Allocating Resources after Hurricane Harvey

(in progress)

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Background and Scope

The data file contains a list of weather events that occurred in the United States in 2017. The events have been categorized by type and the state in which they occurred. There is also information about

• damage costs

• number of resulting injuries

• location of some of the events

Import the Data

```
clear
% import the data using a function generated by the Import Tool
events = import2017stormdata("StormEvents_2017_finalProject.csv");
```

Cleaning the data

Some Property Costs and Crop Costs are missing, with the value NaN. Replacing the missing data with $0 makes the data easier to work with. Since the insurance company is interested in the total damage cost, the property and crop costs can be added together. The data file contains many more weather events than the ones pertaining to Hurricane Harvey, so the results were filtered to show only the states that Harvey passed through.

```
% Set missing Property and Crop Cost to $0
events.Property_Cost(ismissing(events.Property_Cost)) = 0;
events.Crop_Cost(ismissing(events.Crop_Cost)) = 0;
% Add total damage to the table
events.Total_Damage = events.Property_Cost + events.Crop_Cost;
% Filter to Harvey-relevant States
harveystates = events(events.State =='TEXAS'|events.State == 'ARKANSAS' | events.State == 'KENT
```

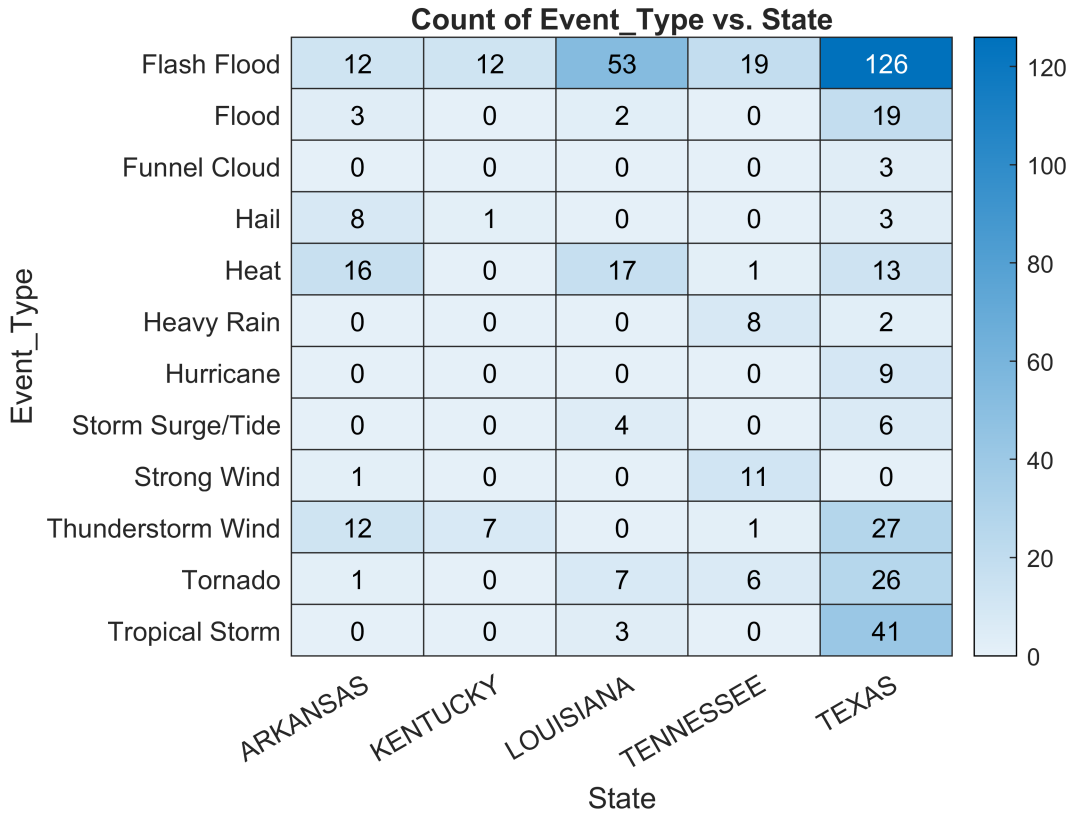
Next, Harvey-related events lasted from August 17th to September 3rd.

```
% Filter to correct timeframe
harveydays = harveystates(isbetween(harveystates.Begin_Date_Time, '2017-08-17', '2017-09-03'),
```

```
% Hard remove states and event types that do not appear in the filtered
% table, so they do not affect later figures
harveydays.State = removecats(harveydays.State);
harveydays.Event_Type = removecats(harveydays.Event_Type);
```

