In [5]:
```
import os
for dirname, _, filenames in os.walk('/kaggle/input'):
    for filename in filenames:
        print(os.path.join(dirname, filename))
```

In [8]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

In [9]:
```
!pip install missingno

import missingno as mn
import plotly.graph_objects as go
```

```
Collecting missingno
  Downloading missingno-0.5.2-py3-none-any.whl (8.7 kB)
Requirement already satisfied: scipy in c:\users\ashwa\anaconda3\lib\site
-packages (from missingno) (1.10.0)
Requirement already satisfied: seaborn in c:\users\ashwa\anaconda3\lib\si
te-packages (from missingno) (0.12.2)
Requirement already satisfied: matplotlib in c:\users\ashwa\anaconda3\lib
\site-packages (from missingno) (3.7.0)
Requirement already satisfied: numpy in c:\users\ashwa\anaconda3\lib\site
-packages (from missingno) (1.23.5)
Requirement already satisfied: cycler>=0.10 in c:\users\ashwa\anaconda3\l
ib\site-packages (from matplotlib->missingno) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in c:\users\ashwa\anacon
da3\lib\site-packages (from matplotlib->missingno) (4.25.0)
Requirement already satisfied: packaging>=20.0 in c:\users\ashwa\anaconda
3\lib\site-packages (from matplotlib->missingno) (22.0)
Requirement already satisfied: pyparsing>=2.3.1 in c:\users\ashwa\anacond
a3\lib\site-packages (from matplotlib->missingno) (3.0.9)
Requirement already satisfied: python-dateutil>=2.7 in c:\users\ashwa\ana
conda3\lib\site-packages (from matplotlib->missingno) (2.8.2)
Requirement already satisfied: pillow>=6.2.0 in c:\users\ashwa\anaconda3
\lib\site-packages (from matplotlib->missingno) (9.4.0)
Requirement already satisfied: kiwisolver>=1.0.1 in c:\users\ashwa\anacon
da3\lib\site-packages (from matplotlib->missingno) (1.4.4)
Requirement already satisfied: contourpy>=1.0.1 in c:\users\ashwa\anacond
a3\lib\site-packages (from matplotlib->missingno) (1.0.5)
Requirement already satisfied: pandas>=0.25 in c:\users\ashwa\anaconda3\l
ib\site-packages (from seaborn->missingno) (1.5.3)
Requirement already satisfied: pytz>=2020.1 in c:\users\ashwa\anaconda3\l
ib\site-packages (from pandas>=0.25->seaborn->missingno) (2022.7)
Requirement already satisfied: six>=1.5 in c:\users\ashwa\anaconda3\lib\s
ite-packages (from python-dateutil>=2.7->matplotlib->missingno) (1.16.0)
Installing collected packages: missingno
Successfully installed missingno-0.5.2
```

In [13]:
```
# Using a raw string to specify the file path
df = pd.read_csv(r"C:\Users\ashwa\Downloads\archive (4)\US_Accidents_Dec20_
```

```
C:\Users\ashwa\AppData\Local\Temp\ipykernel_15428\2597536713.py:2: DtypeW
arning: Columns (30,31,32,33,34,35,36,37,38,39,40,41,42) have mixed type
s. Specify dtype option on import or set low_memory=False.
  df = pd.read_csv(r"C:\Users\ashwa\Downloads\archive (4)\US_Accidents_De
c20_Updated.csv")
```

In [15]:
```
# Displaying the DataFrame
df.head()
```

Out[15]:

	ID	Severity	Start_Time	End_Time	Start_Lat	Start_Lng	End_Lat	End_Lng	Dista
0	A-1	2	2019-05-21 08:29:55	2019-05-21 09:29:40	34.808868	-82.269157	34.808868	-82.269157	
1	A-2	2	2019-10-07 17:43:09	2019-10-07 19:42:50	35.090080	-80.745560	35.090080	-80.745560	
2	A-3	2	2020-12-13 21:53:00	2020-12-13 22:44:00	37.145730	-121.985052	37.165850	-121.988062	
3	A-4	2	2018-04-17 16:51:23	2018-04-17 17:50:46	39.110390	-119.773781	39.110390	-119.773781	
4	A-5	3	2016-08-31 17:40:49	2016-08-31 18:10:49	26.102942	-80.265091	26.102942	-80.265091	

5 rows × 47 columns

Information about the dataframe

In [17]:
```
data.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 42768 entries, 0 to 42767
Data columns (total 47 columns):
 #   Column                 Non-Null Count  Dtype  
---  ------                 --------------  -----  
 0   ID                     42768 non-null  object 
 1   Severity               42768 non-null  int64  
 2   Start_Time             42768 non-null  object 
 3   End_Time               42768 non-null  object 
 4   Start_Lat              42768 non-null  float64
 5   Start_Lng              42767 non-null  float64
 6   End_Lat                38562 non-null  float64
 7   End_Lng                38562 non-null  float64
 8   Distance(mi)           42767 non-null  float64
 9   Description            42767 non-null  object 
 10  Number                 14888 non-null  float64
 11  Street                 42767 non-null  object 
 12  Side                   42767 non-null  object 
 13  City                   42763 non-null  object 
 14  County                 42767 non-null  object 
 15  State                  42767 non-null  object 
 16  Zipcode                42754 non-null  object 
 17  Country                42767 non-null  object 
 18  Timezone               42722 non-null  object 
 19  Airport_Code           42675 non-null  object 
 20  Weather_Timestamp      42086 non-null  object 
 21  Temperature(F)         41785 non-null  float64
 22  Wind_Chill(F)          25171 non-null  float64
 23  Humidity(%)            41728 non-null  float64
 24  Pressure(in)           41928 non-null  float64
 25  Visibility(mi)         41718 non-null  float64
 26  Wind_Direction         41843 non-null  object 
 27  Wind_Speed(mph)        38250 non-null  float64
 28  Precipitation(in)      23564 non-null  float64
 29  Weather_Condition      41711 non-null  object 
 30  Amenity                42767 non-null  object 
 31  Bump                   42767 non-null  object 
 32  Crossing               42767 non-null  object 
 33  Give_Way               42767 non-null  object 
 34  Junction               42767 non-null  object 
 35  No_Exit                42767 non-null  object 
 36  Railway                42767 non-null  object 
 37  Roundabout             42767 non-null  object 
 38  Station                42767 non-null  object 
 39  Stop                   42767 non-null  object 
 40  Traffic_Calming        42767 non-null  object 
 41  Traffic_Signal         42767 non-null  object 
 42  Turning_Loop           42767 non-null  object 
 43  Sunrise_Sunset         42763 non-null  object 
 44  Civil_Twilight         42763 non-null  object 
 45  Nautical_Twilight      42763 non-null  object 
 46  Astronomical_Twilight  42763 non-null  object 
dtypes: float64(13), int64(1), object(33)
memory usage: 15.3+ MB
```

