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EXECUTIVE SUMMARY

Land fragmentation caused by unplanned development beyond city limits due to sustained rapid population growth is impacting the livelihood of agricultural production in Central Texas. The zone of conflict between urban growth and the natural environment is referred to as the peri-urban interface. While these peri-urban regions are influenced by and act as extensions of urban spaces, they are not institutionalized into the urban landscape. Within these regions are networks of biologically diverse farms located at the edge of an urban space. These farms depend on the proximity of urban markets for economic opportunities, materials and labor. Unfortunately though, they are also negatively impacted by urban growth which causes land fragmentation and increased property taxes. The position of these farms tied to and yet fettered by the urban market places them in a unique situation to attempt to meet a community’s agricultural needs.

This study analyzes the role of peri-urban farms in a growing global agriculture market by examining the production capacity of five counties in Central Texas to meet the fruit and vegetable needs of area residents. The five counties include Caldwell, Bastrop, Travis, Hays and Williamson.

Examination of existing cropland in Central Texas reflects the rich agricultural history of the state. While the majority of land is reserved for pasture land, over 54,000 acres are potentially available for fruit and vegetable cultivation. This acreage is more than sufficient to meet current fruit and vegetable consumption estimates of area households. The results of this project provide a strong basis for future exploration of the role and value of urban agriculture in sustaining an adjacent community.
INTRODUCTION

Within the field of agriculture lingers a debate regarding the role of urban agriculture given the increasing world population and trends toward a global agricultural market. Urban agriculture refers to a vulnerable subgroup of the agriculture industry with limited production capacity and therefore limited ability to meet export demands for commodity crops. At one end of the conflict is an argument for the return to localized agricultural markets that depend on peri-urban family farms, drawing on the notion that area farms are an essential aspect of the economic and environmental vitality and health of a community. As an essential part of a community, the question lingers as to what extent peri-urban farms can meet the food needs of a community.

At the fringe of the built landscape exists a transitional zone of tension between urban development and the natural environment. While traditional perceptions of agriculture and rural cling to memories of an idyllic agrarian lifestyle far from the city center, this image is being challenged by a shift toward placement of farming at the margins of urban centers (Dixon, 2003). These peri-urban regions maintain a precarious relationship with the built environment because they are engaged and fettered by the urban landscape yet are not situated within the confines of the formal urbanized area. “The peri-urban interface is characterized by strong urban influences, easy access to markets, services and other inputs, ready supplies of labor, but relative shortages of land and risks from pollution and urban growth (McGregor, 2006).” Situated within this interface is an evolving urban agriculture network that consists of small to medium sized farms of 500 acres or less that are dependent upon the local retail market. While the term urban agriculture implies a certain proximity to the built landscape no metric has been defined to differentiate urban from rural. The plight of farms within this interface, subjected to and reliant upon nearby urban centers, distinguishes these farms from traditional perceptions of rural.

Farmland in the peri-urban interface is vulnerable to potentially detrimental elements yet it also is able to derive myriad benefits from the nearby community. Access to urban markets provides economic opportunities for these farms yet leaves them subject to inflated land values and utility costs (Grigg, 1995). Farm stands and community supported agriculture (CSAs) are viable retail options for farms within the peri-urban interface since customers can easily access the farm. This thereby also increases awareness about where food comes from and the importance of agriculture. Proximity to urban areas also offers easy access to materials and potential labor for farms (McGregor, 2006). Since urban agriculture consists of smaller farms, proximity to resources and capital is of the utmost importance because it reduces travel and time costs.

Accessibility of the city center can also harm these farms as a result of fragmentation caused by the encroachment of urban development on open spaces surrounding the city center. Urban sprawl can lead to land fragmentation which reduces farm size, production capacity and wildlife conservation since it divides parcels into smaller subsets. Fragmentation stems from high property taxes and rent due to increased land values caused by nearby development. High property values can lead to under and over utilization of farmland since it a sign eventual farm loss (Grigg, 1995). Farmers may cease to input time
INTRODUCTION

or resource into the land knowing that they will receive a higher profit from sale of the land. Conversely, fields may be farmed so intensely as to stress the land in hopes of receipt of a profit from a final harvest. In addition to the loss of land, farms in the peri-urban interface also face a loss of labor to the urban job market (Grigg, 1995). While the urban center is a source of labor it is also a drain on the labor pool since many workers hope to find better paying jobs within the city center. The fragility of urban agriculture due to its location calls into question the ability of these farms to sustainably meet the food needs of area residents.

To rely strictly on the vitality of proximate farms to ensure the food needs of community residents is damaging since this subsector cannot exist as a substitute for large-scale, monoculture production. The duality between urban and traditional agriculture production is such that both systems are necessary (Allen, 1999). Small to medium sized farms are unable to grow sufficient quantities of certain crops, like grains, to profit due to land availability constraints. These farms area also unable to grow the volume of produce necessary to offer produce at a price that would be affordable for lower-income households. A mix of farm sizes is necessary in order to fully meet the food needs of a community. Acceptance of this dualism requires reassessment of the spatial boundaries of a community’s foodshed.

