JANUARY 2022 | Rathbun Regional Water Association

QUENCH

news by the glassful

AQUIFERS OF IOWA

Part 1; Bedrock Aquifers

CONTENT

QUENCH
news by the glassful

Publisher	Iowa Rural Water Association
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Project Coordinator	Kelly De Boef
Graphic Design	Bailey Wildt

on the cover

The cover image displays the many layers of soil and bedrock creating an aquifer. Over time, precipitation and runoff soaks into the ground. Water slowly fills up pore spaces in sediment, sand, gravel and bedrock. The resulting saturated material beneath the earth's surface is known as an aquifer.

QUENCH Magazine is published 2 times per year by the Iowa Rural Water Association (IRWA). The magazine is distributed by mail to IRWA members' consumers.

The IRWA Mission: To provide the highest leadership in the support of Iowa's water and wastewater industries through the provision of technical assistance, training and education, legislative, regulatory and public affairs, and financing activities.

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NOTICE OF ANNUAL MEETING

JANUARY 2022

Dear Member:

Please take notice that the annual meeting of the general membership of the Rathbun Regional Water Association, Inc. will be held at the RRWA Administrative Office and Treatment Plant located at 16166 Hwy J29, Centerville, Iowa. The meeting will be held on February 24, 2022 and called to order at 7:00 p.m.

The purpose of the meeting will be for the regular election of Directors whose terms expire in 2022. Those names and the names of those nominated to fill the vacancies are listed below. No nominations by petition were received in any of these districts.

A report of the financial condition of the Association and the primary activities of the Association during 2021 will be presented.

Members then may consider the transaction of any other business which may come before the annual meeting.

Each member present at the annual meeting will be entitled to cast one vote for each directorship to be voted upon, and one vote for any other issue that may come before the members.

Those board members whose terms expire in 2022 are: Randy Eddy and Kenneth Wuthrich.

Those nominated to fill the position of Directors whose terms expire are:

District 1: Randy Eddy – 23246 500th Street – Centerville, IA 52544

District 4: Kenneth Wuthrich – 21177 Mallard Avenue – Bloomfield, IA 52537

The nominees receiving the most votes in each district where vacancies exist, will be declared to have been elected.

Doug Goben
Secretary/Treasurer
Rathbun Regional Water Association, Inc.

RRWA BOARD OF DIRECTORS

Randy Eddy *CHAIRMAN*
Denny Amoss *VICE CHAIRMAN*
Doug Goben *SECRETARY & TREAS.*
Curt Frank
Garry Schiller
Charla Warner
Ken Wuthrich

BIOGRAPHY OF NOMINEES

DISTRICT 1

Randy Eddy, was nominated and is listed on the ballot for the Board of Directors position in District One of the Rathbun Regional Water Association, Inc. (RRWA). He, along with his wife Denise, reside at 23246 500th St., Centerville, Iowa and have two daughters, Shannon and Rachel. Shannon, her husband Jon Piche and their one-year-old son, Whitt, live in Rochester, Minnesota. Rachel and her husband, Ethan Moorman, live in Colorado Springs, Colorado. Randy is a lifelong farmer and, in the past, enjoyed being involved as a member of the Appanoose County 4-H committee, Appanoose County Fair Board, Iowa Cattlemen's Association, and Centerville United Methodist Church. Randy and Denise were recipients of the Iowa Cattlemen's Association 2018 Environmental Stewardship Award and were also the 2012 recipients of the Wallace's Farmer Master Farmer Award. He has been on the Board of Directors at RRWA for the past 17 years and states his involvement has been a great learning experience as well as rewarding.