In [18]:
```
df.shape
```

Out[18]:
```
(42768, 47)
```

In [19]:
```
df.columns
```

Out[19]:
```
Index(['ID', 'Severity', 'Start_Time', 'End_Time', 'Start_Lat', 'Start_Lng',
       'End_Lat', 'End_Lng', 'Distance(mi)', 'Description', 'Number', 'Street',
       'Side', 'City', 'County', 'State', 'Zipcode', 'Country', 'Timezone',
       'Airport_Code', 'Weather_Timestamp', 'Temperature(F)', 'Wind_Chill(F)',
       'Humidity(%)', 'Pressure(in)', 'Visibility(mi)', 'Wind_Direction',
       'Wind_Speed(mph)', 'Precipitation(in)', 'Weather_Condition', 'Amenity',
       'Bump', 'Crossing', 'Give_Way', 'Junction', 'No_Exit', 'Railway',
       'Roundabout', 'Station', 'Stop', 'Traffic_Calming', 'Traffic_Signal',
       'Turning_Loop', 'Sunrise_Sunset', 'Civil_Twilight', 'Nautical_Twilight',
       'Astronomical_Twilight'],
      dtype='object')
```

In [20]:
```
df.describe().T
```

Out[20]:

	count	mean	std	min	25%	50%
Severity	42768.0	2.289632	0.555169	1.000000	2.000000	2.00000
Start_Lat	42768.0	36.495281	4.997337	24.574811	33.631295	36.06910
Start_Lng	42767.0	-96.397656	17.744411	-124.486270	-117.810017	-91.19231
End_Lat	38562.0	36.474763	4.995932	24.571389	33.603940	36.01926
End_Lng	38562.0	-96.128667	17.633613	-124.486270	-117.658536	-91.06052
Distance(mi)	42767.0	0.395864	1.608695	0.000000	0.000000	0.00000
Number	14888.0	6686.169130	14504.608766	1.000000	933.000000	3016.00000
Temperature(F)	41785.0	61.049345	18.413176	-23.800000	49.000000	63.00000
Wind_Chill(F)	25171.0	55.007914	22.212886	-41.600000	39.000000	58.00000
Humidity(%)	41728.0	65.188363	22.866381	2.000000	49.000000	68.00000
Pressure(in)	41928.0	29.658250	0.907478	20.270000	29.590000	29.92000
Visibility(mi)	41718.0	9.133120	2.818903	0.000000	10.000000	10.00000
Wind_Speed(mph)	38250.0	7.855014	5.267950	0.000000	4.600000	7.00000
Precipitation(in)	23564.0	0.010956	0.139378	0.000000	0.000000	0.00000

In [21]:
```
df.describe(include=object)
```

Out[21]:

	ID	Start_Time	End_Time	Description	Street	Side	City	County	State
count	42768	42768	42768	42767	42767	42767	42763	42767	42767
unique	42768	42542	42639	38777	16200	2	4501	1020	49
top	A-1	2016-10-17 07:44:53	2016-10-17 13:44:53	A crash has occurred causing no to minimum del...	I-5 N	R	Houston	Los Angeles	CA
freq	1	3	3	32	591	35392	1099	3450	10790

4 rows × 33 columns

Checking for null/missing values in the dataset

In [22]:
```
df.isna().sum()
```

Out[22]:
```
ID                          0
Severity                    0
Start_Time                  0
End_Time                    0
Start_Lat                   0
Start_Lng                   1
End_Lat                  4206
End_Lng                  4206
Distance(mi)                1
Description                 1
Number                  27880
Street                      1
Side                        1
City                        5
County                      1
State                       1
Zipcode                    14
Country                     1
Timezone                   46
Airport_Code               93
Weather_Timestamp         682
Temperature(F)            983
Wind_Chill(F)           17597
Humidity(%)              1040
Pressure(in)              840
Visibility(mi)           1050
Wind_Direction            925
Wind_Speed(mph)          4518
Precipitation(in)       19204
Weather_Condition         1057
Amenity                     1
Bump                        1
Crossing                    1
Give_Way                    1
Junction                    1
No_Exit                     1
Railway                     1
Roundabout                  1
Station                     1
Stop                        1
Traffic_Calming             1
Traffic_Signal              1
Turning_Loop                1
Sunrise_Sunset              5
Civil_Twilight              5
Nautical_Twilight           5
Astronomical_Twilight       5
dtype: int64
```

Dropping the columns with huge number of null values

In [23]:
```
df.drop(columns=['End_Lat','End_Lng','Wind_Chill(F)','Precipitation(in)'],
```

In [24]:
```
#storing categorical column names to a new variable
categorical=[i for i in df.columns if df[i].dtype=='O']
#for categorical values we can replace the null values with the Mode of it
for i in categorical:
    df[i].fillna(df[i].mode()[0],inplace=True)
```

