JANUARY 2022 | Southern Iowa Rural Water Association

QUENCH

news by the glassful

AQUIFERS OF IOWA

Part 1; Bedrock Aquifers

CONTENT

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news by the glassful

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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.

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DAN McINTOSH, General Manager Retires

After 32 years working at SIRWA, General Manager Dan McIntosh, retired the first week in January. Dan began his career with SIRWA in 1989. Throughout his tenure, he has worked in various capacities, but has filled the roll of General Manager for the past 18 years. Always a progressive thinker, Dan has kept SIRWA on the forefront of expansion and system upgrades, always with the SIRWA customer base in mind. His most esteemed accomplishment has been the vision for SIRWA to own and operate their own water treatment plant. After many years of discussion and planning, that vision is now becoming a reality. Construction of the SIRWA water treatment plant and related infrastructure upgrades began in October of 2021. Dan is looking forward to retirement, spending more time with his family and maybe doing a little traveling. SIRWA wishes Dan all the best as he starts this new chapter in his life.

The SIRWA Board of Directors felt that replacing Dan with Co-General Managers would be the best scenario to bring dual expertise into the position. Although the concept of Co-General Managers is new to SIRWA, there have been Co-General Managers in other rural water systems within the state. After interviewing several qualified candidates, the SIRWA Board of Directors have chosen Brenda Standley and Jeff Rice to take on these roles effective December 29, 2021.

Brenda has been employed by SIRWA for over 19 years. She is currently the Accounts Payable and Human Resources Manager, a role that she has held since 2006. She began her career with SIRWA as assistant to the office manager and has progressively moved into roles of more responsibility. Her understanding of the administration and accounting processes will benefit in her new role. Brenda lives in the rural area just SE of Greenfield.

Jeff has been with SIRWA for over 25 years and lives south of Thayer. He is currently the Projects Manager, but has held many other positions during his time with SIRWA, including Operations Manager. Jeff has worked through many construction projects, both large and small, during his time. This has provided him with a good understanding of the distribution system and related infrastructure.

2022 will bring many changes for SIRWA. Jeff and Brenda look forward to the challenge of their new roles. They, along with the management team and SIRWA staff will continue to work hard for the members of the association in order to supply you with safe, clean and affordable water.w

How to Make Infused Water

In the past, we've explained the health benefits of drinking water. From Brain Washer to Fatigue Buster, water is a very important part of your diet. However, there are many who really need a little pizazz in their water. Luckily, making infused water is easy to do...especially when you only need around four ingredients per recipe.

STEP 1:

COMBINE INGREDIENTS IN A GLASS PITCHER OF WATER

Follow a recipe or come up with your own creation using your favorite fruits, vegetables, herbs and spices. Be sure to use fresh ingredients, and always you're your produce before use. For best results, we suggest using a glass container rather than plastic. If you want to use a few different individual serving combinations, try using mason jars.

STEP 2:

COVER THE CONTAINER

Pop on the lid to your pitcher or cover with plastic wrap. This will prevent any risk of contamination and keep pesky food odors from creeping in.

STEP 3:

REFRIGERATE

It's important to keep your water cool for two reasons, cool is refreshing and it also prevents spoilage. It's best to infuse overnight or for a good 8 hours, but be sure to remove solids after 12 hours. Once ingredients have been strained out, you can keep your infused water up to three days – assuming it lasts that long, of course!

Berries Medley

Infusing your water with a gorgeous blend of strawberries, blackberries and raspberries is one of the easiest recipes on our list. Mix and match your favorites to suit your tastes. Berries are loaded with antioxidants and can help improve blood sugar and insulin response.

You'll need:

- ½ cup strawberries, hulled and sliced
- ½ cup whole raspberries
- ½ cup whole blackberries
- 2 quarts water

Citrus & Cucumber

If you've ever enjoyed cucumber and citrus in a drink before, you know how beautifully they go together. Rich in Vitamin C, citrus is a great boost to your immune system. Recent research suggests that cucumber can assist with cancer prevention and can also lower your blood pressure.

You'll need:

- ½ cup of cucumber, sliced
- ½ lemon, sliced
- ½ lime, sliced
- ½ orange, sliced
- 2 quarts water

Lemon, Ginger & Turmeric

This combination is a fantastic health and energy booster. Turmeric is chock full of antioxidants and can reduce inflammation in the body. Ginger can sooth aching muscles and guard against stomach ulcers.