DISTRICT 4

Ken Wuthrich, was born and raised in Bloomfield, Iowa and graduated from Davis County High School in 1974. He currently lives in Bloomfield where he has owned/operated a farm for the past 40 years raising organic corn, soybeans, and wheat as well as non-organic crops and cattle. Ken and his wife, Lora, have three children: Kristin Wettstein (Phil) of Bloomfield, Eric (Katie) of Burlington, and Kari of Peoria, Illinois and six grandchildren. He currently serves as the vice president of the Davis County School Support Foundation, and he is an active member of the Apostolic Christian Church. Ken has served on the Davis County Hospital Board (President), Davis County School Board (President), Davis County Public Health Board, Davis County Assessors Board, and the Iowa State University Southeast Iowa Research Board (President). He has always enjoyed helping others and worked as an EMT for more than 30 years before retiring in 2015. Ken also enjoys reading, fishing and volunteering with the Midwest Food Bank (Florida Division) where he spends a few months during the winter. He firmly believes in honesty, integrity and always going the extra mile for his community and service to others. Ken greatly enjoys being involved with RRWA and has served on the Board of Directors since 2018.

RATHBUN LAND AND WATER ALLIANCE
*Celebrates **25-Year** Anniversary*

Last year marked the 25th anniversary of the formation of the Rathbun Land and Water Alliance. For the past 25 years, the Alliance has pursued its mission to foster a voluntary approach driven by landowners, water users, and public and private organizations to protect and enhance land, water, and economic resources in the Rathbun region. The focus of Alliance members' and partners' efforts during this time has been the protection of Rathbun Lake, one of the most significant economic and natural resources in Iowa.

Importance of Rathbun Lake

Rathbun Lake is the primary source of water for Rathbun Regional Water Association (RRWA). RRWA relies on Rathbun Lake to supply drinking water to residents, farms, and businesses in 15 counties and 44 communities in Iowa and Missouri. In addition to being an essential source of drinking water, the 11,000-acre lake offers recreational opportunities for one million visitors annually and is the home of Iowa's Honey Creek Resort State Park. Rathbun Lake also provides flood damage reduction for downstream land, fish and wildlife habitat in the lake and on surrounding public land, downstream water quality improvement, storage for supplementing navigational flows, and water for the Iowa Department of Natural Resources' (DNR) Rathbun Fish Hatchery. The US Army Corps of Engineers (ACOE) developed the lake in the late 1960s. The ACOE manages Rathbun Lake, lake facilities, and adjacent public land.

Need to Protect Rathbun Lake

In the early 1990s, stakeholders at the local, state, and federal levels identified the need to protect Rathbun Lake. These groups had the foresight to recognized that action was required to address potential threats to the lake. The primary concern was that the amounts of sediment and associated phosphorus entering Rathbun Lake from land in its watershed and from its shoreline would negatively impact the lake. Water quality monitoring and studies have confirmed that sediment and phosphorus are the two principal causes of water quality impairment in Rathbun Lake. Excessive amounts of sediment and sediment-bound phosphorus in Rathbun Lake can diminish the lake's ability to support its important recreation, habitat, and water supply uses.

Alliance Members and Partners

The Rathbun Land and Water Alliance provides local leadership, coordination, and support for efforts to protect land and water resources in the Rathbun Lake watershed. Alliance members include soil and water conservation districts and county governments in the lake's watershed as well as RRWA. Alliance activities are governed by an 11-member board of directors. The Alliance, established in 1996, is organized as a nonprofit corporation under Iowa Code Chapter 504 and section 501(c)(3) of the US Internal Revenue Code. The Alliance's many private, state, and federal partners provide much of the technical and financial assistance for activities to protect Rathbun Lake. These partners include: Farm Bureau, CoBank, Southern Iowa Development and Conservation Authority, Iowa DNR, Iowa Department of Agriculture and Land Stewardship's Division of Soil Conservation and Water Quality, Iowa State University, USDA Natural Resources Conservation Service, ACOE, and US Environmental Protection Agency.

