

Water Life: Riffles and Pools

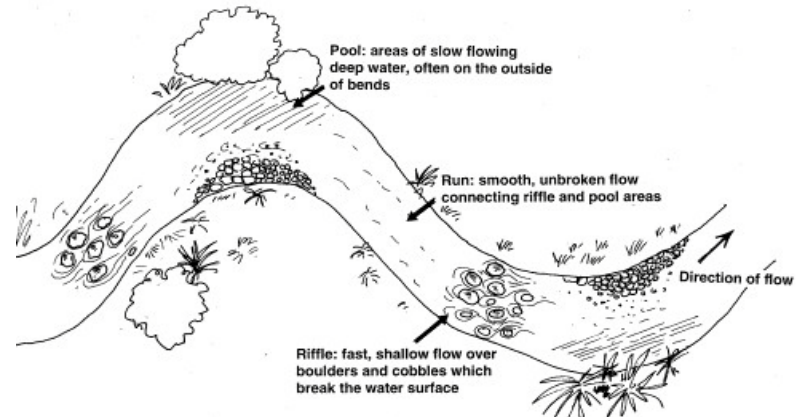
Stream ecosystems provide a habitat or natural environment for many diverse aquatic organisms and plants. A deeper look indicates each stream has a distinctive anatomy as each is composed of a series of pools, riffles and runs.

Pools: An area of the stream characterized by deep depths and slow current.

Pools are typically created by the vertical force of water falling down over logs or boulders. The movement of the water carves a deeper indentation in the stream bed. Pools are important because they can provide depth and still water.

Riffles: An area of stream characterized by shallow depths with fast, turbulent water.

The riffles are short segments of the stream where water flow is agitated by rocks. The rocky bottom provides protection from predators, food deposition and shelter. Riffle depths vary depending upon stream size, but can be as shallow as 1 inch or deep as 1 meter. The turbulence and stream flow results in high dissolved oxygen concentration.



Adapted from:
<http://share3.esd105.wednet.edu/rsandelin/ees/Resources/Flowing%20water%20concepts.htm>

Run: An area of stream characterized by moderate current, continuous surface and depths greater than riffles.

Runs are stretches of the stream downstream of pools and riffles where stream flow and current are moderate. The smooth surface allows for light to penetrate.

Microhabitats:

Habitats are the natural environment in which an organism lives. The distinguishing abiotic conditions of riffles, pools and runs result in specialized environments that are known as microhabitats. The abiotic conditions (dissolved oxygen, turbidity, light and temperature) of these microhabitats can influence which aquatic species can survive and reproduce at that given location and time.

- Dissolved oxygen is a source of oxygen for many living organisms and chemical processes. Dissolved oxygen is a measure of how much oxygen is mixed in with molecules of water. Wind, waves and bubbling of riffles can increase the amount of oxygen that enters the stream from surrounding air. Water with high and relatively stable levels of DO is typically considered to be a healthy ecosystem because it can support greater biodiversity.

0-2 mg/L	Not enough oxygen to support most animals	
2-4 mg/L	Only a few kinds of fish and insects can survive	Aquatic Earthworms, Leeches, Snails, True Flies,
4-7 mg/L	Good for most kinds of pond animals	Dragonflies and Damselflies, Craneflies, Dobsonflies, Alderflies, Scuds, Sowbugs, Crayfish, Clams and Mussels
7-11 mg/L	Very good for most stream fish	Stoneflies, Mayflies, Water Beetles, Caddisflies, Net-spinner Caddisflies,

- Stream flow is greatest in riffles, moderate in runs and slowest in pools. If water flows too quickly some organisms cannot maintain their hold on rocks and vegetation. Current that is too slow results in stagnant water with low aeration.

- Temperature varies depending upon climate, light penetration through surrounding vegetation and groundwater input sources. Stream temperature can affect species composition through biological processes (metabolic rates) and ecosystem processes (leaf breakdown, nutrient uptake). Warmer water holds less oxygen, which means a decrease in dissolved oxygen levels. Colder water temperatures are favored by many fish and macroinvertebrates.

The conditions and resources provided by the microhabitat can determine which organisms are present in the given community. It is also important to consider how biotic interactions may influence community biodiversity. These interactions include competition for a food source, predation, or mutualism.

- The depths of pools provide refuge during dry conditions, protection from predators or shelter. The water flows a little slower which allows the organic debris to settle out and provides a food source. Another advantage is that you don't have to relocate to another area if the stream level starts to lower.
- Riffles are at once a food source, a shelter from predators, and a conveyor belt that brings food to the animals. Many species of invertebrates reproduce or grow to maturity in riffles. Riffles also hold larger prey items and only animals that cling very well, such as net-winged midges, caddisflies, stoneflies, some mayflies, dace, and sculpins can spend much time here, and plant life is restricted to diatoms and small algae. Riffles are a good place for mayflies, stoneflies, and caddisflies to live because the riffles offer plenty of cobble gravel to hide in.
- Runs are preferred by fishes that are too small to compete in ponds such as minnows.

The microhabitats of stream provide by riffles and pools can result in different communities of macroinvertebrates:

Feeding Group	Food Source	Habitat Found	Major Groups/Taxa Found
Predators	Other animals	Pool, Riffles and Runs	Stoneflies, Dragonflies and Damselflies, Dobsonflies and Alderflies, Caddisflies, Crayfish, Leeches, Planaria
Scrapers	Algae, bacteria, anything they can scrape off	Pool	Water beetles, Snails
Shredders	Bacteria and fungi on leaf surfaces. They tear up leaves into smaller pieces (detritus).	Riffles	Crane Flies, Caddisflies, Stoneflies, Scuds,
Collectors – Gathering	Small pieces of food and organic matter, like broken up leaves along the stream bed.	Pools, Riffles	True Flies, Mayflies, Sowbugs, Crayfish, Clams and Mussels, Aquatic Earthworms
Collectors – Filtering	Catch small pieces of food and organic matter, like broken up leaves floating in water.	Runs/Pools	Net Spinning Caddisflies, Blackflies

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Image adapted from *Properties of Flowing Water*. Accessed April 2012. From:
<http://share3.esd105.wednet.edu/rsandelin/ees/Resources/Flowing%20water%20concepts.htm>