna()
#airport is the controlling variable so I need to remove the variables that have that missing
```

In [5]:
```
iata_icao.head(5)
```

Out[5]:

	country_code	region_name	iata	icao	airport	latitude	longitude
0	AE	Abu Zaby	AAN	OMAL	Al Ain International Airport	24.2617	55.6092
1	AE	Abu Zaby	AUH	OMAA	Abu Dhabi International Airport	24.4330	54.6511
2	AE	Abu Zaby	AYM	NaN	Yas Island Seaplane Base	24.4670	54.6103
3	AE	Abu Zaby	AZI	OMAD	Al Bateen Executive Airport	24.4283	54.4581
4	AE	Abu Zaby	DHF	OMAM	Al Dhafra Air Base	24.2482	54.5477

In [6]:

```
merged_complaints_subcat = complaints_subcategory.merge(
    iata_icao,
    left_on="airport",    # column in complaints_subcategory
    right_on="iata",      # column in iata_icao
    how="left"            # keeps all complaints rows
)
```

In [7]:

```
merged_complaints_subcat.head(2)
```

Out[7]:

	pdf_report_date	airport_x	category	subcategory	year_month	count	clean_cat	clean_subcat
0	2019-02	ABE	Hazardous Materials Safety	General	2015-01	0	Hazardous Materials Safety	General
1	2019-02	ABE	Mishandling of Passenger Property	Damaged/Missing Items--Checked Baggage	2015-01	0	Mishandling of Passenger Property	*Damaged/Missing Items--Checked Baggage

In [8]:

```
complaints_category.isnull().sum()
```

Out[8]:

```
pdf_report_date        0
airport             4042
category               0
year_month             0
count                  0
clean_cat              0
clean_cat_status       0
dtype: int64
```

In [9]:

```
complaints_category=complaints_category.dropna()
#airport is the controlling variable so I need to remove the variables that have that missing
```

In [10]:

```
merged_complaints_cat = complaints_category.merge(
    iata_icao,
    left_on="airport",    # column in complaints_subcategory
    right_on="iata",      # column in iata_icao
    how="left"            # keeps all complaints rowscomplaints_airport
)
```

In [11]:

```
merged_complaints_cat.head(2)
```

Out[11]:

	pdf_report_date	airport_x	category	year_month	count	clean_cat	clean_cat_status	country_code	regic
0	2019-02	ABE	Hazardous Materials Safety	2015-01	0	Hazardous Materials Safety	original	US	Penr
1	2019-02	ABE	Mishandling of Passenger Property	2015-01	0	Mishandling of Passenger Property	original	US	Penr

In [12]:

```
complaints_airport.isnull().sum()
```

Out[12]:

```
pdf_report_date      0
airport            109
year_month           0
count                0
dtype: int64
```

In [13]:

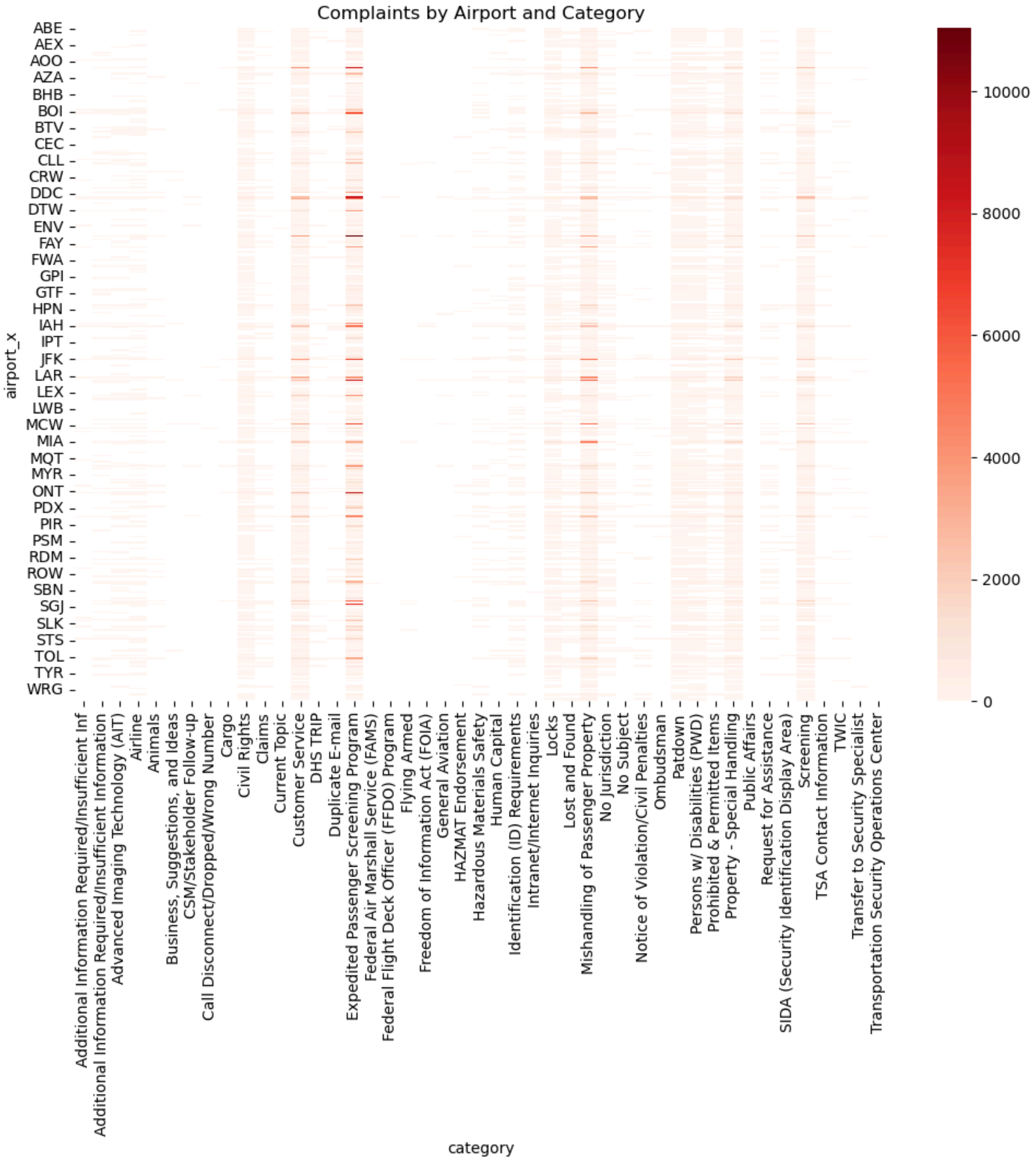
```
complaints_airport=complaints_airport.dropna()
#airport is the controlling variable so I need to remove the variables that have that missing
```

In [14]:

```
merged_complaints_airport = complaints_airport.merge(
    iata_icao,
    left_on="airport",   # column in complaints_subcategory
    right_on="iata",     # column in iata_icao
    how="left"           # keeps all complaints rowscomplaints_airport
)
```

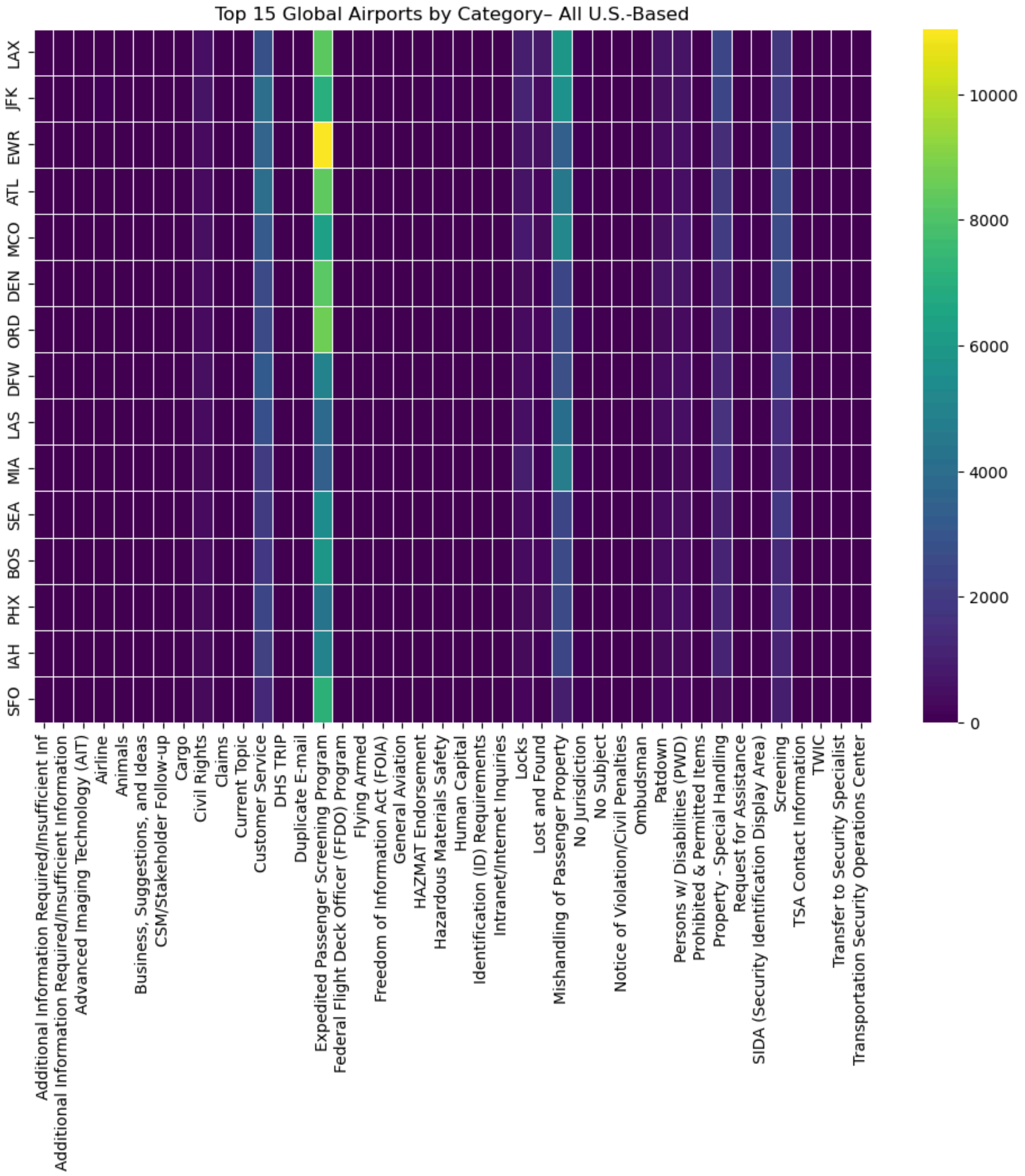
In [15]:

```
import seaborn as sns
import matplotlib.pyplot as plt

pivot = merged_complaints_cat.pivot_table(
    index="airport_x",
    columns="category",
    values="count",
    aggfunc="sum"
)

plt.figure(figsize=(12,8))
sns.heatmap(pivot, cmap="Reds")
plt.title("Complaints by Airport and Category")
plt.show()
```



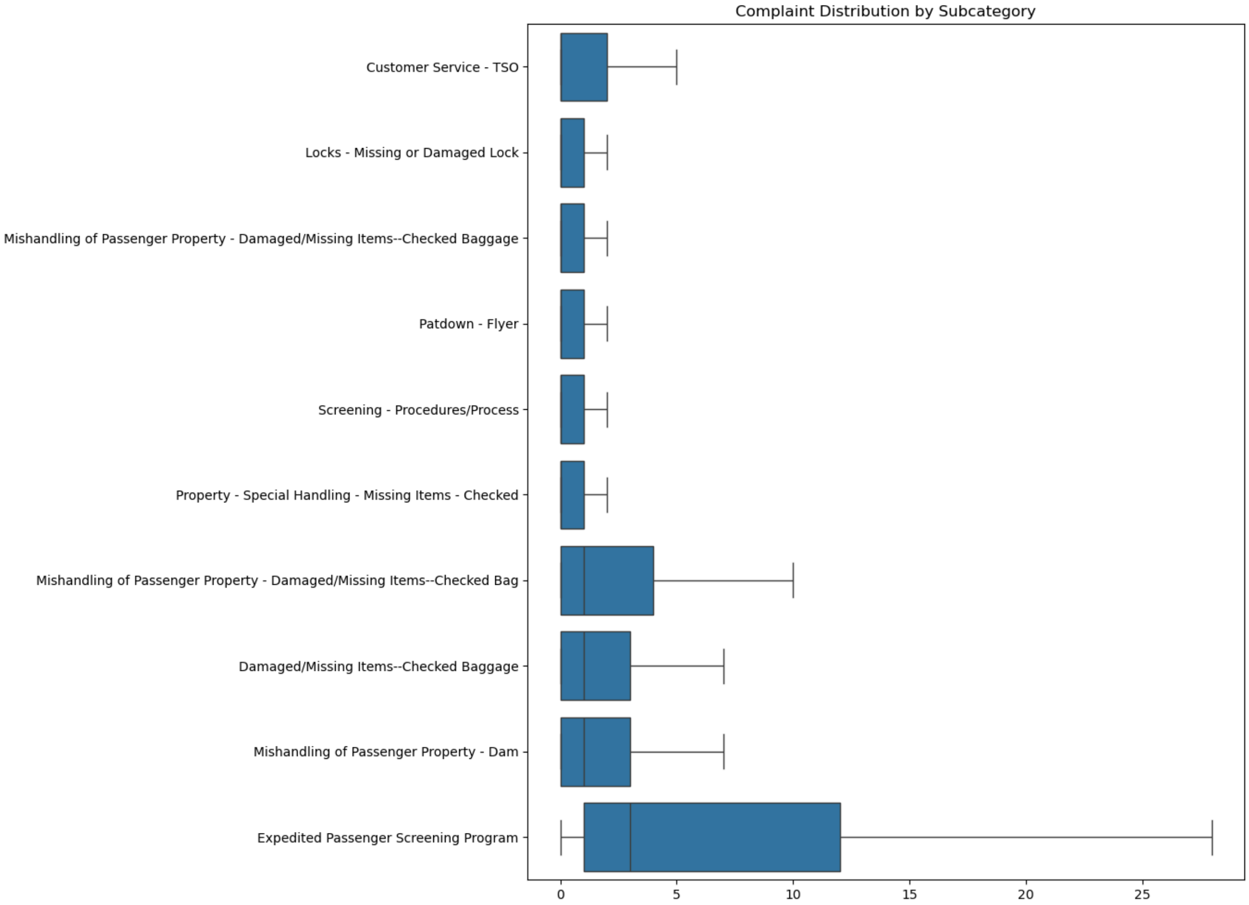
In [30]:

```
#need to clean up that heatmap its too busy

top_airports = (
    merged_complaints_cat.groupby("airport_x")["count"]
    .sum()
    .sort_values(ascending=False)
    .head(15)
    .index
)

filtered = merged_complaints_cat[
    merged_complaints_cat["airport_x"].isin(top_airports)
]

pivot = filtered.pivot_table(
    index="airport_x",
    columns="category",
    values="count",
    aggfunc="sum"
).fillna(0)

pivot = pivot.loc[pivot.sum(axis=1).sort_values(ascending=False).index]

import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(12,8))
sns.heatmap(pivot, cmap="viridis", linewidths=0.5)
plt.title("Top 15 Global Airports by Category– All U.S.-Based")
plt.xlabel("")   # removes X-axis label
plt.ylabel("")   # removes Y-axis label
plt.show()
```



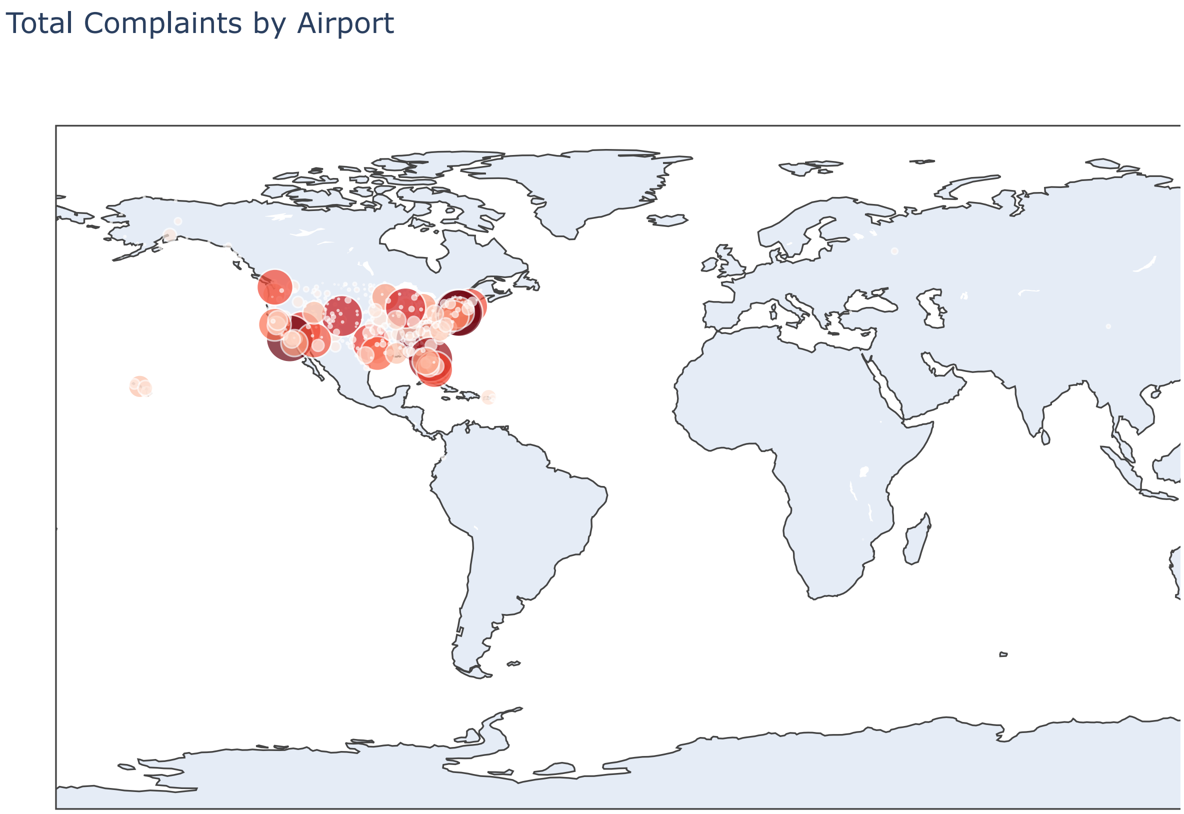
In [17]:

```
top_subcats = (
    merged_complaints_subcat.groupby("subcategory")["count"]
    .sum()
    .sort_values(ascending=False)
    .head(10)
    .index
)

filtered = merged_complaints_subcat[
    merged_complaints_subcat["subcategory"].isin(top_subcats)
]

order = (
    filtered.groupby("subcategory")["count"]
    .median()
    .sort_values(ascending=True)
    .index
)

plt.figure(figsize=(10,12))

sns.boxplot(
    data=filtered,
    y="subcategory",
    x="count",
    order=order,
    showfliers=False
)

plt.xlabel("")   # remove x label
plt.ylabel("")   # remove y label

plt.title("Complaint Distribution by Subcategory")
plt.show()
```



In [18]:

```
airport_counts = (
    merged_complaints_cat
    .groupby(["airport_x", "latitude", "longitude"])["count"]
    .sum()
    .reset_index()
)

import plotly.express as px

fig = px.scatter_geo(
    airport_counts,
    lat="latitude",
    lon="longitude",
    size="count",
    color="count",
    hover_name="airport_x",
    color_continuous_scale="Reds",
    title="Total Complaints by Airport",
    width=1000,
    height=600
)

fig.show()
```



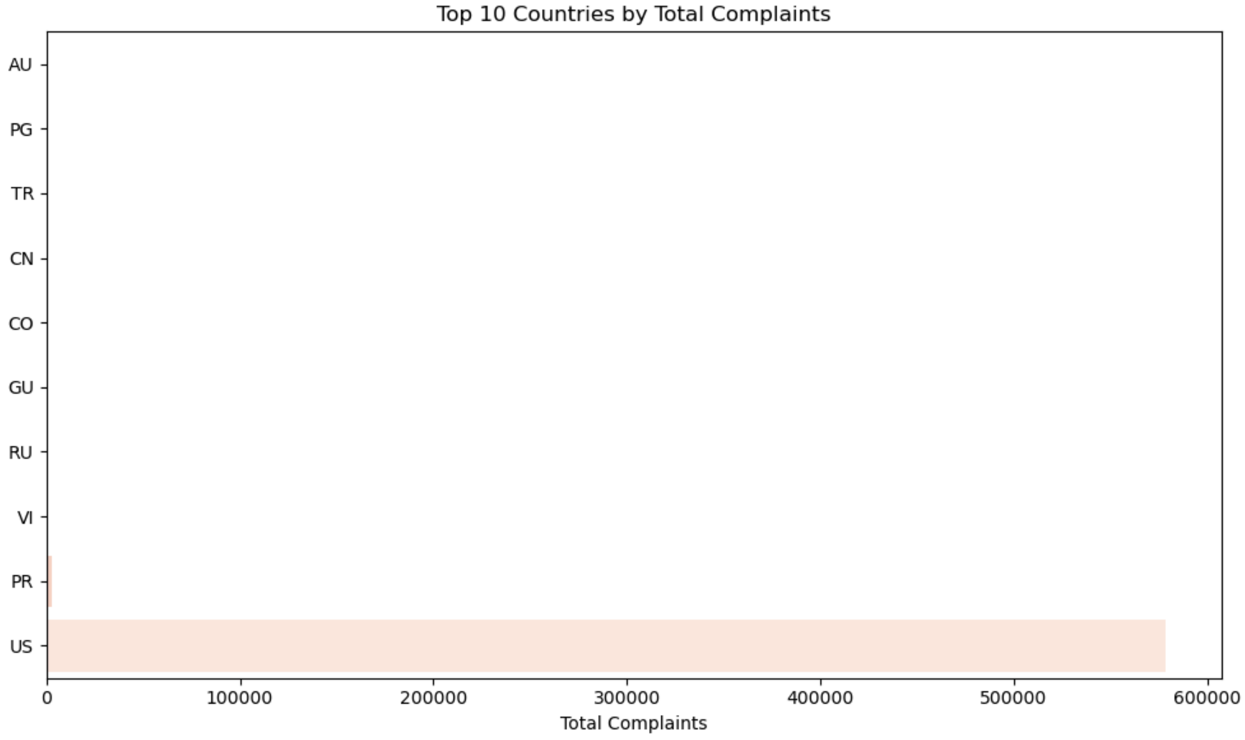
In [19]:
```
merged_complaints_airport.head(2)
```

Out[19]:

	pdf_report_date	airport_x	year_month	count	country_code	region_name	iata	icao	airport_y	latitude
0	2019-02	ABE	2015-01	0	US	Pennsylvania	ABE	KABE	Lehigh Valley International Airport	40.6521
1	2019-02	ABE	2015-02	0	US	Pennsylvania	ABE	KABE	Lehigh Valley International Airport	40.6521

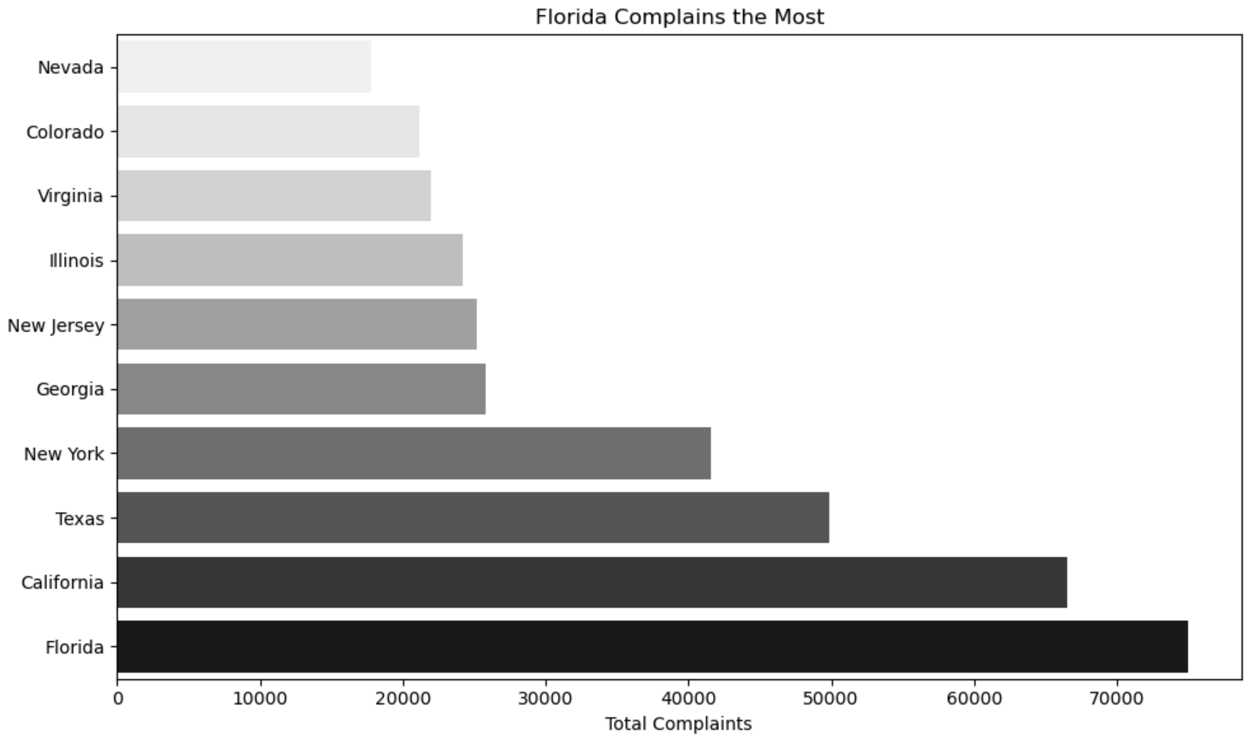
In [20]:
```
country_counts = (
    merged_complaints_airport
    .groupby("country_code")["count"]
    .sum()
    .reset_index()
)

