Spatial Programming Lab 3

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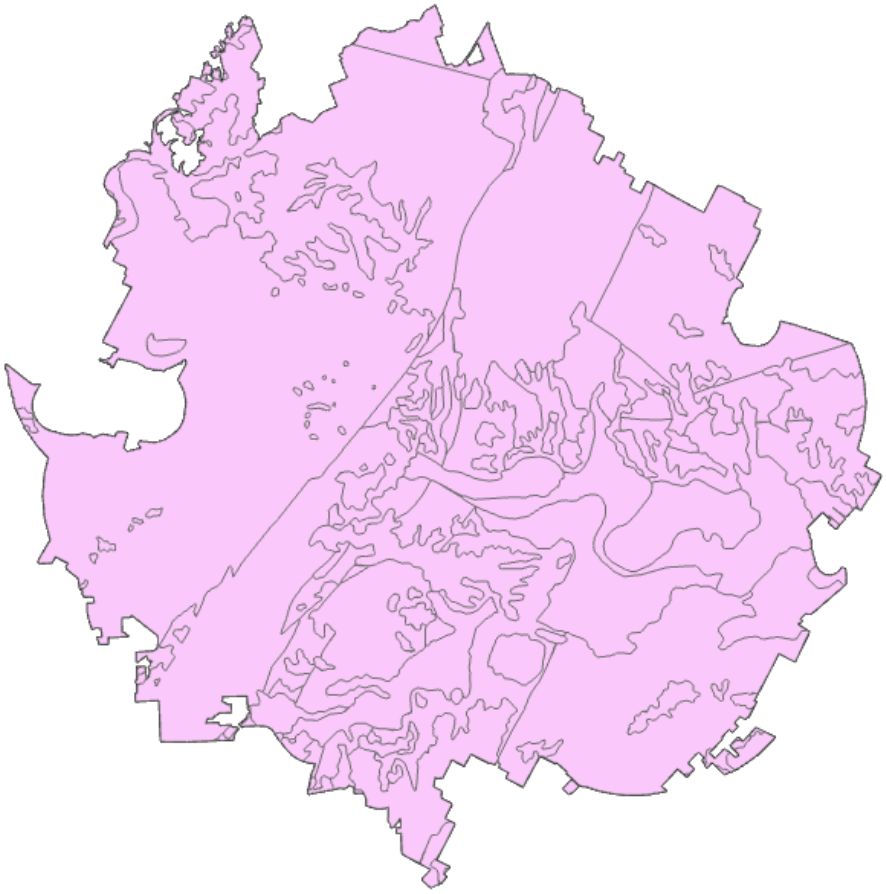
(Python scripts for all 7 questions attached with assignment submission)

Question 1 script:

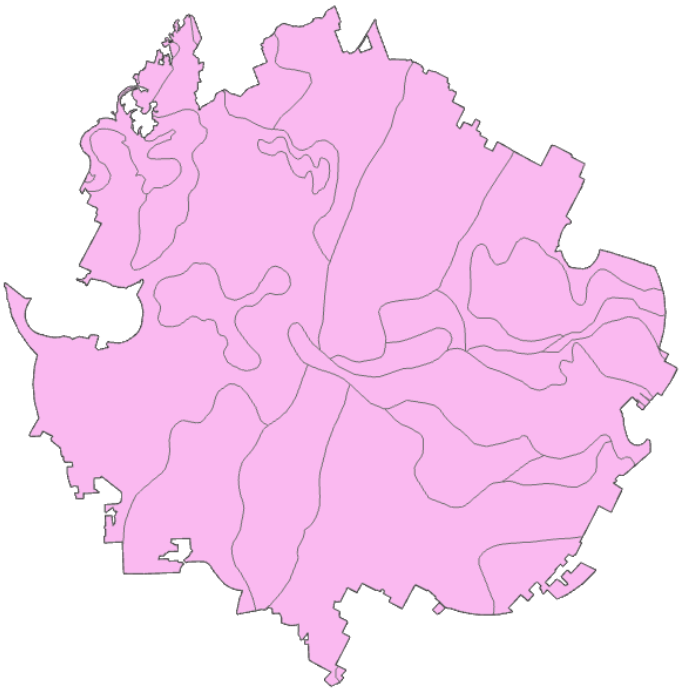
```
# Question 1

import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

features = ["creeks", "geology", "majroads", "schools", "soils", "tracts", "watersheds", "wells"]

for item in features:
    arcpy.analysis.Clip(item, "austin_bnd", item + "_austin") #concatenate feature name string to output file name string
```

