



# **Minnesota Department of Agriculture's Nitrate Testing Clinic Program 2011 Results Summary**

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Kimberly Kaiser  
Thomas Bolas

## Introduction

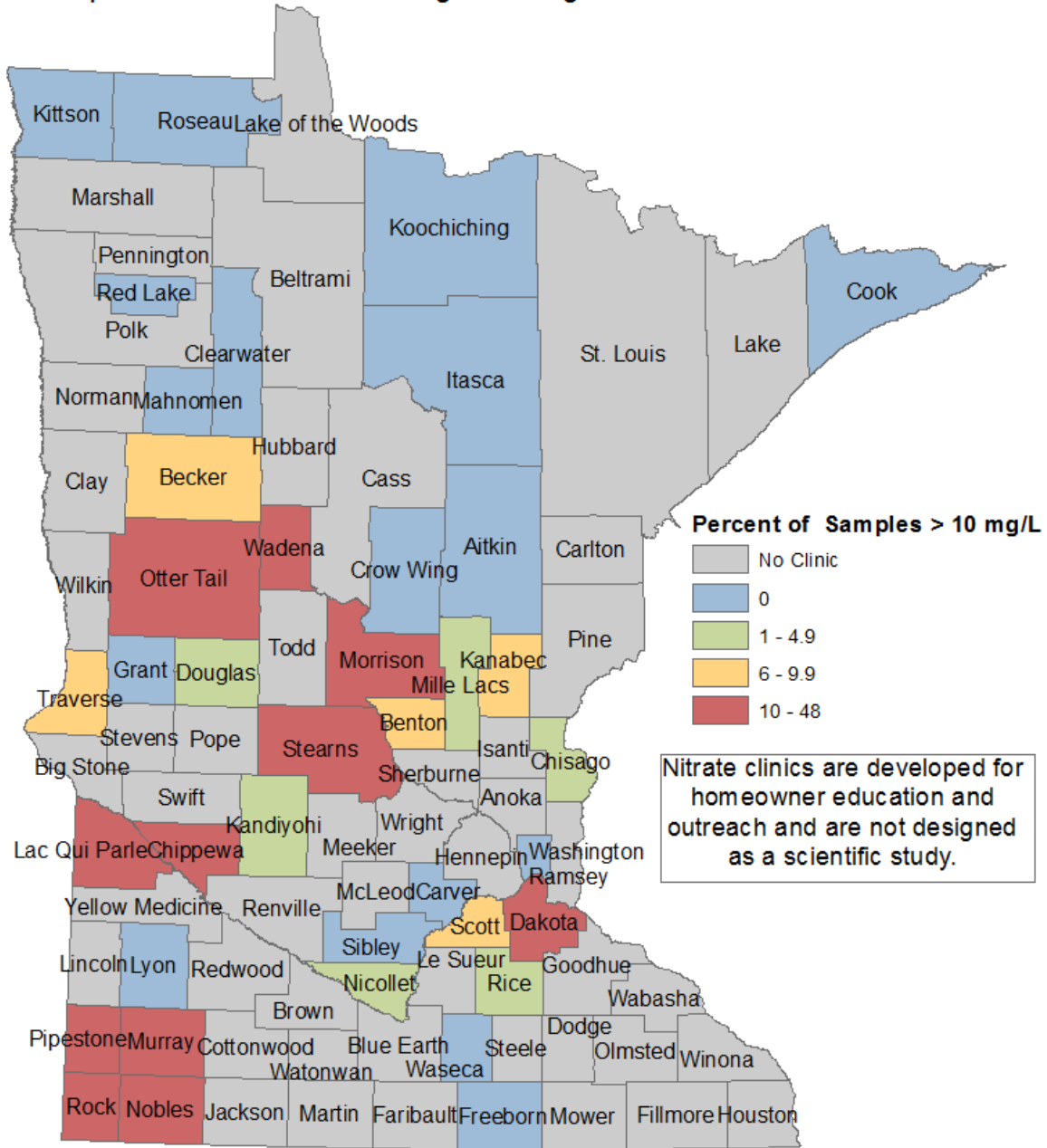
In 1993, the Minnesota Department of Agriculture developed an onsite, walk-in style water testing clinic with the objective of increasing public awareness to nitrate levels in private well water. The program was successful in achieving high monitoring rates in counties that have a chronic problem with nitrate-N concentrations greater than 10 mg/L. Between 1999 and 2006, the program was funded through the Environment and Natural Resource Trust Fund. However, in 2006, this funding ended and the program was not continued. Counties were still able to use the MDA nitrate testing equipment, but had to provide their own personnel to run the clinic and record the nitrate-N analysis results. In 2011, the Nitrate Testing Clinic Program was reinstated with help of Clean Water Funds.

In 2011, over 2000 samples were analyzed from 41 counties across the state (Figure 1). Approximately 6.5 percent of all samples taken were over 10mg/L, which is a level considered toxic for infants and young children (Table 1). The median concentration was 0.7 mg/L and the maximum was 72 mg/L. Counties with the greatest levels of concern were in the southwestern part of the state; Rock, Nobles, and Pipestone had the top three highest nitrate clinic results greater than 10mg/L. Initial enthusiasm by the counties was quite high; many counties hope to have this outreach program become an annual event to get their constituents in the habit of participating.

Nitrate clinic participants are asked to fill out a survey about their well. Of the 1,100 completed surveys, five home owners knew their well head index number. If these wells are newer, then the Department of Agriculture can reference that well head number for accuracy of the information provided. This means that only these five wells can be verified against what the homeowners stated in the surveys. It is important to remember that the survey information is provided by well owners and may contain errors.