In [25]:
```
df.drop(columns=['Wind_Speed(mph)', 'Visibility(mi)', 'Pressure(in)', 'Hum
```

In [26]:
```
df.isna().sum()
```

Out[26]:
```
ID                        0
Severity                  0
Start_Time                0
End_Time                  0
Start_Lat                 0
Start_Lng                 1
Distance(mi)              1
Description               0
Number                27880
Street                    0
Side                      0
City                      0
County                    0
State                     0
Zipcode                   0
Country                   0
Timezone                  0
Airport_Code              0
Weather_Timestamp         0
Wind_Direction            0
Weather_Condition         0
Amenity                   0
Bump                      0
Crossing                  0
Give_Way                  0
Junction                  0
No_Exit                   0
Railway                   0
Roundabout                0
Station                   0
Stop                      0
Traffic_Calming           0
Traffic_Signal            0
Turning_Loop              0
Sunrise_Sunset            0
Civil_Twilight            0
Nautical_Twilight         0
Astronomical_Twilight     0
dtype: int64
```

Checking for duplicate values

In [27]:
```
df.duplicated().sum()
```

Out[27]:
```
0
```

EDA

City with most Number of accidents

In [28]:
```
city_acc = df['City'].value_counts().sort_values(ascending = False).reset_
```

In [29]:
```
city_acc
```

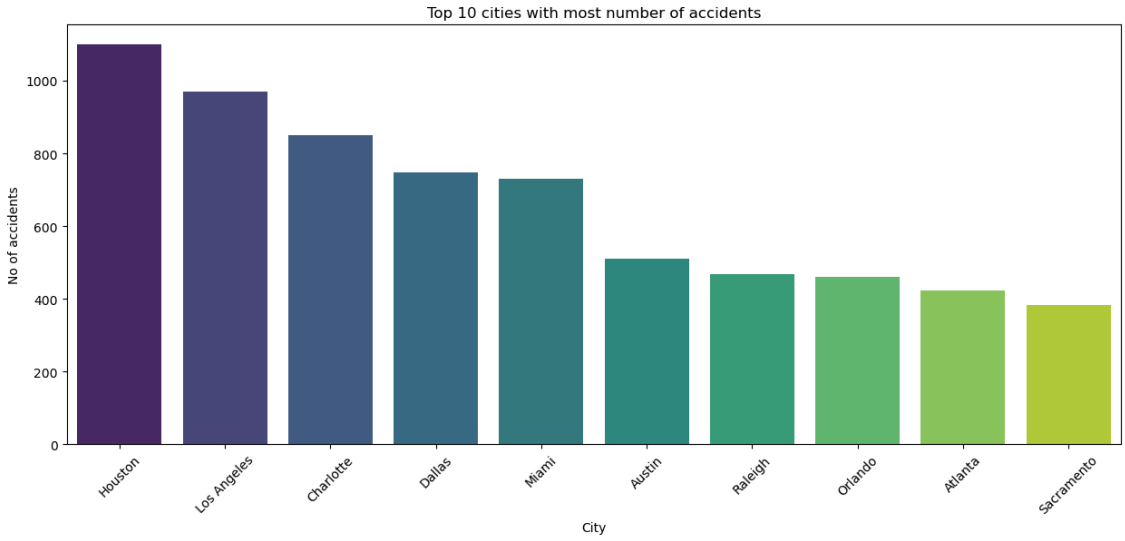
Out[29]:

	index	City
0	Houston	1104
1	Los Angeles	971
2	Charlotte	849
3	Dallas	748
4	Miami	731
...	...	...
4496	Owens Cross Roads	1
4497	Hollsopple	1
4498	Boxborough	1
4499	Indian Harbour Beach	1
4500	Killingworth	1

4501 rows × 2 columns

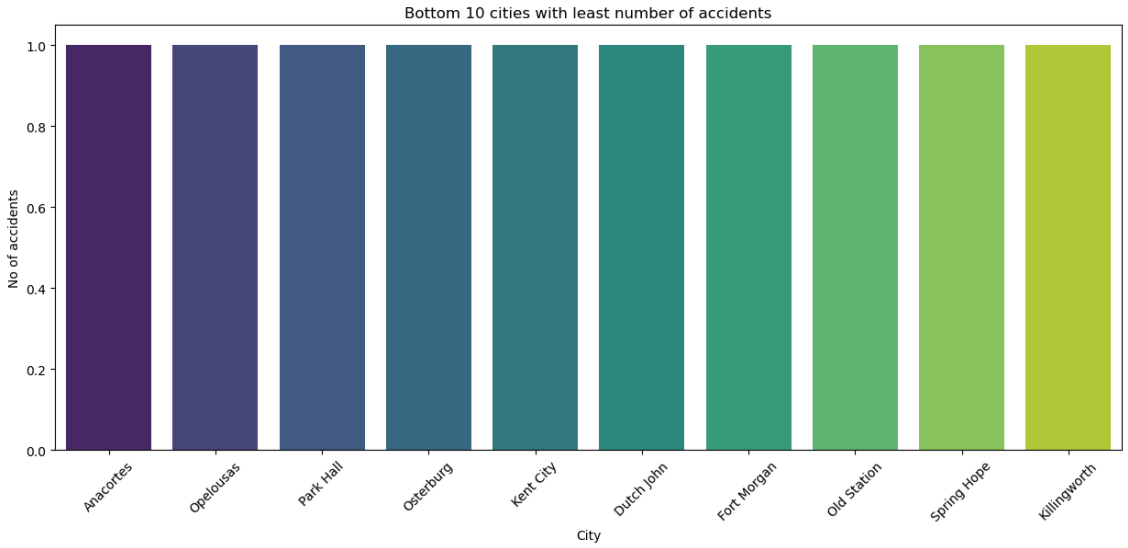
Top 10 cities with most number of accidents

