# Project Tidy Data

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#### **Data Introduction**

Our project partner is Professor Proppe, who is doing research on golden-cheeked warblers in Wild Basin Wilderness Preserve, a constituent of the larger Balcones Canyonlands Preserve (BCP) system. The golden cheeked-warbler is an endangered bird species in Texas, with very narrow habitat in central Texas. The ultimate goal is to preserve this species in central Texas and prevent them from going extinct in Texas. He is seeking to investigate the effects that urban development, highways and housing developments in particular, may be having on the behavior of the Golden-cheeked Warblers as Austin develops into west, closer to the habitat of the warblers. The mission is to determine whether if there is any trend in the warblers within the reserve in response to development around the reserve.

## Questions:

- 1) Are there things that are driving the golden-cheeked warbler out of the area (housing, roads, etc.)?
- 2) Are golden-cheeked warblers moving west away from development?
- 3) How do spatial trends change over time?

To answer these questions, we will first need to find the data about urban development. We can combine the data with the shapefiles of birds observations. One idea that we have is making a grid. In this way, we can compute the number of dots (birds observation) in each grid, and how it changed over time. In addition to making grids, we could also use longitude and latitude as response variables to study where their habitat has been shifting over years.

### **Data Processing**

- 1) Retrieved shape file data for golden-cheeked warbler (GCW) observations and BCP system boundaries from Dr. Darren Proppe
- 2) Using ArcGIS Pro, filtered the boundaries to include only the following properties:
- Barton Creek
- Double J&T
- Emma Bike Park
- Emma Extension
- Forest Ridge
- Hamilton
- Kent Butler
- Reicher Ranch
- Vireo/Wild Basin

- Vista Point
- 3) Filtered the GCW observations to include only observations collected by specific survey types per each year:
- 2011 100 Acre Plot
- 2012 Spot Mapping
- 2013 Intensive Study Plot and Vickery
- 2014 Intensive Study Plot
- 2015 Intensive Study Plot
- 2016 Intensive Study Plot
- 2017 Intensive Study Plot
- 2018 Intensive Study Plot and 100 Acre Plot
- 2019 Intensive Study Plot
- 4) Created a grid using 'Create Fishnet' for the filtered boundaries with 100-meter x 100-meter cells
- 5) Counted the GCW observations per cell per year using 'Summarize Within'
- 6) Joined the GCW observations for each year into one grid using 'Add Join'
- 7) Built 1-kilometer buffers around each cell using 'Buffer'
- 8) Downloaded the National Land Cover Database (NLCD) impervious surface raster for all years (30-meter resolution) for the study area
- 9) Clipped the NLCD raster by the buffer for each cell using 'Clip Raster'
- 10) Converted the NLCD raster to a point vector using 'Raster to Point'
- 11) Calculated the mean impervious surface within each buffer (mean of 30 m cells) for each relevant year (2011, 2013, 2016, 2019) using 'Zonal Statistics'
- 12) Joined the mean impervious surface value for each buffer to the associated cell in the grid using 'Add Join'
- 13) Filtered the grid to include GCW observations for each cell for only relevant years (2011, 2013, 2016, 2019)
- 14) Added UTM Easting and UTM Northing coordinates for each cell centroid using 'Add Geometry Attributes'
- 15) Added the appropriate property name manually to each cell based on the filtered plot boundaries
- 16) Converted the grid attribute table to an Excel file using 'Table to Excel'

## -- Column specification -----

17) Modified the Excel file for use in RStudio, creating a row for each cell and specific year

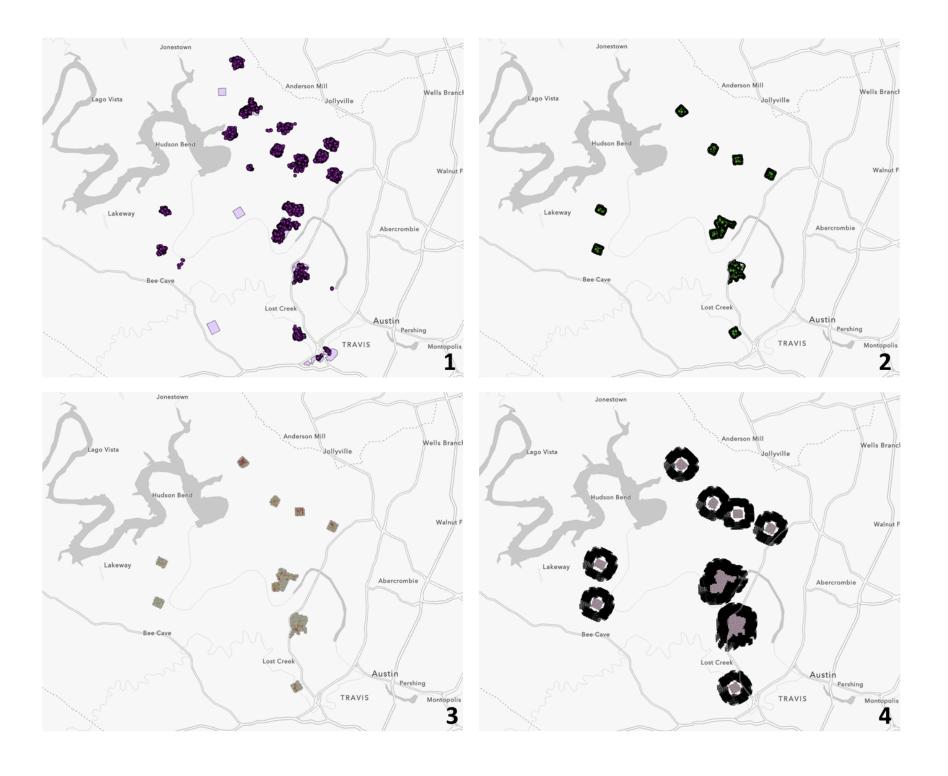
# Reading in Dataset

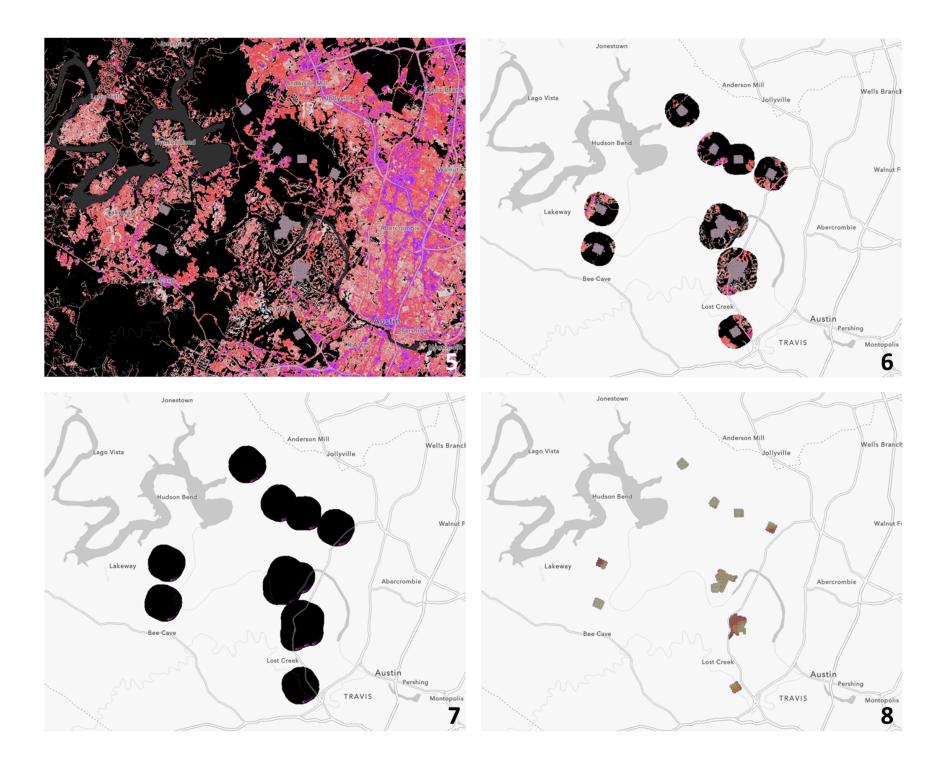
```
warblers <- read_csv('https://docs.google.com/spreadsheets/d/e/2PACX-1vQwR56LrrsuT8BMSLbN6bmu8CPLIFhX5L
## Rows: 3452 Columns: 9</pre>
```

## Delimiter: ","

```
## chr (1): Property
## dbl (7): GCW, Year, IMPCELLS, MeanImp, CENTROID_X, UTM_E, UTM_N
##
## i Use `spec()` to retrieve the full column specification for this data.
## i Specify the column types or set `show_col_types = FALSE` to quiet this message.

warblers <- warblers %>%
    mutate(
        UTM_E = UTM_E / 1000000,
        UTM_N = UTM_N / 1000000,
        Year = as.factor(Year),
        GCW = as.factor(GCW)
    )
# Divided UTM_E and UTM_N by 1,000,000 to fix scaling error
```





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FID	Shape *	Points2011	Points2013	Points2016	Points2019	Point_Coun	MEAN_grid_	Point_Co_1	MEAN_grid1	Point_Co_2	MEA	
1	Polygon	0	1	0	0	3949	2.482147	3949	2.482147	3949	2	
9	Polygon	0	6	0	0	3948	3.112209	3948	3.125633	3948		
16	Polygon	0	5	0	0	3947	3.195085	3947	3.208513	3947	3	
43	Polygon	0	1	0	5	3950	0.878228	3950	0.889114	3950	0	
50	Polygon	0	12	0	1	3944	1.155933	3944	1.190416	3944	1	
51	Polygon	0	2	0	1	3947	1.100836	3947	1.135293	3947	1	
56	Polygon	0	7	0	0	3952	1.413209	3952	1.447621	3952	1	
73	Polygon	0	1	1	0	3950	4.600253	3950	4.637215	3950	5	
104	Polygon	0	2	0	1	3947	3.353686	3947	3.358753	3947		
110	Polygon	0	1	0	1	3952	5.638664	3952	5.648785	3952	-	
137	Polygon	0	2	0	0	3946	4.267866	3946	4.267866	3946		
170	Polygon	0	3	1	0	3957	2.840788	3957	2.864038	3957	2	
171	Polygon	0	3	0	0	3953	2.977232	3953	3.000506	3953	1	
255	Polygon	0	1	0	0	3948	7.257092	3948	7.445035	3948		
276	Polygon	0	1	0	0	3951	10.328778	3951	10.551506	3951		
307	Polygon	0	1	0	4	3943	4.670555	3943	4.791276	3943		
310	Polygon	0	3	0	1	3947	5.345326	3947	5.387129	3947		
319	Polygon	0	1	0	2	3952	5.089069	3952	5.24747	3952		
320	Polygon	0	2	0	2	3951	4.769172	3951	4.794482	3951		
321	Polygon	0	43	6	31	3947	4.868001	3947	4.909805	3947		
332	Polygon	0	3	5	1	3951	5.270058	3951	5.440395	3951		
334	Polygon	0	3	5	6	3948	4.489615	3948	4.531408	3948		
351	Polygon	0	3	0	0	3944	6.284736	3944	6.50431	3944	-	
357	Polygon	0	2	1	1	3950	4.352152	3950	4.519494	3950		
360	Polygon	0	7	2	0	3950	5.383797	3950	5.541013	3950		
377	Polygon	0	6	0	0	3950	4.936962	3950	5.131646	3950		
378	Polygon	0	15	4	2	3945	5.445627	3945	5.640558	3945	•	

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