Suitability Analysis of Potential Urban Gardens within East Austin Food Deserts

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Problem and Methodology

Food deserts, as defined by the USDA, is an area that is devoid of nutritious and fresh foods, where individuals have no access to a supermarket within one mile in urban areas (10 miles for rural areas).[1] These areas often coincide with low income neighborhoods, which tend to have majority black and Latino populations; white neighborhoods will tend to have more supermarkets than black neighborhoods, as well as having less healthy selections.[2] Combatting rising fruit and vegetable costs with lowering processed food costs as well has excluded many out of the appropriately higher income bracket. As a result of access to more unhealthy food, low-income populations (as well as ethnic minority neighborhoods) have higher rates of adult and child obesity,[3] diabetes, and heart disease.[4] According to Austin's Sustainability Office, around 25% of residents in the city are food insecure.

As a response, Austin's 2017 budget sets aside $800,000 to "combating food insecurity,"[5] which will be spent on a food analysis survey to identify existing and potential areas for supermarket retail development for residents. However, adding grocery stores alone does not satisfy food security, especially when such retailers do not see a positive business-profit (i.e. retailers not building stores in areas where they feel there is not enough business). According to HomeAdvisor, the typical cost for clearing land and preparing for lot development can range from $1200 to $4500 nationally; the Austin average is around $3300.[6] This price includes tree clearing, land tilling, and a soil survey, among others. The US national cost to build a supermarket in 2013 was over $4 million in total for a 44,000 sq. ft. building.[7] The US average cost to build a convenience store of 4000 sq. ft. in 2013 was around $460k without union labor.[8] The average cost to build a community urban garden can run up to $5k initially, but could be as high as $30k on public land.[9] By price alone, it appears that building a community or personal urban garden would be much more suitable, should price be a determining factor. Exploring other options such as healthier neighborhood stores and mobile food markets can supplement those

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[1] Gallagher, Mari, "USDA Defines Food Deserts," *Nutrition Digest*, 38 no. 2, accessed 2017.
[2] "Food Deserts," *Food Empowerment Project*, accessed 2017.
[3] Cortez-Neavel, Beth, "The Unexpected Consequence of Food Deserts: Childhood Obesity," *Texas Standard*, 2016, accessed 2017.
[4] "Food Deserts," *Food Empowerment Project*, accessed 2017.
[5] "Food Deserts: How Austin is Tackling the Problem," *KXAN.com*, 2016, accessed 2017.
[6] "Clear Land or Prepare a Construction Site," *HomeAdvisor*, accessed 2017.
[7] "Construction Cost Estimates for Convenience Store in National, US," *RSMeans*, 2013, accessed 2017.
[8] "Construction Cost Estimates for Convenience Store in National, US," *RSMeans*, 2013, accessed 2017.
[9] Evans, Mariwyn, "Start a Community Garden: Get the Community Involved," *Houselogic.com*, accessed 2017.

who have restricted access to a supermarket, although building costs and profit projections may as well be issues for low-income neighborhood store owners. An alternative to building or restocking a store is community or personal urban gardening.

An urban garden is exactly what it sounds like: a garden that grows various crops inside an urban center. The garden is variable in size, ranging from a personal backyard garden enough for several fruits and vegetables, to a larger urban farm taking up an acre or less. Benefits of urban gardening include access to green space (which can increase property value, improve environmental health), physical health improvements (e.g. diet, labor), provide a source food for communities/families (which may reduce grocery costs and increase food security), provide education, integrate cultures and individuals, provide jobs (urban farms), stimulate local economy (food production profits), and reduce carbon emissions (by cutting out food retailer transport, packaging, and distribution).[10] According to the USDA, community gardens can provide over 2000 jobs and create 3600 small businesses; these jobs are essential resources for low-income and unemployed individuals.[11] Food savings can range from $200 in personal gardening to over $915k for community gardens.[12] Gardens or farms placed on vacant lots, developed or undeveloped, can save the city money that would otherwise be spent on preventing illegal dumping, vandalism, and upkeep costs.[13]

East Austin contains a high amount of food deserts as compared to Central and West Austin (Figure 1)[14]. East Austin also has high Hispanic and black populations, as well as a majority of over 20% poverty.[15] Such areas will need access to healthy food that is relatively within a low-income price range. For this project, I want to find areas where urban gardens, urban farms, and community gardens can be developed. The amount of land that is suitable for urban gardens is based upon physical factors, excluding socio-economic factors. This is done so as to find not only where potential land exists, but to include urban garden growth potential (i.e. find areas where it is physically favorable to develop an

[10] The Ecology Center, "10 Ways Urban Farms Benefit the Community," *The Ecology Center*, 2016, accessed 2017.
[11] Golden, Sheila, "Urban Agriculture Impacts: Social, Health, and Economic: A Literature Review," (project report, UC Sustainable Agriculture Research and Education Program, 2013: 13), accessed 2017.
[12] Ibid., 14
[13] Ibid.
[14] Economic Research Service, Food Access Research Atlas (online map, *USDA*, 2015), accessed 2017.
[15] City of Austin, "Poverty Rates, Census Tracts, 2015," map, *City of Austin*, 2015, accessed 2017.

urban garden). Although this approach will not show cultural, political, or economic preferences for urban garden development, it will show areas where the land (either bare or covered) is preferential.

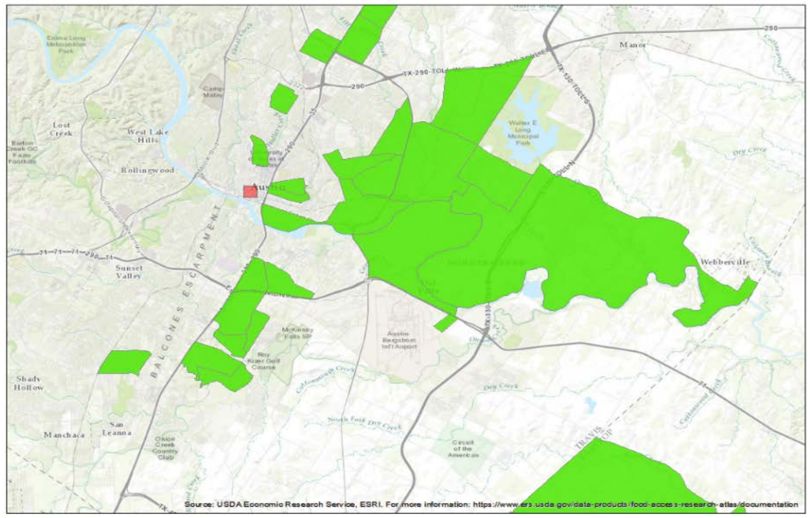

Figure 1. Food Access Research Atlas map showing food deserts (green areas) heavily concentrated in East Austin (east of IH35).

The criteria for this suitability analysis:

1. The suitable area must be within a food desert in East Austin.
2. The area is not within a high-flood risk zone. This is to potentially avoid flood damage and costs, which can significantly impact already impoverished areas.
3. The area must have less than 25% imperviousness. This is to find land that is bare or with little development.
4. The area must by on a flat to nearly flat slope.
5. The area is on “soil-favorable” bedrock.

In order to determine suitable land based upon these five criteria, a suitability analysis model was created in Google Draw, and can be viewed in the Appendix. In summary, using various raster layers, I want to create a suitability map through reclassification and weighting methods. I want to calculate a the area of the total amount of suitable land within my Area of Interest (AOI), spatially examine where these areas exist in the AOI, identify areas of unsuitability, and observe the relationship between existing urban farms and suitable land.

Criteria Description

The impervious land cover represents areas on which any area of greenspace or soil cannot be used for agriculture due to existing hard, impermeable surfaces, such as concrete. Each cell contains a percentage of imperviousness in land cover, from 1 to 100%. In order to find the areas where there is available greenspace/uncovered soil, ideally an area with zero percent hard surfaces would satisfy the criteria. However, given the cell size is 30m, I find it reasonable to assume that as long as 75% of the land is available, then a quarter of the area could be yielded to a hard surface.

Under the criteria, areas with "low slope" are most suitable for urban garden placement. Land with a steep slope means the soil will be thinner, and erosion may be accelerated, soil has low and poor infiltration of water, which means less vegetation. For an urban garden, ideally a flat to low slope is needed for a likely higher crop yield, although there exists other variables that could contribute to a less than ideal garden yield (e.g. water and wind movement, nutrient flow, water depth, soil type, etc.). Therefore, I will look for slopes of less than 10 degrees.

The "soil-favorable" bedrock is the only subjective criteria: its suitability exists upon subjective determinations of geologic unit descriptions by the USGS. In essence, bedrock with high clay amounts, very coarse grain size majority, high amounts of lime, calcite, or halite, and grain cohesively, among others, denote bedrock that is unsuitable for a "good" soil as these factors can influence water absorptivity, soil swelling and shrinking, slope stability, and vegetation growth.