## 2011 NITRATE CLINIC SUMMARY PERCENTAGE OF NITRATE-N SAMPLES > 10 MG/L

Be aware that nitrate clinic data have a high bias and do not represent Minnesota's average drinking water nitrate concentrations.



Prepared by the Minnesota Department of Agriculture 2012



Figure 1. Counties that participated in the nitrate clinic program in 2011.

Table 1. Nitrate Clinics held in 2011

<b>County</b>	<b>Number of Samples</b>	<b>Minimum</b>	<b>Maximum</b>	<b>Median</b>	<b>Percentage of Nitrate Samples Over 10 mg/L</b>
Aitkin	NA	NA	NA	NA	NA
Becker	11	0	27.0	0.5	9.1
Benton	45	0	42.6	0.4	8.9
Carver	30	0	1.7	0.2	0.0
Chippewa	10	0	11.7	1.1	10.0
Chisago	39	0	12.3	0.0	2.6
Clearwater	18	0	9.0	0.0	0.0
Cook	75	0	2.6	0.0	0.0
Crow Wing	203	0	15.5	0.1	1.1
Dakota	309	0	36.0	0.4	14.9
Douglas	75	0	13.7	0.2	1.3
Freeborn	16	0	6.0	0.2	0.0
Grant	41	0	6.7	0.1	0.0
Isanti	75	0	13.2	0.0	1.3
Itasca	51	0	2.0	0.0	0.0
Kanabec	67	0	20.9	0.0	7.5
Kandiyohi	42	0	18.0	0.0	4.8
Kittson	7	0	6.9	0.2	0.0
Koochiching	75	0	6.9	0.0	0.0
Lac Qui Parle	53	0	13.7	0.0	11.3
Lyon	7	0	1.7	0.0	0.0
Mahnomen	6	0	0.6	0.0	0.0
Mille Lacs	54	0	10.4	0.0	1.9
Morrison	46	0	21.0	1.2	16.0
Murray	40	0	25.6	0.0	12.5
Nicollet	75	0	25.9	0.1	4.0
Nobles	25	0	72.0	5.1	48.0
Otter Tail	70	0	28.0	0.0	10.0
Pipestone	44	0	10.4	3.7	27.3
Ramsey	4	0	4.4	1.0	0.0
Red Lake	17	0	0.1	0.1	0.0
Rice	70	0	12.6	0.1	2.9
Rock	12	0.9	20.0	7.3	30.0
Roseau	17	0	1.7	0.0	0.0
Scott	36	0	15.2	0.0	5.6
Sibley	12	0	0.0	0.0	0.0
Stearns	74	0	31.4	0.7	12.2
Traverse	31	0	11.5	0.2	6.5
Wadena	20	0	22.7	1.0	10.0
Waseca	50	0	8.0	0.0	0.0
Washington	141	0	15.7	2.8	3.5
Overall	2093	0	72	0.7	6.6

The following section summarizes the participant surveys. There were 2093 samples analyzed in 2011, but 1183 surveys completed. This means that 56.5% of all samples had a survey completed with that particular sample. There are several reasons for this discrepancy:

- Multiple wells on the property;
- Homeowners bring in a ‘before and after’ sample when they have a water treatment system to find if the treatment is effective at removing nitrates;
- Neighbors will bring in samples to be tested, but they don’t possess the information to fill out the survey
- A small number of people simply do not want to fill out the survey.

The main purpose of the Nitrate Clinic Program is for public outreach. MDA in cooperation with county partners strives to educate well owners about the nitrate concentrations in their drinking water. MDA provides technical assistance regarding strategies for reducing nitrates in groundwater, information on other potential contaminants, and where to find additional testing services. Other benefits of the program include:

- The township information can be used to determine where gaps in data are located and where to apply further outreach efforts
- Assist MDA in targeting pesticide BMP promotional areas and effort
- Provide assistance to local NRCS/SWCD Offices in terms of competing for federal and state cost sharing programs
- Provide public information on well construction, specifically sand points, well codes and set back distances, and well depths. Demonstrate to private well owners why this information is important for public and livestock health

### Survey Results Summary

The vast majority of wells constructed today are drilled. Sand point wells are typically constructed by home owners themselves. However, these shallow wells are the most likely to have high concentrations of nitrate contamination. The ‘Unknown’ category is where owners were unaware of their well’s construction type. Table 1 summarizes the well construction type and nitrate concentration. Hand dug wells and sand point wells had the highest median nitrate-N concentrations. Shallow wells tend to have a higher percentage of high nitrate-N than the deeper wells (Table 2 and Figure 2 and 3). Older wells had a higher average, a higher median, and the highest percentage (9.9%) of wells with nitrate-N concentrations greater than 10 mg/L (Table 4 and Figure 3).

Other information from the 2011 Nitrate Clinic well owner surveys:

- Wells in this survey that were within 50 feet from the septic system had a higher percentage (9.5%) of wells greater than 10 mg/L.
- The majority of well owners said their well was further than 300 feet from a feedlot, while approximately 400 were unsure of the distance.
- Many of the people who attend nitrate clinics are aware that they have high nitrates in their drinking water, which is why they have their wells tested every 1-3 years or multiple times a year.
- Most well owners surveyed said their well was over 300 feet from an agricultural field.

Plans for 2012 are to contact counties and schedule nitrate outreach clinics by region. Also, as more county staff get trained and become familiar with the program, they will host their own clinics with the use of MDA equipment and supplies. This way, efficiency and data collection are increased. Another goal is to find methods that are effective at increasing participation where turnout was previously low.