The spatial bounds of a community’s foodshed are often difficult to determine. The peri-urban interface serves as one means to define this spatial limitation. Given the proximity of this zone to the city center, urban agriculture plays an important role in meeting the food needs of area households however, the impact of these operations is often difficult to gauge. Two studies in particular have attempted to gauge this impact by measuring the potential for the expansion of urban agriculture. *Cultivating the Commons: An Assessment of the Potential for Urban Agriculture on Oakland’s Public Land* examined the availability of public parcels in Oakland for agricultural production (McClintock, 2009). This study compared county tax assessor data of individual parcels with environmental sites conditions, like slope and resource availability, as well as potential land use. Outcomes from this analysis included an inventory of public lands suitable for agricultural use as well as an assessment of zoning regulations impacting agricultural use.

A slightly different approach, *Think Globally ~ Eat Locally* assesses the cultivation capacity of the Bay Area by comparing national consumption patterns and historic agricultural yields to existing agricultural land resources (Thompson, 2008). This measure provides an indication of the agricultural acreage needs of the region. Results of this study include opportunities for local agriculture expansion as well as a debate over the most effective order of activities for growing the local food system: education and awareness then farm expansion or vice versa. Gleaning parameters from both of these studies, this project attempts to evaluate the cultivation capacity of Central Texas.
**Problem Statement**

Texas is a rich agricultural state which specializes in the production of corn, cotton and cattle. Like the rest of the state, Central Texas too concentrates on the production of corn and cotton, as well as hay, sorghum, and wheat. The majority of land in the five counties of Central Texas is used for agricultural production. In Bastrop, Caldwell, Hays and Williamson counties, over half of the land is used for either crop or pasture land, the dominant use being pasture land. Pasture land is the second highest land use behind urban development for Travis County. Of the 2.7 million acres that comprise the five counties, 492,459 acres or 18% is devoted to cropland. Less than 1%, .02% is devoted to vegetable production. Fruit and vegetable production are on a scale so nominal that it does not register with the Census of Agriculture. This production is mainly reserved for farms under 250 acres in size.

The livelihood of small to medium sized farms is in jeopardy though due to development pressures. Since 1997, over 40% of farm and ranch land in 25 counties in Texas has been converted to uses other than agriculture (Texas Trends, 2009). This area includes the Austin-Round Rock MSA which experienced a 3.8% increase in population last year. Williamson and Hays counties ranked sixth and tenth, respectively, of the fastest growing counties in the nation (US Census, 2009). Williamson County has the greatest proportion of agricultural land. Fragmentation though is reducing the ability of urban agriculture to meet the food needs of the nearby population.

![Figure 1: Land Area by Use](source: U.S. Census of Agriculture)
RESEARCH QUESTIONS

The dispute over the role of urban farms within a global agricultural market begs questions about whether a community is able to meet its food needs from food grown solely within the surrounding foodshed. This project is therefore premised on the questions:

- To what extent are farmers and ranchers able to meet federally defined nutrition requirements for residents within a defined foodshed?
- What is the potential for expansion of local food production?

In other words, it is examining the production capacity of farmland in five counties in Central Texas to assess the extent to which area farms are able to meet the fruit and vegetable needs of area residents as an indication of the value of peri-urban farms in a growing global food system.

Peri-urban farms include all parcels of 500 acres or less coded as qualified agricultural land use within five counties in Central Texas. The geographic area of the foodshed is defined by the politically recognized spatial boundaries for Bastrop, Caldwell, Hays, Travis and Williamson counties. Regional farm production is measured by tons of fruits and vegetables harvested with respect to state production levels as indicated by the 2007 Census of Agriculture. Nutrition requirements for residents of the Austin-Round Rock MSA are based on fruit and vegetable intake as measured by the USDA Economic Research Service Loss Adjusted Food Availability data for 2007.
METHODOLOGY

A multifaceted land suitability analysis was conducted to evaluate current and potential cultivation capacity given a defined set of environmental constraints. The project was divided into four steps:

1. Derive a baseline for consumption and production levels based on Census of Agriculture and USDA Food Pyramid Servings data.
2. Identify and isolate existing agricultural land, all parcels labeled for qualified agricultural use including farms, CSAs and community gardens.
3. Identify potential agricultural land based on categorization as vacant land and non-qualified agricultural use.
4. Analyze vacant parcels for agricultural suitability based on proximity to water, well and park and distance from road, railroad landfill and cultural site.

The model utilized to determine a measurement of annual consumption and production levels for Central Texas was derived from a similar study of the San Francisco Foodshed. *Think Globally ~ Eat Locally* utilized consumption estimates from the USDA Economic Research Service and crop yields from the County Agriculture Commissioner Report as an indication of production needs. For this project, statistical information on fruit and vegetable production was gathered from the Census of Agriculture for 2007. Since information for fruit and vegetable production for the five counties is unavailable, production estimates are based on total state yields of crops known to grow in this region. Table 1.1 shows production yields for Texas.

Data on fruit and vegetable consumption was gleaned from the San Francisco Foodshed Assessment report since the report relied on national data from the USDA Economic Research Service on Loss-Adjusted Food Availability. Also known as the Food Guide Pyramid Servings Data, this information reflects total food ingested in the U.S. minus loss due to spoilage, meal leftovers and inedible food parts. The data gleaned from the report was adapted to reflect consumption of only fruits and vegetables that are cultivated regionally. Table 1.2 show national per capita consumption estimates adapted for Central Texas. The per capita consumption estimates were then applied to current and projected population figures for 2020 and 2030 for the five county region. Population projections from the Texas State Data Center are based on Scenario 0.5 estimates. Scenario 0.5 is recommended by the center as the most reliable future estimate given historic growth rates, census counting errors and limited migration data. The production and consumption estimates were then compared with potentially available agricultural land to indicate production capacity in Central Texas.

An inventory of existing urban farms, Community Supported Agriculture (CSAs), farmers’ markets and community gardens was conducted as an indication of the Central Texas Foodshed. This information was gathered from an internet search of Local Harvest, the Austin, River Valley, Sunset Valley, South Austin and Bastrop 1832 farmers’ aarkets, as well as the Georgetown, Taylor Area and San Marcos/New Braunfels farmers’ market associations.
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<th>Planted (acres)</th>
<th>Harvested (acres)</th>
<th>Yield per acre harvested (hundred-weight)</th>
<th>Total Production (thousand hundred-weight)</th>
<th>Total Production (tons)</th>
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*source: Census of Agriculture*
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Methodology

Spatial data for this project was collected from the Capital Area Council of Governments (CAPCOG), General Land Office and USDA Natural Resources Conservation Service Geospatial Database. The following shapefiles were collected from each source:

Capital Area Council of Governments:
- County Boundaries
- Hydrography
- Land Fragmentation 2008
- Landfills
- Regional Roads
- Railroads
- Wells

General Land Office:
- State Parks/Wildlife Management Areas

USDA Natural Resources Conservation Service Geospatial Data Gateway:
- Digital Raster Graphic County Mosaic
- Non-Populated Places
- Soil Survey

The crux of this project is the identification of agricultural land based on land use. Land use information was derived from the CAPCOG Land Fragmentation 2008 shapefiles for Bastrop, Caldwell, Hays, Travis and Williamson counties. These files are identical to the Parcels 2008 shapefiles and contain information on the classification of vacant parcels based on Texas State Land Use code and appraised improvement value. Vacant land includes all parcels coded either C for Real Property: Vacant Lots, D1 for Real Property: Qualified Agricultural Land, D2, 3 or 4 for Real Property: Non-qualified land or E for Real Property: Farm and Ranch Improvements and with an improvement value of $0.05 or less per sq. ft.

While CAPCOG categorizes the majority of agriculturally coded parcels as vacant, this project assumed that all parcels identified as D1 represent operational farms and ranches. According to the Office of the Texas Comptroller, the land use code D1 represents “land that is currently and principally devoted to agricultural use to the degree of intensity typical for the area and has been used for agriculture or timber for at least five of the preceding seven years.” These parcels were selected as existing farmland.

Since the majority of farms in Central Texas grow commodity crops, like corn, wheat, and sorghum, this project assumes that all agriculturally qualified parcels also grow commodity crops. It excludes these sites from the land available for fruit and vegetable production because it assumes that these sites will continue to grow commodity crops. It would require a long term effort to transition these farms from feed to food production due to soil degradation, major operational adjustments, and agricultural subsidies. Depletion of soil fertility due to commodity crop cultivation and associated pesticide application would require years of remediation to grow a productive food crop without heavy reliance on fertilizers and other inputs. At a minimum, the transition from commodity crop to food crop production would require use of different machines, adjustment to a new crop cycle,
and use of different fertilizers. Additionally, national legislation supports the production of commodity crops over food production. Given these obstacles, this project seeks to identify vacant spaces that could be easily adapted for fruit and vegetable production.

Potential farmland includes all parcels identified as vacant by CAPCOG and coded as D2, 3 or 4: Non-qualified Agriculture. Essentially, these are areas that have no productivity value and do not meet the qualifications of other land use categories. While these areas might simply be fallow fields, they could also be brown or grayfields therefore, a suitability analysis is necessary to extract parcels located near environmentally sensitive or hazardous areas. For both existing and potential farmland, parcels labeled E1 were excluded because this category indicates an agricultural improvement like “all houses, barns, sheds, silos, garages and other improvements associated with farming or ranching. Land separated from a larger tract for residential purposes should be included as Category E property (Office of Texas State Comptroller).” Since this designation deals with built structures, it indicates that these parcels may not contain enough contiguous space for agricultural production.

In order to identify potential farmland suitable for cultivation, an analysis of the identified potential parcels was conducted based on a set of natural and built landscape criteria. Excluded from the potential farmland dataset are sites that do not overlap with soils identified by the USDA as prime for farm and ranchlands. Also excluded from the dataset are areas with a slope greater than 5%. Slope calculations were derived from the Digital Raster Graphic County Mosaic, elevation raster images, downloaded from the USDA Geospatial Data Gateway. Desirable agriculture parcels were identified as vacant, with a land use code of D2, 3 or 4, containing USDA defined prime farmland soil and with a grade of 5% or less were then subjected to a suitability analysis.

