Hort 319 - Temperate Fruit and Nut Production

Pampa Apples and Plums

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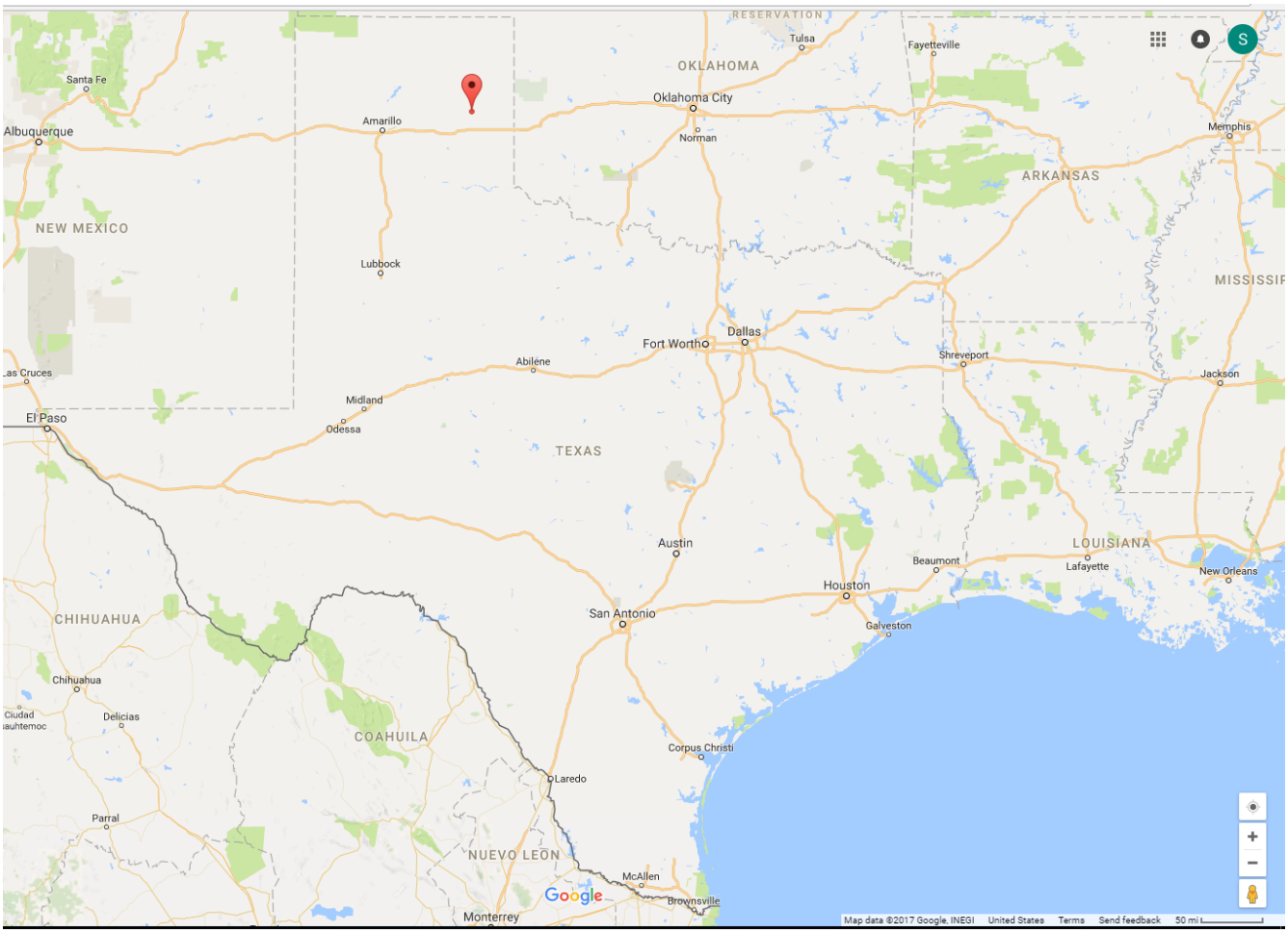
Chapter I.

Site selection, description, and analysis

A. Location with respect to market and suppliers

We plan to plant our plum and peach orchard at a site near Pampa, Texas in the panhandle and market them via a farmers market in Pampa, which is located less than



35 miles from the orchard site. (Figure 1.1).