### Type of Well Construction Surveyed

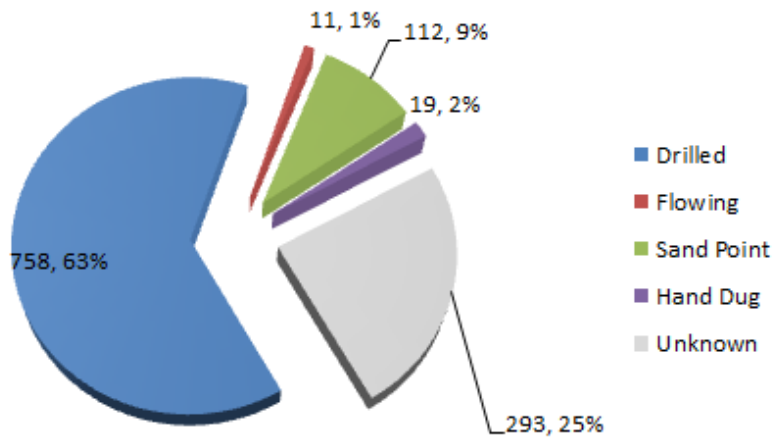


Figure 2. Well Construction Type by Count and Percentage.

Table 2. Nitrate results by Well Construction type.

Well Type	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	% ≥10
Drilled	758	1.54	0.1	667	50	41	88	6.6	5.4
Flowing	11	1.11	0.1	9	2	0	81.8	18.2	0
Sand Point	112	1.92	0.38	93	14	5	83	12.5	4.5
Hand Dug	19	2.28	0.92	13	6	0	68.4	31.6	0
Unknown	293	1.39	0.1	252	34	7	86	11.6	2.4

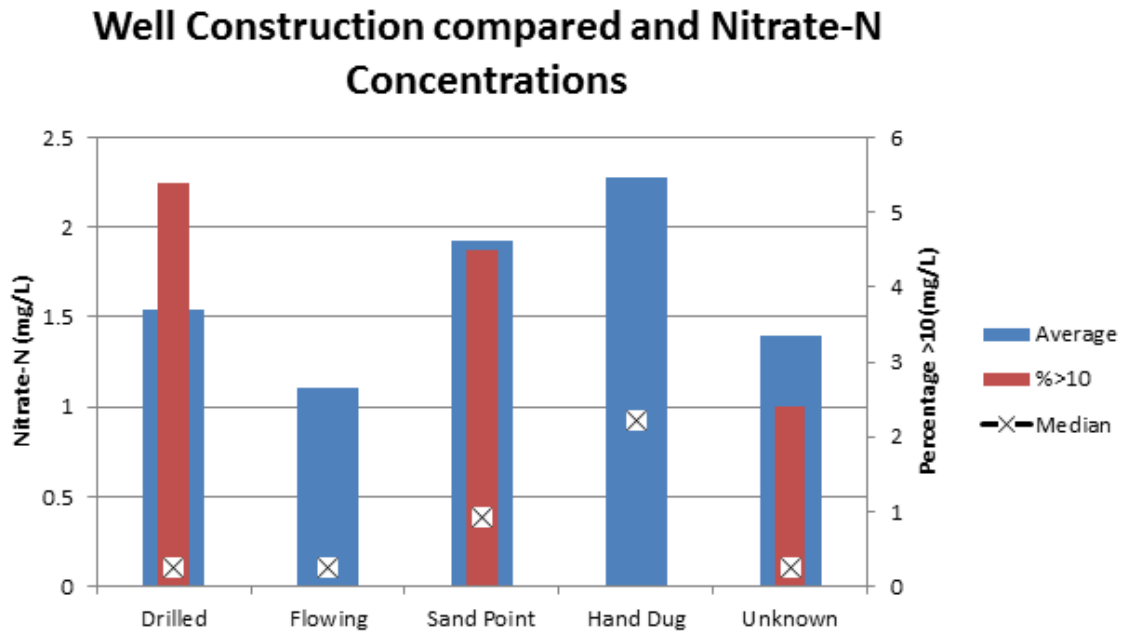


Figure 3. Well construction and N-Nitrate Concentrations.

**Table 3.** Nitrate-N results and Well Depth.

Well Depth	# of Surveys	0-3 mg/L	3 to 10 mg/L	>10 mg/L	% 0-3	% 3-10	%>10	Average	Median
0 to 50	166	124	31	11	74.7	18.6	6.63	2.7	0.57
51 to 100	271	235	18	18	86.8	6.6	6.6	1.83	0.1
100 to 300	339	315	11	13	92.9	3.2	3.8	0.996	0.05
>300	60	57	2	1	95	3.3	1.7	0.65	0.004
Unknown	348	292	45	11	83.9	12.9	1.5	1.51	0.158