Are all the events in this filtered table Harvey-related?

```
heatmap(harveydays,"State","Event_Type")
```



Most of the categories above are hurricane-related, but "Heat" is most likely unrelated. (Checking the dates on those events confirm that they happened while Harvey was not in the area.)

```
% Remove heat from table
harveydays = harveydays(harveydays.Event_Type ~= 'Heat',:)
```

harveydays = 433×25 table

...

	EpisodeID	Event_ID	State	Year	Month	Event_Type	CZ_Name
1	119753	723472	TEXAS	2017	August	Tropical Storm	MONTGOMERY
2	119753	723473	TEXAS	2017	August	Tropical Storm	FORT BEND
3	119753	723449	TEXAS	2017	August	Tropical Storm	GALVESTON
4	119753	723474	TEXAS	2017	August	Tropical Storm	SAN JACINTO
5	119753	723475	TEXAS	2017	August	Tropical Storm	WALKER

	EpisodeID	Event_ID	State	Year	Month	Event_Type	CZ_Name
6	119753	723648	TEXAS	2017	August	Tropical Storm	POLK
7	119821	718430	KENTUCKY	2017	September	Flash Flood	TODD
8	120011	719146	TEXAS	2017	August	Flash Flood	EL PASO
9	120012	719147	TEXAS	2017	August	Thunderstorm Wind	EL PASO
10	120012	719148	TEXAS	2017	August	Flash Flood	EL PASO
11	119746	719493	TEXAS	2017	August	Flash Flood	HARDIN
12	119746	719496	TEXAS	2017	August	Flash Flood	JASPER
13	119746	719497	TEXAS	2017	August	Flash Flood	NEWTON
14	119753	720340	TEXAS	2017	August	Flash Flood	FORT BEND
15	120460	721724	TENNESSEE	2017	September	Heavy Rain	ROBERTSON
16	120460	721725	TENNESSEE	2017	September	Heavy Rain	MONTGOMERY
17	120460	721726	TENNESSEE	2017	September	Heavy Rain	ROBERTSON
18	119659	717786	ARKANSAS	2017	August	Flash Flood	WOODRUFF
19	119826	718436	TEXAS	2017	August	Thunderstorm Wind	MIDLAND
20	117836	708282	TEXAS	2017	August	Thunderstorm Wind	BRISCOE
21	119746	719740	TEXAS	2017	August	Thunderstorm Wind	JASPER
22	119746	720010	TEXAS	2017	August	Flood	ORANGE
23	119611	717581	ARKANSAS	2017	August	Flash Flood	PULASKI
24	120145	719894	TENNESSEE	2017	August	Flash Flood	DAVIDSON
25	119753	720464	TEXAS	2017	August	Flash Flood	MONTGOMERY
26	117944	708949	KENTUCKY	2017	August	Thunderstorm Wind	MONTGOMERY
27	117944	708951	KENTUCKY	2017	August	Thunderstorm Wind	ELLIOTT
28	119853	718515	TEXAS	2017	August	Thunderstorm Wind	ECTOR
29	118099	709783	KENTUCKY	2017	August	Thunderstorm Wind	PENDLETON
30	120145	719849	TENNESSEE	2017	August	Tornado	PERRY
31	120145	719850	TENNESSEE	2017	August	Tornado	MAURY
32	120145	719851	TENNESSEE	2017	August	Thunderstorm Wind	DAVIDSON
33	119746	719342	TEXAS	2017	August	Flash Flood	JEFFERSON
34	119753	720344	TEXAS	2017	August	Flash Flood	GALVESTON
35	118032	709519	TEXAS	2017	August	Thunderstorm Wind	SWISHER
36	118916	714375	LOUISIANA	2017	August	Tropical Storm	SABINE
37	118330	711050	TEXAS	2017	August	Flash Flood	ANGELINA
38	118330	711054	TEXAS	2017	August	Flash Flood	ANGELINA

