**Nitrates in Storm Water – Why Recyclers Should Care.**

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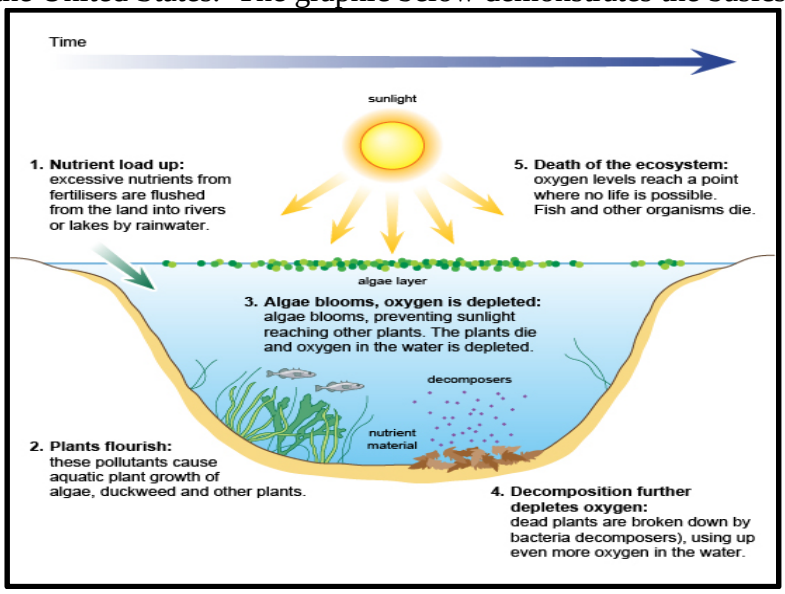
The Illinois Environmental Protection Agency (IEPA) requires all facilities, including automotive recyclers, to monitor for nitrogen in storm water discharges as part of its General NPDES Permit for Storm Water Discharges from Industrial Activities. Permittees are required to determine if nitrogen is present in storm water discharge and, if so, at what concentration. Nutrients can be such destructive contaminants in storm water runoff that they represent 3 of the 8 sampling parameters that are required for all industrial operations. These include Total Phosphorus, Nitrogen (Nitrates plus Nitrite), and Total Kjeldahl Nitrogen (TKN).

We will further discuss Phosphorus and some of its environmental effects in a future article. Nitrites and nitrates are formed when a nitrogen atom bonds with two or three oxygen atoms, respectively. The 'Nitrates plus Nitrite Nitrogen' analytical parameter specifically evaluates the presence of nitrites and nitrates in the sample. The TKN parameter evaluates the presence of organic nitrogen compounds, ammonia ($NH_3$), and ammonium ($NH_4^+$) in the sample. All of the abovementioned nutrients can wreak havoc on nearby water bodies through a process called eutrophication. For simplicity's sake, this article focuses primarily on nitrates' contribution to eutrophication, but all nutrients can play a role.

Nitrates are used in multiple business sectors including food processing, chicken/turkey production, confined animal feeding operations (CAFOs), dairy farms, irrigated and non-irrigated crops, lagoons, fertilizer for rural homesteads, swine production, landfills/dumps, septic systems, wastewater, and industrial water wells. As demonstrated in the above list, the agricultural sector is a major contributor to nitrates in the environment. This may prove to be an issue for rural yards as nitrates could migrate onto automotive recycling facilities from adjacent agricultural operations.

Eutrophication is a process where an aquatic system, a lake for instance, receives nutrients causing adverse effects on the ecosystem. Eutrophication occurs naturally, but an increase in nutrient-rich runoff from human activity has increased the rate and the severity of eutrophication in the United States. The graphic below demonstrates the basics of the process:



Graphic obtained from the British Broadcasting Casting (BBC) at
http://www.bbc.co.uk/schools/gcsebitesize/science/edexcel/problems_in_environment/pollutionrev4.shtml

As shown in the graphic, eutrophication starts when elevated concentrations of nutrients are introduced to an aquatic ecosystem in runoff. Just as nitrogen and phosphorus-rich fertilizers help crops grow, these same nutrients cause aquatic plants and algae to thrive. Algal blooms, a phenomenon where algae grow at faster than normal rates, are caused by increases in nutrient availability in aquatic ecosystems. Often, waterways affected by algal blooms are identifiable by bright colors at the surface of the water caused by algae, which are tiny aquatic microorganisms. Algal blooms can be different colors, for instance: increased numbers of algae known as dinoflagellates, in coastal ecosystems, can cause a noticeable red color to the water, known as red tide. Red tide can be a toxic phenomenon that can make ingestion of the water dangerous, and potentially deadly, to pets, livestock, and even humans.

The most pertinent impact of algal blooms, for this article, is the depletion of dissolved oxygen in the water. Algae present at the surface of a water body prevent sunlight from penetrating the water. Photosynthetic water plants that require sunlight are deprived and begin to die. The death of water plants' impact on the aquatic ecosystem is twofold: 1) the rate of dissolved oxygen recharge from the process of photosynthesis is decreased, and 2) the dead plant matter sinks to the bottom of the water body where bacteria work to break it down further depleting dissolved oxygen. Fish and other aquatic organisms require dissolved oxygen for life. As fish and other members of the ecosystem die, the bacterial decomposers break down the organic matter continually reducing the dissolved oxygen content in the water.

Eventually, if the nutrient-rich runoff is not prevented from reaching the water bodies, the dissolved oxygen can plummet so low that the water body is no longer capable of sustaining life. The ecosystem dies. Eutrophic bodies of water are known for low fish counts and reduced diversity of species. A lack of fish reduces food availability for humans, harms recreational fishing, and disrupts the food chain. When native fish die off, species not native to the region, called invasive species, are able to take over the newly available niche. Even if the algal blooms are eventually cleaned up and dissolved oxygen is restored, it can be incredibly difficult to remove invasive species that may have fully settled into that habitat.

Stay tuned for our next article where we continue to discuss the effects of the nutrients on the environment. We hope to see you all soon to continue to help everyone get into compliance!