Final Project: Mapping Local Food Production Capacity in Alachua County

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Background:

It is no surprise that most people have become accustomed to acquiring whatever produce they wish any time of the year. Thanks to the flourishing industry of the supermarket, every type of food from anywhere in the world is readily available to the consumer. It has been calculated that the average "fresh" food item travels between 1500 and 2500 miles before it reaches a house in North America. The American dependency on global food has increased causing food to travel 25 percent farther that it did twenty years ago.

What most people do not realize is the consequences of this traveling food phenomenon. It now costs around ten calories of fossil fuel for every calorie of energy a person receives from the consumption of food purchased at the supermarket. With the rising awareness of global warming, it should be noted that the nationwide trucking of produce is responsible for a significant portion of the fuel emissions. The food flown into a country generates an even larger emission factor. As Jane Goodall states in *The Myth of "Fresh Food"*, a traditional Sunday meal in Great Britain made from imported ingredients causes nearly 650 times more carbon dioxide emissions as the same meal made from locally grown ingredients. If the produce came with papers listing the date it was picked and all people that have handled it between then and its arrival to the supermarket, the average person may not be so accepting of this trend. They also may be surprised to find out that many of our fresh produce items have been genetically modified to stay fresh longer or to intensify its color to be more appealing to the customer while the nutritional value suffers[1] (Goodall, 2005).

Is there a solution to this dependency on gas guzzling foods? How about the increase in the local food system? One study found that no matter what currency is used, when it's spent on local foods the amount of income generated in the community doubles what it would be when spent on the same item from a supermarket[1]. According to the United States Department of Agriculture (USDA) it has been estimated that the average American spends $3,832 a year or 10% of their disposable income on food. Ed Brown, author of "A Riper Opportunity for Creating a Local Food System," estimated that Alachua County residents spend around $925 million on

[1] Goodall, J. (2005). *Harvest for Hope: A Guide for Mindful Eating.* Warner Wellness.

food every year. Imagine how much revenue the county could be generating if this was all spent on local produce[2]! A local food system reduces the impact on the environment, creates jobs and protects the community from spikes in the price of food and energy. It will also ensure that the food is both safe and nutritional while creating a positive impact on the local economy.

Objective and Criteria:

The objective of this project is to find land that can be used for farming which will increase the local food production capacity in Alachua County. For the purpose of this assignment the only lands that were considered are publicly owned or owned by tax-exempt non profit organizations such as cultural, educational, health or religious institutions.

Methodology:

GIS was used to develop a map of available land in Alachua County that can be used to grow produce such as fruits and vegetables. The methodology used to create this map was broken down into three goals:

- *Goal A: Identify usable land*
- *Goal B: Assess their viability for food production*
- *Goal C: Assess their production capacity as it relates to local population needs*

In order to reach each goal a set of criteria was developed to narrow down the available data to what was needed for this project. A flow chart for each goal was developed and is shown below.

[2] Brown, E. (n.d.). *A Riper Opportunity for Creating a Local Food System.*

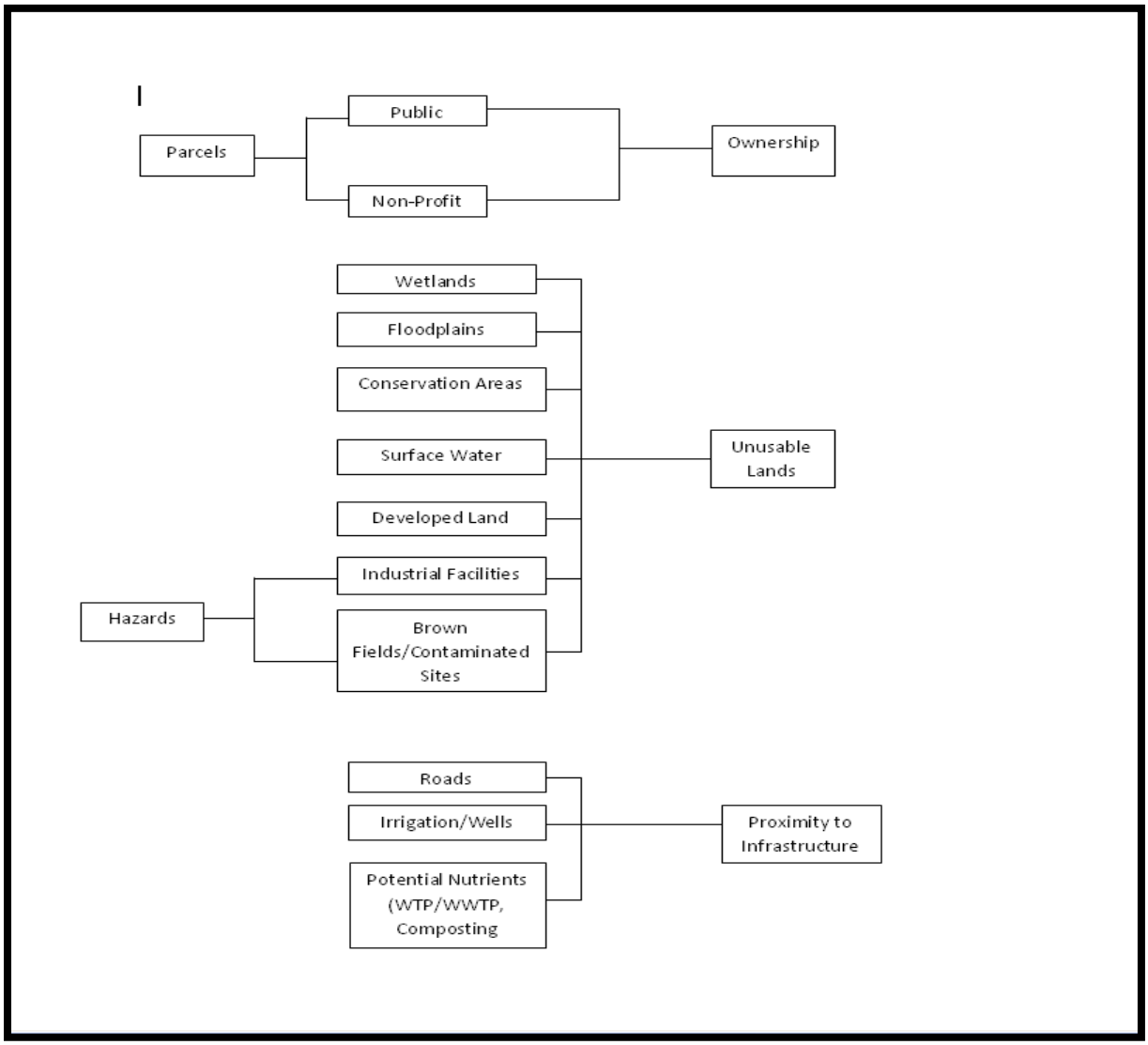

Figure 1: Goal A Flowchart

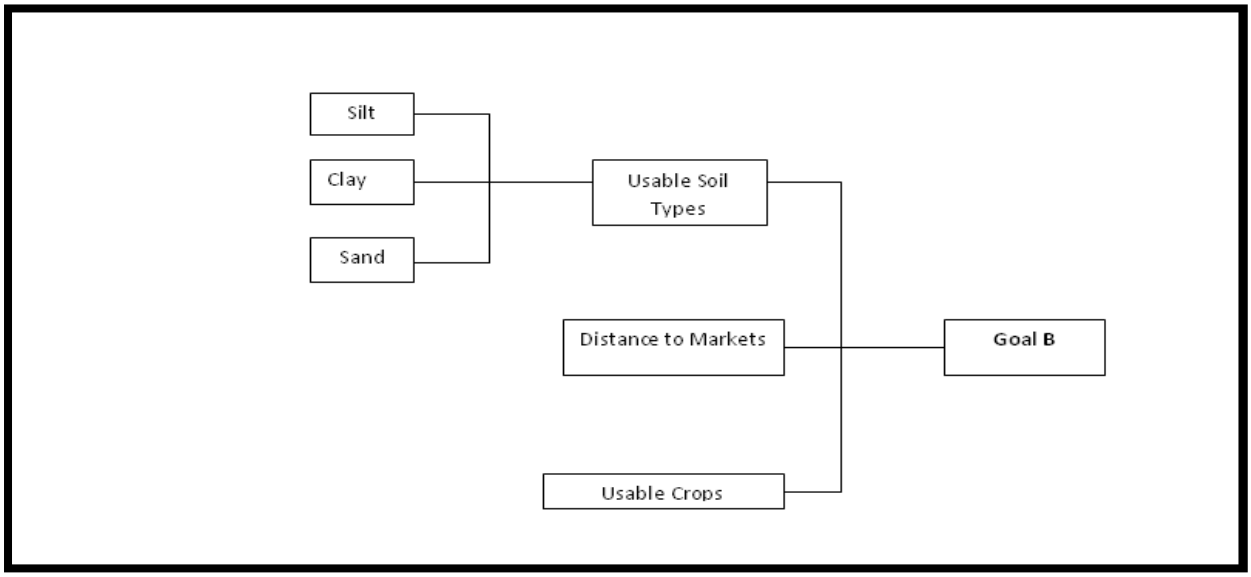

Figure 2: Goal B Flowchart

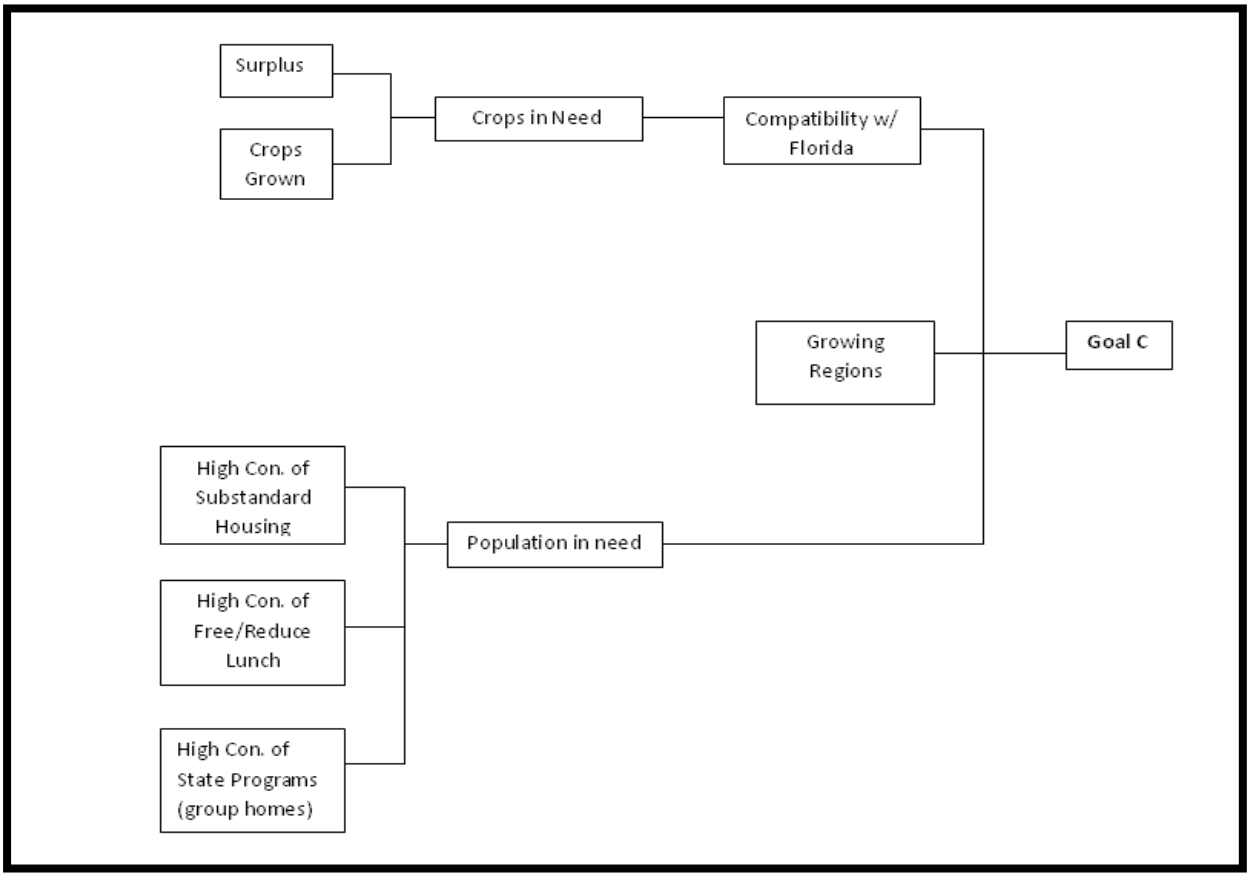

Figure 3: Goal C Flowchart

Goal A: Identifying usable lands for food production in Alachua County

The primary goal of Objective A was to exclude all lands that would not prove to be viable agricultural lands. The parameters that were chosen to use as acceptable public lands were those that were not within a lake, floodplain or within 200 meters of hazardous or solid waste site, or a Super Fund site or Brownfield.

Initially, to achieve this, selections were made by location from the Public Lands layer available in ArcGIS. From these selections layers were created for each of the parameters outlined above in the Goal A flowchart. However, this did not prove fruitful, due to the fact that an attempt was being made to exclude the lands that fit these parameters and not include them. To exclude these, the "switch selection" tool was utilized from Arc Toolbox.

Out of these original 407 designated public land parcels, 70 were deemed usable after the series of selections and exclusions had been made. Furthermore, 33 of these usable land areas were developed and 37 were not. The total acreage of the undeveloped, usable sites at

this point totals to 961 acres. Figure 4 represents all the undeveloped areas shown in green (37 parcels) and the usable lands that meet the criteria set out for goal A (blue parcels).

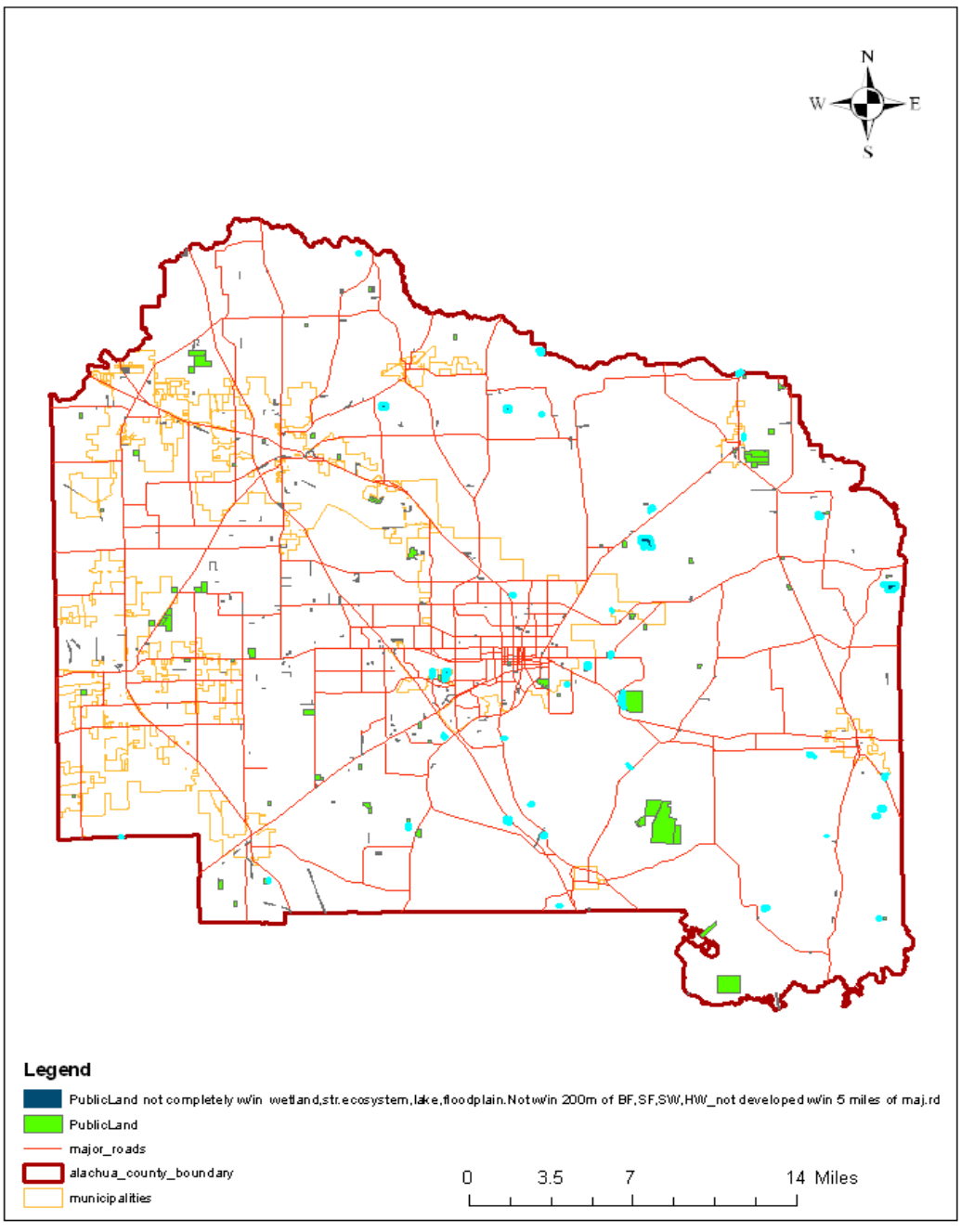

Figure 4: Usable lands for local food production in Alachua County

Goal B: Assessing the viability of food production in Alachua County

In order to assess the viability of food production in Alachua County information on the types of soil, location of existing markets, and historically grown crops were considered. The Florida Geographic Data Library (FGDL) was utilized in order to gain information on the various soil types that make up the 961 square miles of land in the county. Due to the nature of this project, our team wanted to focus on land that was suitable for crop production. The effectiveness of crop production is going to be dependent on the pattern of drainage, soil quality, growing season, moisture supply, slope, and kinds of crops/native plants in the area (Alachua County Soil Survey). There are two distinctive groups of crops that can be grown in Alachua, field crops and special crops. Examples of field crops include corn, soybeans, peanuts, and potatoes. Special crops include watermelons, snapbeans, citrus, pecans, and blackberries. Soil is made up of three classes: sand, silt, and clay. It is not uncommon for a particular region to have a combination of one or more of the mentioned soil types. In Alachua County the soil type that is most suitable for agriculture purposes are the Norfolk loamy fine sand (2 to 5 % slopes), Norfolk loamy fine sand (5 to 8% slopes) and the Micanopy loamy fine sand (2 to 5 % slopes). The soil types are named based on the region that they are found within Alachua County.

Figure 5 shows an overview of the soil types in Alachua County. Parcel selection will be based on land that closely meets the condition for prime farmland. According to the Alachua County Soil Survey (1978), prime farmland is defined as land that is best suited for producing forage, fiber, oilseed crops and most importantly food. In addition, prime farmland areas have the appropriate growing season, soil quality, and moisture supply resulting in high yields and minimal energy input (Alachua County Soil Survey, 1978).

Another component examined for this project is locating the existing markets in Alachua County. This parameter was included because it is important to assess the locations of the current local food market. The selections of potentials parcels will be influenced based on where these existing markets are. Currently, there are 7 existing farmer's markets in Alachua – Alachua County Farmer's Market, Butler Plaza Satellite Market, Haile Plantation Farmer's Market, High Springs Farmer's Market, Shortland Traveling Farmer's Market Co-op, and Union

Street Farmer's Market. Although the locations of these existing markets may change in the future due to unforeseen reasons, it is still imperative to know what areas of Alachua County have access to these markets and where improvements need to be made.

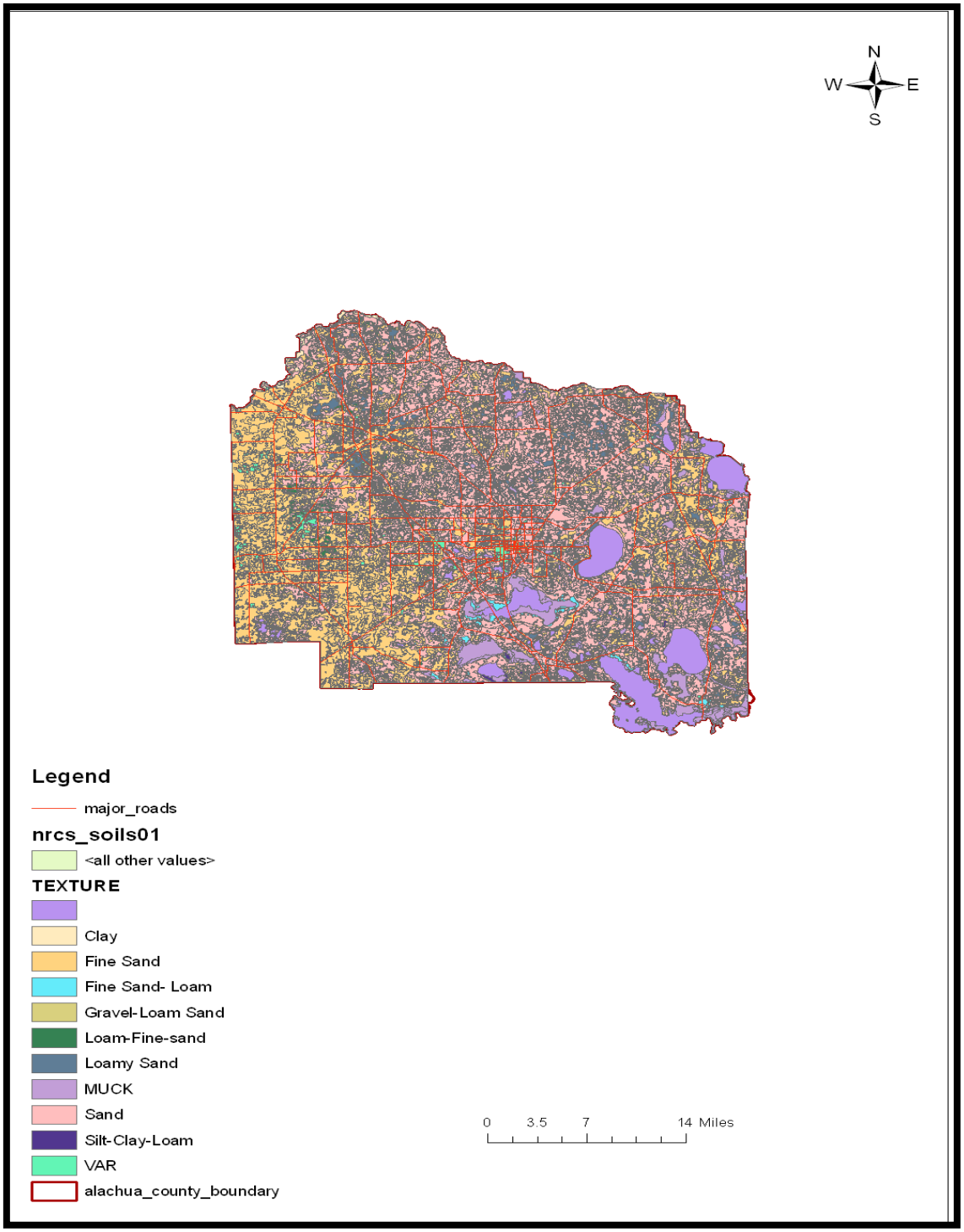

Figure 5: Production Capacity in Alachua County: Soil Overview

Goal C: Assessing food production in Alachua County as it relates to local population needs

To complete assessing the capacity of the lands selected for food production relating to local population need (Goal C) the locations of areas in Alachua County deemed "in need" were determined. The rational for this being that a local food production area could benefit low income areas and provide them with healthy food at an affordable price. To locate low income areas in Alachua County our team first assessed the layers and attribute table data given in ArcGIS. We decided to use substandard housing, free and reduced lunch schools, assisted rentals, and group homes for consideration. Selections were made of high substandard housing (worst quality) in high density substandard housing areas (> 31 substandard high parcels), high percentage free/reduced lunch schools (over 44% students) in high density free/reduced lunch school areas (ranked high lunch aid in feature attribute table). Group homes and assisted rental housing within 10 miles of the previously created selection layers were then selected. The four layers created through this process were then overlaid with the map of usable lands from Goal A to asses the best location for the farmland. A map created with selections from Goal C can be seen below (Figure 6).

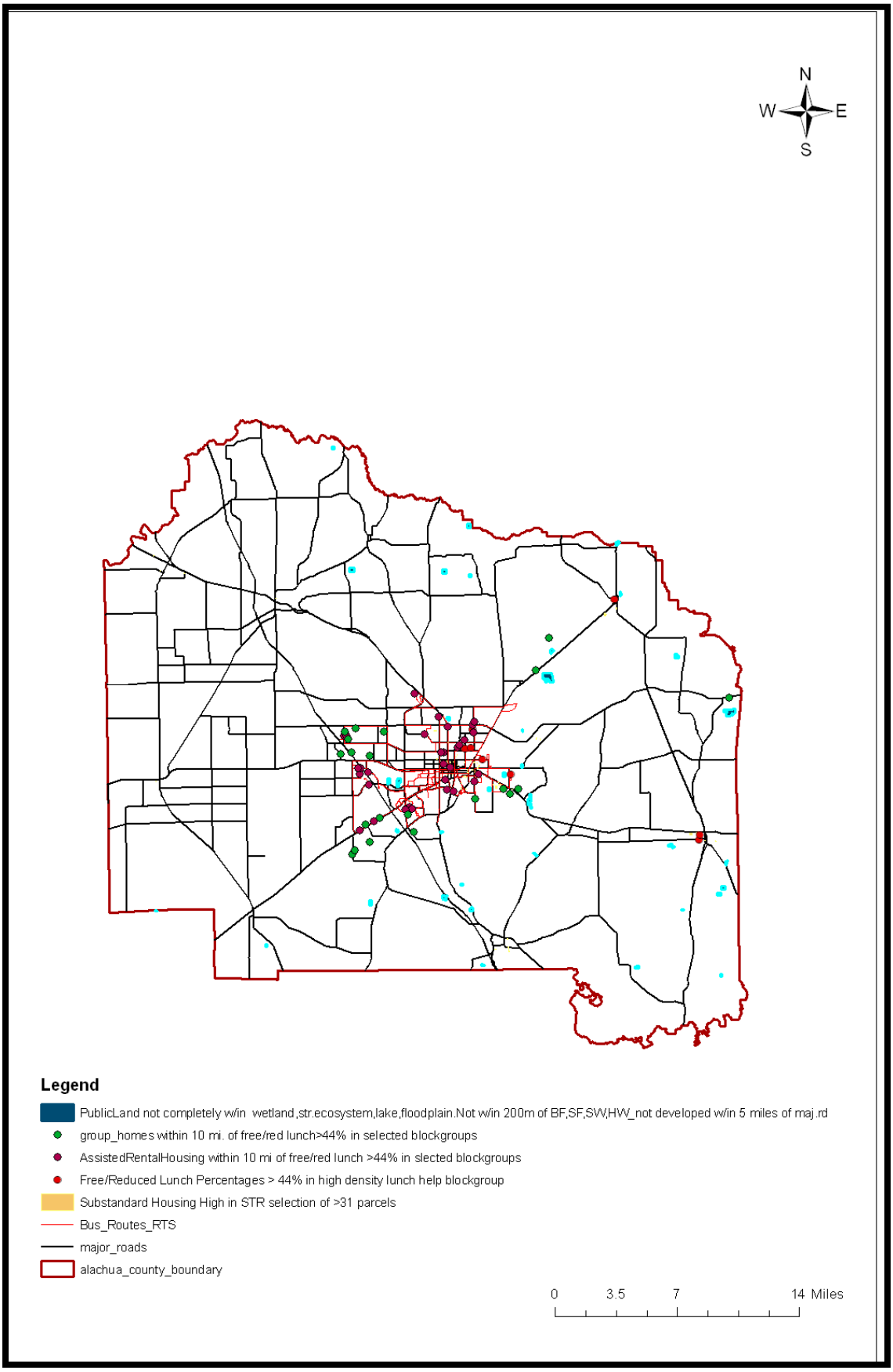

Figure 6: Viability of food Production in Alachua Count

Another part of Goal C was determining which crops are already grown in Alachua County and which crops can be feasibly grown in Alachua County, this would determine which crops it would be best to grow. Using a USDA document titled Florida-Agriculture, Alachua County we found a list of crops grown in Alachua County with the acreage allotted to each crop (data taken from 2002-2006). The crops with the highest amount of land allotted for their production are as follows (excluding land for animal growth or greenhouses):

Table 1: Crops grown in Alachua and respective acreage

Crop	Land Allotted in Alachua County[3] (acres)
Peanuts	6,400
Field Corn	5,800
Snap Beans	2,637
Pecans	1,854
Watermelons	1,636

The data above is only meant to give a rough estimate of Alachua Counties existing crop growth, but was used to select crops to grow on selected lands. The crops compatibility with North Florida weather and soil types was then also determined using a crops field guide published by Institute of Food and Agricultural Sciences at the University of Florida. According to this guide Alachua County is considered North Florida (north SR 40). Crops selected Include:

Table 2: Assessing Crop Production in Alachua County

Crop	Planting Dates for North Fl.[1]	Days to Harvest[4]	Already Grown in Alachua Co?[3]
Broccoli	Aug-Feb	75-90	No
Mustard	Sept-May	40-60	No
Sweet Potatoes	Mar-June	120-140	No
Tomatoes, Stake	Feb-April	99-110	No
Lima Beans	Mar-Aug	65-75	No
Beets	Sept-Mar	50-65	No
Carrots	Sept-Mar	65-80	No
Onions, Bulbing	Sept-Dec	120-160	No
Peppers	Feb-Apr, Jul-Aug	80-100	No
Strawberries	Oct-Nov	90-110	Yes
Peas, English	Jan-Mar	50-70	No

[3] Florida Department of Agriculture and Consumer Services. (2004). Florida Counties- Alachua County: Marketing Florida Agriculture. Retrieved November 13, 2009, from: http://www.florida-agriculture.com/assessment_by_county/alachua_county.htm

Results

Goal A yielded thirty seven undeveloped public lands which gave a total of 961.8 acres that can potentially be used for crop production. A plot of land as small as 15'x 15' can support one family. Based upon this, the available public lands suitable for agricultural production have the potential to support up to 186,215 families. This could greatly increase the local food production in Alachua County and potentially boost the local economy. When incorporating Goal B and C it became obvious that certain areas demonstrated a higher need of a food source than others. Six parcels were chosen as the top choices based on their location and size (Figure 7).

Parcel FID 39762 and 5987 were chosen based on their size. FID 39762 had an area of 162.78 acres which could feed over 32,000 families. FID 5987 had an area of 119.23 acres which could support over 23,800 families. By using only these two plots a large amount of crops can be produced and over 55,800 families could benefit. Small farms have been noted to produce around $1400 worth of food per acre which could add almost $400,000 to the local economy! These parcels are also near group homes and assisted rental housing that are within 10 miles of a high density lunch aid area with a large percentage of participants in the lunch aid programs. Although these parcels are farther away from Gainesville the land is near major roads so it can be easily by picked up and transported to other locations. FID 5987 is 16.3 miles away from the center of Gainesville while FID 39762 is only 8.35 miles away so travel time is still fairly minimal.

Parcel FID 77919 and FID 50725 are treated as one large area since the two plots are adjacent to each other. These plots were chosen based upon being located in Gainesville and in close proximity to many of the group homes with a high percentage of participants in the lunch aid program. FID 77919 has 26.97 acres available and FID 50725 has 61.413 acres available, rendering a total area of 88.38 acres. Crops could be grown by the residents of the surrounding areas as there is a high density of low income group homes in need of food. The parcels are also near major roads and a water source.

Parcel FID 27667 was also chosen for its proximity to those who could benefit the most from producing their own food. The land is surrounded by assisted rental housing with a large

percent of participants in the lunch aid program. There are 16.52 acres available which can feed over 3300 families and again, the area is near a major road so transportation to other areas can be easily done. The land is also mixed in with a compatible loamy soil which is good for the growth of certain crops.

The final plot that is recommended for use is FID 22687 since it is located in an area that closely resembles prime farmland conditions and it is near a water source. In addition, this plot is 20.01 acres in size and due to the fact that it has a slightly different composition of soil, it has the potential to support other crops that other soils can not. This will add more diversity to the crops produced in the area and since it is near a major road and only 6.67 miles away from many of the group and assisted housing needing lunch aid, the crops can be easily transported to other locations. Table 3 gives a comparison of the six selected parcels for mapping food production in Alachua County.

Table 3: Mapping Food Production in Alachua County- Summary of selected Parcels

Parcel	**Acreage**	**# of Families Supported**	**Reason Chosen**
39762	162.78	31514	Size
5987	119.23	23083	Size
77919	26.97	5221	Group Homes
50725	61.41	11890	Group Homes
27667	16.52	3198	Assisted Housing
22687	20.01	3874	Soil Type

Conclusion and Recommendations

In conclusion, lands selected for food production were based on usable lands (public, non floodplain, non superfund, etc), the viability of food production for those areas, and proximity to local areas where production would be beneficial. Crops were selected based on what is known to be grown in Alachua County and what can be grown in north Florida. Six crops selected were known to have planting times in the fall months, and four crops selected which are advisable to be planted in the late winter/spring months. It is recommended that crops be rotated biannually as to keep production flowing. It is also recommended that, after the first harvest, assessments be made of the success of the area, if yield is lacking alternative crops could be substituted for experimentation, soil amendments can be added, and planting times can be adjusted as shown below in Table 4.

Table 4: Pounds yielded per acre for specified crops

Crop	Planting Dates for North Fl.[4]	Pounds Yielded Per Acre
Broccoli	Aug-Feb	7,300
Mustard	Sept-May	14,000
Sweet Potatoes	Mar-June	6,000
Tomatoes, Stake	Feb-April	8,900
Lima Beans	Mar-Aug	1,400
Beets	Sept-Mar	10,800
Carrots	Sept-Mar	19,400
Onions, Bulbing	Sept-Dec	19,800
Peppers	Feb-Apr, Jul-Aug	6,900
Strawberries	Oct-Nov	29,000
Peas, English	Jan-Mar	2,200

Taking into account both the planting dates for North Florida and the days to harvest, the chosen crops have been divided into three groupings to maximize crop yields.

The Grouping 1 is to be comprised of broccoli, strawberries and tomatoes. When rotated throughout the year, this combination could potentially yield 16,229 pounds of food per acre.

[4] University of Florida: Institute of Food and Agricultural Sciences. (2009). *Florida Vegetable Gardening Guide.* Retrieved November 10, 2009, from: http://edis.ifas.ufl.edu/vh021#TABLE_3

Grouping 2 is comprised of carrots, onions and sweet potatoes. This is the most productive grouping which stands to produce 45,200 pounds of food per acre with proper rotation. Grouping 3 consists of peas, peppers, lima beans, beets and mustard greens. This group has the potential to produce 35,300 pounds of food per acre. To maximize both food production per acre while still maintaining crop diversity, the two largest parcels FID 39762 (162.78 acres in area) and FID 5987 (119.23 acres in area) will be assigned those crops in Grouping 2 and the next two largest parcels FID 77919 (26.97 acres) and FID 50725 (61.413 acres) will be assigned Grouping 3 as it is the most diverse. The remaining smaller parcels, FID 27667 (16.52 acres) and FID 22687 (20.01 acres) will be utilized for Grouping 1. Using this formation, the potential crop yield stands to be 8228 tons of food. This is also the highest yielding combination of crop groupings to parcel allotment.