



Spokane Aquifer Joint Board

10/27/2022

1:30 pm

In-Person SCWD3
and via Zoom

ESHB 1329 – Open Public Meetings - Section 9 Agendas Posting Process in Development

1. Anne Francis Web Design will setup a form on a password protected page on SAJB. All purveyors will share the same password.
2. Anne is making a video tutorial to explain the process.
3. Tonilee will work with whomever you want trained to post the agendas.
4. If you need to edit an agenda, you can either post a new agenda or send the edits to Tonilee for updating.

Wellhead Implementation Program Manager's Report

October 27, 2022

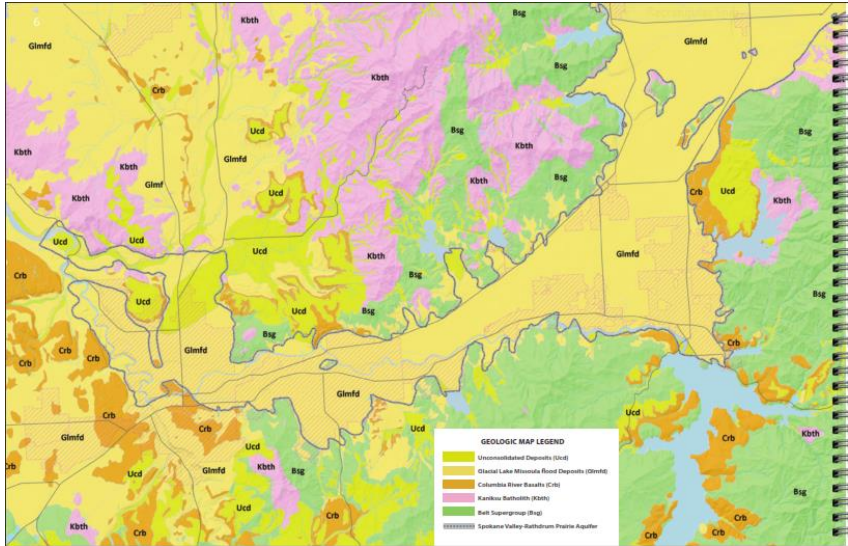




Education and Awareness Events

- 10/4/22 Shadle Library
- 10/7/22 St. Luke's Lutheran Church Environmental Stewardship Group
- 10/24/22 Hamblen Elementary
- 11/7/22 Whitworth Science Methods

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Geology

How geology formed the SVRP Aquifer.

The geology of the Spokane Valley-Rathdrum Prairie area is the result of geologic events that have occurred over hundreds of millions of years, creating both our landscape and the aquifer of today. Understanding the geologic events of the past helps us better understand our environment and current issues affecting our aquifer. The geology of the area is complex and it has taken decades to piece the history together. Five significant geologic units make up most of the rock types found in the Spokane Valley-Rathdrum Prairie area. Brief descriptions of these units follow on the next pages. The color surrounding the name of each rock type match the color of the geologic units shown on the geologic map on the left.

Belt Supergroup



Belt Supergroup rocks in Idaho.

Wyoming, and extending into Canada. Belt Supergroup rocks can be found in mountain ranges but also extend deep below ground surface.

WHAT: Mostly fine-grained sandstone and argillite with some sandstone and meta-sedimentary rocks.

WHERE: 1.1 to 1.4 billion years ago.

WHEN: Found in western Montana, northern Idaho, parts of Washington, and Idaho.

WHY IT'S IMPORTANT: The Belt Supergroup rocks are largely impermeable and water does not easily flow through them. These rocks form parts of the basin that the water of the SVRP aquifer sit on top of much like a bathtub.

Kaniksu Batholith

WHAT: Mostly granitic rock.

WHERE: 50 to 100 million years ago.

WHEN: Northern Idaho and Northeastern Washington.

HOW: About 150 million years ago, the continental margin was located along Idaho's western border, where two tectonic plates collided. This collision resulted in the western plate being forced down (subducted) and overlain by the eastern plate. As the western plate was subducted, the rock was heated and portions were melted.

The melted material (magma) was lighter than the surrounding rock and rose up from deep within the earth. Instead of forming a volcano, it solidified near the earth's surface and formed what is called a batholith.

WHY IT'S IMPORTANT: The formation of the batholith played a key role in the shaping of the topography in the region by pushing the Belt Supergroup rocks upward and out, which provided potential pathways for floodwaters and subsequent deposition of aquifer-bearing rocks. Much like the Belt Supergroup, the Kaniksu batholith also forms part of the bedrock material that the aquifer sits on top of.



Batholith emplacement displaced Belt Supergroup rocks to the east and west.

Spokane Dome, Batholith, Idaho, Kaniksu Batholith, Washington.

WHY IT'S IMPORTANT: The formation of the batholith played a key role in the shaping of the topography in the region by pushing the Belt Supergroup rocks upward and out, which provided potential pathways for floodwaters and subsequent deposition of aquifer-bearing rocks. Much like the Belt Supergroup, the Kaniksu batholith also forms part of the bedrock material that the aquifer sits on top of.



Rocks from the Kaniksu Batholith.

Columbia River Flood Basalts

WHAT: Basalt.

WHERE: 10 to 17 million years ago.

WHEN: Lava erupted from fissures near the Idaho, Oregon, and Washington border. The rocks from the lava flows cover an area of 63,200 square miles in the three states.

HOW: The lava was too fluid to form volcanoes so it flowed like floodwaters, except much slower (estimated roughly 3 miles per hour). The lava spread over the topography and cooled to form distinct layers consisting of low tops full of bubbles or vesicles, a middle section of lower fine colonnades, and a flow bottom where the rock is highly broken and fragmented. In areas where the lava flowed into depressions the rocks are over 100 feet thick.

WHY IT'S IMPORTANT: While the SVRP aquifer is not a basalt aquifer, the Columbia River Flood Basalts are an important supplier of water in much of Eastern Washington, Northern Idaho, and Northern Oregon.



Pass within the Columbia River Flood Basalts. Each basalt flow covered the previous one and contained different aquifers. The cut shows how basalt flows dominate the landscape of the flow as a result.



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GEOLOGY

1. Belt Supergroup (Bsg) - 1.1 to 1.4 billion years ago

What Are They?

Belt Supergroup rocks are composed of a thick sequence of sediments that were deposited in an ancient sea basin. The term "Supergroup" refers to an extremely thick sequence of rocks of the same kind, just that refers to the name of the basin that the sediments were deposited in. The basin was formed by geologic forces pushing the rocks apart and creating a large, deep rift. The rift was filled with water, and the water was being heated, creating a hot, shallow sea. The weight of all the water and the heat caused the sediments to sink, and the weight of the sediments caused the rocks to sink, creating a hot, shallow sea. The weight of the sediments caused the rocks to sink, creating a hot, shallow sea.

Window To An Ancient World

The Belt rocks were probably deposited much like what we see today with oil and sands from layers being covered and then a shallow basin of water. Some of the sediments have ripple marks from wave action, indicating the sediments were deposited near the shoreline.

Rocks in the metamorphosed sediments of a type of blue-green algae are called stromatolites. Stromatolites are the oldest known fossils and formed layers or mats that shaped the corners. These fossilized corners are also in some of the Belt Supergroup rocks. Stromatolites formed in areas of warm shallow water and, the plants of today, needed sunlight and carbon dioxide to live. Stromatolites lived in large colonies, similar to coral. One rock, stromatolites commonly exist in a few places in the world. They are found in small, shallow fresh-water lakes and shallow marine lagoons.

2. Kaniksu Batholith (Krbh) - 50 to 100 million years ago

Batholith Formation

About 150 million years ago, the continental margin was located along Idaho's western border, where two tectonic plates collided. This collision resulted in the western plate being forced down (subducted) and overlain by the eastern plate. As the western plate was subducted, the rock was heated and portions were melted. The melted material (magma) was lighter than the surrounding rock and rose up from deep within the earth. Instead of forming a volcano, it solidified near the earth's surface and formed what is called a batholith.

Batholith Exposure

When the Kaniksu batholith intruded upward, it forced the overlying Belt Supergroup rocks to the east and west. The Kaniksu batholith and the Belt Supergroup rocks along the Portland fault. In geology, a batholith is a large mass of igneous rock bodies that have cooled and solidified. One time volcanic of the Kaniksu batholith exposed the Kaniksu batholith. The movement of the Belt Supergroup rocks to the east also formed a large trench between the two rock groups that eventually filled with gravel and sand forming the Rathdrum Prairie.

Kaniksu Batholith Rocks

The upper crustal material is made up of many different types of igneous rocks that result from one or more materials with different melting temperatures. Minerals with low melting temperatures melt first and separate from the larger rock mass. The rocks that melt first make up granitic rocks. Because it took millions of years for the magma to solidify back into rocks, it has time to form many different minerals as crystals that we can see when we look at the rocks.

GEOLOGIC MAP

Geologic Map Legend

- Unconsolidated Deposits (Ucd)
- Clastic Lake Missoula Flood Deposits (Glnfd)
- Columbia River Basalts (Crb)
- Kaniksu Batholith (Krbh)
- Belt Supergroup (Bsg)
- Spokane Valley - Rathdrum Prairie Aquifer

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Glacial Lake Missoula Flood Deposits

WHAT: Unconsolidated sands, gravels, cobbles, and boulders **WHERE:** Northern Idaho, Eastern Washington, Columbia River gorge, and the Willamette Valley in Oregon **HOW:** The cooling climate during the Pleistocene Epoch, or Ice Age, caused sheets of ice to advance south several times from current day Canada. A finger of the ice sheet called the Puget Trench Lobe blocked the Clark Fork drainage

DIFFERENT PATHS
Sometimes the Puget Trench Lobe extended to the southern end of Lake Pelee Draille. When this ice dam broke, the flow path available to the floods was north through the Rathburn Prairie when the Puget Trench Lobe did not extend to the south. In other cases, the floods had several possible paths leading to the Rathburn Prairie. Some of these paths are shown in the diagram. The flow path through the Clark Fork River valley is the most likely.

