

Summary Report of the Vadose Zone Soil Sampling in the
Bazile Groundwater Management Area
2014-2016



Introduction

Nitrogen is essential to plant growth and is added to agricultural crops and urban lawns to optimize growth and production. In agricultural production, both organic and inorganic forms of nitrogen are added to crops to supply the plants with this needed nutrient. If plants do not utilize all the nitrogen that is applied, the excess will move beyond the root zone and eventually reach the groundwater below. Nitrogen easily attaches to water and the downward movement of nitrogen is expedited by rainfall or by over irrigation (UNL, 2006). Once below the root zone (typically 3-6 feet depending upon crop), the nitrogen is no longer usable to the crop. For this reason, agricultural producers utilize best management practices (BMPs) to assist with application and irrigation timing to ensure efficient use of this nutrient. A few BMPs include split application of nitrogen during the growing season, the use of a nitrogen inhibitor, plant tissue analysis and testing of soil and irrigation water to determine nitrogen credits already available.

Several environmental factors can influence the downward movement of nitrogen. The amount and timing of rainfall can push nitrogen downward. Soil types also play a large role in the speed of water and nutrient transport. Soil with high percentages of sand experience faster movement of water and nutrients through the soil profile than areas with high percentages of clay. This quick movement of water and nutrients necessitates the need for increased watering events of crops grown in sandy areas, thus complicating nitrogen management. The timing of irrigation and the desire to keep nitrogen in the root zone increase the importance of utilizing BMPs.

This study examined the effects of BMPs on the downward flow of nitrogen in the soil profile in the Bazile Groundwater Management Area (GWMA). Covering parts of four Natural Resources Districts (NRDs) in northeastern Nebraska, the Bazile GWMA has had high nitrates in the groundwater since the 1980s. Due to the known hazardous health effects of drinking water with high nitrates, the Environmental Protection Agency (EPA) has set a safe drinking standard of 10 parts per million (ppm). Once a federal health standard has been set, the NRDs are tasked with monitoring and managing for the contaminant in the groundwater (see Nebraska's Groundwater Management and Protection Act state statutes §46-701-754). While each NRD has had a groundwater management plan in place for this area, nitrate levels have continued to rise.

In 2014, the Lower Niobrara, Lewis and Clark, Upper Elkhorn and Lower Elkhorn NRDs received grant funding from the Nebraska Department of Environmental Quality and the Nebraska Environmental Trust to begin a voluntary program to encourage the use of BMPs for both agricultural producers and urban residents. As part of this project, a study examining the effects of BMP use on nitrogen leaching in the Bazile GWMA was conducted from 2014 to 2016.

Methods

Deep vadose soil sampling was conducted throughout the Bazile GWMA (Figure 1). Samples were collected using a Giddings © soil probe equipped with a two inch diameter auger (Figure 2). Samples were taken from 0"-8", 8"-24" and every two feet thereafter up to 24 feet in depth. Once collected, each sample was mixed thoroughly and placed into individual bags. Samples were kept cool in the field by placing them in an ice chest. Samples were sent to Ward Laboratories (Kearney, NE) for nitrate and texture analysis in 2014 and 2015. In 2016, additional analysis of ammonium and moisture content was conducted. Variation in the sample size (8 inches versus 24 inches) was taken into account by Ward Laboratory personnel to ensure the result concentrations were on the same scale. Texture of samples was analyzed by Ward Laboratories or by Upper Elkhorn NRD technicians. Samples were taken between June 2014 and May 2016. Time of sample collection depended upon the location and landowner permission. Pasture, urban lawn and unfarmed pivot corner samples were generally taken earlier in the year, while agricultural crop field samples were collected in the spring before planting or in the fall after harvest. Nitrate concentrations were reported in both parts per million (ppm) and pounds per acre (lbs/acre).

The maximum depth could not be reached for all samples. The presence of gravel presented difficulties in retrieving the auger and the water content at some locations prohibited the core from maintaining its integrity. Samples ranged from 10 – 24 feet in this study. Conversions of nitrate concentrations from ppm to lbs N/ac were conducted by Ward Laboratory personnel using the formula "sample depth (inches) X 0.3 X ppm". For this report, the lbs N/acre values are utilized.

Sites were chosen based upon management type and landowner permission. Producers provided information regarding their management for each field in the previous season and historically along with information regarding their crop rotation and utilized best management practices.

Results and Discussion

A total of 86 samples were collected during this study, of those 65 reached the maximum depth of 24 feet. Only the samples that reached the full 24 feet have been utilized in the summary graphs (Figures 3-11). Samples were taken from a variety of management scenarios. Samples were taken at five alfalfa fields, fifteen dryland agricultural crop fields, one seasonal cattle lot, one golf course, thirty-six irrigated agricultural crop fields, four organic agricultural crop fields, seventeen pastures/pivot corners, one shelterbelt and seven urban lawns. Summary graphs were created for each management type (Figures 3-9) as well as each individual sample (Figures 12-98). On each individual table, the root zone (up to six foot) is denoted with a bold outline. Nitrogen in the root zone can be utilized by the crop. Notice should be taken of the X-

axis scale as they differ among graphs. For example, the X-axis on Figure 3 goes to 40 lbs N/ac whereas Figure 4 goes to 700 lbs N/acre.

Two samples were taken at the Ashfall Fossil Beds near Royal. These pasture samples, P6 and P7, yielded 48 and 21 lbs N/acre, respectively. While both were collected from unbroken pastures, the differences in soil types could account for the differences between the two samples. Soil texture for sample P6 (48 lbs N/acre) was composed of sandy loam and clay the length of the core, while sample P7 (21 lbs N/acre) was composed of sand the length of the core. Water and nitrogen would move more quickly through the sandy core. The samples from Ashfall Fossil Beds serve as a standard of what nitrogen levels would be in naturally occurring conditions. These two samples highlight the importance of the soil types on nitrogen leaching rates.

For each sample, the sum of the nitrogen in the core was calculated and these calculations were used to derive the average amount of lbs nitrate-N/ac and standard deviation (S.D.) for each management type. Table 1 shows the average lbs nitrate-N/acre, S.D. and range for each management type. When dryland and irrigated cropland are compared, the data supports other studies in that nitrogen leaching is more prevalent with increased watering events (Spalding, et al., 2001 and UNL, 2006). As expected, variation existed in all management types and the high S.D. on some management types emphasizes the need for larger sample sizes. Three of the highest irrigated crop cores were sampled during the season when nitrogen was being actively applied (samples C1, C2 and C3). The lowest nitrogen collected for irrigated crop was sample C5, an irrigated field in corn/soybean rotation, currently in soybeans. The other half of the same field, sample C6, was planted into corn and had a much higher total of 241 lbs N/acre. This data could be explained by the nitrogen uptake of a legume crop and the reduced application of nitrogen to a soybean crop.

In 2016, the additional parameters of ammonium-N and soil moisture content were added to each sample. Ammonium has the ability to convert to nitrate through the process of nitrification. Moisture must be present for nitrification to occur.

Other factors did play a role in results, in irrigated fields where two samples were taken, variation was seen. Figure 10 shows the difference between two cores sampled in the same field at differing elevations and should be noted when interpreting these results. However, for the goal of this study, showing the positive effects of BMP use, taking one core per field was deemed adequate. This data was collected to provide a snapshot of nitrogen leaching in different management types across the Bazile GWMA and the influence of BMP usage.

As discussed, abiotic factors such as rainfall and soil type influence results. Soil type is a critical factor when considering the speed of nitrogen movement through the soil profile. A similar study by Spalding and Kitchen (1988) estimated that it took 15 years for nitrogen to move 60 feet vertically through fine-textured, unsaturated soil while the Heartland Regional Water Coordination Initiative suggested a much quicker rate of one to two feet per year in fine-

textured soils (UNL, 2006). The majority of the samples collected for this study were taken from areas dominated by coarse sandy or sandy loam soils which would decrease the time needed for nitrogen to move the 60 feet as discussed by Spalding and Kitchen. Knowing the time needed for applied nitrogen to move the length of the core would provide information regarding our results. Comparing samples directly to one another should be done cautiously as soil type vastly differs across the Bazile GWMA. Some samples consisted of 24 feet of sand while others were largely 24 feet of clay. Sampling the same locations in 5 or 10 years would provide valuable site-specific information. Large rainfall events were frequent in the Bazile GWMA during this study. Nitrogen moves faster in saturated soil versus drier soil. For some samples, the water table was reached within the 24 foot core.

The findings of this project illustrate the usefulness of irrigation scheduling and BMPs to reduce nitrogen leaching in the vadose zone. The data collected for this study supports the key points listed by Frank, et al. (1991) that should be considered when managing nitrogen: 1) Nitrogen loss is closely linked to the amount and timing of nitrogen application and irrigation events; 2) When residual nitrate-N is high at post-harvest, the potential for off-season leaching is high; 3) The amount of nitrogen applied to a corn crop should be based on expected yield and account for all nitrogen credits already available; and 4) Excess irrigation will result in nitrogen leaching, even if fertilizer amounts are timed according to crop needs.

Table 1: Average pounds of nitrogen per acre (\pm S.D.) and range for each management type. Only cores that reached the maximum depth of 24 feet are included in the table. Caution should be taken in interpreting these results as the sample size is small for some of the management types.

Management Type	Sample Size (number of sites where maximum depth reached)	Average lbs N/acre in entire core	Standard Deviation (S.D)	Range (Lowest – Highest)
Alfalfa	4	80.3	31.4	40-114 lbs N/ac
Dryland Crop	10	190.4	141.9	53-240 lbs N/ac
Golf Course	1	123.0	N/A	N/A
Irrigated Crop	29	306.0	167.1	67-622 lbs N/ac
Organic Crop	4	110.5	60.7	46-190 lbs N/ac
Pasture/Pivot Corners	9	94.6	99.4	20-349 lbs N/ac
Seasonal Cattle Lot	1	1,832.0	N/A	N/A
Shelterbelt	1	685.0	N/A	N/A
Urban Lawn	5	65.2	40.9	35-135 lbs N/ac
Old Homestead	1	871.0	N/A	N/A

Literature Cited and Further Readings:

- Bobier, M.W., K.D. Frank and R.F. Spalding. 1993. Nitrate-N Movement in a Fine Textured Vadose Zone. *Journal of Soil and Water Conservation* 48(4): 350-354.
- Exner, M.E., A.J. Hirsh and R.F. Spalding. 2014. Nebraska's Groundwater Legacy: Nitrate Contamination Beneath Irrigated Cropland. *Water Resources Research* 50(5): 4474-4489.
- Frank, K.D., D. Watts, A. Christiansen and E. Penas. 1991. EC91-735 The impact of nitrogen and irrigation management and vadoze zone conditions on groundwater contamination by nitrate-nitrogen. *Historical Materials from University of Nebraska-Lincoln Extension Paper* 1625.
- Katupitiya, A., D.E. Eisenhauer., R.B. Ferguson, R.F. Spalding, F.W. Roeth and M.W. Bobier. 1997. Long-term Tillage and Crop Rotation Effects on Residual Nitrate in the Crop Root Zone and Nitrate Accumulation in the Intermediate Vadose Zone. *American Society of Agricultural Engineers* 40(5): 1321-1327.
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- Spalding, R.F., D.G. Watts, J.S. Schepers, M.E. Burbach, M.E. Exner, R.J. Poreda and G.E. Martin. 2001. Controlling Nitrate Leaching in Irrigated Agriculture. *Journal of Environmental Quality* 30:1184-1194.
- UNL. 2006. Agriculture Nitrogen Management for Water Quality Protection in the Midwest. Heartland Regional Water Coordination Initiative. University of Nebraska-Lincoln. Lincoln, NE.

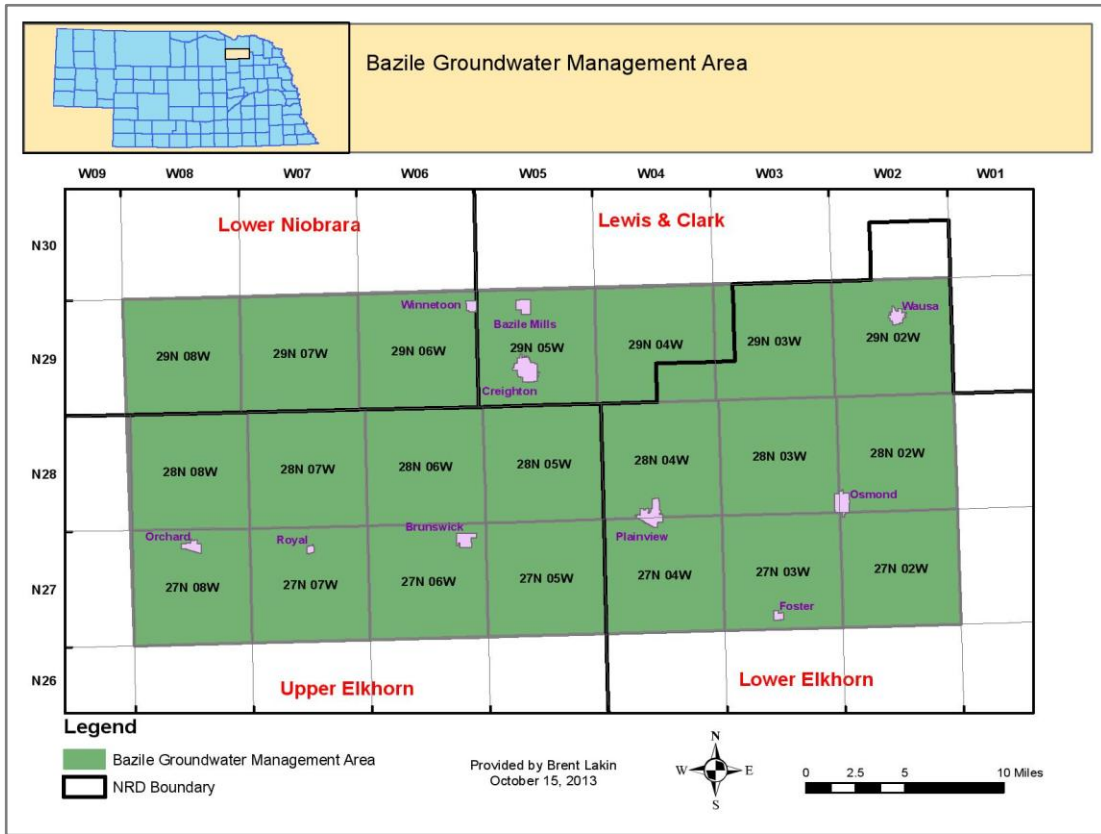


Figure 1: Location of the Bazile Groundwater Management Area, graphic courtesy of Brent Lakin, Lower Niobrara NRD



Figure 2: Probe used to collect samples

Figure 3: Summary Graph – Average nitrate concentrations for all management types, 24 foot depth samples only

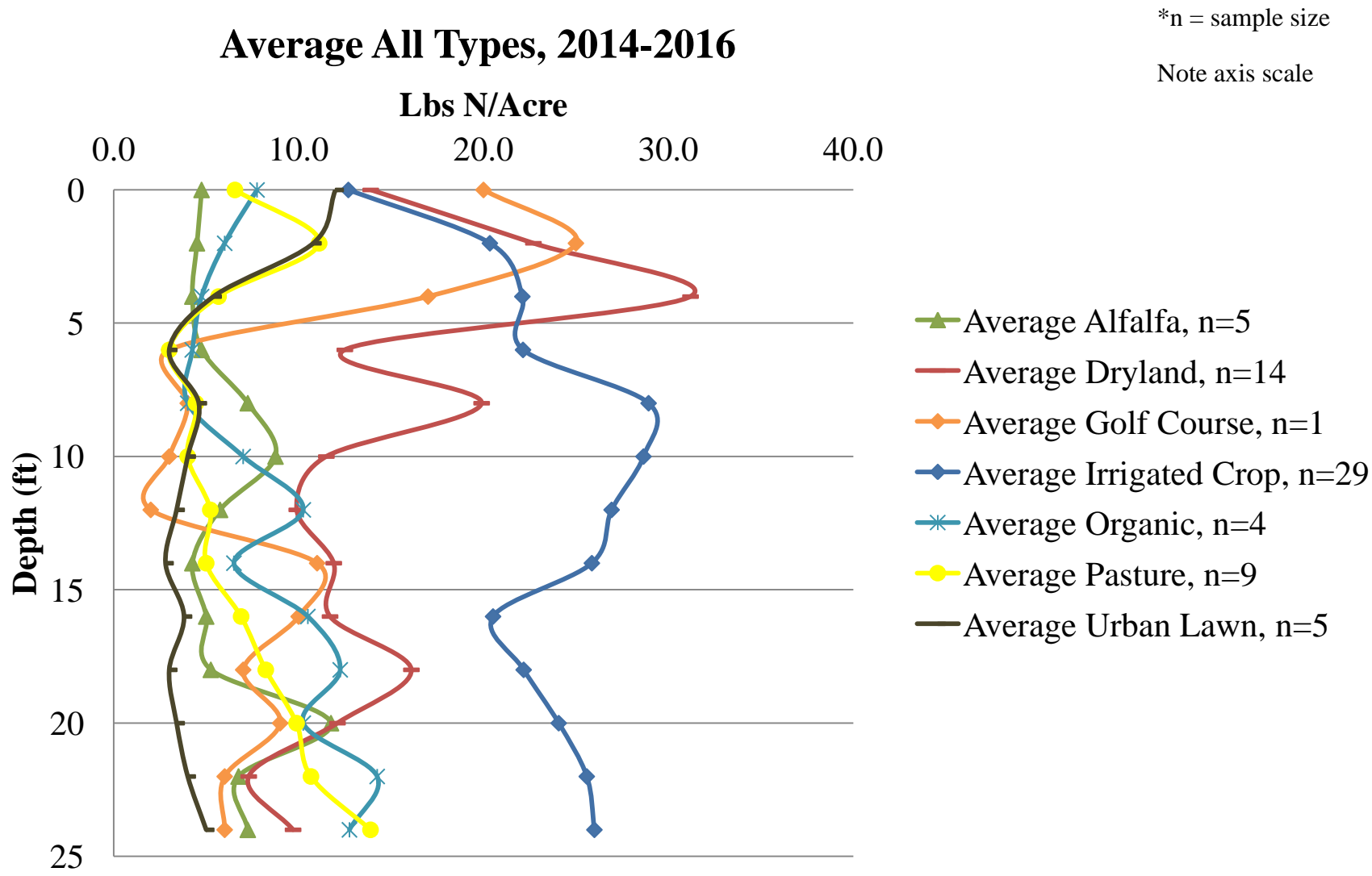


Figure 4: Summary Graph – Average for all Management Types

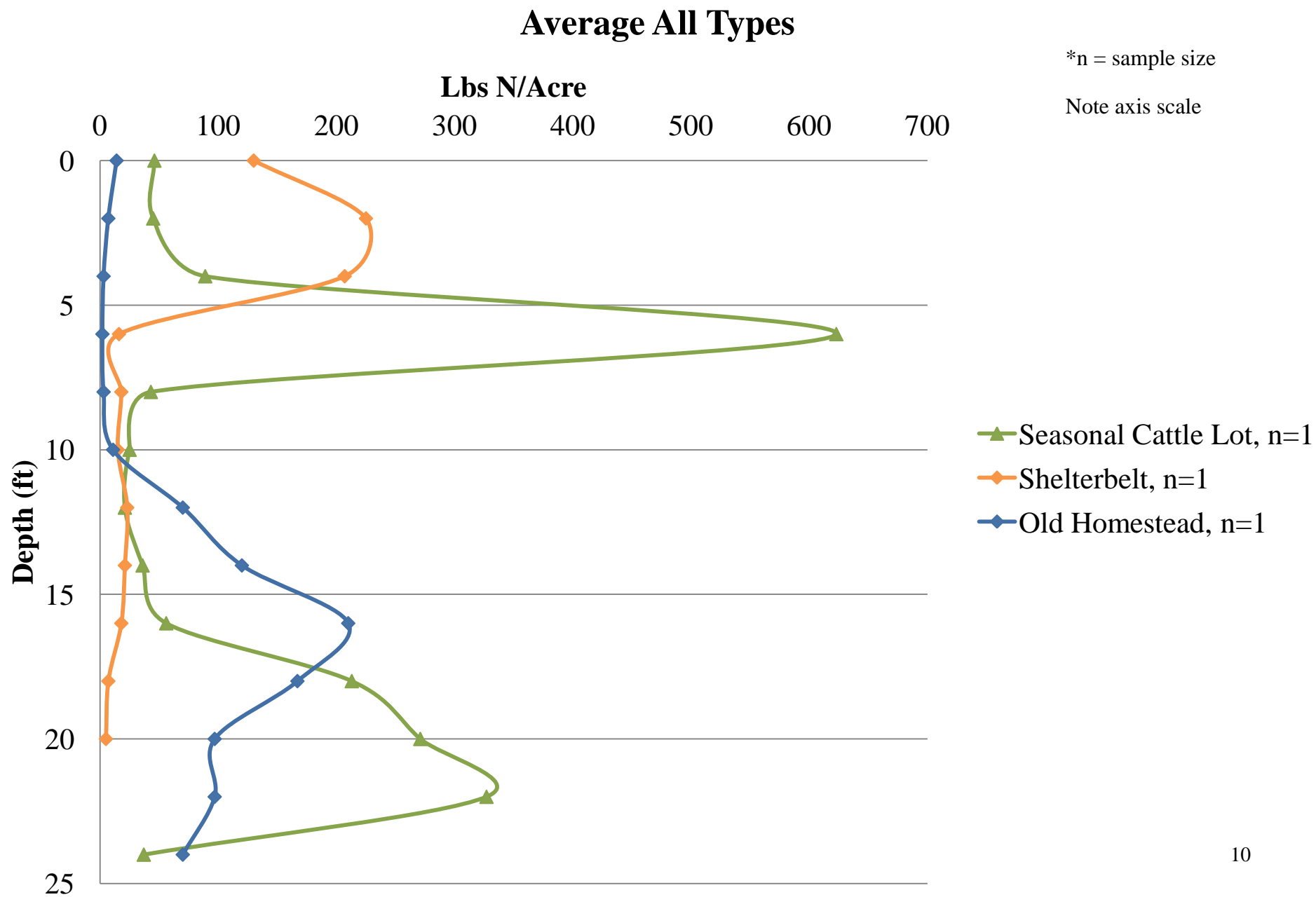


Figure 5: Summary Graph – Alfalfa

*note axis scale

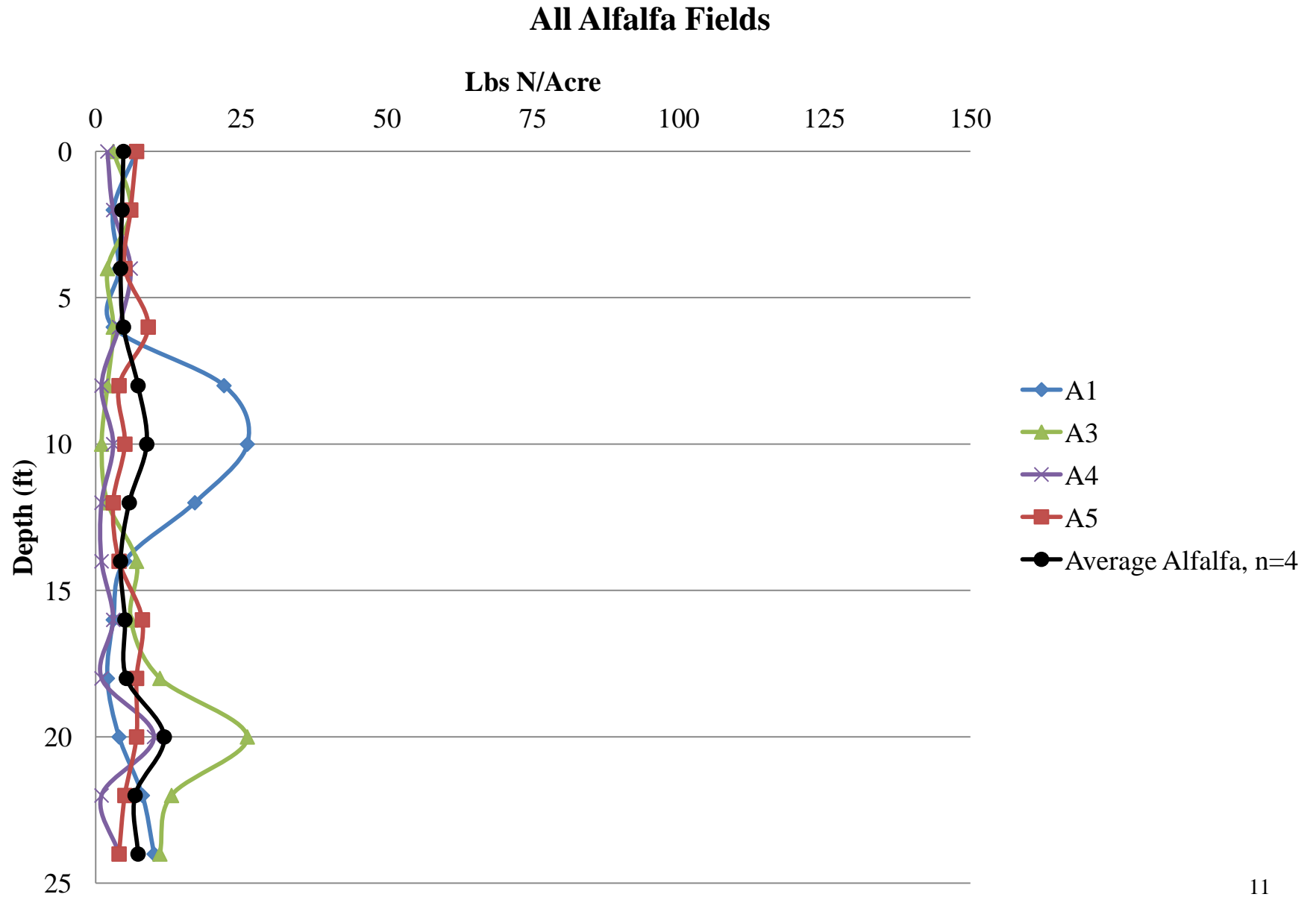


Figure 6: Summary Graph – Dryland Agricultural Crop Fields

*note axis scale

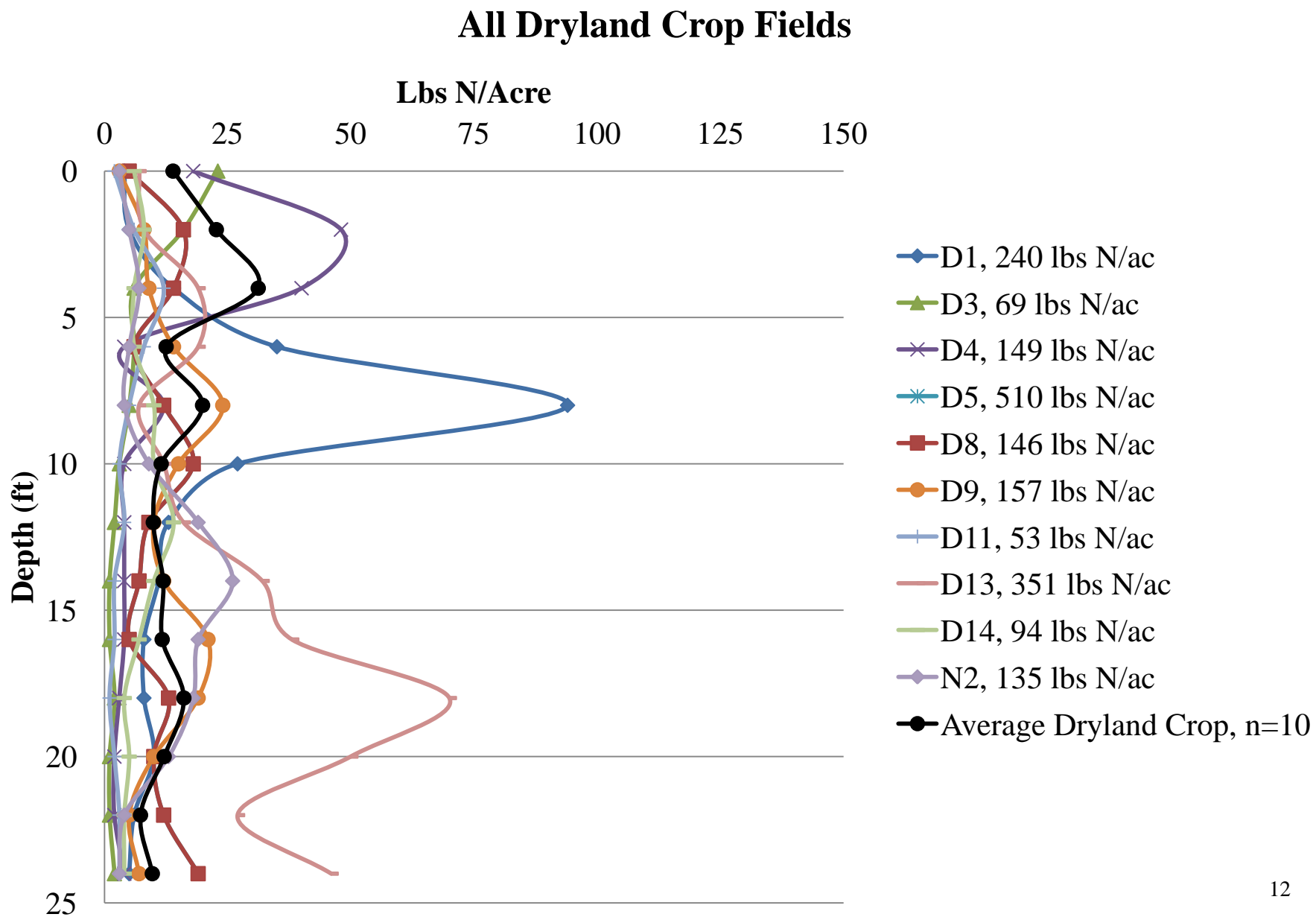


Figure 7: Summary Graph – Irrigated Agricultural Crop Fields

*note axis scale

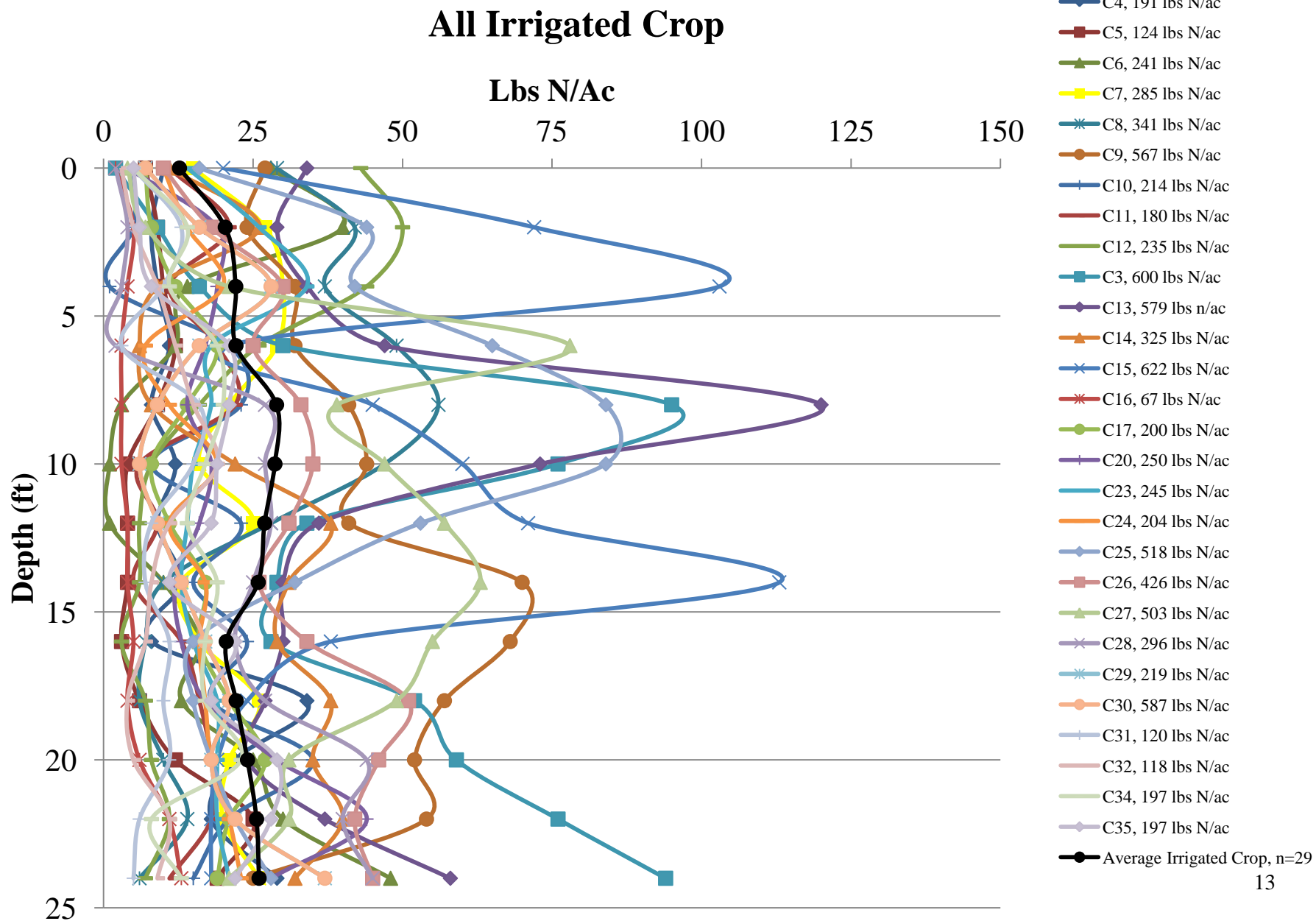


Figure 8: Summary Graph – All Dryland Pastures/Pivot Corners

*note axis scale

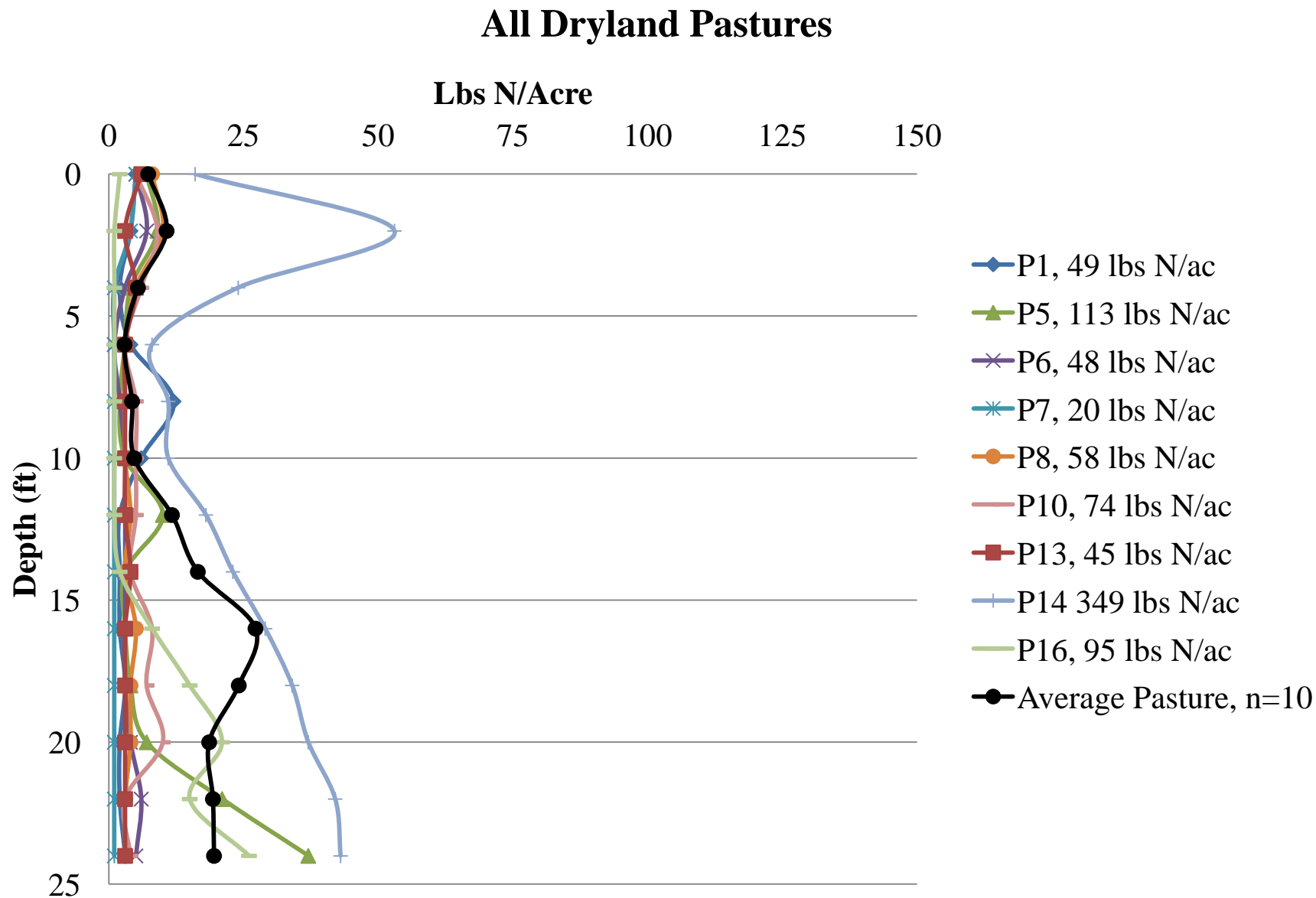


Figure 9: Summary Graph – Urban Lawns

*note axis scale

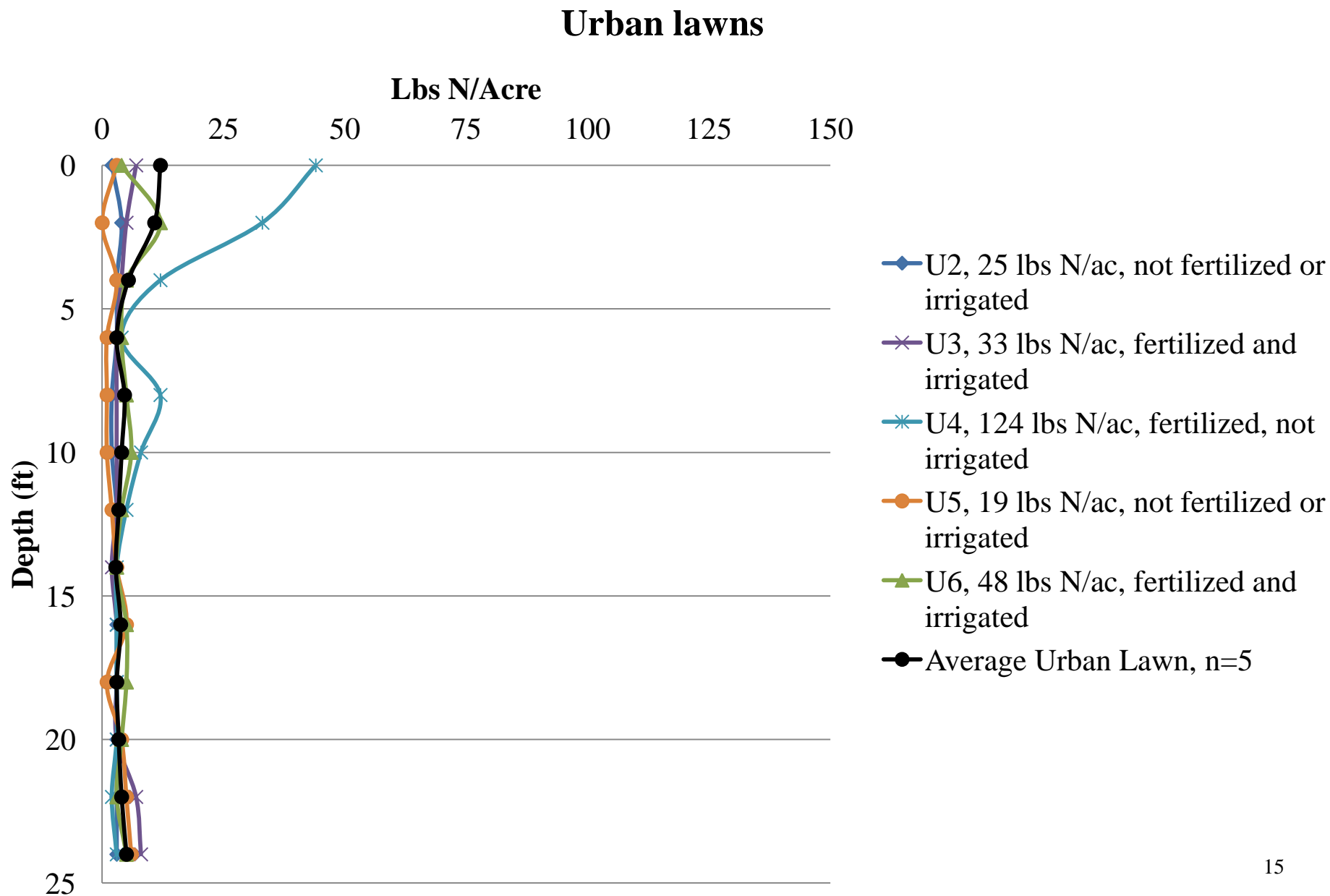


Figure 10: Summary Graphs – Results from two samples being collected in the same field, lines of the same color taken from the same field at different locations, elevation of each sample reported in feet.