In [31]:
```
# Assuming 'data' is your DataFrame containing accident records with a colu
# Group by 'City' and count the number of accidents
city_acc = data['City'].value_counts().reset_index()
city_acc.columns = ['City', 'count']

# Plot the top 10 cities with the most number of accidents
plt.figure(figsize=(15,6))
sns.barplot(x='City', y='count', data=city_acc.head(10), palette='viridis'
plt.title("Top 10 cities with most number of accidents")
plt.ylabel("No of accidents")
plt.xlabel("City")
plt.xticks(rotation=45)  # Rotate city names for better readability
plt.show()
```



Bottom 10 cities with least number of accidents

In [32]:
```
plt.figure(figsize=(15,6))
sns.barplot(x='City',y='count',data= city_acc.tail(10),palette='viridis')
plt.title("Bottom 10 cities with least number of accidents")
plt.ylabel("No of accidents")
plt.xticks(rotation=45)
plt.show()
```



State with most and least Number of accidents

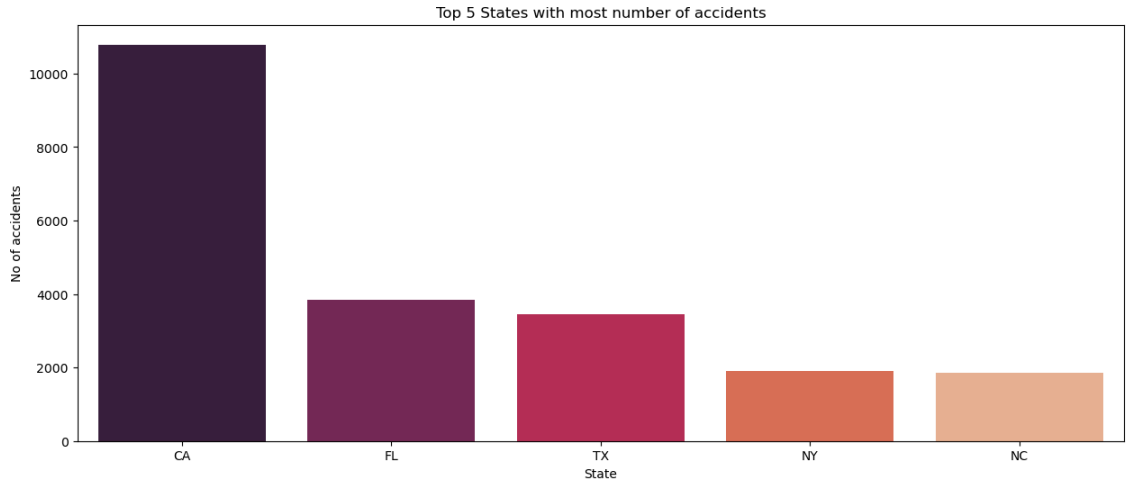
In [33]:
```
state_acc = df['State'].value_counts().sort_values(ascending = False).rese
state_acc
```

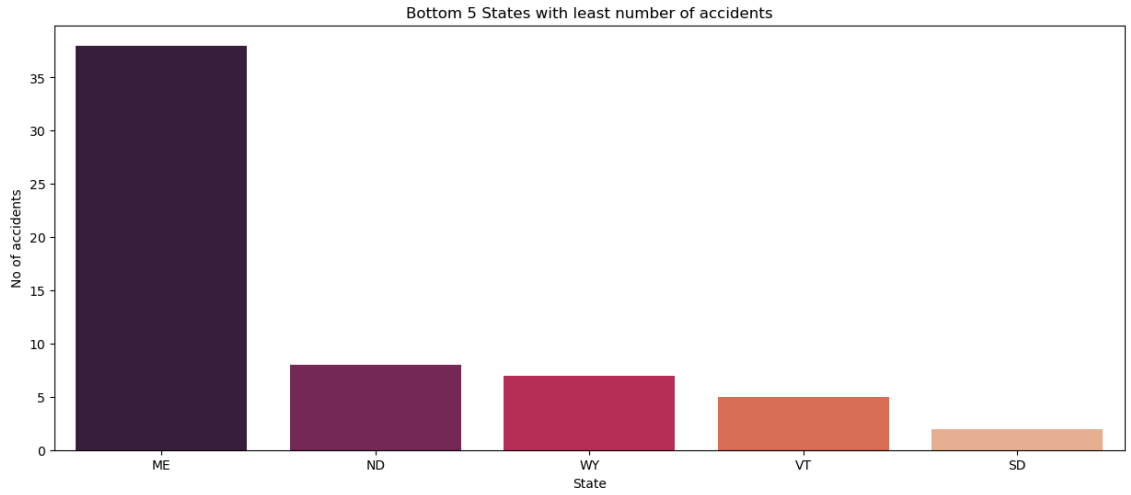
Out[33]:

	index	State
0	CA	10791
1	FL	3841
2	TX	3459
3	NY	1908
4	NC	1854
5	SC	1673
6	OR	1403
7	VA	1356
8	PA	1315
9	MN	1153
10	IL	1152
11	GA	984
12	MI	948
13	AZ	945
14	TN	808
15	NJ	758
16	LA	757
17	MD	755
18	WA	691
19	OH	669
20	UT	633
21	CO	552
22	OK	483
23	AL	473
24	MO	444
25	CT	390
26	MA	385
27	IN	355
28	KY	222
29	WI	206
30	NE	201
31	IA	147
32	NV	128
33	RI	110
34	KS	106
35	DC	104
36	NH	88
37	MS	80
38	AR	80

	index	State
39	DE	69
40	ID	66
41	NM	63
42	MT	54
43	WV	49
44	ME	38
45	ND	8
46	WY	7
47	VT	5
48	SD	2