Did You Know?
The ice dam was over 2,000 feet tall. Glacial lake Missoula was as big as Lake Erie and Lake Ontario combined! The floodwaters speed may have peaked at about 60 mph.

forming Glacial Lake Missoula. At its maximum, the lake covered about 2,000 square miles with more than 500 cubic miles of water and was 2,000 feet deep at the ice dam.

The water behind the ice dam exerted great force on the ice dam and forced its way into the ice. Eventually the ice dam failed and released a great volume of water all at once, creating enormous floods. Ice dams formed and exploded at least 40 times during a proglacial, Icelandic "glacial rain," each time. Each flood covered out the topography and carried and deposited the sediments that filled valleys in the region.

WHAT IT'S IMPORTANT: The unconsolidated sediments that make up these flood deposits are the materials that make up the SVRP aquifer. This "loose" sediment contains a lot of road space between grains that is highly permeable (water easily flows through it) which makes it great aquifer material.

WHERE: Northern Idaho and Eastern Washington **HOW:** Unconsolidated sediments that have been accumulated through wind, water, or as a result of landslides. Included in this unit is the Palouse windblown sediments that extend from the Central Washington to the Pullman-Moscow area north to some of the upland areas surrounding Spokane. About a million years ago a warm dry climate existed and significant winds from the southwest carried silt from the central Washington area. The source of the fine silt was the fine material that flowed with older catastrophic floods and settled in what is now the channeled scablands. These windblown silts are also called "loess" deposits, derived from the German word for loess.

WHAT IT'S IMPORTANT: These unconsolidated sediments often lie above the flood deposits that comprise the SVRP aquifer. These sediments may contain high-quality soil that has been utilized for agriculture.

Ice Age Floods

How Ice Age Floods created the SVRP Aquifer.

The water in the Spokane Valley-Rathburn Prairie (SVRP) area during the ice age floods reached depths of about 450 feet and flowed with peak velocities of 60 miles per hour. The flow rates may have reached one billion cubic feet per second—more than the flow of all the rivers in the world. Large amounts of ice, cobbles, sand, and gravel were carried along with the water.

The larger gravel, cobbles, and boulders were deposited and most of the smaller silt and sand were carried downstream. The gravel, cobbles, and boulders are now part of the SVRP aquifer. Glacial Lake Columbia covered the Rathburn Prairie and Spokane Valley almost to the front of the ice dam during some of the floods. When the lake was present, it slowed down the water so some silt and sand were deposited along with the gravel, cobbles, and boulders.

After flowing through the SVRP area, the floodwaters flowed across central Washington forming cones (steep-sided channels) and defined the landscape giving the area the name "scablands." Large pieces of ice with boulders floated many miles to the flood. The boulders were deposited as the ice melted leaving behind unusual rocks called "erratics." The flood water finally spilled into the present-day Columbia River Gorge and on to the Pacific Ocean.

As an erratic boulder in a scabland.

Repeated Ice Age Floods.
After a flood event ended, the ice lobe slowly moved southward, blocking the Clark Fork River once again. Eventually this dam would fail, resulting in another flood. This repeated flooding deposited large amounts of mainly gravel and cobbles in the SVRP area and eventually blocked the tributary valleys, forming Lakes Couer d'Alene, Hayden, Pease Draille, Spier, Twin, Hansen, Liberty, and Newman.

Harlen Bretz and the Mystery of the Ice Age Floods.
Harlen Bretz (1882-1970) was a University of Chicago professor who studied the unconsolidated deposits in the Spokane Valley-Rathburn Prairie area. He proposed the ice age great flood model, an idea that was eventually accepted because he did not know the source of the flood.

Evidence for the Ice Age Floods.
The evidence for Glacial Lake Missoula comes from shoreline features called wave-cut strandlines on many hillsides in Montana. Joseph T. Pardee (1871-1960) was a U.S. Geological Survey geologist who theorized that the wave-cut strandlines above Missoula, as well as other features in western Montana, came from a large lake that emptied rapidly. In 1940 he reported the lake emptied to the west and was the source of Bretz's catastrophic flood.

Great ripple marks on the Crane Prairie in Montana and on the Wicwas in Washington, as well as large cones, are evidence of vast amounts of water flowing rapidly. Sediments found in many places along the flood paths are the evidence for repeated Ice Age Floods. Some rhythmites are found along the lower part of Hangman Creek. The exposed rhythmites near Touchet, Washington, have at least 40 layers.

Wave-cut strandlines on the hillsides above Missoula, Montana record former high water lines, or shorelines, of Glacial Lake Missoula.

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2015 Atlas Pages Below

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3. Columbia River Flood Basalts (CrB) - 10 to 17 million years ago

Basalt flows 17 million years ago, as many as 270 are found. The largest flow, the Great Basalt, covered the Pacific Northwest and the Willamette Valley. These basalt flows did not form volcanoes because the flows were very fluid and spread out. It is estimated that about 40,000 square miles of basalt flowed out over an area of 40,000 square miles. The individual flows were estimated to be about 100 feet high and flowed at approximately 3 miles per hour. Sometimes there were hundreds of thousands of years between the flows.

In the central area of Washington near the Tri-Cities the cooled and fractured flows, called basalt, is up to 3000 feet thick. The Spokane Valley - Rathburn Prairie (SVRP) aquifer is an old valley of the Columbia River flood basalt and many of the basalt boulders in the SVRP aquifer are up above the basalt.

Three Basalt Flows from Each Lava Flow
The basalt has three distinct layers depending on what you see in the flow. It has three flow tops, middle section, and flow bottom.

- The upper part of the basalt flow (flow top) is called and hardened quickly in contact with the atmosphere and is characterized by many small air bubbles. Basalt with many small air bubbles is called vesicular basalt.
- The middle section of a basalt flow looks like long time to cool and solidify. As the basalt cooled, it shrank and developed cracks. The cracks started near the top where it cooled first and spread downward, making long columns. Each individual crack column is called a columnar.
- The flow bottom was in contact with the ice of the previous glacial basin flow. Generally the top of the previous flow was exposed to the elements and weathered into soil and smaller bits of basalt. When the new flow flowed over the top of the older basalt, it picked up and incorporated large amounts of the old basalt. Basalt with bits of old basalt is called a breccia.

Exploding Ice
The water behind the ice dam exerted great force on the ice dam and forced its way into the ice. Eventually the ice dam failed and released a great volume of water all at once, creating enormous floods. Ice dams formed and exploded at least 40 times. These types of glacial floods are called proglacial, or Icelandic, term meaning "glacial rain."

Different Paths
Sometimes the Puget Trench Lobe extended to the southern end of Lake Pelee Draille. When this ice dam broke, the flow path available to the floods was north through the Rathburn Prairie, when the Puget Trench Lobe did not extend to the south. In other cases, the floods had several possible paths leading to the Rathburn Prairie. Some of these paths are shown in the diagram. The flow path through the Clark Fork River valley is the most likely.

4. Glacial Lake Missoula Flood Deposits (Gmfnd) - 15 to 100 thousand years ago

The cooling climate during the Pleistocene Epoch, or Ice Age, caused sheets of ice to advance south several times from current day Canada. The eastern leading edge of the Cordilleran Ice sheet are called lobes. There were two main lobes in the area. The Puget Trench Lobe flowed to the south and blocked the Clark Fork River and the Okanogan valley. The flow path through the Clark Fork River valley is the most likely.

The Puget Trench Lobe of ice reached south to completely cover the area of present day Lake Pelee Draille during the last glacial advance, 13,000 to 13,500 years ago. This glacier blocked the Clark Fork drainage forming Glacial Lake Missoula. The lake covered about 2,000 square miles with more than 500 cubic miles of water and was 2,000 feet deep at the ice dam.

Repeated Ice Age Floods
After a flood event ended, the ice lobe slowly moved southward, blocking the Clark Fork River once again. Eventually this dam would fail, resulting in another flood. This repeated flooding deposited large amounts of mainly gravel and cobbles in the Spokane Valley - Rathburn Prairie area and eventually blocked the tributary valleys, forming Lakes Couer d'Alene, Hayden, Pease Draille, Spier, Twin, Hansen, Liberty and Newman.

Ice Age Floods Beyond the SVRP Aquifer
The catastrophic floods from Glacial Lake Missoula rapidly flowed into the Pacific Ocean. The floods carried enormous amounts of water forming cones, features called "boulders." Cones are generally long with steep sides caused by the rapid erosion and slow cutting from the large amounts of water flowing through. The water that spilled out into the channels to the west and into low points to the south flows through the ice and sand were carried along. These cones are one part of the basalt aquifer.

Large pieces of ice with boulders floated many miles to the flood. The boulders were deposited as the ice melted leaving behind unusual rocks called "erratics."

The flood water finally spilled into the present-day Columbia River Gorge and on to the Pacific Ocean.

Did you know?

- The ice dam was over 2,000 feet tall.
- Glacial Lake Missoula was as big as Lake Erie and Lake Ontario combined!
- The floodwaters speed may have peaked at about 60 mph.

