

Adopt-a-Reach Update: Nitrates

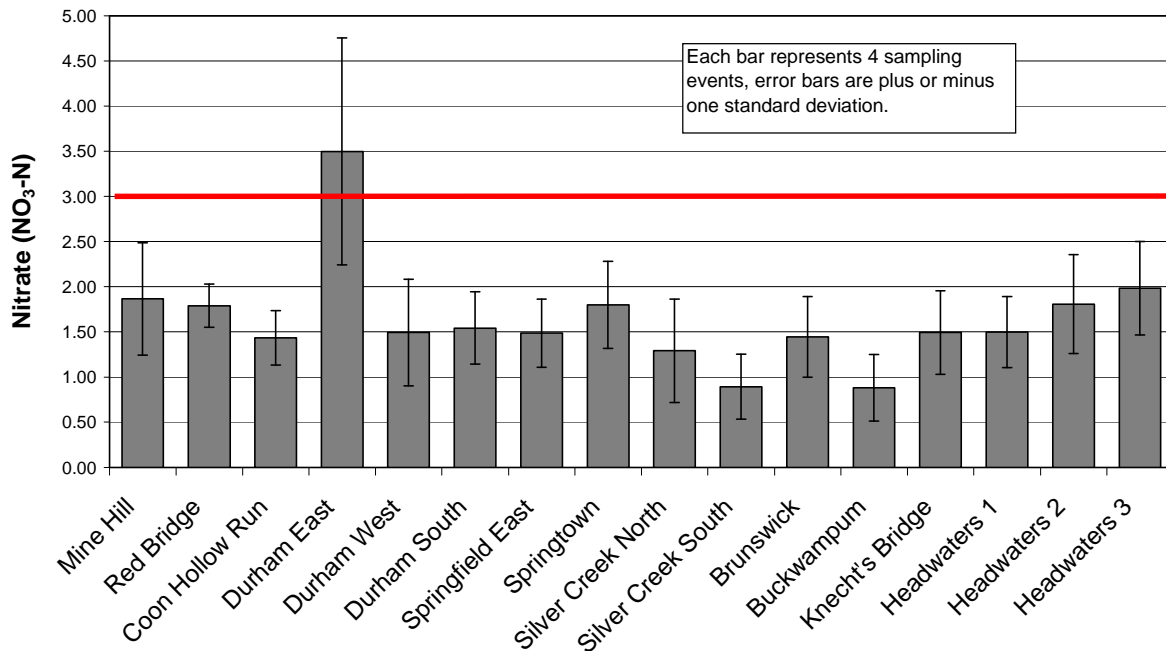
As many of you know, we have officially kicked off our Adopt-a-Reach program with a baseline water quality sampling program at 16 stations scattered throughout the Creek. In previous newsletters I shared the results of our temperature monitoring. We are also measuring several key water quality parameters: dissolved oxygen, conductivity, pH, alkalinity, hardness, and nitrate nitrogen. For those of you with green thumbs, you already know that nitrate nitrogen is an essential component of healthy soil. So why do we consider it a pollutant? Like most things in life, it is possible to have too much of a good thing.

Too much nitrate on the soil usually ends up leaching into the groundwater or running off into our streams and rivers. Once in the surface water, it fuels the growth of algae, resulting in what aquatic scientists term “fuzzy rocks”. Now, much of our Creek looks “fuzzy” during the growth season, but normal growth is usually light brown in color. If the algae is bright green however, or is floating in dark green or brown masses on the surface, then it is a sign of too much nutrient in the water. The main nutrients for plant growth are nitrogen, phosphorus and potassium. Both phosphorus and potassium are usually present in excess in most of our waters, because they come from the sediments themselves. However nitrogen comes naturally from decaying organic matter and is usually only present in relatively small amounts. When we add more through farming or poor septic management, the nitrogen combines with the phosphorus and potassium already there to fuel rampant algal growth.

When algae grows out of control in a river or stream, it burns through the nitrogen that has been added. If the source is temporary, the plants end up starving themselves out of a food source, and die. Their decaying bodies result in both a decrease in dissolved oxygen in the water and a new source of nitrogen that starts the cycle over again. If the source is ongoing, the cycle of growth and decay rapidly degrades the stream ecosystem. While it is alive, the algae takes up too much of the space that insect larvae, young fish, and other stream creatures need to survive and grow. Nitrogen itself can even be toxic to aquatic life, if present in high enough concentrations. While PADEP standards for septic discharge are up to 10 mg/L, current research has shown that concentrations as low as 3.0 mg/L of nitrate (as $\text{NO}_3\text{-N}$) can be harmful to young fish. Truly, too much nitrogen is too much of a good thing.

So, what is the nitrate level in Cooks Creek? Thanks to our Palisades High school team of budding water quality scientists, led by James Douglas, we have a picture of the nitrate concentrations present at each of our 16 stations through four sampling periods representing an entire year. The figure shows the average nitrate observed at each station, and the heavy line marks the 3.0 mg/L level that indicates a potential for chronic toxicity. The overall average nitrate in the Creek is 1.64 mg/L, ranging from a low of 0.5 mg/L to a high of 5.4 mg/L. Because the Cooks Creek is an EV stream, this means that the PADEP should not allow applications which raise the nitrate level above the background of 1.64.

Average Nitrate in Cooks Creek September 2008 - May 2009



Fortunately, only one of the stations monitored showed nitrate concentrations above 3.0 mg/L - Durham East, and none showed concentrations as high as the PADEP limit of 10 mg/L. The Durham East tributary is a small stream, narrow enough to jump across. The watershed drains mostly forested land, but cuts through a large farm just before it dumps into the Creek mainstem. Preliminary investigations of the ecosystem in the Durham East watershed showed that the insect community is dominated by pollution tolerant black fly larvae and leeches. As with most farmers, this one allows his cows to have free access to the stream to cool off and drink. Although more intensive study would be needed to prove that the cows are the culprit here, it stands to reason that the cows are probably not taking care to keep their waste away from the stream. Drainage from the barnyard, and from upstream residences, as well as a lack of riparian buffer along the majority of its length might also be contributing to the problem. We will continue to monitor nitrates in the watershed, and will let you know what we find.