

Chapel Hill Food Shed Analysis

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THE ENVIRONMENT



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Introduction:

In an effort to build a timeless community the Ecoland Institute invests serious interest into developing a secure and sustainable food system. The foundation of any civilization is the control and assurance of its basic needs: food, shelter, water. Chinese empires toppled and flourished with the changing waters of the yellow river. The Mesopotamian region could have only developed law and governance because they harnessed agriculture--with food security came society.

Food security depends on adequate water supply, and water resources are seriously threatened in some areas of the world. Our food must address this problem because agriculture accounts for ~80% of all water consumption (USDA). The International Water Management Institute concludes that, "Unless we change the way we use water and increase water productivity...we will not have enough water to feed the world's growing population."

In this report, the foodshed analysis for Chapel Hill provides recommendations for crops that may be vulnerable to price inflation through a review of California's drought impacts. The potential for North Carolina's local fruit and vegetable production is equally if not more important, and the ultimate objective of this report is to augment a decision making tool for North Carolina producers, providers, and consumers of food to use in a web-based interface.

Background:

After consultation and approval from Dr. Tarboton, this project became a joint effort on behalf of a working research group at UNC in collaboration with The Institute for the Environment and the School of Library and Information sciences, who helped put together a working capstone to create a food algorithm/decision-making tool for our client Ecoland Institute (ELI) and our partner Carolina Dining Services (CDS).

Through the implementation of this tool, ELI will be able to gain insight on nutritional, economic and social data on a wide variety of North Carolina produce, as well as utilize the tool to determine which produce items meet food system goals within community development. The tool can be used to examine the economic



value of locally versus nationally sourced food through a price comparison. Additionally, ELI can use the tool to assess other considerations for growing produce, such as hydroponic or aquaponic capabilities, produce seasonality, shelf life, and the vulnerabilities associated with each produce type.

The extent to which crops are vulnerable to climate conditions and price inflation is a growing concern for producers, providers, and consumers alike. Assessing the vulnerability of a foodshed, or a region that provides a given population with its nutritional demands, involves a national and even global supply chain. Very few populations in the United States have access to local food, which has consequences on food system nutrition, resiliency and security. In fact, centralizing traditional food production methods about large population centers causes greater risk to food security in the event of a drought or natural disaster. Despite this, policy makers incentivize regions to specialize agricultural practices according to their natural comparative advantage, which advocates for countries and states to produce crops particular to their climate region for economic advantage.

Food Shed Analysis & Prior Methods:

Originally, I set out to map the potential food shed of Chapel Hill or even Orange county following the model in Figure 1 from “Mapping potential foodsheds in New York State: A spatial model for evaluating the capacity to localize food production.” in the Renewable Agriculture and Food Systems journal. This map would produce the HNE, or “Human nutritional equivalent”, value of landuse areas, which derives the potential caloric supply of food that could be provided given regional soil and land cover data. I used GAP landcover data from the to create the map Orange County Land Cover 2011.

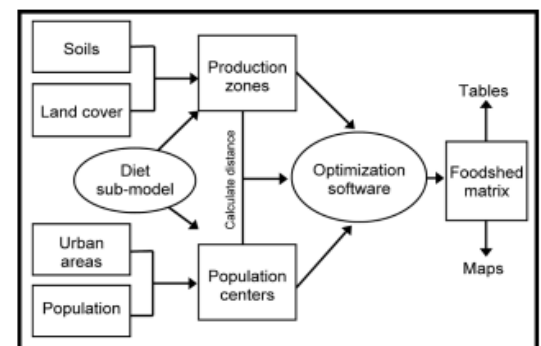
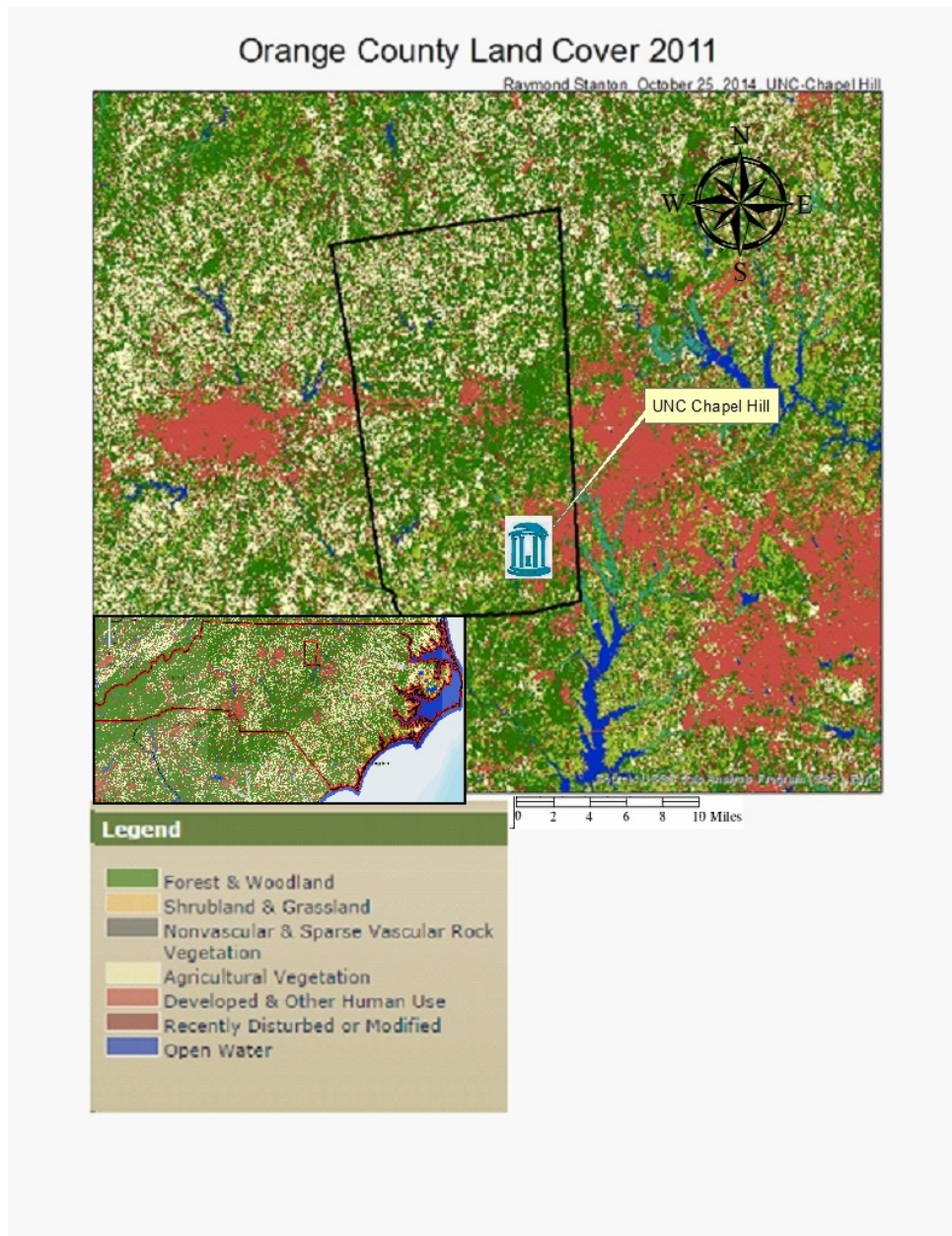


Figure 1. Simplified data flow diagram for the spatial model used to map potential local foodsheds.





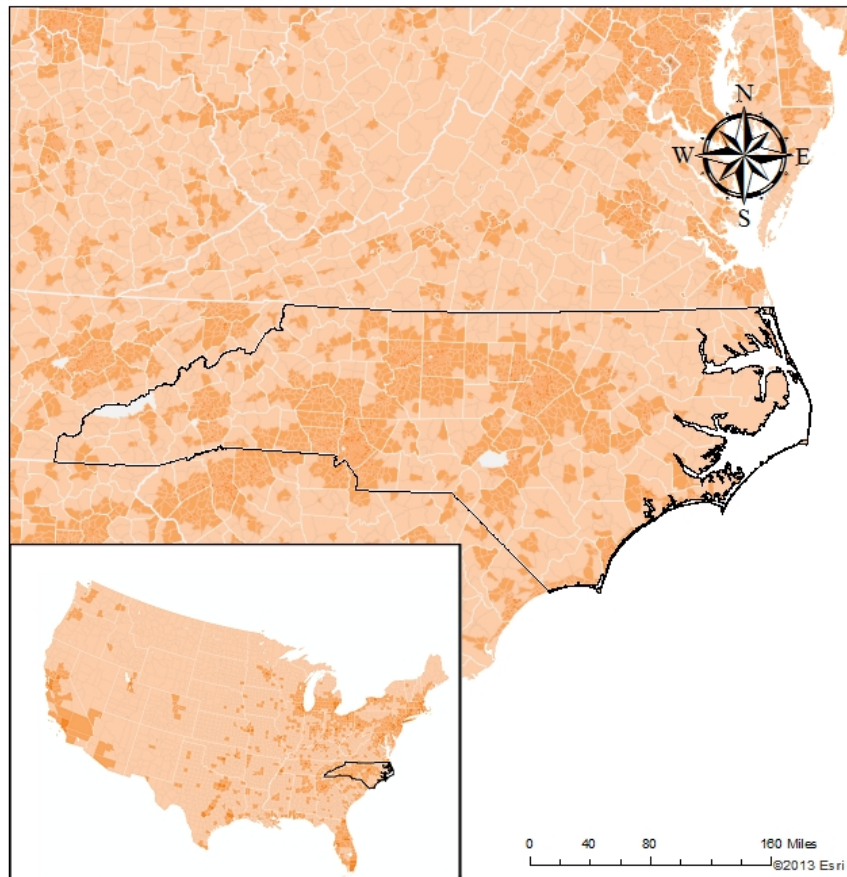
The Orange County Land Cover Map 2011 map indicates Chapel Hill's relative location to the rest of the state, as well the differences in land cover across the county. Approximately 22% of Orange county's land cover is considered "Agricultural Vegetation" compared to about 12% of Human developed land,



however, this is deceptive, because under further scrutiny, the land use report details that only 7% of the land is dedicated to edible crops, while the rest is predominately pastureland for livestock. In conclusion, Orange county's land cover could not produce enough food to feed its population; however for the purpose of the food algorithm it was unnecessary to complete a traditional foodshed analysis to demonstrate that where food is grown is not congruent with where food is eaten.

Where Food is Eaten:

North Carolina Population Density



Legend

NCbound

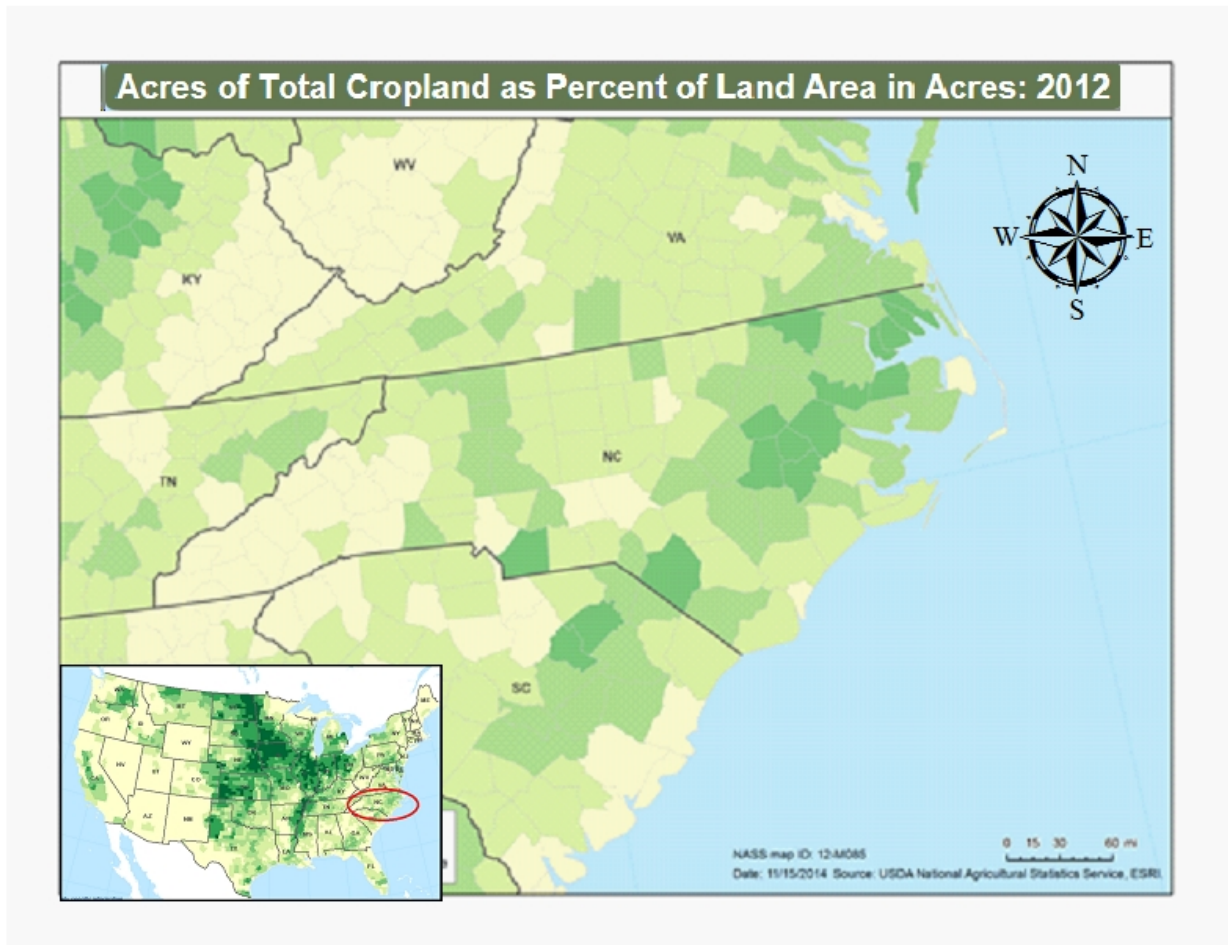
Tracts

2012 Population Density (Pop per Square Mile) (Esri)

- 100,001 or more people
- 25,001 to 100,000 people
- 10,001 to 25,000 people
- 1,001 to 10,000 people
- 101 to 1,000 people
- 100 or less people
- No population



Where Food is Grown:



Legend

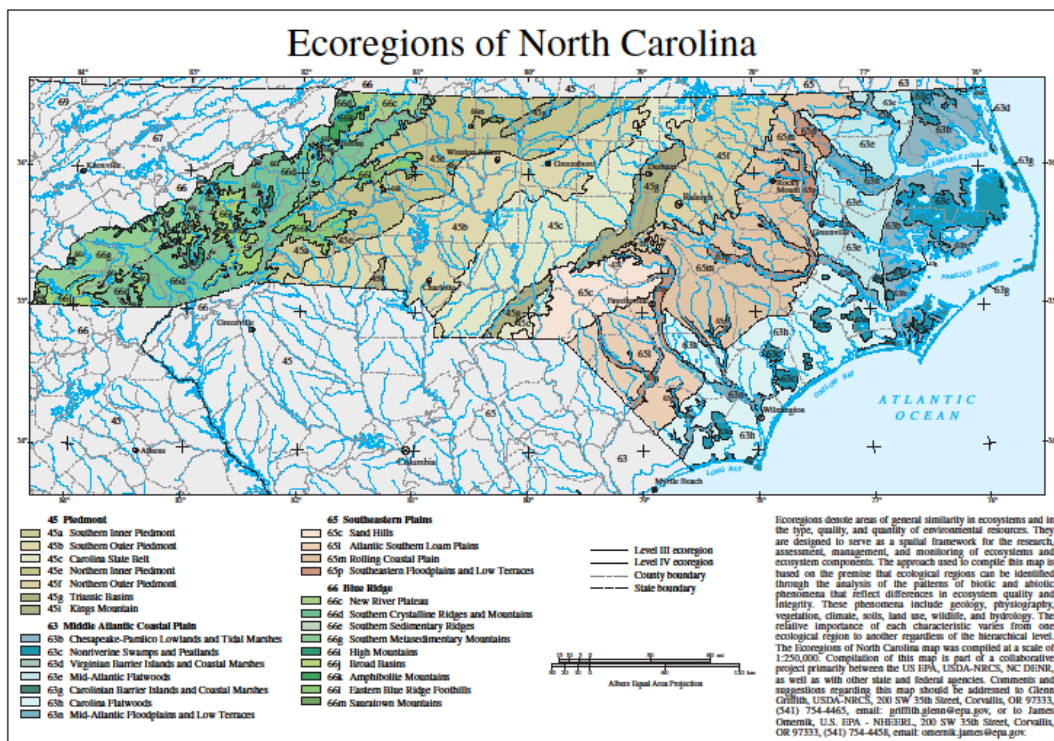
Percent

- Less than 5
- 5 - 14
- 15 - 29
- 30 - 49
- 50 - 74
- 75 or more



North Carolina’s One Map extension service in ArcGIS offers county, zip-code, and census block specific data for population density across the state as recent as 2012. North Carolina’s Population Density map juxtaposed against the Cropland Density map demonstrates that North Carolina’s food production is not located directly about where the majority of food is consumed. If ELI seeks to feed its future citizens through on-site production, there are limitations to what can be produced seasonally and in NC soil. Moreover, Carolina Dining Services purchases many non-NC crops, so next we assessed North Carolina top crop production and the potential for hydroponic fruits and vegetables to supplement local supply.

North Carolina Food Production:



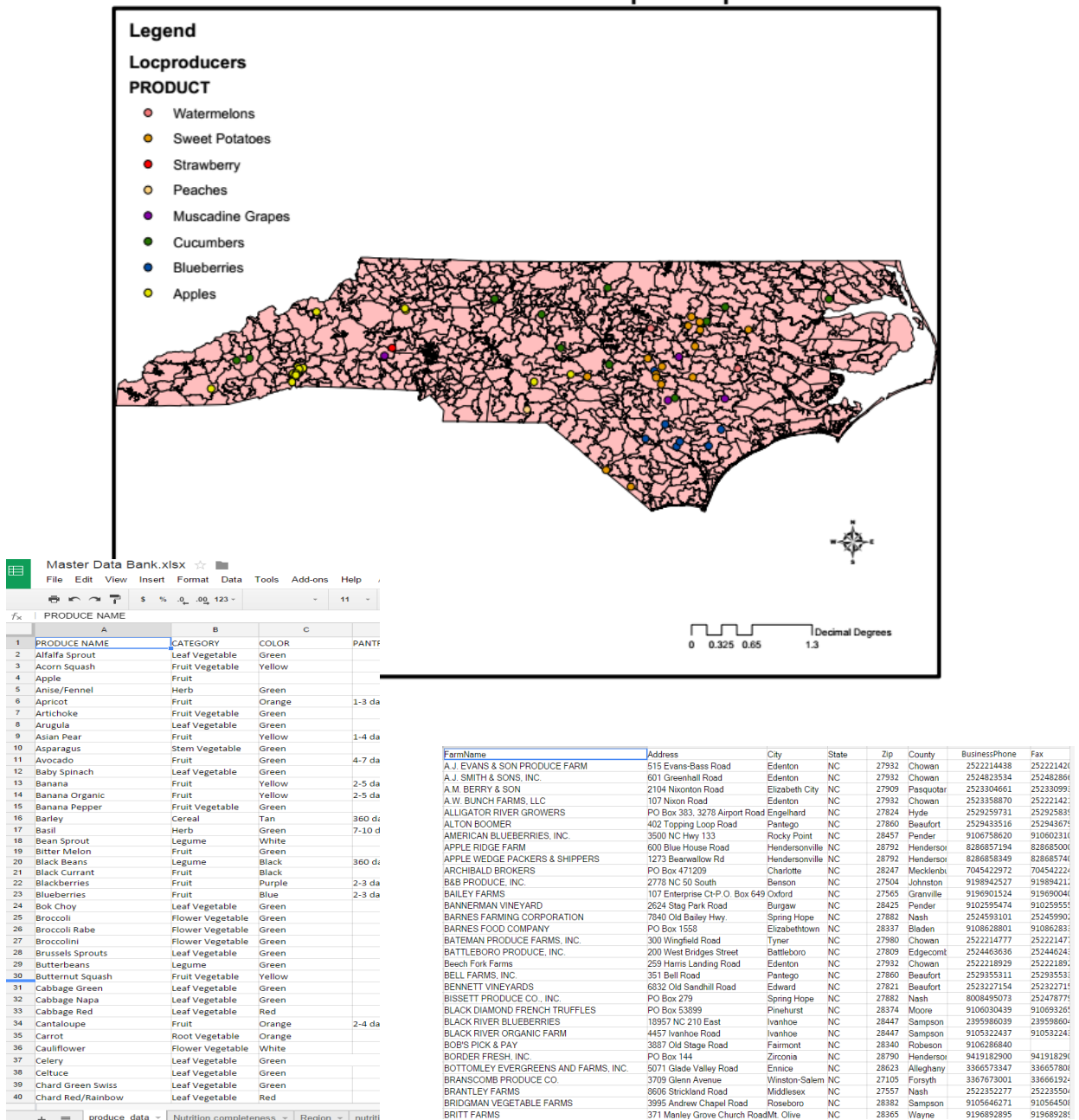
The EPA classifies North Carolina into four basic “ecoregions”; from east to west: the Middle Atlantic Coastal Plain, the Southeastern Plain, the Piedmont, and the Blue Ridge. For the purpose of the F.A.R.M. Food project, NC was classified into three basic categories: Coastal plains, Piedmont, and Mountains (Blue Ridge). These



divisions represent differing soil types and biomes that are more adequately suited to produce certain crops over others. NC top crops were generalized into regional categories. For example, orchards are predominantly classified to the mountains and sweet potatoes associated to the coastal plains. This is important information for our client ELI and other potential producers if they intend to grow produce in local soils.

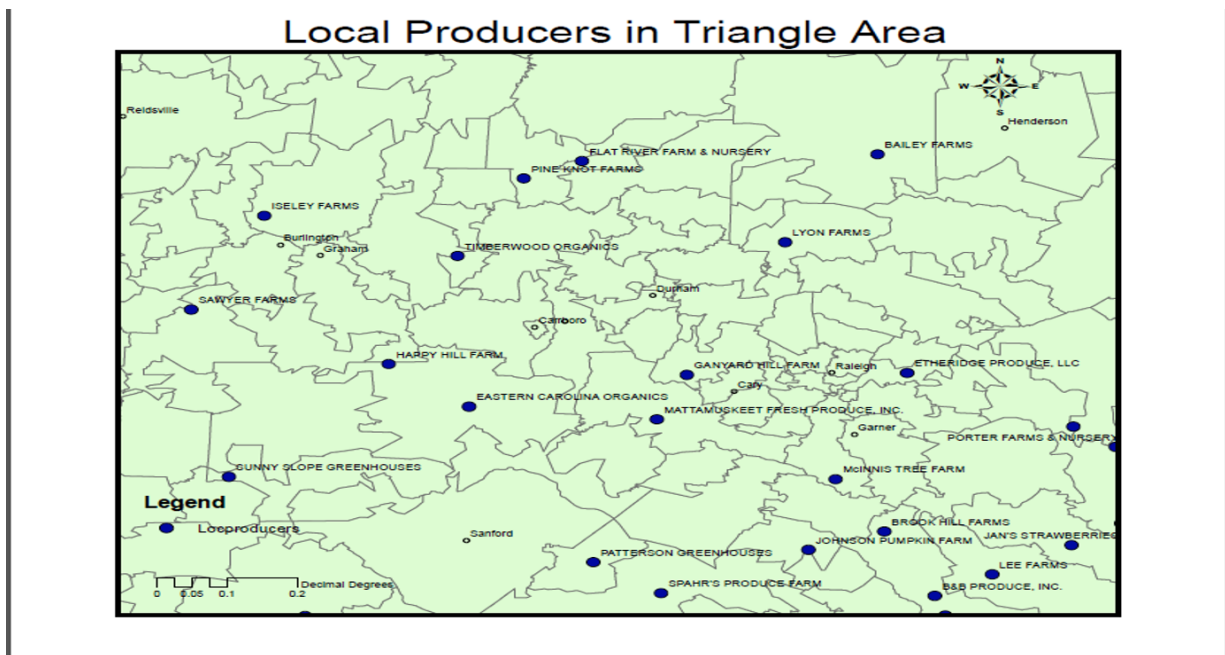
North Carolina Department of Agriculture's and local farmer's market data were geocoded into a database to display local availability of fruits and vegetables.

Producers of NC Top Crops

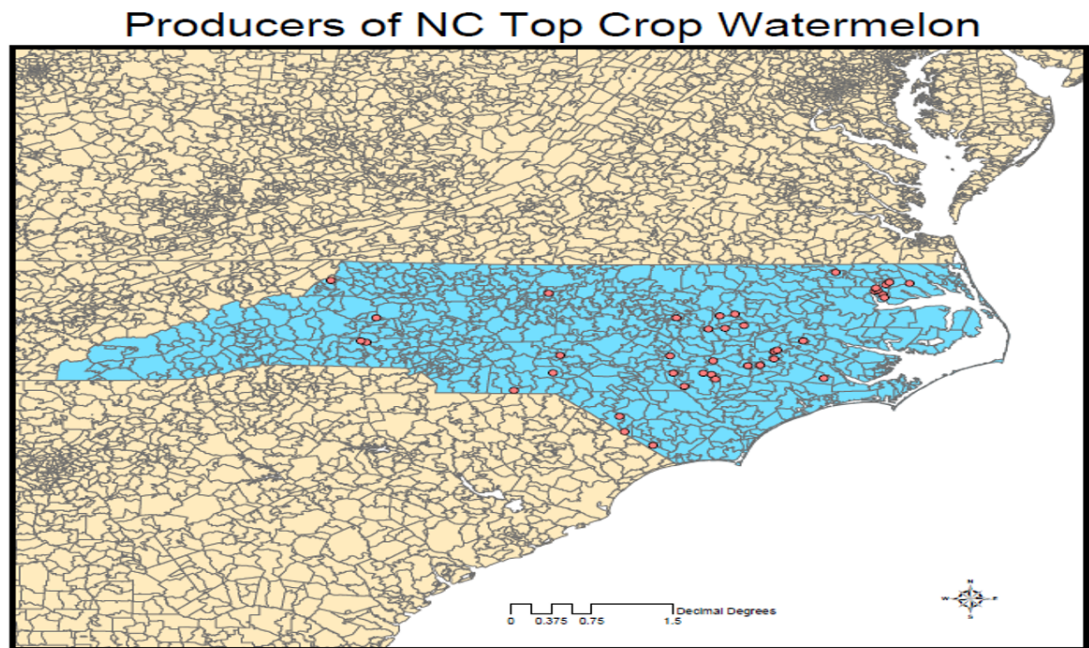


North Carolina farmer's market name and location data was acquired from the UNC School of Public Health's Community Transformation Grant project. Producer information was obtained from the North Carolina Department of Agriculture and Consumer Services. Location data was taken from the NCDA&CS directory of farms in the piedmont NC region found on the NC farm fresh webpage. Kevin Hardison from the NCDA&CS marketing division supplied additional producer data that clarified which crops certain farms produce.

Map 6. Displays producer locations and farm names within the Triangle region.



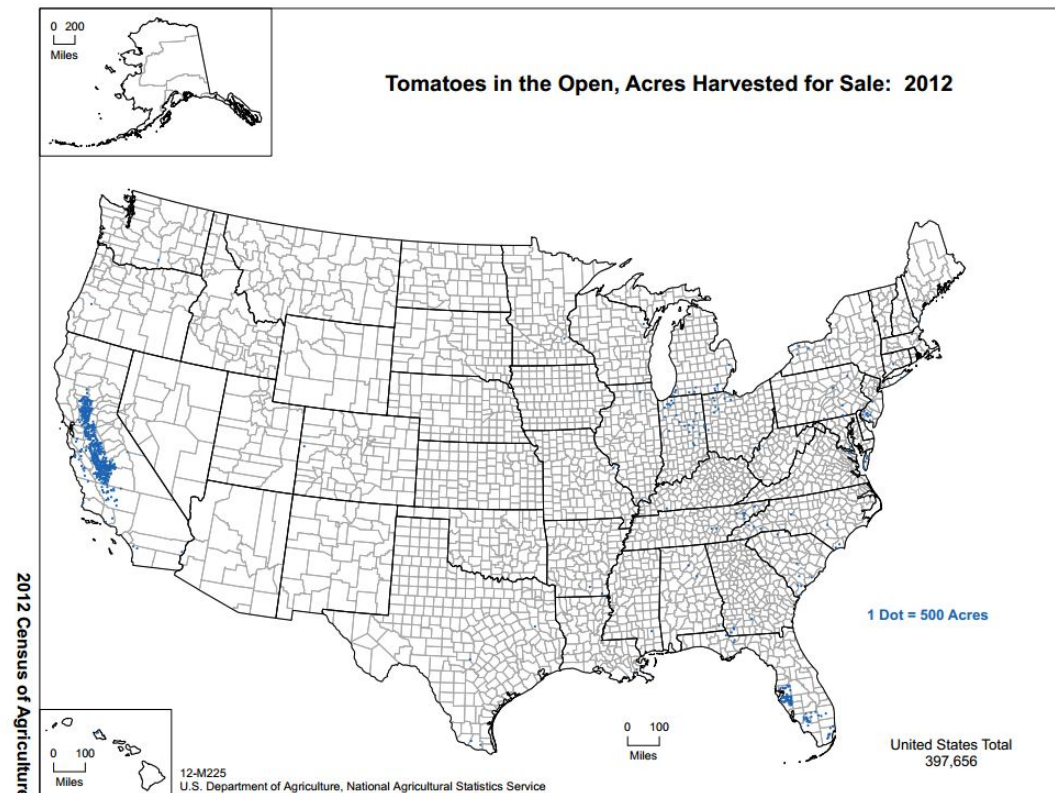
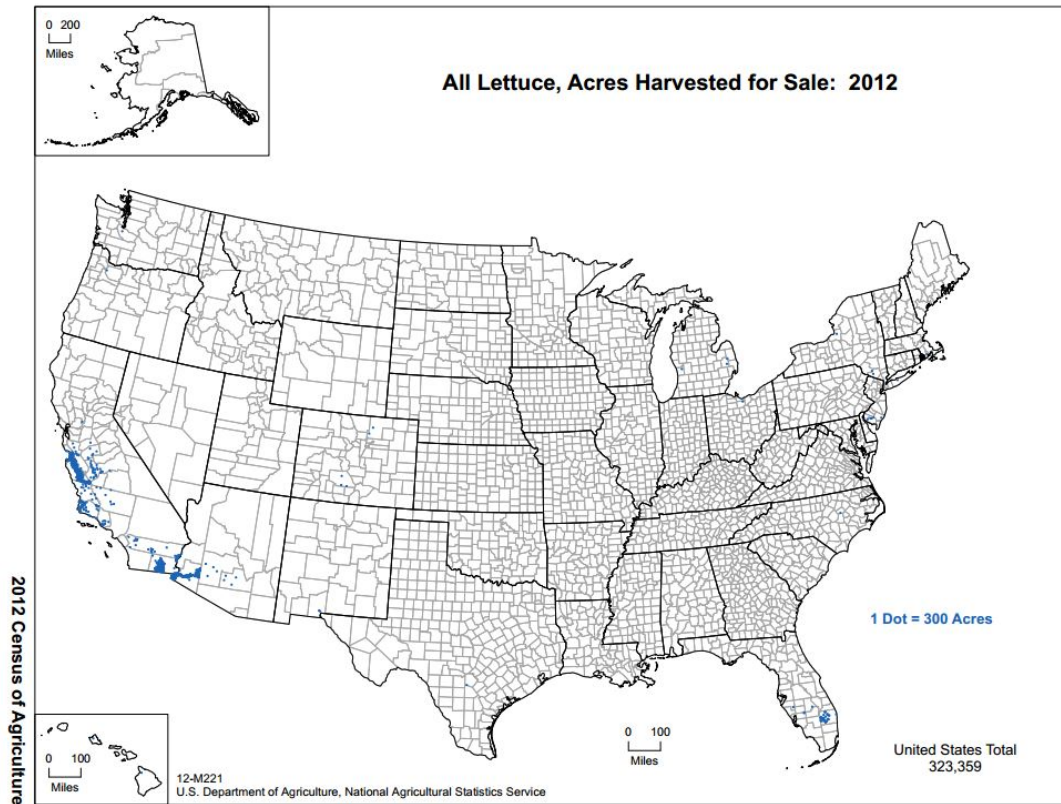
Map 7. Simulates ability to search for producer location for a specific produce item within North Carolina.



Different climate regions have a comparative advantage to grow certain foods over others; however more data relating crops to soil type and water consumption needs to be collected before this information can be used to make decisions about vulnerability on a local level.

North Carolina, as well as our client CDS, consumes a diverse assortment of produce items from all around the nation and world, so the NC “foodshed” can not be confined to state boundaries. Many produce items are sourced in more regular climates than our seasonal temperate biome, and upon further review it became apparent that for many agricultural products that place is California.

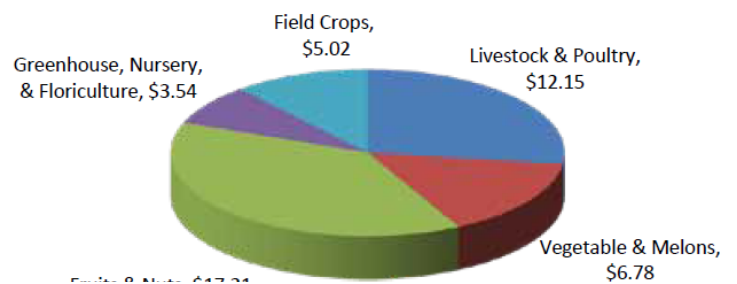
California Vulnerability:



As indicated in the maps above from the USDA Census of Agriculture, lettuce and tomatoes, two crops of particular interest to the commercial hydroponic grower, are predominantly sourced in California. In fact according the California Agricultural Statistical Review, in 2012 California produced 85% of the nation’s leaf lettuce and 96% of the nation’s processed tomatoes; however, lettuce and tomatoes are not exceptional. California has an immense agricultural presence and is a leading producer, if not the sole producer, of more fruits and vegetables than other state in the nation. The California Agricultural Statistics Overview for 2013-2014 states that California produces more than a third of the nation’s vegetables and almost two-thirds of the nation’s fruits and nuts. [See figures below].

Top 5 Agricultural States in Cash Receipts, 2012		
State	Rank	Total Value Billion Dollars
California	1	44.7
Iowa	2	31.9
Nebraska	3	24.4
Texas	4	22.7
Minnesota	5	20.5

California’s Gross Cash Receipts, 2012 \$44.7 Billion*



Crop and Livestock Commodities in which California Leads the Nation 1/			
Almonds	Escarole/Endive	Mandarins & Mandarin Hybrids 2/	Plums
Apricots	Figs	Melons, Cantaloupe	Plums, Dried
Artichokes	Flowers, Bulbs	Melons, Honeydew	Pluots
Asparagus	Flowers, Cut	Milk	Pomegranates
Avocados	Flowers, Potted Plants	Milk Goats	Raspberries
Beans, Dry Lima	Garlic	Nectarines	Rice, Sweet
Beans, F.M. Snap	Grapes, Raisins	Nursery, Bedding Plants	Safflower
Bedding/Garden Plants	Grapes, Table	Nursery Crops	Seed, Alfalfa
Broccoli	Grapes, Wine	Olives	Seed, Bermuda Grass
Brussels Sprouts	Greens, Mustard	Onions, Dry	Seed, Ladino Clover
Cabbage, Chinese	Hay, Alfalfa	Onions, Green	Seed, Vegetable and Flower
Cabbage, F.M.	Herbs	Parsley	Spinach
Carrots	Kale	Peaches, Clingstone	Strawberries
Cauliflower	Kiwifruit	Peaches, Freestone	Tomatoes, F.M.
Celery	Kumquats	Pears, Bartlett	Tomatoes, Processing
Chicory	Lemons	Peppers, Chile	Vegetables, Greenhouse
Cotton, American Pima	Lettuce, Head	Peppers, Bell	Vegetables, Oriental
Daikon	Lettuce, Leaf	Persimmons	Walnuts
Dates	Lettuce, Romaine	Pigeons and Squabs	Wild Rice
Eggplant	Limes	Pistachios	

1/ California is the sole producer (99 percent or more) of the commodities in bold.
2/ Includes tangelos, tangerines and tangors.

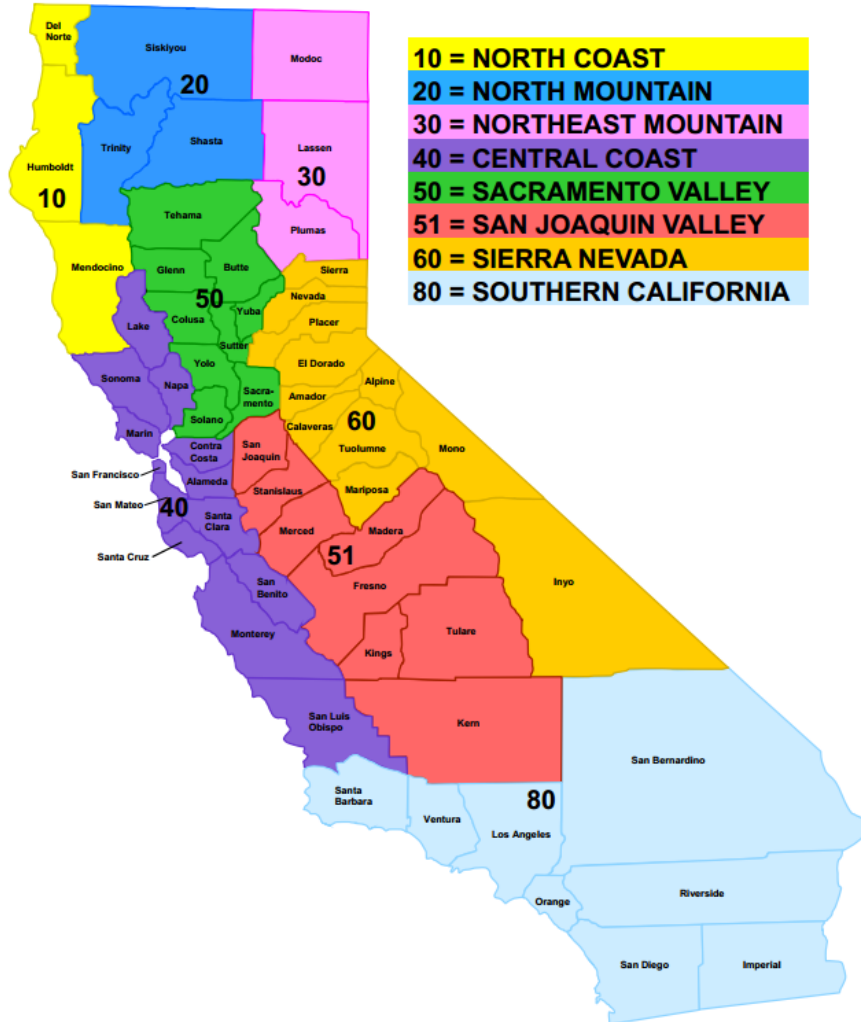


Within California, the dominant agricultural sectors reside in the middle of state in the fertile California Central Valley, which is divided into the Sacramento Valley and San Joaquin Valley, and along the Central Coast. The California Department of Agriculture offers data relating their statistical districts, for the purpose of this project the fruit and vegetable dense counties of San Joaquin, Monterey, and Fresno counties are of particular interest; however it was difficult to obtain the same quality and specificity of data for California as the data available in our own North Carolina.

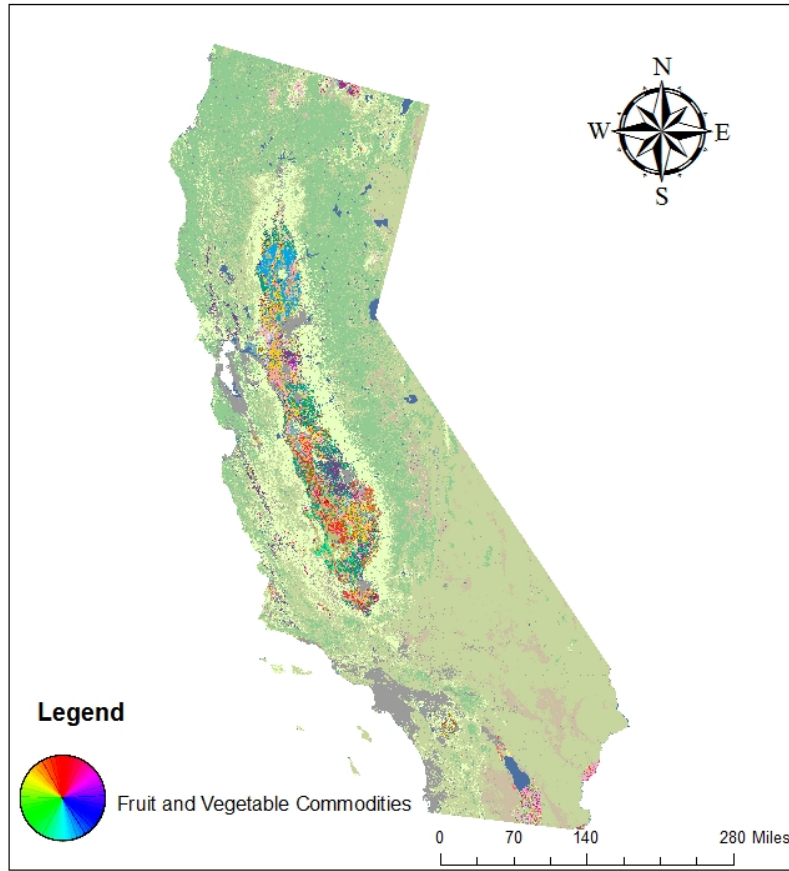
The concentration of food production is a problem because California is in the midst of a historical drought that seriously affects the major food producing counties. The US Drought Monitor provides data and commentary on the nation's drought status daily that provided the information necessary for the map below, which follows a spatial-analysis of California's major fruit and vegetable producing areas and irrigation use using data from USDA Census of Agriculture. In the USDA report California Drought 2014 they indicate that while food demand continues to rise, California's cropland depends on unsustainable irrigation with nearly 100% of fruit and vegetable acreage being irrigated with the exception of orchard farms, which still irrigate acreage at 98%.

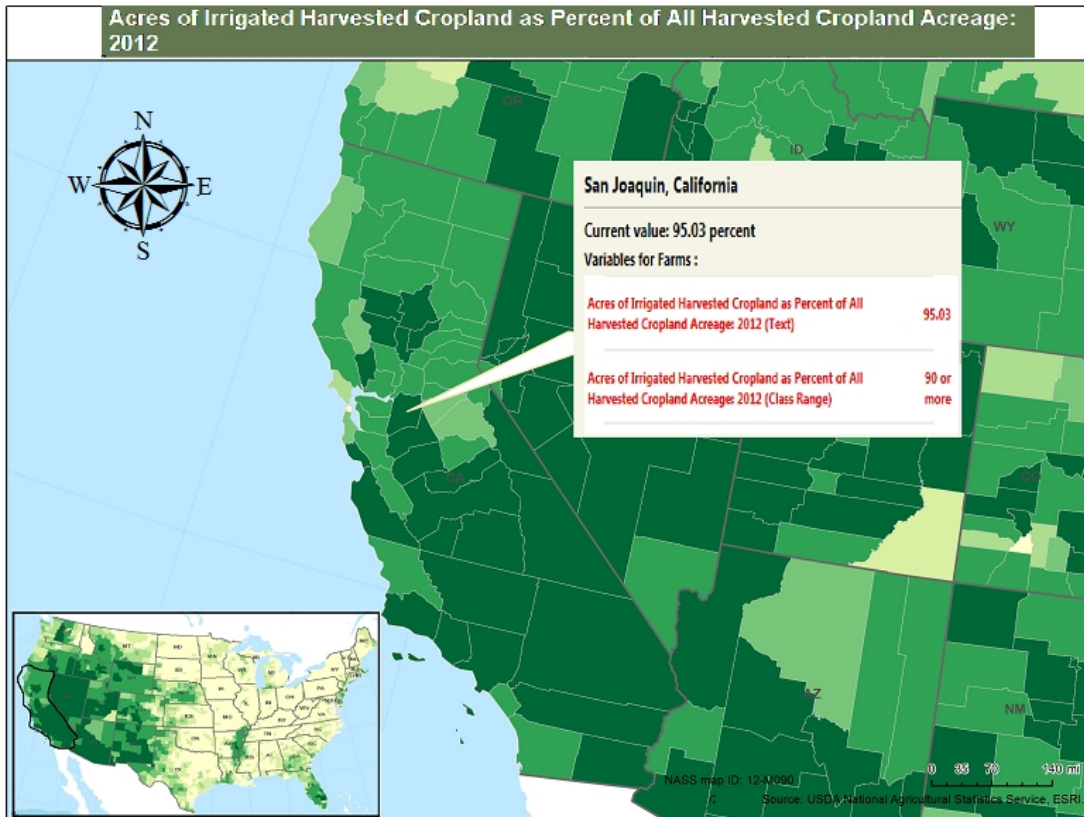


California Agricultural Statistics Districts



California Fruit and Vegetable Production Areas

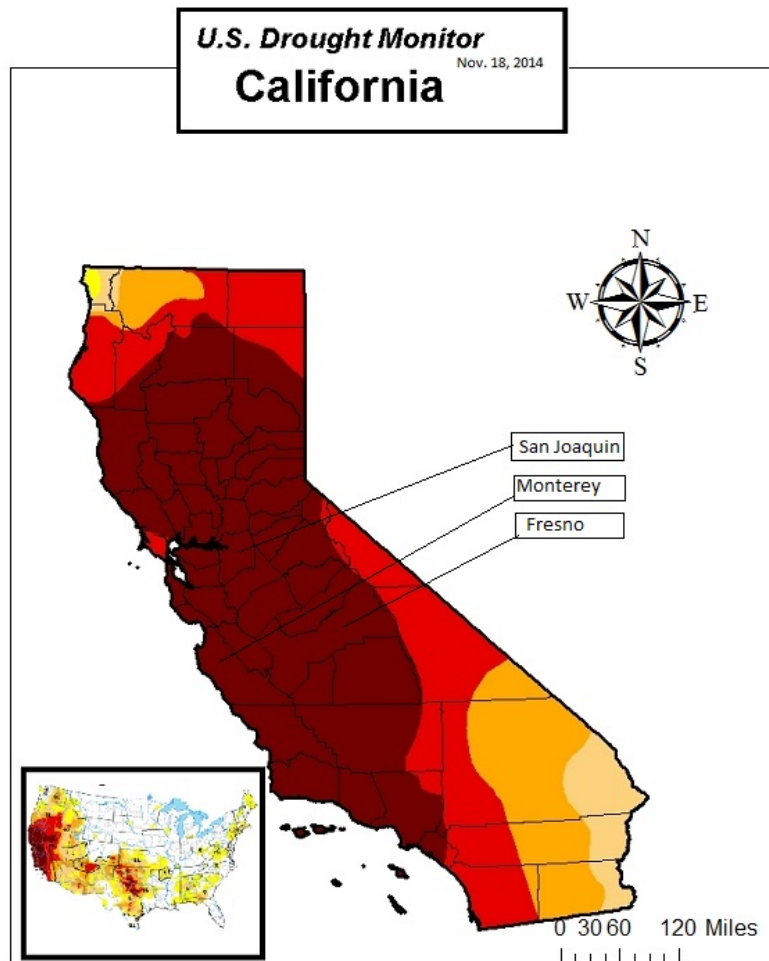




Legend
Percent

- Less than 5
- 5 - 19
- 20 - 39
- 40 - 59
- 60 - 89
- 90 or more





Source: USDA Drought Monitor. <http://droughtmonitor.unl.edu/>

Legend

Intensity:

- | | |
|---|--|
|  D0 Abnormally Dry |  D3 Extreme Drought |
|  D1 Moderate Drought |  D4 Exceptional Drought |
|  D2 Severe Drought | |

According to the US Drought Monitor’s intensity index an exceptional drought classification describes “water shortages and emergencies” and “widespread crop/pasture loss”. Half of California is in this condition, which creates an exigency to address the most vulnerable crops from California because of their high-risk location. In response to the drought, the California Agricultural Statistical



Overview weather highlights “Conditions were ideal for drying corn for grain and grapes for raisins, but further deteriorated pasture and rangeland.” The USDA’s California Drought 2014: Food Prices and Consumers forecasts the droughts effects on food prices and forecasts for fresh fruits and vegetables inflation of upward to 3.0 to 4.0 percent and says, “With respect to fruits and vegetables, the immediate concern is the cost and availability of groundwater to supply the crops. Owing to higher production costs, insufficient water, or both, producers may opt to reduce total acreage, driving up prices not just this year but for years to come. At this point, it is too soon to discuss the extent to which this is likely to happen throughout California.” This suggests that more fruits and vegetables may become cost-competitive to source from North Carolina, but North Carolina is not immune to drought, and nowhere is safe from the effects climate change, so “vulnerability” cannot be complete with an analysis of California’s contribution to the national and local food system. A vulnerability analysis could be a greater asset to the decision-making tool if one evaluated produce items individually for their specific locations, instead of analyzing a high risk location for its vulnerable crops.

The results for CA top crops, and thus the vulnerable top crops, were taken from the California Agricultural Statistical review 2012-2013 and excluded non-edible commodities and nuts because fruits and vegetables are the produce items of primary interest to this project. This list represents items that may be at higher risk of price inflation and thus, may become more cost-effective to grow locally or hydroponically.

California Top Crop	Rank	Percent US total
Grapes	1	91
Strawberries	2	92
Lettuce	3	77
Tomatoes	4	96
Oranges	5	29
Broccoli	6	95
Carrots	7	81
Lemons	8	92
Avocados	9	88
Peppers	10	53



Limitations:

The USDA operates three major geospatial databases related to food with different datasets, years, and applications; they are the National Agricultural Statistics Survey's CropScape, the Economic Research Service's Food Environment Atlas, and the Census of Agriculture Ag Census Web Maps. Sorting through these datasets to find the most recent and congruent data was a messy process, and the Census of Agriculture became the final authority for the California Vulnerabilities section. Also, the US drought monitor offered concise description about the scenario of a region, but perhaps TWI or precipitation maps would have been a more appropriate use of GIS.

Given more time, the vulnerabilities section would be expanded to include more detailed information about the quality and condition and soil and water in a region. Working with a group on a project has limitations; however, and only so much can be accomplished in one semester. Data acquisition is burdensome, but data standardization requires collaboration, and sometimes the work I delegated to my team wasn't always returned to me in the same format that I imagined.

Conclusion:

In an effort to build a timeless community, the development of a secure and sustainable food system ought to be sought. A robust local agricultural system buttressed with hydroponic facilities would promote nutritional balance and fruit and vegetable price stability. Hydroponic and aquaponic farming methods are highly applicable to many leafy greens, herbs, legumes and vegetables and can be a cost effective and convenient farming method, especially for crops that do not grow as well locally or are out of season. The vulnerability of a local food shed is more extensive than an area's potential agricultural output from soil calculations and must also consider a broader supply chain that provides the every day sustenance consumers purchase. Locating food production closer to food demand through on-site facilities would be a sustainable and potentially cost-competitive venture.



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Appendix Brief:

USDA CDA AG STAT Review 2012-2013 Fruit and Vegetable:

Commodity Rank, Acreage, Production, Value and Leading Producing Counties, 2012									
Commodity	U.S. Rank ¹	CA Share of U.S. Prod. ¹	Area Harvested	Short Tons (2,000 lbs.)	Total Value ²	California Rank ³		Harvest	Leading Counties ⁴
	Number	Percent	1,000 Acres	1,000 Tons	\$1,000	2011	2012	Season	
FRUIT AND NUT CROPS TOTAL VALUE -- \$17,373,946,000									
Almond (shelled) ⁵	1	99	780.0	1,000.0	4,347,200	2	3	Aug. 1-Oct. 31	Fresno, Kern, Stanislaus, Merced, Madera
Apples	4	3	17.5	150.0	77,750	53	50	July 15-Oct. 30	San Joaquin, Stanislaus, Kern, El Dorado, Santa Cruz
Apricots	1	88	10.8	53.8	32,260	62	63	May 1-July 15	Stanislaus, Fresno, Kings, Tulare, Kern
Avocados	1	88	12.5	31.1	381,957	19	21	Continuous	San Diego, Ventura, Santa Barbara, Riverside, San Luis Obispo
Berries, Blueberries	6	9	4.7	20.4	133,743	44	43	---	San Joaquin, Tulare, Kern, Ventura, Fresno
Berries, Raspberries	1	74	5.4	48.6	239,820	29	29	June 1-Oct. 31	Ventura, Santa Cruz, Monterey, Kern
Berries, FM Strawberries	1	91	38.5	1,096.8	1,939,142	---	---	---	Monterey, Ventura, Santa Barbara, San Luis Obispo, Sacramento
Berries, Proc Strawberries	1	92	---	285.0	182,432	---	---	---	Ventura, Santa Barbara, San Luis Obispo, Monterey, Others
Berries, All Strawberries	1	92	38.5	1,381.8	2,121,574	6	6	Feb. 20-Nov. 15	Monterey, Ventura, Santa Barbara, San Luis Obispo, Santa Cruz
Cherries, Sweet	2	22	31.0	92.3	257,772	33	28	May 20-June 25	San Joaquin, Stanislaus, Fresno, Tulare, Kern
Dates ⁵	1	82	8.4	31.1	41,674	59	59	Oct. 1-Dec. 15	Imperial, Riverside, Fresno, San Bernardino
*Figs ⁵	1	96	8.6	38.7	20,335	68	69	June 10-Sept. 15	Madera, Merced, Others
Grapefruit, All	3	15	9.4	160.0	55,880	58	54	Nov. 1-Oct. 31	Riverside, San Diego, Tulare, Kern, Imperial
Grapes, Raisin Type	---	---	205.0	1,951.0	0	---	---	May 15-Nov. 15	Fresno, Madera, Kern, Tulare, Kings
Grapes, Table type	---	---	85.0	987.0	1,180,430	---	---	May 25-Dec. 15	Kern, Tulare, Fresno, Riverside, Madera
Grapes, Wine Type	---	---	506.0	3,740.0	0	---	---	Aug. 5-Dec. 15	Napa, Sonoma, San Joaquin, Fresno, Monterey
Grapes, All	1	91	796.0	6,678.0	4,450,626	3	2	---	Kern, Fresno, Tulare, Napa, Sonoma
*Kiwifruit ⁵	1	97	4.2	29.6	22,940	65	67	Oct. 1-May 31	Butte, Tulare, Yuba, Fresno, Sutter
Lemons	1	92	45.0	800.0	435,752	23	19	Aug. 1-July 31	Ventura, San Diego, Riverside, Tulare, Kern
Nectarines ⁵	1	95	25.0	180.0	139,860	42	42	June 10-Sept. 5	Tulare, Fresno, Kings, Kern, Los Angeles
Olives ⁵	1	96	44.0	160.0	130,038	56	45	Sept. 25-Mar. 15	Tehama, Tulare, Glenn, San Joaquin, Butte
Oranges, Navel & Misc	---	---	137.0	1,820.0	607,432	---	---	Nov. 1-June 15	Tulare, Kern, Fresno, San Diego, Riverside
Oranges, Valencia	---	---	40.0	500.0	157,351	---	---	Mar. 15 - Dec. 20	Tulare, Kern, Fresno, Ventura, San Diego
Oranges, All	2	29	177.0	2,320.0	764,783	16	14	---	Tulare, Kern, Fresno, Ventura, San Diego
Peaches, Clingstone	1	100	23.0	369.0	128,397	---	---	July 15-Sept. 15	Stanislaus, Sutter, Yuba, Merced, Fresno
Peaches, Freestone	1	56	24.0	344.0	202,297	---	---	May 10-Sept. 15	Fresno, Tulare, Kings, Stanislaus, Merced
Peaches, All	1	73	47.0	713.0	330,694	25	26	---	Fresno, Tulare, Stanislaus, Sutter, Kings
Pears, All	3	25	14.0	215.0	93,977	45	46	Aug. 5-Oct. 5	Sacramento, Lake, Fresno, Mendocino, Tulare
Pecans	7	2	---	24.0	7,584	70	71	Sept. 1-Nov. 30	Tulare, Others
Pistachios ⁵	1	98	178.0	275.5	1,113,020	13	11	Sept. 15-Dec. 10	Kern, Fresno, Tulare, Madera, Kings
Plums ⁵	1	97	25.0	115.0	79,940	50	48	May 25-Aug. 20	Fresno, Tulare, Kern, Kings, Sutter
Plums, Dried ⁵	1	99	55.0	125.0	156,250	36	40	Aug. 15-Oct. 10	Sutter, Butte, Tehama, Yuba, Glenn
Tangerines, Mandarins, Tangelos & Tangors ⁹	1	51	38.0	540.0	0	32	23	Nov. 1-May 15	Kern, Tulare, Fresno, Riverside, Ventura
Walnuts ⁵	1	99	245.0	470.0	1,363,000	9	9	Sept. 5-Nov. 10	San Joaquin, Butte, Stanislaus, Tulare, Glenn
Other Fruits and Nuts	---	---	---	---	223,790	---	---	---	---



Commodity Rank, Acreage, Production, Value and Leading Producing Counties, 2012

Commodity	U.S. Rank ¹	CA Share of U.S. Prod. ¹	Area Harvested	Short Tons (2,000 Lbs.)	Total Value ²	California Rank ³		Harvest Season	Leading Counties ⁴
	Number	Percent	1,000 Acres	1,000 Tons	\$1,000	2011	2012		
VEGETABLE AND MELON CROPS TOTAL VALUE -- 6,766,288,000									
Artichokes ⁴	1	99	7.8	56.6	53,723	57	56	Continuous	Monterey, Riverside, Fresno, San Mateo, San Bernardino
Asparagus	1	48	11.5	18.4	48,208	54	57	Jan. 1-Nov. 30	San Joaquin, Fresno, Monterey, Kern, Orange
Beans, Fresh Market Snap	1	18	9.2	48.3	62,887	48	53	June 1-Dec. 31	San Diego, Others
Broccoli	1	95	119.0	971.8	644,747	18	17	Continuous	Monterey, Santa Barbara, Imperial, San Luis Obispo, Fresno
Cabbage, Fresh Market	2	21	11.5	218.5	74,727	49	51	Continuous	Monterey, Kern, Ventura, Imperial, Santa Barbara
Carrots, Fresh	1	81	61.0	945.5	503,006	17	18	Continuous	Kern, Imperial, Monterey, Riverside, Fresno
Cauliflower	1	86	32.0	288.0	194,952	28	35	Jan. 20-Dec. 15	Monterey, Santa Barbara, Imperial, Riverside, San Luis Obispo
Celery	1	94	27.0	931.5	344,024	21	24	Continuous	Monterey, Ventura, Santa Barbara, San Luis Obispo, San Benito
Corn, Fresh Market Sweet	2	19	33.8	295.8	123,032	43	44	May 1-Dec. 1	Imperial, Fresno, Contra Costa, Riverside, San Joaquin
Cucumbers, Fresh Market	4	7	3.7	37.0	30,784	66	64	Apr. 1-Nov. 30	---
Garlic ⁴	1	98	25.0	212.5	221,289	27	31	Apr. 1-Sept. 15	Fresno, Kern, Santa Clara, Mono, San Bernardino
Lettuce, Head	1	71	90.0	1,620.0	596,160	---	---	Jan. 1-Nov. 30	Monterey, Imperial, Fresno, Santa Barbara, San Luis Obispo
Lettuce, Leaf	1	85	43.2	529.2	369,382	---	---	Continuous	Monterey, Imperial, Fresno, Santa Barbara, Riverside
Lettuce, Romaine	1	75	66.5	1,030.7	482,391	---	---	Continuous	Monterey, Imperial, San Benito, Riverside, Ventura
Lettuce, All	---	---	199.7	3,179.9	1,447,933	8	8	---	Monterey, Imperial, Fresno, Santa Barbara, San Benito
Melons, Cantaloupe	1	64	36.0	540.0	185,760	37	37	June 1-Dec. 15	Fresno, Imperial, Stanislaus, Merced, Kern
Melons, Honeydew	1	73	10.5	126.0	47,376	55	58	June 1-Dec. 15	Fresno, Imperial, Riverside, Stanislaus, Kern
Melons, Watermelon	3	16	10.0	305.0	78,080	46	49	June 1-Oct. 25	San Joaquin, Fresno, Riverside, Kern, Imperial
Mushroom, Agaricus	2	14	0.6	60.7	208,118	35	32	Continuous	Monterey, Santa Clara, San Diego, Fresno, San Bernardino
Onions, All	1	27	43.7	981.6	179,702	39	38	May 1-Oct. 31	Fresno, Imperial, Kern, Los Angeles, San Joaquin
Peppers, Bell	1	53	23.3	494.6	280,820	---	---	Apr. 1-Oct. 31	Riverside, Ventura, Kern, San Benito, Fresno
Peppers, Chili	1	65	7.1	157.8	99,682	---	---	May 1-Nov. 30	Santa Clara, Others
Peppers, All	---	---	30.4	652.4	380,502	24	22	---	---
Pumpkins	2	15	5.5	93.5	27,489	69	68	Sept. 1-Oct. 31	San Joaquin, San Mateo, Santa Clara, Stanislaus, Ventura
Spinach, Fresh Market	1	60	21.2	159.0	140,556	---	---	Continuous	Monterey, Others
Spinach, Processing	1	85	6.5	88.0	12,313	---	---	Continuous	---
Spinach, All	---	---	27.7	247.0	152,869	40	41	---	Monterey, San Benito, Imperial, Riverside, Ventura
Squash	3	16	6.1	61.0	35,052	63	62	June 1-Aug. 31	Fresno, Santa Barbara, San Diego, Monterey, Santa Clara
Tomatoes, Fresh	1	35	31.0	488.2	221,666	---	---	May 15-Jan. 31	San Diego, Merced, Fresno, San Joaquin, Stanislaus
Tomatoes, Processing	1	96	258.0	12,640.0	948,000	---	---	June 20-Nov. 10	Fresno, Kings, Yolo, Stanislaus, San Joaquin
Tomatoes, All	---	---	289.0	13,128.2	1,169,666	10	10	---	---
Other Vegetable & Melons	---	---	---	---	552,362	---	---	---	---

