Geology of Thousand Springs State Park

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Figure 1. Waterfalls over Quaternary basalt cliffs at Malad Gorge.

INTRODUCTION

Thousand Springs State Park is a spring water oasis amidst the desert of Idaho's Snake River Plain (SRP). The park is divided into six sub-units: Box Canyon Natural Preserve, Billingsley Creek, Malad Gorge, Ritter Island, Kelton Trails, and Niagara Springs. Thousand Springs captures the powerful and delicate nature of arguably the most valuable resource in the state of Idaho: water (Figure 1).

GEOLOGY

The oldest rocks of the central Snake River Plain are Tertiary basalt and rhyolite flows related to the Yellowstone Hotspot. Interbedded with the rhyolite and basalt flows are Tertiary-aged sedimentary rocks of the Chalk Hills and Glenns Ferry Formations. Capping the Glenns Ferry Formation are numerous Quaternary basalt flows that erupted from 2 million to 2,000 years ago. The Quaternary basalt flows come from volcanic cones distributed across the crescent-shaped SRP. Gravel, sand, silt and clay from the ancient Snake River and its tributaries are interbedded with some of these basalt flows. Deep gorges like Malad Canyon, steep-walled canyons like the Snake River Canyon, and the cataracts around the park show the thickness and volume of the Quaternary basalt flows. While the Snake River and its tributary streams carved paths along the plain, many of their major deviations or bends were shaped by Quaternary lava flows. Another influence to the shape of the Snake River was the catastrophic Bonneville Flood that occurred 14,500 years ago where an estimated 1,200 miles^3 (5,000 km^3) of water from Lake Bonneville released over a period of a couple of weeks and flowed northward across the Snake River Plain. Lake Bonneville was an ancient lake that occupied much of north Utah and small portions of southeastern Idaho and eastern Nevada. Water left behind after the Bonneville flood formed the Great Salt Lake in Utah. In Idaho, the catastrophic flood carved and shaped channels in the Quaternary basalts and created cataracts and waterfalls that can be seen in the park.

EASTERN SNAKE RIVER PLAIN AQUIFER

The SRP is a large arcuate volcanic plateau in southern Idaho that shows the path cut by the Yellowstone hotspot. Beneath that plateau lies the SRP aquifer. An aquifer is an underground reservoir of water stored in rocks (Figure 2). Aquifers must have a good basal layer to seal in water, also called an aquitard. An aquitard is layer of rock or sediment that doesn't allow water to filter through the layer easily or at all, clay or shale are effective sealing sediments. In this case of the SRP aquifer, clay layers interbedded with the Quaternary basalt flows acts as the aquitard. Another important factor is porosity, porosity is the amount of pore