Data Gathering

Data was gathered from various governmental agencies of Texas. These sources include:

1. LiDAR image:
   CAPCOG 2007 140cm Lidar, SE Quarter Quadrangle LiDAR image, TNRIS.org.
   https://tnris.org/data catalog/entry/capcog-2007-140cm/
2. LiDAR image:
   CAPCOG 2007 140cm Lidar, SW Quarter Quadrangle LiDAR image, TNRIS.org.
   https://tnris.org/data-catalog/entry/capcog-2007-140cm/
3. Water data geodatabase:
   Texas NHD River, Streams, and Waterbodies, USGS, EPA. https://tnris.org/data-catalog/entry/texas-nhd-river-streams-and-waterbodies/
4. Flood hazard zones kmz file:
   FEMA National Flood Hazard Layer, eliza.ledwell_FEMA, 2017. https://www.fema.gov/national-flood-hazard-layer-nfhl, FEMA.gov
5. Hard surfaces raster:
   NLCD 2011 Percent Developed Imperviousness, National Land Cover Databse 2011, MRLC.
   https://www.mrlc.gov/nlcd11_data.php
6. Census Tracts shapefile:

2010 Census Tract for Texas, US Census Bureau, 2010. https://www.census.gov/geo/maps-data/data/tiger-data.html

7. Food Desert table:

   Food Access Research Atlas, Economic Research Service, USDA, 2017. https://www.ers.usda.gov/data-products/food-access-research-atlas/

8. Geologic units shapefile:

   Geo, Lab 1, Plate VII of "Environmental Geology of the Austin Area: An Aid to Urban Planning" by Garner and Young, 1976, UT Bureau of Econ. Geology, Rept. Inv. No. 86.

9. Geologic unit symbology layer file:

   Garner_YoungGeology, Lab 1, Garner and Young, 1976, UT Bureau of Econ. Geology, Rept. Inv. No. 86.

Preprocessing

To create the AOI for later analysis, the LiDAR datasets (SW and SE quarter quads) need to both define the boundary and provide slope data. The <MOSAIC TO NEW RASTER> tool created a single raster for this purpose called *se_sw_mosaic* (Figure 2). All other variables used (Census Tracts, Geology, NLCD Impervious surfaces, NFHL Flood Hazard Zones) were projected to NAD83 UTM Zone 14N. This coordinate system was chosen so as to reduce area distortion in the considerably small AOI.

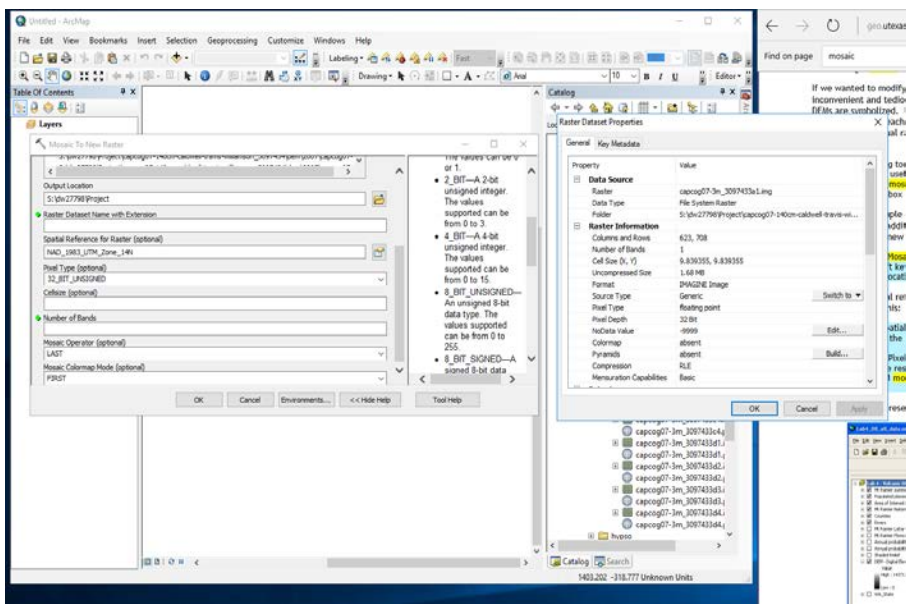

Figure 2. Image showing the Mosaic to New Raster tool in use. The original cell size of the LiDAR data was retained.

Processing

The AOI polygon, which determines the boundaries for analysis, was created by first establishing a personal geodatabase, a new feature class called "AOI", and a new field called "Area" in square feet.

Using the Editor Toolbar, the polygon is digitized around the quarter quadrangle mosaic DEM at 1:62,500 (Figure 3).

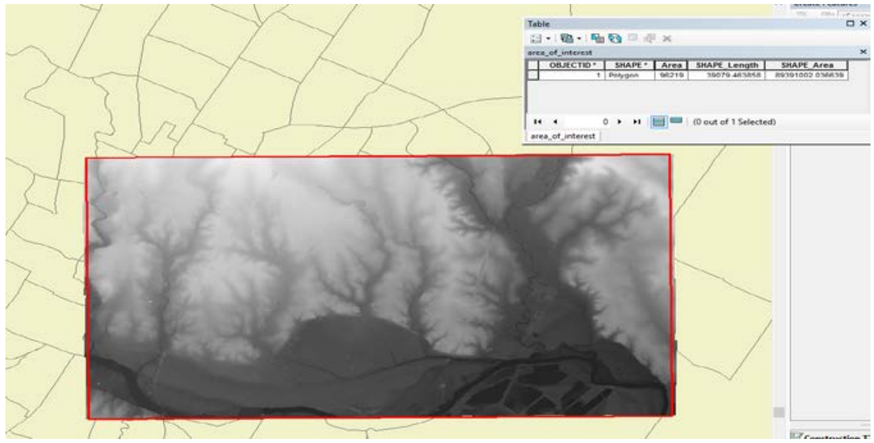

Figure 3. Screen capture showing digitized AOI (red box) and the associated Attribute Table.

To find out what areas are considered food deserts by the USDA, the USDA's Food Access Research Atlas (2015) was joined with the Census tract polygon, using "TRTKEY" (CensusTract vector file) and "CensusTract" (from the USDA table) as keys, seen in Figure 4. The 2015 Food Access Research Atlas data provides the most up-to-date information as to where the food deserts can be located. The food desert polygons are determined by how many people live 1 mile away from a nearby supermarket/grocery store (called "Low Access") and is "Low Income". From this, a <SELECT BY ATTRIBUTES> query determined which census tracts carry this type of data. In the query, (Low Access and Low Income individuals) "LILATRACTS_1And10"=1, where 1 is a flag for a food desert according to the USDA.

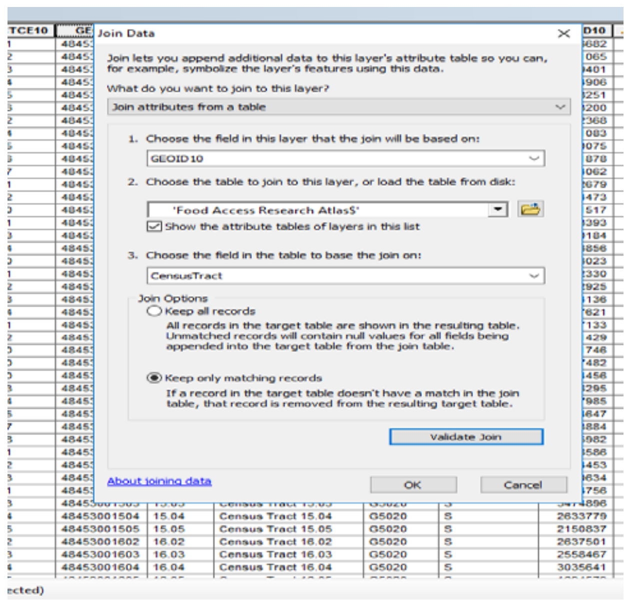

Figure 4. Joining the USDA table and Census tracts shapefile.

The slope map was calculated using the <SLOPE> tool (Spatial Analyst) with output set to DEGREES. This shows the resulting slope DEM, with higher slope degree equivalent to hotter colors (Figure 5).

I would like to find over what type of bedrock the urban gardens lay. This may give clues to soil content, erosive properties, and soil type, among other factors, although these factors are not given further consideration in this project, as discussed below. After clipping to the AOI, the <POLYGON TO RASTER> tool converted the *geo* shapefile into a raster image (Figure 6).

There is not much processing for the Impervious Percentage Cover raster after pre-processing of projecting and clipping to the AOI, since it is already in raster form. The figure below denotes the Impervious Cover raster within my AOI from the original form (Figure 7).

I also want to find the areas available that will not be in a flood hazard zone, as defined by the NFHL from FEMA. I see that FEMA has determined several types of areas indicating flood hazard by type and subtype. Since I would like to compare across rasters to determine suitability, this feature class is converted into a raster image by using the <POLYGON to RASTER> tool; the Cell Assignment Type, Priority Field and Cellsize rows were kept as default (Figure 8).