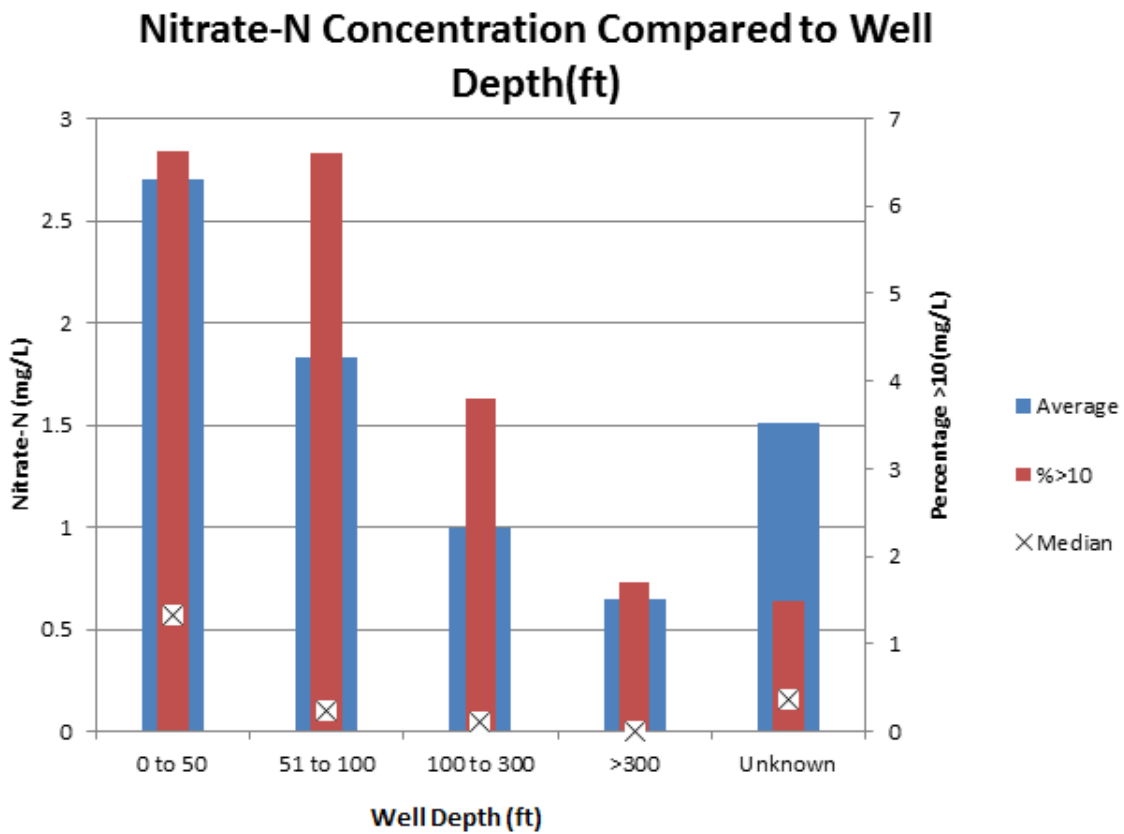
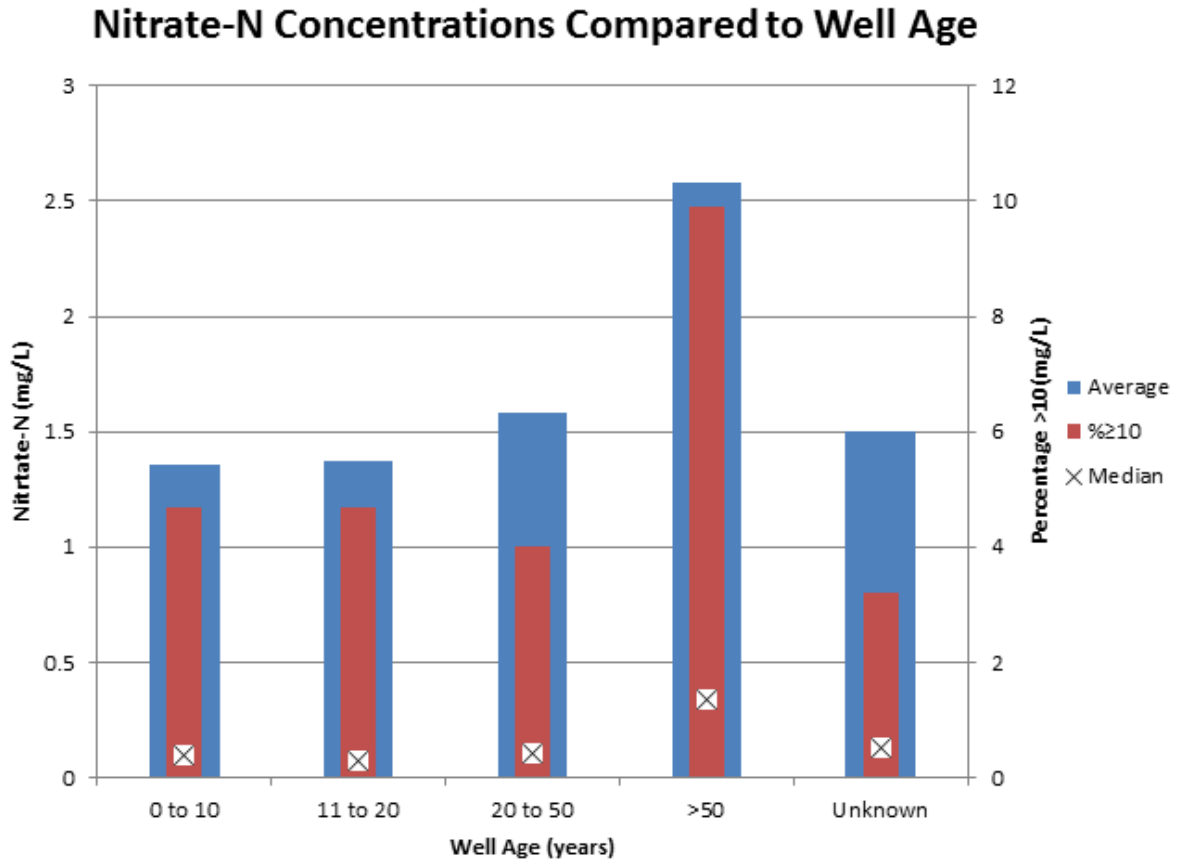


Figure 4. Nitrate-N results and well depth.



**Table 4.** Nitrate-N results and Well Age

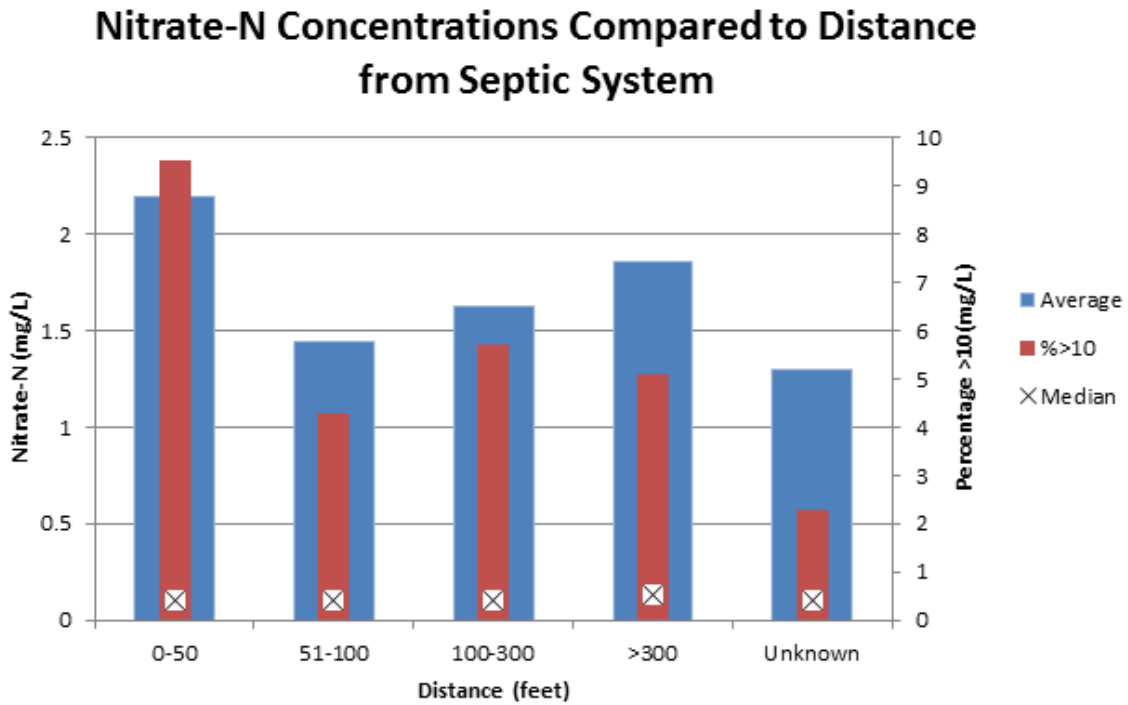
Age	# of Surveys	Average	Median	0>3 mg/L	3>10 mg/L	≥10 mg/L	% 0>3	% 3>10	% ≥10
0 to 10	190	1.36	0.1	170	11	9	89.5	5.8	4.7
11 to 20	253	1.37	0.07	231	10	12	91.3	4	4.7
20 to 50	428	1.58	0.106	366	45	17	85.5	10.5	4
>50	91	2.58	0.34	70	12	9	76.9	13.2	9.9
Unknown	220	1.5	0.1255	184	29	7	83.6	13.2	3.2



**Figure 5.** Nitrate-N Characteristics (mg/L) and Well Age in Years

**Table 5.** Septic System Distance From Well and Nitrate-N Concentrations

Distance	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0-3	% 3-10	%≥10
0-50	63	2.19	0.1	54	3	6	85.7	4.8	9.5
51-100	282	1.44	0.1	245	25	12	86.9	8.8	4.3
100-300	336	1.62	0.1	294	23	19	87.5	6.8	5.7
>300	196	1.85	0.13	166	20	10	84.7	10.2	5.1
Unknown	305	1.3	0.1	262	36	7	85.9	11.8	2.3



**Figure 6.** Septic Systems Distance in Feet from Well Compared to Nitrate-N Concentrations

Table 6. Distance of Feedlots to Well and Nitrate-N Concentrations

Distance (feet)	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	%≥10
0 to 50	62	1.33	0.09	56	2	4	90.3	3.2	6.45
51 to 100	26	6.17	1.225	16	3	7	61.4	18.7	26.9
100 to 300	49	3.32	0.351	36	7	6	73.5	14.3	12.24
>300	643	1.4	0.1	566	51	26	88	7.9	4.04
Unknown	401	1.29	0.1	347	44	10	86.5	11	2.5