Protecting Rathbun Lake

The Alliance and its partners completed assessments and developed management plans for the Rathbun Lake watershed to direct lake protection efforts. Guided by these assessments and plans, Alliance members and partners have worked with hundreds of landowners to install conservation practices on thousands of acres of land in the watershed in an effort to reduce the amounts of sediment and phosphorus that enter Rathbun Lake. These practices have included terraces, sediment basins, wetlands, and shoreline protection. To date, practices installed have reduced the annual delivery of sediment and phosphorus to Rathbun Lake by an estimated 67,000 tons and 283,000 pounds respectively. The Alliance and partners also monitor water quality in the lake and in its tributaries in the watershed to help evaluate progress in protecting Rathbun Lake. Recognition of the Alliance's efforts have included the *Iowa Outstanding Watershed Award* and the *Governor's Iowa Environmental Excellence Award, Water Quality Special Project Award,* and *Environmental Education Special Project Award.*

LEARN MORE To learn more about the Rathbun Land and Water Alliance and Rathbun Lake protection efforts, please visit www.rlwa.org

RETIREMENT BEST WISHES TO RRWA STAFF

In 2021, several key, long-time members of RRWA's family of employees made the decision to begin their well-deserved retirements. Collectively, the many contributions of these dedicated individuals have helped make RRWA the industry-leading rural water association that it is today. Best wishes to our friends and colleagues in their retirement.

MINDY PAYNE
Administrative Manager, *41 years of service*

BILL ELLIS
IT / OT Systems Administrator, *28 years of service*

DAVID SHERRARD
Shop Support, *44 years of service*

MARK HEFNER
Water Treatment Plant Operator, *21 years of service*

MIKE MCKELVY
Construction Support, *41 years of service*

KEVIN BANKSON
Mechanic, *28 years of service*

BRIAN PERKINS
Area Representative, *29 years of service*

IN MEMORIAM

Remembering former RRWA employees who we lost in 2021.

DEAN PERKINS
Area Representative, *44 years of service*

DARROL GAYLORD
Area Representative, *22 years of service*

SHORTY BENGE
Area Representative, *18 years of service*

CALL OR CLICK BEFORE YOU DIG...
More Than a Catchy Slogan!

Always contact **IOWA ONE CALL** by calling **811** or online at **www.iowaonecall.com** if your work or project involves any excavation. Hitting a water main during construction can result in costly repairs for which you may be liable. Even more important, water mains that are damaged during construction can lead to concerns about the safety of drinking water for a utility's customers.

Remember, call or click before you dig!

Questions and Answers about RRWA's Water Main Flushing

Rathbun Regional Water Association's (RRWA) water distribution system stretches across all or parts of 14 counties in southeast Iowa. The distribution system is a complex network of close to 7,000 miles of water mains, 37 water towers, and 41 pump stations. RRWA strives to deliver safe, high quality drinking water to every one of the nearly 100,000 people we serve. Water main flushing helps RRWA achieve this goal. Here are answers to some of the most common questions about water main flushing asked by our customers:

What is water main flushing?

Water main flushing is the process of systematically flowing water through and discharging water from sections of a drinking water distribution system. Flushing is accomplished by using valves to control the movement of water in sections of the system and opening hydrants and cleanouts for the water to flow out of the mains. These hydrants and cleanouts are usually located at the ends of water mains.

Why is water main flushing important?

Water main flushing is one of the most important practices carried out by RRWA to ensure the safety and quality of drinking water served to our customers. Flushing removes any sediment and film that slowly build up over time in the bottom and along the interior walls of water mains. Removal of this sediment and film improves the taste, odor, and color of the water. Flushing is also done to maintain adequate disinfectant residual throughout RRWA's distribution system. This is especially critical in areas of the system with low water use where the disinfectant residual can decrease over time. In addition, RRWA flushes water mains associated with construction activities such as leak repairs to make sure the work performed does not negatively affect water safety or quality.

When does water main flushing normally occur?

Water main flushing can occur at any time during the year. RRWA usually conducts routine flushing to improve water quality and maintain disinfectant residual in the spring and fall of the year. Flushing at these times avoids any potential impacts associated with high water demand in the summer and the freezing temperatures in the winter. While water main flushing associated with planned construction activities occurs primarily during the spring, summer, and fall, flushing that is performed as part of leak repairs can take place at any time.

Who conducts the water main flushing?

RRWA has more than 40 certified water distribution system and water treatment plant operators on staff. All of RRWA's operators are well-trained in the proper methods of water main flushing. Staff primarily responsible for carrying out water main flushing activities include Steve Sherrard, RRWA's Project Supervisor, and RRWA's team of 12 service area representatives. In addition, RRWA's water treatment plant operators and construction crew members directly support water main flushing.

