Hurricane Harvey Analysis

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Background and Scope

Import the Data

Imported:

1. State
2. Event_Table
3. CZ_Name
4. Begin_Date_Time
5. End_Date_Time
6. Property_Cost
7. Begin_Lat
8. Begin_Lon
9. End_Lat
10. End_Lon

```
uiimport("StormEvents\StormEvents_2017_finalProject.csv")
```

States Impacted by harvey

In order to filter the data to know which data is related to hurricane Harvey we need to filter the data to only include these states.

- Arkansas
- Kentucky

- Louisiana
- Mississippi
- North Carolina
- Tennessee
- Texas.

```
StormEvents2017finalProject = StormEvents2017finalProject(StormEvents2017finalProject.State ==
    | StormEvents2017finalProject.State == 'KENTUCKY' | StormEvents2017finalProject.State == 'L
    | StormEvents2017finalProject.State == 'MISSISSIPPI' | StormEvents2017finalProject.State ==
    | StormEvents2017finalProject.State == 'TENNESSEE' | StormEvents2017finalProject.State == '
```

```
StormEvents2017finalProject = 10667×10 table
```

...

	State	Event_Type	CZ_Name	Begin_Date_Time	End_Date_Time	Property_Cost
1	ARKANSAS	Hail	FRANKLIN	2017-04-26 07:57...	2017-04-26 07:...	0
2	TEXAS	Hail	HENDERSON	2017-05-03 14:06...	2017-05-03 14:...	1000
3	NORTH C...	Flash Flood	WAKE	2017-06-16 19:32...	2017-06-16 19:...	0
4	KENTUCKY	Flash Flood	KNOTT	2017-06-14 16:25...	2017-06-14 16:...	0
5	ARKANSAS	Drought	SEBASTIAN	2017-11-15 00:00...	2017-11-30 23:...	0
6	ARKANSAS	Drought	FRANKLIN	2017-11-15 00:00...	2017-11-30 23:...	0
7	ARKANSAS	Drought	CRAWFORD	2017-11-15 00:00...	2017-11-30 23:...	0
8	ARKANSAS	Drought	WASHINGTON	2017-11-15 00:00...	2017-11-30 23:...	0
9	ARKANSAS	Drought	MADISON	2017-11-15 00:00...	2017-11-30 23:...	0
10	TEXAS	Tornado	BOSQUE	2017-01-15 18:17...	2017-01-15 18:...	90000
11	TEXAS	Thunderstorm Wind	DALLAS	2017-01-02 05:50...	2017-01-02 05:...	5000
12	TEXAS	Thunderstorm Wind	LEON	2017-01-02 05:58...	2017-01-02 05:...	0
13	TEXAS	Thunderstorm Wind	ELLIS	2017-01-02 05:10...	2017-01-02 05:...	15000
14	TEXAS	Thunderstorm Wind	LEON	2017-01-02 06:04...	2017-01-02 06:...	0

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Dates that Hurricane Harvey happened in between

I will asume that assume that Harvey related events occurred only from the 17th of August to the 3rd of September.

```
StormEvents2017finalProject = StormEvents2017finalProject(StormEvents2017finalProject.Begin_Dat
    & StormEvents2017finalProject.End_Date_Time <= datetime('2017-09-04 00:00:00') ...
    | ismissing(StormEvents2017finalProject.Begin_Date_Time), :);
```

At the end we will get the following table

```
StormEvents2017finalProject
```

```
StormEvents2017finalProject = 573×10 table
```