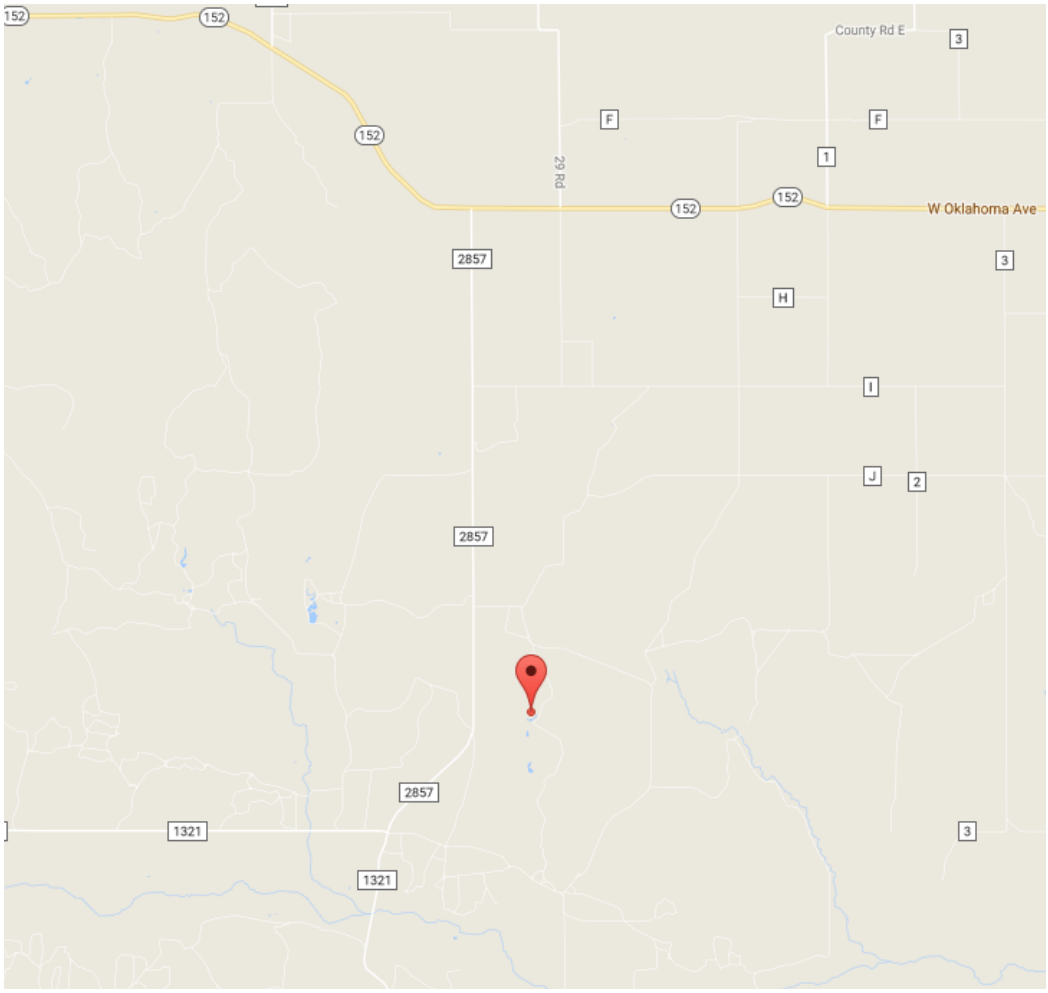


Figure 1.2 Orchard location with respect to farm roads

The population of Pampa has around 17,700 residents. Since the orchard location isn't near any major highways, advertising would best be done through local newspapers and radio. Supplies for the orchard should be fairly easy to obtain locally since all the surrounding area is farm and ranch land. The orchard is located off of FM Road 2857 which is a paved two lane road.

B. Topography

Our site is located in a relatively low area with comparison to the surrounding land. The elevation in gray county ranges from 2,450–3,320 feet (Texas Almanac 2015), with our orchard sitting at around 2,650 feet (Arcgis, 2017).

