GeoNote 15

Snake River Plain Aquifer: Idaho's Hidden Gem

Tens to hundreds of feet beneath the surface of southern Idaho's Snake River Plain is a unique geologic feature known as the Snake River Plain aquifer. It covers an area of more than 10,000 square miles and is estimated to contain over twice the volume of water in Lake Erie. The aquifer supplies more than 70 percent of the needs of 100 industrial plants and 200 Idaho cities and towns, and in excess of $1\frac{1}{2}$ billion gallons of irrigation water per day.

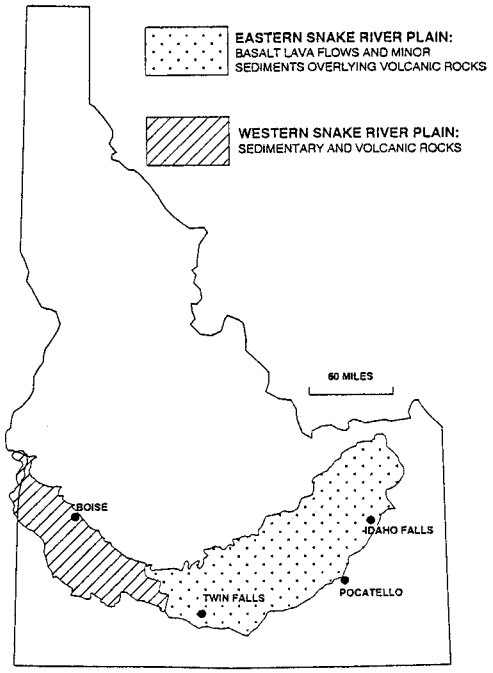
The Snake River Plain is the result of unusual geologic conditions that have prevailed in this part of the state over the last 15 million years. It can be divided into two overlapping geologic provinces. The eastern segment extends from near the Wyoming-Montana border to about Hagerman. It is principally composed of dark, quartz-poor volcanic rock (basalt) interbedded with minor sedimentary sands and silts, which lie on a deeper and thicker section of light-colored, quartz-rich volcanic rock. The volcanic center that produced these rocks has moved through geologic time toward the northeast and is located today in the area of Yellowstone National Park. The western segment extends from near Hagerman into Oregon. It is composed of sedimentary deposits, including sand, gravel, mud, and limestone interbedded with volcanic rocks. These deposits were formed when a large lake, now called Lake Idaho, covered the southwestern part of the state millions of years ago.

An aquifer is a ground-water system capable of producing useful quantities of water. It consists of the water itself and the porous and permeable rocks and sediments that store and transmit the water. Despite increasingly large withdrawals of water over the past 60-80 years, the volume of ground water beneath the Snake River Plain has remained fairly constant, because it is being steadily replenished by the infiltration of water from the surface.

Rainfall and snow percolating through soil and bedrock at higher elevations are thought to constitute most of the water replenishing the aquifer. Streams and rivers may also lose water to the aquifer, and tributary valleys can augment the ground water. Human constructions, such as dams, ditches and unlined canals, irrigation systems, drain fields, and injection wells can also provide important sources of water for recharge. Much of the water falling as rain or snow on the surface of the plain is lost to evaporation, so that only a fraction of this moisture reaches the ground water.

Over the last 80 years, agricultural irrigation has greatly changed the natural balance of water entering and leaving the aquifer. Between 1900 and 1950, a 60-percent increase in spring discharge was recorded in the Thousand Springs area, reflecting a greater replenishment of the aquifer due to the increasing application of irrigation water on the surface of the eastern plain.

Ground water beneath the plain is constantly in motion. Its movement is directed by the force of gravity, the amount of water entering the ground, and the geology through which the water moves. Water seeping into the ground at higher elevations may resurface again hundreds of miles away. In southern Idaho, some water that origi-



Map of Idaho, showing the extent of the eastern and western Snake River Plain aquifer.

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nated as snow melt in the mountains moves through the aquifer and eventually returns to the surface at lower elevations through springs and stream beds, as in the Thousand Springs area. The general direction of ground water movement in the eastern Snake River Plain aquifer is southwest to west. Although most ground water in saturated formations moves slowly (inches per day), in parts of the eastern Snake River Plain aquifer it can travel up to 3-5 feet per day because the basaltic volcanic rocks are so permeable.

The Snake River Plain aquifer is not a single large body of rock and water but rather consists of numerous ground-water systems. The western segment is composed of permeable sand and gravel aquifers interbedded with low-permeability layers, such as clay beds. In these aquifers, the ground water flows through intergranular pores and can rise to the surface under artesian pressure when intercepted by a well. In the eastern plain, most ground water is contained in basaltic volcanic rocks rarely overlain by low-permeability beds. Ground water is, at best, only mildly artesian. Unlike the western plain, water in these aquifers is principally stored in and transmitted through open fractures, gas-bubble voids, and lava tubes formed during the flow and cooling of molten volcanic rock.

The Snake River Plain aquifer is the largest aquifer in Idaho and has been called one of the most productive in the world. The tremendous amount of stored water in it represents an important supplement to surface water sources. In certain areas, however, sustained drought or overuse can temporarily or locally reduce the volume of water in the aquifer; the result is declining water levels and productivity in wells that penetrate it. Although in the longer term water levels can be expected to recover, this is little consolation today to those users who must deepen their wells to maintain productivity.

Tens of thousands of production wells, ranging in depth from a few feet to hundreds of feet, have been drilled to pump ground water to the surface. This water is being used for a multiplicity of purposes that include domestic consumption, aquiculture, manufacturing, and irrigation. The quality of the water from the aquifer is excellent in most places, owing to the natural filtration provided by the geological materials through which the ground water must pass. In some places, human activities have intentionally or accidentally introduced contaminants such as farm and domestic wastes, industrial chemicals, and radioactive wastes into the aquifer. This contamination may limit the aquifer's use and require costly remediation.

The Snake River Plain aquifer will always be vital to Idaho's economy. As with any gem, care must be exercised in its handling. Idahoans should respect the limits of the aquifer to filter, cleanse, and store high quality water. They must manage this irreplaceable resource wisely not only to fulfill today's needs but also to leave it unspoiled for the needs of future generations.

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