Decorah Water Supply

Source Water Protection Plan

PWS #9630012

Prepared For
Decorah Water Supply

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Assistance Provided by
City of Decorah Water Department
City of Decorah
City of Decorah Wastewater Department
Northeast Iowa Resource Conservation and Development
Iowa Department of Natural Resources – Decorah Hatchery
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Introduction

Background of Source Water Protection

In 1974 the United States Congress enacted the Safe Drinking Water Act (SDWA) with the goal of providing safe drinking water for public water supplies and their users. The SDWA gave the United States Environmental Protection Agency (EPA) the authority to develop a uniform national drinking water protection program, and to establish standards for known or suspected drinking water contaminants. In 1996, Congress amended the SDWA to reflect a growing awareness of potential biological and chemical threats to drinking water. The amendment to the SDWA outlines a plan for communities to protect their own source and keep program effectiveness at the local level.

During 1998-1999, the Iowa Department of Natural Resources (IDNR) and the Iowa Geological Survey Bureau (IGSB) started developing a Source Water Protection Program for the State of Iowa. In October 1999, EPA approved the IDNR Source Water Protection Program, including the already active program of Wellhead Protection.

At this time, legislators in the State of Iowa indicated that Iowa will maintain a voluntary approach to Source Water Protection planning. A voluntary implementation (as opposed to regulatory) is appropriate for Iowa due to the uniqueness of each public water supply system. The voluntary approach also conveys a positive image of the Source Water Protection Program

Iowa Rural Water Association (IRWA) has taken an active role in developing Source Water Protection Plans for small communities. IRWA's mission in this regard is to provide technical assistance to small communities in developing Source Water Protection Plans to protect their drinking water supplies.

Currently, IRWA's Source Water Protection Program is serviced by two grants. One supplies a program through a USDA-FSA grant and another through the Iowa Department of Natural Resources (IDNR). The Decorah Water Supply Source Water Protection Plan has been developed through Iowa Rural Water Association's IDNR Source Water Protection Program

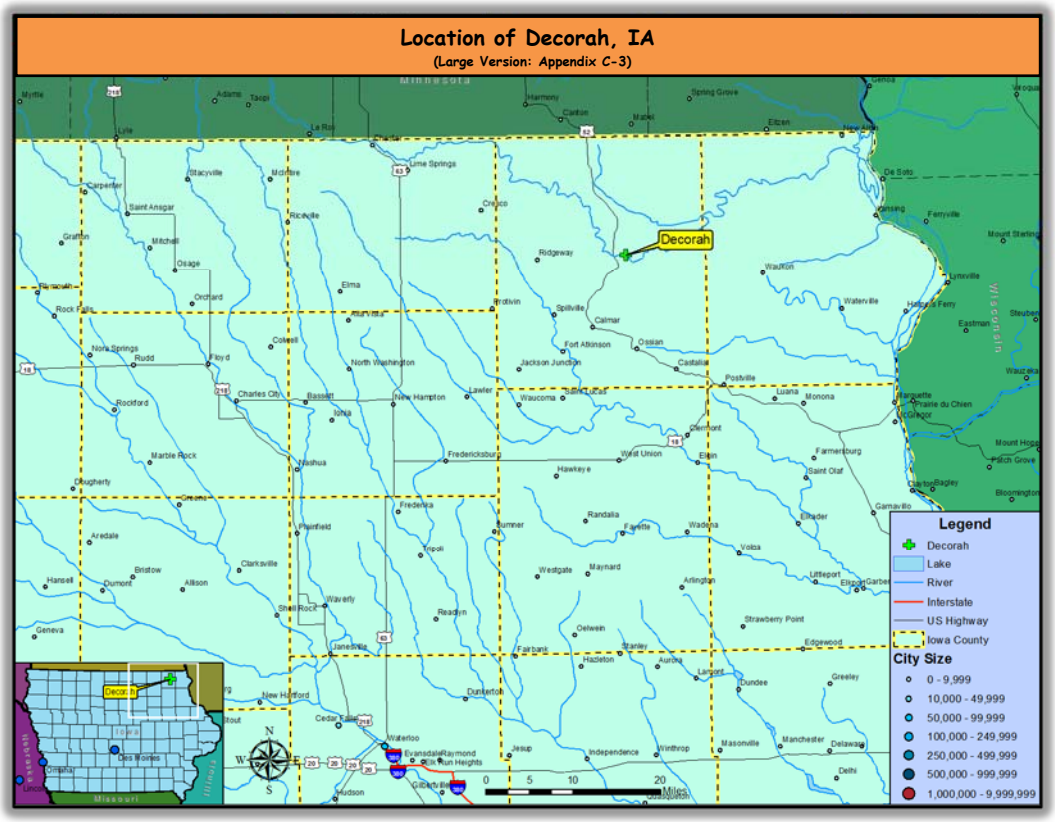
Purpose

The purpose of the Source Water Protection (SWP) plan is to provide an organized approach to effectively protect public water supplies from contamination. There are many important reasons for protecting the Decorah's drinking water source.

- Safeguard the health of community residents
- Prevent and reduce financial burdens caused by contaminated drinking water should it occur
- Educate and promote community awareness on drinking water contamination
- Safe drinking water is the life line of the community in the present and in the future
- Develop a contingency plan in the unlikely event that your drinking water supply would happen to become contaminated

Decorah Water Supply #9630012

Location



Decorah, IA is located in northeast Iowa's Winneshiek County. This area is one of the most unique in Iowa. The historic bluffs carved by the local rivers and stream make this one of Iowa's tourist destinations. Decorah is located along State Highway 9 and US Highway 52 on the banks of the Upper Iowa River. The utility's wells are located near the heart of Decorah in the alluvium of the Upper Iowa River and the underlying Cambrian-Ordovician Bedrock layer, St. Peter Formation.

Water Supply Information

Source

Decorah Water Supply operates six shallow wells, wells #1, #2, #3, #5, #6, and #7, in the alluvium of the Upper Iowa River. According to well records for well number #5, #6, #7, and possibly #1, these wells also tap a portion of the shallow St. Peter Formation. At the time this plan was written, the utility also operates a single deep well (well #8) drilled into multiple layers of the Cambrian-Ordovician sandstone in the airport industrial park. This well is not a focus of this source water protection plan due to potential changes that are occurring with the well and distribution system for this well.

Decorah Public Well Inventory

GeoSAM	Tag ID	Local Name	Drill Date	Aquifer	Depth	Status	Elevation	Bedrock Depth	Pump Test Date	SWL	PWL	Yield
52462	1010282	Decorah #8	5/26/2000	Cambrian-Ordovician	715	Active	1175	36	5/26/2000	316	340	102

Decorah Public Well Inventory												
GeoSAM	Tag ID	Local Name	Drill Date	Aquifer	Depth	Status	Elevation	Bedrock Depth	Pump Test Date	SWL	PWL	Yield
39057	1010288	Decorah #7	1/1/1980	Alluvial	70	Active	859	50	1/24/2001	12.8	32.1	unkn
19738	1010286	Decorah #5	1/1/1967	Alluvial, Cambrian-Ordovician	73	Active	859	52	N/A	N/A	N/A	N/A
39056	1010287	Decorah #6	1/1/1972	Alluvial, Cambrian-Ordovician	82	Active	859	62	1/24/2001	16.2	42.9	unkn
5885		Decorah #3	6/25/1953	Cambrian-Ordovician	934	Not Used	861	40	6/25/1953	27	205	155
39055	1010285	Decorah #3	1/1/1962	Alluvial	64	Active	862	63	1/24/2001	19.8	40.4	unkn
39058		Decorah #4	6/1/1958	Alluvial	59	Not Used	862	unkn	1/1/1958	13	36	600
39054	1010284	Decorah #2	1/1/1957	Alluvial	67	Active	861	59	1/24/2001	19.5	28.5	unkn
3473	1010283	Decorah #1	1/1/1948	Alluvial	62	Active	862	58	N/A	N/A	N/A	N/A
124		Decorah #1	10/1/1935	Cambrian-Ordovician	1250	Not Used	1060	38	1/1/1935	42	220	225

Customers

Decorah is the largest community in northeast Iowa. Decorah Water Supply serves approximately 8,200 residents and college students. These residents are served on approximately 2,500 connections. The community will typically use 700,000 gallons of water per day (gpd) during the winter and 1,300,000gpd during the summer months. During the summer months, Luther College uses city water as cooling mechanism for buildings on campus. Much of the 600,000gpd swing in water use is contributed to this activity. The utility has storage capabilities of a 750,000 gallon elevated storage tank and two ground storage reservoirs storing 375,000 gallons of water. To ensure that water is always available to the customer, the utility has a portable generator to provide power in the event of a power loss and an interconnection with the Freeport Water District in the event that Decorah cannot provide water to its customers.