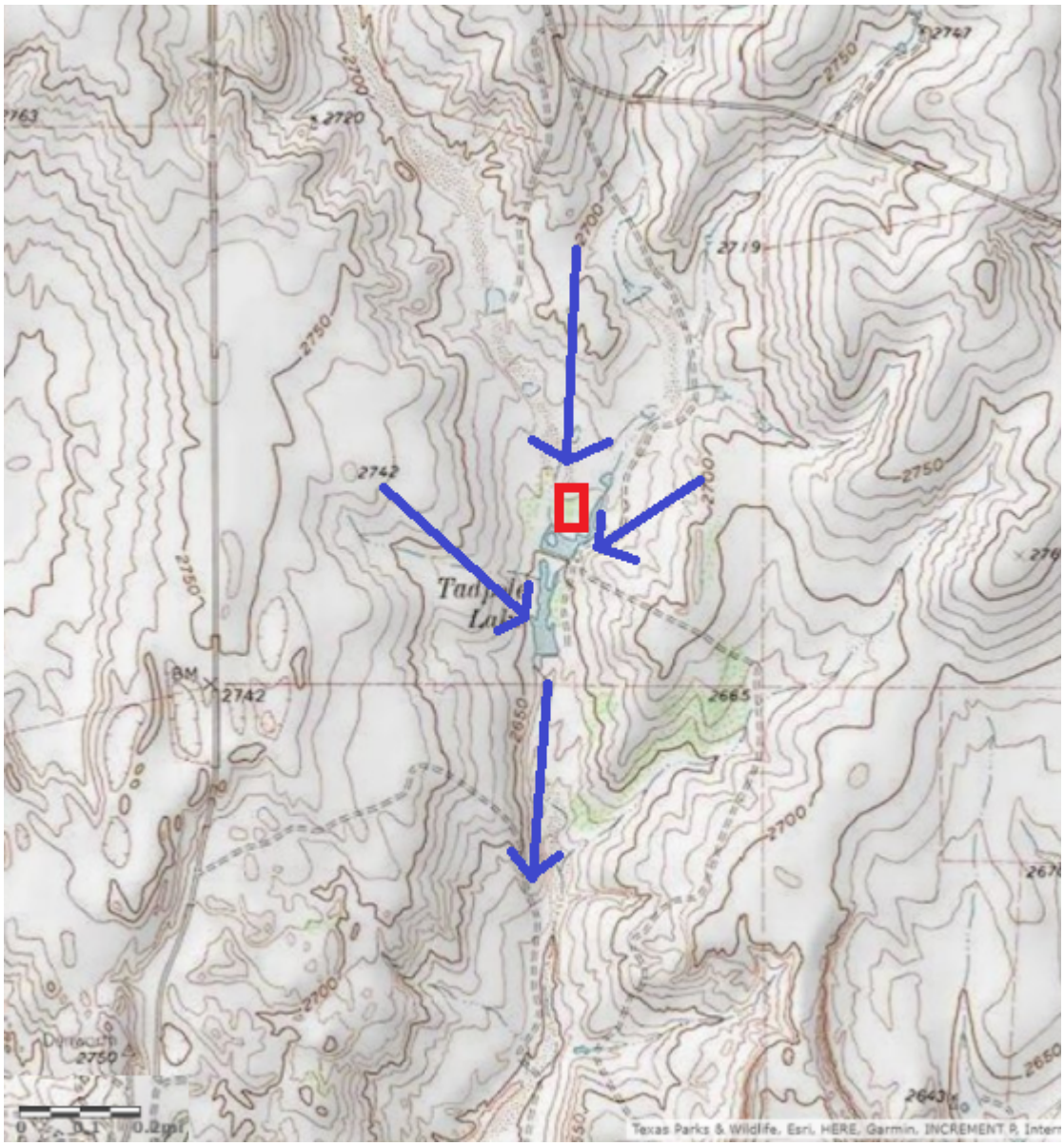


Figure 1.3 Figure 1.3. Topographic map of the area including and surrounding the proposed orchard site. The red rectangle marks the orchard (532 x 385 ft, 4.2 acres) and the arrows indicate the direction the cold air will flow. There is a 2% slope that will allow cold air to drain during a freeze event. The map was obtained using arcGIS.