top10 = (
    country_counts
    .sort_values("count", ascending=False)
    .head(10)
    .sort_values("count", ascending=True)
)

import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(10,6))

sns.barplot(
    data=top10,
    x="count",
    y="country_code",
    palette="Reds_r"
)

plt.title("Top 10 Countries by Total Complaints")
plt.xlabel("Total Complaints")
plt.ylabel("")
plt.tight_layout()
plt.show()

#I need to reduce the number of categories here, its all the USA
```

```
C:\Users\samkl\AppData\Local\Temp\ipykernel_15996\1256489040.py:20: FutureWarning:



Passing `palette` without assigning `hue` is deprecated and will be removed in v0.14.0. Assign the `y` v
ariable to `hue` and set `legend=False` for the same effect.
```



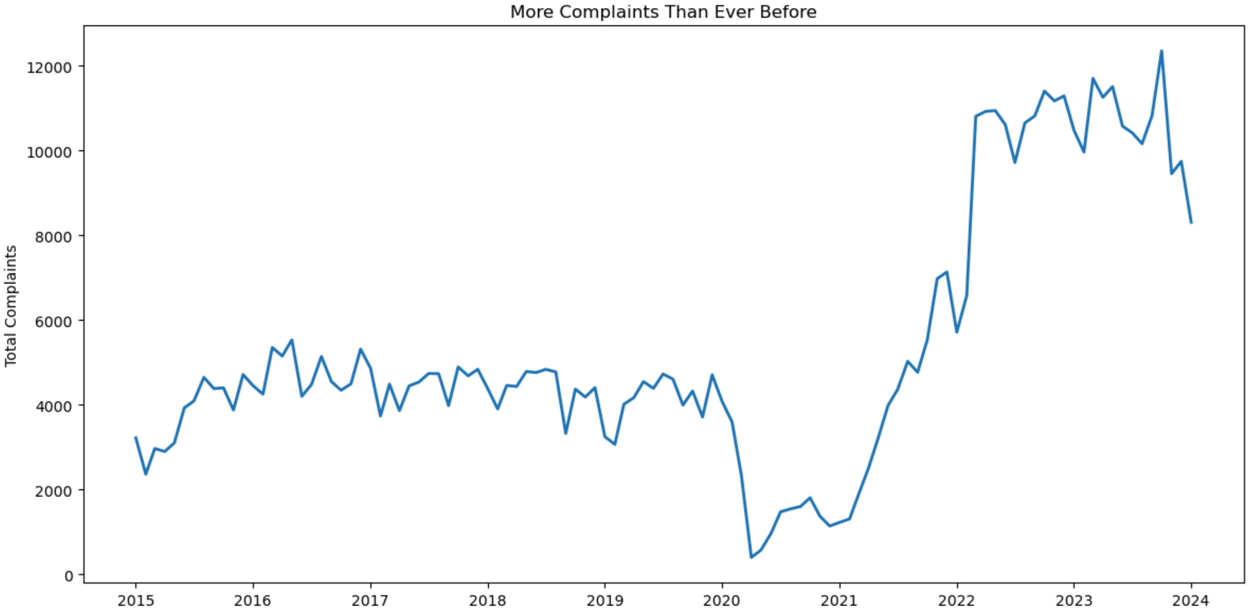
In [21]:

```
us_data = merged_complaints_airport[
    merged_complaints_airport["country_code"] == "US"
]

state_counts = (
    us_data
    .groupby("region_name")["count"]
    .sum()
    .reset_index()
)

top10_states = (
    state_counts
    .sort_values("count", ascending=False)
    .head(10)
    .sort_values("count", ascending=True)
)

import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(10,6))

sns.barplot(
    data=top10_states,
    x="count",
    y="region_name",
    hue="region_name",
    palette="Greys",
    legend=False
)

plt.title("Florida Complains the Most")
plt.xlabel("Total Complaints")
plt.ylabel("")
plt.tight_layout()
plt.show()
```



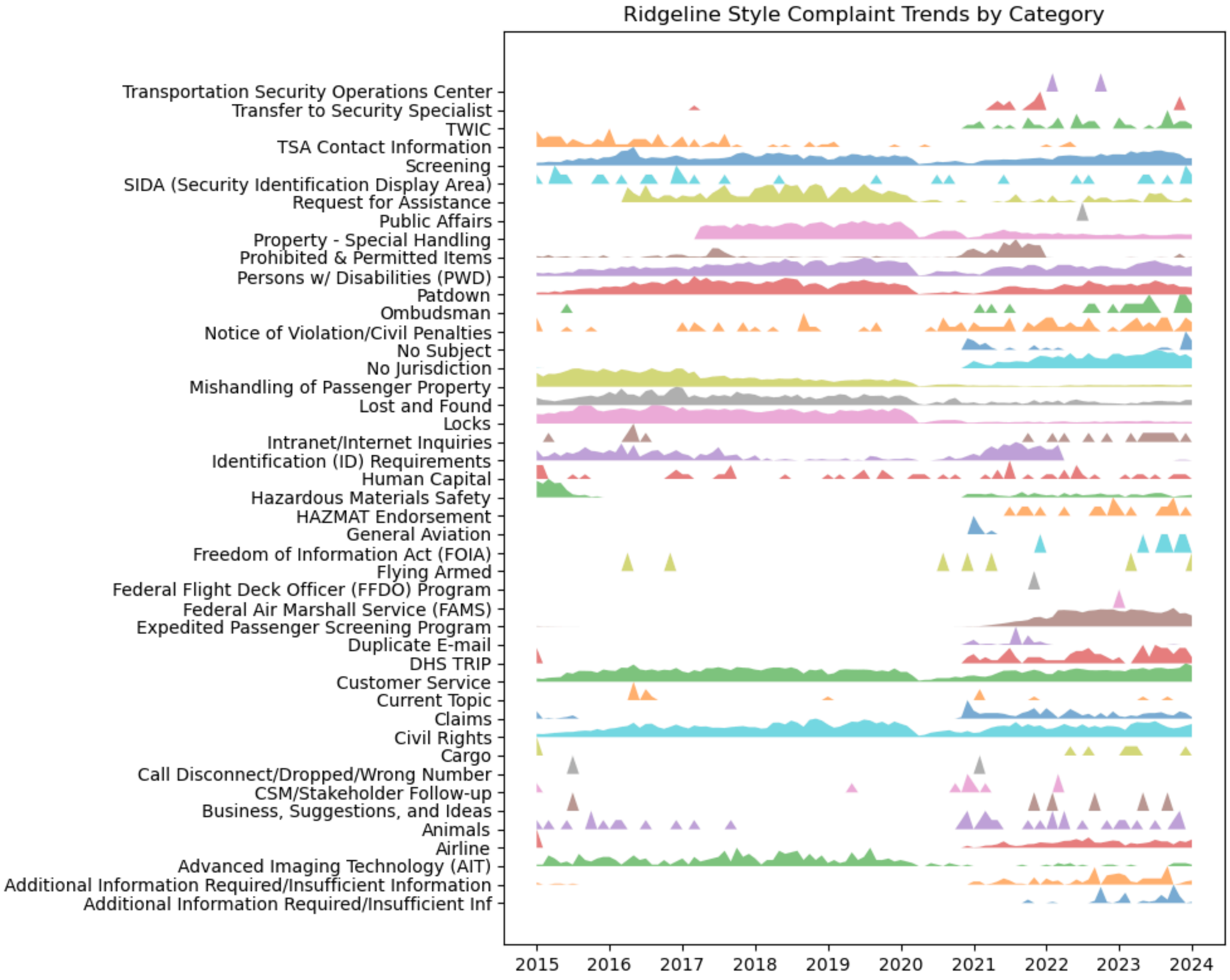
In [23]:

```
df = merged_complaints_airport.copy()