Water Treatment

Decorah requires very little treatment to make the water safe to drink. The only treatment that the utility completes is the addition of chlorine for disinfection. This is a necessary addition to kill any bacteria in the water that could cause adverse health effects.

Known Water Quality Issues

Decorah has had or is experiencing water quality issues related to nitrate. Most wells show moderate to low levels of nitrate. There is a strong correlation in well #2 and #3 and to an extent well #5 to discharge in the Upper Iowa River. As the discharge increases, nitrate increases in the three wells. The highest nitrate sample in the last seven years was 9.6 parts per million (ppm) and the lowest sampled value was 1.4ppm. It is important to note, the highest value and the second lowest value, 1.6ppm, occurred in the same well as the highest sampled value. This indicates there is an outside influence on the nitrate source, not something that can be easily controlled or identified. Fluctuations in nitrate are likely closely

Nitrate Samples Over 6ppm 2007-Present		
Month-Year	Nitrate	Well #
July 2014	9.6ppm	2
July 2010	8.1ppm	2
July 2009	8.1ppm	2
July 2014	7.9ppm	3
July 2013	7.7ppm	2
July 2008	7.1ppm	2
July 2008	6.8ppm	3
July 2009	6.8ppm	3
July 2014	6.6ppm	5
July 2010	6.5ppm	3
January 2011	6.4ppm	3
April 2011	6.1ppm	2
June 2011	6.1ppm	3
January 2011	6.1ppm	2
Total Samples: 116		

Statistical Analysis of All Sampled Nitrate Values and Overall High – Low Ranking							
	Well #1	Well #2	Well #3	Well #5	Well #6	Well #7	All Wells
Mean	3.66 (109)	5.04 (39)	4.69 (52)	4.84 (47)	3.56 (115)	3.2 (134)	4.16
Median	3.7 (100)	5 (40)	4.6 (53)	5 (40)	3.6 (110)	3.2 (134)	3.9
Mode	3.7	5.8	6.8	5.3	3	3.1	4.4
Maximum	5.1 (36)	9.6 (1)	7.9 (4)	6.6 (9)	4.5 (56)	4 (83)	9.6
Minimum	2.7 (170)	1.6 (179)	1.4 (180)	2.8 (166)	2.5 (173)	2.1 (177)	1.4
Nitrate (Ranking); Nitrate as ppm; Ranking out of 174 Samples and six averages from August 2007-July 2014							

related to seasonal weather patterns, nutrient application timing, and tied to changes in the environment outside of the aquifer. There is notable correlation between the Upper Iowa River discharge and nitrate values, specifically with lower discharge values and low nitrate values.

Historically, there have also been significant detections of hazardous chemicals in the drinking water wells. These values have returned below safe drinking water standards. One example is Tetrachloroethylene, or PCE. This, and its subsequent degradation byproducts, were found in well #2, #5, #6 and #7, with the highest values in well #5. Well #2 only showed PCE one time, and it was a minimal value. PCE is a chemical that was used in the dry cleaning process. The PCE source was determined to be the former Classic Cleaners facility along College Drive, now the used lot for Weis Buick GMC. Iowa DNR Contaminated Sites division worked with the City to clean the site, and the site was listed as closed on 1/2/2007. During the mid-1990s other chemicals, such as those related to fuel and herbicides, were found in very low levels and only in one or two samples but have not been detected since.

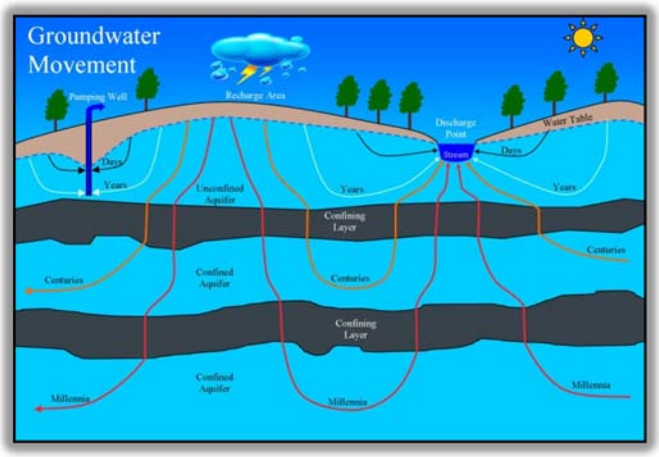
Hydrogeology

Over 80% of Iowan's obtain their drinking water from groundwater. Groundwater is found in aquifers that vary in depth, size and water quality. Many different aquifers are found and used in Iowa to supply quality drinking water to municipalities and private residences.

Along many of Iowa's Rivers we find surficial or unconfined aquifers. Surficial aquifers are generally made up of sand and gravel with little material overlying them. These are found in the modern river valleys, and are generally referred to as alluvial, drift, or buried channel aquifers. Alluvial aquifers are generally exposed to the surface and located next to modern day rivers. Drift aquifers are small rogue areas of sand and gravel that are generally small in nature and for the most part are only used for local or private wells, not community water supplies. Buried channel aquifers are very good sources of drinking water for all uses and mark out former river channels.

In most of Iowa we find confined aquifers located in the bedrock beneath the glacial till that makes Iowa well suited for farming activities. These aquifers provide a reliable source of good quality water in much of Central and Northeastern Iowa. From Central Iowa southward, the bedrock aquifers are rarely used. These aquifers are deeper as you move southwest across the state and the water generally contains higher amounts dissolved minerals. We like to see water stay in contact with the ground for extended periods of time because it tends to "clean" the water of harmful chemicals. If water stays in contact to long, it will dissolve minerals from the surrounding rock. This creates a very poor quality of water. These aquifers are still used in

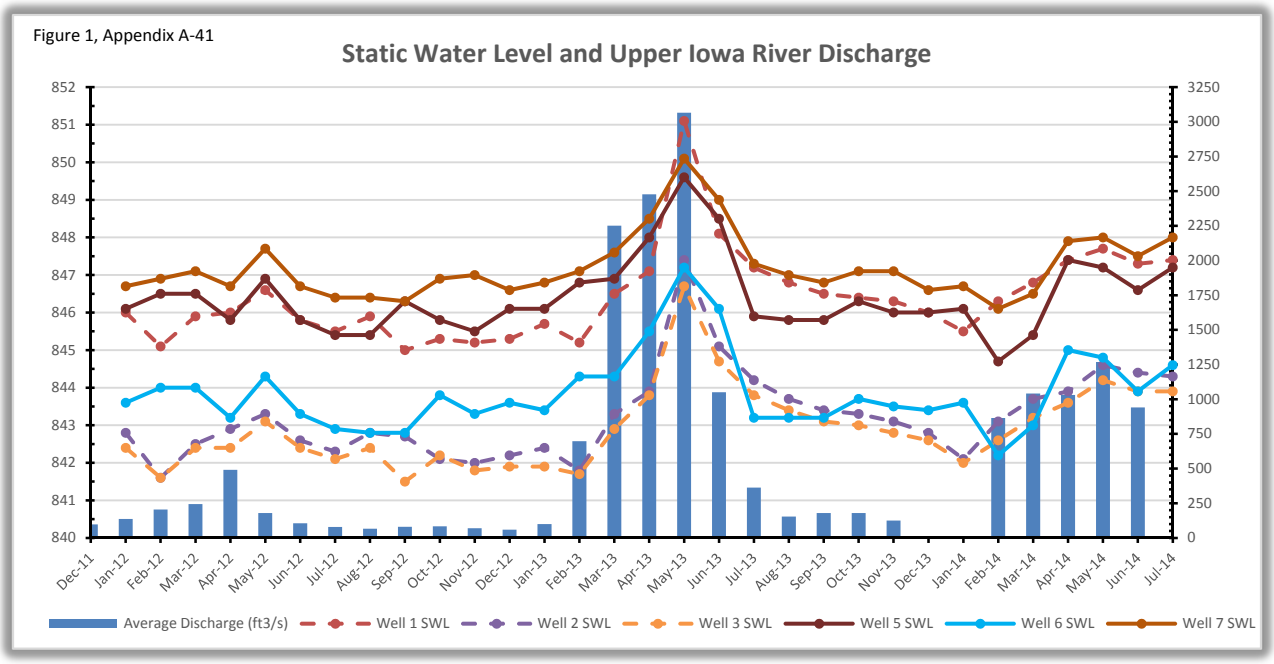
industries such as ethanol production because the wells produce plenty of water, and require little treatment to be used in these industries.



