

# Exploring Urban Development and Wildfire Vulnerability in Austin



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# *Understanding the Wildland-Urban Interface (WUI)*

## What is the Wildland Urban Interface?

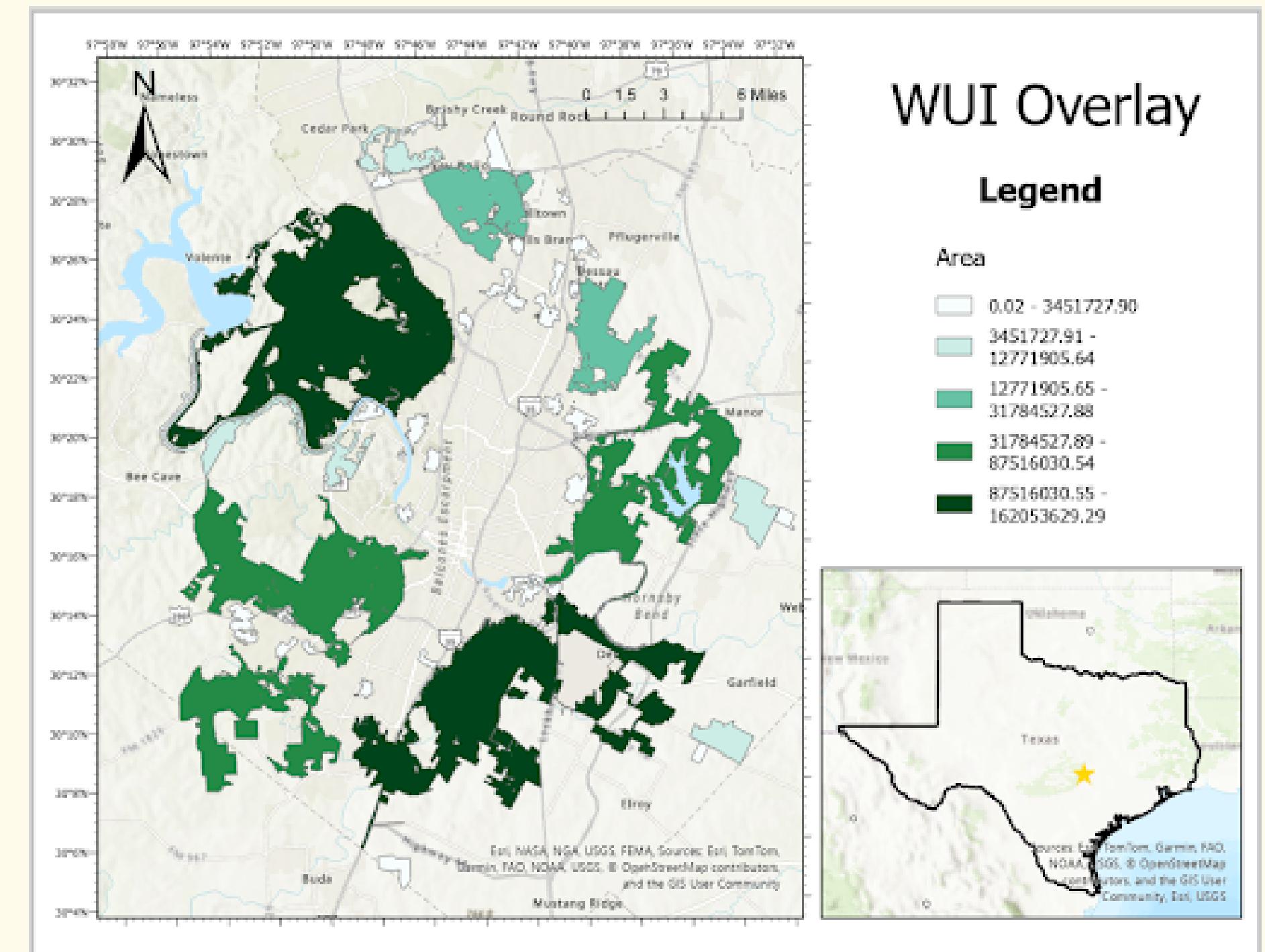
Area where human development and underdeveloped wildland meet

## Area for Human-Environmental Conflicts

- Wildfires (which we will be focusing on)
- Invasive species
- Habitat Fragmentation
- Biodiversity Decline