	State	Event_Type	CZ_Name	Begin_Date_Time	End_Date_Time	Property_Cost
1	TEXAS	Tropical Storm	MONTGOMERY	2017-08-25 12:00...	2017-08-30 00:...	7.0000e+09
2	MISSISS...	Strong Wind	LOWNDES	2017-09-01 01:00...	2017-09-01 01:...	5000
3	NORTH C...	Flash Flood	WAKE	2017-09-01 17:35...	2017-09-01 18:...	0
4	NORTH C...	Flash Flood	CUMBERLAND	2017-09-01 19:20...	2017-09-01 21:...	0
5	NORTH C...	Hail	LEE	2017-09-01 15:20...	2017-09-01 15:...	0
6	TEXAS	Tropical Storm	FORT BEND	2017-08-26 00:00...	2017-08-30 00:...	8.0000e+09
7	NORTH C...	Hail	WAYNE	2017-09-01 13:50...	2017-09-01 14:...	0
8	NORTH C...	Thunderstorm Wind	RICHMOND	2017-09-01 13:35...	2017-09-01 13:...	500
9	NORTH C...	Thunderstorm Wind	WAYNE	2017-09-01 14:10...	2017-09-01 14:...	15000
10	NORTH C...	Thunderstorm Wind	LEE	2017-09-01 14:52...	2017-09-01 14:...	8000
11	NORTH C...	Thunderstorm Wind	LEE	2017-09-01 15:00...	2017-09-01 15:...	75000
12	TEXAS	Tropical Storm	GALVESTON	2017-08-25 12:00...	2017-08-30 00:...	1.0000e+10
13	TEXAS	Tropical Storm	SAN JACINTO	2017-08-25 12:00...	2017-08-30 00:...	350000000
14	NORTH C...	Thunderstorm Wind	HARNETT	2017-09-01 15:45...	2017-09-01 15:...	8000

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Two States Most Impacted by Harvey

Here we will find the two most states that have the heighest property cost

```
T = groupsummary(StormEvents2017finalProject, 'State', 'sum', 'Property_Cost'); % finding the t
T.sum_Property_Cost = sort(T.sum_Property_Cost, 'descend') % sort the rows in a descending orde
```

T = 7×3 table

	State	GroupCount	sum_Property_Cost
1	ARKANSAS	52	7.7427e+10
2	KENTUCKY	20	75277000
3	LOUISIANA	85	12338500
4	MISSISS...	39	915000
5	NORTH C...	59	504000
6	TENNESSEE	46	435000
7	TEXAS	272	61000

```
T([1, 2], :) % display the first two rows
```

ans = 2×3 table

	State	GroupCount	sum_Property_Cost
1	ARKANSAS	52	7.7427e+10

	State	GroupCount	sum_Property_Cost
2	KENTUCKY	20	75277000

From here we can see that the two most impacted states are Arkansas and Kentucky.

Table of Events for Two Most Impacted States

Here we will create a table with only the rows which contains the states Arknasas and Kentucky and group them with the events most frequent

```
clearvars -except StormEvents2017finalProject % delete the variables T and ans
T = StormEvents2017finalProject(StormEvents2017finalProject.State == "ARKANSAS" ...
    | StormEvents2017finalProject.State == 'KENTUCKY', :);
T = groupsummary(T, "Event_Type");
T.GroupCount = sort(T.GroupCount, 'descend');
T
```

T = 7×2 table

	Event_Type	GroupCount
1	Flash Flood	24
2	Flood	19
3	Hail	16
4	Heat	9
5	Strong Wind	2
6	Thunderstorm Wind	1
7	Tornado	1

```
clear T
```

From the table above we can see that the events that impactes these states from most frequent to least frequent are:

1. Flash Flood
2. Flood
3. Hail
4. Heat
5. Strong Wind
6. Thunderstorm Wind
7. Tornado

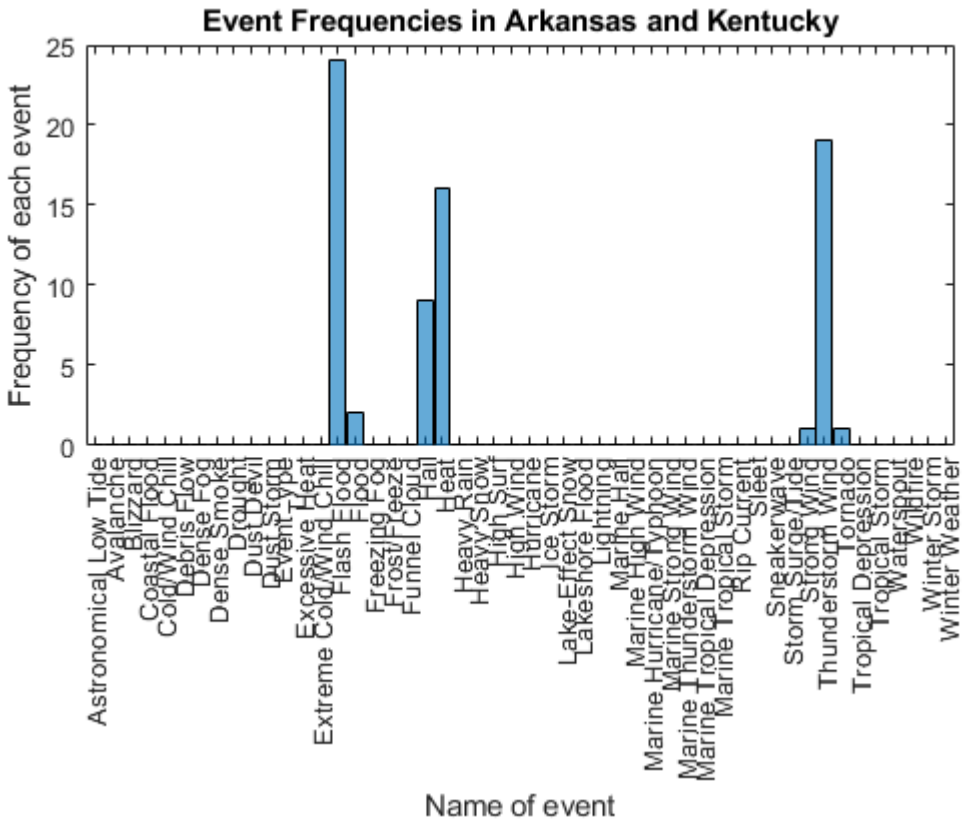
Visualizations

Figure of Event Types

First we will show a visualization for the event type and number of occurancies of events that occured in Arkansas and Kentucky.

Arkansas and Kentucky

```
T = StormEvents2017finalProject(StormEvents2017finalProject.State == "ARKANSAS" ...
    | StormEvents2017finalProject.State == 'KENTUCKY', :);
histogram(T.Event_Type)

title('Event Frequencies in Arkansas and Kentucky')
xlabel('Name of event')
ylabel('Frequency of each event')
```



Showing a table of frequencies to better interpret the data

```
T = groupsummary(T, 'Event_Type');
T.GroupCount = sort(T.GroupCount, 'descend');
T
```

T = 7×2 table

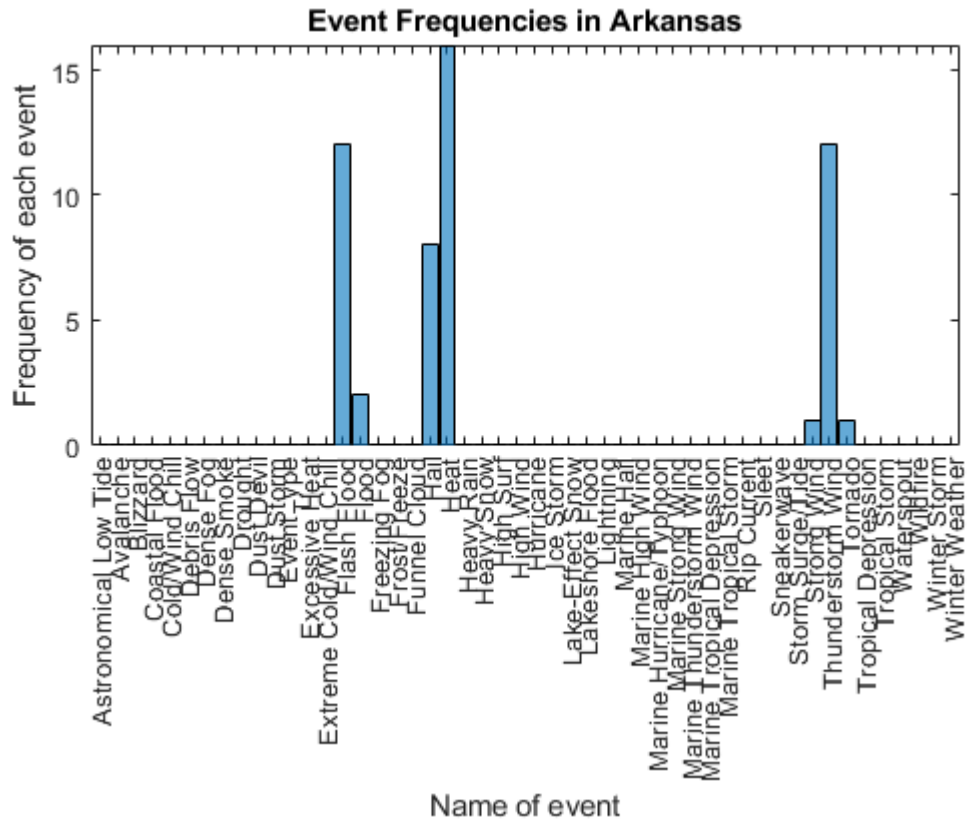
	Event_Type	GroupCount
1	Flash Flood	24
2	Flood	19