How will water main flushing affect my water service?

RRWA customers may experience minor fluctuations in water pressure and some noticeable discoloration of water from the sediment and film as a result of water main flushing. The discoloration may also consist of tiny air bubbles that give the water a milky appearance. Changes in water pressure and color should be short-term. Water service will not usually be disrupted during water main flushing.

What should I do if my water is discolored after flushing?

RRWA customers who notice discolored water as a result of water main flushing can turn on several cold water taps until the water runs clear. It should only take a few minutes until the discoloration is gone. Any discoloration only affects the appearance of the water. The water remains safe. It is advisable to not do laundry until the water is completely clear. Also, do not use hot water taps to flush pipes as this may draw sediment into a hot water tank. Remember to maintain hot water tanks according to manufacturer recommendations.

What should I do if my water pressure stays low after flushing?

Any low water pressure associated with water main flushing should be temporary. RRWA customers who experience continuous low water pressure at one or two taps may want to make sure that the aerator or screen is clean. Customers who experience low pressure in their entire house or facility should call the RRWA office at 1-800-233-8849.

Is water main flushing a waste of water?

No. Water main flushing is a normal and necessary activity for drinking water distribution system maintenance. Flushing is the most effective way to ensure safe, high quality drinking water for RRWA customers.

Does water main flushing harm the environment?

RRWA staff always conduct water main flushing to avoid any negative impact on the environment. Water flowing from hydrants and cleanouts is directed to grass-covered areas to prevent soil erosion. Flushing is not performed at locations where discharged water would flow directly into any water body. Whenever necessary, RRWA uses a dechlorination process to remove chlorine from the flow of water before it is discharged.

Will my water smell like chlorine after flushing?

RRWA customers may notice that water has a slight chlorine smell associated with water main flushing. This smell may be particularly noticeable when flushing occurs during RRWA's change from chloramines to free chlorine as our disinfectant. This change to free chlorine is done to ensure the sanitary condition of RRWA's water distribution system, and usually takes place for about two weeks once every three years or as needed to maintain water quality. A slight chlorine smell may also be noticeable when flushing occurs following construction related disinfection. Any chlorine smell associated with flushing will be temporary, and the water is safe.

What should I do if I see a hydrant or cleanout running?

RRWA's distribution system operators monitor hydrants and cleanouts used for water main flushing. In some cases, hydrants and cleanouts may be left running throughout the day or even overnight. This is done to make sure that the water main is completely flushed. Please do not tamper with any hydrants or cleanouts.

What if I have other questions or concerns about my water?

RRWA customers should contact the office with any questions or concerns about their water. RRWA's office phone number is 1-800-233-8849 and the email address is rrwainc@rrwa.net. Customers can also visit RRWA's website at www.rrwa.net .

AQUIFERS OF IOWA
PART 1 | BEDROCK AQUIFERS

Aaron Schroeder – *Source Water Protection Specialist – Iowa Rural Water Association*

Across Iowa, the quality and availability of groundwater can vary greatly. A plentiful, good quality source of water in one part of the state might have poor water quality or not exist in another area of the state. Water quantity issues can make it necessary for utilities to seek additional water sources to meet their needs. Water quality issues often necessitate more complex water treatment procedures, and can sometimes make a plentiful water source infeasible. This article seeks to explore quality and availability of bedrock groundwater sources throughout the state of Iowa. Much of the material in this article is from a publication called "Iowa's Groundwater Basics" as well as a presentation by Iowa Department of Natural Resources Geologist Chad Fields at the Iowa Rural Water Association's 2019 Annual Conference. A digital version of Iowa's *Groundwater* Basics is available online and is a great resource for anyone interested in learning even more about aquifers.