## Why is the WUI so dangerous?

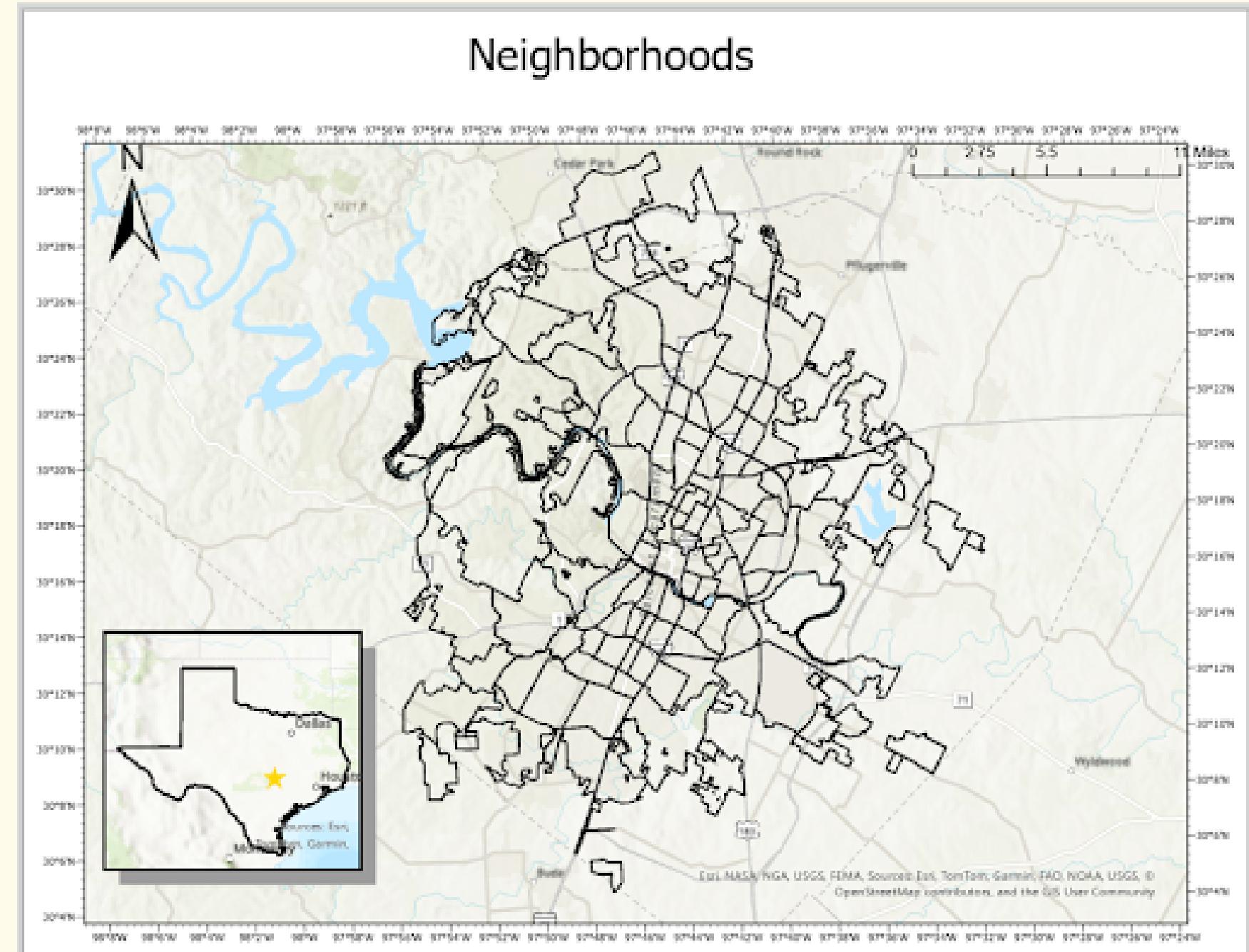
- About 86% of wildfires in Texas occur within two miles of a community
- Over 14,500 communities in Texas are at risk of wildfires



# Objective

Do higher populated areas near undeveloped wildland areas increase the likelihood of wildfires?

- We are also exploring how the proximity of human development to wildfires can impact a community's vulnerability.
- What makes a population vulnerable?
  - Proximity
  - Densely populated areas tend to have more urban development which increases the amount of WUI zones
- Where we pulled our data from
  - Austin Wildland Urban Interface code zones
  - Austin Neighborhood dataset
  - Austin and Travis County Wildland Urban Interface
  - Travis County Wildfire Hazards



# Code & Methods

```
#Obtain a list of the feature classes displayed on our map
shpList = arcpy.ListFeatureClasses()
shpList

['Austin.shp',
'FINAL_PROJECT_MAP.shp',
'Neighborhoods.shp',
'Neighborhoods_line.shp',
'Neighborhood_Populations.shp',
'POP_SQMI.shp',
'POP_SQMI_Clipped.shp',
'Travis_County_Boundary.shp',
'Travis_County_Neighborhoods.shp',
'Vulnerable_Pops.shp',
'Vulnerable_Pops_Clipped.shp',
'WUI_Code_Overlay.shp',
'WUI_Code_Overlay_Clipped.shp']
```

```
target_features = 'Austin_Neighborhoods'
join_features = 'Vulnerable_Pops_Clipped'
out_feature_class = 'VulnerablePops_Neighborhoods'

arcpy.analysis.SpatialJoin(target_features, join_features, out_feature_class, join_type="KEEP_ALL")
```

```
target_features = 'Austin_Neighborhoods'
join_features = 'POP_SQMI_Clipped'
out_feature_class = 'Neighborhood_Populations'

arcpy.analysis.SpatialJoin(target_features, join_features, out_feature_class, join_type="KEEP_ALL")
```

```
out_dataset = 'FINAL_PROJECT_MAP.shp'
out_spatial_ref = arcpy.SpatialReference(4326)
arcpy.management.Project(shpList[0], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[1], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[2], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[3], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[4], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[5], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[6], out_dataset, out_spatial_ref)
arcpy.management.Project(shpList[7], out_dataset, out_spatial_ref)
```

```
in_features = 'POP_SQMI.shp'
clip_features = 'Austin_Neighborhoods.shp'
out_feature_class = 'POP_SQMI_Clipped.shp'

arcpy.analysis.Clip(in_features, clip_features, out_feature_class)
```

```
in_features = 'Austin_Neighborhoods.shp'
out_feature_class = 'Austin_Neighborhoods_line.shp'
arcpy.management.PolygonToLine(in_features, out_feature_class)
```

```
in_table = 'Neighborhood_Populations'  
field_name = 'Population'  
field_type = 'DOUBLE'
```

```
arcpy.management.AddField(in_table, field_name, field_type)
```

```
cursor = arcpy.da.SearchCursor(outint, ["neighname", "sqmiles"])  
df = pd.DataFrame(data = [row for row in cursor])  
df.columns = ["neighname", "sqmiles"]  
del cursor  
df
```

```
df.sort_values(by=["sqmiles"], ascending = False, inplace = True)
```

```
outint = "Neighborhood_Populations.shp"  
fields = arcpy.ListFields(outint)  
for f in fields:  
    print(f"Field name: {f.name}")  
  
Field name: FID  
Field name: Shape  
Field name: Join_Count  
Field name: TARGET_FID  
Field name: fid_1  
Field name: target_f_1  
Field name: neighname  
Field name: sqmiles  
Field name: shape_leng  
Field name: shape_area  
Field name: shape_le_2  
Field name: POP  
Field name: POP10_SQMI  
Field name: POP10_SQ_1  
Field name: TRACT  
Field name: FIPS  
Field name: POP10_SQ_2  
Field name: SQMI  
Field name: Shape_Are  
Field name: Shape_Len  
Field name: TOT_POP  
Field name: POP_DEN  
Field name: Population
```