	Event_Type	GroupCount
3	Hail	16
4	Heat	9
5	Strong Wind	2
6	Thunderstorm Wind	1
7	Tornado	1

Arkansas

Arkansas Histogram to show the frequencies

```
clear T
T = StormEvents2017finalProject(StormEvents2017finalProject.State == "ARKANSAS", :);
histogram(T.Event_Type)

title('Event Frequencies in Arkansas')
xlabel('Name of event')
ylabel('Frequency of each event')
```



Showing a table of frequencies to better interpret the data

```
T = groupsummary(T, 'Event_Type');
T.GroupCount = sort(T.GroupCount, 'descend');
T
```

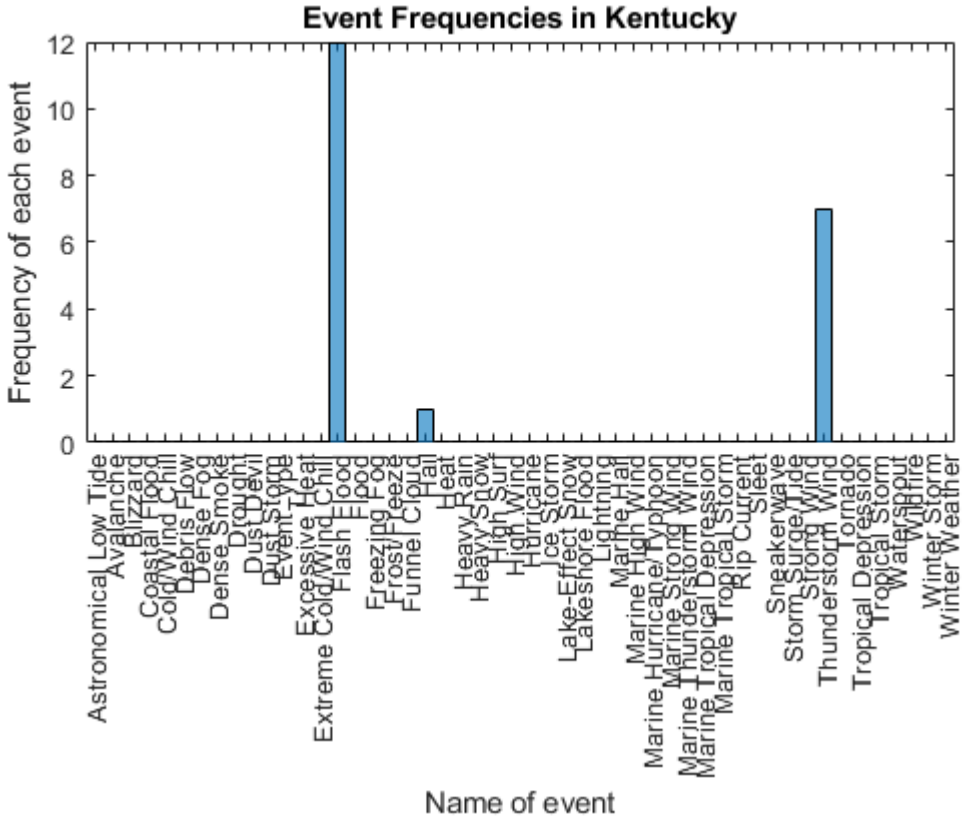
T = 7×2 table

	Event_Type	GroupCount
1	Flash Flood	16
2	Flood	12
3	Hail	12
4	Heat	8
5	Strong Wind	2
6	Thunderstorm Wind	1
7	Tornado	1