Evidence For The Ice Age Floods
The evidence for Glacial Lake Missoula comes from shoreline features called wave-cut strandlines on many hillsides in Montana. Joseph T. Pardee (1871-1960) was a U.S. Geological Survey geologist who theorized that the wave-cut strandlines above Missoula, as well as other features in western Montana, came from a large lake that emptied rapidly. In 1940 he reported the lake emptied to the west and was the source of Bretz's catastrophic flood.

Great ripple marks on the Crane Prairie in Montana and on the Wicwas in Washington, as well as large mounds are evidence of large amounts of water flowing rapidly. Sediments found in many places along the flood paths are the evidence for repeated Ice Age Floods. Some rhythmites are found along the lower part of Hangman Creek. The exposed rhythmites near Touchet, Washington, have at least 40 layers.

Wave-cut strandlines on the hillsides above Missoula, Montana record former high water lines, or shorelines, of Glacial Lake Missoula.

5. Unconsolidated Deposits (Ucd) - Present to 1.6 million years ago

These deposits include unconsolidated deposits that have been accumulated through wind, water, or as a result of landslides. These include the Palouse windblown sediments that extend from the Central Washington to the Pullman-Moscow area north to some of the upland areas surrounding Spokane. About a million years ago a warm dry climate existed and significant winds from the southwest carried silt from the central Washington area. The source of the fine silt was the fine material that flowed with older catastrophic floods and settled in what is now the channeled scablands. These windblown silts are also called "loess" deposits, derived from the German word for loess.

Geologists Unravel the Mystery of the Ice Age Floods and Glacial Lake Missoula
Joseph T. Pardee (1871-1960) was a US Geological Survey geologist who theorized that the wave-cut strandlines above Missoula, as well as other features in western Montana, came from a large lake that emptied rapidly. In 1940 he reported the lake emptied to the west and was the source of Bretz's catastrophic flood.

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10 Hydrogeology

The Spokane Valley Rathdrum Prairie Aquifer (SVRP) covers about 370 square miles in northern Idaho and eastern Washington. It is composed of Ice Age flood deposited gravels, cobbles, and boulders and is filled with water. No continuous clay or silt layers exist across the SVRP Aquifer to keep contaminants from the surface moving down into the SVRP Aquifer.

The valley walls are composed of massive rocks and clay that continue below the ground surface to form the impervious basin that holds the SVRP Aquifer gravels. Relatively flat basalt plateaus such as Five Mile Prairie and the Columbia Prairie rise hundreds of feet above the valley.

The Bitterroot Mountains east of Rathdrum Prairie and the Selkirk Mountains along the Washington - Idaho border also form the aquifer edges (or "walls"). These mountains are more than 2,000 feet higher than the basalt plateaus to the southwest.

Altitude of water level in feet, of the Spokane Valley Rathdrum Prairie Aquifer, September 2004
(Data from North American Vertical Datum of 1988)

2,200 to 2,300	1,600 to 1,650
2,100 to 2,200	1,500 to 1,600
2,000 to 2,100	1,400 to 1,500
1,900 to 2,000	1,300 to 1,400
1,800 to 1,900	1,200 to 1,300
1,700 to 1,800	1,100 to 1,200

SVRP Aquifer Recharge
 Water enters the SVRP aquifer from several sources including:
 • Precipitation
 • Seepage from lakes
 • Seepage from the Spokane River
 • Water from irrigation
 • Effluent from septic systems

Precipitation that falls onto the land surface above the SVRP Aquifer eventually infiltrates and recharges the aquifer. Precipitation that falls onto the bedrock upland areas infiltrates very little because the bedrock is not very permeable. The water moves more laterally eventually combining with other water in the watershed and forming small streams. These streams flow downhill and discharge onto the permeable soils above the aquifer and quickly infiltrate downward to the water table. Some of the watersheds have lakes at the bottom that collect all the water. The lakes contribute water to the aquifer either through seepage from the bottom or overflow to streams that discharge onto the land surface above the aquifer. The Water Budget on page 14 shows the average amount of water that enters the SVRP Aquifer from each of these sources in a year.

The amount of water that recharges the SVRP Aquifer is lowest in the summer and highest in the spring when the snow melts.

Groundwater Flow
 The elevation of groundwater in the northern Rathdrum Prairie is about 2,110 feet while the elevation is about 1,350 feet near Lake Spokane. Groundwater in the SVRP Aquifer flows from the northern Rathdrum Prairie area southward to Coeur d'Alene-Pool Falls, then toward the west into Washington. The water flows through Spokane-Spokane Valley areas and seeps out to flow around the Five Mile Prairie. All the water eventually empties into the Spokane and Little Spokane Rivers that flow into Lake Spokane. Because of the very permeable nature of the aquifer, groundwater flow velocities can reach approximately 50 feet per day.

In some places, water seeps out of the bottom of the Spokane River and supplies recharge to the SVRP Aquifer. Water is pumped from the SVRP Aquifer for people to use. Some of this water is returned to the SVRP Aquifer through irrigation or septic discharge. Generally people use more water than is returned to the SVRP aquifer, so there is a net loss.

Did You Know?
 The surface of the SVRP Aquifer is so porous, create flow in a short distance on top of it before all the water soaks into the ground!

11 Aquifer-River Interchange

The connection between the SVRP Aquifer and Spokane River

Spans between the rocks and gravel in the Spokane Valley Rathdrum Prairie (SVRP) Aquifer allow large interchanges of water with the river. The losing reaches of the Spokane River are the largest recharge sources to the SVRP Aquifer. The gaining reaches of the river get additional water from the aquifer.

The surface elevation of the SVRP Aquifer is a little higher than the bottom of the Spokane River in parts of Washington. Water flows into the river through the bottom or via seeps on the overbanks. These are called "gaining reaches".

The photograph below is a gaining reach of the Spokane River near Selkirk Road. The rippling on the water at the bottom left corner of the picture shows down water flowing out of the SVRP Aquifer and into the river on August 18, 2021.

SVRP Aquifer and Spokane River Water Levels
 The aquifer surface levels downstream of Pool Falls depend on the flow in the Spokane River, and vice versa. The Spokane Valley well on the graph to the right is located two miles from the Spokane River. See how the river and well water level track closely!

Pumping from the aquifer reduces its level, in turn reducing the amount of gaining reach. This reduces the river flow since there are fewer locations where the aquifer soaks the river. (See the River Gaining and River Losing diagrams). The closer a well is to a gaining reach, or the greater the pumping rate, the larger the reduction will be.

Keeping enough water in the Spokane River is important to maintain a healthy environment for fish and other aquatic life. It also supports recreation and scenic beauty. The best way to accomplish this during summer months when the river is already seasonally low is to reduce the amount of outdoor water use, particularly landscape and lawn watering.

Did You Know?
 The Spokane River is the largest source of water to the SVRP aquifer and most water that discharge onto the Spokane River.

Aquifer-River Interchange
 Below the elevation differences between the Spokane River and the SVRP aquifer along with a plan view map with the gaining and losing reaches.

- Leaving Reaches: The river loses water to the aquifer.
- Gaining Reaches: The river gains water from the aquifer.
- Transitional Reaches: Changing conditions between gains/losses.
- Minimal Interactions: The river neither gains nor loses.

2015 Atlas Pages Below

HYDROGEOLOGY

The Spokane Valley - Rathdrum Prairie (SVRP) Aquifer

The SVRP aquifer covers about 370 square miles in northern Idaho and eastern Washington. It is composed of Ice Age flood deposited gravels, cobbles, and boulders and is filled with water. No continuous clay or silt layers exist across the SVRP Aquifer to keep contaminants from the surface moving down into the SVRP Aquifer.

The valley walls are composed of massive rocks and clay that continue below the ground surface to form the impervious basin that holds the SVRP aquifer gravels. Relatively flat basalt plateaus such as Five Mile Prairie and the Columbia Prairie rise hundreds of feet above the valley.

The Bitterroot Mountains east of Rathdrum Prairie and the Selkirk Mountains along the Washington - Idaho border also form the aquifer edges (or "walls"). These mountains are more than 2,000 feet higher than the basalt plateaus to the southwest.

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1,700 to 1,800	1,100 to 1,200

SVRP Aquifer Recharge
 Water enters the SVRP aquifer from several sources including:
 1) Precipitation
 2) Inflow from upland bedrock watersheds
 3) Seepage from lakes
 4) Seepage from the Spokane River
 5) Water from irrigation
 6) Effluent from septic systems

Precipitation that falls onto the land surface above the SVRP Aquifer eventually infiltrates and recharges the aquifer. Precipitation that falls onto the bedrock upland areas infiltrates very little because the bedrock is not very permeable. The water moves more laterally eventually combining with other water in the watershed and forming small streams. These streams flow downhill and discharge onto the permeable soils above the aquifer and quickly infiltrate downward to the water table. Some of the watersheds have lakes at the bottom that collect all the water. The lakes contribute water to the aquifer either through seepage from the bottom or overflow to streams that discharge onto the land surface above the aquifer. The Water Budget on page 14 shows the average amount of water that enters the SVRP Aquifer from each of these sources in a year.

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In some places, water seeps out of the bottom of the Spokane River and supplies a bit of recharge to the SVRP Aquifer. Water is pumped from the SVRP Aquifer for people to use. Some of this water is returned to the SVRP Aquifer through irrigation or septic discharge. Generally people use more water than is returned to the SVRP aquifer, so there is a net loss.