	neighname	sqmiles
0	MLK	1.545283
1	EAST CESAR CHAVEZ	0.681529
2	NORTH LAMAR	0.986354
3	HOLLY	0.712029
4	WEST CONGRESS	0.586179
...	...	...
98	SOUTH MANCHACA	1.389067
99	WINDSOR HILLS	1.244682
100	UNIVERSITY HILLS	1.134856
101	POND SPRINGS	3.118958
102	DITTMAR--SLAUGHTER	3.916488

103 rows × 2 columns

	neighname	sqmiles
20	MANSFIELD--RIVER PLACE	16.473853
52	BLUFF SPRINGS	12.104283
81	WEST OAK HILL	11.501983
8	ROBINSON RANCH	10.777298
41	DECKER LAKE	9.637395
...	...	...
51	DAWSON	0.495535
79	TRIANGLE STATE	0.454327
30	NORTH UNIVERSITY	0.366984
68	OLD ENFIELD	0.328503
23	CHESTNUT	0.283444

103 rows × 2 columns

	neighname	FIRECAT
97	SWEETBRIAR	Elevated Potential Zone
11	UNIVERSITY HILLS	Elevated Potential Zone
13	JESTER	Elevated Potential Zone
14	CIRCLE C SOUTH	Elevated Potential Zone
15	WESTGATE	Elevated Potential Zone
...	...	...
7	OLD WEST AUSTIN	Potential Zone
18	HYDE PARK	Potential Zone
16	GALINDO	Potential Zone
53	WEST CONGRESS	Potential Zone
83	CENTRAL EAST AUSTIN	Potential Zone