In [35]:
```
# Group by 'State' and count the number of accidents
state_acc = data['State'].value_counts().reset_index()
state_acc.columns = ['State', 'count']

# Plot the top 5 states with the most number of accidents
plt.figure(figsize=(15,6))
sns.barplot(x='State', y='count', data=state_acc.head(5), palette='rocket'
plt.title("Top 5 States with most number of accidents")
plt.ylabel("No of accidents")
plt.xlabel("State")
plt.show()

# Plot the bottom 5 states with the least number of accidents
plt.figure(figsize=(15,6))
sns.barplot(x='State', y='count', data=state_acc.tail(5), palette='rocket'
plt.title("Bottom 5 States with least number of accidents")
plt.ylabel("No of accidents")
plt.xlabel("State")
plt.show()
```

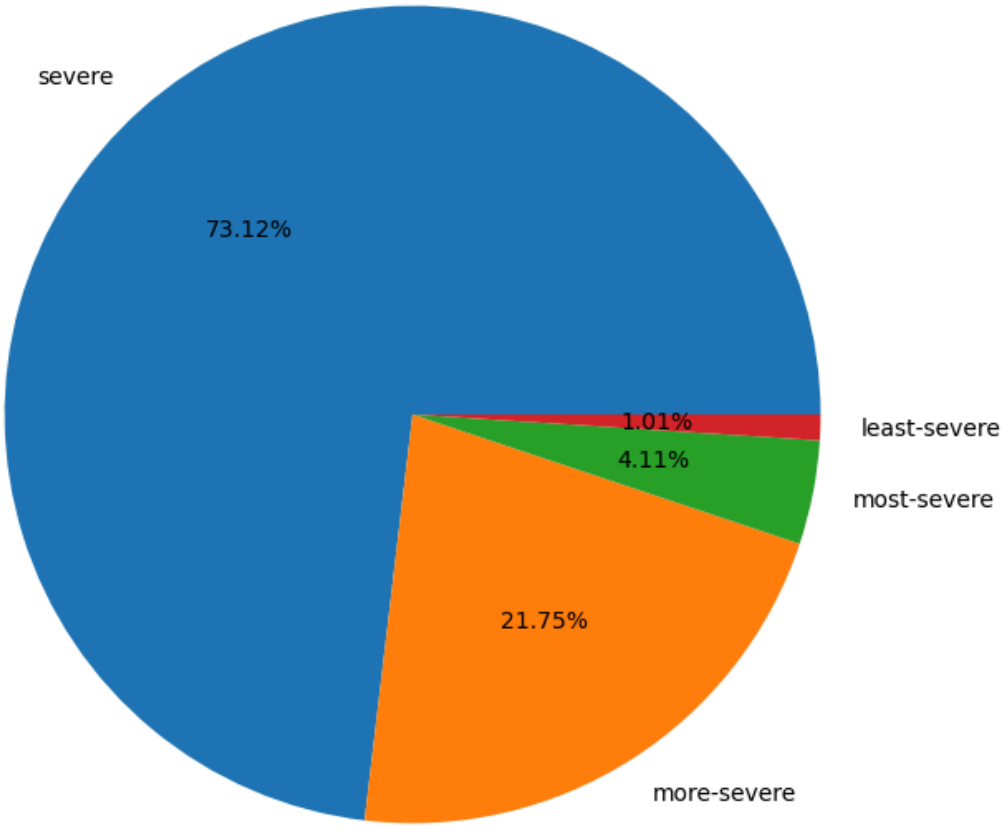




In [36]:
```
#Observations:
df['Severity'].value_counts().index
```

Out[36]:
```
Int64Index([2, 3, 4, 1], dtype='int64')
```

In [37]:
```
plt.figure(figsize=(8,8))
plt.pie(df['Severity'].value_counts(),labels=['severe','more-severe','most
plt.show()
```



In [38]:
```
# Convert the 'Start_Time' column to datetime format
df['Start_Time'] = pd.to_datetime(df['Start_Time'], errors='coerce')

# Extract the year from the 'Start_Time' column and store it in a new colu
df['Year'] = df['Start_Time'].dt.year

# Display the first few rows to verify
print(df[['Start_Time', 'Year']].head())
```

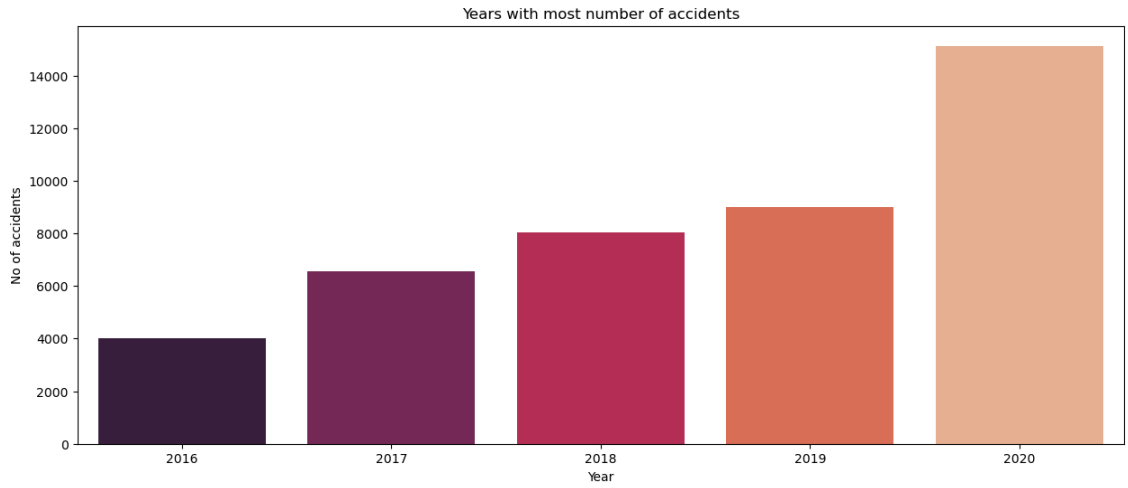
```
           Start_Time  Year
0 2019-05-21 08:29:55  2019
1 2019-10-07 17:43:09  2019
2 2020-12-13 21:53:00  2020
3 2018-04-17 16:51:23  2018
4 2016-08-31 17:40:49  2016
```

