The Physical Characteristics of Hyporheic Flow

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Hyporheic flow, also called interstitial flow, is the percolating flow of water through the sand, gravel, sediments and other permeable soils under and beside the open streambed. It is the subsurface flow between rheic flow, which is visible free running water such as a stream, river or other moving flow of water; and the water table. The hyporheic zone is the area under or beside a stream channel or floodplain that contributes water to the stream. The source of hyporheic flow can be from the channel itself or the water percolating to the stream from the surroundings (Folke 2007). Critical factors needed to establish hyporheic flow are mean grain size and a hydraulic gradient (Naiman et al. 2005).

Hyporheic flow plays a significant role in the preservation of the ecosystems in the Grande Ronde River, particularly for the rainbow trout and salmonid fish populations (Ebersole 2003). Because hyporheic flow is located in the subsurface, it is protected from solar radiation and thus has a lower temperature than the surrounding surface waters. Where it emerges, cold water refugia are created for fish such as rainbow trout and salmonids.

One location where hyporheic flow occurs is approximately two miles downstream of the Boggans bridge. Hyporheic flow emerges from the bottom of a gravel bar located in the middle of the Grande Ronde. After the flow emerges from the subsurface, it runs 34.2 ft. (10.5 m.) before mixing with the river. The channel is approximately 3.3 ft (1 m) wide and 2.6 ft (.8 m) deep. Average velocity is .75 ft/s (.23 m/s). Flowrate is 5.2 cubic feet per second (.15 cubic meters per second). Water quality of the mainstem Grande Ronde and the area of hyporheic flow are described in tables 1 and 2 below. Although the hyporheic flow two miles downstream of Boggans bridge was found to be warmer than the mainstem temperature, hyporheic flow found near Wildcat Creek (Figure 1) was found to have significantly lower temperatures than the Grande Ronde. A pond created by hyporheic flow at that location was discovered to have a temperature of 12.63 degrees Celsius. This contrasts with the mainstem Grande Ronde that was found to have a temperature of 18.26 degrees Celsius at the same time. Hyporheic flow that has a colder water temperature than that of the mainstem serves an important role in creating cold water refugia for temperature sensitive fish species.

Figure 1. Pool created by hyporheic flow in Wildcat Creek

Table 1 Grande Ronde River Water Quality

Temperature (◦C)	19.06
Conductivity (mS/cm)	0.090
Dissolved Oxygen (mg/L)	8.36
pH	8.80
Turbidity (NTU)	1.1

Table 2 Hyporheic Flow Water Quality

Temperature (°C)	19.37
Conductivity (mS/cm)	0.09
Dissolved Oxygen (mg/L)	8.17
pH	8.82
Turbidity (NTU)	0.4

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