103 rows × 2 columns

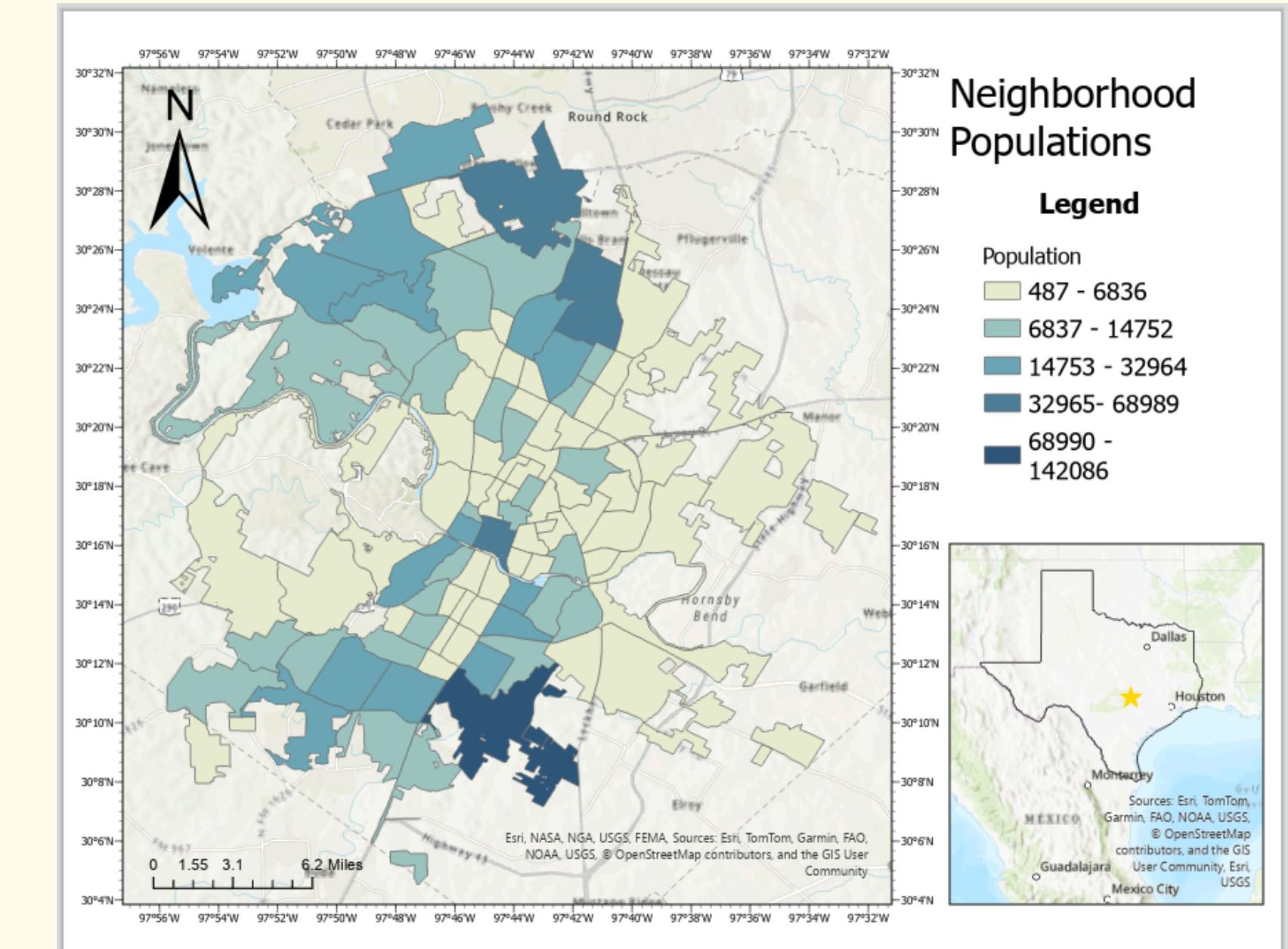
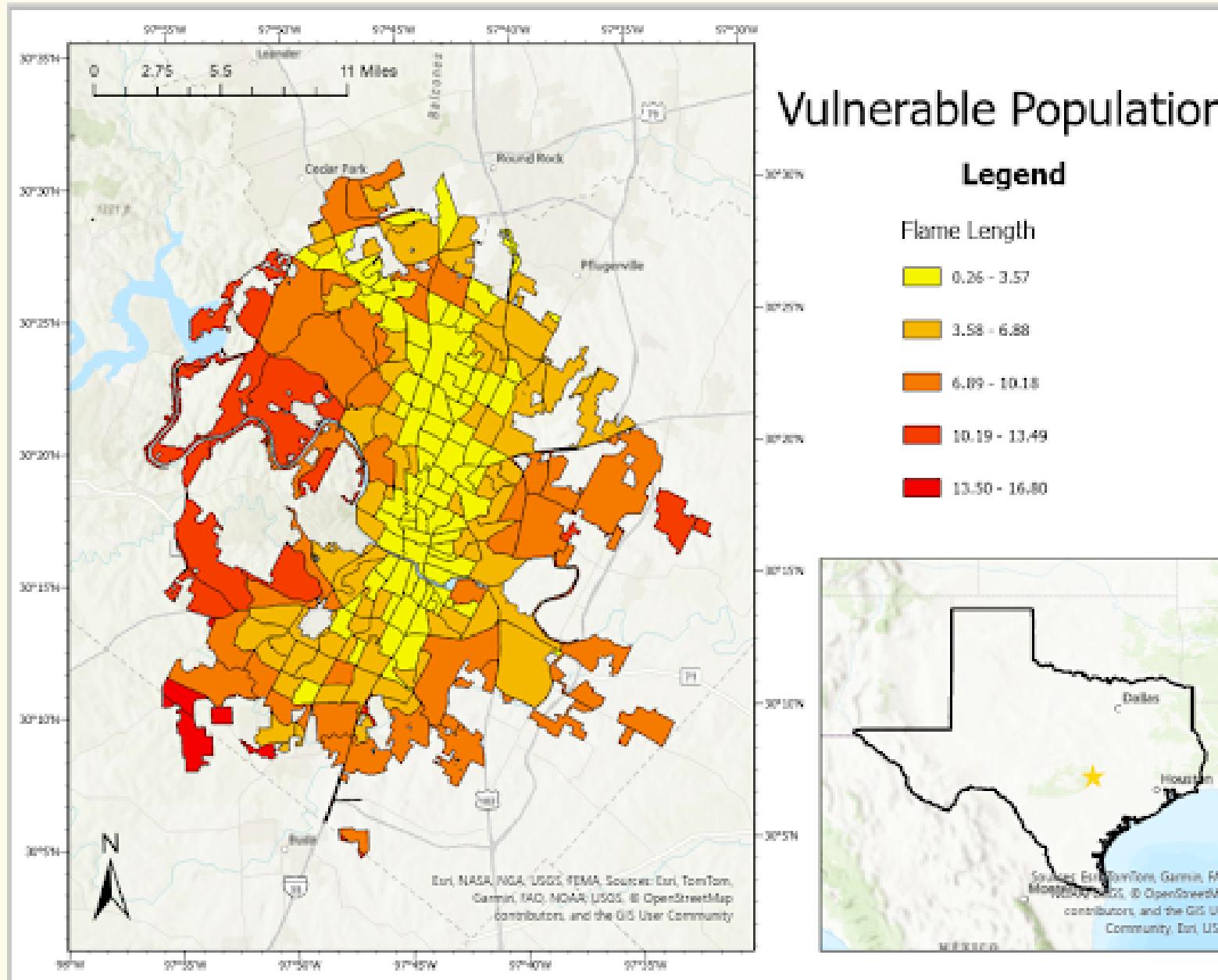
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# *Main Code Flow*