In [39]:
```
df['Year'].value_counts()
```

Out[39]:
```
2020    15127
2019     9008
2018     8037
2017     6568
2016     4028
Name: Year, dtype: int64
```

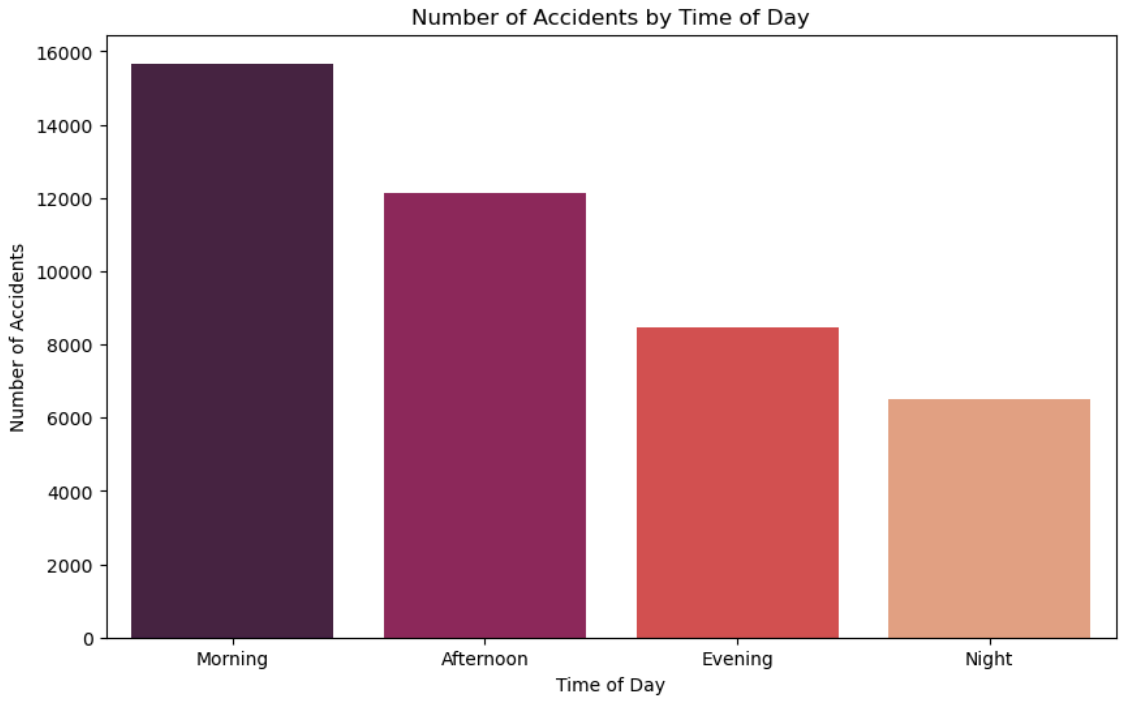
Years with most number of accidents

In [41]:
```
# Get the count of accidents per year
year_count = df['Year'].value_counts().reset_index()
year_count.columns = ['Year', 'count']  # Rename columns for clarity

# Plot the years with the most number of accidents
plt.figure(figsize=(15,6))
sns.barplot(x='Year', y='count', data=year_count, palette='rocket')
plt.title("Years with most number of accidents")
plt.xlabel("Year")
plt.ylabel("No of accidents")
plt.show()
```



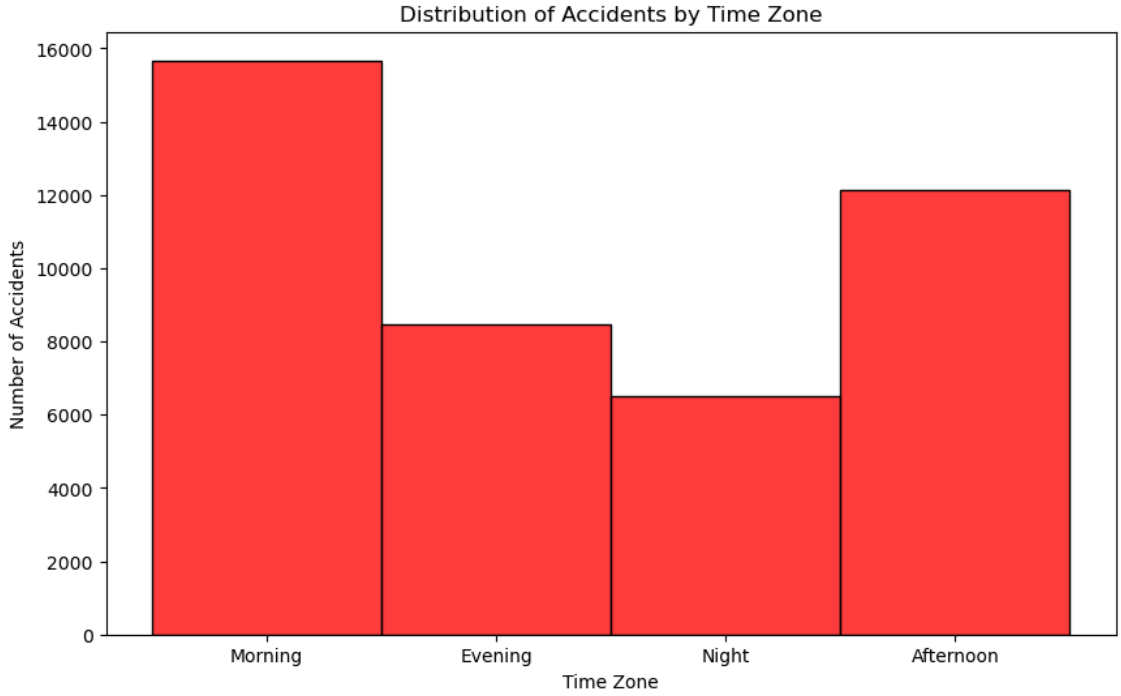
Number of accidents at different time zones