	EpisodeID	Event_ID	State	Year	Month	Event_Type	CZ_Name
39	118330	711059	TEXAS	2017	August	Flash Flood	ANGELINA
40	118330	711060	TEXAS	2017	August	Flash Flood	ANGELINA
41	120145	719854	TENNESSEE	2017	August	Tornado	DAVIDSON
42	120145	719856	TENNESSEE	2017	August	Tornado	DAVIDSON
43	119753	721087	TEXAS	2017	August	Flash Flood	SAN JACINTO
44	117997	709332	KENTUCKY	2017	August	Thunderstorm Wind	FAYETTE
45	117997	709333	KENTUCKY	2017	August	Thunderstorm Wind	FAYETTE
46	119753	720859	TEXAS	2017	August	Flash Flood	GALVESTON
47	118032	709521	TEXAS	2017	August	Thunderstorm Wind	LUBBOCK
48	118916	714376	LOUISIANA	2017	August	Tropical Storm	NATCHITOC...
49	118916	714377	LOUISIANA	2017	August	Tropical Storm	UNION
50	118330	711063	TEXAS	2017	August	Flash Flood	ANGELINA
51	118032	709520	TEXAS	2017	August	Flash Flood	SWISHER
52	118032	709525	TEXAS	2017	August	Thunderstorm Wind	HOCKLEY
53	120145	719885	TENNESSEE	2017	August	Strong Wind	DAVIDSON
54	120145	719886	TENNESSEE	2017	August	Strong Wind	DICKSON
55	120132	719823	TEXAS	2017	August	Thunderstorm Wind	CLAY
56	119753	720465	TEXAS	2017	August	Flash Flood	GALVESTON
57	120318	720930	TEXAS	2017	August	Tropical Storm	KENEDY
58	118032	709522	TEXAS	2017	August	Flash Flood	HOCKLEY
59	118032	709523	TEXAS	2017	August	Thunderstorm Wind	LYNN
60	118032	711899	TEXAS	2017	August	Heavy Rain	HOCKLEY
61	118330	711072	TEXAS	2017	August	Flash Flood	SABINE
62	118330	711078	TEXAS	2017	August	Flash Flood	SAN AUGUS...
63	118330	711079	TEXAS	2017	August	Flash Flood	SABINE
64	118330	711081	TEXAS	2017	August	Flash Flood	SABINE
65	118330	711083	TEXAS	2017	August	Flash Flood	ANGELINA
66	118330	711089	TEXAS	2017	August	Flash Flood	ANGELINA
67	118330	711090	TEXAS	2017	August	Flash Flood	ANGELINA
68	118330	711092	TEXAS	2017	August	Flash Flood	SABINE
69	118330	711405	TEXAS	2017	August	Flash Flood	SABINE
70	118330	711407	TEXAS	2017	August	Flash Flood	SABINE
71	118330	711408	TEXAS	2017	August	Flash Flood	SABINE