Weighted criteria for the suitability analysis were based on the presence and proximity to built or hazardous structures, like roads, railroads, landfills and historic sites, as well as natural amenities, like parks, wells and lakes. Since landfills and railroads both contain hazardous materials that can possibly contaminate agricultural lands, a higher weight was applied to these features. Preference was also given to agricultural sites located farther from roads and cultural sites. Trash and debris from roads can pollute fields so a safe distance from main roads is desirable. The cultural sites feature contains not only historic sites and cemeteries but also airfields, military bases and oilfields which is either sensitive or harmful to agricultural activity. The analysis also however, gave preference to proximity to wells, lakes, rivers and parks by assigning a lower weight to these criteria. Water is vital for a farm to function therefore access to a source of water is of utmost importance, especially in rural areas where municipal water is unavailable. Proximity to parks is also important since agricultural fields can act as an extension of the wildlife habitat preserved in these natural areas which contributes to a healthy ecosystem. Based on these criteria, a ranking of suitability was assigned to all desirable agriculture parcels. Those with a ranking of 9 or 10 were the prime locations for future agricultural activity.
**FINDINGS**

**Current Cultivation and Consumption**

While production levels for individual fruits and vegetables are not high enough to be counted by the Census of Agriculture, Central Texas does have a small network of local farms, farmers markets, farm stands, CSAs and community gardens which facilitate the cultivation of fruits and vegetable. In 2007, there were 77 registered farms growing fruits and vegetables for sale on 416 acres. Of those farms, none were larger than 250 acres. In addition to 77 farms, there were also 48 registered CSAs. As would be expected, most of these farms are clustered around urban areas. An internet search revealed a network of 17 farmers’ markets and ten farm stands. While the majority of community gardens are located within the Austin city limits, there are 28 community gardens in the five counties. Map 1.1 shows the location of these operations throughout the five counties. In 2007, the state of Texas, harvested a total of 141,200 tons of fruits and vegetables from 188,500 acres. On average, 8.43 tons of produce was harvested from each acre. This weight however varies based on crop harvested since chile peppers weigh less than watermelons. Given this average, the 77 farms in Central Texas are producing 3507 tons of food annually. This amount however, constitutes less than 1% (.76%) of the amount needed to meet fruit and vegetable consumption of area residents.

**Table 3: Farms Cultivating Fruits & Vegetables in Central Texas**

<table>
<thead>
<tr>
<th></th>
<th>Farms harvesting vegetables</th>
<th>Acres harvested</th>
<th>Farm Size (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>&gt;5</td>
</tr>
<tr>
<td>Bastrop</td>
<td>23</td>
<td>223</td>
<td>16</td>
</tr>
<tr>
<td>Caldwell</td>
<td>12</td>
<td>89</td>
<td>4</td>
</tr>
<tr>
<td>Hays</td>
<td>7</td>
<td>24</td>
<td>4</td>
</tr>
<tr>
<td>Travis</td>
<td>23</td>
<td>47</td>
<td>19</td>
</tr>
<tr>
<td>Williamson</td>
<td>12</td>
<td>33</td>
<td>11</td>
</tr>
</tbody>
</table>

*source: U.S. Census of Agriculture*

**Table 4: Acreage Estimates to Meet Fruit & Vegetable Needs**

<table>
<thead>
<tr>
<th></th>
<th>2009</th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population, all counties</td>
<td>1,550,213</td>
<td>1,821,433</td>
<td>2,272,224</td>
</tr>
<tr>
<td>Per Capita Consumption (tons/yr)</td>
<td>0.296</td>
<td>0.296</td>
<td>0.296</td>
</tr>
<tr>
<td>Total annual consumption in Central Texas (tons)</td>
<td>458,863</td>
<td>539,144</td>
<td>672,578</td>
</tr>
<tr>
<td>Field planted with vegetables (acres)</td>
<td>188,500</td>
<td>188,500</td>
<td>188,500</td>
</tr>
<tr>
<td>Harvested vegetables (tons)</td>
<td>1,589,210</td>
<td>1,589,210</td>
<td>1,589,210</td>
</tr>
<tr>
<td>Harvest per acre planted (tons)</td>
<td>8.43</td>
<td>8.43</td>
<td>8.43</td>
</tr>
<tr>
<td>Area needed to feed population</td>
<td>54,432</td>
<td>63,955</td>
<td>79,784</td>
</tr>
</tbody>
</table>

*source: U.S. Census of Agriculture and USDA ERS*
MAP 1: FARMS, COMMUNITY GARDENS AND MARKETS IN CENTRAL TEXAS

Peri-urban Agriculture in Central Texas

Farms, Community Gardens & Markets

author: Karen Banks
date: December 11, 2009
datum: NAD 1983
projections: Central Texas State Plane, 4203 ft
data sources: Capital Area Council of Governments, USDA
FINDINGS

In order to meet the food needs of the population of 1,550,213, the five counties would need to grow 458,863 tons of food. This would require 54,432 acres of land. In other words, the region will need to place 50,925 more acres under cultivation for fruits and vegetables. If the population grows according to estimates by the Texas State Data Center, the region will need an additional 9,523 acres in 2020 and 15,829 acres in 2030 for a total of 63,955 and 79,784 acres respectively.

CROPLAND CAPACITY

Based on the parcels selected as existing agriculture from the Land Fragmentation 2008 dataset, 1,221,673 acres of the total 2.7 million acres that comprise the five counties are used for some sort of agricultural activity. In other words, almost half of the land in this region is devoted to agriculture. Map 1.2 show the distribution of these agricultural sites. Most crop land is located to the east and the north. Bastrop and Williamson counties both maintain the largest area of farmland with 424,628 and 440,878 acres respectively. This distribution follows the spatial pattern of USDA identified prime soils for farmland as indicated in Map 1.3. Hays County has the least amount of agriculturally qualified land, 46,193 acres, and the least amount of prime soils for farmland. This lesser acreage may be a result of the parcel selection process since many of the attributes for parcels in Hays County were missing land use codes. Conversely though, Hays County has the largest mean parcel size, 114 acres. The mean parcel size for each of the other four counties is under 100 acres, ranging between 50-70 acres.

Table 5: Population Estimates

<table>
<thead>
<tr>
<th></th>
<th>2020</th>
<th>2030</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bastrop</td>
<td>99,329</td>
<td>127,167</td>
</tr>
<tr>
<td>Caldwell</td>
<td>49,975</td>
<td>60,127</td>
</tr>
<tr>
<td>Hays</td>
<td>101,508</td>
<td>227,912</td>
</tr>
<tr>
<td>Travis</td>
<td>1,112,034</td>
<td>1,257,213</td>
</tr>
<tr>
<td>Williamson</td>
<td>458,587</td>
<td>599,805</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>1,821,433</strong></td>
<td><strong>2,272,224</strong></td>
</tr>
</tbody>
</table>

*source: Texas State Data Center*

Table 6: Existing and Potential Cropland by Land-use Code

<table>
<thead>
<tr>
<th></th>
<th>Existing Cropland (acres)</th>
<th>Mean Parcel Size of Existing Cropland (acres)</th>
<th>Potential Cropland (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bastrop</td>
<td>424,628</td>
<td>50.74</td>
<td>51,442</td>
</tr>
<tr>
<td>Caldwell</td>
<td>113,085</td>
<td>54.16</td>
<td>22,572</td>
</tr>
<tr>
<td>Hays</td>
<td>46,193</td>
<td>114.06</td>
<td>180,222</td>
</tr>
<tr>
<td>Travis</td>
<td>196,889</td>
<td>53.13</td>
<td>80,446</td>
</tr>
<tr>
<td>Williamson</td>
<td>440,878</td>
<td>68.79</td>
<td>12,165</td>
</tr>
</tbody>
</table>

*source: Capital Area Council of Governments*
Peri-urban Agriculture in Central Texas
Prime Soils for Farming

Bastrop County
- Clay
- Silty loam
- Fine sandy loam

Caldwell County
- Clay
- Loamy fine clay
- Silty clay

Hays County
- Silty clay
- Clay
- Clay loam

Travis County
- Clay
- Silty clay
- Gravelly clay

Williamson County
- Silty clay
- Clay
- Clay loam

Map 3: Prime Farmland Soils

Data sources: Capital Area Council of Governments, USDA

Karen Banks                  CRP 386
Peri-urban Agriculture in the Capital Area             Fall 2009
FINDINGS

1.4 shows this distribution of potential parcels. The total amount of potential farmland available is more than sufficient to grow enough fruits and vegetable to meet consumption levels of area residents. Not all of the potential farmland is suitable for cultivation however. Results of the suitability analysis, as shown in Map 1.6, indicate that only 54,148 of the 346,847 acres are suitable for agricultural production. While 56,130 acres fall within the desirable agricultural areas, 1,982 acres do not meet the qualification of the weighted criteria. Most of the parcels fall within Hays, Caldwell and Travis counties, the three counties with the most available potential farmland. Of the ranked parcels, 3,158 parcels 1,480 are ranked 9 or 10. In other words, 31,849 acres are ideal farmland. Of these ideal parcels, 63 are over 100 acres with the largest being 499.25 acres. These 63 parcels constitute 10,734 acres. These larger parcels constitute 21% of the additional 50,925 acres needed for fruit and vegetable production. The entire 54,148 acres of suitable farmland is more than sufficient to cover the gap in farmland for food production.
Peri-urban Agriculture in Central Texas

Land Use: Non-Qualified Agriculture

Bastrop County: 51,442 acres
Caldwell County: 22,572 acres
Hays County: 180,222 acres
Travis County: 80,446 acres
Williamson County: 12,165 acres

Map 4: Potential Farmland

Karen Banks
Peri-urban Agriculture in the Capital Area

CRP 386
Fall 2009

Datum: NAD 1983
Projections: Central Texas State Plane, 4203 ft

Data sources: Capital Area Council of Governments, USDA
Peri-urban Agriculture in Central Texas

Suitable Farm Sites

Potential Farm Sites
Vacant parcels with soil ideal for agriculture and a slope of 5% or less.

Undesirable Areas
Areas unsuitable for agriculture, including roads, railroads, landfills, cemeteries, historic sites, and airfields.

Parcel Ranking
Suitability ranking based on weighted criteria, including proximity to water and parks, and distance from sensitive areas.

author: Karen Banks
date: December 11, 2009

datum: NAD 1983
projections: Central Texas State Plane, 4203 ft
data sources: Capital Area Council of Governments, USDA
Texas has a wealth of agricultural resources as is indicated by findings of this project for Central Texas. The majority of prime cropland in this region is located to the east and north of the Austin metropolitan area. Given regional growth trends, it is imperative to put forth efforts to preserve this area. A recent study from the Trust for Public Land identified nearly 1 million acres (977,749 acres) as high priority for conservation within this region (Trust for Public Land, 2009). One means of ensuring current agricultural land use is to obtain a working land easement. Less than 3% of the land in Hays County and less than 1% of the land in Bastrop and Caldwell counties is protected (Trust for Public Land, 2009). While crop and pasture land in Central Texas seems inexhaustible, lack of valuation by public entities of agricultural land leaves these areas vulnerable to future development.

According to the Land Fragmentation 2008 dataset available from the Capital Area Council of Governments, most agriculture land is considered vacant. Even though the appraisal district identifies these parcels as qualified agriculture, the parameters established by CAPCOG for vacant land, including improvement value and subjective observation, deem these parcels to be non-productive. This classification disregards agriculture as a viable economic industry and diminishes the importance of agricultural land adjacent to city centers for food production. Future conservation and expansion of urban agriculture will require efforts to educate and raise awareness about the value of peri-urban farms.

This project assumes that the peri-urban interface for the five county study area extends from incorporated city limits to the county boundary. Even though a foodshed does not conform to political boundaries, it is more accurate to compare statistical and spatial data which is available only by political jurisdiction. Many farms however, were not included in the inventory of farm operations that serve the Austin MSA because they fall outside of the county boundaries. This restriction makes it difficult to fully define and analyze a foodshed which may not conform to political boundaries.

While the results of this project indicate that Central Texas has sufficient space to expand the cultivation capacity of fruits and vegetables, these findings are not rich enough to deduce meaningful conclusions. Due to limitation on data availability as well as reliance on information on national trends, the findings of this study do not provide a meaningful analysis of the role of urban agriculture. Access to spatial data on farm locations and yields is restricted by Section 1619 of the 2008 Farm Bill. It prohibits the disclosure of: “1. Information provided by an agricultural producer or owner of agricultural land; 2. concerning the: (a) agricultural operation; (b) farming or conservation practices; or (c) the land itself; and 3. provided in order to participate in USDA program (USDA, 2009).” This project therefore relied on land use information to classify parcels in the five counties. While this provides an indication of agricultural use, it does not indicate cultivation type. Crop yield information had to be gleaned from the Census of Agriculture which lacks spatial data. The lack of coordination between these two datasets means that a lot of assumptions are made regarding production techniques and capacity for the region. Additionally, assumptions are made regarding consumption levels since estimates are based on national data regarding food intake. No survey of food habits exists on a county level.
The Loss Adjusted Food Availability study provides information on national trends in food consumption based on farm yield, product sales and food loss. Since these datasets are not specific to the Central Texas region, it is assumed therefore that residents exhibit the same consumption patterns as the rest of the nation. The results of this project therefore can only be said to provide an overview of the agriculture industry in Central Texas currently, laying the groundwork for a richer assessment of regional agriculture production.

Building on this foundation, a risk analysis of the impact of urban development on existing agriculture land would provide an indication of the value of farmland in the peri-urban interface. Risk could be evaluated based on building permits and fluctuations in property values. Another analysis that would indicate the role of urban agriculture in providing for the food needs of area households would be the study of the sale and distribution of locally grown produce. Where are locations that sell local produce? How much do they sell? Where does the local food come from? Who is purchasing local produce and where do they reside? Additionally, a cost benefit analysis of both traditional production techniques such as commodity crop production compared to the production of fruits and vegetables would provide a justification for the transition of pasture land to cropland.

As the Austin MSA continues to grow, preservation of existing farmland will become more important. This study provides an introduction to the current spatial configuration of agricultural land in Central Texas thereby forming the basis from which to build comprehensive arguments for the role of urban agriculture in sustaining an adjacent community. As the results of this study indicate, Central Texas has a reserve of agriculture land that could potentially be used to meet the food needs of area households. Reliance upon farms within the peri-urban interface to meet all of the food needs of area residents will require a transition however, of existing pasture and commodity cropland to food production.
REFERENCES


APPENDIX

Steps
1. Identify and isolate existing agricultural land and potential agricultural land.
   a. Address Locator
      i. Created new address locator in ArcCatalog using US Streets with Zone.
      ii. Imported into ArcMap Excel spreadsheet of farm, market, and community garden addresses. Used regional_roads shapefile to match addresses with parameter of City as the Zone. 42% match rate (47 matched).
      iii. Manually matched additional addresses to increase match rate to 67%. Not all addresses matched because many outside of region. Saved point locations as Geocode_Result_12082009 shapefile.
   b. Land Fragmentation 2008
      i. DEFINE PROJECTION and then PROJECT land fragmentation shapefile for Hays County to NAD_1983_StatePlane_Texas_Central_FIPS_4203_Feet.
      ii. Existing Agricultural Land
          1. Travis, Bastrop, Caldwell: Select by Attribute land_state or LU_Code = D1. Saved as: county_D1
          2. Williamson: since many of the attributes are not assigned a land use code, selected by attribute “LU_Code” = ‘D1’ AND “LU_Code” = ‘ ’ then removed from selection “Ag_land” = ‘N’ and “Ag_land” = ‘ ’ leaving parcels with the land use code of D1 and those identified as ag land.
          3. Hays: No attributes had a “LU_Code” of ‘D1’; most attributes are not populated. Selected “agland” = ‘y’ or ‘yes’ for existing agriculture land.
      iii. Potential Agriculture Land.
          5. Merged all county_VLIY_D234 to form allpossibleag_merge.
   c. Soil Survey
      i. Select by Attribute all attributes identified as prime farmland according to the USDA. Saved as: county_Soil_Primeland.
APPENDIX

OR “MUSYM” = ‘DnC’ OR “MUSYM” = ‘FaA’ OR “MUSYM” = ‘FaB’ OR “MUSYM” = ‘GeB’ OR “MUSYM” = ‘HeB’ OR “MUSYM” = ‘HuA’ OR “MUSYM” = ‘HuB’ OR “MUSYM” = ‘KsA’ OR “MUSYM” = ‘KsB’ OR “MUSYM” = ‘Oa’ OR “MUSYM” = ‘RaB’ OR “MUSYM” = ‘RkD’ OR “MUSYM” = ‘RoC’ OR “MUSYM” = ‘SuA’ OR “MUSYM” = ‘SuB’ OR “MUSYM” = ‘Tc’

2. Bastrop: “MUSYM” = ‘BaA’ OR “MUSYM” = ‘BaB’ OR “MUSYM” = ‘BeB’ OR “MUSYM” = ‘BuB’ OR “MUSYM” = ‘HeB’ OR “MUSYM” = ‘HoA’ OR “MUSYM” = ‘HoB’ OR “MUSYM” = ‘KrA’ OR “MUSYM” = ‘Nd’ OR “MUSYM” = ‘No’ OR “MUSYM” = ‘RoB’ OR “MUSYM” = ‘Sg’ OR “MUSYM” = ‘Sm’ OR “MUSYM” = ‘Tr’ OR “MUSYM” = ‘Bo’

3. Caldwell: “MUSYM” = ‘BeB’ OR “MUSYM” = ‘Bo’ OR “MUSYM” = ‘BrA’ OR “MUSYM” = ‘BuA’ OR “MUSYM” = ‘BuB’ OR “MUSYM” = ‘CaC’ OR “MUSYM” = ‘CbB’ OR “MUSYM” = ‘DeC’ OR “MUSYM” = ‘Go’ OR “MUSYM” = ‘HeB’ OR “MUSYM” = ‘HmB’ OR “MUSYM” = ‘HoB’ OR “MUSYM” = ‘LeB’ OR “MUSYM” = ‘Le’ OR “MUSYM” = ‘RoD’ OR “MUSYM” = ‘SeB’ OR “MUSYM” = ‘Sm’ OR “MUSYM” = ‘Tr’

a. Hays soil shapefile contains data for both Hays and Comal counties. After exporting selected attributes, clipped to Hays county boundary.

5. Travis: “MUSYM” = ‘AsB’ OR “MUSYM” = ‘BeA’ OR “MUSYM” = ‘BeB’ OR “MUSYM” = ‘BgA’ OR “MUSYM” = ‘BtB’ OR “MUSYM” = ‘BsA’ OR “MUSYM” = ‘Bt’ OR “MUSYM” = ‘ChB’ OR “MUSYM” = ‘CrA’ OR “MUSYM” = ‘CrB’ OR “MUSYM” = ‘DeB’ OR “MUSYM” = ‘DeC’ OR “MUSYM” = ‘DoA’ OR “MUSYM” = ‘Fo’ OR “MUSYM” = ‘HaC’ OR “MUSYM” = ‘HeB’ OR “MUSYM” = ‘Hf’ OR “MUSYM” = ‘HnB’ OR “MUSYM” = ‘Hn’ OR “MUSYM” = ‘LcA’ OR “MUSYM” = ‘LcB’ OR “MUSYM” = ‘Mc’ OR “MUSYM” = ‘No’ OR “MUSYM” = ‘Nr’ OR “MUSYM” = ‘PdB’ OR “MUSYM” = ‘SaB’ OR “MUSYM” = ‘TrC’ OR “MUSYM” = ‘Tv’ OR “MUSYM” = ‘Ya’

ii. All county_Soil_Primeland shapefiles were then merged together and the attributes were dissolved. Saved as: All_Soil_Prime_Merge_Dissolv1.

d. Digital Raster Graphic County Mosaic
i. Use MOSAIC TO NEW RASTER tool to stitch all raster images together. Save
APPENDIX

as: All_ElevMos_32Float.tif
ii. Use SPATIAL ANALYST→SLOPE tool to calculate slope. Set parameters to
Degree, z-factor = 0.3048, Output cell size: 32.8083333. Save as: All_Slope
iii. Select slopes under 5% using SPATIAL ANALYST→RECLASSIFY tool.
Classify breaks by percent. Changed all ‘New Values’ to 1 for ‘Old Values’ under
5.098039%. All other ‘New Values’ changed to 0.
iv. SPATIAL ANALYST→CONVERT RASTER TO FEATURE. Save as: All_slopereclass.shp