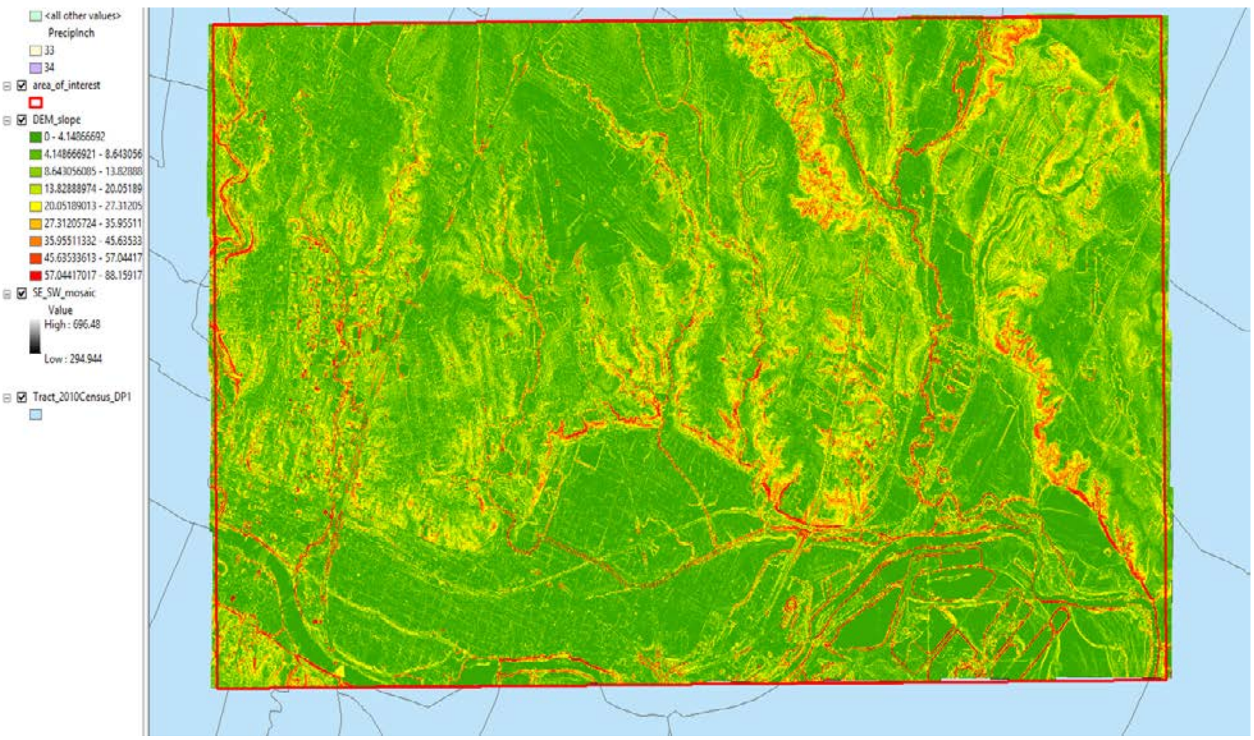

Figure 5. Showing resulting slope DEM raster; shown in degrees.

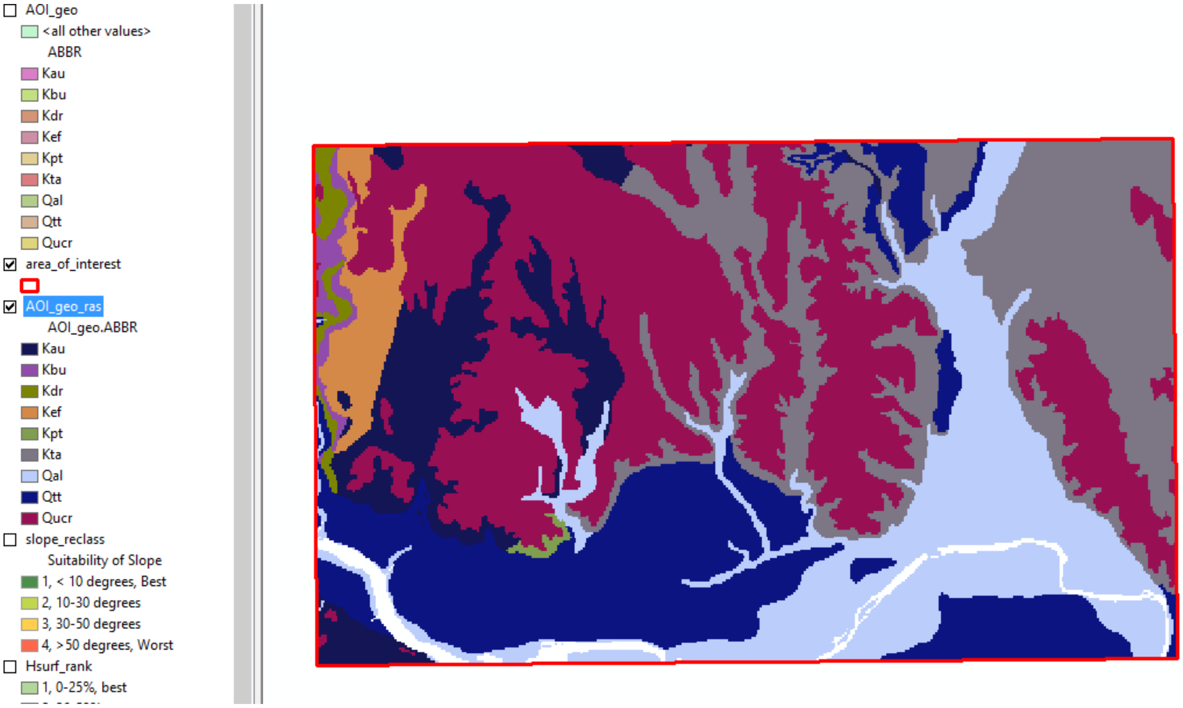

Figure 6. Geologic units as a raster image, within the AOI, before analysis.

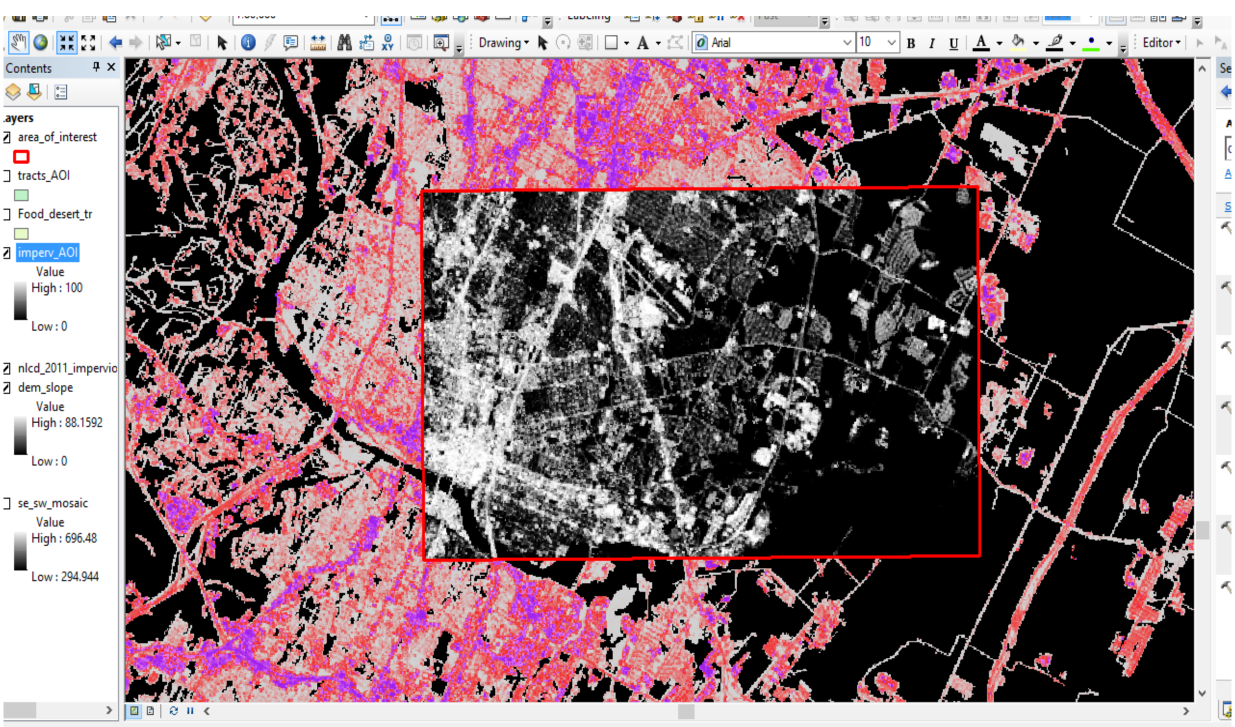

Figure 7. Impervious Percentage Cover raster inside AOI (red box).