In [42]:
```
df['Start_Time'] = pd.to_datetime(df['Start_Time'], errors='coerce')

# Extract the time and store it in a new column 'Time'
df['Time'] = df['Start_Time'].dt.time

# Function to categorize time
def categorize_time(time):
    if pd.isna(time):
        return 'Unknown'
    if time >= pd.to_datetime('05:00:00').time() and time < pd.to_datetime
        return 'Morning'
    elif time >= pd.to_datetime('12:00:00').time() and time < pd.to_dateti
        return 'Afternoon'
    elif time >= pd.to_datetime('17:00:00').time() and time < pd.to_dateti
        return 'Evening'
    else:
        return 'Night'

# Apply the function to create a new column 'Time_Zone'
df['Time_Zone'] = df['Time'].apply(categorize_time)

# Filter out 'Unknown' time zones for plotting
filtered_df = df[df['Time_Zone'] != 'Unknown']


# Count the number of accidents in each timezone
time_zone_counts = filtered_df['Time_Zone'].value_counts()

# Plot the distribution
plt.figure(figsize=(10, 6))
sns.barplot(x=time_zone_counts.index, y=time_zone_counts.values, palette='
plt.xlabel('Time of Day')
plt.ylabel('Number of Accidents')
plt.title('Number of Accidents by Time of Day')
plt.show()
```



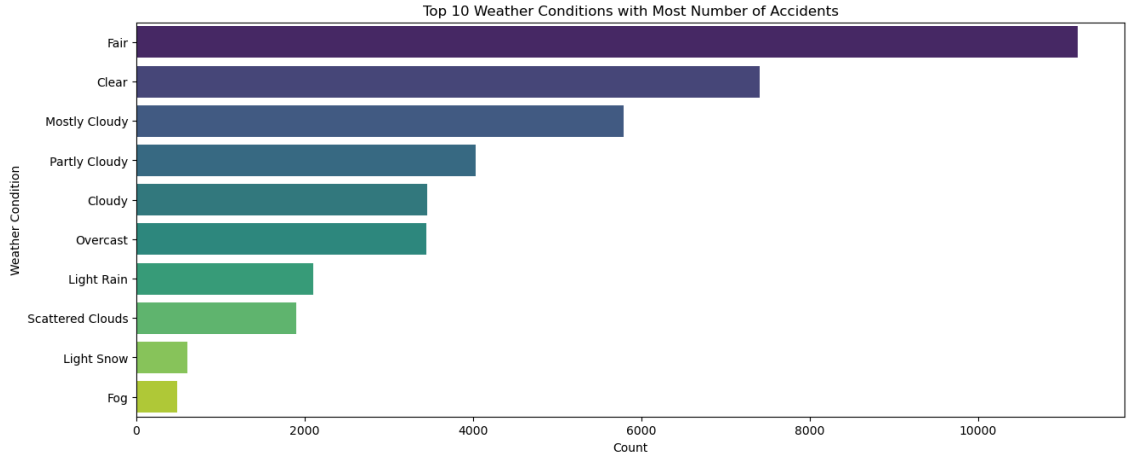
histogram to show the distribution of accidents through the time zones

In [44]:
```
plt.figure(figsize=(10, 6))
sns.histplot(filtered_df['Time_Zone'], bins=4, kde=False, color='red')
plt.xlabel('Time Zone')
plt.ylabel('Number of Accidents')
plt.title('Distribution of Accidents by Time Zone')
plt.show()
```