You'll need:

- 1 tbs. turmeric powder
- 4 slices peeled fresh ginger
- ½ lemon, sliced
- 2 quarts water

Cantaloupe, Mint & Lemon

Fresh melon is truly a pleasure to use in beverages. You can also play around with this recipe and swap cantaloupe for honeydew or watermelon.

You'll need:

- 5 sprigs fresh mint
- ½ lemon, sliced
- ½ cup cantaloupe, cubed
- 2 quarts water

Peach, Lemon, Raspberry & Rosemary

This drink's summery flavors will have you reaching for it all day.

You'll need:

- 2 sliced small peaches (or 1 large depending on the size)
- ½ lemon sliced
- ½ cup of muddled raspberries
- 2 sprigs of rosemary
- 2 quarts water

Nectarine, Basil & Clementine

Nectarine and basil may sound a little strange, but trust us, this combination is a real winner. The citrus fruit again help your body's natural immunity. Basil aids in digestion and is a natural anti-inflammatory.

You'll need:

- 8 slices of nectarine
- 6 fresh basil leaves
- 3 slices of clementine
- 2 quarts water

Pineapple, blackberry & Cucumber

The pineapple adds a crisp and bright quality to everyday water plus you get the added benefit of antioxidants and inflammation suppression. Combined with the fresh blackberries and sliced cucumber, this combination is especially refreshing paired with sparkling water.

You'll need:

- 5 cucumber slices
- 1 cup of chopped pineapple
- ½ cup of muddled blackberries
- 2 quarts water

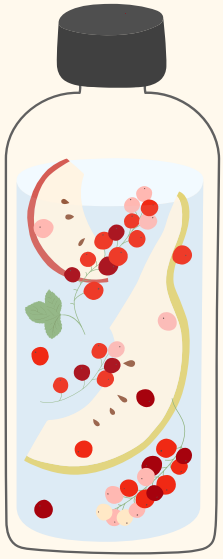
Green Tea, Mint & Pomegranate

Replenish your body fluids with this healthy minty cooler, studded with tangy, ruby jewels and steeped with green tea goodness. Infuse this festive water around the holidays to impress your guests.

You'll need:

- 1 bag green tea
- 2 sprigs mint
- 20 pomegranate seeds, crushed
- 2 quarts water

BENEFIT OF INFUSED WATER



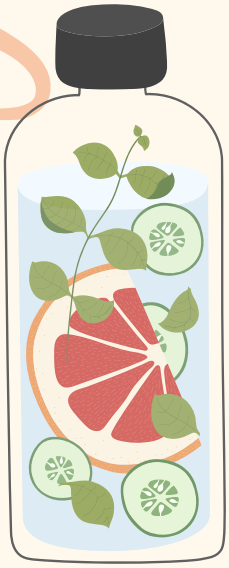
1 INCREASED WATER CONSUMPTION

There are many benefits of consuming water to be hydrated, here is the description.

- Boosts energy, immune system and brain function
- Delivers oxygen throughout the body
- Flushes out toxins and body waste
- Improves physical performance

2 REDUCED SUGAR CONSUMPTION = INCREASED WEIGHT LOSS

Fruit infused water can be disguised as juice, which makes it easy to replace sugary drinks. Removing sugary drinks from your diet is an easy way to kick-start weight loss and a healthy lifestyle.



3 LOW IN CALORIES

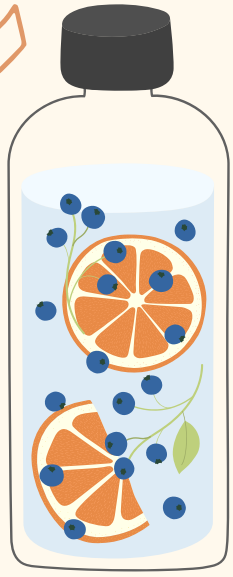
Fruit, vegetables, and herbs are all low in calories.

4 RIDS TOXINS FROM THE BODY

Because of the antioxidants in the detox water, and the larger consumption of water, toxins will be flushed out from the body.

5 INCREASES ENERGY

Some infused fruits and herbs will help to increase energy and brain function.



6 MAKES WATER MORE APPEALING

Some find it hard to meet the daily recommended water intake due to water being bland and boring. Infused water solves this problem by flavoring the water to suit your taste bud preferences.

Quality On Tap!
Our Commitment Our Profession

Bill Payment

Southern Iowa Rural Water Association offers a wide variety of convenient payment options for our customers but our most convenient is our Online Bill Pay. Simply visit our website at www.sirwa.org and select the Bill Payment box found on the right side of our home page. Then click the "Pay Your Bill Now" button and you will be redirected to our secure bill payment portal. We accept Visa and MasterCard.