AQUIFER-RIVER INTERCHANGE

Spokane Valley - Rathdrum Prairie (SVRP) Aquifer - Spokane River Interconnection

The large spans between the rocks in the SVRP aquifer allow relatively large interchanges of water with the river. The losing reaches of the Spokane River are the largest and largest sources to the SVRP Aquifer. The gaining reaches of the river get a significant amount of water from the SVRP aquifer.

Did you know?
 The Spokane River is the largest source of water to the SVRP aquifer and most water leaving the SVRP aquifer goes to the Spokane River.

SVRP Aquifer and Spokane River Water Levels
 The aquifer surface levels in the SVRP aquifer downstream of Pool Falls depend on the flow in the Spokane River, and vice versa. The Spokane Valley well on the graph to the right is located 2 miles from the Spokane River. See how the river and well water level track closely!

Pumping from the aquifer can lower the amount of groundwater that seeps into the Spokane River in the gaining reaches, which reduces the river flow. The closer a well is located to the gaining reach, or the greater the pumping rate, the larger the reduction will be. In order to maintain a healthy environment for fish and other aquatic life, it also supports recreation and scenic beauty.

This graph shows the elevation differences between the Spokane River and the SVRP aquifer along with a plan view map with the gaining and losing reaches.

- Leaving Reaches: The river loses water to the aquifer.
- Gaining Reaches: The river gains water from the aquifer.
- Transitional Reaches: Changing conditions between gains/losses.
- Minimal Interactions: The river neither gains nor loses.

2023 Monitoring pages 16-17

16 SVRP Aquifer Monitoring

The Spokane Valley-Bathlum Prairie (SVRP) Aquifer is the primary source of water for drinking and irrigation for over 500,000 people living in the area. The SVRP Aquifer has been designated as a sole source aquifer by the US Environmental Protection Agency and as a sensitive resource aquifer by the Idaho Department of Environmental Quality. The large number of people that use the SVRP Aquifer and the lack of any natural barriers to prevent pollutants from reaching the aquifer make it important to monitor the water quality and water quantity.

The **Panhandle Health District (PHD)** has been monitoring the aquifer on the Bathlum Prairie since 1973. The sampling began because of concerns about the increasing number of septic systems and the potential to impact water quality. The sampling program has changed over time. Today PHD monitors water quality for approximately 38 wells three times a year, looking for chemicals such as nitrate, arsenic, chloride, and chloride.

The **Idaho State Department of Agriculture (ISDA)** groundwater monitoring program addresses issues that involve pesticides, fertilizers, and other potential agricultural contaminants. ISDA regional monitoring projects are located in areas where groundwater quality is susceptible to degradation from agricultural practices.

The **Idaho Department of Water Resources (IDWR)** began monitoring groundwater on the Bathlum Prairie in 1976. The program objective is to characterize the groundwater quality of the state's major aquifers, identify trends and changes in groundwater quality within the state's major aquifers, and identify potential groundwater quality problem areas.

All public water systems are required to regularly monitor water quality in their wells. The water quality information is reported in their annual Consumer Confidence Report, which you can get from the public water systems website or by calling their office.

Chloride Trends

Chloride, not to be confused with chlorine added to drinking water and swimming pools, gets into groundwater naturally when it dissolves from rocks and soil. Chloride is also added to groundwater from human sources such as wastewater, leaching, landfills, industrial waste, fertilizer, and drinking salt. Chloride dissolved in water can move very easily through sand and gravel from the ground to the water table and through the aquifer. This means that chloride is a good indicator of water quality that may be impacting aquifer quality.

The lowest chloride concentrations in the Spokane Valley-Bathlum Prairie Aquifer are less than 1 milligram per liter (mg/L). Since the late 1990s, the chloride concentrations have been increasing slightly, some getting to 30 mg/L. Fortunately, the chloride concentrations are still significantly below the drinking water standard of 250 mg/L. Nevertheless, increasing trends in chloride may indicate that more work can be done to reduce our impact on our region's drinking water.

One large source of chloride is the salt used for deicing roads, parking lots, and sidewalks. During the winter season hundreds of pounds of salt can be used for every mile of road to make them safer for driving. Discharge from septic systems can have chloride concentrations around 50 mg/L. Thousands of septic drainfields over the SVRP Aquifer can contribute to the elevated chloride concentrations.

The increasing chloride concentrations tend to be in areas with higher populations. The graphs show the chloride concentrations in the water from two wells in the SVRP Aquifer with increasing chloride trends.

Phosphorus

Phosphorus is an important nutrient required for plant growth. Too much phosphorus in a lake or river can lead to excessive algae and aquatic plant growth. Excessive plant growth in lakes and rivers can make the water unsafe for swimming or reduce dissolved oxygen for fish.

Local efforts to reduce phosphorus pollution since the 1970s have led to reductions of phosphorus in household products such as laundry detergent, dishwasher detergent, and turf fertilizer. Keeping phosphorus

Monitoring wells

Monitoring wells are drilled into the ground to measure the water levels and test water quality. They are often located where there are no public supply wells nearby. These wells may be from 30 to over 400 feet deep. The well diameter is usually 2 to 4 inches in diameter pipe into the hole to keep the hole from collapsing. They also put screens or sieves at the bottom of the pipe to keep the sand and rocks out. Most monitoring wells do not have pumps in them unlike public supply wells.

Emerging Contaminants

The Spokane Valley-Bathlum Prairie Aquifer is monitored for water quality by several agencies in both Washington and Idaho. Water quality records date back to the 1970s and are taken in numerous well locations.

As part of normal water quality surveying, some local agencies also explore potential impacts from emerging contaminants of concern (ECCO). These are chemicals or related contaminants that were previously unknown to cause environmental health risks, or they are highly suspected to be a risk to water quality but the current evidence of their impact is still unknown or inconclusive. While the investigation of these contaminants is performed, some water providers are proactively sampling for their presence in SVRP Aquifer waters.

Notable examples of ECCOs that have already been studied in the SVRP Aquifer are poly (aryl) bisphenol A (PBA) microplastics, and aluminum compounds (PACs). Contaminants that may be candidates in future sampling endeavors are: Polychlorinated Biphenyls (PCBs).

SVRP Aquifer Monitoring 17

Fibers (PFEBs) which are used in flame retardants in a wide variety of laminar, upholstery, and electrical equipment and Polybrominated Biphenyls (PBBs) which is no longer produced in the US but served similar flame retardant purposes as PBBs.

Polychlorinated Biphenyls (PCBs)

Polychlorinated Biphenyls (PCBs), a group of persistent organic pollutants, have been given special attention in the Spokane River since 2012 when a concerned effort was launched to address sources of PCBs in the river.

In 1979, PCB production was banned in the United States. Nevertheless, the impact of PCBs remains in many places today. The most common use of PCBs was, and is, in electronic and control in electrical equipment, most notably in transformers. On top of that, we can find legacy PCBs in products and materials like oil-based paints, the oil used in motor and hydraulic system adhesives, tapes, carbonless copy paper, floor finish, fluorescent light ballasts, etc. (EPA, 2022).

When PCBs end up in our lakes and rivers, they persist and travel up through the food chain, in some cases having significant health risks to humans and in the environment. Low concentrations in the river hold up or bioaccumulate, to higher concentrations in fish. This is a health risk not only to aquatic life but also for people that consume fish from these water bodies. Populations that eat high fish consumers, such as Native American tribes, Asian Pacific Islanders, and recreational fishers, are at greater risk.

The WA Department of Ecology has been doing some work regarding PCBs impacts to the Spokane River Basin. Additionally, the Spokane River Regional Toxics Task Force (SRRTTF) has led efforts to identify and reduce toxic compounds in the Spokane River. Learn more at spokanekeeper.org

Did You Know?

The SVRP Aquifer is unconfined meaning it has no protective layer of clay or rock above it to keep out pollutants that are nearby on the surface. Monitoring of water quality and water levels shows how the SVRP Aquifer is changing over time.

SVRP Aquifer Monitoring

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Annual average aquifer surface elevations

These wells are both measured by the IDEQ — one in Idaho and the other in Washington. The data in these graphs represent the average of all the measurements taken in each year.

The SVRP aquifer surface elevation in the water table's most higher spot is in Washington, and the average you'll encounter there is the highest and most variable (1 foot in the Washington well). The SVRP aquifer surface levels in the Washington well are affected by the Spokane River while the wells in the Idaho well are influenced mainly by snow melt and precipitation.

Monthly IDEQ collects groundwater (depth) data samples from the SVRP aquifer to better understand how groundwater concentrations vary by location. The elevation in concentrations in the SVRP aquifer wells flowing into the Spokane and Little Spokane Rivers are low.

Monitoring wells

Monitoring wells are drilled into the ground to measure the water levels and test water quality. They are often located where there are no public supply wells nearby. These wells may be from 30 to over 400 feet deep. The well diameter is usually 2 to 4 inches in diameter pipe into the hole to keep the hole from collapsing. They also put screens or sieves at the bottom of the pipe to keep the sand and rocks out. Most monitoring wells do not have pumps in them unlike public supply wells.

SVRP Aquifer Surface Elevation Monitoring

The IDEQ and others measure the depth of the SVRP aquifer surface below the ground surface. SVRP aquifer surface elevations are affected from these data. Changes in aquifer surface elevations are caused by precipitation, snowmelt, and river flow.