Kentucky

Kentucky Histogram to show the frequencies

```
clear T
T = StormEvents2017finalProject(StormEvents2017finalProject.State == "KENTUCKY", :);
histogram(T.Event_Type)

title('Event Frequencies in Kentucky')
xlabel('Name of event')
ylabel('Frequency of each event')
```



Showing a table of frequencies to better interpret the data

```
T = groupsummary(T, 'Event_Type');
T.GroupCount = sort(T.GroupCount, 'descend');
T
```

T = 3×2 table

	Event_Type	GroupCount
1	Flash Flood	12
2	Hail	7
3	Thunderstorm Wind	1

```
clear T
```

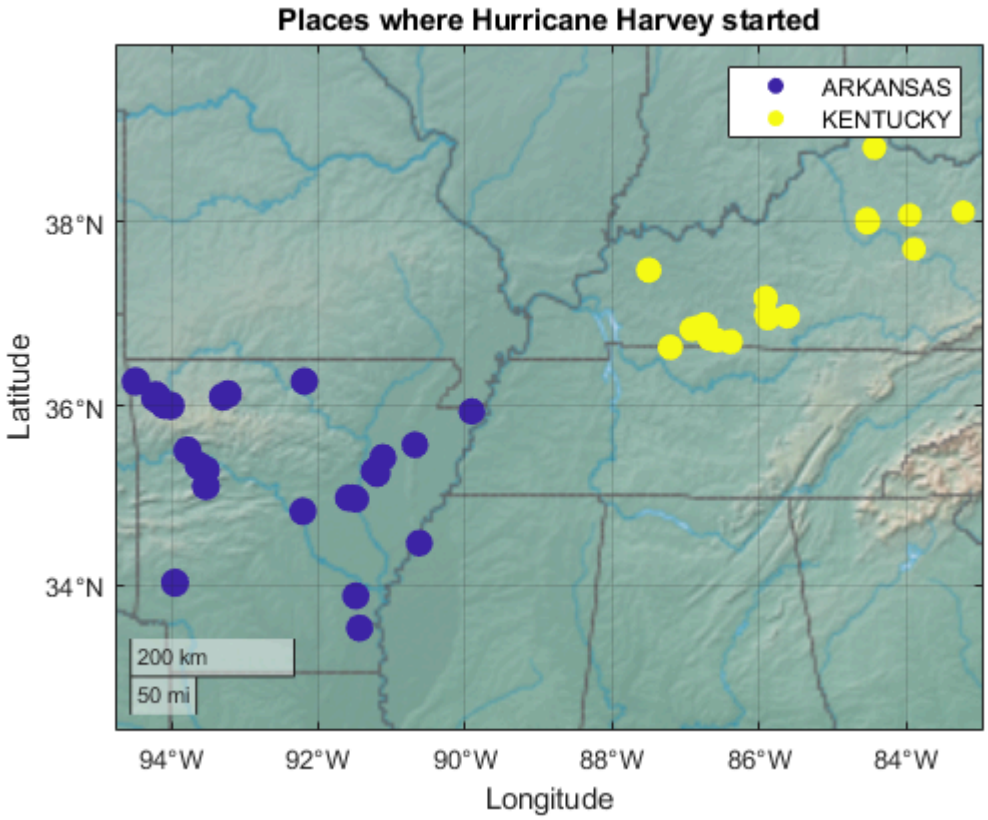
Figure of Event Locations

```
T = StormEvents2017finalProject(StormEvents2017finalProject.State == "ARKANSAS" ...
    | StormEvents2017finalProject.State == 'KENTUCKY', :);
T = T(~isnan(T.Begin_Lat), :);
T = T(~isnan(T.Begin_Lon), :);
T = T(~isnan(T.End_Lat), :);
T = T(~isnan(T.End_Lon), :);
```

