Organic Material

Metabolic activity within a stream reach depends on autochthonous, allochthonous, and upstream sources of food and nutrients (Minshall et al. 1985). Autochthonous materials, such as algae and aquatic macrophytes, originate within the stream channel, whereas allochthonous materials such as wood, leaves, and dissolved organic carbon, originate outside the stream channel. Upstream materials may be of autochthonous or allochthonous origin and are transported by streamflow to downstream locations. Seasonal flooding provides allochthonous input of organic material to the stream channel and also can significantly increase the rate of decomposition of organic material.

The role of primary productivity of streams can vary depending on geographic location, stream size, and season (Odum 1957, Minshall 1978). The river continuum concept (Vannote et al. 1980) (see *The River Continuum Concept* in section 1.E in Chapter 1) hypothesizes that primary productivity is of minimal importance in shaded headwater streams but increases in significance as stream size increases and riparian vegetation no longer limits the entry of light to stream periphyton. Numerous researchers have demonstrated that primary productivity is of greater importance in certain ecosystems, including streams in grassland and desert ecosystems. Flora of streams can range from diatoms in high mountain streams to dense stands of macrophytes in low gradient streams of the Southeast.

As discussed in Section 2.C, loading of nitrogen and phosphorus to a stream can increase the rate of algae and aquatic plant growth, a process known as *eutrophication*. Decomposition of this excess organic matter can deplete oxygen reserves and result in fish kills and other aesthetic problems in waterbodies.

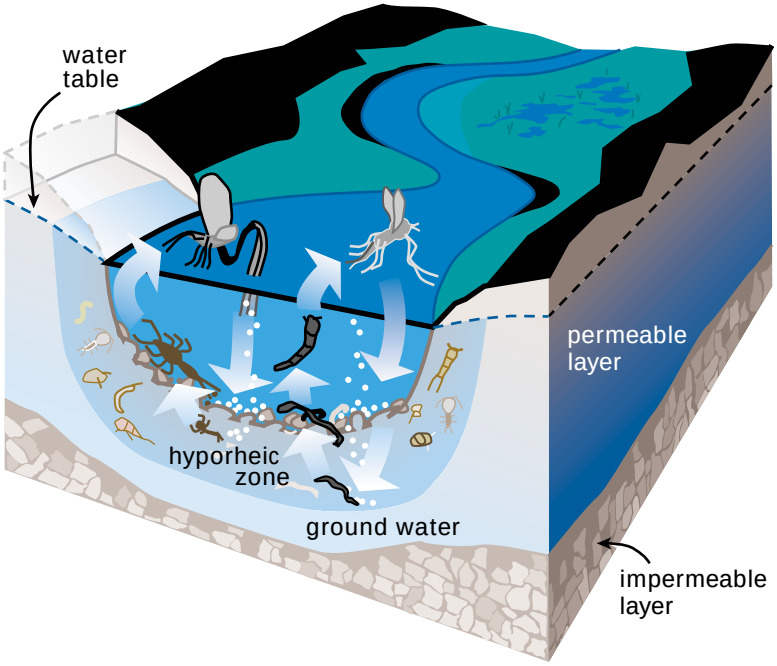

Figure 2.35: Hyporheic zone. *Summary of the different means of migration undergone by members of the stream benthic community.*

Eutrophication in lakes and reservoirs is indirectly measured as standing crops of phytoplankton biomass, usually represented by planktonic chlorophyll a concentration. However, phytoplankton biomass is usually not the dominant portion of plant biomass in smaller streams, due to periods of energetic flow and high substrate to volume ratios that favor the development of periphyton and macrophytes on the stream bottom. Stream eutrophication can result in excessive algal mats and oxygen depletion at times of decreased flows and higher temperatures (**Figure 2.36**). Furthermore, excessive plant growth can occur in streams at apparently low ambient concentrations of nitrogen and phosphorus because the stream currents promote efficient exchange of nutrients and metabolic wastes at the plant cell surface.