

# THE HYPORHEIC ZONE, ITS FUNCTIONING AND MEANING

## Summary

The hyporheic zone is defined as a subsurface volume of sediment and porous space adjacent to a stream through which stream water readily exchanges. Although the hyporheic zone physically is defined by the hydrology of a stream and its surrounding environment, it has a strong influence on stream ecology, and stream biogeochemical cycling. Thus, the hyporheic zone is an important component of the stream ecosystems. The formation of the environmental gradients in the hyporheic zone is highly determined by the hydrologic exchange between surface water and groundwater. The hydrologic exchange can be subdivided into three types:

- a) infiltration (downwelling surface water)
- b) exfiltration (upwelling interstitial water)
- c) horizontal advection (subsurface flow along the stream).

The exchange of water, nutrients, and organic matter occur in response to variation in discharge and bed topography and porosity.

Although the hyporheic zones extent is controlled by surface-water penetration into the sub-

surface, hyporheic water is generally composed of a mixture of surface water and groundwater. From a biogeochemical perspective, groundwater is generally low in dissolved oxygen and enriched in inorganic solutes compared to stream water. Thus, biogeochemical gradients exist within the hyporheic zone between two extremes defined by the surfacewater and groundwater end members. This makes the hyporheic zone a very active location of biogeochemical transformation of nutrients and other dissolved solutes. The upwelling subsurface water supplies stream organisms with nutrients while the downwelling stream water provides dissolved oxygen and organic matter to microbes and invertebrates in the hyporheic zone. Hyporheic biogeochemical processes strongly influence the quality of surface water.

The hyporheic zone is an ecotone between stream water and groundwater environments, combining not only biogeochemical but also physical characteristics of both environments. The hyporheic zone provides an ideal habitat for a wide array of microbes and invertebrates.