Daily depth to aquifer surface measurements

The well bores in this well have been measured daily for an electronic device since September 2013. The peak level was in May 2012 after the Spokane River had high flow from rain melt in Idaho mountains. The lowest levels occur in the summer when we have the most precipitation and lowest flows in the Spokane River.

2015 Atlas Pages Below

2023 The Value of Water pages 16-17

Protecting the levels of our aquifer & river.

Everyone who lives in the Spokane Valley-Rathdrum Prairie service area uses the aquifer as their water supply. We use water from the aquifer to drink, wash our toilets, water our yards, irrigate crops and, perhaps most importantly, we drink it! **What people understand the most, why and how of our aquifer and river, perhaps then, collectively we'll appreciate the value of our water**

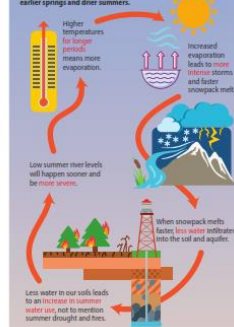
WHAT impacts our aquifer and river levels?

CLIMATE AND WEATHER

Produced higher temperatures bring winter melt and winter moists. Earlier and later snowmelt bring more spring and summer moists, causing increasing withdrawals from the SVRP aquifer during the hot summer months.

The effect of climate change on our aquifer and river.

Climate and weather changes are creating earlier springs and drier summers.

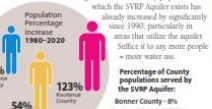


What Do YOU Think?

If we VALUE water more—will we waste it less?

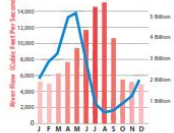
POPULATION IMPACT

Research is ongoing to determine if the Pacific Northwest will experience an exceptional influx of residents fleeing undesirable or suboptimal climate conditions elsewhere. Regardless, the in-county population in which the SVRP Aquifer exists has already increased significantly since 1990, particularly in areas that utilize the aquifer. Suffice it to say more people = more water use.



SEASONAL WATER USE WE PUMP AT THE WORST TIME

Just as we pump more water from the aquifer to water our lawns during the summer, the river flows at its lowest. In a dry year, the river can fall 8-10 feet and the aquifer can fall 1-2 feet.

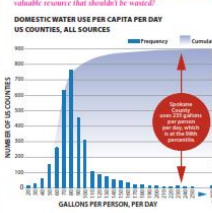


THE COST OF WATER

We are fortunate to have efficient waterpower and low cost of a very clean and accessible water source. This keeps our costs much lower than most areas of the country. The result? Spokane County ranks in the top 2% in the nation in highest water usage per person, per day. Currently our water is affordable, however, the question we might ask ourselves is: **Regardless of the price, should I treat water like it's a valuable resource that should be conserved?**

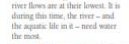
DOMESTIC WATER USE PER CAPITA PER DAY

US COUNTIES, ALL SOURCES



LANDSCAPING CHOICES

The grass grows so densely in our cities and homes greatly impact water use. Whether it's a retail property with large people per acre or a suburban home with green lawns, landscaping choices impact water use.



Indoor water use remains flat even as our population has increased due in part, in part, to more efficient shower heads, faucet aerators and toilets. Outdoor water use and landscaping decisions have not gone through the same efficiency revolution.

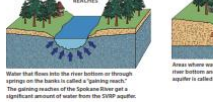
any other specific conservation logos for other areas?

WHY should I care?

PRESERVING OUR LOCAL RIVER ECOSYSTEM

The primary reason is the Aquifer-River Ecosystem. Check out page XX for a full explanation.

Bottom line: When we pump from the aquifer, we risk it impacts the river flows to the detriment of the aquatic life in the Spokane River. With continued population increases in the in-county area served by the SVRP aquifer and the expected hotter summer season, now is the time to take actions that protect this habitat.



Water that flows into the river bottom or through springs on the banks is called a "spring reach". The spring reach is the area where the SVRP aquifer amount of water from the SVRP aquifer.

DEVELOPING REGIONAL CULTURE
It is important to develop a regional culture of conservation now. It drags-down drought years our region at the same time more people rely on the aquifer, adapting and teaching conservation habits will prepare future generations. The culture takes time to develop, and it requires a community of caretakers. If we wait, there may be economic damage that will cost more to reverse than it is to prevent.

PREVENTING UNNECESSARY INFRASTRUCTURE EXPENSES
If water providers must build their entire system for the peak use of outdoor summer irrigation, an increase in more water conservation will mean additional infrastructure (pumps, booster pumps, wells, etc.) at a significant cost to residents.

HOW can I make a difference?

REDUCE OUTDOOR WATER USE

Every individual that contributes to water conservation is key to long-term preservation of the Spokane River and SVRP Aquifer. If area residents wish to have a water-secure future for the next generation, the time to develop good habits is now. Individual actions matter.

IRRIGATE EFFICIENTLY

- Choose the right irrigation brand type. Technology and research together have resulted in very efficient spray systems. Take time to review the newer heads and switch them out on your current system.
- Use a timer to water - and adjust the timer with the seasons, evaluating monthly. Do not set it and forget it!
- Visit "Outdoor Watering Heads, a local website, for great guidance on reducing your outdoor watering footprint.

TURF LAWNS VS. NATIVE LANDSCAPING

- Many lawns require more water with native landscaping that uses less water.
- Learn more online at WaterWiseSpokane.org and SpokaneScapes.org. Click with your water provider to see if they offer irrigation programs.



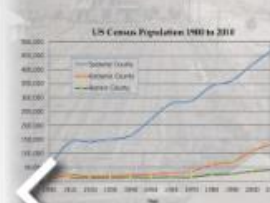
MAKING THIS WOULD BE A NICE PLACE FOR LISTING NATIVE PLANTS, TREES OR OTHER HELPFUL INFO



2015 Atlas Pages Below

WATER USE

Everyone who lives in the Spokane Valley - Rathdrum Prairie (SVRP) area uses the aquifer as their water supply. We use water from the SVRP aquifer to drink, wash our toilets, water our yards, and irrigate crops. Being good stewards of our aquifer means knowing how much water we use and how much is available.



Consumptive and Nonconsumptive Water Use

All the water we pump from the SVRP aquifer either returns to the unconfined (the aquifer is the Spokane River) or it leaves the watershed. When it returns to the watershed it is nonconsumptive water use. Consumptive water use occurs whenever the water evaporates or transpires. Transpiration happens when water moves through plants that is released through small pores in the leaves. Consumptive water use can also happen when the water is evaporated to another watershed, aquifer, or river.



SVRP Aquifer Water Use

Today, the water is used for different purposes depending on where you are on the SVRP aquifer. Public water systems supply residences, businesses, and irrigate for agriculture and parks. Private wells also supply water for residences and businesses, but significant quantities are used for agricultural irrigation.

The Idaho Comprehensive Aquifer Planning and Management Program (ICAMP) provides calculated average rates of water flows for 2009 to 2013, and the Spokane County Meter Based Demand Forecast provides calculated water use for 2015.



This graph shows how much more water we use in the summer. It also shows the amount of consumptive water use in each month.

FORECAST OF SPOKANE VALLEY - RATHDRUM PRAIRIE (SVRP) AQUIFER WATER USE IN SPOKANE COUNTY

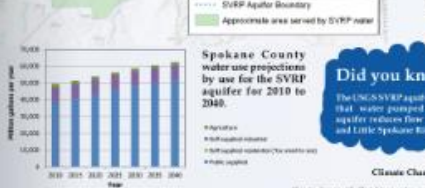
The goal for the Spokane County Demand Study included developing a model to forecast future water use for consumption use in Spokane County on total groundwater available for use.

The forecast model is a spreadsheet model based on water use data, population and economic data, agricultural and industrial data, and 30 year average temperatures and precipitation. It can be updated to use different inputs as new information becomes available.

The SVRP aquifer water use for Spokane County is forecasted to increase 20% by 2040. The increase is approximately 12 billion gallons a year, which is significant given that the river returns (GWRI) to the aquifer is withdrawn from the SVRP aquifer decreases 5% in the Spokane River.

The SVRP aquifer provides 70% of the water used in Spokane County and provides a significant amount of water to the Spokane River during the low flows of the dry years. Analysis of nonconsumptive and consumptive water use and return flows are a critical understanding of the relationship of water use and the river itself.

The water use projections are based on the 30 year average temperatures and precipitation. Using the water and weather modeling of 2005 forecasted the reduced water use by 3%. Using that water use also weather from 2005 (forecasted water use by the Spokane County Meter Based Demand Forecast, 2015 weather that water use is forecasted at the 2005 level.



Spokane County water use projections by year for the SVRP aquifer for 2010 to 2040. Climate change will affect future water use. The Climate Impacts Group (CIG) at the University of Washington studied the potential change in climate for the Pacific Northwest. The CIG study indicates that the SVRP aquifer area will experience higher temperatures along with earlier fall and winter months and other spring and summer months. These changes may increase irrigation with additional withdrawals from the SVRP aquifer. The additional withdrawals would reduce the amount of return flow to the Spokane River and decrease return flow to the Spokane River.

FUTURE WATER USE

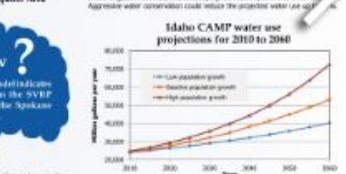
FORECAST OF SVRP AQUIFER WATER USE IN KOOTENAI AND BONNER COUNTIES

The Idaho Comprehensive Aquifer Planning and Management Program (ICAMP) was created to provide information for managing ground and surface water resources into the future. The purpose of ICAMP is to assist future conflicts over water resources, provide data availability to water resources, and find ways to decrease the difference between future water needs and available supply.

