



Soil and Water Science

Research Brief

University of Florida

Institute of Food and Agricultural Sciences

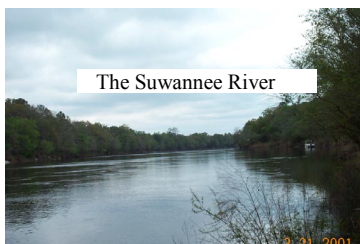
THRESHOLD DEGREE OF PHOSPHORUS SATURATION (DPS) FOR FLORIDA'S SANDY SOILS

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Soil tests were originally designed and calibrated to evaluate soil fertility for crop production. However, in Florida and in most of the US, soil fertility tests for phosphorus (STP) are currently used for environmental evaluation of P saturation even though calibration for such purposes is minimal. For example, STP is a factor in the Florida P-Index. Details of the Florida P-Index can be found at:

<http://www.fl.nrcs.usda.gov/flgeneral/pifinal.pdf>

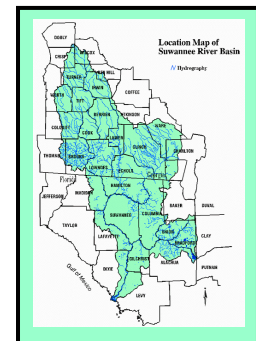
The need for an indicator to assess the potential of P moving from its application site to surface waters either via surface runoff or subsurface drainage is critical. The sandy soils of the Suwannee River Basin, which receive significant loadings of animal manure, are an ideal testing site for an environmental indicator.



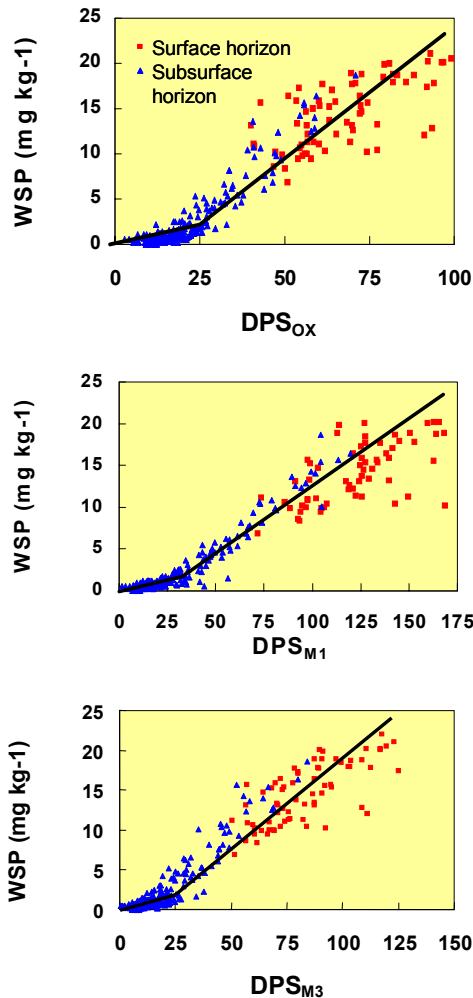
The Degree of P Saturation (DPS), a concept first introduced in the Netherlands, relates extractable P

concentration in a soil to its P sorbing capacity and is an indicator of the P likely to be mobilized from a soil. DPS_{Ox} , expressed as a percent, is calculated by dividing the ammonium oxalate-extractable P by the sum of oxalate-extractable Fe and Al. Soil profiles with weighted DPS values $>25\%$ have been identified in the Netherlands as contributing to groundwater P pollution.

For DPS evaluation, soil profiles were selected from four manure-impacted and four non-impacted dairy sites within the Suwannee River Basin.



Oxalate extractions are not common in Florida, so use of the DPS approach would require a more appropriate analytical protocol. Mehlich 1 is the common soil test extractant for P while Mehlich 3 is becoming increasingly popular. We determined DPS_{OX} for several manure-impacted surface and subsurface soils and compared the results with DPS calculated using Mehlich 1 (DPS_{M1}) and Mehlich 3 (DPS_{M3}) as the extractants for P, Fe, and Al. The DPS values calculated by the various methods were related to water soluble P (WSP).



In all three cases of DPS calculations (using oxalate, Mehlich-1, or Mehlich-3), it was noticed that the relationship between water soluble P and DPS has an abrupt slope change at about 25% DPS. If the 25% DPS value is taken as a critical DPS for Florida soils, a large percentage of manure-impacted surface soils will exceed the value, and could potentially be a risk to water quality.

It should be noted that there are several soils with $DPS > 25\%$ even at the subsurface horizon, and therefore, P likely may have moved down into the soil profiles of these manure-impacted soils. The average DPS (irrespective of the analytical method) for non-impacted surface soils in this region was $< 20\%$.

Given that DPS_{M1} can be readily obtained in Florida soil testing programs and there is strong evidence in the literature for the 25% DPS being a critical value for environmental risk, it may be desirable to replace STP with DPS_{M1} as an indicator of P release potential in the management factor in Florida's P-Index. This possibility of introduction of the DPS factor in the Florida P-Index matrix is currently being explored with the aid of a USDA-IFAFS grant (PIs: W.G. Harris and V.D. Nair).

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