*note axis scale

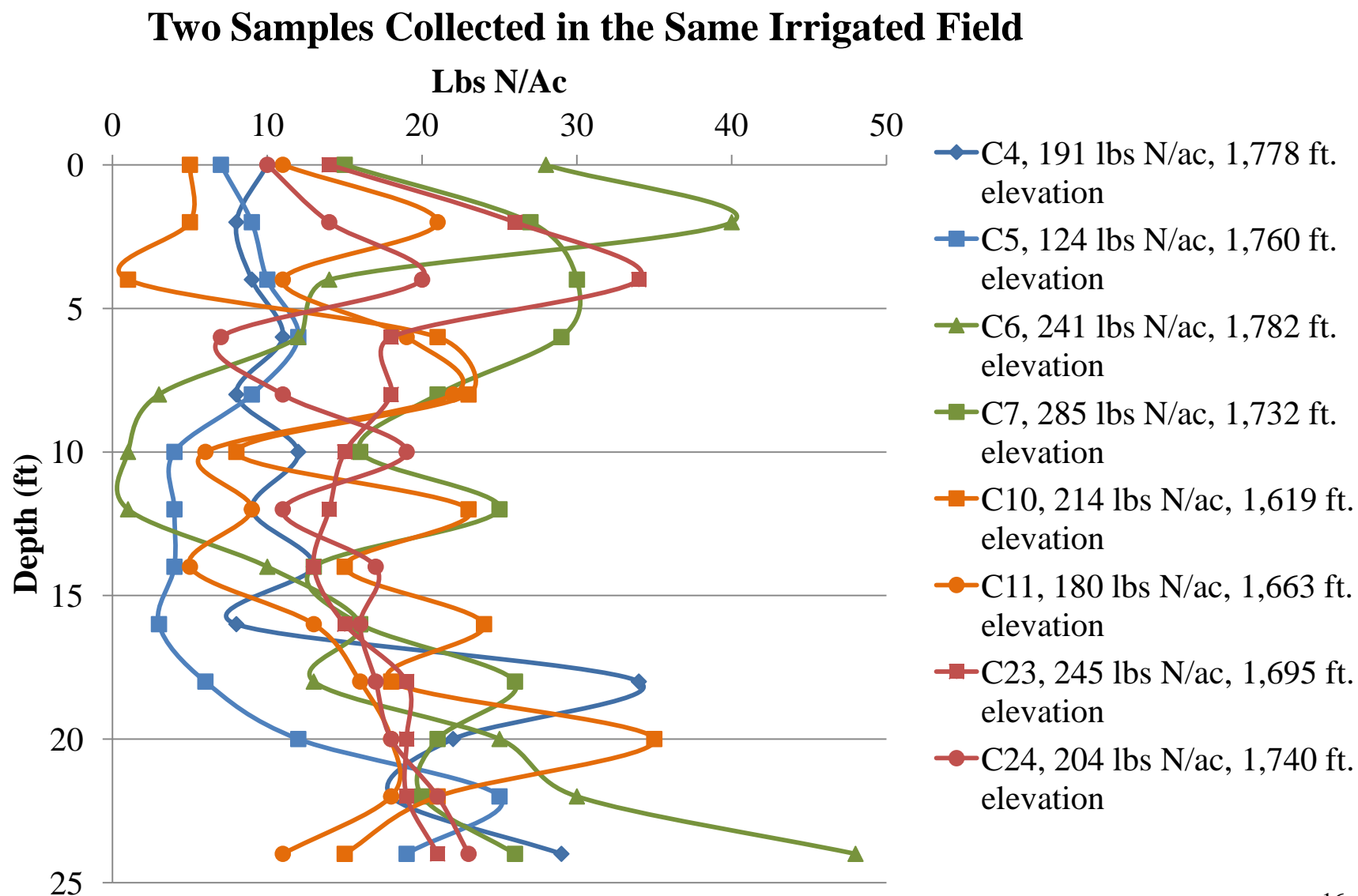


Figure 11: Summary Graph – One field, each half farmed by separate producers

Two Samples from the Same Field, Farmed by Two Producers

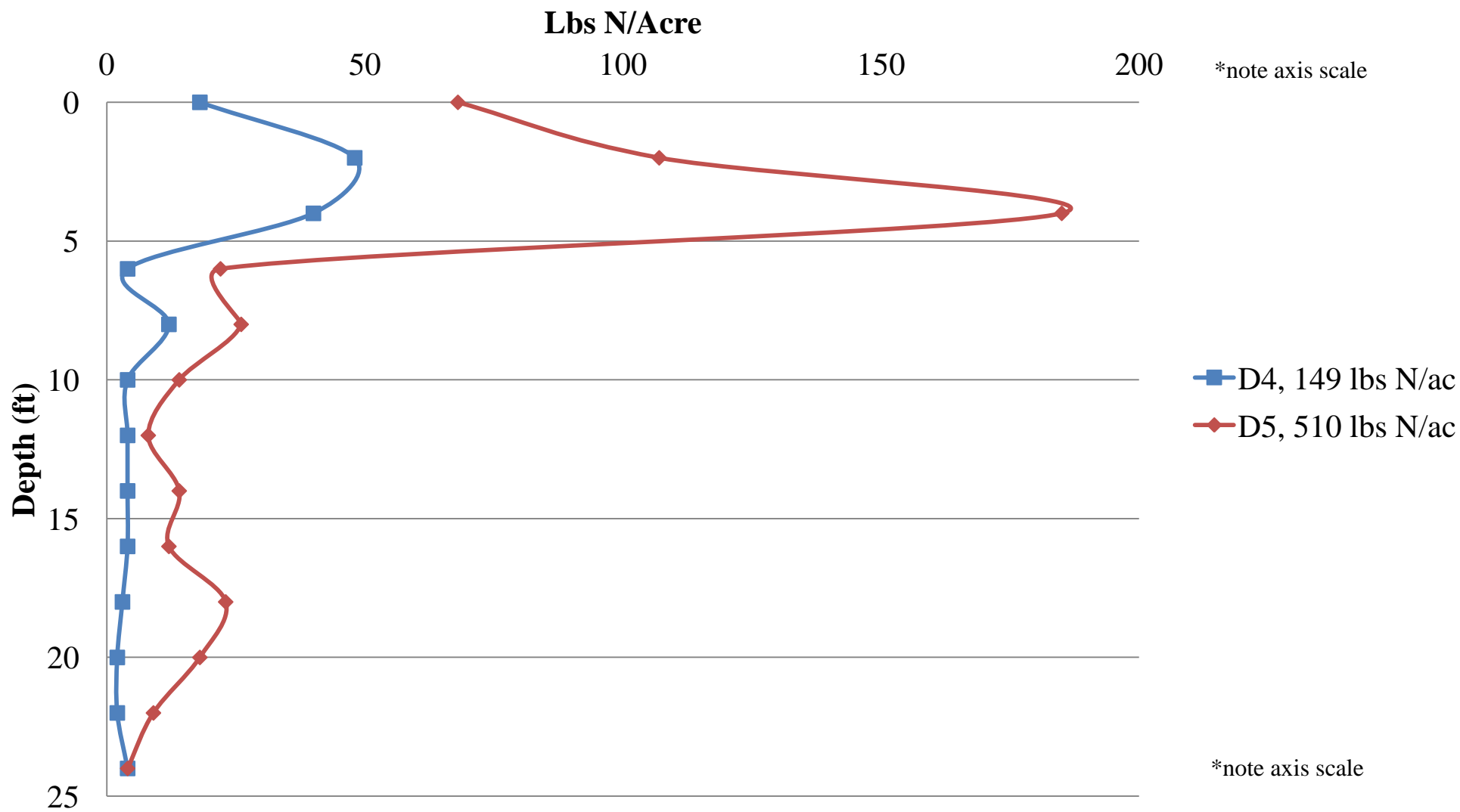


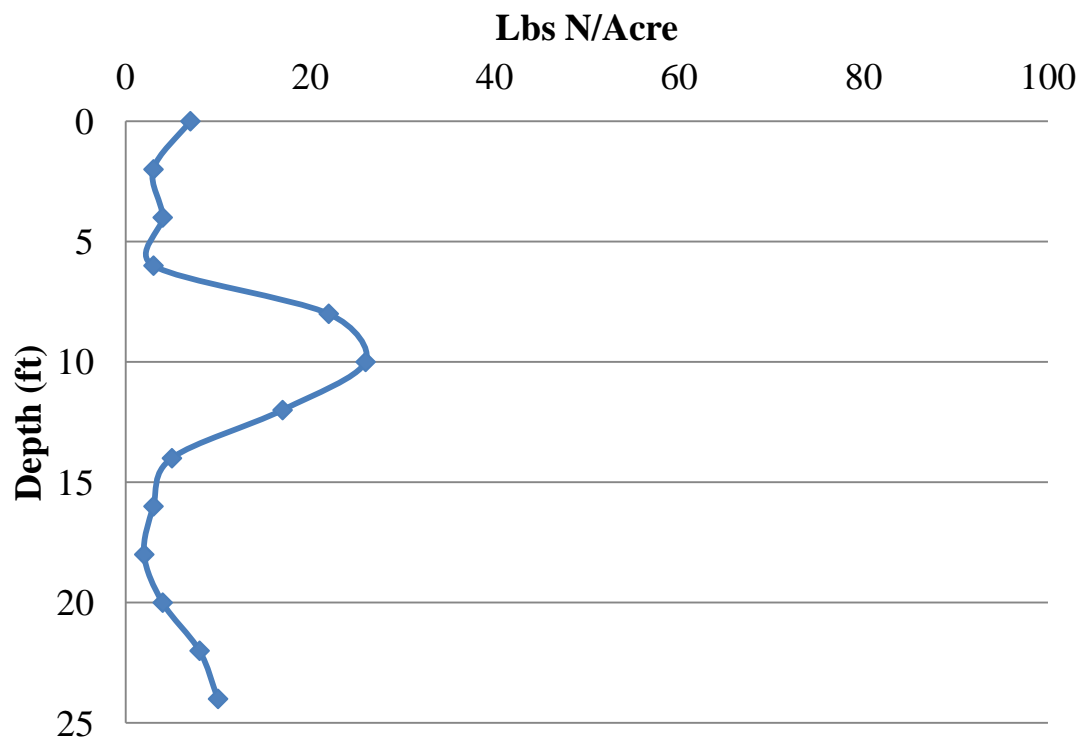
Figure 12: Site A1

Field Management Type: Alfalfa rotation

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Fine Sand	7
2	Fine Sand	3
4	Fine Sand	4
6	Fine Sand	3
8	Fine Sand	22
10	Fine Sand	26
12	Fine Sand	17
14	Fine Sand	5
16	Fine Sand	3
18	Fine Sand	2
20	Fine Sand	4
22	Fine Sandy Clay	8
24	Fine/Medium Sand	10
Total lbs N/acre 114 for Core		

A1 - Alfalfa Field



Management Details:

Sampled 7/11/14. This field is in year three of a five year rotation. The last crop before alfalfa was corn, but has been in soybeans previous to corn.

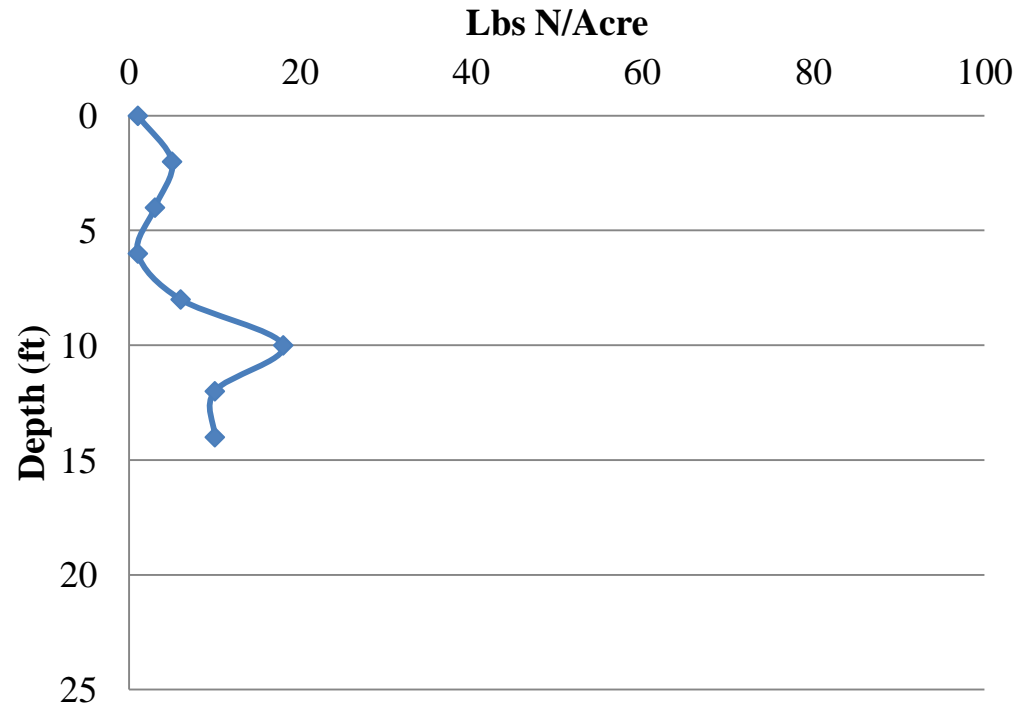
Figure 13: Site A2

Field Management Type: Alfalfa

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	1
2	Sandy Loam	5
4	Sandy Loam	3
6	Loamy Sand	1
8	Sand	6
10	Sand	18
12	Sand	10
14	Sand	10
16	N/A	
18	N/A	
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 54 for Core		

A2 - Alfalfa Field



Management Details:

Sampled 12/5/14. In a six year rotation with corn, this field is currently on year five in the rotation. Water prevented further sampling below 14 feet.

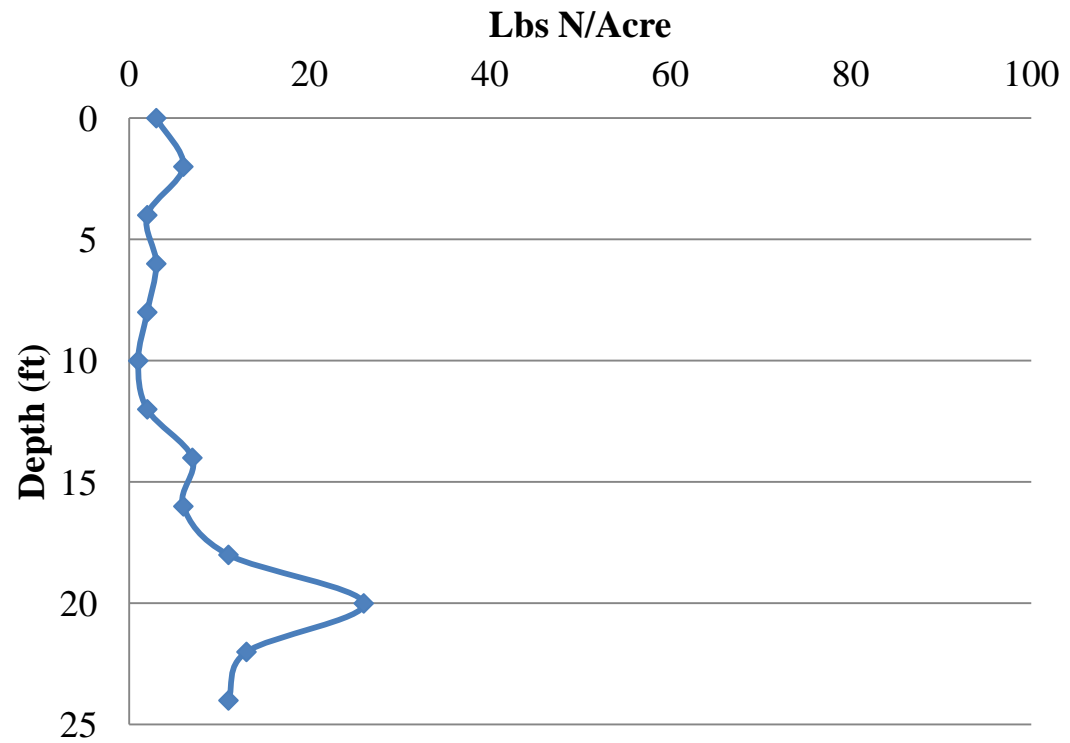
Figure 14: Site A3

Field Management Type: Alfalfa

Soil Texture Analysis: Conducted by Ward labs

A3 - Alfalfa Field

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	3
2	Sandy Loam	6
4	Loamy Sand	2
6	Loamy Sand	3
8	Sandy Loam	2
10	Sandy Loam	1
12	Loamy Sand	2
14	Loam	7
16	Loam	6
18	Loam	11
20	Loam	26
22	Loam	13
24	Loam	11
Total lbs N/acre 93 for Core		



Management Details:

Sampled 12/5/14. In a six year rotation with corn, this field is currently on year five in the rotation.

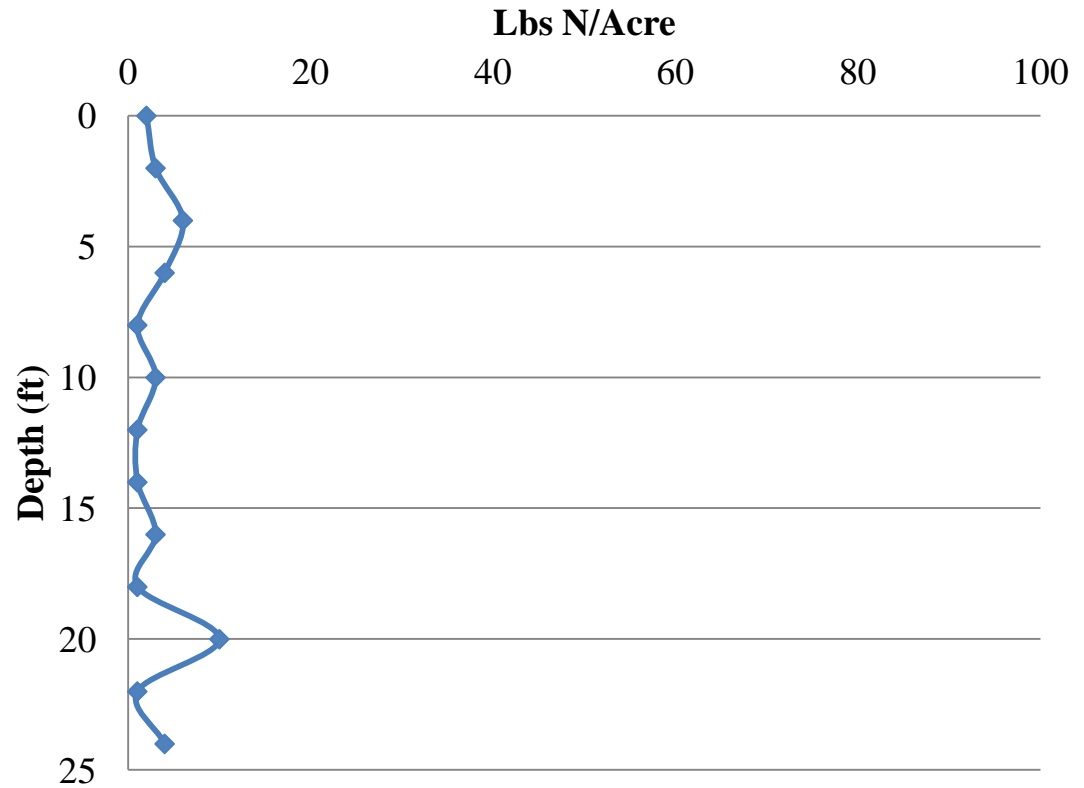
Figure 15: Site A4

Field Management Type: Alfalfa

Soil Texture Analysis: Conducted by Ward Labs

A4- Alfalfa Field

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	2
2	Sandy loam	3
4	Sandy loam	6
6	Loam	4
8	Loam	1
10	Loam	3
12	Clay loam	1
14	Clay loam	1
16	Sand	3
18	Sand	1
20	Loamy sand	10
22	Sand	1
24	Loamy sand	4
Total lbs N/acre 40 for Core		



Management Details:

Sampled 12/10/14. This location is in year four of a five year rotation with the crop prior to alfalfa being corn.

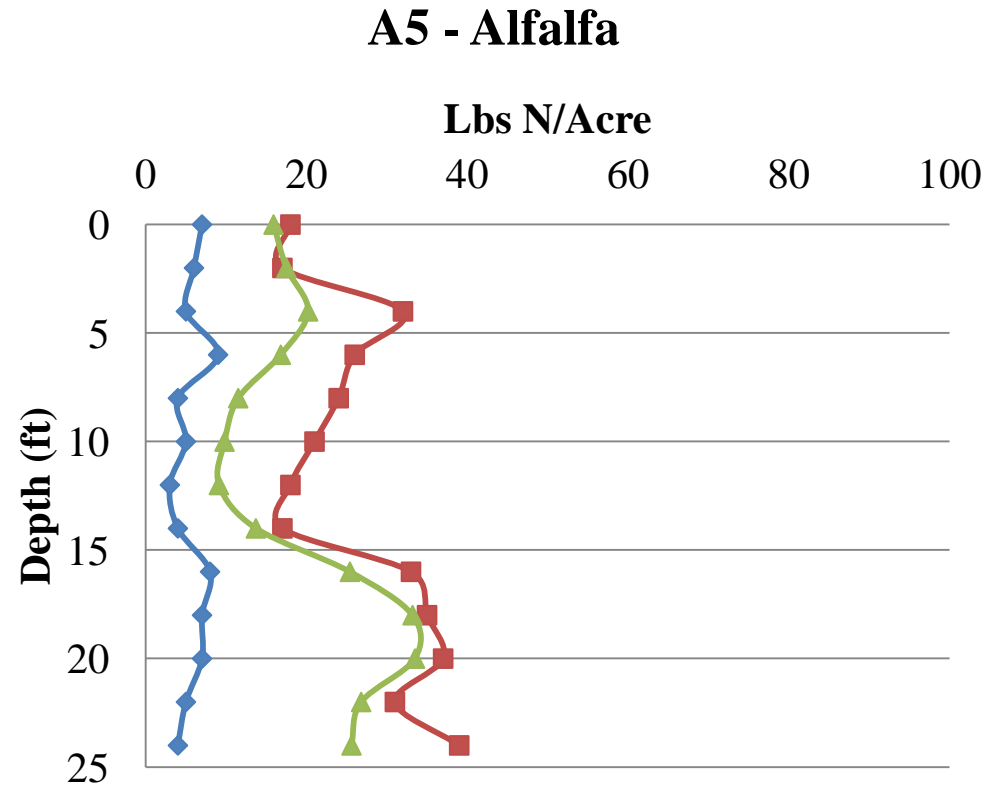
Figure 16: Site A5

Field Management Type: Alfalfa

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	7	18	15.9
2	Loam	6	17	17.5
4	Loam	5	32	20.2
6	Loam	9	26	16.8
8	Sandy Loam	4	24	11.5
10	Sandy Loam	5	21	9.8
12	Sandy Loam	3	18	9.1
14	Sandy Loam	4	17	13.7
16	Clay Loam	8	33	25.4
18	Clay Loam	7	35	33.2
20	Clay Loam	7	37	33.5
22	Loam	5	31	26.8
24	Silt Loam	4	39	25.6
Total		74	348	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %



Management Details:

Sampled 3/16/16. Irrigated alfalfa field, sample taken near a dedicated monitoring well.

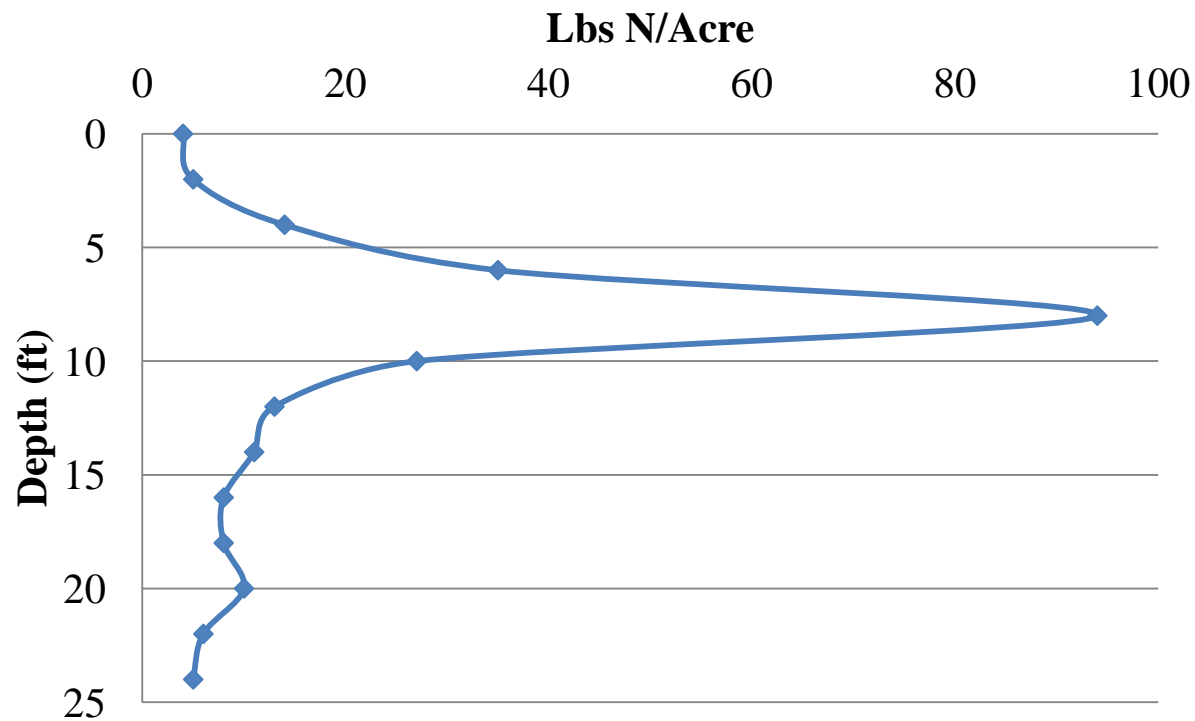
Figure 17: Site D1

Field Management Type: Dryland Corn

Soil Texture Analysis: Conducted by UENRD

D1 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Fine Sand	4
2	Fine Sand	5
4	Fine Sand	14
6	Fine Sand	35
8	Fine Sand	94
10	Fine Sand	27
12	Fine Sand	13
14	Fine Sand	11
16	Fine Sand	8
18	Fine Sand	8
20	Fine Sand	10
22	Fine Sand	6
24	Fine Sand	5
Total lbs N/acre 240 for Core		



Management Details:

Sampled 7/23/14 during the growing season. Producer utilizes nitrogen credits in soil and irrigation water.

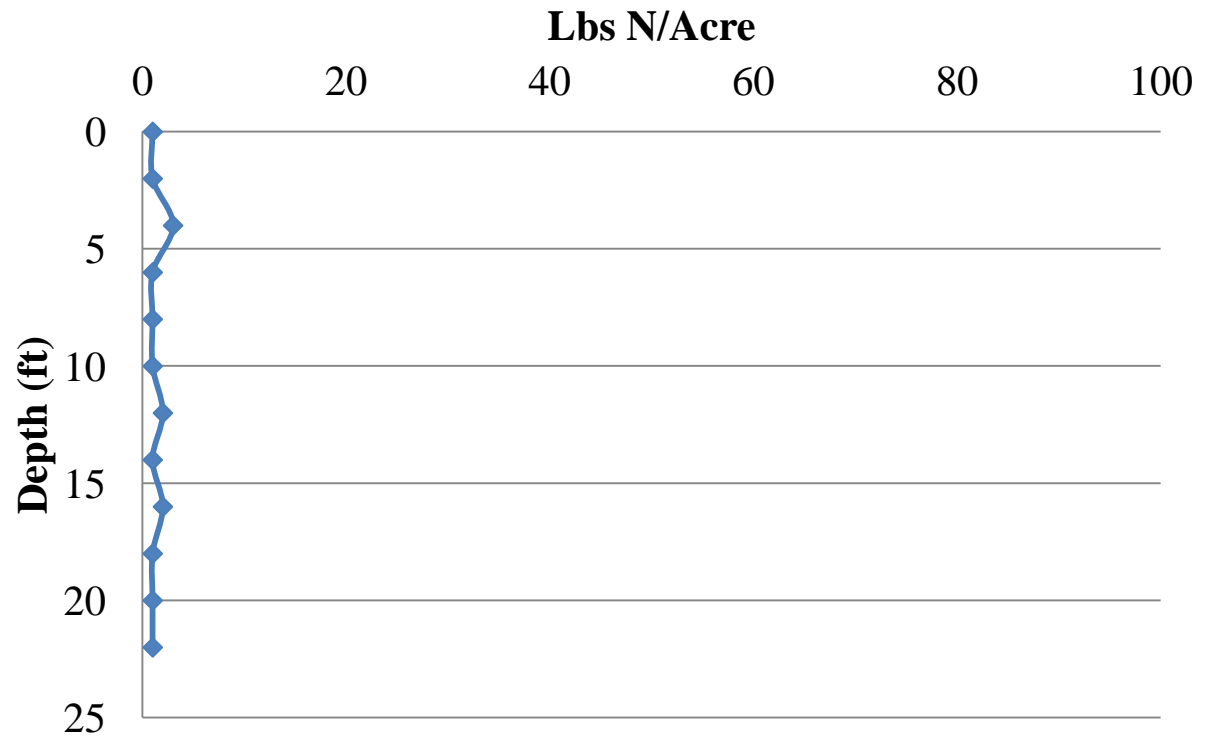
Figure 18: Site D2

Field Management Type: Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

D2 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	1
2	loam	1
4	Loam	3
6	Loamy Sand	1
8	Loamy Sand	1
10	Sandy Loam	1
12	Sandy Loam	2
14	Sandy Loam	1
16	Sandy Loam	2
18	Sandy Loam	1
20	Sand	1
22	Sand	1
24	N/A	
Total lbs N/acre 16 for Core		



Management Details:

Sampled 11/21/14. The producer split applies nitrogen during the season and utilizes nitrogen credits in the soil. A hard limestone layer prevented further sampling below 22 feet.

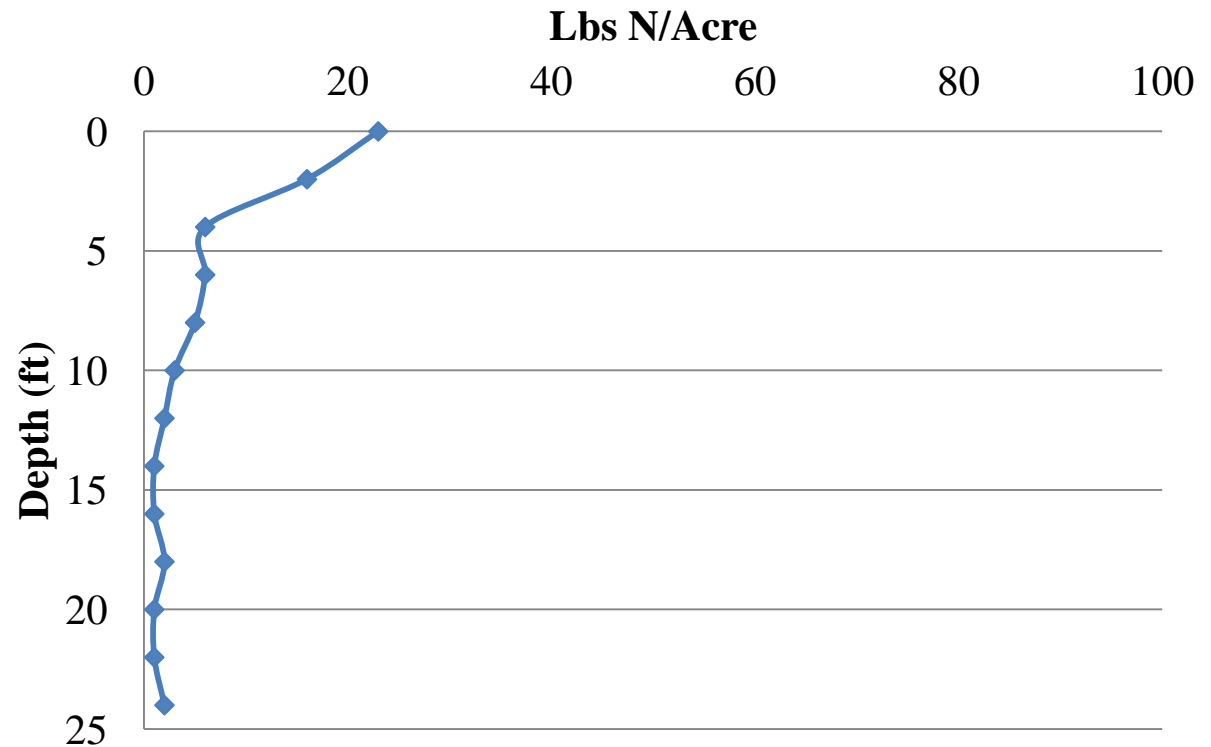
Figure 19: Site D3

Field Management Type: Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

D3 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	23
2	Loam	16
4	Clay Loam	6
6	Clay Loam	6
8	Clay Loam	5
10	Sandy Loam	3
12	Loamy Sand	2
14	Sandy Loam	1
16	Sandy Loam	1
18	Sandy Loam	2
20	Sandy Loam	1
22	Sandy Loam	1
24	Loamy sand	2
Total lbs N/acre 69 for Core		



Management Details:

Sampled 11/21/14. The producer split applies nitrogen during the season and utilizes nitrogen credits in the soil.

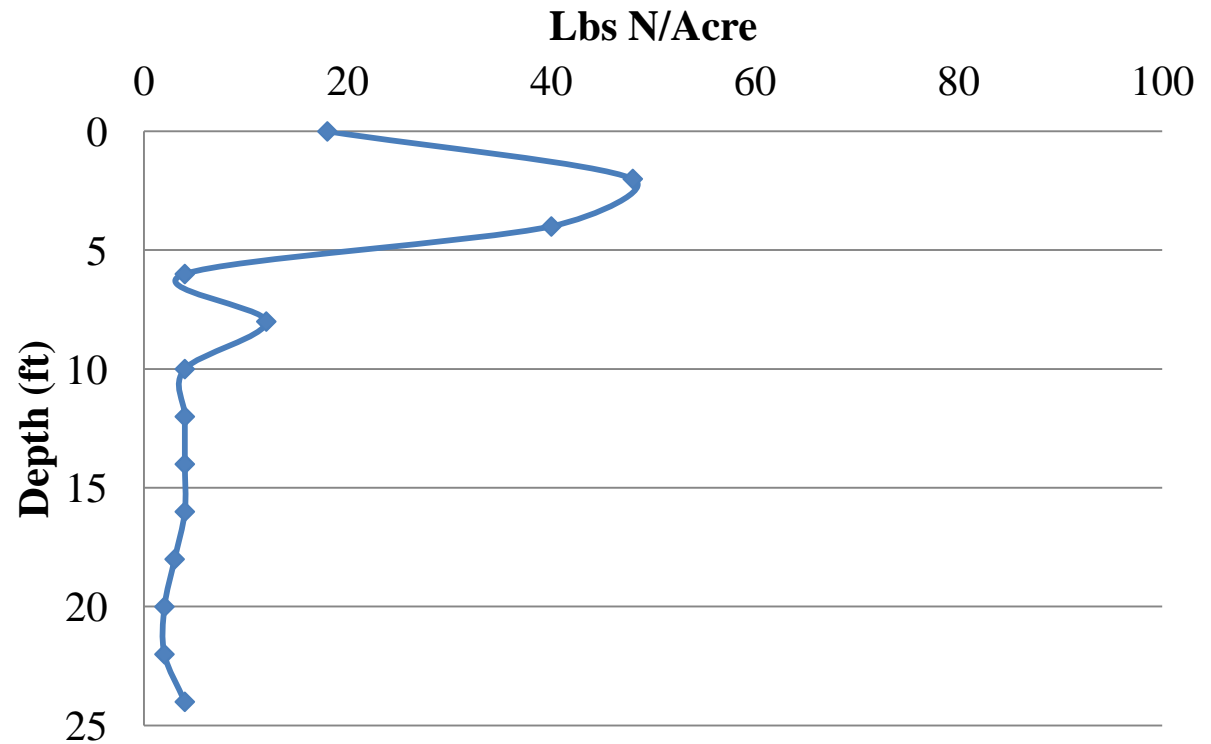
Figure 20: Site D4

Field Management Type: Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

D4 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	18
2	Loam	48
4	Clay Loam	40
6	Sandy Loam	4
8	Sandy Loam	12
10	Loamy Sand	4
12	Sand	4
14	Sand	4
16	Sand	4
18	Loamy Sand	3
20	Loamy Sand	2
22	Sand	2
24	Sand	4
Total lbs N/acre 149 for Core		



Management Details: Sampled 11/21/14. Producer split applies nitrogen during the season. This field has been in no-till management since 1997. Location also sampled in 2016, see sample D11.