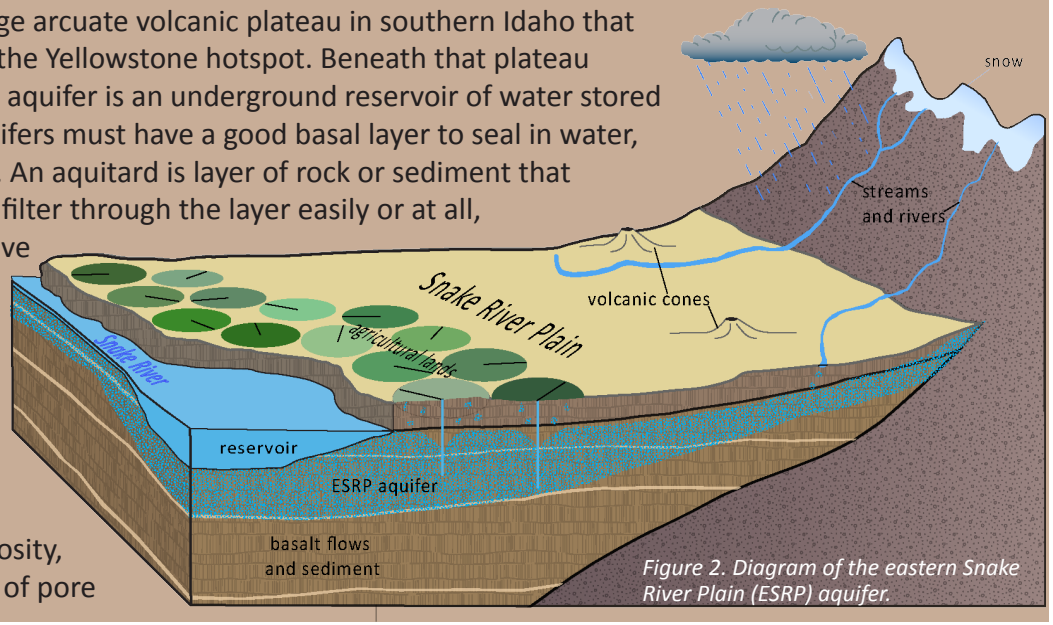

Figure 2. Diagram of the eastern Snake River Plain (ESRP) aquifer.

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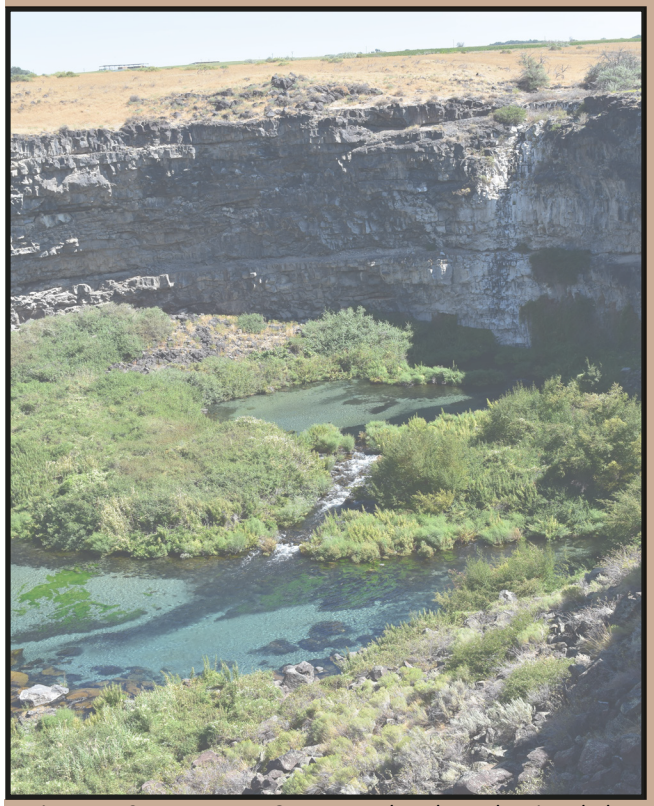

Figure 4. Cataracts over Quaternary basalts and springs bubbling up from the eastern Snake River Plain aquifer below at Box Canyon Nature Preserve of Thousand Springs State Park.

ESRP AQUIFER cont'd

space available in the rock, high porosity means more water can be stored in a rock. The SRP has high porosity found in sand, gravel and in cracks and fractures in basalt. Permeability is the connectivity of the pore space, or ability for water to flow through a rock. High permeability is necessary for discharge and recharge of the aquifer. Springs occur when the top of the saturated zone, also called the water table, intersects with the surface.