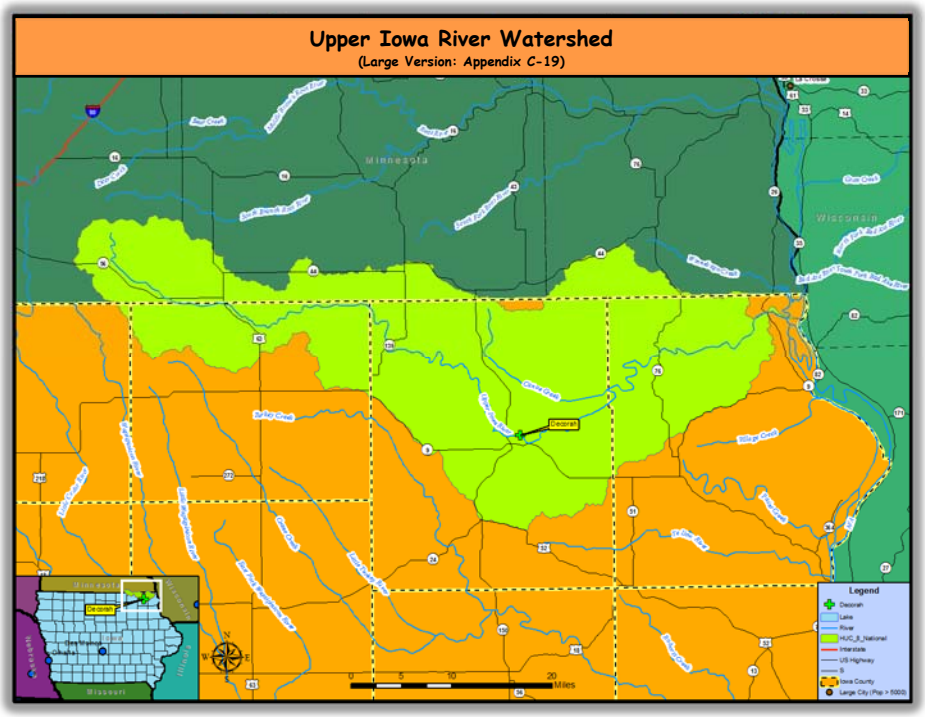
In Iowa, we are looking for aquifers that have good water quality, are easily recharged, and also have confining layers that are thick. Confining layers are layers of soil or rock that do not easily transmit water. These are generally made up of clay or shale and act as a confining unit depending on its thickness. This is very important when classifying a well as deep or shallow. Iowa's Administrative Code (IAC, Chapter 567-40.2) defines shallow and deep wells. If a well has a continuous layer of low permeable rock at least 25 feet below the grounds surface and is a minimum of 5 feet thick, a well is considered a deep well. If a well does not meet these criteria, the well is considered shallow. Deep wells are less susceptible to contamination, thus they are given lower susceptibility designations. Decorah Water Supply's wells do not meet these criteria. The overlying material is shallower and less than 5ft thick. This information was used to assign a ranking of **Highly Susceptible** to the alluvial aquifer due to the thickness of the confining layer. This indicates that the wells have the potential to be impacted by surface and subsurface contaminants such as leaking underground storage tanks and agricultural chemicals.

The Upper Iowa Alluvium is the primary aquifer used by the Decorah Water Supply. There are indications in both the discharge relationship with nitrate and static water levels that show a possible hydrologic and chemical connection between the aquifer and the Upper Iowa River. The 1998 Water Supply Sanitary Survey for the Decorah Water Supply indicated that the source is not under the direct influence of surface water. The chemical connectivity between the river and the groundwater cannot be confirmed as there is not sufficient data from the Upper Iowa River and the Decorah public water supply wells. Nitrate data are available for the Upper Iowa River near the Decorah Wells, however, it is limited to summer months. The time frame of the sample requirements for the public wells (quarterly) and monthly summer samples do not allow for good comparison between the two.

Figure 1 represents the relationship between the static water level and the discharge values from the Upper Iowa River. The discharge values are placed 1 month ahead of the recorded monthly average due to the day's the samples are drawn for monthly static water level measurements. This shows a very close relationship between static water levels and the amount of water moving

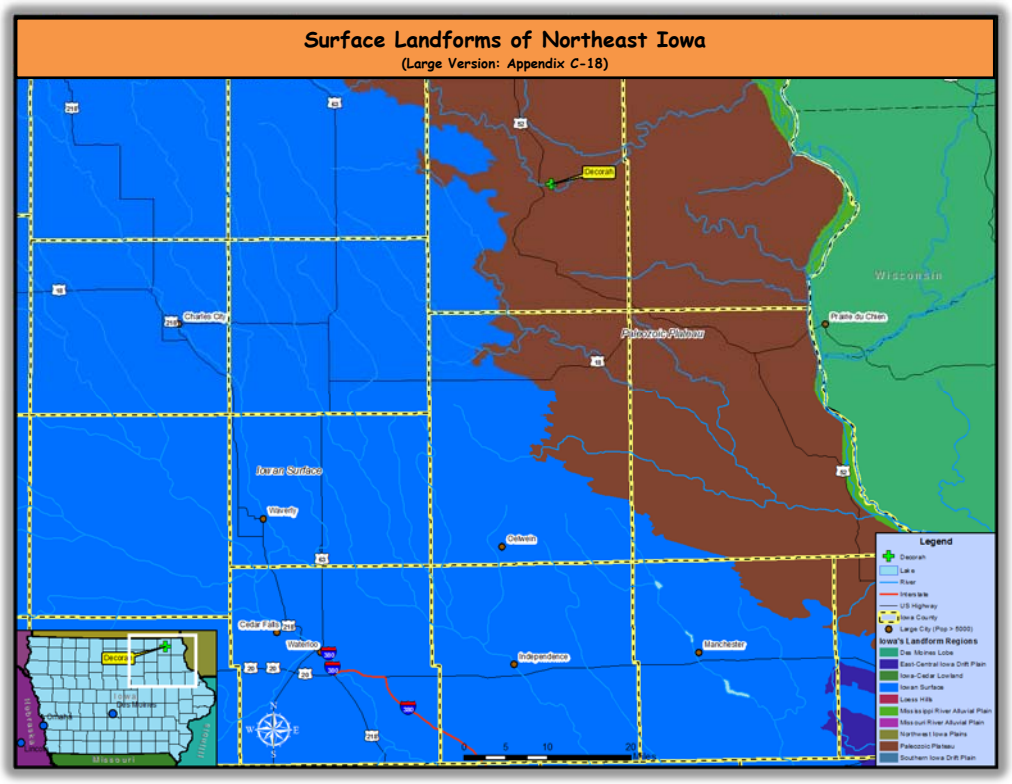


past the wells in the river. The more water in the river, the more that is available in the shallow alluvium next to the river. During drought periods, such as the summer of 2012, it appears that the river is the primary source of water for the aquifer. Analysis of the wells, and hydrogeology also lead to the possibility of upward recharge from the Cambrian – Ordovician Aquifer during dry periods. This is an excellent situation because it provides a continuous water source for Decorah.



The Upper Iowa River is a prominent watershed in northeast Iowa. This watershed covers a large area made up of a diversified land use. Land use is mostly row crop agriculture and grasslands (over 75% between the two) [Upper IA Watershed Assessment, Page 12]. The row crop agriculture is a significant source of nitrate in the river. Decorah lies near the center of the Upper Iowa

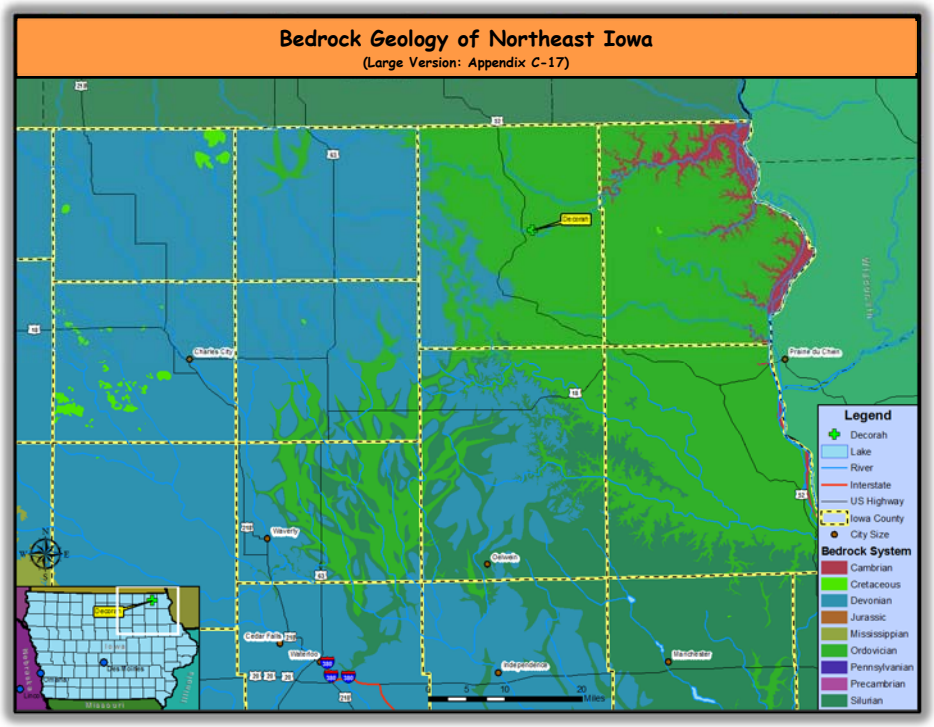
Watershed, and any water upstream of Decorah will flow past the public wells.