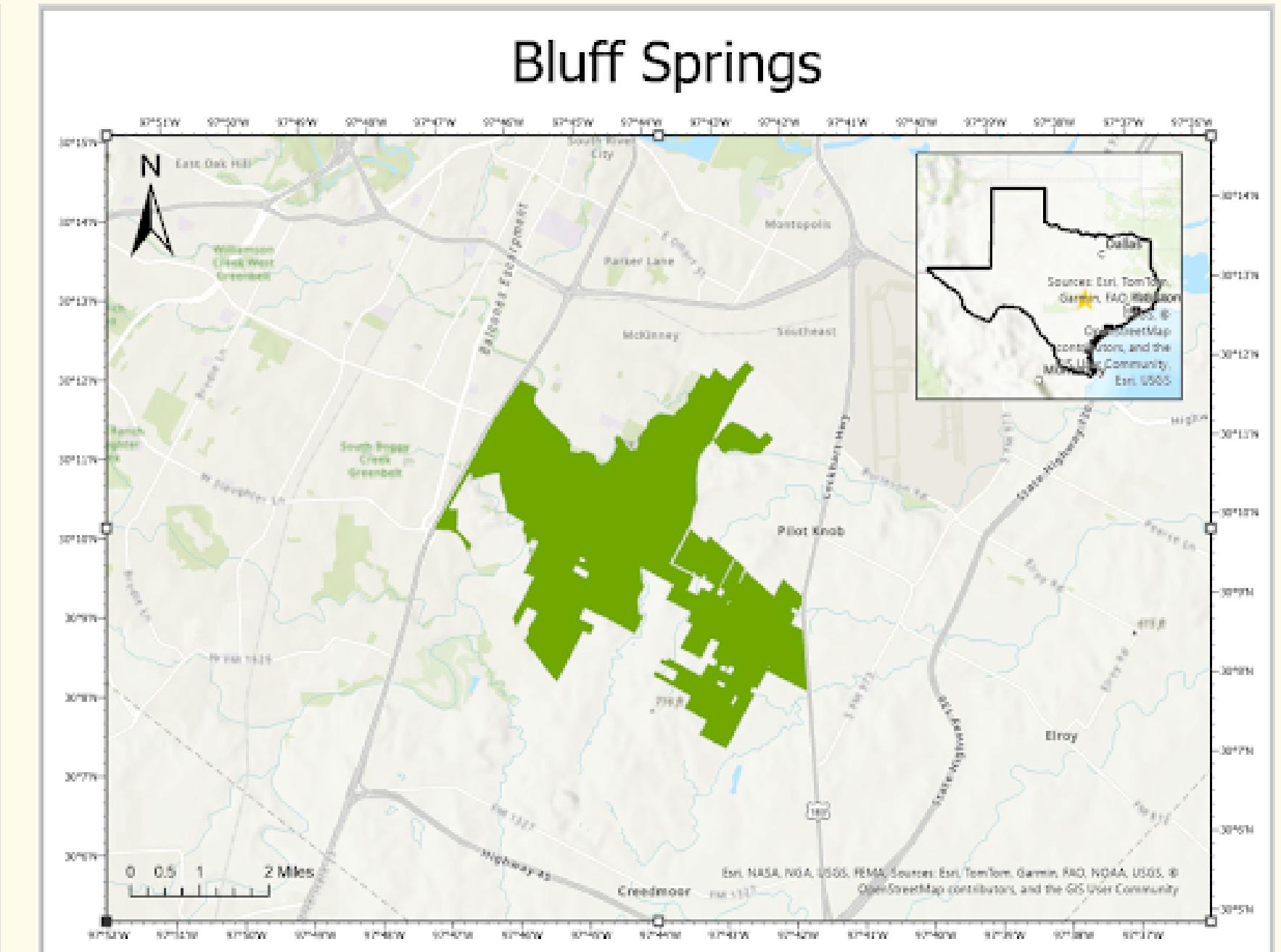
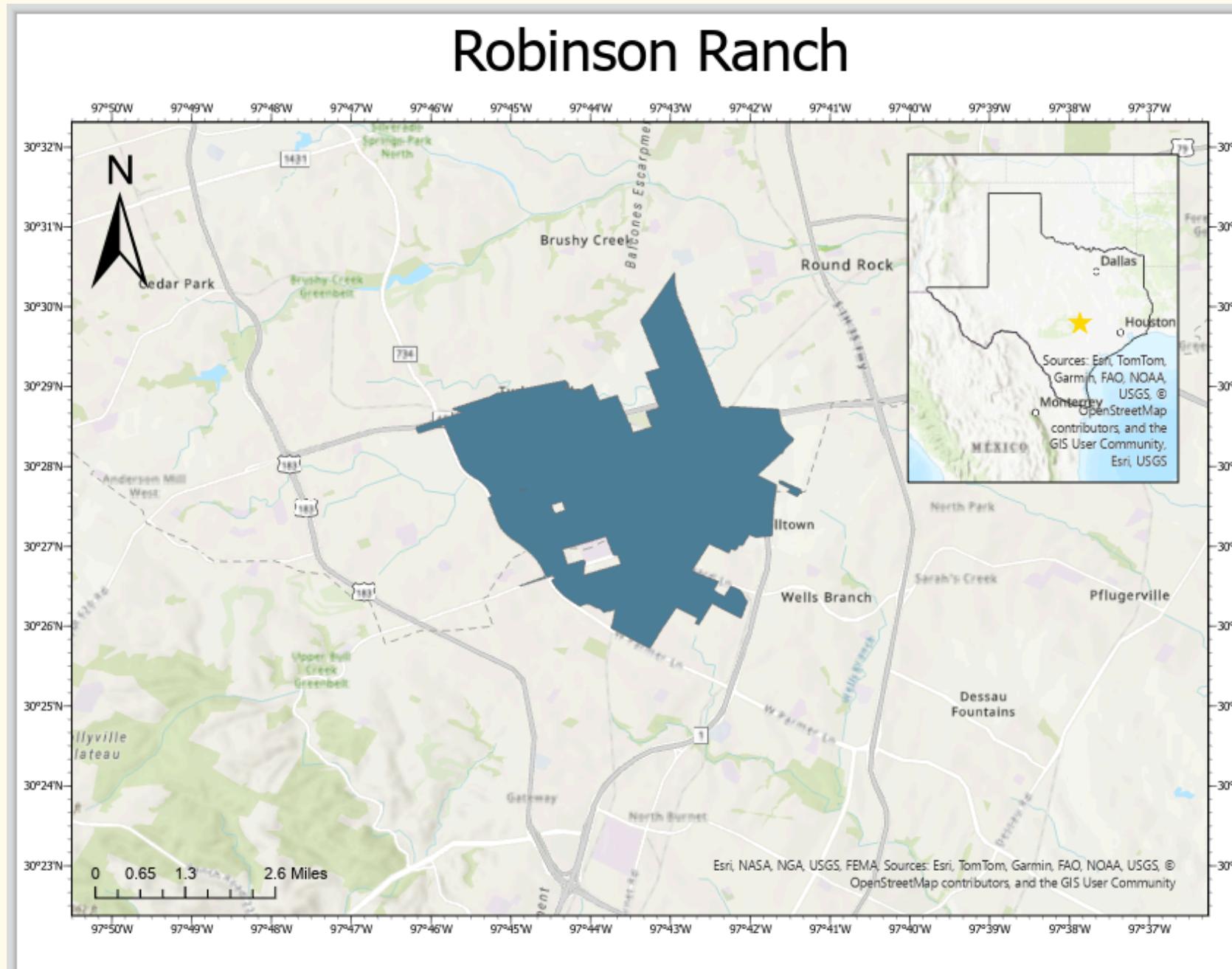
## *Chart*

