not be limiting. The shape and slope of individual nitrogen and phosphorus growth-response curves usually differ only in magnitude and scale, with nitrogen showing a stronger potential growth response than phosphorus, particularly in mineral soils. In general, yield response to phosphorus is not as consistent or dramatic as response to nitrogen. Any fertilization which raises nutrient concentration above the optimal zone is counter-productive. Decrease in growth at higher nitrogen or phosphorus levels can be the result of salt build-up, acidity, or direct interference with chemical processes occurring within the plant.

In summary, plants will take up nutrients and respond according to their physiological state and the presence of other factors limiting growth. Many such factors may be present in the field, so maximum potential growth is rarely achieved. Since these factors limit a plant's potential growth in response to fertilizer application, fertilizer rates should accordingly be adjusted downward.

PROCESSES AFFECTING TRANSPORT: CYCLES OF NITROGEN AND PHOSPHORUS TRANSFORMATION

The previous section pointed out the relationships between the soil, plants, and nutrients related to growth; but how are these nutrients, often considered to be pollutants, leaving the field? At first glance the answer is simple: WATER. Where water flows so will the substances contained within it. However, controlling these losses becomes complicated when trying to determine how nutrients get into water and how long they will remain there.

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The solution lies partially in an understanding of the transport capacities of water and in nitrogen and phosphorus cycles of transformation. In order for water to transport a substance the substance must be physically within the water, either suspended as particulate matter or dissolved in solution. Water movement within the soil by percolation or leaching usually will filter out the suspended materials so that only dissolved materials are transported to groundwater. Sometimes, in fractured soils with cracks or root channels, or in well-structured soils, fine colloidal