Our Mission

At Southern Iowa Rural Water Association, we are committed to providing safe, high quality water services to our community, while maintaining a standard of excellence in customer service and environmental conservation.

2022 Sewer Rate Increase

SIRWA sewer rates will be increasing $0.50/1,000 gallons usage effective January 1st, 2022. This is the first sewer rate increase we have implemented in several years. If you are part of our regular sewer systems the new, monthly minimum bill will be $20.00. For our low-pressure sewer systems, the new, monthly minimum bill will be $30.00. If you have any questions, please feel free to contact our office.

SIRWA Water Treatment Plant is *Becoming a Reality*

One year ago, SIRWA was in the process of finalizing plans and securing the funding to construct our own water treatment plant. We finally saw everything come together mid-2021, and broke ground on October 20. The plant is located east of Creston on Highway 34. In addition to the treatment plant, we will be constructing a one-million-gallon water tower and installing several miles of 20" and 24" water main from the treatment plant to the SIRWA office. The new treatment plant will have a capacity to treat water at 6.0 Million Gallons per Day (6 MGD). SIRWA has built additional capacity into the piping inside the plant so that it can be expanded by an additional 2.0 MGD for an 8.0 MGD plant, if needed in the future.

Hawkins Construction, Omaha Nebraska was low bidder for Division 1, which is the water treatment plant at $46,157,000. Shane Poe Construction, Downing, Mo., was the low bidder for Division 2, the pipeline and associated appurtenances, for a total of $8,108,835. Low bidder for Division 3, the one-million-gallon water tower, was Maguire Iron, Inc, Sioux Fall, S. Dakota, for $2,855,000. The total construction cost for the treatment plant and related infrastructure upgrades comes in at $57,120,835.

With engineering, legal services, inspection, land purchases, contingencies, etc., the total funding package is $65,585,000. SIRWA is borrowing the funds from United States Department of Agriculture – Rural Development (USDA-RD) at 1 3/8% interest over a forty-year loan term.

The fall weather was very conducive for construction and it did not take long for significant progress to be made. At the writing of this article, Hawkins Construction has removed clay for the plant foundation, which is being used in the four, wastewater lagoon dikes. Maguire Iron is also working on the water tower foundations for the new 1-million-gallon tower. It will have eight legs holding up the bowl of the tower.

According to the proposed construction schedule, the treatment plant will be operational by the end of 2023. Updates will be posted periodically on SIRWA's website, www.sirwa@sirwa.org.


11.1.21


11.8.21


12.8.21


12.8.21


12.8.21

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

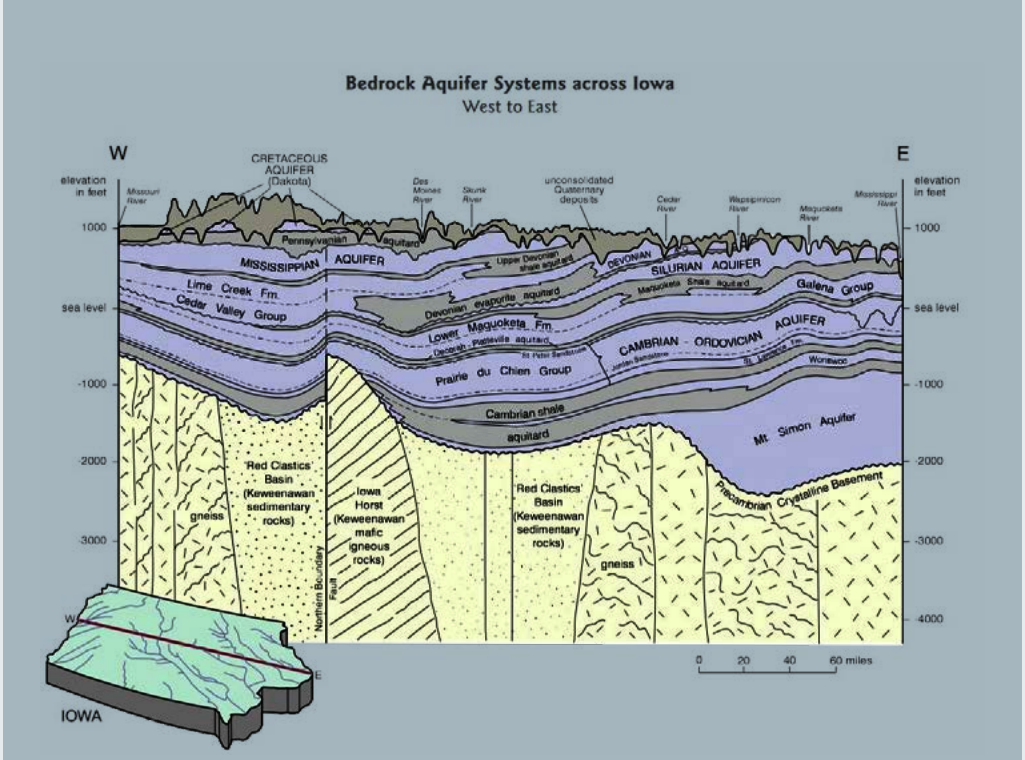
The Cambrian-Ordovician aquifer, commonly known as the "Jordan" is the most productive bedrock aquifer in Iowa. Wells in this aquifer can yield well over 1,000 gallons per minute in some areas. The Cambrian-Ordovician aquifer is composed of the Jordan Sandstone, the Prairie du Chien Group (chert, dolomite, 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

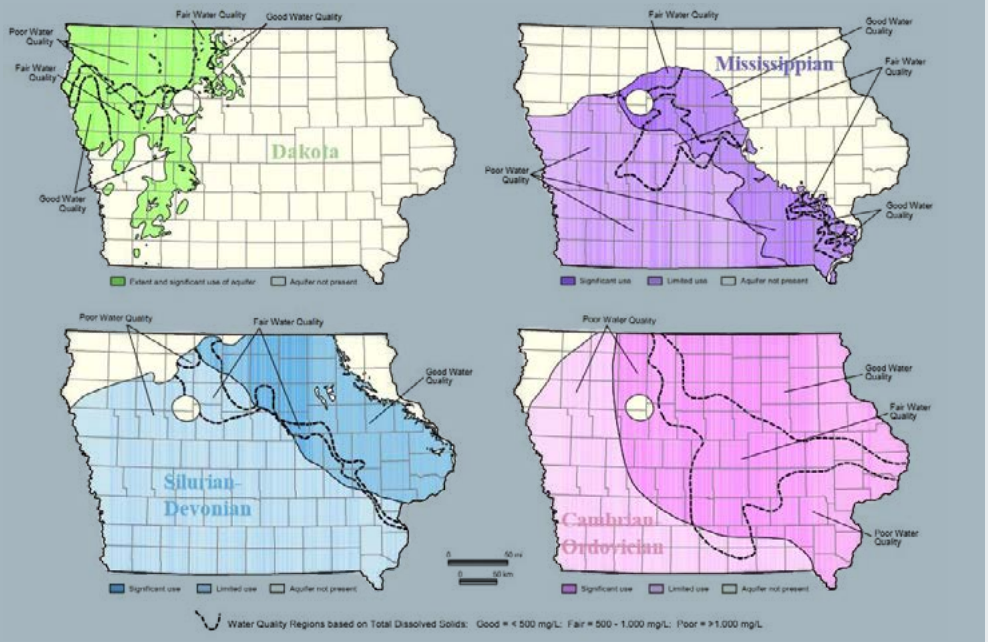
The Silurian-Devonian aquifer is composed of dolomite and limestone. The Silurian and Devonian aquifers can be considered separately, but they are often described as one aquifer due to the similarity of bedrock that make up both aquifers, similar water quality, and due to Silurian and Devonian bedrock 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

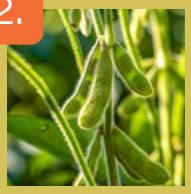
Iowa dominates the agricultural world holding the number one spot in Corn, Pork and Eggs. The state offers fertile land, a quality workforce and low cost of doing business which are very appealing to manufacturers in the food industry. In fact, 29 of the largest 100 food manufacturers have operations 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

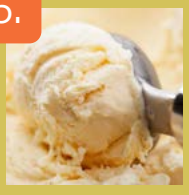
49 million head are marketed per year coming in at 27.2% of the total U.S. production.

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/

Southern Iowa Rural Water Assoc
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Creston, IA 50801

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?

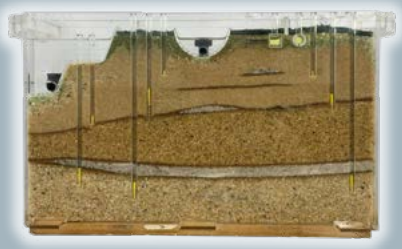
An aquifer is an area beneath the earth's surface where pore spaces between sand, gravel, or bedrock become saturated with water over time. An effective aquifer is both permeable and porous. Permeability refers to the ability of water to move through the aquifer. Porosity refers to the amount of open 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.