OPINION

Stream flows impact Whitefish Lake

The limiting nutrient concept developed in the field of ecology a century ago states that the yield of any organism will be determined by the abundance of the substance that, in relation to the needs of the organism, is least abundant in the environment. For algae in a lake, the limiting nutrient is usually either nitrogen or phosphorus. In multispecies algal communities like we have in Whitefish Lake, growth rates among different species are likely to be affected by the timing and delivery amounts of nutrients to the system.

That's why we routinely measure stream flows and chemical concentrations to yield a loading rate for nitrogen and phosphorus to the lake. In 2014, our volume estimate shows Swift Creek contributing 80.1 percent of the water volume to the lake, followed by Lazy Creek 7 percent, Hellroaring Creek 2.9 percent, Smith Creek 1.5 percent, Viking Creek 0.9 percent, Beaver Creek 0.5 percent, and precipitation 7.1 percent. Groundwater was not estimated.

From a nutrient loading perspective Swift Creek contributes approximately 70 percent of the nitrogen and phosphorus budget, Lazy Creek around 12 percent, each of the smaller streams around 1-2 percent and atmospheric deposition (wet and dry) at approximately 14 percent. Whitefish Lake nutrient sink percentages over the years range from 24 percent to 68 percent for phosphorus and 40 percent to 61 percent for nitrogen, meaning what goes into the lake is ultimately stored in the bottom sediments.

When the longitudinal profile of Whitefish Lake is analyzed it's clear that during peak flows, the north end of the lake is influenced by sediment and nutrient input by Swift and Lazy Creeks. This area of the lake shows a phosphorus limitation starting after the spring runoff in early July when loading decreases.

Towards the middle of the lake, a phosphorus limitation occurs sooner than at the north end of the lake. The earlier phosphorus limitation in this area is due to the precipitation of sediment with adsorbed phosphorus that has already occurred, and prior assimilation of phosphorus by algae.

It's clear that the lack of stream inputs near the lake outlet, coupled by sediment deposition and algal assimilation of nutrients in the lake before this site creates a predominately phosphorus limitation for the entire year. The issue is that this is also the most developed shoreline area of the lake where human inputs like failing septic systems and fertilizer runoff can drive algal production decreasing water clarity and water quality.

— Mike Koopal is executive director at Whitefish Lake Institute