To the east, there is a 4% slope towards the site with the rise measuring 50 feet and the run measuring 1,230 feet. To the north west there is a 3.4% slope, and to the east there is a 5.3% slope with both running towards the site. The greatest slope draining air away from the orchard is located due south with a drop of fifty feet in 2,500 feet, resulting in a slope of about 2% that may serve to drain the area of cold air. Unfortunately, the drainage is probably not sufficient enough to stave off all freezes, so it may be beneficial to install a wind machine.

The site measures roughly 532 x 385 feet and is composed of 4.2 acres that will all make up the orchard (Web Soil 2017).

C. Climate (rainfall, extreme temperatures, chilling hours, variability in climate)

Depending on the climate and variety apples can bloom as early as mid-April or mid-May and ripen from anywhere to late June to early September. For Texas, the chilling hours for most varieties are anywhere from 350 to 2,200 hours (Timing, 2013).

Plums can bloom anywhere from beginning of March to the beginning of April and ripen between Late May to September. The amount of chilling hours for varieties can be anywhere from 500 to 1,000 hours. (Fruit Tree, 2017)

In this ten year period there was a chilling range from 1330 to 1900 so to avoid problems with chilling the best range would be from 1250 to 1400 for both crops.

Since the area has low humidity diseases such as apple scab, fire blight, and powdery mildew shouldn't be too much of a problem. However one issue could be the heat during the late summer time when the apples are ripening. This could potentially cause apple water core and pit burn in the plums. Both crops could have other issues including off-flavors or woolliness in the fruit.

Table 1.1 Average Maximum Monthly Temperature at Pampa from 2006 to 2016. Data from NOAA web site at https://www.ncdc.noaa.gov/cdo-web/results.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2006	60	56	63	78	84	92	95	90	78	71	63	49
2007	41	49	66	63	76	84	91	93	84	77	63	47
2008	52	55	63	71	81	92	91	89	80	71	64	52
2009	53	62	65	70	75	89	94	90	79	64	65	45
2010	48	42	58	72	78	92	90	94	89	77	62	53
2011	50	51	65	77	83	97	100	100	87	74	62	44
2012	58	51	71	78	84	94	98	94	87	71	68	54
2013	49	50	61	67	81	91	89	91	87	72	58	48
2014	51	47	61	73	82	87	88	93	82	77	57	51
2015	47	52	64	73	73	87	91	89	88	74	60	53
2016	50	61	69	71	76	88	95	89	84	81	68	50
Avg.	49.9	52	64.3	71.5	78.9	90.1	92.7	92.2	84.7	73.8	62.7	49.7

Table 1.2 Average Minimum Monthly Temperature at Pampa from 2006 to 2016. Data from NOAA web site at https://www.ncdc.noaa.gov/cdo-web/results.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2006	27	24	36	46	55	64	68	67	52	46	34	26
2007	20	23	40	39	53	59	64	67	59	47	32	24
2008	22	24	32	39	51	62	66	64	55	44	33	22
2009	20	29	33	40	49	61	65	63	54	39	34	19
2010	20	21	32	43	51	65	66	65	59	46	30	26
2011	19	19	33	42	49	66	71	69	55	44	32	23
2012	24	27	41	46	55	63	69	64	56	42	35	24
2013	23	25	31	34	50	64	66	66	61	43	31	20
2014	20	20	28	40	51	62	65	65	58	48	29	28
2015	23	24	35	45	51	64	67	65	63	49	34	29
2016	24	30	37	43	49	64	69	64	60	50	38	21
Avg.	22	24.18	34.36	41.54	51.27	63.1	66.91	65.36	57.45	45.277	32.91	23.82