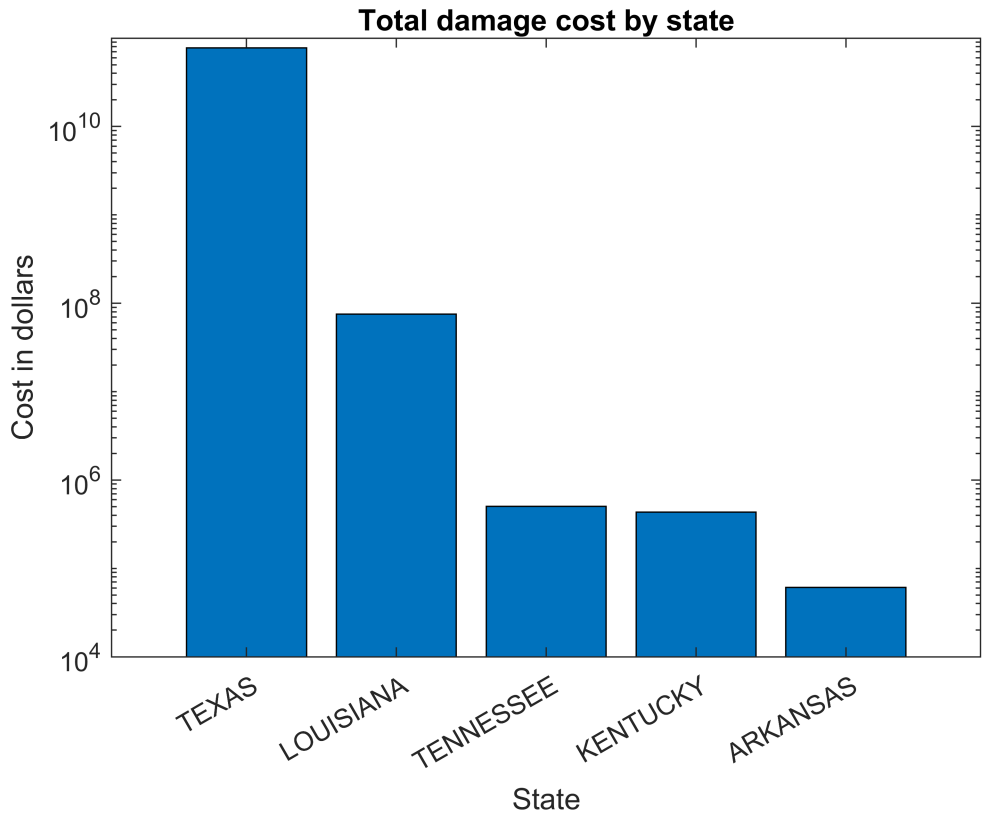
	EpisodeID	Event_ID	State	Year	Month	Event_Type	CZ_Name
72	118330	711409	TEXAS	2017	August	Flash Flood	SABINE
73	118330	711412	TEXAS	2017	August	Flash Flood	ANGELINA
74	119556	717411	TEXAS	2017	August	Hail	SHERMAN
75	120145	719895	TENNESSEE	2017	August	Flash Flood	HICKMAN
76	120145	719897	TENNESSEE	2017	August	Flash Flood	CHEATHAM
77	119753	720858	TEXAS	2017	August	Flash Flood	HARRIS
78	119753	720860	TEXAS	2017	August	Flash Flood	HARRIS
79	119611	717572	ARKANSAS	2017	August	Thunderstorm Wind	BOONE
80	118330	711413	TEXAS	2017	August	Flash Flood	SHELBY
81	118330	711414	TEXAS	2017	August	Flash Flood	SHELBY
82	118330	711415	TEXAS	2017	August	Flash Flood	SABINE
83	118386	711416	LOUISIANA	2017	August	Flash Flood	SABINE
84	118386	711417	LOUISIANA	2017	August	Flash Flood	SABINE
85	118386	711418	LOUISIANA	2017	August	Flash Flood	SABINE
86	118386	711419	LOUISIANA	2017	August	Flash Flood	RED RIVER
87	118386	711420	LOUISIANA	2017	August	Flash Flood	SABINE
88	118386	711421	LOUISIANA	2017	August	Flash Flood	RED RIVER
89	118386	711422	LOUISIANA	2017	August	Flash Flood	SABINE
90	118386	711423	LOUISIANA	2017	August	Flash Flood	NATCHITOC...
91	118386	711424	LOUISIANA	2017	August	Flash Flood	NATCHITOC...
92	119556	717412	TEXAS	2017	August	Hail	HUTCHINSON
93	119556	717413	TEXAS	2017	August	Thunderstorm Wind	RANDALL
94	119565	717436	TEXAS	2017	August	Thunderstorm Wind	HARTLEY
95	120145	719896	TENNESSEE	2017	August	Flash Flood	WILLIAMSON
96	120145	719900	TENNESSEE	2017	August	Flash Flood	MAURY
97	120145	719901	TENNESSEE	2017	August	Strong Wind	SUMNER
98	119753	721098	TEXAS	2017	August	Flash Flood	AUSTIN
99	118397	711484	KENTUCKY	2017	September	Flash Flood	SIMPSON
100	117921	708659	ARKANSAS	2017	August	Flash Flood	HOWARD