The dominant surface landform that Decorah lies on is the Paleozoic Plateau. The Paleozoic Plateau is made up of narrow valleys with very few glacial deposits. This region is a former tropical sea bed distinguished by the fossils that are found. The bedrock layers are resistant to erosion giving the region unique features such as caves and waterfalls. Large sinkholes are also numerous in this region and can act as pathways for contaminants to reach drinking water sources.

The second aquifer that wells #1, #5, #6, and #7 tap is the Cambrian-Ordovician aquifer. The Upper Iowa River has eroded much of this aquifer away in in the Upper Iowa River Valley where the wells are drilled. After examining cross section provided in the *Geologic Mapping for Water Quality Projects in the Upper Iowa River Watershed (Page 9)* it appears that the layers above the St. Peter sandstone have been removed. The St. Peter is 50-100ft thick and made of fine to medium grained sandstone and is recharged from the aquifers above. The above layers of the Cambrian era are Wise Lake/Dubuque and Dunleith formations. The limestone formations are extremely fractured "Karst" aquifers with numerous sinkholes and springs. In the valley, the only overlying material is the sand and gravel deposited by the Upper Iowa River. These two aquifers are hydrologically connected in the valley. Decorah only drilled a few feet into the bedrock to develop sumps for their water supply pumps. The differences in these wells vs those drilled only in the sand and gravel, indicate that the St. Peter may be impacting the water source.

The Ordovician Bedrock also makes up the bedrock surface across most of Decorah and



Winneshiek County. This directly overlies the Cambrian era bedrock. Traveling west/southwest, the Devonian bedrock becomes prominent and overlies the Cambrian-Ordovician bedrock surface. One unique feature that was identified in the late 2000's and confirmed in the early 2010's, is a meteorite impact structure beneath the City of Decorah that is estimated to be 470 million years old. This was confirmed during a partnership study of gravity to study basement bedrock conducted by USGS, Iowa DNR, and the Minnesota Geological Survey (Iowa Meteorite Crater Confirmed; (http://www.usgs.gov/newsroom/article.asp?ID=3521#.UulbF7RMFQJ). This has disrupted the bedrock layers below the St. Peter Sandstone making water availability below the St. Peter unknown in Decorah

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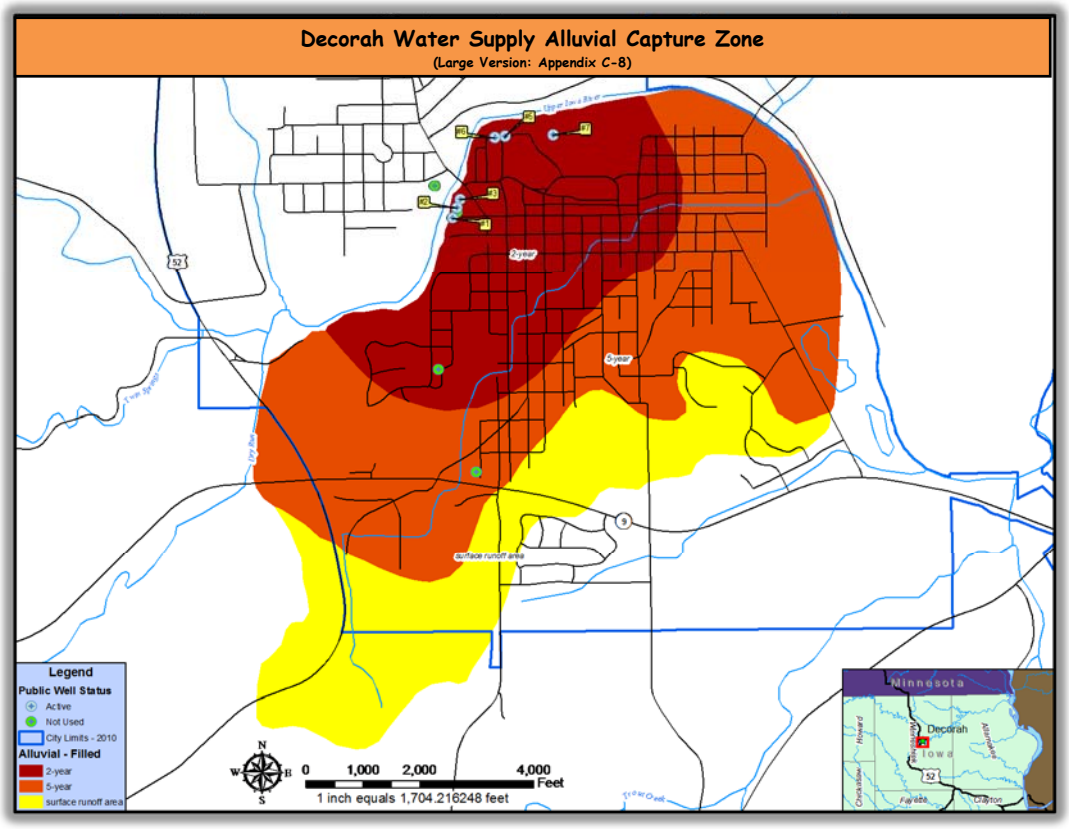
Decorah Water Supply Source Water Protection Plan

Capture Zone

The Decorah Water Supply operates wells in two different capture zones. The capture zones were modeled using an analytical model for the purpose of delineating source water protection areas. The primary capture zone is the alluvial capture zone where wells #1-#3 and #5-#7 are operated. The second is a minor capture zone and is not a focus of this Source Water Protection Plan. The second capture zone is for a Cambrian-Ordovician well located near the airport in a small industrial park. The committee is not focusing on this well for this source water protection plan due to the low quantity of water provided and the unknown future of the well.



The model has determined a 2-year, and 5-year of travel for both well fields. The Cambrian-Ordovician well also has a 10-year time of travel delineated. The alluvial well field also has a delineated surface runoff area. Water that falls in the surface runoff area has the potential to runoff into the capture zone and infiltrate in as recharge to the drinking water supply. Any contaminants that are dissolved in this water could impact the drinking water source.

A majority of the 2-year and 5-year time of travels are dominated by residential and commercial districts. The surface runoff area land use is mostly defined by agriculture and unusable land

acting as open space due to the changes in elevation. There are small areas of residential, but these areas are minimal.