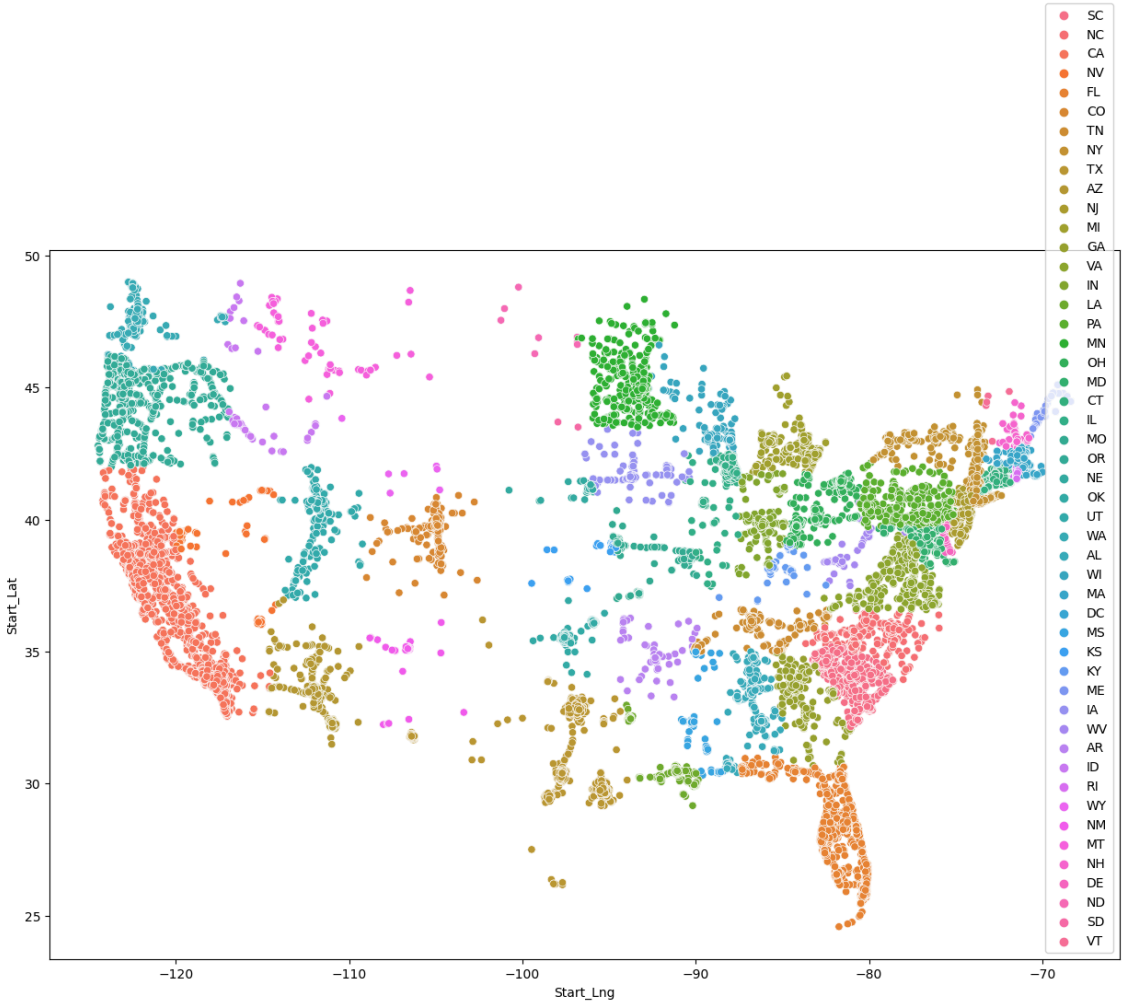


Weather conditions at the time of accidents

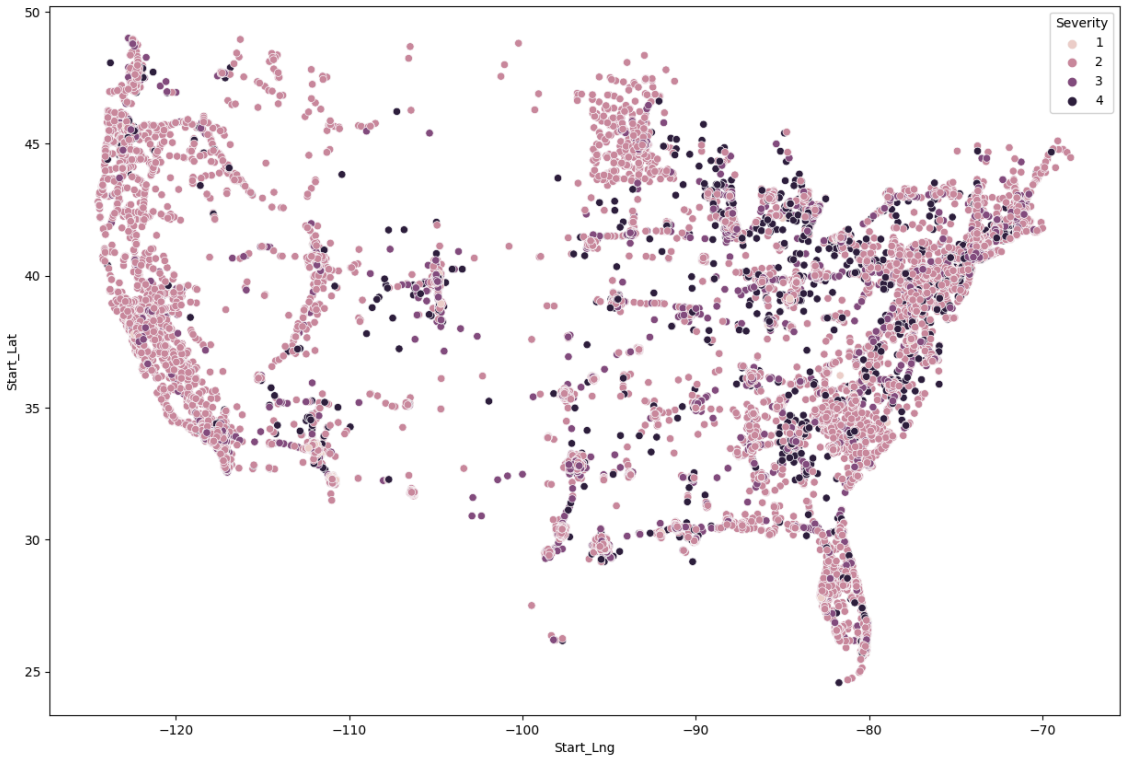
In [46]:
```
# Get the count of each weather condition
weather = df['Weather_Condition'].value_counts().reset_index()
weather.columns = ['Weather_Condition', 'count']  # Rename columns for cla

# Plot the top 10 weather conditions with the most number of accidents
plt.figure(figsize=(15,6))
sns.barplot(x='count', y='Weather_Condition', data=weather[:10], palette='
plt.title("Top 10 Weather Conditions with Most Number of Accidents")
plt.xlabel("Count")
plt.ylabel("Weather Condition")
plt.show()
```



In [47]:
```
plt.figure(figsize=(15,10))
sns.scatterplot(x=df['Start_Lng'],y=df['Start_Lat'],hue=df['State'])
plt.legend(loc="lower right")
plt.show()
```



In [48]:
```
plt.figure(figsize=(15,10))
sns.scatterplot(x=df['Start_Lng'],y=df['Start_Lat'],hue=df['Severity'])
plt.show()
```



In [ ]: