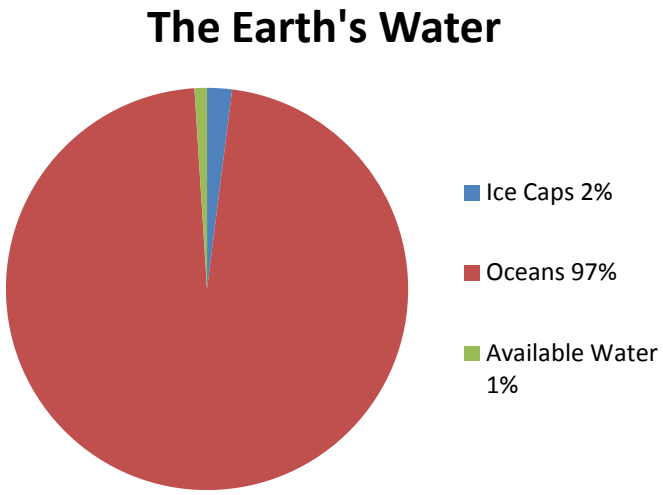
Long Term Water Quality Study
In
Van Wert County, Ohio
1989-2012

Results from the Van Wert Soil and Water Conservation District

A grant by the Van Wert County Foundation

Why should we protect our water?

Our bodies are mostly water, and we need 64 ounces of fresh water everyday. We would die without water. The same is true for most living things. That is why clean water is so important. Although the Earth has an abundance of water, most of it (97%) is in the oceans, which is unsafe for humans to drink. Another 2% is frozen in the polar icecaps. That means only 1% of the Earth's water is available for humans, animals, trees, and all other living things



New water is never created, it just gets recycled- a process known as the water cycle. The water you drink today will be used again and again for years to come. That is why it is important to keep the water clean and free of pollution.

There are many things you and your family can do to help protect the water. Here are just a few ideas:

- Properly dispose of household wastes
- Reduce consumption of water
- Recycle to reduce the volume of trash that ends up in landfills
- Reduce fertilizer and pesticide use on lawns
- Limit the use of toxic products

This booklet talks about a water quality study in Van Wert County, Ohio. Read on for more information!

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BACKGROUND INFORMATION

Who is responsible for the water quality study?

This study was initiated by the Van Wert County Foundation following some concerns about pesticides in drinking water. The foundation approached the Van Wert Soil and Water Conservation District and a partnership was formed, where the foundation provides the funds for the study and the SWCD is responsible for collection, data summary, reporting and presenting the information.

When did the study begin?

The study was initiated in June of 1989. It has been a learning process for all involved and some things were changed following the initial sampling rounds. In January of 1990 nutrient monitoring was added to the study, and in 2001 E. Coli sampling was added. Since then the sampling procedure has remained the same. This booklet focuses on the data collected from 1990-2012

What is Van Wert County like?

Van Wert County is located in Northwest Ohio, extending 21 miles in a North-South direction and 24 miles in an East-West direction, encompassing 409 square miles (261,760 acres). Van Wert County is home to 28,601 people, of which about 10,793 reside in the city of Van Wert.

The residents and industries in the City of Van Wert use an average of 1.4 million gallons of water per day all of which originates from Town Creek. The water is pumped from Town Creek into three earth embankment reservoirs. The reservoirs are located at the South edge of the city, just east of US 127. The first reservoir was constructed in 1949, and has a capacity of 380 million gallons. The second one was built in 1964, and then expanded for more capacity in 2007 holding a total of 650 million gallons.

Town Creek has a watershed of approximately 52.6 square miles within Van Wert County. It starts in the Southwest part of Van Wert County and flows into Paulding County where it soon joins Maddox Creek to form Middle Branch Creek—a tributary to the Little Auglaize River. Eventually this water flows into Lake Erie.

Land use in Van Wert County is primarily Agriculture. Ninety five percent of the land is in agriculture and other open areas, 3% is in forest, and 1% is in urban developments. Typical agriculture management is cash grain farming with a corn-soybean rotation. Little livestock is found within the county.

The soils in Van Wert County originate from Wisconsin Age glacial material. The area North of Lincoln Highway is part of a glacial lakebed. These soils are high in clay, poorly drained and nearly level. A narrow beach ridge with sandier soils runs along the south edge of the lake deposits, coinciding with the location of Lincoln Highway. Areas South of Lincoln Highway are a

bit more sloping, high in clay, and like the rest of the county require artificial drainage to increase crop yields.

In 1949 a project was undertaken to reduce flooding potential in Van Wert County. The streams within the Little Auglaize River Watershed were reconstructed (widened, deepened, and straightened) to increase capacity and flow of water. Mitigation efforts included placing rock dams at ¼ mile intervals and preserving a few oxbows. Town Creek was part of this project, with construction of the entire Little Auglaize River Watershed completed in 1998

What is being tested and why?

This study focuses on nitrogen (nitrates), phosphorus, pesticides, and E.Coli. Nitrogen and Phosphorus occurs naturally in the environment, but human activities (fertilization of crops and lawns, disposal of human and animal waste) can cause elevated levels. High nitrate levels can interfere with the body's use of oxygen, a condition known as blue baby syndrome. Young children and pregnant women are especially sensitive to high nitrate levels. Phosphorus is required for plant growth and is usually in short supply in lakes and streams in the Midwestern United States. Addition of phosphorus to water can cause access algae growth or blooms. Although algae is not a serious problem the decomposition of algae consumes the oxygen essential for fish. If too much phosphorus is added to a stream or a lake it may cause a fish kill.

There are many different kinds of pesticides that may be used to control weeds or insects. Pesticides are used in both rural and urban areas. Farmers may use these chemicals to control weeds or insects in their crops, while people living in the city use similar chemicals in their gardens and lawns. Every chemical is tested for potential health effects prior to its sale, and some pesticides have been associated with cancer or birth defects in laboratory studies. From this information the Environmental Protection Agency (EPA) may establish a health advisory level (HAL). The HAL is a concentration that does not pose a direct threat to human health, and includes a margin of safety. Not all chemicals have a HAL, and many of the current levels are under review. The EPA may also establish a maximum contaminant level (MCL). This is the maximum permissible level of a contaminant in water that is delivered to the public. Contaminant levels found in the County's drinking water supplies (municipalities and wells) are compared to the MCL.

Where do these pollutants come from?

Today most of the pollution entering water sources is non-point, or from an indefinable source. For example, nitrogen is widely used in agriculture and may be present in runoff and tile leaching. A specific source of nitrogen loading may be impossible to locate, therefore it is called a non-point source pollutant (NPSP). Phosphorus is another nutrient that enters the water via runoff and classified as a NPSP. Pesticides may enter the water via runoff and leaching, or by improper application and disposal.

Urban areas can also be a significant source of nutrient and pesticide enrichment. Homeowners in these areas can reduce the potential for water quality impairment by decreasing the amount

of fertilizers and pesticides applied to lawns. Proper disposal methods for hazardous materials should always be used to avoid contamination of local water resources.

Pollutants also come from human and animal waste. Most cities have a wastewater treatment plant to treat the water before it goes back into a stream. If this is not designed correctly or not working properly it can be a source of harmful pollution. Rural homeowners often have a septic system to treat their waste. Unfortunately, the soils in Van Wert County are not suited for septic systems and most do not function correctly. Agencies and government in Van Wert County are currently addressing this issue.

Are nutrients and pesticides the primary polluters of surface water?

Although this study focuses on nutrients and pesticides in water, the biggest threat to water quality in this nation is sediment. Erosion from agriculture fields and urban construction sites sends soil particles into local rivers and streams. The particles make the water cloudy, can suffocate fish, and carry other pollutants like nutrients and pesticides with them. Other threats to water quality in Ohio include pathogens, organic enrichment, metals, salinity, and habitat and flow alteration.

OBJECTIVE AND METHODS

What is the objective of this study?

The first objective is to obtain information on the quality of surface water in Van Wert County. This is done by monitoring nitrogen and phosphorus levels in Town Creek each month. Town Creek is also tested twice yearly (June and November) for approximately 27 pesticides. Seven streams leaving Van Wert County are also tested for E. Coli quarterly.

How the study is conducted:

- The map on the next page shows the sampling locations
- Samples are collected by District personnel and analyzed by Brookside Laboratories in New Knoxville, Ohio
- Nitrate and phosphorus analysis are conducted on three samples from Town Creek (at locations TC2, TC3, and TC4) every month.
- Pesticide Screening (MR1)* is performed on three sites of Town Creek (TC1, TC2, TC3) in June and November.
- Herbicide (HS1) ** and nitrate screening of township wells and municipalities are done in June.
- E . Coli samples are tested from the township samples every June. Town Creek is sampled every June and November. All Streams entering Paulding County are tested quarterly.

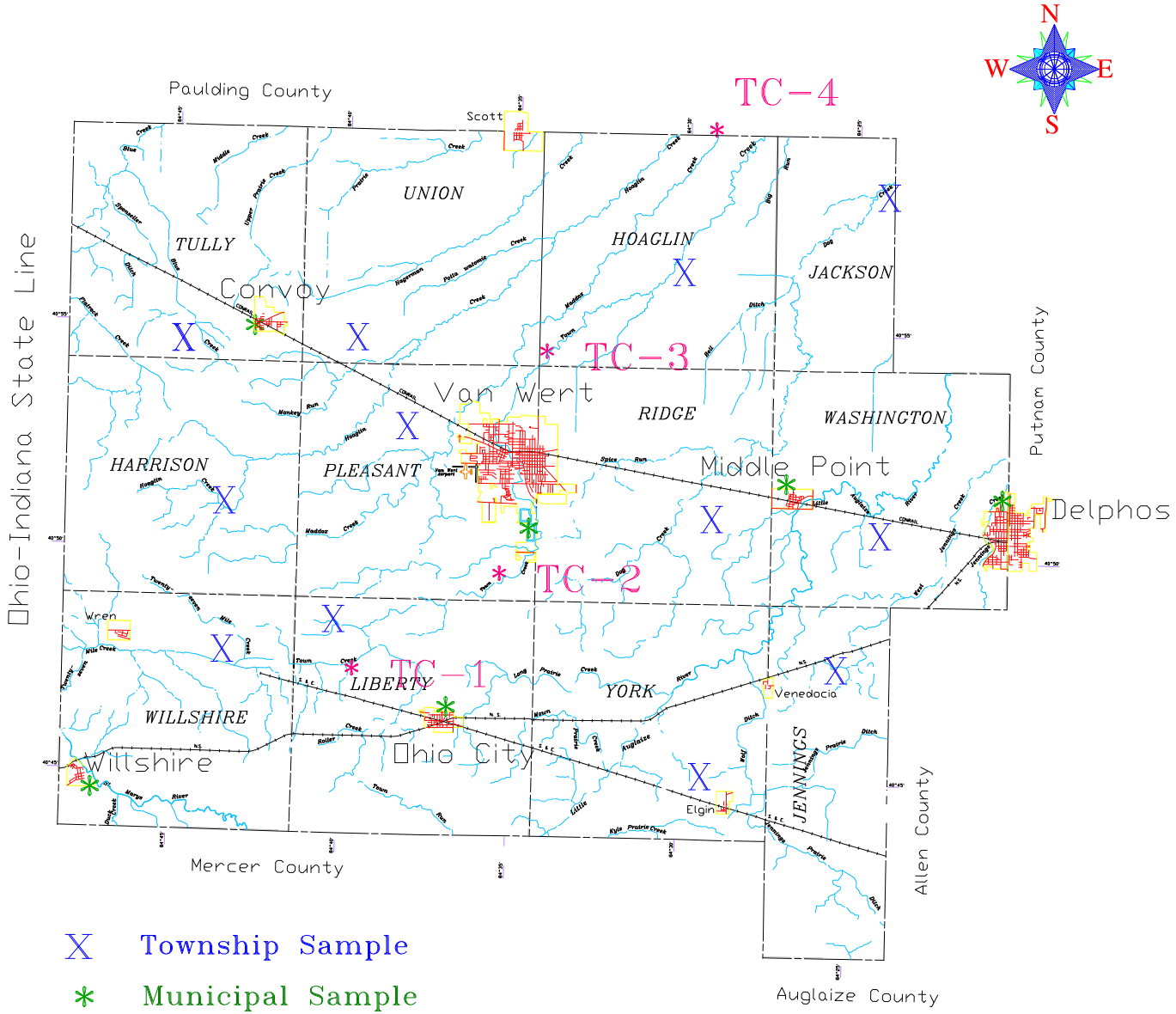
*MR1 Pesticides: (brand names are given in parentheses)

Alachlor (Lasso)	Metribuzin (Lexone/Sencore)	Ethyl Chlorpyrifos
Acetochlor (Harness)	Pebulate	Diazinon
Atrazine	Pendimethalin (Prowl)	Ethyl Parathion
Butylate(Sutan)	Prometon (Pramitol)	Fonofos (Dyfonate)
Clomazone (Command)	Propachlor	Isofenphos
Cyanazine (Bladex)	Propazine	Malathion
EPTC (Eptam)	Simazine (Princep)	Methyl Parathion
Ethalfluralin (Dual)	Trifluralin (Treflan)	Terbufos (counter)
Fluchloralin	Vernolate	
Metolachlor (Dual)	Carbofuran (Furadan)	

**HS1 Herbicides

Alachlor (Lasso)	Metolachlor (Dual)	Propazine
Atrazine	Propachlor	Simazine (Princep)

More information on these chemicals can be found in the appendix.


N
W
E
S
Paulding County
Scott
TC-4
UNION
TULLY
HOAGLIN
JACKSON
Convoy
TC-3
Van Wert
RIDGE
WASHINGTON
Putnam County
Ohio-Indiana State Line
HARRISON
PLEASANT
Middle Point
Delphos
TC-2
Wren
TC-1
LIBERTY
YORK
Venedocia
WILLSHIRE
Willshire
Ohio City
Elgin
JENNINGS
Allen County
Mercer County
Auglaize County
X Township Sample
* Municipal Sample
* Town Creek Sample

How is the information presented?

The data are presented in tables and graphs on the following pages. The numbers represent a concentration. Some common ways to express concentration include units like parts per million (ppm) and parts per billion (ppb). These values are hard to imagine, so to illustrate consider a bag of 1 million marbles. If there were 10 red marbles in this bag, then that would equal 10 ppm red marbles. One ppm is also equal to 1 minute in 2 years. Parts per billion is similar except the quantity reported is out of 1 billion total units. Eleven square feet (about the size of a bathtub) in Van Wert County is equal to 1 ppb since there is approximately 11 billion square feet in the county. There is even a parts per trillion – this equals 1 square foot in the state of Indiana.

How is this information being used?

The information is sort of an insurance policy so the people of Van Wert County know the water is safe. It may also be used as background data should any problems be detected in the future. Quarterly reports are submitted to local newspapers, and regular updates have been given on the radio. This booklet is another way to distribute the information gathered. Local schools have each received a copy, as well as many local government offices. Additional copies may be obtained from the Soil and Water Conservation District. It is hoped that the residents of Van Wert are made aware of the water quality issue and the work being done to ensure clean water into the future.

What can be done to reduce pollution of local waters?

Conservation tillage, waterways, cover crops and filter strips can be used in the field to reduce pollution potential. Implementing a filter strip between the edge of the field and the stream will catch most of the sediment and decrease the potential for nutrients and pesticides entering the water. Sediment barriers near construction sites will function the same way.

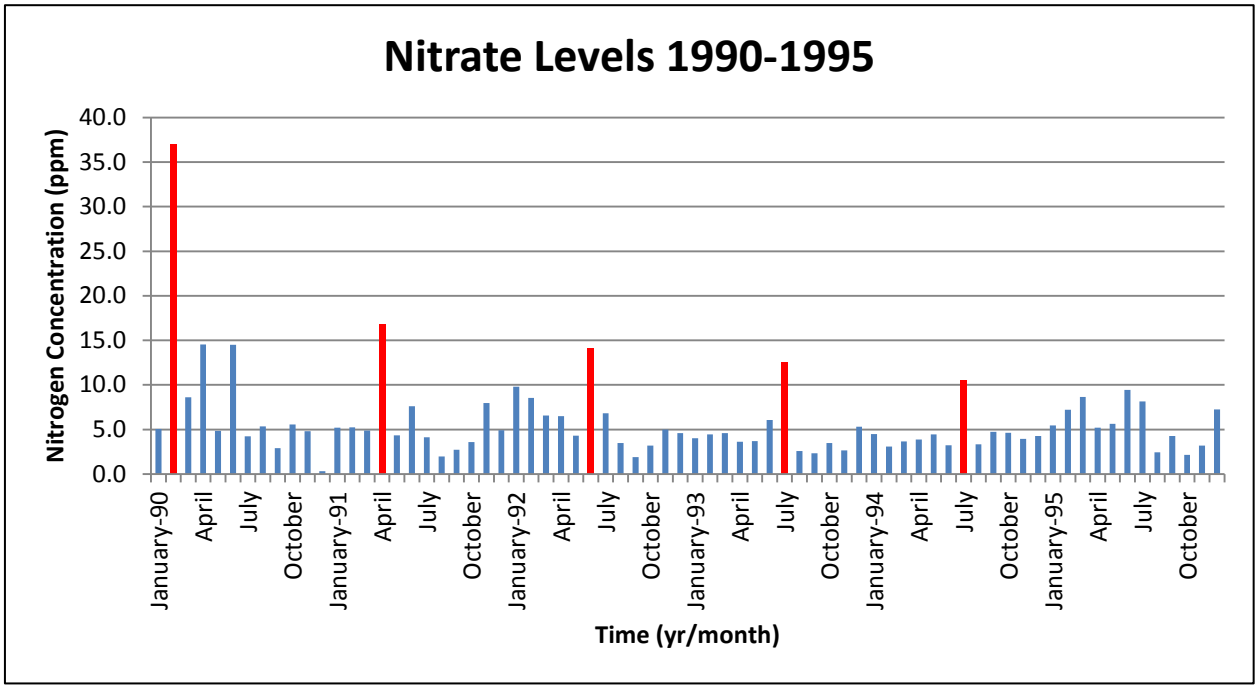
**In 2011 approximately 79% of crops were either no tilled, fall mulched or strip tilled. Van wert has a total of 70 acres of waterways constructed, and filter strips continue to be implemented along streams and ditches.

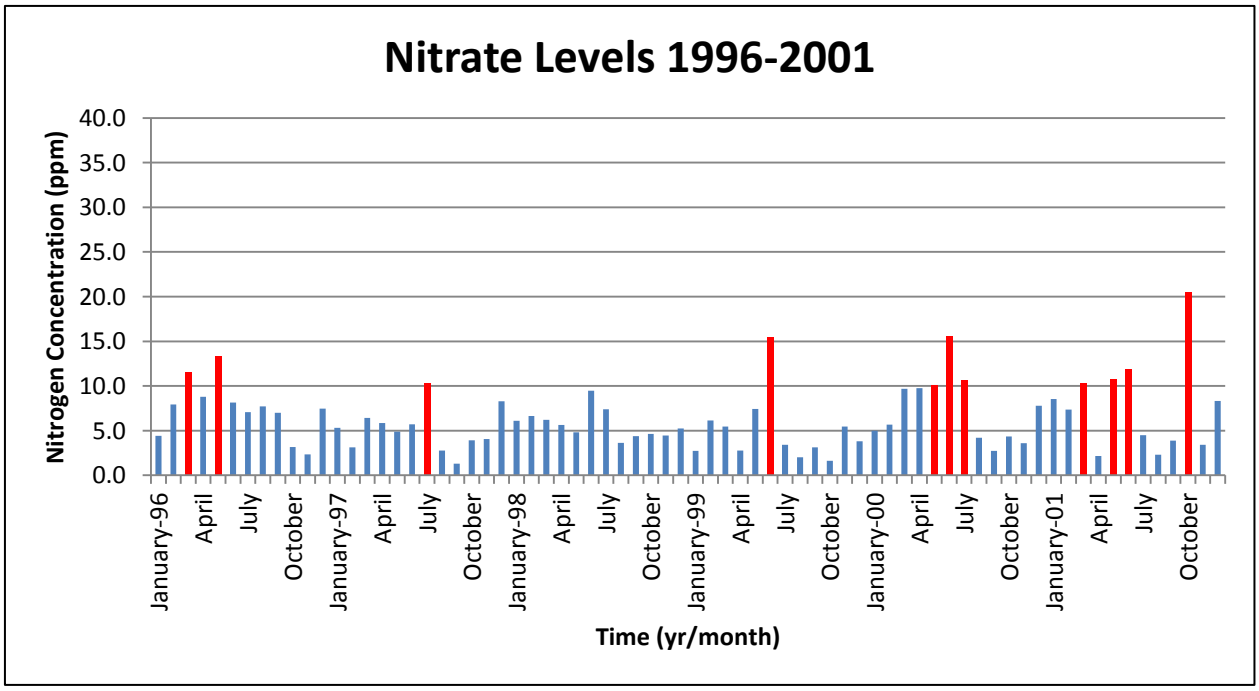
Another way the agriculture industry has changed to protect the water is the development of low volume pesticides. Many of the new chemicals have directions to use a couple ounces per acre (compare this with a quart per acre used for some older chemicals). This means that less chemical is being applied to the soil, with less likelihood to end up in the water. Many of these chemicals break down very quickly, further decreasing the potential for contamination.

Homeowners need to be aware of potential septic system failures. Due to local soil conditions, the majority of systems fail within the first two years of operation. This results in harmful nutrients and bacteria entering local waters. A properly designed system, regular pumping and periodic inspections to ensure functioning are ways to prevent contamination.

Where can I learn more information about water quality?

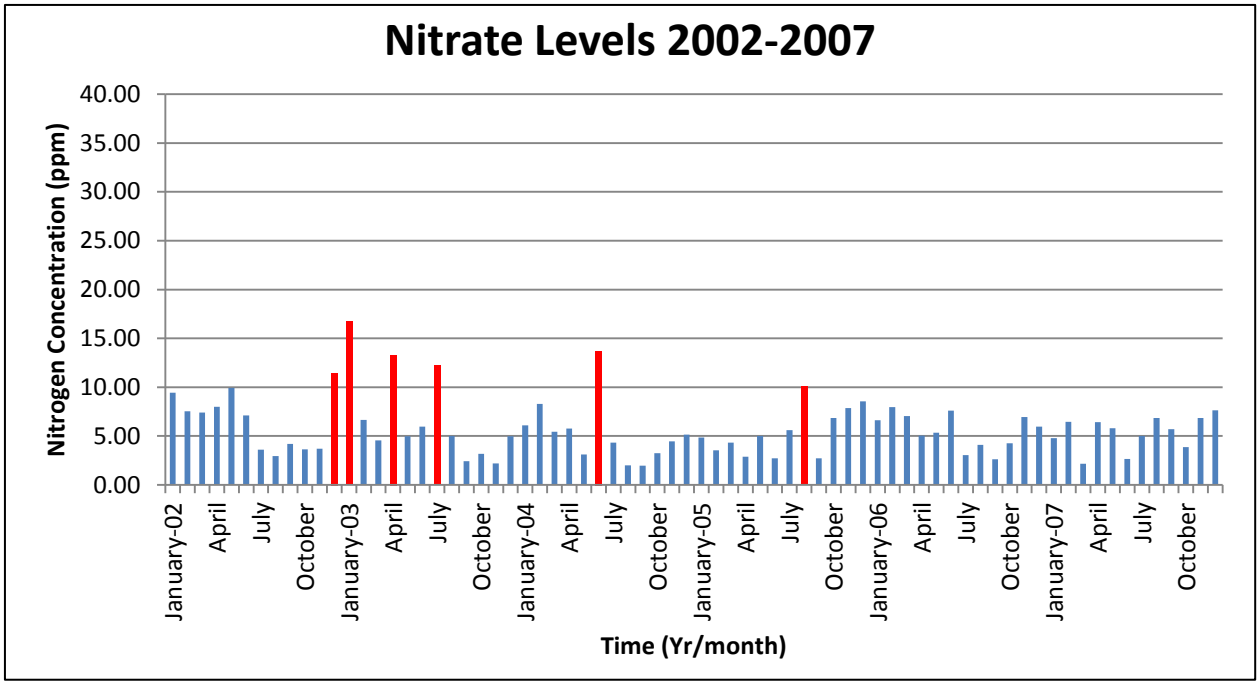
If you have any questions about the water quality study, you can contact the Soil and Water Conservation District. They can help explain the information in this book and assist you in your efforts to protect your water.

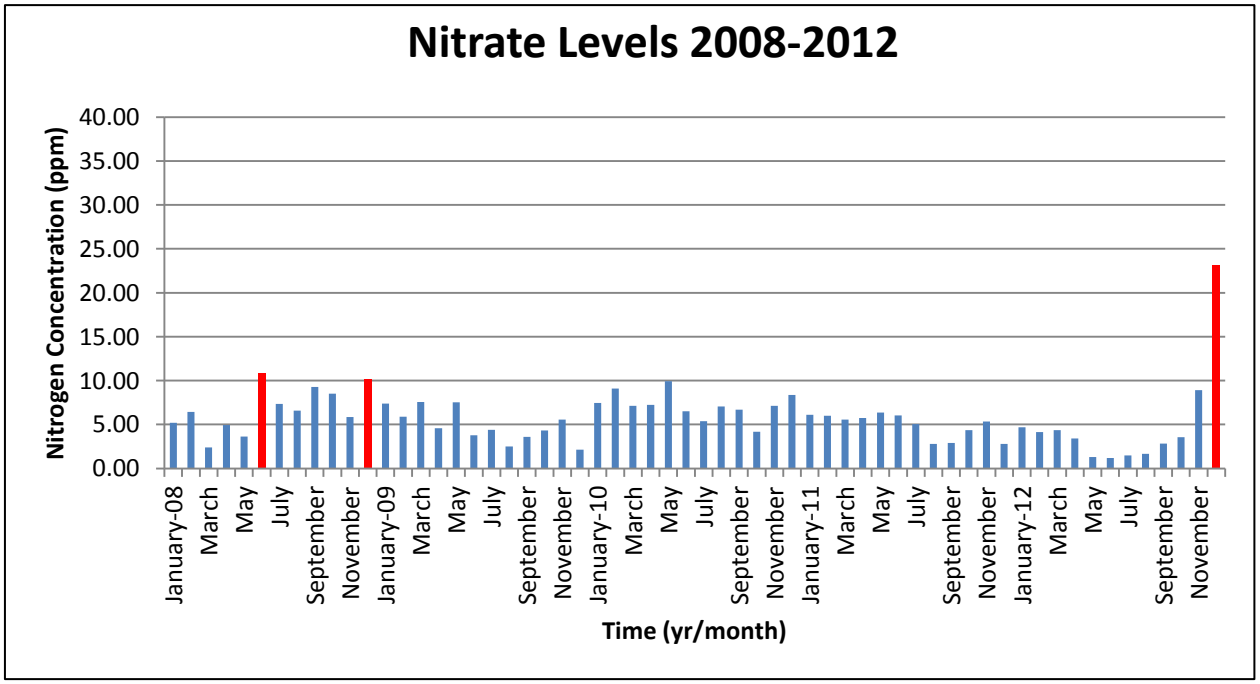




TOWN CREEK- NUTRIENT DATA

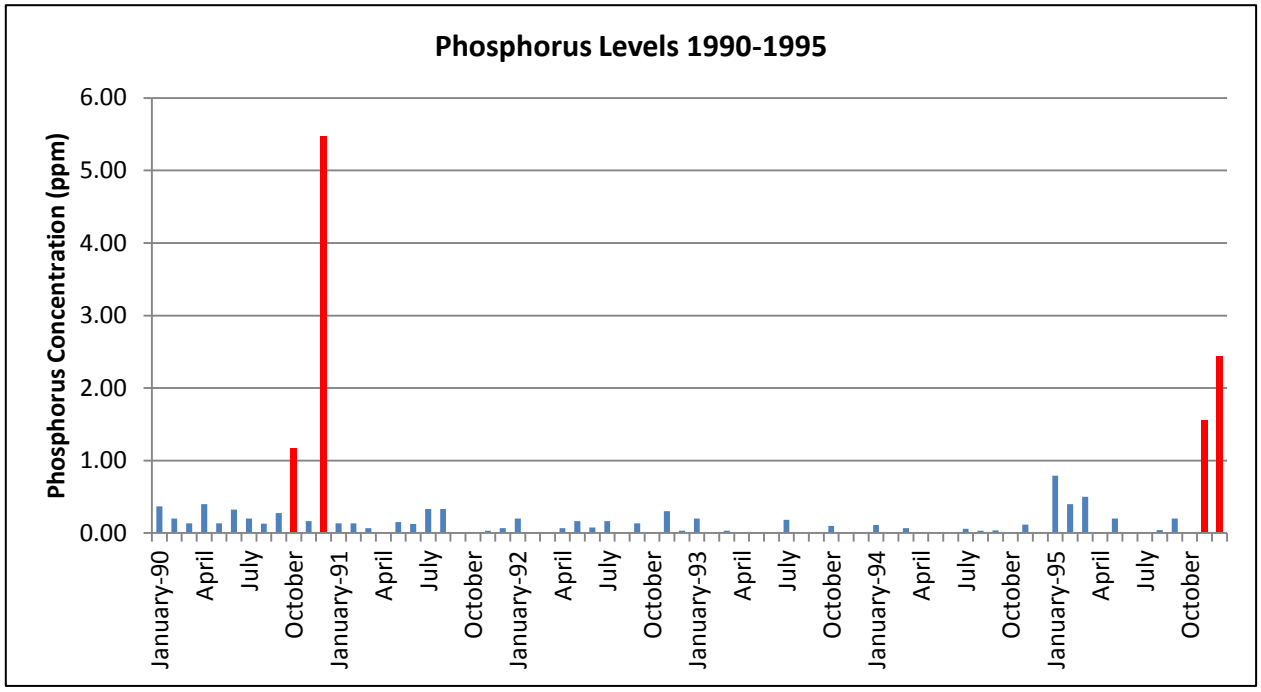
The graphs above show the average nitrogen (nitrogen plus nitrate) concentration the years 1990-2001. Raw data for this graph is presented in the Appendix. The values for nitrogen vary from near zero to greater than 20. It is unclear why the 2001 value is so high relative to the other readings. This value could be considered an outlier, and not a good indication of overall water quality. The EPA HAL for nitrates is 10ppm. Any month that had a reading over 10ppm is highlighted in red.

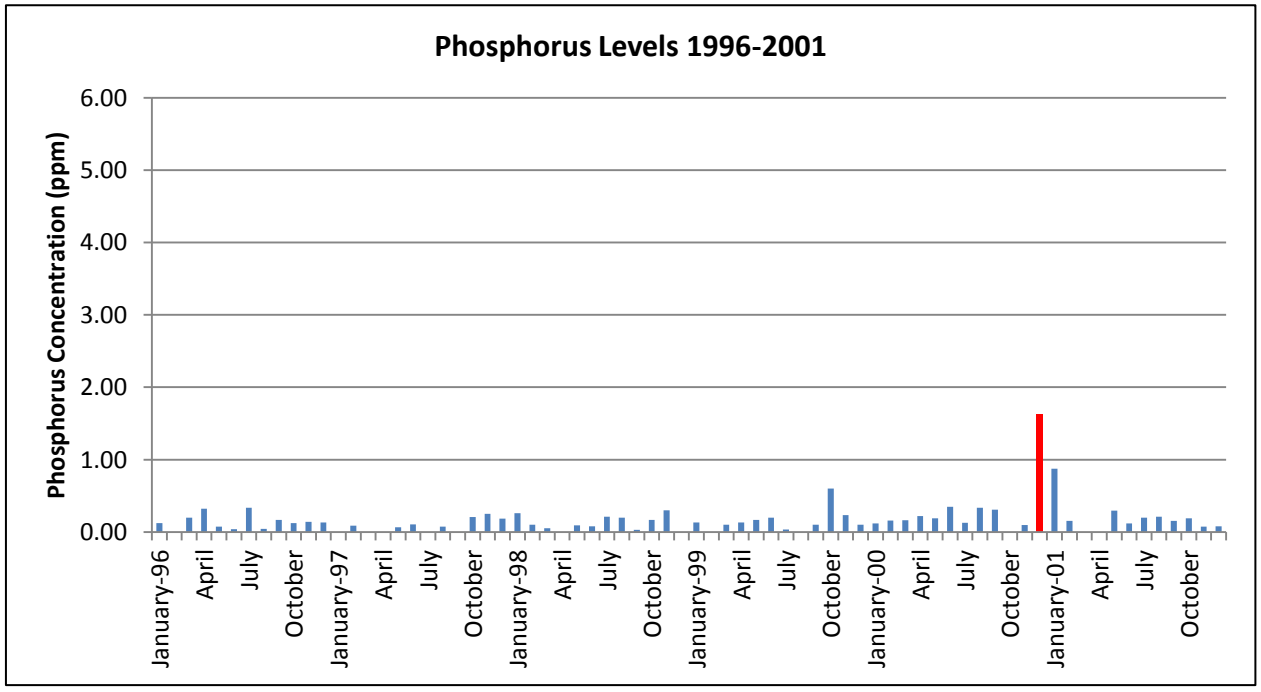




TOWN CREEK- NUTRIENT DATA

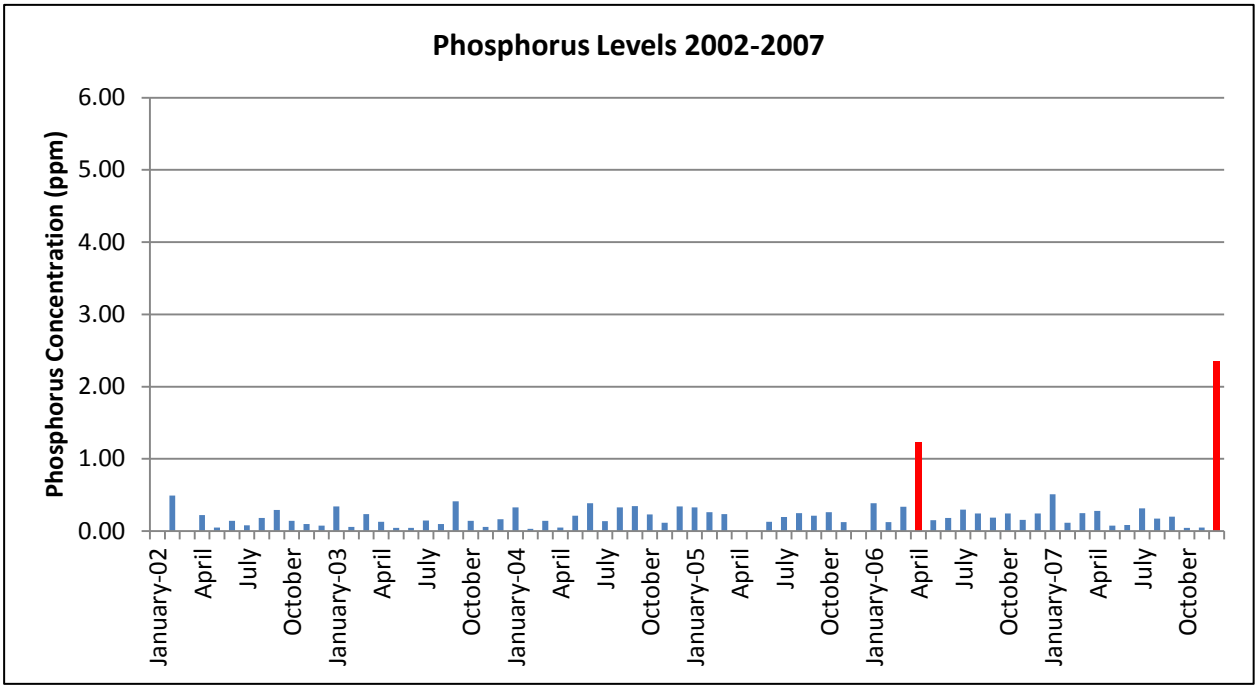
The graphs above show the average nitrogen (nitrogen plus nitrate) concentration for years 2001-2012. Raw data for this graph is shown in the Appendix. The values for nitrogen vary from near zero to greater than 20. It is unclear why the October 2001 value is so high relative to the other readings. This value could be considered an outlier, and not a good indication of overall water quality. The EPA HAL for nitrates is 10ppm. Those values are highlighted in red. The nitrogen levels consistently decreased as time progressed being a good indicator that water quality is improving.

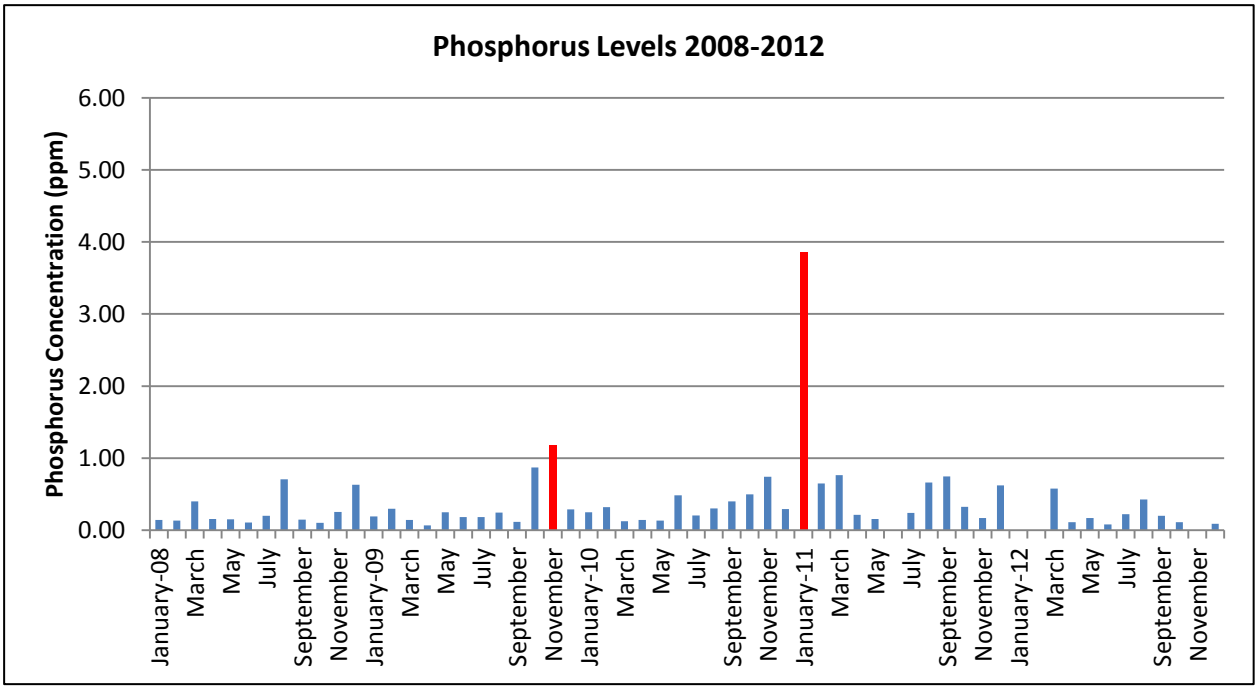




TOWN CREEK-NUTRIENT DATA

The graph above shows the average phosphorus (ortho-phosphorus) concentration for each sampling period for years 1990-2001. Raw data for these graphs are available in the Appendix. Phosphorus concentrations are relatively low with the exception of a few readings exceeding 1.0ppm. There is no HAL for phosphorus, but excess algae growth is likely at concentrations greater than 1.0ppm. The December 1990 value is not considered a good indicator of water quality due to it being extremely high compared to other values.





TOWN CREEK-NUTRIENT DATA

The graph above shows the average phosphorus (ortho-phosphorus) concentrations for each sampling period for years 2001-2012. Raw data for these graphs are available in the Appendix. Phosphorus concentrations are relatively low with the exceptions of a few readings exceeding 1.0ppm. There were no readings above 1.0ppm from 2001-2005, and only four from 2006-2012. These values are not a good indicator of water quality.

This table shows the overall average nitrogen (nitrogen plus nitrate) and phosphorus (ortho-phosphorus) concentrated by month. The values were obtained by averaging all sample results acquired from 1990-2012. When the concentration was below the detection limit, a value of zero was listed.

Month	Average Nitrogen Concentration (ppm)	Average Phosphorus Concentration (ppm)
January	6.32	0.42
February	7.58	0.16
March	6.28	0.20
April	6.64	0.16
May	6.16	0.13
June	8.23	0.14
July	6.40	0.18
August	3.75	0.22
September	3.74	0.21
October	4.82	0.24
November	5.02	0.27
December	6.86	0.66

* See discussion of values below.

Nitrogen concentrations were greatest in spring and early summer (March – July). This may be explained by crop management and rainfall patterns at this time of year. Fertilization of agricultural crops is done mostly in the spring (April and May). These fertilizers may enter the water through surface runoff or tile leachate. Additionally, intense rainstorms tend to occur early in the growing season when crop cover is limited, increasing the chance of surface runoff and erosion

The winter months (November – January) exhibit the highest phosphorus concentrations. The biggest limitation to the nutrient monitoring portion of this study is the testing for ortho-phosphorus rather than total phosphorus. Ortho-phosphorus is only a portion of the total phosphorus, and is influenced by biotic activity. Less biotic activity during the winter months may explain the higher values.

To determine the effect rainfall had on nutrient concentration, the amount of rain received 96 hours before sampling was recorded (see the Appendix for rainfall amounts). This value was compared to the nutrient concentrations. High amounts of rain did not always correlate to higher nitrogen and phosphorus concentrations. This may be due to the sampling technique, as grab samples determine the condition of the stream *only* at the instant the sample is collected. Rainfall received more than 96 hours before collecting the sample, soil moisture and soil conditions contributed.

TOWN CREEK – PESTICIDE DATA

Twice a year Town Creek is analyzed for nearly 30 different pesticides. Samples taken in June consistently have one or more pesticides present, while the November samples generally do not have pesticides above detectable levels. Like the nutrient concentrations, this may be explained by the management and rainfall patterns at this time of year. The table below shows the years and locations that each pesticide was detected (note that 14 of the 28 pesticides have not been detected throughout this study).

	June Sampling			November Sampling		
Pesticide	**TC1**	**TC2**	**TC3**	**TC1**	**TC2**	**TC3**
Alachlor	90-92, 94, 97	90, 91, 93, 97	90-92, 97, 98			
Acetochlor		08	08			
Atrazine	90-08,11,12	90-08,11,12	90-08,11,12	91	91, 95, 02,11	91, 95-97
Carbofuran			98			
Chlorpyrifos		90	91	91	91	91
Cyanazine	90-99	90-99	90-99	95		93, 97
Fluchloralin	01	01				
Metolachlor	90-94, 97-99, 01, 02, 04, 06, 08	90-99, 01, 02, 04, 06, 08	90, 91, 06, 94-99, 01, 02, 04, 08	93, 05		
Metribuzin	90, 97, 99, 02	90, 91, 97-99, 04, 07	90-92, 97-99, 04, 08	05	05	96, 05, 06
Pendimethalin		90				
Simazine	97-99, 01	97, 99, 01, 08	97, 99, 01, 08			
Terbufos	99					
Propachlor			06			05, 06
Acetochlor	99		98, 99			

Note: Butylate, Diazinon, EPTC, Ethalfluralin, Ethyl Parathion, Fonofos, Isofenphos, Malathion, Methyl Parathion, Pebulate, Propazine, Prometon, Trifluralin and Vernolate have not been detected through this study.

Although pesticides have commonly been detected in Town Creek, levels have not exceeded the HALs in the samples analyzed. Perhaps this is a good time to point out that although Town Creek serves as the source of water for Van Wert, no one is (or should be) drinking the water directly from Town Creek. The water goes through a mixing and processing period before it is sent to residential areas. This study also tests the processed water in Van Wert and other municipalities in the county. Continue reading for more details.

MUNICIPAL WATER SUPPLIES

As stated earlier, Town Creek serves as the source of drinking water for Van Wert. The drinking water sources for Convoy, Delphos, Middle Point, and Ohio City are wells. The village of Willshire relied on surface water until 1998 when they switched to groundwater through wells. Every year in June, samples are collected from these municipalities and tested for Nitrates, Atrazine, Alachlor, Metolachlor, Propachlor, Propazine and Simazine.

The tables that follow are arranged by municipality. The value given for herbicide concentrations is in parts per billion and nitrate concentration is in parts per million. N/T indicates that the sample was not analyzed for the compound. A * means that pesticides and nitrates were not present at detectable levels.

Convoy	Atrazine	Alachlor	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	N/T	N/T	N/T	*	*	*
1993	0.5	N/T	N/T	N/T	*	*	*
1994	*	N/T	N/T	N/T	*	*	*
1995	*	*	*	*	*	*	*
1996	1.17	1.24	*	*	*	*	0.44
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	0.07
2007	*	*	*	8.1	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes herbicide and nitrate concentrations in Convoy's water supply from 1990-2012. Samples were collected in June.

Delphos	Atrazine	Alachlor	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	N/T	N/T	N/T	*	*	*
1994	*	N/T	N/T	N/T	*	*	*
1995	*	*	*	*	*	*	*
1996	*	0.8	*	*	*	*	0.5
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	1.2	*	*	*	*	*
2008	0.9	*	*	*	*	*	4.59
2009	0.4	*	*	*	*	*	3.7
2010	0.8	*	*	*	*	*	5.86
2011	*	*	*	*	*	*	4.28
2012	1.47	*	*	*	*	*	2.43

This table includes pesticide and nitrate concentrations in Delphos' water supply from 1990-2012. Samples were collected in June.

Middle Point	Atrazine	Alachlor	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	N/T	N/T	N/T	*	*	*
1993	*	N/T	N/T	N/T	*	*	*
1994	*	N/T	N/T	N/T	*	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.5
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.17
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations in Middle Point's water supply from 1990-2012. Samples were collected in June.

Ohio City	Atrazine	Alachlor	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	N/T	N/T	N/T	*	*	4.5
1993	*	N/T	N/T	N/T	*	*	*
1994	*	N/T	N/T	N/T	*	*	*
1995	*	*	*	*	*	*	*
1996	0.38	*	*	*	*	*	5.32
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	0.06
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	0.14

This table includes pesticide and nitrate concentrations in Ohio City's water supple from 1990-2012. Samples were collected in June.

Van Wert	Atrazine	Alachlor	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	0.6	*	*	N/T	N/T	*	4.8
1991	0.2	*	*	N/T	N/T	*	1.2
1992	*	N/T	N/T	N/T	*	*	4.2
1993	1.21	N/T	N/T	N/T	*	*	1
1994	1.43	N/T	N/T	N/T	*	*	2.1
1995	0.43	*	*	*	*	*	5
1996	*	*	*	*	*	*	0.5
1997	1.9	*	1.46	*	*	*	3.2
1998	0.58	*	*	*	*	*	2.4
1999	0.73	*	*	*	*	*	3.9
2000	*	*	*	*	*	*	0.59
2001	0.94	*	0.6	*	*	*	3.61
2002	0.5	*	*	*	*	*	1.86
2003	0.71	*	*	*	*	*	4.99
2004	1.4	*	0.08	*	*	*	0.35
2005	1.3	*	*	*	*	*	0.35
2006	2.24	*	*	*	*	*	2.86
2007	0.6	*	*	*	*	*	0.46
2008	*	*	*	*	*	*	2.59
2009	*	*	*	*	*	*	1.43
2010	*	*	*	*	*	*	1.02
2011	*	*	*	*	*	*	1.15
2012	*	*	*	*	*	*	0.10

This table includes pesticide and nitrate concentrations in Van Wert's water supply from 1990-2012. Samples were collected in June. Atrazine and nitrate levels regularly exceeded the detectable levels, but have not exceeded the MCL (3.0ppb for Atrazine and 10.0ppm for nitrates). The increased levels of Atrazine and nitrates in Van Wert's water may be explained by the source of the water, as surface waters tend to be more susceptible to contaminations when compared to groundwater sources.

Willshire	Atrazine	Alachlor	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	1.3	*	*	N/T	N/T	*	0.7
1991	0.4	*	*	N/T	N/T	*	0.2
1992	*	N/T	N/T	N/T	*	*	*
1993	1.03	N/T	N/T	N/T	*	*	0.3
1994	0.71	N/T	N/T	N/T	*	*	*
1995	1.54	*	0.86	*	*	*	*
1996	0.39	*	*	*	*	*	0.49
1997	1.63	0.68	1.41	*	*	*	1.3
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	6.55
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations in Willshire's water supply from 1990-2012. Samples were collected in June.

Municipality Summary

Each municipality tested in 1996 had some level of nitrates present. 0.85 inches of rain was received 96 hours before sampling, perhaps introducing nitrates into municipal water supplies. Additionally, the spring of 1996 was relatively wet, with April and May receiving 4.37 and 5.21 inches respectively. Nitrates are subject to leaching, with large amounts of rainfall increasing the leaching potential.

It is also possible that the small nitrate concentrations detected in 1996 are due to laboratory or sampling error. With the exception of Ohio city (concentration of 5.32ppm), all samples had a nitrate concentration between 0.44 and 0.50ppm. Whether these concentrations are true or due to an error, the values are small and not a real concern.

The drinking water made available to county residents through the municipalities tested is safe for consumption by all people. Levels have not exceeded the MCL. Water treatment plants throughout the country take considerable measures to ensure the safety of drinking waters, complying with all EPA regulations.

TOWNSHIP WELLS

In rural areas across the country, wells often serve as the source of drinking water. Wells pump ground water from beneath the surface, making it available to people and livestock. Groundwater usually originates as rainfall that has flowed through the soil into an underground aquifer. Most soils have an inherent ability to filter out any contaminants that may be in the water. However, groundwater is vulnerable to contamination through improper management (handling, application and disposal) of pesticides and nutrients. To assess the quality of groundwater in Van Wert County, one well in each of the twelve townships was tested for nitrates and five pesticides each June.

The following charts are organized by township. The value given for pesticide concentrations is in parts per billion and nitrate concentration is parts per million. N/T indicates that the sample was not analyzed for the compound. A * means that pesticides and nitrates were not present at detectable levels. Italicized values indicate concentrations exceeding the MCL - the maximum permissible level of a contaminant in water that is delivered to any user of a public water system (established by the EPA). Township wells exceeding the MCL should be more of a safety concern than a regulatory concern, as none of the wells tested in this portion of the study are for a public water supply.

This table includes pesticide and nitrate concentrations for a well located in Harrison Township. Samples were collected in June of each year from 1990-2012. The only detectable levels occurred in 1996 and 2006 with a small amount of nitrates present. The MCL for Nitrates in 10ppm.

Harrison	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.51
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	0.06
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.11
2012	*	*	*	*	*	*	0.16

This table includes pesticide and nitrate concentrations for a well located in Hoaglin Township. Samples were taken in June of each year from 1990-2012. The only detectable levels occurred in 1991, 1996, and 2001 with small amounts of nitrate present. The MCL for nitrates is 10ppm.

Hoaglin	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	0.6
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.5
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	1.79	*	*	*	*	0.53
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.1
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Jackson Township. Samples were collected in June of each year from 1990-2012. The only detectable level occurred in 1996, with a small amount of nitrates present.

Jackson	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.5
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Jennings Township. Samples were collected in June of each year from 1990-2012. The only detectable levels occurred in 1993, 1996, 2009, and 2011 with small amounts of nitrates present.

Jennings	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	0.3
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.51
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	0.9	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	0.2
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.1
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Liberty Township. Samples were collected in June of each year from 1990-2012. The only detectable levels occurred in 1992, 1993, and 1996, with small amounts of nitrates present.

Liberty	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	0.2
1993	*	*	*	N/T	N/T	*	0.3
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.52
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Pleasant Township. Samples were collected in June of each year from 1990-2012. The only detectable levels occurred in 1996, 2004, 2006, 2009, and 2011with small amounts of nitrates present as well as small levels of pesticides. In 2006 the reading for Atrazine was above the EPA's MCL, but still below the HAL.

Pleasant	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.52
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	0.3	*
2005	*	*	*	*	*	*	*
2006	*	3.32	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	7.6	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.12
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Ridge Township. Samples were collected in June of each year from 1990-2012. The only detectable levels occurred in 1996, and 1999, with small amount of nitrates present.

Ridge	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.51
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	0.21
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Tully Township. Samples were collected in June of each year from 1990-2012. Alachlor was detected in 1990 and nitrates were detected in 1996. The MCL for Alachlor is 2ppb.

Tully	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	1.3	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.52
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Union Township. Samples were collected in June of each year from 1990-2012. Nitrates were detected in 1996, 1997, 2002, and 2009. The 1999 and 2001 samples had detectable levels of Atrazine and Simazine but still remained under the HAL which is 200ppb for Atrazine and 70ppb for Simazine.

Union	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.73
1997	*	*	*	*	*	*	3
1998	*	*	*	*	*	*	*
1999	*	3.11	*	*	*	1.85	*
2000	*	*	*	*	*	*	*
2001	*	0.26	*	*	*	*	*
2002	*	*	*	*	*	*	0.22
2003	*	*	*	*	*	*	0.2
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	0.22
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Washington Township. Samples were collected in June of each year from 1990 to 2012. Nitrates were detected in 1990, 1991, 1993, 1996, 2002 and 2011. The MCL for nitrates is 10ppm. The 1996 sample also had detectable levels of Atrazine and Alachlor. The Atrazine concentration at 0.45ppb does not exceed the MCL of 3ppb. The Alachlor concentration of 7.35ppb exceeds the MCL of 2ppb, but does not exceed the HAL of 10ppb.

Washington	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	0.1
1991	*	*	*	N/T	N/T	*	0.3
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	0.5
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	7.35	0.45	*	*	*	*	0.49
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	0.24
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.1
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in Willshire Township. Samples were collected in June of each year from 1990 to 2012. The only detectable levels occurred in 1990 and 1996, with small amounts of nitrates present. The MCL for nitrates is 10ppm.

Willshire	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	0.1
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	*
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.51
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	*	*	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	*
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	*
2012	*	*	*	*	*	*	*

This table includes pesticide and nitrate concentrations for a well located in York Township. Samples were collected in June of each year from 1990 to 2012. The only detectable levels occurred in 1992, 1996, 2006, and 2011, with small amounts of nitrates present. The MCL for nitrates is 10ppm.

York	Alachlor	Atrazine	Metolachlor	Propachlor	Propazine	Simazine	Nitrates (ppm)
1990	*	*	*	N/T	N/T	*	*
1991	*	*	*	N/T	N/T	*	*
1992	*	*	*	N/T	N/T	*	0.1
1993	*	*	*	N/T	N/T	*	*
1994	*	*	*	N/T	N/T	*	*
1995	*	*	*	*	*	*	*
1996	*	*	*	*	*	*	0.51
1997	*	*	*	*	*	*	*
1998	*	*	*	*	*	*	*
1999	*	*	*	*	*	*	*
2000	*	*	*	*	*	*	*
2001	*	*	*	*	*	*	*
2002	*	0.9	12	*	*	*	*
2003	*	*	*	*	*	*	*
2004	*	*	*	*	*	*	*
2005	*	*	*	*	*	*	*
2006	*	*	*	*	*	*	0.07
2007	*	*	*	*	*	*	*
2008	*	*	*	*	*	*	*
2009	*	*	*	*	*	*	*
2010	*	*	*	*	*	*	*
2011	*	*	*	*	*	*	0.64
2012	*	*	*	*	*	*	0.33

Township Well Summary

Overall, the water coming from the wells tested is safe for consumption. A few samples tested had levels that may be of concern, but levels exceeding the HALs were not present. Additionally, problems did not persist from one sampling year to the next.

Each township well tested in 1996 had some level of nitrates present. 0.85 inches of rain was received 96 hours before sampling, perhaps causing nitrate movement to local wells. Additionally, the spring of 1996 was relatively wet, with April and May receiving 4.37 and 5.21 inches respectively. Nitrates are subject to leaching, with large amounts of rainfall increasing the leaching potential.

It is also possible that the small nitrate concentrations detected in 1996 are due to laboratory or sampling error. With the exception of Union Township (concentration of 0.73ppm), all samples had a nitrate concentration between 0.49 and 0.52ppm. Whether these concentrations are true or due to an error, the values are small and not a real concern.

As mentioned earlier the soils in Van Wert County have a large capacity to filter out contaminants like pesticides, contributing to the low number of detectable levels in most wells. However, heavy use and improper storage, application and disposal can contribute to groundwater contamination. Care should always be used when working with these chemicals.

E. Coli Tests

In the summer of 2001 the study added E. Coli Tests. The tests are for 7 streams that come into Van Wert County from Paulding County. There is a variety of E. Coli in nature. They are usually found in the intestines of healthy humans and animals. The presence of E. Coli and other bacteria within our intestines is necessary for us to develop and operate correctly, and for us to remain healthy. E. Coli along with other bacteria manufacture and provide us with many of the necessary vitamins such as Vitamin K and B complex's. Billions of these little bacteria are inside us making things our body needs to survive. However there is one bad character out of the bunch that gets a lot of attention, and it is E. Coli 0157:H7 and it produces toxins instead of vitamins. The tests that the study takes does not distinguish between the two, just total colonies of E. Coli. Results from 2001 through 2009 are shown in col/100ml. Results from 2010 and forward are shown mpn/125ml.

Below is the chart that lists E. Coli sampling for Town Creek from 2002-2012

Town Creek	March	June	September	December
2002	140	230	200	470
2003	110	200	17600	9400
2004	500	N/T	1000	2400
2005	16000	5600	1900	3200
2006	*	600	13300	2600
2007	15700	1700	100	5600
2008	5400	2080	282	250
2009	1120	1200	30	102
2010	250	N/T	198	N/T
2011	90.8	62.4	40.4	1119.1
2012	59.8	619.8	517.2	21.3

Below is the chart that lists E. Coli sampling for Maddox Creek from 2002-2012

Maddox Creek	March	June	September	December
2002	40	160	20	2010
2003	280	200	5000	1800
2004	300	N/T	1000	2000
2005	17000	400	4200	5900
2006	200	400	13900	3300
2007	6200	400	800	3560
2008	1700	1800	46	354
2009	346	220	72	1240
2010	96	384	460	N/T
2011	2	93.4	70.3	1553.1
2012	68.3	686.7	461.1	43.5

Below is the chart that lists E. Coli sampling for Hoaglin Creek from 2002-2012

Hoaglin Creek	March	June	September	December
2002	260	160	200	310
2003	200	*	5400	2000
2004	1300	N/T	1000	1000
2005	10000	2000	9400	8500
2006	*	200	42400	800
2007	2700	400	850	2400
2008	960	1440	102	352
2009	242	80	78	280
2010	186	154	492	N/T
2011	43.7	40.8	17.3	648.8
2012	35.4	290.9	108.6	248.1

Below is the chart that lists the E. Coli sampling for Hagerman Creek from 2002-2012

Hagerman Creek	March	June	September	December
2002	110	530	3580	1240
2003	200	1600	4400	600
2004	500	N/T	1000	700
2005	9000	600	6000	7200
2006	400	20	39200	1500
2007	1700	400	1500	1840
2008	500	1520	48	334
2009	362	5440	N/T	2220
2010	164	250	3580	N/T
2011	4.1	261.3	307.6	727
2012	34.6	574.8	547.5	488.4

Below is the chart that lists E. Coli sampling for Upper Prairie Creek from 2002-2012

Upper Prairie Creek	March	June	September	December
2002	50	190	260	750
2003	300	*	2600	400
2004	1300	N/T	1000	700
2005	27000	3200	12400	3200
2006	400	600	8000	1300
2007	2200	400	1900	1660
2008	280	1680	N/T	198
2009	200	640	40	2460
2010	1620	118	48	N/T
2011	4.1	161.6	13.2	920.8
2012	74.8	<1	129.1	248.1

Below is the chart that lists the E. Coli sampling for Middle Creek from 2002-2012

Middle Creek	March	June	September	December
2002	40	160	200	130
2003	200	*	2200	800
2004	300	N/T	1000	700
2005	6000	3200	22800	5800
2006	200	500	20600	1200
2007	1600	500	1350	1300
2008	1240	1560	260	516
2009	282	300	126	700
2010	216	210	400	N/T
2011	2	488.4	2419.6	574.8
2012	10.5	601.5	67.7	>2419.6

Below is the chart that lists E. Coli sampling for Blue Creek from 2002-2012

Blue Creek	March	June	September	December
2002	660	400	800	120
2003	200	400	3200	2200
2004	800	N/T	1000	300
2005	5000	4400	5600	2600
2006	200	200	19400	1100
2007	1500	1100	2000	4360
2008	660	1140	1380	28
2009	940	540	50	1260
2010	240	172	58	N/T
2011	5.2	218.7	435.2	461.1
2012	461.1	353.8	156.5	1203.3

E. Coli Test Summary

As you can see not all streams act the same through the year. The only environmental correlation we could come up with is that when we have extreme rains, E. Coli in every stream go up.

Appendices

Chemical (Product Name)	MCL *	EPA/HAL** (ppb unless noted)		Detection Limit	Category / Use
	ppb unless noted	14 day 10kg child	long term, 70kg adult	ppb unless noted	
Nitrate + Nitrite (as N)	10.00 (ppm)	10.00 (ppm)	N/A	0.24 (ppm)	Fertilizer, essential for plant growth
Phosphorus (as Ortho P)	N/A	N/A	N/A	0.10 (ppm)	Fertilizer, essential for plant growth
Alachlor (Lasso)	2.00	100.00	N/A	0.50	Herbicide
Atrazine	3.00	100.00	200.00	0.50	Herbicide
Butylate (Sutan)	N/A	2000.00	4000.00	0.50	Herbicide
Carbofuran (Furadan)	40	50.00	200.00	0.50	Insecticide/nematocide
Clomazone (Command)	N/A	N/A	N/A	0.50	Herbicide
Cyanazine (Bladex)	N/A	100.00	70.00	0.50	Herbicide
Diazinon	N/A	20.00	20.00	0.10	Insecticide/nematocide
EPTC (Eradicane)	N/A	N/A	N/A	0.50	Herbicide
Ethalfluralin (Basalin)	N/A	N/A	N/A	0.50	Herbicide
Ethyl Chlorpyrifos/Chlorpyrifos (Lorsban)	N/A	30.00	100.00	0.10	Insecticide
Ethyl Parathion	N/A	N/A	N/A	0.10	Insecticide
Fluchloralin	N/A	N/A	N/A	0.50	Herbicide
Fonofos (Dyfonate)	N/A	20.00	70.00	0.10	Insecticide
Isofenphos (Amaze)	N/A	N/A	N/A	0.10	Insecticide
Malathion	N/A	200.00	800.00	0.10	Insecticide
Methyl Parathion	N/A	300.00	100.00	0.10	Insecticide
Metolachlor (Dual)	N/A	1000.00	3500.00	0.50	Herbicide
Metribuzin (Lexone-Sencore)	N/A	5000.00	500.00	0.50	Herbicide
Pebulate (Tillam)	N/A	N/A	N/A	0.50	Herbicide
Pendimethalin (Prowl)	N/A	2.00	N/A	0.50	Herbicide
Propachlor (Ramrod)	N/A	500.00	500.00	0.50	Herbicide
Prometon (Pramitol)	N/A	200.00	500.00	0.50	Herbicide
Propazine (Milogard)	N/A	1000.00	2000.00	0.50	Herbicide
Simazine (Princep)	4.00	70.00	70.00	0.50	Herbicide
Trifluralin (Treflan)	N/A	80.00	300.00	0.50	Herbicide
Terbufos (Counter)	N/A	5.00	5.00	0.10	Insecticide/nematocide
Vernolate (Vernam)	N/A	N/A	N/A	0.50	Herbicide

N/A = No MCL of HAL Established. *MCL = Maximum Contaminant Level- Maximum permissible level of a contaminant in water that is delivered to any user of a public water system.

**HAL's based on the concentration of a chemical in drinking water that is not expected to cause any adverse non carcinogenic effects with up to 14 consecutive days of exposure in a 10kg child, or up to ~7years (10% of lifetime) in a 70kg adult. Both values have a margin of safety.

Rainfall (inches) recorded prior to sampling.

1990	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.40	0.00	0.01	0.28	0.17	0.65	0.00	0.00	0.00	0.00	0.20
48 Hours	0.00	0.00	0.00	0.10	0.00	1.10	0.46	0.00	0.00	0.00	0.00	1.09
72 Hours	0.00	0.16	0.00	0.23	0.00	0.00	0.00	0.00	0.00	T	0.00	0.00
96 Hours	0.00	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.00	0.56	0.00	0.34	0.28	1.27	1.11	0.00	0.00	0.00	0.00	1.29

1991	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.15	0.18	0.23	0.13	1.16	0.08	0.08	0.00	T
48 Hours	0.12	0.00	0.12	0.00	0.00	T	0.00	0.00	0.00	0.04	0.00	0.00
72 Hours	0.00	0.00	0.00	0.00	T	0.00	0.00	0.00	0.00	0.15	0.27	0.03
96 Hours	0.00	0.00	T	0.00	T	0.12	0.72	0.00	0.00	0.32	0.00	0.30
Totals	0.12	0.00	0.12	0.15	0.18	0.35	0.85	1.16	0.08	0.59	0.27	0.33

1992	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	T	0.10	0.15	0.00	0.00	T	0.00	0.13	0.00	0.05	0.00
48 Hours	0.70	0.05	0.10	0.15	0.00	0.36	1.54	0.00	0.49	0.00	0.00	0.00
72 Hours	0.05	T	0.02	0.20	0.00	0.89	2.27	0.00	0.00	0.00	0.15	0.00
96 Hours	0.05	0.05	T	0.20	0.00	0.00	0.13	0.00	0.00	0.00	1.27	0.00
Totals	0.80	0.10	0.22	0.70	0.00	1.25	3.94	0.00	0.62	0.00	1.47	0.00

1993	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.54	0.00	0.02	0.30	0.72	0.00	0.24	0.00	0.00	0.00
48 Hours	0.82	0.00	0.19	0.00	0.10	0.00	0.26	0.00	0.28	0.00	0.16	0.00
72 Hours	0.65	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.02
96 Hours	0.05	0.00	0.00	0.00	0.00	0.67	0.00	0.00	0.00	0.00	0.00	0.18
Totals	1.52	0.00	0.73	0.00	0.12	0.97	0.98	0.00	0.52	0.00	0.26	0.20

1994	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00
48 Hours	0.05	T	0.00	0.00	0.02	0.00	0.24	0.00	0.00	0.00	0.37	0.00
72 Hours	0.00	0.07	0.00	0.00	0.52	0.00	0.38	0.00	0.00	0.00	0.00	0.00
96 Hours	T	T	0.00	0.02	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
Totals	0.29	0.07	0.00	0.02	0.54	0.00	0.64	0.00	0.00	0.00	0.50	0.00

1995	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	T	0.20	0.00	0.00	0.00	0.00	0.00	0.35	0.00
48 Hours	0.00	0.00	0.00	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72 Hours	0.00	0.00	0.45	T	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00
96 Hours	0.15	0.00	0.28	0.05	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.15	0.00	0.73	0.05	0.20	0.06	0.00	0.00	0.00	0.00	0.44	0.00

1996	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.00	0.67	0.25	0.00	1.24	0.00	0.00	0.00	0.20
48 Hours	0.00	0.00	0.08	0.00	0.39	0.35	0.00	0.37	0.00	0.00	0.59	0.33
72 Hours	0.00	0.00	0.19	0.00	0.00	T	0.00	0.35	0.00	0.80	0.00	0.00
96 Hours	0.00	0.07	0.00	0.30	T	0.25	0.00	0.00	0.00	0.31	0.00	0.00
Totals	0.00	0.07	0.27	0.30	1.06	0.85	0.00	1.96	0.00	1.11	0.59	0.53

1997	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.13	0.15	0.00	0.96	0.07	0.00	0.00	0.00	0.00	0.06
48 Hours	0.00	0.00	T	0.00	0.00	0.38	0.00	0.00	0.00	0.06	0.00	0.21
72 Hours	0.00	0.00	0.00	0.01	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.83
96 Hours	0.00	0.00	2.69	0.00	0.00	0.80	0.00	T	0.00	0.00	0.00	0.00
Totals	0.00	0.00	2.82	0.16	0.00	2.17	0.07	0.00	0.00	0.06	0.00	1.10

1998	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.28	0.00	0.00	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
48 Hours	0.03	0.00	0.00	0.00	0.31	0.00	2.50	0.00	0.02	0.00	0.00	0.00
72 Hours	0.00	T	0.00	0.45	0.00	0.00	T	0.00	0.00	0.00	0.29	0.00
96 Hours	0.02	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.70
Totals	0.33	0.00	0.00	0.48	0.51	0.00	2.50	0.00	0.02	0.00	0.29	0.70

1999	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.04	0.05	0.18	0.00	0.00	1.04	0.00	0.00	T	0.80	0.00	0.00
48 Hours	0.00	0.00	0.00	0.00	0.36	0.40	0.10	0.04	T	0.57	0.00	0.00
72 Hours	0.23	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00
96 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.25	0.00	0.00	0.00	0.03
Totals	0.00	0.05	0.18	0.00	0.36	1.44	0.48	0.29	0.00	1.37	0.00	0.03

2000	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.10
48 Hours	0.00	0.60	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
72 Hours	0.00	0.00	0.00	0.13	0.00	0.42	0.27	0.00	0.00	0.00	0.00	0.00
96 Hours	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.00	0.00	0.00	0.05
Totals	0.00	0.60	0.00	0.13	0.00	0.70	0.31	0.00	0.00	0.00	0.00	0.15

2001	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.02	0.00	0.00	0.09	0.00	0.00	0.13	0.00	0.00	0.00	0.00	0.00
48 Hours	0.00	0.07	0.00	0.00	0.00	0.04	0.00	0.03	0.00	0.00	0.00	0.00
72 Hours	0.02	0.40	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00
96 Hours	0.17	0.07	0.48	0.02	0.00	0.04	0.00	0.00	0.02	0.00	0.00	0.00
Totals	0.21	0.54	0.48	0.11	0.00	0.08	0.13	0.06	0.02	0.00	0.00	0.00

2002	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.62	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.22
48 Hours	0.00	0.75	0.42	0.45	0.02	0.00	0.00	1.12	0.00	0.00	0.00	0.00
72 Hours	0.00	0.00	0.00	0.00	1.45	0.00	0.00	0.00	0.00	0.20	0.00	0.00
96 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00
Totals	0.00	1.37	0.52	0.45	1.47	0.00	0.00	1.12	0.00	1.15	0.00	0.22

2003	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.00	0.00	0.72	0.04	0.00	0.00	0.00	0.00	0.00
48 Hours	0.00	0.00	0.00	0.00	0.38	0.00	0.52	0.00	0.17	0.01	0.00	0.00
72 Hours	0.00	0.09	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.12	0.50
96 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.78	0.50	0.00	1.49	0.02	0.00
Totals	0.00	0.09	0.00	0.72	0.38	0.72	1.34	0.50	0.17	1.50	0.14	0.50

2004	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.00	0.00	1.60	0.00	0.00	0.00	0.90	0.10	0.15
48 Hours	0.00	0.00	0.00	0.02	0.00	0.00	0.00	2.00	0.00	0.00	0.00	0.00
72 Hours	0.00	0.08	0.00	0.00	0.00	0.00	0.04	0.02	0.02	0.00	0.00	0.42
96 Hours	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	1.50	0.00	0.50	0.00
Totals	0.00	0.08	0.00	0.02	0.03	1.60	0.04	2.02	1.52	0.90	0.60	0.57

2005	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.05	0.00	0.04	0.10	0.15	0.88	0.00	1.80	0.00	0.00	0.00
48 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.22	0.00	0.00	0.41	0.00	1.20
72 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96 Hours	0.00	0.00	0.00	0.00	0.31	0.15	0.00	0.05	0.00	0.00	0.00	0.00
Totals	0.00	0.05	0.00	0.04	0.41	0.30	1.10	0.05	1.80	0.41	0.00	1.20

2006	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.04	0.08	0.00	0.00	0.00	0.21	0.22	0.00	0.05
48 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.08	0.00	0.00	0.00
72 Hours	0.00	0.45	0.00	0.00	0.00	0.00	0.00	0.00	0.68	0.27	0.00	0.00
96 Hours	0.00	0.00	0.00	0.17	0.00	0.00	0.00	1.85	0.02	0.00	0.68	0.00
Totals	0.00	0.45	0.00	0.21	0.08	0.00	0.15	1.85	0.99	0.49	0.68	0.05

2007	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.00	0.00	0.24	0.00	0.00	0.00	0.00	0.00	0.90
48 Hours	1.10	0.00	0.00	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30
72 Hours	0.00	1.50	0.47	0.00	0.20	0.00	0.00	0.00	0.00	0.00	0.00	0.00
96 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.00	0.00
Totals	1.10	1.50	0.47	0.55	0.20	0.24	0.56	0.00	0.00	0.00	0.00	1.20

2008	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.14	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00
48 Hours	1.10	0.02	0.00	0.55	0.45	1.92	0.14	0.00	0.00	0.00	0.00	0.00
72 Hours	0.00	0.06	1.40	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00
96 Hours	0.00	0.00	0.00	0.00	0.00	0.00	0.13	0.00	0.00	0.09	0.00	0.00
Totals	1.10	0.22	1.40	0.55	0.45	1.92	0.36	0.00	0.00	0.09	0.00	0.00

2009	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.07	0.00	0.00	0.00	0.26
48 Hours	0.00	0.00	0.00	0.04	0.38	0.10	0.00	0.00	0.00	0.28	0.84	0.00
72 Hours	0.61	0.00	0.24	0.27	0.15	0.15	0.00	0.00	0.90	0.00	0.02	0.00
96 Hours	0.18	0.15	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.02	0.04	0.16
Totals	0.79	0.15	0.24	0.31	0.71	0.25	0.00	0.11	0.90	0.30	0.90	0.42

2010	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42
48 Hours	0.00	0.00	0.35	0.00	0.00	0.00	0.00	0.77	0.00	0.00	0.00	0.00
72 Hours	0.01	0.00	0.00	0.60	0.00	0.00	0.90	0.00	0.00	0.75	0.00	0.00
96 Hours	0.00	0.08	0.00	0.59	0.00	1.50	0.00	0.00	0.00	0.00	0.00	0.00
Totals	0.03	0.08	0.35	1.19	0.00	1.50	0.90	0.77	0.00	0.75	0.00	0.42

2011	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.00	0.00	1.48	0.00	0.08	0.00	0.00	0.00	0.00	0.53	0.00	0.00
48 Hours	0.48	0.00	0.05	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.23
72 Hours	0.00	0.00	0.29	0.00	0.07	0.00	0.00	0.00	0.00	0.40	0.00	0.00
96 Hours	0.00	0.00	0.51	0.00	1.25	0.00	0.00	0.00	0.05	0.02	0.00	0.43
Totals	0.48	0.00	2.33	0.00	1.40	0.03	0.00	0.00	0.05	0.95	0.00	0.66

2012	January	February	March	April	May	June	July	August	September	October	November	December
24 Hours	0.25	0.11	0.37	0.00	0.57	0.00	0.00	0.00	0.17	0.65	0.52	0.04
48 Hours	0.25	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.20	0.14
72 Hours	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.00	0.55	0.00	0.00	0.00
96 Hours	0.16	0.00	0.00	0.00	0.00	0.10	0.00	0.00	0.02	0.00	0.00	0.00
Totals	0.66	0.11	0.37	0.00	0.67	0.10	0.25	0.00	0.74	0.65	0.72	0.18

Rainfall (inches) Recorded from 1990-2011

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	Avg.
Jan	3.82	1.81	1.89	2.75	1.98	2.97	2.70	2.29	1.71	3.82	1.65	0.65	1.63	1.45	2.54	6.01	2.53	8.47	1.87	3.4	0.98	6.65	6.06	3.03
Feb	6.40	0.94	1.20	1.60	0.70	0.75	0.36	3.70	1.53	1.94	1.45	2.18	2.51	2.42	0.41	1.07	2.24	0.8	3.57	2.95	1.85	4.38	4.91	2.17
Mar	1.87	2.38	2.24	1.34	0.72	1.86	1.97	2.50	3.15	1.26	1.53	0.61	3.42	1.76	1.95	1.14	1.22	3.67	4.51	3.49	2.87	2.65	2.43	2.20
Apr	1.89	3.87	4.09	5.21	4.43	4.70	4.37	0.78	5.03	5.11	1.51	3.43	3.71	2.07	0.64	3.26	2.62	4.36	3.41	5.56	3.52	6.37	1.14	3.53
May	5.28	3.94	2.53	3.04	1.77	4.24	5.21	4.58	3.23	2.13	4.98	5.78	5.56	8.18	5.69	1.31	4.2	1.18	5.1	3.15	6.27	9.72	3.37	4.37
Jun	3.47	0.12	2.09	8.68	5.27	4.95	4.65	3.79	7.56	3.64	9.23	2.61	2.4	4.55	5.54	2.91	2.81	0.85	6.66	3.14	6.78	1.92	0.75	4.10
Jul	8.95	2.87	6.79	5.65	4.39	2.19	8.30	8.33	4.28	3.19	1.86	3.65	3.03	8.81	9.45	3.04	5.95	1.14	3.33	2.24	1.96	0.8	3.87	4.52
Aug	5.21	3.89	2.22	1.25	2.31	3.50	1.77	3.01	4.31	2.71	3.04	1.71	2.23	6.51	5.85	3.21	2.79	11.86	2.31	3.08	2.25	4.57	7.89	3.80
Sep	3.28	1.66	1.66	4.11	0.62	0.43	2.42	5.53	0.80	1.59	5.32	6.29	2.77	4.79	2.31	5.06	2.46	2.75	2.35	1.58	1.49	6.7	4.59	3.07
Oct	3.37	2.21	2.61	1.82	0.80	4.08	2.40	1.61	2.70	2.08	2.3	7.79	1.45	1.73	3.25	1.28	5.19	2.67	3.26	6.36	2.13	4.51	4.4	3.04
Nov	2.31	1.05	5.51	4.13	3.56	2.63	5.56	2.74	1.89	1.25	1.9	7.76	2.91	2.99	3.66	3.19	1.65	3.85	2.44	1.37	4.35	5	1	3.16
Dec	7.10	1.10	1.33	1.56	2.59	1.10	0.00	1.73	0.93	2.51	3.2	0.37	2.198	2.86	2.16	2.99	4.71	4.41	3.54	2.77	1.11	4.87	3.36	2.54
total/ year	52.95	25.84	34.16	41.14	29.14	33.40	39.71	40.59	37.12	31.23	37.97	42.83	33.82	48.12	43.45	34.47	38.37	46.01	42.35	39.09	35.56	58.14	43.77	39.53

		Nitrogen (ppm)$^{+}$					Phosphorus (ppm)$^{++}$				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
1989	June	70.90	78.00	N/S	N/S	74.45	N/S	N/S	N/S	N/S	N/S
	July	*	7.10	2.80	32.10	10.50	*	*	0.30	N/S	0.10
	August	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	September	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	October	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S	N/S
	November	8.90	10.60	4.30	N/S	7.93	N/S	N/S	N/S	N/S	N/S
	December	22.00	*	*	N/S	7.33	0.40	0.20	1.40	N/S	0.67
1990	January	N/S	7.00	3.80	4.40	5.07	N/S	0.20	0.60	0.30	0.37
	February	N/S	50.00	33.00	28.00	37.00	N/S	*	0.30	0.30	0.20
	March	N/S	9.60	7.60	8.60	8.60	N/S	*	0.20	0.20	0.13
	April	N/S	15.60	14.20	13.80	14.53	N/S	0.30	0.50	0.40	0.40
	May	N/S	7.50	2.90	4.10	4.83	N/S	0.10	0.20	0.10	0.13
	June	13.00	17.00	15.00	13.00	14.50	0.20	0.30	0.40	0.40	0.33
	July	N/S	5.30	1.90	5.50	4.23	N/S	0.10	0.30	0.20	0.20
	August	N/S	1.00	8.00	7.00	5.33	N/S	*	0.39	*	0.13
	September	N/S	0.50	5.50	2.70	2.90	N/S	*	0.60	0.23	0.28
	October	N/S	1.30	11.00	4.40	5.57	N/S	0.30	2.10	1.10	1.17
	November	4.30	3.90	5.00	6.00	4.80	0.50	*	0.50	*	0.17
	December	N/S	0.20	0.10	0.70	0.33	N/S	6.60	2.40	7.40	5.47
1991	January	N/S	3.40	6.00	6.20	5.20	N/S	*	0.20	0.20	0.13
	February	N/S	5.60	4.90	5.20	5.23	N/S	0.10	0.20	0.10	0.13
	March	N/S	5.10	4.80	4.70	4.87	N/S	*	0.20	*	0.07
	April	N/S	5.40	21.00	24.00	16.80	N/S	*	*	*	*
	May	N/S	3.80	4.30	4.90	4.33	N/S	*	0.10	0.20	0.10
	June	7.20	8.60	6.40	8.20	7.60	*	*	0.00	0.25	0.06
	July	N/S	3.90	7.00	1.50	4.13	N/S	0.00	0.00	1.00	0.33
	August	N/S	0.10	2.90	2.90	1.97	N/S	*	*	1.00	0.33
	September	N/S	*	6.00	2.20	2.73	N/S	*	*	*	*
	October	N/S	0.50	9.80	0.50	3.60	N/S	*	*	*	*
	November	7.90	8.80	7.90	7.20	7.95	*	*	0.10	*	0.03
	December	N/S	8.50	3.30	3.00	4.93	N/S	0.10	*	0.10	0.07
1992	January	N/S	12.00	7.40	10.00	9.80	N/S	0.10	0.30	0.20	0.20
	February	N/S	9.90	7.40	8.30	8.53	N/S	*	*	*	*
	March	N/S	7.50	5.20	7.00	6.57	N/S	*	*	*	*
	April	N/S	7.50	5.00	7.00	6.50	N/S	*	0.20	*	0.07
	May	N/S	4.80	1.80	6.30	4.30	N/S	0.30	*	0.20	0.17
	June	12.00	14.50	15.00	15.00	14.13	*	*	0.10	0.20	0.08
	July	N/S	6.50	7.00	7.00	6.83	N/S	0.30	0.10	0.10	0.17
	August	N/S	2.70	3.40	4.30	3.47	N/S	*	*	*	*
	September	N/S	2.00	2.60	1.10	1.90	N/S	0.20	0.10	0.10	0.13
	October	N/S	2.80	3.50	3.30	3.20	N/S	*	*	*	*
	November	4.80	4.90	4.30	6.00	5.00	0.40	0.30	0.20	0.30	0.30
	December	N/S	4.40	4.60	4.80	4.60	N/S	*	0.10	*	0.03

		Nitrogen (ppm)+					Phosphorus (ppm)++				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
1993	January	N/S	4.10	3.80	4.20	4.03	N/S	0.20	0.20	0.20	0.20
	February	N/S	4.40	4.50	4.50	4.47	N/S	*	*	*	*
	March	N/S	4.90	4.20	4.70	4.60	N/S	*	0.10	*	0.03
	April	N/S	4.10	3.00	3.80	3.63	N/S	*	*	*	*
	May	N/S	3.40	3.90	3.80	3.70	N/S	*	*	*	*
	June	4.30	5.70	6.10	8.20	6.08	*	*	*	*	*
	July	N/S	16.00	13.00	8.80	12.60	N/S	0.21	0.19	0.15	0.18
	August	N/S	1.50	6.30	*	2.60	N/S	*	*	*	*
	September	N/S	*	3.40	3.60	2.33	N/S	*	*	*	*
	October	N/S	2.00	2.40	6.00	3.47	N/S	0.10	*	*	0.03
	November	*	*	4.80	5.80	2.65	*	*	*	*	*
	December	N/S	5.20	5.00	5.70	5.30	N/S	*	*	*	*
1994	January	N/S	3.60	5.51	4.38	4.50	N/S	0.10	0.10	0.14	0.11
	February	N/S	2.20	3.20	3.90	3.10	N/S	*	*	*	*
	March	N/S	3.80	3.40	3.80	3.67	N/S	*	*	0.20	0.07
	April	N/S	3.30	4.60	3.70	3.87	N/S	*	*	*	*
	May	N/S	4.10	4.70	4.60	4.47	N/S	*	*	*	*
	June	1.90	2.30	6.80	1.90	3.23	*	*	*	*	*
	July	N/S	11.70	8.50	11.60	10.60	N/S	0.18	*	*	0.06
	August	N/S	*	8.40	1.60	3.33	N/S	*	0.10	*	0.03
	September	N/S	*	9.80	4.40	4.73	N/S	*	0.11	*	0.04
	October	N/S	*	10.70	3.20	4.63	N/S	*	*	*	*
	November	0.70	*	5.20	6.60	2.95	0.21	*	*	0.26	0.12
	December	N/S	0.89	6.10	5.80	4.26	N/S	*	*	*	*
1995	January	N/S	5.60	4.90	5.90	5.47	N/S	0.67	0.94	0.76	0.79
	February	N/S	7.80	6.80	7.00	7.20	N/S	0.40	0.40	0.40	0.40
	March	N/S	10.20	7.40	8.30	8.63	N/S	0.42	0.57	0.51	0.50
	April	N/S	5.80	5.10	4.70	5.20	N/S	*	*	*	*
	May	N/S	6.50	4.80	5.60	5.63	N/S	0.10	0.10	0.40	0.20
	June	9.90	10.10	8.60	9.20	9.45	*	*	*	*	*
	July	N/S	8.60	8.50	7.30	8.13	N/S	*	*	*	*
	August	N/S	1.40	3.00	2.90	2.43	N/S	*	0.12	*	0.04
	September	N/S	0.39	8.20	4.20	4.26	N/S	0.20	0.20	0.20	0.20
	October	N/S	1.70	1.40	3.40	2.17	N/S	*	*	*	*
	November	0.94	1.60	5.00	5.20	3.19	0.90	0.90	2.20	2.20	1.55
	December	N/S	5.30	8.60	7.80	7.23	N/S	*	7.30	*	2.43

		Nitrogen (ppm)					Phosphorus (ppm)$^{++}$				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
1996	January	N/S	1.90	5.70	5.70	4.43	N/S	0.10	*	0.27	0.12
	February	N/S	8.90	8.00	6.90	7.93	N/S	*	*	*	*
	March	N/S	11.60	10.80	12.10	11.50	N/S	0.19	0.23	0.18	0.20
	April	N/S	9.80	7.40	9.20	8.80	N/S	0.12	0.54	0.30	0.32
	May	N/S	14.10	11.70	14.20	13.33	N/S	*	0.10	0.12	0.07
	June	8.70	9.14	7.10	7.70	8.16	*	*	0.16	*	0.04
	July	N/S	6.00	7.60	7.60	7.07	N/S	0.60	0.40	*	0.33
	August	N/S	8.20	7.40	7.50	7.70	N/S	*	0.13	*	0.04
	September	N/S	0.84	17.50	2.60	6.98	N/S	*	0.50	*	0.17
	October	N/S	0.69	6.80	2.00	3.16	N/S	*	0.21	0.16	0.12
	November	1.00	2.20	2.80	3.30	2.33	*	0.20	0.20	0.17	0.14
	December	N/S	8.40	6.80	7.20	7.47	N/S	0.12	0.14	0.14	0.13
1997	January	N/S	6.10	4.30	5.50	5.30	N/S	*	*	*	*
	February	N/S	3.20	3.00	3.20	3.13	N/S	0.12	*	0.14	0.09
	March	N/S	6.80	6.10	6.40	6.43	N/S	*	*	*	*
	April	N/S	5.60	5.30	6.60	5.83	N/S	*	*	*	*
	May	N/S	4.40	5.40	4.90	4.90	N/S	*	0.20	*	0.07
	June	N/S	5.90	5.80	5.40	5.70	N/S	0.12	0.10	0.10	0.11
	July	N/S	13.60	9.40	8.00	10.33	N/S	*	*	*	*
	August	N/S	0.77	6.00	1.50	2.76	N/S	*	0.22	*	0.07
	September	N/S	*	*	1.30	0.43	N/S	*	*	*	*
	October	N/S	3.10	7.90	0.71	3.90	N/S	0.18	0.33	0.11	0.21
	November	N/S	2.50	7.20	4.50	4.73	N/S	0.15	0.60	*	0.25
	December	N/S	10.30	7.50	7.10	8.30	N/S	0.18	0.19	0.18	0.18
1998	January	N/S	7.90	5.50	4.90	6.10	N/S	0.18	0.31	0.29	0.26
	February	N/S	7.10	6.80	6.00	6.63	N/S	*	0.15	0.15	0.10
	March	N/S	7.30	5.80	5.50	6.20	N/S	*	0.15	*	0.05
	April	N/S	6.90	4.70	5.30	5.63	N/S	*	*	*	*
	May	N/S	6.20	4.90	3.30	4.80	N/S	*	0.28	*	0.09
	June	7.30	10.30	14.00	6.30	9.48	0.12	*	*	0.19	0.08
	July	N/S	9.90	6.00	6.30	7.40	N/S	0.17	0.23	0.23	0.21
	August	N/S	1.70	6.80	2.40	3.63	N/S	0.20	0.40	*	0.20
	September	N/S	0.32	10.20	2.60	4.37	N/S	*	0.10	*	0.03
	October	N/S	*	9.84	4.10	4.65	N/S	*	0.40	0.10	0.17
	November	0.41	1.10	10.10	6.20	4.45	0.40	0.30	0.30	0.20	0.27
	December	N/S	8.40	5.30	2.00	5.23	N/S	*	*	*	*

		Nitrogen (ppm)[+]					Phosphorus (ppm)[++]				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
1999	January	N/S	4.50	1.60	2.10	2.73	N/S	*	0.10	0.30	0.13
	February	N/S	7.20	5.40	5.80	6.13	N/S	*	*	*	*
	March	N/S	5.80	5.30	5.30	5.47	N/S	0.10	0.20	*	0.10
	April	N/S	3.70	2.40	2.20	2.77	N/S	*	0.30	0.10	0.13
	May	N/S	8.70	6.20	7.40	7.43	N/S	*	0.20	0.30	0.17
	June	15.00	16.00	13.90	17.00	15.48	0.20	0.30	0.20	0.10	0.20
	July	N/S	0.31	8.00	1.90	3.40	N/S	*	0.10	*	0.03
	August	N/S	1.20	4.40	0.42	2.01	N/S	*	*	*	*
	September	N/S	*	8.70	0.69	3.13	N/S	*	0.20	0.10	0.10
	October	N/S	*	3.50	1.40	1.63	N/S	0.50	0.60	0.70	0.60
	November	0.45	*	10.10	6.30	4.21	0.10	0.10	0.30	0.30	0.20
	December	N/S	0.25	8.82	2.34	3.80	N/S	*	0.13	0.17	0.10
2000	January	N/S	0.65	9.70	4.60	4.98	N/S	0.11	0.14	0.10	0.12
	February	N/S	1.90	8.80	6.30	5.67	N/S	0.11	0.20	0.17	0.16
	March	N/S	13.40	6.00	9.60	9.67	N/S	0.10	0.28	0.11	0.16
	April	N/S	11.40	8.00	9.90	9.77	N/S	0.66	*	*	0.22
	May	N/S	11.60	9.40	9.50	10.17	N/S	*	0.43	0.14	0.19
	June	13.50	20.00	12.80	16.20	15.63	0.26	0.40	0.40	0.33	0.35
	July	N/S	*	11.40	9.80	10.60	N/S	*	0.38	*	0.13
	August	N/S	0.37	9.80	2.40	4.19	N/S	0.13	0.53	0.34	0.33
	September	N/S	0.53	6.11	1.53	2.72	N/S	0.20	0.44	0.28	0.31
	October	N/S	*	8.82	4.20	4.34	N/S	*	*	*	0.00
	November	*	1.05	10.70	3.61	3.58	*	0.10	0.10	0.19	0.10
	December	N/S	7.80	9.00	6.60	7.80	N/S	2.50	0.68	1.70	1.63
2001	January	N/S	9.00	8.50	8.10	8.53	N/S	0.22	*	2.40	0.87
	February	N/S	9.44	6.24	6.34	7.34	N/S	0.11	0.19	0.16	0.15
	March	N/S	12.12	9.66	9.23	10.34	N/S	*	*	*	0.00
	April	N/S	2.07	2.64	1.82	2.18	N/S	*	*	*	0.00
	May	N/S	13.84	8.94	9.68	10.82	N/S	*	0.61	0.27	0.29
	June	13.13	13.11	10.74	10.78	11.94	*	0.16	0.21	0.10	0.12
	July	N/S	3.81	7.36	2.29	4.49	N/S	0.11	0.23	0.25	0.20
	August	N/S	*	6.90	0.00	3.45	N/S	*	0.34	0.30	0.21
	September	N/S	*	11.60	0.00	5.80	N/S	*	0.21	0.25	0.15
	October	N/S	12.32	42.00	19.70	20.57	N/S	0.11	0.28	0.18	0.19
	November	*	7.98	7.22	6.39	3.40	*	*	0.18	0.11	0.07
	December	N/S	9.22	8.06	7.69	8.32	N/S	*	0.11	0.12	0.08

		Nitrogen (ppm)[+]					Phosphorus (ppm)[++]				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
2002	January	N/S	9.49	10.01	4.60	8.03	N/S	0.11	0.14	0.10	0.12
	February	N/S	7.76	7.82	6.30	7.29	N/S	0.11	0.20	0.17	0.16
	March	N/S	9.13	6.71	9.60	8.48	N/S	0.10	0.28	0.11	0.16
	April	N/S	9.00	7.64	9.90	8.85	N/S	0.66	*	*	0.22
	May	N/S	11.40	9.27	9.50	10.06	N/S	*	0.43	0.14	0.19
	June	7.42	8.34	7.57	16.20	9.88	0.26	0.40	0.40	0.33	0.35
	July	N/S	2.84	6.37	9.80	6.34	N/S	*	0.38	*	0.13
	August	N/S	*	5.17	2.40	3.79	N/S	0.13	0.53	0.34	0.33
	September	N/S	2.01	8.89	1.53	4.14	N/S	0.20	0.44	0.28	0.31
	October	N/S	1.43	7.80	4.20	4.00	N/S	*	*	*	0.00
	November	0.22	3.25	10.93	3.61	3.64	*	0.10	0.10	0.19	0.10
	December	N/S	16.15	11.54	6.60	11.43	N/S	2.50	0.68	1.70	1.63
2003	January	N/S	20.50	17.61	12.01	16.71	N/S	0.25	0.39	0.38	0.34
	February	N/S	10.40	4.72	4.82	6.65	N/S	*	0.17	*	0.06
	March	N/S	5.82	4.16	3.67	4.55	N/S	0.25	0.24	0.21	0.23
	April	N/S	15.42	11.96	12.52	13.30	N/S	0.11	0.16	0.11	0.13
	May	N/S	6.31	3.66	4.94	4.97	N/S	*	0.13	*	0.04
	June	4.82	7.03	7.59	4.42	5.97	0.11	*	0.17	0.10	0.10
	July	N/S	18.02	12.12	6.61	12.25	N/S	0.18	0.13	0.13	0.15
	August	N/S	6.15	5.04	3.79	4.99	N/S	*	0.29	*	0.10
	September	N/S	2.41	2.03	2.54	2.33	N/S	0.41	0.40	0.43	0.41
	October	N/S	5.85	5.05	4.49	3.18	N/S	0.11	0.17	0.15	0.14
	November	3.19	2.86	5.66	3.07	2.18	*	*	0.14	0.10	0.06
	December	N/S	5.45	4.75	4.68	4.96	N/S	0.21	0.16	0.12	0.16
2004	January	N/S	6.74	6.31	5.22	6.09	N/S	0.41	0.28	0.30	0.33
	February	N/S	6.28	10.57	8.03	8.29	N/S	0.10	0.00	0.00	0.03
	March	N/S	5.89	4.76	5.62	5.42	N/S	0.12	0.15	0.16	0.14
	April	N/S	6.22	5.88	5.19	5.76	N/S	0.00	0.15	*	0.05
	May	N/S	1.80	5.46	2.04	3.10	N/S	0.14	0.35	0.15	0.21
	June	12.72	14.86	14.61	12.63	13.71	0.39	0.37	0.55	0.24	0.39
	July	N/S	3.56	6.35	3.01	4.31	N/S	0.10	0.20	0.11	0.14
	August	N/S	1.85	2.12	2.02	2.00	N/S	0.26	0.24	0.48	0.33
	September	N/S	2.19	2.14	1.60	1.98	N/S	0.18	0.23	0.63	0.35
	October	N/S	1.23	4.22	4.24	2.82	N/S	0.14	0.31	0.24	0.23
	November	4.50	4.15	4.95	4.28	2.31	0.11	0.00	0.20	0.14	0.09
	December	N/S	5.96	4.98	4.49	5.14	N/S	0.35	0.36	0.31	0.34

		Nitrogen (ppm)$^{+}$					Phosphorus (ppm)$^{++}$				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
2005	January	N/S	5.70	4.10	4.73	4.84	N/S	0.39	0.29	0.31	0.33
	February	N/S	3.85	3.42	3.34	3.54	N/S	0.22	0.28	0.28	0.26
	March	N/S	4.28	4.58	4.11	4.32	N/S	0.26	0.21	0.24	0.24
	April	N/S	3.06	3.48	2.12	2.89	N/S	*	*	*	0.00
	May	N/S	5.45	5.08	4.47	5.00	N/S	*	*	*	0.00
	June	1.51	1.58	5.97	1.74	2.70	0.10	*	0.22	0.17	0.12
	July	N/S	10.54	3.53	2.76	5.61	N/S	0.12	0.23	0.24	0.20
	August	N/S	0.00	10.10	0.00	3.37	N/S	0.21	0.37	0.16	0.25
	September	N/S	0.00	3.03	2.38	1.80	N/S	0.22	0.20	0.22	0.21
	October	N/S	9.96	4.88	5.72	3.53	N/S	0.34	0.25	0.19	0.26
	November	6.31	14.59	6.99	3.49	2.62	0.10	0.23	0.14	*	0.09
	December	N/S	9.54	8.90	7.17	8.54	N/S	*	*	*	0.00
2006	January	N/S	7.56	5.98	6.28	6.61	N/S	0.41	0.38	0.37	0.39
	February	N/S	9.45	7.70	6.69	7.95	N/S	*	0.19	0.18	0.12
	March	N/S	6.42	8.42	6.29	7.04	N/S	0.15	0.24	0.62	0.34
	April	N/S	4.51	4.65	5.97	5.04	N/S	1.26	1.32	1.12	1.23
	May	N/S	4.62	5.21	6.13	5.32	N/S	0.18	*	0.27	0.15
	June	7.29	8.49	8.02	6.58	7.60	*	0.10	0.28	0.16	0.14
	July	N/S	0.80	3.95	4.36	3.04	N/S	*	0.44	0.45	0.30
	August	N/S	*	7.03	1.15	4.09	N/S	0.12	0.38	0.23	0.24
	September	N/S	0.14	5.34	2.36	2.61	N/S	0.13	0.21	0.22	0.19
	October	N/S	*	4.10	4.39	2.83	N/S	*	0.38	0.35	0.24
	November	5.26	8.44	7.14	6.88	3.51	0.10	0.13	0.20	0.14	0.12
	December	N/S	6.73	5.56	5.63	5.97	N/S	0.25	0.25	0.23	0.24
2007	January	N/S	5.46	4.56	4.34	4.79	N/S	0.50	0.49	0.54	0.51
	February	N/S	6.08	7.23	6.07	6.46	N/S	0.00	0.16	0.18	0.11
	March	N/S	1.98	2.24	2.22	2.15	N/S	0.26	0.24	0.24	0.25
	April	N/S	7.34	5.80	6.00	6.38	N/S	0.24	0.32	0.28	0.28
	May	N/S	6.71	5.69	5.02	5.81	N/S	0.00	0.11	0.11	0.07
	June	0.76	0.32	7.62	1.85	2.64	0.00	0.12	0.13	0.00	0.06
	July	N/S	0.00	9.81	0.22	3.34	N/S	0.20	0.20	0.55	0.32
	August	N/S	0.00	12.56	1.13	4.56	N/S	0.14	0.20	0.18	0.17
	September	N/S	1.39	13.25	2.48	5.71	N/S	0.15	0.24	0.21	0.20
	October	N/S	0.70	9.70	1.20	3.63	N/S	0.00	0.14	0.00	0.05
	November	4.49	5.45	10.72	6.67	4.35	0.11	0.00	0.15	0.00	0.04
	December	N/S	8.78	7.81	6.27	7.62	N/S	5.80	0.67	0.58	2.35

		Nitrogen (ppm)$^{+}$					Phosphorus (ppm)$^{++}$				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
2008	January	N/S	6.88	4.54	4.18	5.20	N/S	0.10	0.17	0.15	0.14
	February	N/S	5.36	7.01	6.99	6.45	N/S	0.00	0.27	0.13	0.13
	March	N/S	2.44	2.13	2.61	2.39	N/S	0.39	0.40	0.41	0.40
	April	N/S	5.73	4.80	4.25	4.93	N/S	0.14	0.17	0.16	0.16
	May	N/S	3.32	4.31	3.27	3.63	N/S	0.00	0.45	0.00	0.15
	June	9.47	13.30	9.10	11.20	10.77	0.18	0.00	0.16	0.16	0.13
	July	N/S	7.87	7.31	6.82	7.33	N/S	0.14	0.22	0.24	0.20
	August	N/S	0.00	10.20	2.99	4.40	N/S	0.11	0.19	1.82	0.71
	September	N/S	0.00	13.30	5.23	6.18	N/S	0.14	0.16	0.14	0.15
	October	N/S	0.00	11.50	5.52	5.67	N/S	0.11	0.19	0.00	0.10
	November	0.00	0.00	6.93	4.80	2.93	0.00	0.18	0.00	0.58	0.19
	December	N/S	14.90	9.06	6.48	10.15	N/S	0.14	0.15	1.60	0.63
2009	January	N/S	8.83	6.58	6.79	7.40	N/S	0.18	0.20	0.19	0.19
	February	N/S	3.59	7.77	6.27	5.88	N/S	0.10	0.46	0.33	0.30
	March	N/S	9.01	7.06	6.60	7.56	N/S	0.12	0.16	0.15	0.14
	April	N/S	3.73	6.28	3.68	4.56	N/S	0.00	0.20	0.00	0.07
	May	N/S	8.70	7.16	6.78	7.55	N/S	0.27	0.21	0.26	0.25
	June	2.89	3.02	6.55	2.69	3.79	0.10	0.00	0.24	0.30	0.16
	July	N/S	6.54	6.63	0.05	4.41	N/S	0.10	0.30	0.15	0.18
	August	N/S	0.05	7.26	0.22	2.51	N/S	0.15	0.24	0.31	0.23
	September	N/S	0.21	8.09	2.44	3.58	N/S	0.10	0.15	0.10	0.12
	October	N/S	0.05	9.87	3.04	4.30	N/S	0.94	0.45	1.22	0.87
	November	11.10	3.78	4.28	3.07	1.84	0.36	0.21	0.25	3.07	0.88
	December	N/S	0.20	3.41	2.83	2.15	N/S	0.10	0.50	0.26	0.29
2010	January	N/S	6.37	8.76	7.27	7.47	N/S	*	0.32	0.18	0.25
	February	N/S	9.40	9.52	8.37	9.10	N/S	*	0.36	0.28	0.32
	March	N/S	8.62	5.28	7.51	7.14	N/S	*	0.14	0.11	0.13
	April	N/S	8.12	6.58	7.02	7.24	N/S	*	0.14	0.14	0.14
	May	N/S	11.00	9.56	9.19	9.92	N/S	*	0.15	0.12	0.14
	June	6.67	6.55	6.98	5.81	6.50	0.41	0.57	0.55	0.40	0.48
	July	N/S	5.59	6.66	3.84	5.36	N/S	0.25	0.24	0.12	0.20
	August	N/S	7.31	6.79	*	7.05	N/S	0.11	0.47	0.33	0.30
	September	N/S	*	9.52	3.87	6.70	N/S	0.16	0.54	0.50	0.40
	October	N/S	*	6.02	2.33	4.18	N/S	0.60	0.31	0.58	0.50
	November	*	*	9.95	4.31	7.13	0.51	0.24	0.41	1.80	0.74
	December	N/S	9.91	5.23	9.92	8.35	N/S	0.38	0.26	0.24	0.29

		Nitrogen (ppm)$^{+}$					Phosphorus (ppm)$^{++}$				
		TC-1	TC-2	TC-3	TC-4	AVG.	TC-1	TC-2	TC-3	TC-4	AVG.
2011	January	N/s	8.93	9.23	0.16	6.11	N/S	8.93	0.76	1.90	3.86
	February	N/S	3.91	8.06	6.05	6.01	N/S	0.45	0.69	0.80	0.65
	March	N/S	5.41	5.30	5.96	5.56	N/S	0.78	0.76	0.75	0.76
	April	N/S	5.44	5.49	6.35	5.76	N/S	0.20	0.42	0.02	0.21
	May	N/S	6.81	5.90	6.39	6.37	N/S	0.20	0.02	0.25	0.16
	June	5.81	5.65	6.88	5.80	6.04	N/S	N/S	N/S	N/S	N/S
	July	N/S	3.87	6.27	5.02	5.05	N/S	0.02	0.44	0.26	0.24
	August	N/S	0.18	8.02	0.15	2.78	N/S	0.53	0.77	0.68	0.66
	September	N/S	0.26	7.69	0.76	2.90	N/S	0.45	0.69	1.10	0.75
	October	N/S	4.78	5.17	3.12	4.36	N/S	0.02	0.46	0.50	0.33
	November	N/S	4.64	5.02	6.38	5.35	N/S	0.02	0.24	0.24	0.17
	December	N/S	2.45	2.53	3.40	2.79	N/S	0.65	0.61	0.60	0.62
2012	January	N/S	4.76	4.63	4.66	4.68	N/S	*	*	*	0.00
	February	N/S	4.46	3.75	4.22	4.14	N/S	*	*	*	0.00
	March	N/S	4.19	3.57	5.31	4.36	N/S	0.38	0.27	1.08	0.58
	April	N/S	2.91	3.92	3.42	3.42	N/S	*	*	0.32	0.11
	May	N/S	0.37	1.21	2.29	1.29	N/S	*	0.52	*	0.17
	June	0.31	0.39	3.43	0.6	1.18	*	*	0.33	*	0.08
	July	N/S	0.16	4.09	0.16	1.47	N/S	*	0.31	0.34	0.22
	August	N/S	0.17	4.31	0.47	1.65	N/S	0.55	0.28	0.45	0.43
	September	N/S	*	6.96	1.53	2.83	N/S	*	0.37	0.24	0.20
	October	N/S	3.68	6	1.04	3.57	N/S	*	0.33	*	0.11
	November	10.11	10.23	5.52	9.8	8.92	*	*	*	*	0.00
	December	N/S	14.1	32.1	23.2	23.13	N/S	*	0.27	*	0.09