2. Analyze vacant parcels for agricultural suitability
a. County Boundaries
i. Select by Attribute Bastrop, Caldwell, Hays, Travis and Williamson counties.
Export and save as FiveCounties shapefile.
b. Landfills
i. Use PROJECT tool to project cli_landfills_unpermitted to NAD_1983_StatePlane_Texas_Central_FIPS_4203_Feet. Saved as: landfill_unpermit_project
ii. Use MERGE tool to join cli_landfills_permitted and landfill_unpermit_project.
Saved as: landfills_permNun
iii. Clipped landfills_permNun to Five Counties and saved as landfills_permNun_Clip
iv. Use BUFFER tool to buffer landfills by 1000 ft. Design of Landfills and
Integrated Solid Waste Management recommends distancing landfills 365 meters
from drinking water sources as well as 1000 feet from lakes and highways (Bagchi,
2004). Assuming possible leaching of contaminates from the landfill, the same
buffer is applied for farmland. Saved as: landfills_permNun_Clip_buffer
c. NonPop Places
i. For each county, select by attribute “Class” = ‘cemetery’ OR “Class” = ‘military’
OR “Class” = ‘airfield’ OR “Class” = ‘oilfield’. Exported selected attributes and
saved as county_culturalsites.
ii. Use MERGE tool to join all county_culturalsites and saved as all_culturalsites
d. Rivers
i. Clip to Five Counties
ii. Select by Attribute: “GNIS_Name” = ‘Colorado River’ OR “GNIS_Name” =
‘Blanco River’ OR “GNIS_Name” = ‘Little Blanco River’ OR “GNIS_Name” =
‘Middle Fork San Gabriel River’ OR “GNIS_Name” = ‘North Fork San Gabriel
River’ OR “GNIS_Name” = ‘Pedernales River’ OR “GNIS_Name” = ‘San Gabriel
River’ OR “GNIS_Name” = ‘San Marcos River’
iii. Create layer from selection and save as: River_Clip_Rivers
e. Regional Roads
i. Clip regional_roads to Five Counties
APPENDIX

ii. From Regional_roads_Clip select by attribute “ROC” = ‘FM’ OR “ROC” = ‘IH’ OR “ROC” = ‘SH’ OR “ROC” = ‘US’ OR “ROC” = ‘FR’

iii. Create layer from selection and as: regional_roads_Clip_major

iv. Use BUFFER tool to apply 200 foot buffer around major roads. Saved as: majorroad_buffer

f. Texas Parks and Wildlife Department Parks:

i. Project twpdparks to NAD_1983_StatePlane_Texas_Central_FIPS_4203_Feet using PROJECT tool.

ii. Clip twpdparks_Project to FiveCounties and save as: tpwdparks_Project_Clip

g. Wells

i. Clipped wells to FiveCounties and saved as wells_clip.

ii. Select by Attribute “WELL_TYPE” = ‘W’ representing all wells used for water withdrawal. Remove from selection wells with “water_level” = ‘H’ OR “water_level” = ‘N’ indicating only historical observation data or no information is available on water levels for wells. Saved at well_clip_typeW_noHorN.

iii. Selected by Attribute wells with depth >= 243 feet, the average depth for irrigation according to the Census of Agriculture, and saved as welldepthover243

iv. Use BUFFER tool to apply 50 foot buffer around wells. Saved as well_buffer

h. Clip railroad and lake24h to FiveCounties. Save as: railroad_clip and Lakes_FiveCounties.

i. Use BUFFER tool to buffered railroad by 200 feet. Saved as railroad_buffer

j. Use DISSOLVE tool to dissolve attributes for landfills_permNun_Clip_buffer, railroad_buffer, majorroad_buffer, all_culturalsites and tpwdparks_Project_Clip

k. Use UNION tool to join dissolved landfills_permNun_Clip_buffer, railroad_buffer, majorroad_buffer, all_culturalsites and tpwdparks_Project_Clip shapefiles and then use DISSOLVE tool form shapefile underireable_union_dissolve.

l. Use ERASE tool to remove undesireable_union_dissolve from potentialagsites. Saved as desirableagland.

m. Use SPATIAL ANALYST→DISTANCE→STRAIGHT LINE for landfills_permNun_Clip, railroad_Clip, regional_roads_clip, all_culturalsites, tpwdparks_Project_Clip, welldepthover243, Lakes_FiveCounties, and River_Clip_Rivers

n. Use SPATIAL ANALYST→RECLASSIFY to reclassify ‘New Values’ from 0-10 to 10-0 for landfills_permNun_Clip, railroad_Clip, regional_roads_clip, all_culturalsites indicating preference for agricultural areas farther from these sites. Use SPATIAL ANALYST→RECLASSIFY to reclassify tpwdparks_Project_Clip, welldepthover243, Lakes_FiveCounties, and River_Clip_Rivers but do not change ‘New Values’ indicating preference for proximity to these amenities.

o. Use SPATIAL ANALYST→RASTER CALCULATOR to apply the following weights to the select criteria for the suitability analysis:

i. TPWD Parks: 10%

ii. Lakes: 7%
iii. Rivers: 7%
iv. Landfills: 20%
v. Cultural Sites: 15%
vi. Wells: 7%
vii. Roads: 15%
viii. Railroad: 20%

Save output from RASTER CALCULATOR as rastercalc.
q. Use SPATIAL ANALYST→CONVERT→RASTER TO FEATURE to change rastercalcre to a vector file and save as landrank.
r. Use INTERSECT tool to find where the land ranking or landrank overlap with the desirableagland. Save as desirableagland_ranked.