BACKGROUND

Over time, precipitation and runoff soaks into the ground beneath the earth's surface. Water slowly fills up pore spaces in sediment, sand, gravel, and bedrock. The resulting saturated material beneath the earth's surface is known as an aquifer. Properties including the type of rock that makes up the aquifer, age of the water, and aquifer depth can have an influence on the characteristics of water in a given aquifer. In Iowa, aquifers take many forms including; porous and permeable bedrock, saturated material adjacent to rivers and streams, and buried sand and gravel aquifers cut by ancient river channels. There are pros and cons associated with each type of aquifer. For now, we'll focus on the characteristics of the main bedrock aquifers in Iowa, with a part 2 on other types of aquifers coming in summer of 2022.

BEDROCK AQUIFER CHARACTERISTICS

Bedrock aquifers in Iowa consist primarily of limestone, sandstone, shale, and other sedimentary rocks. The permeability and porosity of sandstone and fractured limestone allows them to transmit substantial amounts of water, making them particularly good aquifers. Bedrock aquifers vary greatly in depth from the grounds surface and in aquifer thickness. Aquifer depth and thickness are often related to water quality. Deeper groundwater aquifers with other layers of rock over top of them often have high Total Dissolved Solids concentrations from infiltrating water coming in contact with other materials before reaching the aquifer. Shallow aquifers with little overlying sediment and/or bedrock often have issues with contamination from sources at the earth's surface—such as nitrate from agricultural sources. There are four main bedrock aquifers that are commonly used as a source of drinking water for Iowans, each with their own set of benefits and challenges.

CAMBRIAN-ORDOVICIAN

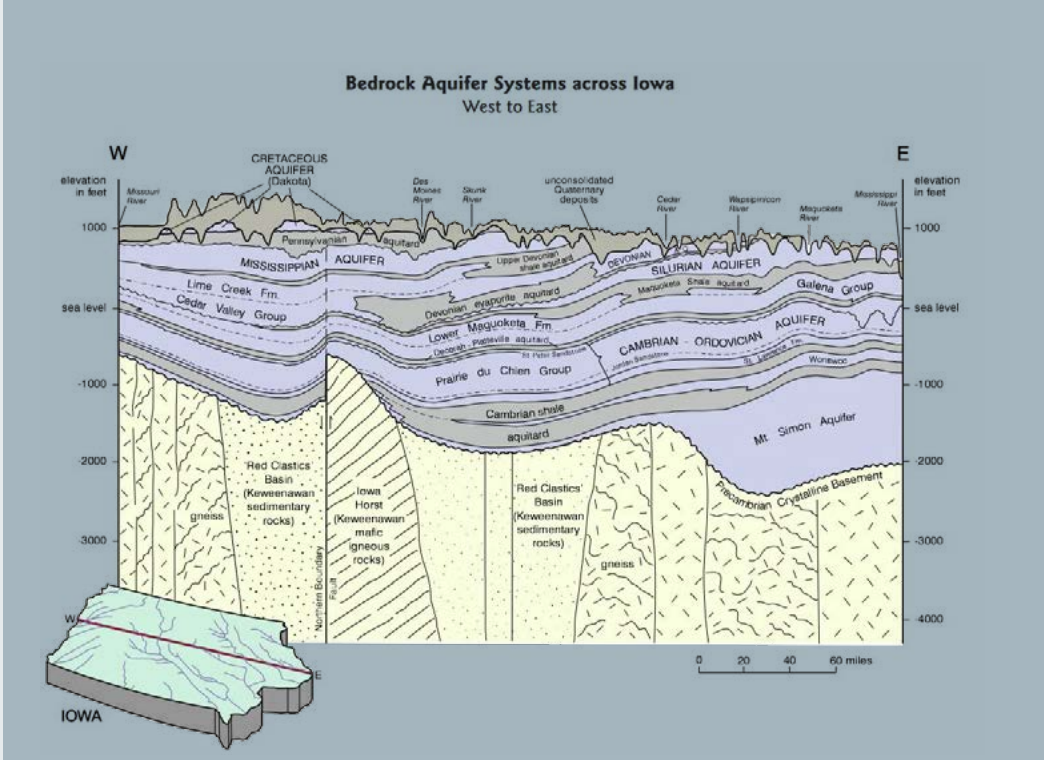
The Cambrian-Ordovician aquifer, commonly known as the "Jordan" is the most productive bedrock aquifer in Iowa. Wells in this aquifer can yield well over 1,000 gallons per minute in some areas. The Cambrian-Ordovician aquifer is composed of the Jordan Sandstone, the Prairie du Chien Group (chert, dolomite, sandstone), and the Saint Peter Sandstone. Well depths in this aquifer can range from under 300 feet in northeast Iowa, to well over 2,000 feet further south and west across Iowa. The best water quality from the Cambrian Ordovician aquifer is in northeast Iowa. Further south and west across the state, where the aquifer is deeper beneath the earth's surface, water from the Cambrian-Ordovician aquifer is less desirable due to high amounts of dissolved minerals and elevated radium levels.

SILURIAN-DEVONIAN

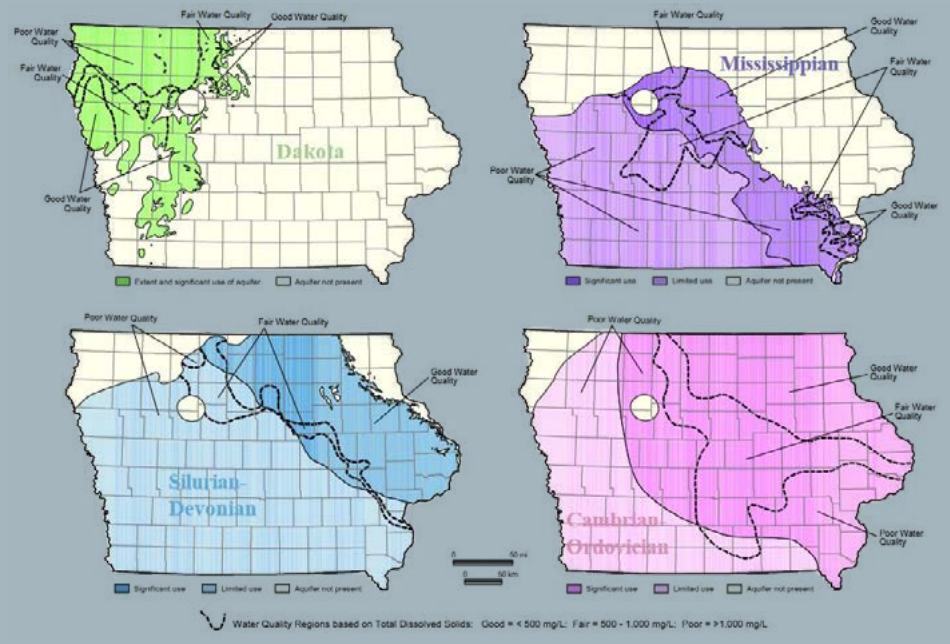
The Silurian-Devonian aquifer is composed of dolomite and limestone. The Silurian and Devonian aquifers can be considered separately, but they are often described as one aquifer due to the similarity of bedrock that make up both aquifers, similar water quality, and due to Silurian and Devonian bedrock often being hydraulically connected. The Silurian-Devonian aquifer is used most extensively in north central and eastern Iowa. Wells in this aquifer range from under 100 to over 1000 feet in depth. Silurian-Devonian wells usually yield 200-400 gallons per minute, but in areas with highly fractured and dissolved bedrock (karst areas), and recharge assisted by nearby rivers and streams, well yields can be as high as 4,000 gallons per minute. Much like the Cambrian-Ordovician aquifer, water quality of the Silurian-Devonian aquifer declines as you move southwest across Iowa—in this case, primarily due to elevated total dissolved solids and sulfate concentrations.

MISSISSIPPIAN

Iowa's Mississippian aquifer is made up of mostly limestone and dolomite. This aquifer is most productive and yields the best water quality in the north-central part of the state. It is a viable water source in central and southeast Iowa as well, but well yields and water quality tend to decrease in those areas. Like the previous two aquifers, the viability of this aquifer tends to decrease further toward the southwest corner of the state. In this area, shale and glacial material limit recharge. In areas with a thick layer of shale over the aquifer, Total Dissolved Solid concentrations are often high enough to render water from this aquifer unusable as a drinking water source.



Cross-section of Iowa displaying estimated aquifer location and depth. From Iowa's Groundwater Basics



Location and water quality based on total dissolved solids of Iowa's four main bedrock aquifers. From Iowa's Groundwater Basics

DAKOTA

The Dakota aquifer is a potential source of drinking water for much of western Iowa. It is composed of Cretaceous age sandstone—the youngest bedrock of Iowa's four main aquifers. Wells in this aquifer range from 100 to 600 feet deep. Poor water quality in certain areas of this aquifer is often due to the layers of rock above it, which limit recharge and introduce minerals to the water as it percolates through them into the Dakota. In areas where the Dakota aquifer is close to the earth's surface, nitrate levels tend to be high. Due to the relative difficulty of producing quality water from the Dakota, annual water use in this aquifer has actually declined roughly 10% since the 1980's.

WHAT DOES ALL THIS MEAN?

As consumers, we don't often consider the steps involved in where our resources come from. The aquifers identified in this article each present unique benefits and challenges for delivering water to consumers. For most public water supplies, location and amount of water needed for their customers ultimately determine what source their water comes from. Regardless of what water source your water is being delivered from, know that there is a whole list of considerations that went into bringing that water to your tap.

Sources: https://s-iihr34.iihr.uiowa.edu/publications/uploads/2014-08-24_08-08-21_es-06.pdf

SAFE DRINKING WATER *AFTER LEAVING THE UTILITY*

SCOTT SHOVER *CEO with Iowa Rural Water Association*

There are several measures taken within a water system to ensure a safe reliable product is delivered to the consumer with minimal interruptions. Water system operations are required to run several different tests on both raw and finished water to ensure they are providing safe drinking water to their customers. This safe finished product then begins its journey through the distribution system that can at times be several miles long. A water system also samples the water at various points throughout the system at the end user's facility weather that be residential, commercial, or agricultural.

I would like to address the concern of safe drinking water after the water leaves utility infrastructure and enters the user's system. What concerns could a customers have with water that is within their own house, farm, or commercial building pipes? There are two different methods of contamination within a water system that I would like to talk about. The first method is a condition known as backflow. Backflow is defined as an undesirable reverse flow of water that returns contaminated water from a work site back to the potable water source. The other method of contamination is using a devise to overcome the system pressure to add a contaminate. But why would anyone want to contaminate their water?

A contaminate for Human consumption could be beneficial in other applications. Livestock producers are among some of the largest customers connected to water systems. When livestock get sick, one method of treatment is through their drinking water. Medicated water is pumped into the distribution system of the facility to treat the livestock with proportioner pumps. This practice works great for treating sick animals, but what happens when someone that does not know the source is medicated takes a drink from the hose? It's typical for Iowans to drink from a hose and not think a thing about it. Some of these medications can be fatal for human consumption. This practice should never be done on a community water supply. A stand-alone system with measures in place to prevent backflow and incidental consumption is the only time this is allowed.

In some parts of the state, private wells are used in conjunction with a community water supply. Often these wells are used for "process water". Because the well water is not being used for human consumption, users may view wells with less importance for protection from contaminates. Wells provide water from an aquifer, a backflow event from a farm or industry could contaminate a whole water source that others depend upon. Even sources with water not suitable for human consumption should have measures in place to protect against the possibility of contamination from a backflow event.

Community water supplies do a great job of providing a safe and reliable product to their customers, but they can only do so much. Once the water has left the utilities system and it has entered the customers it is out of the utilities control. It is important that each customer evaluates their system for deficiencies and makes necessary corrections for the safety of everyone on the system. If a customer has concerns about practices that could influence the safety of the water within the system, they should reach out to the service provider for clarification. Utility personnel are always willing to answer any and all questions or concerns dealing with a water system.