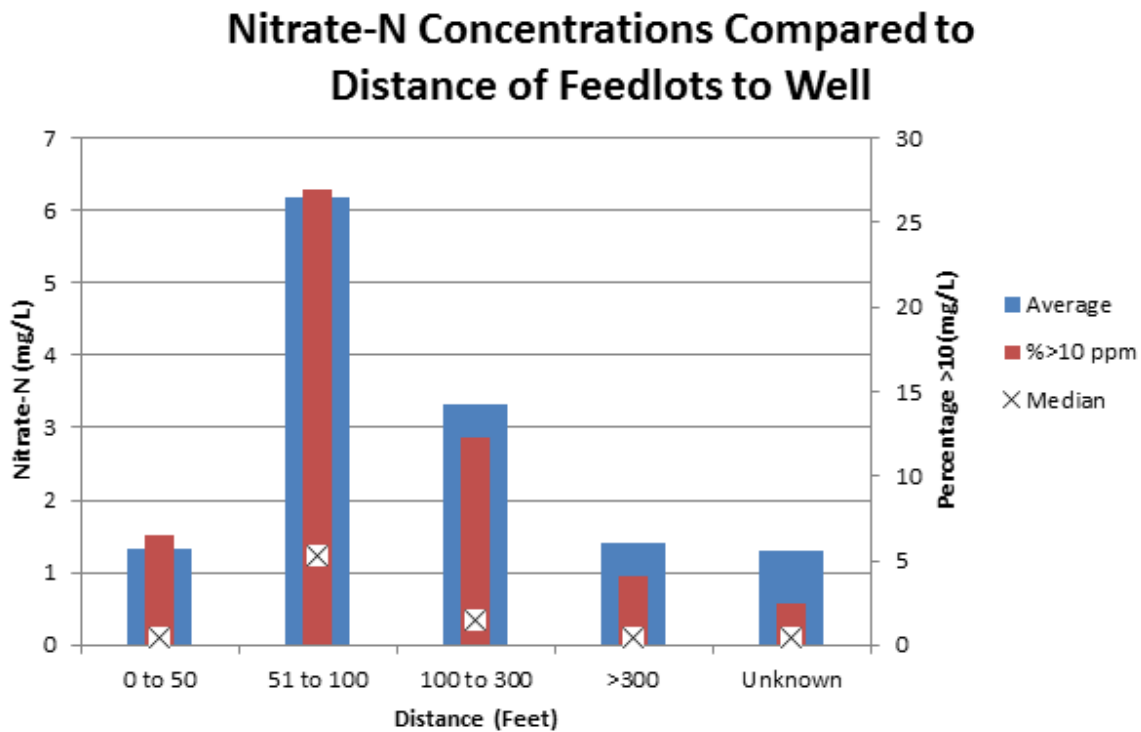
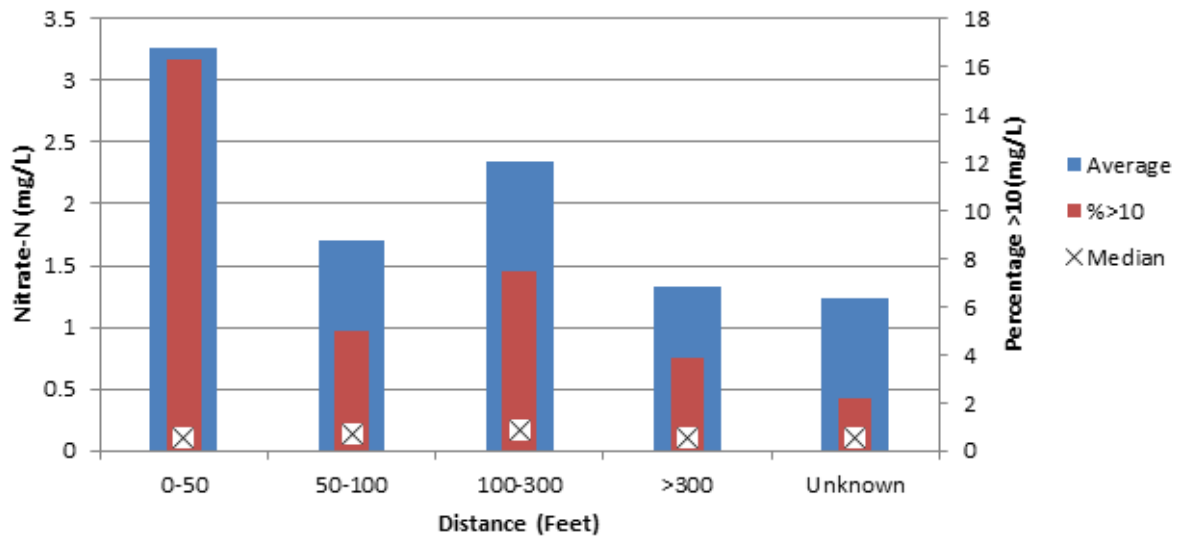


Figure 7. The Percentage of Well Distances from Feedlot and Nitrate-N Concentrations

**Table 7. Distance of Agricultural Fields to Well and Nitrate-N Concentrations**

Distance	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	% ≥10
<b>0-50</b>	49	3.26	0.1	37	4	8	75.5	8.2	16.3
<b>50-100</b>	80	1.71	0.1405	69	7	4	86.3	8.7	5
<b>100-300</b>	173	2.34	0.169	137	23	13	79.2	13.3	7.5
<b>&gt;300</b>	559	1.33	0.1	500	37	22	89.5	6.6	3.9
<b>Unknown</b>	321	1.24	0.1	278	36	7	86.6	11.2	2.2