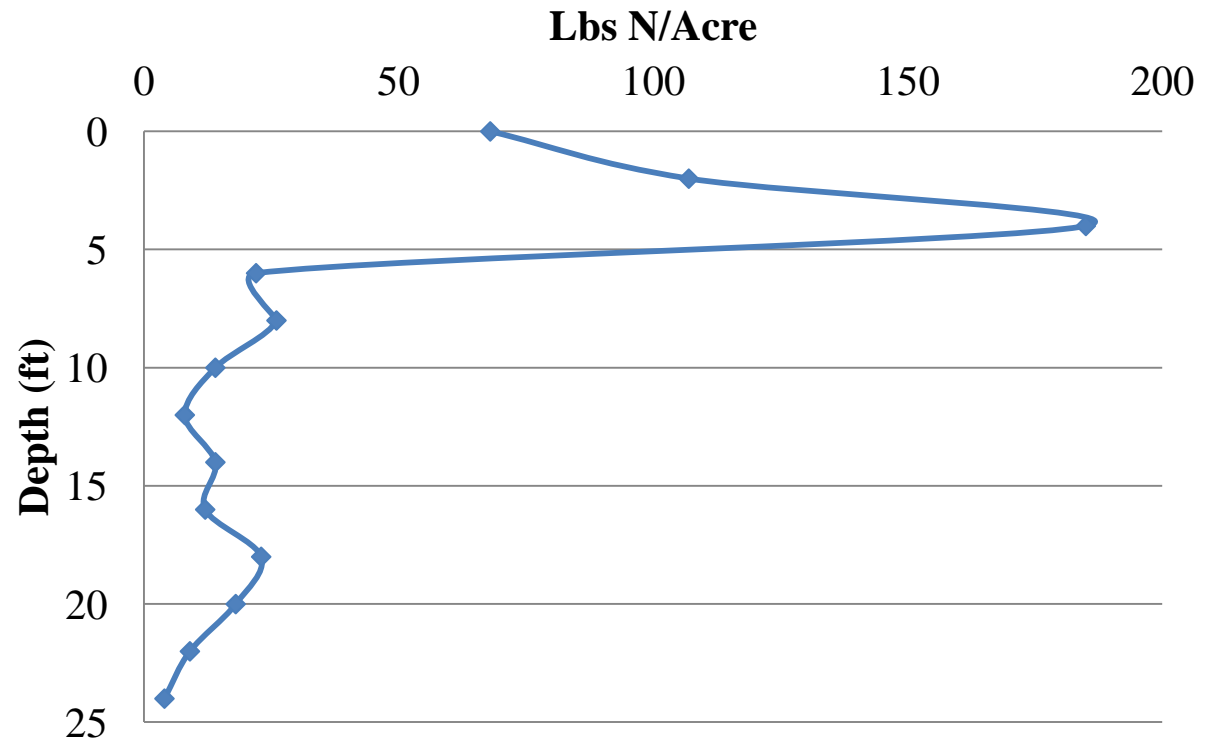
Figure 21: Site D5

Field Management Type: Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	68
2	Loam	107
4	Loam	185
6	Loam	22
8	Sandy Loam	26
10	Loamy Sand	14
12	Loamy Sand	8
14	Sandy Loam	14
16	Sandy Loam	12
18	Loam	23
20	Loam	18
22	Loam	9
24	Sandy Loam	4
Total lbs N/acre 510 for Core		

D5 - Dryland Crop



Management Details: Sampled 11/21/14. Producer applies nitrogen at beginning of season and uses conventional tillage methods.

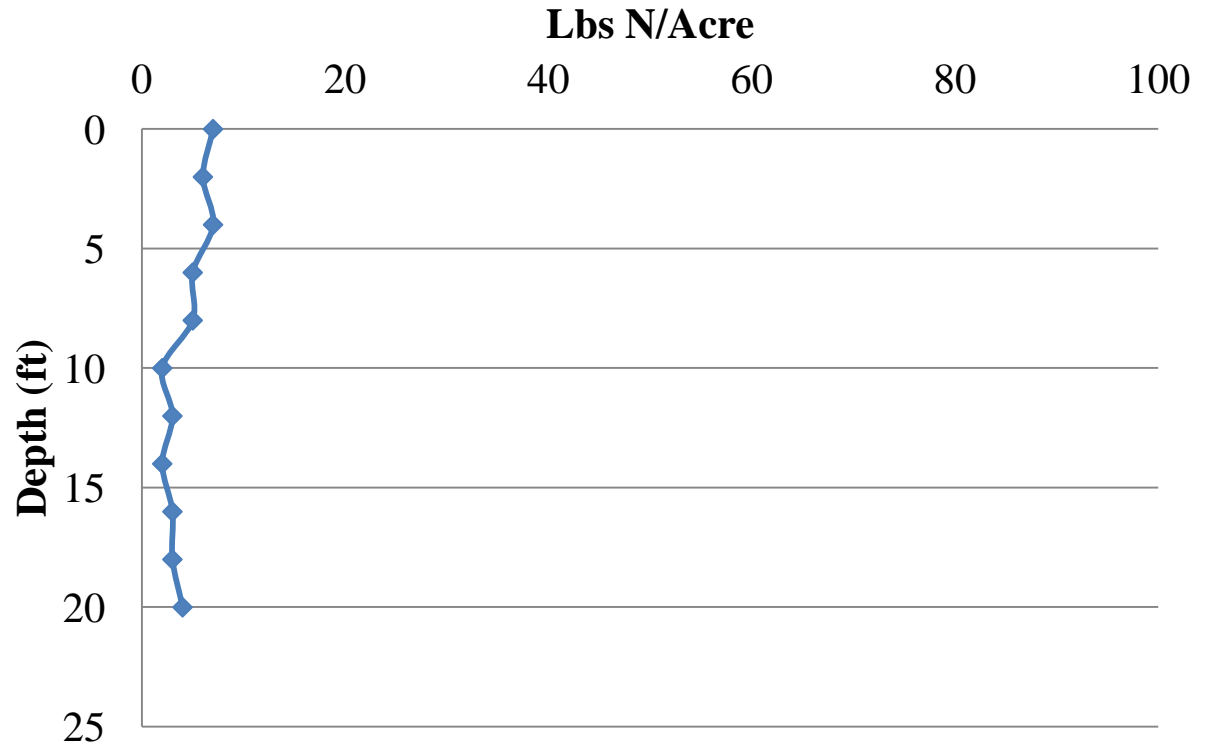
Figure 22: Site D6

Field Management Type: Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

D6 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy loam	7
2	Sandy loam	6
4	Loam	7
6	Sandy loam	5
8	Sandy loam	5
10	Sandy loam	2
12	Sand	3
14	Sand	2
16	Sand	3
18	Sand	3
20	Sand	4
22	N/A	
24	N/A	
Total lbs N/acre 47 for Core		



Management Details:

Sampled 11/13/14. This field corresponds to P11, a pasture. The presence of gravel prevented further sampling below 20 feet.

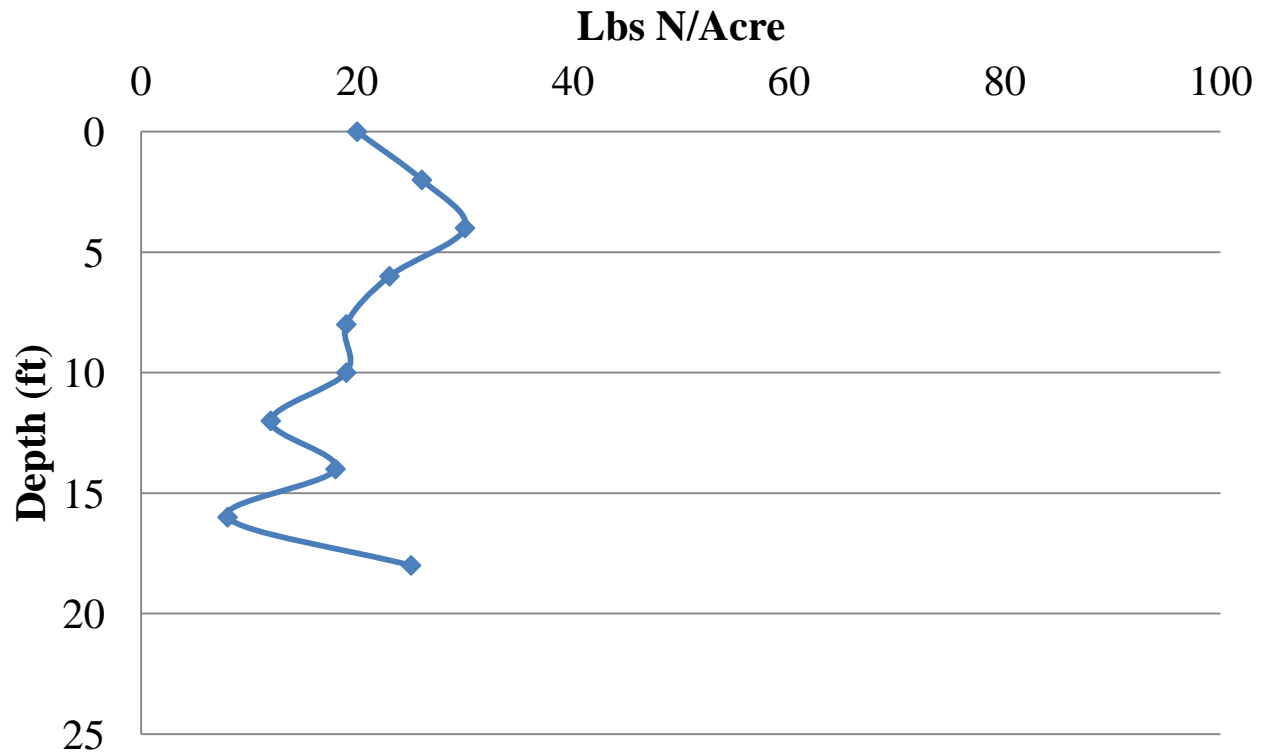
Figure 23: Site D7

Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward Labs

D7 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	20
2	Clay Loam	26
4	Clay Loam	30
6	Loam	23
8	Loam	19
10	Loam	19
12	Sandy Loam	12
14	Sandy Loam	18
16	Loam	8
18	Loam	25
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 200 for Core		



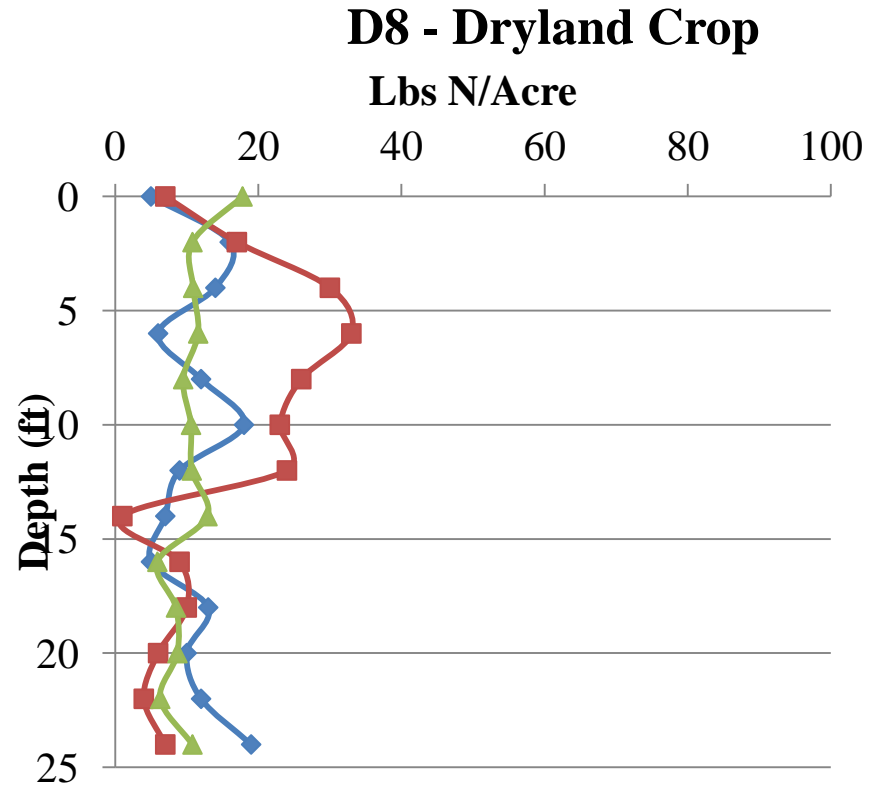
Management Details: Sampled 12/5/14. This sample was taken from an area that has been dryland farmed for 50+ years. Field was currently in soybeans. Water prevented further sampling below 18 feet.

Figure 24: Site D8

Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	5	7	17.8
2	Silt Loam	16	17	10.8
4	Loam	14	30	10.9
6	Silty Clay Loam	6	33	11.6
8	Silt Loam	12	26	9.5
10	Loam	18	23	10.6
12	Loam	9	24	10.7
14	Loam	7	1	12.9
16	Loam	5	9	5.9
18	Loam	13	10	8.5
20	Loam	10	6	8.7
22	Loam	12	4	6.3
24	Loam	19	7	10.8
Total		146	197	



Management Details:

Sampled 4/5/16. Dryland Corn crop. Farmed in the 1950s, in CRP from the 1960s-2003. Dryland farmed since 2003.

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

Figure 25: Site D9

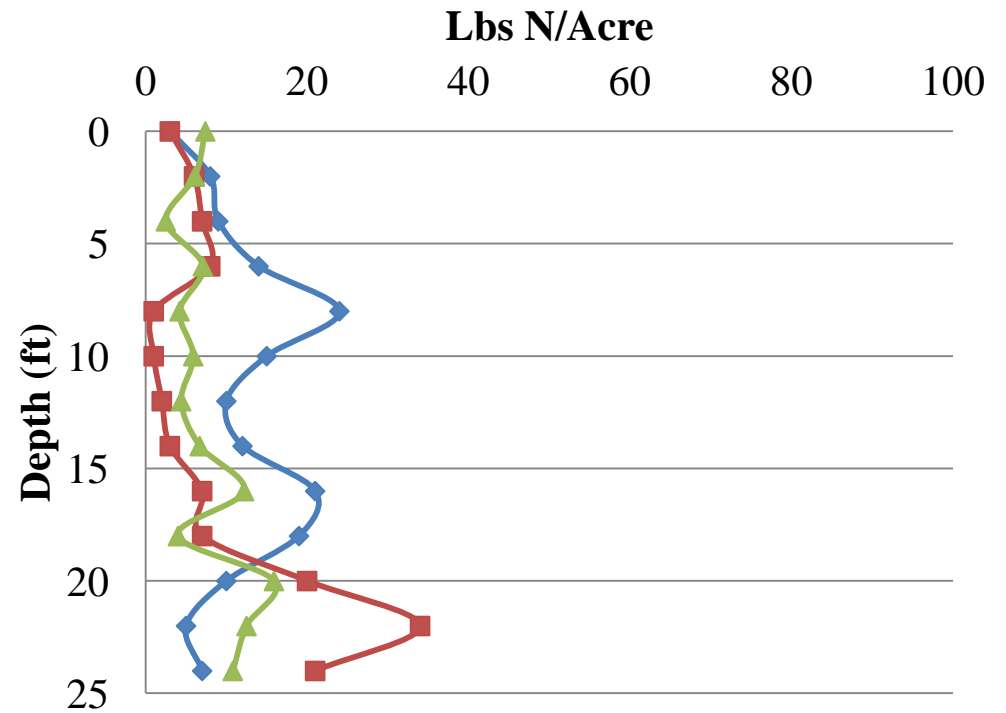
Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	3	3	7.4
2	Loam	8	6	6.1
4	Sandy Loam	9	7	2.5
6	Sandy Loam	14	8	7.1
8	Sandy Loam	24	1	4.2
10	Loamy Sand	15	1	5.9
12	Loamy Sand	10	2	4.4
14	Sandy Loam	12	3	6.7
16	Sandy Loam	21	7	12.2
18	Loam	19	7	4
20	Loam	10	20	15.9
22	Silty Clay	5	34	12.5
24	Sandy Loam	7	21	10.8
Total		157	120	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

D9 - Dryland Crop



Management Details:

Sampled 4/5/16. Dryland corn crop.

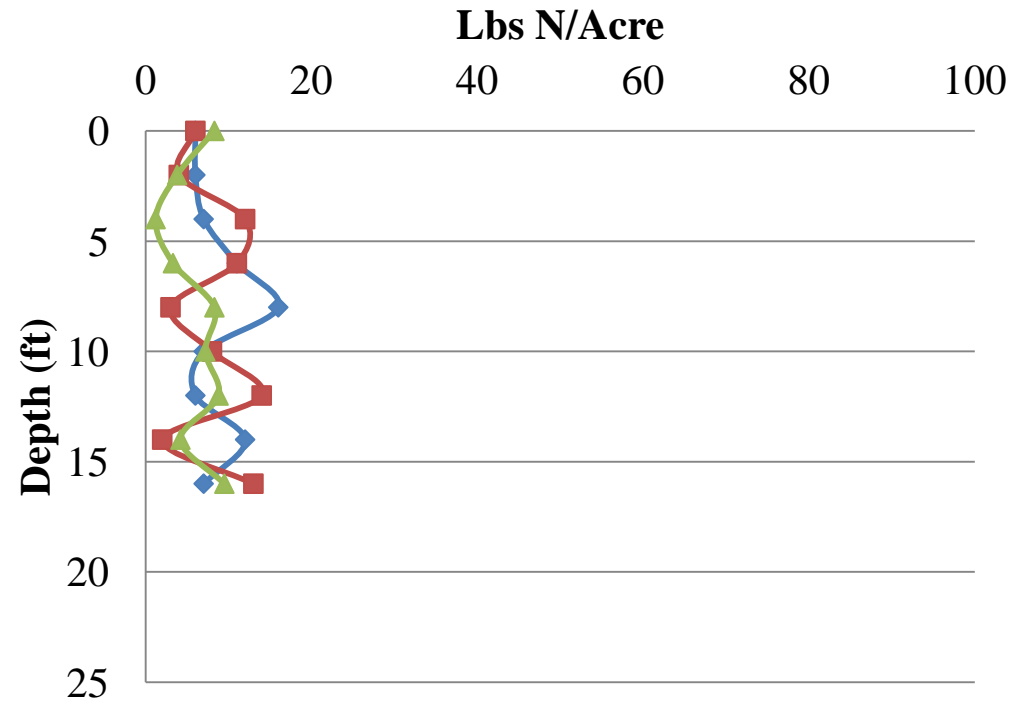
Figure 26: Site D10

Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

D10 - Dryland Crop

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	6	6	8.3
2	Sandy Loam	6	4	3.8
4	Loamy Sand	7	12	1.2
6	Loamy Sand	11	11	3.3
8	Sandy Loam	16	3	8.3
10	Sandy Loam	7	8	7.2
12	Loamy Sand	6	14	8.8
14	Loamy Sand	12	2	4.2
16	Sandy Loam	7	13	9.5
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		78	73	



Management Details:

Sampled 4/5/16. Dryland Corn crop. No-till. Water prevent further sampling.

Figure 27: Site D11

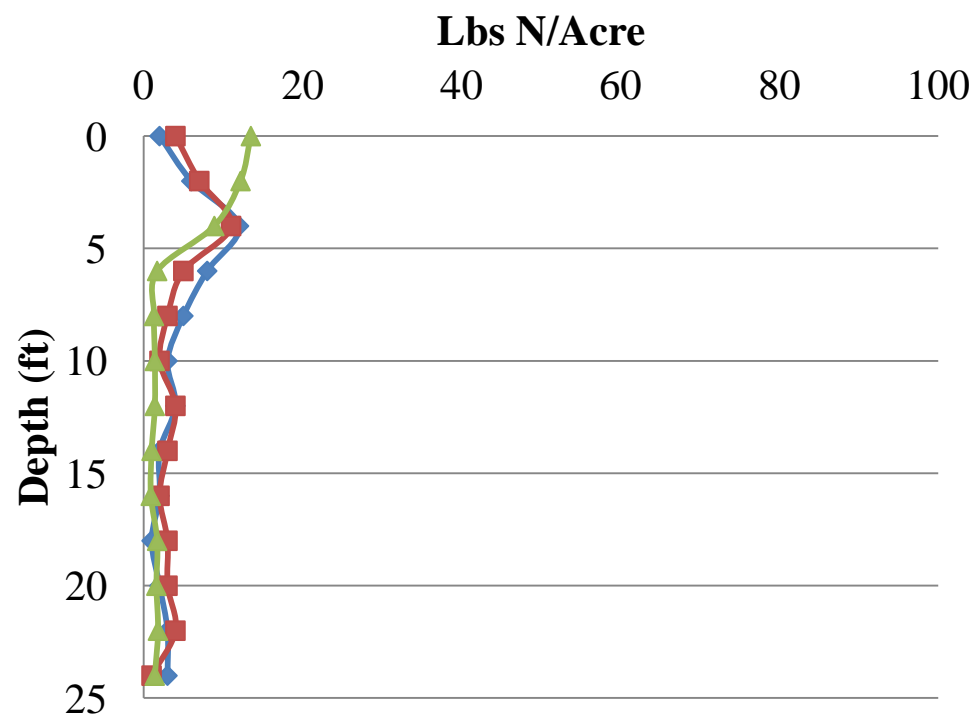
Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	2	4	13.5
2	Silt Loam	6	7	12.2
4	Silt Loam	12	11	8.9
6	Sandy Loam	8	5	1.7
8	Sandy Loam	5	3	1.3
10	Sandy Loam	3	2	1.4
12	Loamy Sand	4	4	1.4
14	Loamy Sand	2	3	1.0
16	Loamy Sand	2	2	0.9
18	Sandy Loam	1	3	1.7
20	Sandy Loam	2	3	1.6
22	Loamy Sand	3	4	1.8
24	Sand	3	1	1.4
Total		53	52	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

D11 - Dryland Crop



Management Details:

Sampled 4/5/16. Soybeans during 2015 season, currently in rye cover crop. Same location as sampled in 2014, see location D4.

Figure 28: Site D12

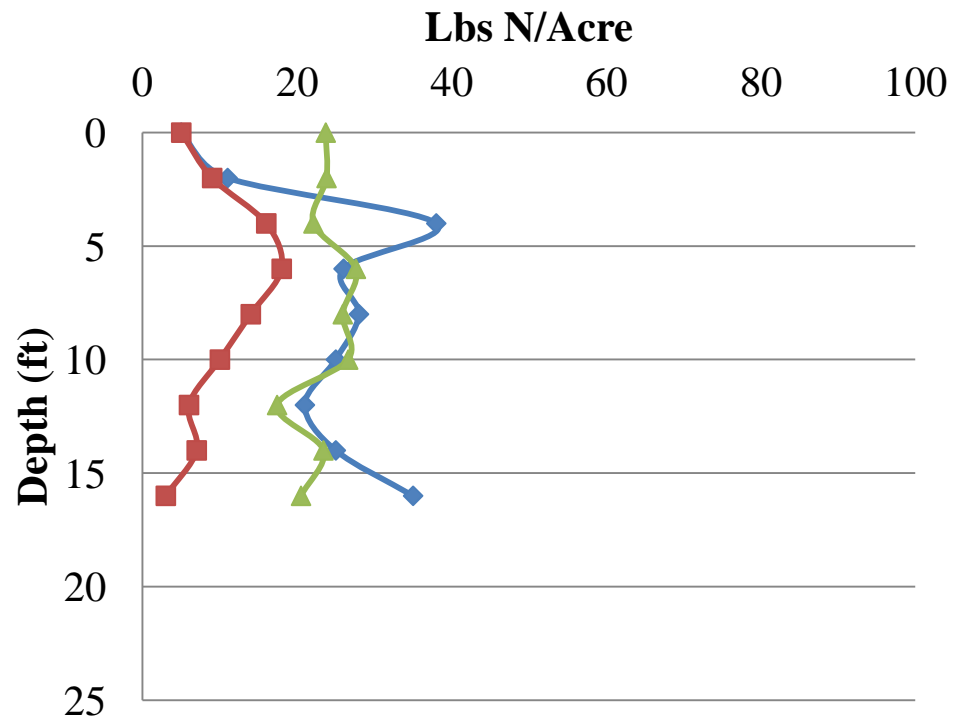
Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	5	5	23.7
2	Silt Loam	11	9	23.8
4	Loam	38	16	22.1
6	Silt	26	18	27.6
8	Silt	28	14	25.9
10	Loam	25	10	26.6
12	Sandy Loam	21	6	17.4
14	Sandy Loam	25	7	23.4
16	Loamy Sand	35	3	20.5
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		214	88	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

D12 - Dryland Crop



Management Details:

Sampled 4/4/16. Dryland wildlife corn plot ~0.25 acres. Water prevented further sampling.

Figure 29: Site D13

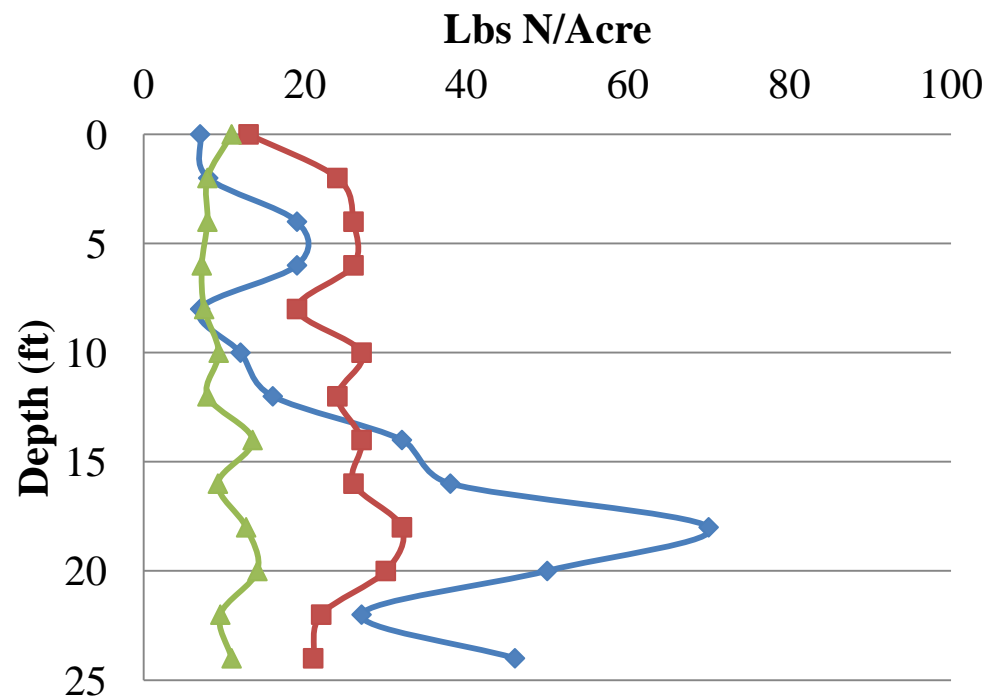
Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	7	13	10.9
2	Sandy Loam	8	24	7.9
4	Sandy loam	19	26	7.9
6	Sandy Loam	19	26	7.2
8	Sandy Loam	7	19	7.5
10	Sandy Loam	12	27	9.3
12	Loamy Sand	16	24	7.9
14	Sandy Loam	32	27	13.5
16	Sandy Loam	38	26	9.2
18	Loam	70	32	12.7
20	Loam	50	30	14.1
22	Sandy Loam	27	22	9.5
24	Sandy Loam	46	21	10.9
Total		351	317	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

D13- Dryland Crop



Management Details:

Sampled 1/7/16. Dryland soybeans. Sampled taken near a monitoring well.

Figure 30: Site D14

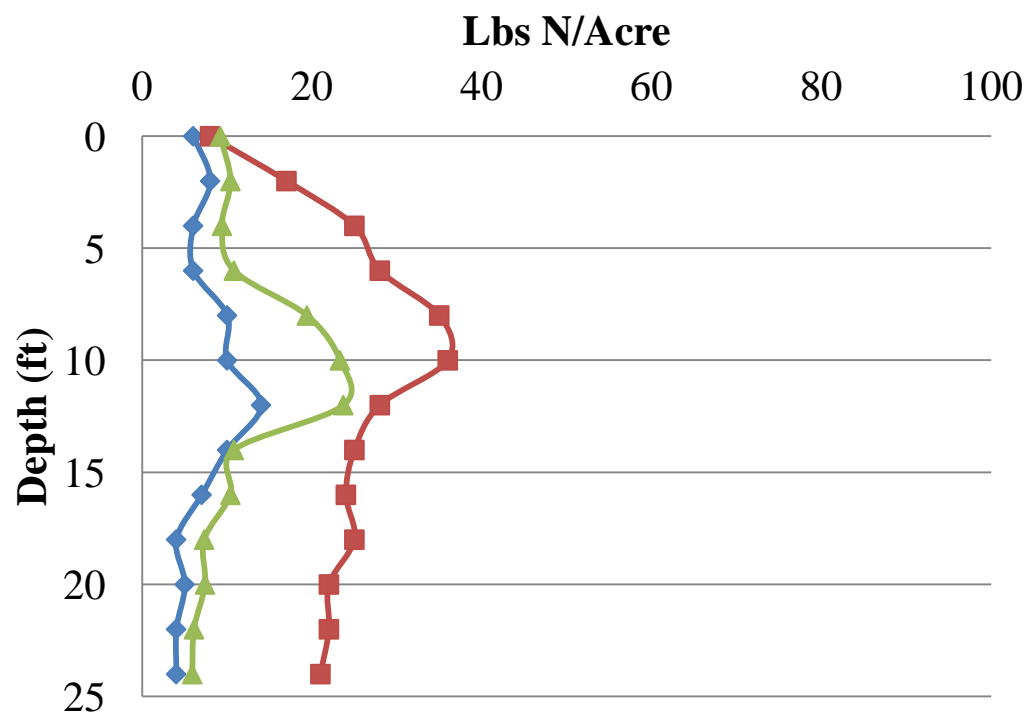
Field Management Type: Dryland

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	6	8	9.2
2	Sandy Loam	8	17	10.4
4	Sandy Loam	6	25	9.4
6	Sandy Loam	6	28	10.8
8	Loam	10	35	19.4
10	Loam	10	36	23.3
12	Loam	14	28	23.7
14	Sandy Loam	10	25	10.8
16	Sandy Loam	7	24	10.4
18	Sandy Loam	4	25	7.3
20	Sandy Loam	5	22	7.4
22	Sandy Loam	4	22	6.1
24	Sandy Loam	4	21	5.9
Total		94	316	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

D14- Dryland Crop



Management Details:

Sampled 3/15/16. Dryland corn. Sampled taken near a monitoring well.

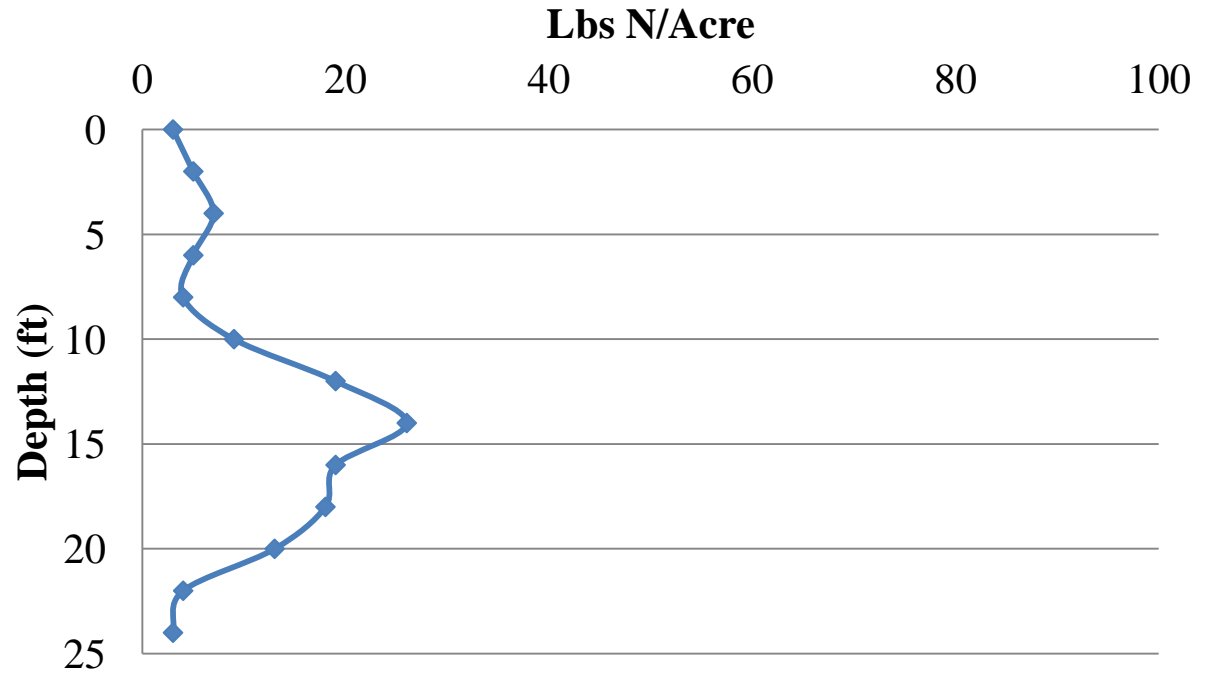
Figure 31: Site N2

Field Management Type: No-Till Dryland Soybeans

Soil Texture Analysis: Conducted by Ward Labs

N2 - Dryland Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	3
2	Sandy Loam	5
4	Loam	7
6	Sandy Loam	5
8	Sandy Loam	4
10	Loam	9
12	Loam	19
14	Sandy Loam	26
16	Clay Loam	19
18	Clay Loam	18
20	Sandy Loam	13
22	Sandy Loam	4
24	Sandy Loam	3
Total lbs N/acre 135 for Core		



Management Details: Sampled 11/10/14

This irrigated field has been in no-till for seven years. Sample was collected in the fall while field was in winter wheat, crop had been soybeans. The producer utilizes nitrogen credits in the soil.

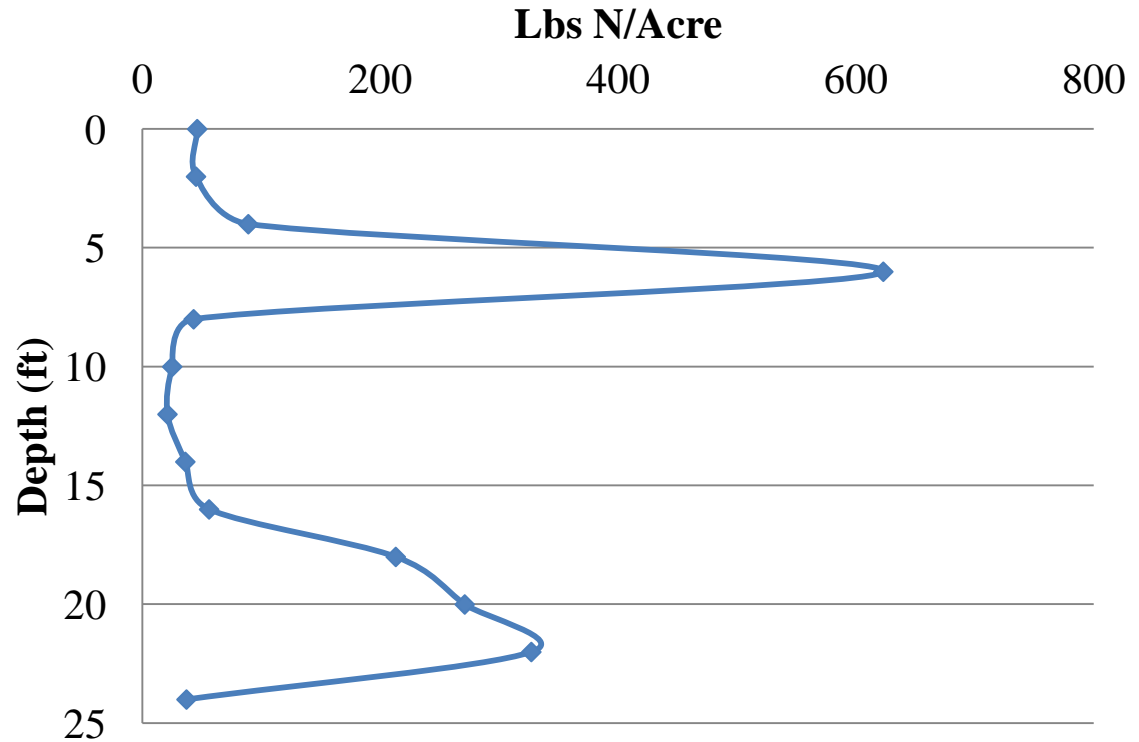
Figure 32: Site F1

Field Management Type: Seasonal Cattle Lot

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	46
2	Loam	45
4	Sandy Loam	89
6	Sandy Loam	623
8	Sand	43
10	Sand	25
12	Sand	21
14	Sand	36
16	Sand	56
18	Sand with Clay	213
20	Clay with Sand	271
22	Clay	327
24	Sand	37
Total lbs N/acre 1,832 for Core		

F1- Cattle lot



Management Details:

Sampled 9/26/14. A seasonal cattle lot, used intermittently throughout the year.

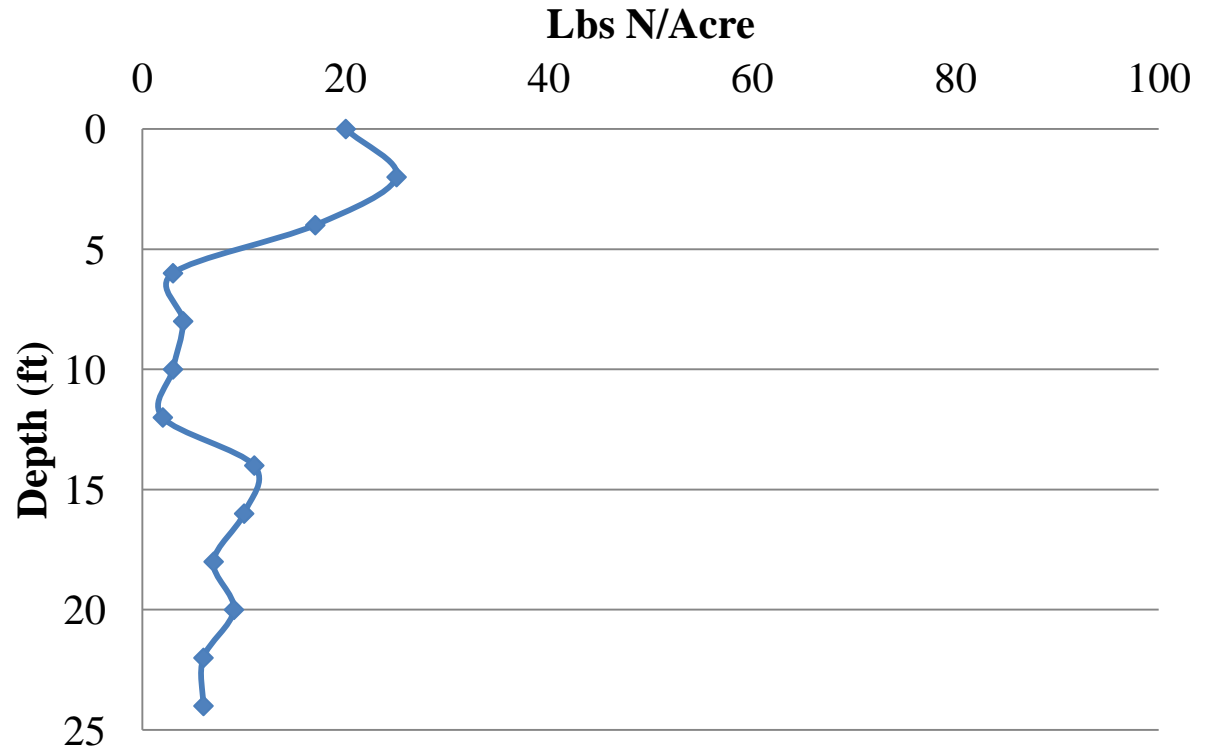
Figure 33: Site G1

Field Management Type: Golf Course

Soil Texture Analysis: Conducted by Ward Labs

G1 - Golf Course

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	20
2	Sandy Loam	25
4	Sandy Loam	17
6	Sand	3
8	Sand	4
10	Sand	3
12	Sand	2
14	Sand	11
16	Sand	10
18	Sand	7
20	Sand	9
22	Sand	6
24	Sand	6
Total lbs N/acre 123 for Core		



Management Details:

Sampled 11/12/14, a few days after fall fertilization (60 lbs N/ac) occurred.