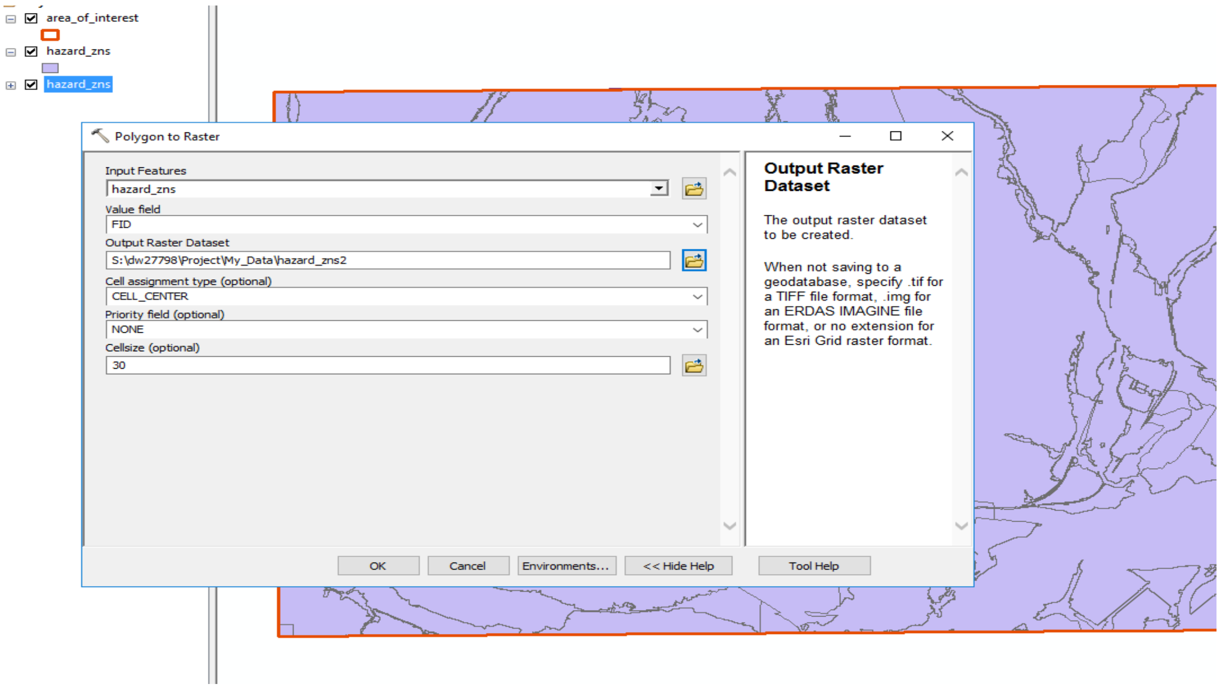

Figure 8. Using the Polygon to Raster tool for the NFHL shapefile.

From this, the raster's Valued Attribute Table has lost all original FEMA attributes that were in the shapefile; In order to process this for suitability analysis, the raster needs to both A. be joined to a table for data pulling and B. classified by flooding hazard type.

First, the "FID" and "Rowid" fields are used as keys to join the NFHL raster and NFHL vector Attribute Tables. Next I need to identify how exactly I want to classify my raster image. The metadata and a separate reference table for FEMA's Flood Zone Type definitions (See Appendix) indicated that the Flood Zone Type field ("FLD_ZONE") indicate areas with flood hazard probability denoted as letters. In

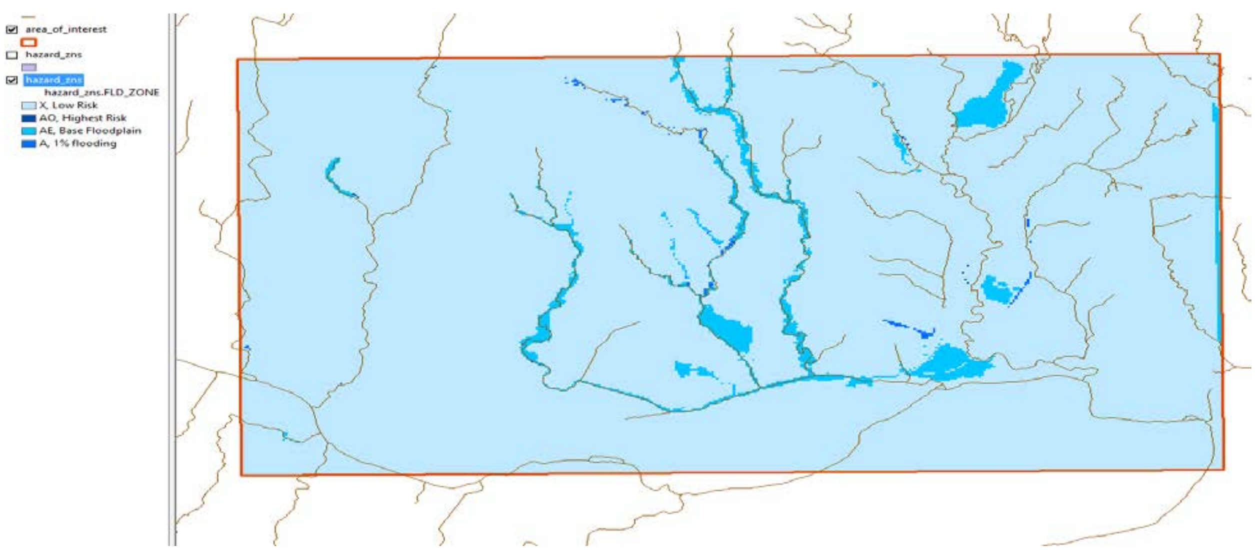

Figure 9. NFHL Flood Hazard raster image, symbolized by flood zone type.

my AOI, only 4 are used: X, AE, A, and AO. In short, X is an area of low to moderate flood risk (100 to 500 year flooding), and AO are areas of high flood risk (greater than 1% chance a year). After symbolizing, the resulting raster image shows that much of the AOI experiences low risk flooding (Figure 9).

ANALYSIS

To analyse the slope for suitability, I needed to rank and reclassify the slope values from best to worst using Table 1 below as a rubric. The resulting slope reclassification raster shows that much of my AOI is suitable for urban farming placement, denoted as 1 (dark green). From running the statistics, near 66% of the area has a slope of less than 10 degrees. The least suitable areas, 4 (red), are small, and tend to be near existing buildings, river channels, and other steep slopes (Figure 10), and make up only 1.7% of the AOI (See Appendix for Statistics Table calculations).

0-10	1	0-10 degree slope, Low slope; Most suitable
10-30	2	10-30 degrees, Med slope
30-50	3	30-50 degrees, Med-High slope
50-90	4	50-90 degree slope, Steep slope; Least suitable

Table 1. Reclassification table for the slope raster.

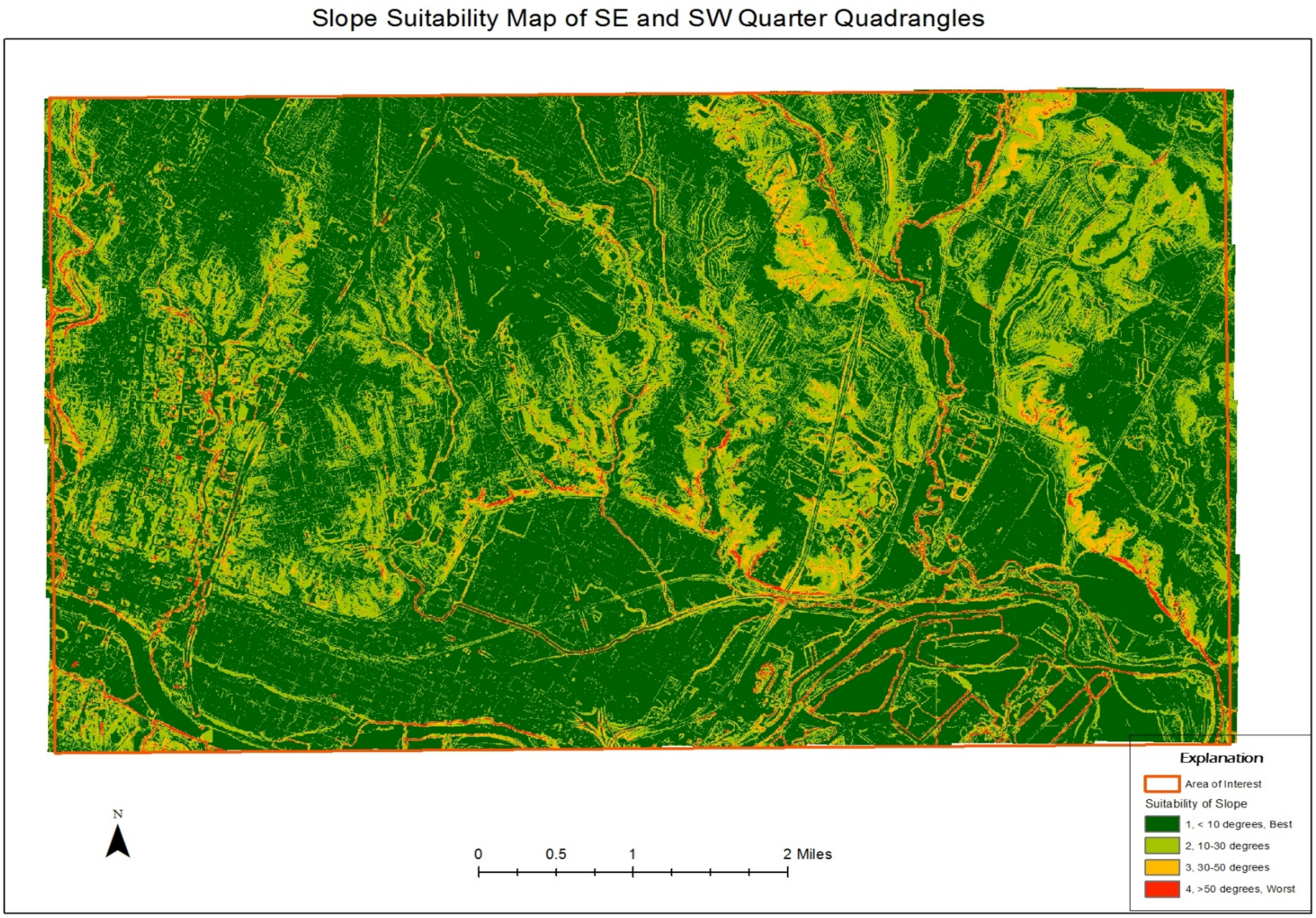

Figure 10. Slope Suitability Map within the AOI. Much of the area is found suitable.

