The objective of this document is to provide you with current and helpful information regarding water protection, and the Michigan Agriculture Environmental Assurance Program (MAEAP).

Precipitation extremes highlight the need for flexible, adaptive nitrogen management programs

As corn moves into mid-reproductive stages and its period of greater N uptake, ensuring adequate N fertility is essential to maximizing production. Existing N levels in the soil from pre-plant or starter fertilizer applications and optimal rates for in-season N application rates can be strongly influenced by precipitation. As of mid-June, southern areas of Michigan, particularly in the southwest corner of the state, have experienced as much as 10 inches of rain, more than 200% of normal. During the same time period, other areas of the state, including eastern portions of the Thumb, have seen less than 50% of their normal rainfall. Both situations, too much and too little rain, can require adjustments of N fertility programs.

The N in fertilizer is typically applied as urea, ammonium, nitrate, or combinations of these forms. All can be expected to transform into nitrate forms during the growing season, the form of N most often taken up by the plant. These nitrate forms, however, are highly water soluble and are subject to leaching in the soil, potentially moving downward out of the rooting zone. In waterlogged soil conditions, nitrates can undergo denitrification, being converted to gaseous N₂ that can be lost to the atmosphere. Sandy soil textures tend to be more prone to leaching losses, while heavier textures are subject to denitrification losses. Under high precipitation conditions, significant amounts of N can be lost through these pathways.

Dry conditions can create N management challenges as well. Urease enzymes that transform urea into ammonia require water as a living organisms, while the conversion of ammonia to ammonium is a chemical reaction that requires water. Placement of fertilizers can be especially important in dry conditions. Typically, water can be expected to better move N fertilizer in contact with roots, but without this mechanism, applied through shallow sidedress applications placed between corn rows, for instance, will not readily be intercepted by plant roots.

Most corn planters in Michigan are equipped with starter fertilizer, making up a portion of the total N needs of the crop. Around 55% of corn acres in Michigan receive an in-season N fertilizer application, indicating the remaining 45% of acres have the majority of N applied pre-plant. Typically, a pre-sidedress nitrate test (PSNT) is used to better inform in-season N application rates. In areas of southern Michigan that have seen high rainfall amounts, PSNT testing will also be useful this year even if the full N rates were applied pre-plant to determine if rescues applications are necessary.

Crop advisors are an excellent resource for growers looking to assess in-field N status and formulate in-season N management plans. The extreme rainfall conditions seen in Michigan this spring highlight the need for flexible and adaptable N management systems. Rapid, informed in-season management of N fertility promises to have both economic and environmental benefits in these challenging conditions.