⋮

Two States Most Impacted by Harvey

```
% Group Total Damage Costs by State
  statecost = groupsummary(harveydays, "State", "sum", "Total_Damage");
```

```
% Order states by descending order of costs
  [S_Sorted,idx1] = sort(statecost.sum_Total_Damage,'descend');
  statecost.State = categorical(statecost.State(idx1));
  statecost.State = reordercats(statecost.State,string(statecost.State));
% View the results using a bar chart
  bar(statecost.State,S_Sorted);
% For better viewing, set y-axis to logarithmic scale
  set(gca,'YScale','log');
  title("Total damage cost by state")
  xlabel("State")
  ylabel("Cost in dollars")
```

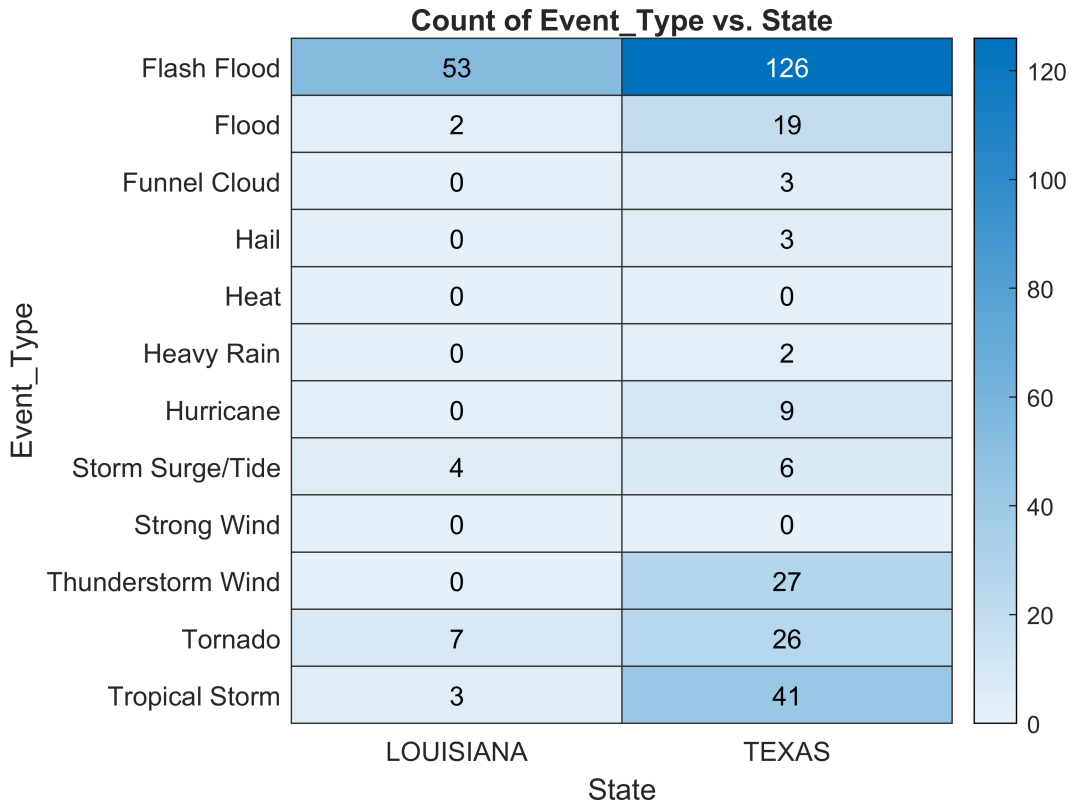


The two most impacted states were Texas and Louisiana!