There is no special reason to reclassify the geology raster based upon hierarchy. No one geologic unit is better or worse than the other at this point; therefore, an arbitrary number was assigned for each geologic unit (1 to 11; Figure 11). This premature

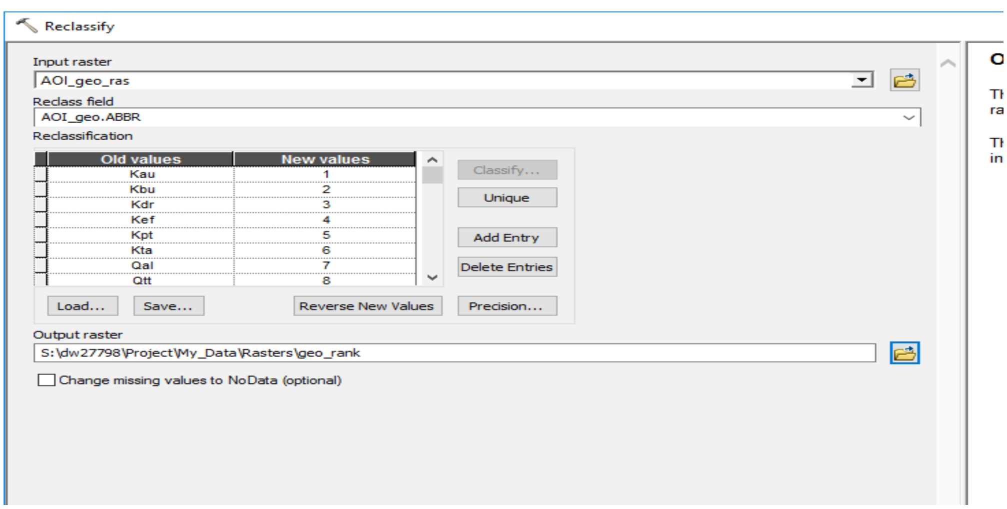

Figure 11. Reclassifing geologic units arbitrarily for pre-suitability analysis.

ranking will be more useful for combining and overlaying every raster, where at that time a final ranking will be issued.

To find the soft surfaces (i.e. bare earth/grass) where an urban garden (of presumably any size) could exist. To do that, I reclassified the *hardsurf_UTM* raster according to the criteria, as seen in the table below. From the Statistics Table, 0-25% impervious coverage takes up around 58% of the total area in the AOI, with 14.2%.of land taking up 75% and over coverage. As seen in Figure 12, areas of high coverage tend to be near already urbanized areas, such as near and west of IH35, and at US183; areas of lower coverage tend to be further from the city center, where there is less land development.

Old Value	New Value	Description
0-25	1	0-25% impervious coverage, Best
25-50	2	25-50% coverage
50-75	3	50-75% coverage
75-100	4	75-100% coverage, Worst

Table 2. Reclassification table for hard surfaces coverage ranking.

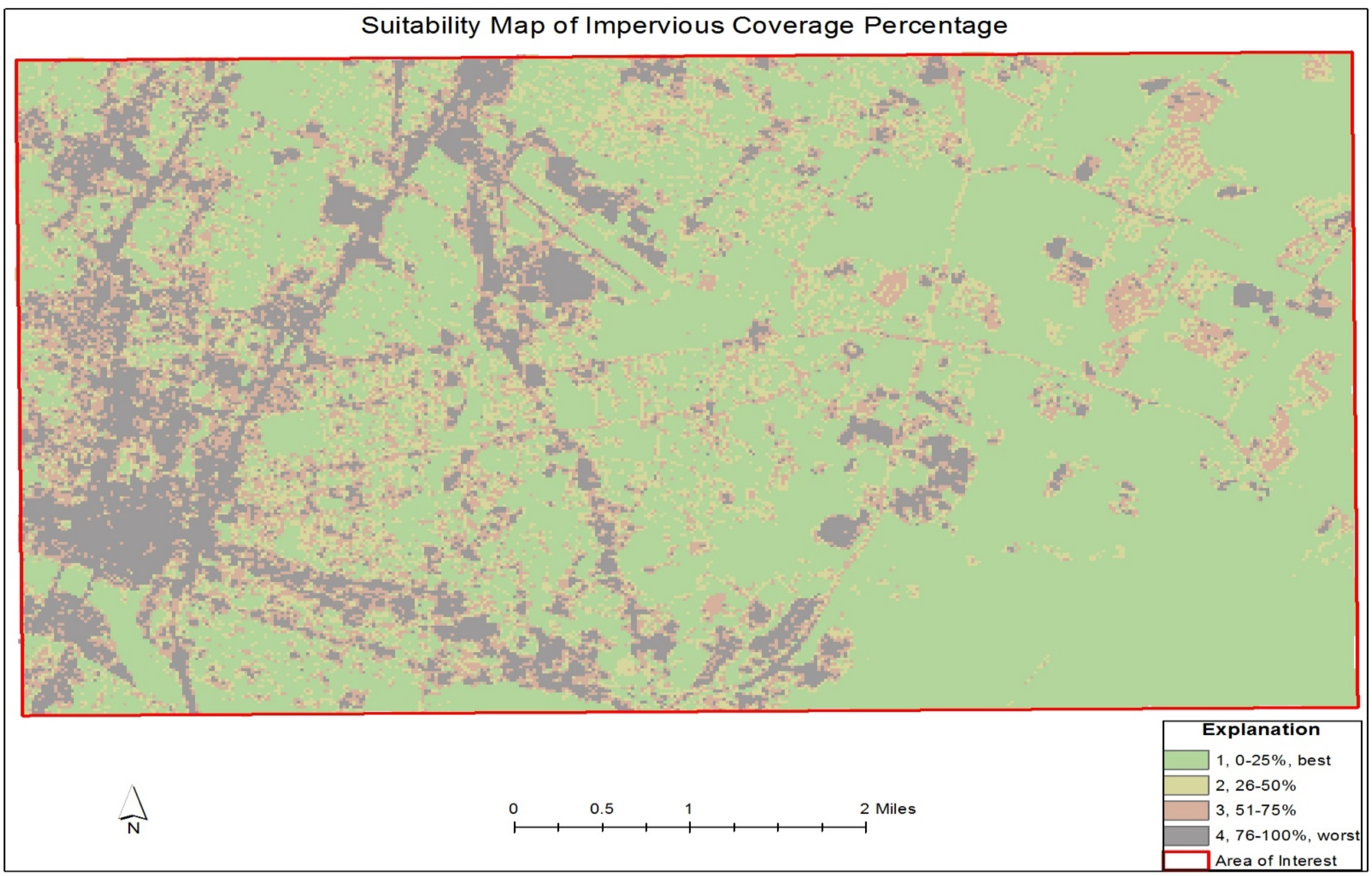

Figure 12. Suitability Map of hard surfaces within the AOI. Areas nearest major roads and highways are found unsuitable.

Lastly, to find the areas that have minimal flood risk, I reclassified the flood hazard raster from 1 (low risk) to 4 (high risk), as shown in Table 3. This gives me a reclassified raster of flood hazard zones, from 1-best (lowest risk) to 4-worst (highest probability of flooding), as seen in Figure 13. This raster image shows that much of the AOI is at a low to moderate flood risk, and that areas just nearest the rivers/streams will experience flooding more often. This is expected and ideal. The Statistics Table shows that 96% of the AOI is within a minimal-risk flood hazard zone, while less than 1% is at risk for a yearly flood risk (although some caution must be made as these floods can still occur).

Old Value	New Value	Description
X	1	Low-Moderate flood risk, Best
A	2	Moderate flood risk
AE	3	Moderate flood risk, BFE
AO	4	High flood risk, Worst

Table 3. Reclassification table for flood hazard zones, from 1 to 4.