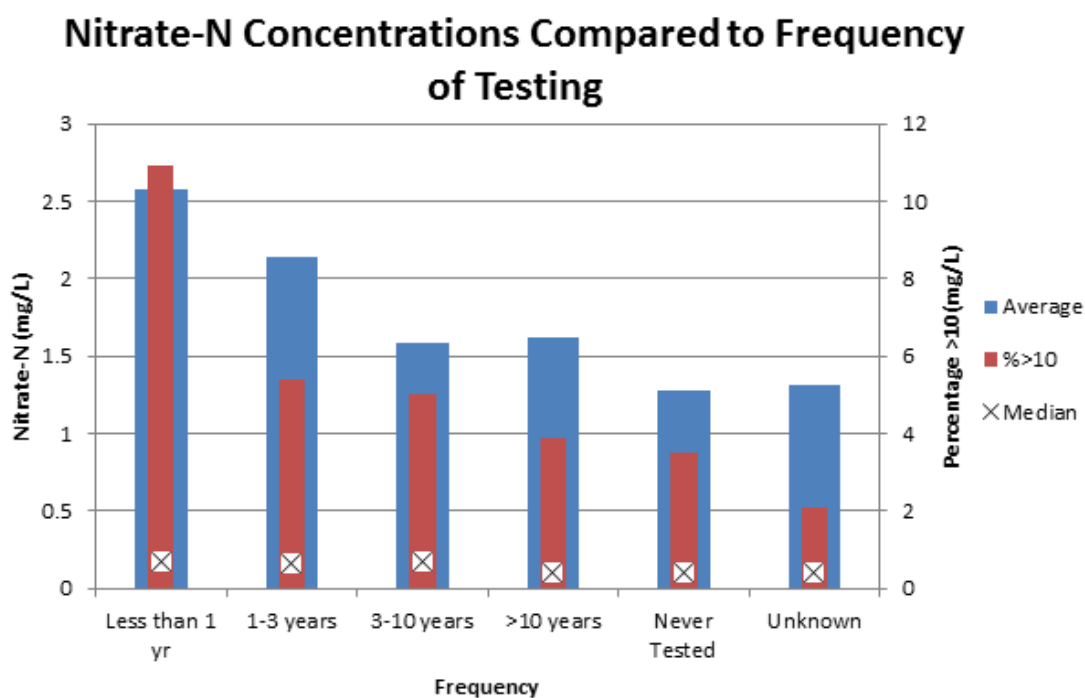
### Nitrate-N Concentration Compared to Distance from Agricultural Fields



**Figure 8. Well Distances from Agricultural Fields and Nitrate-N Concentrations**

**Table 8.** Frequency of well testing correlated to Nitrate-N results

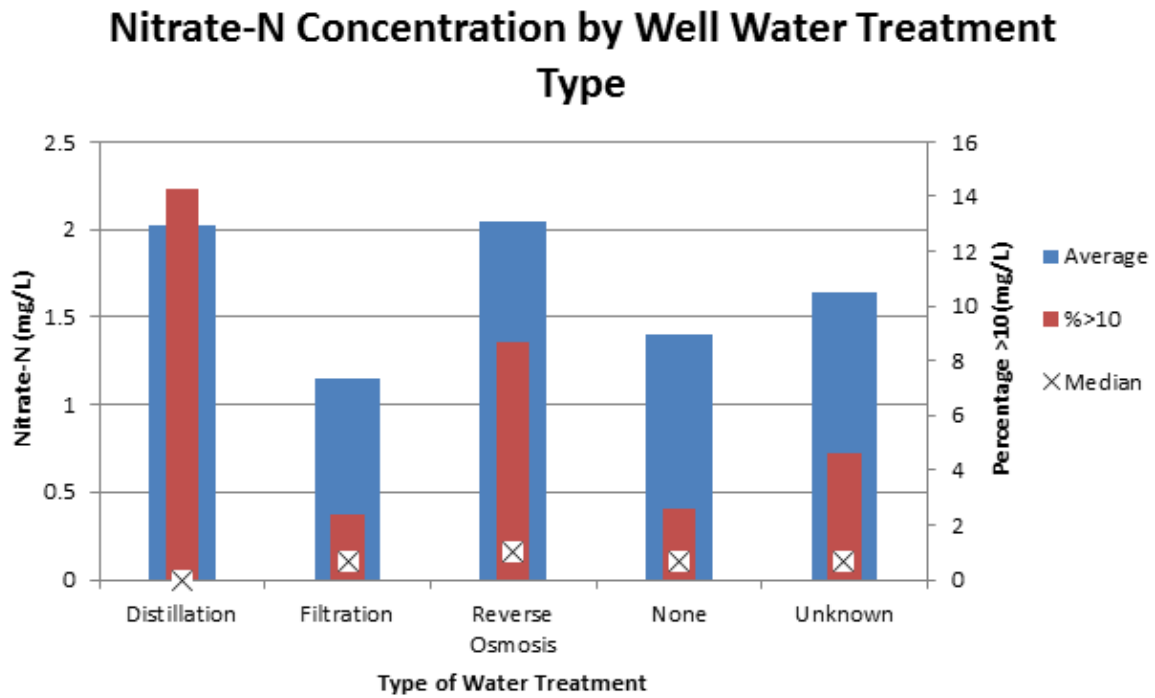
Time	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	% ≥10
Less than 1 yr	64	2.58	0.18	49	7	7	76.6	10.9	10.9
1-3 years	129	2.14	0.16	104	18	7	80.6	14	5.4
3-10 years	281	1.58	0.17	241	26	14	85.7	9.3	5
>10 years	153	1.62	0.1	131	16	6	85.6	10.5	3.9
Never Tested	458	1.28	0.1	413	29	16	90.2	6.3	3.5
Unknown	97	1.31	0.1	82	13	2	84.5	13.4	2.1