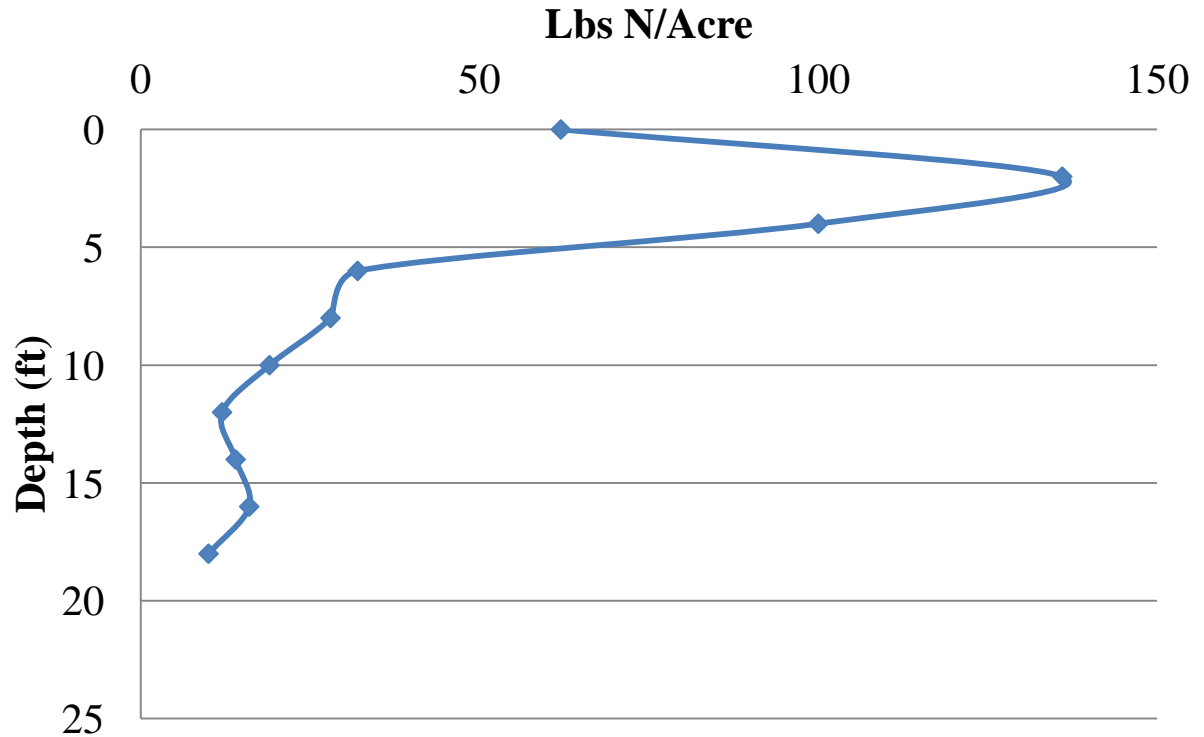
Figure 34: Site C1

Field Management Type: Irrigated Crop

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	62
2	Clay Loam	136
4	Clay Loam	100
6	Sand	32
8	Sand	28
10	Sand	19
12	Sand	12
14	Sand	14
16	Sandy Loam	16
18	Sandy Loam	10
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 429 for Core		

C1 - Irrigated Crop



Management Details: Sampled 7/9/14

Sample was collected during the growing season. Currently in soybeans. The producer utilizes nitrogen credits in the soil and water. Water prevented further sampling below 18 feet. Field also sampled in 2016 in a different location, see location C21.

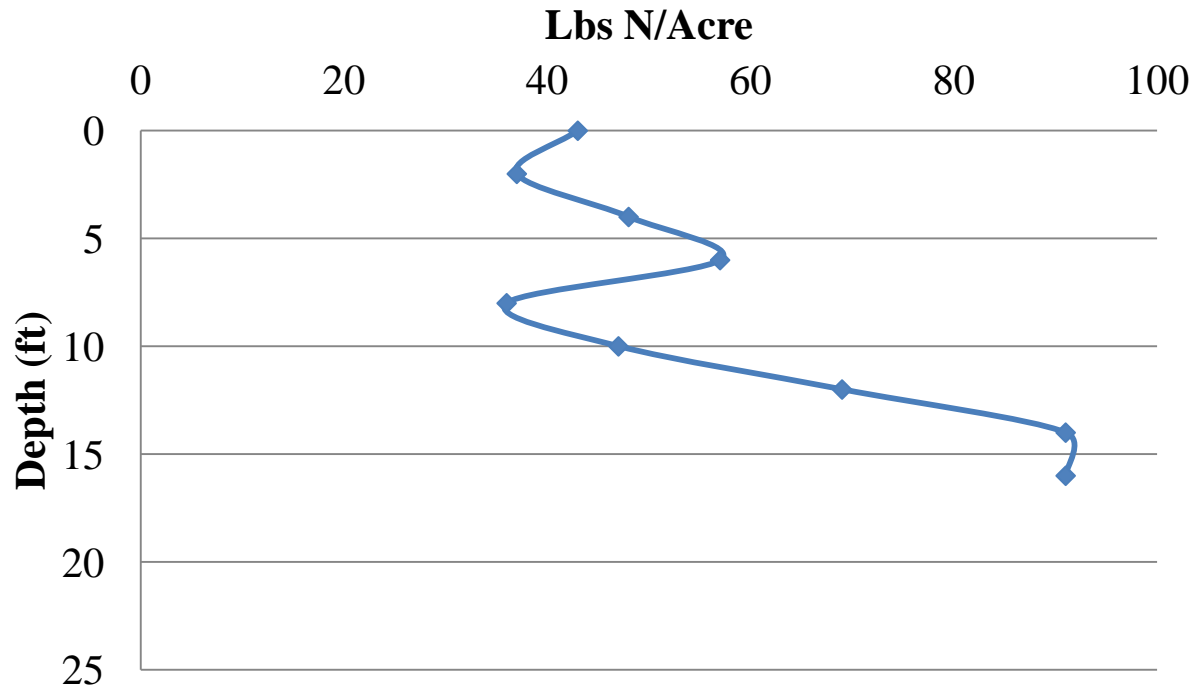
Figure 35: Site C2

Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sand	43
2	Sand	37
4	Sand	48
6	Sand	57
8	Sand	36
10	Sand	47
12	Sand	69
14	Sand	91
16	Sand	91
18	N/A	
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 519 for Core		

C2 - Irrigated Crop



Management Details: Sampled 7/9/14

Sample was collected during the growing season. This field has been in row crop production since 1987. The producer utilizes nitrogen credits in the soil and water. Water prevented further sampling below 16 feet.

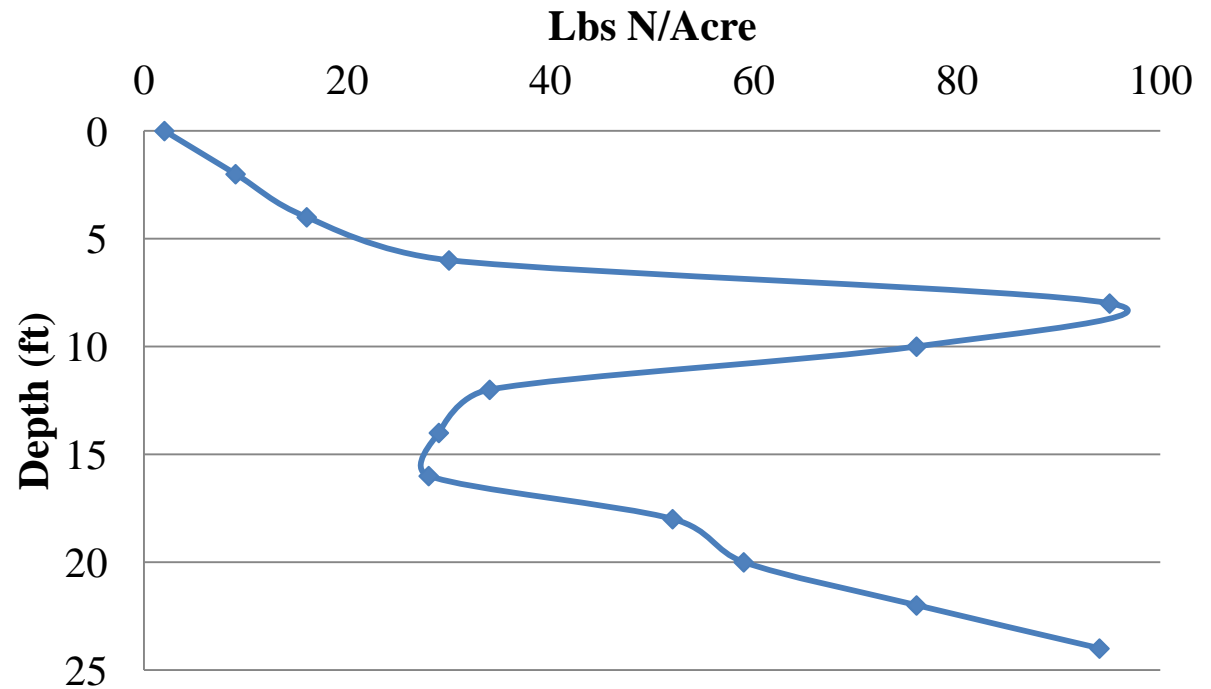
Figure 36: Site C3

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sand	2
2	Sand	9
4	Sand	16
6	Sand	30
8	Sand	95
10	Sand	76
12	Sand	34
14	Sand	29
16	Sand	28
18	Sand	52
20	Sand	59
22	Sand	76
24	Sand	94
Total lbs N/acre 600 for Core		

C3 - Irrigated Crop



Management Details:

Sampled 7/23/14 on edge of field during the growing season. The producer utilizes nitrogen credits in the soil and water.

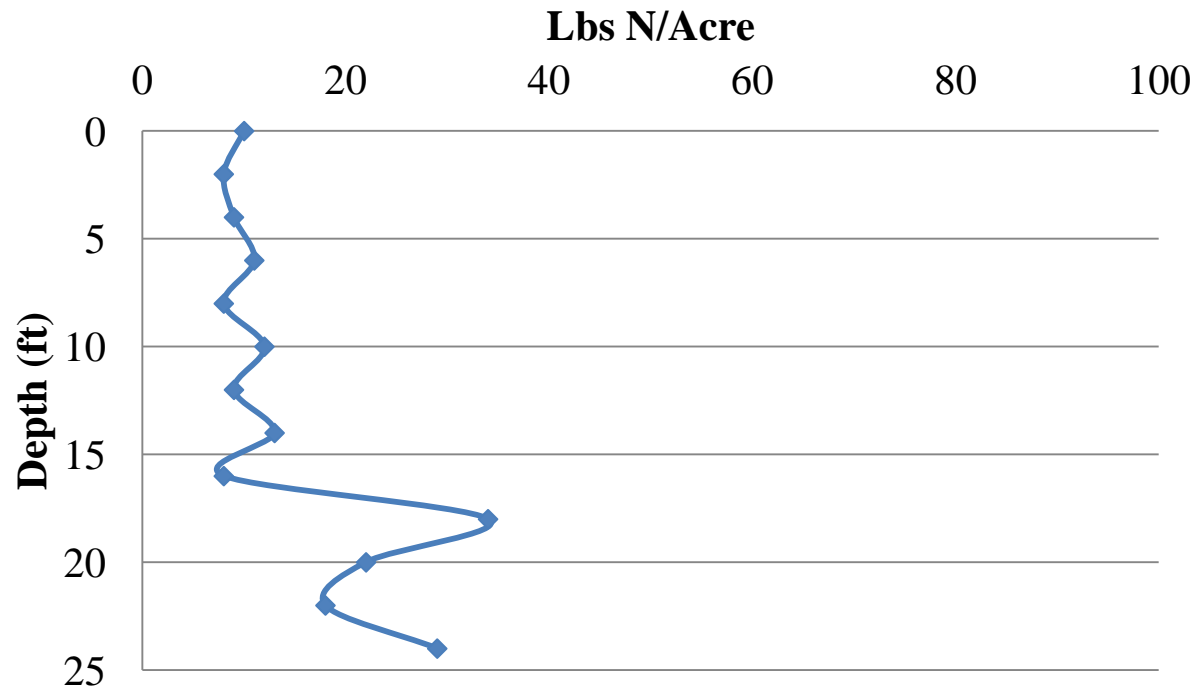
Figure 37: Site C4

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

C4 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	10
2	Sandy Loam	8
4	Sandy Loam	9
6	Sandy Loam	11
8	Sandy Loam	8
10	Sandy Loam	12
12	Sandy Loam	9
14	Sandy Loam	13
16	Sandy Loam	8
18	Sandy Loam	34
20	Loam	22
22	Loam	18
24	Clay Loam	29
Total lbs N/acre 191 for Core		



Management Details: Sampled 11/12/14

This field was half corn/half soybeans. A sample was also taken on the soybean side, see C5 for those results. The producer utilizes nitrogen credits in the soil and water.

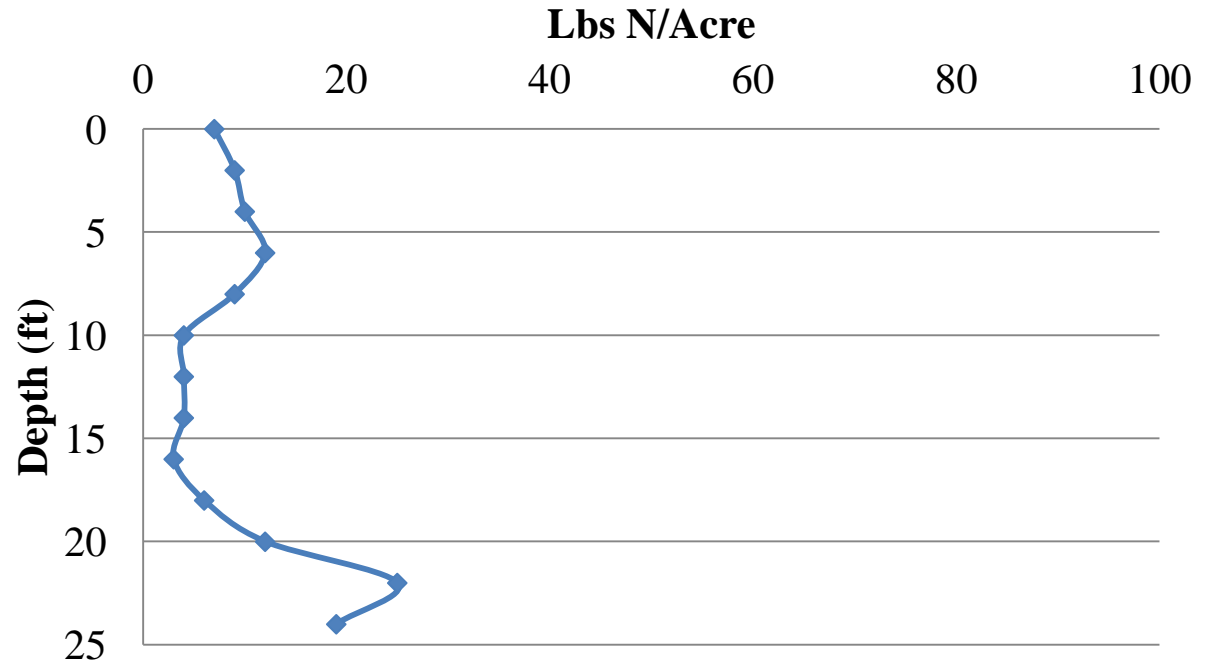
Figure 38: Site C5

Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward Labs

C5 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	7
2	Sandy Loam	9
4	Loam	10
6	Loam	12
8	Sandy Loam	9
10	Loamy Sand	4
12	Loamy Sand	4
14	Loamy Sand	4
16	Loamy Sand	3
18	Sandy Loam	6
20	Sandy Loam	12
22	Loam	25
24	Loam	19
Total lbs N/acre 124 for Core		



Management Details: Sampled 11/12/14

This field was half corn/half soybeans. A sample was also taken on the corn side, see C4 for those results. The producer utilizes nitrogen credits in the soil and water.

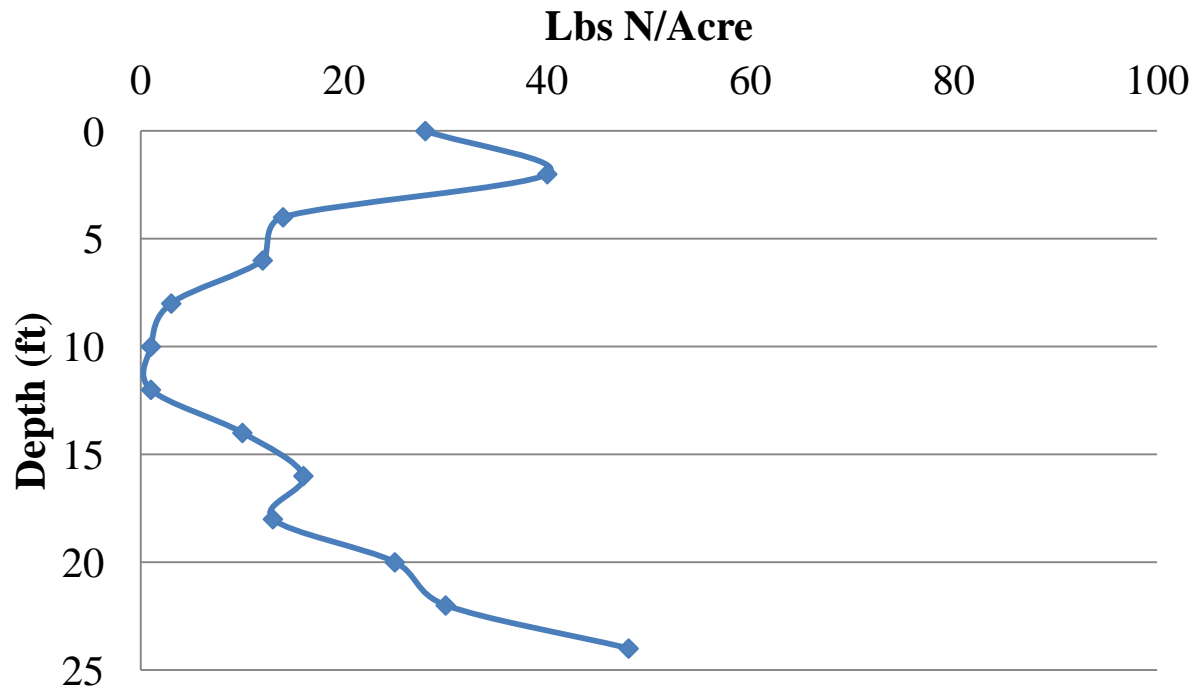
Figure 39: Site C6

Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward Labs

C6 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	28
2	Clay Loam	40
4	Clay Loam	14
6	Loam	12
8	Sandy Loam	3
10	Sandy Loam	1
12	Sandy Loam	1
14	Sandy Loam	10
16	Sandy Loam	16
18	Sandy Loam	13
20	Sandy Clay	25
22	Sandy Loam	30
24	Sandy Loam	48
Total lbs N/acre 241 for Core		



Management Details: Sampled 11/18/14

Two locations were sampled in this field. This one was at a high spot (elevation 1,782 feet) in the field and another sample, C7, was taken at a low spot (elevation 1,732 feet) in the field. The producers utilizes stalk nitrate tests, split applies nitrogen applications, uses a nitrogen stabilizer and accounts for nitrogen credits in the soil and water.

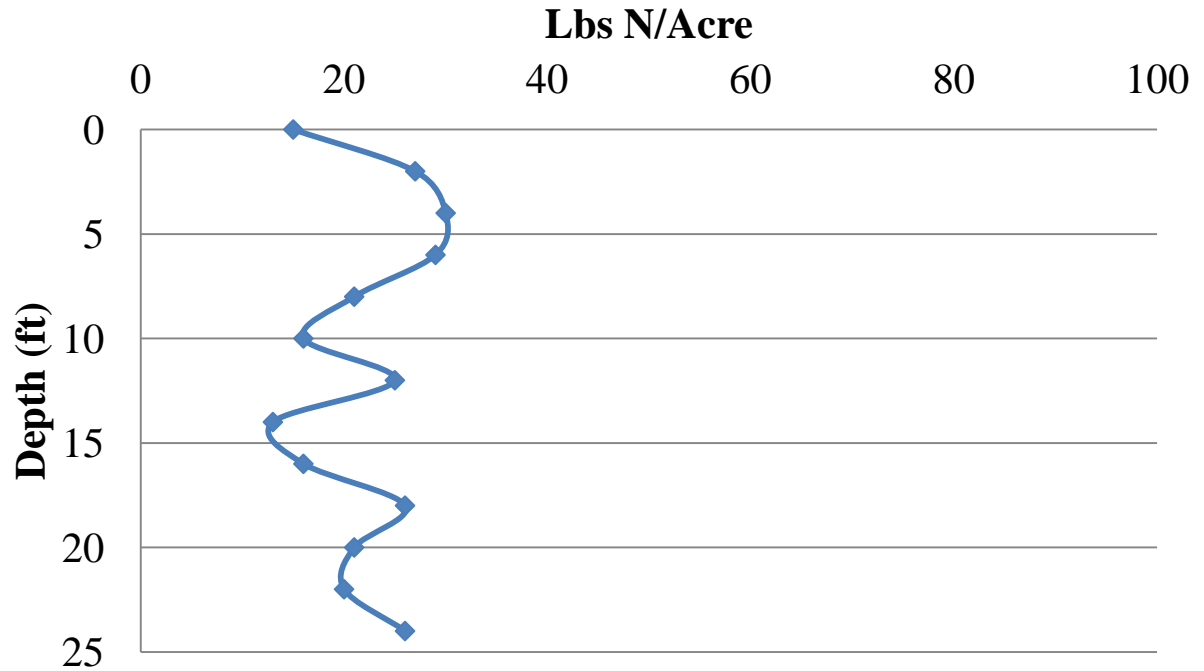
Figure 40: Site C7

Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward Labs

C7 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	15
2	Loam	27
4	Loam	30
6	Loam	29
8	Loam	21
10	Sandy Loam	16
12	Sandy Loam	25
14	Sandy Loam	13
16	Loamy Sand	16
18	Sandy Loam	26
20	Loam	21
22	Loam	20
24	Silt Loam	26
Total lbs N/acre 285 for Core		



Management Details: Sampled 11/18/14

Two locations were sampled in this field. This one was at a low spot (elevation 1,732 feet) in the field and another sample, C6, was taken at a high spot (elevation 1,782 feet) in the field. The producer utilizes nitrogen credits in the soil and water.

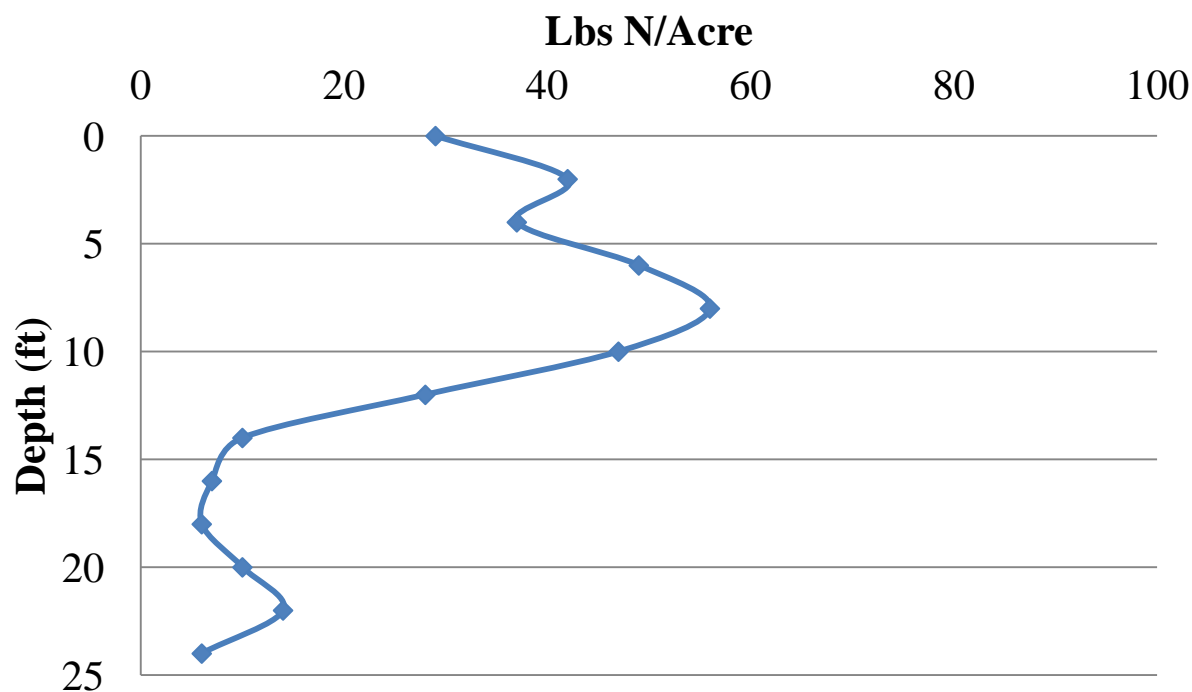
Figure 41: Site C8

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

C8 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	29
2	Silt Loam	42
4	Silt Loam	37
6	Silt Loam	49
8	Silt Loam	56
10	Silt Loam	47
12	Silt Loam	28
14	Silt Loam	10
16	Silt Loam	7
18	Silt Loam	6
20	Silt Loam	10
22	Loam	14
24	Loam	6
Total lbs N/acre 341 for Core		



Management Details:

Sampled 11/13/14. The producer utilizes crop rotation and accounts for nitrogen credits in the soil and irrigation water.

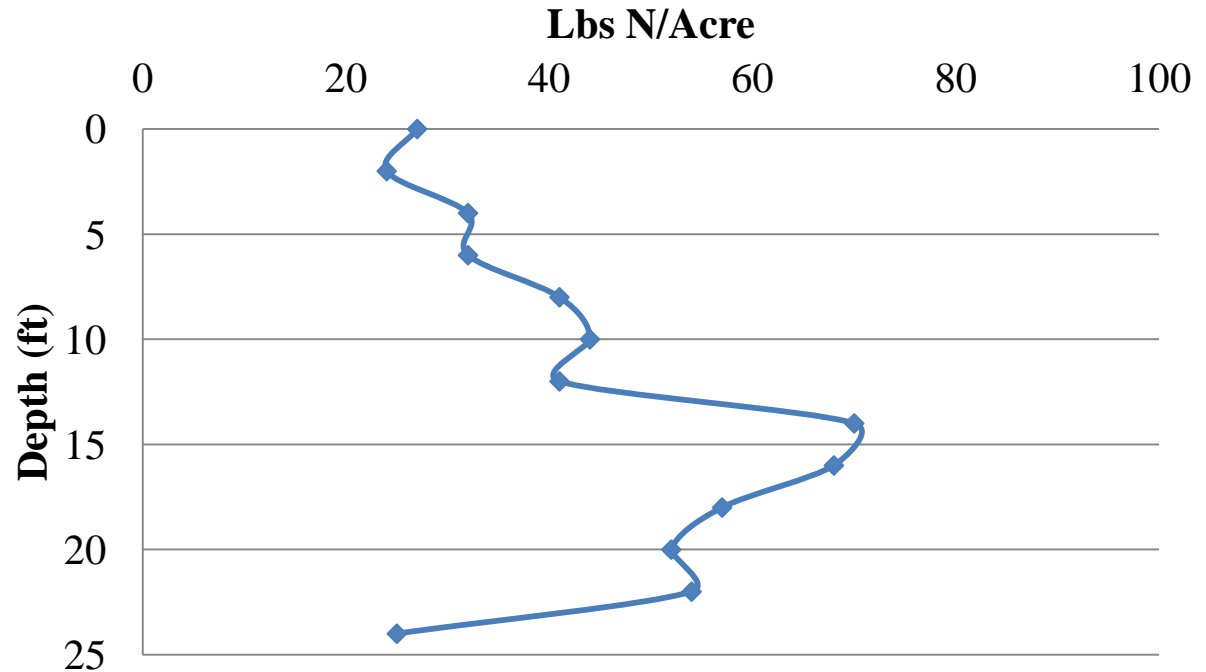
Figure 42: Site C9

Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	27
2	Loam	24
4	Sandy Loam	32
6	Sandy Loam	32
8	Loam	41
10	Loam	44
12	Silt Loam	41
14	Silt Loam	70
16	Silt Loam	68
18	Silt Loam	57
20	Silt Loam	52
22	Silt Loam	54
24	Silt Loam	25
Total lbs N/acre 567 for Core		

C9 - Irrigated Crop



Management Details: Sampled 11/13/14

This field sample was taken along with a sample from one of the field's corners (P1). The producer utilizes nitrogen credits in the soil and water.

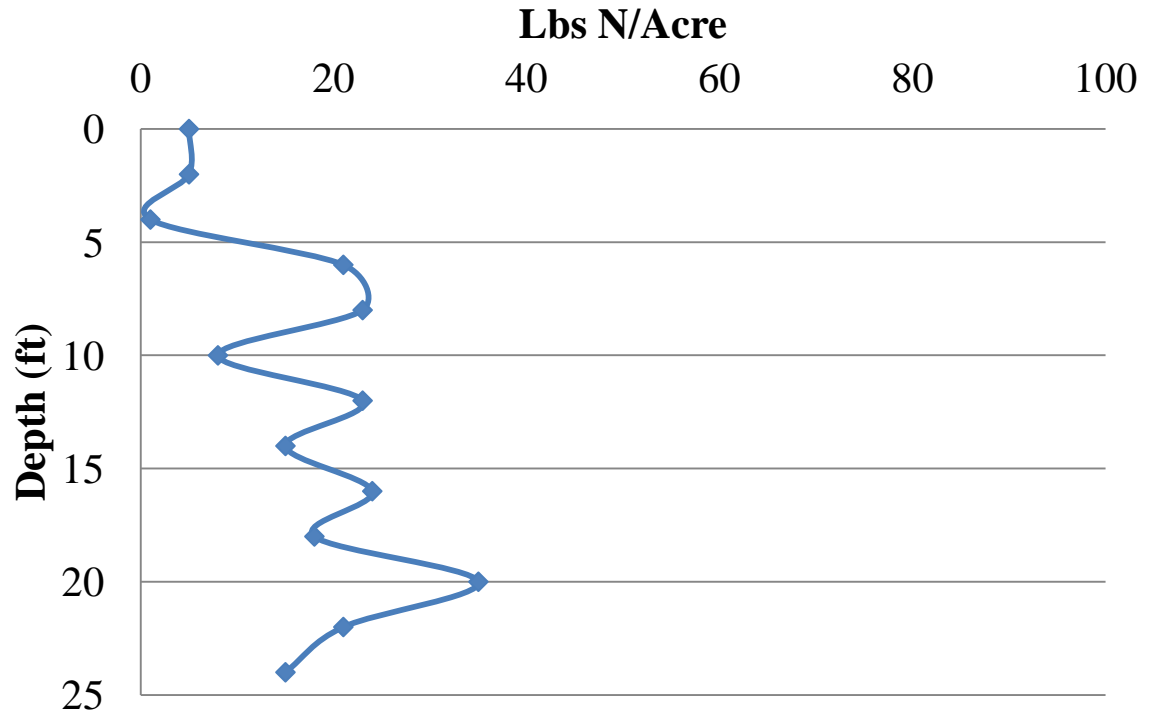
Figure 43: Site C10

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	5
2	Loam	5
4	Loam	1
6	Loam	21
8	Loam	23
10	Loam	8
12	Loam	23
14	Sandy Loam	15
16	Sandy Loam	24
18	Sandy Loam	18
20	Loam	35
22	Sandy Loam	21
24	Loamy Sand	15
Total lbs N/acre 214 for Core		

C10 - Irrigated Crop



Management Details: Sampled 12/10/14

This sample was collected in a high spot in the field and corresponds to C11, a low spot in the field. This field has been in corn-on-corn rotation since the 1970s. The producer utilizes nitrogen credits in the soil and water.

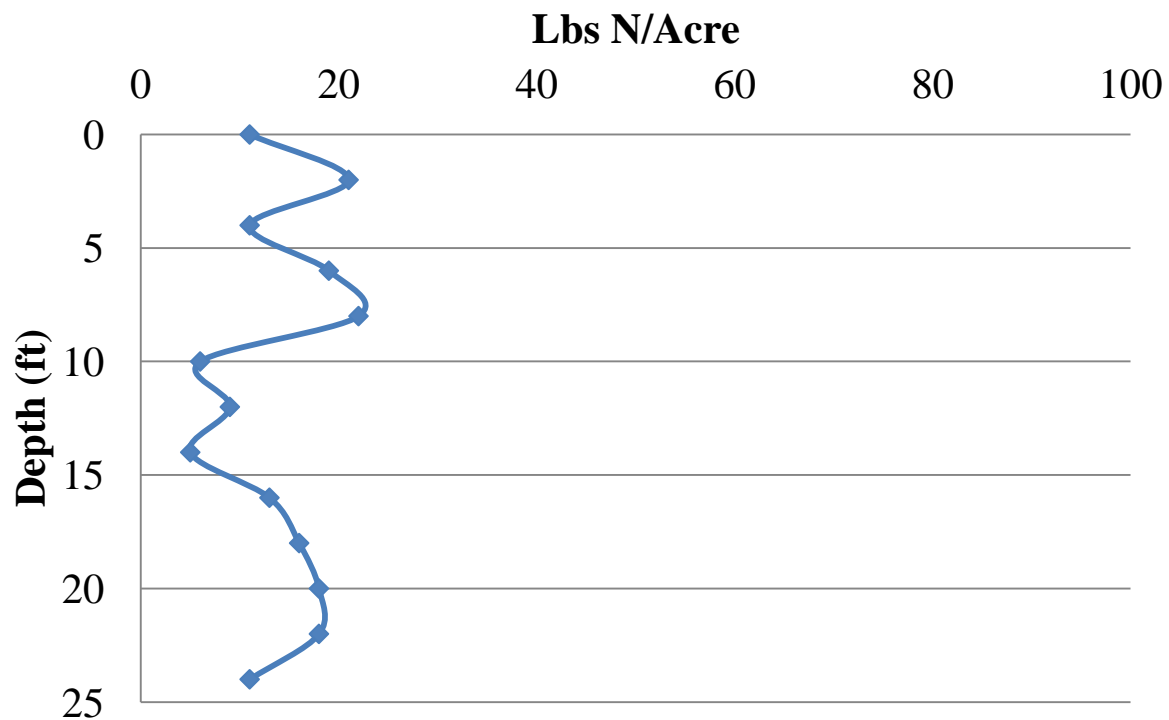
Figure 44: Site C11

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

C11 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loamy Sand	11
2	Sandy Loam	21
4	Sandy loam	11
6	Sandy loam	19
8	Sandy loam	22
10	Sand	6
12	Sand	9
14	Sand	5
16	Sand	13
18	Sand	16
20	Sand	18
22	Sand	18
24	Sand	11
Total lbs N/acre 180 for Core		



Management Details: Sampled 12/10/14

This sample was collected in a low spot in the field and corresponds to C10, a high spot in the field. This field has been in corn-on-corn rotation since the 1970s. The producer utilizes nitrogen credits in the soil and water.

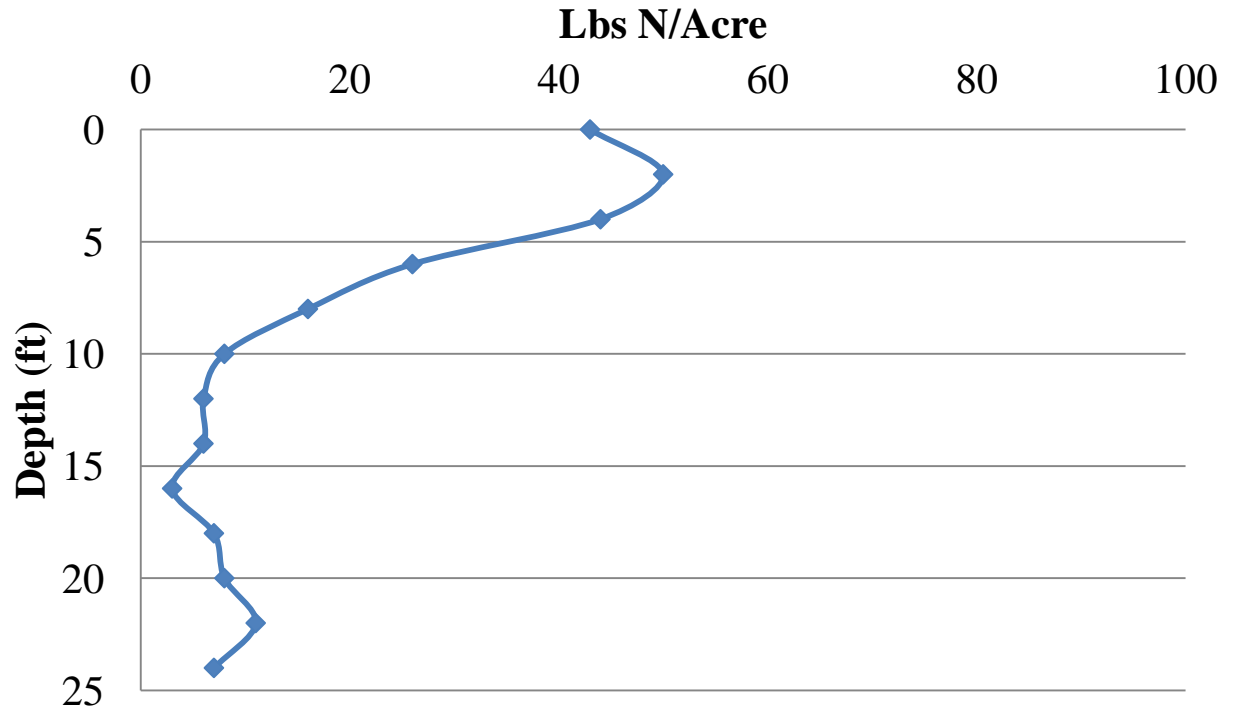
Figure 45: Site C12

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

C12 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	43
2	Loam	50
4	Clay Loam	44
6	Clay Loam	26
8	Loam	16
10	Loam	8
12	Loam	6
14	Loam	6
16	Loam	3
18	Loam	7
20	Clay Loam	8
22	Clay Loam	11
24	Loam	7
Total lbs N/acre 235 for Core		



Management Details:

Sampled 12/5/14 The producer uses the UNL recommendation for fertilizer application (even less) and utilizes nitrogen credits in the soil and water. The field has been irrigated since 2000.