Question 1 Outputs:

Clipped geology:



Clipped soils:



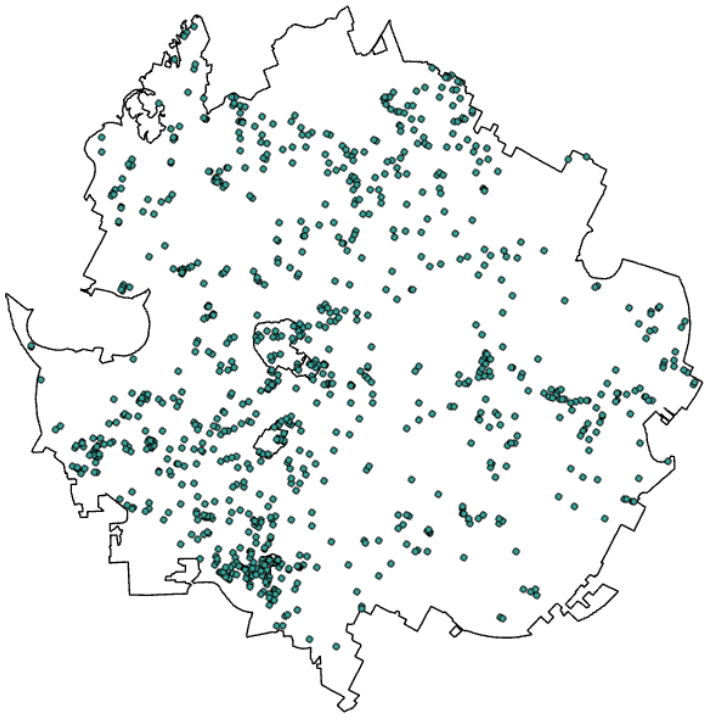
Clipped tracts:

Clipped watersheds:

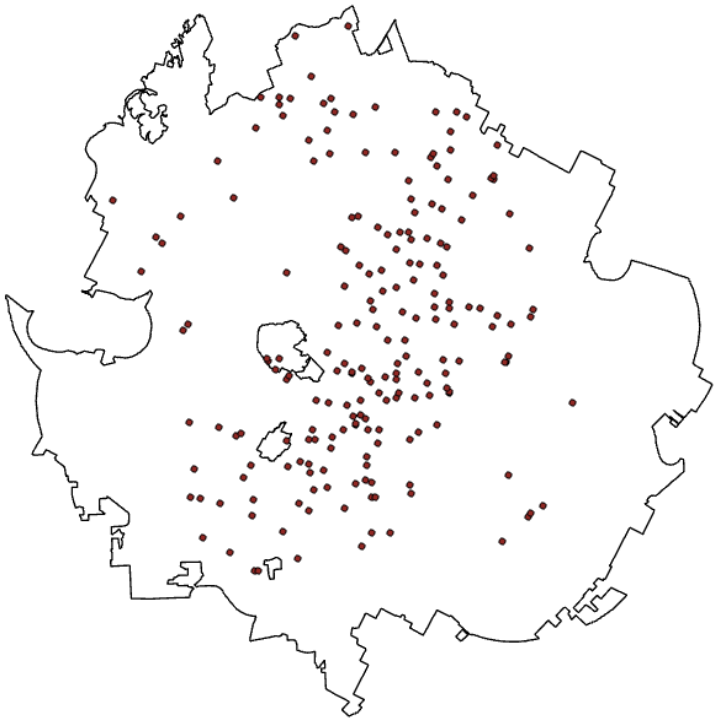
Clipped creeks:

Clipped majroads:

Clipped wells:



Clipped schools:



Question 2 script:

```
# Question 2

import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

count = arcpy.management.GetCount('watersheds_austin')
print(f"There are {count} watersheds in Austin.")

arcpy.analysis.Statistics('tracts_austin',
                          'total_pop_austin',
                          [["POP2010", "SUM"], ["POP2014", "SUM"]])
```

Question 2 watershed count output:

```
================ RESTART: C:/PythonPro/Exercise03/count_opatz.py ===============
There are 73 watersheds in Austin.
```

Question 2 population table output:

	OBJECTID *	FREQUENCY	SUM_POP2010	SUM_POP2014
1	1	240	1147513	1244057
	Click to add new row.			

Question 3 script:

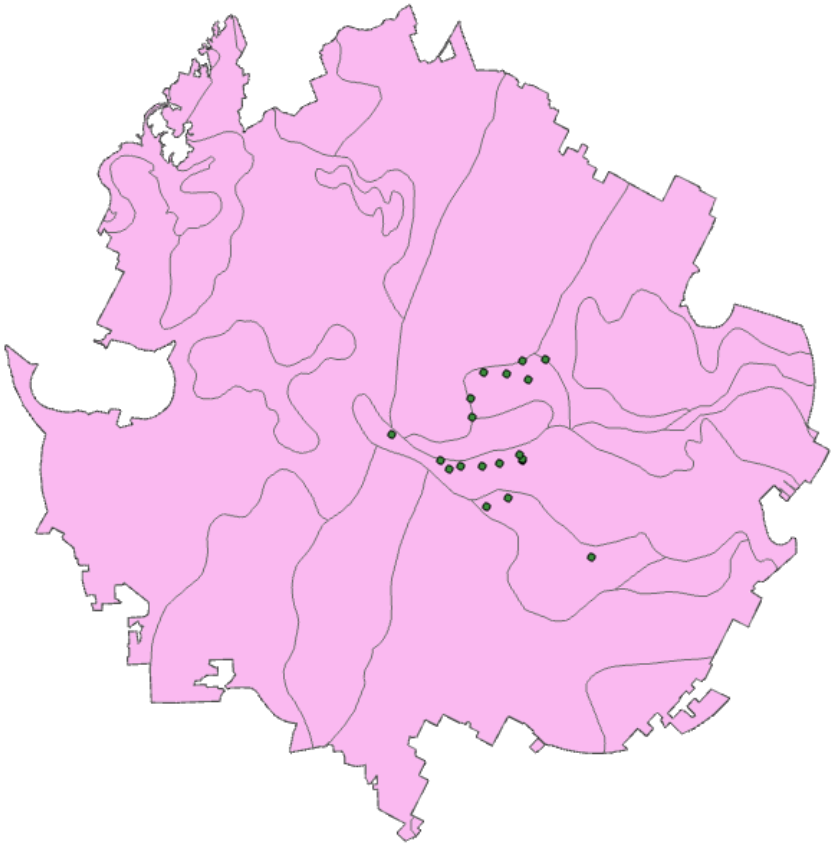
```
# Question 3

import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

# Select all wells within 1000 feet of a creek
wells_at_risk = arcpy.management.SelectLayerByLocation("wells_austin",
                                        "WITHIN_A_DISTANCE",
                                        "creeks_austin",
                                        "1000 feet")

# Copy selected features to new feature class
arcpy.management.CopyFeatures(wells_at_risk, "wells_at_risk")
```

Question 3 map output:

Question 4 script:

```
# Question 4

import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

# Select moderate flood risk soils
mfr_soils = arcpy.management.SelectLayerByAttribute(
    in_layer_or_view="soils_austin",
    selection_type="NEW_SELECTION",
    where_clause="AFLDFREQ < 3"
)

# Select schools that intersect the moderate flood risk soils
schools_at_risk = arcpy.management.SelectLayerByLocation(
    in_layer="schools_austin",
    overlap_type="INTERSECT",
    select_features = mfr_soils
)

# Copy selected features to new feature class
arcpy.management.CopyFeatures(schools_at_risk, "schools_at_risk")
```

