

WATER: Region's geology plays a big role

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outside the city limits rely on their own individual or shared wells for their water. All wells are accessing groundwater.

Groundwater vs. surface water

Groundwater is the water that collects or flows beneath the earth's surface, filling the porous spaces in soil, sediment, and rocks. It originates from rain and melting snow and ice and is the source of water for aquifers, springs, and wells.

The water table is an underground boundary between the soil surface and the area where groundwater fully saturates spaces between sediments and cracks in rocks. The saturated zone is bounded at the bottom by impenetrable rock or sediment. The aquifer from which the City of Sisters draws its water is a basalt aquifer.

Surface water is the water that is available above ground in the form of rivers, streams, oceans, lakes, and wetlands. Surface water is mainly collected from precipitation. However, in the Deschutes River Basin, studies have determined there is a hydraulic connection (operated by the pressure of water) between groundwater and surface water. Groundwater appropriations (wells) have the potential for substantial interference with surface water and could measurably reduce waterway flows. Likewise, low stream flows could reduce the amount of groundwater available to be pumped from a well.

What is an aquifer?

Aquifers are often identified by the way they were formed. Alluvial aquifers are water-deposited (usually by moving water), and glacial drift aquifers are deposited by the gradual movement of glaciers. Large aquifer systems

may be composed of several geologic formations, including both alluvial and glacial drift deposits.

Coarse sand and gravel, transported and deposited by rapidly moving water, turns into permeable aquifer deposits when buried. They can extend laterally from a few feet to many miles and can be paper thin to hundreds of feet thick.

The Deschutes Basin aquifer has been described as a large bowl, with a deep end near the Cascade Mountains (and Sisters) becoming shallower up to the northeast and Madras. Much of the eastern side of the Cascade Range drains into this bowl, which is lined by large areas of permeable volcanic rock. When the large annual precipitation at higher elevations collects on that permeable rock, the result is a substantial regional aquifer system and a stream system that is heavily dominated by groundwater, with either resulting springs when the groundwater is high or lower water levels when the groundwater level is lower. The headwaters of the Metolius and Fall Rivers, as well as the springs downriver that feed the Metolius, are examples of that groundwater being released.

When it comes to water, Sisters is ideally located. Groundwater elevations are highest near the Cascade Mountains in the west and Newberry Volcano in the south and decrease to the northeast and north toward the confluence of the Deschutes and Crooked Rivers. The City only needs to drill down about 300-plus feet to reach copious groundwater.

Surface water became the source for irrigation by the early farmers and ranchers in Sisters Country and beyond. A large network of open canals carried water throughout the area. Gradually, over the years, a number of those canals have been replaced by wells and irrigation ponds. In

recent years, the irrigation districts have been piping the remaining canals to stop leakage into the ground.

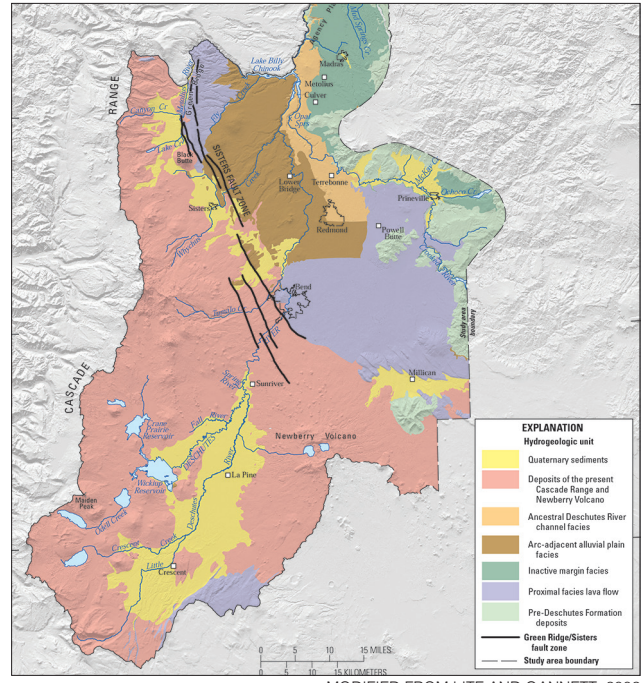
For almost 100 years, due to those leaky canals, the entire area had an artificially high water table. With the piping, the water table is returning to its original natural level, which is leaving some shallow wells dry, intermittently or permanently.

Increasing water demands

The demands for water in the region are coming from all corners — a rapidly increasing regional population, agriculture, environmental projects, hydroelectric, businesses, and recreation. Additional appropriations for surface water have been closed. In a collaborative effort, a new water bank project by the Deschutes River Conservancy will offer payments to Central Oregon Irrigation District patrons in exchange for renting their water out to the North Unit for a year. There are several collaborations working on possible solutions to a variety of water-related issues but, where water is involved, each possible solution can also have unintended consequences.

Impact of climate cycles

Additionally, the current climate cycle has the area in a drought, so the amount of snow melt in the mountains is currently reduced, leaving less ground and surface water to meet increasing demands. Glaciers are integral to the Central Oregon ecosystems and economies, and they are disappearing, most likely due to regional climate change. A new unnamed lake now sits on the flanks of North Sister where Thayer Glacier used to flow.



Sisters lies at an advantageous spot over the region's water table.

Some of the more recent modeling done in the Upper Deschutes Basin, in cooperation with the Oregon Water Resources Department (OWRD), explores the influence of well location and geologic structure on stream capture by pumping wells. The OWRD report states:

"Wells were simulated at three locations within a 12-mile area close to known groundwater discharge areas and crossed by a regional fault zone. Simulations indicate that the magnitude and timing of stream capture from pumping is largely controlled by the geographic location of the wells, but that faults can have a large influence on the increase of pumping stresses."

Sisters fault zone

In addition to the regional flow pattern from higher groundwater elevations near the mountains, groundwater levels in the central part of the Upper Deschutes Basin are several feet to several hundred feet below the surface of the land, indicating that stream reaches in the central part of the basin are separated from the regional groundwater flow system by an unsaturated zone, perhaps along the Sisters Fault Zone which runs from the northwest of the Upper Deschutes

Basin to the south central down by Sunriver. Some scientists believe that the fault could be responsible for disrupting an even flow of groundwater to the east from higher western elevations.

Long-term groundwater level records in the central part of the Upper Deschutes Basin have shown that some areas are experiencing persistent groundwater level declines, particularly in an area extending from the vicinity of Bend, north toward Lake Billy Chinook, and northeast toward Redmond and Powell Butte. The Deschutes Basin Groundwater Mitigation Program allows for limited, additional groundwater development using mitigation to offset the impacts to the State Scenic Waterways and specific instream rights.

Sister area wells going dry

In the Sisters Country area, this past summer, there have been reports of wells going dry, and the need to either lower the pump or drill an entirely new well. Some of the reports came from properties on Harrington Loop, Gold Coach Road, and around the Cloverdale area, as well as Terrebonne and Redmond. It is important to remember that most wells, depending on circumstances, have a lifespan of 30-50 years and most well pumps typically last anywhere from eight to 15 years.

In subsequent articles, we will explore one longtime Sisters resident's experience with wells, what to do if your well runs dry, as well as water as it relates to growth and development and the political umbrella of more regulated uses, higher costs, etc.

FUN & GAMES

SUDOKU EASY PEASY!

1	2			3				6	
		6		2				3	
		7	5		1				2
		8			2			9	
4	9						1		
	6								4
		1	8		6				
5		4		9		6			
			7			3			9

Place a number in the empty boxes in such a way that each row across, each column down, and each small nine-box square contains all of the numbers from 1 to 9.

MATH SQUARE

	+	7	-		+		12
-		x		-		-	
	x		-	13	-		112
-		+		x		-	
	÷		x		+		27
+		-		-		+	
	-		-		-		0
-2		67		-56			-23

Use the numbers 1 through 16 to complete the equations. Each number is used once. Each row is a math equation. Each column is a math equation. Remember that multiplication and division are performed before addition and subtraction.

WORD SEARCH PUZZLE

C	A	R	R	O	T	R	W	P	E
P	E	P	P	W	Q	X	R	U	G
C	T	O	M	A	T	O	A	M	G
O	V	E	G	C	V	G	D	P	P
R	R	T	E	T	O	M	I	K	L
N	P	E	P	P	E	R	S	I	A
C	A	P	B	A	G	E	H	N	N
W	P	O	T	A	T	O	E	S	T
C	U	C	U	M	B	E	R	A	Q
W	R	G	D	W	S	A	A	F	I
P	O	T	A	F	P	G	T	S	F

1	S	I	D	I	V	I	O	4
I	J	V	S	M	O	D	R	M
D	V	S	B	R	N	C	O	3
1	S	O	L	V	I	O	M	
N	N	S	D	V	E	V	C	
V	S	S	I	L	L	N		
1	X	I	W	O	L	I	L	R
4	4	O	S	A	J	D	A	O
4	W	O	A	V	W	O	I	
3	N	X	D	M	A	D	D	4
3	G	M	X	D	R	V	V	