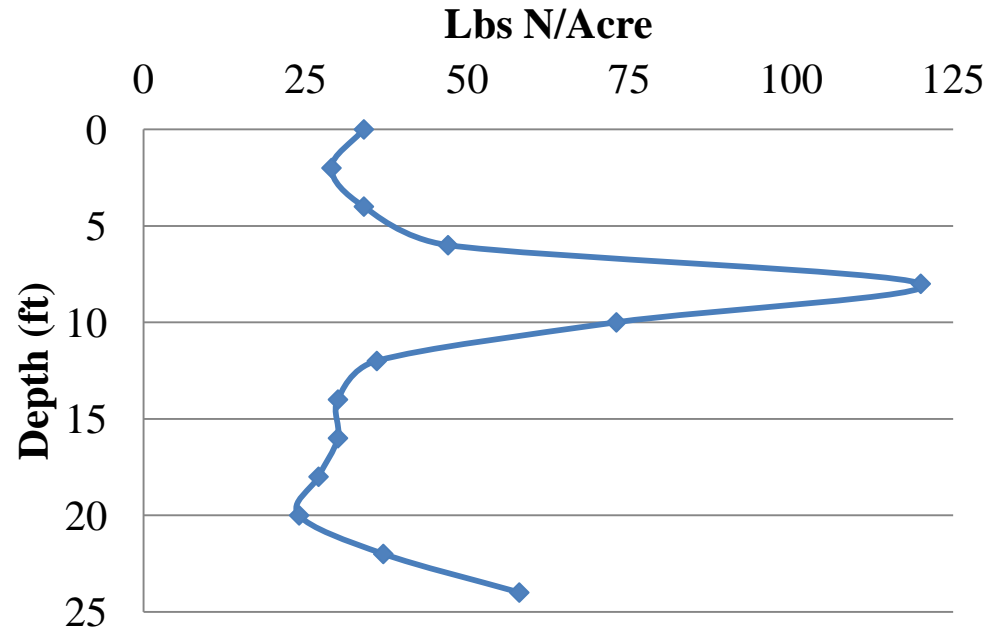
Figure 46: Site C13

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Silt Loam	34
2	Silt Loam	29
4	Silt Loam	34
6	Silt Loam	47
8	Silt Loam	120
10	Silt Loam	73
12	Silt Loam	36
14	Silt Loam	30
16	Silt Loam	30
18	Silt Loam	27
20	Silty Clay Loam	24
22	Silty Clay Loam	37
24	Silty Clay Loam	58
Total lbs N/acre 579 for Core		

C13- Irrigated Crop



Management Details:

Sampled 4/3/15. Continuous corn. Same location sampled in 2016, see location C25.

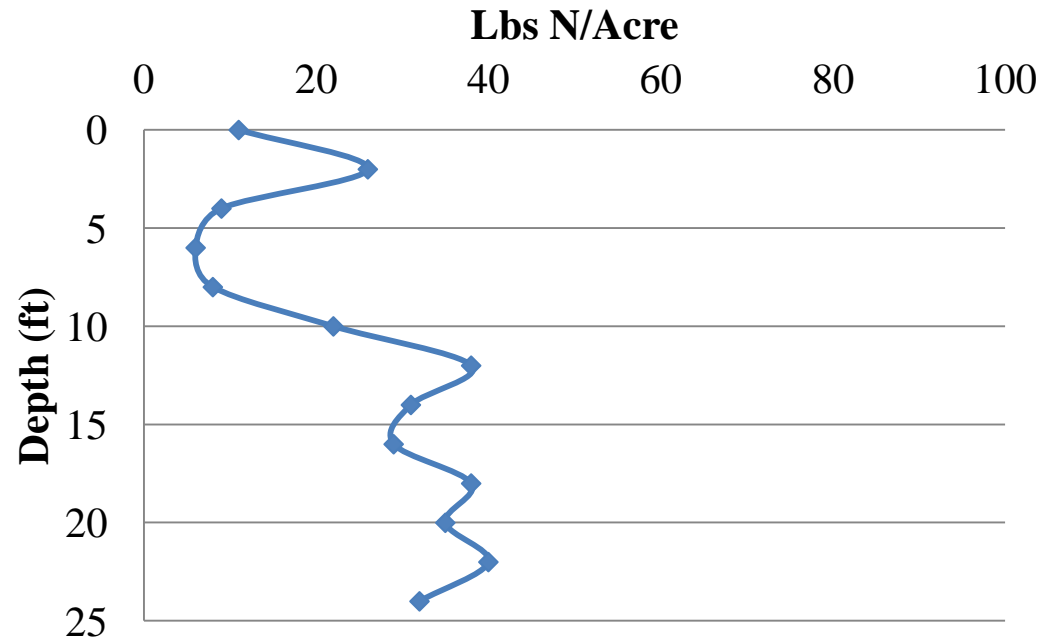
Figure 47: Site C14

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loamy Sand	11
2	Sandy Loam	26
4	Sandy Loam	9
6	Sandy Loam	6
8	Loam	8
10	Loam	22
12	Clay Loam	38
14	Clay Loam	31
16	Loam	29
18	Clay Loam	38
20	Clay Loam	35
22	Clay Loam	40
24	Clay Loam	32
Total lbs N/acre 325 for Core		

C14- Irrigated Crop



Management Details:

Sampled 4/3/15. Continuous corn. Same location sampled in 2016, see location C35.

Figure 48: Site C15

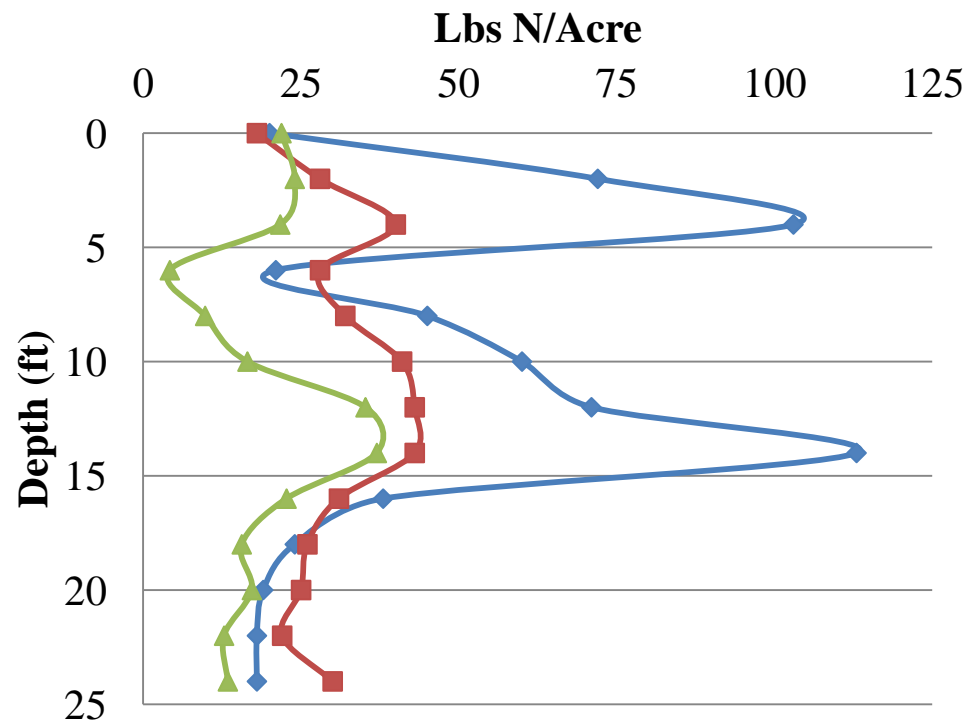
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Silt Loam	20	18	21.9
2	Silt Loam	72	28	24
4	Loam	103	40	21.7
6	Sandy Loam	21	28	4.2
8	Sandy Loam	45	32	9.8
10	Clay Loam	60	41	16.5
12	Clay Loam	71	43	35.2
14	Clay Loam	113	43	37
16	Loam	38	31	22.7
18	Sandy Loam	24	26	15.6
20	Sandy Loam	19	25	17.2
22	Sandy Loam	18	22	12.8
24	Loamy Sand	18	30	13.4
Total		622	407	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C15 - Irrigated Crop



Management Details:

Sampled 3/18/16. Irrigated corn. Sample taken near a monitoring well.

Figure 49: Site C16

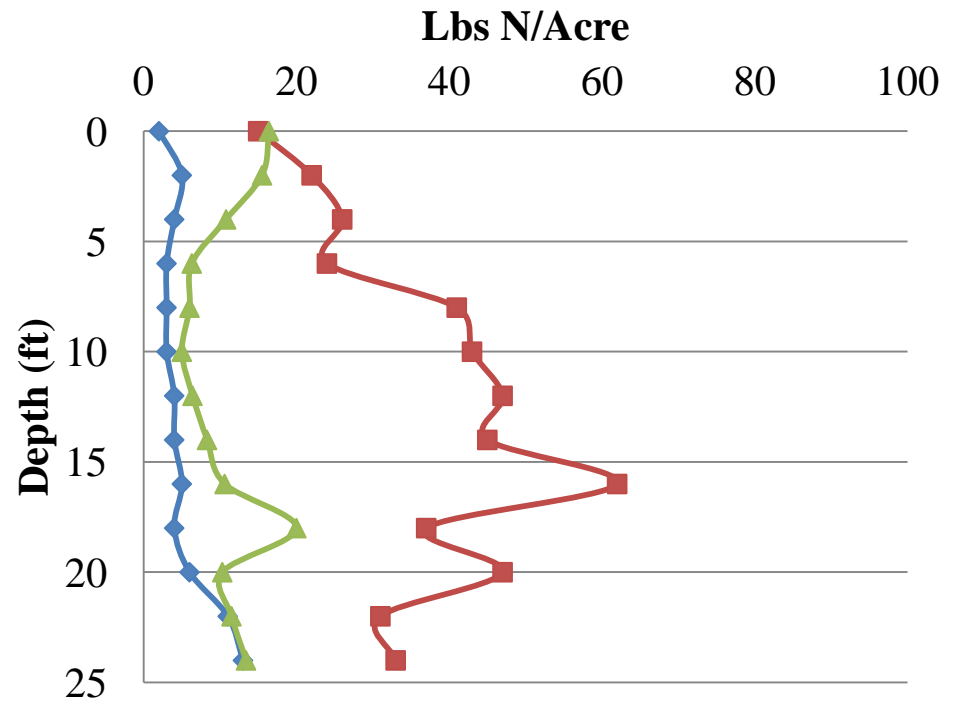
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	2	15	16.4
2	Loam	5	22	15.5
4	Sandy Loam	4	26	10.8
6	Sandy Loam	3	24	6.3
8	Sandy Loam	3	41	6
10	Sandy Loam	3	43	5
12	Sandy Loam	4	47	6.4
14	Sandy Loam	4	45	8.3
16	Sandy Loam	5	62	10.6
18	Loamy sand	4	37	20
20	Loamy Sand	6	47	10.3
22	Loamy Sand	11	31	11.5
24	Loamy Sand	13	33	13.4
Total		67	473	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C16 - Irrigated Crop



Management Details:

Sampled 3/18/16. Irrigated corn, currently in rye cover crop. Sample taken near a monitoring well.

Figure 50: Site C17

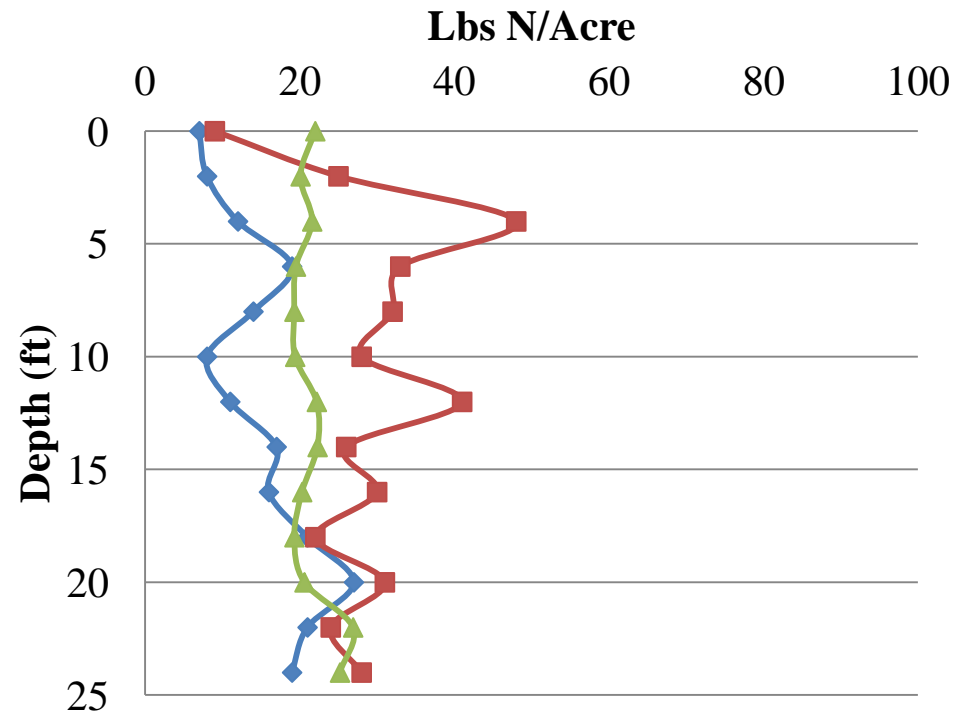
Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	7	9	22
2	Loam	8	25	20.1
4	Clay Loam	12	48	21.6
6	Clay Loam	19	33	19.5
8	Loam	14	32	19.3
10	Loam	8	28	19.4
12	Loam	11	41	22.2
14	Silt Loam	17	26	22.3
16	Silt Loam	16	30	20.3
18	Loam	21	22	19.3
20	Silt Loam	27	31	20.6
22	Silt Loam	21	24	26.9
24	Silt Loam	19	28	25.2
Total		200	377	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C17 - Irrigated Crop



Management Details:

Sampled 3/16/16. Irrigated soybeans. Sample taken near a monitoring well.

Figure 51: Site C18

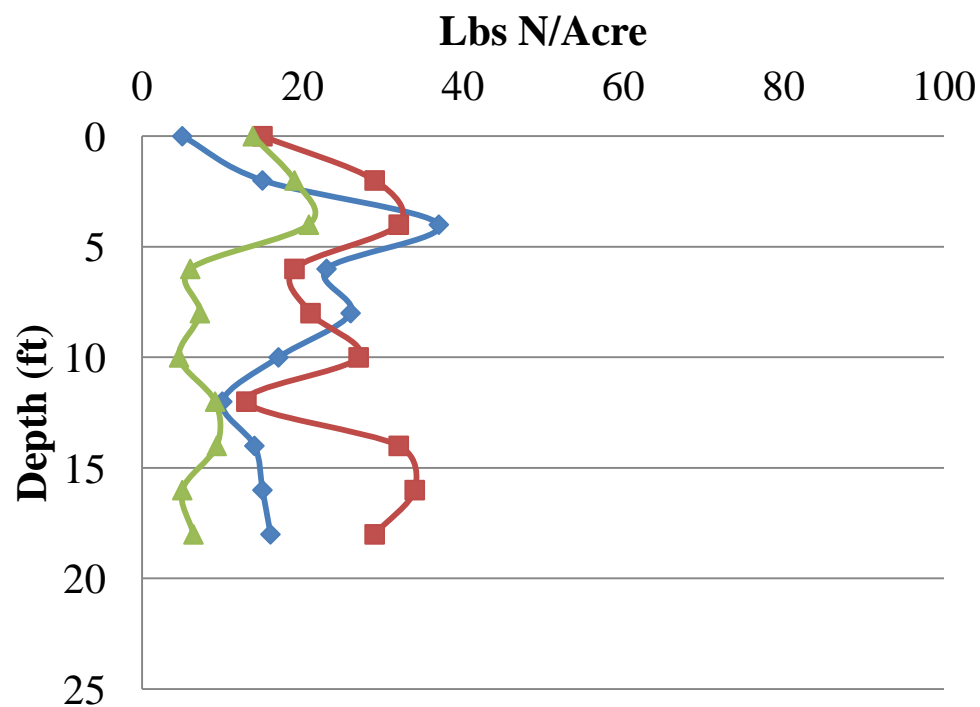
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	5	15	13.8
2	Loam	15	29	19
4	Loam	37	32	20.8
6	Sandy Loam	23	19	6
8	Sand	26	21	7.2
10	Sand	17	27	4.6
12	Sand	10	13	9.1
14	Sand	14	32	9.3
16	Sand	15	34	5
18	Sand	16	29	6.4
20	N/A			
22	N/A			
24	N/A			
Total		178	251	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C18 - Irrigated Crop



Management Details:

Sampled 1/6/16. Irrigated corn. Presence of gravel and hole collapse prevented further sampling.

Figure 52: Site C19

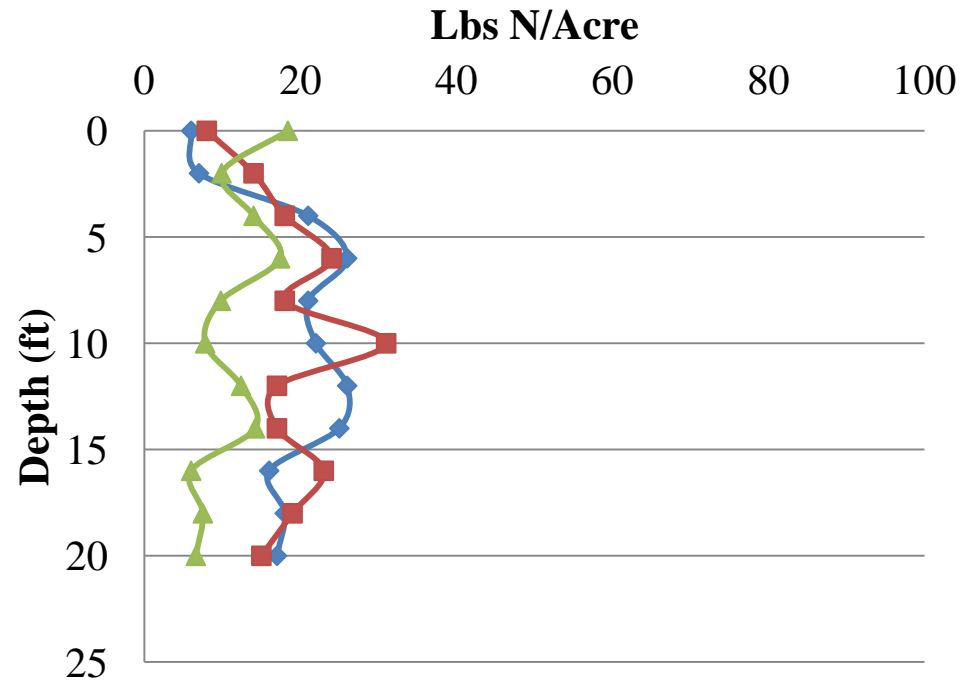
Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	6	8	18.4
2	Sandy Loam	7	14	9.9
4	Sandy Loam	21	18	14
6	Loam	26	24	17.4
8	Sandy Loam	21	18	9.8
10	Sandy Loam	22	31	7.8
12	Sandy Loam	26	17	12.4
14	Sandy Loam	25	17	14.2
16	Loamy Sand	16	23	6
18	Loamy Sand	18	19	7.5
20	Loamy Sand	17	15	6.6
22	N/A			
24	N/A			
Total		205	204	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C19 - Irrigated Crop



Management Details:

Sampled 1/6/16. Irrigated soybeans. . Presence of gravel and hole collapse prevented further sampling.

Figure 53: Site C20

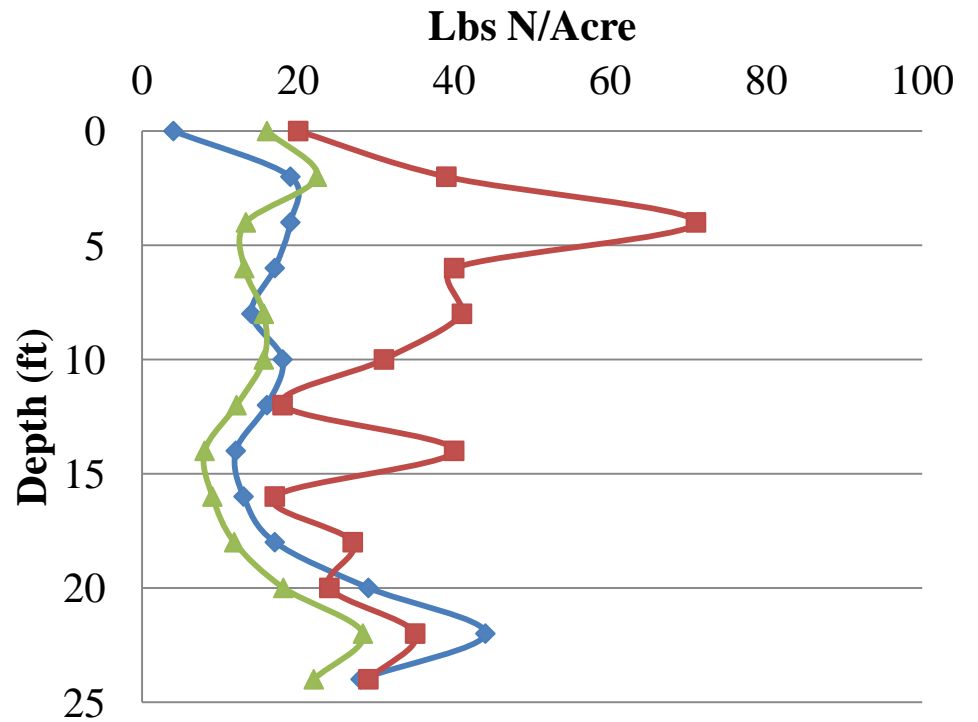
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	4	20	16.0
2	Loam	19	39	22.4
4	Sandy Loam	19	71	13.3
6	Sandy Clay	17	40	13.1
8	Loam	14	41	15.6
10	Loam	18	31	15.6
12	Loam	16	18	12.1
14	Sandy Loam	12	40	8.0
16	Loamy Sand	13	17	9.0
18	Sandy Loam	17	27	11.8
20	Sandy Loam	29	24	18.1
22	Loam	44	35	28.3
24	Silt Loam	28	29	22.0
Total		250	432	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C20 - Irrigated Crop



Management Details:

Sampled 1/5/16. Irrigated Corn

Figure 54: Site C21

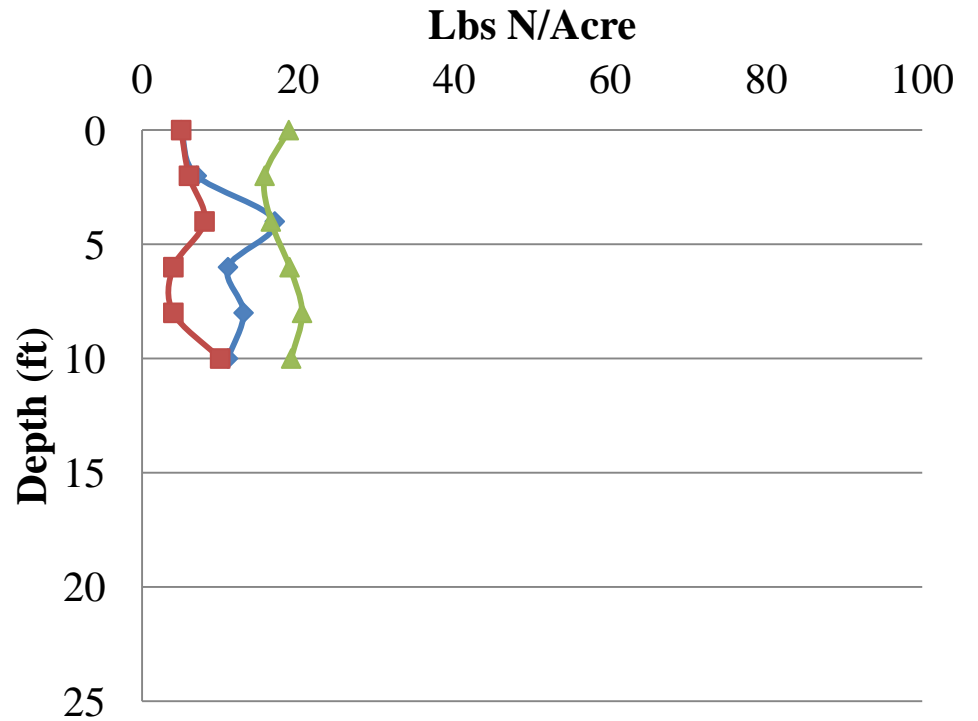
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	5	5	18.8
2	Loam	7	6	15.7
4	Sandy Loam	17	8	16.5
6	Loamy Sand	11	4	18.9
8	Loamy Sand	13	4	20.5
10	Sandy Loam	11	10	19.1
12	N/A			
14	N/A			
16	N/A			
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		64	37	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C21 - Irrigated Crop



Management Details:

Sampled 4/4/16. Irrigated Corn, same field as location C1. Water prevented further sampling.

Figure 55: Site C22

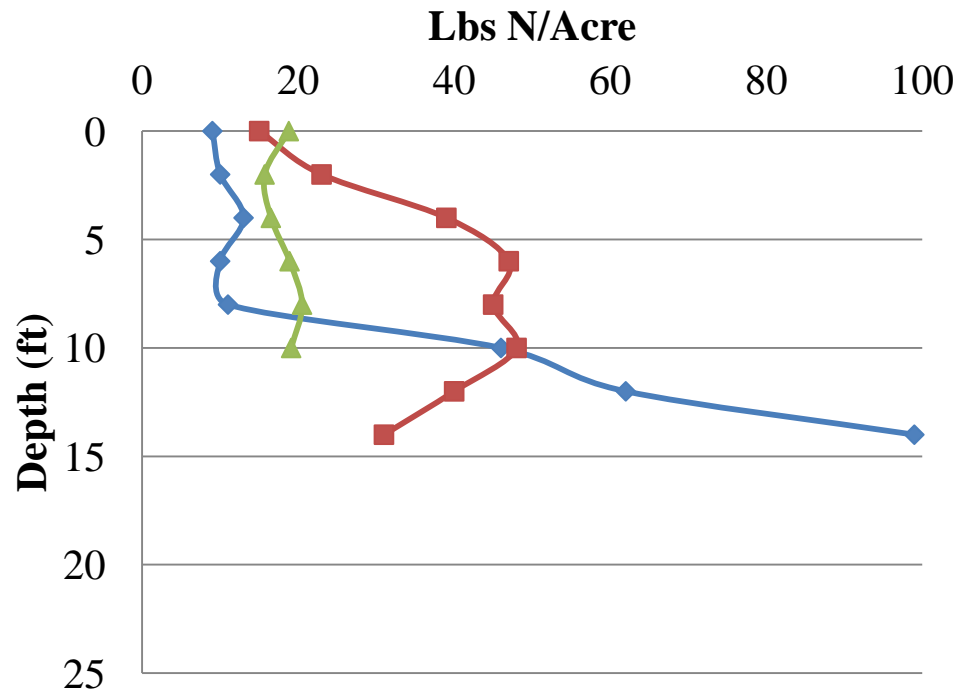
Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	9	15	19.4
2	Clay Loam	10	23	22.4
4	Loam	13	39	7.0
6	Sand	10	47	3.5
8	Sand	11	45	2.9
10	Sand	46	48	13.6
12	Sand	62	40	17.9
14	Sand	99	31	13.7
16	N/A			
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		260	288	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C22 - Irrigated Crop



Management Details:

Sampled 1/6/16. Irrigated Soybeans. Site also sampled in 2014, see location C2.

Figure 56: Site C23

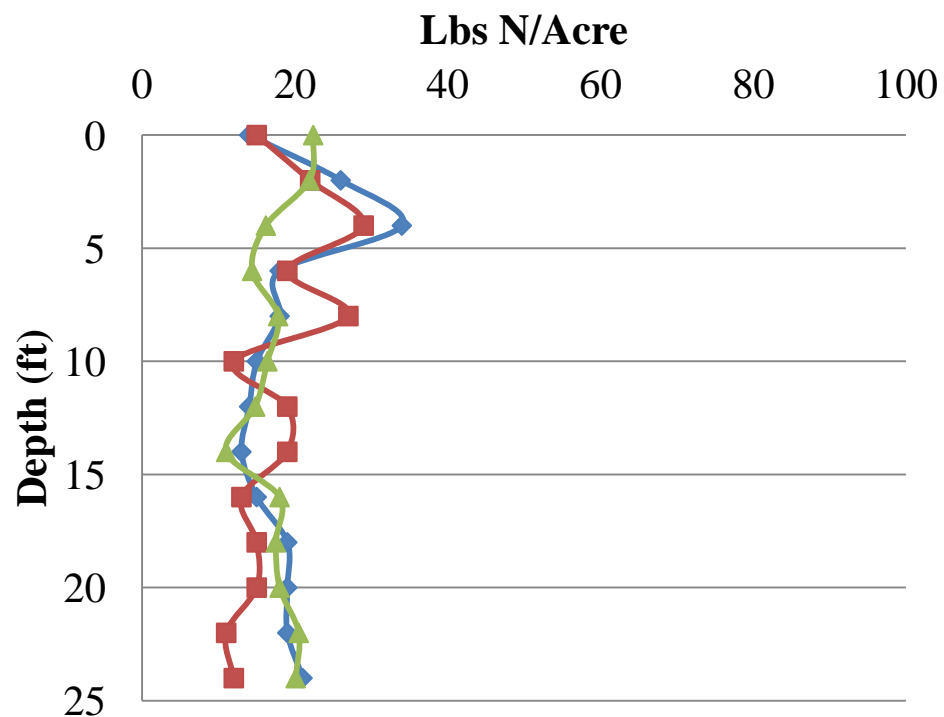
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	14	15	22.4
2	Loam	26	22	21.9
4	Loam	34	29	16.2
6	Sandy Loam	18	19	14.4
8	Loam	18	27	17.8
10	Loam	15	12	16.4
12	Sandy Loam	14	19	14.8
14	Loamy Sand	13	19	11.0
16	Loam	15	13	18.0
18	Loam	19	15	17.5
20	Loam	19	15	18.0
22	Sandy Loam	19	11	20.5
24	Sandy Loam	21	12	20.1
Total		245	228	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C23 - Irrigated Crop



Management Details:

Sampled 3/4/16. Irrigated Corn. Chicken manure applied within last two weeks prior to sampling.

Figure 57: Site C24

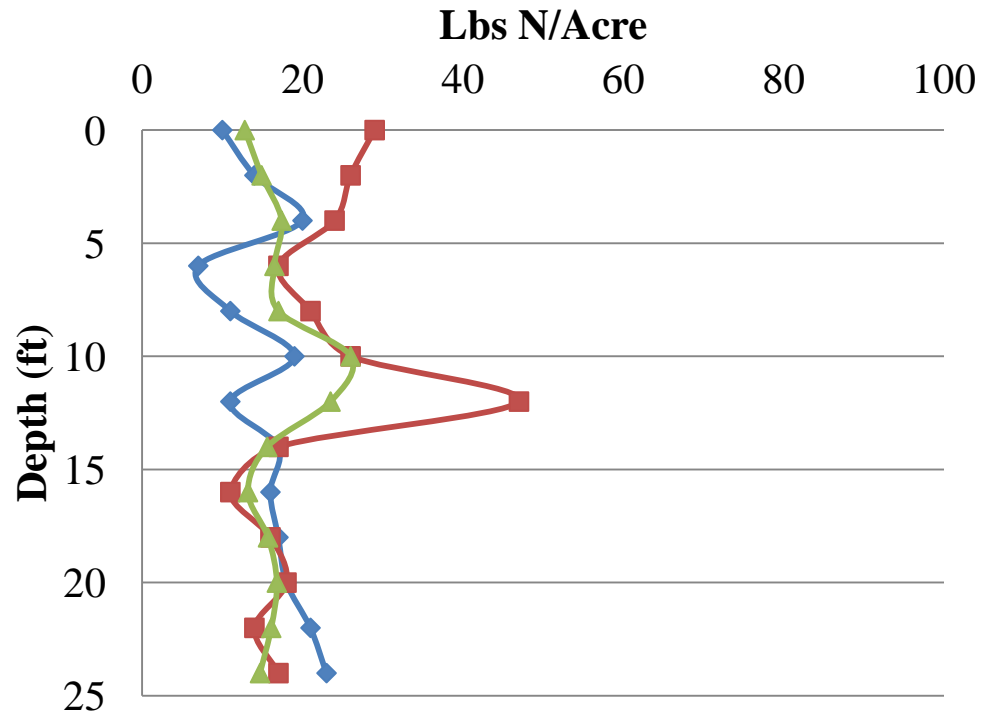
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	10	29	12.8
2	Sandy Loam	14	26	14.9
4	Loam	20	24	17.4
6	Loam	7	17	16.5
8	Loam	11	21	17.0
10	Clay Loam	19	26	26.0
12	Clay Loam	11	47	23.5
14	Sandy Loam	17	17	15.6
16	Sandy Loam	16	11	13.2
18	Sandy Loam	17	16	15.7
20	Loam	18	18	16.8
22	Loam	21	14	16.1
24	Loam	23	17	14.7
Total		204	283	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C24- Irrigated Crop



Management Details:

Sampled 3/4/16. Irrigated Corn. Chicken manure applied within last two weeks prior to sampling. Same field as C23.

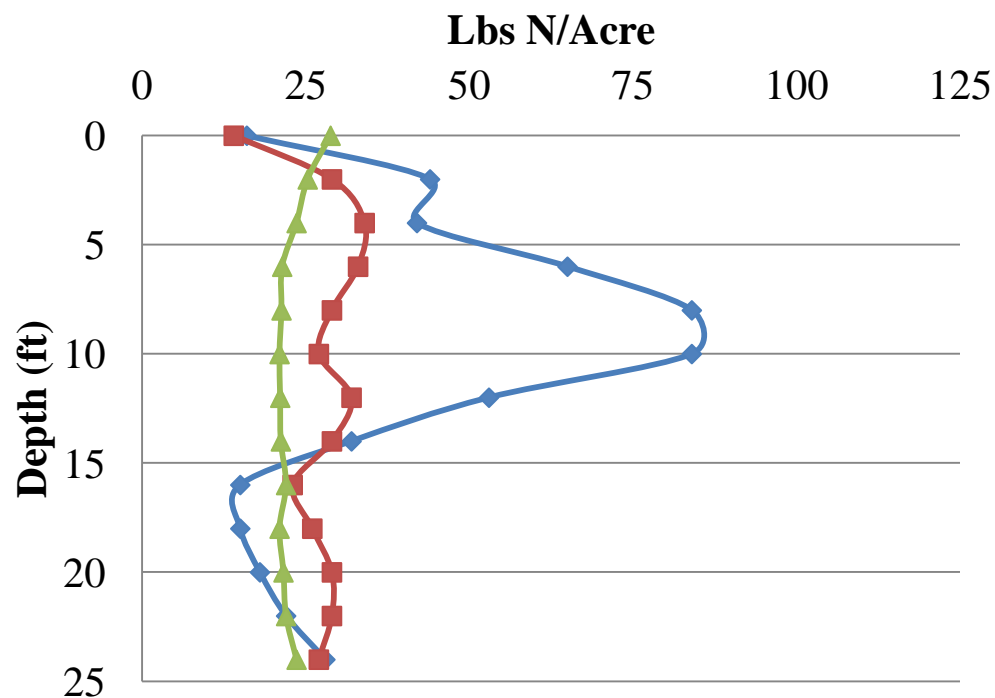
Figure 58: Site C25

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	16	14	28.8
2	Loam	44	29	25.3
4	Silt Loam	42	34	23.6
6	Silt Loam	65	33	21.4
8	Silt Loam	84	29	21.3
10	Silt Loam	84	27	21
12	Silt Loam	53	32	21.1
14	Silt Loam	32	29	21.2
16	Silt Loam	15	23	22
18	Silt Loam	15	26	21
20	Silt Loam	18	29	21.6
22	Silt Loam	22	29	22
24	Silt Loam	28	27	23.6
Total		518	361	

C25- Irrigated Crop



Management Details:

Sampled 3/17/16. Irrigated Corn. Same location sampled in 2015, see location C13.

Nitrate lbs N/ac 2016 Sample, Ammonium lbs N/ac, Moisture Content %

Figure 59: Site C26

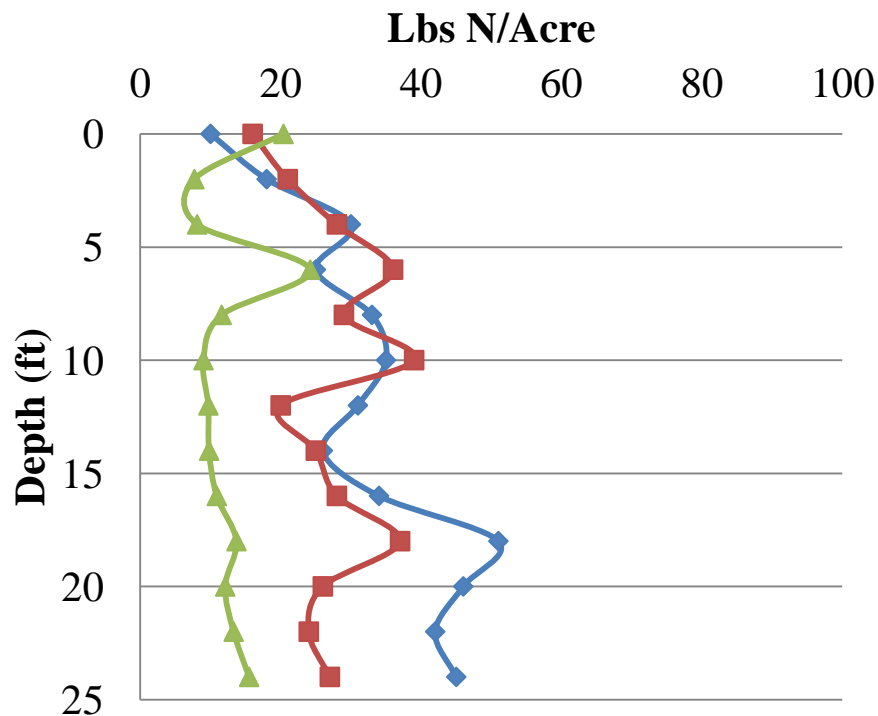
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	10	16	20.4
2	Sandy Loam	18	21	7.7
4	Sandy Loam	30	28	8.1
6	Loam	25	36	24.2
8	Sandy Loam	33	29	11.6
10	Sandy Loam	35	39	9
12	Sandy Loam	31	20	9.7
14	Sandy Loam	26	25	9.8
16	Sandy Loam	34	28	10.9
18	Sandy Loam	51	37	13.7
20	Loamy Sand	46	26	12.1
22	Loamy Sand	42	24	13.3
24	Loamy Sand	45	27	15.5
Total		426	356	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C26- Irrigated Crop



Management Details:

Sampled 1/7/16. Irrigated Corn.