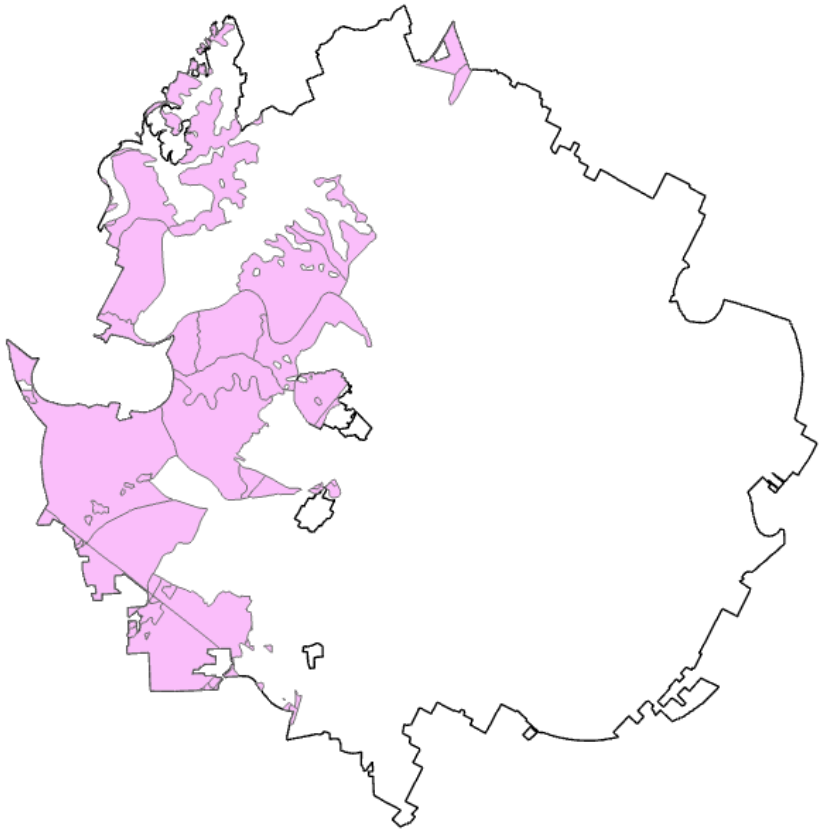
Question 4 map output:



Question 5 script:

```
# Question 5

import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

tracts_geology_Intersect = arcpy.analysis.Intersect(
    in_features="tracts_austin #;geology_austin #",
    out_feature_class="tracts_geology_Intersect",
    join_attributes="ALL",
    cluster_tolerance=None,
    output_type="INPUT"
)

tract_geo_selection = arcpy.management.SelectLayerByAttribute(
    in_layer_or_view=tracts_geology_Intersect,
    selection_type="NEW_SELECTION",
    where_clause="POP_SQMI < 1000 And UNIT_NAME LIKE '%Limestone%'",
    invert_where_clause=None
)

# Copy selected features to new feature class
arcpy.management.CopyFeatures(tract_geo_selection, "rural_septic")
```

Question 5 map output:



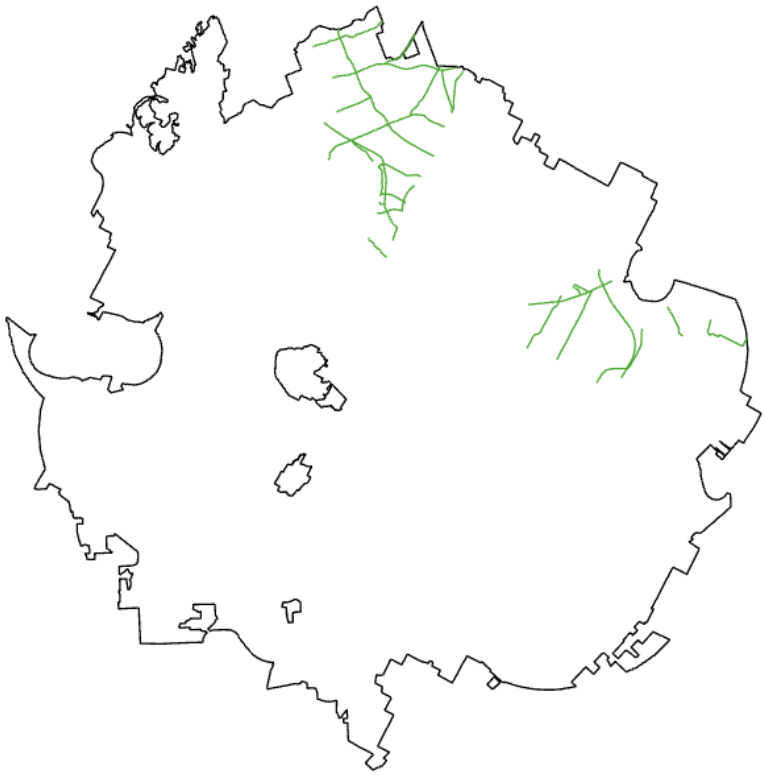
Question 6 script:

```
# Question 6

import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

road_soils_Intersect = arcpy.analysis.Intersect(
    in_features="majroads_austin #;soils_austin #",
    out_feature_class="roads_soils_Intersect",
    join_attributes="ALL",
    cluster_tolerance=None,
    output_type="INPUT"
)

roads_on_clay = arcpy.management.SelectLayerByAttribute(
    in_layer_or_view=road_soils_Intersect,
    selection_type="NEW_SELECTION",
    where_clause="CLAY > 50",
    invert_where_clause=None
)

# Add new field converting feet length to mile length
arcpy.management.AddField(roads_on_clay, "Mileage", "DOUBLE")

factor = 0.0001893939 #conversion factor for feet to miles

# Calculate the adjusted values using an Update Cursor
with arcpy.da.UpdateCursor(roads_on_clay, ["Shape_Length", "Mileage"]) as cursor:
    for row in cursor:
        row[1] = row[0] * factor  # Multiply Shape_Length by factor
        cursor.updateRow(row)

# Copy selected features to new feature class
arcpy.management.CopyFeatures(roads_on_clay, "roads_at_risk")

arcpy.analysis.Statistics(
    "roads_at_risk",
    'risk_roadway_mileage',
    [["Mileage", "SUM"]]
)
```

Question 6 mileage summary statistics table output:

	OBJECTID *	FREQUENCY	SUM_Mileage
1	1	64	70.356982
	Click to add new row.		