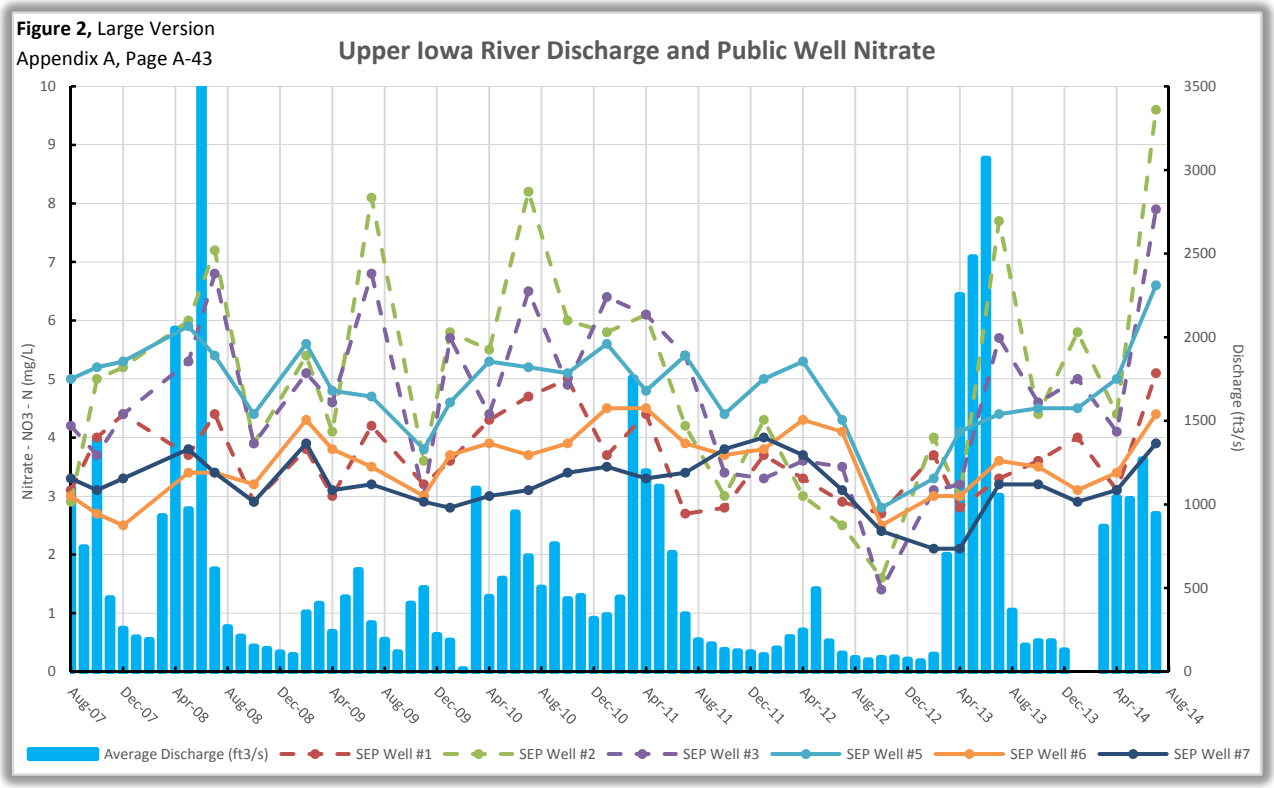
Potential Contaminant Inventory

There are numerous active and historical potential point source contaminants in Decorah. Many of the historical point sources are located in the historical downtown area near the active alluvial wells. Most of the active point sources of contamination are located near the outer reaches of the 5-year capture zone where the surface runoff area begins. Large scale non-point sources of contamination have not been identified in the time of travel portions capture zone.

Nitrate/Non-Point Source

Nitrate values ranges vary extremely depending on well construction, location, and local changes in the weather. The source of the non-point contamination could not be determined through this study. The primary sources of nitrate are lawn fertilizing, agriculture, manure or fertilizer spills, or leaking nitrogen/anhydrous ammonia tanks. With the exception of lawn fertilizing, the sources are absent in large quantities in the capture zone. The Well with the highest N Values, is well #2. This well is ~120ft from the Upper Iowa River, and is constructed only in the sand and gravel of the Upper Iowa River. This leads to the assumption that the nitrate contamination is from the watershed. Nitrate samples from the Upper Iowa indicate nitrate values higher than

Figure 2, Large Version
Appendix A, Page A-43



those found in the wells.

Figure 2 represents the changes in nitrate as discharge changes. Wells #2, #3, and #5 are similar

to increases in discharge. The other three wells have a small relationship with the correlation to the Upper Iowa River, but do not follow short term trends. The more water there is in the river, the higher the nitrate values are. The opposite is also true, the lower volumes of water in the river, the lower the nitrate values are. This is very evident during periods of drought. When the river had very low flows, the nitrate values were the lowest recorded, especially in wells #2 and #3. This is a correlation only, due to sampling requirements and sampling dates, the relationship cannot be confirmed due to lack of data and frequency of data collection for both Upper Iowa River and Decorah wells nitrate sampling.

Potential Point-Source Contaminant Sites

Major point sources of contamination in the primary protection area are minimal. Most locations have been closed, such as the PCE contamination that was found at the former Classic Cleaners location, now part of the Weis Buick Pre-Owned facility. Active point sources of contamination include active and closed underground storage tanks, facilities that use small quantities of chemicals, and active manufacturing facilities nearly a mile away from the wells. A file folder with the contaminated sites reports is available on the provided flash drive or by clicking the link E:\Decorah Contaminant-Land Use Inventory\.

Ranking Criteria

The potential contaminants are listed below alphabetically. The FieldID# links to the table of potential contaminants and numbers on the potential contaminant maps (appendix pages C-13 & C-14). The potential contaminants were ranked on 4 scales. The first was a 1-5 scale based on the chemical type and storage threat with 5 being the highest. The second was on the basis of the aquifer susceptibility. In Decorah, the aquifer being taken into consideration is an **alluvial aquifer** that is **highly susceptible** to contamination. All potential contaminants were given a ranking of 4 for aquifer susceptibility. The third scale was the capture zone the point was located in. If the contaminant was in the 2-year it was given a 3, 5-year was given a 2 and 10-year was assigned a value of 1. The assigned risk assessment was developed using the total risk number. The fourth scale was proximity to the well. This was formulated using mandatory setback distances of 200ft, 400ft, and 1000ft. If a contaminant was found in the 200ft setback, it was assigned a value of 4, in the 400ft a value of 3 was assigned, and a 1 was assigned if it was with in 1000ft. If the point was located out of the radiuses, it was assigned a 0. If a potential contaminant had a total risk value of 12 or larger, it was ranked as a High threat of contamination, 8-12 were ranked as a Moderate threat of contamination and 7 or lower received a Low threat of contamination. If a point was found in the far reaches of the capture zone and was closed, it was listed as a Slight risk of contamination.

The high risk locations are listed in the table below. The full contaminant inventory and other well locations (private wells, etc from the sourcewaterotherwells GIS Layer, 2013 edition) are listed in Appendix B.

Decorah Water Supply Potential Point Source Contaminant Inventory – High Risk Sites										
Field ID	Name	Address	Site Type	State Program ID	Status	Hazardous Material	Capture Zone	Proximity	Total Risk	Risk Ranking
10	City Hall		Solid Waste Facility		Closed	Landfill	2-Year	1000ft	13	High
13	Dans Standard	217 Washington St	Leaking Underground Storage Tank	9LTA06/ 198605816	Active	Gasoline	2-Year	N/A	14	High
16	Decorah Cleaners		Dry Cleaner		Active		2-Year	1000ft	12	High
18	Decorah Community Schools	NW Of Riverside and Center Ave Intersection	Private Well	72296	Active	Geothermal Well - Pump and Dump	2-Year	N/A	16	High
27	Hovden Oil	611 South Ave	Aboveground Storage Tank		Active	Gasoline, Heating/Fuel Oil, Diesel, Kerosene	5-Year	N/A	13	High
28	Hovden Oil Company	611 South St	Underground Storage Tank	198811683	Active	Gasoline, Diesel	5-Year	N/A	13	High
44	US Army Reserve Center	404 W Heivly St	RCRA - Hazardous Waste	IA0000594812	Active		2-Year	1000ft	12	High
45	Viking State Bank	321 W Water St	Leaking Underground Storage Tank - Closed	8LTW79/19860 8440	Closed	Gasoline	2-Year	N/A	12	High
46	Weis Buick Pre Owned Lot	110 College Dr	Leaking Underground Storage Tank - Closed	8LTO25/9LTH14 /198607503	Closed	Gasoline, Diesel, Used Oil	2-Year	400ft	14	High
49	Weis Buick Pre Owned Lot		Dry Cleaner	Contaminated Site ID: 1633	Closed	PCE	2-Year	400ft	14	High
51			Automotive Dealer		Active		2-Year	400ft	14	High
52			Automotive Dealer		Active		2-Year	200ft	14	High
Onsite Potential Point Source Contaminant Inventory completed on 5/11/2014, Inventory Completed 7/9/2014										

Other Wells in the Decorah Water Supply Capture Zone – Full list is available in Appendix B						
Map ID	Well ID	Well Source	Depth	Completion Date	Owner	Status
No private wells were found during the Potential Contaminant Inventory, a GIS layer list of possible wells is available in Appendix B, page B-9						

Decorah Water Supply Potential Non-Point Sources of Contamination				
Contaminant	Location	Type	Size/Amount	Description
Row Crop	Surface Runoff Area	Agriculture	~500 Acres	Agricultural farming of corn and bean cash crops requires numerous chemical inputs. These chemicals can impact the drinking water source by infiltrating in to the drinking water source and in runoff
Upper Iowa River	North, East, and west hydrologic boundary of the Alluvial capture zone	Surface Water	Edge of time of travel zones, not surface runoff area	Contaminants that are found in the Upper Iowa river, especially during flood periods, may impact the drinking water source through bank recharge and induced recharge due to pumping
High School Athletic Fields	Near well #7	Turf Grass	~13 Acres south of the levee	Application of chemicals and fertilizer to ensure healthy grass growth to support the heavy use
Residential Areas	Decorah Alluvial Capture Zone	Turf Grass	50% of the Capture Zone	Application of chemicals (fertilizer/pesticide) by homeowners to grow grass and suppress weeds

