



Transcript: Track That Nutrient

This is the story of a watershed, which, it turns out, is about more than water. That's because a watershed also cycles nutrients up and down and in and out of headwaters, streams, and rivers that supply clean water for plants and animals. How does that happen?

Let's take a closer look.

It has taken the water centuries to carve this path, flowing over rocks, washing away the soil and evening knocking down over trees. All that tumbling water adds oxygen to the stream and the shade keeps the water cool.

Which makes it perfect for a raccoon, which on this early October day is getting a drink and a snack of fish.

A waterthrush joins the raccoon and snaps up a fat stonefly. It will need the energy for its long migration to Central America.

It's a sunny day, but an early cold front has started the leaves falling. There's a branch coming down too. Let's see what happens.

In a few days a dark film of bacteria covers the soggy leaves and *Anchytarsus* comes to examine this delicious discovery. It is a year old larval toe-winged beetle, too young to know that predators, like the stonefly *Eccoptura*, prowl leaf packs looking for herbivores. It is a successful hunt.

But the *Eccoptura* doesn't see the school of rosy-sided dace, a kind of minnow swimming nearby. These fish travel the length of the river basin, from the headwaters to the streams and rivers and back in search of food and shelter.

In the food chain that supports the complex web of life throughout the watershed, what is lunch today becomes waste tomorrow. But the waste is full of nutrients like nitrogen, phosphorous, calcium, and potassium.

For example, the kingfisher's guano lands in the water and disperses in a cloud of nutrients. Tiny microbes in the water attach to the guano and begin multiplying.

The miniscule food particles are a perfect snack for a caddisfly name *Hydropsyche Nueroclipis* that uses her silken net to catch particles to eat.



A predatory caddisfly named *Rhyacophila* has been waiting and begins to attack. But the commotion catches the eye of a brook trout just in time for *Hydropsyche Nueroclipis* to escape back into her net.

The brook trout plays a role in this nutrient cycle and not only as a top predator.

As the fish swims away, the mucus-like slime that protects its scales sloughs off into the water. It is full of nutrients and the microbes in the water quickly move in. As the microbe colony settles to the bottom of the stream, the brown mayfly *Maccaffertium* settles in for lunch. It also leaves behind what is left of its breakfast.

Let's go back to the surface of our stream for a minute.

When the water flow is really strong, say after a heavy rain, some of the water gets pushed through the porous bottom of the stream bank where it mixes with the groundwater beneath the channel.

That's what happens with the nutrients in that bit of breakfast the brown mayfly left behind.

It travels for a ways underneath the channel of the stream and emerges into a large sunlit expanse of river water. The nutrients combine with the warm sunshine and fuel an explosion of single-celled plant life in the river.

Silica-shelled diatoms feast, replenishing their supply of chlorophyll, amino acids and nucleotides, the molecular machinery required for life.

The diatoms are a delightful discovery for a hungry crustacean called *Daphnia*, which used its feathery antenna to filter out the tiny creatures.

At night, the satisfied daphnia dropped to the bottom, only to provide dinner for an *Aeshna*, which, it turns out, is very hungry because it is getting ready to molt.

It climbs out of the water and slowly sheds its exoskeleton to be transformed into an adult mosaic damselfly.

It will use those new wings to fly up to the headwaters where our story began. Along the way, it will find a mate and when it lays its eggs it will have recycled nutrients from the bottom of the watershed to the top.

Clean water provides and protects all this biodiversity. And the biodiversity helps ensure clean water.

The incredible diversity of life is supported through the continuous cycling of water and nutrient... and intricate life-giving choreography that can only be staged in a healthy watershed.