# Convert properly (YYYY-MM format)
df["year_month"] = pd.to_datetime(
    df["year_month"],
    format="%Y-%m",
    errors="coerce"
)

monthly_totals = (
    df.groupby("year_month")["count"]
      .sum()
      .reset_index()
      .sort_values("year_month")
)

import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(12,6))

sns.lineplot(
    data=monthly_totals,
    x="year_month",   # FIXED
    y="count",
    linewidth=2
)

plt.title("More Complaints Than Ever Before")
plt.xlabel("")
plt.ylabel("Total Complaints")
plt.tight_layout()
plt.show()
```



In [24]:

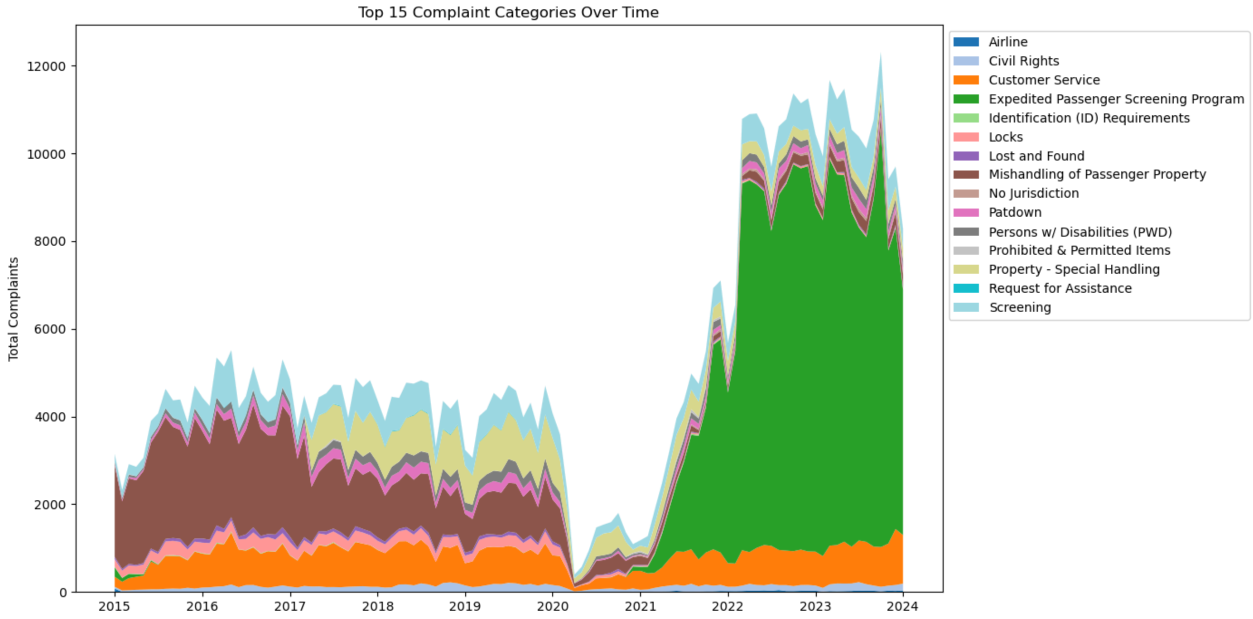
```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns

df = merged_complaints_cat.copy()

# Convert date
df["year_month"] = pd.to_datetime(df["year_month"])

# Pivot for ridgeline effect
pivot_df = df.pivot_table(
    index="year_month",
    columns="category",
    values="count",
    aggfunc="sum"
).fillna(0)

# Normalize (optional for shape comparison)
pivot_df = pivot_df / pivot_df.max()

plt.figure(figsize=(10,8))

for i, col in enumerate(pivot_df.columns):
    plt.fill_between(
        pivot_df.index,
        pivot_df[col] + i,
        i,
        alpha=0.6
    )

plt.yticks(range(len(pivot_df.columns)), pivot_df.columns)
plt.title("Ridgeline Style Complaint Trends by Category")
plt.tight_layout()
plt.show()
```



In [27]:

```
import pandas as pd

df = merged_complaints_cat.copy()

# Make sure count is numeric
df["count"] = pd.to_numeric(df["count"], errors="coerce")

# Get top 15 categories by total volume
top15 = (
    df.groupby("category")["count"]
```

```
      .sum()
      .sort_values(ascending=False)
      .head(15)
      .index
)

# Filter dataframe to reduce number of categories to top 15
df_top15 = df[df["category"].isin(top15)].copy()


import matplotlib.pyplot as plt
import numpy as np

categories = pivot_df.columns
num_categories = len(categories)

# Generate distinct colors
colors = plt.cm.tab20(np.linspace(0, 1, num_categories))

plt.figure(figsize=(14,7))

plt.stackplot(
    pivot_df.index,
    pivot_df.T,
    labels=categories,
    colors=colors
)

plt.legend(loc="upper left", bbox_to_anchor=(1,1))
plt.title("Top 15 Complaint Categories Over Time")
plt.ylabel("Total Complaints")
plt.tight_layout()
plt.show()
```



In [ ]: