Dynamics of a Natural Stream Ecosystem

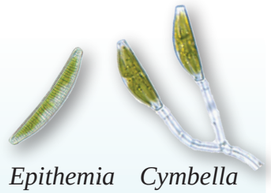
Healthy stream ecosystems support diverse communities of aquatic organisms

Hydrology: Water connects the watershed to the stream. In an undisturbed ecosystem, precipitation reaches a stream gradually by flowing over the vegetated land surface into the stream and by infiltrating the soil and flowing underground (as groundwater) toward the stream. Natural seasonal patterns of streamflow serve as life cycle cues to aquatic organisms.

Water chemistry: Nutrients such as nitrogen, phosphorus and carbon are required for all stream life. Nutrients are incorporated into algae, which are then consumed by other organisms, introducing the nutrients into the stream's food web. Oxygen dissolved in water is essential for most aquatic organisms because they respire through their skin or gills.

Physical habitat: The physical living space of aquatic organisms includes the water in the stream—whether in pools or faster-flowing riffles—as well as the rocks and sediment in the stream bottom and along the banks, submerged leaves and wood, and aquatic plants. A stream with more diverse kinds of physical habitat will generally have more diverse kinds of organisms.

Fish have life cycles that span years. Because they are more mobile than algae or macroinvertebrates, they are affected by conditions that extend upstream and downstream within the river network. Smallmouth bass may hide under logs or undercut banks along stream edges or in pools, emerging to feed on invertebrates and small fish. Greenside darters live in riffle habitats of streams, where they feed on aquatic insects such as mayflies.



Epithemia *Cymbella*

Algae have short life cycles of days to weeks and can respond relatively rapidly to changes in water chemistry. The most common algae found in natural streams of small to moderate size are diatoms, which attach to underwater surfaces such as rocks and aquatic plants. The diatom *Cymbella* can be found in riffles, either as solitary cells or at the ends of branched stalks on rocks and other surfaces. The diatom *Epithemia* is commonly found on the surfaces of submerged aquatic plants. Algae are the foundation of most aquatic food webs.

Macroinvertebrates, including these aquatic insects, have complex life cycles that occur over time spans of weeks to months. Most aquatic insects spend nearly all their life in the water as eggs and larvae and then leave the water and develop wings as adults. Many mayflies crawl on the surfaces of rocks in riffle areas, and feed by gathering fine particles of organic matter or scraping algae. Some stoneflies feed by shredding submerged leaves that have been colonized by bacteria and fungi.