Figure 60: Site C27

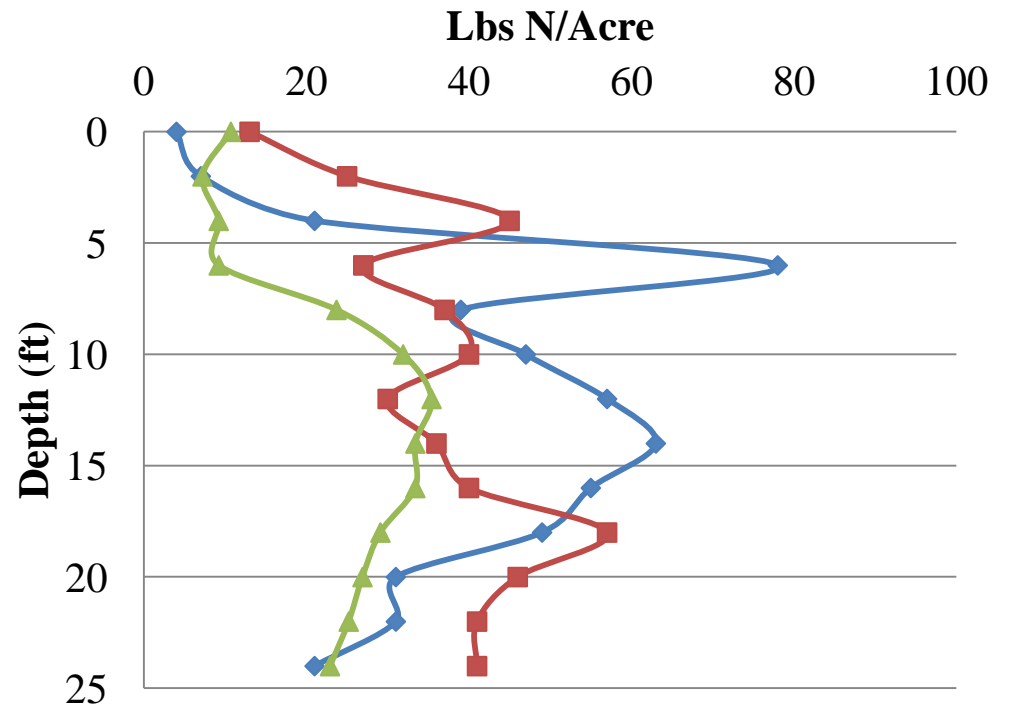
Field Management Type: Irrigated Popcorn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	4	13	10.7
2	Sandy Loam	7	25	7.2
4	Loamy Sand	21	45	9.2
6	Loamy Sand	78	27	9.2
8	Silt Loam	39	37	23.7
10	Silt Loam	47	40	31.9
12	Silt Loam	57	30	35.4
14	Silt Loam	63	36	33.4
16	Silt Loam	55	40	33.4
18	Silt Loam	49	57	29.1
20	Silt Loam	31	46	26.9
22	Silt Loam	31	41	25.2
24	Loam	21	41	22.9
Total		503	487	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C27- Irrigated Crop



Management Details:

Sampled 1/7/16. Irrigated Popcorn.

Figure 61: Site C28

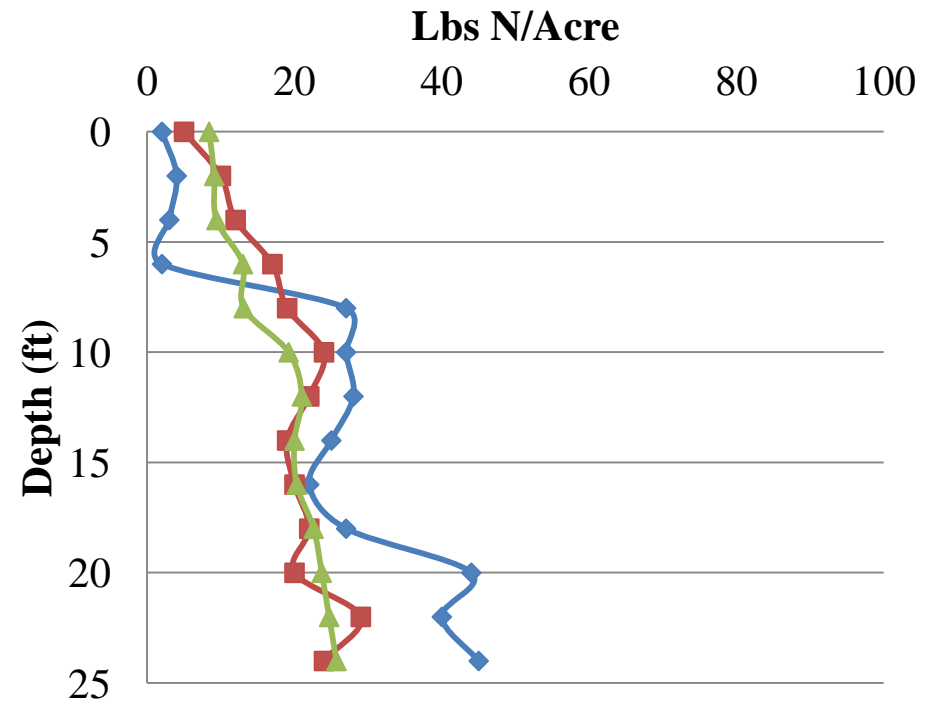
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	2	5	8.4
2	Sandy Loam	4	10	9.1
4	Sandy Loam	3	12	9.4
6	Loamy Sand	2	17	13.0
8	Loamy Sand	27	19	13.1
10	Loam	27	24	19.2
12	Clay Loam	28	22	21.0
14	Clay Loam	25	19	20.0
16	Clay Loam	22	20	20.3
18	Clay Loam	27	22	22.6
20	Silt Loam	44	20	23.7
22	Silt Loam	40	29	24.7
24	Silt Loam	45	24	25.7
Total		296	243	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C28- Irrigated Crop



Management Details:

Sampled 1/7/16. Irrigated corn, currently in rye cover crop.

Figure 62: Site C29

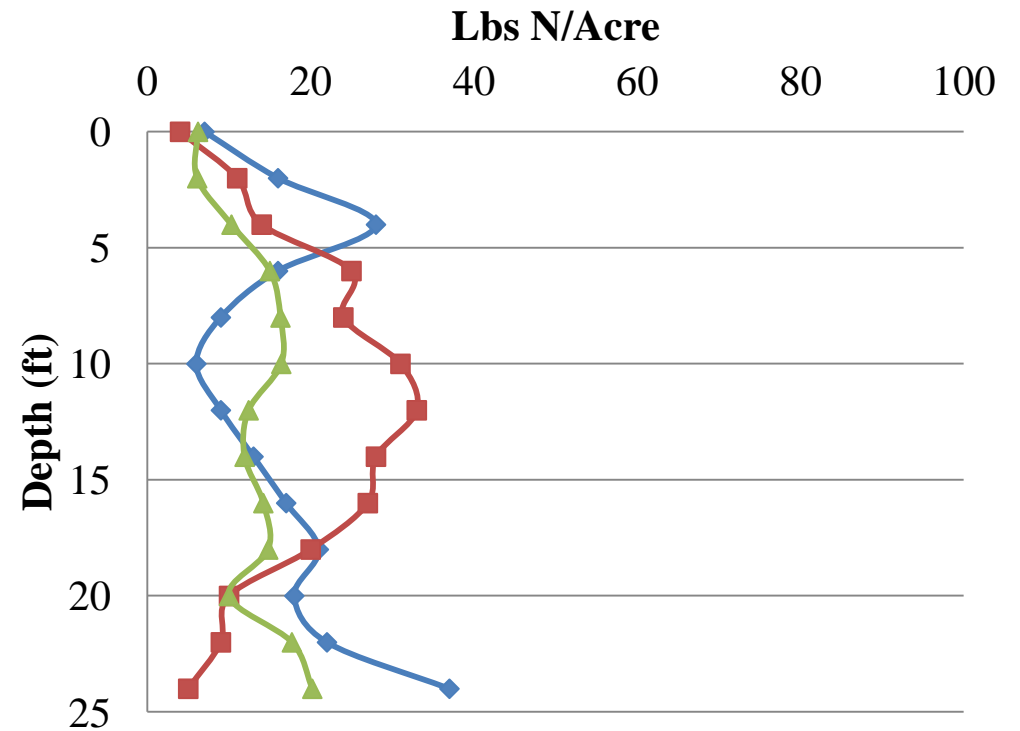
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	7	4	6.2
2	Loam	16	11	6.1
4	Loam	28	14	10.3
6	Silty Clay Loam	16	25	15
8	Clay Loam	9	24	16.3
10	Silt Loam	6	31	16.4
12	Silt Loam	9	33	12.4
14	Silt Loam	13	28	11.9
16	Silt Loam	17	27	14.2
18	Silt Loam	21	20	14.8
20	Silt	18	10	10
22	Silty Clay Loam	22	9	17.7
24	Silt Loam	37	5	20.2
Total		219	241	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C29 Irrigated Crop



Management Details:

Sampled 4/5/16. Irrigated soybeans.

Figure 63: Site C30

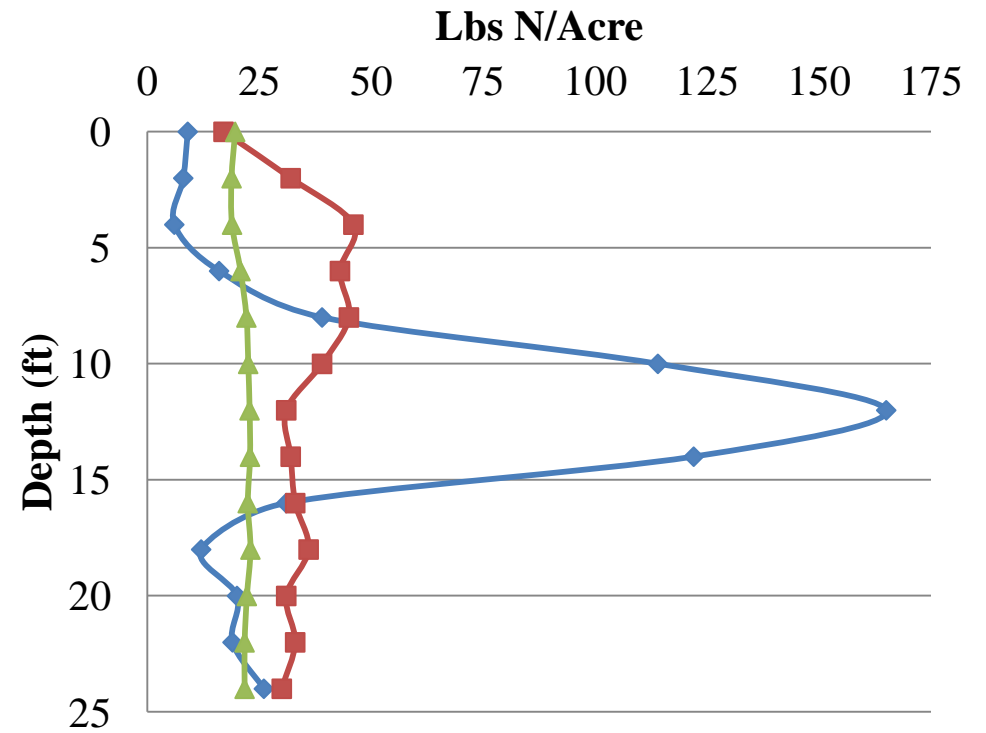
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	9	17	19.6
2	Loam	8	32	18.8
4	Silt Loam	6	46	18.9
6	Silt Loam	16	43	20.8
8	Silt Loam	39	45	22.1
10	Silt Loam	114	39	22.5
12	Silt Loam	165	31	22.8
14	Silt Loam	122	32	22.9
16	Silt Loam	31	33	22.4
18	Silt Loam	12	36	23.0
20	Silt Loam	20	31	22.2
22	Silt Loam	19	33	21.7
24	Silt Loam	26	30	21.7
Total		587	448	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C30- Irrigated Crop



Management Details:

Sampled 3/15/16. Irrigated corn, sample taken near a monitoring well.

Figure 64: Site C31

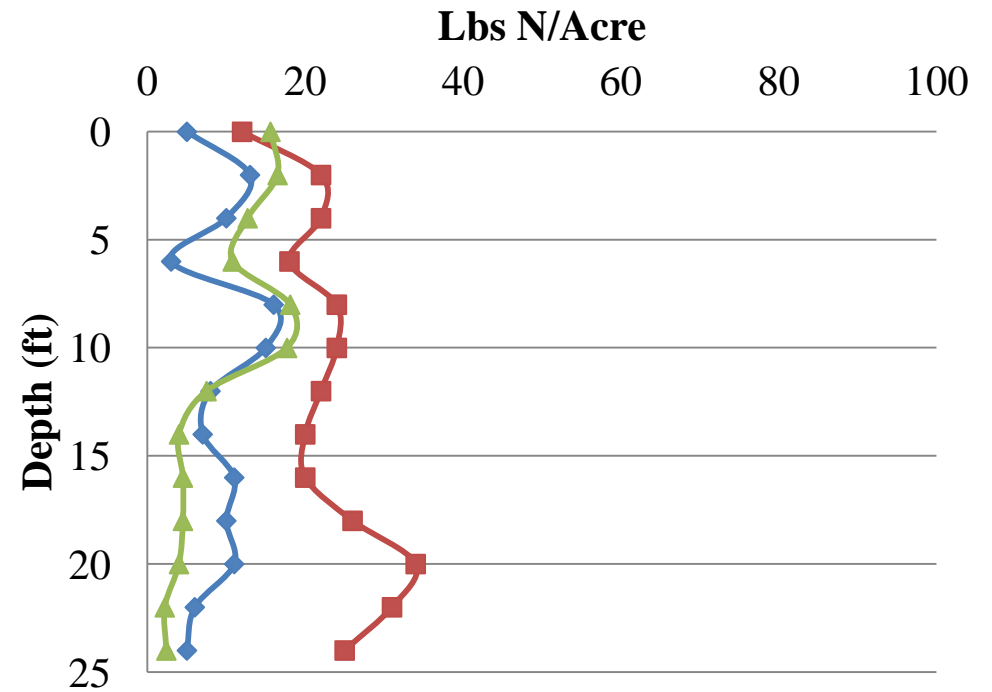
Field Management Type: Irrigated Soybeans

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	5	12	15.6
2	Loam	13	22	16.5
4	Sandy Loam	10	22	12.7
6	Sandy Loam	3	18	10.8
8	Loam	16	24	18.1
10	Sandy Loam	15	24	17.7
12	Sandy Loam	8	22	7.5
14	Sandy Loam	7	20	4.0
16	Sandy Loam	11	20	4.5
18	Loamy Sand	10	26	4.5
20	Sand	11	34	4.0
22	Sand	6	31	2.2
24	Sand	5	25	2.4
Total		120	300	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C31- Irrigated Crop



Management Details:

Sampled 3/15/16. Irrigated soybeans.

Figure 65: Site C32

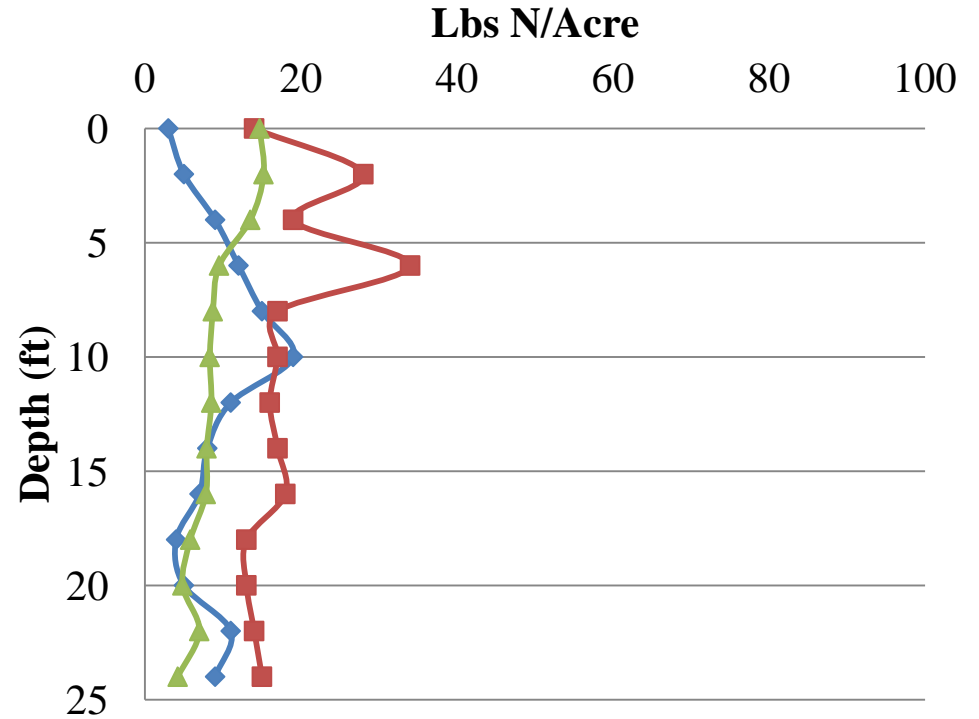
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	3	14	14.7
2	Loam	5	28	15.2
4	Loam	9	19	13.5
6	Sandy Loam	12	34	9.5
8	Sandy Loam	15	17	8.7
10	Sandy Loam	19	17	8.3
12	Sandy Loam	11	16	8.5
14	Sandy Loam	8	17	7.9
16	Sandy Loam	7	18	7.8
18	Sandy Loam	4	13	5.8
20	Sandy Loam	5	13	4.8
22	Loamy Sand	11	14	7.0
24	Sand	9	15	4.2
Total		118	235	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C32- Irrigated Crop



Management Details:

Sampled 3/16/16. Irrigated corn.

Figure 66: Site C33

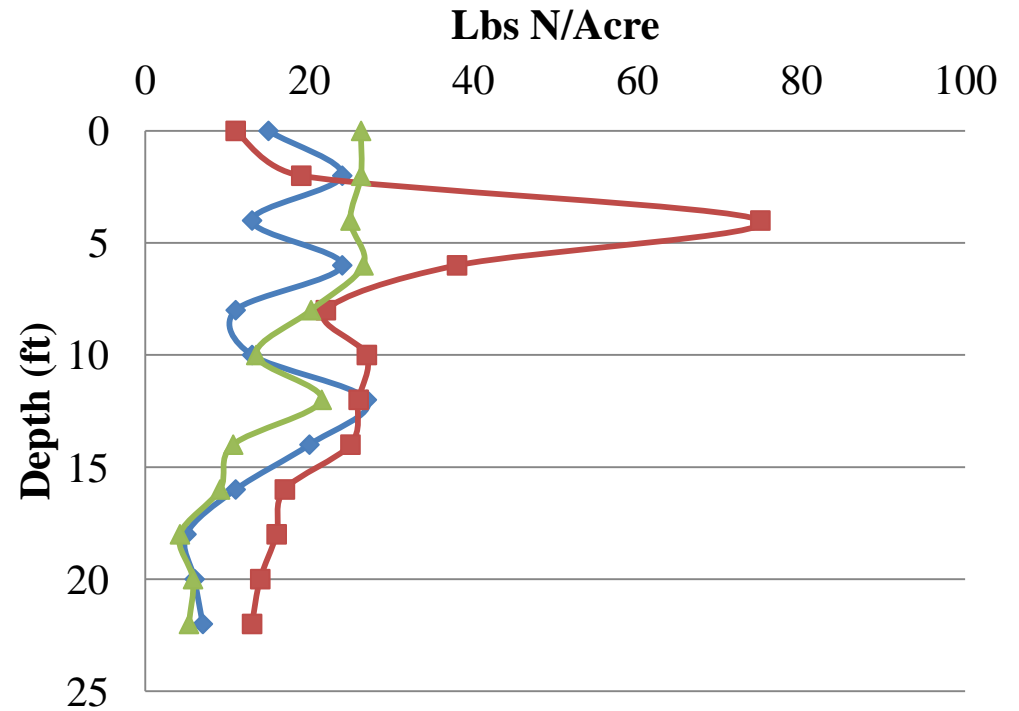
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	15	11	26.3
2	Loam	24	19	26.3
4	Silt Loam	13	75	25
6	Silt Loam	24	38	26.6
8	Loam	11	22	20.2
10	Sandy Loam	13	27	13.5
12	Sandy Loam	27	26	21.5
14	Sandy Loam	20	25	10.7
16	Sandy Loam	11	17	9.1
18	Sand	5	16	4.2
20	Sand	6	14	5.8
22	Sand	7	13	5.3
24	N/A			
Total		176	303	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C33- Irrigated Crop



Management Details:

Sampled 3/16/16. Irrigated corn. Presence of gravel prevented further sampling.

Figure 67: Site C34

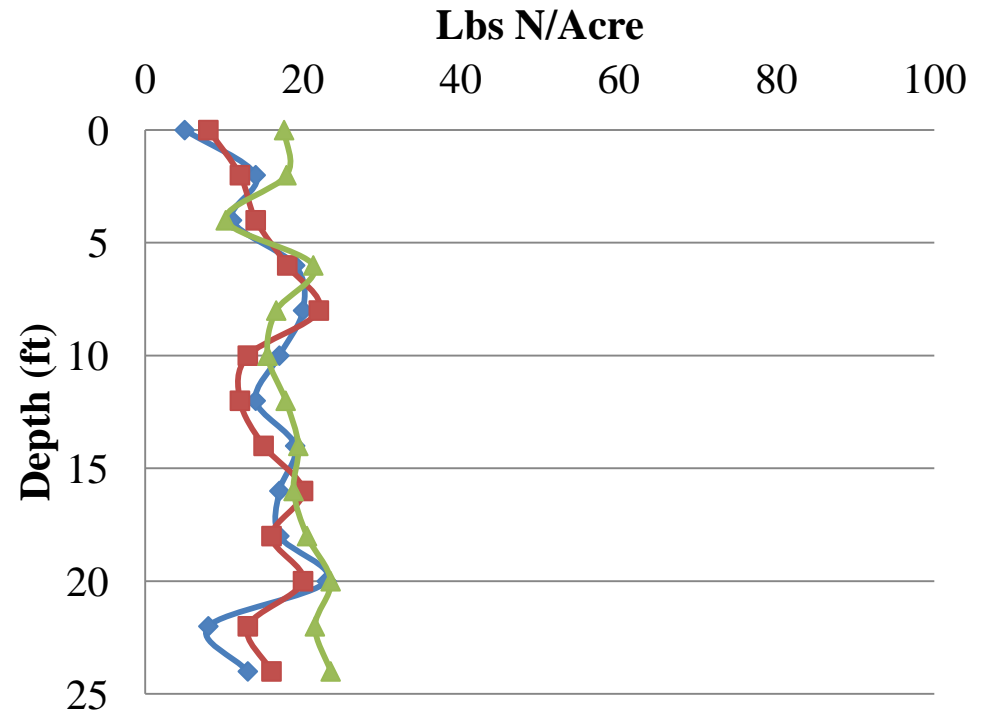
Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	5	8	17.6
2	Loam	14	12	17.9
4	Sandy Loam	11	14	10.2
6	Loam	19	18	21.3
8	Sandy Loam	20	22	16.6
10	Sandy Loam	17	13	15.5
12	Sandy Loam	14	12	17.8
14	Sandy Loam	19	15	19.4
16	Sandy Loam	17	20	18.8
18	Sandy Loam	17	16	20.5
20	Loam	23	20	23.5
22	Sandy Loam	8	13	21.5
24	Loamy Sand	13	16	23.5
Total		197	199	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

C34- Irrigated Crop



Management Details:

Sampled 3/4/16. Irrigated corn.

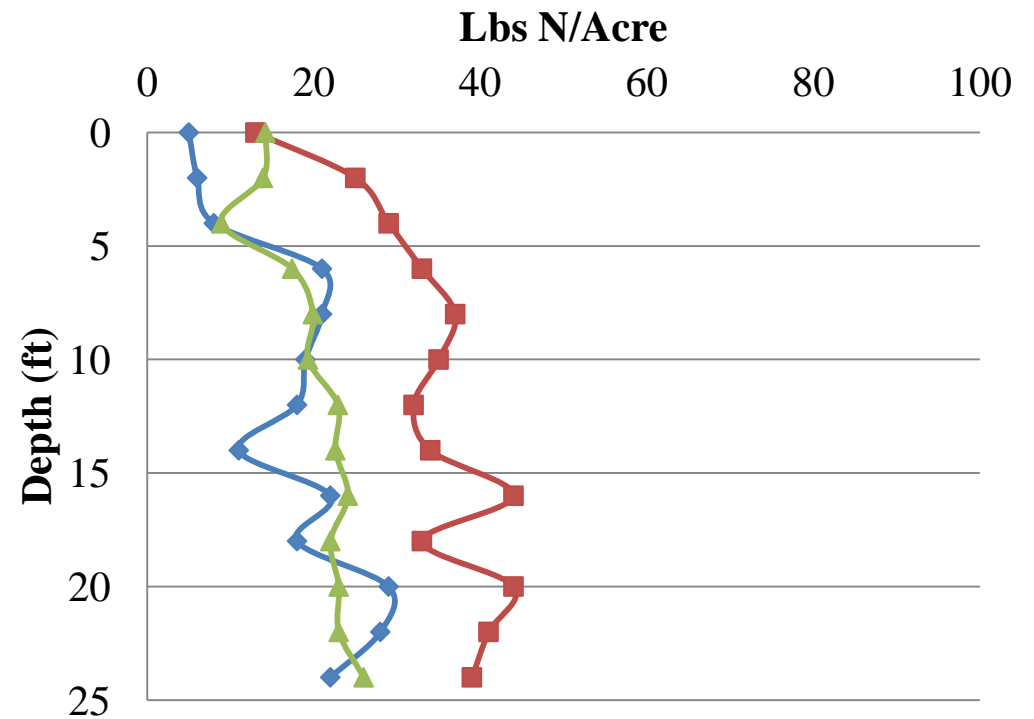
Figure 68: Site C35

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Sandy Loam	5	13	14.2
2	Sandy Loam	6	25	13.9
4	Sandy Loam	8	29	8.9
6	Sandy Loam	21	33	17.4
8	Loam	21	37	19.9
10	Loam	19	35	19.3
12	Loam	18	32	22.9
14	Loam	11	34	22.6
16	Loam	22	44	24.1
18	Clay Loam	18	33	22.0
20	Clay Loam	29	44	23.0
22	Loam	28	41	23.0
24	Loam	22	39	26.0
Total		228	439	

C35- Irrigated Crop



Management Details:

Sampled 3/17/16. Irrigated corn. Location also sampled in 2015, see location C14.

Nitrate lbs N/ac 2016 sample, Ammonium lbs N/ac 2016, Moisture Content % 2016

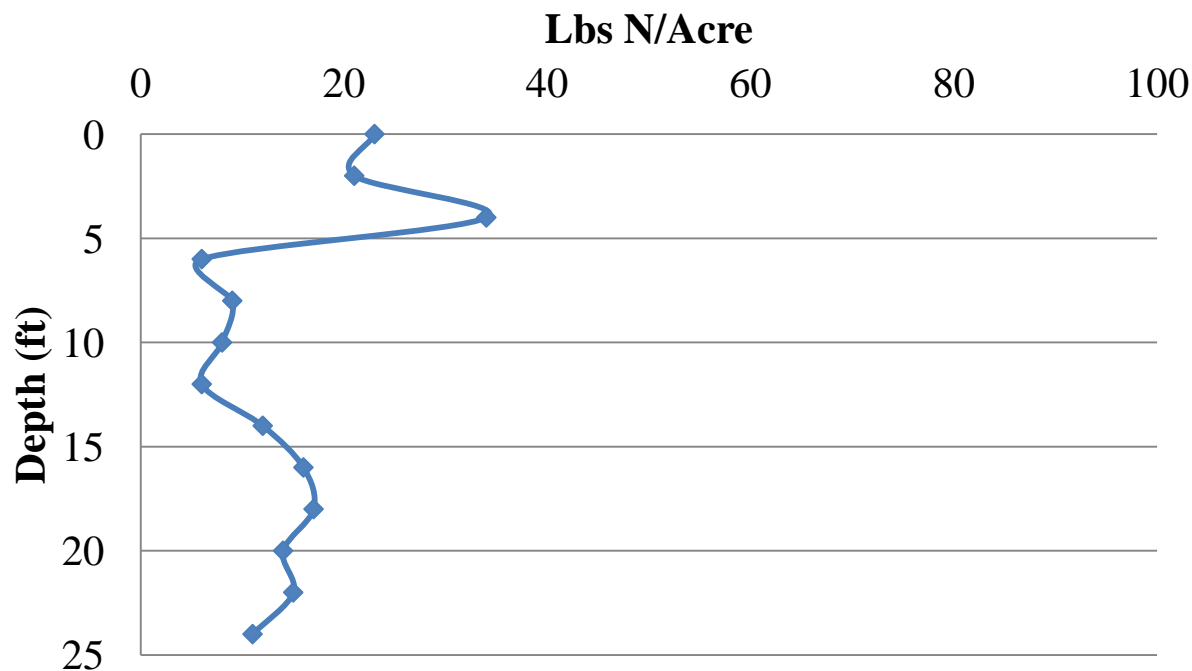
Figure 69: Site N1

Field Management Type: No-Till Corn

Soil Texture Analysis: Conducted by Ward Labs

N1 - Irrigated Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	23
2	Clay Loam	21
4	Loam	34
6	Sandy Loam	6
8	Sandy Loam	9
10	Sandy Loam	8
12	Sandy Loam	6
14	Sandy Loam	12
16	Loamy Sand	16
18	Sandy Loam	17
20	Sandy Loam	14
22	Sandy Loam	15
24	Loamy Sand	11
Total lbs N/acre 192 for Core		



Management Details: Sampled 11/10/14

This irrigated field has been in no-till for three years. The producer utilizes nitrogen credits in the soil and water, irrigation scheduling based off of soil moisture sensors. Currently in corn production.

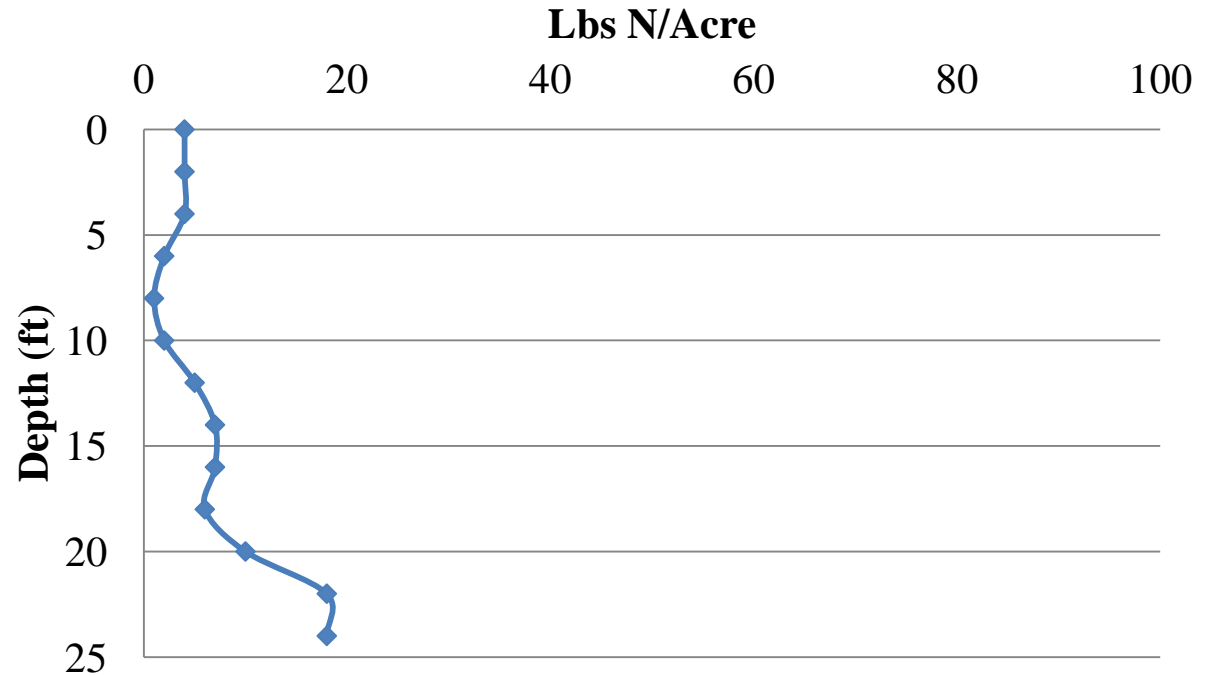
Figure 70: Site O1

Field Management Type: Organic Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

O1 - Organic Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	4
2	Loam	4
4	Loam	4
6	Sandy Loam	2
8	Sandy Loam	1
10	Loamy Sand	2
12	Loamy Sand	5
14	Sandy Loam	7
16	Sandy Loam	7
18	Loamy Sand	6
20	Loam	10
22	Loam	18
24	Silt Loam	18
Total lbs N/acre 88 for Core		



Management Details: 11/12/14

This field was dryland corn with strips of oats. Organic nitrogen applied.

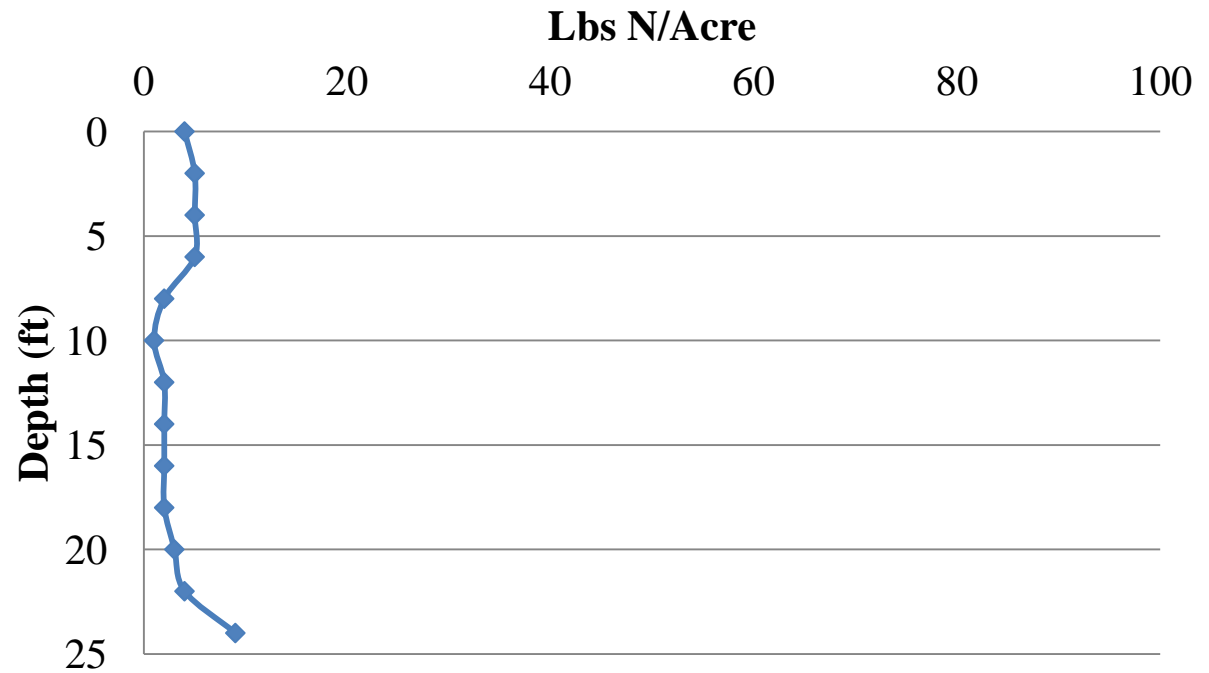
Figure 71: Site O2

Field Management Type: Organic Dryland Corn

Soil Texture Analysis: Conducted by Ward Labs

O2 - Organic Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	4
2	Sandy Loam	5
4	Sandy Loam	5
6	Sandy Loam	5
8	Sandy Loam	2
10	Sandy Loam	1
12	Loamy Sand	2
14	Sandy Loam	2
16	Sandy Loam	2
18	Sandy Loam	2
20	Sandy Loam	3
22	Sandy Loam	4
24	Sandy Loam	9
Total lbs N/acre 46 for Core		



Management Details: Sampled 11/12/14

This field was dryland corn with strips of oats. Organic nitrogen applied.

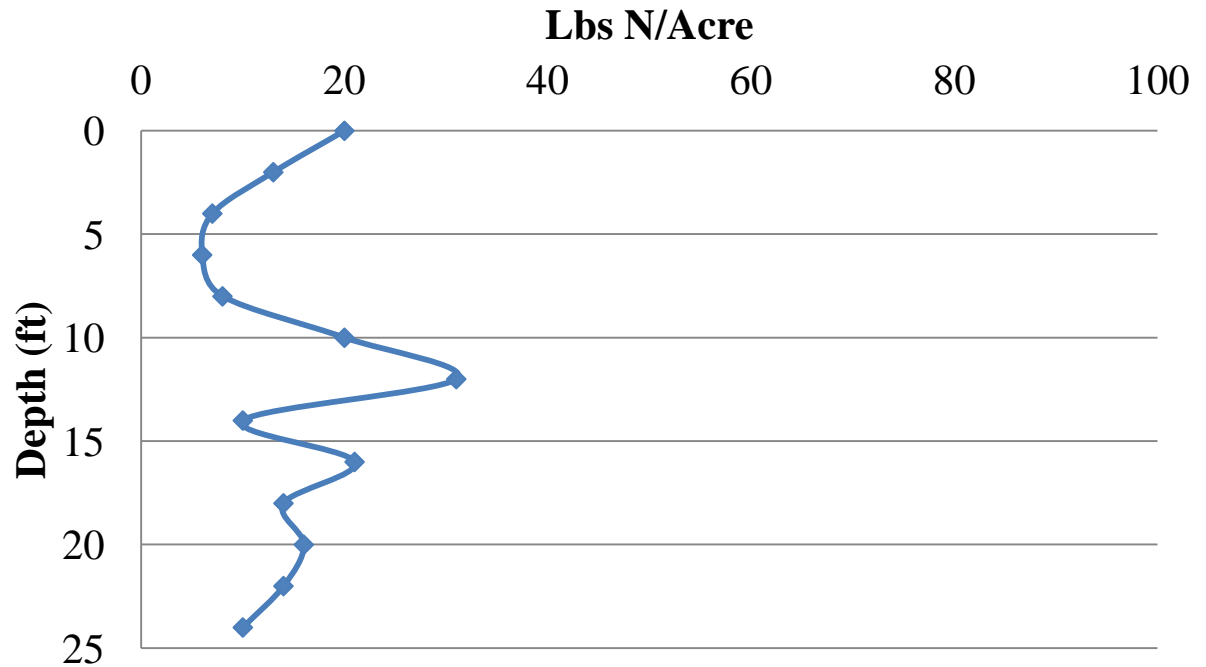
Figure 72: Site O3

Field Management Type: Irrigated Corn

Soil Texture Analysis: Conducted by Ward Labs

O3 - Organic Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	20
2	Clay Loam	13
4	Loam	7
6	Silt Loam	6
8	Silt Loam	8
10	Clay Loam	20
12	Clay Loam	31
14	Sandy Loam	10
16	Loam	21
18	Sandy Loam	14
20	Sandy Loam	16
22	Sand	14
24	Sand	10
Total lbs N/acre 190 for Core		



Management Details:

Sampled 11/10/14 This irrigated field is in rotation with a legume like clover and wheat, currently in corn. The producer utilizes nitrogen credits in the soil and water. Organic nitrogen applied.