Decorah Water Supply Source Water Protection Committee							
Name	Affiliation	Email	Phone	Mailing Address	City	State	Zip
Brent Beste	IRWA	brentbeste@iowaruralwater.org	(515) 205-4026	4221 S. 22nd Ave E.	Newton	IA	50208

Decorah Water Supply Source Water Protection Committee							
Name	**Affiliation**	**Email**	**Phone**	**Mailing Address**	**City**	**State**	**Zip**
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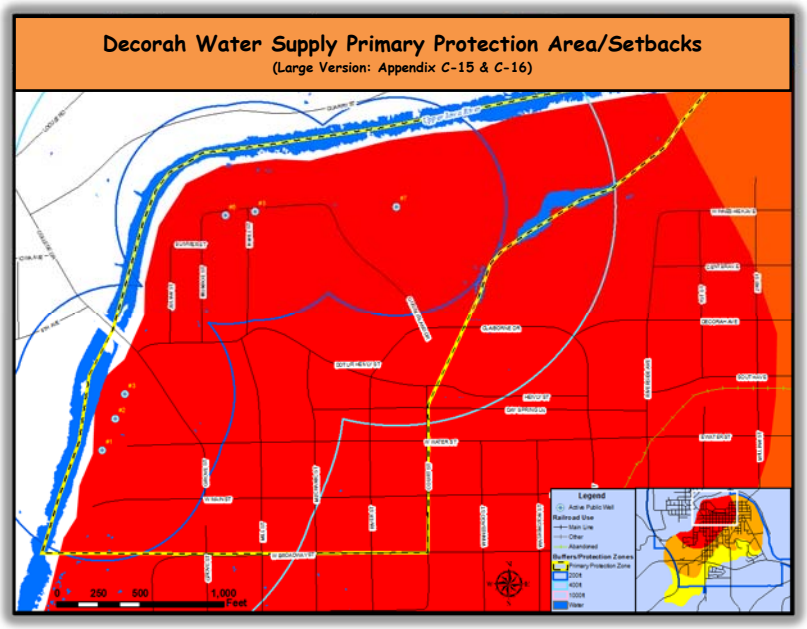
Chad Bird	City of Decorah – City Manager	citymanager@decorahia.org	(563) 382-3651	PO Box 138	Decorah	IA	52101
Michael O'Hara	City of Decorah – Wastewater	mohara@decorahia.org	(563) 382-3410	1766 Old Stage Rd	Decorah	IA	52101
Todd Ihde	City of Decorah – Water	decwat@decorahia.org	(563) 382-5171	800 W Water St	Decorah	IA	52101
Chad Kehrli	IDNR Field Office #1	Chad.kehrli@dnr.iowa.gov	(563) 927-2640	909 W Main Suite 4	Manchester	IA	52057
Don Arendt	City of Decorah – Mayor	mayor@decorahia.org	(563) 382-3651	PO Box 138	Decorah	IA	52101

Focus Area

The committee is focusing on a primary area near downtown Decorah and the alluvial wells. This is a modified version of the secondary protection area developed in the 1996 source water protection plan. This area was determined by examining hydrogeologic conditions, source water areas, and setback requirements as required by Iowa DNR. The main goals to protect this primary area are related to defining setback requirements, enforcing the 200ft radius of protection near the public wells, and ensuring that chemical contamination does not occur.



The main goal of this new primary protection area is to ensure a repeat of the Classic Cleaners contamination does not occur from existing or future chemical threats. The goal is also to mitigate the threat of contamination from deep geothermal systems. Combining the elimination of pathway and the storage of chemicals will decrease the threat of contamination to the public wells.

Watershed/Nitrate Focus

Due to the lack of nitrate sources in the drinking water capture zone, the committee is assuming that the nitrate source in the Decorah public wells is coming from the Upper Iowa River. This was determined through analysis of nitrate data (Decorah Water Department), Upper Iowa Discharge data (USGS), public well static and pumping water levels (Decorah Water Department), and historic aerial photography (Iowa DNR). The distance from the river and trending of nitrate during river and static water level changes have led the committee to believe that the nitrate impact is from the river. Well #5 is the only well that does not completely follow the distance from the river trend. Historical aerial photography indicate that a former river

channel (1930's Air Photo) and former ox bow lake lie (1950's, 1970's historical air photos) within 200ft of well #5.

Using this information, the Decorah source water protection committee decided to focus on gathering more nitrate data from the public wells and the Upper Iowa River near the public wells and working with the Upper Iowa River watershed group to mitigate the nitrate threat. The source water focus is going to be on how the City and Water Department can cooperate more with the watershed on water quality projects and education in the City of Decorah.

Management Strategies

Initial Projects Prepared: 6/11/2014, 6/13/2014
Small Committee Discussed and updated: 6/24/2014, updates finalized 7/9/2014
Project List Finalized by the Committee: 8/26/2014, Final Updates: 8/28/2014

1. **Open House Event at the Water or Wastewater Treatment facility to promote drinking water quality, Source Water Protection, and other water initiatives in Decorah**
    a. Cost: Staff Time, Educational Materials, Refreshments (if needed)
    b. Goal: Open House at the Wastewater Treatment Plant to Promote water/wastewater department activities
    c. Timeline: Fall 2014
    d. Contact:
        i. Todd Ihde, Water Superintendent, City of Decorah
        ii. Michael O'Hara, Wastewater Superintendent, City of Decorah
        iii. Educational Assistance: Brent Beste, Source Water Specialist, Iowa Rural Water Assn.
    e. Implementation Status: Committee Discussed

Project Description

This would be an educational event for the all residents of the City of Decorah to attend and learn about where their drinking water comes from, what the quality is, and how it gets to their home. This is an opportunity to really promote the City of Decorah Water Department to gain confidence from the community to implement projects that are high dollar to protect the drinking water source. This will also help promote other activities to the public such as leak detection, line locating, and why the system needs to be maintained.

Goal

The committee discussed conducting this event at either the water department office or the wastewater treatment plant. Either location is excellent, and will provide the customers of Decorah Water Department an opportunity to learn more about the system.

Covered Topics

- Water Treatment
- Wastewater Treatment
- Drinking Water Source & Protection
- Protection Management Strategies
- Watershed Protections
- Distribution System Maintenance

Potential Partners

- City of Decorah Water and Wastewater
- Iowa Rural Water Association
- Winneshiek County Soil and Water Conservation District
- Upper Iowa River Watershed
- Natural Resources Conservation Service

Decorah could implement this as an annual event to continue promotion of all activities and progress to the customers of the water department.

Results

The committee has discussed this management strategy.

2. **Guide the development of Geothermal Wells in the Primary Protection Area**
    a. Cost: Staff Time, Ordinance Development
    b. Goal: Ordinance/Planning Zoning
    c. Timeline: Spring 2017
    d. Contact:
        i. Chad Bird, City Manager, City of Decorah
    e. Implementation Status: Committee discussed

Project Description

This will alleviate the concerns of the existing no new wells in the City to allow for geothermal wells to be installed. Managing the type of geothermal systems that can be installed and where they can be installed will protect the water source in many ways. This can eliminate all forms of geothermal, specific types, require a city permit for installation to include a GPS location, etc. The goal is to prevent more contamination pathways than necessary from being developed, contamination from materials that can be used in geothermal wells, and the threat from improper construction of the wells.

Goal

- Work with local geothermal installers to develop guidance to protect the drinking water source
    - This would ensure that geothermal systems can be installed in the City. The existing ordinances ban all types of well installation
- Develop an ordinance containing the following
    - Ban the installation of new geothermal systems in the primary protection zone
    - Restrict the type of systems installed to horizontal systems in the sand and gravel of the upper Iowa River
    - Require that all systems use food grade materials as the liquid in the system
    - Require that all wells are constructed to drinking water standards (cased, sanitary seals, grouted)
    - Require a permit with a nominal fee to:

- GPS locate of the geothermal system
- Well Log Collected by the Code Enforcement Officer
- Ordinance Enforcement

Results

The committee has discussed this management strategy.

3. **Conduct weekly monitoring of the water supply wells and the Upper Iowa River for Nitrate in conjunction with the Decorah Wastewater Department Water Quality Lab**
    a. Cost: ~$.10/sample plus staff time for collection
    b. Goal: Weekly nitrate samples for each well and the Upper Iowa River
    c. Timeline:
    d. Contact:
        i. Todd Ihde, Water Superintendent, City of Decorah
        ii. Lora Friest, Executive Director, NE Iowa RC&D
    e. Implementation Status: Committee discussed

Project Description

Developing a monitoring plan for the water supply wells and the Upper Iowa River for nitrate will benefit the City and the Upper Iowa Watershed group as they work cooperatively to determine the nitrate impact on the Upper Iowa River. The City of Decorah has a certified lab at the wastewater department that has the ability and the willingness to run nitrate samples for the water department at very low cost.

The committee discussed the benefits for completing this project. This is a project that will collect information that is needed to apply for certain grants and funding opportunities for projects completed in the watershed. This information will also be useful for future well development (even though capacity is currently not an issue).

Goal

- Develop an internal sampling plan for nitrate
    - I.e.: Conduct weekly sampling for each water supply well and the Upper Iowa River to develop a continuous nitrate data set
- Conduct an intensive monitoring event (one fall, one spring) of the Upper Iowa River and the water supply wells (multiple nitrate samples per day) prior to and for multiple days after an upstream watershed rainfall event
    - This will give the utility an idea on how long it takes nitrate to travel through the aquifer
- Work with IIHR, IDNR and a PhD student to develop a hydrogeologic model of the Upper Iowa River Alluvial Aquifer and the Cambrian-Ordovician interaction

Results

This project has been discussed by the source water protection committee.

4. **Promote chemical application reduction and following guidelines for home application of lawn chemicals**
    a. Cost: Materials for brochures/printing/staff time
    b. Goal:
        i. Brochures and other educational material made available to the residents of Decorah
        ii. Place brochures and other information near lawn chemicals in locally owned retail outlets
    c. Timeline: Spring 2015
    d. Contact:
        i. Charles Lore, Council Member, City of Decorah
        ii. Educational Materials: Brent Beste, Source Water Specialist, Iowa Rural Water Assn.
    e. Implementation Status: Committee discussed

Project Description

Promoting chemical use changes by homeowners will help decrease the use of chemical fertilizers that may be attributing to the increased nitrate in groundwater and in surface water bodies. Educating the public on proper application will limit the loss through infiltration and runoff into the storm sewers.

Working with the private commercial applicators will also be a benefit. These applicators may or may not be applying the proper amounts for private lawns. Working to educate them on the water quality issues in Decorah may help decrease nutrient losses as well.

Goal

- Educational materials to promote protection efforts
    - Brochures (provided by IRWA)
    - Materials from other governmental agencies (provided by IRWA)
- Work with local business that sell chemicals for private application to post educational materials about over application
- Work with Private companies/applicators to decrease rates to only what is necessary
- Institute an ordinance banning the mowing of grass clippings onto city streets

Results

The committee has discussed this management strategy.

5. **Information booth at local festivals**
    a. Cost: Staff Time, educational materials, booth costs
    b. Goal: Educational booth to promote homeowner protection activities and SW Protection
    c. Timeline: When the opportunity arises
    d. Contact:
        i. Chad Bird, City Manager, City of Decorah

ii. Educational Assistance: Brent Beste, Source Water Specialist, Iowa Rural Water Assn.

e. Implementation Status: Committee discussed

Project Description

Having a booth at major community events is a great way to interact with the community to promote the activities of the water department, source water protection efforts, and where Decorah's drinking water comes from. Partnering with the other groups involved with water quality programs can also benefit to spread the overall word about water quality and benefits of implementing protection measures.

Goal

- Brent will be developing educational materials and locating materials that can be provided to interested booth visitors – Completed by Fall 2014
- The City will work to schedule booths and contact Brent for availability to assist with promoting source water efforts

Results

The committee has discussed this project and would like to see booths if opportunities arise at events like the Winneshiek County Fair and Decorah's Nordic Fest. The committee discussed partnering with other groups to share booth space so the City does not need to staff it 100% of the time.

6. **Work with the Decorah School District to minimize chemical application on the football fields**
    a. Cost: Staff time
    b. Goal: Have a discussion with the schools facilities manager, promote proper education
    c. Timeline: Fall 2014
    d. Contact:
        i. Todd Ihde, Water Superintendent, City of Decorah
    e. Implementation Status: Committee Discussed

Project Description

Currently, it is thought that there is no application on the school districts athletic fields (football field). The City owns the other athletic fields and does not apply any chemicals to the grass.

Goal

The Committee would like to have the water department visit with the school district to ensure that this is the case and if they are applying, that it is minimal amounts of chemicals or spot use in the areas.

Results

The committee has discussed this management strategy.

7. **Sanitary Sewer System Inspections**
    a. Cost: Staff Time, Liquid Smoke
    b. Goal: Complete smoke blowing in the primary protection area
    c. Timeline: Fall 2014/Spring 2015
    d. Contact:
        i. Todd Ihde, Water Superintendent, City of Decorah
        ii. Michael O'Hara, Wastewater Superintendent, City of Decorah
    e. Implementation Status: Committee Discussed

Project Description

Completing regular maintenance and inspections on the sanitary sewer system is good practice to ensure the system meets regulatory requirements. This also helps determine sources of I&I (infiltration and inflow). Any location where water can get into the system, water can also get out. Ensuring that water is not getting into the system will help make sure that the drinking water system is not compromised.

Sanitary sewers are also a source of one of the emerging contaminants in groundwater. Groundwater investigations in Ames, IA and Madison, WI have found traces of living viruses, pharmaceuticals, and other traces of human activity in deep wells. The wells where these contaminants were found were thought to be well protected from surface activities. There currently is no guidance or completed research to verify the source, but studies are leaning towards leaking sanitary sewers and sources of raw sewage.

Smoke blowing is a great starting point. When it is dry, it is possible that smoke will come out of the ground near locations where the sewer system is leaking. Iowa Rural Water Associations Wastewater Technicians are available to assist the City with this project at no cost to the city, with the exception of consumables such as the liquid smoke.

To follow up sources of smoke, using a sewer camera to visually inspect the location is a good idea before spending money on potentially costly repairs.

Goal

Conduct sanitary sewer smoke blowing in the primary protection are to ensure that the system is well protected and sewers are not leaking. Leaks from line breaks have been found in service lines and mains. Smoke blowing is a quick way to inspect all aspects of the existing system.

If there are threats that are found during smoke blowing, follow up with inspections using a sewer camera.

Results

The committee has discussed this management strategy.

8. **Promote Urban Storm Water Management for Homeowners**
    a. Cost: Staff time, Printing
    b. Goal:
        i. Educational materials made available to residents

ii. Demonstration projects completed by groups looking for service projects

c. Timeline:

d. Contact:

i. Charles Lore, Council Member, City of Decorah

ii. Educational Materials: Brent Beste, Iowa Rural Water Assn.

e. Implementation Status: Discussed

Project Description

Encourage residents and commercial/industrial facilities to install storm water management practices to minimize runoff and the chemicals that are in runoff such as excess nutrients or industrial waste. This can be done using brochures and other educational materials provided through the Source Water Protection Project.

Working with a community organization (i.e. Boy Scouts, Girl Scouts, 4H, etc.) that need to complete community service projects. These groups can install and at a minimum, maintain the practices through the establishment period. The projects may also inspire residents to do the same on their own properties.

Residents are eligible for SRF Loans through IDALS and the local SWCD to install management strategies.

Goal

- Filters/Filter Strips
- Rain Gardens in City parks
- Bio retention cells
- Bioswales
- Native grass planting

A demonstration project completed by groups looking for a community service project. This project can then be promoted to the rest of the community for installation on their own properties.

- Native grass planting around City Hall
- Rain garden at the edge of the City Hall parking lot
- Rain garden at the assisted living complex near well #5

Results

The committee has discussed this management strategy.

9. **Develop Urban Storm Water Management practices for the downtown area to improve infiltration and filter out excess nutrients and chemicals prior to reaching the storm water system during major upgrades/repairs**
    a. Cost: Staff time, Printing Costs
    b. Goal: Incorporate storm water management in street/downtown upgrades
    c. Timeline: As streets are repaired/redesigned
    d. Contact:
        i. Chad Bird, City Manager, City of Decorah
    e. Implementation Status: Committee discussed

Project Description

Considering large scale storm water management strategies as the downtown area of Decorah develops and partnering with commercial/industrial facilities to install storm water management practices to minimize runoff and the chemicals that are in runoff such as excess nutrients or industrial waste. This will add an element of natural areas to the city's core.

The City is eligible for SRF Loans through IDALS and the local SWCD to install management strategies. Many grants are also available through different organizations to install management strategies.