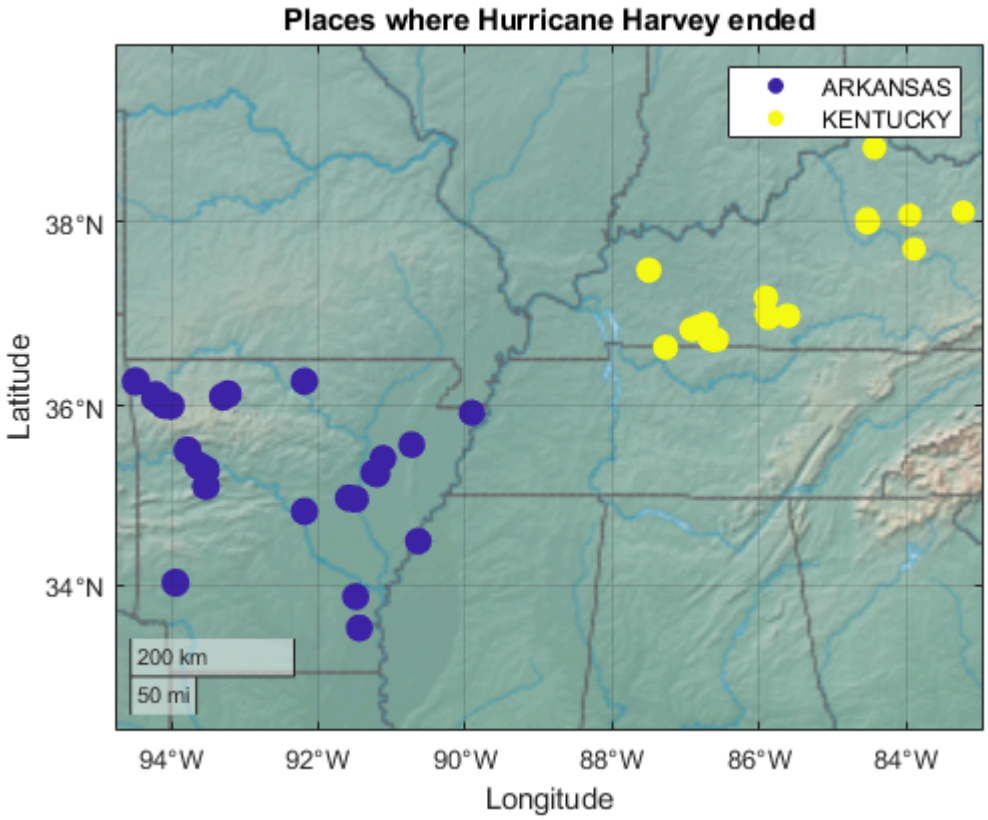
To calculate the are of each marker I will use a calculation in one of the examples in the documentation

```
T.A_Begin = 101 + 100*(sind(2*T.Begin_Lon));
```

```
T.A_End = 101 + 100*(sind(2*T.End_Lon));

ARKANSAS = T(T.State == "ARKANSAS", :);
KENTUCKY = T(T.State == "KENTUCKY", :);

clear T

geoscatter(ARKANSAS.Begin_Lat,ARKANSAS.Begin_Lon, ARKANSAS.A_Begin, ARKANSAS.State, 'filled')
hold on
geoscatter(KENTUCKY.Begin_Lat,KENTUCKY.Begin_Lon, KENTUCKY.A_Begin, KENTUCKY.State, 'filled')
hold off
title('Places where Hurricane Harvey started')
legend('ARKANSAS', 'KENTUCKY')
geobasemap colorterrain
```




```
geoscatter(ARKANSAS.End_Lat,ARKANSAS.End_Lon, ARKANSAS.A_End, ARKANSAS.State, 'filled')
hold on
geoscatter(KENTUCKY.End_Lat,KENTUCKY.End_Lon, KENTUCKY.A_End, KENTUCKY.State, 'filled')
hold off
title('Places where Hurricane Harvey ended')
legend('ARKANSAS', 'KENTUCKY')
geobasemap colorterrain
```




```
clear KENTUCKY
clear ARKANSAS
```

Analysis

Three Counties with Most Events in Arkansas

Table of the Three Counties with Most Events

```
T = StormEvents2017finalProject(StormEvents2017finalProject.State == 'ARKANSAS', :);
T = groupsummary(T, 'CZ_Name');
T.GroupCount = sort(T.GroupCount, 'descend')
```