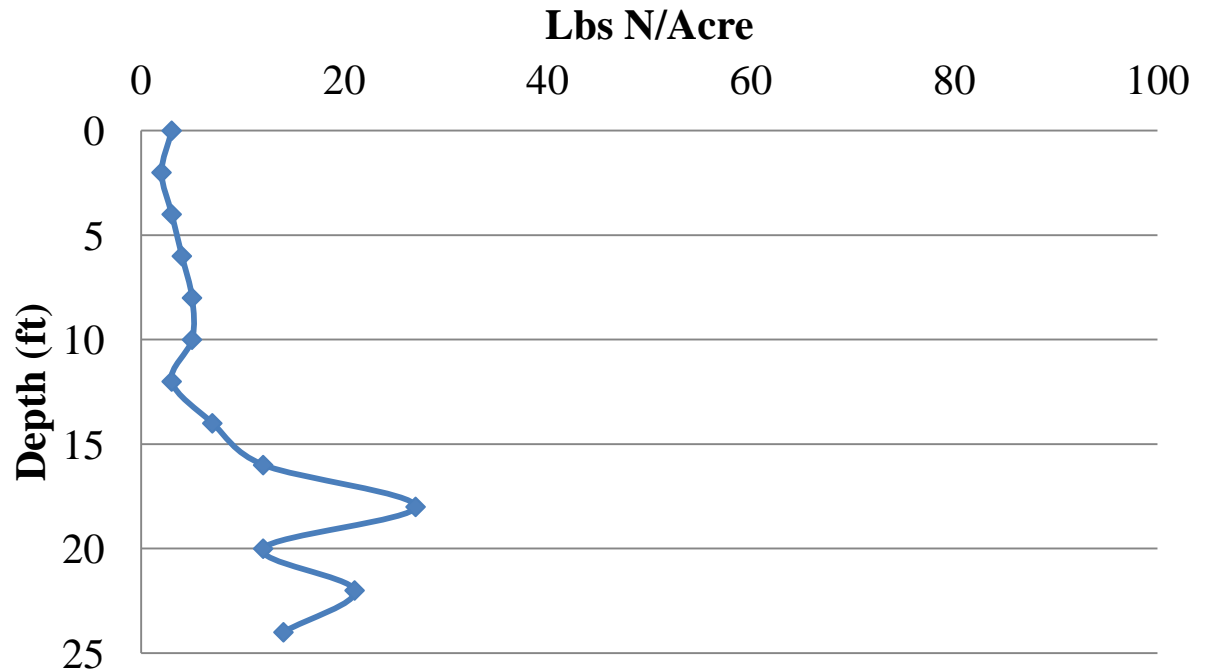
Figure 73: Site O4

Field Management Type: Irrigated Clover

Soil Texture Analysis: Conducted by Ward Labs

O4 - Organic Crop

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Clay Loam	3
2	Clay Loam	2
4	Clay Loam	3
6	Loamy Sand	4
8	Loam	5
10	Loamy Sand	5
12	Loamy Sand	3
14	Loamy Sand	7
16	Sandy Loam	12
18	Sand	27
20	Sand	12
22	Loamy Sand	21
24	Loamy Sand	14
Total lbs N/acre 118 for Core		



Management Details:

Sampled 11/10/14 This irrigated field is in rotation with corn and wheat, currently in clover for one year, no nitrogen was added while in clover.

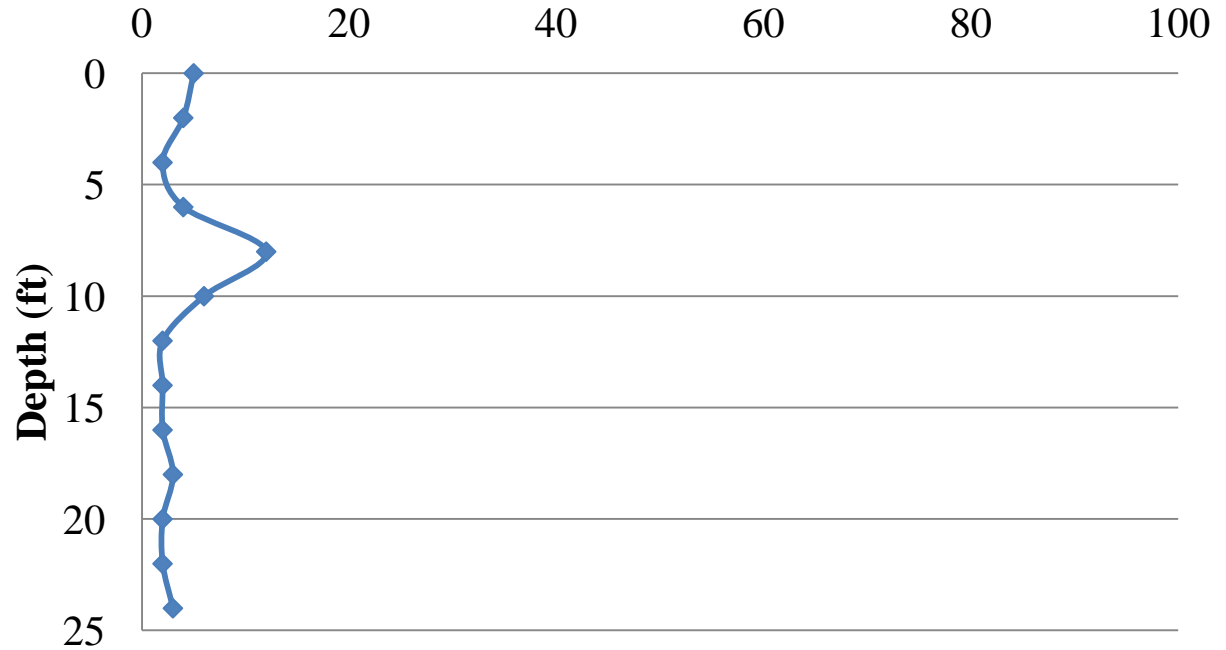
Figure 74: Site P1

Field Management Type: Unfarmed pivot corner

Soil Texture Analysis: Conducted by UENRD

P1 - Pivot Corner Lbs N/Acre

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Fine Sand	5
2	Fine Sand	4
4	Fine Sand	2
6	Fine Sand	4
8	Fine Sand	12
10	Fine Sand	6
12	Fine Sand	2
14	Loamy Sand	2
16	Fine Sand	2
18	Fine Sand	3
20	Fine Sand	2
22	Fine Sand	2
24	Fine Sand	3
Total lbs N/acre 49 for Core		



Management Details: Sampled 7/9/14

This pivot corner corresponds to field C9.

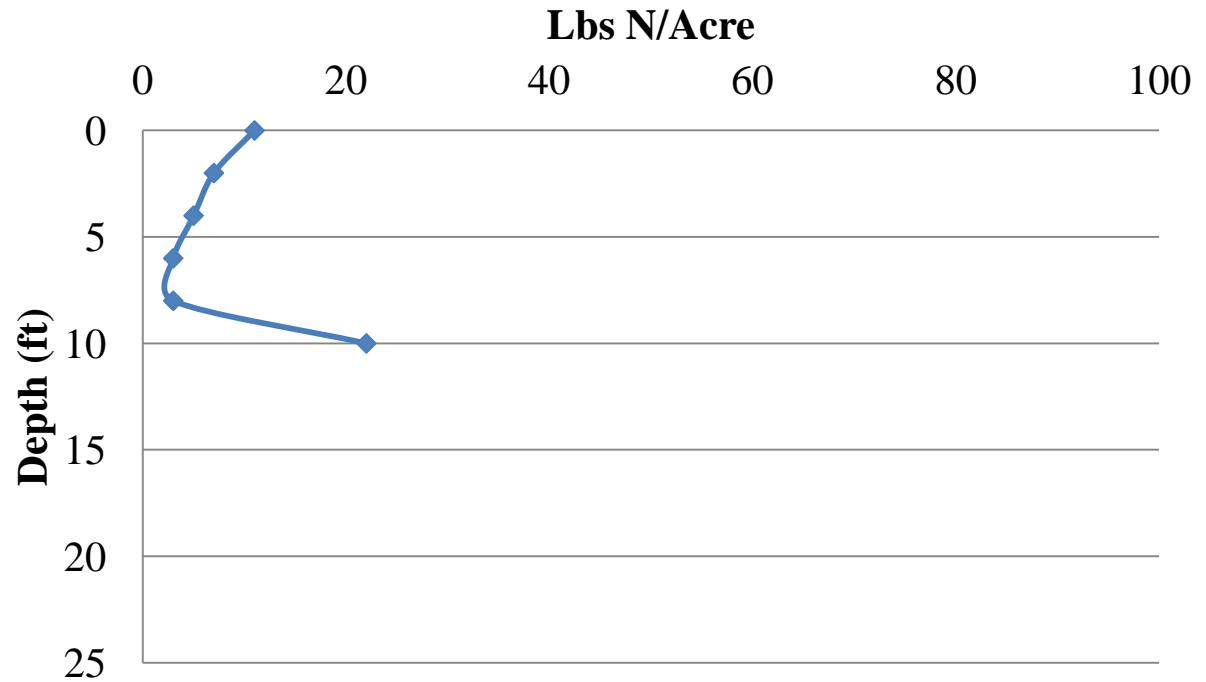
Figure 75: Site P2

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P2 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	11
2	Clay	7
4	Clay	5
6	Clay with Sand	3
8	Clay with Sand	3
10	Sand	22
12	N/A	
14	N/A	
16	N/A	
18	N/A	
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 51 for Core		



Management Details:

Sampled 7/7/14 Water prevented further sampling after 10 feet.

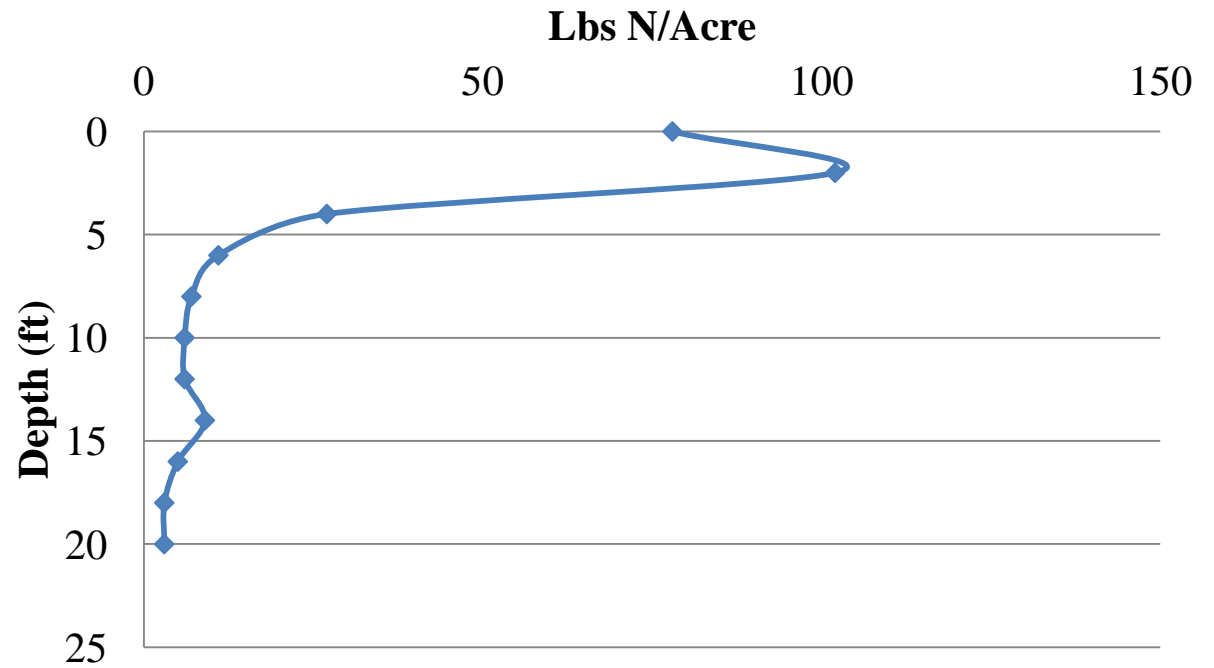
Figure 76: Site P4

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P4 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Silt Loam	78
2	Silt Loam	102
4	Silt Loam	27
6	Sand	11
8	Sand	7
10	Sand	6
12	Sand	6
14	Sand	9
16	Sand	5
18	Clay Loam	3
20	Sand	3
22	N/A	
24	N/A	
Total lbs N/acre 257 for Core		



Management Details:

Sampled 7/3/14 Water prevented further sampling below 20 feet.

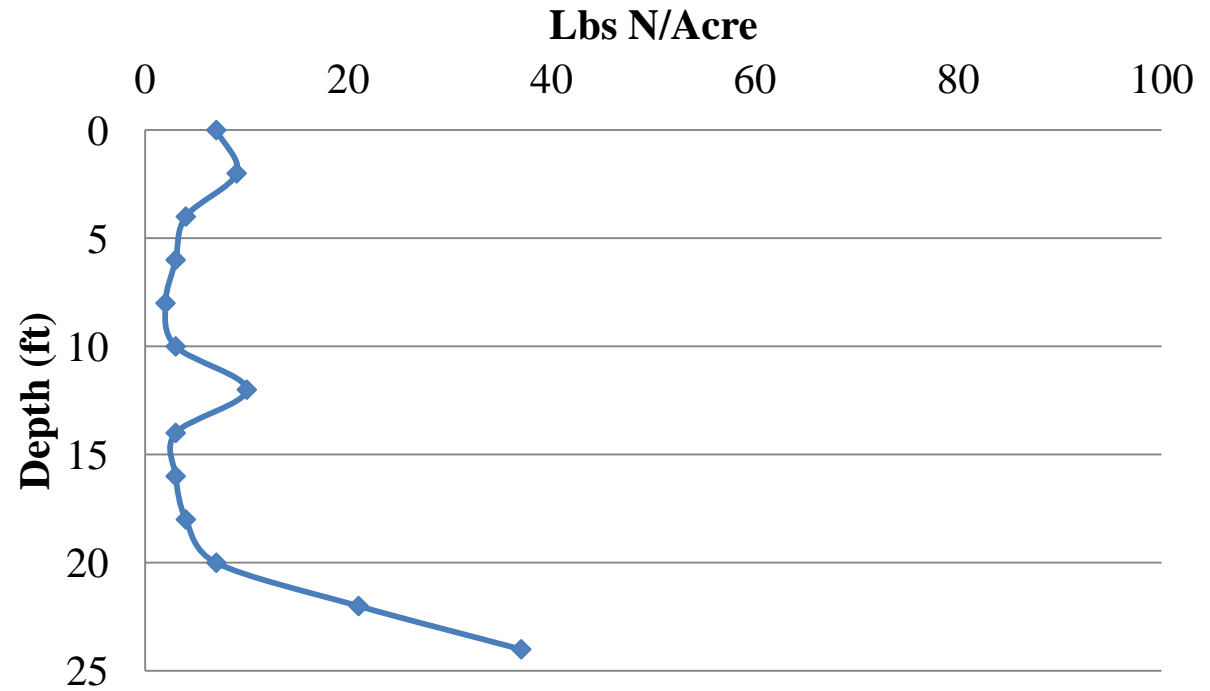
Figure 77: Site P5

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P5 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	7
2	Sandy Clay	9
4	Sandy Clay	4
6	Sandy Clay	3
8	Sand	2
10	Sandy Clay	3
12	Sandy Clay	10
14	Sandy Clay	3
16	Sandy Clay	3
18	Sandy Clay	4
20	Clay	7
22	Clay	21
24	Clay	37
Total lbs N/acre 113 for Core		



Management Details:

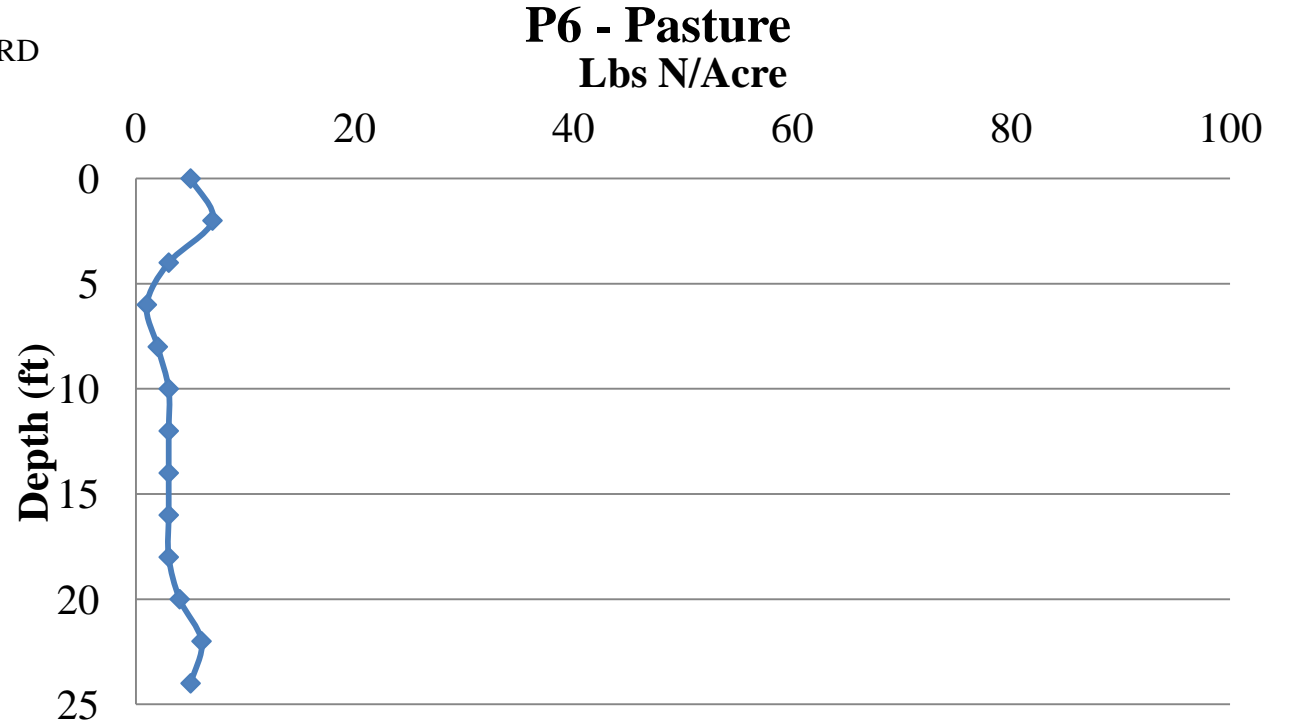
Sampled 7/3/14

Figure 78: Site P6

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	7
2	Sand	9
4	Sand	4
6	Sand	3
8	Sand	2
10	Sand	3
12	Sand	10
14	Sand	3
16	Sand	3
18	Sand	4
20	Sand	7
22	Sand	21
24	Sand	37
Total lbs N/acre 48 for Core		



Management Details:

Sampled 7/5/14 Ashfall Fossil Beds

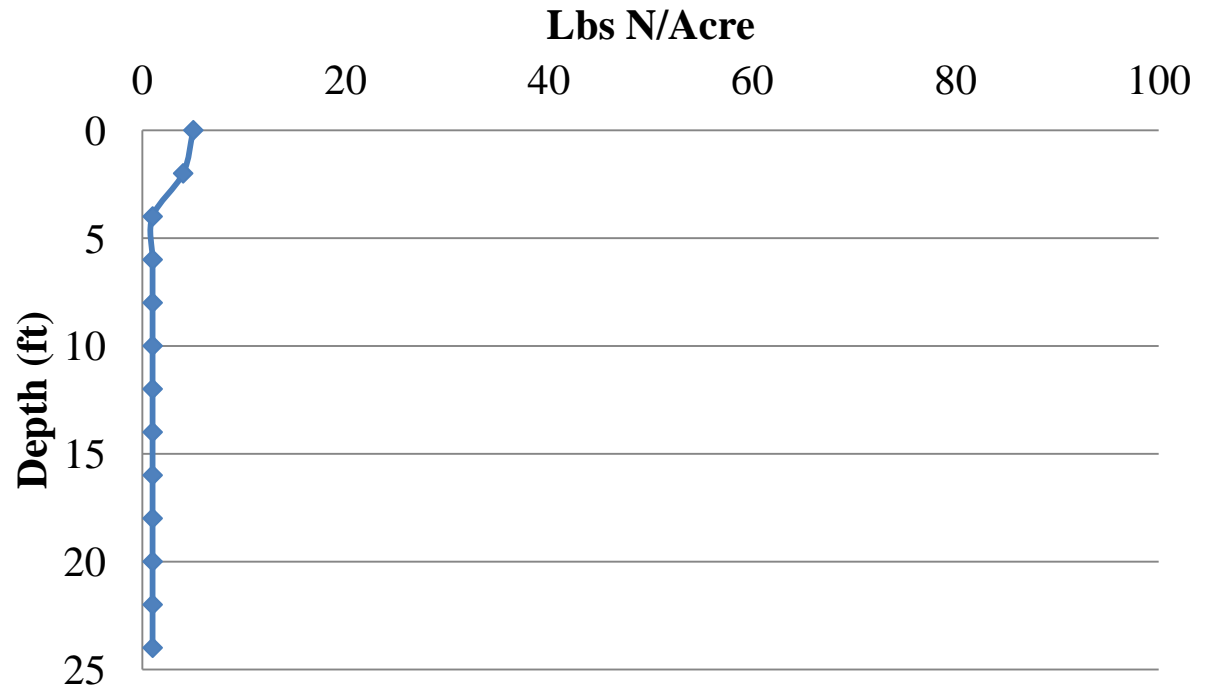
Figure 79: Site P7

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P7 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	5
2	Sandy Loam	4
4	Sand	1
6	Sand	1
8	Sand	1
10	Sand	1
12	Sand	1
14	Sand	1
16	Sand	1
18	Sand	1
20	Sand	1
22	Sand	1
24	Sand	1
Total lbs N/acre 21 for Core		



Management Details:

Sampled 7/15/14 Ashfall Fossil Beds

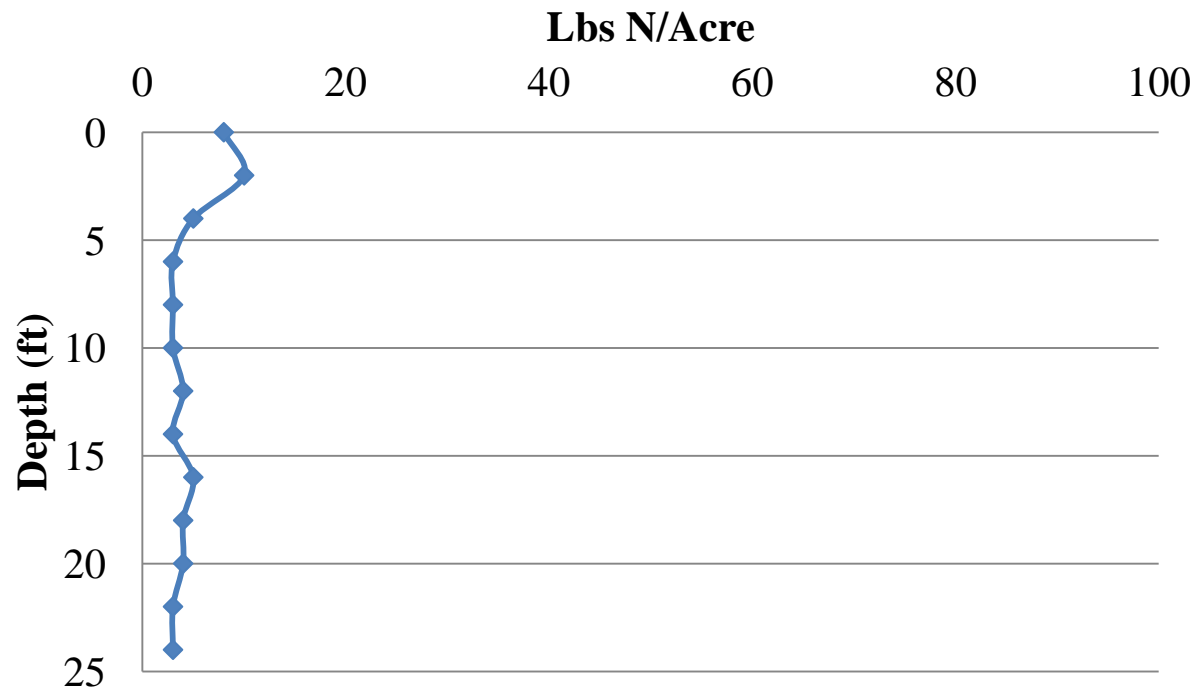
Figure 80: Site P8

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P8 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	8
2	Sandy Loam	10
4	Sandy Loam	5
6	Sand	3
8	Sand	3
10	Sand	3
12	Sand	4
14	Sandy Loam	3
16	Clay	5
18	Clay	4
20	Clay	4
22	Clay	3
24	Sand	3
Total lbs N/acre 58 for Core		



Management Details:

Sampled 7/3/14 Hay pasture where human waste slurry is applied for nitrogen

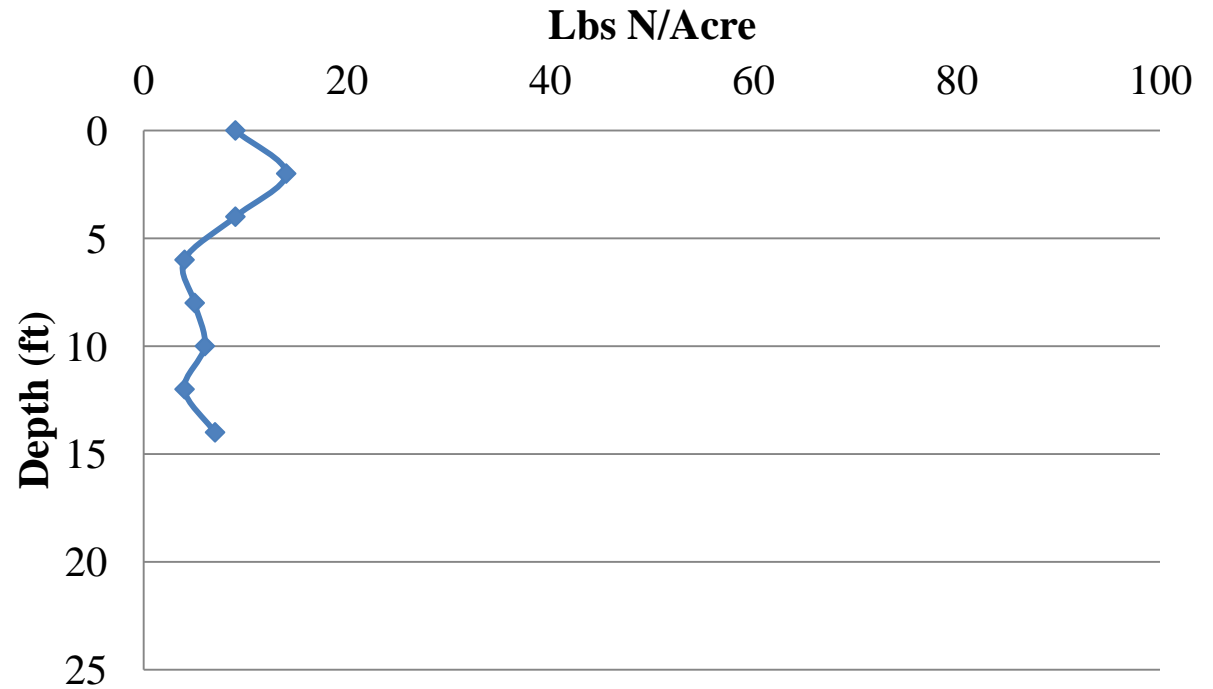
Figure 81: Site P9

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P9 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	9
2	Sandy Loam	14
4	Clay	9
6	Sand	4
8	Sand	5
10	Sand	6
12	Sand	4
14	Sand	7
16	N/A	
18	N/A	
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 58 for Core		



Management Details:

Sampled 7/23/14 Hay meadow, gravel prevented collection after 14 feet. Gravel prevented further sampling below 14 feet.

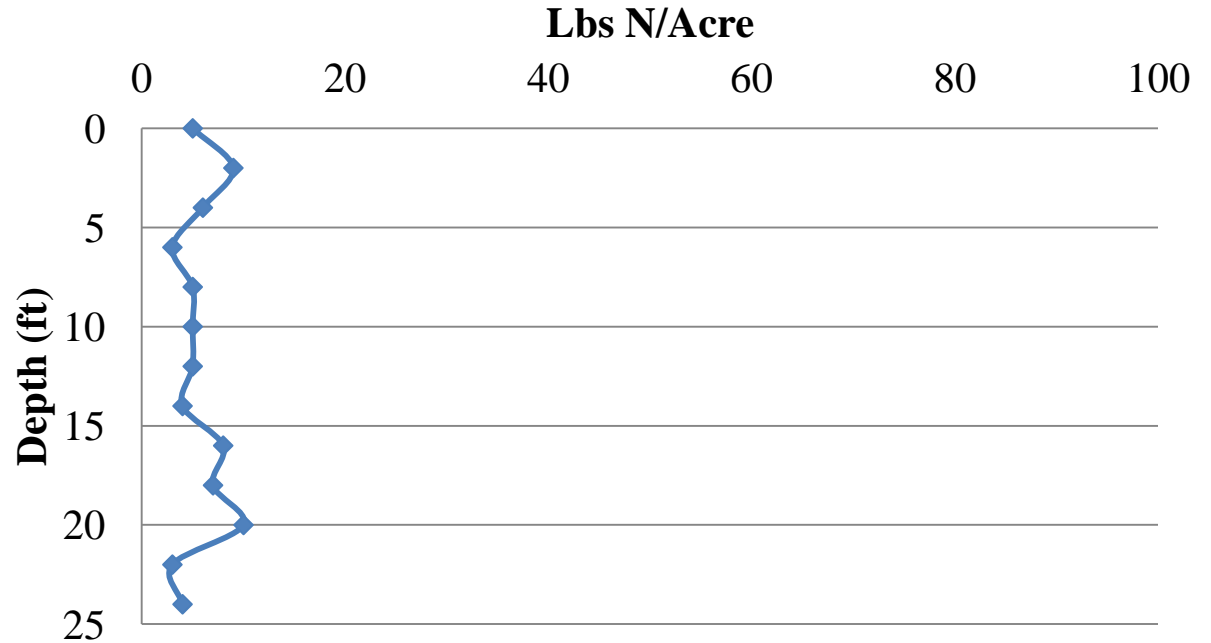
Figure 82: Site P10

Field Management Type: Pasture

Soil Texture Analysis: Conducted by UENRD

P10 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	5
2	Sandy Loam	9
4	Sand	6
6	Sand	3
8	Sand	5
10	Sand	5
12	Sand	5
14	Sand	4
16	Sand	8
18	Sand	7
20	Sand	10
22	Sand	3
24	Sandy Loam	4
Total lbs N/acre 74 for Core		



Management Details:

Sampled 7/23/14

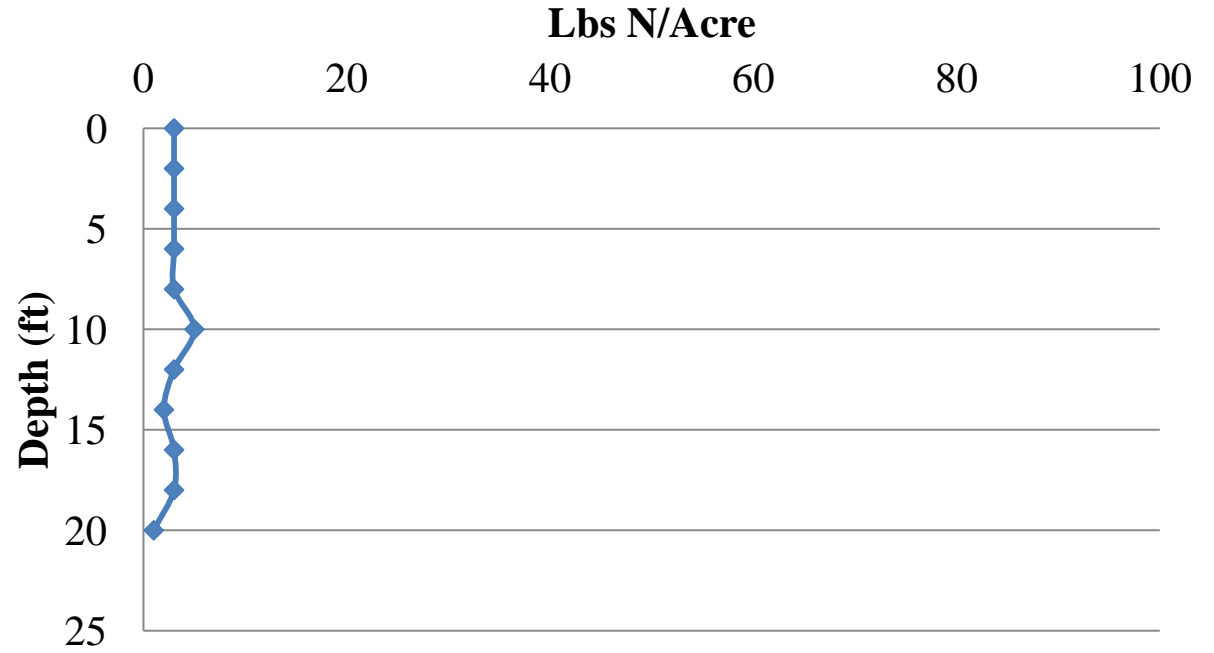
Figure 83: Site P11

Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward Labs

P11 - Pasture

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	3
2	Loam	3
4	Loam	3
6	Loam	3
8	Sandy Loam	3
10	Sand	5
12	Sand	3
14	Sand	2
16	Sand	3
18	Sand	3
20	Sand	1
22	N/A	
24	N/A	
Total lbs N/acre 32 for Core		



Management Details:

Sampled 11/13/14 This pasture corresponds to dryland corn D6. Fine sand caused core to collapse and prevented further sampling after 20 feet.

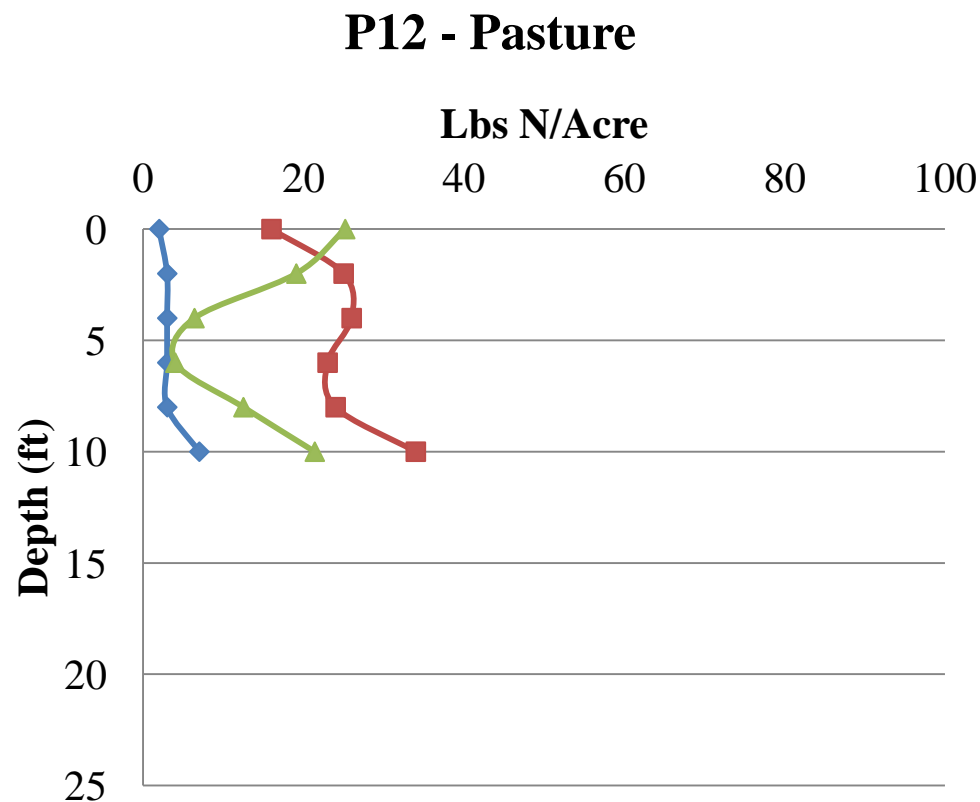
Figure 84: Site P12

Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	2	16	25.2
2	Sandy Loam	3	25	19.1
4	Loamy Sand	3	26	6.4
6	Loamy Sand	3	23	4.0
8	Loamy Sand	3	24	12.5
10	Sandy Clay	7	34	21.4
12	N/A			
14	N/A			
16	N/A			
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		21	148	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %



Management Details:

Sampled 4/6/16. Pasture, sampled by monitoring well. Presence of gravel prevented further sampling.

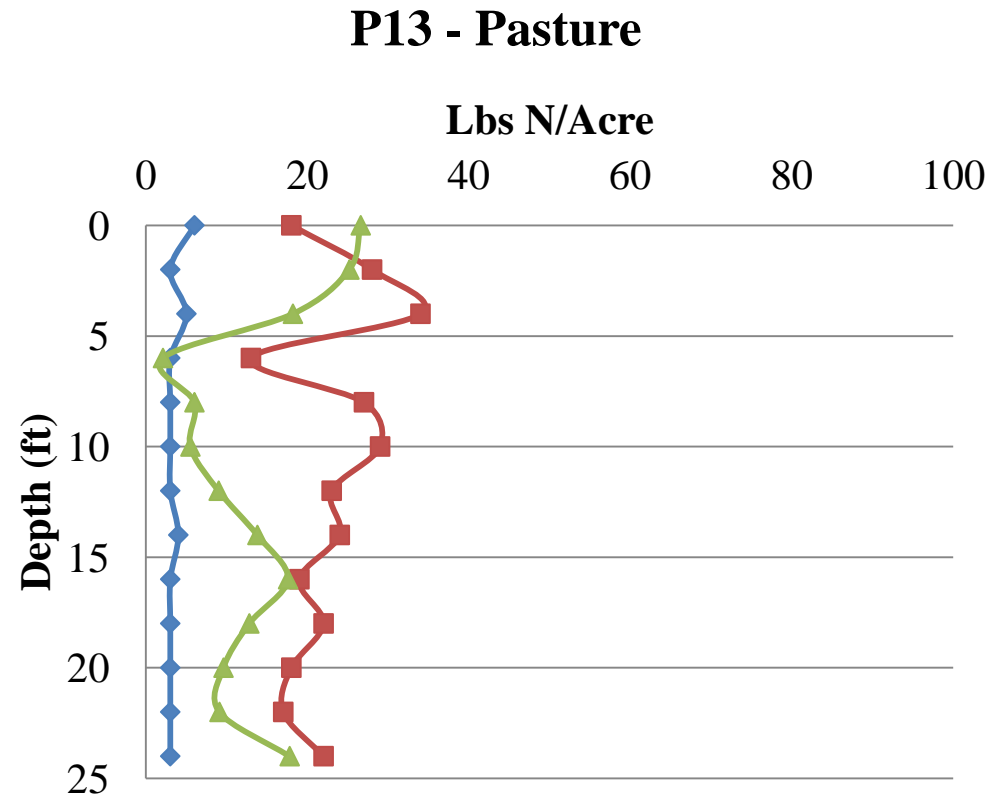
Figure 85: Site P13

Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	6	18	26.6
2	Loam	3	28	25.2
4	Loamy Sand	5	34	18.2
6	Loamy Sand	3	13	2.1
8	Sandy Loam	3	27	6
10	Sandy Loam	3	29	5.5
12	Sandy Loam	3	23	9
14	Sandy Loam	4	24	13.8
16	Sandy Loam	3	19	17.6
18	Sandy Loam	3	22	12.8
20	Sandy Loam	3	18	9.6
22	Sandy Loam	3	17	9.1
24	Sandy Loam	3	22	17.8
Total		45	294	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %



Management Details:

Sampled 4/6/16. Pasture, sampled by monitoring well.