Thousand Spring State Park is the site where the 9,600 mi² Eastern Snake River Plain (ESRP) aquifer intersects the surface of the earth (Figure 3). The park is home to 11 of the largest 65 springs in the U.S. Some springs like Niagara and Crystal gush from the steep canyon walls of the Snake River beneath the Quaternary basalts. While springs in Box Canyon or Ritter Island bubble up from underground to form crystal clear pools (Figure 4). The ESRP aquifer is recharged from rain and snow (10%), rivers, streams, and reservoirs (13%), recharge from small neighboring high valley aquifers (18%), and largely from irrigation (60%). Natural discharge from the ESRP aquifer happens at springs found along the Snake River but the largest amount (86%) emerges at Thousand Springs, the other 14% is pumped out for agricultural, residential, and municipal needs. Over the last 70 years increased withdrawal of water from the ESPR aquifer for agricultural and municipal need and changes in irrigation practices has led to a reduction in volume of discharge from Thousand Springs. Thoughtful management of the ESRP aquifer is necessary to preserve the health and beauty of the Thousand Springs State park, as well as protect the sole source of drinking water for more than 300,000 residents in southern Idaho, and the needs of a thriving agricultural community.

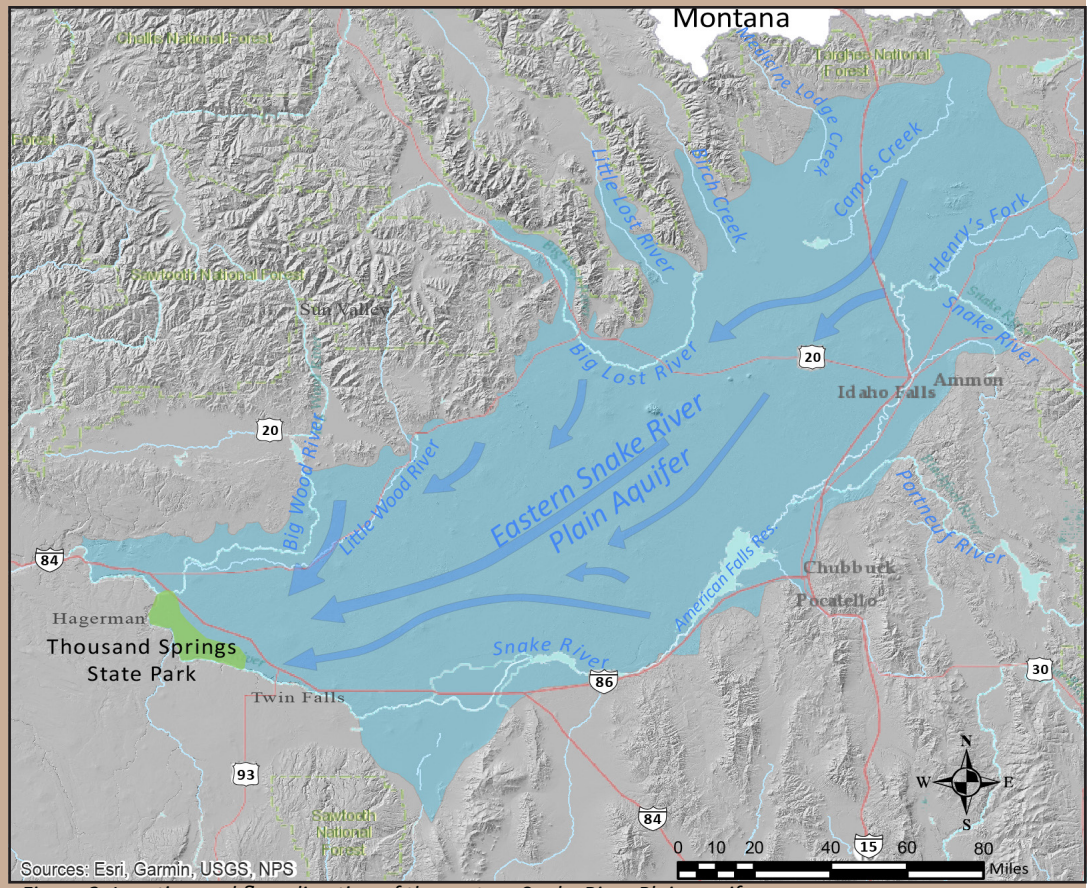

Figure 3. Location and flow direction of the eastern Snake River Plain aquifer.

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