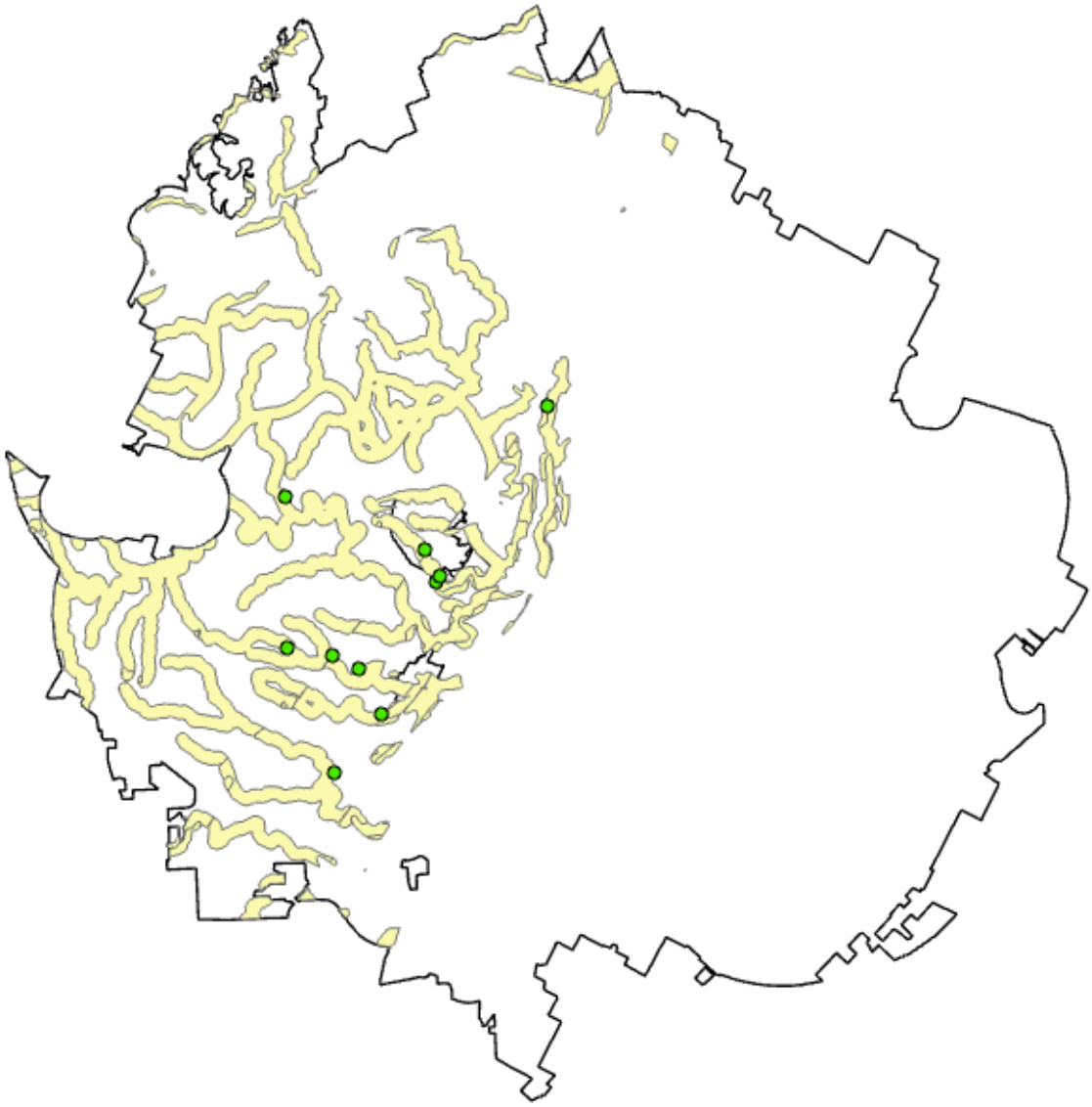
Question 6 map output:



Question 7 script:

```
import arcpy
arcpy.env.workspace = "C:\PythonPro\Exercise03\Exercise03.gdb"

limestone = arcpy.management.SelectLayerByAttribute(
    in_layer_or_view="geology_austin",
    selection_type="NEW_SELECTION",
    where_clause="UNIT_NAME LIKE '%Limestone%'",
    invert_where_clause=None
)

arcpy.analysis.Buffer(
    in_features="creeks_austin",
    out_feature_class="creeks_buffer",
    buffer_distance_or_field="1000 Feet",
    line_side="FULL",
    line_end_type="ROUND",
    dissolve_option="ALL",
    dissolve_field=None,
    method="PLANAR"
)

arcpy.analysis.Intersect(
    in_features=[limestone, "creeks_buffer"],
    out_feature_class="limestone_creek_intersect",
    join_attributes="ALL",
    cluster_tolerance=None,
    output_type="INPUT"
)

arcpy.analysis.Intersect(
    in_features="schools_austin #; limestone_creek_intersect #",
    out_feature_class="schools_meeting_criteria",
    join_attributes="ALL",
    cluster_tolerance=None,
    output_type="INPUT"
)

school_count = arcpy.management.GetCount('schools_meeting_criteria')
print(f"There are {school_count} schools in Austin that are in close proximity to creeks and built on limestone.")
```

Question 7 map output (limestone-creek buffer intersect and schools meeting criteria):



Question 7 School count output:

```
=============== RESTART: C:/PythonPro/Exercise03/schools_opatz.py ==============
There are 10 schools in Austin that are in close proximity to creeks and built on limestone.
```

10 schools in Austin fit the criteria.