A ICAMP report forecasts Rathdrum Prairie water use over the next 30 years for three levels of population growth based on the Idaho Economic Forecasting Model. The water use projection that shows the amount of water that could be withdrawn from the aquifer for law, business, and high population growth projections.

The consumption portion of the projected water use in 2040 is about 20% with the rest returning to the SVRP aquifer in Spokane River. This represents a decrease from 32% consumption use in 2010.

The total amount of projected water use could be reduced by water conservation. Water conservation means using less water for the same purposes. Conservation could include more efficient landscaping, low-flow toilets, better irrigation methods, and landscaping with plants that need less water. Water conservation could reduce the projected water use by up to 20%.



The Idaho water demand study was conducted for publication by the Idaho Economic Forecasting Model (IEM) as part of the Spokane River Demand Study. The study was conducted by IDPR, Engineering, Inc., IDPR, Idaho State University, Idaho Economic Forecasting Model (IEM), and Idaho State University, with assistance from the Idaho, Idaho Department of Water Resources, and the Rathdrum Prairie DWP Advisory Committee. The study was done between 2009 and 2010 and 2010 and 2011.

2023 Stormwater pages 20-21

20 Stormwater & the SVRP Aquifer

What is stormwater?



Rain and snowmelt are important for healthy wildlife habitat, recreation, and replenishing groundwater supplies in the Spokane Valley-Bathrum Prairie Aquifer. However, when we replace the natural landscape with rooftops, parking lots, and streets, the water no longer soaks naturally into the ground. Instead, it flows across these hard surfaces as stormwater runoff.



Did You Know?
Check out the photos on below to learn about the many different places storm drains lead, including the SVRP Aquifer.

POLLUTION IN STORMWATER

Water will carry a lot of everything it touches. Stormwater runoff carries everything the pollution for our trees, lakes, and water. Stormwater runoff carries everything it touches. Stormwater runoff carries everything it touches. Stormwater runoff carries everything it touches.

- PET WASTE
- DIRTY SOIL & SAND
- INSECTICIDES
- PAINT
- GREASE
- TRASH
- LEAVES & GRASS CLIPPINGS
- HERBICIDES & FERTILIZERS
- PAINT
- DIRTY CAR WASH
- WHEELS

It's important for local governments and businesses to manage runoff as quickly as possible to prevent flooding, erosion, and water pollution. In our region, storm drains are the most commonly used method to handle stormwater runoff, as they can easily be placed in the curb and gutter during road and parking lot construction.



Stormwater drains

City stormwater drainage systems have drains along the roads that can flow to the river, lake or a wastewater treatment facility. Most stormwater in our region does not get treated and flows directly to a surface water body. A common phrase to remember is "only rain down the drain". Anything that flows into these drains has the potential to go directly into our rivers and lakes in the area.

Illicit discharge

An illicit discharge is any flow or dumping to a municipal separate sewer or storm drain that is not a permitted discharge. There are only a few exceptions to this rule, including discharges from emergency firefighting operations.

Anything other than stormwater that goes into a storm drain is called an illicit discharge. If you see an illicit discharge, such as a spill or discharge of pollutants, please call your local water or wastewater provider to report the illicit discharge.

Where does stormwater go?

In our urban environment, stormwater runoff is directed to:

- Stormwater is collected in pipes and discharged to streams such as the Spokane River or other surface water sources and/or a wastewater treatment facility.
- Stormwater is directed to swales and dry wells and infiltrated into the ground, eventually recharging the Spokane Valley-Bathrum Prairie Aquifer.

Swales: The natural way to capture stormwater.

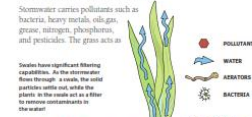
When it rains, the water runs over pavement and other hard surfaces, picking up pollutants along the way. Much of this polluted stormwater runoff historically flowed only to storm drains, which ultimately empty into rivers, lakes, or tributaries to the SVRP Aquifer.

In recent years, local governments have been turning to swales rather than storm drains and dry wells to manage runoff. In fact, swales are now the preferred method to handle stormwater runoff!

Swales not only provide for immediate collection of stormwater to reduce flooding, but the ponding of rainfall in the swale allows the water to naturally soak into the ground.

How do swales work?

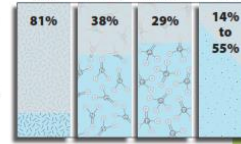
Swales play an important role in our community to remove the pollutants from stormwater prior to infiltrating into our drinking water source, the Spokane Valley Bathrum Prairie Aquifer.



A filter pulling pollutants out as the stormwater passes through it. The following processes occur for pollutant reduction:

- Absorption:** The pollutants in water attach to the surface of soil particles, where roots and bacteria can use them, or where they just remain in situ.
- Storage:** Roots, insects, and worms increase the space between soil particles, making more room for stormwater storage.
- Plant Uptake:** Water, nitrogen, phosphorus, and other trace elements are used for plant growth.
- Recharge:** The excess stormwater (the water not used by the plants) recharges the groundwater supplies in the aquifer via infiltration.

HOW MUCH POLLUTION CAN SWALES REMOVE FROM STORMWATER?



Low-Impact Development: Naturally reducing stormwater runoff

Low-impact development (LID) preserves and creates natural landscape features, minimizing hard surfaces and their effects to create functional and appealing drainage that treats stormwater as a resource rather than a waste product. LID techniques include bioretention facilities, rain gardens, vegetated roof tops, rain barrels, and porous pavement.

Porous pavement prevents stormwater runoff and allows any rain or snowmelt to soak through the pavement itself and into the soil below. Rain barrels store the rain from rooftops to use for watering lawns or other plants. Vegetated roof tops can reduce stormwater runoff and act as insulation. Rain gardens

STORMWATER & THE SVRP AQUIFER 21

and bioretention facilities function like swales and are planted with native and ornamental grasses, shrubs, and trees to filter stormwater. Rain gardens can easily be installed in your front yard to reduce stormwater runoff. Bioretention facilities are engineered for water quality and low cost.

LID over the SVRP Aquifer

You can spot LID facilities over the SVRP aquifer in many places, including the Parkside Health District in Hayden, Corner of High School, Broadway Avenue near Maple in Spokane, and Country Homes Boulevard in Spokane County. You can even see rain barrels in residential yards!

SWALE MAINTENANCE TIPS

A properly maintained swale can help to keep our aquifer clean. The following list will assist homeowners by ensuring their swale can manage runoff efficiently:

- Mow grassed swales to promote healthy growth.
- Don't replace the grass or plants with rocks.
- Minimize the use of lawn and/or garden chemicals.
- Avoid overwatering. Water should pond in the swale only when it rains.
- Remove sediment, litter, branches, leaves, and other debris that accumulates at the inlets so that runoff can flow into the swale.
- Dig up and replace any dead plants or patches of grass.



2015 Atlas Pages Below

STORM DRAINS & THE AQUIFER

WHAT IS STORMWATER?

Rain and snowmelt are important for healthy wildlife habitat, recreation, and replenishing groundwater supplies in the Spokane Valley-Bathrum Prairie (SVRP) aquifer.

However, when we replace the natural landscape with rooftops, parking lots, and streets, the water no longer soaks naturally into the ground. Instead, it flows across these hard surfaces as stormwater runoff.

Where does stormwater go?

In our urban environment, stormwater runoff is directed to:

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- Stormwater is directed to swales and dry wells and infiltrated into the ground, eventually recharging the Spokane Valley-Bathrum Prairie Aquifer.

Where does stormwater go after it enters a storm drain?

Stormwater drains lead to lakes, rivers, streams, and wetlands. Stormwater runoff can also infiltrate into the SVRP aquifer.

Dear Storm Swale Dad,

The other day I saw my neighbor changing the oil of his car on his driveway. Then I saw the used oil go to the storm drain and your oil got right in it. I'm sure he had you in his thoughts! It's so important to not let your oil go down the drain.

Dear Ne To Doer,

My neighbor says that the water from a down drain goes just by looking at it. But if you're not sure, it's better to check it out. It's important to not let your oil go down the drain.

Dear Neighbor,

It's really a good problem that your neighbor's motor oil could eventually reach the SVRP aquifer, and cause problems for the water we use to drink. Please call your local water or wastewater provider to report the illicit discharge.

Dear Neighbor,

It's really a good problem that your neighbor's motor oil could eventually reach the SVRP aquifer, and cause problems for the water we use to drink. Please call your local water or wastewater provider to report the illicit discharge.

Dear Neighbor,

It's really a good problem that your neighbor's motor oil could eventually reach the SVRP aquifer, and cause problems for the water we use to drink. Please call your local water or wastewater provider to report the illicit discharge.

SWALES: THE NATURAL WAY TO CAPTURE STORMWATER

When it rains, the water runs over pavement and other hard surfaces, picking up pollutants along the way. Much of this polluted stormwater runoff historically flowed only to storm drains, which ultimately empty into rivers, lakes, or tributaries to the SVRP aquifer.

In recent years, local governments have been turning to swales rather than storm drains and dry wells to manage runoff. In fact, swales are now the preferred method to handle stormwater runoff!

Swales not only provide for immediate collection of stormwater to reduce flooding, but the ponding of rainfall and snowmelt in the swale allows the water to naturally soak into the ground.

