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ECO TALK

Eco Talk: Why eco-friendly fertilizer management is complicated

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In my previous Eco Talk article on Feb. 7, I explained what the element phosphorus was and why too much of it can be bad for our environment. I also suggested that getting our soil tested and using these test results to plan how much fertilizer we apply is a great first step toward reducing our P impact on the environment. Professionals who work in the soil and water arena call this process of using current soil conditions to plan how much fertilizer to add and when to add it "fertilizer management."

To gain a better understanding of fertilizer management as it applies to P, we need to realize that P can take on various forms in the environment. If we think back to chemistry class, we remember that solids can be dissolved, meaning they become incorporated into a solution. For example, if you think of adding salt (sodium chloride, also known by its chemical formula NaCl) to your favorite soup. You add the salt as solid NaCl crystal, but when it comes in contact with the water in your soup it dissolves and can no longer be solid salt as NaCl. Instead, it becomes many sodium ions (Na^+) and chloride ions (Cl^-) floating around in your soup. Similarly to my salt example, P can have a dissolved form. This dissolved form is generally easier for plants and other soil organisms to use. It is the form that farmers and gardeners need to have in the soil to keep their plants healthy.

What we often do not realize is that P can also have a non-dissolved, or what is called particulate form in our soils. In fact, the majority (up to 80 percent) of P in our soils is in this form. Particulate P is not free to float around in the spaces between soil particles like dissolved P can and is, therefore, less available to plants and soil organisms. P in the particulate form can be attached to soil minerals like iron (Fe), aluminum (Al) and calcium (Ca) or clays, which are often a major component of soils. Finally, P can be tied up within living soil organic matter, such as microbes and other soil organisms, as well as non-living soil organic matter like decomposing leaves.

So by now you might be wondering, "What does this all have to do with fertilizer management?" The answer is complicated, or rather, fertilizer management becomes more complicated because we need to consider both forms of P if we wish to improve water quality. We can start asking questions like: "What type of fertilizer am I applying?" "What percentage of my fertilizer will be available once I apply it?" and "How will my soil conditions impact the amount of P that is available?"

All fertilizers are different in terms of the amount of P that will be immediately available (as dissolved P) or not (as particulate P). Additionally, the chemical properties of our soil such as temperature, pH and many others can impact whether P is in the dissolved or particulate form. For example, many farmers that have fields with an acidic soil (pH below 7) will add lime to their fields to increase soil pH because more P will be available to crops within a pH range of 6 to 7. However, if they add too much lime, their soil will become too basic (pH above 7) and P will no longer be available. Just as these soil properties change over time, the availability of P to plants and soil organisms can also change over time; P availability is dynamic and ever-changing.

In summary, it is important for us to realize that P forms (dissolved and particulate) can change over time and can also vary based on the conditions of our soil. By knowing these conditions, we can make educated decisions about how much fertilizer we need to apply, when we need to apply it, and what other strategies we can use to increase P availability for plants in our fields, lawns and gardens. We should realize that the decisions we make can influence the amount of P that is available to our plants, as well as the amount of P that makes its way to local water bodies. Stay tuned for my third article on how P is transported in the environment.