Table 1.3 Average Mean Monthly Temperature at Pampa from 2006 to 2016. Data from NOAA web site at https://www.ncdc.noaa.gov/cdo-web/results.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2006	43.5	40	49.5	62	69.5	78	81.5	78.5	65	58.5	48.5	37.5
2007	30.5	36	53	51	64.5	71.5	77.5	80	71.5	62	47.5	35.5
2008	37	39.5	47.5	55	66	77	78.5	76.5	67.5	57.5	48.5	37
2009	36.5	45.5	49	55	62	75	79.5	76.5	66.5	51.5	49.5	32
2010	34	31.5	45	57.5	64.5	78.5	78	79.5	74	61.5	46	39.5
2011	34.5	35	49	59.5	66	81.5	85.5	84.5	71	59	47	33.5
2012	41	39	56	62	69.5	78.5	83.5	79	71.5	56.5	51.5	39
2013	36	37.5	46	50.5	65.5	77.5	77.5	78.5	74	57.5	44.5	34
2014	35.5	33.5	44.5	56.5	66.5	74.5	76.5	79	70	62.5	43	39.5
2015	33.5	36	46	56.5	62	74.5	78	77	73	61	44.5	40.5
2016	37	45.5	53	57	62.5	76	82	76.5	72	65.5	53	35.5

Avg.	35.95	38.09	49.33	56.52	65.085	76.6	79.805	78.78	71.075	59.538	47.805	36.76

Table 1.4 Monthly precipitation (inches) at Pampa from 2006 to 2016. Data from NOAA web site at https://www.ncdc.noaa.gov/cdo-web/results.

Year	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
2006	1.63	0	3.78	.09	3.07	1.79	3.07	5.94	1.17	2.7	5.33	6.99
2007	9.64	2.87	6.71	13.13	3.36	.80	2.17	1.56	4.04	3.02	1.05	7.89
2008	.85	.23	.51	1.35	3.59	3.15	2.68	5.06	.40	4.2	.28	3.27
2009	.56	.37	14.36	5.17	2.99	2.01	2.18	6.17	1.72	3.48	.03	2.34
2010	11.36	7.68	6.64	4.52	3.75	.37	4.42	3.27	.55	1.83	3.27	4.84
2011	.16	14.2	.26	.18	.15	1.74	1.33	2.36	.56	4.08	.92	6.55
2012	.31	5.78	2.45	3.57	.80	2.01	.26	1.56	1.81	.46	.01	2.65
2013	2.73	27.59	2.38	.18	2.87	2.48	2.73	3.02	4.97	.23	3.43	3.41
2014	.55	6.04	.30	1.74	1.28	4.43	3.52	2.55	2.82	1.94	3.41	.20
2015	10.16	4.81	1.14	6.12	9.67	4.37	3.86	5.06	.75	4.93	2.92	9.37
2016	3.18	.37	3.5	2.68	2.71	4.23	1.66	3.69	1.81	0	.35	.9
Avg.	3.74	6.36	3.82	3.52	3.11	2.50	2.53	3.66	1.87	2.44	1.91	4.4

Table 1.5 Estimated chilling accumulated at College Station from the period of 2006 to 2016. Chilling estimated by the following formula CU – 3547 – 54(mean January temperature ˚F).

Year	Jan. (mean temp.)	Chilling Hours
2006	43.5	1198
2007	30.5	1900
2008	37	1549
2009	36.5	1576
2010	34	1711
2011	34.5	1684
2012	41	1333
2013	36	1603
2014	35.5	1630

2015	**33.5**	**2408**
2016	**37**	**1549**
Average		**1649**

D. Soil (pH, texture, depth, drainage, etc.)

The soil description (Figure 1.4) indicates that the site is located on an area consisting of Likes loamy fine sand and Spur and Guadalupe soils (LfD and Sg) (Web Soil 2017). Spur and Guadalupe soils are lumped in together in the soil description (Figures 1.5 and 1.6), with both having a fairly shallow first horizon from about 0-15.5 inches composed of fine sandy loam. The second horizon is a sandy clay loam from 15.5-60 inches for Spur and a continuation of fine sandy loam from 15.5-60 inches for Guadalupe. Both soils are slightly calcareous throughout. The soil is well drained and there is no frequency of ponding (Figures 1.5 and 1.6). There should be no soil issues with either apple or plum. The limiting factor named in the soil survey was occasional flooding due to the location being near a pond, which will be controlled by installing a proper drainage system and built up retaining wall near the pond.