Figure 86: Site P14

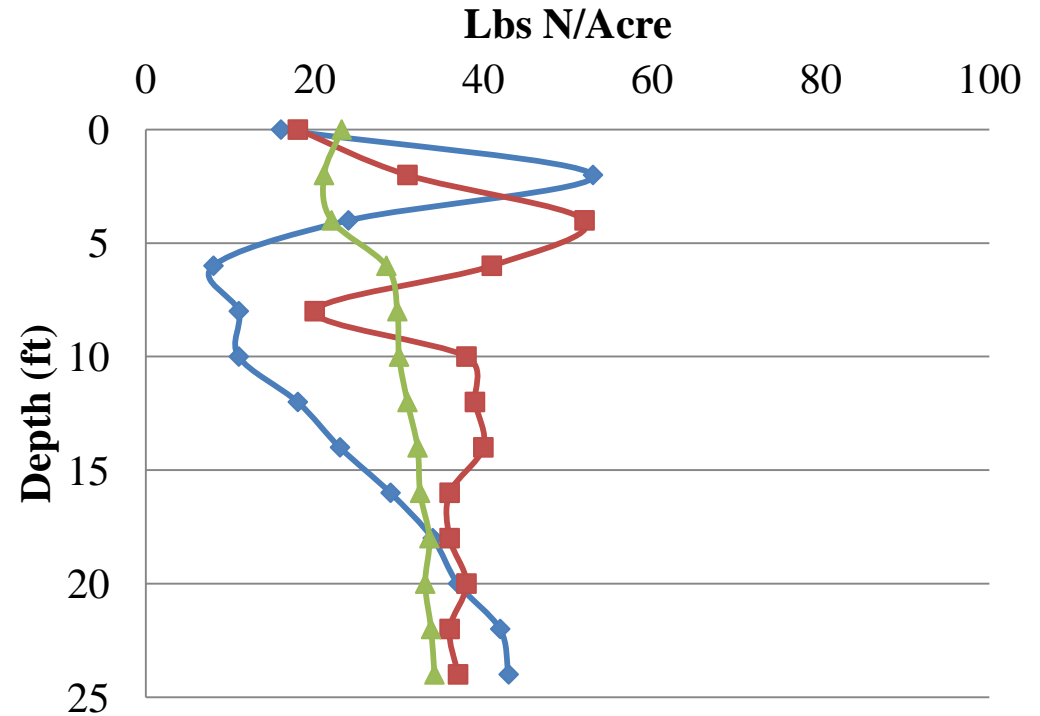
Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Silt Loam	16	18	23.2
2	Clay Loam	53	31	21.1
4	Silty Clay Loam	24	52	22
6	Silt Loam	8	41	28.5
8	Silt Loam	11	20	29.8
10	Silty Clay Loam	11	38	30
12	Silty Clay Loam	18	39	31
14	Silt Loam	23	40	32.2
16	Silt Loam	29	36	32.5
18	Silt loam	34	36	33.6
20	Silt Loam	37	38	33.1
22	Silt Loam	42	36	33.8
24	Silt Loam	43	37	34.2
Total		349	462	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

P14 - Pasture



Management Details:

Sampled 3/18/16. Pasture, sampled by monitoring well.

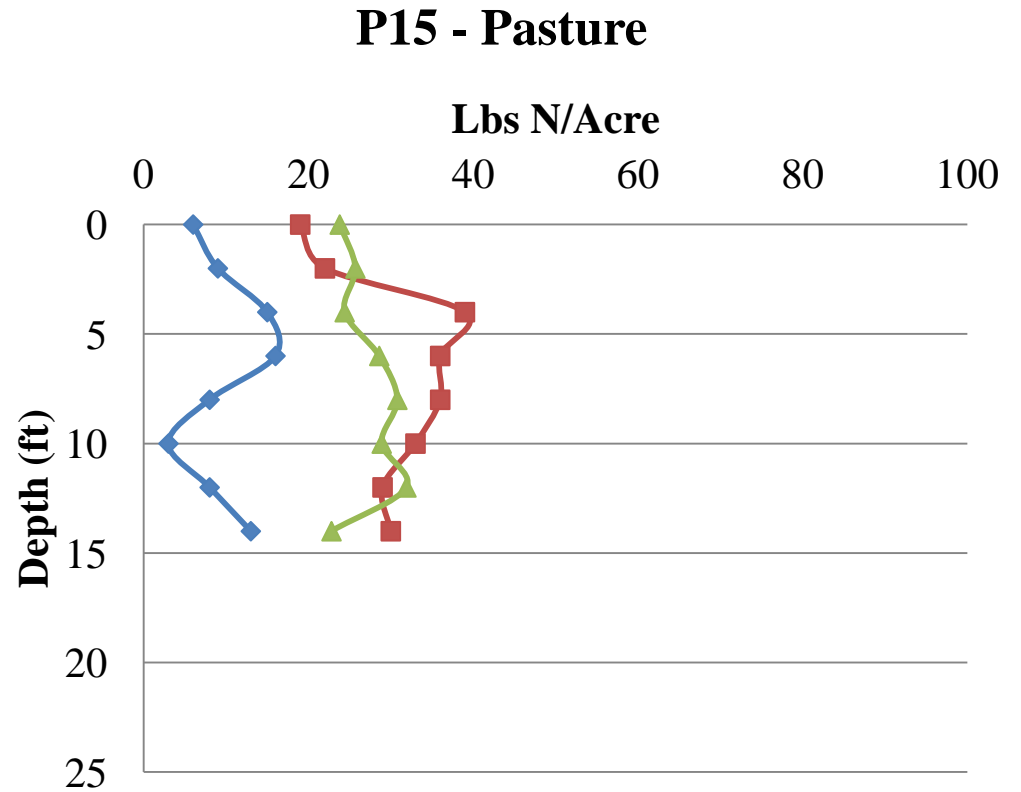
Figure 87: Site P15

Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	6	19	23.8
2	Loam	9	22	25.7
4	Silt Loam	15	39	24.4
6	Loam	16	36	28.6
8	silt loam	8	36	30.8
10	Loam	3	33	28.9
12	Loam	8	29	31.9
14	Loam	13	30	22.8
16	N/A			
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		78	244	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %



Management Details:

Sampled 3/17/16. Pasture. Water prevented further sampling.

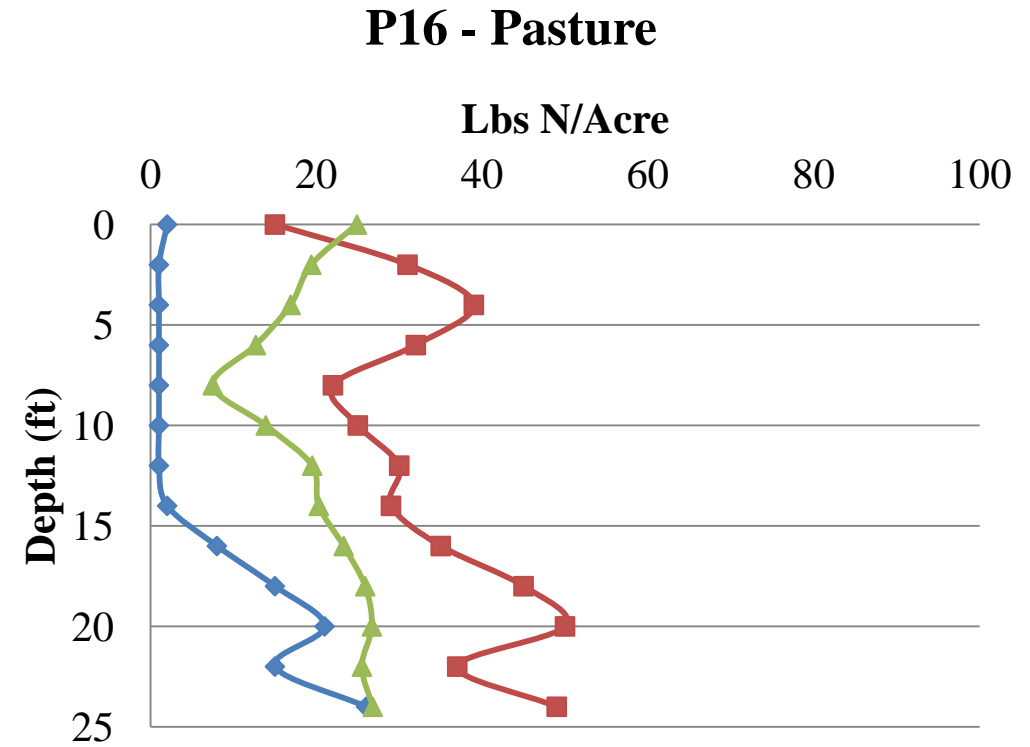
Figure 88: Site P16

Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Silt Loam	2	15	24.9
2	Silt Loam	1	31	19.4
4	Silt Loam	1	39	16.9
6	Silt Loam	1	32	12.7
8	Loam	1	22	7.5
10	Loam	1	25	13.9
12	Loam	1	30	19.5
14	Loam	2	29	20.3
16	Loam	8	35	23.3
18	Loam	15	45	25.9
20	Silt Loam	21	50	26.7
22	Loam	15	37	25.5
24	Clay Loam	26	49	26.8
Total		95	439	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %



Management Details:

Sampled 3/17/16. Pasture.

Figure 89: Site P17

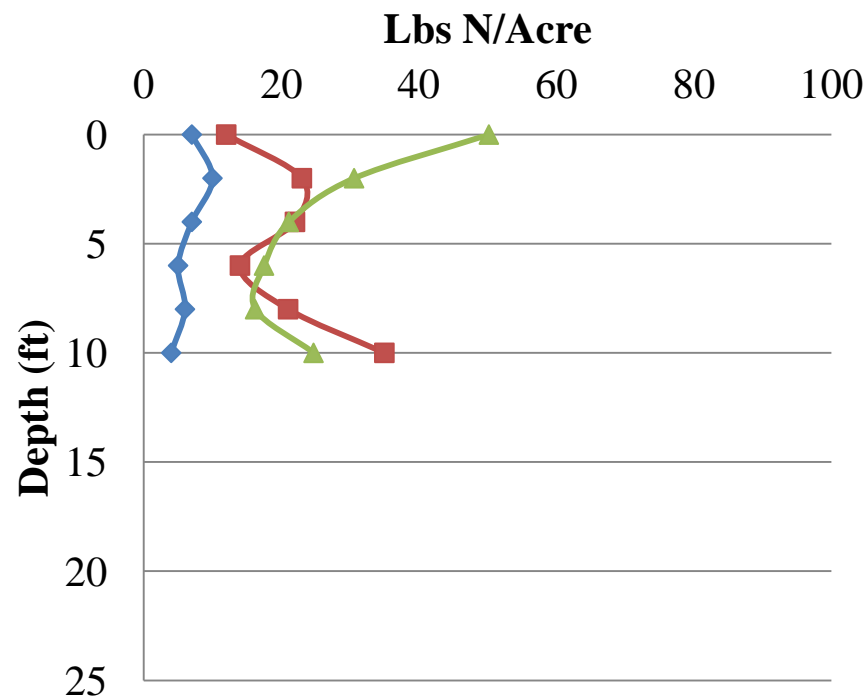
Field Management Type: Pasture

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate - Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	7	12	50.2
2	Loam	10	23	30.6
4	Loam	7	22	21.1
6	Loamy Sand	5	14	17.5
8	Sandy Loam	6	21	16.2
10	Sandy Loam	4	35	24.7
12	N/A			
14	N/A			
16	N/A			
18	N/A			
20	N/A			
22	N/A			
24	N/A			
Total		39	127	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

P17- Pivot Corner



Management Details:

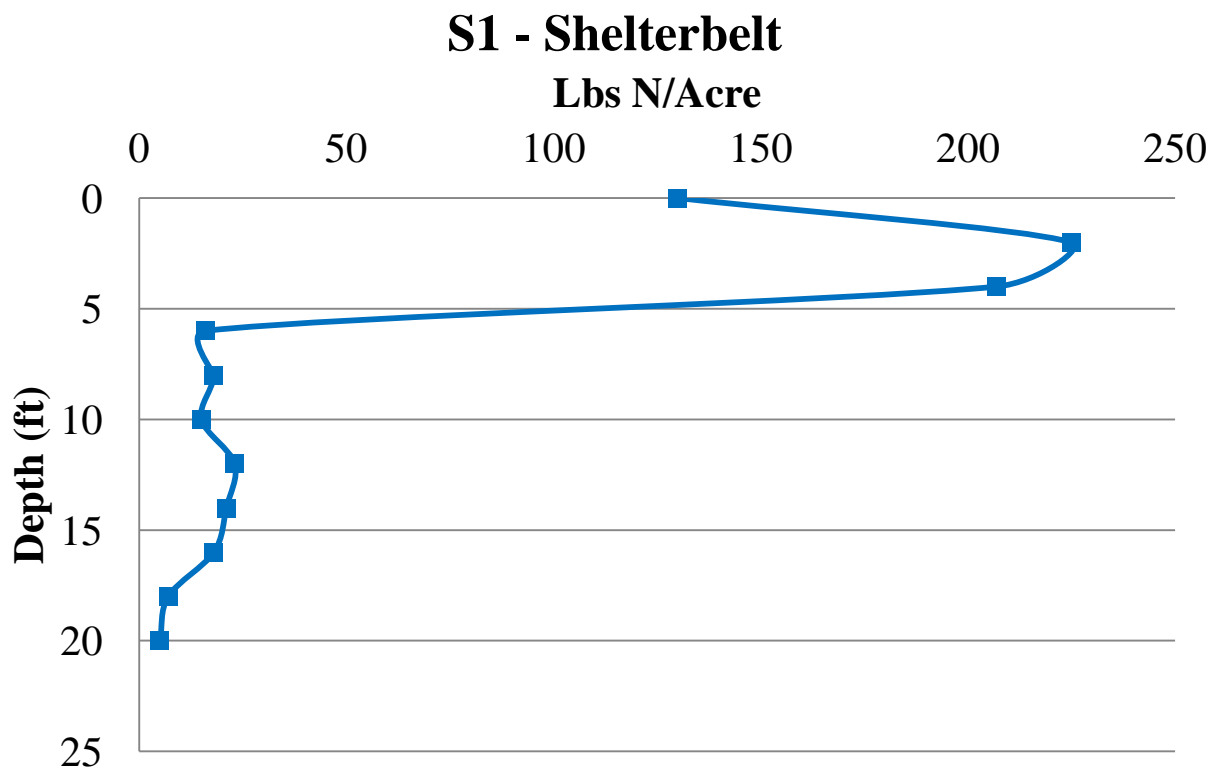
Sampled 1/7/16. Seeded grass, irrigated pivot corner, sample taken near monitoring well. No sample was taken in the field.

Figure 90: Site S1

Field Management Type: Shelterbelt

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loam	130
2	Loam	225
4	Clay Loam	207
6	Clay loam	16
8	Silty Clay	18
10	Silty Clay	15
12	Silty Clay	23
14	Clay Loam	21
16	Sandy Loam	18
18	Sandy Loam	7
20	Loamy Sand	5
22	N/A	
24	N/A	
Total lbs N/acre 685 for Core		



Management Details:

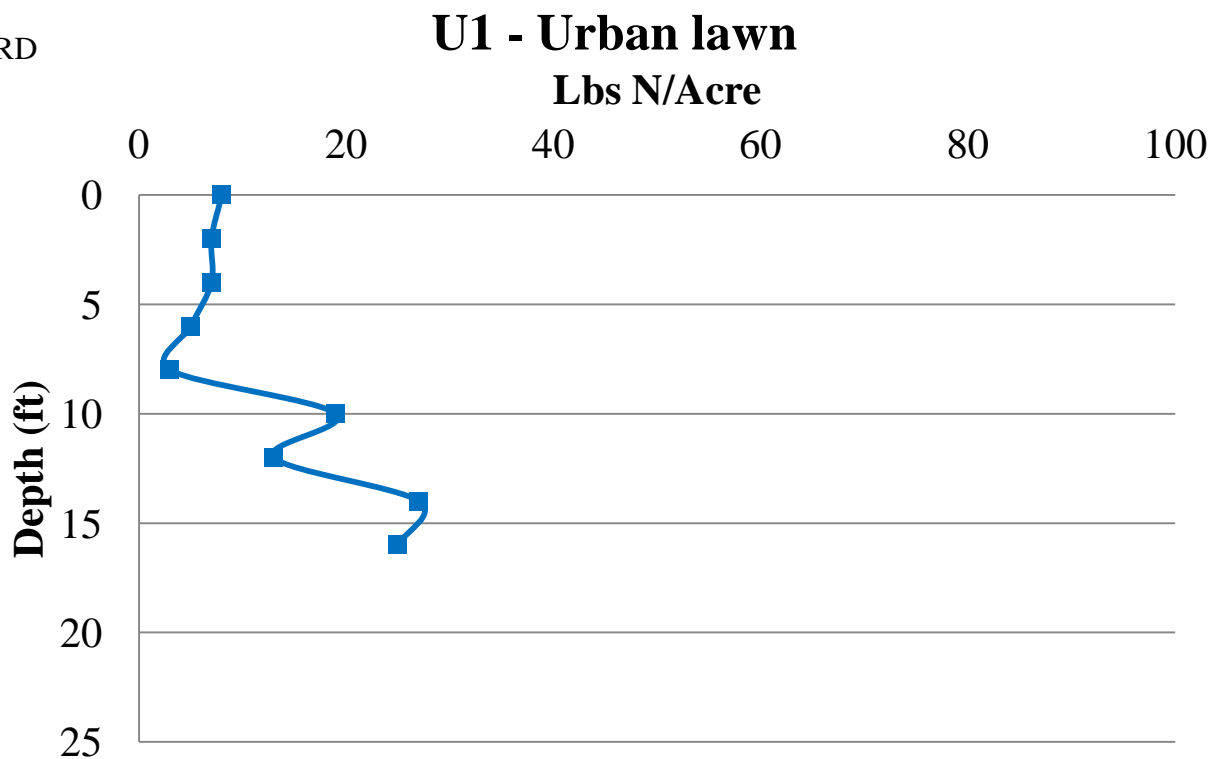
Sampled 11/10/14 This shelterbelt is surrounded by irrigated crop fields. Water prevented further sampling below 20 feet. Location near a monitoring well.

Figure 91: Site U1

Field Management Type: Urban lawn

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Fine Sand	8
2	Fine Sand	7
4	Fine Sand	7
6	Fine Sand	5
8	Fine Sand	3
10	Fine Sand	19
12	Fine Sand	13
14	Fine Sand	27
16	Fine Sand	25
18	N/A	
20	N/A	
22	N/A	
24	N/A	
Total lbs N/acre 114 for Core		



Management Details:

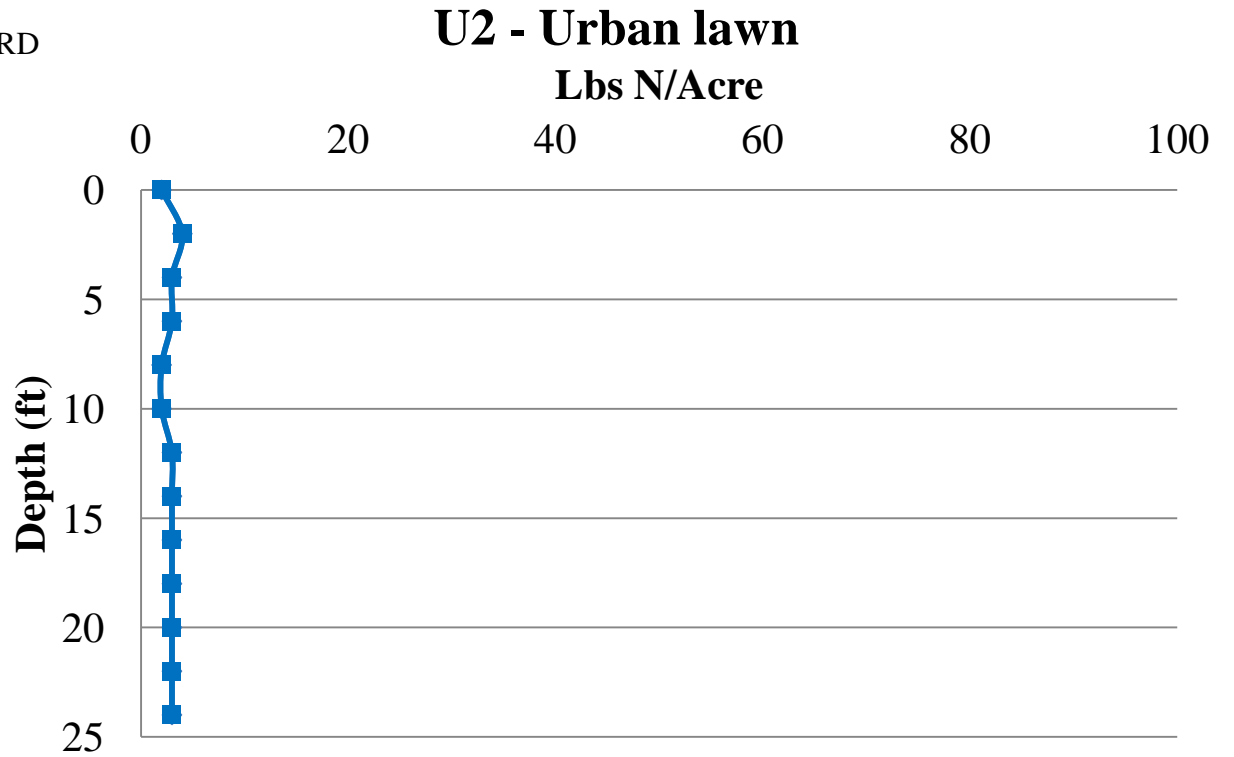
Sampled 7/9/14 Not irrigated or fertilized. Fine sand caused the core to collapse and prevented further sampling below 16 feet. Location was also sampled in 2016, see location U7.

Figure 92: Site U2

Field Management Type: Urban lawn

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Clay	2
2	Clay	4
4	Fine Sand	3
6	Fine Sand	3
8	Fine Sand	2
10	Fine Sand	2
12	Fine Sand	3
14	Fine Sand	3
16	Silty Clay	3
18	Silty Clay	3
20	Clay	3
22	Clay	3
24	Clay	3
Total lbs N/acre 25 for Core		



Management Details:

Sampled 8/19/14 Not irrigated or fertilized.

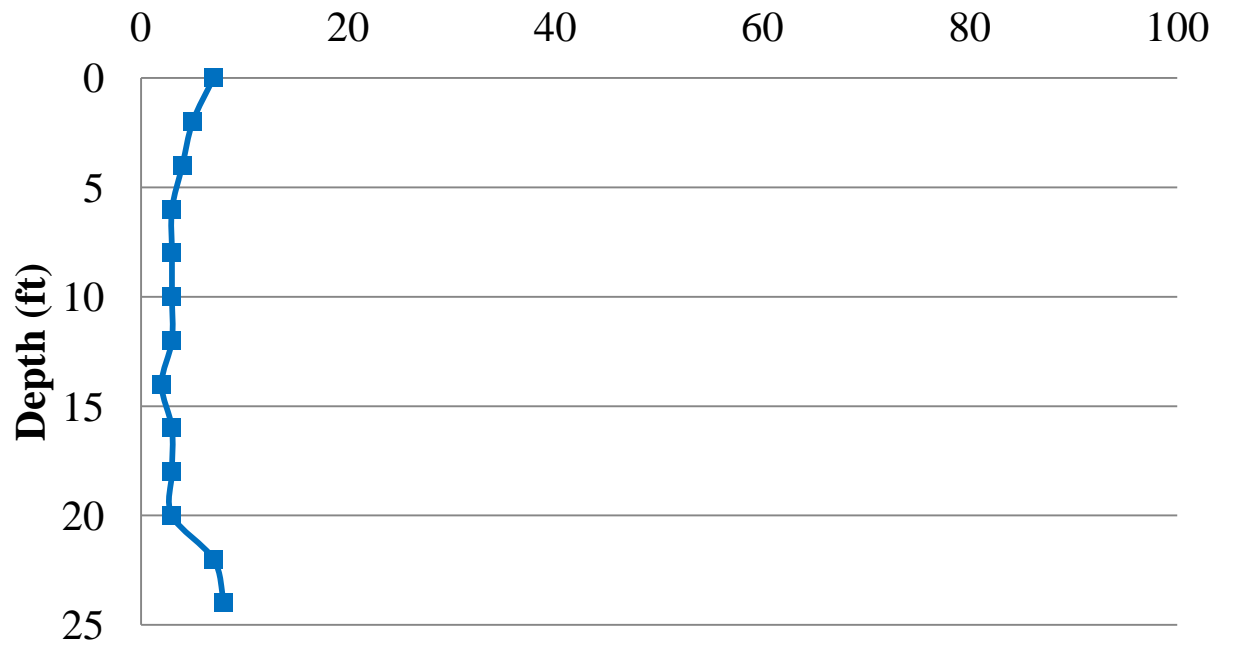
Figure 93: Site U3

Field Management Type: Urban lawn

Soil Texture Analysis: Conducted by UENRD

U3 - Urban lawn Lbs N/Acre

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Loamy Clay	7
2	Clay	5
4	Clay Loam	4
6	Clay	3
8	Silty Clay	3
10	Clay	3
12	Clay	3
14	Clay	2
16	Clay	3
18	Clay	3
20	Clay	3
22	Clay	7
24	Clay	8
Total lbs N/acre 33 for Core		



Management Details:

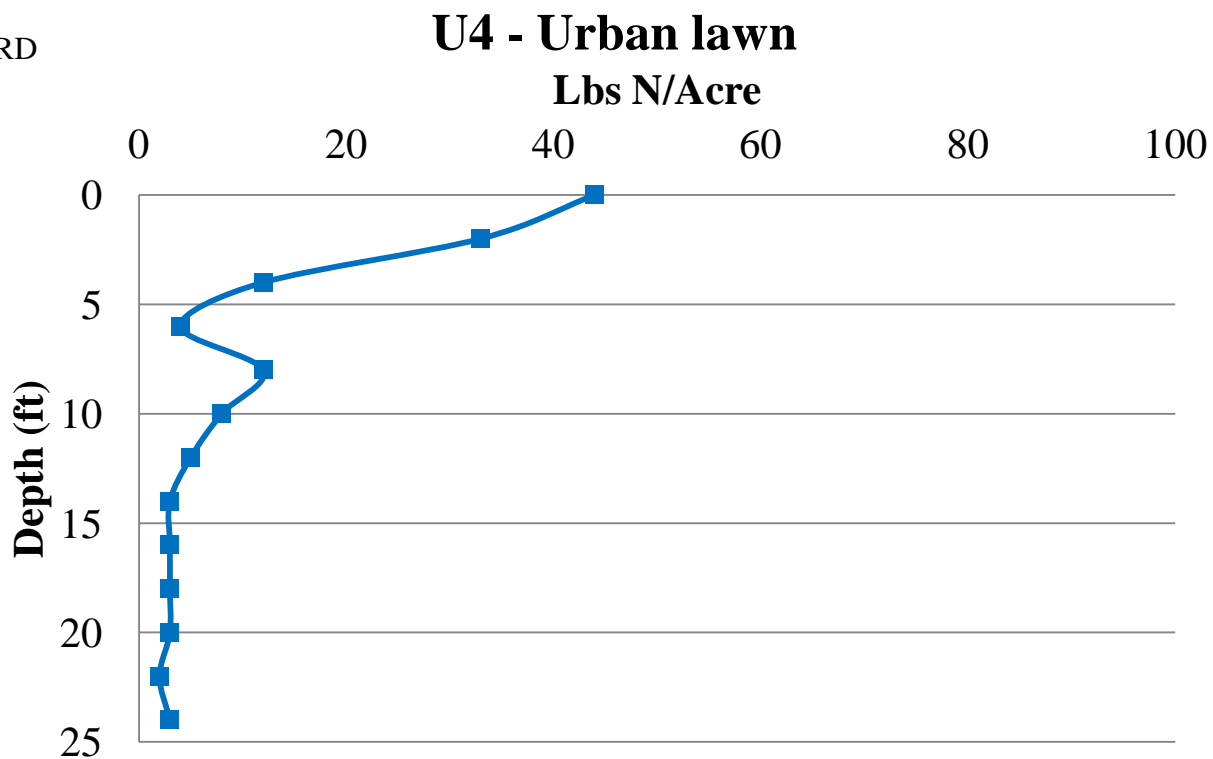
Sampled 8/19/14 Irrigated and fertilized.

Figure 94: Site U4

Field Management Type: Urban lawn

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Clay Loam	44
2	Clay Loam	33
4	Clay	12
6	Clay	4
8	Clay	12
10	Clay	8
12	Clay	5
14	Clay	3
16	Clay	3
18	Clay	3
20	Clay	3
22	Clay	2
24	Clay	3
Total lbs N/acre 124 for Core		



Management Details:

Sampled 9/26/14 Not irrigated, fertilized. Location also sampled in 2016 (location U7).

Figure 95: Site U5

Field Management Type: Urban lawn

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	3
2	Sandy Loam	0
4	Sandy Loam	3
6	Loam	1
8	Loam	1
10	Sandy Loam	1
12	Sandy Loam	2
14	Sandy Loam	3
16	Sandy Loam	5
18	Loam	1
20	Loam	4
22	Silt Loam	5
24	Loam	6
Total lbs N/acre 19 for Core		



Management Details:

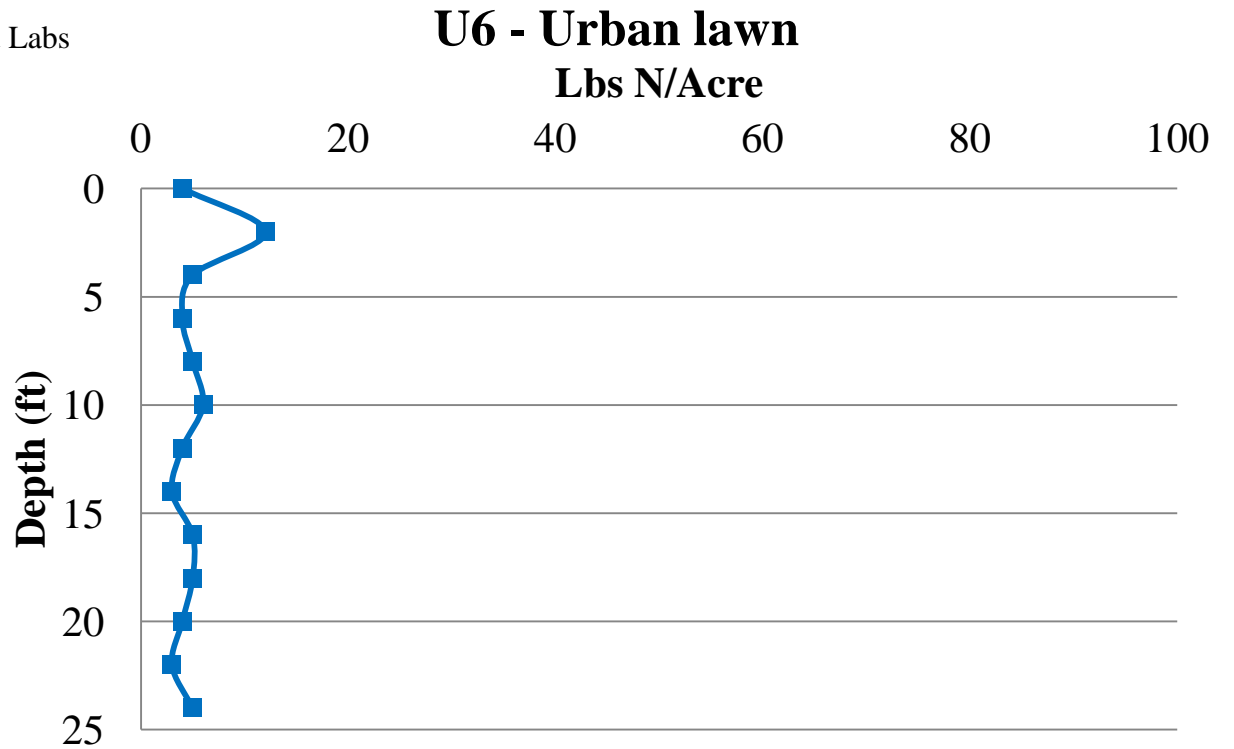
Sampled 11/18/14 Not irrigated or fertilized

Figure 96: Site U6

Field Management Type: Urban lawn

Soil Texture Analysis: Conducted by Ward Labs

Depth (ft)	Texture by Feel	Lbs N/Acre
0	Sandy Loam	4
2	Sandy Loam	12
4	Sandy Loam	5
6	Loamy Sand	4
8	Sandy Loam	5
10	Silt Loam	6
12	Silt Loam	4
14	Silt Loam	3
16	Silt Loam	5
18	Silt Loam	5
20	Silt Loam	4
22	Silt Loam	3
24	Sandy Loam	5
Total lbs N/acre 48 for Core		



Management Details:

Sampled 11/13/14 Irrigated and fertilized.

Figure 97: Site U7

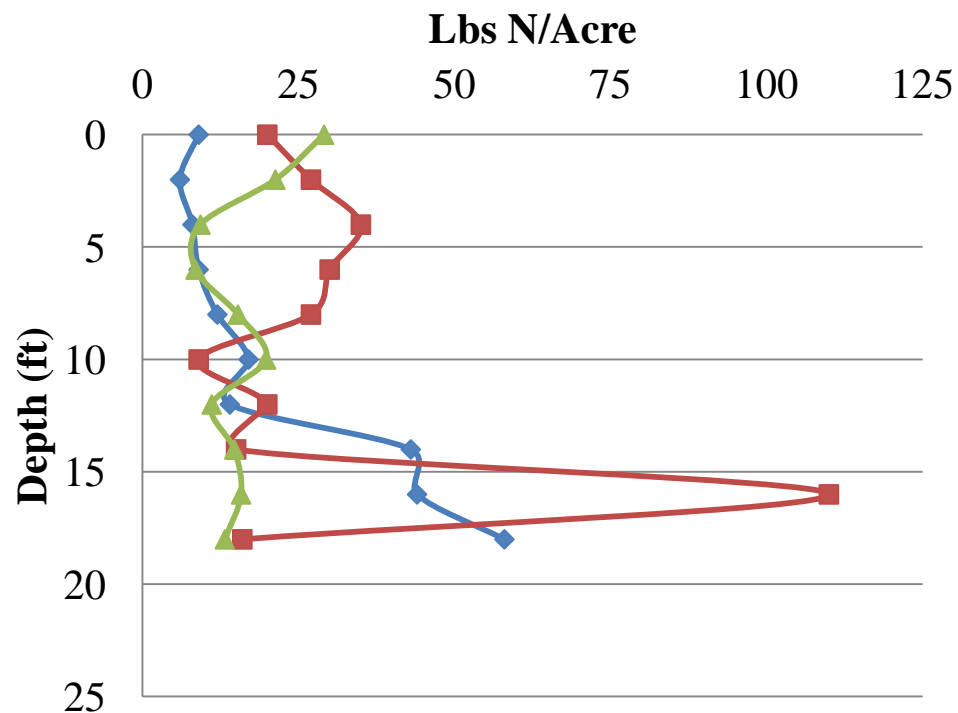
Field Management Type: Urban Lawn

Soil Texture Analysis: Conducted by Ward labs

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre	NH4 – Lbs N/Ac	Soil Moisture %
0	Loam	9	20	29.1
2	Loam	6	27	21.3
4	Sandy Loam	8	35	9.3
6	Sandy Loam	9	30	8.5
8	Loam	12	27	15.3
10	Silt Loam	17	9	19.8
12	Loam	14	20	11.1
14	Loamy Sand	43	15	14.7
16	Loamy Sand	44	110	15.8
18	Sand	58	16	13.2
20	N/A			
22	N/A			
24	N/A			
Total		220	309	

Nitrate lbs N/ac, Ammonium lbs N/ac, Moisture Content %

U7- Urban Lawn



Management Details:

Sampled 1/6/16. Urban lawn, non-irrigated and not fertilized.

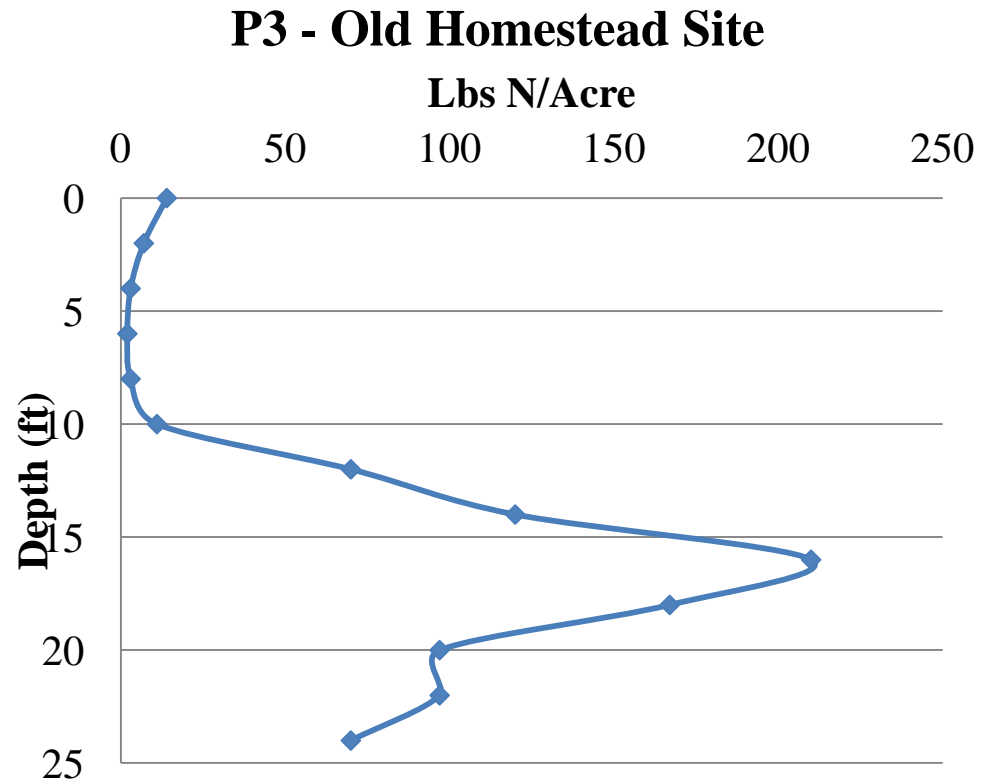
Location also sampled in 2014 (location U1).

Figure 98: Site P3

Field Management Type: Old Homestead Site

Soil Texture Analysis: Conducted by UENRD

Depth (ft)	Texture by Feel	Nitrate -Lbs N/Acre
0	medium sand	14
2	medium sand	7
4	medium sand	3
6	medium sand	2
8	fine sand	3
10	fine sandy clay	11
12	clay with fine sand	70
14	clay with fine sand	120
16	clay	210
18	clay	167
20	clay	97
22	clay	97
24	clay	70
Total		871



Management Details:

Sampled 7/3/14. Highest amount of nitrogen found at clay layer.