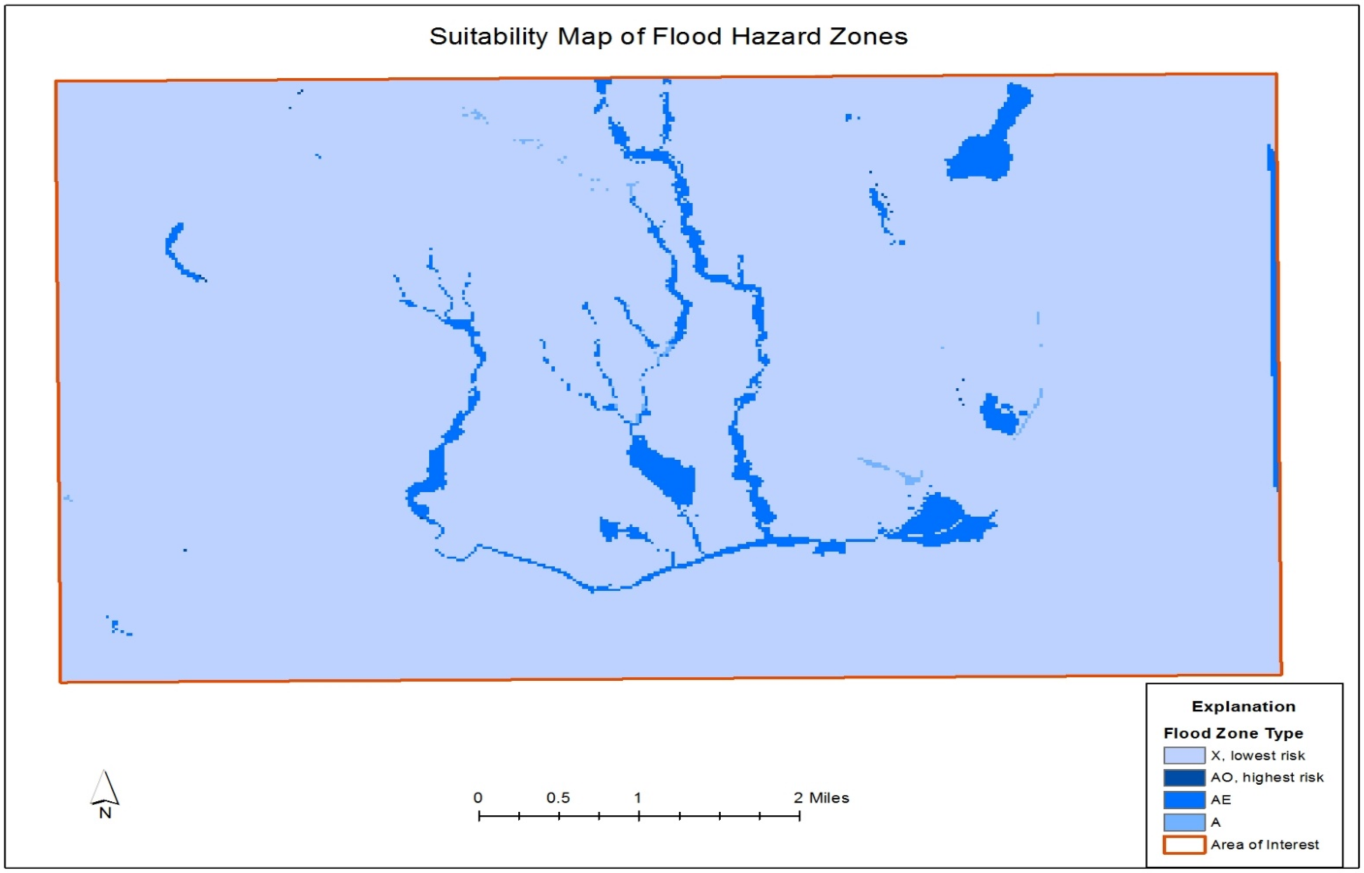

Figure 13. Suitability Map of flood hazard areas within the AOI. Much of the flooding risk is nearest rivers and other waterbodies.

An overlay analysis is needed in order to combine each raster, give a final ranking, and determine the suitability for urban garden placement. Using the <WEIGHTED OVERLAY> tool, I assign new weights for each raster: Slope 40%, Geologic Units 25%, Impervious surfaces 20%, Flooding zones 15%. This weighting was chosen because slope has a direct influence on erosion, water flow, vegetation growth, as well as solar radiation, wind speed, and soil types; therefore, I chose slope to be the most important criterion. Geologic units can also reveal details about soil; therefore, it was taken as the second important criterion, although not as important as slope. Flood zones was given the lowest weight since much of the AOI experiences minimal flooding risk; although this risk can still have impacts on an urban garden should a flood occur, the flooding will be shallow.

All ranks were scaled from 1-4, with 1 being the most suitable to 4 as the least suitable (Figure 14). Slope, hard surfaces, and flood zones were not affected by this re-ranking. However, with the geology unit classifications, because the original ranks were from 1-11, re-ranking was necessary here. From the USGS' Mineral Resources Spatial Data in Texas, Qal, Qtt (lower Colorado River), and Qucr were given the ranking of 1; Qtt (terrace) and Kta ranked 2; Kau and Kpt ranked 3; and Kef, Kbu, and Kdr ranked 4. This ranking is subjective, as I took the general unit description for each unit and subjectively compared the grain size types and relative amounts (i.e primary, secondary), rock type, and presence and/or amount of clay minerals/sediment.

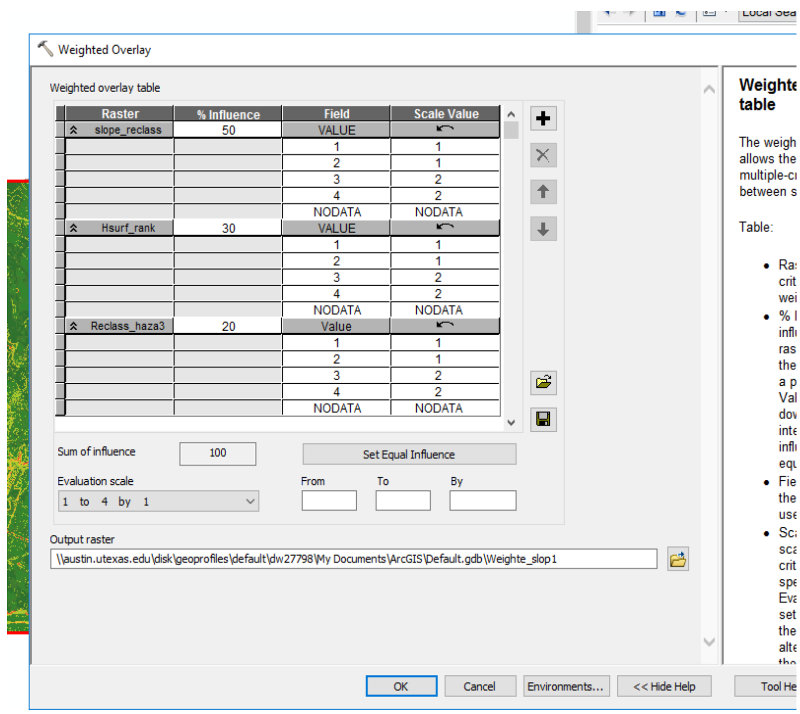

Figure 14. Weighted Overlay Analysis tool re-ranking every input raster for a suitability raster.

As shown in Figure 15, the suitability map shows that much of the AOI is suitable for urban garden placement, with moderate to highly unsuitable areas (ranks 3 and 4) occurring near the center of Austin and around existing urbanized areas. The Statistics Table reveals that 56% of the total area is highly suitable, 41% has moderate suitability (rank 2), 3% has medium suitability (rank 3), and less than 1% has low suitability (rank 4).

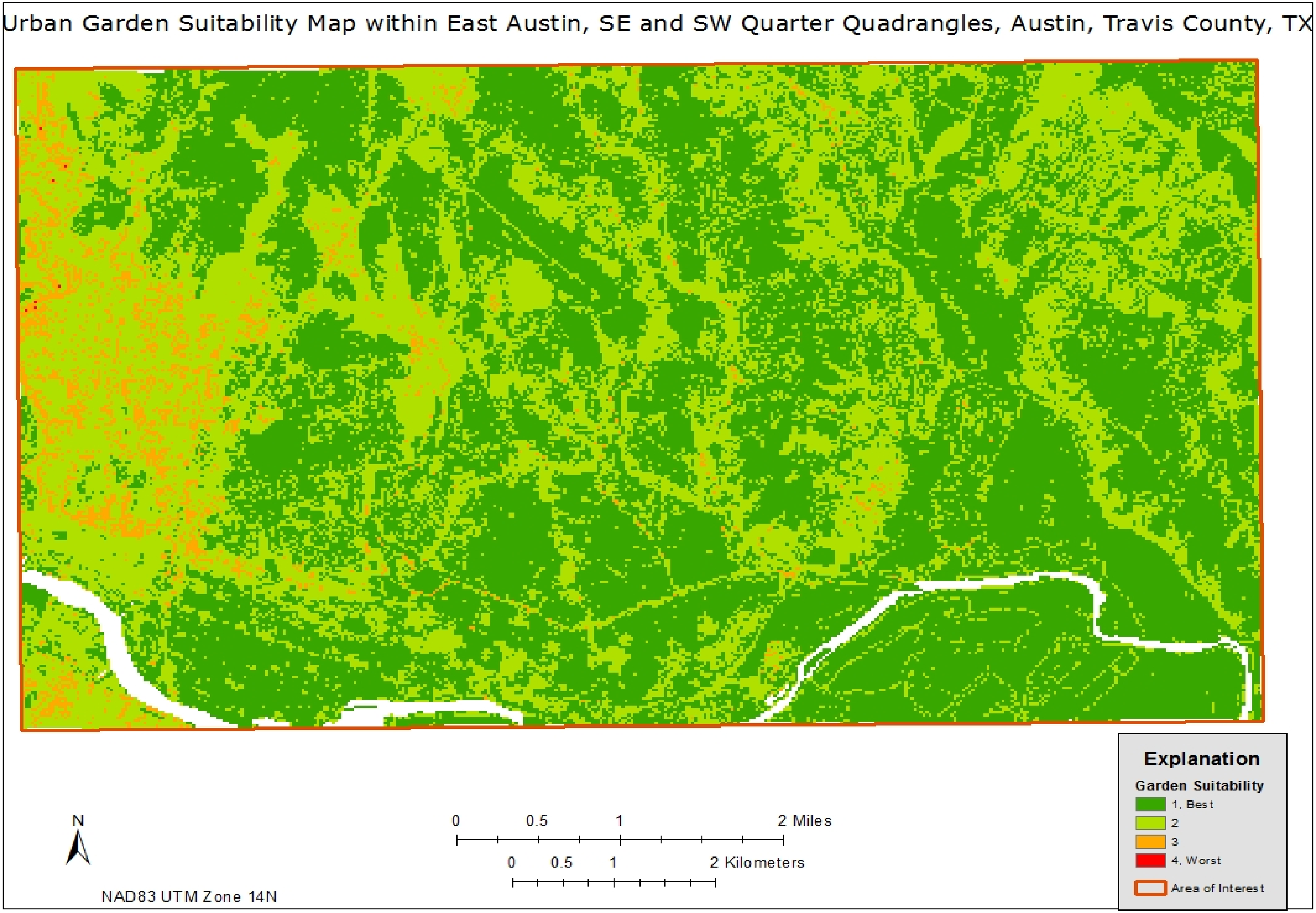

Figure 15. Suitability Map of urban garden placement within the AOI; the white area indicated the Colorado River, which was ignored during Weighted Overlay use.

I am left with a suitability map for the AOI; however, I want to find the suitability within food desert designated zones, as these areas will need the most access to nutritious food compared to areas not in a food desert. Since the zones are a vector polygon, and the suitability map is a raster, the <EXTRACT BY MASK> tool placed the raster over the food desert polygons. This yields a raster within the food desert polygons ranked 1-3 (I believe no rank 4 cells lie within the food desert polygons, and therefore are not outputted; see Appendix for final map).

Existing urban garden locations were digitized using 1:6000 scale. Locations were looked up on Google Maps and relatively placed using the ArcGIS Streets Basemap as a reference. Due to time considerations, aerial photography would have been preferred, but was not used. To create the existing urban gardens, I created two new feature classes within my geodatabase called UrbanGarden, as well as a domain named "Type" (Figure 16).

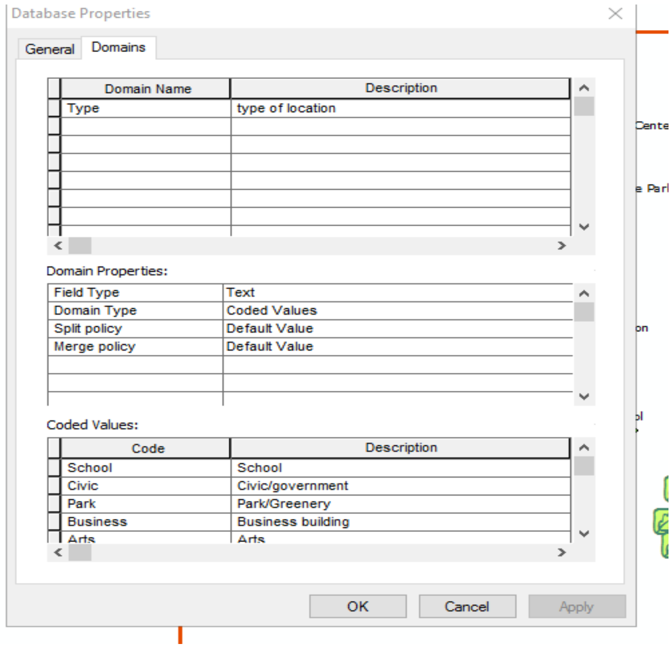

Figure 16. Domain called "Type" created in geodatabase for location.

DISCUSSION

From the final suitability map, it appears that much of the East Austin area within the AOI is highly suitable for an urban garden based upon the criteria. 64.14% of the area within food deserts (≈7810 acres) is highly suitable for urban garden placement; was 34.69% of the food desert area (≈4424 acres); only 1.17% of land (142 acres) was found unsuitable. The location of existing urban gardens within the AOI correlate well to the suitability raster image. Although the location placing is not accurate, the areas surrounding existing gardens is deemed suitable for new urban garden locations.

The areas of medium suitability tend to occur around major roads, floodways and rivers, and existing urban development; however, not all areas are near developed land (see Appendix). As an example, the NE corner census tract (Tract 2202) shows a majority of medium stability areas. Current satellite images on Google Maps show a significant amount of undeveloped land. Looking at each individual variable raster, I find that this tract area is influenced by slope (Figure 17) and geologic unit rank. In addition, much of this area takes places over the Taylor Fm., which was assigned a final ranking of 2.

The least suitable areas, denoted in red, are few in number; however, they concentrate most towards the West, near and past IH35, as seen in Figure 18. Notably, the University of Texas has its own census tract, of which only 3 cells (i.e. 2700 m^2) are suitable for urban gardens near the Northern end. Most of this food desert has medium suitability. This trend seems to be due to impervious surfaces (over 25% majority) and slope (over 10 degrees majority). If this area were to improve its conditions for urban farming, it would either have to have raised gardens on a hard surface or clear out developed, unused land.

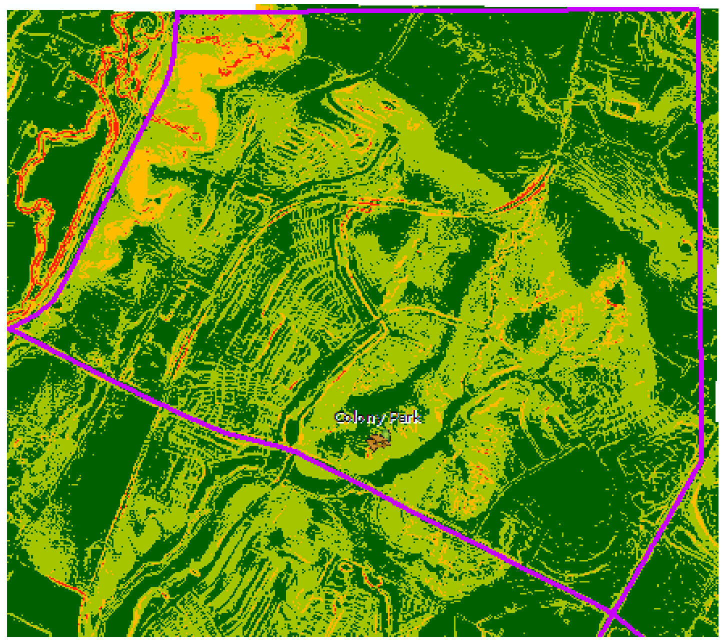

Figure 17. Image shows Tract 2202 with a majority of the slope raster as greater than 10 degrees.

This is not a comprehensive suitability map. Some important factors not included in analysis include urban garden size, which could help to find what areas are suitable for a minimum garden size; however, this was not taken into consideration as the urban garden can vary in size due to preference. Water areas were additionally not included in the analysis; this has caused areas of open water (lakes and rivers) to be included in the suitability map. These areas cannot be farmed on; this oversight has affected all raster suitability maps, which in turn affect the overall

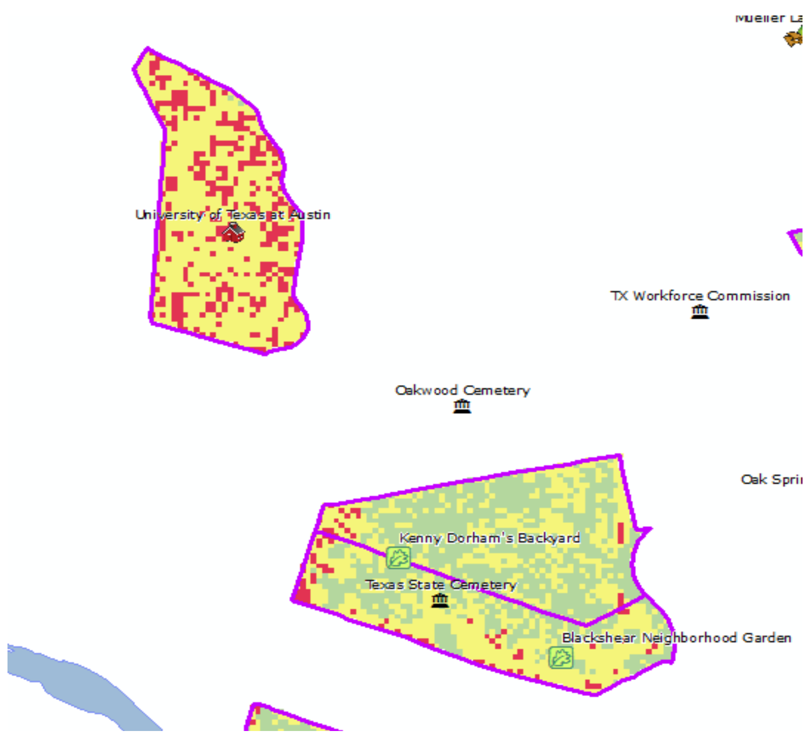

Figure 18. Screen capture showing two food desert areas with a majority of medium-low suitability. Areas are towards West of IH35, near the urban center of Austin.

suitability map. Therefore, areas on open water bodies should be ignored in the suitability map. As a note, hydroponic urban farming was not considered-traditional ground farming (i.e. using soil *in-situ*) represented urban farming in this project. Access and distance to a water source could have narrowed down the analysis, as urban gardeners will need access to fresh water if they do not have so already. Another important factor not included is annual temperature across the AOI. Temperature, which can have a direct effect on vegetation growth and soil, if considered would be able to find the locations where temperature is relatively fair. However, since the annual temperatures of Texas tend to be high, I doubt that there would be much effect.

One future consideration for this project would be to overlay land lot data. Here, the vacancy and price of lots in the AOI would be able to show which lots are immediately available for urban farm development. This is useful for land appraisal and future planning surveys, as well as identifying to residents where land is available for a suitable urban garden. A further consideration is the distance of suitable areas to roads. This highlights areas that may be easily accessible to residents and communities; assuming urban gardens are placed near low-income and low-access neighborhoods, this distance should be small: a distance of less than 1 mile would be ideal.