Import packages > ListFeatureClasses > Set Spatial Reference > Clip features to Austin Neighborhoods > Spatial joins between Austin neighborhoods and population density > Add Population Field > multiply area by population density in new field > Search cursor/columns > sort values

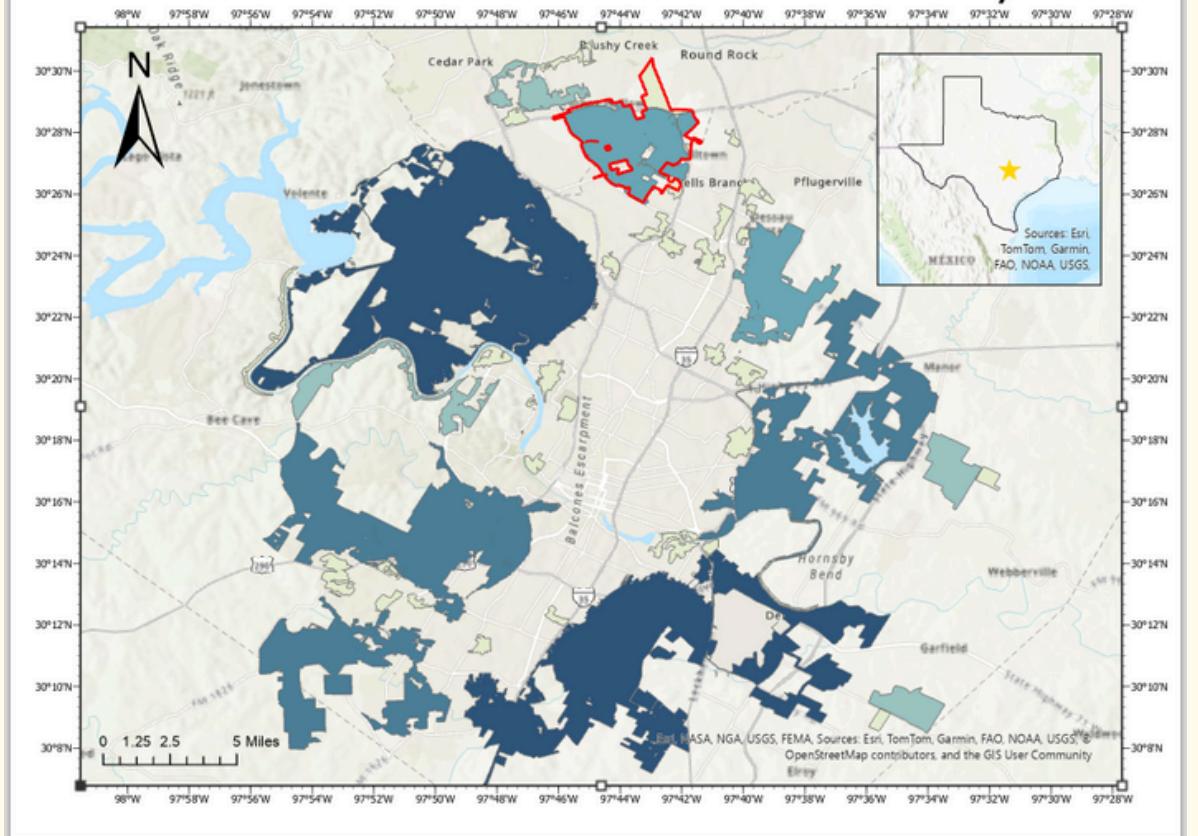
# Visualizing Risk: Maps and Insights



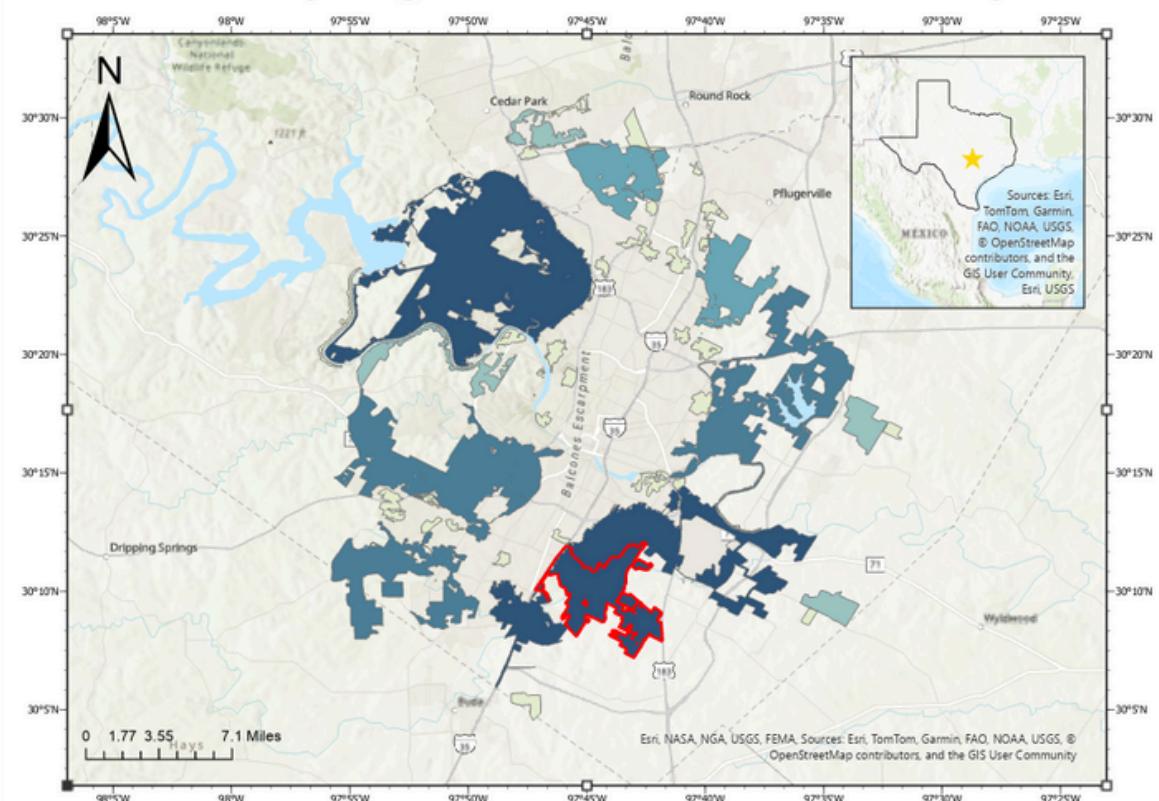
# Visualizing Risk: Maps and Insights



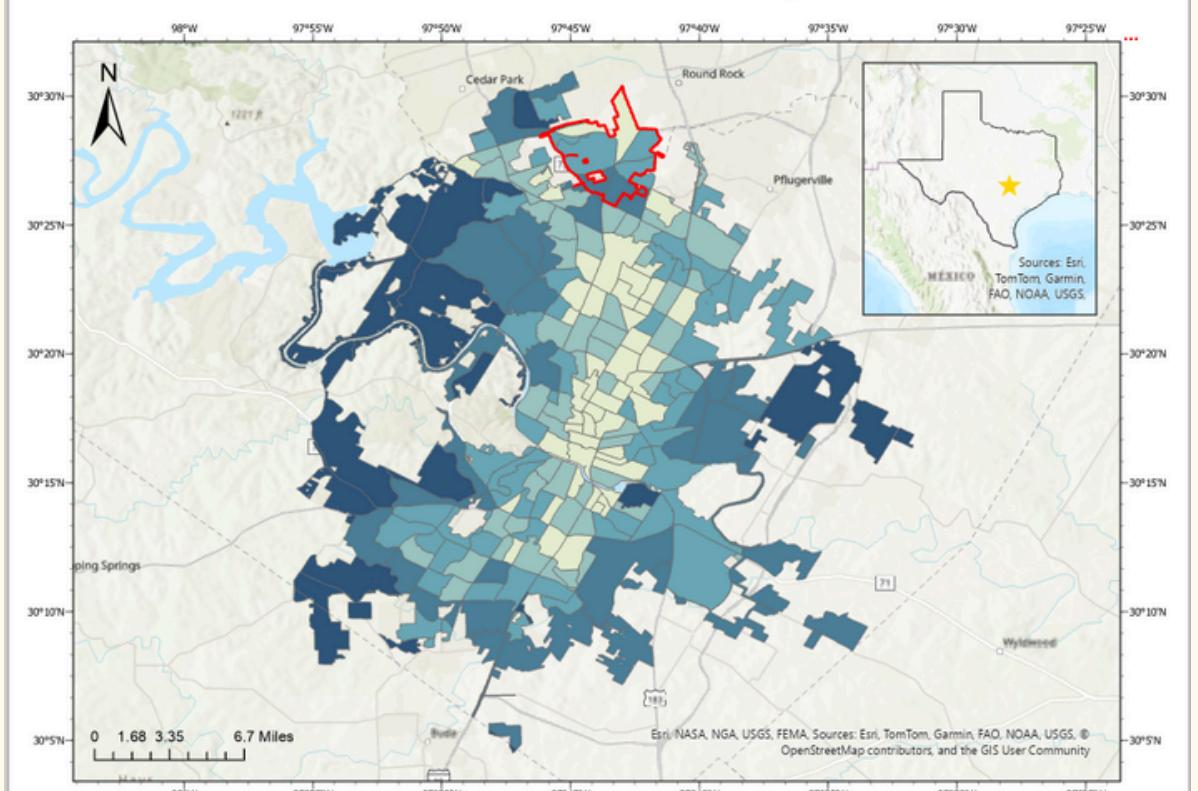
### Robinson Ranch over the WUI Code Overlay



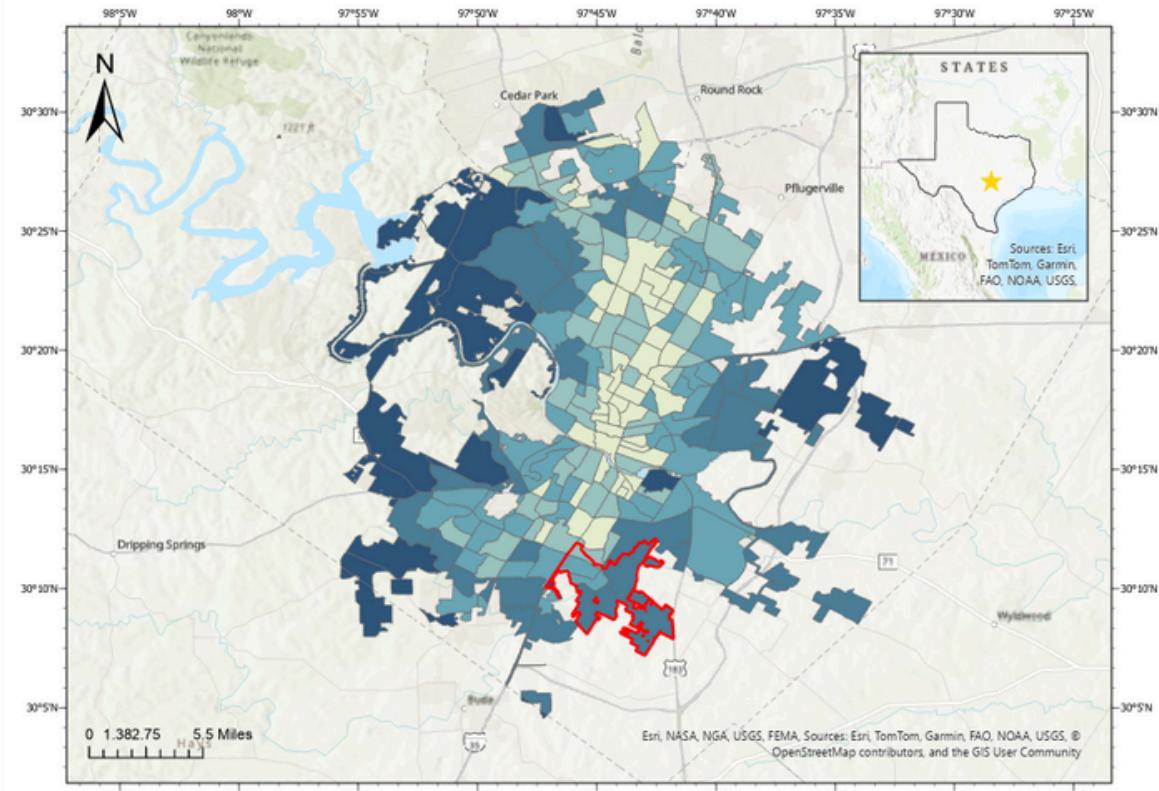
### Bluff Springs over WUI Code Overlay



### Robinson Ranch over Vulnerable Populations



### Bluff Springs Over Vulnerable Populations



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# *Limitations and Implications*

- Due to limited time as this research can and should be done over a long period of time there were factors that were not accounted for such as:
  - Fire education/preparedness
  - Socio-economic status of communities
  - Topography
  - Climatology of the area
  - Engineering of urban development
- Accessibility to data
- When downloading data into ArcGIS the fields were inputted backwards from the original format so we had to redo and switch it manually
- ArcGIS locks on certain data details such as the Schema lock

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# *Conclusion*

- Robinson Ranch and Bluff Springs are the largest (in terms of population) suburban neighborhoods in Travis County that are also closest to a high risk zone for wildfires, and the WUI.
- This means that in the event of a wildfire, Robinson Ranch and Bluff Springs could potentially be the most affected.
- The more urban development near the WUI and areas more vulnerable to wildfires also puts a strain on firefighters, who now not only have to focus on putting fires out in forests but also human developments as well.
- Though our data it answers the question, but it could be null because we only focused on population size and neighborhood size.

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# Sources

*Wildland-Urban Interface Code | AustinTexas.gov.* (2024). Austintexas.gov.

<https://www.austintexas.gov/department/wildland-urban-interface-code>

*Neighborhoods.* (2020, September 25). Austintexas.gov. [https://data.austintexas.gov/Locations-and-Maps/Neighborhoods/a7ap-j2yt/data\\_preview](https://data.austintexas.gov/Locations-and-Maps/Neighborhoods/a7ap-j2yt/data_preview)

*Austin Fire Department Wildfire Division.* (2020). *Austin and Travis County Wildland Urban Interface.* Esri. <https://austin.maps.arcgis.com/apps/View/index.html?appid=bd2a9d1475c64951a4e64b47d24fe3eb>

*Esri.* (n.d.). *Travis County Wildfire Hazards.* <https://austin.maps.arcgis.com/apps/View/index.html?appid=ac1072648f9a407c8170a6c254bc540d>

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# *Thank You*

We will now open the floor for questions.