LOW-IMPACT DEVELOPMENT: NATURALLY REDUCING STORMWATER RUNOFF

Low-impact development (LID) preserves and creates natural landscape features, minimizing hard surfaces and their effects to create functional and appealing drainage that treats stormwater as a resource rather than a waste product. LID techniques include bioretention facilities, rain gardens, vegetated roof tops, rain barrels, and porous pavement.

Porous pavement prevents stormwater runoff and allows any rain or snowmelt to soak through the pavement itself and into the soil below. Rain barrels store the rain from rooftops to use for watering lawns or other plants. Vegetated roof tops can reduce stormwater runoff and act as insulation. Rain gardens

LID over the SVRP Aquifer

You can spot LID facilities over the SVRP aquifer in many places, including the Parkside Health District in Hayden, Corner of High School, Broadway Avenue near Maple in Spokane, and Country Homes Boulevard in Spokane County. You can even see rain barrels in residential yards!

STORMWATER SWALES & THE AQUIFER

How Much Pollution Can Swales Remove from Stormwater?

TOTAL SUSPENDED SOLIDS	NITRATE/NITROGEN	PHOSPHATE/PHOSPHORUS	HEAVY METALS
81%	38%	29%	14% to 55%

SWALE MAINTENANCE TIPS FOR HOMEOWNERS

A properly maintained swale can help to keep our aquifer clean. The following list will assist homeowners by ensuring their swale can manage runoff efficiently:

- Mow grassed swales to promote healthy growth.
- Don't replace the grass or plants with rocks.
- Minimize the use of lawn and/or garden chemicals.
- Avoid overwatering. Water should pond in the swale only when it rains.
- Remove sediment, litter, branches, leaves, and other debris that accumulates at the inlets so that runoff can flow into the swale.
- Dig up and replace any dead plants or patches of grass.

2023 Business Protection & Stewardship pages 24 - 25

24 Aquifer Protection & Stewardship

Business risks & best practices management.

W are fortunate to have many types of businesses in our area including aerospace, agriculture, vehicle maintenance and fueling, machining, manufacturing, metal fabrication, bulk storage, surface manufacturing and asphalt, and heavy equipment manufacturing and maintenance. Unfortunately all these businesses present a potential risk to groundwater when they store and use chemicals.

To minimize risk, businesses are asked, or required, to implement best management practices (BMPs). BMPs are methods using current knowledge and technology to provide the most acceptable control and/or treatment of the four main sources of contamination: chemical storage and handling, process wastewater, underground storage tanks, and contaminated stormwater.

Local, state and national organizations working with businesses to protect the Aquifer.

Chemical Storage

Tens of millions of gallons of chemicals are stored over our SVRP Aquifer. Storage containers may leak, or their contents can be displaced by stormwater if left unprotected outside. Chemicals stored outside should be covered to keep out stormwater and should be stored in a containment device that can hold 110% of the total volume in case of a spill.

CHEMICAL STORAGE WITH SECONDARY CONTAINMENT

Store chemicals and hazardous waste in secondary containment to keep spills from spreading and moving. Chemicals stored outside should be covered to keep up stormwater.

Chemical Handling

Sometimes chemicals such as dyes, pesticides, fertilizers, and herbicides are intentionally applied to the ground for our benefit. They may present a risk especially if unintentionally released, misapplied, or overused.

Transferring chemicals between containers or to a vehicle presents a risk of a spill and release to the ground, i.e. magnesium chloride (road deicer), gasoline, oil, and antifreeze.

Did You Know?

Tens of millions of gallons of chemicals are stored over our SVRP Aquifer.

Businesses need a spill plan and spill clean-up materials ready at all times.

Improper Disposal of Process Wastewater

Wastewater from washing vehicles, commercial carpet cleaning, metal plating, and numerous other manufacturing and industrial processes can pollute our water if it is not disposed of properly.

Have multiple points of potential failure and if wastewater containment and washout basins are inadequately designed they may overflow. It is important for these facilities to be monitored and properly maintained.

Before draining a washroom floor, contact with your local sewer provider that accept this type of wastewater. Generally speaking, residential pools are recommended to be drained to sewers, away from any shallow aquifers with and commercial pools should be drained to sanitary sewer. Do not drain pools on streets or into storm drains. Pool chemicals can harm the river and Aquifer.

Contaminated Stormwater

Rain and snow can mix with exposed contaminants at industrial sites. Stormwater carries contaminants into storm drains that discharge into lakes, rivers, and the SVRP aquifer. The most common way stormwater becomes contaminated is at fueling sites where dips, overfills, and drive-offs are common.

Oil Water Separator

2015 Atlas Pages Below

AQUIFER PROTECTION - BUSINESS

We are fortunate to have many types of businesses in our area including aerospace, agriculture, vehicle maintenance and fueling, machining, manufacturing, metal fabrication, surface coating, concrete and asphalt, and heavy equipment manufacturing and maintenance. Unfortunately, all these businesses present a potential risk to groundwater when they store and use chemicals.

RISKS

Did you know? There are tens of millions of gallons of chemicals stored over our SVRP aquifer.

AQUIFER PROTECTION - BUSINESS

CHEMICAL STORAGE & HANDLING

Store chemicals and hazardous waste in secondary containment to keep spills from spreading and moving. Chemicals stored outside should be covered to keep out stormwater.

SOLUTIONS - Best Management Practices at Businesses

To minimize risk, businesses are asked (or required) to implement best management practices (BMPs). BMPs are methods using current knowledge and technology to provide the best acceptable control and/or treatment of the two main sources of contamination: chemical storage and handling, process wastewater, and contaminated stormwater.

UNDERGROUND STORAGE TANKS

Underground storage tanks (USTs) are used to store petroleum or other liquid fuels. There are nearly 350 active UST sites, often with multiple tanks at each site, operating near the Spokane Valley - Rathburn Prairie Aquifer that are regulated in state UST programs.

Every UST facility must be inspected at least once every 3 years.

All owners and operators of USTs are required to complete training in how to properly identify, operate, and maintain UST components.

Operator Training!

STORMWATER

Rain and snow can mix with exposed contaminants at industrial sites. The contaminants can enter from industrial areas or from certain types of buildings. The most common way stormwater becomes contaminated is at fueling sites where dips, overfills, and drive-offs are common.

All contaminated stormwater at fueling businesses must be collected on concrete pads and passed to a drain, and then through an oil-water separator (OWS). Oil-water separators work because fluids, such as oils and fuels, which are less dense than water, float and remain in the first chamber, the heavy sludge sinks to the bottom where it can be removed and disposed of properly. Oil-water separators must be cleaned regularly to remain effective.

23

24

2023 Protect the Aquifer at Home pages 26-27

Aquifer Protection & Stewardship

Protect the Aquifer at home.

Many products that we use every day contain hazardous materials that can be dangerous to people, water, and the environment. Use safe housekeeping practices when using, handling, and disposing of harmful materials, including automotive fluids, cleaning products, fertilizers and pesticides, fluorescent lights, medications, paint, and swimming pool or hot tub chemicals.

Do this.

- Use products that are non-toxic and environmentally friendly.
- Read and follow directions carefully when using any hazardous product.
- Store products in their original containers and label them clearly.
- Store products above basement flood level and off the ground in garages and sheds.

Not this.

- Don't throw hazardous or their containers in the trash.
- Never pour leftover products down sink drains or into the toilet.
- Never mix leftover products.
- Do not dispose household hazardous waste in streams, rivers or lakes.
- Do not dump toxics into storm drains.

PIPE POLLUTERS

Medications and toxic substances including chemicals, cleaners, degreasers, oils, paints, disinfectants, and pesticides should never be put down the drain.

LAUNDRY CLOGGERS

Use liquid laundry detergent, and use it sparingly. Powdered detergent is more likely to have fillers that could damage a septic system!

TOILET CLOGGERS

Household drains and toilets are designed to take only used water, human waste, and toilet paper. Many products, like wipes, clays to be "flushable" but that doesn't mean these items are treatable in the wastewater system.

SINK CLOGGERS

Eliminate the use of garbage disposals. Ground-up garbage does not decompose easily, causes buildup of solids in septic tanks, and may clog distribution pipes.


TOILET CLOGGERS

Household drains and toilets are designed to take only used water, human waste, and toilet paper. Many products, like wipes, clays to be "flushable" but that doesn't mean these items are treatable in the wastewater system.

Conserve water around the home.

Only water when needed. Depending on the weather or type of plants/crops you may only need to water once or twice a week.

- Water early in the morning or late in the day. Water when the soil is low to minimize evaporation.
- Watch where you are watering. Check sprinkler heads to be sure water is not wasted on driveways, sidewalks, or streets.
- Keep an eye on the weather. If rain is in the forecast, turn your sprinkler system off.
- Use drought-resistant species. Native plants are adapted to the local climate and need less water and maintenance.
- Match beds. Two to three inches of mulch retains moisture and helps prevent weeds.
- Set your mower higher. Mow at 2.5 - 3.5 inches high to reduce evaporation and protect your lawn from burnout, weeds, insects, and disease.
- Check for leaks and breaks. Inspect your landscaped area regularly to make sure system pipes and sprinkler heads are in good condition.
- Sweep, don't spray. Use a broom instead of a hose to clean patios, decks, and sidewalks.
- Repair leaky pipes, running toilets, and dripping faucets ASAP. Faucets that drip once per second waste over 3,000 gallons a year!
- Car Wash Wisely. Wash your car on the lawn and use a hose nozzle or take it to a car wash.
- Replace old appliances and fixtures with more efficient models. Look for Energy Star logos.
- Convert older toilets to low-flow with dual-flush or dual-flush device.