References

1. City of Austin. “Poverty Rates, Census Tracts, 2015,” map, *City of Austin*. 2015. Accessed 2017.
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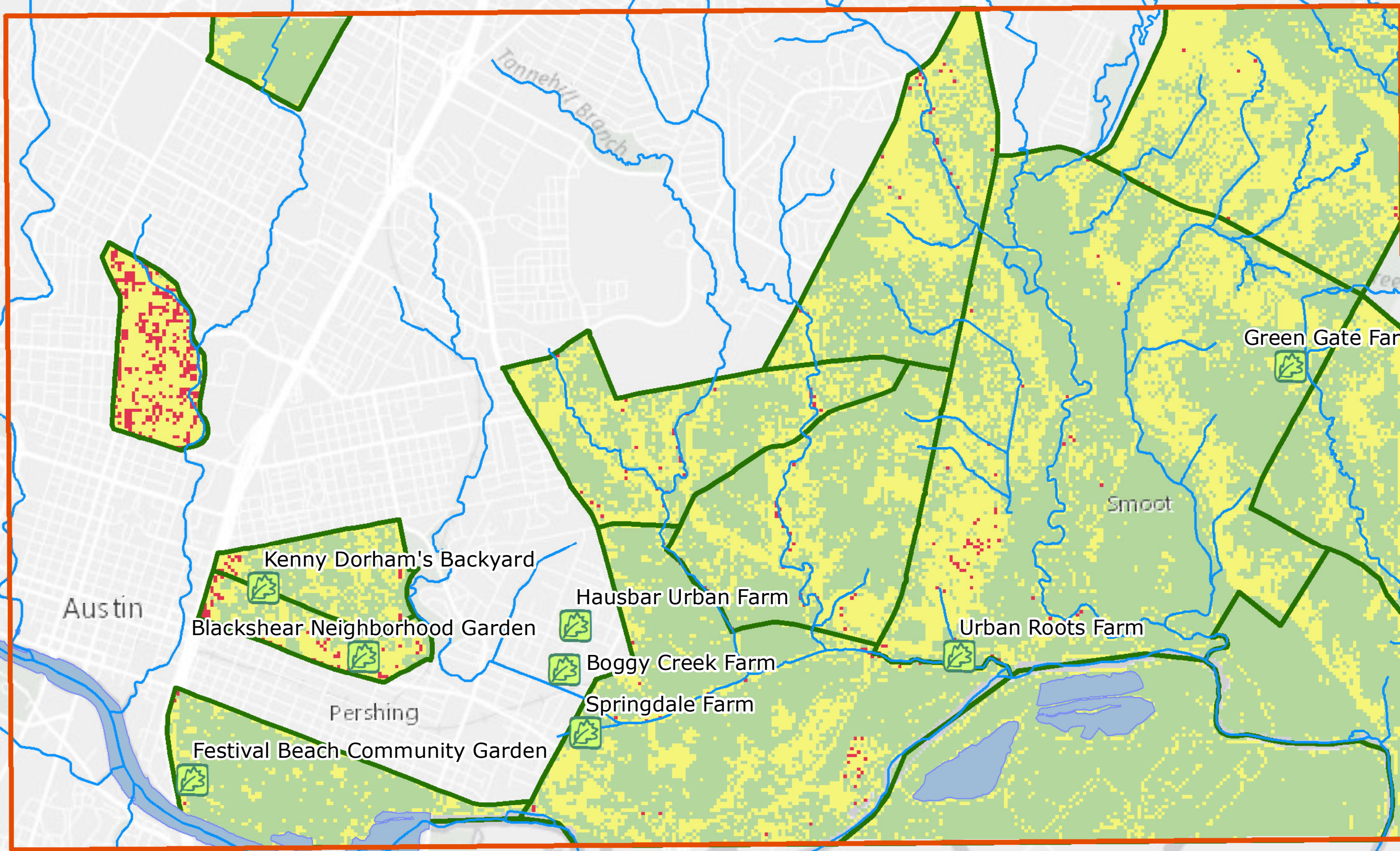
Appendix

Statistics								
	Rowid	VALUE	COUNT	% OF TOTAL COUNT	AOI AREA (m^2)	RANK	DESCRIPTION	AREA OF VALUE (m^2)
SLOPE	0	1	6606132	65.80%	8391002.037	1	<10 deg	5521354.29
	1	2	2707305	26.97%		2	10- 30	2262744.69
	2	3	554689	5.53%		3	30-50	463604.80
	3	4	171452	1.71%		4	50-90	143298.26
FLOOD ZONES	1	X	95542	96.19%		1	X type	8071413.20
	2	A	152	0.15%		2	A	12841.00
	3	AE	3613	3.64%		3	AE	305227.19
	4	AO	18	0.02%		4	AO	1520.64
IMPERVIOUSNESS	0	1	58310	58.71%		1	0-25% coverage, Best	4926143.28
	1	2	12795	12.88%		2	26-50	1080946.72
	2	3	14117	14.21%		3	51-75	1192631.88
	3	4	14101	14.20%		4	76-100%, Worst	1191280.16
SUITABILITY (AOI)	0	1	54578	56.06%		1	Best	4704353.50
	1	2	39776	40.86%		2	2nd best	3428494.36
	2	3	2988	3.07%		3	3rd best	257550.81
	3	4	7	0.01%		4	Worst	603.37
SUITABILITY (Food Deserts)	1	1	34450	64.14%	49275576.48	1	High suitability	31606315.69
	2	2	18632	34.69%		2	Med	17094016.66
	3	3	627	1.17%		3	Low	575244.12

Statistics table showing percent of total area for each raster rank.

Urban Garden Placement Suitability Map within East Austin, SE and SW Quarter Quadrangles, Austin, Travis County, TX



N

0 1 2 4 Kilometers

0 1 2 Miles

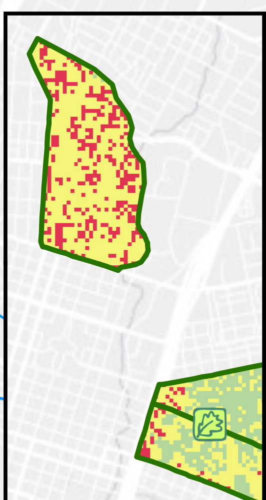
1:64,000

Explanation

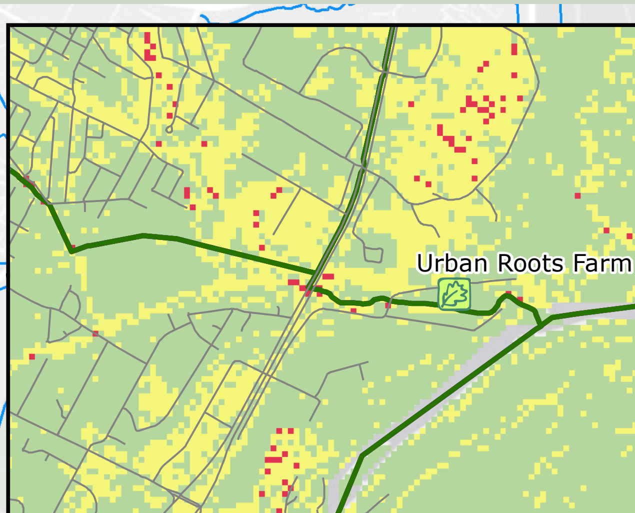
Urban Garden Location	Locations	Areas of Interest	Waterbodies
High Suitability	Urban Garden	Food Desert	Open Water
Medium Suitability	Street	Austin Eastside	River
Low suitability			

Suitability map shows areas that trend towards medium to low suitability in majority. Left: The University of Texas census tract (upper left, 601) is nearly all medium-low suitability; Tract 804 (lower right) shows similar clustering near western side. Right: Other areas showing clustering of med-low suitability nearest major roads and existing urbanized areas.

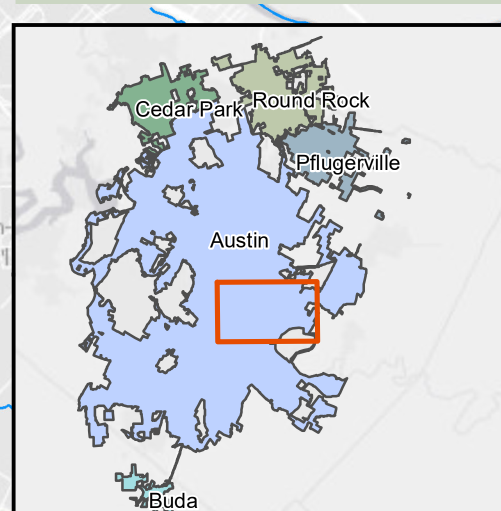
Austin Eastside AOI (red box) shown in relation to nearby urban centers (colored polygons) of Central TX (from US Census Bureau).



0 0.25 0.5 Miles



0 0.5 1 Miles



NAD83 UTM Zone14N
Source: USGS, ESRI, TNRIS, US Census Bureau, Garner and Young, FEMA, USDA

Land Suitability Analysis and Process Model

Coordinate System:
NAD83 UTM Zone 14N

CRITERIA:

1. Low slope
2. <25 percent hard surface
3. not in a flood hazard zone
4. within a Food Desert zone
5. On "soil-favorable" bedrock

Questions:
1. Where are the suitable locations compared to existing urban gardens?

LEGEND