Likes loamy fine sand, slopes 1-8% is composed of loamy fine sand from 0-10 inches and loamy sand from 10-80 inches (Figure 1.7 and 1.8). This soil is highly calcareous and has a Ck horizon, denoting that there is an abundance of calcium carbonate. The soil is somewhat excessively drained and instances of ponding and flooding are non existent according to web soil survey. The Soil Survey lists the land as highly limited due to erosion factors, however, based on the topography map (Figure 1.3), we can see that the slope at our site is not very steep. Nonetheless, we will plant on a contour and utilize deep-rooted vegetation like triticale in the aisles to mitigate any erosion. Special care should be taken when selecting plum and apple rootstocks to assure that they will be tolerant of the high pH. Excessive drainage should not be a problem because the land will be irrigated.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
LfD	Likes loamy fine sand, 1 to 8 percent slopes	1.3	32.4%
Sg	Spur and Guadalupe soils	2.8	67.6%
Totals for Area of Interest		**4.2**	**100.0%**

Gray County, Texas

Sg—Spur and Guadalupe soils

Map Unit Setting

National map unit symbol: f4vp
Elevation: 1,000 to 3,000 feet
Mean annual precipitation: 16 to 30 inches
Mean annual air temperature: 57 to 72 degrees F
Frost-free period: 180 to 225 days
Farmland classification: Farmland of statewide importance

Map Unit Composition

Spur and similar soils: 60 percent
Guadalupe and similar soils: 35 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Spur

Setting

Landform: Flood-plain steps on river valleys
Down-slope shape: Linear
Across-slope shape: Linear
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 15 inches: fine sandy loam
H2 - 15 to 60 inches: sandy clay loam

Properties and qualities

Slope: 0 to 1 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: High (about 9.6 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: B
Ecological site: Loamy Bottomland 16-24" PZ (R077EY058TX)
Hydric soil rating: No

Figure 1.5 Description of Spur soils (Web Soil Survey)

Description of Guadalupe

Setting

Landform: Flood plains on draws
Down-slope shape: Linear
Across-slope shape: Concave
Parent material: Loamy alluvium

Typical profile

H1 - 0 to 16 inches: fine sandy loam
H2 - 16 to 60 inches: fine sandy loam

Properties and qualities

Slope: 0 to 2 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Occasional
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Available water storage in profile: Moderate (about 6.9 inches)

Interpretive groups

Land capability classification (irrigated): 2w
Land capability classification (nonirrigated): 2w
Hydrologic Soil Group: A
Ecological site: Sandy Bottomland 16-24" PZ (R077EY065TX)
Hydric soil rating: No

Minor Components

Unnamed

Percent of map unit: 4 percent
Hydric soil rating: No

Unnamed, hydric

Percent of map unit: 1 percent
Landform: Depressions
Hydric soil rating: Yes

Data Source Information

Soil Survey Area: Gray County, Texas
Survey Area Data: Version 12, Sep 21, 2016

Figure 1.6 Description of Guadalupe soils (Web Soil Survey)

Gray County, Texas

LfD—Likes loamy fine sand, 1 to 8 percent slopes

Map Unit Setting

National map unit symbol: 2tqtm
Elevation: 1,970 to 3,940 feet
Mean annual precipitation: 15 to 26 inches
Mean annual air temperature: 57 to 61 degrees F
Frost-free period: 185 to 220 days
Farmland classification: Not prime farmland

Map Unit Composition

Likes and similar soils: 95 percent
Minor components: 5 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Likes

Setting

Landform: Alluvial fans, hillslopes
Landform position (two-dimensional): Backslope, summit, shoulder, footslope, toeslope
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Parent material: Calcareous sandy colluvium and/or alluvium

Typical profile

A - 0 to 10 inches: loamy fine sand
Ck - 10 to 80 inches: loamy sand

Properties and qualities

Slope: 1 to 8 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High to very high (5.95 to 19.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 4 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Low (about 4.9 inches)

Interpretive groups

Land capability classification (irrigated): 6e
Land capability classification (nonirrigated): 6e
Hydrologic Soil Group: A

Figure 1.7 Description of Likes soil (Web Soil Survey)

Ecological site: Sandy 16-24" PZ (R077EY064TX)
Hydric soil rating: No

Minor Components

Tivoli

Percent of map unit: 2 percent
Landform: Dunes
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Side slope
Down-slope shape: Convex
Across-slope shape: Convex
Ecological site: Sand Hills 16-24" PZ (R077EY063TX)
Hydric soil rating: No