Let's pull the plug on e-waste!

The United States dumps 300-400 million electronic items per year. Less than 20% of e-waste is recycled. E-waste represents 7% of trash in landfills, but is 70% of all toxic waste. E-waste is on the Waste and Recycle Directory for proper e-waste disposal options.

WHAT IS E-WASTE?

E-waste consists of all discarded, surplus, obsolete, and broken household or business electronic devices and electric appliances.

WHY IS E-WASTE A PROBLEM?

A typical 19-inch computer contains roughly 2.2 pounds of lead. Lead is a toxic substance that may cause lead poisoning!

E-WASTE LEACHATE & THE AQUIFER

An immense flow through a landfill, it discolors many of the toxic compounds found in e-waste.

The contaminated landfill water, called leachate, eventually seeps the many layers of landfill liner. When the leachate reaches groundwater, it can be lethal to humans.

For the **CSPW** aquifer, this could be the **drinking water** for over 600,000 people.

Local Resources For Waste Management

Coeur d'Alene Lake Area's Dept
oregon.gov/documents/landowners/hazardouswaste.pdf

Idaho Department of Environmental Quality
deq.idaho.gov/media/10747/deq-recycling-guide.pdf

Panhandle Health District
phd1.idaho.gov

Spokane County Regional Solid Waste System
spokanecounty.org/utilities/solidwaste

Kootenai County Solid Waste
kootenai.org/departments/solidwaste

Spokane City Solid Waste
spokanecitysolidwaste.com

City of Spokane Valley
spokanevalley.org/solidwaste

Spokane County Waste Disposal Sites
 Office: 509-477-3004 Hotline: 509-477-6800
 Regional facilities in Spokane County accept tires, recyclables, organics and yard waste, household hazardous waste, construction and demolition waste, and appliances.

It's easy to recycle and properly dispose of water materials. Just go to any of these locations:

- Waste-to-Energy Facility 2905 N. Gateway Road, Spokane Valley, WA 99214
- Valley Transfer Station 2905 N. Gateway Road, Spokane Valley, WA 99214
- University Transfer Station 2423 N. University Road, Spokane Valley, WA 99216
- North County Transfer Station 2217 S. Coeur d'Alene Blvd, Colton, WA 99007

Kootenai County Waste Disposal Sites
 Office: 208-446-1430 Hotline: 208-446-1433
 Kootenai County provides five full-service transfer stations. The transfer stations are open to the general public and waste-hauling companies.

NOTE: All state-owned facilities in Kootenai and Bonanza Counties are closed on the following holidays: New Year's Day, Memorial Day, 4th of July, Labor Day, Thanksgiving Day, and Christmas Day.

For information regarding waste collection facilities within Bonanza County, visit: bonanzacounty.wa.gov/waste

2015 Atlas Pages Below

AQUIFER PROTECTION - HOME

Household Hazardous Waste

Many products that we use every day contain hazardous materials that can be dangerous to people, water, and the environment. Use safe housekeeping practices when using, handling, and disposing of harmful materials, including automotive fluids, cleaning products, fertilizers and pesticides, fluorescent lights, medications, paint, and swimming pool or hot tub chemicals.

WHAT TO DO

- Use products that are non-toxic and environmentally friendly.
- Read and follow directions carefully when using any hazardous product.
- Store products in their original containers and label them clearly.
- Store products above basement flood level and off the ground in garages and sheds.

WHAT NOT TO DO

- Don't throw hazardous waste or their containers in the trash.
- Never pour leftover products down sink drains or into the toilet.
- Never mix leftover products.
- Do not dispose household hazardous waste in streams, rivers or lakes.
- Do not dump toxics into storm drains.

SOME THINGS DON'T BELONG IN YOUR DRAIN. THEY CAN CLOG PIPES AND POLLUTE OUR WATER!

TOILET CLOGGERS

Household drains and toilets are designed to take only used water, human waste, and toilet paper. Many products, like wipes, clays to be "flushable" but that doesn't mean these items are treatable in the wastewater system.

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LAUNDRY CLOGGERS

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11 WAYS TO CONSERVE WATER in the HOME

- Shower shorter times, and shower showers use less water.
- Take short hot showers.
- Only wash clothes, dishes, and mop in full loads.
- Use a 4-gallon bucket to wash cars.
- Use a 4-gallon bucket to wash cars.
- Adjust shower heads, faucets, and toilets to save water.
- Repair leaky faucets, toilets, and showers.
- Install water-saving devices.
- Install water-saving devices.
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AQUIFER PROTECTION - HOME

SPokane County WASTE DISPOSAL SITES

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- North County Transfer Station 2217 S. Coeur d'Alene Blvd, Colton, WA 99007

KOOTENAI COUNTY WASTE DISPOSAL SITES

Office: 208-446-1430 Hotline: 208-446-1433

Kootenai County provides five full-service transfer stations. The transfer stations are open to the general public and waste-hauling companies.

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Monthly Digital Marketing Performance

September 2022

Prepared for:



September 2022 Media Campaign

Home Backflow Protection Video

Online Targeted Display Video

\$1,800

90,208 Impressions

100% video thurplays 48,264

Clicks 37

Social Advertising

\$1,400

35,359 Impressions

100% video thurplays 13,689

Clicks 84



**The video was watched for 1 minute and 12 seconds to the end
61,935 times**



Purpose: To recognize Food Service Establishments that reduce institutional food waste by:

- 1) properly donating needed food resources to Spokane County hunger relief organizations,
- 2) for farm use
- 3) for compost

KSPS Food Rescue Video

- 10/13 2nd Harvest
- 10/18 Safeway – E. Sprague
- 10/19 Whitworth University – Sodexo
- 10/25 Super 1 Foods - 29th
- 10/28 Grocery Outlet - Cheney

KSPS Filming - Food Rescue Video

2nd Harvest - Eric Williams



Whitworth Dining - Sodexo



Also in video:

Safeway on East Sprague, Super 1 Foods on East 29th and Grocery Outlet in Cheney

Saving Water Matters

All of us who live in the Spokane Valley – Rathdrum Prairie (SVRP) Aquifer area use the Aquifer as our only water supply. We use water from the SVRP Aquifer to drink, cook, shower, flush our toilets, and water our yards. In the hot summer months, our water use increases three to five times over what we use in the winter due to lawn and outdoor watering. Poorly installed and maintained home sprinkler systems can spray or leak water onto roadways, sidewalks, and driveways. Water carries a bit of everything it touches and transports pollutants like auto fluids, herbicides, pesticides, and fertilizers into storm drains, the SVRP Aquifer, area lakes and the Spokane River.

In the summer months as we are pumping more water from the aquifer to water our lawns, the Spokane river flow is at its lowest. It is during this time that the river needs water the most to maintain a healthy environment for fish, wildlife, and recreation. It takes all of us doing our part to protect our aquifer and river by using water wisely and finding ways to reduce water waste.

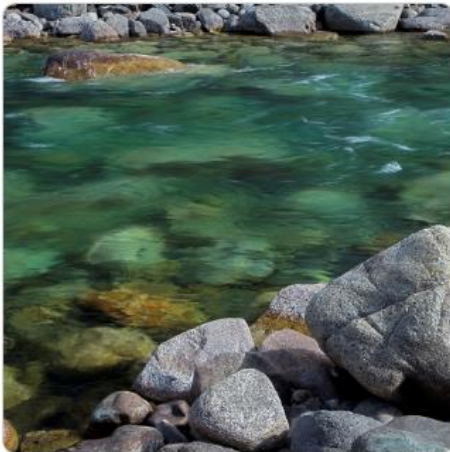
In This Section

[Saving Water Matters](#)

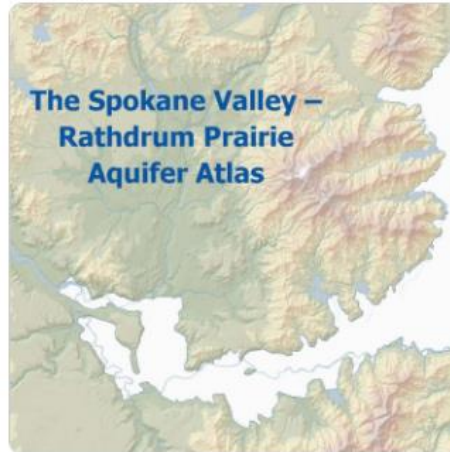
- [Protect the Aquifer and River](#)
- [Aquifer Atlases](#)
- [Videos](#)

Useful Links

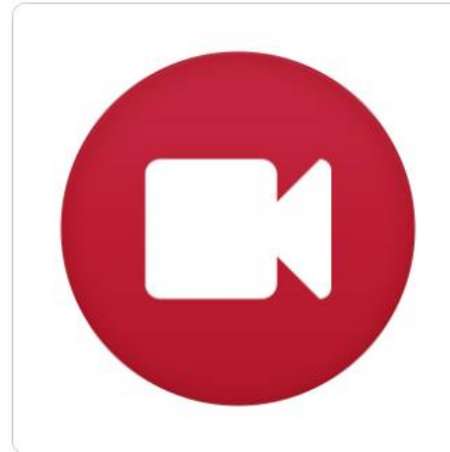
- [Find a Professional](#)
- [DIY Resources](#)
- [How to Videos](#)
- [Watering Restrictions](#)
- [Rebates, Coupons, Contests](#)
- [Events & Classes](#)
- [Water Need Calculator](#)
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See you
November 17, 2022