**Figure 9.** Frequency of Well Testing to Nitrate-N Concentrations

**Table 9.** Nitrate-N Trends Correlated to Private Well Treatment

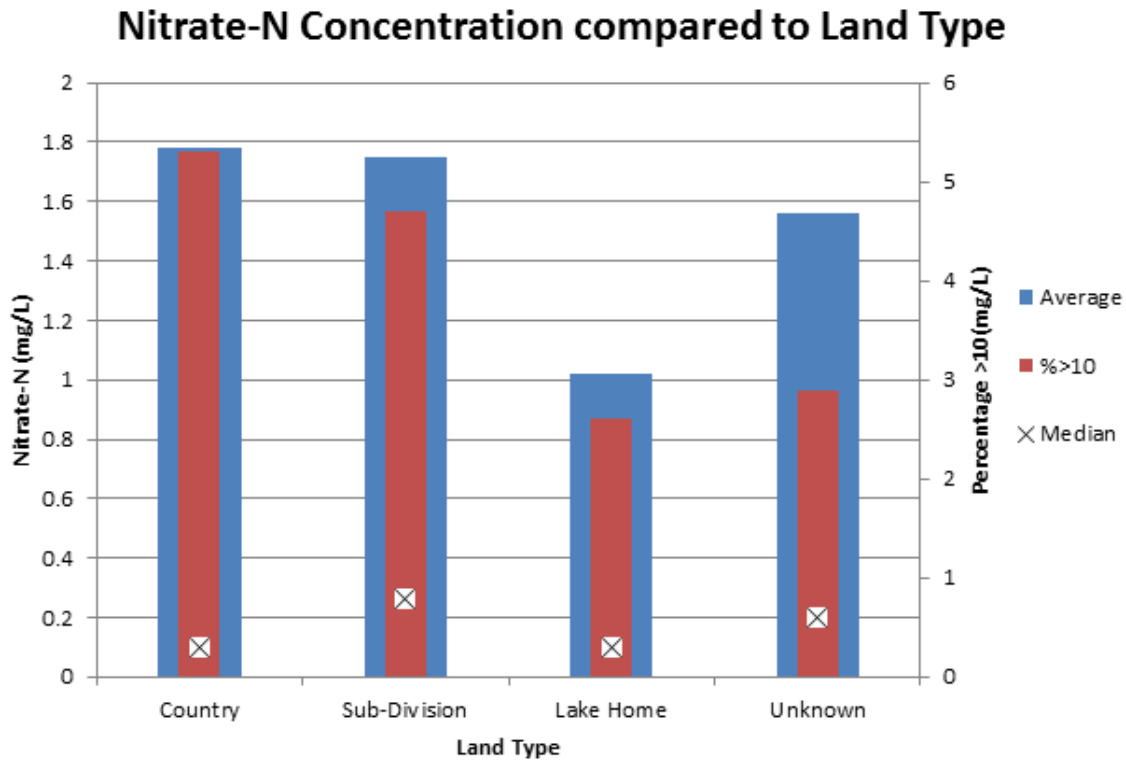
Treatment	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	% ≥10
Distillation	7	2.02	0	6	0	1	85.7	0	14.3
Filtration	208	1.15	0.1	190	13	5	91.3	6.3	2.4
Reverse Osmosis	115	2.05	0.16	93	12	10	80.9	10.4	8.7
None	151	1.4	0.1	129	18	4	85.4	11.9	2.6
Unknown	701	1.64	0.1	603	66	32	86	9.4	4.6



**Figure 10.** Private Well Water Treatment Methods Correlated to Nitrate-N Concentrations

**Table 10.** Correlations of Nitrate-N Concentration to Development

Development	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	% ≥10
Country	715	1.78	0.1	606	71	38	84.7	10	5.3
Sub-Division	85	1.75	0.263	73	8	4	85.9	9.4	4.7
Lake Home	313	1.02	0.1	285	20	8	91.1	6.3	2.6
Unknown	69	1.56	0.2	58	9	2	84.1	13	2.9



**Figure 11.** Type of Development Compared to the Percentage of Wells Nitrate-N Concentrations

**Table 11.** More than 500lbs Fertilizer Stored on Property

Fertilizer	# of Surveys	Average	Median	0<3 mg/L	3<10 mg/L	≥10 mg/L	% 0<3	% 3<10	% ≥10
Yes	16	2.94	0.345	11	3	2	68.8	18.7	12.5
No	1087	1.55	0.1	944	93	50	86.8	8.6	4.6
Unknown	80	1.44	0.2	67	11	2	83.8	13.7	2.5

### Nitrate-N Concentrations compared to Fertilizer Storage

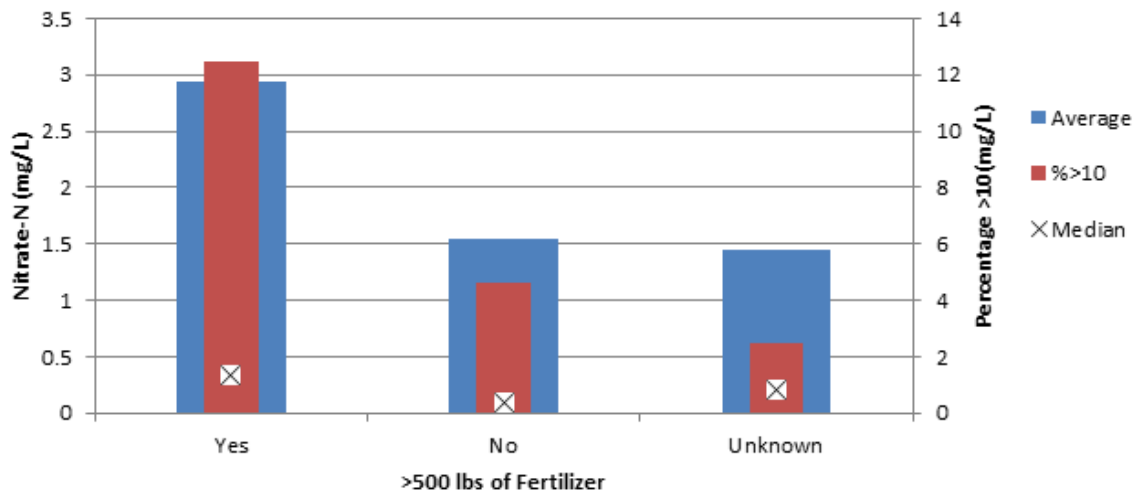


Figure 12. >500lbs Fertilizer on Site and Well Water Nitrate-N Concentrations