Mobeetie

Percent of map unit: 2 percent
Landform: Alluvial fans, hillslopes
Landform position (two-dimensional): Summit, shoulder, backslope, footslope, toeslope
Landform position (three-dimensional): Side slope
Down-slope shape: Linear, convex
Across-slope shape: Linear, convex
Ecological site: Mixedland Slopes 16-24" PZ (R077EY061TX)
Hydric soil rating: No

Guadalupe

Percent of map unit: 1 percent
Landform: Terraces, flood plains
Landform position (two-dimensional): Summit
Landform position (three-dimensional): Tread
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Bottomland 16-24" PZ (R077EY065TX)
Hydric soil rating: No

Data Source Information

Soil Survey Area: Gray County, Texas
Survey Area Data: Version 12, Sep 21, 2016

Figure 1.8 Description of Likes soil cont. (Web Soil Survey)

E. Water supply (well or surface water, water quality and quantity)

The orchard site sits over the Ogallala Aquifer (Figure 1.9), which provides water for eight states and is a major agricultural resource (Star 2009). According to the USGS, water quality is acceptable for irrigation and human consumption and salt levels are relatively low (Star 2009). Additionally, there is a 3.4 acre spring-fed pond available for irrigation if need be (Web Soil 2017).

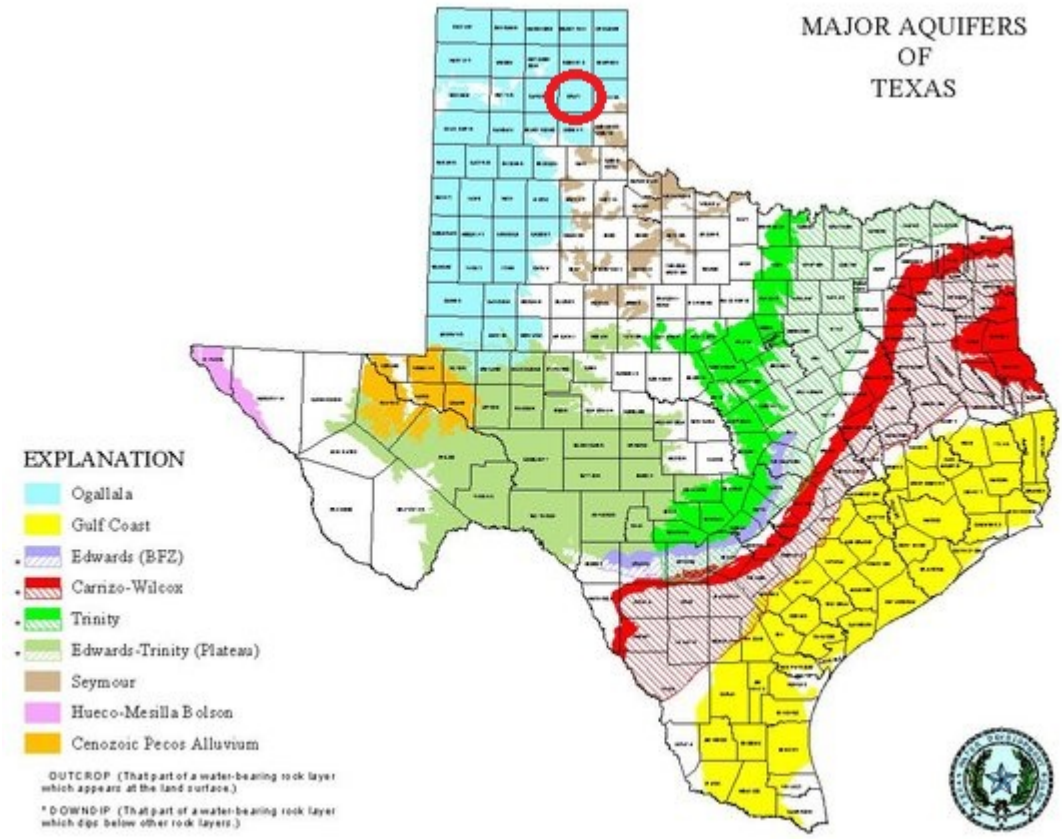


Figure 1.9 our orchard in relation to Texas Aquifers

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