T = 32×2 table

	CZ_Name	GroupCount
1	ASHLEY	11
2	BAXTER	4
3	BENTON	3
4	BOONE	3
5	CHICOT	2
6	COLUMBIA	2
7	CRAIGHEAD	2

	CZ_Name	GroupCount
8	CRITTENDEN	1
9	CROSS	1
10	DESHA	1
11	FRANKLIN	1
12	HEMPSTEAD	1
13	HOWARD	1
14	JACKSON	1

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```
T = T([1, 2, 3], :);
T
```

T = 3×2 table

	CZ_Name	GroupCount
1	ASHLEY	11
2	BAXTER	4
3	BENTON	3

The three Counties are:

1. Ashley
2. Baxter
3. Benton

```
clear T
```

Three Counties with Most Events in Kentucky

Table of the Three Counties with Most Events

```
T = StormEvents2017finalProject(StormEvents2017finalProject.State == 'KENTUCKY', :);
T = groupsummary(T, 'CZ_Name');
T.GroupCount = sort(T.GroupCount, 'descend')
```

T = 12×2 table

	CZ_Name	GroupCount
1	BARREN	3
2	ELLIOTT	3
3	ESTILL	3
4	FAYETTE	2
5	HART	2
6	LOGAN	1

	CZ_Name	GroupCount
7	METCALFE	1
8	MONTGOMERY	1
9	PENDLETON	1
10	SIMPSON	1
11	TODD	1
12	WEBSTER	1

```
T = T([1, 2, 3], :);
T
```

T = 3×2 table

	CZ_Name	GroupCount
1	BARREN	3
2	ELLIOTT	3
3	ESTILL	3

The three Counties are:

1. Barren
2. Elliott
3. Estill

```
clear T
```

Three Counties with Highest Property Cost in Arkansas

Table of the Three Counties with Highest Property Cost

```
T = StormEvents2017finalProject(StormEvents2017finalProject.State == 'ARKANSAS', :);
T = groupsummary(T, 'CZ_Name', 'sum', 'Property_Cost');
T.sum_Property_Cost = sort(T.sum_Property_Cost, 'descend')
```

T = 32×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	ASHLEY	1	39000
2	BAXTER	1	15000
3	BENTON	1	5000
4	BOONE	1	2000
5	CHICOT	1	0
6	COLUMBIA	1	0
7	CRAIGHEAD	1	0
8	CRITTENDEN	1	0

	CZ_Name	GroupCount	sum_Property_Cost
9	CROSS	1	0
10	DESHA	1	0
11	FRANKLIN	1	0
12	HEMPSTEAD	1	0
13	HOWARD	2	0
14	JACKSON	1	0

⋮

```
T = T([1, 2, 3], :);
T
```

T = 3×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	ASHLEY	1	39000
2	BAXTER	1	15000
3	BENTON	1	5000

The three Counties are:

1. Ashley
2. Baxter
3. Benton

```
clear T
```

Three Counties with Highest Property Cost in Kentucky

Table of the Three Counties with Highest Property Cost

```
T = StormEvents2017finalProject(StormEvents2017finalProject.State == 'KENTUCKY', :);
T = groupsummary(T, 'CZ_Name', 'sum', 'Property_Cost');
T.sum_Property_Cost = sort(T.sum_Property_Cost, 'descend')
```

T = 12×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	BARREN	2	350000
2	ELLIOTT	1	34000
3	ESTILL	1	20000
4	FAYETTE	3	20000
5	HART	1	10000

	CZ_Name	GroupCount	sum_Property_Cost
6	LOGAN	3	1000
7	METCALFE	2	0
8	MONTGOMERY	1	0
9	PENDLETON	1	0
10	SIMPSON	3	0
11	TODD	1	0
12	WEBSTER	1	0

```
T = T([1, 2, 3], :);
T
```

T = 3×3 table

	CZ_Name	GroupCount	sum_Property_Cost
1	BARREN	2	350000
2	ELLIOTT	1	34000
3	ESTILL	1	20000

The three Counties are:

1. Barren
2. Elliott
3. Estill

```
clear T
```

Conclusions and Recommendations

Recommendations

If the people effected by the hurricane agreed to go to a different state then they should be sent to any state not in this table.

If the people did not agree to go to a different state then they should go to any countie not in this table if they are from Arkansas if it existed.

If the people did not agree to go to a different state then they should go to any countie not in this table if they are from Kentucky if it existed.

```
clear StormEvents2017finalProject
```