Goal

- Filters/Filter Strips
- Rain Gardens in City parks
- Bio retention cells
- Bioswales
- Native grass planting
- Porous Pavement

When completing redesigns on city streets in the downtown area, consider using porous pavers/concrete, or other storm water management techniques to drive infiltration and bio-removal/filtration of nutrients/chemicals in runoff from impervious surfaces

- Assistance may be available from Iowa Department of Agriculture and Land Stewardship Urban Conservation or IDALS Northeast Iowa Regional Coordinator

Results

The committee has discussed this management strategy.

10. **Construct a new well north of the Upper Iowa River outside of the existing flood plain for use in emergency situations such as flooding**
    a. Cost: To be determined by an engineering study

b. Goal: Well located north of the Upper Iowa River
c. Timeline: Revaluate Yearly
d. Contact:
    i. Chad Bird, City Manager, City of Decorah
    ii. Todd Ihde, Water Superintendent, City of Decorah
e. Implementation Status: Discussed

Project Description

This project is a goal for the City and is also included in the County/City Hazard Mitigation Plan. The City would like to install a well on the north side of the Upper Iowa River to ensure that water can be provided to residents in this area in the event of a natural disaster or loss of water lines crossing below the Upper Iowa River.

Discussion centered on existing hazards and issues with water quality. The concerns with radium and mineralization in deeper water, geologic issues such as sinkholes in karst conditions, and the potential issues related to the meteor impact structure below ground.

The City should contact Mike Anderson at IDNR Water Supply Engineering as a starting point, he may have ideas for funding and Chad Fields for water quality and geologic setting information/well forecast before contacting an engineer. The City should also discuss options with local drillers as they know the most about the regional geologic conditions.

- Mike Anderson: (515) 725-0336, Michael.anderson@dnr.iowa.gov
- Chad Fields: (515) 725-3407, chad.fields@dnr.iowa.gov

Goal

Install a new water supply well north of the Upper Iowa River to ensure continued availability of drinking water in the event that the water lines under the Upper Iowa River are damaged or a natural disaster causes water loss.

Results

The committee has discussed this management strategy.

11. Work with owners of private wells to abandon and properly plug all private wells in City Limits and the Capture Zone

a. Cost: Staff Time/Education Material
b. Goal:
    a. Locate all private wells in Decorah
c. Timeline: Plug wells within 1yr of locating
d. Contact:
    i. Todd Ihde, Water Superintendent, City of Decorah
e. Implementation Status: Committee Discussed

Project Description

Decorah requires all water users to connect to the Public Water Supply if available. Few wells are left in the City or capture zone. Plugging private wells eliminates possible pathways for

contamination to reach deeper drinking water aquifers. This happens when chemicals enter the soil and groundwater system. When chemicals in the soil or groundwater reach a well that has failing casing or improper construction, there is a possibility that deeper aquifers can be contaminated. The State of Iowa requires all abandoned or wells not in use be properly plugged. (See IAC information below)

The Iowa Administrative Code, Section 567, Chapter 39 contains the following regarding private wells:

> ***"Abandoned well"*** - means a water well which is no longer in use or which is in such a state of disrepair that continued use for the purpose of accessing water is unsafe or impractical.
>
> **39.5(4)** - Wells abandoned after April 25, 1990. All classes of wells which are abandoned on or after April 25, 1990, must be properly plugged within 90 days of the date of abandonment.

This requires owners of wells that are no longer in use or in disrepair to plug them within 90 days of abandoning.

Goal

- Locate private wells during normal water supply activities (i.e. meter reads/checks)
  - Conduct an inspection of the home to ensure that there are no cross connections between the well and the public water supply
- Recommend that wells that are found be plugged
- If the well is found to be in a deteriorating condition, a cross connection is found, or the well is not used require the well owner to plug the well and provide the contact information for the Winneshiek County Sanitarians office
  - Follow up in 30 days to check progress
  - Follow up within 90 days to ensure the well has been plugged (require City notification)
- If the well is in good condition, in use, and no cross connections are found, recommend that the well be plugged
  - Follow up in 6 months to check progress
  - Follow up in one year to complete a status check on the well
- Require copies of the well plugging record be sent to the City/Water Department

Results

The committee has discussed this management strategy.

12. Relocate the existing Water Supply Protection area signs

a. Cost: Staff Time

b. Goal:
   i. Relocate the existing signs to more visible locations
   ii. Add "Federal Offensive for Tampering" Stickers to water supply facilities
c. Timeline: Fall 2014
d. Contact:
   i. Todd Ihde, Water Superintendent, City of Decorah
   ii. Signs/Stickers Provided by: Brent Beste, Source Water Specialist, Iowa Rural Water Assn.
e. Implementation Status: Committee Discussed

Project Description

With the initial Source Water Protection Plan, IRWA provided Decorah with Drinking Water Supply Protection Area signs. These signs could be moved to more visible areas (such as Water Street leading to the Water Department Offices). To replace these signs, IRWA provides Federal Offense for tampering with this facility stickers to help turn away vandals. IRWA is also in the process of a redesign of the provided signs to make them smaller (but still visible) for better placement in urban settings

Goal

- Move signs to more visible areas and replace them with red federal no tampering stickers (IRWA provided)

Results

The committee has discussed this management strategy.

13. Construct a pipe connecting all of the utilities wells to a point near the water department offices

a. Cost: Consult an engineer
b. Goal: Pipeline with valves for each well to blend water from all wells before entering the system
c. Timeline: Review yearly based on sample results until complete
d. Contact:
   i. Todd Ihde, Water Superintendent, City of Decorah
   ii. Chad Bird, City Manager, City of Decorah
e. Implementation Status: Committee Discussed

Project Description

IDNR Field Office #1 recommended that the City bring all of the wells together at a central location. This is recommended in the event that the City needs to blend water from all of the wells to lower the concentration of a compound such as nitrate. All of the wells have different water quality values, and if one is high, and the others are not, it will allow the utility to blend the water below maximum contaminant values. This may also decrease the testing requirements. The City may be able to change to only one or possibly two source entry points, decreasing the

need to sample each well. If a nitrate violation were to occur in only well #2, currently the utility would have to notify because of the one well even though the water is blended in the system.

This will also help in the event that the utility needs to change treatment in the future. It will also allow the city to shrink the chemical input locations to one, instead of six. The system could be set up to valve off each well, and each group of wells in case there is a need to shut down one of the groups (such as during the PCE contamination). The utility could also consider two treatment facilities to ensure backup (one at each well grouping, i.e. at Well #1 and Well #7).

Goal

Re-plumb the wells so that the water comes together at one central location before entering the drinking water distribution system.

Results

The committee has discussed this management strategy.

14. **Conduct inspections around the known sinkholes and work with NRCS and local property owners to implement storm water management practices to protect water entering the ground**
    a. Cost: TBD
    b. Goal: All sinkholes in Decorah
    c. Timeline: Address the sinkholes in the capture zone in first 5-years, then all sinkholes in the city in 10-years
    d. Contact:
        i. Todd Ihde, Water Superintendent, City of Decorah
        ii. Todd Duncan, Natural Resources Conservation Service
        iii. Educational Materials: Brent Beste, Iowa Rural Water Assn.
    e. Implementation Status: Committee Discussed

Project Description

Sinkholes are known to act as a pathway for many sources of contamination to reach deep groundwater quickly. There are a number of ways to protect these from contamination including filling them in and managing the storm water that enters the sinkhole. This will likely decrease the nutrient concentration entering deep groundwater.

Goal

i. Identify the sinkholes that are receiving storm water and need additional protection
ii. Work with the landowner and NRCS to implement storm water management practices to slow the water flow into the sinkhole and allow water to filter before reaching the sinkhole

iii. Start with the sinkholes in the capture zone
iv. Follow up with all sinkholes in the City.

Results

The committee has discussed this management strategy. The committee discussed promoting the filling of sinkholes in cooperation with the NRCS office in a specific way. Todd Duncan explained that constructing the sinkholes as a natural filter will help mitigate future washouts of the sinkhole and help with nutrient removal before the water enters deeper groundwater.

The process is: Fill with larger rocks to smaller rocks, then add sand and gravel as the top base and plant native plants to hold the soil in place.

Possible Watershed Partnership Ideas

Using the nitrate information, the City is exploring ways to work closer with the Upper Iowa Watershed group to decrease nutrient impacts from the Upper Iowa River. The committee determined that the nitrate problems could not be addressed through localized source water protection due to the complexity and extent of the issue.

Starting Point Ideas

- When conducting landowner meetings for management practices (i.e. cover crops) talk about how the water supplies along the Upper Iowa may be impacted (nitrate in Decorah)
- Educate the community on the impact the Upper Iowa River is having on the water supply to gain support from the community to support watershed project implementation
- Work to determine projects that the Upper Iowa River Watershed Group is working on that may have the most impact on the Decorah Water Supply to direct community support

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