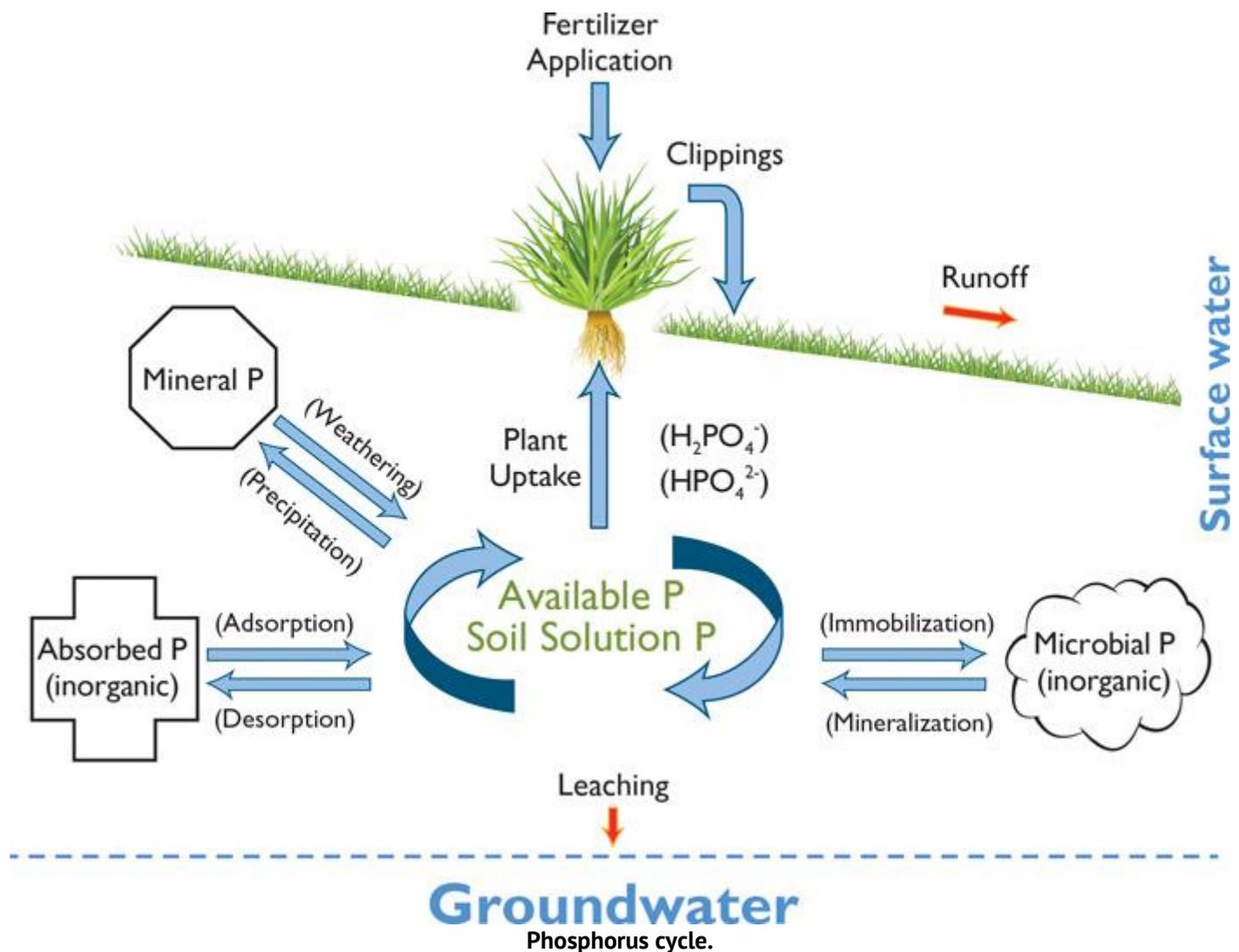


Phosphorus

Phosphorus (P) is a critical nutrient for turfgrass growth and development, playing important roles in energy transformations in plant cells and root development. Therefore, P enhances turfgrass establishment and is the most important nutrient in 'starter fertilizers'. On soils low in P, most of the enhanced establishment is from the (N). Phosphorus management is focused on maximizing plant response to supplemental phosphorus, when required as based on soil test results, while minimizing offsite movement.

In the soil, P is generally in complex with other elements and is an insoluble (plant unavailable) nutrient. Phosphorus is slowly made available to plants on an 'as needed' basis by chemical reactions in the soil that convert it to either of two anionic forms, hydrogen phosphate (HPO_4^{2-}) or dihydrogen phosphate (H_2PO_4^-).



A soil is considered to have a phosphorus deficiency if it is at or below the medium sufficiency level. Research has often found that turfgrass shows signs of distress at P levels of 5 to 11 ppm (Mehlich III), a range considered Low or Very Low. The medium sufficiency ratings for each test method are shown in the table below.

Medium sufficiency levels by test method. Source: <http://nmsp.cals.cornell.edu/software/Morganequiv7.xls>

Test Method/Extractant	Medium Sufficiency	
	ppm	lbs/acre
Mehlich-3	26-54	52-108
Bray P1	15-30	30-60
Olsen	12-28	24-56
Morgan (for agronomic crops)	10-20	20-40
Modified Morgan/Cornell (for turf)	< 2	1-4

Testing labs provide recommendations for the amount of phosphorus fertilizer needed to correct the deficiency. In the table below recommendations are made separately for fertilizing established turfgrass or for pre-plant fertilization to establish a new stand of turf with either seeded or sodded turfgrass.

Phosphorus fertilizer recommendations for turfgrass (Petrovic 2012)

Established Turfgrass	Current Recommendations		P ₂ O ₅ Recommended lbs/acre
	Morgan lbs/acre	Mehlich-3 lbs/acre	
Low	< 1	< 3	80
Medium	≥ 1	≥ 3	40
High	> 4	> 12	0
Newly Seeded or Sodded Turfgrass	< 1	< 3	140
	≥ 1	≥ 3	100
	≥ 4	≥ 12	60
	≥ 8	≥ 24	40