Food Production in Iowa

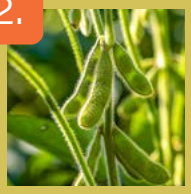
Iowa dominates the agricultural world holding the number one spot in Corn, Pork and Eggs. The state offers fertile land, a quality workforce and low cost of doing business which are very appealing to manufacturers in the food industry. In fact, 29 of the largest 100 food manufacturers have operations in Iowa, including companies like Barilla, Heinz, Hormel, Tyson and Quaker Oats. And they all rely on quality water service for efficient food production.

1.

#1 in Corn Production

Iowa produces an average of 2.30 billion bushels per year. That's 16.2% of the total U.S. corn production.

2.



#2 in Soybean Production

494 million bushels soybeans per year are produced in Iowa covering 11.9 % of the total U.S. production.

3.

#1 in Pork Production

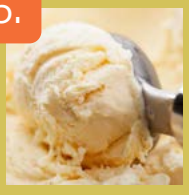
49 million head are marketed per year coming in at 27.2% of the total U.S. production.

4.

#1 in Egg Production

15.2 billion eggs are prduced each year in Iowa. That averages out to be around 13.6%of the total U.S. production.

5.



Ice Cream Capitol of the World

One of the world's largest and coldest freezers is located in Le Mars. Wells Enterprises operates a 12-story freezer at 20 degerees below zero that can hold up to 53 pallets of Ice Cream. Wells produces 150 million gallons each year with a semi-trailer leaving the plants every 13 minutes. The company sources 100 percent of its fluid milk from surrounding counties.

Quality On Tap!
Our Commitment Our Profession

Reference:
https://www.iadg.com/iowa-advantages/value-added-agriculture-food_ingredients/

RRWA

Rathbun Regional Water Association, Inc.
16166 Hwy J29
Centerville, IA 52544

DID YOU KNOW that the water that comes out of the faucet for many Iowans started out below the earth's surface? 'Groundwater' is the term used for this water that is found in porous rock or sediment. The unit of sand, gravel, or bedrock that holds this groundwater is called an aquifer — but where does this groundwater originate — and how does it reach our faucet?

What is an Aquifer, and How Does Water Get There?

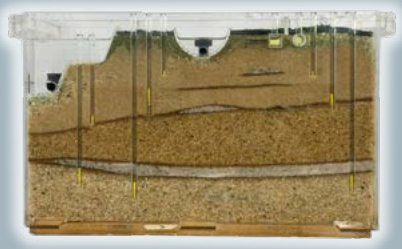
An aquifer is an area beneath the earth's surface where pore spaces between sand, gravel, or bedrock become saturated with water over time. An effective aquifer is both permeable and porous. Permeability refers to the ability of water to move through the aquifer. Porosity refers to the amount of open spaces in the rock that allow for storage of groundwater. In Iowa, drinking water comes from bedrock aquifers — often made of sandstone or fractured limestone, as well as "alluvial" aquifers — made of sand and gravel near rivers and streams. Most aquifers recharge from rain, runoff, melting snow, or other sources of water above ground. The deeper the aquifer and the less permeable the material or rock above the aquifer, the longer it usually takes to recharge. A layer of impermeable material above an aquifer is called a "confining layer." Confining layers are often a good thing as they protect groundwater from contaminants. However, they typically make the recharge of the aquifer a bit trickier.

How Does Water get From the Ground to our faucet?

To extract water from aquifers, holes are drilled from the earth's surface down to the aquifer. A pump is then installed in this hole, which allows water to be pumped from deep underground to the surface. This hole in the ground with a pump is referred to as a well. Wells range in diameter from a few inches, to over two feet. Alluvial wells are often less than 100 feet deep, but deep bedrock wells can reach over 2000 feet in depth in parts of Iowa. For an aquifer to continue to be a sustainable source of water for the long term, the aquifer must recharge at a rate equal to (or faster than) the rate at which water is pumped from the well.

Make your own aquifer at home!

Fill a jar with rocks and sand to simulate an aquifer, but insert a layer of clay to seal off some of the material. As you slowly fill the jar with water to simulate recharge, notice how the upper area quickly becomes saturated, but the confining material (white clay in this case) causes the layer below it to fill up with water much more slowly.



Groundwater model showing a cross-sectional view of different layers of rock, wells, confining layers, and how they interact.