Visualizations *(in progress)*

Figure of Event Types

```
topstates = harveydays(harveydays.State =='TEXAS'|harveydays.State == 'LOUISIANA',:);
topstates.State = removecats(topstates.State);
heatmap(topstates,"State","Event_Type")
```



Flash flooding was the most frequent in both states, especially in Texas.

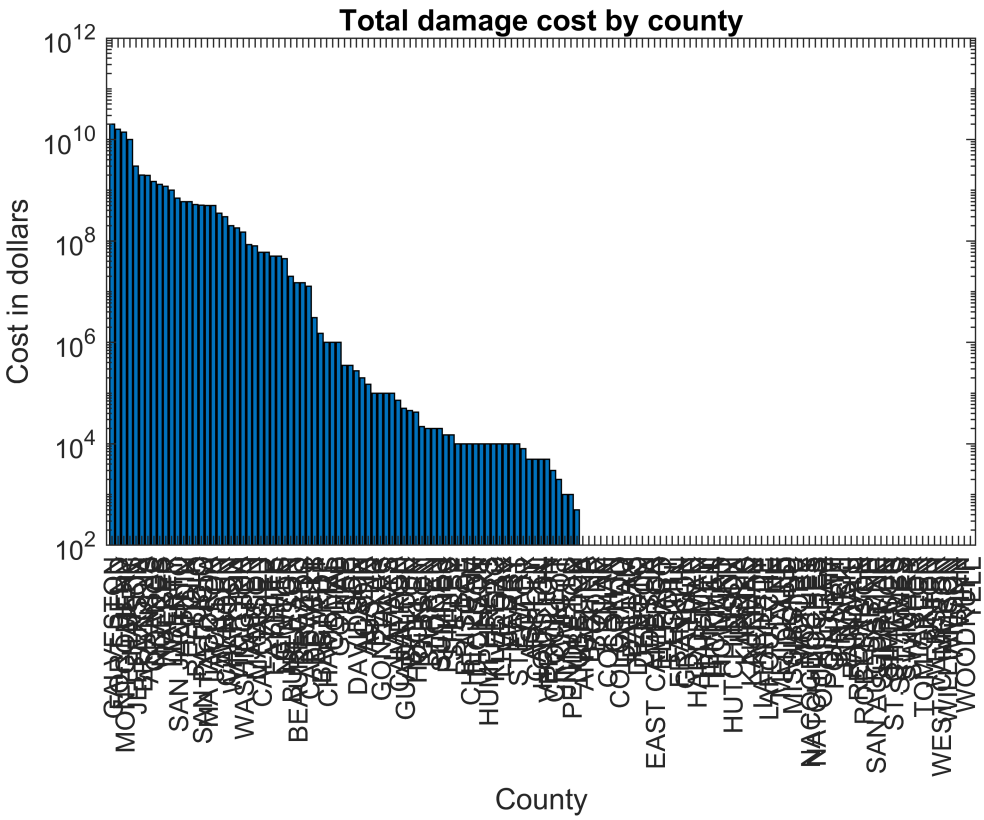
Analysis

Three Counties with Most Events in State 1 *(this section in progress)*

Texas and Louisiana had the most damage costs. But what about the specific counties?

```
harveydays.CZ_Name = removecats(harveydays.CZ_Name); % remove empty categories

% Group Total Damage Costs by County
countycost = groupsummary(harveydays, "CZ_Name", "sum", "Total_Damage");
% Order states by descending order of costs
[CC_Sorted,idx2] = sort(countycost.sum_Total_Damage,'descend');
countycost.CZ_Name = categorical(countycost.CZ_Name(idx2));
countycost.CZ_Name = reordercats(countycost.CZ_Name,string(countycost.CZ_Name));
% View the results using a bar chart
   bar(countycost.CZ_Name, CC_Sorted);
   set(gca,'YScale','log');
   title("Total damage cost by county")
   xlabel("County")
   ylabel("Cost in dollars")
```




```
%cleanup to come!
```